114th Congress, 2d Session – – – – – – – – – – – – – House Document 114–139

# SKOKOMISH RIVER BASIN ECOSYSTEM RESTORATION, MASON COUNTY, WASHINGTON

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## COMMUNICATION

FROM

## THE ASSISTANT SECRETARY OF THE ARMY, CIVIL WORKS, THE DEPARTMENT OF DEFENSE

TRANSMITTING

THE SKOKOMISH RIVER BASIN ECOSYSTEM RESTORATION PROJECT IN MASON COUNTY, WASHINGTON FOR APRIL 2015, PURSUANT TO PUBLIC LAW 87–874, SEC. 209; (76 STAT. 1197)

## PART 2 OF 2

MAY 23, 2016.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

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20–222 WASHINGTON : 2016

# SKOKOMISH GENERAL INVESTIGATION: ECOSYSTEM RESTORATION
# SKOKOMISH, WASHINGTON

## DRAFT
## GEOTECHNICAL REPORT

26 OCTOBER 2014

PREPARED BY

SOILS SECTION, DESIGN BRANCH
SEATTLE DISTRICT, U.S. ARMY CORPS OF ENGINEERS

Skokomish General Investigation: Ecosystem Restoration
Skokomish, Washington

1. General. This project consists of construction of two setback levees along the right descending bank of the Skokomish River. The purpose of this geotechnical report is to provide information regarding potential borrow sources for levee construction.

2. Potential Borrow Sources & Sample Collection.

Samples for levee fill were taken at two general locations near the project site. First, approximately 40,000 loose cubic yards of potential borrow material is stockpiled approximately 7 miles away from the proposed project sites. The source of the spoil is a roadside slope re-grade near US-101. Additional material from future WSDOT slope re-grades will be stockpiled for these purposes. The location of the first source is 6351 McReavy Road in Shelton, WA. The second source is a potential borrow source from the hill south of the Skokomish Valley. Site soils are of the Grove series classified as gravelly sandy loam (SM) by NRCS. An NRCS soil map is attached at the end of this report. For reference, the geologic map of the Skokomish Valley and Union 7.5-minute quadrangles, Mason County, Washington (2010) was included at the end of this report. Samples were collected along California Road. See Figure 1 below for approximate sample locations.

Six samples were taken to analyze the suitability for potential levee fill. Four samples were taken from the first potential fill source and 2 samples were collected along California Road. (See photos section below.) Soils were visually classified in accordance with the Unified Soil Classification System (ASTM D 2487 and ASTM D 2488). A total of six disturbed soil samples were collected from the site visit. Samples were collected in sealable sample bags soon immediately after collection.

Figure 1: Location of Potential Levee Fill Samples Collected

3. Laboratory Testing

From the six samples collected, five samples were tested for moisture content (ASTM D2216) and grain size analysis (ASTM C136/C117, ASTM D422). Sample number 4 from the McReavy Road stockpile was not tested due to similarities with 3 other samples. All geotechnical laboratory testing was completed by the U.S. Army Corps of Engineers (USACE) soils laboratory.

4. Results

The USCS soil classification are percent passing are tabulated below in Table 1. Gradation curves are attached to the end of the report.

Table 1: Soil Sample Gradation Curves

| Sample | USCS | % Fines |
|---|---|---|
| **Sample 1** | SP | 3.9 |
| **Sample 2** | SP-SM | 5.9 |
| **Sample 3** | SP-SM | 6.5 |
| **Sample 5** | GW-GM | 9.1 |
| **Sample 6** | GM | 12.1 |

5. Photos

Figure 2: McReavy Road Stockpile (Potential Borrow Source Site 1)

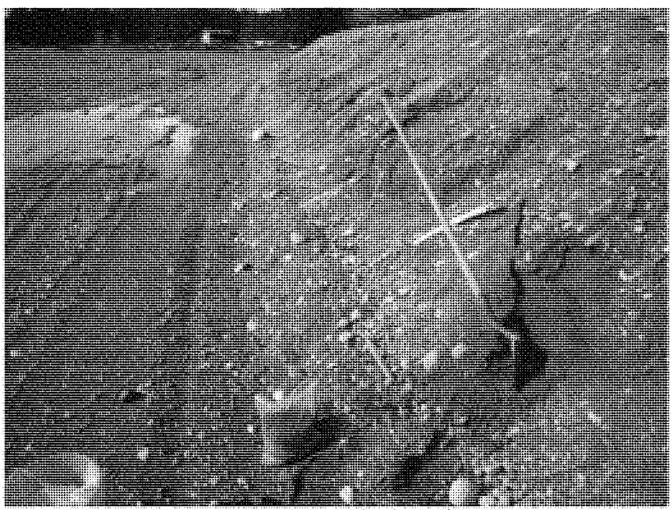
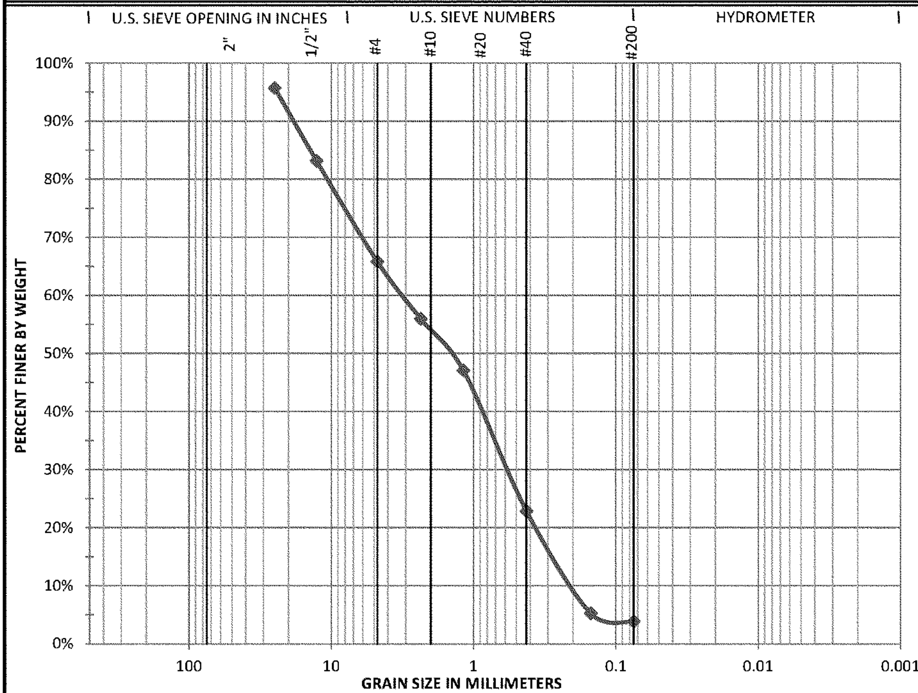


Figure 3: McReavy Road Stockpile: Sample 3

Figure 4: California Road Sample 5 Collection Point (Potential Borrow Source Site 2)

Figure 5: Figure 4: California Road Sample 6 Collection Point (Potential Borrow Source Site 2)

## Grain Size Analysis




| COBBLES | GRAVEL | SAND | | | SILT or CLAY |
|---|---|---|---|---|---|
| | | coarse | medium | fine | |

| Sieve Size | Percent Finer |
|---|---|
| 1" | 95.7% |
| 1/2" | 83.2% |
| #4 | 65.8% |
| #8 | 55.9% |
| #16 | 47.1% |
| #40 | 22.9% |
| #100 | 5.2% |
| #200 | 3.9% |

**Sample Name:** Sample 1
**Depth:** Surface
**USCS Classification & Description:** SP, Poorly graded SAND with Gravel
**Test Date:** 23-Oct-14

**Natural Moisture Content:** 6.03%

$D_{60}$: 3.1 $C_c$ 0.53
$D_{30}$: 0.6 $C_u$ 5.17
$D_{10}$: 0.22

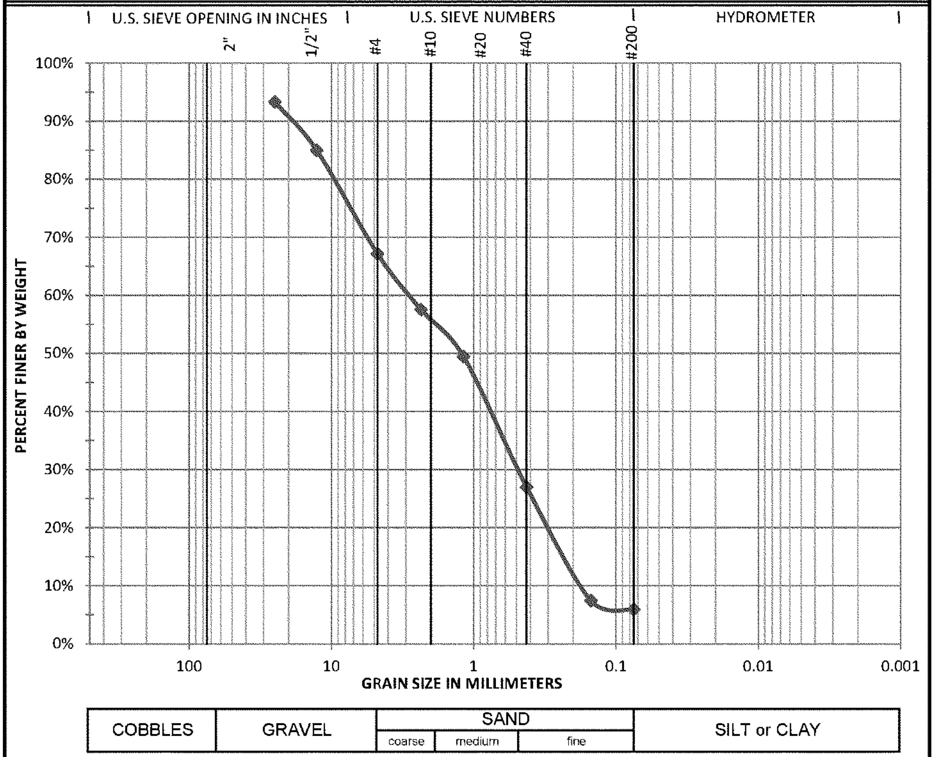
$C_c = D_{30}^2/(D_{60}*D_{10})$
$C_u = D_{60}/D_{30}$

To be well graded: $1 < C_c < 3$ & $C_u > 4$ for GW or $C_u > 6$ for SW

Skokomish GI: Ecosystem Restoration

**Seattle District**
**Army Corps of Engineers**
**CENWS-EN-DB-SS**

## Grain Size Analysis




| Sieve Size | Percent Finer |
|---|---|
| 1" | 93.3% |
| 1/2" | 85.0% |
| #4 | 85.0% |
| #8 | 57.6% |
| #16 | 49.5% |
| #40 | 27.0% |
| #100 | 7.4% |
| #200 | 5.9% |

**Sample Name:** Sample 2
**Depth:** Surface
**USCS Classification & Description:** SP-SM, Poorly graded SAND with Silt & Gravel
**Test Date:** 23-Oct-14

**Natural Moisture Content:** 7.54%

| | | | |
|---|---|---|---|
| **$D_{60}$:** | 2.9 | **$C_c$** | 0.47 |
| **$D_{30}$:** | 0.5 | **$C_u$** | 5.80 |
| **$D_{10}$:** | 0.185 | | |

$C_c = D_{30}^2/(D_{60}*D_{10})$
$C_u = D_{60}/D_{30}$

To be well graded: $1 < C_c < 3$ & $C_u > 4$ for GW or $C_u > 6$ for SW

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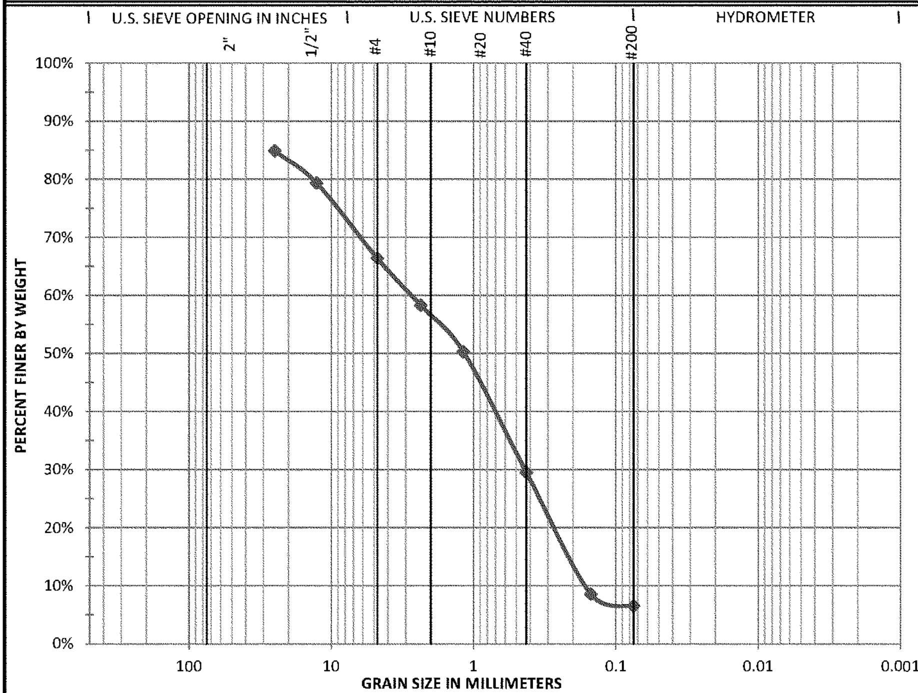
**Army Corps of Engineers**

**CENWS-EN-DB-SS**

# Grain Size Analysis




| COBBLES | GRAVEL | SAND | | | SILT or CLAY |
|---|---|---|---|---|---|
| | | coarse | medium | fine | |

| Sieve Size | Percent Finer |
|---|---|
| 1" | 84.9% |
| 1/2" | 79.4% |
| #4 | 66.4% |
| #8 | 58.3% |
| #16 | 50.3% |
| #40 | 29.5% |
| #100 | 8.5% |
| #200 | 6.5% |

**Sample Name:** Sample 3
**Depth:** Surface
**USCS Classification & Description:** SP-SM, Poorly graded SAND with Silt & Gravel
**Test Date:** 26-Oct-14

**Natural Moisture Content:** 8.21%

**$D_{60}$:** 2.9 **$C_c$** 0.41
**$D_{30}$:** 0.45 **$C_u$** 6.44
**$D_{10}$:** 0.17

$C_c = D_{30}^2/(D_{60}*D_{10})$
$C_u = D_{60}/D_{30}$

To be well graded: $1 < C_c < 3$ & $C_u > 4$ for GW or $C_u > 6$ for SW

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**Army Corps of Engineers**

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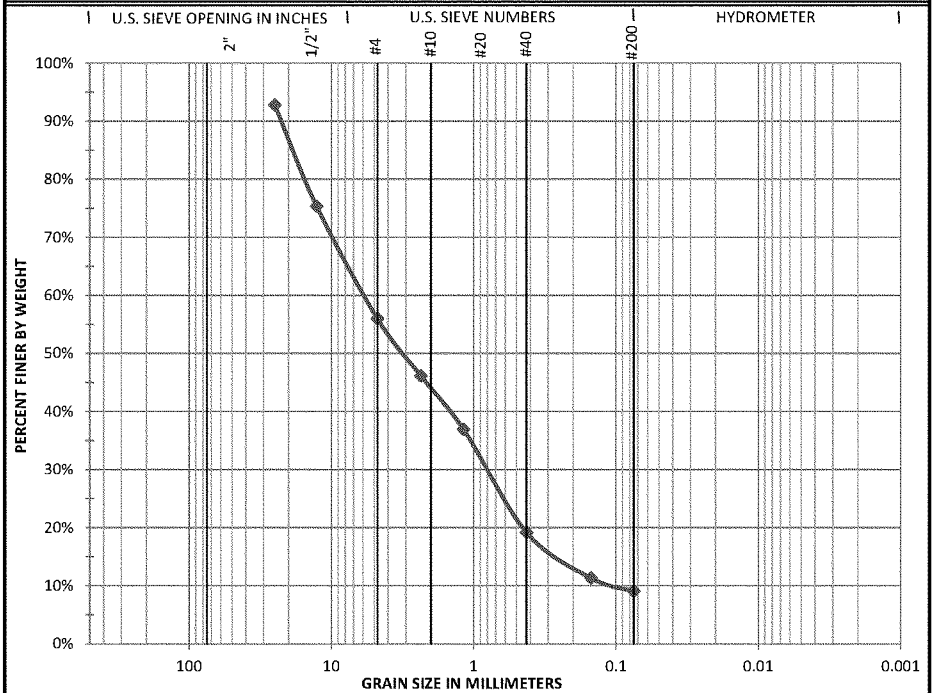
## Grain Size Analysis




| Sieve Size | Percent Finer |
|---|---|
| 1" | 92.7% |
| 1/2" | 75.3% |
| #4 | 56.0% |
| #8 | 46.1% |
| #16 | 36.9% |
| #40 | 19.2% |
| #100 | 11.3% |
| #200 | 9.1% |

**Sample Name:** Sample 5

**Depth:** Surface

**USCS Classification & Description:** GW-GM, Well graded GRAVEL with Silt & Sand

**Test Date:** 26-Oct-14

**Natural Moisture Content:** 9.36%

| | | | |
|---|---|---|---|
| **$D_{60}$:** | 6 | **$C_c$** | 1.07 |
| **$D_{30}$:** | 0.8 | **$C_u$** | 7.50 |
| **$D_{10}$:** | 0.1 | | |

$C_c = D_{30}^2/(D_{60}*D_{10})$
$C_u = D_{60}/D_{30}$

To be well graded: $1 < C_c < 3$ & $C_u > 4$ for GW or $C_u > 6$ for SW

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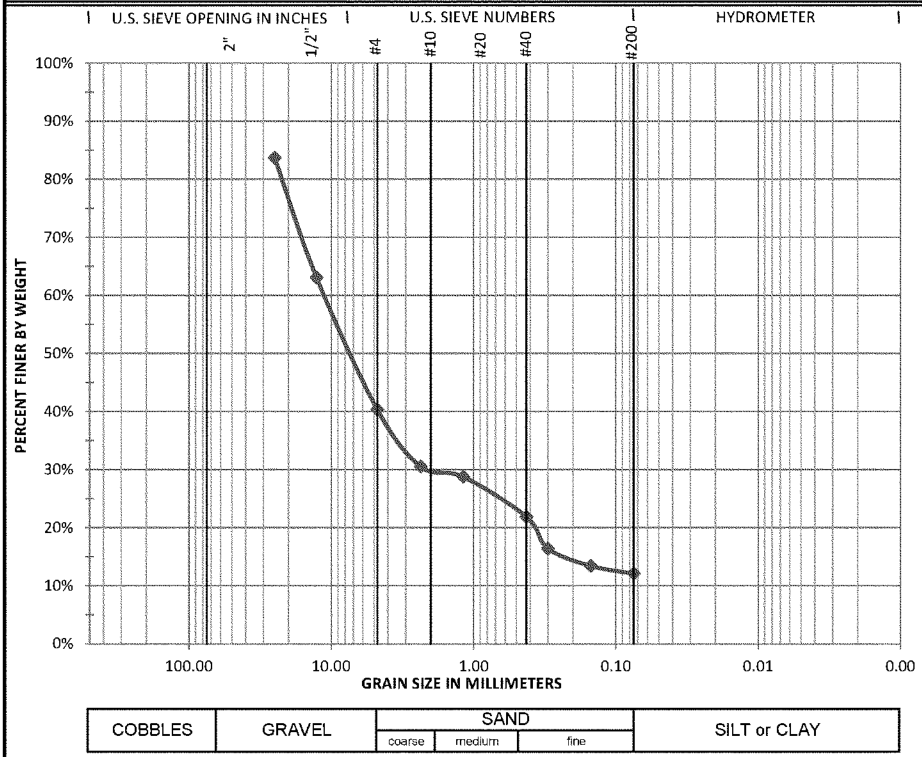
## Grain Size Analysis




| Sieve Size | Percent Finer |
|---|---|
| 1" | 83.7% |
| 1/2" | 63.1% |
| #4 | 40.4% |
| #8 | 30.5% |
| #16 | 28.8% |
| #40 | 21.9% |
| #100 | 13.4% |
| #200 | 12.1% |

**Sample Name:** Sample 6

**Depth:** Surface

**USCS Classification & Description:** GM, Silty GRAVEL with Sand

**Test Date:** 23-Oct-14

**Natural Moisture Content:** 10.99%

**$D_{60}$:** 11.00 **$C_c$** 4.85

**$D_{30}$:** 2.00 **$C_u$** 5.50

**$D_{10}$:** 0.075

$C_c = D_{30}^2/(D_{60}*D_{10})$

$C_u = D_{60}/D_{30}$

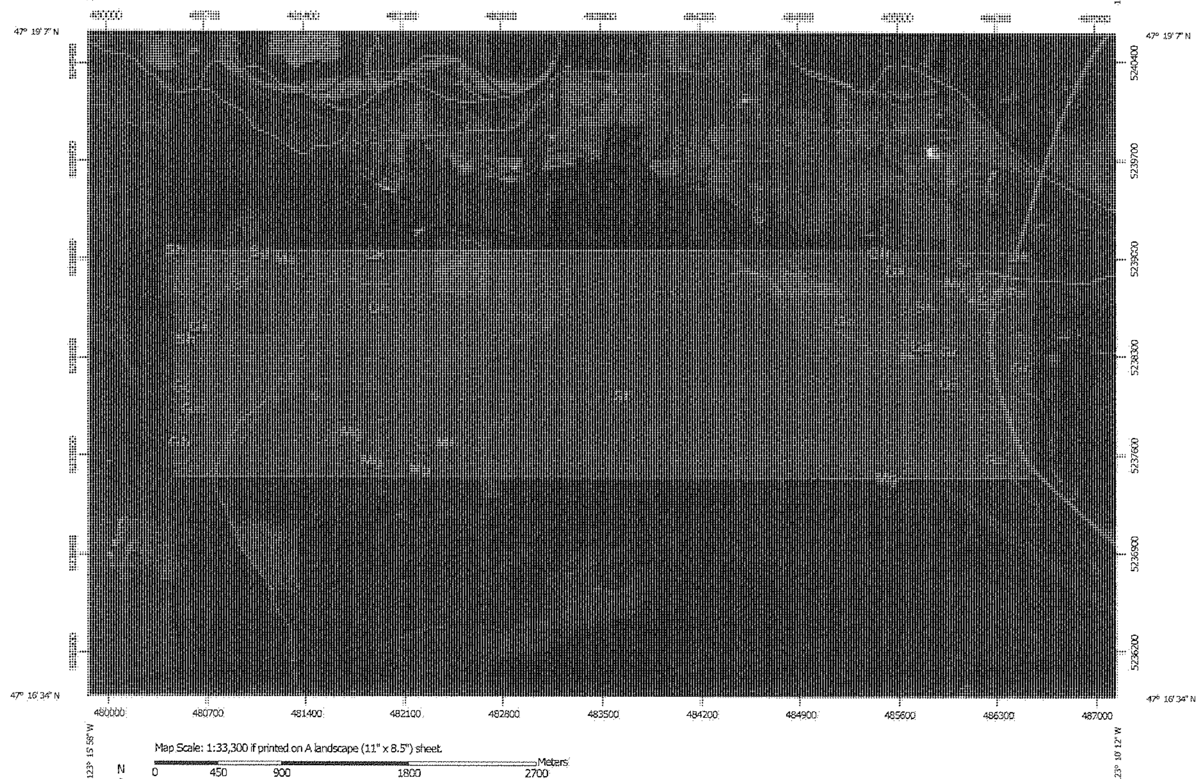
To be well graded: $1 < C_c < 3$ & $C_u > 4$ for GW or $C_u > 6$ for SW

Skokomish GI: Ecosystem Restoration

**Seattle District**
**Army Corps of Engineers**

**CENWS-EN-DB-SS**

Unified Soil Classification (Surface)—Mason County, Washington
(Soil Map South of Skokomish Valley)




Map Scale: 1:33,300 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 | 450 | 900 | 1800 | 2700

Feet: 0 | 1500 | 3000 | 6000 | 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**
- CH
- CL
- CL-A (proposed)
- CL-K (proposed)
- CL-ML
- CL-O (proposed)
- CL-T (proposed)
- GC
- GC-GM
- GM
- GP
- GP-GC
- GP-GM
- GW
- GW-GC
- GW-GM
- MH
- MH-A (proposed)
- MH-K (proposed)
- MH-O (proposed)
- MH-T (proposed)
- ML
- ML-A (proposed)
- ML-K (proposed)
- ML-O (proposed)
- ML-T (proposed)
- OH
- OH-T (proposed)
- OL
- PT
- SC
- SC-SM
- SM
- SP
- SP-SC
- SP-SM
- SW
- SW-SC
- SW-SM
- Not rated or not available

**Soil Rating Lines**
- CH
- CL
- CL-A (proposed)
- CL-K (proposed)
- CL-ML
- CL-O (proposed)
- CL-T (proposed)
- GC
- GC-GM
- GM
- GP
- GP-GC
- GP-GM
- GW
- GW-GC
- GW-GM
- MH
- MH-A (proposed)
- MH-K (proposed)
- MH-O (proposed)
- MH-T (proposed)
- ML
- ML-A (proposed)
- ML-K (proposed)
- ML-O (proposed)
- ML-T (proposed)
- OH
- OH-T (proposed)
- OL
- PT
- SC
- SC-SM
- SM
- SP
- SP-SC
- SP-SM
- SW
- SW-SC
- SW-SM
- Not rated or not available

**Soil Rating Points**
- CH
- CL
- CL-A (proposed)
- CL-K (proposed)
- CL-ML
- CL-O (proposed)
- CL-T (proposed)
- GC
- GC-GM
- GM
- GP
- GP-GC
- GP-GM
- GW
- GW-GC
- GW-GM
- MH
- MH-A (proposed)
- MH-K (proposed)
- MH-O (proposed)
- MH-T (proposed)
- ML
- ML-A (proposed)
- ML-K (proposed)
- ML-O (proposed)
- ML-T (proposed)
- OH
- OH-T (proposed)
- OL
- PT
- SC
- SC-SM
- SM
- SP
- SP-SC
- SP-SM
- SW
- SW-SC
- SW-SM
- Not rated or not available

**Water Features**
- Streams and Canals

**Transportation**
- Rails

## MAP INFORMATION

Interstate Highways

US Routes

Major Roads

Local Roads

**Background**

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:31,700.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mason County, Washington
Survey Area Data: Version 10, Sep 30, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Unified Soil Classification (Surface)

| Unified Soil Classification (Surface)— Summary by Map Unit — Mason County, Washington (WA645) | | | | |
|---|---|---|---|---|
| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
| Dk | Dungeness silt loam, 0 to 2 percent slopes | ML | 3.1 | 0.1% |
| Gb | Grove cobbly sandy loam, 0 to 5 percent slopes | SM | 9.8 | 0.4% |
| Gc | Grove cobbly sandy loam, 5 to 15 percent slopes | SM | 53.0 | 2.2% |
| Gd | Grove cobbly sandy loam, 15 to 30 percent slopes | SM | 5.9 | 0.2% |
| Gh | Grove gravelly sandy loam, 0 to 5 percent slopes | SM | 513.9 | 21.2% |
| Gk | Grove gravelly sandy loam, 5 to 15 percent slopes | SM | 37.0 | 1.5% |
| Gm | Grove gravelly sandy loam, 15 to 30 percent slopes | SM | 7.8 | 0.3% |
| Gn | Grove gravelly sandy loam, 30 to 45 percent slopes | SM | 105.3 | 4.3% |
| Go | Grove gravelly sandy loam, basin phase, 0 to 5 percent slopes | SM | 94.5 | 3.9% |
| Me | McMurray peat, 0 to 2 percent slopes | PT | 1.4 | 0.1% |
| Mg | Mukilteo peat, 0 to 2 percent slopes | PT | 57.6 | 2.4% |
| Mh | Mukilteo peat, shallow over gravel, 0 to 2 percent slopes | PT | 0.9 | 0.0% |
| Pd | Puget silt loam, 0 to 2 percent slopes | ML | 7.9 | 0.3% |
| Sf | Shelton gravelly sandy loam, 5 to 15 percent slopes | GM | 1,345.0 | 55.4% |
| Sg | Shelton gravelly sandy loam, 15 to 30 percent slopes | GM | 0.7 | 0.0% |
| Sh | Shelton gravelly sandy loam, 30 to 45 percent slopes | GM | 151.8 | 6.3% |

| Unified Soil Classification (Surface)— Summary by Map Unit — Mason County, Washington (WA645) | | | | |
|---|---|---|---|---|
| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
| Sr | Skokomish silt loam, 0 to 3 percent slopes | ML | 31.9 | 1.3% |
| Totals for Area of Interest | | | 2,427.4 | 100.0% |

## Description

The Unified soil classification system classifies mineral and organic mineral soils for engineering purposes on the basis of particle-size characteristics, liquid limit, and plasticity index. It identifies three major soil divisions: (i) coarse-grained soils having less than 50 percent, by weight, particles smaller than 0.074 mm in diameter; (ii) fine-grained soils having 50 percent or more, by weight, particles smaller than 0.074 mm in diameter; and (iii) highly organic soils that demonstrate certain organic characteristics. These divisions are further subdivided into a total of 15 basic soil groups. The major soil divisions and basic soil groups are determined on the basis of estimated or measured values for grain-size distribution and Atterberg limits. ASTM D 2487 shows the criteria chart used for classifying soil in the Unified system and the 15 basic soil groups of the system and the plasticity chart for the Unified system.

The various groupings of this classification correlate in a general way with the engineering behavior of soils. This correlation provides a useful first step in any field or laboratory investigation for engineering purposes. It can serve to make some general interpretations relating to probable performance of the soil for engineering uses.

For each soil horizon in the database one or more Unified soil classifications may be listed. One is marked as the representative or most commonly occurring. The representative classification is shown here for the surface layer of the soil.

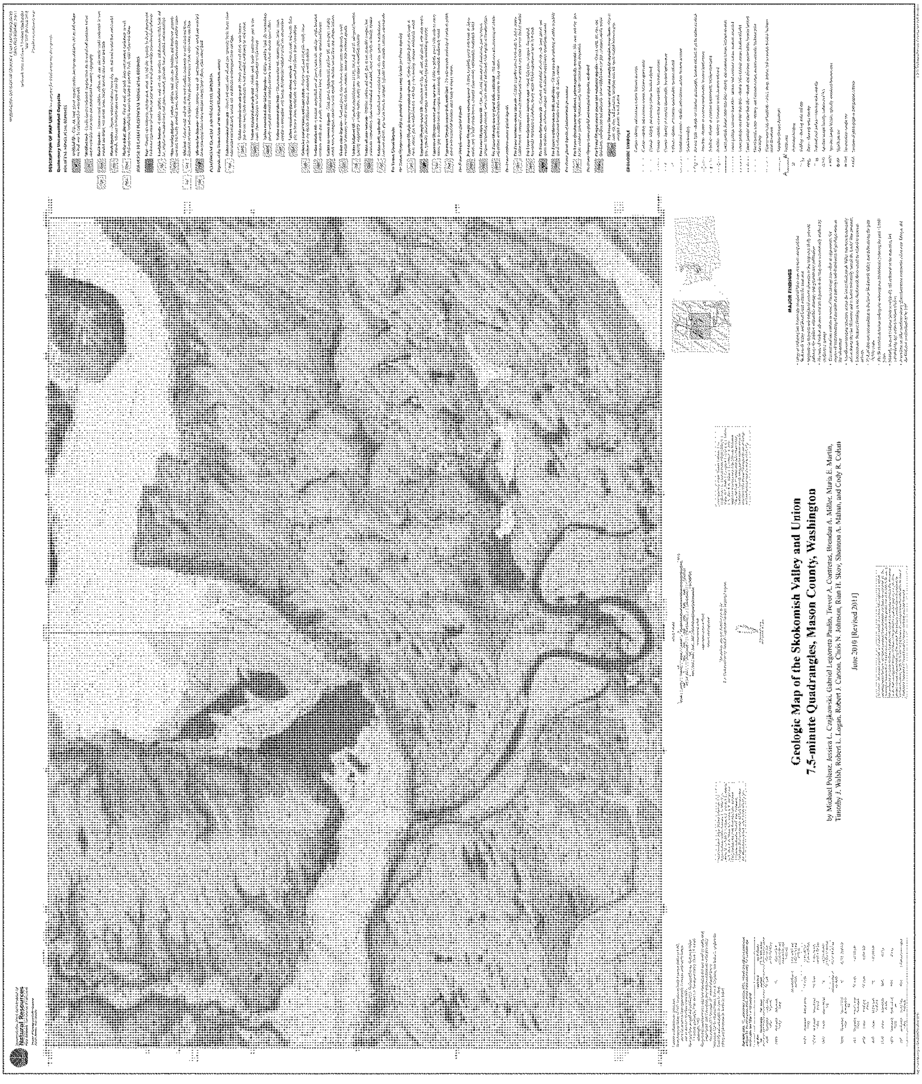
## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

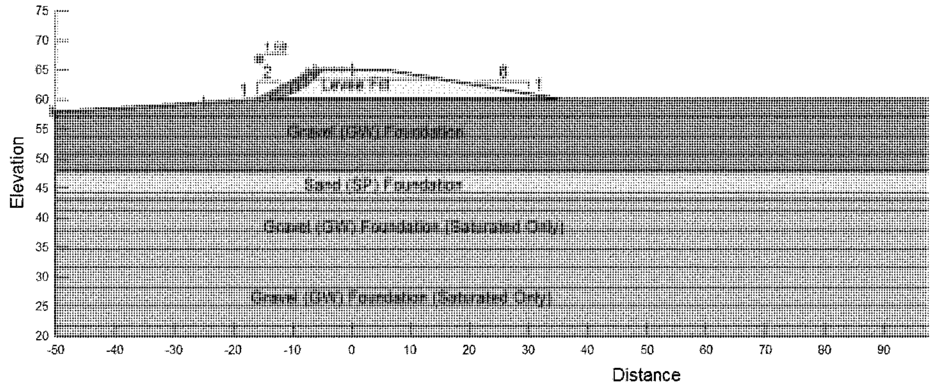
*Tie-break Rule:* Lower

*Layer Options (Horizon Aggregation Method):* Surface Layer (Not applicable)


Geologic Map of the Skokomish Valley and Union
7.5-minute Quadrangles, Mason County, Washington
by Michael Polenz, Jessica L. Czajkowski, Gabriel Legorreta Paulin, Trevor A. Contreras, Brendan A. Miller, Maria E. Martin,
Timothy J. Walsh, Robert L. Logan, Robert J. Carson, Chris N. Johnson, Ruth H. Skov, Shannon A. Mahan, and Cody R. Cohan
June 2010 [Revised 2011]

Skokomish General Investigation
River Mile 9 Levee Setback
Station 2+00
BH-01
Levee Design Elevation: 64.5'
Added 6" raise for settlement.

Errata Note: Design based on 17,000 cfs. See Section 1.6 of the Engineering Appendix.




Name: Levee Fill (SM)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Well graded Gravel (GW) Foundation
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Poorly Graded Sand (SP) Foundation (Saturated Only)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Well graded Gravel (GW) Foundation (Saturated Only)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

**Slope Stability Analyses**
**Rivermile 9 Levee, Section 1- Station 2+00**
**Static Slope Stability**

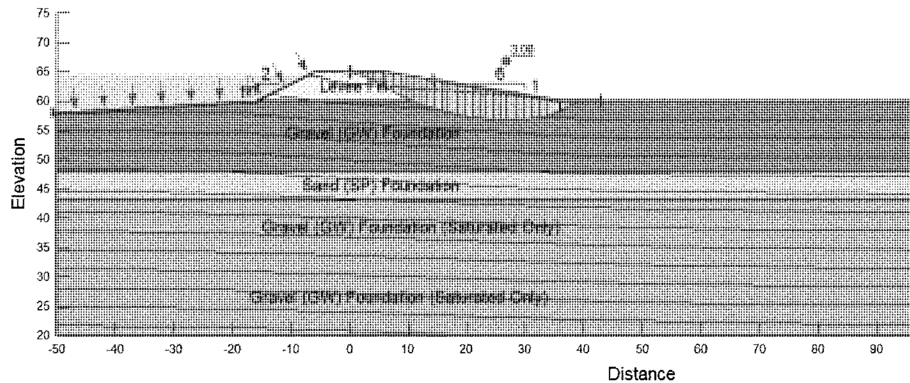
***Skokomish General Investigation***
***Skokomish, WA***

*U.S. Army Corps of Engineers*
*Seattle District*

**Figure B-1**

Skokomish General Investigation
River Mile 9 Levee Setback
Station 2+00
BH-01
Levee Design Elevation: 64.5'
Added 6" raise for settlement.

Errata Note: Design based on 17,000 cfs. See Section 1.6 of the Engineering Appendix.




Name: Levee Fill (SM)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Well graded Gravel (GW) Foundation
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Poorly Graded Sand (SP) Foundation (Saturated Only)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Well graded Gravel (GW) Foundation (Saturated Only)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

**Slope Stability Analyses**
**Rivermile 9 Levee, Section 1- Station 2+00**
**Steady Seepage Slope Stability**

***Skokomish General Investigation***
***Skokomish, WA***

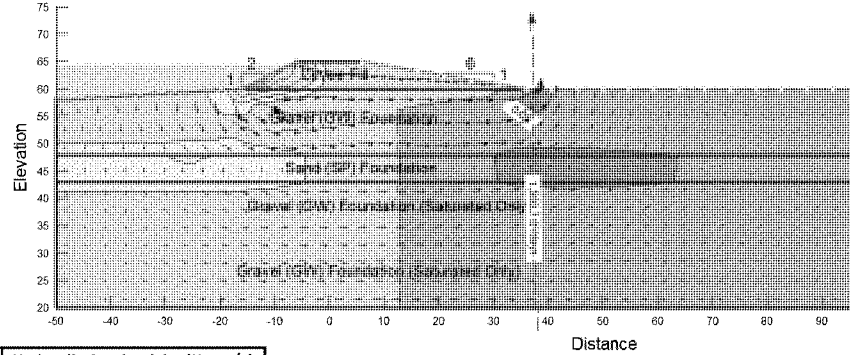
*U.S. Army Corps of Engineers*
*Seattle District*

**Figure B-2**

Skokomish General Investigation
River Mile 9 Levee Setback
Station 2+00
BH-01

Errata Note: Design based on 17,000 cfs. See Section 1.6 of the Engineering Appendix.

Levee Design Elevation: 64.5'
Added 6" raise for settlement.




| Soil Type | Hydraulic Conductivity (K, cm/s) |
|---|---|
| Levee Fill | 5.00E-04 |
| ML | 5.00E-05 |
| SM | 1.00E-04 |
| SP-SM | 1.00E-02 |
| SP | 5.00E-02 |
| GW/GP | 5.00E-01 |

*Average Vertical Exit Gradient (0-2' below toe)
$(i_{y\,AVG}) = 0.05$

$FS = (\gamma_{soil}-\gamma_{w})/(i_y*\gamma_w)$
$= (120-62.4)/(0.05*62.4)$
$= 18.5$

**Slope Stability Analyses**
**Rivermile 9 Levee, Section 1- Station 2+00**
**Steady State Seepage**

***Skokomish General Investigation***
***Skokomish, WA***

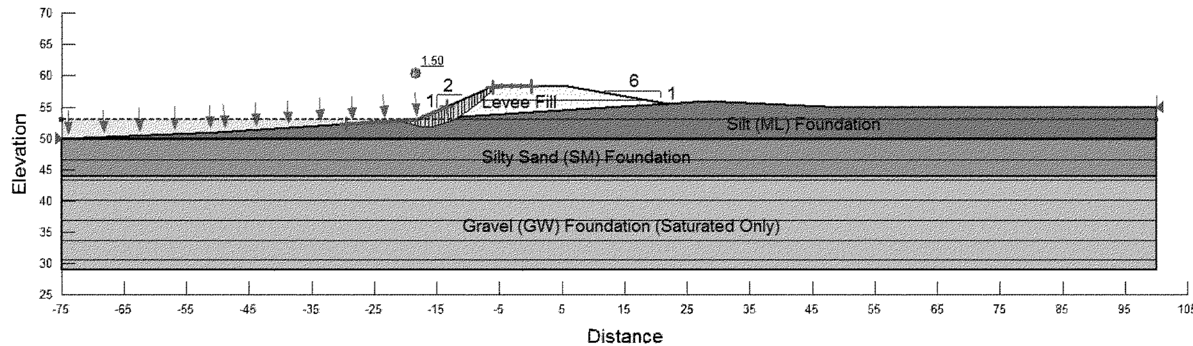
*U.S. Army Corps of Engineers*
*Seattle District*

**Figure B-3**

Skokomish General Investigation
River Mile 9 Levee Setback
Station 25+00
BH-05R

Errata Note: Design based on 17,000 cfs. See Section 1.6 of the Engineering Appendix.

Levee Design Elevation: 58.25'
Added 9" for settlement




Name: Levee Fill (SM)
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Silt (ML) Foundation
Unit Weight: 110 pcf
Cohesion': 0 psf
Phi': 30 °

Name: Well graded Gravel (GP-GM/GP) Foundation (Saturated Only)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Silty Sand (SM) Foundation
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 32 °

**Slope Stability Analyses**
**Rivermile 9 Levee, Section 1- Station 25+00**
**Static Slope Stability**

***Skokomish General Investigation***
***Skokomish, WA***

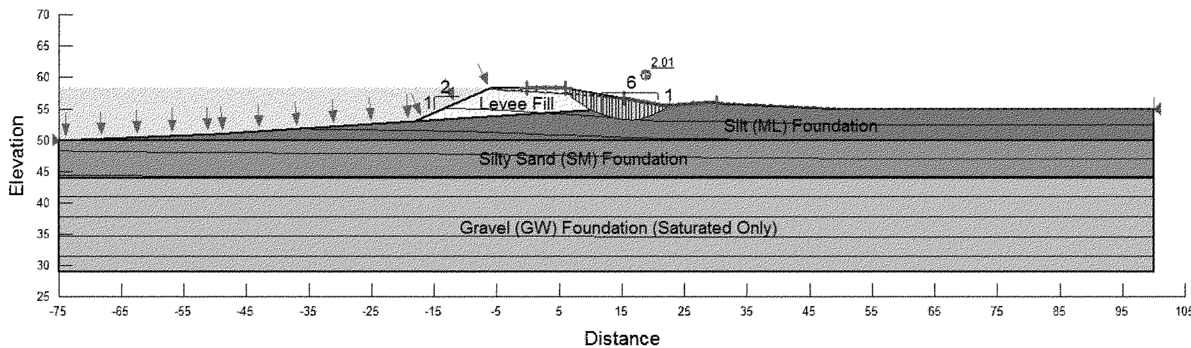
*U.S. Army Corps of Engineers*
*Seattle District*

**Figure B-4**

Skokomish General Investigation
River Mile 9 Levee Setback
Station 25+00
BH-05R

Errata Note: Design based on 17,000 cfs. See Section 1.6 of the Engineering Appendix.

Levee Design Elevation: 58.25'
Added 9" for settlement




Name: Levee Fill (SM)
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Silt (ML) Foundation
Unit Weight: 110 pcf
Cohesion': 0 psf
Phi': 30 °

Name: Well graded Gravel (GP-GM/GP) Foundation (Saturated Only)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Silty Sand (SM) Foundation
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 32 °

**Slope Stability Analyses**
**Rivermile 9 Levee, Section 1- Station 25+00**
**Steady Seepage Slope Stability**

***Skokomish General Investigation***
***Skokomish, WA***

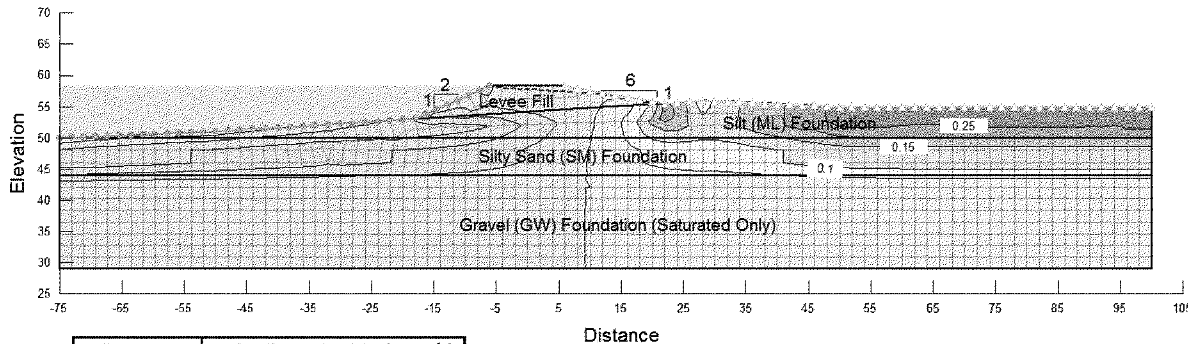
*U.S. Army Corps of Engineers*
*Seattle District*

**Figure B-5**

Skokomish General Investigation
River Mile 9 Levee Setback
Station 25+00
BH-05R

Levee Design Elevation: 58.25'
Added 9" for settlement

Errata Note: Design based on 17,000 cfs. See Section 1.6 of the Engineering Appendix.




| Soil Type | Hydraulic Conductivity (K, cm/s) |
|---|---|
| Levee Fill | 5.00E-04 |
| ML | 5.00E-05 |
| SM | 1.00E-04 |
| SP-SM | 1.00E-02 |
| SP | 5.00E-02 |
| GW/GP | 5.00E-01 |

*Average Vertical Exit Gradient (0-2' below toe)
$(i_{y\,AVG}) = 0.27$

$FS = (\gamma_{soil} - \gamma_w) / (i_y * \gamma_w)$
$= (110-62.4)/(0.27*62.4)$
$= 2.8$

**Slope Stability Analyses**
**Rivermile 9 Levee, Section 1- Station 25+00**
**Steady State Seepage**

***Skokomish General Investigation***
***Skokomish, WA***

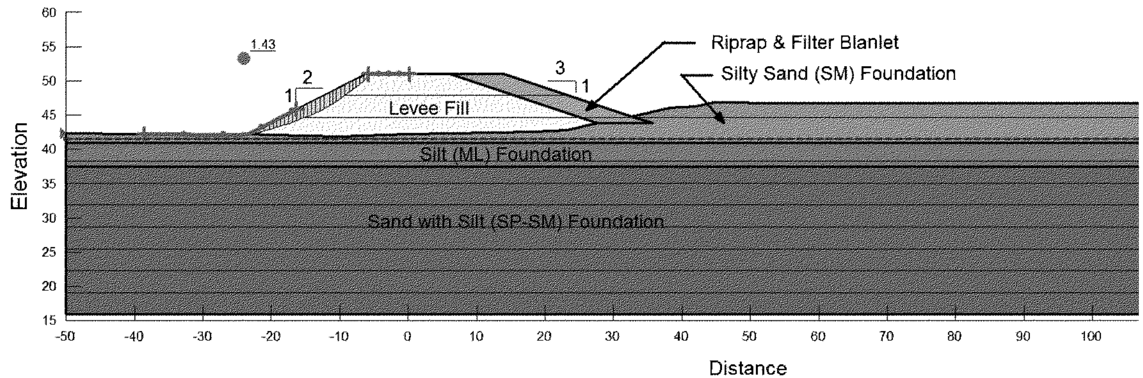
*U.S. Army Corps of Engineers*
*Seattle District*

**Figure B-6**

Skokomish General Investigation
Grange Levee Setback
Station 15+00
BH-08

Errata Note: Design based on 17,000 cfs. See Section 1.6 of the Engineering Appendix.

Levee Design Elevation: 51'
(Includes 6" for settlement & 18" for superiority)




Name: Levee Fill (SM)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Silty Sand (SM) Foundation
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 32 °

Name: Silt (ML) Foundation
Unit Weight: 110 pcf
Cohesion': 0 psf
Phi': 30 °

Name: Poorly Graded Sand with Silt (SP-SM) Foundation (Saturated Only)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Riprap & Filter Blanket
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 40 °

**Slope Stability Analyses**
**Grange Levee, Section 2- Station 15+00**
**Static Slope Stability**

***Skokomish General Investigation***
***Skokomish, WA***

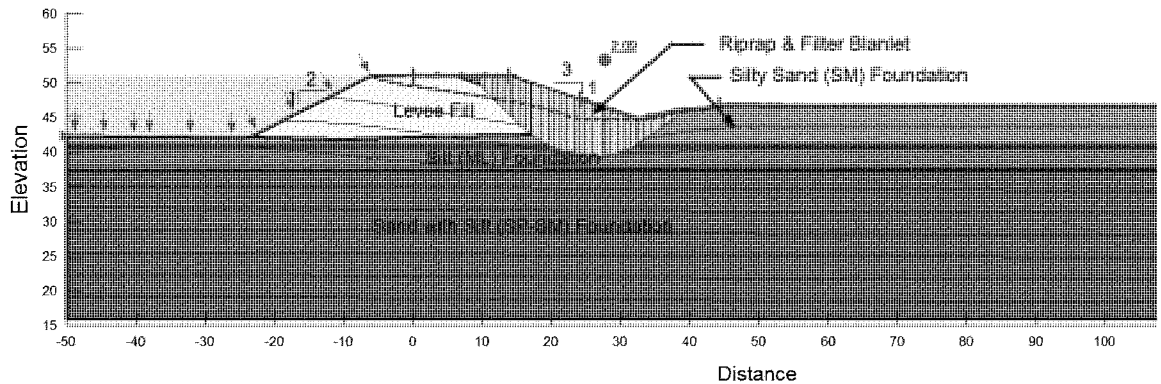
*U.S. Army Corps of Engineers*
*Seattle District*

**Figure B-7**

Skokomish General Investigation
Grange Levee Setback
Station 15+00
BH-08

Errata Note: Design based on 17,000 cfs. See Section 1.6 of the Engineering Appendix.

Levee Design Elevation: 51'
(Includes 6" for settlement & 18" for superiority)




Name: Levee Fill (SM)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Silty Sand (SM) Foundation
Unit Weight: 115 pcf
Cohesion': 0 psf
Phi': 32 °

Name: Silt (ML) Foundation
Unit Weight: 110 pcf
Cohesion': 0 psf
Phi': 30 °

Name: Poorly Graded Sand with Silt (SP-SM) Foundation (Saturated Only)
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °

Name: Riprap & Filter Blanket
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 40 °

**Slope Stability Analyses**
**Grange Levee, Section 2- Station 15+00**
**Steady Seepage Slope Stability**

***Skokomish General Investigation***
***Skokomish, WA***

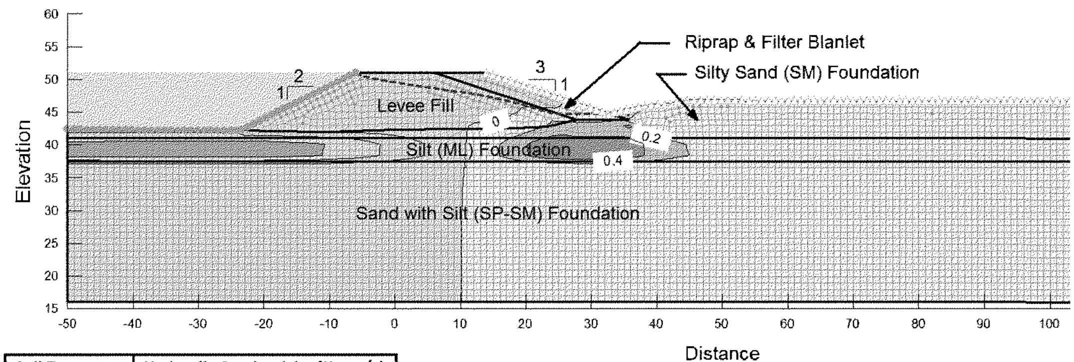
*U.S. Army Corps of Engineers*
*Seattle District*

**Figure B-8**

Skokomish General Investigation
Grange Levee Setback
Station 15+00
BH-08

Errata Note: Design based on 17,000 cfs. See Section 1.6 of the Engineering Appendix.

Levee Design Elevation: 51'
(Includes 6" for settlement & 18" for superiority)




| Soil Type | Hydraulic Conductivity (K, cm/s) |
|---|---|
| Levee Fill | 5.00E-04 |
| ML | 5.00E-05 |
| SM | 1.00E-04 |
| SP-SM | 1.00E-02 |
| SP | 5.00E-02 |
| GW/GP | 5.00E-01 |

*Average Vertical Exit Gradient (0-2' below toe)
$(i_{y\,AVG}) = 0.17$

$FS = (\gamma_{soil} - \gamma_w) / (i_y * \gamma_w)$
$= (115-62.4)/(0.17*62.4)$
$= 5.0$

**Slope Stability Analyses**
**Grange Levee, Section 2- Station 15+00**
**Steady State Seepage**

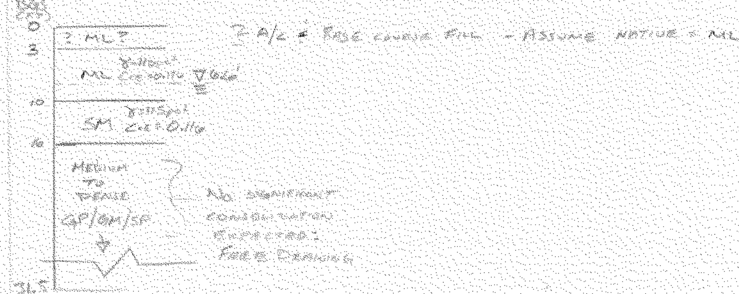
***Skokomish General Investigation***
***Skokamish, WA***

*U.S. Army Corps of Engineers*
*Seattle District*

**Figure B-9**

SKOKOMISH GI
RM 9 LEVEE SETBACK 8/20/2014

PRIMARY CONSOLIDATION
EXPLORATION: BH-05R
STATION: 35+00




LEVEE SPECIFICATIONS (SM FILL)
HEIGHT: 5'
UNIT WEIGHT: 115 pcf
$\sigma'$ INCREASE = (5')(115 pcf) = 575 psf

CALCULATE PRIMARY CONSOLIDATION OF ML @ MID LAYER
ML $\gamma$ = 110 pcf, $H_0$ = 10'
$C_{c\varepsilon}$ = 0.176 (BASED ON BH-02C CONSOLIDATION TEST OF ML @ 7.5' BGS)

$\sigma'_1$ = (5)(110) = 550 psf
$\sigma'_2$ = 550 psf + 575 psf = 1125 psf

$$S_c = C_{c\varepsilon}\,(H_0)\,\log\left(\frac{\sigma'_2}{\sigma'_1}\right)$$

$$= (0.176)(10)\log\left(\frac{1125}{550}\right) = 0.55\text{ ft}$$

CALCULATE PRIMARY CONSOLIDATION OF SM @ MID LAYER
SM $\gamma$ = 115, $H_0$ = 6
$C_{c\varepsilon}$ = 0.116 (BASED ON ONE-DIMENSIONAL CONSOL. TEST OF SAMPLE @ 12.5')

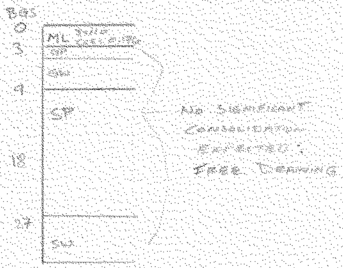
$\sigma'_1$ = (6.6)(110) + (3.4)(110 - 62.4) + (3)(115 - 62.4)
$\sigma'_1$ = 1045.64 psf
$\sigma'_2$ = 1045.64 + 575 = 1620.64

$$S_c = (0.116)(6)\log\left(\frac{1620.64}{1045.64}\right) = 0.13\text{ ft}$$

TOTAL CONSOLIDATION = 0.55' + 0.13' = 0.68'
= 8.2"
USE 9" FOR DESIGN

Skokomish GI | | 8/27/2014
River Mile 9 Setback

Primary Consolidation
Exploration: BH-03R
Station: 24+00



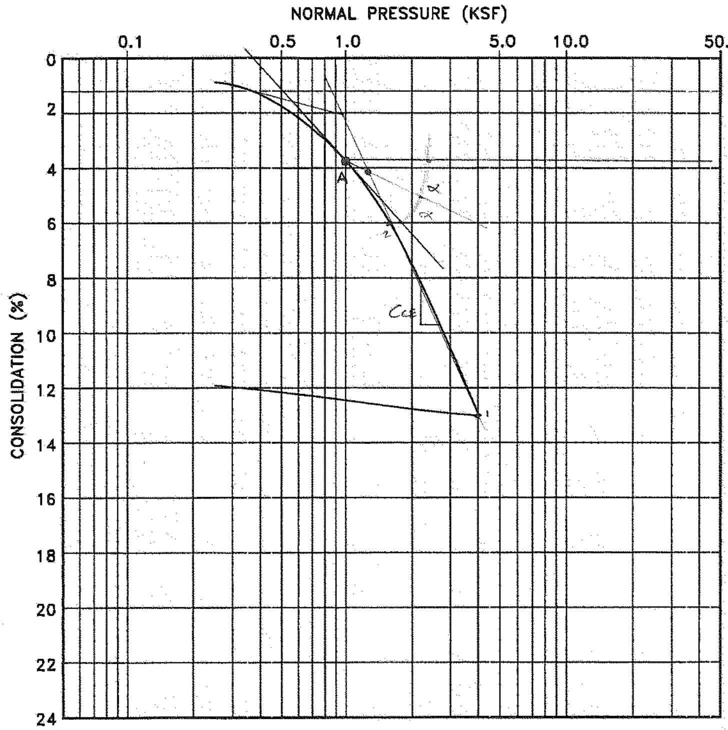

Levee specifications: (SM, levee fill)
Height ~6' on 14' crest width
Unit weight = 115 pcf
$\sigma'$ increase = (6')(115 pcf) = 690 psf

Calculate primary consolidation of ML @ mid layer
ML $\gamma$ = 110 pcf, $H_0$ = 3'
$C_{c\varepsilon}$ = 0.176 (based on consolidation test of ML @ 7.5' BGS)
$\sigma'_1$ = (1.5)(110) = 165 psf
$\sigma'_2$ = 165 + 690 = 855 psf

$$S_c = (C_{c\varepsilon})(H_0)\log\left(\frac{\sigma'_2}{\sigma'_1}\right)$$

$$= (0.176)(3)\log\left(\frac{855}{165}\right) = 0.38'$$

Total consolidation: (0.38)(12) = 4.5"
Use 6" for design




Point #1 (4,13)

Point #2: (1.6, 6)

$\sigma'_p = 1.3$ KSF

$w = 50.3\%$

$\gamma_d = 69.0$ pcf

$\gamma = 69(1+0.503)$

$\gamma = 103.7$ pcf

| SYMBOL | SAMPLE LOCATION | NORMAL PRESSURE AT SATURATION (KSF) |
|---|---|---|
| ——— | BH-02C S-1 @ 2.5 FT. | 0.25 |

$m = \frac{(0.13-0.06)}{\log\left(\frac{4}{1.6}\right)}$

$C_{c\varepsilon} = 0.176$

$\sigma'_{vo} = 2.5(103.7) = 260$ pcf $\therefore OCR = \frac{1.3 \text{ ksf}}{0.26 \text{ ksf}} = 5.0$ [OVER-CONSOLIDATED]

$C_{c\varepsilon} = \frac{C_c}{1+e_0}$

# CONSOLIDATION TEST RESULTS – ASTM D2435

| PROJECT NO. 2823.1.1 | LANDAU ASSOCIATES, INC.<br>LABORATORY TESTING | LAB NO. 14-239 |
|---|---|---|

BH-02, ML LAYER THICKNESS = 5.5'

Eq 8.12: $S_c = C_{c\varepsilon} H_0 \log \frac{\sigma'_f}{\sigma'_i}$

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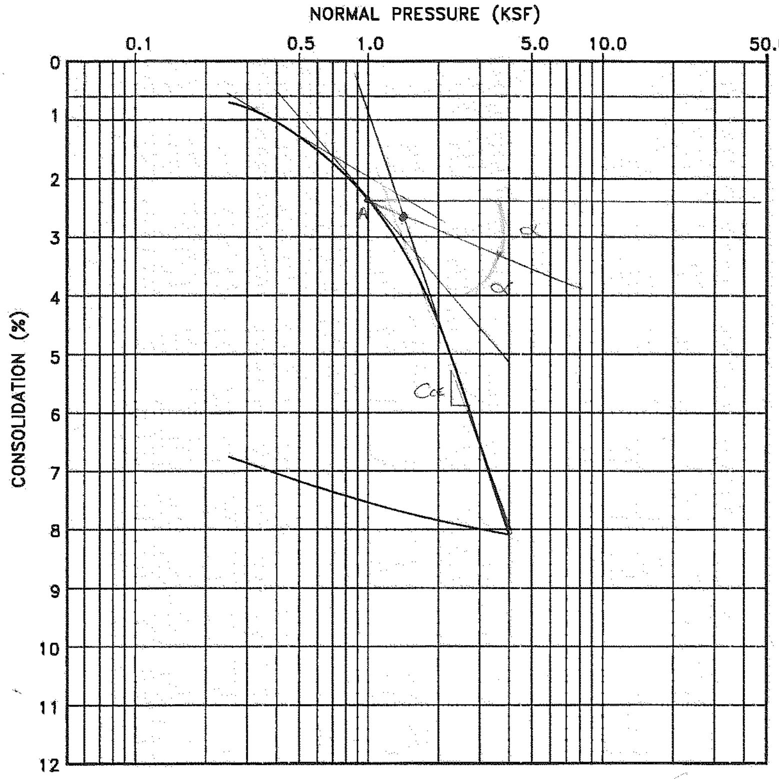
A Division of Northwest Geotech, Inc.

$C_{r\varepsilon}$

Point #1: (0.25, 12)

Point #2: (4, 13)

$m = \frac{(0.13-0.12)}{\log(\ldots)} = C_{r\varepsilon} = 0.008$




$\sigma'_p = 1.4$ ksf
$w = 39.7\%$
$\gamma_D = 80.5$

| SYMBOL | SAMPLE LOCATION | NORMAL PRESSURE AT SATURATION (KSF) |
|---|---|---|
| ——— | BH-05R S-4 @ 12.5 FT. | 0.25 |

Cce
Point #1: (4.5, 2)
Point #2: (8, 4)
Cce = 0.116

$\sigma'_{vo} = 1000$ psf ∴ OCR = 1.0 – 1.4 (Assume normally consolidated)

# CONSOLIDATION TEST RESULTS – ASTM D2435

| PROJECT NO. 2823.1.1 | LANDAU ASSOCIATES, INC. LABORATORY TESTING | LAB NO. 14-239 |
|---|---|---|

For settlement BH-05R

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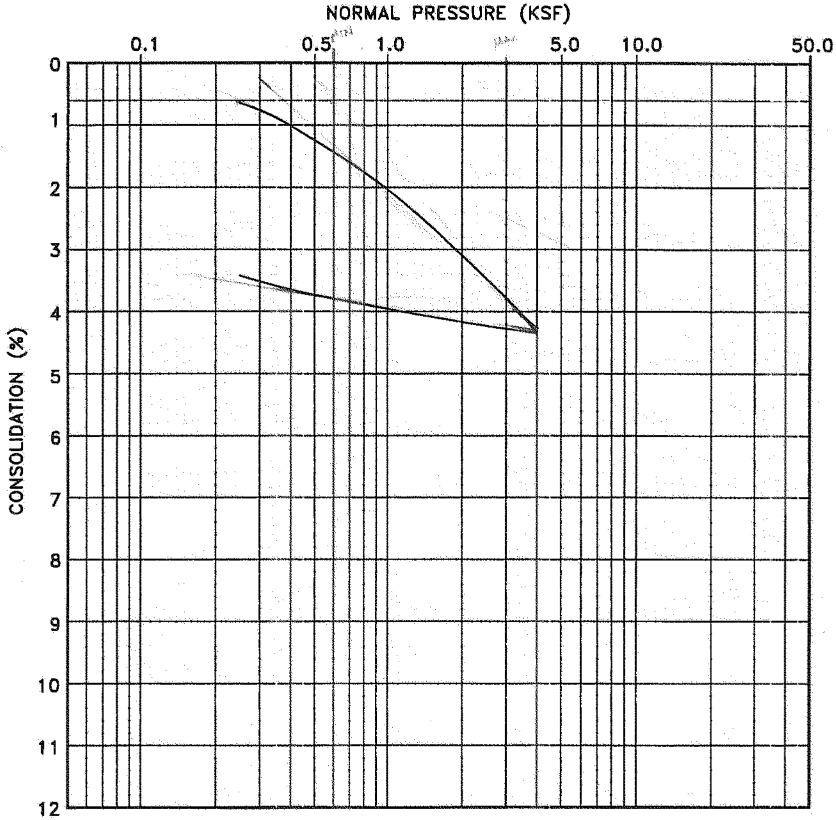


TEST SAMPLE APPEARS TO BE OF POOR QUALITY & WAS NOT USED

| SYMBOL | SAMPLE LOCATION | NORMAL PRESSURE AT SATURATION (KSF) |
|---|---|---|
| ——— | BH-07R S-1 @ 2.5 FT. | 0.25 |

# CONSOLIDATION TEST RESULTS – ASTM D2435

| PROJECT NO. 2823.1.1 | LANDAU ASSOCIATES, INC. LABORATORY TESTING | LAB NO. 14-239 |
|---|---|---|

Northwest Testing, Inc.
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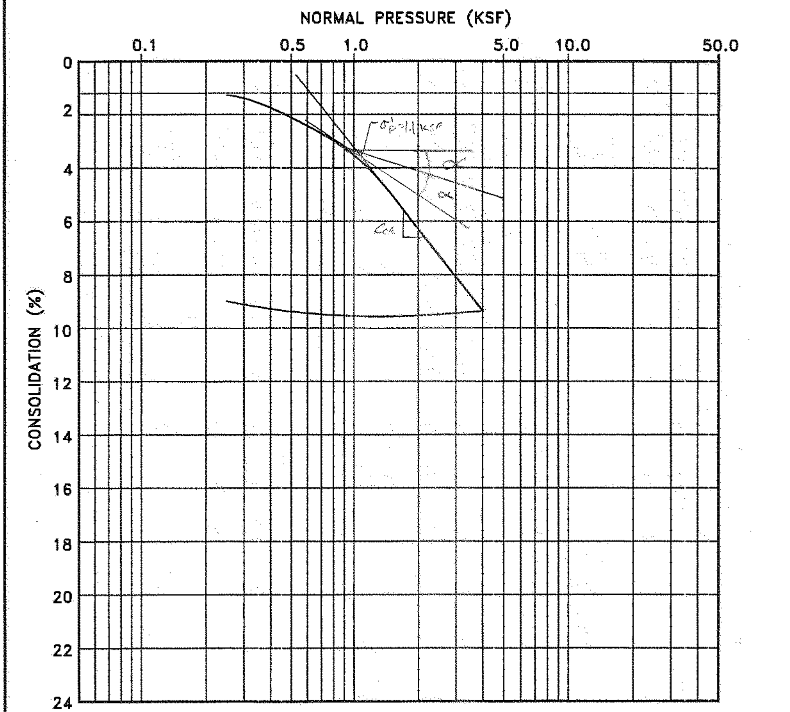


$\sigma'_p$ = 1.1 ksf

$w$ = 40.7%
$\gamma_D$ = 79.8 pcf
$\gamma$ = 79.8 (1+.407)
$\gamma$ = 112.3 pcf

$\sigma'_{vo}$ = 7.5 (112.3) = 842 psf ∴ OCR = $\frac{1.1 \text{ ksf}}{0.842 \text{ ksf}}$ = 1.3 ~ [NORMALLY CONSOLIDATED]

Cce
Point #1 = (4, 4.4)
Point #2 = (0.75, 2)
m = $\frac{(0.044 - 0.02)}{\log(\frac{4}{0.75})}$
Cce = 0.102

| SYMBOL | SAMPLE LOCATION | NORMAL PRESSURE AT SATURATION (KSF) |
|---|---|---|
| ———— | BH-08 S-3 @ 7.5 FT. | 0.25 |

# CONSOLIDATION TEST RESULTS – ASTM D2435

| PROJECT NO. 2823.1.1 | LANDAU ASSOCIATES, INC.<br>LABORATORY TESTING | LAB NO. 14-239 |
|---|---|---|

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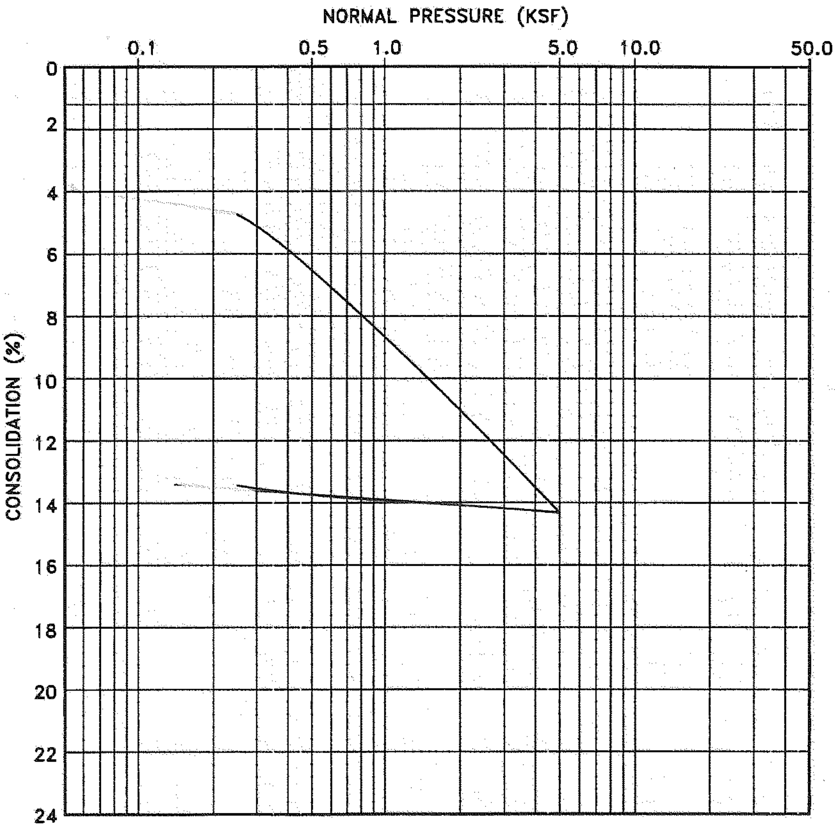
BH-08, SMALL LAYER THICKNESS = 10.5' DOUBLY DRAINED
GW @ 6.2' BGS
Cce = 0.102

LEVEE HEIGHT = 5' +1.5' SUPERELEVATION = 6.5

$S_c = C_{ce} H_0 \log \frac{\sigma'_f}{\sigma'_i} = (0.10)(10.5) \log \left(\frac{590 + 780}{590}\right) = 0.38' \approx 4.6"$ USE 6" FOR DESIGN




TEST SAMPLE APPEARS TO BE POOR QUALITY & WAS NOT USED

| SYMBOL | SAMPLE LOCATION | NORMAL PRESSURE AT SATURATION (KSF) |
|---|---|---|
| ——— | BH-10 S-3 @ 6.5 FT. | 0.25 |

# CONSOLIDATION TEST RESULTS – ASTM D2435

| PROJECT NO. 2823.1.1 | LANDAU ASSOCIATES, INC.<br>LABORATORY TESTING | LAB NO. 14-239 |
|---|---|---|

Northwest Testing, Inc.
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SKOKOMISH GI
RM 9 LEVEE SETBACK

9/8/2014

ESTIMATE OF TIME RATE OF CONSOLIDATION

@ STATION 35+00
SILT LAYER THICKNESS = 10 FEET
TWO WAY DRAINAGE EXPECTED ∴ DRAINAGE LENGTH = 5 FT

$$T_v = \frac{C_v t}{H^2}$$

USING CORRELATIONS OF $C_v$ WITH LIQUID LIMIT (LL) FROM US NAVY, 1971

ML ATTERBERG LIMIT TESTING PROVIDED NP = PLASTIC RESULTS. FOR ESTIMATION, LL TEST RESULTS

| EXPLORATION | DEPTH | LL |
|---|---|---|
| BH-02C | 2.5 | 31 |
| BH-07B | 2.5 | 31 |
| BH-09B | 2.5 | 43 |

AVG LL = 35

FROM CHART, ASSUME VIRGIN COMPRESSION . . .

$C_v \approx 3 \times 10^{-3}$ cm²/s = 0.279 ft²/day

@ 90% CONSOLIDATION, U% = 90 → $T_v$ = 0.848

$$t = \frac{(0.848)(5)^2}{(0.279)} = 75 \text{ DAYS}$$

**Table(1) Typieal values of the coefficient of consolidation $c_v$ ( from Holtz and Kovacs, 1981).**

| Soil | $C_v$ ($m^2$/year) |
|---|---|
| Boston blue clay (CL)<br>(Ladd and Luscher, 1965) | 12 + 6 |
| Organic silt (OH)<br>(Lowe, Zaccheo, and Feldman,1964) | 0.6 -3 |
| Glacial lake clays (CL)<br>(Wallace and Otto, 1964) | 2 – 2.7 |
| Chicago silty clay (CL)<br>(Terzaghi and Peck, 1967) | 2.7 |
| Swedish medium sensitive clays (CL-CH)<br>(Holtz and Broms, 1972)<br>1- Laboratory<br>2- field | <br><br>0.1 – 0.2<br>0.2 - 1.0 |
| San Francisco Bay Mud (CL) | 0.6 – 1.2 |
| Mexico City clay (MH)<br>(Leonards and Girault, 1961) | 0.3 – 0.5 |

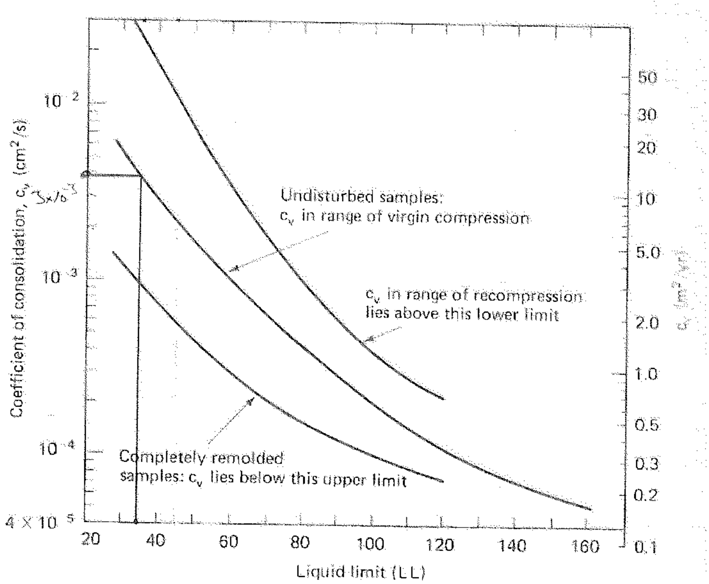



**Figure (3) Approximate correlations of the coefficient of consolidation $c_v$ with the liquid limit (after U. S. Navy, 1971).**

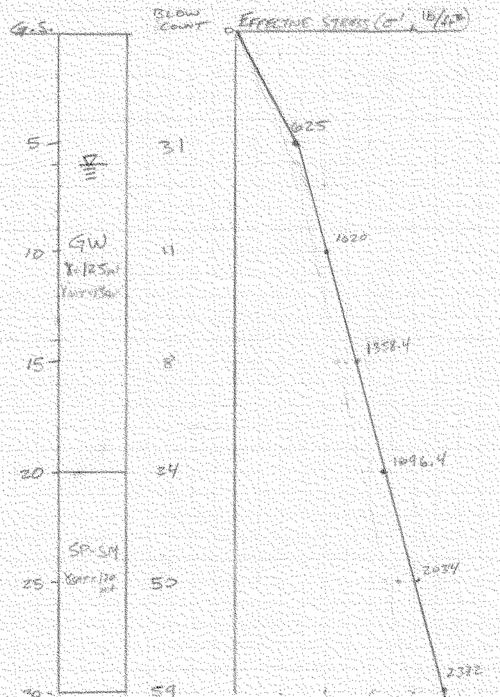
SKOKOMISH G.I.
ELS PILE DESIGN

06 OCT 2014

1

NEAREST SUBSURFACE EXPLORATION IS BH-15 IN CHANNEL DEPOSITS. NEGLECT TOP 3 FEET OF OVERBANK SILTY SAND. ASSUME TOP LAYER OF IN-CHANNEL GRAVEL IS LOOSE.

$\gamma = 110$ lb/ft³, $\gamma_{SAT} = 120$ lb/ft³




CORRECTED N-VALUE

$(N_1)_{60} = (N_{60})(C_N)$

$C_N = [0.77 \log_{10}(20/\sigma'_v)]$, $C_N < 2.0$

$\sigma'_v$ in tons/ft²

@ 5', $N_{1,60} = 43$

@ 10' $N_{1,60} = 14$

@ 15' $(N_1)_{60} = 9$

@ 20' $(N_1)_{60} = 25$

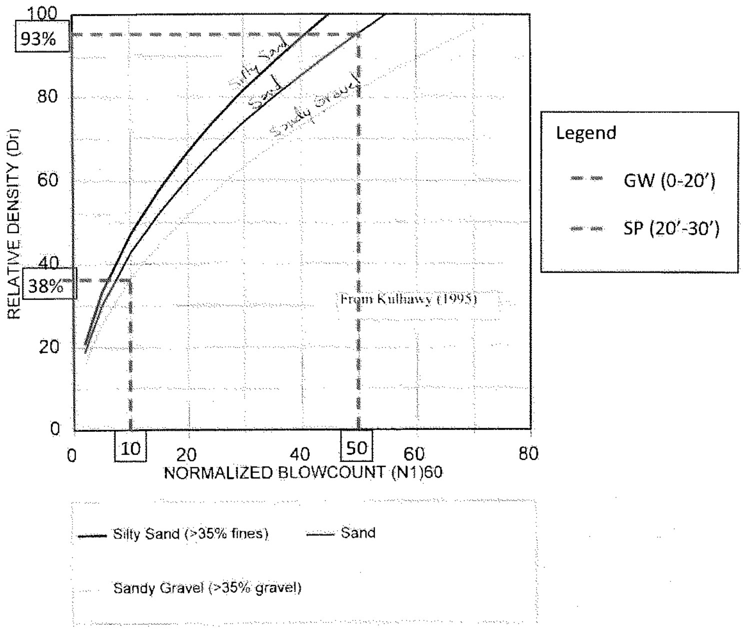
@ 25' $(N_1)_{60} = 50$

@ 30' $(N_1)_{60} = 56$

FOR MEDIUM DENSE GRAVEL LAYER ($N_{1,60}$ BLOW COUNT ~10)
$\phi° = 30°-35°$ BASED ON WSDOT GEOTECH DESIGN MANUAL SECTION 5.6.3.

GRAIN SIZE ANALYSIS FOR BH-15, SAMPLE @ 10' DEPTH CONTAINS TRACE FINES, (1.8% FINES)
COARSER MATERIAL WITH <5% FINES FALL IN UPPER RANGE
SELECT $\phi = 33°$ FOR DESIGN

FOR VERY DENSE SP-SM LAYER, $N_{1,60} = 50$, $\phi$ RANGE = 38-43°, FINES = 2.8%
SELECT $\phi = 38°$ FOR DESIGN



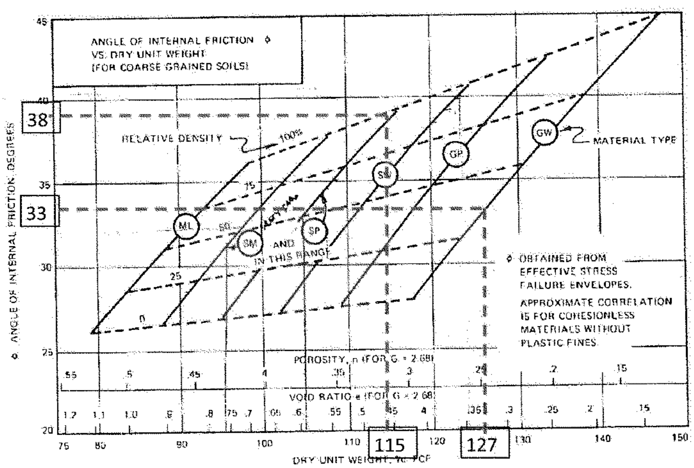




**Fig. 6 — Angle of internal friction for granular soils (after U.S. Navy[57])**

Skokomish GI, ELJ Pile Design. Selection of Dry Unit Weight & Internal Friction Angle based on $(N1)_{60}$ corrected blow counts from BH-15.

**Single Pile Capacity Calculations - 18" Diameter Timber Piles**

***From EM 1110-2-2906, Pile Foundations, Ch. 4***

Piles in Cohesionless Soil

a) Skin Friction Critical Depth

$D_c = 10B$ Loose sands

$D_c = 15B$ Medium Dense Sands

$D_c = 20B$ Dense Sands

*(B = Pile Diameter)*

Medium Dense | Critical Depth = | 22.5

Assumptions:

-'Floating Piles', zero end-bearing capacity
-Riverbed sands/gravels are cohesionless
-Effective stress remains constant past "Critical Depth"
-Buoyant force from logjam itself considered
-Soil profile assumes homogeneous conditions below riverbed, possibility that loose materials may warrant additional pile length.

-Unit wt. of wood = 32 pcf (12% MC) - 37.1 pcf (30% MC) - 42.9 pcf (50% MC)
*Preliminary pile length estimates - NOT for construction
**FS set = 1 based on PDT communication that FS = 2 will be input separately

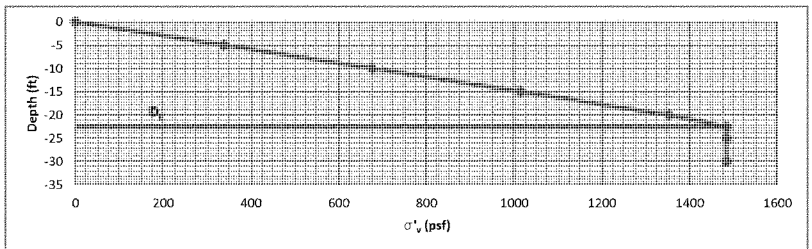
Unit Skin Friction: $f_s = K*\sigma'_v \tan\delta$

Skin Friction: $Q_s = f_s*A_s$

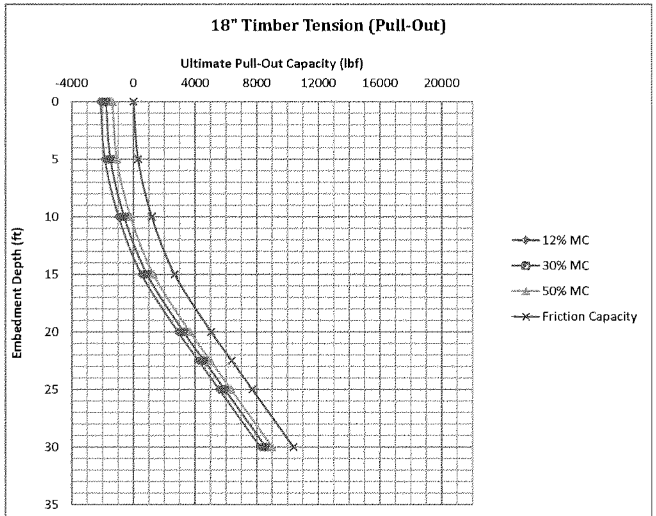
where:

| | | |
|---|---|---|
| $\sigma'_v$ = Vert. Eff. Stress = $\gamma'D$ | | for $D < D_c$ |
| $\sigma'_v$ = Vert. Eff. Stress = $\gamma'D_c$ | | for $D \geq D_c$ |
| $\delta = 0.8\phi$ to $1.0\phi$ = | 26.4 | (angle of frict betw. soil/pile, Timber piles, Tbl 4-3) |
| $K_c = 1.0$ = | 1 | Lateral Earth Pressure Coeff. (Sand Table 4-4) |
| $K_t = 0.6$ = | 0.6 | |

| Elevation (ft) | $\phi$ (°) | $\gamma$ (pcf) | c (psf) | Avg. Pile Dia. (ft) | $\Delta z$ (ft) | $\sigma'_v$ (psf) | $\sigma'_v$ (psf) w/ Critical Depth |
|---|---|---|---|---|---|---|---|
| 0.0 | 33 | 130 | 0 | 1.5 | 0.0 | 0 | 0 |
| -5.0 | 33 | 130 | 0 | 1.5 | 5.0 | 338 | 338 |
| -10.0 | 33 | 130 | 0 | 1.5 | 5.0 | 676 | 676 |
| -15.0 | 33 | 130 | 0 | 1.5 | 5.0 | 1014 | 1014 |
| -20.0 | 33 | 130 | 0 | 1.5 | 5.0 | 1352 | 1352 |
| -22.5 | 38 | 115 | 0 | 1.5 | 2.5 | 1484 | 1484 |
| -25.0 | 38 | 115 | 0 | 1.5 | 2.5 | 1615 | 1484 |
| -30.0 | 38 | 115 | 0 | 1.5 | 5.0 | 1878 | 1484 |

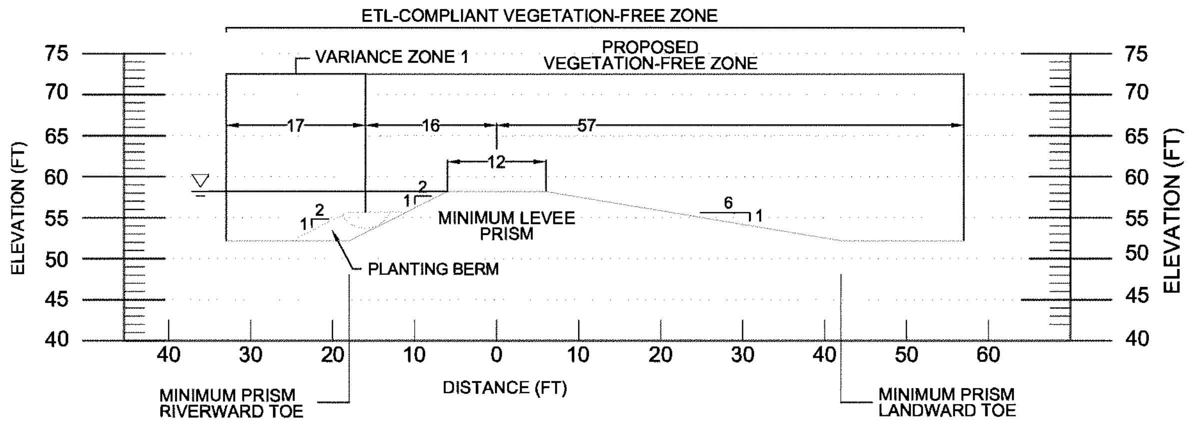


| Tension (Pull-out Capacity) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Embedment (ft) | K | $f_s$ (psf) | $\Sigma Q_s$ (lbf) | FS | $Q_{all}$ (lbf) | $\Sigma(Q_{all} - F_b + W)$ @ 12% MC | $\Sigma(Q_{all} - F_b + W)$ @ 30% MC | $\Sigma(Q_{all} - F_b + W)$ @ 50% MC |
| 0 | 0.6 | 0 | 0 | 4 | 0 | -2149 | -1788 | -1378 |
| 5 | 0.6 | 101 | 1186 | 4 | 296 | -1852 | -1492 | -1082 |
| 10 | 0.6 | 201 | 4744 | 4 | 1186 | -963 | -602 | -192 |
| 15 | 0.6 | 302 | 10674 | 4 | 2668 | 520 | 880 | 1290 |
| 20 | 0.6 | 403 | 20162 | 4 | 5040 | 2892 | 3252 | 3662 |
| 22.5 | 0.6 | 453 | 25499 | 4 | 6375 | 4226 | 4586 | 4996 |
| 25 | 0.6 | 453 | 30836 | 4 | 7709 | 5560 | 5921 | 6331 |
| 30 | 0.6 | 453 | 41510 | 4 | 10377 | 8229 | 8589 | 8999 |



Errata Note: Design based on 17,000 cfs. See Section 1.6 in the Engineering Appendix.

NOTES:
1. ALL ELEVATIONS BASED NGVD 88 DATUM.
2. VARIANCE ZONE 1 ALLOWS TREE SPECIES WITH MATURE TREE HEIGHTS OF 10 TO 20 FEET.




1 RIVERMILE 9 TYPICAL SECTION
1H:1V (STA 25+00) N.T.S.

POTENTIAL PIT EXTENT

# Annex C

## *Civil Annex*

| Work Area | Station Begin ft | Station End ft | Length ft | Width ft | Area Acre | Cut CY/LF | Cut CY | Fill CY | Strip Replaced CY | Topsoil CY | Wearing CY | Spoils CY | Filter CY | Riprap CY | Strip CY | Strip Not Replaced CY | Strip ACRE | Work Limits Acre | Tree smaller than 12" DBH | Tree larger than 12" DBH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Skokomish Feasibility Civil Quantities | | | | | | | | | | | | | |
| Carbody Levee Removal | | | | | | | | | | | | | | | | | | | | |
| Left Bank | 0 | 1,050 | 1,050 | | | | 824 | 3 | | 195 | | | | | | | 1.6 | 2.8 | | |
| Estimated by averaging last 375' | 0 | 1,050 | 1,050 | | | | **3,895** | | | | | | | | | | | | | |
| | 1,050 | 1,625 | 575 | | | 3.7 | 2,133 | 2 | | 137 | | | | | | | | | | |
| Total Left Bank | | | 2,675 | | | | 6,128 | 5 | | 332 | | | | | | | 1.6 | 2.8 | | |
| All right bank 25 foot intervals | 1,750 | 5,525 | 3,775 | | | | 4,315 | 1 | | 881 | | | | | | | 2.0 | 4.5 | | |
| **Total Remove Levee** | | | **6,450** | | | | **10,443** | **6** | | **1,273** | | | | | | | **3.6** | **7.7** | | |
| **Breach** | | | **200** | | | | **4,715** | **5** | | | | | | | | | | | | |
| **Total Remove Levee and Breach** | | | **6,650** | | | | **15,058** | **11** | | **1,273** | | | | | | | **3.6** | **7.7** | | |
| Car Body Willows | | | **540** | | | | | | | | | | | | | | | **0.6** | | |
| Temporary Access | | | | | | | | | | | | | | | | | | | | |
| 1 50' Access point to the river assume 3' fill each access | | | 50 | 14 | 0.0 | | | 26 | | | 1 | | | | | | | | | |
| 3 culvert crossings car body area | | | 220 | 14 | | | | 114 | | | | | | | | | | | | |
| 6 - 3' x 16' long culverts | | | 96 | 9 | | | | 11 | | | | | | | | | | | | |
| **Total Temporary Access** | | | **366** | **31** | | | | **151** | | | **1** | | | | | | | | | |
| **Total** | | | **7,016** | **31** | | | **15,058** | **162** | **0** | **1,273** | **1** | **0** | **0** | **0** | **0** | **0** | **3.6** | **8.3** | **61** | **57** |
| **River Mile 9 Levee** | **0** | **4,370** | **4,370** | | | | **128** | **14,313** | **3,019** | **1,970** | **662** | | **102** | **141** | **3,076** | **58** | **4.0** | **7.7** | **120** | **112** |
| Planting Berm 3.5' High | 0 | 1400 | 1400 | **7** | | | | 1270 | | 121 | | | | | | | | | | |
| | 3200 | 4260 | 1060 | **7** | | | | 962 | | 92 | | | | | | | | | | |
| **Total Planting Berm** | | **3460** | **2460** | | | | | **2232** | | **213** | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | **Trees based on Car Body Tree Density** | |
| Breaches elevation NAVD 88 | 60 | | 100 | | | | 1,187 | 36 | | | | | | | | | 0.2 | 0.3 | | |
| | 57 | | 180 | | | | 1,593 | 9 | | | | | | | | | 0.3 | 0.5 | | |
| | 56 | | 290 | | | | 2,793 | 2 | | | | | | | | | 0.5 | 0.7 | | |
| | 51 | | 365 | | | | 2,455 | 280 | | | | | | | | | 0.7 | 0.9 | | |
| **Total Breaches** | | | **935** | | | | **7,594** | **327** | | | | | | | | | **2** | **2** | **42** | **39** |
| Temporary Access | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | 16,872 | 3,019 | | | | | | | | | | | |
| **Total** | | | **5,305** | | | | **8,062** | **19,851** | | **1,583** | **662** | **0** | **102** | **141** | **3,076** | **58** | **5.7** | **10.1** | **162** | **151** |
| **Grange Levee** | **10** | **2,751** | **2,741** | | | | | **22,119** | **2,839** | **1,037** | **444** | | **1,107** | **1,598** | **2,847** | **9** | **3.7** | **6.5** | **26** | **13** |
| Planting Berm 3.5' High | 100 | 1,450 | 1,350 | **7** | | | | 1225 | | 117 | | | | | | | | | | |
| | 1,800 | 2,100 | 300 | **7** | | | | 272 | | 26 | | | | | | | | | | |
| **Total Planting Berm** | | **3550** | **1650** | | | | | **1497** | | **143** | | | | | | | | | | |
| **Grange Ramp** | **0** | **320** | **320** | | | | | **367** | **104** | **63** | **33** | | | | **112** | **8** | | | | |
| breach triangles | 44 | | 780 | 40 | | | 2,671 | 95 | | | | | | | | | 0.3 | 0.5 | **Breach Trees based on Car Body Tree Density** | |
| | 49 | | 600 | 40 | | | 1,118 | 113 | | | | | | | | | | | | |
| **Total Breaches** | | | **880** | | | | **3,789** | **208** | | | | | | | | | **0.3** | **0.5** | **6** | **6** |
| | | | | | | | | 24,191 | 2,947 | | | | | | | | | | | |
| **Total** | | | | | | | **3,789** | **27,134** | | **1,245** | **479** | **0** | **1,107** | **1,598** | **2,995** | **17** | **4.0** | **7.0** | **32** | **19** |
| Side Channel Reconnection | | | | | | | | | | | | | | | | | | | **Trees based on Car Body Tree Density** | |
| **Side Channel Alt 2 Entrance** | **0** | **560** | **560** | | | | **3,600** | **69** | | | | | | | | | **0.8** | **0.8** | **17** | **16** |
| Temporary Access | | | | | | | | | | | | | | | | | | | | |
| Access x 10' | | | 265 | 10 | 0.06 | | | | | | | 98 | | | | | | | 1 | 1 |
| 1 culvert crossing upstream area | | | 45 | | | | 14 | | | | | | 23 | | | | | | | |
| 1 - 3' x 16' long culverts | | | 16 | 9 | | | | 2 | | | | | | | | | | | | |
| **Total Temporary Access Entrance** | | | **326** | **13** | **0.1** | | **14** | **2** | **0** | **0** | **0** | **98** | **23** | **0** | **0** | **0** | **0** | **0** | | |
| **Side Channel Exit** | **500** | **650** | **150** | | | | | | | **137** | | | | | | | | **0.0** | | |
| Temporary Access | | | | | | | | | | | | | | | | | | | | |
| Improve gravel access raise 18" x 12' wide | | | 1,920 | 12 | | | | 844 | | | 391 | | | | | | | | | |
| 5 - 2' x 14' long culverts | | | 70 | 2 | | | | | | | | | | | | | | | | |
| 2 - 3' x 16' long culverts | | | 32 | 3 | | | | | | | | | | | | | | | | |
| Clear old road x 12' | | | 1,000 | | 0.3 | | | | | | 148 | | | | | | | | 0 | 5 |
| work pad | | | | | 0.02 | | | 61 | | | | | | | | | | | | |
| **Total Temporary Access Exit** | | | **3,002** | **17** | **0.3** | | **0** | **505** | **0** | **0** | **430** | **0** | **0** | **0** | **0** | **0** | **0.9** | **0.0** | **6** | **5** |
| **Total** | | | **4,038** | **30** | **0** | | **3,614** | **976** | **0** | **137** | **430** | **98** | **23** | **0** | **0** | **0** | **0.8** | **9.8** | **23** | **21** |
| **Upstream LWD** | | | | | | | | | | | | | | | | | | **87.3** | | |
| Temporary Access | | | | | | | | | | | | | | | | | | | | |
| 4, 50' Access points to the river assume 3' fill each access | | | 200 | 14 | 0.1 | | | 104 | | | 2 | | | | | | | | | |
| 6 culvert crossings upstream area | | | 315 | 14 | | | | 163 | | | | | | | | | | | | |
| 13 - 3' x 16' long culverts | | | 192 | 9 | | | | | | | | | | | | | | | | |
| **Total Temporary Access** | | | **707** | **31** | | | | **267** | | | **2** | | | | | | | | | |
| **Total** | | | **707** | **31** | **0** | **0** | **0** | **267** | **0** | **0** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **87.3** | **0** | **0** |
| **Total** | | | **17,066** | **92** | **0** | | **30,523** | **48,430** | | **4,237** | **1,574** | **98** | **1,282** | **1,739** | **6,085** | **75** | **14** | **114** | **276** | **248** |
| Work Area | | | | | | | Feasibility | | | | | | | | | | | | | |
| | Station Begin ft | Station End ft | Length ft | Width ft | Area Acre | | Cut CY | Fill CY | Strip Replaced CY | Topsoil CY | Wearing CY | Spoils CY | Filter CY | Riprap CY | Strip CY | Strip Not Replaced CY | Strip ACRE | Work Limits Acre | Tree smaller than 12" DBH | Tree larger than 12" DBH |

Skokomish Feasibility Civil Quantities

| | Station Begin ft | Station End ft | Length ft | Width ft | Area Acre | Cut CY/LF | Cut CY | Fill CY | Strip Replaced CY | Topsoil CY | Wearing CY | Spalls CY | Filter CY | Riprap CY | Strip CY | Strip Not Replaced CY | Strip ACRE | Work Limits Acre | Tree smaller than 12" DBH | Tree larger than 12" DBH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **River Mile 9 Berm 6000 cfs with overbuild 0-4.5 feet high 2.2 feet average centerline height** | **0** | **4,370** | **4,370** | | | | **278** | **6,253** | **1,960** | **703** | **662** | | **83** | **115** | **2,123** | **163** | **2.9** | **6.2** | **120** | **112** |
| Planting Berm 2' High | 100 | 500 | 400 | 7 | | | | 207 | | 35 | | | | | | | | | | |
| Planting Berm 2' High | 700 | 1,400 | 700 | 7 | | | | 363 | | 60 | | | | | | | | | | |
| Planting Berm 3.5' High | 1,800 | 1,950 | 150 | 7 | | | | 136 | | 13 | | | | | | | | | | |
| Planting Berm 2' High | 2,400 | 2,760 | 360 | 7 | | | | 187 | | 31 | | | | | | | | | | |
| Planting Berm 3.5' High | 3,000 | 4,270 | 1,270 | 7 | | | | 1152 | | 110 | | | | | | | | | | |
| **Total Planting Berm** | | **10,880** | **2,880** | | | | | **2,046** | | **249** | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | **Trees based on Car Body Tree Density** | |
| Breaches elevation NAVD 88 | 60 | | 100 | | | | 1,187 | 36 | | | | | | | | | 0.2 | 0.3 | | |
| | 57 | | 180 | | | | 1,599 | 9 | | | | | | | | | 0.3 | 0.5 | | |
| | 56 | | 290 | | | | 2,793 | 2 | | | | | | | | | 0.5 | 0.7 | | |
| | 51 | | 365 | | | | 2,355 | 280 | | | | | | | | | 0.7 | 0.9 | | |
| **Total Breaches** | | | **935** | | | | **7,934** | **327** | | | | | | | | | **2** | **2** | **42** | **39** |
| Temporary Access | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | 8,626 | 1,960 | | | | | | | | | | | |
| **Total** | | | **5,305** | | | | **8,212** | **10,586** | | **952** | **662** | **0** | **83** | **115** | **2,123** | **163** | **4.6** | **8.6** | **162** | **151** |
| | | | | | | | | | | | | | | | | | | | | |
| **Grange Berm 6000 cfs with overbuild 0-6.6 feet high 4.2 feet average centerline height** | **40** | **2,750** | **2,710** | | | | **20** | **10,530** | **1,927** | **549** | **439** | | **782** | **1,128** | **1,953** | **27** | **3.7** | **6.7** | **26** | **13** |
| Planting Berm 3.5' High | 100 | 1,450 | 1,350 | 7 | | | | 1225 | | 117 | | | | | | | | | | |
| Planting Berm 3.5' High | 1,800 | 2,100 | 300 | 7 | | | | 272 | | 26 | | | | | | | | | | |
| **Total Planting Berm** | | **3,550** | **1,650** | | | | | **1497** | | **143** | | | | | | | | | | |
| **Grange Ramp** | **0** | **0** | **0** | | | | | **0** | **0** | **0** | **0** | | | | **0** | **0** | | | | |
| breach triangles | 44 | | 280 | 40 | | | 2,671 | 95 | | | | | | | | | 0.3 | 0.5 | **Breach Trees based on Car Body Tree Density** | |
| | 49 | | 600 | 40 | | | 1,118 | 113 | | | | | | | | | | | | |
| **Total Breaches** | | | **880** | | | | **3,789** | **208** | | | | | | | | | **0.3** | **0.5** | **6** | **6** |
| | | | | | | | | 12,235 | 1,927 | | | | | | | | | | | |
| **Total** | | | | | | | **3,809** | **14,162** | | **692** | **439** | **0** | **782** | **1,128** | **1,953** | **27** | **4.0** | **7.2** | **32** | **19** |

Skokomish Tree Estimate 11/3/2014

| | Trees <12" DBH | Trees >12" DBH | Striping Area, Acre | Avg Tree per Acre <12" DBH | Avg Tree per Acre >12" DBH |
|---|---|---|---|---|---|
| Car Body Levee Removal | 61 | 57 | 2.9 | 21 | 20 |
| Grange Levee | 26 | 13 | 4.0 | 7 | 3 |
| * Mile 9 Levee | 120 | 112 | 5.7 | | |
| * Channel Reconnection Entrance | 17 | 16 | 0.8 | | |
| * Channel Reconnection Exit | 6 | 5 | 0.3 | | |
| * Grange Breaches | 6 | 6 | 0.3 | | |
| * Mile 9 Breaches | 42 | 39 | 2.0 | | |
| | | | | | |
| * Estimates based on Car Body tree/acre count | | | | | |
| | | | | | |

CAR BODY LEVEE TREE REMOVAL ESTIMATE EXHIBIT 1 OF 3
DESIGNER: GEOFF DORSEY LEAD: GLENN KATO

| TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|
| DECIDUOUS | <12" | 0+50 |
| DECIDUOUS | >12" | 0+60 |
| DECIDUOUS | >12" | 1+40 |
| DECIDUOUS | >12" | 1+60 |
| DECIDUOUS | >12" | 2+30 |
| DECIDUOUS | <12" | 2+50 |
| DECIDUOUS | <12" | 2+85 |
| DECIDUOUS | <12" | 2+90 |
| DECIDUOUS | >12" | 3+15 |
| DECIDUOUS | <12" | 3+90 |
| DECIDUOUS | <12" | 4+50 |
| DECIDUOUS | <12" | 4+80 |
| DECIDUOUS | >12" | 5+60 |
| DECIDUOUS | <12" | 5+70 |
| DECIDUOUS | >12" | 5+90 |
| DECIDUOUS | <12" | 6+30 |
| DECIDUOUS | <12" | 6+40 |
| DECIDUOUS | >12" | 6+80 |
| DECIDUOUS | <12" | 7+00 |
| DECIDUOUS | >12" | 7+25 |
| DECIDUOUS | <12" | 7+80 |
| DECIDUOUS | >12" | 10+30 |
| DECIDUOUS | >12" | 11+20 |
| DECIDUOUS | <12" | 11+90 |
| DECIDUOUS | <12" | 12+80 |
| DECIDUOUS | <12" | 13+20 |
| DECIDUOUS | >12" | 13+20 |
| DECIDUOUS | >12" | 13+80 |
| DECIDUOUS | <12" | 14+20 |
| DECIDUOUS | <12" | 14+30 |
| DECIDUOUS | <12" | 15+40 |
| DECIDUOUS | <12" | 15+80 |
| DECIDUOUS | <12" | 16+15 |
| DECIDUOUS | >12" | 17+60 |
| DECIDUOUS | <12" | 18+10 |
| DECIDUOUS | <12" | 18+20 |
| DECIDUOUS | >12" | 18+60 |
| DECIDUOUS | <12" | 19+00 |
| DECIDUOUS | >12" | 19+30 |
| DECIDUOUS | >12" | 19+50 |
| DECIDUOUS | >12" | 19+90 |

Total trees counted:

< 12" = 61 trees
> 12" = 57 trees

TREE GIRTH DIAMETER WAS ESTIMATED BASED OFF OF CANOPY SIZE. CANOPIES GREATER THAN 30' IN DIAMETER WERE ASSUMED TO BE GREATER THAN 12" . FOR TREES WITH CANOPIES OF LESS THAN 30' THE TREE GIRTH WAS ASSUMED TO BE LESS THAN 12".

NO SURVEY WAS COMPLETED FOR TREE DBH, AERIAL PHOTOS WERE USED TO ESTIMATE TREE GIRTH.

CAR BODY LEVEE TREE REMOVAL ESTIMATE EXHIBIT 2 OF 3
DESIGNER: GEOFF DORSEY LEAD: GLENN KATO

| TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|
| DECIDUOUS | <12" | 20+30 |
| DECIDUOUS | <12" | 20+50 |
| DECIDUOUS | >12" | 20+70 |
| DECIDUOUS | <12" | 20+85 |
| DECIDUOUS | >12" | 21+30 |
| DECIDUOUS | >12" | 21+50 |
| DECIDUOUS | >12" | 21+95 |
| DECIDUOUS | >12" | 22+40 |
| DECIDUOUS | <12" | 22+90 |
| DECIDUOUS | <12" | 23+40 |
| DECIDUOUS | <12" | 23+50 |
| DECIDUOUS | >12" | 23+80 |
| DECIDUOUS | <12" | 24+10 |
| DECIDUOUS | <12" | 24+40 |
| DECIDUOUS | >12" | 24+80 |
| DECIDUOUS | <12" | 25+40 |
| DECIDUOUS | <12" | 25+60 |
| DECIDUOUS | >12" | 26+20 |
| DECIDUOUS | <12" | 26+60 |
| DECIDUOUS | <12" | 26+85 |
| DECIDUOUS | <12" | 27+05 |
| DECIDUOUS | <12" | 27+30 |
| DECIDUOUS | >12" | 27+60 |
| DECIDUOUS | >12" | 27+95 |
| DECIDUOUS | >12" | 28+40 |
| DECIDUOUS | >12" | 28+95 |
| DECIDUOUS | >12" | 29+10 |
| DECIDUOUS | >12" | 29+60 |
| DECIDUOUS | >12" | 29+85 |
| DECIDUOUS | >12" | 30+40 |
| DECIDUOUS | <12" | 30+80 |
| DECIDUOUS | >12" | 30+95 |
| DECIDUOUS | <12" | 31+40 |
| DECIDUOUS | >12" | 31+70 |
| DECIDUOUS | >12" | 32+95 |
| DECIDUOUS | >12" | 33+60 |
| DECIDUOUS | <12" | 34+10 |
| DECIDUOUS | <12" | 34+40 |
| DECIDUOUS | <12" | 35+05 |
| DECIDUOUS | <12" | 35+95 |

Total trees counted:

< 12" = 61 trees
> 12" = 57 trees

TREE GIRTH DIAMETER WAS ESTIMATED BASED OFF OF CANOPY SIZE. CANOPIES GREATER THAN 30' IN DIAMETER WERE ASSUMED TO BE GREATER THAN 12" . FOR TREES WITH CANOPIES OF LESS THAN 30' THE TREE GIRTH WAS ASSUMED TO BE LESS THAN 12".

NO SURVEY WAS COMPLETED FOR TREE DBH, AERIAL PHOTOS WERE USED TO ESTIMATE TREE GIRTH.

CAR BODY LEVEE TREE REMOVAL ESTIMATE EXHIBIT 3 OF 3
DESIGNER: GEOFF DORSEY LEAD: GLENN KATO

| TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|
| DECIDUOUS | <12" | 36+20 |
| DECIDUOUS | <12" | 37+50 |
| DECIDUOUS | >12" | 38+20 |
| DECIDUOUS | <12" | 38+60 |
| DECIDUOUS | <12" | 38+80 |
| DECIDUOUS | >12" | 39+00 |
| DECIDUOUS | <12" | 39+50 |
| DECIDUOUS | >12" | 39+60 |
| DECIDUOUS | >12" | 40+20 |
| DECIDUOUS | >12" | 40+60 |
| DECIDUOUS | <12" | 41+15 |
| DECIDUOUS | <12" | 41+50 |
| DECIDUOUS | <12" | 41+90 |
| DECIDUOUS | <12" | 42+30 |
| DECIDUOUS | <12" | 42+60 |
| DECIDUOUS | >12" | 42+80 |
| DECIDUOUS | >12" | 43+20 |
| DECIDUOUS | >12" | 43+80 |
| DECIDUOUS | <12" | 44+30 |
| DECIDUOUS | >12" | 44+80 |
| DECIDUOUS | >12" | 45+30 |
| DECIDUOUS | >12" | 45+50 |
| DECIDUOUS | <12" | 46+20 |
| DECIDUOUS | >12" | 46+80 |
| DECIDUOUS | >12" | 47+40 |
| DECIDUOUS | <12" | 47+60 |
| DECIDUOUS | >12" | 47+90 |
| DECIDUOUS | >12" | 48+40 |
| DECIDUOUS | >12" | 48+80 |
| DECIDUOUS | >12" | 49+40 |
| DECIDUOUS | <12" | 50+90 |
| DECIDUOUS | >12" | 51+50 |
| DECIDUOUS | >12" | 52+40 |
| DECIDUOUS | <12" | 52+85 |
| DECIDUOUS | <12" | 53+60 |
| DECIDUOUS | <12" | 53+80 |
| DECIDUOUS | <12" | 53+90 |

Total trees counted:

< 12" = 61 trees
> 12" = 57 trees

TREE GIRTH DIAMETER WAS ESTIMATED BASED OFF OF CANOPY SIZE. CANOPIES GREATER THAN 30' IN DIAMETER WERE ASSUMED TO BE GREATER THAN 12" . FOR TREES WITH CANOPIES OF LESS THAN 30' THE TREE GIRTH WAS ASSUMED TO BE LESS THAN 12".

NO SURVEY WAS COMPLETED FOR TREE DBH, AERIAL PHOTOS WERE USED TO ESTIMATE TREE GIRTH.

## ESTIMATED TREE DIAMETER FOR REMOVAL PER LINEAL FOOT

| TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DECIDUOUS | <12" | 7+60 | DECIDUOUS | <12" | 6+30 | DECIDUOUS | <12" | 4+50 | DECIDUOUS | <12" | 2+50 | DECIDUOUS | <12" | 2+50 |
| DECIDUOUS | >12" | 7+25 | DECIDUOUS | >12" | 5+90 | DECIDUOUS | <12" | 3+90 | DECIDUOUS | >12" | 2+30 | | | |
| DECIDUOUS | <12" | 7+00 | DECIDUOUS | <12" | 5+70 | DECIDUOUS | >12" | 3+15 | DECIDUOUS | >12" | 1+60 | | | |
| DECIDUOUS | >12" | 6+80 | DECIDUOUS | >12" | 5+60 | DECIDUOUS | <12" | 2+90 | DECIDUOUS | >12" | 1+40 | | | |
| DECIDUOUS | <12" | 6+40 | DECIDUOUS | <12" | 4+80 | DECIDUOUS | <12" | 2+85 | DECIDUOUS | >12" | 0+60 | | | |

NOTE:

1. NO SURVEY WAS AVAILABLE FOR TREE DBH.
TREE DIAMETER ESTIMATED BASED ON CANOPY DIAMETER.

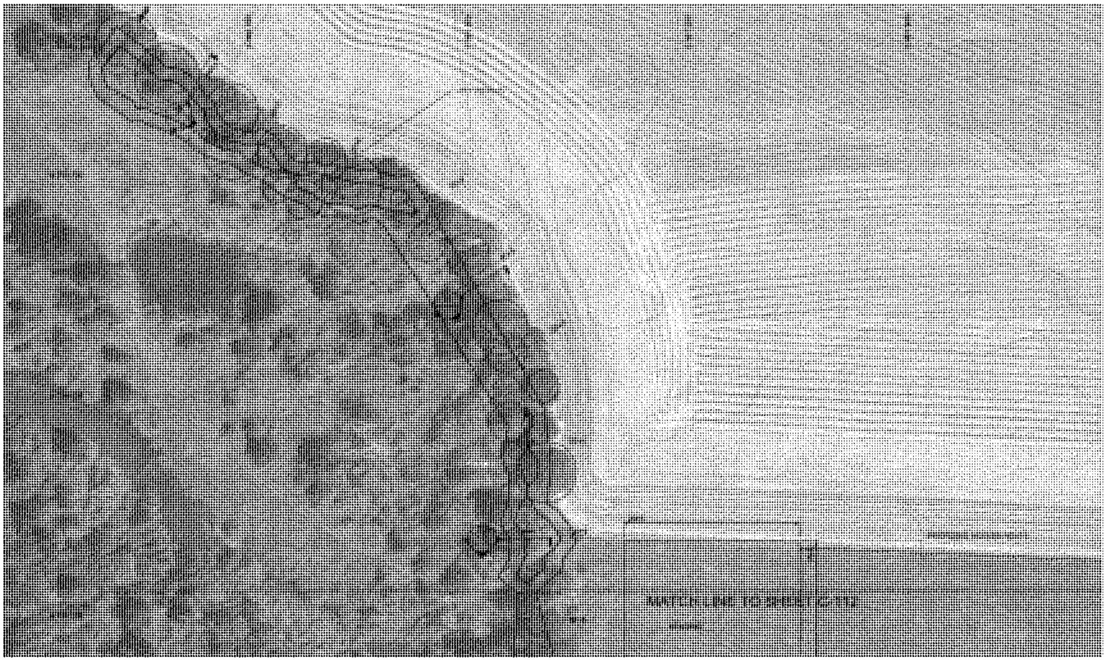
NOTES:

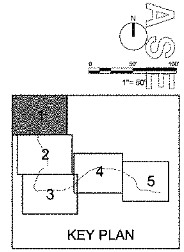
1. HORIZONTAL DATUM IS WASHINGTON STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 83/91.

2. VERTICAL DATUM BASED ON NAVD 1988.

3. MAPPING COMPILED FROM AERIAL PHOTOGRAPHY DATED 3-25-1994, MAPPED AT A SCALE OF 1"=200'.






US Army Corps of Engineers
SEATTLE DISTRICT

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
SEATTLE, WASHINGTON

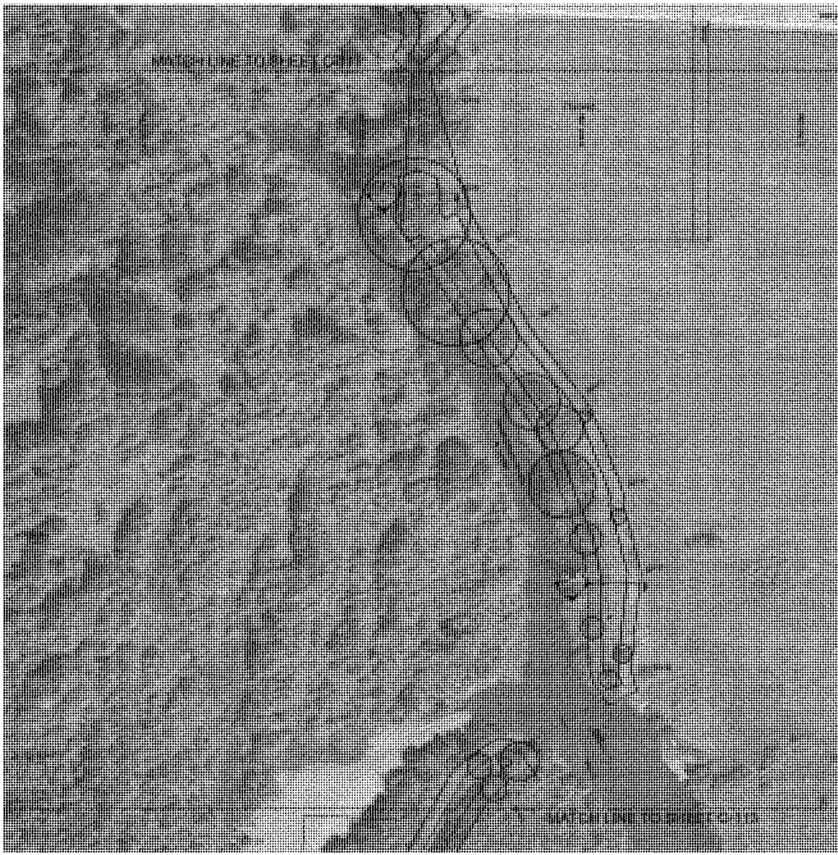
DESIGNED BY: KATO

SKOKOMISH RIVER ECOSYSTEM RESTORATION
GENERAL INVESTIGATION
SKOKOMISH RIVER, WASHINGTON
PN384832

CAR BODY TREE REMOVAL
EXHIBIT 1

SHEET IDENTIFICATION
C-EX1

DRAFT NOT FOR RELEASE




## ESTIMATED TREE DIAMETER FOR REMOVAL PER LINEAL FOOT

| TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|
| DECIDUOUS | >12" | 10+30 |
| DECIDUOUS | >12" | 11+20 |
| DECIDUOUS | <12" | 11+80 |
| DECIDUOUS | <12" | 12+80 |
| DECIDUOUS | <12" | 13+20 |
| DECIDUOUS | >12" | 13+20 |
| DECIDUOUS | >12" | 13+80 |
| DECIDUOUS | <12" | 14+20 |
| DECIDUOUS | <12" | 14+30 |
| DECIDUOUS | <12" | 15+40 |
| DECIDUOUS | <12" | 15+60 |
| DECIDUOUS | <12" | 16+15 |
| DECIDUOUS | >12" | 17+60 |
| DECIDUOUS | <12" | 18+10 |
| DECIDUOUS | <12" | 18+20 |

NOTES:

1. NO SURVEY WAS AVAILABLE FOR TREE DBH. TREE DIAMETER ESTIMATED BASED ON CANOPY DIAMETER.

NOTES:

1. HORIZONTAL DATUM IS WASHINGTON STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 83/91.

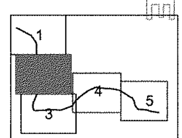
2. VERTICAL DATUM BASED ON NAVD 1988.

3. MAP COMPILED FROM FIELD SURVEY PEFORMED BY MASON COUNTY. SURVEY DATE: MAY/JUNE 2014.

N

0 50' 100'

1"= 50'




KEY PLAN

US Army Corps of Engineers®
SEATTLE DISTRICT

| MARK | DESCRIPTION | DATE | APPR. | MARK | DESCRIPTION | DATE | APPR. |
|---|---|---|---|---|---|---|---|

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
SEATTLE, WASHINGTON

DESIGNED BY: KATO
DATE:
DWN BY:
CKD BY:
SOLICITATION NO.: XXXXXX-XX-X-XXXX
SUBMITTED BY:
CONTRACT NO.: XXXXXX-XX-X-XXXX
PLOT DATE: 10/17/2014
PLOT TIME: 8:32:26 AM
FILE NUMBER: 2-35-1-22
SIZE: ANSI D
FILE NAME: PN384832.DM-C-CAR_BODY_TREE EXHIBIT 2.0.DGN

SKOKOMISH RIVER ECOSYSTEM RESTORATION
GENERAL INVESTIGATION
SKOKOMISH RIVER, WASHINGTON
PN384832

CAR BODY TREE REMOVAL
EXHIBIT 2

SHEET IDENTIFICATION
C-EX2
SHEET 3 OF 6

DESIGN FILE: pw:\\NWS-AS01PJW.nws.ds.usace.army.mil:cenws01\Documents\Civil Works\Skokomish River, WA\FY16 PN384832 SKOK\Current Phase\Con_Docs\CAD_Sheets\Civil\Exhibits\C-EX2 CAR BODY TREE REMOVAL SITE PLAN 2

DATE AND TIME PLOTTED: 10/17/2014

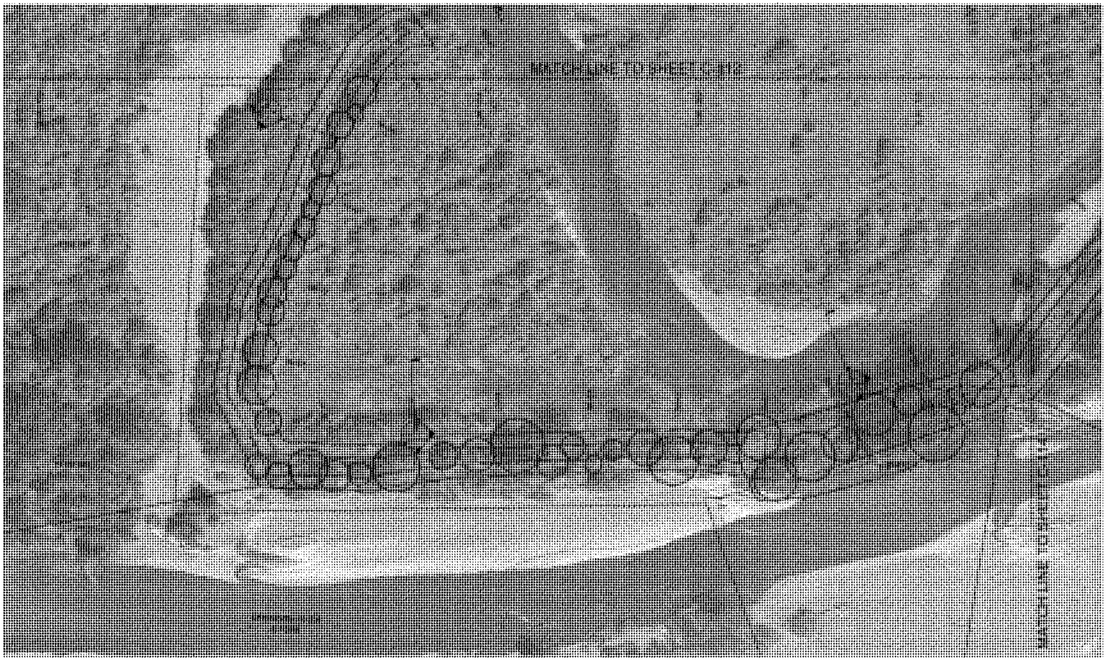
DRAFT NOT FOR RELEASE

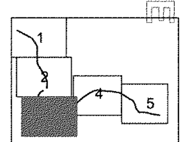
NOTES:

1. HORIZONTAL DATUM IS WASHINGTON STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 83/91.

2. VERTICAL DATUM BASED ON NAVD 1988.

3. MAP COMPILED FROM FIELD SURVEY PEFORMED BY MASON COUNTY, SURVEY DATE: MAY/JUNE 2014.



KEY PLAN

## ESTIMATED TREE DIAMETER FOR REMOVAL PER LINEAR FOOT

| TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DECIDUOUS | >12" | 18+60 | DECIDUOUS | <12" | 20+30 | DECIDUOUS | >12" | 21+50 | DECIDUOUS | <12" | 23+50 | DECIDUOUS | <12" | 25+40 |
| DECIDUOUS | <12" | 19+00 | DECIDUOUS | <12" | 20+50 | DECIDUOUS | >12" | 21+95 | DECIDUOUS | >12" | 23+80 | DECIDUOUS | <12" | 25+60 |
| DECIDUOUS | >12" | 19+30 | DECIDUOUS | >12" | 20+70 | DECIDUOUS | >12" | 22+40 | DECIDUOUS | <12" | 24+10 | DECIDUOUS | >12" | 26+20 |
| DECIDUOUS | >12" | 19+50 | DECIDUOUS | <12" | 20+85 | DECIDUOUS | <12" | 22+90 | DECIDUOUS | <12" | 24+40 | DECIDUOUS | <12" | 26+60 |
| DECIDUOUS | >12" | 19+90 | DECIDUOUS | >12" | 21+30 | DECIDUOUS | <12" | 23+40 | DECIDUOUS | >12" | 24+80 | DECIDUOUS | <12" | 26+85 |

| TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|---|---|---|---|---|---|
| DECIDUOUS | <12" | 27+05 | DECIDUOUS | >12" | 28+95 | DECIDUOUS | <12" | 30+60 |
| DECIDUOUS | <12" | 27+30 | DECIDUOUS | >12" | 29+10 | DECIDUOUS | >12" | 30+95 |
| DECIDUOUS | >12" | 27+60 | DECIDUOUS | >12" | 29+60 | DECIDUOUS | <12" | 31+40 |
| DECIDUOUS | >12" | 27+85 | DECIDUOUS | >12" | 29+85 | DECIDUOUS | >12" | 31+70 |
| DECIDUOUS | >12" | 28+40 | DECIDUOUS | >12" | 30+40 | | | |

NOTES:

1. NO SURVEY WAS AVAILABLE FOR TREE DBH. TREE DIAMETER ESTIMATED BASED ON CANOPY DIAMETER.

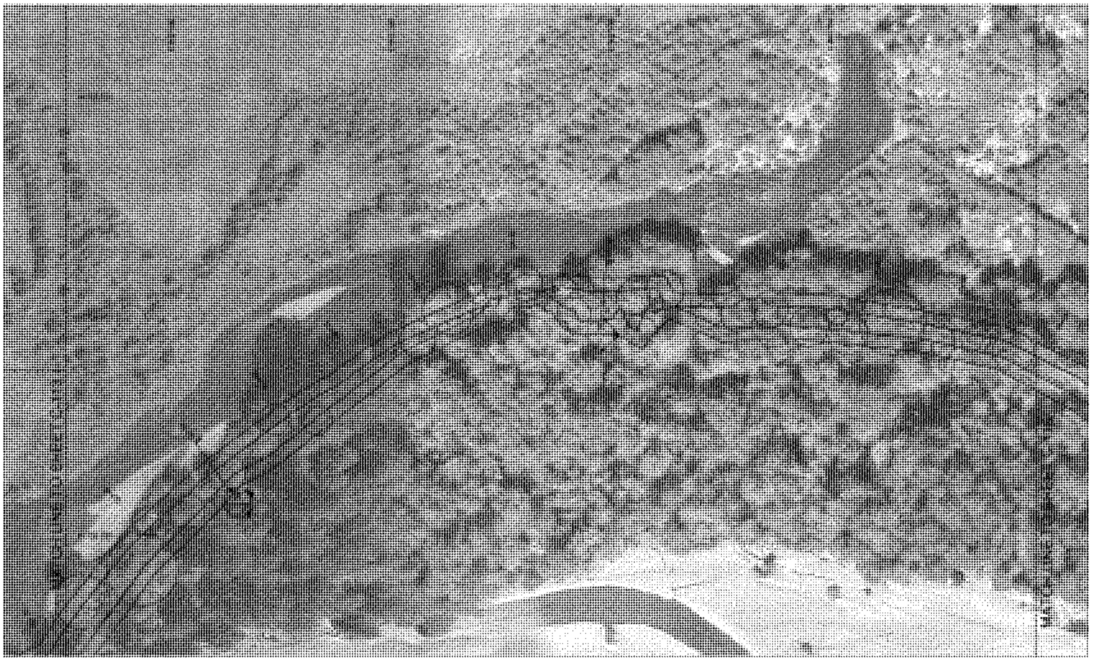
US Army Corps of Engineers
SEATTLE DISTRICT

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
SEATTLE, WASHINGTON

SKOKOMISH RIVER ECOSYSTEM RESTORATION
GENERAL INVESTIGATION
SKOKOMISH RIVER, WASHINGTON
CAR BODY TREE REMOVAL
EXHIBIT 3

SHEET IDENTIFICATION
C-EX3

DATE AND TIME PLOTTED: 10/17/2014



NOTES:

1. HORIZONTAL DATUM IS WASHINGTON STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 83/91.

2. VERTICAL DATUM BASED ON NAVD 1988

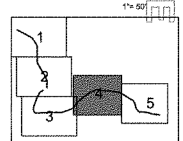
3. MAP COMPILED FROM FIELD SURVEY PEFORMED BY MASON COUNTY MAY/JUNE 2014 AND AERIAL PHOTOGRAPHY DATED 3-MAY-1994

DRAFT NOT FOR RELEASE

N

0 50' 100'

1"= 50'



KEY PLAN

## ESTIMATED TREE DIAMETER FOR REMOVAL PER LINEAL FOOT

| TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DECIDUOUS | >12" | 32+95 | DECIDUOUS | <12" | 35+95 | DECIDUOUS | <12" | 38+80 | DECIDUOUS | >12" | 40+60 | DECIDUOUS | <12" | 42+60 | DECIDUOUS | >12" | 44+60 |
| DECIDUOUS | >12" | 33+60 | DECIDUOUS | <12" | 36+20 | DECIDUOUS | >12" | 39+00 | DECIDUOUS | <12" | 41+15 | DECIDUOUS | >12" | 42+80 | | | |
| DECIDUOUS | <12" | 34+10 | DECIDUOUS | <12" | 37+50 | DECIDUOUS | <12" | 39+50 | DECIDUOUS | <12" | 41+50 | DECIDUOUS | >12" | 43+20 | | | |
| DECIDUOUS | <12" | 34+40 | DECIDUOUS | >12" | 38+20 | DECIDUOUS | >12" | 39+60 | DECIDUOUS | <12" | 41+90 | DECIDUOUS | >12" | 43+80 | | | |
| DECIDUOUS | <12" | 35+05 | DECIDUOUS | <12" | 38+60 | DECIDUOUS | >12" | 40+20 | DECIDUOUS | <12" | 42+30 | DECIDUOUS | <12" | 64+30 | | | |

NOTES:

1. NO SURVEY WAS AVAILABLE FOR TREE DBH. TREE DIAMETER WAS ESTIMATED BASED ON CANOPY DIAMETER.

US Army Corps of Engineers®
SEATTLE DISTRICT

| MARK | DESCRIPTION | DATE | APPR. | MARK | DESCRIPTION | DATE | APPR. |
|---|---|---|---|---|---|---|---|

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
SEATTLE, WASHINGTON

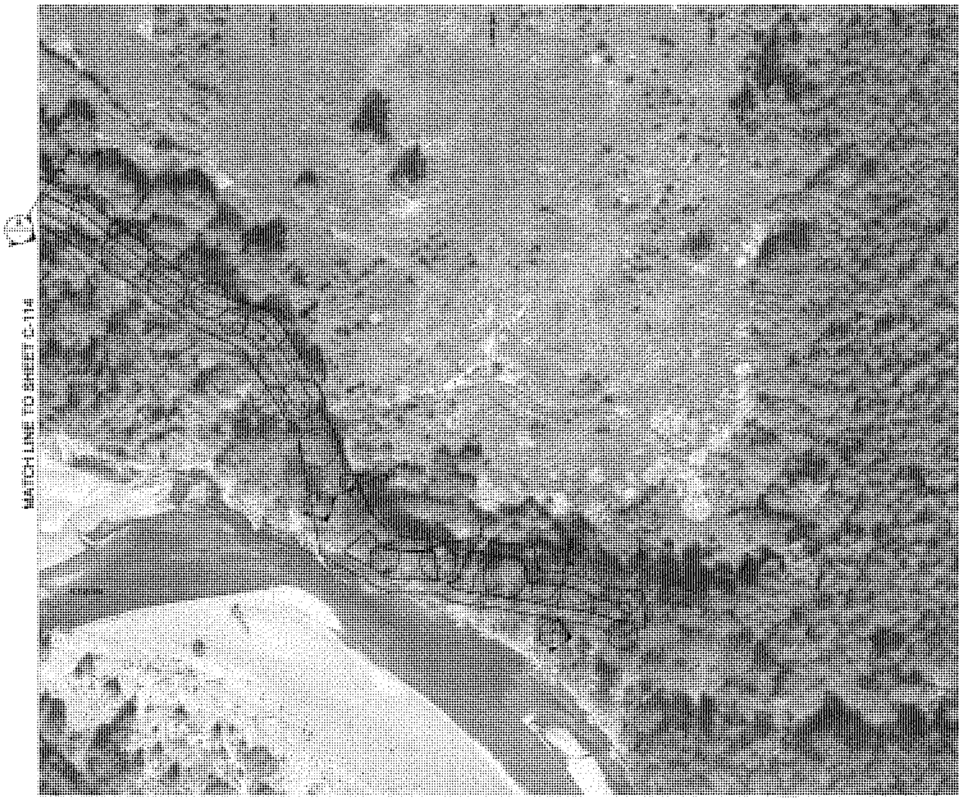
DESIGNED BY: KS10 | DATE:
DWN BY: | CKD BY: | SOLICITATION NO.: XXXXXX-XX-X-XXXX
SUBMITTED BY: | CONTRACT NO.: XXXXXX-XXX-XXXX
PLOT DATE: 10/17/2014 | PLOT TIME: 8:33:27 AM | FILE NUMBER: E-25-1-22
SIZE: ANSI D | FILE NAME: PN394832-CIV-C-CAR_BODY_TREE EXHIBIT 4.DGN

SKOKOMISH RIVER ECOSYSTEM RESTORATION
GENERAL INVESTIGATION
SKOKOMISH RIVER, WASHINGTON
PN394832

CAR BODY TREE REMOVAL
EXHIBIT 4

SHEET IDENTIFICATION
C-EX4
SHEET 8 OF 9

DATE AND TIME PLOTTED: 10/17/2014




DRAFT NOT FOR RELEASE

## ESTIMATED TREE DIAMETER FOR REMOVAL PER LINEAL FOOT

| TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|
| DECIDUOUS | >12" | 45+30 |
| DECIDUOUS | >12" | 45+50 |
| DECIDUOUS | <12" | 46+20 |
| DECIDUOUS | >12" | 46+80 |
| DECIDUOUS | >12" | 47+40 |
| DECIDUOUS | <12" | 47+60 |
| DECIDUOUS | >12" | 47+90 |
| DECIDUOUS | >12" | 48+40 |
| DECIDUOUS | >12" | 48+80 |
| DECIDUOUS | >12" | 49+40 |
| DECIDUOUS | <12" | 50+90 |
| DECIDUOUS | >12" | 51+50 |
| DECIDUOUS | >12" | 52+40 |
| DECIDUOUS | <12" | 52+85 |
| DECIDUOUS | <12" | 53+60 |
| DECIDUOUS | <12" | 53+80 |
| DECIDUOUS | <12" | 53+90 |

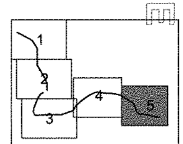
NOTES:

1. NO SURVEY WAS AVAILABLE FOR TREE DBH. TREE DIAMETER ESTIMATED BASED ON CANOPY DIAMETER.

N

0 50' 100'

1"= 50'



KEY PLAN

1. HORIZONTAL DATUM IS WASHINGTON STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 83/91.

2. VERTICAL DATUM BASED ON NAVD 1988

3. MAP COMPILED FROM FIELD SURVEY PEFORMED BY MASON COUNTY MAY/JUNE 2014 AND AERIAL PHOTOGRAPHY DATED 3-MAR-1994

US Army Corps of Engineers
SEATTLE DISTRICT

| MARK | DESCRIPTION | DATE | APPR | MARK | DESCRIPTION | DATE | APPR |
|---|---|---|---|---|---|---|---|

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
SEATTLE, WASHINGTON

DESIGNED BY: KATO | DATE:
DWN BY: KATO | CKD BY: | SOLICITATION NO.: XXXXXX-XX-X-XXXX
SUBMITTED BY: | CONTRACT NO.: XXXXXX-XXX-XXXX
PLOT DATE: 10/17/2014 | PLOT TIME: 8:33:49 AM | FILE NUMBER: E-XX-XXX
SIZE: ANSI D | FILE NAME: PN384832-DM-C-CAR_BODY_TREE-EXHIBIT 5.DGN

SKOKOMISH RIVER ECOSYSTEM RESTORATION
GENERAL INVESTIGATION
SKOKOMISH RIVER, WASHINGTON
PN384832

CAR BODY TREE REMOVAL
EXHIBIT 5

SHEET IDENTIFICATION
C-EX5
SHEET 0 OF 0

DESIGN FILE: pw:\\NWS-AS01PJW.nws.ds.usace.army.mil:cenws01\Documents\Civil Works\Skokomish River, WA\FY16 PN384832 SKOKO\Current Phase\Con_Docs\CAD_Sheets\Civil\Exhibits\C-EX5 CAR BODY TREE REMOVAL SITE PLAN 5

DATE AND TIME PLOTTED: 10/17/2014

GRANGE LEVEE TREE REMOVAL ESTIMATE EXHIBIT
DESIGNER: GEOFF DORSEY LEAD: GLENN KATO

| TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|
| DECIDUOUS | >12" | 0+35 |
| DECIDUOUS | <12" | 0+75 |
| DECIDUOUS | >12" | 1+20 |
| DECIDUOUS | <12" | 1+75 |
| DECIDUOUS | <12" | 2+15 |
| DECIDUOUS | <12" | 2+50 |
| DECIDUOUS | >12" | 3+00 |
| DECIDUOUS | <12" | 3+80 |
| DECIDUOUS | <12" | 4+15 |
| DECIDUOUS | <12" | 4+50 |
| DECIDUOUS | <12" | 4+90 |
| DECIDUOUS | <12" | 5+30 |
| DECIDUOUS | <12" | 5+60 |
| DECIDUOUS | >12" | 6+30 |
| DECIDUOUS | <12" | 6+85 |
| DECIDUOUS | <12" | 7+20 |
| DECIDUOUS | <12" | 7+50 |
| DECIDUOUS | <12" | 7+75 |
| DECIDUOUS | <12" | 8+10 |
| DECIDUOUS | >12" | 8+60 |
| DECIDUOUS | >12" | 9+75 |
| DECIDUOUS | <12" | 10+20 |
| DECIDUOUS | >12" | 10+60 |
| DECIDUOUS | >12" | 11+30 |
| DECIDUOUS | >12" | 12+00 |
| DECIDUOUS | >12" | 12+75 |
| DECIDUOUS | <12" | 15+05 |
| DECIDUOUS | <12" | 15+40 |
| DECIDUOUS | <12" | 15+85 |
| DECIDUOUS | <12" | 16+10 |
| DECIDUOUS | <12" | 17+50 |
| DECIDUOUS | <12" | 18+00 |
| DECIDUOUS | <12" | 18+60 |
| DECIDUOUS | >12" | 23+00 |
| DECIDUOUS | >12" | 23+60 |
| DECIDUOUS | >12" | 26+75 |
| DECIDUOUS | <12" | 27+40 |
| DECIDUOUS | <12" | 28+00 |
| DECIDUOUS | <12" | 28+80 |

Total trees counted:

< 12" = 26 trees
> 12" = 13 trees

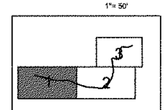
TREE GIRTH DIAMETER WAS ESTIMATED BASED OFF OF CANOPY SIZE. CANOPIES GREATER THAN 30' IN DIAMETER WERE ASSUMED TO BE GREATER THAN 12" . FOR TREES WITH CANOPIES OF LESS THAN 30' THE TREE GIRTH WAS ASSUMED TO BE LESS THAN 12".

NO SURVEY WAS COMPLETED FOR TREE DBH, AERIAL PHOTOS WERE USED TO ESTIMATE TREE GIRTH.

NOTES:

1. HORIZONTAL DATUM IS WASHINGTON STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 83/91.
2. VERTICAL DATUM BASED ON NAVD-1988.
3. MAP COMPILED FROM AERIAL PHOTOGRAPHY DATED 3-MAR-1994.


1" = 50'




## ESTIMATED TREE DIAMETER FOR REMOVAL PER LINEAL FOOT

| TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DECIDUOUS | >12" | 0+35 | DECIDUOUS | <12" | 2+50 | DECIDUOUS | <12" | 4+90 | DECIDUOUS | <12" | 7+20 |
| DECIDUOUS | <12" | 0+75 | DECIDUOUS | >12" | 3+00 | DECIDUOUS | <12" | 5+30 | DECIDUOUS | <12" | 7+50 |
| DECIDUOUS | >12" | 1+20 | DECIDUOUS | <12" | 3+80 | DECIDUOUS | <12" | 5+60 | DECIDUOUS | <12" | 7+75 |
| DECIDUOUS | <12" | 1+75 | DECIDUOUS | <12" | 4+15 | DECIDUOUS | >12" | 6+30 | DECIDUOUS | <12" | 8+10 |
| DECIDUOUS | <12" | 2+15 | DECIDUOUS | <12" | 4+50 | DECIDUOUS | <12" | 6+85 | DECIDUOUS | >12" | 8+60 |

NOTE:

1. NO SURVEY WAS AVAILABLE FOR TREE DBH.
TREE DIAMETER ESTIMATED BASED ON CANOPY DIAMETER.

US Army Corps of Engineers
SEATTLE DISTRICT

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
SEATTLE, WASHINGTON

SKOKOMISH RIVER ECOSYSTEM RESTORATION
GENERAL INVESTIGATION
SKOKOMISH RIVER, WASHINGTON
PN394832
GRANGE TREE REMOVAL
EXHIBIT 1

SHEET IDENTIFICATION
C-EX 2-1

DATE AND TIME PLOTTED: 10/29/2014


NOTES:

1. HORIZONTAL DATUM IS WASHINGTON STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 83/91.

2. VERTICAL DATUM BASED ON NAVD 1988

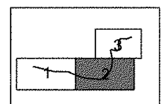
3. MAP COMPILED FROM AERIAL PHOTOGRAPHY DATED 3-MAR-1994

DRAFT NOT FOR RELEASE

N

0 50' 100'

1"= 50'




KEY PLAN

## ESTIMATED TREE DIAMETER FOR REMOVAL PER LINEAL FOOT

| TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|---|---|---|---|---|---|
| DECIDUOUS | >12" | 9+75 | DECIDUOUS | >12" | 12+75 | DECIDUOUS | <12" | 17+50 |
| DECIDUOUS | <12" | 10+20 | DECIDUOUS | <12" | 15+05 | DECIDUOUS | <12" | 18+00 |
| DECIDUOUS | >12" | 10+60 | DECIDUOUS | <12" | 15+40 | DECIDUOUS | <12" | 18+60 |
| DECIDUOUS | >12" | 11+30 | DECIDUOUS | <12" | 15+85 | | | |
| DECIDUOUS | >12" | 12+00 | DECIDUOUS | <12" | 16+10 | | | |

NOTE:

1. NO SURVEY WAS AVAILABLE FOR TREE DBH.
TREE DIAMETER ESTIMATED BASED ON CANOPY DIAMETER.

US Army Corps of Engineers®
SEATTLE DISTRICT

| MARK | DESCRIPTION | DATE | APPR. | MARK | DESCRIPTION | DATE | APPR. |
|---|---|---|---|---|---|---|---|

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
SEATTLE, WASHINGTON

DESIGNED BY: | DATE:
DWN BY: | CKD BY: | SOLICITATION NO.: XXXXXX-XX-X-XXXX
SUBMITTED BY: | CONTRACT NO.: XXXXXX-XXX-XXXX
PLOT DATE: 10/23/2014 | PLOT TIME: 3:57:30 PM | FILE NUMBER: E-25-1-22
SIZE: ANSI D | FILE NAME: C-EX 2-2 GRANGE TREE EXHIBIT 2.DGN

SKOKOMISH RIVER ECOSYSTEM RESTORATION
GENERAL INVESTIGATION
SKOKOMISH RIVER, WASHINGTON
PN394832
GRANGE TREE REMOVAL
EXHIBIT 2

SHEET IDENTIFICATION
C-EX 2-2
SHEET 6 OF 6

DESIGN FILE: pw:\\NWS-AS01PJW.nws.ds.usace.army.mil:cenws01\Documents\Civil Works\Skokomish River, WA\FY16 PN394832 SKOK\Current Phase\Con_Docs\CAD_Sheets\Civil\Exhibits\C-EX 2-2 GRANGE LEVEE TREE REMOVAL SITE PLAN 2

DATE AND TIME PLOTTED: 10/23/2014

## ESTIMATED TREE DIAMETER FOR REMOVAL PER LINEAL FOOT

| TREE TYPE | EST. DIAMETER | STATIONING | TREE TYPE | EST. DIAMETER | STATIONING |
|---|---|---|---|---|---|
| DECIDUOUS | >12" | 23+90 | DECIDUOUS | <12" | 28+60 |
| DECIDUOUS | >12" | 23+60 | | | |
| DECIDUOUS | >12" | 26+75 | | | |
| DECIDUOUS | <12" | 27+40 | | | |
| DECIDUOUS | <12" | 28+00 | | | |

NOTE:

1. NO SURVEY WAS AVAILABLE FOR TREE DBH. TREE DIAMETER ESTIMATED BASED ON CANOPY DIAMETER.

NOTES:

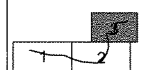
1. HORIZONTAL DATUM IS WASHINGTON STATE PLANE COORDINATE SYSTEM SOUTH ZONE NAD 83/91.
2. VERTICAL DATUM BASED ON NAVD 1988.
3. MAP COMPILED FROM AERIAL PHOTOGRAPHY DATED 3-MAR-1994.



N

0 50' 100'

1"= 50'



KEY PLAN

US Army Corps of Engineers® SEATTLE DISTRICT

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT
SEATTLE, WASHINGTON

SKOKOMISH RIVER ECOSYSTEM RESTORATION
GENERAL INVESTIGATION
SKOKOMISH RIVER, WASHINGTON
PN334832
GRANGE TREE REMOVAL
EXHIBIT 3

SHEET IDENTIFICATION
C-EX 2-3

DESIGN FILE: pw:\\NWS-AS01PJW.nws.ds.usace.army.mil:cenws01\Documents\Civil Works\Skokomish River, WA\FY16 PN334832 SKOKO\Current Phase\Con_Docs\CAD_Sheets\Civil\Exhibits\C-EX 2-3 GRANGE LEVEE TREE REMOVAL SITE PLAN 3

DATE AND TIME PLOTTED: 10/23/2014

# Volumes Report

Report Created: 11/4/2014
Time: 7:22am

Bentley InRoads Suite V8i (SELECTseries 2), 08.11.07.536

**Cross Section Set Name:** car_body ds

**Alignment Name:** car_body ds

**Input Grid Factor:** 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

**Surface:** skok_lidar Last Revised 9/14/2014 1:51:45 PM

**Surface:** car body Remove LB 0-1050 Last Revised 10/17/2014 1:12:17 PM

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **-0+00.713** | | | | | | | 0.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+00.000** | | | | | | | 0.7 |
| | Normal Cut: | 54.8 | 0.7 | 1.000 | 0.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 10.4 | 0.1 | 1.000 | 0.1 | No | |
| **0+25.000** | | | | | | | 72.1 |
| | Normal Cut: | 99.2 | 71.3 | 1.000 | 71.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 14.3 | 11.4 | 1.000 | 11.4 | No | |
| **0+50.000** | | | | | | | 157.6 |
| | Normal Cut: | 85.4 | 85.5 | 1.000 | 85.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 12.6 | 12.5 | 1.000 | 12.5 | No | |
| **0+75.000** | | | | | | | 225.4 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 61.0 | 67.8 | 1.000 | 67.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 13.8 | 12.2 | 1.000 | 12.2 | No | |
| **1+00.000** | | | | | | | 284.7 |
| | Normal Cut: | 67.1 | 59.3 | 1.000 | 59.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 12.5 | 12.2 | 1.000 | 12.2 | No | |
| **1+25.000** | | | | | | | 342.4 |
| | Normal Cut: | 57.6 | 57.7 | 1.000 | 57.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 11.2 | 10.9 | 1.000 | 10.9 | No | |
| **1+50.000** | | | | | | | 383.9 |
| | Normal Cut: | 32.0 | 41.5 | 1.000 | 41.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.6 | 8.7 | 1.000 | 8.7 | No | |
| **1+75.000** | | | | | | | 407.9 |
| | Normal Cut: | 19.9 | 24.0 | 1.000 | 24.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.8 | 6.7 | 1.000 | 6.7 | No | |
| **2+00.000** | | | | | | | 424.9 |
| | Normal Cut: | 16.9 | 17.0 | 1.000 | 17.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.4 | 6.6 | 1.000 | 6.6 | No | |
| **2+25.000** | | | | | | | 432.6 |
| | Normal Cut: | 0.0 | 7.8 | 1.000 | 7.8 | Yes | |
| | Normal Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 0.1 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 3.4 | 1.000 | 3.4 | No | |
| **2+50.000** | | | | | | | 432.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+75.000** | | | | | | | 434.0 |
| | Normal Cut: | 3.2 | 1.5 | 1.000 | 1.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 3.4 | 1.6 | 1.000 | 1.6 | No | |
| **3+00.000** | | | | | | | 436.0 |
| | Normal Cut: | 1.1 | 2.0 | 1.000 | 2.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 1.0 | 2.0 | 1.000 | 2.0 | No | |
| **3+25.000** | | | | | | | 447.0 |
| | Normal Cut: | 22.6 | 11.0 | 1.000 | 11.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.1 | 4.2 | 1.000 | 4.2 | No | |
| **3+50.000** | | | | | | | 475.2 |
| | Normal Cut: | 38.3 | 28.2 | 1.000 | 28.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.1 | 8.0 | 1.000 | 8.0 | No | |
| **3+75.000** | | | | | | | 506.0 |
| | Normal Cut: | 28.3 | 30.8 | 1.000 | 30.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.9 | 7.9 | 1.000 | 7.9 | No | |
| **4+00.000** | | | | | | | 519.1 |
| | Normal Cut: | 0.0 | 13.1 | 1.000 | 13.1 | Yes | |
| | Normal Fill: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 3.7 | 1.000 | 3.7 | No | |
| **4+25.000** | | | | | | | 518.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.2 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+50.000** | | | | | | | 518.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.3 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+75.000** | | | | | | | 518.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.4 | 0.3 | 1.000 | 0.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+00.000** | | | | | | | 517.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.4 | 0.4 | 1.000 | 0.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+25.000** | | | | | | | 517.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.3 | 0.4 | 1.000 | 0.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+50.000** | | | | | | | 517.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.1 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+75.000** | | | | | | | 517.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.1 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+00.000** | | | | | | | 517.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+25.000** | | | | | | | 517.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+50.000** | | | | | | | 517.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+75.000** | | | | | | | 521.1 |
| | Normal Cut: | 8.5 | 4.0 | 1.000 | 4.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 3.4 | 1.6 | 1.000 | 1.6 | No | |
| **7+00.000** | | | | | | | 525.0 |
| | Normal Cut: | 0.0 | 4.0 | 1.000 | 4.0 | Yes | |
| | Normal Fill: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 1.6 | 1.000 | 1.6 | No | |
| **7+25.000** | | | | | | | 536.8 |
| | Normal Cut: | 25.4 | 11.8 | 1.000 | 11.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.1 | 3.3 | 1.000 | 3.3 | No | |
| **7+50.000** | | | | | | | 548.5 |
| | Normal Cut: | 0.0 | 11.8 | 1.000 | 11.8 | Yes | |
| | Normal Fill: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 3.3 | 1.000 | 3.3 | No | |
| **7+75.000** | | | | | | | 554.9 |
| | Normal Cut: | 14.0 | 6.5 | 1.000 | 6.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.0 | 2.8 | 1.000 | 2.8 | No | |
| **8+00.000** | | | | | | | 574.9 |
| | Normal Cut: | 29.2 | 20.0 | 1.000 | 20.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 14.3 | 9.4 | 1.000 | 9.4 | No | |
| **8+25.000** | | | | | | | 600.4 |
| | Normal Cut: | 25.8 | 25.5 | 1.000 | 25.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 10.3 | 11.4 | 1.000 | 11.4 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **8+50.000** | | | | | | | 623.4 |
| | Normal Cut: | 24.0 | 23.0 | 1.000 | 23.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.8 | 8.4 | 1.000 | 8.4 | No | |
| **8+75.000** | | | | | | | 634.4 |
| | Normal Cut: | 0.0 | 11.1 | 1.000 | 11.1 | Yes | |
| | Normal Fill: | 0.2 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 3.6 | 1.000 | 3.6 | No | |
| **9+00.000** | | | | | | | 634.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.1 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+25.000** | | | | | | | 634.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.2 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+50.000** | | | | | | | 633.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.1 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+75.000** | | | | | | | 633.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.1 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+00.000** | | | | | | | 662.5 |

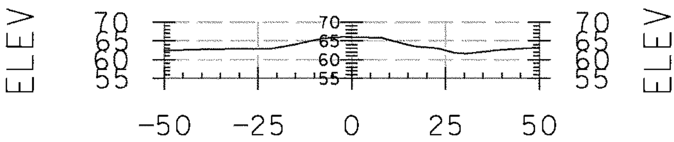
| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 62.2 | 28.8 | 1.000 | 28.8 | Yes | |
| | Normal Fill: | 0.1 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 13.5 | 6.2 | 1.000 | 6.2 | No | |
| **10+25.000** | | | | | | | 740.7 |
| | Normal Cut: | 106.7 | 78.2 | 1.000 | 78.2 | Yes | |
| | Normal Fill: | 0.0 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 18.9 | 15.0 | 1.000 | 15.0 | No | |
| **10+50.000** | | | | | | | 821.5 |
| | Normal Cut: | 67.9 | 80.8 | 1.000 | 80.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 15.9 | 16.1 | 1.000 | 16.1 | No | |

| Totals: | Type | Volume | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|
| | Normal Cut: | 824.6 | 824.6 | Yes | |
| | Normal Fill: | 3.0 | 3.0 | Yes | |
| | Added Cut: | 0.0 | 0.0 | Yes | |
| | Added Fill: | 0.0 | 0.0 | Yes | |
| | Topsoil: | 194.8 | 194.8 | No | |

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

STA.-0+01 TO STA.0+25

Car Body LB 0-1100

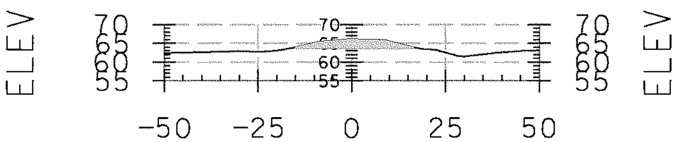



CA:0.00 SF
FA:0.00 SF
MO:0.00

-0+01

CV:0.00 CY
FV:0.00 CY

Car Body LB 0-1100

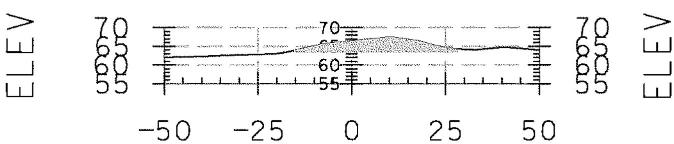



CA:54.84 SF
FA:0.00 SF
MO:0.72

0+00

CV:0.72 CY
FV:0.00 CY

Car Body LB 0-1100



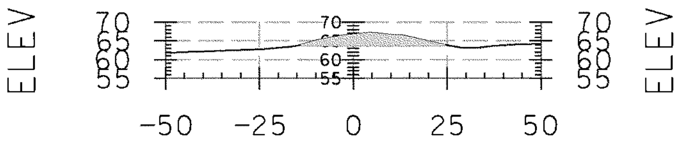

CA:99.24 SF
FA:0.00 SF
MO:72.06

0+25

CV:71.33 CY
FV:0.00 CY

STA.0+50 TO STA.1+00

Car Body LB 0-1100

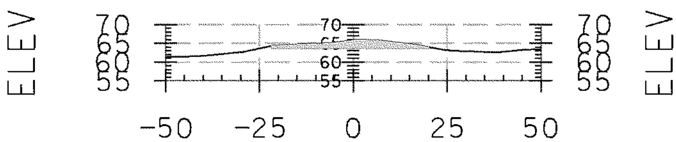



CA:85.43 SF
FA:0.00 SF
MO:157.55

0+50

CV:85.49 CY
FV:0.00 CY

Car Body LB 0-1100

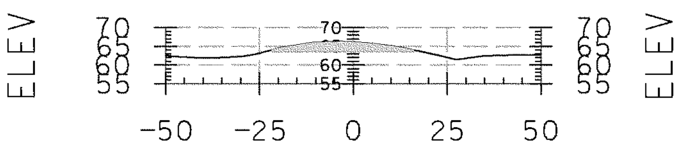



CA:61.03 SF
FA:0.00 SF
MO:225.36

0+75

CV:67.81 CY
FV:0.00 CY

Car Body LB 0-1100



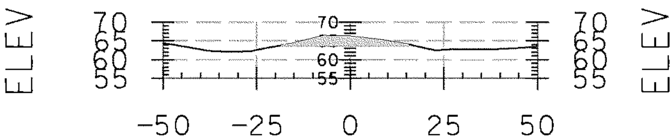

CA:67.07 SF
FA:0.00 SF
MO:284.66

1+00

CV:59.31 CY
FV:0.00 CY

STA.1+25 TO STA.1+75

Car Body LB 0-1100

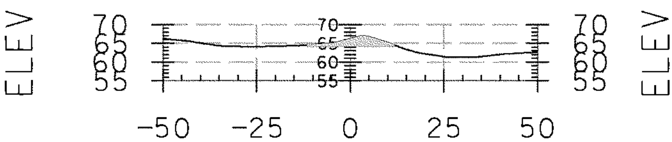



CA:57.64 SF
FA:0.00 SF
MO:342.40

1+25

CV:57.73 CY
FV:0.00 CY

Car Body LB 0-1100

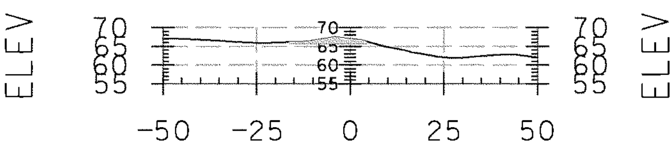



CA:31.95 SF
FA:0.00 SF
MO:383.88

1+50

CV:41.48 CY
FV:0.00 CY

Car Body LB 0-1100



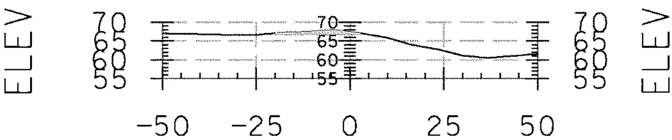

CA:19.87 SF
FA:0.00 SF
MO:407.87

1+75

CV:23.99 CY
FV:0.00 CY

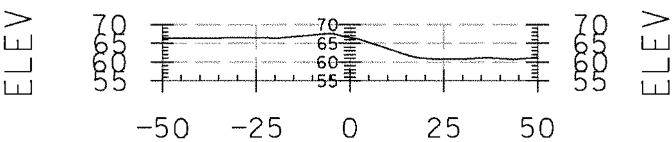
STA.2+00 TO STA.2+50

Car Body LB 0-1100



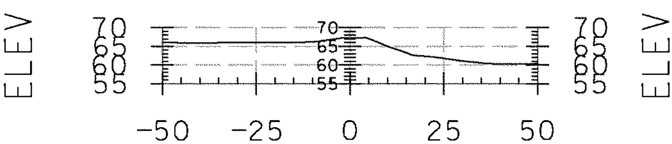

CA:16.86 SF 2+00 CV:17.01 CY
FA:0.00 SF FV:0.00 CY
MO:424.87

Car Body LB 0-1100




CA:0.00 SF 2+25 CV:7.80 CY
FA:0.12 SF FV:0.06 CY
MO:432.62

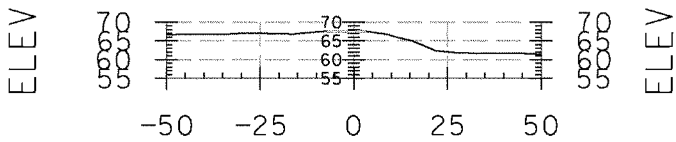
Car Body LB 0-1100




CA:0.00 SF 2+50 CV:0.00 CY
FA:0.02 SF FV:0.06 CY
MO:432.56

# STA.2+75 TO STA.3+25

Car Body LB 0-1100

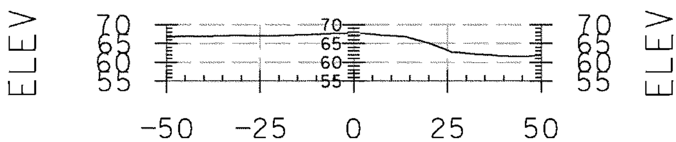



CA:3.22 SF
FA:0.00 SF
MO:434.04

2+75

CV:1.49 CY
FV:0.01 CY

Car Body LB 0-1100

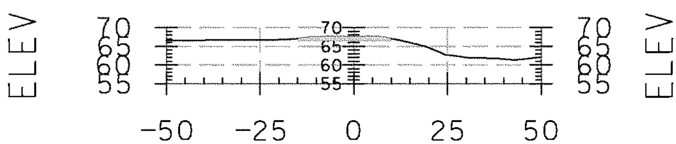



CA:1.06 SF
FA:0.00 SF
MO:436.02

3+00

CV:1.98 CY
FV:0.00 CY

Car Body LB 0-1100



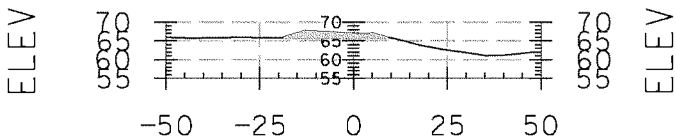

CA:22.63 SF
FA:0.00 SF
MO:446.98

3+25

CV:10.97 CY
FV:0.00 CY

# STA.3+50 TO STA.4+00

Car Body LB 0-1100

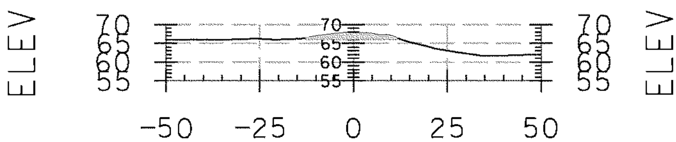



CA:38.30 SF
FA:0.00 SF
MO:475.19

3+50

CV:28.21 CY
FV:0.00 CY

Car Body LB 0-1100

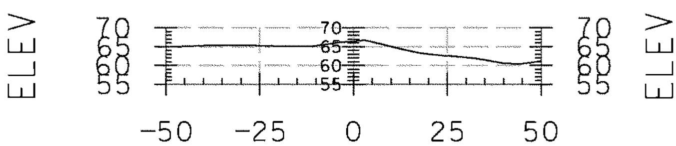



CA:28.25 SF
FA:0.00 SF
MO:506.00

3+75

CV:30.81 CY
FV:0.00 CY

Car Body LB 0-1100



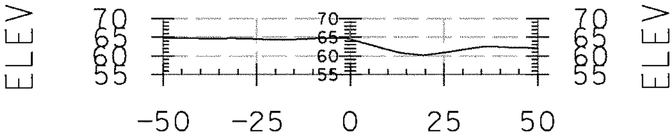

CA:0.00 SF
FA:0.06 SF
MO:519.05

4+00

CV:13.08 CY
FV:0.03 CY

STA.4+25 TO STA.4+75

Car Body LB 0-1100

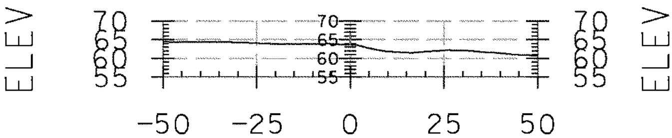



CA:0.00 SF
FA:0.23 SF
MO:518.92

4+25

CV:0.00 CY
FV:0.13 CY

Car Body LB 0-1100

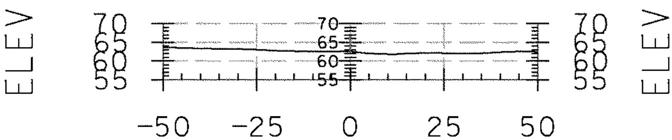



CA:0.00 SF
FA:0.31 SF
MO:518.67

4+50

CV:0.00 CY
FV:0.25 CY

Car Body LB 0-1100



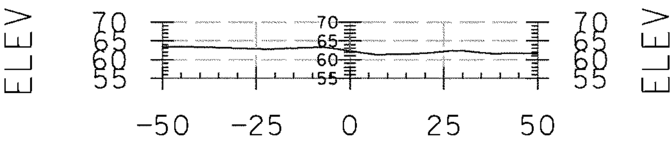

CA:0.00 SF
FA:0.43 SF
MO:518.33

4+75

CV:0.00 CY
FV:0.34 CY

# STA.5+00 TO STA.5+50

Car Body LB 0-1100




CA:Ø.ØØ SF

5+00

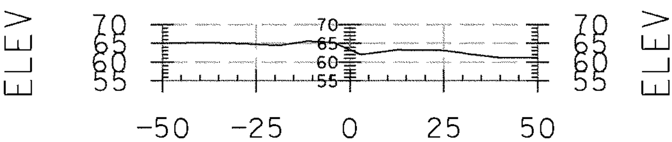
CV:Ø.ØØ CY

FA:Ø.43 SF

FV:Ø.40 CY

MO:517.93

Car Body LB 0-1100




CA:Ø.ØØ SF

5+25

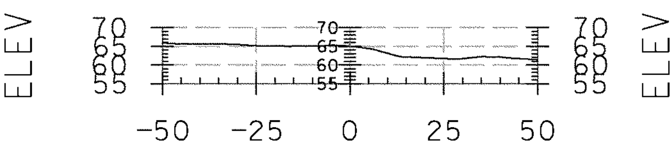
CV:Ø.ØØ CY

FA:Ø.34 SF

FV:Ø.36 CY

MO:517.58

Car Body LB 0-1100




CA:Ø.ØØ SF

5+50

CV:Ø.ØØ CY

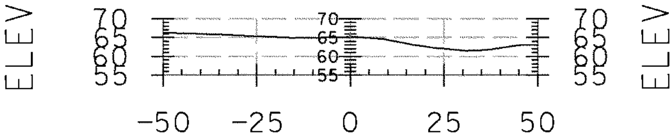
FA:Ø.13 SF

FV:Ø.22 CY

MO:517.36

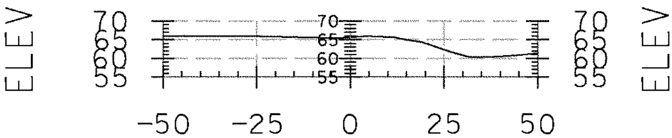
STA.5+75 TO STA.6+25

Car Body LB 0-1100



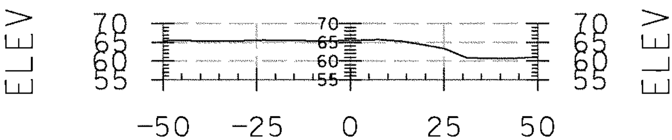

CA:0.00 SF
5+75
CV:0.00 CY
FA:0.12 SF
FV:0.12 CY
MO:517.24

Car Body LB 0-1100




CA:0.00 SF
6+00
CV:0.00 CY
FA:0.02 SF
FV:0.06 CY
MO:517.18

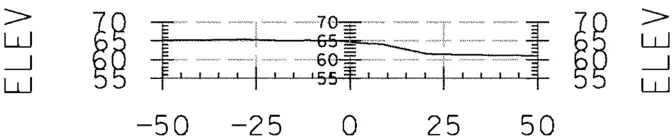
Car Body LB 0-1100




CA:0.00 SF
6+25
CV:0.00 CY
FA:0.00 SF
FV:0.01 CY
MO:517.17

STA.6+50 TO STA.7+00

Car Body LB 0-1100

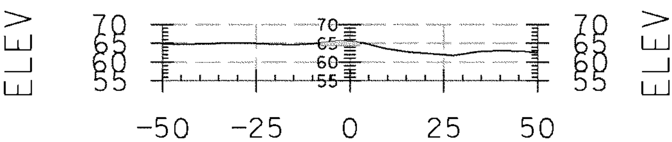



CA:0.00 SF
FA:0.05 SF
MO:517.14

6+50

CV:0.00 CY
FV:0.02 CY

Car Body LB 0-1100

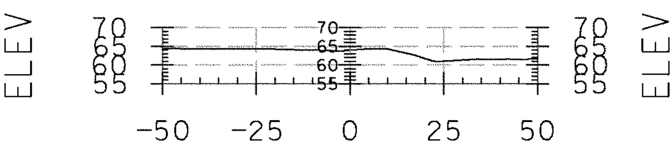



CA:8.55 SF
FA:0.00 SF
MO:521.08

6+75

CV:3.96 CY
FV:0.02 CY

Car Body LB 0-1100



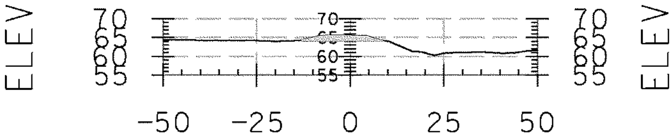

CA:0.00 SF
FA:0.06 SF
MO:525.01

7+00

CV:3.96 CY
FV:0.03 CY

# STA.7+25 TO STA.7+75

Car Body LB 0-1100




CA:25.44 SF

7+25

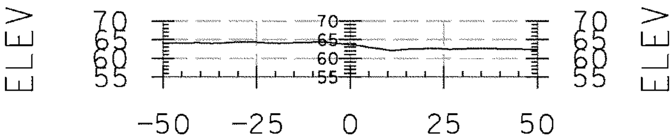
CV:11.78 CY

FA:0.00 SF

FV:0.03 CY

MO:536.76

Car Body LB 0-1100




CA:0.00 SF

7+50

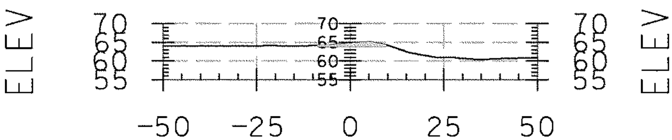
CV:11.78 CY

FA:0.05 SF

FV:0.02 CY

MO:548.51

Car Body LB 0-1100




CA:13.96 SF

7+75

CV:6.46 CY

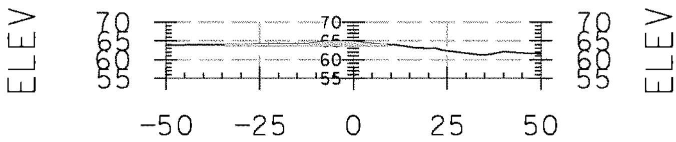
FA:0.00 SF

FV:0.02 CY

MO:554.95

STA.8+00 TO STA.8+50

Car Body LB 0-1100

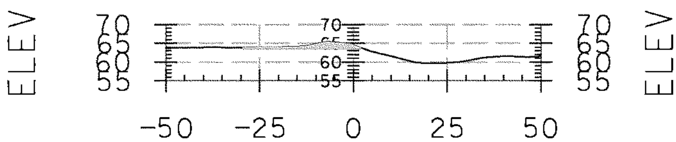



CA:29.20 SF
FA:0.00 SF
MO:574.93

8+00

CV:19.98 CY
FV:0.00 CY

Car Body LB 0-1100

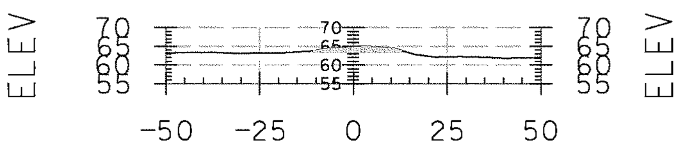



CA:25.80 SF
FA:0.00 SF
MO:600.39

8+25

CV:25.46 CY
FV:0.00 CY

Car Body LB 0-1100



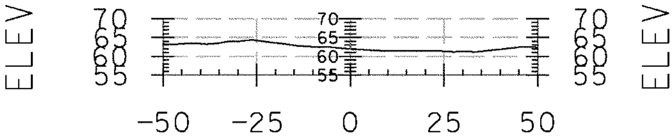

CA:23.97 SF
FA:0.00 SF
MO:623.43

8+50

CV:23.04 CY
FV:0.00 CY

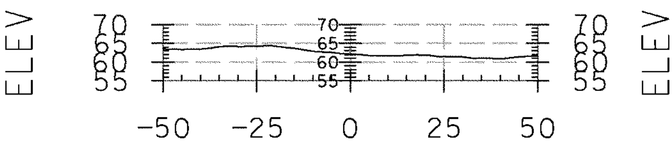
STA.8+75 TO STA.9+25

Car Body LB 0-1100



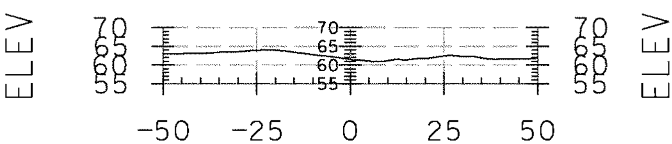

CA:0.00 SF
8+75
CV:11.10 CY
FA:0.23 SF
FV:0.10 CY
MO:634.42

Car Body LB 0-1100




CA:0.00 SF
9+00
CV:0.00 CY
FA:0.14 SF
FV:0.17 CY
MO:634.25

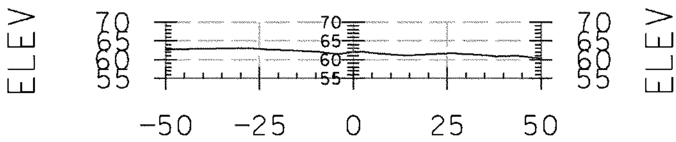
Car Body LB 0-1100




CA:0.00 SF
9+25
CV:0.00 CY
FA:0.21 SF
FV:0.16 CY
MO:634.09

STA.9+50 TO STA.10+00

Car Body LB 0-1100

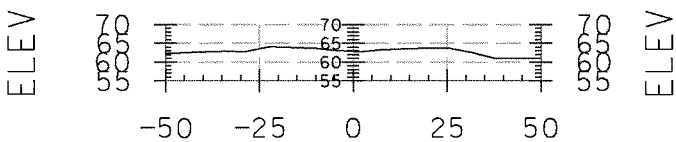



CA:0.00 SF
FA:0.14 SF
MO:633.92

9+50

CV:0.00 CY
FV:0.16 CY

Car Body LB 0-1100

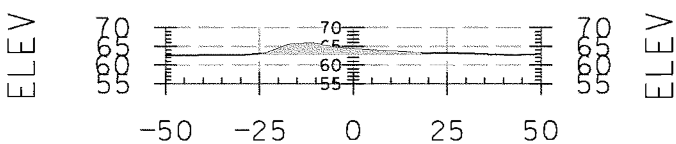



CA:0.00 SF
FA:0.07 SF
MO:633.83

9+75

CV:0.00 CY
FV:0.10 CY

Car Body LB 0-1100



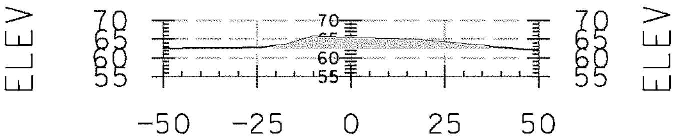

CA:62.21 SF
FA:0.11 SF
MO:662.54

10+00

CV:28.80 CY
FV:0.09 CY

STA.10+25 TO STA.10+50

Car Body LB 0-1100




CA:106.71 SF

10+25

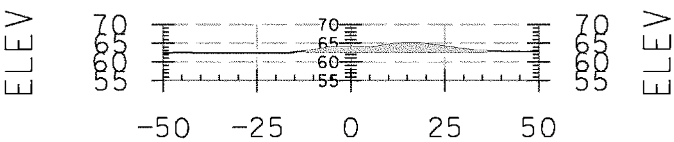
CV:78.21 CY

FA:0.00 SF

FV:0.05 CY

MO:740.70

Car Body LB 0-1100




CA:67.91 SF

10+50

CV:80.85 CY

FA:0.00 SF

FV:0.00 CY

MO:821.55

# Volumes Report

Report Created: 11/4/2014
Time: 7:24am

Bentley InRoads Suite V8i (SELECTseries 2), 08.11.07.536

**Cross Section Set Name:** car_body ds_1

**Alignment Name:** car_body ds

**Input Grid Factor:** 1.000000

**Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

**Surface:** carbody Last Revised 8/29/2014 5:57:31 AM

**Surface:** car body Remove LB 1050-1620 Last Revised 10/10/2014 9:26:31 AM

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **10+40.000** | | | | | | | 0.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+50.000** | | | | | | | 0.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+75.000** | | | | | | | 59.9 |
| | Normal Cut: | 129.5 | 59.9 | 1.000 | 59.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 13.7 | 6.4 | 1.000 | 6.4 | No | |
| **11+00.000** | | | | | | | 173.3 |
| | Normal Cut: | 115.4 | 113.4 | 1.000 | 113.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 12.9 | 12.3 | 1.000 | 12.3 | No | |
| **11+25.000** | | | | | | | 277.8 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 110.3 | 104.5 | 1.000 | 104.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 12.2 | 11.6 | 1.000 | 11.6 | No | |
| **11+50.000** | | | | | | | 380.4 |
| | Normal Cut: | 111.4 | 102.6 | 1.000 | 102.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 11.4 | 10.9 | 1.000 | 10.9 | No | |
| **11+75.000** | | | | | | | 483.8 |
| | Normal Cut: | 111.8 | 103.3 | 1.000 | 103.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 10.6 | 10.2 | 1.000 | 10.2 | No | |
| **12+00.000** | | | | | | | 587.2 |
| | Normal Cut: | 111.5 | 103.4 | 1.000 | 103.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.8 | 9.4 | 1.000 | 9.4 | No | |
| **12+25.000** | | | | | | | 690.0 |
| | Normal Cut: | 110.7 | 102.9 | 1.000 | 102.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.8 | 9.0 | 1.000 | 9.0 | No | |
| **12+50.000** | | | | | | | 792.3 |
| | Normal Cut: | 110.2 | 102.3 | 1.000 | 102.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 10.3 | 9.3 | 1.000 | 9.3 | No | |
| **12+75.000** | | | | | | | 894.8 |
| | Normal Cut: | 111.2 | 102.5 | 1.000 | 102.5 | Yes | |
| | Normal Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 11.0 | 9.9 | 1.000 | 9.9 | No | |
| **13+00.000** | | | | | | | 998.8 |
| | Normal Cut: | 113.6 | 104.1 | 1.000 | 104.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 11.6 | 10.4 | 1.000 | 10.4 | No | |
| **13+25.000** | | | | | | | 1104.5 |
| | Normal Cut: | 114.7 | 105.7 | 1.000 | 105.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 11.9 | 10.9 | 1.000 | 10.9 | No | |
| **13+50.000** | | | | | | | 1213.5 |
| | Normal Cut: | 120.7 | 109.0 | 1.000 | 109.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 12.1 | 11.1 | 1.000 | 11.1 | No | |
| **13+75.000** | | | | | | | 1327.1 |
| | Normal Cut: | 124.7 | 113.6 | 1.000 | 113.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 12.1 | 11.2 | 1.000 | 11.2 | No | |
| **14+00.000** | | | | | | | 1443.5 |
| | Normal Cut: | 126.8 | 116.4 | 1.000 | 116.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 12.2 | 11.3 | 1.000 | 11.3 | No | |
| **14+25.000** | | | | | | | 1556.4 |
| | Normal Cut: | 117.0 | 112.9 | 1.000 | 112.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 10.3 | 10.4 | 1.000 | 10.4 | No | |
| **14+50.000** | | | | | | | 1659.6 |
| | Normal Cut: | 105.9 | 103.2 | 1.000 | 103.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.4 | 9.1 | 1.000 | 9.1 | No | |
| **14+75.000** | | | | | | | 1751.5 |
| | Normal Cut: | 94.4 | 92.7 | 1.000 | 92.7 | Yes | |
| | Normal Fill: | 1.8 | 0.8 | 1.000 | 0.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 4.3 | 1.000 | 4.3 | No | |
| **15+00.000** | | | | | | | 1841.4 |
| | Normal Cut: | 101.6 | 90.8 | 1.000 | 90.8 | Yes | |
| | Normal Fill: | 0.0 | 0.8 | 1.000 | 0.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **15+25.000** | | | | | | | 1930.6 |
| | Normal Cut: | 91.0 | 89.2 | 1.000 | 89.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.3 | 4.3 | 1.000 | 4.3 | No | |
| **15+50.000** | | | | | | | 2004.7 |
| | Normal Cut: | 68.8 | 74.0 | 1.000 | 74.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.1 | 8.0 | 1.000 | 8.0 | No | |
| **15+75.000** | | | | | | | 2060.7 |
| | Normal Cut: | 52.3 | 56.1 | 1.000 | 56.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | | | | | |

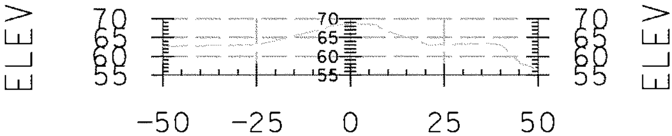
| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.9 | 6.9 | 1.000 | 6.9 | No | |
| **16+00.000** | | | | | | | 2103.6 |
| | Normal Cut: | 40.4 | 42.9 | 1.000 | 42.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.9 | 5.9 | 1.000 | 5.9 | No | |
| **16+25.000** | | | | | | | 2131.4 |
| | Normal Cut: | 19.8 | 27.8 | 1.000 | 27.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 3.5 | 4.3 | 1.000 | 4.3 | No | |

| **Totals:** | Type | Volume | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|
| | Normal Cut: | 2133.1 | 2133.1 | Yes | |
| | Normal Fill: | 1.6 | 1.6 | Yes | |
| | Added Cut: | 0.0 | 0.0 | Yes | |
| | Added Fill: | 0.0 | 0.0 | Yes | |
| | Topsoil: | 197.3 | 197.3 | No | |

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

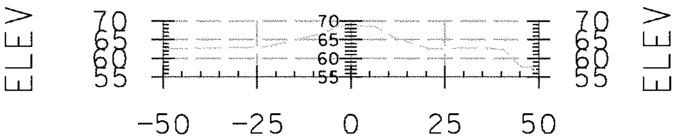
# STA.10+40 TO STA.10+75

Car Body LB 1050-1620



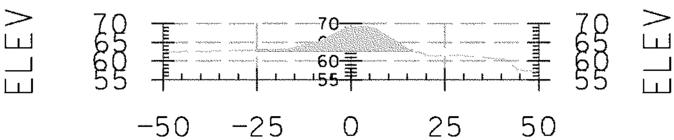

CA:0.00 SF
10+40
CV:0.00 CY
FA:0.00 SF
FV:0.00 CY
MO:0.00

Car Body LB 1050-1620




CA:0.00 SF
10+50
CV:0.00 CY
FA:0.00 SF
FV:0.00 CY
MO:0.00

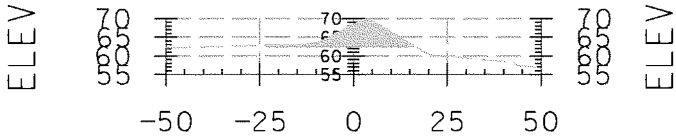
Car Body LB 1050-1620




CA:129.47 SF
10+75
CV:59.94 CY
FA:0.00 SF
FV:0.00 CY
MO:59.94

# STA.11+00 TO STA.11+50

Car Body LB 1050-1620

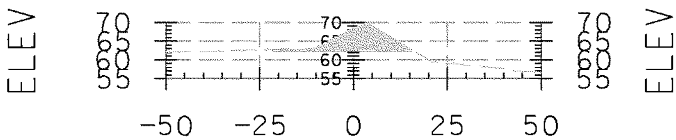



CA:115.38 SF
FA:Ø.ØØ SF
MO:173.29

11+00

CV:113.35 CY
FV:Ø.ØØ CY

Car Body LB 1050-1620

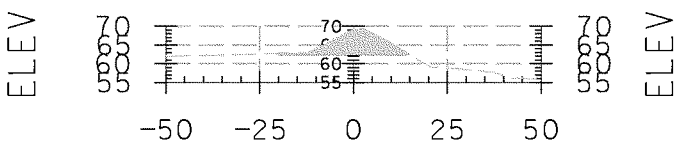



CA:11Ø.31 SF
FA:Ø.ØØ SF
MO:277.78

11+25

CV:1Ø4.49 CY
FV:Ø.ØØ CY

Car Body LB 1050-1620



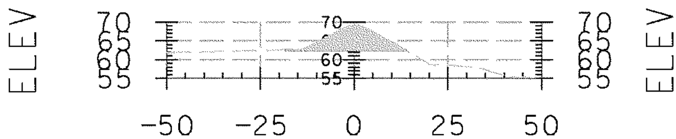

CA:111.4Ø SF
FA:Ø.ØØ SF
MO:38Ø.42

11+50

CV:1Ø2.64 CY
FV:Ø.ØØ CY

STA.11+75 TO STA.12+25

Car Body LB 1050-1620

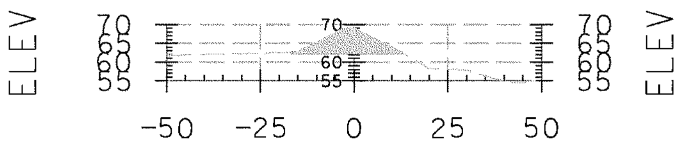



CA:111.80 SF
FA:0.00 SF
MO:483.76

11+75

CV:103.33 CY
FV:0.00 CY

Car Body LB 1050-1620

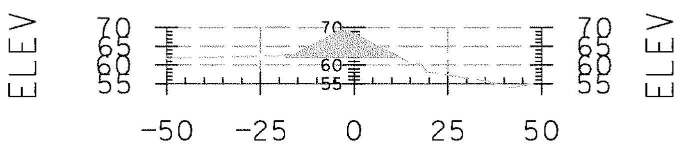



CA:111.54 SF
FA:0.00 SF
MO:587.15

12+00

CV:103.40 CY
FV:0.00 CY

Car Body LB 1050-1620



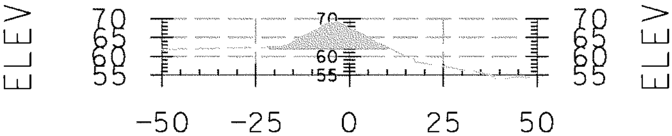

CA:110.69 SF
FA:0.00 SF
MO:690.04

12+25

CV:102.89 CY
FV:0.00 CY

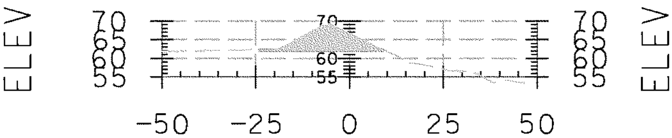
# STA.12+50 TO STA.13+00

Car Body LB 1050-1620



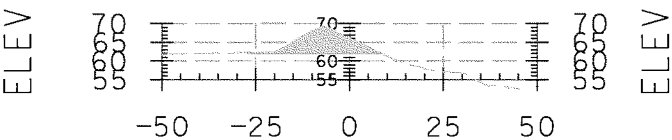

CA:110.19 SF
12+50
CV:102.26 CY
FA:0.00 SF
FV:0.00 CY
MO:792.30

Car Body LB 1050-1620




CA:111.15 SF
12+75
CV:102.47 CY
FA:0.00 SF
FV:0.00 CY
MO:894.77

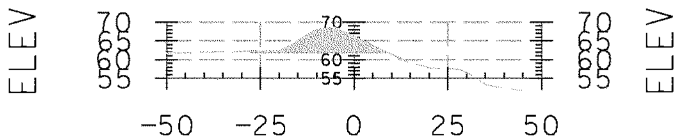
Car Body LB 1050-1620




CA:113.61 SF
13+00
CV:104.06 CY
FA:0.00 SF
FV:0.00 CY
MO:998.83

STA.13+25 TO STA.13+75

Car Body LB 1050-1620

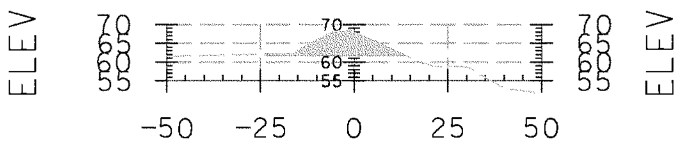



CA:114.70 SF
FA:0.00 SF
MO:1104.52

13+25

CV:105.70 CY
FV:0.00 CY

Car Body LB 1050-1620

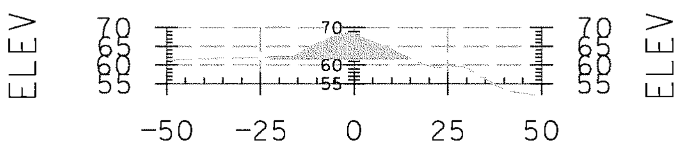



CA:120.70 SF
FA:0.00 SF
MO:1213.51

13+50

CV:108.98 CY
FV:0.00 CY

Car Body LB 1050-1620



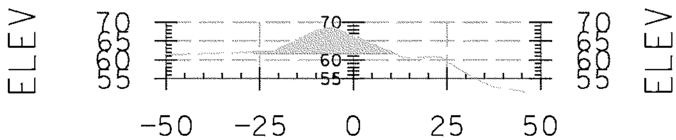

CA:124.68 SF
FA:0.00 SF
MO:1327.11

13+75

CV:113.61 CY
FV:0.00 CY

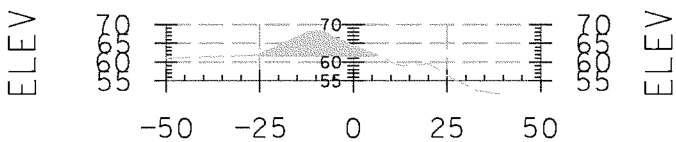
STA.14+00 TO STA.14+50

Car Body LB 1050-1620



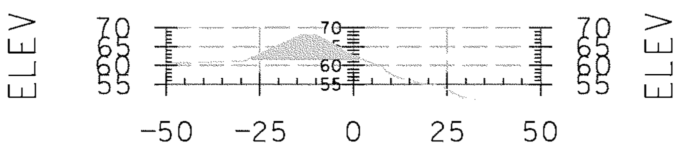

CA:126.78 SF
14+00
CV:116.42 CY
FA:0.00 SF
FV:0.00 CY
MO:1443.53

Car Body LB 1050-1620




CA:117.00 SF
14+25
CV:112.86 CY
FA:0.00 SF
FV:0.00 CY
MO:1556.39

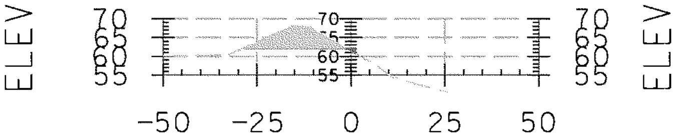
Car Body LB 1050-1620




CA:105.90 SF
14+50
CV:103.20 CY
FA:0.00 SF
FV:0.00 CY
MO:1659.59

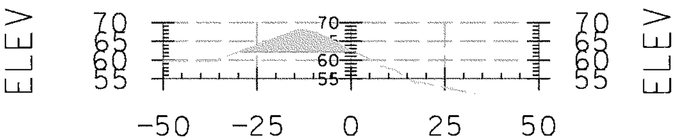
STA.14+75 TO STA.15+25

Car Body LB 1050-1620



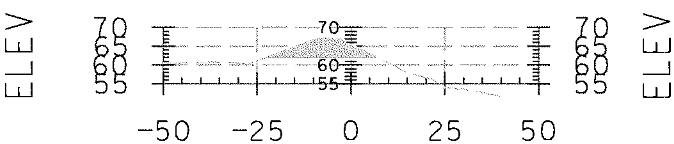

CA:94.38 SF
14+75
CV:92.72 CY
FA:1.76 SF
FV:Ø.81 CY
MO:1751.5Ø

Car Body LB 1050-1620




CA:1Ø1.65 SF
15+00
CV:9Ø.75 CY
FA:Ø.Ø1 SF
FV:Ø.82 CY
MO:1841.43

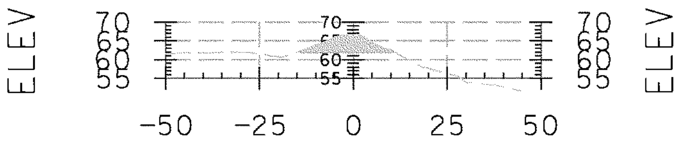
Car Body LB 1050-1620




CA:91.Ø4 SF
15+25
CV:89.21 CY
FA:Ø.ØØ SF
FV:Ø.ØØ CY
MO:193Ø.63

# STA.15+50 TO STA.16+00

## Car Body LB 1050-1620

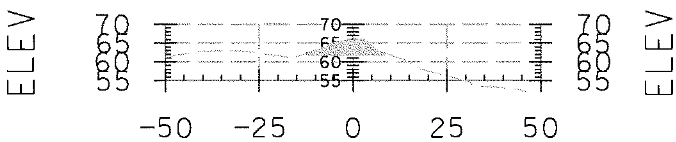



CA:68.84 SF
FA:0.00 SF
MO:2004.65

15+50

CV:74.02 CY
FV:0.00 CY

## Car Body LB 1050-1620

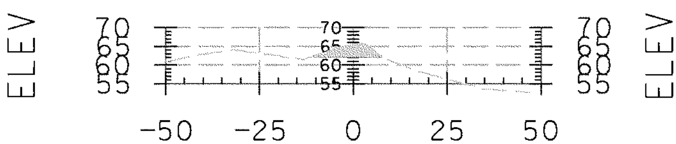



CA:52.26 SF
FA:0.00 SF
MO:2060.72

15+75

CV:56.06 CY
FV:0.00 CY

## Car Body LB 1050-1620

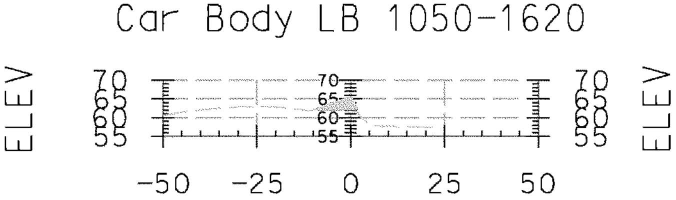



CA:40.35 SF
FA:0.00 SF
MO:2103.59

16+00

CV:42.88 CY
FV:0.00 CY

STA.16+25 TO STA.16+25




CA:19.78 SF
16+25
CV:27.84 CY
FA:0.01 SF
FV:0.00 CY
MO:2131.43

# Volumes Report

Report Created: 11/4/2014
Time: 7:25am

Bentley InRoads Suite V8i (SELECTseries 2), 08.11.07.536

**Cross Section Set Name:** car_body ds_2

**Alignment Name:** car_body ds

**Input Grid Factor:** 1.000000

**Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

**Surface:** carbody Last Revised 8/29/2014 5:57:31 AM

**Surface:** Car body Remove1 Last Revised 10/18/2014 11:18:51 AM

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **17+50.000** | | | | | | | 0.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **17+75.000** | | | | | | | 2.6 |
| | Normal Cut: | 5.6 | 2.6 | 1.000 | 2.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+00.000** | | | | | | | 20.6 |
| | Normal Cut: | 33.4 | 18.0 | 1.000 | 18.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.0 | 2.8 | 1.000 | 2.8 | No | |
| **18+25.000** | | | | | | | 59.1 |
| | Normal Cut: | 49.7 | 38.5 | 1.000 | 38.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.7 | 6.4 | 1.000 | 6.4 | No | |
| **18+50.000** | | | | | | | 110.3 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 60.7 | 51.1 | 1.000 | 51.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.5 | 7.5 | 1.000 | 7.5 | No | |
| **18+75.000** | | | | | | | 171.7 |
| | Normal Cut: | 72.0 | 61.4 | 1.000 | 61.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.1 | 8.1 | 1.000 | 8.1 | No | |
| **19+00.000** | | | | | | | 244.3 |
| | Normal Cut: | 84.8 | 72.6 | 1.000 | 72.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.7 | 8.7 | 1.000 | 8.7 | No | |
| **19+25.000** | | | | | | | 329.5 |
| | Normal Cut: | 99.2 | 85.2 | 1.000 | 85.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 10.5 | 9.4 | 1.000 | 9.4 | No | |
| **19+50.000** | | | | | | | 419.7 |
| | Normal Cut: | 95.7 | 90.2 | 1.000 | 90.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 10.3 | 9.6 | 1.000 | 9.6 | No | |
| **19+75.000** | | | | | | | 503.5 |
| | Normal Cut: | 85.4 | 83.8 | 1.000 | 83.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.6 | 9.2 | 1.000 | 9.2 | No | |
| **20+00.000** | | | | | | | 578.1 |
| | Normal Cut: | 75.9 | 74.7 | 1.000 | 74.7 | Yes | |
| | Normal Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.9 | 8.6 | 1.000 | 8.6 | No | |
| **20+25.000** | | | | | | | 644.5 |
| | Normal Cut: | 67.4 | 66.4 | 1.000 | 66.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.3 | 8.0 | 1.000 | 8.0 | No | |
| **20+50.000** | | | | | | | 703.6 |
| | Normal Cut: | 60.2 | 59.1 | 1.000 | 59.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.9 | 7.5 | 1.000 | 7.5 | No | |
| **20+75.000** | | | | | | | 756.3 |
| | Normal Cut: | 53.7 | 52.7 | 1.000 | 52.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.7 | 7.2 | 1.000 | 7.2 | No | |
| **21+00.000** | | | | | | | 803.6 |
| | Normal Cut: | 48.4 | 47.3 | 1.000 | 47.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.7 | 7.1 | 1.000 | 7.1 | No | |
| **21+25.000** | | | | | | | 846.7 |
| | Normal Cut: | 44.7 | 43.1 | 1.000 | 43.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.7 | 7.1 | 1.000 | 7.1 | No | |
| **21+50.000** | | | | | | | 886.8 |
| | Normal Cut: | 41.9 | 40.1 | 1.000 | 40.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.5 | 7.0 | 1.000 | 7.0 | No | |
| **21+75.000** | | | | | | | 923.9 |
| | Normal Cut: | 38.2 | 37.1 | 1.000 | 37.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.9 | 6.7 | 1.000 | 6.7 | No | |
| **22+00.000** | | | | | | | 958.5 |
| | Normal Cut: | 36.4 | 34.6 | 1.000 | 34.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.3 | 6.1 | 1.000 | 6.1 | No | |
| **22+25.000** | | | | | | | 992.2 |
| | Normal Cut: | 36.5 | 33.7 | 1.000 | 33.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.2 | 5.8 | 1.000 | 5.8 | No | |
| **22+50.000** | | | | | | | 1023.9 |
| | Normal Cut: | 31.9 | 31.6 | 1.000 | 31.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.5 | 5.4 | 1.000 | 5.4 | No | |
| **22+75.000** | | | | | | | 1051.9 |
| | Normal Cut: | 28.7 | 28.1 | 1.000 | 28.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.2 | 4.9 | 1.000 | 4.9 | No | |
| **23+00.000** | | | | | | | 1078.1 |
| | Normal Cut: | 27.8 | 26.2 | 1.000 | 26.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.2 | 4.8 | 1.000 | 4.8 | No | |
| **23+25.000** | | | | | | | 1105.2 |
| | Normal Cut: | 30.6 | 27.1 | 1.000 | 27.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.6 | 5.0 | 1.000 | 5.0 | No | |
| **23+50.000** | | | | | | | 1138.4 |
| | Normal Cut: | 41.3 | 33.3 | 1.000 | 33.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.8 | 6.2 | 1.000 | 6.2 | No | |
| **23+75.000** | | | | | | | 1174.8 |
| | Normal Cut: | 37.2 | 36.3 | 1.000 | 36.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.2 | 7.0 | 1.000 | 7.0 | No | |
| **24+00.000** | | | | | | | 1207.5 |
| | Normal Cut: | 33.4 | 32.7 | 1.000 | 32.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.7 | 6.5 | 1.000 | 6.5 | No | |
| **24+25.000** | | | | | | | 1236.6 |
| | Normal Cut: | 29.5 | 29.1 | 1.000 | 29.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.1 | 5.9 | 1.000 | 5.9 | No | |
| **24+50.000** | | | | | | | 1262.6 |
| | Normal Cut: | 26.7 | 26.0 | 1.000 | 26.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 5.8 | 5.5 | 1.000 | 5.5 | No | |
| **24+75.000** | | | | | | | 1286.8 |
| | Normal Cut: | 25.6 | 24.2 | 1.000 | 24.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.6 | 5.3 | 1.000 | 5.3 | No | |
| **25+00.000** | | | | | | | 1310.0 |
| | Normal Cut: | 24.5 | 23.2 | 1.000 | 23.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.5 | 5.1 | 1.000 | 5.1 | No | |
| **25+25.000** | | | | | | | 1332.3 |
| | Normal Cut: | 23.5 | 22.2 | 1.000 | 22.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.4 | 5.0 | 1.000 | 5.0 | No | |
| **25+50.000** | | | | | | | 1353.7 |
| | Normal Cut: | 22.8 | 21.5 | 1.000 | 21.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.4 | 5.0 | 1.000 | 5.0 | No | |
| **25+75.000** | | | | | | | 1373.2 |
| | Normal Cut: | 19.2 | 19.4 | 1.000 | 19.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.8 | 4.7 | 1.000 | 4.7 | No | |
| **26+00.000** | | | | | | | 1389.5 |
| | Normal Cut: | 16.2 | 16.4 | 1.000 | 16.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.4 | 4.3 | 1.000 | 4.3 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **26+25.000** | | | | | | | 1403.2 |
| | Normal Cut: | 13.4 | 13.7 | 1.000 | 13.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.1 | 4.0 | 1.000 | 4.0 | No | |
| **26+50.000** | | | | | | | 1414.7 |
| | Normal Cut: | 11.4 | 11.5 | 1.000 | 11.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.1 | 3.8 | 1.000 | 3.8 | No | |
| **26+75.000** | | | | | | | 1424.7 |
| | Normal Cut: | 10.2 | 10.0 | 1.000 | 10.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.1 | 3.8 | 1.000 | 3.8 | No | |
| **27+00.000** | | | | | | | 1433.9 |
| | Normal Cut: | 9.7 | 9.2 | 1.000 | 9.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.1 | 3.8 | 1.000 | 3.8 | No | |
| **27+25.000** | | | | | | | 1444.1 |
| | Normal Cut: | 12.3 | 10.2 | 1.000 | 10.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.4 | 3.9 | 1.000 | 3.9 | No | |
| **27+50.000** | | | | | | | 1455.8 |
| | Normal Cut: | 12.9 | 11.6 | 1.000 | 11.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.5 | 4.1 | 1.000 | 4.1 | No | |
| **27+75.000** | | | | | | | 1467.6 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 12.7 | 11.8 | 1.000 | 11.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.5 | 4.2 | 1.000 | 4.2 | No | |
| **28+00.000** | | | | | | | 1479.7 |
| | Normal Cut: | 13.5 | 12.1 | 1.000 | 12.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.6 | 4.2 | 1.000 | 4.2 | No | |
| **28+25.000** | | | | | | | 1493.3 |
| | Normal Cut: | 16.0 | 13.7 | 1.000 | 13.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.0 | 4.4 | 1.000 | 4.4 | No | |
| **28+50.000** | | | | | | | 1510.7 |
| | Normal Cut: | 21.5 | 17.4 | 1.000 | 17.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.7 | 5.0 | 1.000 | 5.0 | No | |
| **28+75.000** | | | | | | | 1534.2 |
| | Normal Cut: | 29.1 | 23.5 | 1.000 | 23.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.8 | 5.8 | 1.000 | 5.8 | No | |
| **29+00.000** | | | | | | | 1561.9 |
| | Normal Cut: | 30.7 | 27.7 | 1.000 | 27.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.2 | 6.5 | 1.000 | 6.5 | No | |
| **29+25.000** | | | | | | | 1590.3 |
| | Normal Cut: | 30.7 | 28.4 | 1.000 | 28.4 | Yes | |
| | Normal Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.4 | 6.8 | 1.000 | 6.8 | No | |
| **29+50.000** | | | | | | | 1614.7 |
| | Normal Cut: | 22.1 | 24.4 | 1.000 | 24.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.1 | 6.3 | 1.000 | 6.3 | No | |
| **29+75.000** | | | | | | | 1633.6 |
| | Normal Cut: | 18.7 | 18.9 | 1.000 | 18.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.3 | 5.3 | 1.000 | 5.3 | No | |
| **30+00.000** | | | | | | | 1649.9 |
| | Normal Cut: | 16.6 | 16.3 | 1.000 | 16.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.8 | 4.7 | 1.000 | 4.7 | No | |
| **30+25.000** | | | | | | | 1664.6 |
| | Normal Cut: | 15.1 | 14.7 | 1.000 | 14.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.5 | 4.3 | 1.000 | 4.3 | No | |
| **30+50.000** | | | | | | | 1678.6 |
| | Normal Cut: | 15.2 | 14.1 | 1.000 | 14.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.7 | 4.3 | 1.000 | 4.3 | No | |
| **30+75.000** | | | | | | | 1693.2 |
| | Normal Cut: | 16.2 | 14.5 | 1.000 | 14.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.8 | 4.9 | 1.000 | 4.9 | No | |
| **31+00.000** | | | | | | | 1707.6 |
| | Normal Cut: | 14.9 | 14.4 | 1.000 | 14.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.0 | 5.9 | 1.000 | 5.9 | No | |
| **31+25.000** | | | | | | | 1719.2 |
| | Normal Cut: | 10.1 | 11.6 | 1.000 | 11.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.5 | 6.2 | 1.000 | 6.2 | No | |
| **31+50.000** | | | | | | | 1723.8 |
| | Normal Cut: | 0.0 | 4.7 | 1.000 | 4.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 3.0 | 1.000 | 3.0 | No | |
| **31+75.000** | | | | | | | 1723.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+00.000** | | | | | | | 1723.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+25.000** | | | | | | | 1728.5 |
| | Normal Cut: | 10.0 | 4.7 | 1.000 | 4.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.0 | 3.7 | 1.000 | 3.7 | No | |
| **32+50.000** | | | | | | | 1741.3 |
| | Normal Cut: | 17.7 | 12.9 | 1.000 | 12.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.1 | 7.9 | 1.000 | 7.9 | No | |
| **32+75.000** | | | | | | | 1761.3 |
| | Normal Cut: | 25.5 | 20.0 | 1.000 | 20.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.1 | 8.4 | 1.000 | 8.4 | No | |
| **33+00.000** | | | | | | | 1787.9 |
| | Normal Cut: | 31.9 | 26.6 | 1.000 | 26.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.0 | 8.4 | 1.000 | 8.4 | No | |
| **33+25.000** | | | | | | | 1819.7 |
| | Normal Cut: | 36.9 | 31.8 | 1.000 | 31.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.9 | 8.3 | 1.000 | 8.3 | No | |
| **33+50.000** | | | | | | | 1855.5 |
| | Normal Cut: | 40.4 | 35.8 | 1.000 | 35.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.8 | 8.2 | 1.000 | 8.2 | No | |
| **33+75.000** | | | | | | | 1893.4 |
| | Normal Cut: | 41.3 | 37.8 | 1.000 | 37.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 8.6 | 8.0 | 1.000 | 8.0 | No | |
| **34+00.000** | | | | | | | 1931.2 |
| | Normal Cut: | 40.3 | 37.8 | 1.000 | 37.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.6 | 8.0 | 1.000 | 8.0 | No | |
| **34+25.000** | | | | | | | 1968.8 |
| | Normal Cut: | 41.0 | 37.6 | 1.000 | 37.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.2 | 7.8 | 1.000 | 7.8 | No | |
| **34+50.000** | | | | | | | 2007.4 |
| | Normal Cut: | 42.5 | 38.6 | 1.000 | 38.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.0 | 7.5 | 1.000 | 7.5 | No | |
| **34+75.000** | | | | | | | 2045.1 |
| | Normal Cut: | 38.9 | 37.7 | 1.000 | 37.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.5 | 7.2 | 1.000 | 7.2 | No | |
| **35+00.000** | | | | | | | 2077.8 |
| | Normal Cut: | 31.7 | 32.7 | 1.000 | 32.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.4 | 6.4 | 1.000 | 6.4 | No | |
| **35+25.000** | | | | | | | 2105.8 |
| | Normal Cut: | 28.7 | 28.0 | 1.000 | 28.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.5 | 6.0 | 1.000 | 6.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **35+50.000** | | | | | | | 2133.8 |
| | Normal Cut: | 31.8 | 28.0 | 1.000 | 28.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.9 | 6.7 | 1.000 | 6.7 | No | |
| **35+75.000** | | | | | | | 2164.1 |
| | Normal Cut: | 33.8 | 30.4 | 1.000 | 30.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.8 | 7.2 | 1.000 | 7.2 | No | |
| **36+00.000** | | | | | | | 2196.2 |
| | Normal Cut: | 35.4 | 32.0 | 1.000 | 32.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.6 | 7.1 | 1.000 | 7.1 | No | |
| **36+25.000** | | | | | | | 2229.4 |
| | Normal Cut: | 36.4 | 33.2 | 1.000 | 33.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.5 | 7.0 | 1.000 | 7.0 | No | |
| **36+50.000** | | | | | | | 2262.8 |
| | Normal Cut: | 35.7 | 33.4 | 1.000 | 33.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.0 | 6.7 | 1.000 | 6.7 | No | |
| **36+75.000** | | | | | | | 2295.9 |
| | Normal Cut: | 35.7 | 33.1 | 1.000 | 33.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.6 | 6.3 | 1.000 | 6.3 | No | |
| **37+00.000** | | | | | | | 2329.5 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 37.0 | 33.7 | 1.000 | 33.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.0 | 5.8 | 1.000 | 5.8 | No | |
| **37+25.000** | | | | | | | 2364.8 |
| | Normal Cut: | 39.2 | 35.3 | 1.000 | 35.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.1 | 5.6 | 1.000 | 5.6 | No | |
| **37+50.000** | | | | | | | 2401.9 |
| | Normal Cut: | 40.9 | 37.1 | 1.000 | 37.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.3 | 5.7 | 1.000 | 5.7 | No | |
| **37+75.000** | | | | | | | 2440.6 |
| | Normal Cut: | 42.6 | 38.7 | 1.000 | 38.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.4 | 5.9 | 1.000 | 5.9 | No | |
| **38+00.000** | | | | | | | 2481.2 |
| | Normal Cut: | 45.2 | 40.6 | 1.000 | 40.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.6 | 6.0 | 1.000 | 6.0 | No | |
| **38+25.000** | | | | | | | 2524.8 |
| | Normal Cut: | 48.9 | 43.6 | 1.000 | 43.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.4 | 6.5 | 1.000 | 6.5 | No | |
| **38+50.000** | | | | | | | 2573.1 |
| | Normal Cut: | 55.5 | 48.3 | 1.000 | 48.3 | Yes | |
| | Normal Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.8 | 7.1 | 1.000 | 7.1 | No | |
| **38+75.000** | | | | | | | 2621.7 |
| | Normal Cut: | 49.6 | 48.6 | 1.000 | 48.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.9 | 6.8 | 1.000 | 6.8 | No | |
| **39+00.000** | | | | | | | 2660.7 |
| | Normal Cut: | 34.7 | 39.0 | 1.000 | 39.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 9.2 | 7.5 | 1.000 | 7.5 | No | |
| **39+25.000** | | | | | | | 2697.2 |
| | Normal Cut: | 44.0 | 36.5 | 1.000 | 36.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 11.0 | 9.4 | 1.000 | 9.4 | No | |
| **39+50.000** | | | | | | | 2743.1 |
| | Normal Cut: | 55.2 | 46.0 | 1.000 | 46.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 13.0 | 11.1 | 1.000 | 11.1 | No | |
| **39+75.000** | | | | | | | 2802.3 |
| | Normal Cut: | 72.6 | 59.2 | 1.000 | 59.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 17.8 | 14.3 | 1.000 | 14.3 | No | |
| **40+00.000** | | | | | | | 2863.2 |
| | Normal Cut: | 59.0 | 60.9 | 1.000 | 60.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 16.2 | 15.7 | 1.000 | 15.7 | No | |
| **40+25.000** | | | | | | | 2906.1 |
| | Normal Cut: | 33.6 | 42.9 | 1.000 | 42.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 11.8 | 13.0 | 1.000 | 13.0 | No | |
| **40+50.000** | | | | | | | 2938.3 |
| | Normal Cut: | 36.0 | 32.2 | 1.000 | 32.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.2 | 8.8 | 1.000 | 8.8 | No | |
| **40+75.000** | | | | | | | 2954.9 |
| | Normal Cut: | 0.0 | 16.7 | 1.000 | 16.7 | Yes | |
| | Normal Fill: | 0.2 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 3.3 | 1.000 | 3.3 | No | |
| **41+00.000** | | | | | | | 2954.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+25.000** | | | | | | | 2954.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+50.000** | | | | | | | 2974.1 |
| | Normal Cut: | 41.6 | 19.2 | 1.000 | 19.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.9 | 3.6 | 1.000 | 3.6 | No | |
| **41+75.000** | | | | | | | 3016.7 |
| | Normal Cut: | 50.5 | 42.6 | 1.000 | 42.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.7 | 7.2 | 1.000 | 7.2 | No | |
| **42+00.000** | | | | | | | 3060.9 |
| | Normal Cut: | 44.9 | 44.2 | 1.000 | 44.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.9 | 6.8 | 1.000 | 6.8 | No | |
| **42+25.000** | | | | | | | 3100.1 |
| | Normal Cut: | 39.9 | 39.2 | 1.000 | 39.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.7 | 6.3 | 1.000 | 6.3 | No | |
| **42+50.000** | | | | | | | 3137.0 |
| | Normal Cut: | 39.8 | 36.9 | 1.000 | 36.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.1 | 6.4 | 1.000 | 6.4 | No | |
| **42+75.000** | | | | | | | 3174.0 |
| | Normal Cut: | 40.1 | 37.0 | 1.000 | 37.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.1 | 6.6 | 1.000 | 6.6 | No | |
| **43+00.000** | | | | | | | 3210.3 |
| | Normal Cut: | 38.4 | 36.3 | 1.000 | 36.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 6.7 | 6.4 | 1.000 | 6.4 | No | |
| **43+25.000** | | | | | | | 3244.8 |
| | Normal Cut: | 36.2 | 34.5 | 1.000 | 34.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.3 | 6.0 | 1.000 | 6.0 | No | |
| **43+50.000** | | | | | | | 3277.1 |
| | Normal Cut: | 33.5 | 32.2 | 1.000 | 32.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.9 | 5.6 | 1.000 | 5.6 | No | |
| **43+75.000** | | | | | | | 3307.7 |
| | Normal Cut: | 32.7 | 30.6 | 1.000 | 30.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.7 | 5.4 | 1.000 | 5.4 | No | |
| **44+00.000** | | | | | | | 3338.8 |
| | Normal Cut: | 34.5 | 31.1 | 1.000 | 31.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.8 | 5.3 | 1.000 | 5.3 | No | |
| **44+25.000** | | | | | | | 3371.7 |
| | Normal Cut: | 36.8 | 33.0 | 1.000 | 33.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.0 | 5.5 | 1.000 | 5.5 | No | |
| **44+50.000** | | | | | | | 3407.1 |
| | Normal Cut: | 39.6 | 35.4 | 1.000 | 35.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.2 | 5.6 | 1.000 | 5.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **44+75.000** | | | | | | | 3444.0 |
| | Normal Cut: | 40.0 | 36.9 | 1.000 | 36.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.4 | 5.8 | 1.000 | 5.8 | No | |
| **45+00.000** | | | | | | | 3479.5 |
| | Normal Cut: | 36.8 | 35.6 | 1.000 | 35.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.5 | 6.0 | 1.000 | 6.0 | No | |
| **45+25.000** | | | | | | | 3511.5 |
| | Normal Cut: | 32.2 | 31.9 | 1.000 | 31.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.7 | 6.1 | 1.000 | 6.1 | No | |
| **45+50.000** | | | | | | | 3538.5 |
| | Normal Cut: | 26.3 | 27.1 | 1.000 | 27.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.0 | 6.4 | 1.000 | 6.4 | No | |
| **45+75.000** | | | | | | | 3562.1 |
| | Normal Cut: | 24.7 | 23.6 | 1.000 | 23.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.5 | 6.3 | 1.000 | 6.3 | No | |
| **46+00.000** | | | | | | | 3584.4 |
| | Normal Cut: | 23.4 | 22.3 | 1.000 | 22.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.0 | 5.8 | 1.000 | 5.8 | No | |
| **46+25.000** | | | | | | | 3605.6 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 22.4 | 21.2 | 1.000 | 21.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.8 | 5.5 | 1.000 | 5.5 | No | |
| **46+50.000** | | | | | | | 3627.9 |
| | Normal Cut: | 25.7 | 22.3 | 1.000 | 22.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.7 | 5.3 | 1.000 | 5.3 | No | |
| **46+75.000** | | | | | | | 3651.9 |
| | Normal Cut: | 26.1 | 24.0 | 1.000 | 24.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.5 | 5.2 | 1.000 | 5.2 | No | |
| **47+00.000** | | | | | | | 3676.5 |
| | Normal Cut: | 27.0 | 24.6 | 1.000 | 24.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.6 | 5.1 | 1.000 | 5.1 | No | |
| **47+25.000** | | | | | | | 3702.0 |
| | Normal Cut: | 28.2 | 25.5 | 1.000 | 25.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.6 | 5.2 | 1.000 | 5.2 | No | |
| **47+50.000** | | | | | | | 3729.6 |
| | Normal Cut: | 31.3 | 27.5 | 1.000 | 27.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.2 | 5.5 | 1.000 | 5.5 | No | |
| **47+75.000** | | | | | | | 3760.6 |
| | Normal Cut: | 35.8 | 31.0 | 1.000 | 31.0 | Yes | |
| | Normal Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.2 | 6.2 | 1.000 | 6.2 | No | |
| **48+00.000** | | | | | | | 3798.2 |
| | Normal Cut: | 45.4 | 37.6 | 1.000 | 37.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 8.8 | 7.4 | 1.000 | 7.4 | No | |
| **48+25.000** | | | | | | | 3836.6 |
| | Normal Cut: | 37.5 | 38.4 | 1.000 | 38.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.0 | 7.3 | 1.000 | 7.3 | No | |
| **48+50.000** | | | | | | | 3870.9 |
| | Normal Cut: | 36.6 | 34.3 | 1.000 | 34.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.5 | 6.2 | 1.000 | 6.2 | No | |
| **48+75.000** | | | | | | | 3904.3 |
| | Normal Cut: | 35.6 | 33.4 | 1.000 | 33.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.0 | 5.8 | 1.000 | 5.8 | No | |
| **49+00.000** | | | | | | | 3923.3 |
| | Normal Cut: | 5.4 | 19.0 | 1.000 | 19.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 1.6 | 3.6 | 1.000 | 3.6 | No | |
| **49+25.000** | | | | | | | 3925.6 |
| | Normal Cut: | 0.0 | 2.5 | 1.000 | 2.5 | Yes | |
| | Normal Fill: | 0.5 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.8 | 1.000 | 0.8 | No | |
| **49+50.000** | | | | | | | 3925.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.4 | 0.4 | 1.000 | 0.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **49+75.000** | | | | | | | 3925.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.1 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **50+00.000** | | | | | | | 3924.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.1 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **50+25.000** | | | | | | | 3924.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.1 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **50+50.000** | | | | | | | 3944.9 |
| | Normal Cut: | 43.6 | 20.2 | 1.000 | 20.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 11.4 | 5.3 | 1.000 | 5.3 | No | |
| **50+75.000** | | | | | | | 3980.7 |
| | Normal Cut: | 33.8 | 35.8 | 1.000 | 35.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.9 | 8.0 | 1.000 | 8.0 | No | |
| **51+00.000** | | | | | | | 4014.2 |
| | Normal Cut: | 38.5 | 33.4 | 1.000 | 33.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.9 | 5.5 | 1.000 | 5.5 | No | |
| **51+25.000** | | | | | | | 4050.6 |
| | Normal Cut: | 40.2 | 36.4 | 1.000 | 36.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.5 | 5.7 | 1.000 | 5.7 | No | |
| **51+50.000** | | | | | | | 4086.4 |
| | Normal Cut: | 37.2 | 35.8 | 1.000 | 35.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.0 | 6.2 | 1.000 | 6.2 | No | |
| **51+75.000** | | | | | | | 4116.4 |
| | Normal Cut: | 27.7 | 30.0 | 1.000 | 30.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.1 | 6.5 | 1.000 | 6.5 | No | |
| **52+00.000** | | | | | | | 4137.0 |
| | Normal Cut: | 16.6 | 20.5 | 1.000 | 20.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 7.2 | 6.6 | 1.000 | 6.6 | No | |
| **52+25.000** | | | | | | | 4149.9 |
| | Normal Cut: | 11.4 | 13.0 | 1.000 | 13.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 6.4 | 6.3 | 1.000 | 6.3 | No | |
| **52+50.000** | | | | | | | 4160.3 |
| | Normal Cut: | 11.0 | 10.4 | 1.000 | 10.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.1 | 5.8 | 1.000 | 5.8 | No | |
| **52+75.000** | | | | | | | 4170.5 |
| | Normal Cut: | 11.1 | 10.2 | 1.000 | 10.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.0 | 5.6 | 1.000 | 5.6 | No | |
| **53+00.000** | | | | | | | 4180.5 |
| | Normal Cut: | 10.6 | 10.0 | 1.000 | 10.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.4 | 5.3 | 1.000 | 5.3 | No | |
| **53+25.000** | | | | | | | 4190.4 |
| | Normal Cut: | 10.8 | 9.9 | 1.000 | 9.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.3 | 4.9 | 1.000 | 4.9 | No | |
| **53+50.000** | | | | | | | 4201.0 |
| | Normal Cut: | 12.1 | 10.6 | 1.000 | 10.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.3 | 4.9 | 1.000 | 4.9 | No | |
| **53+75.000** | | | | | | | 4213.3 |
| | Normal Cut: | 14.6 | 12.3 | 1.000 | 12.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.7 | 5.1 | 1.000 | 5.1 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **54+00.000** | | | | | | | 4228.1 |
| | Normal Cut: | 17.4 | 14.8 | 1.000 | 14.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.0 | 5.4 | 1.000 | 5.4 | No | |
| **54+25.000** | | | | | | | 4245.5 |
| | Normal Cut: | 20.1 | 17.4 | 1.000 | 17.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 6.3 | 5.7 | 1.000 | 5.7 | No | |
| **54+50.000** | | | | | | | 4265.0 |
| | Normal Cut: | 22.0 | 19.5 | 1.000 | 19.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.9 | 5.6 | 1.000 | 5.6 | No | |
| **54+75.000** | | | | | | | 4285.0 |
| | Normal Cut: | 21.4 | 20.1 | 1.000 | 20.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 5.4 | 5.3 | 1.000 | 5.3 | No | |
| **55+00.000** | | | | | | | 4304.3 |
| | Normal Cut: | 20.1 | 19.2 | 1.000 | 19.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 4.9 | 4.8 | 1.000 | 4.8 | No | |
| **55+25.000** | | | | | | | 4313.6 |
| | Normal Cut: | 0.0 | 9.3 | 1.000 | 9.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Topsoil: | 0.0 | 2.3 | 1.000 | 2.3 | No | |

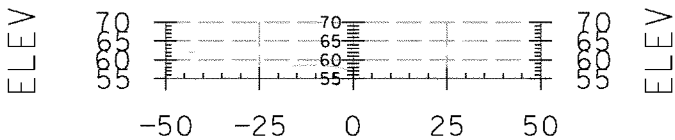
| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|

| Type | Volume | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|
| Normal Cut: | 4314.8 | 4314.8 | Yes | |
| Normal Fill: | 1.2 | 1.2 | Yes | |
| Added Cut: | 0.0 | 0.0 | Yes | |
| Added Fill: | 0.0 | 0.0 | Yes | |
| Topsoil: | 881.1 | 881.1 | No | |

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

# STA.17+50 TO STA.18+00

## Car Body LB 1050-1620

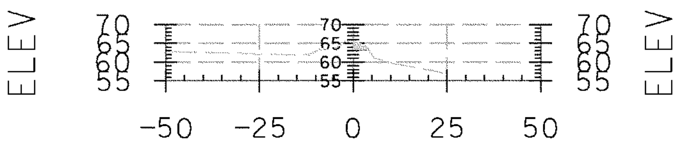



CA:0.00 SF
FA:0.00 SF
MO:0.00

17+50

CV:0.00 CY
FV:0.00 CY

## Car Body LB 1050-1620

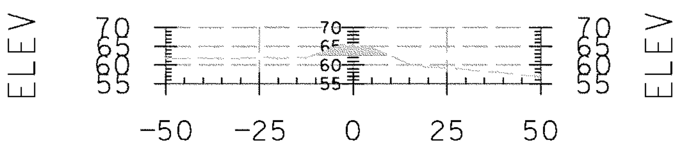



CA:5.57 SF
FA:0.00 SF
MO:2.58

17+75

CV:2.58 CY
FV:0.00 CY

## Car Body LB 1050-1620



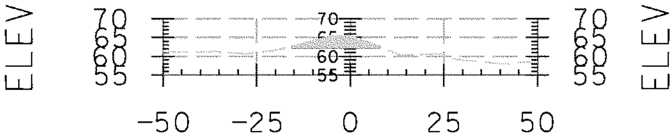

CA:33.39 SF
FA:0.00 SF
MO:20.62

18+00

CV:18.04 CY
FV:0.00 CY

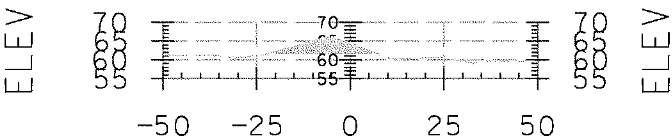
STA.18+25 TO STA.18+75

Car Body LB 1050-1620



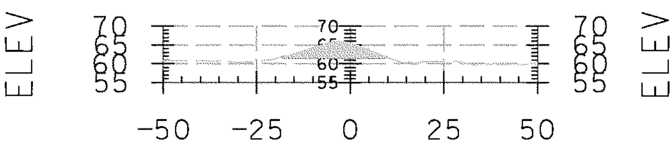

CA:49.74 SF
18+25
CV:38.49 CY
FA:Ø.ØØ SF
FV:Ø.ØØ CY
MO:59.11

Car Body LB 1050-1620




CA:6Ø.73 SF
18+50
CV:51.15 CY
FA:Ø.ØØ SF
FV:Ø.ØØ CY
MO:11Ø.26

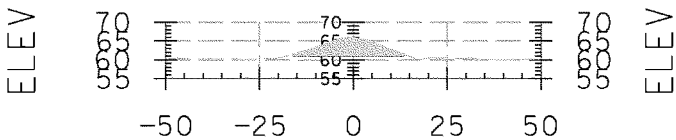
Car Body LB 1050-1620




CA:71.99 SF
18+75
CV:61.45 CY
FA:Ø.ØØ SF
FV:Ø.ØØ CY
MO:171.7Ø

# STA.19+00 TO STA.19+50

Car Body LB 1050-1620

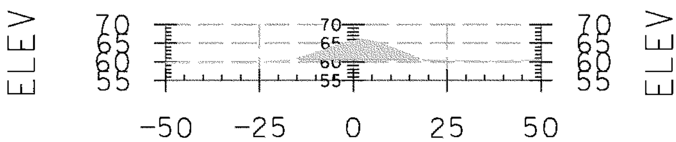



CA:84.80 SF
FA:0.00 SF
MO:244.29

19+00

CV:72.59 CY
FV:0.00 CY

Car Body LB 1050-1620

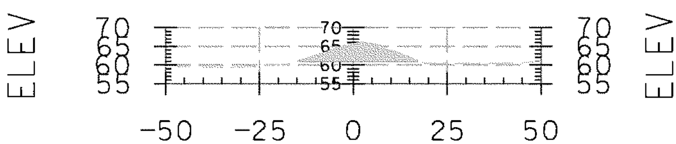



CA:99.18 SF
FA:0.00 SF
MO:329.47

19+25

CV:85.18 CY
FV:0.00 CY

Car Body LB 1050-1620



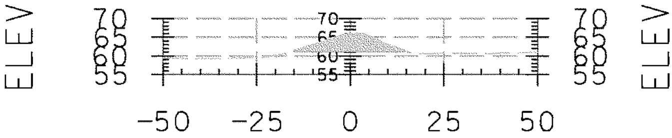

CA:95.66 SF
FA:0.00 SF
MO:419.67

19+50

CV:90.20 CY
FV:0.00 CY

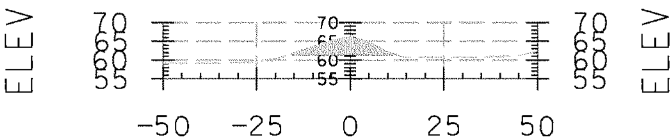
# STA.19+75 TO STA.20+25

Car Body LB 1050-1620



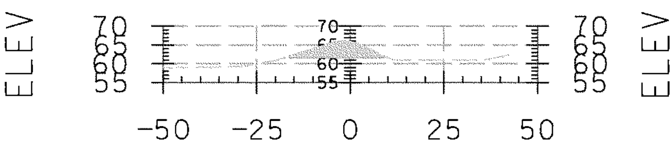

CA:85.36 SF
19+75
CV:83.80 CY
FA:0.00 SF
FV:0.00 CY
MO:503.47

Car Body LB 1050-1620




CA:75.95 SF
20+00
CV:74.68 CY
FA:0.00 SF
FV:0.00 CY
MO:578.15

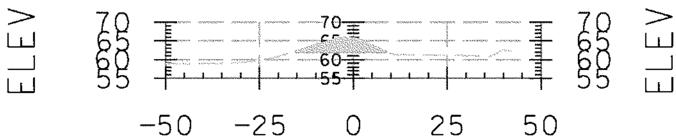
Car Body LB 1050-1620




CA:67.42 SF
20+25
CV:66.37 CY
FA:0.00 SF
FV:0.00 CY
MO:644.52

# STA.20+50 TO STA.21+00

Car Body LB 1050-1620




CA:60.21 SF

20+50

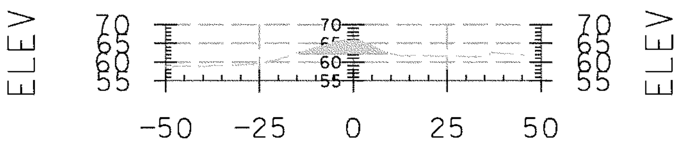
CV:59.08 CY

FA:0.00 SF

FV:0.00 CY

MO:703.61

Car Body LB 1050-1620




CA:53.69 SF

20+75

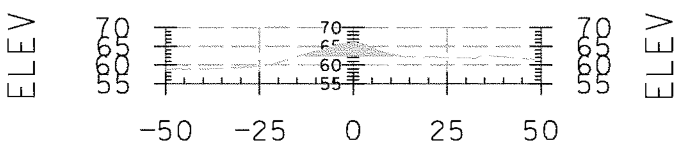
CV:52.73 CY

FA:0.00 SF

FV:0.00 CY

MO:756.34

Car Body LB 1050-1620




CA:48.39 SF

21+00

CV:47.26 CY

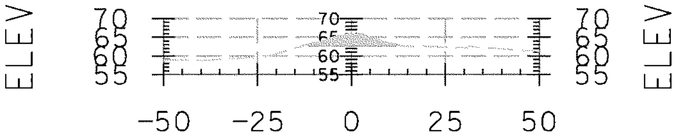
FA:0.00 SF

FV:0.00 CY

MO:803.59

# STA.21+25 TO STA.21+75

Car Body LB 1050-1620

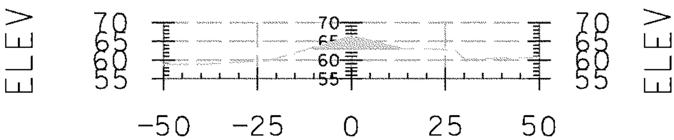



CA:44.70 SF
FA:0.00 SF
MO:846.69

21+25

CV:43.10 CY
FV:0.00 CY

Car Body LB 1050-1620

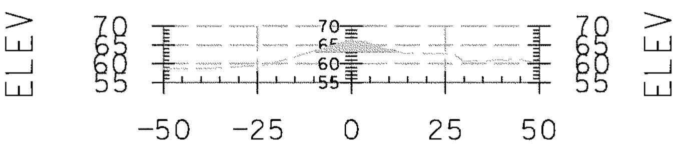



CA:41.93 SF
FA:0.00 SF
MO:886.80

21+50

CV:40.11 CY
FV:0.00 CY

Car Body LB 1050-1620



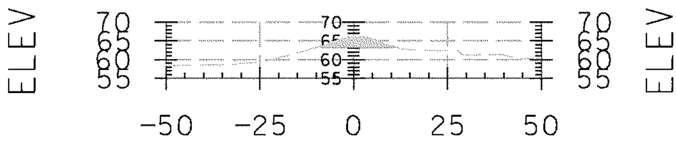

CA:38.22 SF
FA:0.00 SF
MO:923.91

21+75

CV:37.11 CY
FV:0.00 CY

STA.22+00 TO STA.22+50

Car Body LB 1050-1620

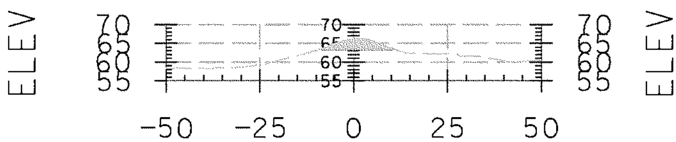



CA:36.42 SF
FA:Ø.ØØ SF
MO:958.46

22+00

CV:34.56 CY
FV:Ø.ØØ CY

Car Body LB 1050-1620

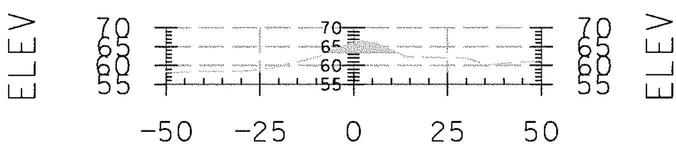



CA:36.47 SF
FA:Ø.ØØ SF
MO:992.21

22+25

CV:33.75 CY
FV:Ø.ØØ CY

Car Body LB 1050-1620



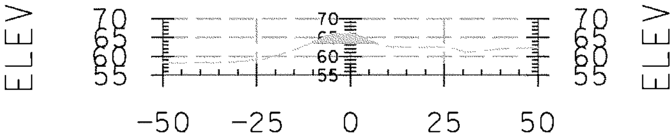

CA:31.88 SF
FA:Ø.ØØ SF
MO:1Ø23.86

22+50

CV:31.64 CY
FV:Ø.ØØ CY

STA.22+75 TO STA.23+25

Car Body LB 1050-1620

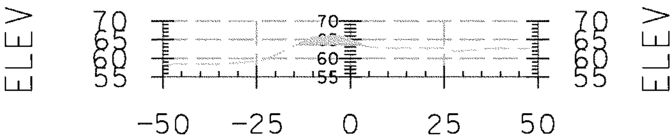



CA:28.74 SF
FA:0.00 SF
MO:1051.92

22+75

CV:28.07 CY
FV:0.00 CY

Car Body LB 1050-1620

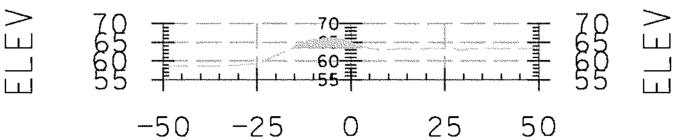



CA:27.81 SF
FA:0.00 SF
MO:1078.10

23+00

CV:26.18 CY
FV:0.00 CY

Car Body LB 1050-1620



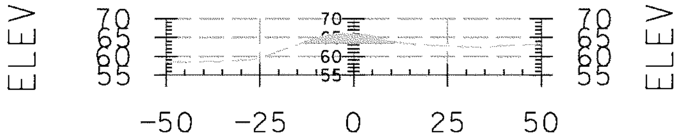

CA:30.63 SF
FA:0.00 SF
MO:1105.16

23+25

CV:27.06 CY
FV:0.00 CY

# STA.23+50 TO STA.24+00

Car Body LB 1050-1620




CA:41.26 SF

23+50

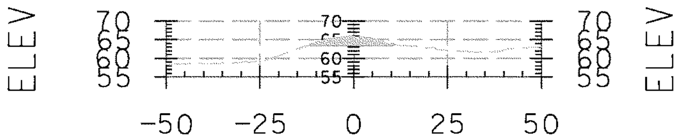
CV:33.28 CY

FA:Ø.ØØ SF

FV:Ø.ØØ CY

MO:1138.44

Car Body LB 1050-1620




CA:37.22 SF

23+75

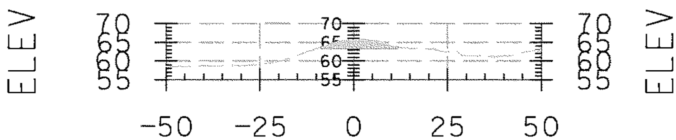
CV:36.33 CY

FA:Ø.ØØ SF

FV:Ø.ØØ CY

MO:1174.78

Car Body LB 1050-1620




CA:33.38 SF

24+00

CV:32.69 CY

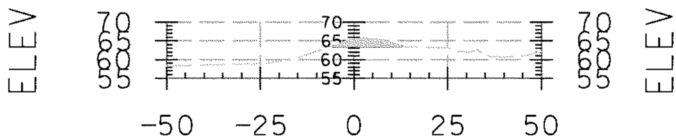
FA:Ø.ØØ SF

FV:Ø.ØØ CY

MO:12Ø7.46

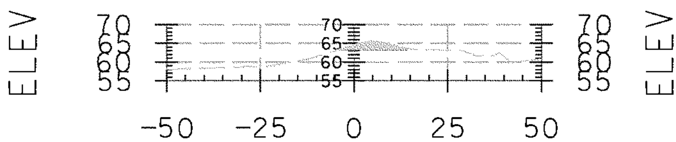
STA.24+25 TO STA.24+75

Car Body LB 1050-1620



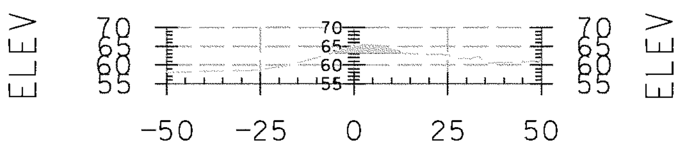

CA:29.54 SF
24+25
CV:29.13 CY
FA:0.00 SF
FV:0.00 CY
MO:1236.59

Car Body LB 1050-1620




CA:26.67 SF
24+50
CV:26.02 CY
FA:0.00 SF
FV:0.00 CY
MO:1262.62

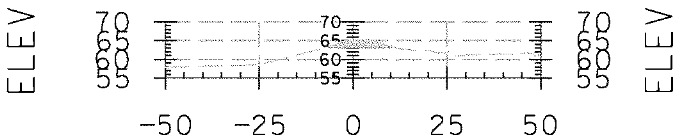
Car Body LB 1050-1620




CA:25.59 SF
24+75
CV:24.19 CY
FA:0.00 SF
FV:0.00 CY
MO:1286.81

# STA.25+00 TO STA.25+50

## Car Body LB 1050-1620

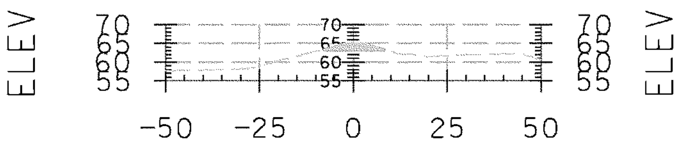



CA:24.51 SF
FA:0.00 SF
MO:1310.00

25+00

CV:23.19 CY
FV:0.00 CY

## Car Body LB 1050-1620

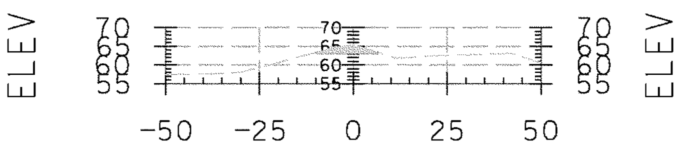



CA:23.54 SF
FA:0.00 SF
MO:1332.25

25+25

CV:22.25 CY
FV:0.00 CY

## Car Body LB 1050-1620



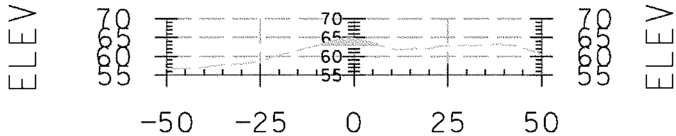

CA:22.83 SF
FA:0.00 SF
MO:1353.72

25+50

CV:21.47 CY
FV:0.00 CY

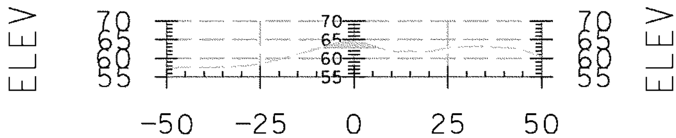
STA.25+75 TO STA.26+25

Car Body LB 1050-1620



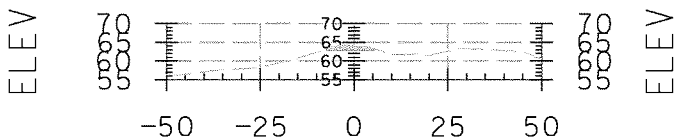

CA:19.18 SF
25+75
CV:19.45 CY
FA:0.00 SF
FV:0.00 CY
MO:1373.17

Car Body LB 1050-1620



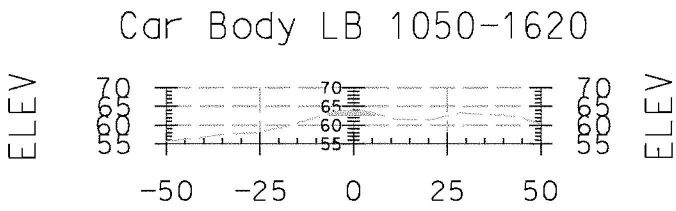

CA:16.19 SF
26+00
CV:16.37 CY
FA:0.00 SF
FV:0.00 CY
MO:1389.54

Car Body LB 1050-1620

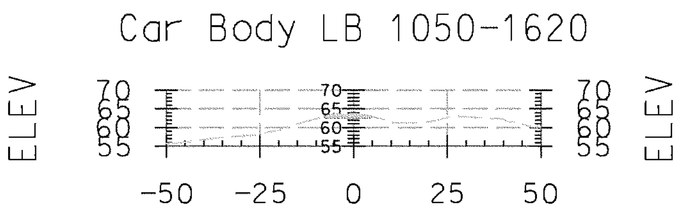



CA:13.41 SF
26+25
CV:13.70 CY
FA:0.00 SF
FV:0.00 CY
MO:1403.24

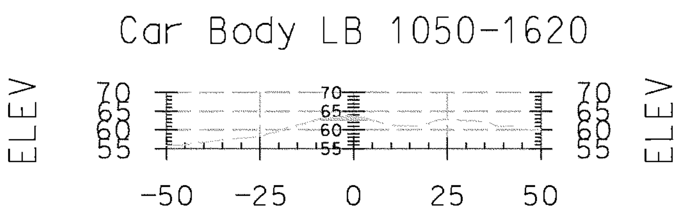
STA.26+50 TO STA.27+00




CA:11.37 SF 26+50 CV:11.47 CY
FA:0.00 SF FV:0.00 CY
MO:1414.71



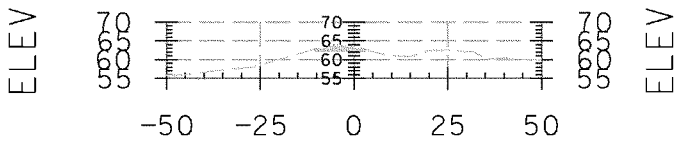

CA:10.18 SF 26+75 CV:9.98 CY
FA:0.00 SF FV:0.00 CY
MO:1424.69




CA:9.75 SF 27+00 CV:9.22 CY
FA:0.00 SF FV:0.00 CY
MO:1433.91

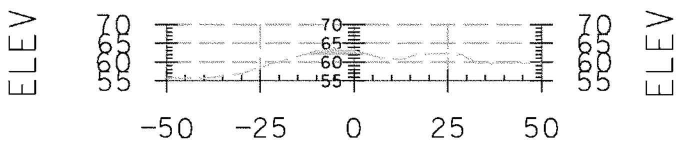
STA.27+25 TO STA.27+75

Car Body LB 1050-1620



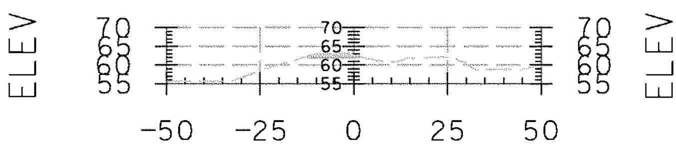
CA:12.29 SF
27+25
CV:10.20 CY
FA:0.00 SF
FV:0.00 CY
MO:1444.12

Car Body LB 1050-1620



CA:12.85 SF
27+50
CV:11.64 CY
FA:0.00 SF
FV:0.00 CY
MO:1455.76

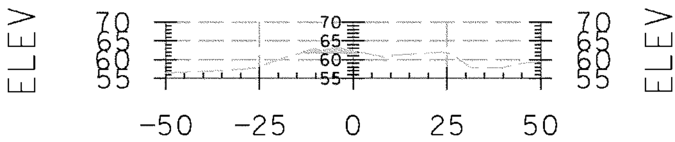
Car Body LB 1050-1620



CA:12.66 SF
27+75
CV:11.81 CY
FA:0.00 SF
FV:0.00 CY
MO:1467.57

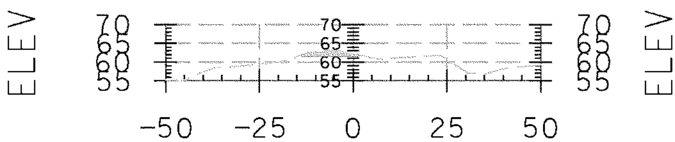
# STA.28+00 TO STA.28+50

## Car Body LB 1050-1620



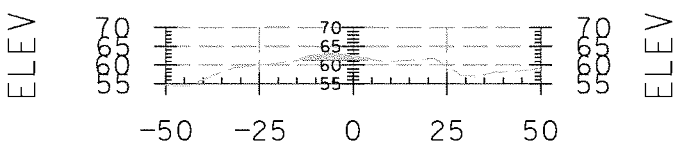

CA:13.47 SF
28+00
CV:12.10 CY
FA:0.00 SF
FV:0.00 CY
MO:1479.67

## Car Body LB 1050-1620




CA:16.03 SF
28+25
CV:13.66 CY
FA:0.00 SF
FV:0.00 CY
MO:1493.33

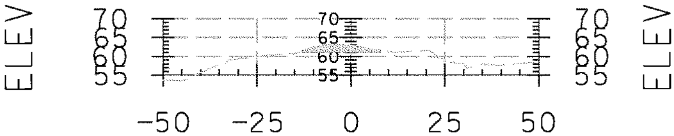
## Car Body LB 1050-1620




CA:21.55 SF
28+50
CV:17.40 CY
FA:0.00 SF
FV:0.00 CY
MO:1510.72

STA.28+75 TO STA.29+25

Car Body LB 1050-1620




CA:29.14 SF

28+75

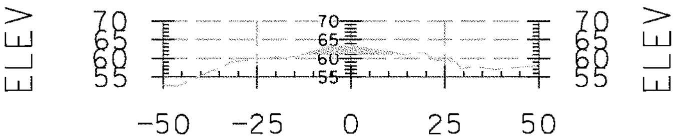
CV:23.47 CY

FA:0.00 SF

FV:0.00 CY

MO:1534.19

Car Body LB 1050-1620




CA:30.68 SF

29+00

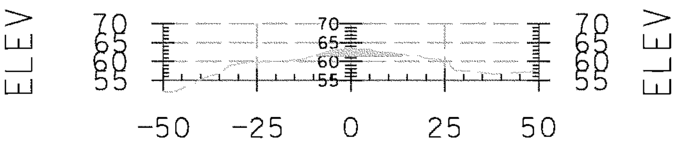
CV:27.69 CY

FA:0.00 SF

FV:0.00 CY

MO:1561.88

Car Body LB 1050-1620




CA:30.66 SF

29+25

CV:28.40 CY

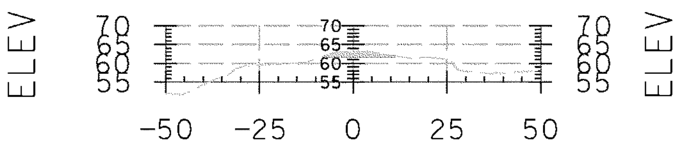
FA:0.00 SF

FV:0.00 CY

MO:1590.28

# STA.29+50 TO STA.30+00

Car Body LB 1050-1620

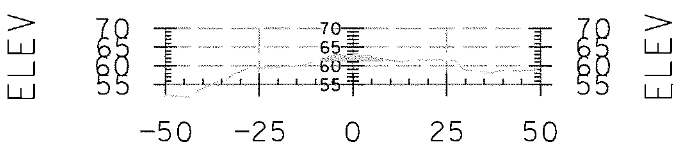



CA:22.07 SF
FA:0.00 SF
MO:1614.69

29+50

CV:24.41 CY
FV:0.00 CY

Car Body LB 1050-1620

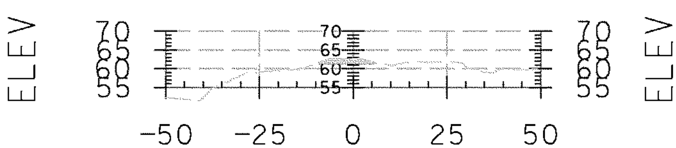



CA:18.68 SF
FA:0.00 SF
MO:1633.56

29+75

CV:18.87 CY
FV:0.00 CY

Car Body LB 1050-1620



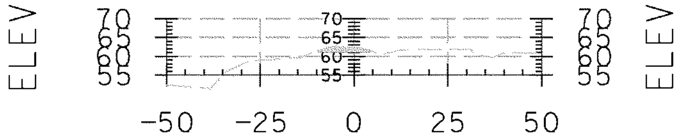

CA:16.60 SF
FA:0.00 SF
MO:1649.89

30+00

CV:16.33 CY
FV:0.00 CY

# STA.30+25 TO STA.30+75

Car Body LB 1050-1620

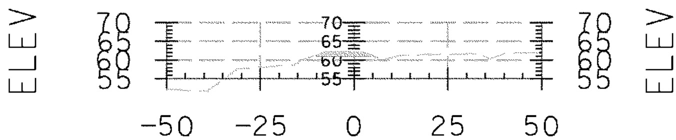



CA:15.15 SF
FA:0.00 SF
MO:1664.59

30+25

CV:14.70 CY
FV:0.00 CY

Car Body LB 1050-1620

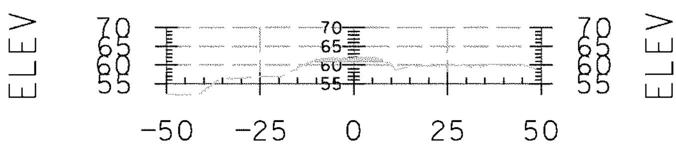



CA:15.21 SF
FA:0.00 SF
MO:1678.64

30+50

CV:14.06 CY
FV:0.00 CY

Car Body LB 1050-1620



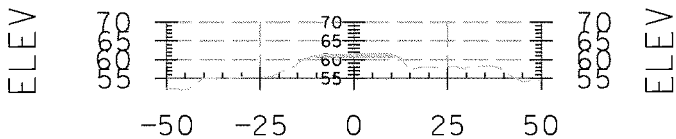

CA:16.21 SF
FA:0.00 SF
MO:1693.19

30+75

CV:14.55 CY
FV:0.00 CY

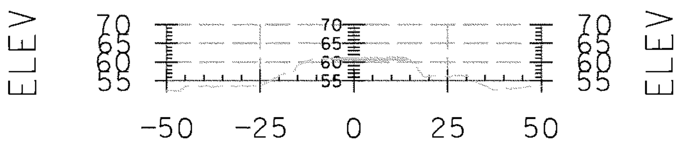
STA.31+00 TO STA.31+50

Car Body LB 1050-1620



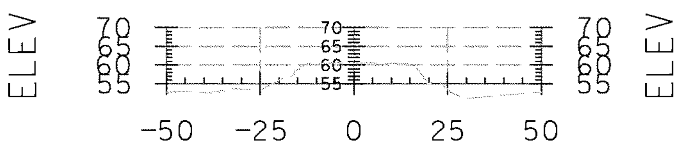

CA:14.92 SF
31+00
CV:14.41 CY
FA:Ø.ØØ SF
FV:Ø.ØØ CY
MO:17Ø7.6Ø

Car Body LB 1050-1620




CA:1Ø.Ø8 SF
31+25
CV:11.57 CY
FA:Ø.ØØ SF
FV:Ø.ØØ CY
MO:1719.17

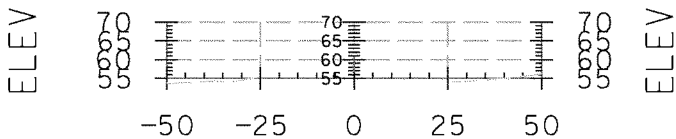
Car Body LB 1050-1620




CA:Ø.ØØ SF
31+50
CV:4.67 CY
FA:Ø.Ø2 SF
FV:Ø.Ø1 CY
MO:1723.83

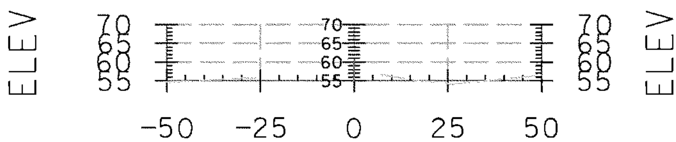
STA.31+75 TO STA.32+25

Car Body LB 1050-1620



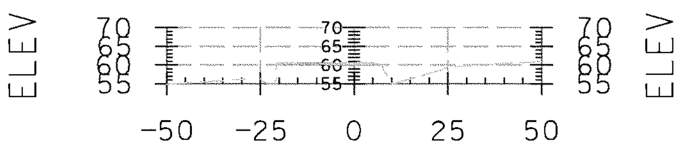

CA:0.00 SF | 31+75 | CV:0.00 CY
FA:0.00 SF | | FV:0.01 CY
MO:1723.82

Car Body LB 1050-1620




CA:0.00 SF | 32+00 | CV:0.00 CY
FA:0.00 SF | | FV:0.00 CY
MO:1723.82

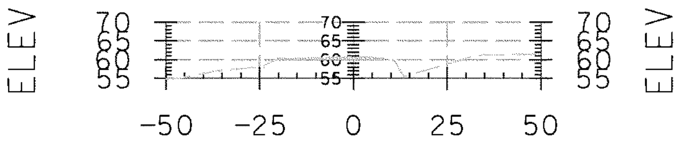
Car Body LB 1050-1620




CA:10.05 SF | 32+25 | CV:4.65 CY
FA:0.00 SF | | FV:0.00 CY
MO:1728.47

# STA.32+50 TO STA.33+00

Car Body LB 1050-1620

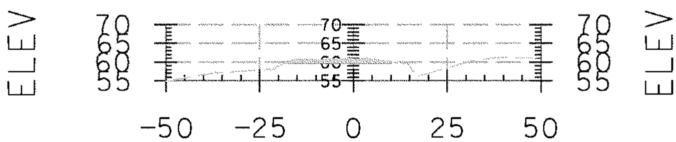



CA:17.72 SF
FA:0.00 SF
MO:1741.32

32+50

CV:12.85 CY
FV:0.00 CY

Car Body LB 1050-1620

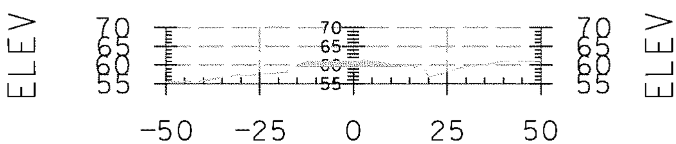



CA:25.50 SF
FA:0.00 SF
MO:1761.33

32+75

CV:20.01 CY
FV:0.00 CY

Car Body LB 1050-1620



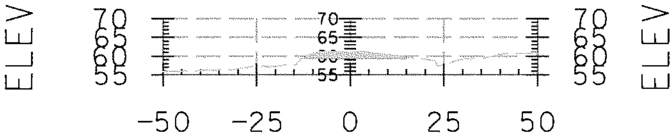

CA:31.88 SF
FA:0.00 SF
MO:1787.90

33+00

CV:26.57 CY
FV:0.00 CY

STA.33+25 TO STA.33+75

Car Body LB 1050-1620

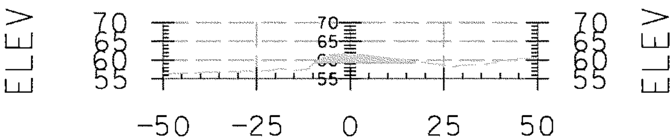



CA:36.87 SF
FA:0.00 SF
MO:1819.73

33+25

CV:31.83 CY
FV:0.00 CY

Car Body LB 1050-1620

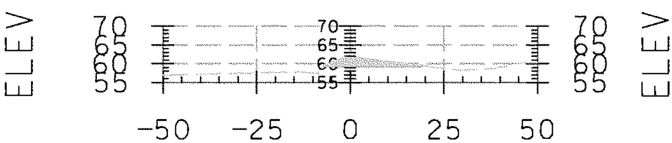



CA:40.44 SF
FA:0.00 SF
MO:1855.53

33+50

CV:35.79 CY
FV:0.00 CY

Car Body LB 1050-1620



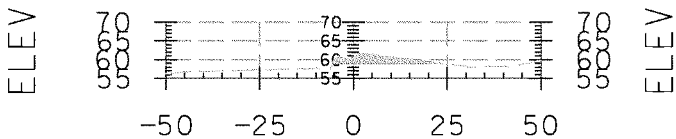

CA:41.30 SF
FA:0.00 SF
MO:1893.37

33+75

CV:37.84 CY
FV:0.00 CY

STA.34+00 TO STA.34+50

Car Body LB 1050-1620

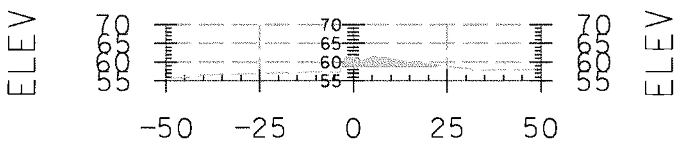



CA:40.33 SF
FA:0.00 SF
MO:1931.15

34+00

CV:37.79 CY
FV:0.00 CY

Car Body LB 1050-1620

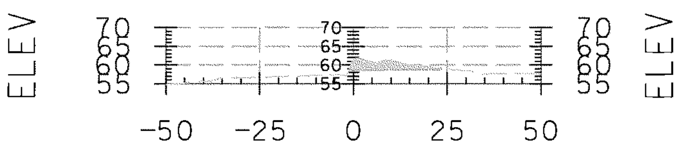



CA:40.98 SF
FA:0.00 SF
MO:1968.79

34+25

CV:37.64 CY
FV:0.00 CY

Car Body LB 1050-1620



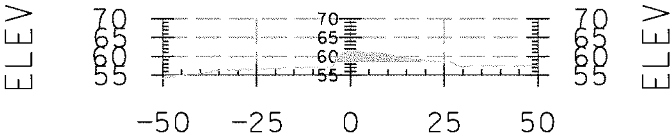

CA:42.48 SF
FA:0.00 SF
MO:2007.43

34+50

CV:38.64 CY
FV:0.00 CY

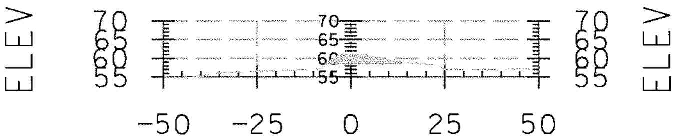
STA.34+75 TO STA.35+25

Car Body LB 1050-1620



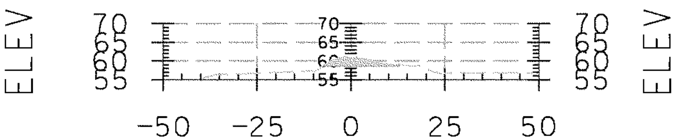

CA:38.92 SF
34+75
CV:37.68 CY
FA:0.00 SF
FV:0.00 CY
MO:2045.12

Car Body LB 1050-1620



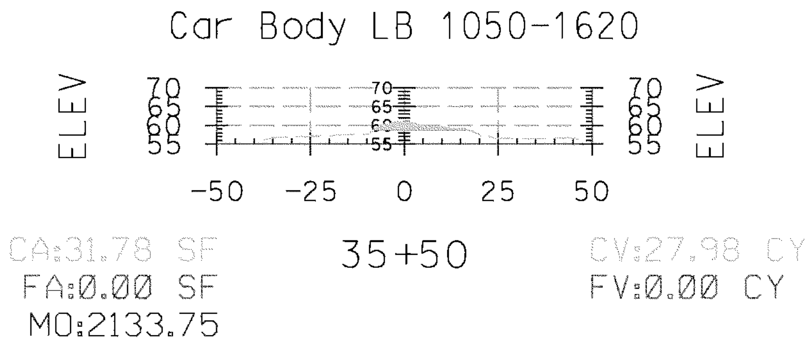

CA:31.72 SF
35+00
CV:32.70 CY
FA:0.00 SF
FV:0.00 CY
MO:2077.82

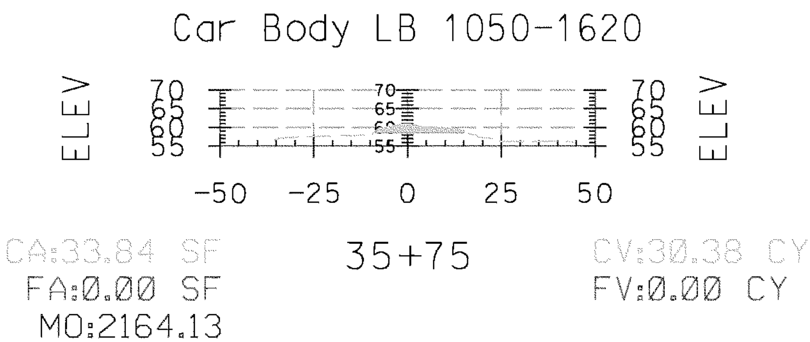
Car Body LB 1050-1620

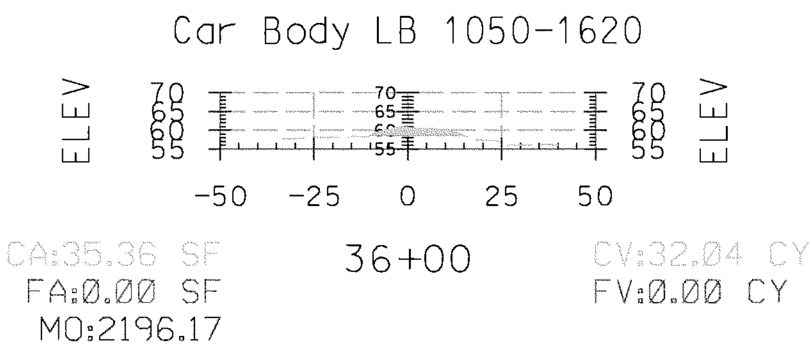



CA:28.66 SF
35+25
CV:27.95 CY
FA:0.00 SF
FV:0.00 CY
MO:2105.77

STA.35+50 TO STA.36+00

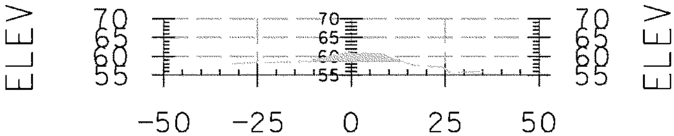


# STA.36+25 TO STA.36+75

Car Body LB 1050-1620

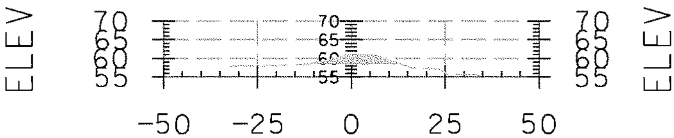



CA:36.36 SF
FA:0.00 SF
MO:2229.38

36+25

CV:33.21 CY
FV:0.00 CY

Car Body LB 1050-1620

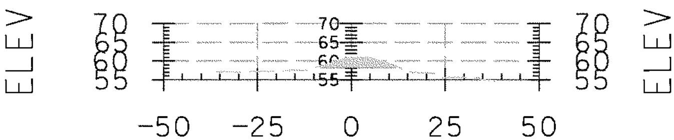



CA:35.74 SF
FA:0.00 SF
MO:2262.76

36+50

CV:33.38 CY
FV:0.00 CY

Car Body LB 1050-1620



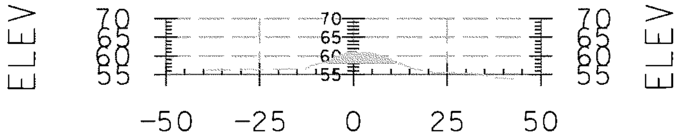

CA:35.74 SF
FA:0.00 SF
MO:2295.85

36+75

CV:33.09 CY
FV:0.00 CY

STA.37+00 TO STA.37+50

Car Body LB 1050-1620

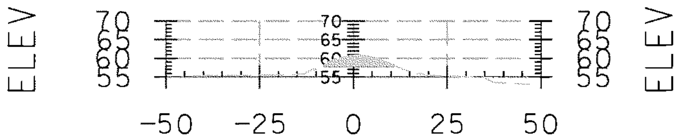



CA:36.98 SF
FA:0.00 SF
MO:2329.52

37+00

CV:33.67 CY
FV:0.00 CY

Car Body LB 1050-1620

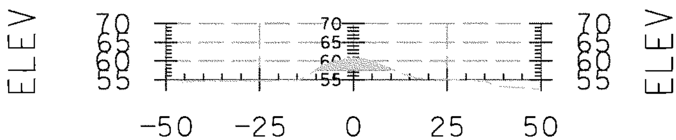



CA:39.22 SF
FA:0.00 SF
MO:2364.80

37+25

CV:35.28 CY
FV:0.00 CY

Car Body LB 1050-1620



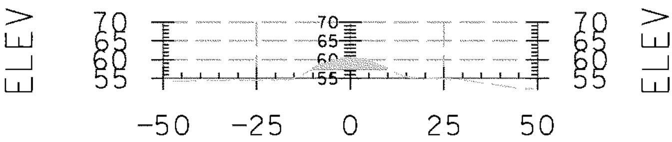

CA:40.93 SF
FA:0.00 SF
MO:2401.91

37+50

CV:37.11 CY
FV:0.00 CY

STA.37+75 TO STA.38+25

Car Body LB 1050-1620




CA:42.56 SF

37+75

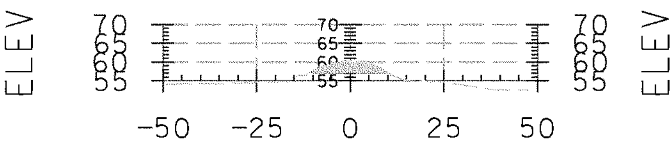
CV:38.66 CY

FA:0.00 SF

FV:0.00 CY

MO:2440.56

Car Body LB 1050-1620




CA:45.17 SF

38+00

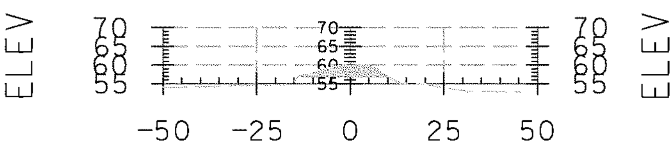
CV:40.62 CY

FA:0.00 SF

FV:0.00 CY

MO:2481.18

Car Body LB 1050-1620




CA:48.94 SF

38+25

CV:43.57 CY

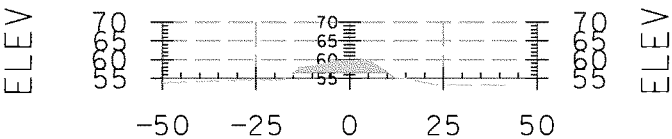
FA:0.00 SF

FV:0.00 CY

MO:2524.75

# STA.38+50 TO STA.39+00

## Car Body LB 1050-1620

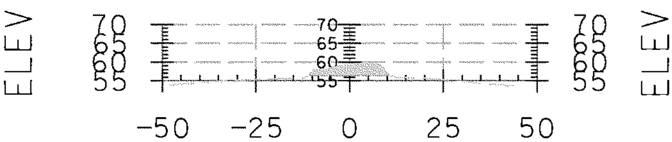



CA:55.45 SF
FA:0.00 SF
MO:2573.08

38+50

CV:48.33 CY
FV:0.00 CY

## Car Body LB 1050-1620

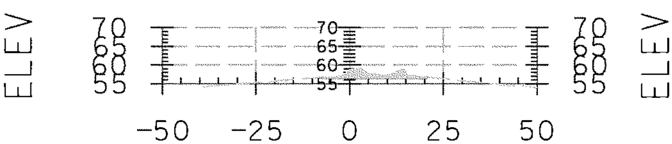



CA:49.57 SF
FA:0.00 SF
MO:2621.71

38+75

CV:48.62 CY
FV:0.00 CY

## Car Body LB 1050-1620



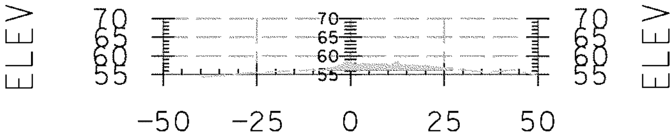

CA:34.70 SF
FA:0.00 SF
MO:2660.72

39+00

CV:39.01 CY
FV:0.00 CY

# STA.39+25 TO STA.39+75

Car Body LB 1050-1620

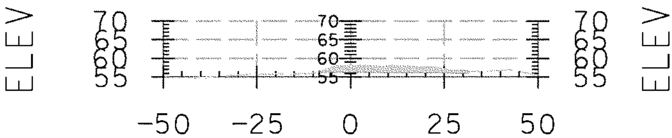



CA:44.05 SF
FA:0.00 SF
MO:2697.18

39+25

CV:36.46 CY
FV:0.00 CY

Car Body LB 1050-1620

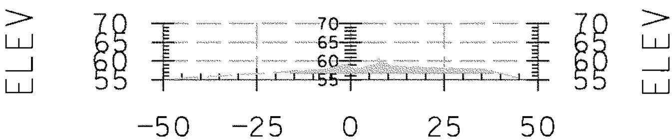



CA:55.23 SF
FA:0.00 SF
MO:2743.14

39+50

CV:45.96 CY
FV:0.00 CY

Car Body LB 1050-1620



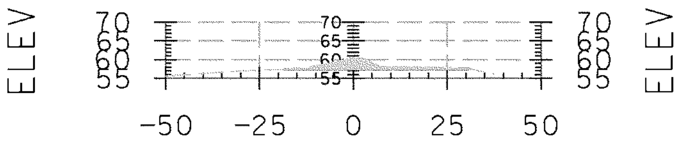

CA:72.56 SF
FA:0.00 SF
MO:2802.30

39+75

CV:59.16 CY
FV:0.00 CY

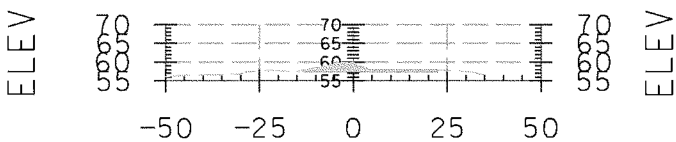
STA.40+00 TO STA.40+50

Car Body LB 1050-1620



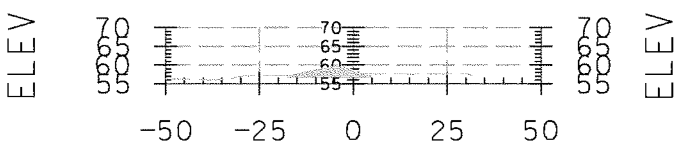

CA:59.03 SF
40+00
CV:60.92 CY
FA:0.00 SF
FV:0.00 CY
MO:2863.22

Car Body LB 1050-1620




CA:33.60 SF
40+25
CV:42.88 CY
FA:0.00 SF
FV:0.00 CY
MO:2906.11

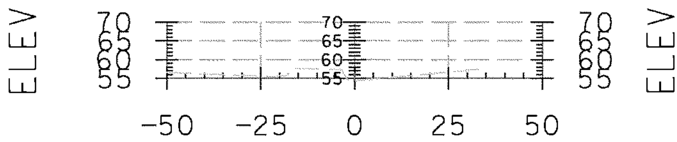
Car Body LB 1050-1620




CA:36.03 SF
40+50
CV:32.23 CY
FA:0.00 SF
FV:0.00 CY
MO:2938.34

# STA.40+75 TO STA.41+25

Car Body LB 1050-1620

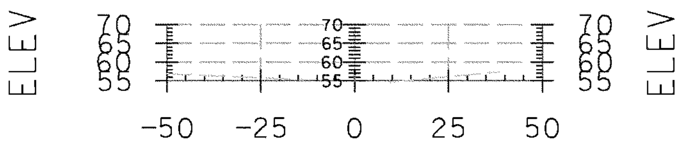



CA:0.00 SF
FA:0.20 SF
MO:2954.93

40+75

CV:16.68 CY
FV:0.09 CY

Car Body LB 1050-1620

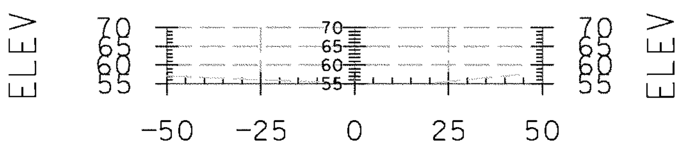



CA:0.00 SF
FA:0.00 SF
MO:2954.83

41+00

CV:0.00 CY
FV:0.09 CY

Car Body LB 1050-1620



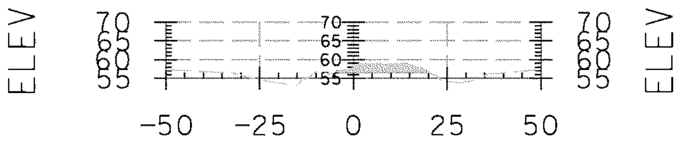

CA:0.00 SF
FA:0.00 SF
MO:2954.83

41+25

CV:0.00 CY
FV:0.00 CY

STA.41+50 TO STA.42+00

Car Body LB 1050-1620




CA:41.56 SF

41+50

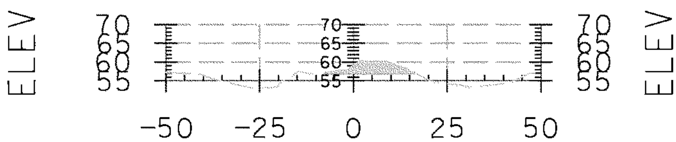
CV:19.24 CY

FA:0.00 SF

FV:0.00 CY

MO:2974.07

Car Body LB 1050-1620




CA:50.51 SF

41+75

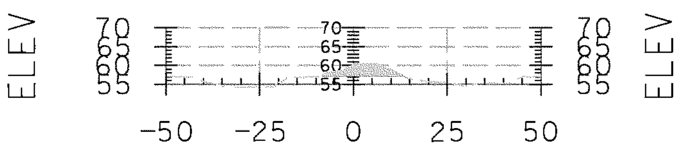
CV:42.62 CY

FA:0.00 SF

FV:0.00 CY

MO:3016.69

Car Body LB 1050-1620




CA:44.87 SF

42+00

CV:44.16 CY

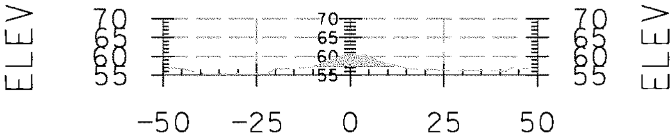
FA:0.00 SF

FV:0.00 CY

MO:3060.85

STA.42+25 TO STA.42+75

Car Body LB 1050-1620

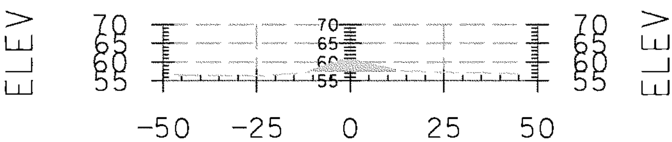



CA:39.89 SF
FA:0.00 SF
MO:3100.09

42+25

CV:39.24 CY
FV:0.00 CY

Car Body LB 1050-1620

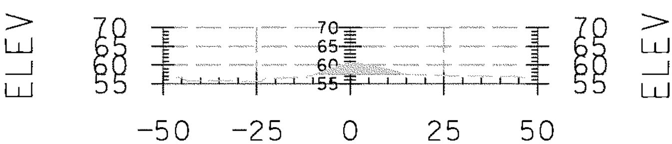



CA:39.80 SF
FA:0.00 SF
MO:3136.98

42+50

CV:36.89 CY
FV:0.00 CY

Car Body LB 1050-1620



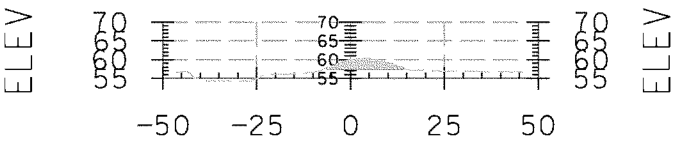

CA:40.12 SF
FA:0.00 SF
MO:3173.98

42+75

CV:37.00 CY
FV:0.00 CY

STA.43+00 TO STA.43+50

Car Body LB 1050-1620

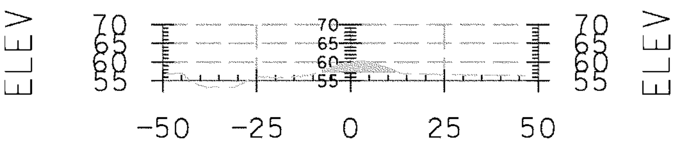



CA:38.38 SF
FA:0.00 SF
MO:3210.33

43+00

CV:36.34 CY
FV:0.00 CY

Car Body LB 1050-1620

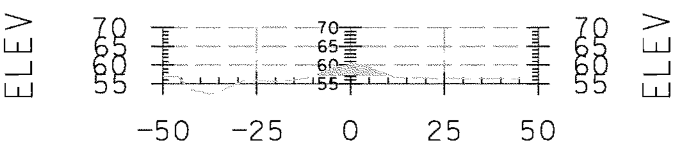



CA:36.16 SF
FA:0.00 SF
MO:3244.83

43+25

CV:34.51 CY
FV:0.00 CY

Car Body LB 1050-1620



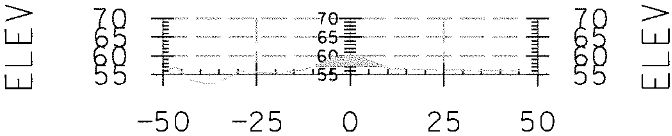

CA:33.46 SF
FA:0.00 SF
MO:3277.06

43+50

CV:32.23 CY
FV:0.00 CY

# STA.43+75 TO STA.44+25

Car Body LB 1050-1620




CA:32.69 SF

43+75

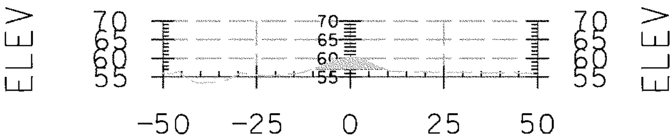
CV:30.63 CY

FA:0.00 SF

FV:0.00 CY

MO:3307.69

Car Body LB 1050-1620




CA:34.46 SF

44+00

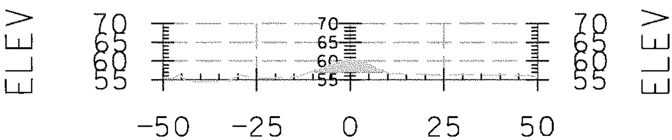
CV:31.09 CY

FA:0.00 SF

FV:0.00 CY

MO:3338.78

Car Body LB 1050-1620




CA:36.76 SF

44+25

CV:32.97 CY

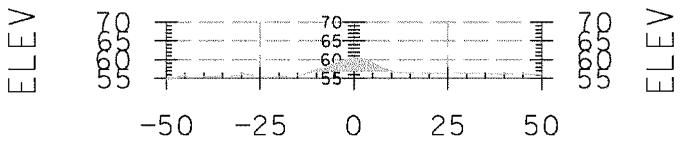
FA:0.00 SF

FV:0.00 CY

MO:3371.75

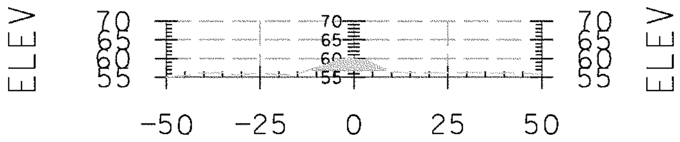
STA.44+50 TO STA.45+00

Car Body LB 1050-1620



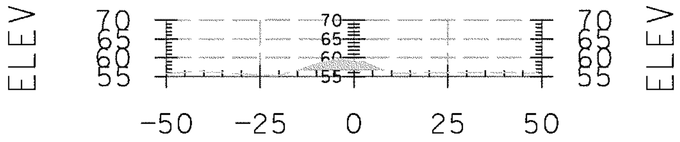

CA:39.63 SF
44+50
CV:35.37 CY
FA:0.00 SF
FV:0.00 CY
MO:3407.12

Car Body LB 1050-1620




CA:39.98 SF
44+75
CV:36.86 CY
FA:0.00 SF
FV:0.00 CY
MO:3443.97

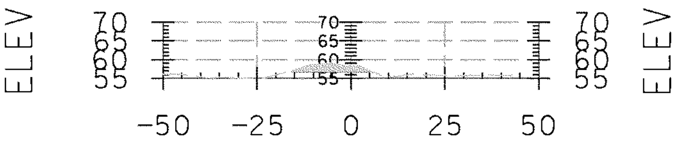
Car Body LB 1050-1620




CA:36.83 SF
45+00
CV:35.56 CY
FA:0.00 SF
FV:0.00 CY
MO:3479.53

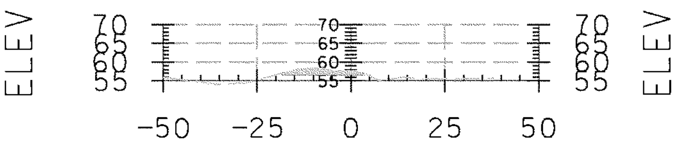
## STA.45+25 TO STA.45+75

Car Body LB 1050-1620



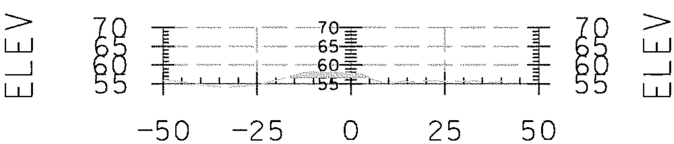

CA:32.16 SF | 45+25 | CV:31.94 CY
FA:0.00 SF | | FV:0.00 CY
MO:3511.47

Car Body LB 1050-1620




CA:26.27 SF | 45+50 | CV:27.05 CY
FA:0.00 SF | | FV:0.00 CY
MO:3538.53

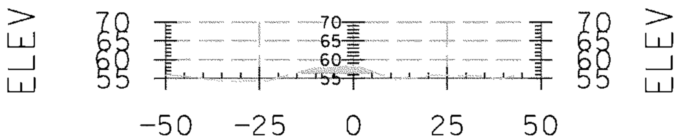
Car Body LB 1050-1620




CA:24.74 SF | 45+75 | CV:23.62 CY
FA:0.00 SF | | FV:0.00 CY
MO:3562.15

STA.46+00 TO STA.46+50

Car Body LB 1050-1620




CA:23.37 SF

46+00

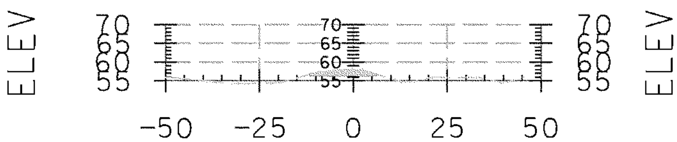
CV:22.27 CY

FA:0.00 SF

FV:0.00 CY

MO:3584.42

Car Body LB 1050-1620




CA:22.44 SF

46+25

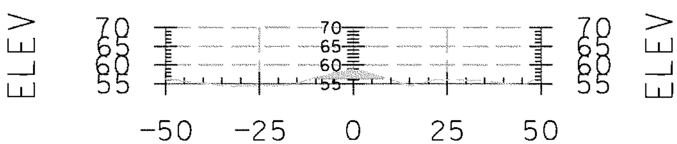
CV:21.21 CY

FA:0.00 SF

FV:0.00 CY

MO:3605.63

Car Body LB 1050-1620




CA:25.73 SF

46+50

CV:22.30 CY

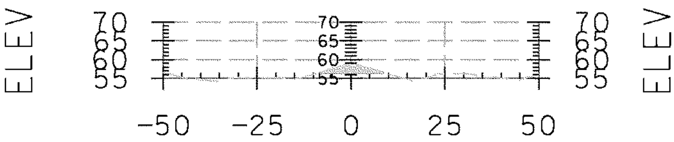
FA:0.00 SF

FV:0.00 CY

MO:3627.93

STA.46+75 TO STA.47+25

Car Body LB 1050-1620

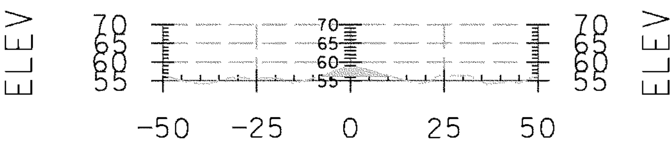



CA:26.10 SF
FA:0.00 SF
MO:3651.92

46+75

CV:24.00 CY
FV:0.00 CY

Car Body LB 1050-1620

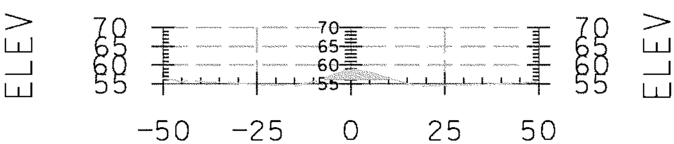



CA:26.96 SF
FA:0.00 SF
MO:3676.49

47+00

CV:24.57 CY
FV:0.00 CY

Car Body LB 1050-1620



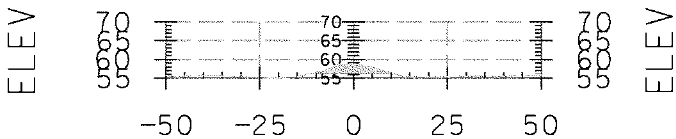

CA:28.20 SF
FA:0.00 SF
MO:3702.03

47+25

CV:25.54 CY
FV:0.00 CY

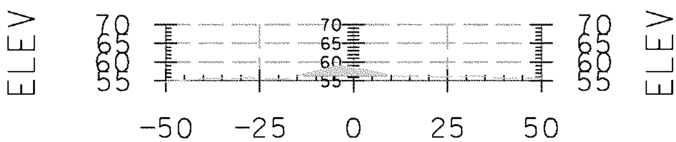
# STA.47+50 TO STA.48+00

## Car Body LB 1050-1620



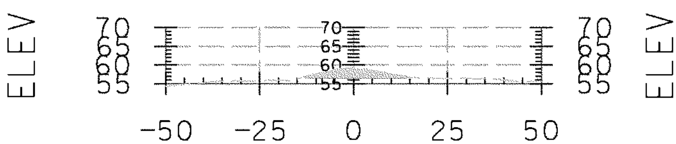

CA:31.30 SF
47+50
CV:27.54 CY
FA:0.00 SF
FV:0.00 CY
MO:3729.57

## Car Body LB 1050-1620




CA:35.77 SF
47+75
CV:31.05 CY
FA:0.00 SF
FV:0.00 CY
MO:3760.62

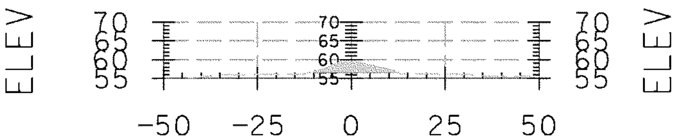
## Car Body LB 1050-1620




CA:45.37 SF
48+00
CV:37.57 CY
FA:0.00 SF
FV:0.00 CY
MO:3798.19

STA.48+25 TO STA.48+75

Car Body LB 1050-1620

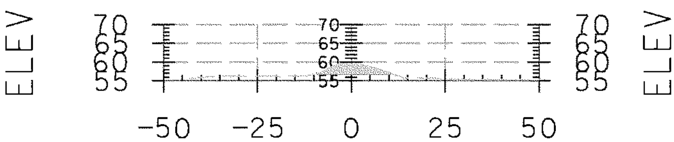



CA:37.50 SF
FA:0.00 SF
MO:3836.56

48+25

CV:38.37 CY
FV:0.00 CY

Car Body LB 1050-1620

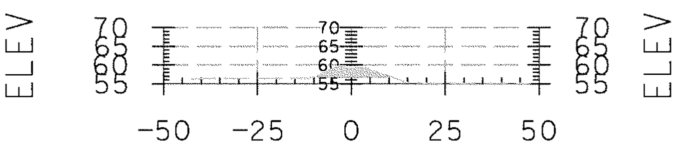



CA:36.63 SF
FA:0.00 SF
MO:3870.88

48+50

CV:34.32 CY
FV:0.00 CY

Car Body LB 1050-1620



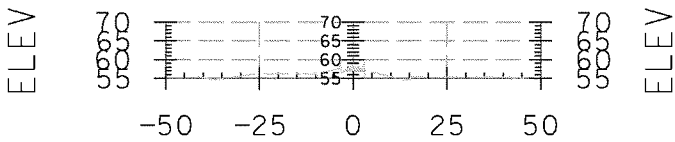

CA:35.62 SF
FA:0.00 SF
MO:3904.33

48+75

CV:33.45 CY
FV:0.00 CY

STA.49+00 TO STA.49+50

Car Body LB 1050-1620

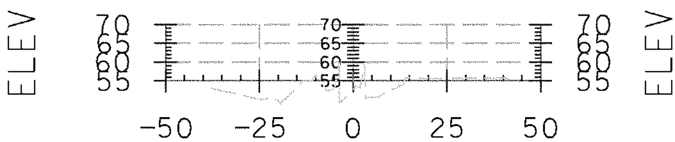



CA:5.37 SF
FA:0.00 SF
MO:3923.30

49+00

CV:18.97 CY
FV:0.00 CY

Car Body LB 1050-1620

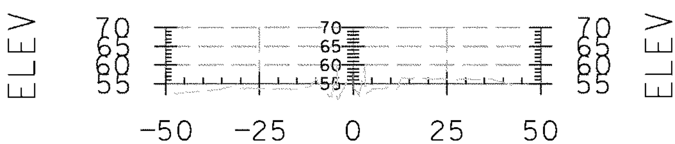



CA:0.00 SF
FA:0.47 SF
MO:3925.57

49+25

CV:2.49 CY
FV:0.22 CY

Car Body LB 1050-1620



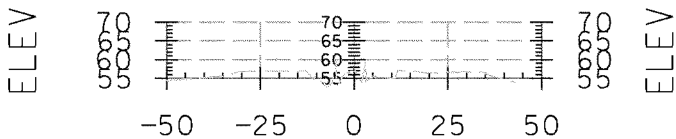

CA:0.00 SF
FA:0.36 SF
MO:3925.18

49+50

CV:0.00 CY
FV:0.39 CY

STA.49+75 TO STA.50+25

Car Body LB 1050-1620




CA:0.00 SF

49+75

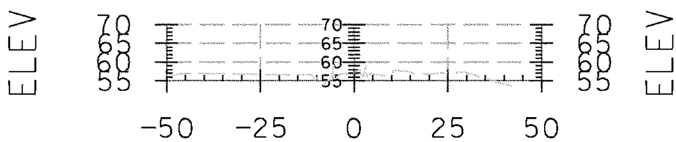
CV:0.00 CY

FA:0.07 SF

FV:0.20 CY

MO:3924.98

Car Body LB 1050-1620




CA:0.00 SF

50+00

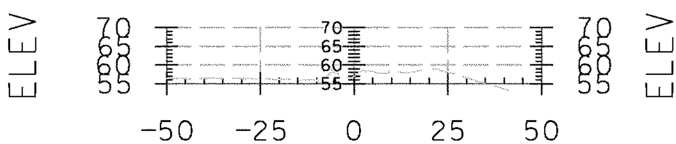
CV:0.00 CY

FA:0.08 SF

FV:0.07 CY

MO:3924.91

Car Body LB 1050-1620




CA:0.00 SF

50+25

CV:0.00 CY

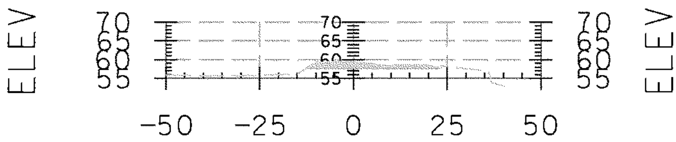
FA:0.09 SF

FV:0.08 CY

MO:3924.83

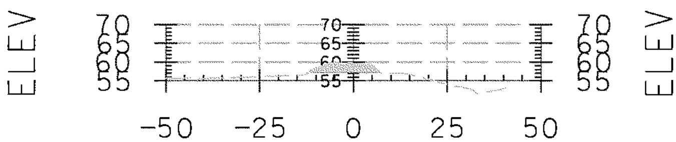
STA.50+50 TO STA.51+00

Car Body LB 1050-1620



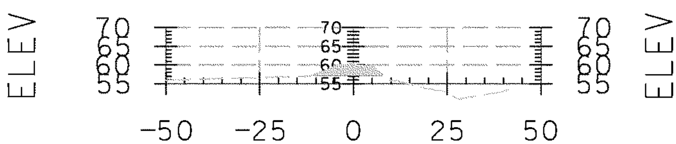

CA:43.56 SF | 50+50 | CV:20.17 CY
FA:0.00 SF | | FV:0.04 CY
MO:3944.95

Car Body LB 1050-1620




CA:33.75 SF | 50+75 | CV:35.79 CY
FA:0.00 SF | | FV:0.00 CY
MO:3980.74

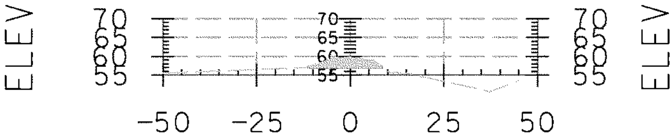
Car Body LB 1050-1620




CA:38.47 SF | 51+00 | CV:33.44 CY
FA:0.00 SF | | FV:0.00 CY
MO:4014.18

# STA.51+25 TO STA.51+75

Car Body LB 1050-1620

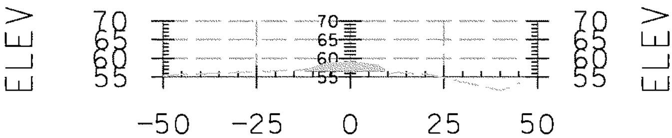



CA:40.17 SF
FA:0.00 SF
MO:4050.59

51+25

CV:36.41 CY
FV:0.00 CY

Car Body LB 1050-1620

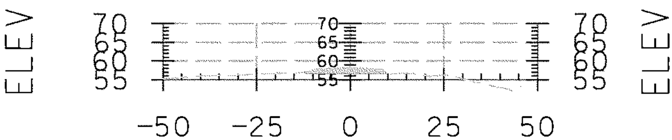



CA:37.15 SF
FA:0.00 SF
MO:4086.38

51+50

CV:35.80 CY
FV:0.00 CY

Car Body LB 1050-1620



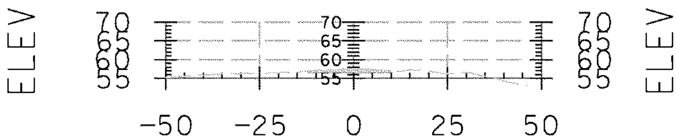

CA:27.75 SF
FA:0.00 SF
MO:4116.43

51+75

CV:30.05 CY
FV:0.00 CY

# STA.52+00 TO STA.52+50

Car Body LB 1050-1620

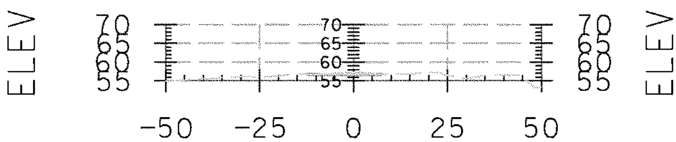



CA:16.61 SF
FA:0.00 SF
MO:4136.97

52+00

CV:20.54 CY
FV:0.00 CY

Car Body LB 1050-1620

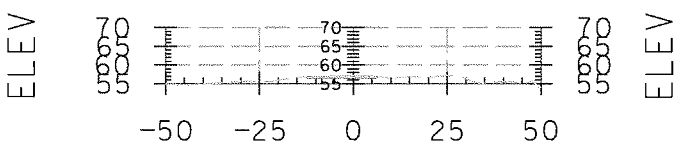



CA:11.40 SF
FA:0.00 SF
MO:4149.94

52+25

CV:12.97 CY
FV:0.00 CY

Car Body LB 1050-1620



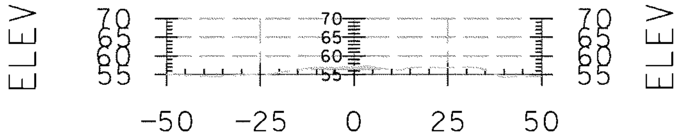

CA:10.97 SF
FA:0.00 SF
MO:4160.29

52+50

CV:10.36 CY
FV:0.00 CY

STA.52+75 TO STA.53+25

Car Body LB 1050-1620




CA:11.07 SF

52+75

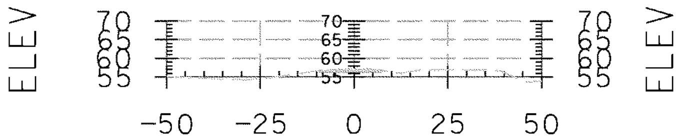
CV:10.20 CY

FA:0.00 SF

FV:0.00 CY

MO:4170.49

Car Body LB 1050-1620




CA:10.61 SF

53+00

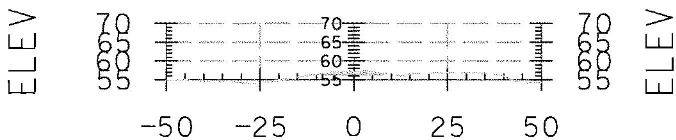
CV:10.04 CY

FA:0.00 SF

FV:0.00 CY

MO:4180.53

Car Body LB 1050-1620




CA:10.78 SF

53+25

CV:9.90 CY

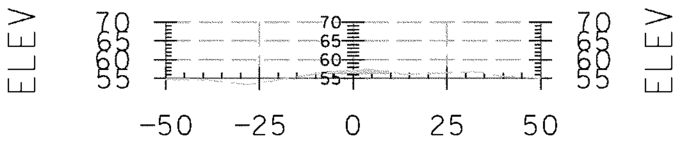
FA:0.00 SF

FV:0.00 CY

MO:4190.43

# STA.53+50 TO STA.54+00

Car Body LB 1050-1620

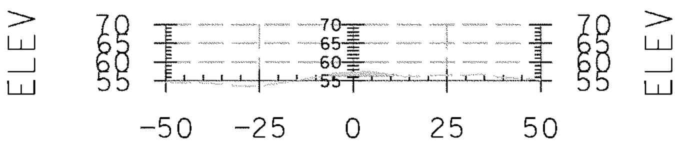



CA:12.05 SF
FA:0.00 SF
MO:4201.00

53+50

CV:10.57 CY
FV:0.00 CY

Car Body LB 1050-1620

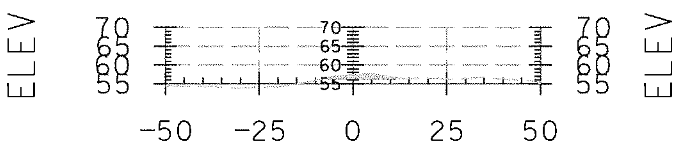



CA:14.56 SF
FA:0.00 SF
MO:4213.32

53+75

CV:12.32 CY
FV:0.00 CY

Car Body LB 1050-1620



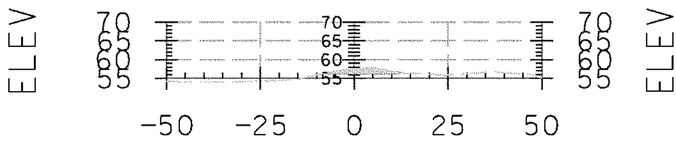

CA:17.39 SF
FA:0.00 SF
MO:4228.11

54+00

CV:14.79 CY
FV:0.00 CY

STA.54+25 TO STA.54+75

Car Body LB 1050-1620




CA:20.13 SF

54+25

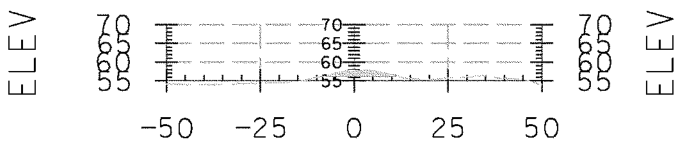
CV:17.37 CY

FA:0.00 SF

FV:0.00 CY

MO:4245.49

Car Body LB 1050-1620




CA:21.96 SF

54+50

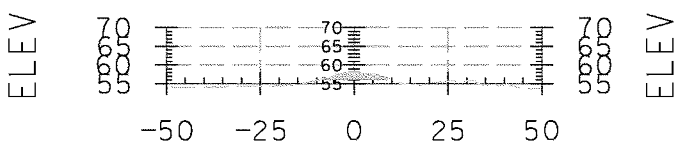
CV:19.49 CY

FA:0.00 SF

FV:0.00 CY

MO:4264.97

Car Body LB 1050-1620




CA:21.40 SF

54+75

CV:20.07 CY

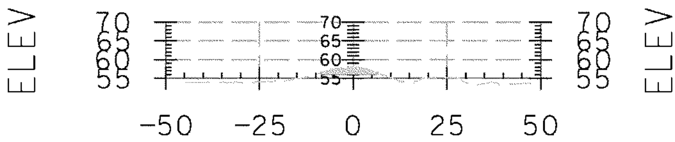
FA:0.00 SF

FV:0.00 CY

MO:4285.05

STA.55+00 TO STA.55+25

Car Body LB 1050-1620




CA:20.11 SF

55+00

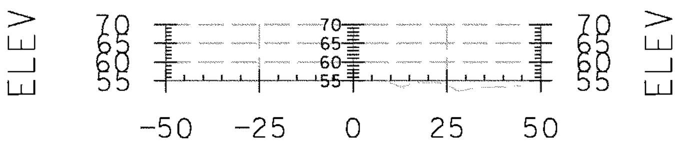
CV:19.22 CY

FA:0.00 SF

FV:0.00 CY

MO:4304.27

Car Body LB 1050-1620




CA:0.00 SF

55+25

CV:9.31 CY

FA:0.00 SF

FV:0.00 CY

MO:4313.58

# Triangle Volume Report

Report Created: 10/28/2014
Time: 4:39pm

**Mode:** Entire Surface
**Input Grid Factor:** 1.000000

---

| | | |
|---|---|---|
| **Original Surface:** | **carbody** | Last Revised |
| **Design Surface:** | **Car Body Breach** | |
| Cut Factor: | 1.000 | |
| Fill Factor: | 1.000 | |
| | | |
| Cut: | 127293.7 cu ft | |
| Fill: | 131.0 cu ft | |
| Net: | 127162.7 cu ft | |
| | | |
| Cut: | 4714.6 cu yd | |
| Fill: | 4.9 cu yd | |
| Net: | 4709.7 cu yd | |

# Volumes Report

Report Created: 8/5/2015
Time: 3:48pm

Bentley InRoads Suite V8i (SELECTseries 2), 08.11.07.536

**Cross Section Set Name:** Large Levee 6000 cfs

**Alignment Name:** Large Levee

**Input Grid Factor:** 1.000000

**Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

**Surface:** Skokomish Last Revised 8/29/2014 5:56:26 AM

**Surface:** skok_lidar Last Revised 9/14/2014 1:51:45 PM

**Surface:** Large Levee 6000 cfs overbuild Last Revised 8/3/2015 11:11:05 AM

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **0+00.000** | | | | | | | 0.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 20.6 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.9 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 0.5 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.4 | 0.0 | 1.000 | 0.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.2 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.1 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+10.000** | | | | | | | -7.3 |
| | Normal Cut: | 2.9 | 0.5 | 1.000 | 0.5 | Yes | |
| | Normal Fill: | 6.1 | 4.9 | 1.000 | 4.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 6.0 | 2.9 | 1.000 | 2.9 | Yes | |
| | Unsuitable (not replaced): | 3.6 | 0.8 | 1.000 | 0.8 | No | |
| | Total Unsuitable: | 9.5 | 3.7 | 1.000 | 3.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.6 | 0.7 | 1.000 | 0.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| 0+20.000 | | | | | | | -7.2 |
| | Normal Cut: | 11.5 | 2.7 | 1.000 | 2.7 | Yes | |
| | Normal Fill: | 0.1 | 1.1 | 1.000 | 1.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 1.3 | 1.4 | 1.000 | 1.4 | Yes | |
| | Unsuitable (not replaced): | 6.8 | 1.9 | 1.000 | 1.9 | No | |
| | Total Unsuitable: | 8.2 | 3.3 | 1.000 | 3.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.6 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| 0+30.000 | | | | | | | -0.9 |
| | Normal Cut: | 24.1 | 6.6 | 1.000 | 6.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.2 | 1.000 | 0.2 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 2.8 | 1.000 | 2.8 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| 0+40.000 | | | | | | | 9.4 |
| | Normal Cut: | 31.1 | 10.2 | 1.000 | 10.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| 0+50.000 | | | | | | | 20.7 |
| | Normal Cut: | 30.2 | 11.3 | 1.000 | 11.3 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.5 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.5 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+60.000** | | | | | | | 30.6 |
| | Normal Cut: | 23.2 | 9.9 | 1.000 | 9.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.5 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.5 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+70.000** | | | | | | | 36.0 |
| | Normal Cut: | 11.9 | 6.5 | 1.000 | 6.5 | Yes | |
| | Normal Fill: | 0.4 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 5.7 | 1.1 | 1.000 | 1.1 | Yes | |
| | Unsuitable (not replaced): | 7.2 | 2.9 | 1.000 | 2.9 | No | |
| | Total Unsuitable: | 12.9 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.9 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+80.000** | | | | | | | 34.9 |
| | Normal Cut: | 4.9 | 3.1 | 1.000 | 3.1 | Yes | |
| | Normal Fill: | 7.2 | 1.4 | 1.000 | 1.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.1 | 2.8 | 1.000 | 2.8 | Yes | |
| | Unsuitable (not replaced): | 4.3 | 2.1 | 1.000 | 2.1 | No | |
| | Total Unsuitable: | 13.4 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.2 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+90.000** | | | | | | | 27.6 |
| | Normal Cut: | 1.6 | 1.2 | 1.000 | 1.2 | Yes | |
| | Normal Fill: | 18.0 | 4.7 | 1.000 | 4.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.8 | 3.9 | 1.000 | 3.9 | Yes | |
| | Unsuitable (not replaced): | 2.4 | 1.2 | 1.000 | 1.2 | No | |
| | Total Unsuitable: | 14.2 | 5.1 | 1.000 | 5.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.0 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+00.000** | | | | | | | 14.9 |
| | Normal Cut: | 0.1 | 0.3 | 1.000 | 0.3 | Yes | |
| | Normal Fill: | 26.4 | 8.2 | 1.000 | 8.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.8 | 4.7 | 1.000 | 4.7 | Yes | |
| | Unsuitable (not replaced): | 0.8 | 0.6 | 1.000 | 0.6 | No | |
| | Total Unsuitable: | 14.6 | 5.3 | 1.000 | 5.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.3 | 1.9 | 1.000 | 1.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+10.000** | | | | | | | -2.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 36.5 | 11.7 | 1.000 | 11.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 15.0 | 5.3 | 1.000 | 5.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.2 | 1.000 | 0.2 | No | |
| | Total Unsuitable: | 15.0 | 5.5 | 1.000 | 5.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.9 | 2.1 | 1.000 | 2.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+20.000** | | | | | | | -22.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 42.7 | 14.7 | 1.000 | 14.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.0 | 5.7 | 1.000 | 5.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.0 | 5.7 | 1.000 | 5.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.5 | 2.3 | 1.000 | 2.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+30.000** | | | | | | | -44.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 46.2 | 16.5 | 1.000 | 16.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.1 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.1 | 5.9 | 1.000 | 5.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.6 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+40.000** | | | | | | | -68.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 46.8 | 17.2 | 1.000 | 17.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.7 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 16.7 | 6.1 | 1.000 | 6.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.1 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+50.000** | | | | | | | -86.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 23.0 | 12.9 | 1.000 | 12.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.8 | 5.5 | 1.000 | 5.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.8 | 5.5 | 1.000 | 5.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.6 | 2.2 | 1.000 | 2.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+60.000** | | | | | | | -95.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.3 | 5.2 | 1.000 | 5.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.0 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.0 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.0 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+70.000** | | | | | | | -100.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.6 | 1.8 | 1.000 | 1.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.2 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.2 | 3.0 | 1.000 | 3.0 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+80.000** | | | | | | | -106.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 9.2 | 2.5 | 1.000 | 2.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.9 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.9 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+90.000** | | | | | | | -112.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 10.0 | 3.6 | 1.000 | 3.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.3 | 3.2 | 1.000 | 3.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.3 | 3.2 | 1.000 | 3.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.4 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+00.000** | | | | | | | -119.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 10.7 | 3.8 | 1.000 | 3.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.7 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.7 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.6 | 0.5 | 1.000 | 0.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+10.000** | | | | | | | -126.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 9.9 | 3.8 | 1.000 | 3.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.2 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.2 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.3 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+20.000** | | | | | | | -133.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 9.4 | 3.6 | 1.000 | 3.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.9 | 3.2 | 1.000 | 3.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.9 | 3.2 | 1.000 | 3.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.2 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+30.000** | | | | | | | -140.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 9.2 | 3.5 | 1.000 | 3.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.9 | 3.3 | 1.000 | 3.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.9 | 3.3 | 1.000 | 3.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **2+40.000** | | | | | | | -146.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 8.5 | 3.3 | 1.000 | 3.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.7 | 3.3 | 1.000 | 3.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.7 | 3.3 | 1.000 | 3.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.1 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+50.000** | | | | | | | -153.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 8.4 | 3.1 | 1.000 | 3.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.9 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.9 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.0 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+60.000** | | | | | | | -159.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 10.0 | 3.4 | 1.000 | 3.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.2 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.2 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+70.000** | | | | | | | -166.5 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 11.7 | 4.0 | 1.000 | 4.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.4 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.4 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+80.000** | | | | | | | -174.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 13.4 | 4.7 | 1.000 | 4.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.7 | 3.2 | 1.000 | 3.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.7 | 3.2 | 1.000 | 3.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.6 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+90.000** | | | | | | | -183.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 15.6 | 5.4 | 1.000 | 5.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.1 | 3.3 | 1.000 | 3.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.1 | 3.3 | 1.000 | 3.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.9 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+00.000** | | | | | | | -192.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 18.6 | 6.3 | 1.000 | 6.3 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.8 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.8 | 3.5 | 1.000 | 3.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.3 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+10.000** | | | | | | | -204.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.6 | 7.4 | 1.000 | 7.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.6 | 3.8 | 1.000 | 3.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.6 | 3.8 | 1.000 | 3.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.9 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+20.000** | | | | | | | -216.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 23.3 | 8.3 | 1.000 | 8.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.9 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.9 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.1 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+30.000** | | | | | | | -229.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 25.9 | 9.1 | 1.000 | 9.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 11.4 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.4 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+40.000** | | | | | | | -244.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 29.1 | 10.2 | 1.000 | 10.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.9 | 4.3 | 1.000 | 4.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.9 | 4.3 | 1.000 | 4.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.8 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+50.000** | | | | | | | -260.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.8 | 11.5 | 1.000 | 11.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.6 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.6 | 4.5 | 1.000 | 4.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.3 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+60.000** | | | | | | | -277.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 35.9 | 12.7 | 1.000 | 12.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.1 | 4.8 | 1.000 | 4.8 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.1 | 4.8 | 1.000 | 4.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.6 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+70.000** | | | | | | | -295.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 33.0 | 12.8 | 1.000 | 12.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.3 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.3 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.8 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+80.000** | | | | | | | -311.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 29.4 | 11.6 | 1.000 | 11.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.8 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.8 | 4.8 | 1.000 | 4.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.5 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+90.000** | | | | | | | -326.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 26.9 | 10.4 | 1.000 | 10.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.4 | 4.7 | 1.000 | 4.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.4 | 4.7 | 1.000 | 4.7 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.2 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+00.000** | | | | | | | -340.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 24.9 | 9.6 | 1.000 | 9.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.1 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.1 | 4.5 | 1.000 | 4.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.0 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+10.000** | | | | | | | -354.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 23.3 | 8.9 | 1.000 | 8.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.8 | 4.4 | 1.000 | 4.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.8 | 4.4 | 1.000 | 4.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.8 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+20.000** | | | | | | | -367.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.9 | 8.4 | 1.000 | 8.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.6 | 4.3 | 1.000 | 4.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.6 | 4.3 | 1.000 | 4.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 3.6 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+30.000** | | | | | | | -379.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 20.9 | 7.9 | 1.000 | 7.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.4 | 4.3 | 1.000 | 4.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.4 | 4.3 | 1.000 | 4.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.5 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+40.000** | | | | | | | -391.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 20.4 | 7.6 | 1.000 | 7.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.3 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.3 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+50.000** | | | | | | | -402.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 20.2 | 7.5 | 1.000 | 7.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.3 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.3 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+60.000** | | | | | | | -413.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 18.2 | 7.1 | 1.000 | 7.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.9 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.9 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.1 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+70.000** | | | | | | | -424.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 16.2 | 6.4 | 1.000 | 6.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.5 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.5 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.9 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+80.000** | | | | | | | -433.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 14.3 | 5.7 | 1.000 | 5.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.1 | 3.8 | 1.000 | 3.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.1 | 3.8 | 1.000 | 3.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.6 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **4+90.000** | | | | | | | -442.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 12.5 | 5.0 | 1.000 | 5.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.7 | 3.7 | 1.000 | 3.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.7 | 3.7 | 1.000 | 3.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.3 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+00.000** | | | | | | | -450.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 10.8 | 4.3 | 1.000 | 4.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.4 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.4 | 3.5 | 1.000 | 3.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.2 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+10.000** | | | | | | | -457.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 9.4 | 3.7 | 1.000 | 3.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.2 | 3.4 | 1.000 | 3.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.2 | 3.4 | 1.000 | 3.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.0 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+20.000** | | | | | | | -464.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 8.2 | 3.2 | 1.000 | 3.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.9 | 3.3 | 1.000 | 3.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.9 | 3.3 | 1.000 | 3.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.8 | 0.7 | 1.000 | 0.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+30.000** | | | | | | | -470.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 7.1 | 2.8 | 1.000 | 2.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.7 | 3.3 | 1.000 | 3.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.7 | 3.3 | 1.000 | 3.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.6 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+40.000** | | | | | | | -475.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 7.0 | 2.6 | 1.000 | 2.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.5 | 3.2 | 1.000 | 3.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.5 | 3.2 | 1.000 | 3.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.5 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+50.000** | | | | | | | -481.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 7.8 | 2.7 | 1.000 | 2.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.5 | 3.2 | 1.000 | 3.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.5 | 3.2 | 1.000 | 3.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.5 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+60.000** | | | | | | | -488.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 8.7 | 3.1 | 1.000 | 3.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.8 | 3.2 | 1.000 | 3.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.8 | 3.2 | 1.000 | 3.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.7 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+70.000** | | | | | | | -494.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 9.7 | 3.4 | 1.000 | 3.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.0 | 3.3 | 1.000 | 3.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.0 | 3.3 | 1.000 | 3.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.8 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+80.000** | | | | | | | -501.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 10.7 | 3.8 | 1.000 | 3.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 9.2 | 3.4 | 1.000 | 3.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.2 | 3.4 | 1.000 | 3.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.0 | 0.7 | 1.000 | 0.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+90.000** | | | | | | | -509.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 12.4 | 4.3 | 1.000 | 4.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.6 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.6 | 3.5 | 1.000 | 3.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.3 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+00.000** | | | | | | | -518.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 14.4 | 5.0 | 1.000 | 5.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.0 | 3.6 | 1.000 | 3.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.0 | 3.6 | 1.000 | 3.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.6 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+10.000** | | | | | | | -527.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 16.5 | 5.7 | 1.000 | 5.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.5 | 3.8 | 1.000 | 3.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 10.5 | 3.8 | 1.000 | 3.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.8 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+20.000** | | | | | | | -538.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 18.7 | 6.5 | 1.000 | 6.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.9 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.9 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.1 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+30.000** | | | | | | | -549.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 20.1 | 7.2 | 1.000 | 7.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.0 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.0 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.2 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+40.000** | | | | | | | -560.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 18.6 | 7.2 | 1.000 | 7.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.7 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.7 | 4.0 | 1.000 | 4.0 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.0 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+50.000** | | | | | | | -571.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 16.8 | 6.5 | 1.000 | 6.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.4 | 3.9 | 1.000 | 3.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.4 | 3.9 | 1.000 | 3.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.8 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+60.000** | | | | | | | -580.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 14.8 | 5.9 | 1.000 | 5.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.0 | 3.8 | 1.000 | 3.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.0 | 3.8 | 1.000 | 3.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.5 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+70.000** | | | | | | | -589.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 13.1 | 5.2 | 1.000 | 5.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.6 | 3.6 | 1.000 | 3.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.6 | 3.6 | 1.000 | 3.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.3 | 0.9 | 1.000 | 0.9 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+80.000** | | | | | | | -597.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 11.8 | 4.6 | 1.000 | 4.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.3 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.3 | 3.5 | 1.000 | 3.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.1 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **6+90.000** | | | | | | | -605.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 11.1 | 4.2 | 1.000 | 4.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.3 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.3 | 3.5 | 1.000 | 3.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.1 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **7+00.000** | | | | | | | -613.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 12.6 | 4.4 | 1.000 | 4.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.6 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.6 | 3.5 | 1.000 | 3.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.3 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **7+10.000** | | | | | | | -621.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 14.3 | 5.0 | 1.000 | 5.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.0 | 3.6 | 1.000 | 3.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.0 | 3.6 | 1.000 | 3.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.5 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **7+20.000** | | | | | | | -631.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 16.1 | 5.6 | 1.000 | 5.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.3 | 3.8 | 1.000 | 3.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.3 | 3.8 | 1.000 | 3.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.8 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **7+30.000** | | | | | | | -641.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 17.9 | 6.3 | 1.000 | 6.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.7 | 3.9 | 1.000 | 3.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.7 | 3.9 | 1.000 | 3.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.0 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **7+40.000** | | | | | | | -652.5 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 19.7 | 7.0 | 1.000 | 7.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.0 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.0 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.2 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **7+50.000** | | | | | | | -664.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 20.6 | 7.5 | 1.000 | 7.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.1 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.1 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **7+60.000** | | | | | | | -676.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.3 | 7.8 | 1.000 | 7.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.3 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.3 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **7+70.000** | | | | | | | -688.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.9 | 8.0 | 1.000 | 8.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.4 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.4 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.5 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **7+80.000** | | | | | | | -700.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 22.5 | 8.2 | 1.000 | 8.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.5 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.5 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.5 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **7+90.000** | | | | | | | -713.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 22.4 | 8.3 | 1.000 | 8.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.4 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.4 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.5 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **8+00.000** | | | | | | | -725.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.9 | 8.2 | 1.000 | 8.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 11.3 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.3 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **8+10.000** | | | | | | | -737.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.6 | 8.0 | 1.000 | 8.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.2 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.2 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **8+20.000** | | | | | | | -749.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.2 | 7.9 | 1.000 | 7.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.2 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.2 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **8+30.000** | | | | | | | -761.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 20.8 | 7.8 | 1.000 | 7.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.1 | 4.1 | 1.000 | 4.1 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.1 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **8+40.000** | | | | | | | -773.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.5 | 7.8 | 1.000 | 7.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.3 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.3 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **8+50.000** | | | | | | | -786.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 22.7 | 8.2 | 1.000 | 8.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.4 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.4 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.5 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **8+60.000** | | | | | | | -799.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 23.9 | 8.6 | 1.000 | 8.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.6 | 4.3 | 1.000 | 4.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.6 | 4.3 | 1.000 | 4.3 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.6 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **8+70.000** | | | | | | | -812.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 24.8 | 9.0 | 1.000 | 9.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.7 | 4.3 | 1.000 | 4.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.7 | 4.3 | 1.000 | 4.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.7 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **8+80.000** | | | | | | | -825.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 24.4 | 9.1 | 1.000 | 9.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.5 | 4.3 | 1.000 | 4.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.5 | 4.3 | 1.000 | 4.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.6 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **8+90.000** | | | | | | | -839.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 24.0 | 9.0 | 1.000 | 9.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.4 | 4.3 | 1.000 | 4.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.4 | 4.3 | 1.000 | 4.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 3.5 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+00.000** | | | | | | | -852.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 23.5 | 8.8 | 1.000 | 8.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.4 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.4 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+10.000** | | | | | | | -864.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 23.0 | 8.6 | 1.000 | 8.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.3 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.3 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+20.000** | | | | | | | -877.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 22.9 | 8.5 | 1.000 | 8.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.3 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.3 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+30.000** | | | | | | | -890.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 22.8 | 8.5 | 1.000 | 8.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.3 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.3 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+40.000** | | | | | | | -902.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 20.4 | 8.0 | 1.000 | 8.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.9 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.9 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.1 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+50.000** | | | | | | | -913.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 17.8 | 7.1 | 1.000 | 7.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.5 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.5 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.8 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **9+60.000** | | | | | | | -923.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 16.1 | 6.3 | 1.000 | 6.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.1 | 3.8 | 1.000 | 3.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.1 | 3.8 | 1.000 | 3.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.6 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+70.000** | | | | | | | -932.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 14.7 | 5.7 | 1.000 | 5.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.0 | 3.7 | 1.000 | 3.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.0 | 3.7 | 1.000 | 3.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.5 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+80.000** | | | | | | | -941.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 14.6 | 5.4 | 1.000 | 5.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.1 | 3.7 | 1.000 | 3.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.1 | 3.7 | 1.000 | 3.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.6 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+90.000** | | | | | | | -951.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 14.5 | 5.4 | 1.000 | 5.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.0 | 3.7 | 1.000 | 3.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.0 | 3.7 | 1.000 | 3.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.5 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+00.000** | | | | | | | -963.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 29.1 | 8.1 | 1.000 | 8.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.9 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.9 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.5 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+10.000** | | | | | | | -980.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 36.6 | 12.2 | 1.000 | 12.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.5 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.5 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.9 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+20.000** | | | | | | | -998.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.9 | 12.9 | 1.000 | 12.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.0 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.0 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.6 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+30.000** | | | | | | | -1014.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 29.6 | 11.6 | 1.000 | 11.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.5 | 4.7 | 1.000 | 4.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.5 | 4.7 | 1.000 | 4.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.2 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+40.000** | | | | | | | -1029.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 26.4 | 10.4 | 1.000 | 10.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.0 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.0 | 4.5 | 1.000 | 4.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.9 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+50.000** | | | | | | | -1043.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 24.2 | 9.4 | 1.000 | 9.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 11.9 | 4.4 | 1.000 | 4.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.9 | 4.4 | 1.000 | 4.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.8 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+60.000** | | | | | | | -1056.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 24.6 | 9.0 | 1.000 | 9.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.0 | 4.4 | 1.000 | 4.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.0 | 4.4 | 1.000 | 4.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.9 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+70.000** | | | | | | | -1070.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 26.3 | 9.4 | 1.000 | 9.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.2 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.2 | 4.5 | 1.000 | 4.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.0 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+80.000** | | | | | | | -1085.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 28.2 | 10.1 | 1.000 | 10.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.5 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 12.5 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.3 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+90.000** | | | | | | | -1100.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 30.1 | 10.8 | 1.000 | 10.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.8 | 4.7 | 1.000 | 4.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.8 | 4.7 | 1.000 | 4.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.5 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+00.000** | | | | | | | -1116.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.0 | 11.5 | 1.000 | 11.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.1 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.1 | 4.8 | 1.000 | 4.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.7 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+10.000** | | | | | | | -1134.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 34.2 | 12.3 | 1.000 | 12.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.6 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.6 | 4.9 | 1.000 | 4.9 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.0 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+20.000** | | | | | | | -1152.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 36.9 | 13.2 | 1.000 | 13.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.0 | 5.1 | 1.000 | 5.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.0 | 5.1 | 1.000 | 5.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.3 | 1.9 | 1.000 | 1.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+30.000** | | | | | | | -1171.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 39.3 | 14.1 | 1.000 | 14.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.3 | 5.2 | 1.000 | 5.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.3 | 5.2 | 1.000 | 5.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.5 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+40.000** | | | | | | | -1192.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 41.7 | 15.0 | 1.000 | 15.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.7 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.7 | 5.4 | 1.000 | 5.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.7 | 2.1 | 1.000 | 2.1 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+50.000** | | | | | | | -1213.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 44.1 | 15.9 | 1.000 | 15.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.9 | 5.5 | 1.000 | 5.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.9 | 5.5 | 1.000 | 5.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.9 | 2.2 | 1.000 | 2.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+60.000** | | | | | | | -1235.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 45.6 | 16.6 | 1.000 | 16.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.9 | 5.5 | 1.000 | 5.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.9 | 5.5 | 1.000 | 5.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.9 | 2.2 | 1.000 | 2.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+70.000** | | | | | | | -1257.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 42.9 | 16.4 | 1.000 | 16.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.4 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.4 | 5.4 | 1.000 | 5.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.5 | 2.1 | 1.000 | 2.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **11+80.000** | | | | | | | -1277.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 39.3 | 15.2 | 1.000 | 15.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.9 | 5.2 | 1.000 | 5.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.9 | 5.2 | 1.000 | 5.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.2 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+90.000** | | | | | | | -1296.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 35.7 | 13.9 | 1.000 | 13.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.4 | 5.0 | 1.000 | 5.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.4 | 5.0 | 1.000 | 5.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.8 | 1.9 | 1.000 | 1.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+00.000** | | | | | | | -1314.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.4 | 12.6 | 1.000 | 12.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.9 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.9 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.5 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+10.000** | | | | | | | -1330.6 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 30.4 | 11.6 | 1.000 | 11.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.6 | 4.7 | 1.000 | 4.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.6 | 4.7 | 1.000 | 4.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+20.000** | | | | | | | -1346.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 28.6 | 10.9 | 1.000 | 10.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.4 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.4 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.2 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+30.000** | | | | | | | -1361.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 27.9 | 10.5 | 1.000 | 10.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.4 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.4 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.2 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+40.000** | | | | | | | -1376.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 27.9 | 10.3 | 1.000 | 10.3 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.4 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.4 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.2 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+50.000** | | | | | | | -1391.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 28.1 | 10.4 | 1.000 | 10.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.4 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.4 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.2 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+60.000** | | | | | | | -1406.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 27.8 | 10.4 | 1.000 | 10.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.4 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.4 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.2 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+70.000** | | | | | | | -1420.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 27.3 | 10.2 | 1.000 | 10.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 12.3 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.3 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+80.000** | | | | | | | -1435.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 26.7 | 10.0 | 1.000 | 10.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.2 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.2 | 4.5 | 1.000 | 4.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.0 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+90.000** | | | | | | | -1449.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 26.0 | 9.8 | 1.000 | 9.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.1 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.1 | 4.5 | 1.000 | 4.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.9 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+00.000** | | | | | | | -1463.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 25.2 | 9.5 | 1.000 | 9.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.9 | 4.4 | 1.000 | 4.4 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.9 | 4.4 | 1.000 | 4.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.9 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+10.000** | | | | | | | -1477.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 26.0 | 9.5 | 1.000 | 9.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.1 | 4.4 | 1.000 | 4.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.1 | 4.4 | 1.000 | 4.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.0 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+20.000** | | | | | | | -1491.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 27.6 | 9.9 | 1.000 | 9.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.3 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.3 | 4.5 | 1.000 | 4.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+30.000** | | | | | | | -1507.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 29.2 | 10.5 | 1.000 | 10.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.6 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.6 | 4.6 | 1.000 | 4.6 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+40.000** | | | | | | | -1522.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 30.9 | 11.1 | 1.000 | 11.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.9 | 4.7 | 1.000 | 4.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.9 | 4.7 | 1.000 | 4.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.5 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+50.000** | | | | | | | -1539.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.3 | 11.7 | 1.000 | 11.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.0 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.0 | 4.8 | 1.000 | 4.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.6 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+60.000** | | | | | | | -1556.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 33.4 | 12.2 | 1.000 | 12.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.1 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.1 | 4.8 | 1.000 | 4.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 4.7 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+70.000** | | | | | | | -1573.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 33.4 | 12.4 | 1.000 | 12.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.3 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.3 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.8 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+80.000** | | | | | | | -1590.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.9 | 12.3 | 1.000 | 12.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.3 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.3 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+90.000** | | | | | | | -1607.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.0 | 12.0 | 1.000 | 12.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.2 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.2 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.7 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **14+00.000** | | | | | | | -1624.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 31.1 | 11.7 | 1.000 | 11.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.0 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.0 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 6.6 | 1.2 | 1.000 | 1.2 | No | |
| | Topsoil: | 3.4 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 4.6 | 0.9 | 1.000 | 0.9 | No | |
| **14+10.000** | | | | | | | -1640.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 30.3 | 11.4 | 1.000 | 11.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.9 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.9 | 4.8 | 1.000 | 4.8 | | |
| | Riprap: | 6.4 | 2.4 | 1.000 | 2.4 | No | |
| | Topsoil: | 3.4 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 4.5 | 1.7 | 1.000 | 1.7 | No | |
| **14+20.000** | | | | | | | -1656.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 29.8 | 11.1 | 1.000 | 11.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.0 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.0 | 4.8 | 1.000 | 4.8 | | |
| | Riprap: | 6.3 | 2.4 | 1.000 | 2.4 | No | |
| | Topsoil: | 3.5 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 4.4 | 1.7 | 1.000 | 1.7 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **14+30.000** | | | | | | | -1672.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 30.4 | 11.1 | 1.000 | 11.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.2 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.2 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 6.1 | 2.3 | 1.000 | 2.3 | No | |
| | Topsoil: | 3.6 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| **14+40.000** | | | | | | | -1689.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.6 | 11.7 | 1.000 | 11.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.5 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.5 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 6.2 | 2.3 | 1.000 | 2.3 | No | |
| | Topsoil: | 3.8 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 4.5 | 1.6 | 1.000 | 1.6 | No | |
| **14+50.000** | | | | | | | -1707.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 37.2 | 12.9 | 1.000 | 12.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.1 | 5.1 | 1.000 | 5.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.1 | 5.1 | 1.000 | 5.1 | | |
| | Riprap: | 6.8 | 2.4 | 1.000 | 2.4 | No | |
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 4.9 | 1.7 | 1.000 | 1.7 | No | |
| **14+60.000** | | | | | | | -1727.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 42.1 | 14.7 | 1.000 | 14.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.8 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.8 | 5.4 | 1.000 | 5.4 | | |
| | Riprap: | 7.5 | 2.6 | 1.000 | 2.6 | No | |
| | Topsoil: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 5.4 | 1.9 | 1.000 | 1.9 | No | |
| **14+70.000** | | | | | | | -1749.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 47.4 | 16.6 | 1.000 | 16.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.6 | 5.6 | 1.000 | 5.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.6 | 5.6 | 1.000 | 5.6 | | |
| | Riprap: | 8.1 | 2.9 | 1.000 | 2.9 | No | |
| | Topsoil: | 4.8 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 5.8 | 2.1 | 1.000 | 2.1 | No | |
| **14+80.000** | | | | | | | -1773.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 52.9 | 18.6 | 1.000 | 18.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.3 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.3 | 5.9 | 1.000 | 5.9 | | |
| | Riprap: | 8.7 | 3.1 | 1.000 | 3.1 | No | |
| | Topsoil: | 5.2 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 6.2 | 2.2 | 1.000 | 2.2 | No | |
| **14+90.000** | | | | | | | -1800.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 58.7 | 20.7 | 1.000 | 20.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.0 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.0 | 6.2 | 1.000 | 6.2 | | |
| | Riprap: | 9.3 | 3.3 | 1.000 | 3.3 | No | |
| | Topsoil: | 5.5 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 6.7 | 2.4 | 1.000 | 2.4 | No | |
| **15+00.000** | | | | | | | -1829.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 63.7 | 22.7 | 1.000 | 22.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.2 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.2 | 6.3 | 1.000 | 6.3 | | |
| | Riprap: | 9.9 | 3.6 | 1.000 | 3.6 | No | |
| | Topsoil: | 5.5 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 7.1 | 2.6 | 1.000 | 2.6 | No | |
| **15+10.000** | | | | | | | -1859.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 65.3 | 23.9 | 1.000 | 23.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.3 | 6.4 | 1.000 | 6.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.3 | 6.4 | 1.000 | 6.4 | | |
| | Riprap: | 10.1 | 3.7 | 1.000 | 3.7 | No | |
| | Topsoil: | 5.5 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 7.2 | 2.7 | 1.000 | 2.7 | No | |
| **15+20.000** | | | | | | | -1889.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 62.5 | 23.7 | 1.000 | 23.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 17.0 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.0 | 6.3 | 1.000 | 6.3 | | |
| | Riprap: | 10.1 | 3.7 | 1.000 | 3.7 | No | |
| | Topsoil: | 5.3 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 7.3 | 2.7 | 1.000 | 2.7 | No | |
| **15+30.000** | | | | | | | -1918.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 59.1 | 22.5 | 1.000 | 22.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.6 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.6 | 6.2 | 1.000 | 6.2 | | |
| | Riprap: | 9.9 | 3.7 | 1.000 | 3.7 | No | |
| | Topsoil: | 5.1 | 1.9 | 1.000 | 1.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 7.1 | 2.7 | 1.000 | 2.7 | No | |
| **15+40.000** | | | | | | | -1946.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 55.8 | 21.3 | 1.000 | 21.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.1 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.1 | 6.1 | 1.000 | 6.1 | | |
| | Riprap: | 9.6 | 3.6 | 1.000 | 3.6 | No | |
| | Topsoil: | 4.9 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 6.8 | 2.6 | 1.000 | 2.6 | No | |
| **15+50.000** | | | | | | | -1972.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 52.7 | 20.1 | 1.000 | 20.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.8 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 15.8 | 5.9 | 1.000 | 5.9 | | |
| | Riprap: | 9.3 | 3.5 | 1.000 | 3.5 | No | |
| | Topsoil: | 4.7 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 6.6 | 2.5 | 1.000 | 2.5 | No | |
| **15+60.000** | | | | | | | -1996.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 50.4 | 19.1 | 1.000 | 19.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.5 | 5.8 | 1.000 | 5.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.5 | 5.8 | 1.000 | 5.8 | | |
| | Riprap: | 9.0 | 3.4 | 1.000 | 3.4 | No | |
| | Topsoil: | 4.5 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 6.4 | 2.4 | 1.000 | 2.4 | No | |
| **15+70.000** | | | | | | | -2020.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 48.4 | 18.3 | 1.000 | 18.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.3 | 5.7 | 1.000 | 5.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.3 | 5.7 | 1.000 | 5.7 | | |
| | Riprap: | 8.8 | 3.3 | 1.000 | 3.3 | No | |
| | Topsoil: | 4.4 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 6.3 | 2.3 | 1.000 | 2.3 | No | |
| **15+80.000** | | | | | | | -2044.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 46.7 | 17.6 | 1.000 | 17.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.0 | 5.6 | 1.000 | 5.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.0 | 5.6 | 1.000 | 5.6 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 8.5 | 3.2 | 1.000 | 3.2 | No | |
| | Topsoil: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 6.1 | 2.3 | 1.000 | 2.3 | No | |
| **15+90.000** | | | | | | | -2066.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 45.2 | 17.0 | 1.000 | 17.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.8 | 5.5 | 1.000 | 5.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.8 | 5.5 | 1.000 | 5.5 | | |
| | Riprap: | 8.3 | 3.1 | 1.000 | 3.1 | No | |
| | Topsoil: | 4.2 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 5.9 | 2.2 | 1.000 | 2.2 | No | |
| **16+00.000** | | | | | | | -2088.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 44.0 | 16.5 | 1.000 | 16.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.7 | 5.5 | 1.000 | 5.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.7 | 5.5 | 1.000 | 5.5 | | |
| | Riprap: | 8.2 | 3.1 | 1.000 | 3.1 | No | |
| | Topsoil: | 4.2 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 5.8 | 2.2 | 1.000 | 2.2 | No | |
| **16+10.000** | | | | | | | -2110.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 43.8 | 16.3 | 1.000 | 16.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.6 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.6 | 5.4 | 1.000 | 5.4 | | |
| | Riprap: | 8.2 | 3.0 | 1.000 | 3.0 | No | |
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 5.8 | 2.2 | 1.000 | 2.2 | No | |
| **16+20.000** | | | | | | | -2131.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 43.6 | 16.2 | 1.000 | 16.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.6 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.6 | 5.4 | 1.000 | 5.4 | | |
| | Riprap: | 7.8 | 3.0 | 1.000 | 3.0 | No | |
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 5.7 | 2.1 | 1.000 | 2.1 | No | |
| **16+30.000** | | | | | | | -2153.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 42.9 | 16.0 | 1.000 | 16.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.5 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.5 | 5.4 | 1.000 | 5.4 | | |
| | Riprap: | 7.4 | 2.8 | 1.000 | 2.8 | No | |
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 5.4 | 2.1 | 1.000 | 2.1 | No | |
| **16+40.000** | | | | | | | -2174.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 41.8 | 15.7 | 1.000 | 15.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.4 | 5.3 | 1.000 | 5.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.4 | 5.3 | 1.000 | 5.3 | | |
| | Riprap: | 6.9 | 2.6 | 1.000 | 2.6 | No | |
| | Topsoil: | 4.2 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 5.1 | 1.9 | 1.000 | 1.9 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **16+50.000** | | | | | | | -2194.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 38.8 | 14.9 | 1.000 | 14.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.1 | 5.3 | 1.000 | 5.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.1 | 5.3 | 1.000 | 5.3 | | |
| | Riprap: | 6.4 | 2.5 | 1.000 | 2.5 | No | |
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 4.7 | 1.8 | 1.000 | 1.8 | No | |
| **16+60.000** | | | | | | | -2213.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 33.5 | 13.4 | 1.000 | 13.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.5 | 5.1 | 1.000 | 5.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.5 | 5.1 | 1.000 | 5.1 | | |
| | Riprap: | 5.6 | 2.2 | 1.000 | 2.2 | No | |
| | Topsoil: | 3.9 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 4.2 | 1.6 | 1.000 | 1.6 | No | |
| **16+70.000** | | | | | | | -2229.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 27.9 | 11.4 | 1.000 | 11.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.0 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.0 | 4.9 | 1.000 | 4.9 | | |
| | Riprap: | 4.9 | 1.9 | 1.000 | 1.9 | No | |
| | Topsoil: | 3.6 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 3.6 | 1.4 | 1.000 | 1.4 | No | |
| **16+80.000** | | | | | | | -2243.2 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 22.1 | 9.3 | 1.000 | 9.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.1 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.1 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 4.1 | 1.7 | 1.000 | 1.7 | No | |
| | Topsoil: | 3.2 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 3.1 | 1.2 | 1.000 | 1.2 | No | |
| **16+90.000** | | | | | | | -2254.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 17.0 | 7.2 | 1.000 | 7.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.5 | 4.4 | 1.000 | 4.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.5 | 4.4 | 1.000 | 4.4 | | |
| | Riprap: | 3.4 | 1.4 | 1.000 | 1.4 | No | |
| | Topsoil: | 3.2 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 2.6 | 1.0 | 1.000 | 1.0 | No | |
| **17+00.000** | | | | | | | -2265.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 14.1 | 5.8 | 1.000 | 5.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.0 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.5 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 13.5 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 2.0 | 1.0 | 1.000 | 1.0 | No | |
| | Topsoil: | 3.7 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.9 | 0.8 | 1.000 | 0.8 | No | |
| **17+10.000** | | | | | | | -2274.2 |
| | Normal Cut: | 2.7 | 0.5 | 1.000 | 0.5 | Yes | |
| | Normal Fill: | 12.9 | 5.0 | 1.000 | 5.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.0 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 3.3 | 0.7 | 1.000 | 0.7 | No | |
| | Total Unsuitable: | 15.3 | 5.3 | 1.000 | 5.3 | | |
| | Riprap: | 1.7 | 0.7 | 1.000 | 0.7 | No | |
| | Topsoil: | 4.1 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.2 | 0.6 | 1.000 | 0.6 | No | |
| **17+20.000** | | | | | | | -2280.0 |
| | Normal Cut: | 9.6 | 2.3 | 1.000 | 2.3 | Yes | |
| | Normal Fill: | 8.1 | 3.9 | 1.000 | 3.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.2 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 5.8 | 1.7 | 1.000 | 1.7 | No | |
| | Total Unsuitable: | 16.1 | 5.8 | 1.000 | 5.8 | | |
| | Riprap: | 1.7 | 0.6 | 1.000 | 0.6 | No | |
| | Topsoil: | 4.6 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| **17+30.000** | | | | | | | -2279.0 |
| | Normal Cut: | 20.4 | 5.6 | 1.000 | 5.6 | Yes | |
| | Normal Fill: | 1.5 | 1.8 | 1.000 | 1.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 4.6 | 2.7 | 1.000 | 2.7 | Yes | |
| | Unsuitable (not replaced): | 8.0 | 2.6 | 1.000 | 2.6 | No | |
| | Total Unsuitable: | 12.6 | 5.3 | 1.000 | 5.3 | | |
| | Riprap: | 1.7 | 0.6 | 1.000 | 0.6 | No | |
| | Topsoil: | 2.6 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| **17+40.000** | | | | | | | -2270.6 |
| | Normal Cut: | 32.9 | 9.9 | 1.000 | 9.9 | Yes | |
| | Normal Fill: | 0.0 | 0.3 | 1.000 | 0.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 2.0 | 1.2 | 1.000 | 1.2 | Yes | |
| | Unsuitable (not replaced): | 10.3 | 3.4 | 1.000 | 3.4 | No | |
| | Total Unsuitable: | 12.3 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 1.7 | 0.6 | 1.000 | 0.6 | No | |
| | Topsoil: | 0.7 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| **17+50.000** | | | | | | | -2257.3 |
| | Normal Cut: | 40.9 | 13.7 | 1.000 | 13.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.4 | 1.000 | 0.4 | Yes | |
| | Unsuitable (not replaced): | 11.2 | 4.0 | 1.000 | 4.0 | No | |
| | Total Unsuitable: | 11.2 | 4.3 | 1.000 | 4.3 | | |
| | Riprap: | 1.7 | 0.6 | 1.000 | 0.6 | No | |
| | Topsoil: | 0.3 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| **17+60.000** | | | | | | | -2240.7 |
| | Normal Cut: | 48.5 | 16.6 | 1.000 | 16.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 11.2 | 4.1 | 1.000 | 4.1 | No | |
| | Total Unsuitable: | 11.2 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 1.7 | 0.6 | 1.000 | 0.6 | No | |
| | Topsoil: | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| **17+70.000** | | | | | | | -2221.7 |
| | Normal Cut: | 54.1 | 19.0 | 1.000 | 19.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 11.1 | 4.1 | 1.000 | 4.1 | No | |
| | Total Unsuitable: | 11.1 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 1.7 | 0.6 | 1.000 | 0.6 | No | |
| | Topsoil: | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| **17+80.000** | | | | | | | -2200.8 |
| | Normal Cut: | 59.0 | 20.9 | 1.000 | 20.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 11.1 | 4.1 | 1.000 | 4.1 | No | |
| | Total Unsuitable: | 11.1 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 1.7 | 0.6 | 1.000 | 0.6 | No | |
| | Topsoil: | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| **17+90.000** | | | | | | | -2178.2 |
| | Normal Cut: | 63.0 | 22.6 | 1.000 | 22.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 11.1 | 4.1 | 1.000 | 4.1 | No | |
| | Total Unsuitable: | 11.1 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 1.7 | 0.6 | 1.000 | 0.6 | No | |
| | Topsoil: | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| **18+00.000** | | | | | | | -2154.7 |
| | Normal Cut: | 64.1 | 23.5 | 1.000 | 23.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 11.2 | 4.1 | 1.000 | 4.1 | No | |
| | Total Unsuitable: | 11.2 | 4.1 | 1.000 | 4.1 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 1.7 | 0.6 | 1.000 | 0.6 | No | |
| | Topsoil: | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| **18+10.000** | | | | | | | -2136.8 |
| | Normal Cut: | 32.3 | 17.8 | 1.000 | 17.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.5 | 3.6 | 1.000 | 3.6 | No | |
| | Total Unsuitable: | 8.5 | 3.6 | 1.000 | 3.6 | | |
| | Riprap: | 0.0 | 0.3 | 1.000 | 0.3 | No | |
| | Topsoil: | 0.5 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.2 | 1.000 | 0.2 | No | |
| **18+20.000** | | | | | | | -2126.7 |
| | Normal Cut: | 22.4 | 10.1 | 1.000 | 10.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.5 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.5 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+30.000** | | | | | | | -2120.3 |
| | Normal Cut: | 12.4 | 6.4 | 1.000 | 6.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.4 | 0.1 | 1.000 | 0.1 | Yes | |
| | Unsuitable (not replaced): | 8.0 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.5 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+40.000** | | | | | | | -2117.6 |
| | Normal Cut: | 4.9 | 3.2 | 1.000 | 3.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 2.1 | 0.5 | 1.000 | 0.5 | Yes | |
| | Unsuitable (not replaced): | 6.4 | 2.7 | 1.000 | 2.7 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+50.000** | | | | | | | -2118.0 |
| | Normal Cut: | 0.0 | 0.9 | 1.000 | 0.9 | Yes | |
| | Normal Fill: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 5.1 | 1.3 | 1.000 | 1.3 | Yes | |
| | Unsuitable (not replaced): | 3.0 | 1.7 | 1.000 | 1.7 | No | |
| | Total Unsuitable: | 8.1 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.9 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+60.000** | | | | | | | -2120.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 1.6 | 0.3 | 1.000 | 0.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 6.2 | 2.1 | 1.000 | 2.1 | Yes | |
| | Unsuitable (not replaced): | 2.6 | 1.0 | 1.000 | 1.0 | No | |
| | Total Unsuitable: | 8.8 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.1 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+70.000** | | | | | | | -2124.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.5 | 1.3 | 1.000 | 1.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.4 | 2.7 | 1.000 | 2.7 | Yes | |
| | Unsuitable (not replaced): | 1.3 | 0.7 | 1.000 | 0.7 | No | |
| | Total Unsuitable: | 9.6 | 3.4 | 1.000 | 3.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.7 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+80.000** | | | | | | | -2131.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 11.6 | 3.2 | 1.000 | 3.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.3 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.3 | 1.000 | 0.3 | No | |
| | Total Unsuitable: | 10.4 | 3.7 | 1.000 | 3.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.1 | 0.7 | 1.000 | 0.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+90.000** | | | | | | | -2140.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 19.9 | 5.8 | 1.000 | 5.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.2 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.2 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.8 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **19+00.000** | | | | | | | -2154.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 29.6 | 9.2 | 1.000 | 9.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.9 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.9 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.3 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+10.000** | | | | | | | -2170.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 33.8 | 11.8 | 1.000 | 11.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.1 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.1 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+20.000** | | | | | | | -2185.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 27.5 | 11.4 | 1.000 | 11.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.9 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.9 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.2 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+30.000** | | | | | | | -2195.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 5.6 | 6.1 | 1.000 | 6.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.7 | 3.6 | 1.000 | 3.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.7 | 3.6 | 1.000 | 3.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.7 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+40.000** | | | | | | | -2200.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 3.3 | 1.7 | 1.000 | 1.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.1 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.3 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.1 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+50.000** | | | | | | | -2204.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.0 | 1.3 | 1.000 | 1.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.2 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.2 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.0 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+60.000** | | | | | | | -2208.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.4 | 1.5 | 1.000 | 1.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.2 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.2 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.0 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+70.000** | | | | | | | -2213.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.7 | 1.7 | 1.000 | 1.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.1 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.2 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.0 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+80.000** | | | | | | | -2218.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.2 | 1.8 | 1.000 | 1.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.1 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.1 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.3 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+90.000** | | | | | | | -2223.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.6 | 1.8 | 1.000 | 1.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 8.4 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.1 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+00.000** | | | | | | | -2227.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 2.2 | 1.3 | 1.000 | 1.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.8 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.0 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.9 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+10.000** | | | | | | | -2230.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.5 | 0.5 | 1.000 | 0.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 6.5 | 2.7 | 1.000 | 2.7 | Yes | |
| | Unsuitable (not replaced): | 0.9 | 0.2 | 1.000 | 0.2 | No | |
| | Total Unsuitable: | 7.4 | 2.9 | 1.000 | 2.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.6 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+20.000** | | | | | | | -2233.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 5.4 | 2.2 | 1.000 | 2.2 | Yes | |
| | Unsuitable (not replaced): | 2.9 | 0.7 | 1.000 | 0.7 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 8.4 | 2.9 | 1.000 | 2.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+30.000** | | | | | | | -2234.8 |
| | Normal Cut: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 3.5 | 1.7 | 1.000 | 1.7 | Yes | |
| | Unsuitable (not replaced): | 4.9 | 1.4 | 1.000 | 1.4 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+40.000** | | | | | | | -2235.9 |
| | Normal Cut: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 2.6 | 1.1 | 1.000 | 1.1 | Yes | |
| | Unsuitable (not replaced): | 5.7 | 2.0 | 1.000 | 2.0 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+50.000** | | | | | | | -2236.7 |
| | Normal Cut: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 1.8 | 0.8 | 1.000 | 0.8 | Yes | |
| | Unsuitable (not replaced): | 6.6 | 2.3 | 1.000 | 2.3 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+60.000** | | | | | | | -2237.1 |
| | Normal Cut: | 0.2 | 0.1 | 1.000 | 0.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 1.0 | 0.5 | 1.000 | 0.5 | Yes | |
| | Unsuitable (not replaced): | 7.4 | 2.6 | 1.000 | 2.6 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+70.000** | | | | | | | -2237.3 |
| | Normal Cut: | 0.5 | 0.1 | 1.000 | 0.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.4 | 0.3 | 1.000 | 0.3 | Yes | |
| | Unsuitable (not replaced): | 7.9 | 2.8 | 1.000 | 2.8 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+80.000** | | | | | | | -2237.7 |
| | Normal Cut: | 0.2 | 0.1 | 1.000 | 0.1 | Yes | |
| | Normal Fill: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 2.3 | 0.5 | 1.000 | 0.5 | Yes | |
| | Unsuitable (not replaced): | 5.7 | 2.5 | 1.000 | 2.5 | No | |
| | Total Unsuitable: | 8.0 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+90.000** | | | | | | | -2238.6 |
| | Normal Cut: | 0.6 | 0.2 | 1.000 | 0.2 | Yes | |
| | Normal Fill: | 0.6 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 3.0 | 1.0 | 1.000 | 1.0 | Yes | |
| | Unsuitable (not replaced): | 5.3 | 2.0 | 1.000 | 2.0 | No | |
| | Total Unsuitable: | 8.3 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **21+00.000** | | | | | | | -2239.0 |
| | Normal Cut: | 2.1 | 0.5 | 1.000 | 0.5 | Yes | |
| | Normal Fill: | 0.0 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.9 | 0.7 | 1.000 | 0.7 | Yes | |
| | Unsuitable (not replaced): | 7.5 | 2.4 | 1.000 | 2.4 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **21+10.000** | | | | | | | -2237.9 |
| | Normal Cut: | 4.6 | 1.2 | 1.000 | 1.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.2 | 1.000 | 0.2 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 2.9 | 1.000 | 2.9 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **21+20.000** | | | | | | | -2235.8 |
| | Normal Cut: | 6.7 | 2.1 | 1.000 | 2.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **21+30.000** | | | | | | | -2233.2 |
| | Normal Cut: | 7.8 | 2.7 | 1.000 | 2.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **21+40.000** | | | | | | | -2230.1 |
| | Normal Cut: | 8.7 | 3.1 | 1.000 | 3.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **21+50.000** | | | | | | | -2226.8 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 8.9 | 3.3 | 1.000 | 3.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **21+60.000** | | | | | | | -2223.5 |
| | Normal Cut: | 9.0 | 3.3 | 1.000 | 3.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **21+70.000** | | | | | | | -2220.2 |
| | Normal Cut: | 9.0 | 3.3 | 1.000 | 3.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **21+80.000** | | | | | | | -2217.0 |
| | Normal Cut: | 8.4 | 3.2 | 1.000 | 3.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **21+90.000** | | | | | | | -2213.9 |
| | Normal Cut: | 8.2 | 3.1 | 1.000 | 3.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **22+00.000** | | | | | | | -2210.7 |
| | Normal Cut: | 9.2 | 3.2 | 1.000 | 3.2 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **22+10.000** | | | | | | | -2207.6 |
| | Normal Cut: | 7.5 | 3.1 | 1.000 | 3.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **22+20.000** | | | | | | | -2205.2 |
| | Normal Cut: | 5.2 | 2.3 | 1.000 | 2.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **22+30.000** | | | | | | | -2203.8 |
| | Normal Cut: | 3.2 | 1.6 | 1.000 | 1.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.6 | 0.1 | 1.000 | 0.1 | Yes | |
| | Unsuitable (not replaced): | 7.8 | 3.0 | 1.000 | 3.0 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **22+40.000** | | | | | | | -2203.3 |
| | Normal Cut: | 1.7 | 0.9 | 1.000 | 0.9 | Yes | |
| | Normal Fill: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 1.8 | 0.4 | 1.000 | 0.4 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 6.3 | 2.6 | 1.000 | 2.6 | No | |
| | Total Unsuitable: | 8.1 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **22+50.000** | | | | | | | -2204.1 |
| | Normal Cut: | 0.6 | 0.4 | 1.000 | 0.4 | Yes | |
| | Normal Fill: | 1.3 | 0.3 | 1.000 | 0.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 3.5 | 1.0 | 1.000 | 1.0 | Yes | |
| | Unsuitable (not replaced): | 5.0 | 2.1 | 1.000 | 2.1 | No | |
| | Total Unsuitable: | 8.5 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.9 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **22+60.000** | | | | | | | -2206.0 |
| | Normal Cut: | 0.1 | 0.1 | 1.000 | 0.1 | Yes | |
| | Normal Fill: | 1.8 | 0.6 | 1.000 | 0.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 4.5 | 1.5 | 1.000 | 1.5 | Yes | |
| | Unsuitable (not replaced): | 4.1 | 1.7 | 1.000 | 1.7 | No | |
| | Total Unsuitable: | 8.6 | 3.2 | 1.000 | 3.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.9 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **22+70.000** | | | | | | | -2208.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 1.5 | 0.6 | 1.000 | 0.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 4.7 | 1.7 | 1.000 | 1.7 | Yes | |
| | Unsuitable (not replaced): | 3.8 | 1.5 | 1.000 | 1.5 | No | |
| | Total Unsuitable: | 8.5 | 3.2 | 1.000 | 3.2 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.9 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **22+80.000** | | | | | | | -2210.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 1.3 | 0.5 | 1.000 | 0.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 5.1 | 1.8 | 1.000 | 1.8 | Yes | |
| | Unsuitable (not replaced): | 3.4 | 1.3 | 1.000 | 1.3 | No | |
| | Total Unsuitable: | 8.5 | 3.2 | 1.000 | 3.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **22+90.000** | | | | | | | -2213.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 1.1 | 0.4 | 1.000 | 0.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 5.6 | 2.0 | 1.000 | 2.0 | Yes | |
| | Unsuitable (not replaced): | 2.9 | 1.2 | 1.000 | 1.2 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **23+00.000** | | | | | | | -2215.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.9 | 0.4 | 1.000 | 0.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 6.1 | 2.2 | 1.000 | 2.2 | Yes | |
| | Unsuitable (not replaced): | 2.3 | 0.9 | 1.000 | 0.9 | No | |
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 0.8 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **23+10.000** | | | | | | | -2218.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.8 | 0.3 | 1.000 | 0.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 6.7 | 2.4 | 1.000 | 2.4 | Yes | |
| | Unsuitable (not replaced): | 1.6 | 0.7 | 1.000 | 0.7 | No | |
| | Total Unsuitable: | 8.3 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **23+20.000** | | | | | | | -2220.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.6 | 0.3 | 1.000 | 0.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 5.9 | 2.3 | 1.000 | 2.3 | Yes | |
| | Unsuitable (not replaced): | 2.4 | 0.7 | 1.000 | 0.7 | No | |
| | Total Unsuitable: | 8.3 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **23+30.000** | | | | | | | -2223.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.6 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 6.0 | 2.2 | 1.000 | 2.2 | Yes | |
| | Unsuitable (not replaced): | 2.3 | 0.9 | 1.000 | 0.9 | No | |
| | Total Unsuitable: | 8.3 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **23+40.000** | | | | | | | -2225.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.6 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 5.7 | 2.2 | 1.000 | 2.2 | Yes | |
| | Unsuitable (not replaced): | 2.6 | 0.9 | 1.000 | 0.9 | No | |
| | Total Unsuitable: | 8.3 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **23+50.000** | | | | | | | -2228.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.6 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 5.3 | 2.0 | 1.000 | 2.0 | Yes | |
| | Unsuitable (not replaced): | 2.9 | 1.0 | 1.000 | 1.0 | No | |
| | Total Unsuitable: | 8.3 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **23+60.000** | | | | | | | -2230.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.5 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 5.0 | 1.9 | 1.000 | 1.9 | Yes | |
| | Unsuitable (not replaced): | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Total Unsuitable: | 8.3 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **23+70.000** | | | | | | | -2232.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.5 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 4.6 | 1.8 | 1.000 | 1.8 | Yes | |
| | Unsuitable (not replaced): | 3.6 | 1.3 | 1.000 | 1.3 | No | |
| | Total Unsuitable: | 8.2 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **23+80.000** | | | | | | | -2233.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.5 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 4.2 | 1.6 | 1.000 | 1.6 | Yes | |
| | Unsuitable (not replaced): | 4.0 | 1.4 | 1.000 | 1.4 | No | |
| | Total Unsuitable: | 8.2 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **23+90.000** | | | | | | | -2236.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 1.1 | 0.3 | 1.000 | 0.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 5.7 | 1.8 | 1.000 | 1.8 | Yes | |
| | Unsuitable (not replaced): | 2.9 | 1.3 | 1.000 | 1.3 | No | |
| | Total Unsuitable: | 8.6 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.9 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **24+00.000** | | | | | | | -2239.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 1.7 | 0.5 | 1.000 | 0.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.3 | 2.6 | 1.000 | 2.6 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.6 | 1.000 | 0.6 | No | |
| | Total Unsuitable: | 8.6 | 3.2 | 1.000 | 3.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **24+10.000** | | | | | | | -2243.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.8 | 1.2 | 1.000 | 1.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.8 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.8 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.1 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **24+20.000** | | | | | | | -2248.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 8.7 | 2.5 | 1.000 | 2.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.5 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.5 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.6 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **24+30.000** | | | | | | | -2256.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 13.3 | 4.1 | 1.000 | 4.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.5 | 3.3 | 1.000 | 3.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.5 | 3.3 | 1.000 | 3.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.2 | 0.7 | 1.000 | 0.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **24+40.000** | | | | | | | -2265.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 18.4 | 5.9 | 1.000 | 5.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.5 | 3.7 | 1.000 | 3.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.5 | 3.7 | 1.000 | 3.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.9 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **24+50.000** | | | | | | | -2276.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 17.1 | 6.6 | 1.000 | 6.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.6 | 3.9 | 1.000 | 3.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.6 | 3.9 | 1.000 | 3.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.0 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **24+60.000** | | | | | | | -2286.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 16.8 | 6.3 | 1.000 | 6.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 10.5 | 3.9 | 1.000 | 3.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.5 | 3.9 | 1.000 | 3.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.0 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **24+70.000** | | | | | | | -2297.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 20.9 | 7.0 | 1.000 | 7.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.9 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.9 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **24+80.000** | | | | | | | -2309.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.8 | 7.9 | 1.000 | 7.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.7 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.7 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.8 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **24+90.000** | | | | | | | -2323.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 26.3 | 8.9 | 1.000 | 8.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.7 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 12.7 | 4.5 | 1.000 | 4.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.5 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **25+00.000** | | | | | | | -2338.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 29.6 | 10.4 | 1.000 | 10.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.3 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.3 | 4.8 | 1.000 | 4.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.9 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **25+10.000** | | | | | | | -2353.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 26.1 | 10.3 | 1.000 | 10.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.4 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.4 | 4.8 | 1.000 | 4.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.2 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **25+20.000** | | | | | | | -2366.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 23.8 | 9.2 | 1.000 | 9.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.8 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.8 | 4.5 | 1.000 | 4.5 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.8 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **25+30.000** | | | | | | | -2379.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 22.5 | 8.6 | 1.000 | 8.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.2 | 4.3 | 1.000 | 4.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.2 | 4.3 | 1.000 | 4.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **25+40.000** | | | | | | | -2392.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.7 | 8.2 | 1.000 | 8.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.0 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.0 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.2 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **25+50.000** | | | | | | | -2403.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 18.1 | 7.4 | 1.000 | 7.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.5 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.5 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.9 | 1.1 | 1.000 | 1.1 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **25+60.000** | | | | | | | -2413.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 15.6 | 6.2 | 1.000 | 6.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.1 | 3.8 | 1.000 | 3.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.1 | 3.8 | 1.000 | 3.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.6 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **25+70.000** | | | | | | | -2422.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 14.2 | 5.5 | 1.000 | 5.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.8 | 3.7 | 1.000 | 3.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.8 | 3.7 | 1.000 | 3.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.4 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **25+80.000** | | | | | | | -2431.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 12.8 | 5.0 | 1.000 | 5.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.5 | 3.6 | 1.000 | 3.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.5 | 3.6 | 1.000 | 3.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.2 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **25+90.000** | | | | | | | -2439.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 11.6 | 4.5 | 1.000 | 4.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.3 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.3 | 3.5 | 1.000 | 3.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.0 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+00.000** | | | | | | | -2446.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 10.8 | 4.1 | 1.000 | 4.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.1 | 3.4 | 1.000 | 3.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.1 | 3.4 | 1.000 | 3.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.9 | 0.7 | 1.000 | 0.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+10.000** | | | | | | | -2454.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 10.4 | 3.9 | 1.000 | 3.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.0 | 3.3 | 1.000 | 3.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.0 | 3.3 | 1.000 | 3.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.8 | 0.7 | 1.000 | 0.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+20.000** | | | | | | | -2461.0 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 9.4 | 3.7 | 1.000 | 3.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.7 | 3.3 | 1.000 | 3.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.7 | 3.3 | 1.000 | 3.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.6 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+30.000** | | | | | | | -2467.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 7.5 | 3.1 | 1.000 | 3.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.2 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.2 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.3 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+40.000** | | | | | | | -2472.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.8 | 2.5 | 1.000 | 2.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.8 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.8 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.0 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+50.000** | | | | | | | -2477.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.0 | 2.0 | 1.000 | 2.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.6 | 2.9 | 1.000 | 2.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.6 | 2.9 | 1.000 | 2.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.9 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+60.000** | | | | | | | -2482.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.9 | 2.0 | 1.000 | 2.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.0 | 2.9 | 1.000 | 2.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.0 | 2.9 | 1.000 | 2.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+70.000** | | | | | | | -2488.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 9.5 | 2.8 | 1.000 | 2.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.9 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.9 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.8 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+80.000** | | | | | | | -2496.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 13.9 | 4.3 | 1.000 | 4.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 9.9 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.9 | 3.5 | 1.000 | 3.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.4 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+90.000** | | | | | | | -2505.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 16.9 | 5.7 | 1.000 | 5.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.4 | 3.8 | 1.000 | 3.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.4 | 3.8 | 1.000 | 3.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.8 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+00.000** | | | | | | | -2516.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 19.7 | 6.8 | 1.000 | 6.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.0 | 4.0 | 1.000 | 4.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.0 | 4.0 | 1.000 | 4.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.2 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+10.000** | | | | | | | -2528.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 22.4 | 7.8 | 1.000 | 7.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.6 | 4.2 | 1.000 | 4.2 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.6 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.6 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+20.000** | | | | | | | -2542.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 27.4 | 9.2 | 1.000 | 9.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.4 | 4.4 | 1.000 | 4.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.4 | 4.4 | 1.000 | 4.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.1 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+30.000** | | | | | | | -2557.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 33.3 | 11.2 | 1.000 | 11.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.3 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.3 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+40.000** | | | | | | | -2573.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 28.9 | 11.5 | 1.000 | 11.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.0 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.0 | 4.5 | 1.000 | 4.5 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.8 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+50.000** | | | | | | | -2586.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 17.3 | 8.5 | 1.000 | 8.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.7 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.7 | 4.2 | 1.000 | 4.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.0 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+60.000** | | | | | | | -2594.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 6.9 | 4.5 | 1.000 | 4.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.4 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.4 | 3.5 | 1.000 | 3.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.4 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+70.000** | | | | | | | -2599.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 3.2 | 1.9 | 1.000 | 1.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.4 | 2.9 | 1.000 | 2.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.4 | 2.9 | 1.000 | 2.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 0.7 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+80.000** | | | | | | | -2603.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 3.8 | 1.3 | 1.000 | 1.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.6 | 2.8 | 1.000 | 2.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.6 | 2.8 | 1.000 | 2.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.9 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+90.000** | | | | | | | -2607.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.5 | 1.5 | 1.000 | 1.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.8 | 2.8 | 1.000 | 2.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.8 | 2.8 | 1.000 | 2.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.0 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **28+00.000** | | | | | | | -2612.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.2 | 1.8 | 1.000 | 1.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.9 | 2.9 | 1.000 | 2.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.9 | 2.9 | 1.000 | 2.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.1 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **28+10.000** | | | | | | | -2617.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.9 | 2.0 | 1.000 | 2.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.1 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.1 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **28+20.000** | | | | | | | -2622.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.9 | 2.2 | 1.000 | 2.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.1 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.1 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.3 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **28+30.000** | | | | | | | -2627.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.2 | 2.1 | 1.000 | 2.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.9 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.9 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.1 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **28+40.000** | | | | | | | -2632.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.4 | 1.8 | 1.000 | 1.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.7 | 2.9 | 1.000 | 2.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.7 | 2.9 | 1.000 | 2.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.0 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **28+50.000** | | | | | | | -2636.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 3.6 | 1.5 | 1.000 | 1.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.4 | 2.8 | 1.000 | 2.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.4 | 2.8 | 1.000 | 2.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **28+60.000** | | | | | | | -2640.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 2.8 | 1.2 | 1.000 | 1.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.2 | 2.7 | 1.000 | 2.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.2 | 2.7 | 1.000 | 2.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.6 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **28+70.000** | | | | | | | -2644.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 2.8 | 1.1 | 1.000 | 1.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.1 | 2.7 | 1.000 | 2.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.1 | 2.7 | 1.000 | 2.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **28+80.000** | | | | | | | -2648.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 3.6 | 1.2 | 1.000 | 1.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.4 | 2.7 | 1.000 | 2.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.4 | 2.7 | 1.000 | 2.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **28+90.000** | | | | | | | -2652.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.1 | 1.6 | 1.000 | 1.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.8 | 2.8 | 1.000 | 2.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.8 | 2.8 | 1.000 | 2.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.0 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **29+00.000** | | | | | | | -2657.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 6.6 | 2.2 | 1.000 | 2.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.1 | 2.9 | 1.000 | 2.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.1 | 2.9 | 1.000 | 2.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **29+10.000** | | | | | | | -2663.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 6.1 | 2.4 | 1.000 | 2.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.2 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.2 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.3 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **29+20.000** | | | | | | | -2668.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.2 | 2.1 | 1.000 | 2.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.9 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.9 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.1 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **29+30.000** | | | | | | | -2672.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.2 | 1.7 | 1.000 | 1.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 7.7 | 2.9 | 1.000 | 2.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.7 | 2.9 | 1.000 | 2.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.9 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **29+40.000** | | | | | | | -2677.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 3.3 | 1.4 | 1.000 | 1.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.4 | 2.8 | 1.000 | 2.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.4 | 2.8 | 1.000 | 2.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **29+50.000** | | | | | | | -2681.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.0 | 1.3 | 1.000 | 1.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.5 | 2.8 | 1.000 | 2.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 7.5 | 2.8 | 1.000 | 2.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **29+60.000** | | | | | | | -2686.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 8.5 | 2.3 | 1.000 | 2.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.5 | 3.0 | 1.000 | 3.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 8.5 | 3.0 | 1.000 | 3.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.5 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **29+70.000** | | | | | | | -2693.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 13.8 | 4.1 | 1.000 | 4.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.7 | 3.4 | 1.000 | 3.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.7 | 3.4 | 1.000 | 3.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.3 | 0.7 | 1.000 | 0.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **29+80.000** | | | | | | | -2703.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 19.5 | 6.2 | 1.000 | 6.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.7 | 3.8 | 1.000 | 3.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.7 | 3.8 | 1.000 | 3.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.0 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **29+90.000** | | | | | | | -2714.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 15.3 | 6.4 | 1.000 | 6.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.8 | 3.8 | 1.000 | 3.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.8 | 3.8 | 1.000 | 3.8 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.4 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **30+00.000** | | | | | | | -2722.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 10.5 | 4.8 | 1.000 | 4.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.9 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.9 | 3.5 | 1.000 | 3.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.8 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **30+10.000** | | | | | | | -2729.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 8.2 | 3.5 | 1.000 | 3.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.3 | 3.2 | 1.000 | 3.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.3 | 3.2 | 1.000 | 3.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.4 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **30+20.000** | | | | | | | -2735.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 8.7 | 3.1 | 1.000 | 3.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.2 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.2 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.3 | 0.5 | 1.000 | 0.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **30+30.000** | | | | | | | -2742.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 11.5 | 3.7 | 1.000 | 3.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.2 | 3.2 | 1.000 | 3.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.2 | 3.2 | 1.000 | 3.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.0 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **30+40.000** | | | | | | | -2751.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 17.7 | 5.4 | 1.000 | 5.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.2 | 3.6 | 1.000 | 3.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.2 | 3.6 | 1.000 | 3.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.6 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **30+50.000** | | | | | | | -2762.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.5 | 7.3 | 1.000 | 7.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.8 | 3.9 | 1.000 | 3.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.8 | 3.9 | 1.000 | 3.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.1 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **30+60.000** | | | | | | | -2775.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 24.7 | 8.6 | 1.000 | 8.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.3 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.3 | 4.1 | 1.000 | 4.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.4 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **30+70.000** | | | | | | | -2788.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 27.1 | 9.6 | 1.000 | 9.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.7 | 4.3 | 1.000 | 4.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.7 | 4.3 | 1.000 | 4.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.7 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **30+80.000** | | | | | | | -2803.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 28.8 | 10.3 | 1.000 | 10.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.0 | 4.4 | 1.000 | 4.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.0 | 4.4 | 1.000 | 4.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.9 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **30+90.000** | | | | | | | -2819.1 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 30.4 | 11.0 | 1.000 | 11.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.4 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.4 | 4.5 | 1.000 | 4.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.2 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **31+00.000** | | | | | | | -2835.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.6 | 11.7 | 1.000 | 11.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.7 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.7 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **31+10.000** | | | | | | | -2853.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 39.4 | 13.3 | 1.000 | 13.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.5 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.5 | 4.8 | 1.000 | 4.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.9 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **31+20.000** | | | | | | | -2874.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 47.3 | 16.1 | 1.000 | 16.1 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.6 | 5.2 | 1.000 | 5.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.6 | 5.2 | 1.000 | 5.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.7 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **31+30.000** | | | | | | | -2898.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 48.5 | 17.7 | 1.000 | 17.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.7 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.7 | 5.4 | 1.000 | 5.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.8 | 2.1 | 1.000 | 2.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **31+40.000** | | | | | | | -2922.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 52.1 | 18.6 | 1.000 | 18.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.0 | 5.5 | 1.000 | 5.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.0 | 5.5 | 1.000 | 5.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.9 | 2.2 | 1.000 | 2.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **31+50.000** | | | | | | | -2947.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 53.8 | 19.6 | 1.000 | 19.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 15.2 | 5.6 | 1.000 | 5.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.2 | 5.6 | 1.000 | 5.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.1 | 2.2 | 1.000 | 2.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **31+60.000** | | | | | | | -2973.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 55.0 | 20.2 | 1.000 | 20.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.4 | 5.7 | 1.000 | 5.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.4 | 5.7 | 1.000 | 5.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.2 | 2.3 | 1.000 | 2.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **31+70.000** | | | | | | | -2999.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 56.3 | 20.6 | 1.000 | 20.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.6 | 5.7 | 1.000 | 5.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.6 | 5.7 | 1.000 | 5.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.3 | 2.3 | 1.000 | 2.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **31+80.000** | | | | | | | -3026.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 57.9 | 21.2 | 1.000 | 21.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.8 | 5.8 | 1.000 | 5.8 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.8 | 5.8 | 1.000 | 5.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.5 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **31+90.000** | | | | | | | -3054.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 59.6 | 21.8 | 1.000 | 21.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.0 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.0 | 5.9 | 1.000 | 5.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.6 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+00.000** | | | | | | | -3082.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 61.3 | 22.4 | 1.000 | 22.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.2 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.2 | 6.0 | 1.000 | 6.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.7 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+10.000** | | | | | | | -3111.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 62.8 | 23.0 | 1.000 | 23.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.4 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.4 | 6.0 | 1.000 | 6.0 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.9 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+20.000** | | | | | | | -3140.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 63.0 | 23.3 | 1.000 | 23.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.5 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.5 | 6.1 | 1.000 | 6.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.0 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+30.000** | | | | | | | -3170.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 62.3 | 23.2 | 1.000 | 23.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.7 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.7 | 6.2 | 1.000 | 6.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.1 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+40.000** | | | | | | | -3199.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 60.9 | 22.8 | 1.000 | 22.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.6 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.6 | 6.2 | 1.000 | 6.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 7.1 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+50.000** | | | | | | | -3227.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 59.4 | 22.3 | 1.000 | 22.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.5 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.5 | 6.1 | 1.000 | 6.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.0 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+60.000** | | | | | | | -3255.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 58.0 | 21.7 | 1.000 | 21.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.3 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.3 | 6.1 | 1.000 | 6.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.8 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+70.000** | | | | | | | -3282.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 56.7 | 21.2 | 1.000 | 21.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.1 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.1 | 6.0 | 1.000 | 6.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.7 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+80.000** | | | | | | | -3309.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 55.4 | 20.8 | 1.000 | 20.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.0 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.0 | 5.9 | 1.000 | 5.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.6 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **32+90.000** | | | | | | | -3335.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 54.2 | 20.3 | 1.000 | 20.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.8 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.8 | 5.9 | 1.000 | 5.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.5 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **33+00.000** | | | | | | | -3361.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 53.2 | 19.9 | 1.000 | 19.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.7 | 5.8 | 1.000 | 5.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.7 | 5.8 | 1.000 | 5.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.5 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **33+10.000** | | | | | | | -3386.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 53.2 | 19.7 | 1.000 | 19.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.8 | 5.8 | 1.000 | 5.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.8 | 5.8 | 1.000 | 5.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.5 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **33+20.000** | | | | | | | -3412.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 53.8 | 19.8 | 1.000 | 19.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.9 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.9 | 5.9 | 1.000 | 5.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.5 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **33+30.000** | | | | | | | -3438.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 54.3 | 20.0 | 1.000 | 20.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.9 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.9 | 5.9 | 1.000 | 5.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.6 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **33+40.000** | | | | | | | -3464.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 54.8 | 20.2 | 1.000 | 20.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.0 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.0 | 5.9 | 1.000 | 5.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.6 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **33+50.000** | | | | | | | -3490.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 55.2 | 20.4 | 1.000 | 20.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.0 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.0 | 5.9 | 1.000 | 5.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.7 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **33+60.000** | | | | | | | -3517.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 55.8 | 20.6 | 1.000 | 20.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.2 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.2 | 6.0 | 1.000 | 6.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.8 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **33+70.000** | | | | | | | -3544.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 56.7 | 20.8 | 1.000 | 20.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.4 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.4 | 6.0 | 1.000 | 6.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.9 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **33+80.000** | | | | | | | -3571.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 58.2 | 21.3 | 1.000 | 21.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.7 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.7 | 6.1 | 1.000 | 6.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.1 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **33+90.000** | | | | | | | -3599.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 59.7 | 21.8 | 1.000 | 21.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.9 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.9 | 6.2 | 1.000 | 6.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.3 | 2.7 | 1.000 | 2.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **34+00.000** | | | | | | | -3628.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 60.0 | 22.2 | 1.000 | 22.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 17.0 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.0 | 6.3 | 1.000 | 6.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.3 | 2.7 | 1.000 | 2.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **34+10.000** | | | | | | | -3656.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 60.0 | 22.2 | 1.000 | 22.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.1 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.1 | 6.3 | 1.000 | 6.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.4 | 2.7 | 1.000 | 2.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **34+20.000** | | | | | | | -3685.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 60.0 | 22.2 | 1.000 | 22.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.1 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.1 | 6.3 | 1.000 | 6.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.4 | 2.7 | 1.000 | 2.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **34+30.000** | | | | | | | -3713.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 59.9 | 22.2 | 1.000 | 22.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.1 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 17.1 | 6.3 | 1.000 | 6.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.4 | 2.7 | 1.000 | 2.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **34+40.000** | | | | | | | -3742.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 59.7 | 22.2 | 1.000 | 22.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.1 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.1 | 6.3 | 1.000 | 6.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.4 | 2.7 | 1.000 | 2.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **34+50.000** | | | | | | | -3770.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 59.5 | 22.1 | 1.000 | 22.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.6 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.6 | 6.3 | 1.000 | 6.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.0 | 2.7 | 1.000 | 2.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **34+60.000** | | | | | | | -3799.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 61.1 | 22.3 | 1.000 | 22.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.5 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.5 | 6.1 | 1.000 | 6.1 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.9 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **34+70.000** | | | | | | | -3828.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 62.6 | 22.9 | 1.000 | 22.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.3 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.3 | 6.1 | 1.000 | 6.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.8 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **34+80.000** | | | | | | | -3857.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 63.6 | 23.4 | 1.000 | 23.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.2 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.2 | 6.0 | 1.000 | 6.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.7 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **34+90.000** | | | | | | | -3887.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 64.1 | 23.6 | 1.000 | 23.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.0 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.0 | 6.0 | 1.000 | 6.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.6 | 2.5 | 1.000 | 2.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **35+00.000** | | | | | | | -3916.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 64.3 | 23.8 | 1.000 | 23.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.0 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.0 | 5.9 | 1.000 | 5.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.6 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **35+10.000** | | | | | | | -3947.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 66.8 | 24.3 | 1.000 | 24.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.4 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.4 | 6.0 | 1.000 | 6.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.9 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **35+20.000** | | | | | | | -3978.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 71.5 | 25.6 | 1.000 | 25.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.8 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.8 | 6.1 | 1.000 | 6.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.2 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **35+30.000** | | | | | | | -4012.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 76.5 | 27.4 | 1.000 | 27.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.3 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.3 | 6.3 | 1.000 | 6.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.5 | 2.7 | 1.000 | 2.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **35+40.000** | | | | | | | -4048.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 81.0 | 29.2 | 1.000 | 29.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.7 | 6.5 | 1.000 | 6.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.7 | 6.5 | 1.000 | 6.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.8 | 2.8 | 1.000 | 2.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **35+50.000** | | | | | | | -4085.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 84.9 | 30.7 | 1.000 | 30.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.0 | 6.6 | 1.000 | 6.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.0 | 6.6 | 1.000 | 6.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.0 | 2.9 | 1.000 | 2.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **35+60.000** | | | | | | | -4124.1 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 87.8 | 32.0 | 1.000 | 32.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.3 | 6.7 | 1.000 | 6.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.3 | 6.7 | 1.000 | 6.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.2 | 3.0 | 1.000 | 3.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **35+70.000** | | | | | | | -4163.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 90.1 | 32.9 | 1.000 | 32.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.6 | 6.8 | 1.000 | 6.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.6 | 6.8 | 1.000 | 6.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.5 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **35+80.000** | | | | | | | -4204.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 91.8 | 33.7 | 1.000 | 33.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.9 | 7.0 | 1.000 | 7.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.9 | 7.0 | 1.000 | 7.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.7 | 3.2 | 1.000 | 3.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **35+90.000** | | | | | | | -4244.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 86.8 | 33.1 | 1.000 | 33.1 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.4 | 6.9 | 1.000 | 6.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.4 | 6.9 | 1.000 | 6.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.4 | 3.2 | 1.000 | 3.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **36+00.000** | | | | | | | -4282.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 82.9 | 31.4 | 1.000 | 31.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.3 | 6.8 | 1.000 | 6.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.3 | 6.8 | 1.000 | 6.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.3 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **36+10.000** | | | | | | | -4319.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 81.0 | 30.4 | 1.000 | 30.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.3 | 6.8 | 1.000 | 6.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.3 | 6.8 | 1.000 | 6.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.3 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **36+20.000** | | | | | | | -4356.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 80.8 | 30.0 | 1.000 | 30.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 18.3 | 6.8 | 1.000 | 6.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.3 | 6.8 | 1.000 | 6.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.3 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **36+30.000** | | | | | | | -4393.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 82.3 | 30.2 | 1.000 | 30.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.4 | 6.8 | 1.000 | 6.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.4 | 6.8 | 1.000 | 6.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.3 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **36+40.000** | | | | | | | -4431.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 83.5 | 30.7 | 1.000 | 30.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.3 | 6.8 | 1.000 | 6.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.3 | 6.8 | 1.000 | 6.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.2 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **36+50.000** | | | | | | | -4468.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 82.6 | 30.8 | 1.000 | 30.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.1 | 6.7 | 1.000 | 6.7 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.1 | 6.7 | 1.000 | 6.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.1 | 3.0 | 1.000 | 3.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **36+60.000** | | | | | | | -4505.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 81.2 | 30.3 | 1.000 | 30.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.0 | 6.7 | 1.000 | 6.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.0 | 6.7 | 1.000 | 6.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.0 | 3.0 | 1.000 | 3.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **36+70.000** | | | | | | | -4542.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 80.6 | 30.0 | 1.000 | 30.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.9 | 6.7 | 1.000 | 6.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.9 | 6.7 | 1.000 | 6.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.0 | 3.0 | 1.000 | 3.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **36+80.000** | | | | | | | -4578.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 80.6 | 29.9 | 1.000 | 29.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.1 | 6.7 | 1.000 | 6.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.1 | 6.7 | 1.000 | 6.7 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.1 | 3.0 | 1.000 | 3.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **36+90.000** | | | | | | | -4615.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 82.0 | 30.1 | 1.000 | 30.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.4 | 6.8 | 1.000 | 6.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.4 | 6.8 | 1.000 | 6.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.3 | 3.0 | 1.000 | 3.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **37+00.000** | | | | | | | -4653.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 87.1 | 31.3 | 1.000 | 31.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.8 | 6.9 | 1.000 | 6.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.8 | 6.9 | 1.000 | 6.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.6 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **37+10.000** | | | | | | | -4694.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 92.1 | 33.2 | 1.000 | 33.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.3 | 7.1 | 1.000 | 7.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.3 | 7.1 | 1.000 | 7.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 8.9 | 3.2 | 1.000 | 3.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **37+20.000** | | | | | | | -4736.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 97.1 | 35.0 | 1.000 | 35.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.8 | 7.2 | 1.000 | 7.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.8 | 7.2 | 1.000 | 7.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.3 | 3.4 | 1.000 | 3.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **37+30.000** | | | | | | | -4780.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 102.1 | 36.9 | 1.000 | 36.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.3 | 7.4 | 1.000 | 7.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.3 | 7.4 | 1.000 | 7.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.6 | 3.5 | 1.000 | 3.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **37+40.000** | | | | | | | -4827.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 107.0 | 38.7 | 1.000 | 38.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.7 | 7.6 | 1.000 | 7.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.7 | 7.6 | 1.000 | 7.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.9 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **37+50.000** | | | | | | | -4875.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 111.5 | 40.5 | 1.000 | 40.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.0 | 7.7 | 1.000 | 7.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.0 | 7.7 | 1.000 | 7.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.1 | 3.7 | 1.000 | 3.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **37+60.000** | | | | | | | -4925.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 115.6 | 42.0 | 1.000 | 42.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.4 | 7.8 | 1.000 | 7.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.4 | 7.8 | 1.000 | 7.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.3 | 3.8 | 1.000 | 3.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **37+70.000** | | | | | | | -4976.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 119.1 | 43.5 | 1.000 | 43.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.7 | 8.0 | 1.000 | 8.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.7 | 8.0 | 1.000 | 8.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.6 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **37+80.000** | | | | | | | -5029.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 121.9 | 44.6 | 1.000 | 44.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.0 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.0 | 8.1 | 1.000 | 8.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.7 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **37+90.000** | | | | | | | -5083.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 123.7 | 45.5 | 1.000 | 45.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.2 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.2 | 8.2 | 1.000 | 8.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.8 | 4.0 | 1.000 | 4.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **38+00.000** | | | | | | | -5137.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 126.7 | 46.4 | 1.000 | 46.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.4 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.4 | 8.2 | 1.000 | 8.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.0 | 4.0 | 1.000 | 4.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **38+10.000** | | | | | | | -5193.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 128.5 | 47.3 | 1.000 | 47.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.4 | 8.3 | 1.000 | 8.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.4 | 8.3 | 1.000 | 8.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.0 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **38+20.000** | | | | | | | -5249.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 129.5 | 47.8 | 1.000 | 47.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.4 | 8.3 | 1.000 | 8.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.4 | 8.3 | 1.000 | 8.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.0 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **38+30.000** | | | | | | | -5305.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 129.9 | 48.1 | 1.000 | 48.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.4 | 8.3 | 1.000 | 8.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.4 | 8.3 | 1.000 | 8.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.1 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **38+40.000** | | | | | | | -5362.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 130.5 | 48.2 | 1.000 | 48.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.5 | 8.3 | 1.000 | 8.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.5 | 8.3 | 1.000 | 8.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.1 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **38+50.000** | | | | | | | -5418.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 131.5 | 48.5 | 1.000 | 48.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.7 | 8.4 | 1.000 | 8.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.7 | 8.4 | 1.000 | 8.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.2 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **38+60.000** | | | | | | | -5476.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 132.7 | 48.9 | 1.000 | 48.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.8 | 8.4 | 1.000 | 8.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.8 | 8.4 | 1.000 | 8.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.3 | 4.2 | 1.000 | 4.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **38+70.000** | | | | | | | -5534.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 133.3 | 49.3 | 1.000 | 49.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 22.9 | 8.5 | 1.000 | 8.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.9 | 8.5 | 1.000 | 8.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.4 | 4.2 | 1.000 | 4.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **38+80.000** | | | | | | | -5591.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 131.7 | 49.1 | 1.000 | 49.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.6 | 8.4 | 1.000 | 8.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.6 | 8.4 | 1.000 | 8.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.2 | 4.2 | 1.000 | 4.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **38+90.000** | | | | | | | -5648.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 128.3 | 48.2 | 1.000 | 48.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.4 | 8.3 | 1.000 | 8.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.4 | 8.3 | 1.000 | 8.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.0 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **39+00.000** | | | | | | | -5703.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 126.7 | 47.2 | 1.000 | 47.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.1 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 22.1 | 8.2 | 1.000 | 8.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.8 | 4.0 | 1.000 | 4.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **39+10.000** | | | | | | | -5758.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 127.0 | 47.0 | 1.000 | 47.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.8 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.8 | 8.1 | 1.000 | 8.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.6 | 4.0 | 1.000 | 4.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **39+20.000** | | | | | | | -5813.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 127.9 | 47.2 | 1.000 | 47.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.6 | 8.0 | 1.000 | 8.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.6 | 8.0 | 1.000 | 8.0 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.5 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **39+30.000** | | | | | | | -5869.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 128.7 | 47.5 | 1.000 | 47.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.7 | 8.0 | 1.000 | 8.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.7 | 8.0 | 1.000 | 8.0 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.5 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **39+40.000** | | | | | | | -5925.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 129.2 | 47.8 | 1.000 | 47.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.8 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.8 | 8.1 | 1.000 | 8.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.6 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **39+50.000** | | | | | | | -5981.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 129.1 | 47.8 | 1.000 | 47.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.8 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.8 | 8.1 | 1.000 | 8.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.6 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **39+60.000** | | | | | | | -6037.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 130.9 | 48.2 | 1.000 | 48.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.1 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.1 | 8.1 | 1.000 | 8.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.8 | 4.0 | 1.000 | 4.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **39+70.000** | | | | | | | -6095.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 135.3 | 49.3 | 1.000 | 49.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.8 | 8.3 | 1.000 | 8.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.8 | 8.3 | 1.000 | 8.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.3 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **39+80.000** | | | | | | | -6154.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 138.1 | 50.6 | 1.000 | 50.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.5 | 8.6 | 1.000 | 8.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.5 | 8.6 | 1.000 | 8.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.8 | 4.3 | 1.000 | 4.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **39+90.000** | | | | | | | -6214.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 138.8 | 51.3 | 1.000 | 51.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.8 | 8.8 | 1.000 | 8.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.8 | 8.8 | 1.000 | 8.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.8 | 4.4 | 1.000 | 4.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **40+00.000** | | | | | | | -6274.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 138.7 | 51.4 | 1.000 | 51.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.7 | 8.8 | 1.000 | 8.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.7 | 8.8 | 1.000 | 8.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.9 | 4.4 | 1.000 | 4.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **40+10.000** | | | | | | | -6334.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 138.6 | 51.4 | 1.000 | 51.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.7 | 8.8 | 1.000 | 8.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.7 | 8.8 | 1.000 | 8.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.8 | 4.4 | 1.000 | 4.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **40+20.000** | | | | | | | -6394.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 137.8 | 51.2 | 1.000 | 51.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.5 | 8.7 | 1.000 | 8.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.5 | 8.7 | 1.000 | 8.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.7 | 4.4 | 1.000 | 4.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **40+30.000** | | | | | | | -6453.9 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 136.3 | 50.8 | 1.000 | 50.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.4 | 8.7 | 1.000 | 8.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.4 | 8.7 | 1.000 | 8.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.6 | 4.3 | 1.000 | 4.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **40+40.000** | | | | | | | -6513.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 139.5 | 51.1 | 1.000 | 51.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.3 | 8.6 | 1.000 | 8.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.3 | 8.6 | 1.000 | 8.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.5 | 4.3 | 1.000 | 4.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **40+50.000** | | | | | | | -6576.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 154.1 | 54.4 | 1.000 | 54.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.5 | 8.7 | 1.000 | 8.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.5 | 8.7 | 1.000 | 8.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.7 | 4.3 | 1.000 | 4.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **40+60.000** | | | | | | | -6644.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 165.3 | 59.2 | 1.000 | 59.2 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.7 | 8.7 | 1.000 | 8.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.7 | 8.7 | 1.000 | 8.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.8 | 4.4 | 1.000 | 4.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **40+70.000** | | | | | | | -6715.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 169.9 | 62.1 | 1.000 | 62.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.8 | 8.8 | 1.000 | 8.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.8 | 8.8 | 1.000 | 8.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.0 | 4.4 | 1.000 | 4.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **40+80.000** | | | | | | | -6788.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 175.5 | 64.0 | 1.000 | 64.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.3 | 8.9 | 1.000 | 8.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.3 | 8.9 | 1.000 | 8.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.3 | 4.5 | 1.000 | 4.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **40+90.000** | | | | | | | -6861.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 172.9 | 64.5 | 1.000 | 64.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 24.0 | 8.9 | 1.000 | 8.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.0 | 8.9 | 1.000 | 8.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.1 | 4.5 | 1.000 | 4.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+00.000** | | | | | | | -6931.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 155.7 | 60.9 | 1.000 | 60.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.0 | 8.7 | 1.000 | 8.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.0 | 8.7 | 1.000 | 8.7 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.4 | 4.3 | 1.000 | 4.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+10.000** | | | | | | | -6995.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 146.5 | 56.0 | 1.000 | 56.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.8 | 8.5 | 1.000 | 8.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.8 | 8.5 | 1.000 | 8.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.3 | 4.2 | 1.000 | 4.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+20.000** | | | | | | | -7056.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 135.9 | 52.3 | 1.000 | 52.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.5 | 8.4 | 1.000 | 8.4 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.5 | 8.4 | 1.000 | 8.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.1 | 4.2 | 1.000 | 4.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+30.000** | | | | | | | -7112.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 124.7 | 48.3 | 1.000 | 48.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.9 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.9 | 8.2 | 1.000 | 8.2 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.8 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+40.000** | | | | | | | -7164.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 113.3 | 44.1 | 1.000 | 44.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.9 | 7.9 | 1.000 | 7.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.9 | 7.9 | 1.000 | 7.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.1 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+50.000** | | | | | | | -7212.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 101.9 | 39.9 | 1.000 | 39.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.9 | 7.6 | 1.000 | 7.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.9 | 7.6 | 1.000 | 7.6 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.4 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+60.000** | | | | | | | -7256.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 94.3 | 36.3 | 1.000 | 36.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.5 | 7.3 | 1.000 | 7.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.5 | 7.3 | 1.000 | 7.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.1 | 3.4 | 1.000 | 3.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+70.000** | | | | | | | -7297.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 89.7 | 34.1 | 1.000 | 34.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.8 | 7.1 | 1.000 | 7.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.8 | 7.1 | 1.000 | 7.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.5 | 3.3 | 1.000 | 3.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+80.000** | | | | | | | -7336.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 87.4 | 32.8 | 1.000 | 32.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.5 | 6.9 | 1.000 | 6.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.5 | 6.9 | 1.000 | 6.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 8.3 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **41+90.000** | | | | | | | -7375.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 85.7 | 32.1 | 1.000 | 32.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.3 | 6.8 | 1.000 | 6.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.3 | 6.8 | 1.000 | 6.8 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.2 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **42+00.000** | | | | | | | -7414.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 86.5 | 31.9 | 1.000 | 31.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.9 | 6.9 | 1.000 | 6.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.9 | 6.9 | 1.000 | 6.9 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.7 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **42+10.000** | | | | | | | -7455.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 97.1 | 34.0 | 1.000 | 34.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.6 | 7.1 | 1.000 | 7.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.6 | 7.1 | 1.000 | 7.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.2 | 3.3 | 1.000 | 3.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **42+20.000** | | | | | | | -7499.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 100.0 | 36.5 | 1.000 | 36.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.9 | 7.3 | 1.000 | 7.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.9 | 7.3 | 1.000 | 7.3 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.4 | 3.4 | 1.000 | 3.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **42+30.000** | | | | | | | -7543.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 99.8 | 37.0 | 1.000 | 37.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.0 | 7.4 | 1.000 | 7.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.0 | 7.4 | 1.000 | 7.4 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.5 | 3.5 | 1.000 | 3.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **42+40.000** | | | | | | | -7588.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 102.3 | 37.4 | 1.000 | 37.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.2 | 7.5 | 1.000 | 7.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.2 | 7.5 | 1.000 | 7.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.6 | 3.5 | 1.000 | 3.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **42+50.000** | | | | | | | -7634.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 105.8 | 38.5 | 1.000 | 38.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.3 | 7.5 | 1.000 | 7.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.3 | 7.5 | 1.000 | 7.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.6 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **42+60.000** | | | | | | | -7681.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 105.0 | 39.0 | 1.000 | 39.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.4 | 7.5 | 1.000 | 7.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.4 | 7.5 | 1.000 | 7.5 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.7 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **42+70.000** | | | | | | | -7726.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 99.0 | 37.8 | 1.000 | 37.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.5 | 7.6 | 1.000 | 7.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.5 | 7.6 | 1.000 | 7.6 | | |
| | Riprap: | 13.6 | 2.5 | 1.000 | 2.5 | No | |
| | Topsoil: | 6.9 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 9.7 | 1.8 | 1.000 | 1.8 | No | |
| **42+80.000** | | | | | | | -7769.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 89.5 | 34.9 | 1.000 | 34.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.6 | 7.4 | 1.000 | 7.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.6 | 7.4 | 1.000 | 7.4 | | |
| | Riprap: | 12.7 | 4.9 | 1.000 | 4.9 | No | |
| | Topsoil: | 6.5 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 9.1 | 3.5 | 1.000 | 3.5 | No | |
| **42+90.000** | | | | | | | -7807.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 79.8 | 31.4 | 1.000 | 31.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.6 | 7.1 | 1.000 | 7.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.6 | 7.1 | 1.000 | 7.1 | | |
| | Riprap: | 11.8 | 4.5 | 1.000 | 4.5 | No | |
| | Topsoil: | 6.0 | 2.3 | 1.000 | 2.3 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 8.5 | 3.2 | 1.000 | 3.2 | No | |
| **43+00.000** | | | | | | | -7835.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 37.4 | 21.7 | 1.000 | 21.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.2 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.2 | 6.1 | 1.000 | 6.1 | | |
| | Riprap: | 7.3 | 3.5 | 1.000 | 3.5 | No | |
| | Topsoil: | 4.1 | 1.9 | 1.000 | 1.9 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 5.2 | 2.5 | 1.000 | 2.5 | No | |
| **43+10.000** | | | | | | | -7858.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 56.2 | 17.3 | 1.000 | 17.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.1 | 5.6 | 1.000 | 5.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.1 | 5.6 | 1.000 | 5.6 | | |
| | Riprap: | 7.4 | 2.7 | 1.000 | 2.7 | No | |
| | Topsoil: | 5.1 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 5.6 | 2.0 | 1.000 | 2.0 | No | |
| **43+20.000** | | | | | | | -7888.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 75.1 | 24.3 | 1.000 | 24.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.4 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.4 | 6.2 | 1.000 | 6.2 | | |
| | Riprap: | 7.2 | 2.7 | 1.000 | 2.7 | No | |
| | Topsoil: | 5.8 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 5.7 | 2.1 | 1.000 | 2.1 | No | |
| **43+30.000** | | | | | | | -7920.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 59.0 | 24.8 | 1.000 | 24.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.6 | 6.5 | 1.000 | 6.5 | Yes | |
| | Unsuitable (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 18.1 | 6.6 | 1.000 | 6.6 | | |
| | Riprap: | 2.0 | 1.7 | 1.000 | 1.7 | No | |
| | Topsoil: | 6.2 | 2.2 | 1.000 | 2.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 2.0 | 1.4 | 1.000 | 1.4 | No | |
| **43+40.000** | | | | | | | -7940.0 |
| | Normal Cut: | 7.8 | 1.4 | 1.000 | 1.4 | Yes | |
| | Normal Fill: | 24.9 | 15.5 | 1.000 | 15.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 14.2 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 5.5 | 1.1 | 1.000 | 1.1 | No | |
| | Total Unsuitable: | 19.7 | 7.0 | 1.000 | 7.0 | | |
| | Riprap: | 1.7 | 0.7 | 1.000 | 0.7 | No | |
| | Topsoil: | 6.6 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 1.2 | 0.6 | 1.000 | 0.6 | No | |
| **43+50.000** | | | | | | | -7943.7 |
| | Normal Cut: | 14.1 | 4.0 | 1.000 | 4.0 | Yes | |
| | Normal Fill: | 0.0 | 4.6 | 1.000 | 4.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 2.8 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 13.9 | 3.6 | 1.000 | 3.6 | No | |
| | Total Unsuitable: | 16.7 | 6.7 | 1.000 | 6.7 | | |
| | Riprap: | 0.0 | 0.3 | 1.000 | 0.3 | No | |
| | Topsoil: | 3.2 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.2 | 1.000 | 0.2 | No | |
| **43+60.000** | | | | | | | -7938.7 |
| | Normal Cut: | 15.8 | 5.5 | 1.000 | 5.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 0.0 | 0.5 | 1.000 | 0.5 | Yes | |
| | Unsuitable (not replaced): | 8.4 | 4.1 | 1.000 | 4.1 | No | |
| | Total Unsuitable: | 8.4 | 4.6 | 1.000 | 4.6 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.7 | 1.000 | 0.7 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **43+70.000** | | | | | | | -7935.3 |
| | Normal Cut: | 5.7 | 4.0 | 1.000 | 4.0 | Yes | |
| | Normal Fill: | 0.5 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 3.1 | 0.6 | 1.000 | 0.6 | Yes | |
| | Unsuitable (not replaced): | 5.3 | 2.5 | 1.000 | 2.5 | No | |

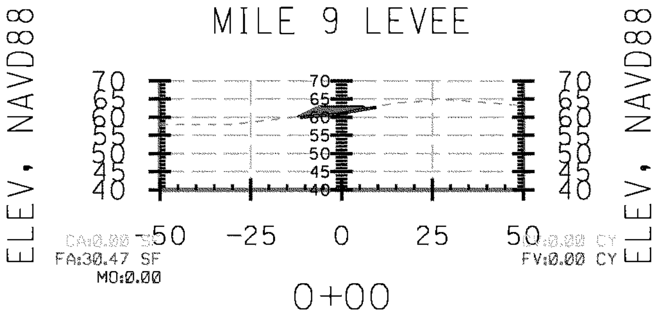
| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 8.4 | 3.1 | 1.000 | 3.1 | | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

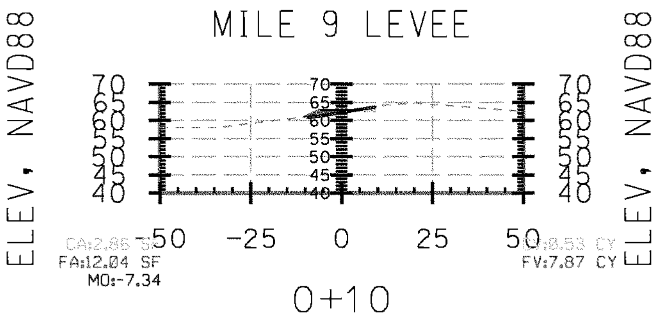
**Totals:**

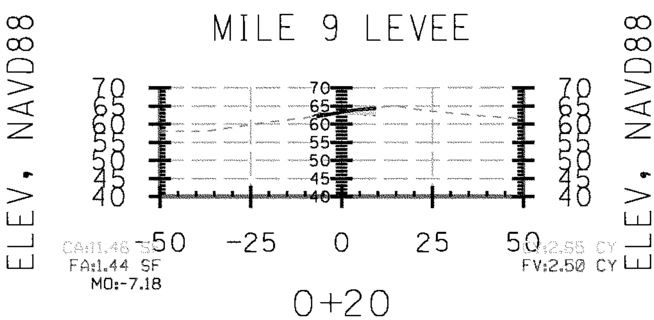
| Type | Volume | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|
| Normal Cut: | 278.4 | 278.4 | Yes | |
| Normal Fill: | 6253.4 | 6253.4 | Yes | |
| Added Cut: | 0.0 | 0.0 | Yes | |
| Added Fill: | 0.0 | 0.0 | Yes | |
| Unsuitable (replaced): | 1960.3 | 1960.3 | Yes | |
| Unsuitable (not replaced): | 163.3 | 163.3 | No | |
| Total Unsuitable: | 2123.6 | 2123.6 | | |
| Riprap: | 115.1 | 115.1 | No | |
| Topsoil: | 702.8 | 702.8 | No | |
| Wearing Course: | 661.9 | 661.9 | No | |
| Filter: | 83.4 | 83.4 | No | |

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

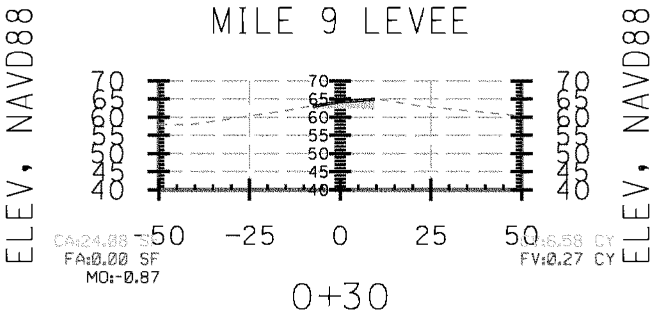
STA.0+00 TO STA.0+20

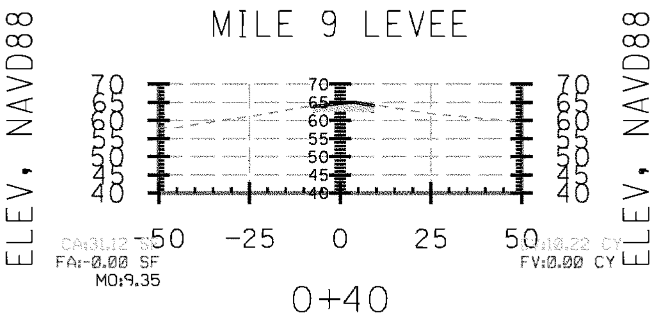


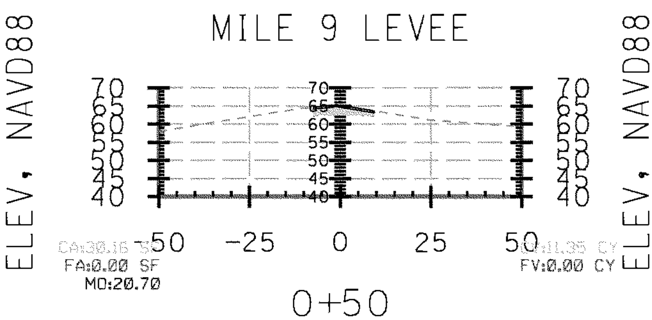



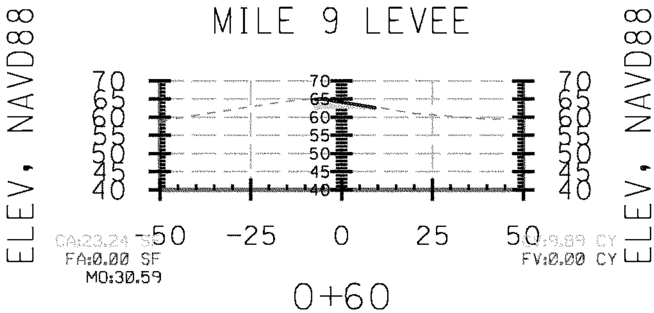
STA.0+30 TO STA.0+50

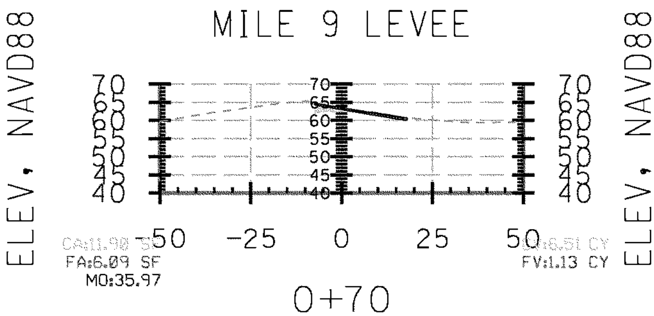


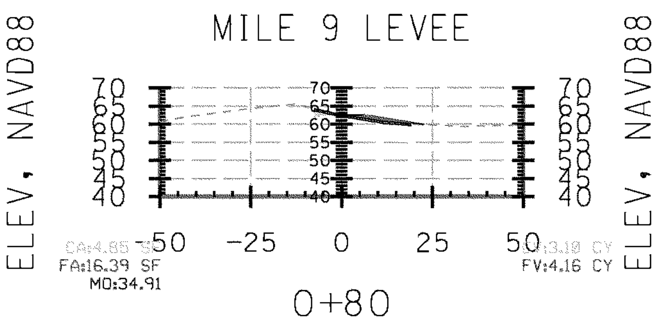



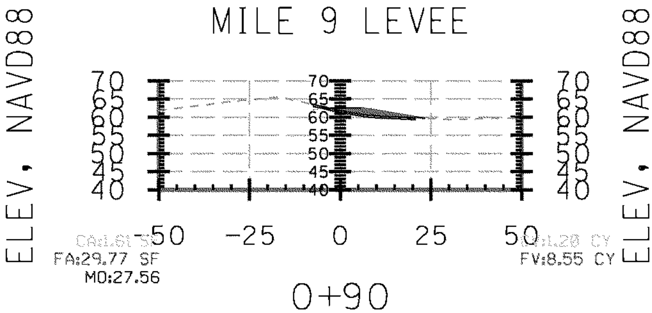
# STA.0+60 TO STA.0+80

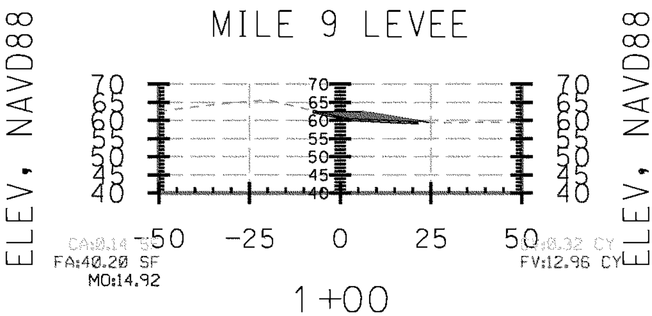


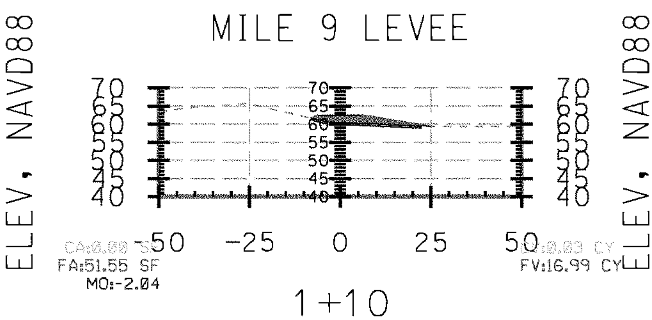



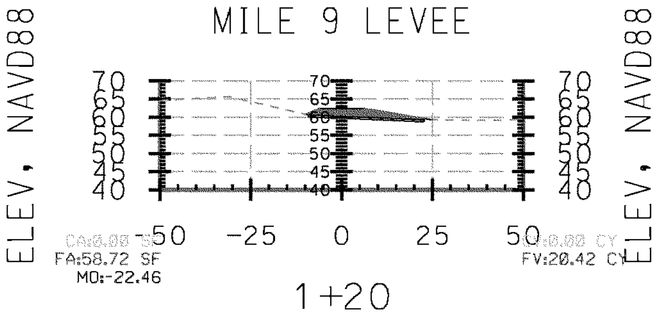
# STA.0+90 TO STA.1+10

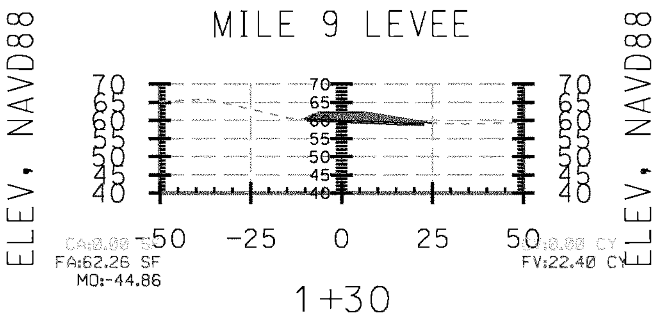


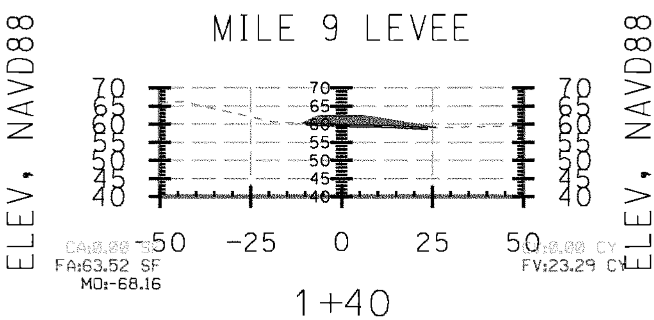



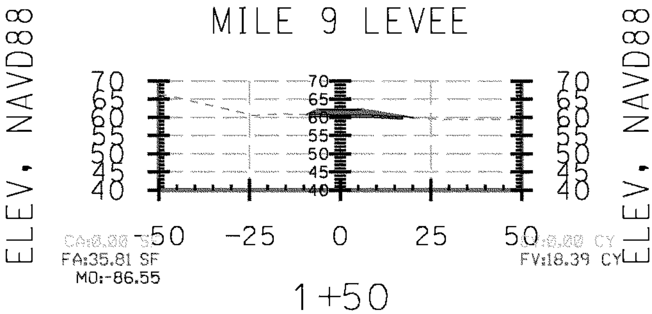
STA.1+20 TO STA.1+40

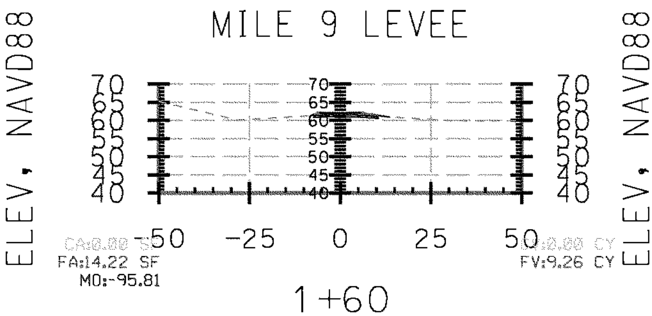


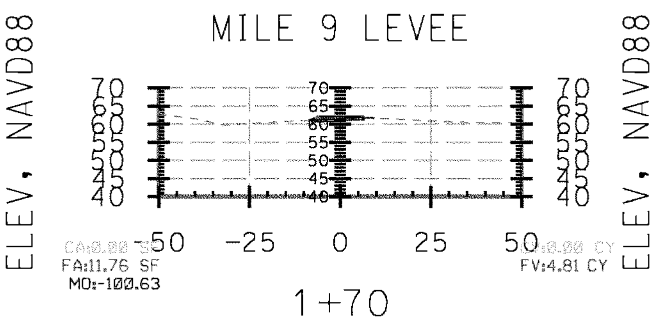



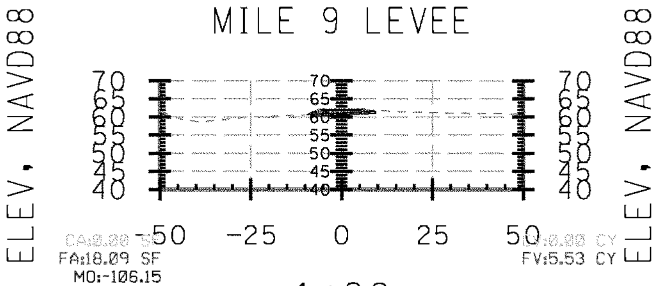
# STA.1+50 TO STA.1+70



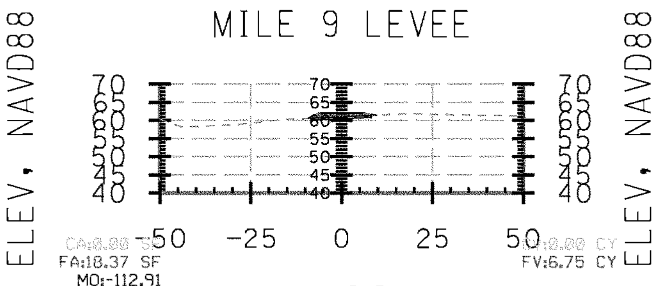



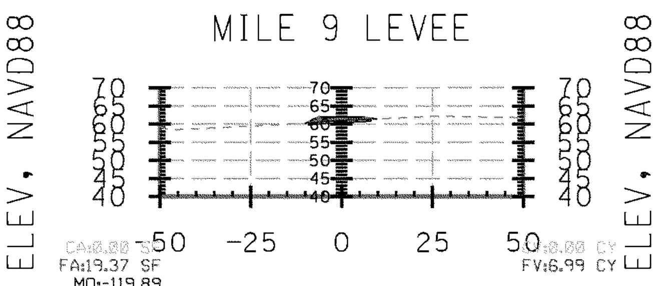
# STA.1+80 TO STA.2+00




1+80

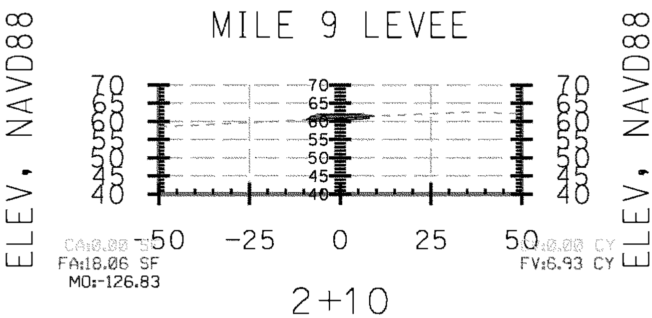


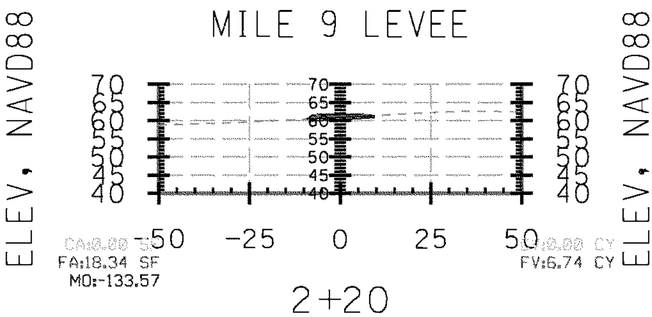

1+90

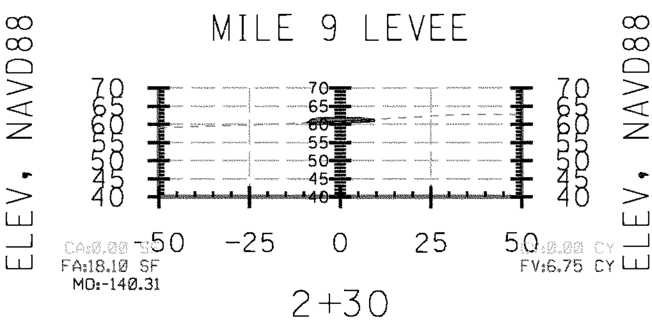



2+00

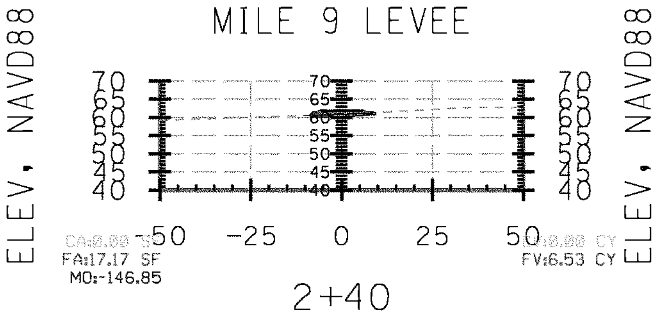
STA.2+10 TO STA.2+30

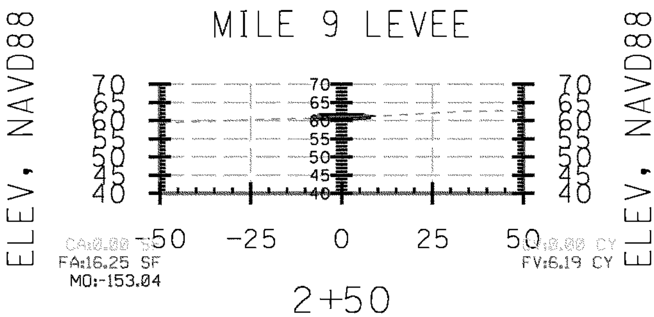


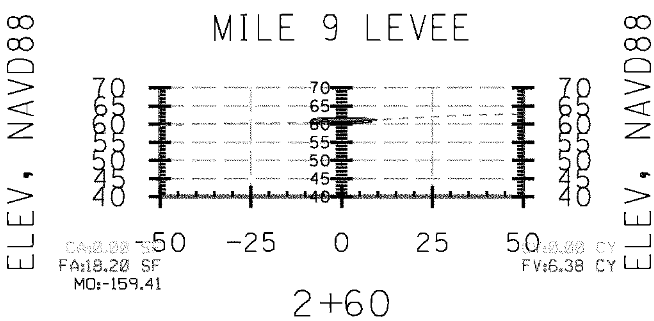



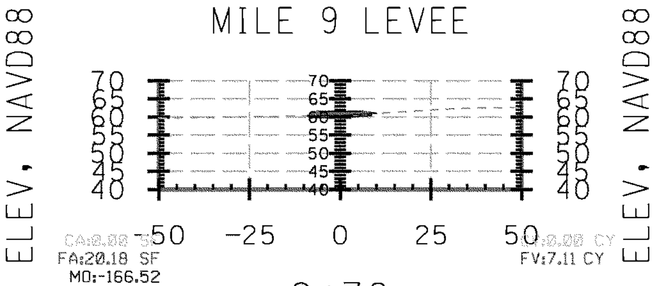
STA.2+40 TO STA.2+60



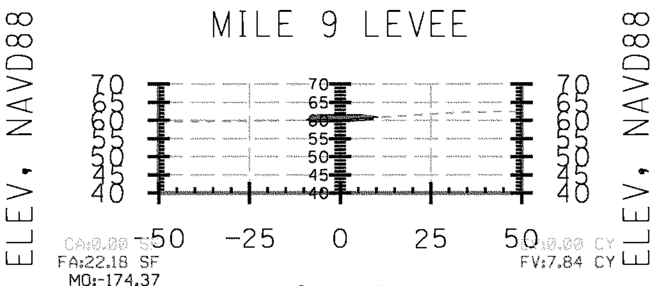



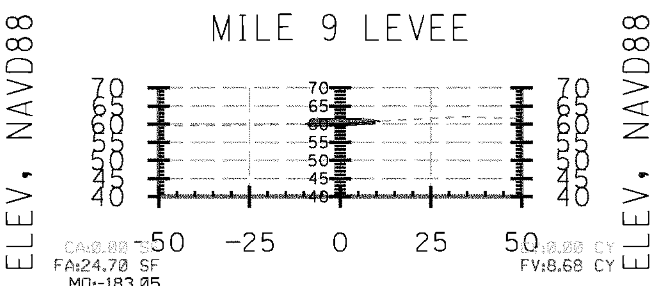
# STA.2+70 TO STA.2+90




2+70

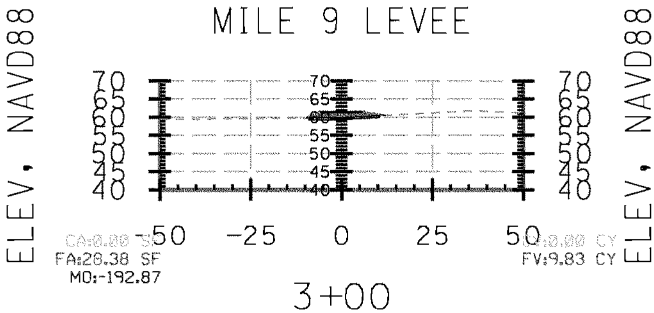


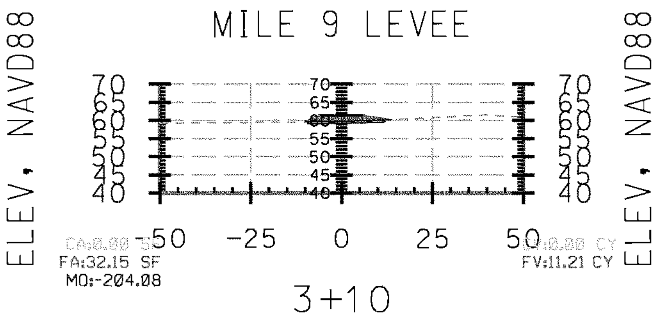

2+80

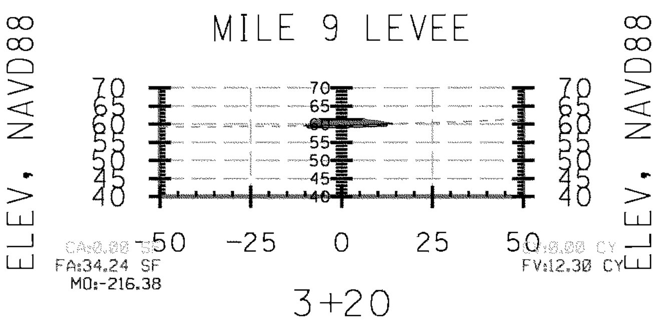



2+90

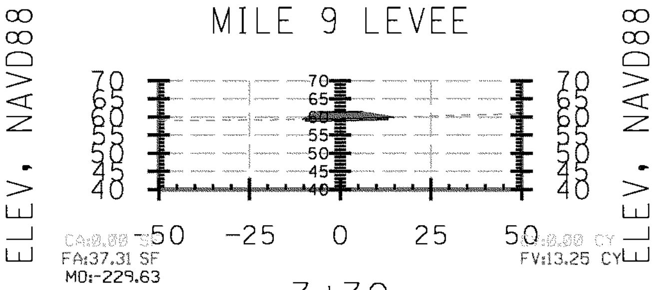
# STA.3+00 TO STA.3+20



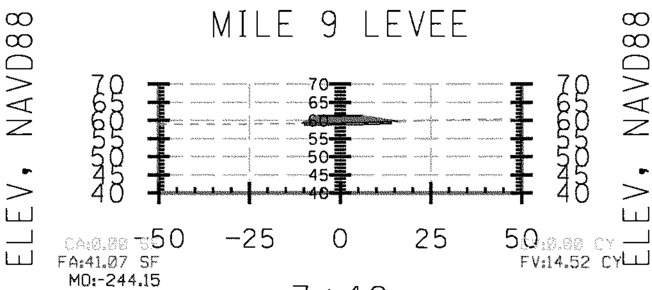



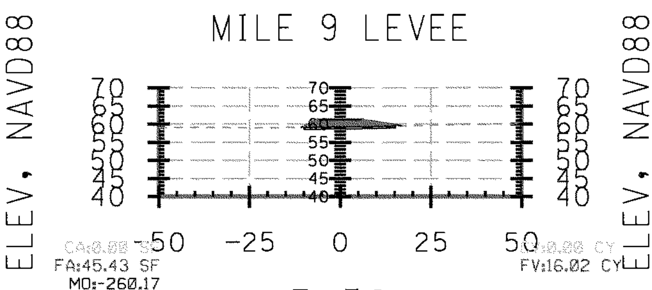
# STA.3+30 TO STA.3+50




3+30

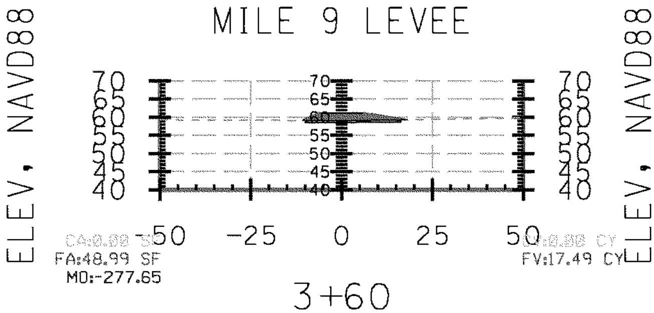


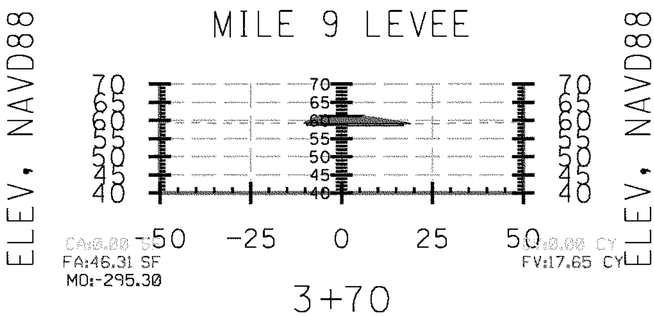

3+40

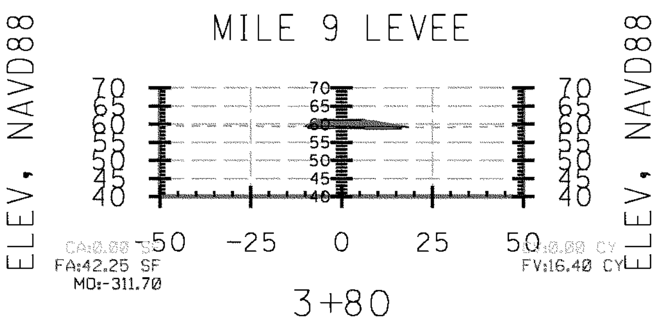



3+50

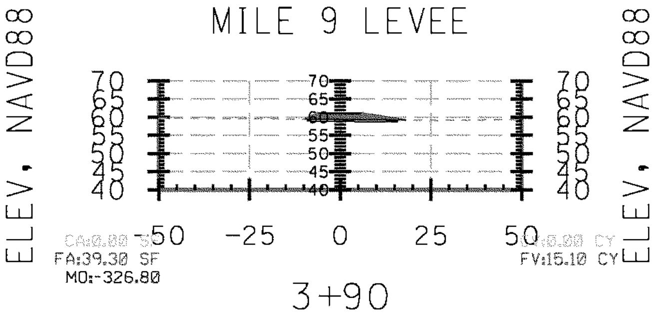
STA.3+60 TO STA.3+80

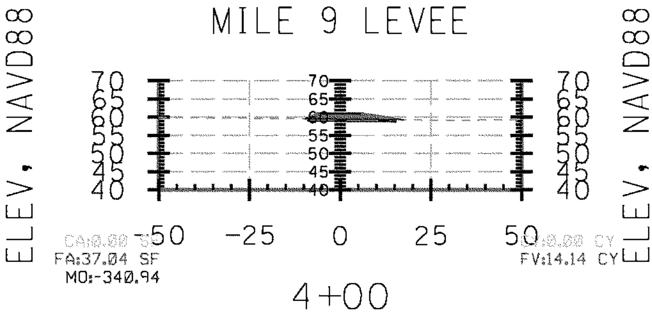


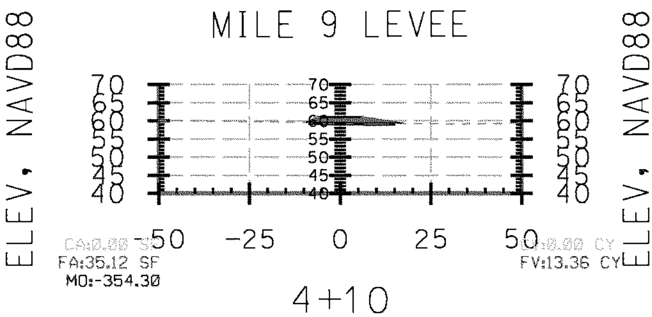



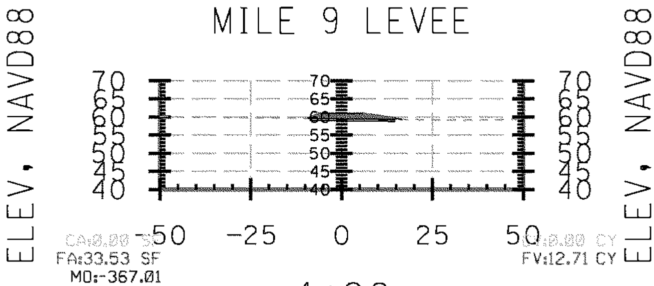
STA.3+90 TO STA.4+10



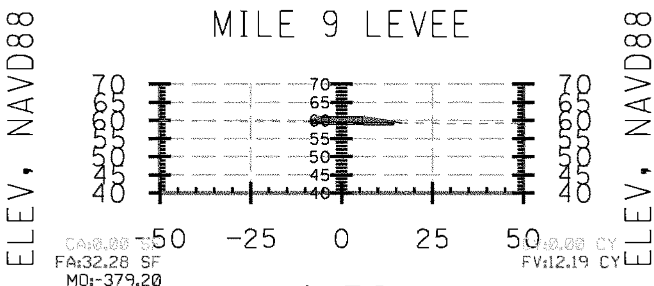



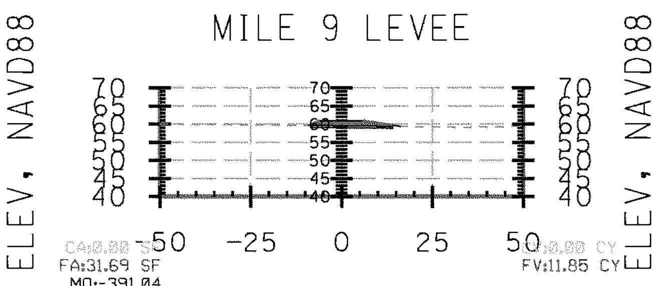
STA.4+20 TO STA.4+40




4+20

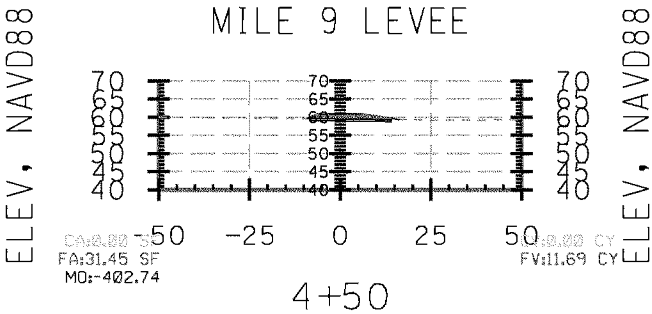


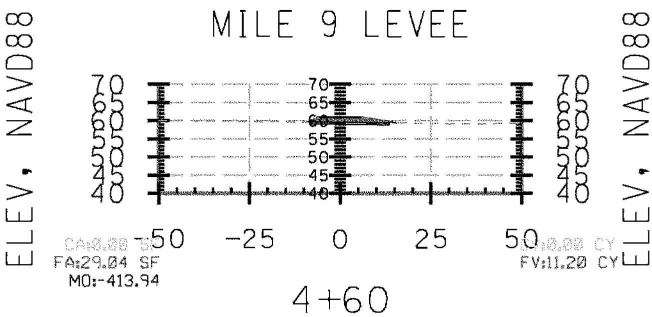

4+30

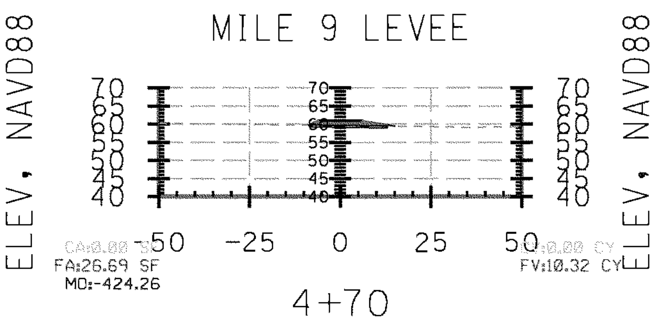



4+40

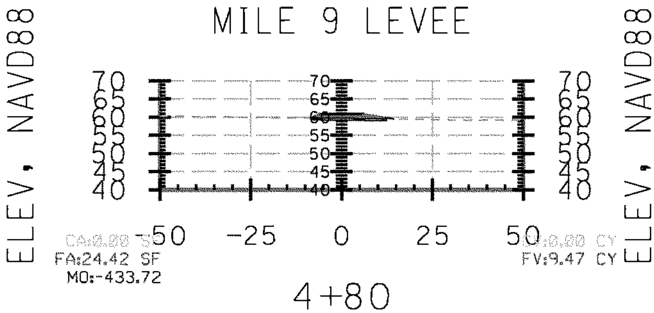
STA.4+50 TO STA.4+70

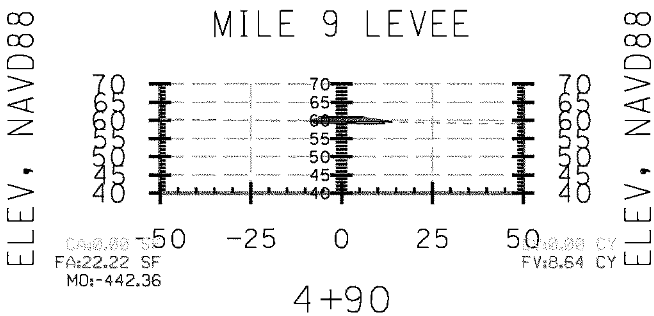


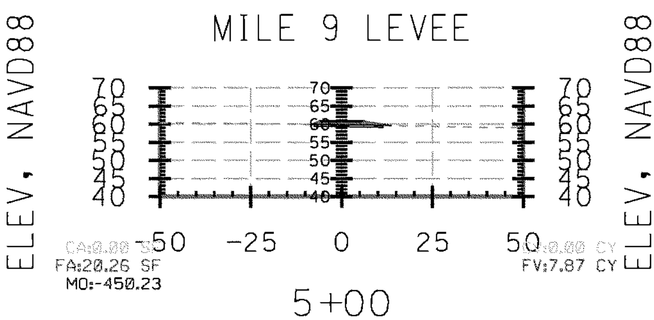



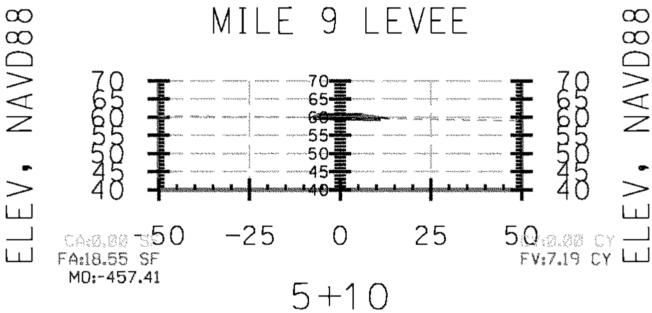
# STA.4+80 TO STA.5+00

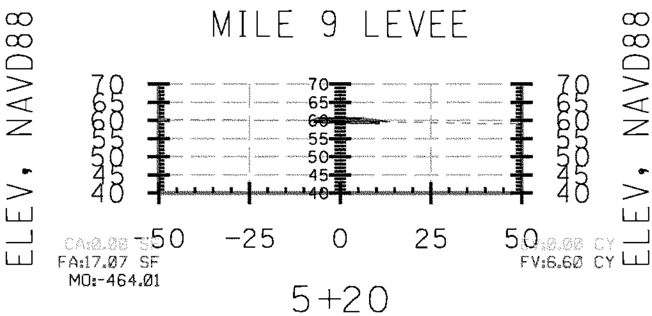


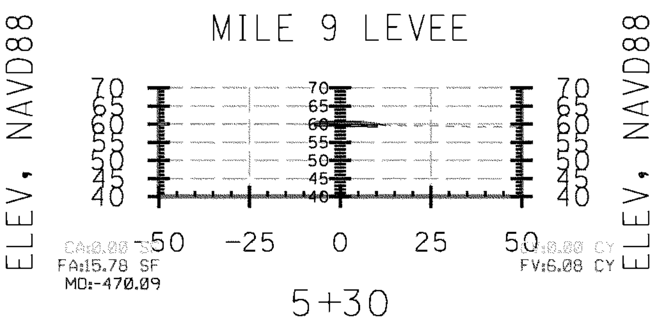



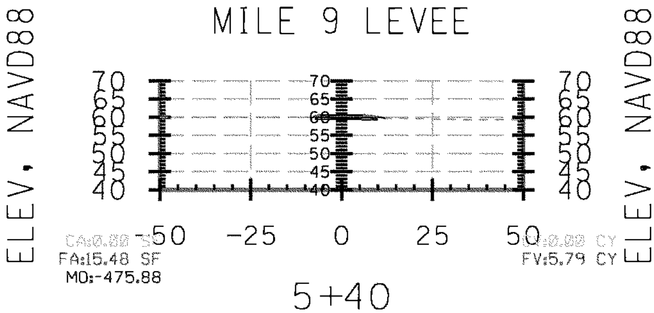
STA.5+10 TO STA.5+30

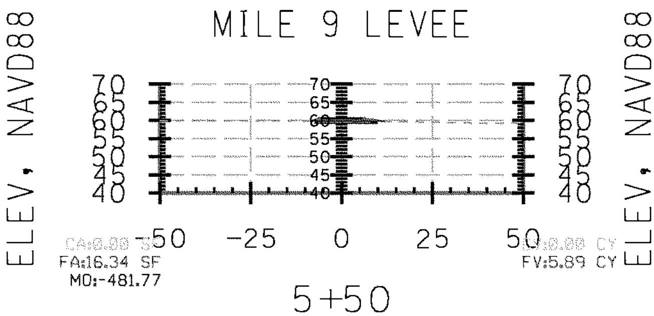


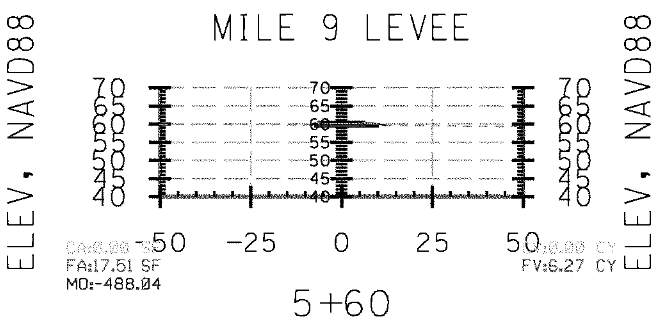



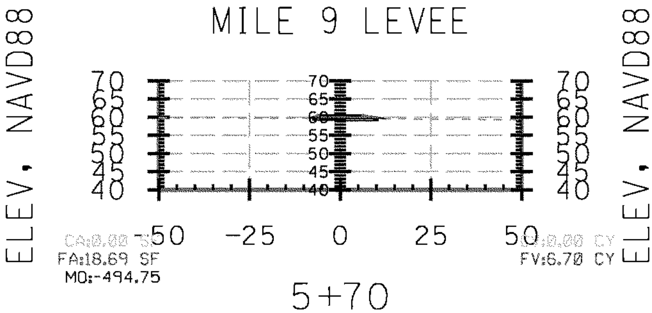
STA.5+40 TO STA.5+60

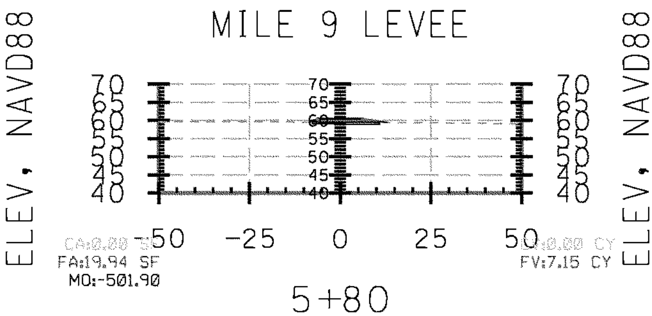


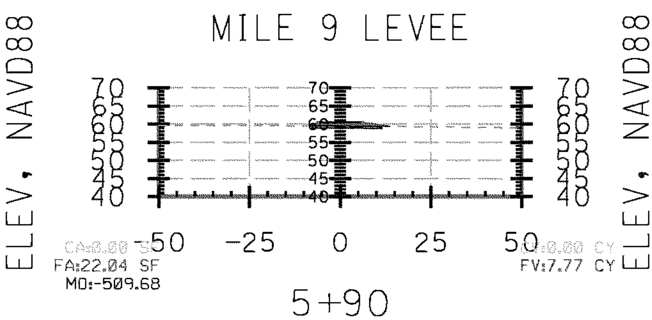



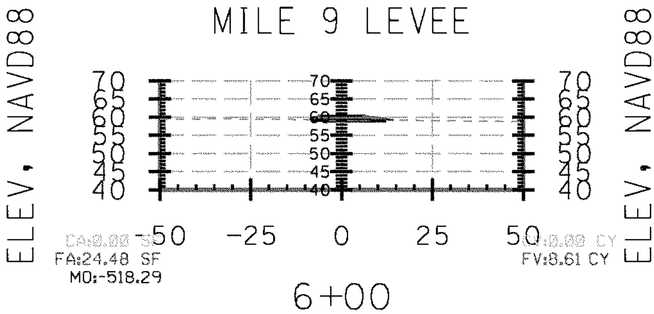
STA.5+70 TO STA.5+90

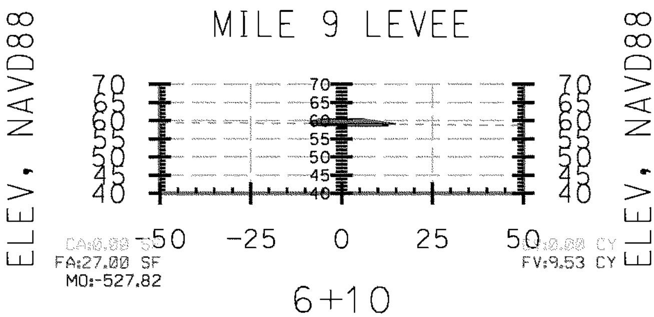


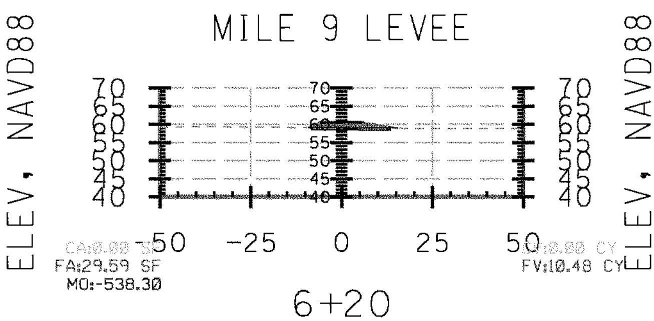



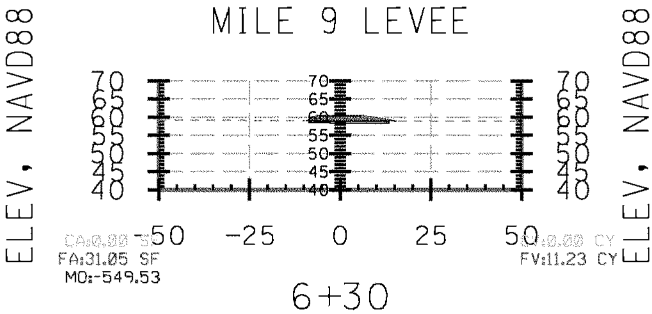
# STA.6+00 TO STA.6+20

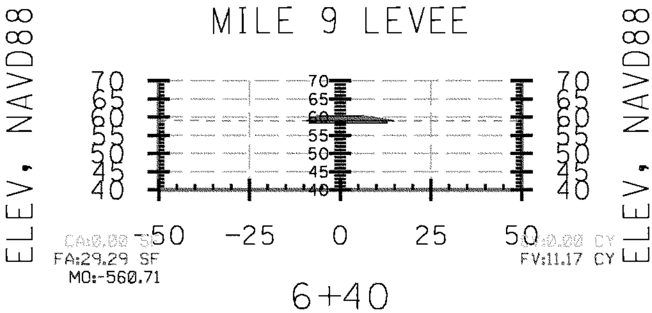


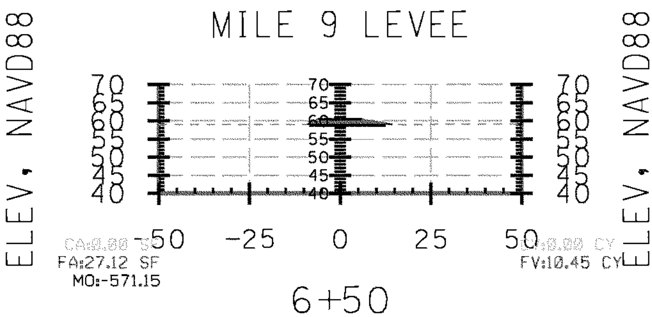



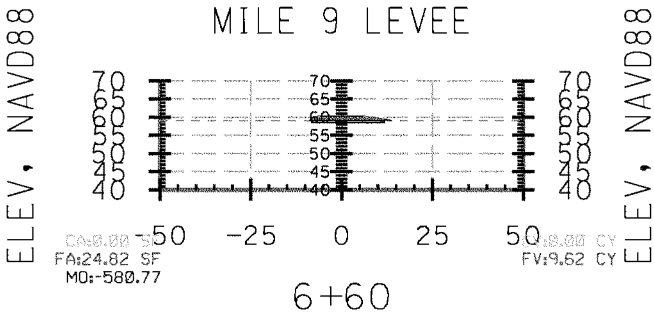
STA.6+30 TO STA.6+50

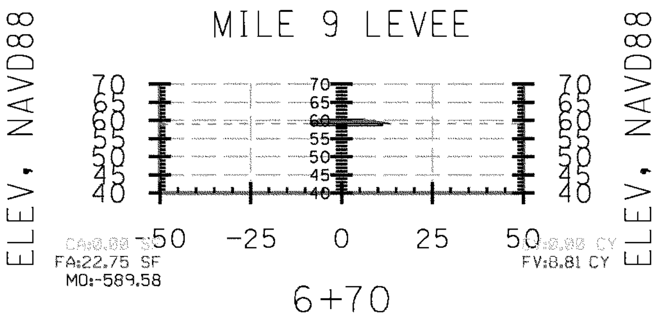


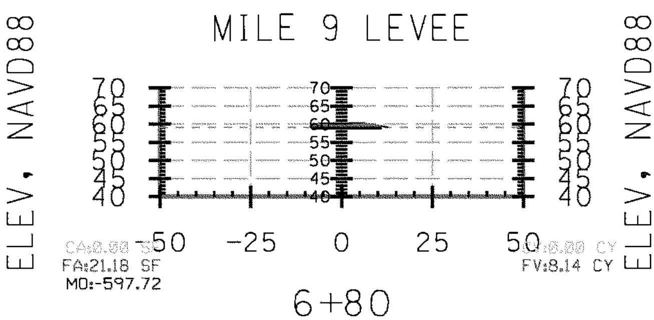



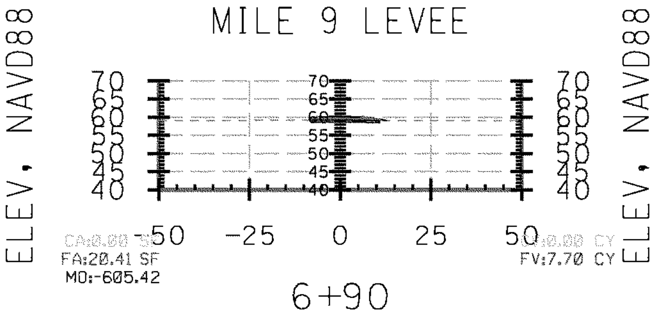
# STA.6+60 TO STA.6+80

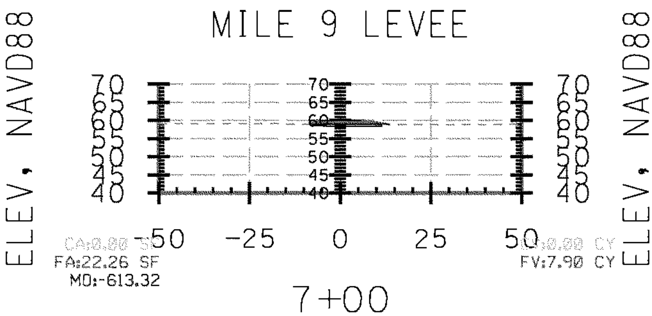


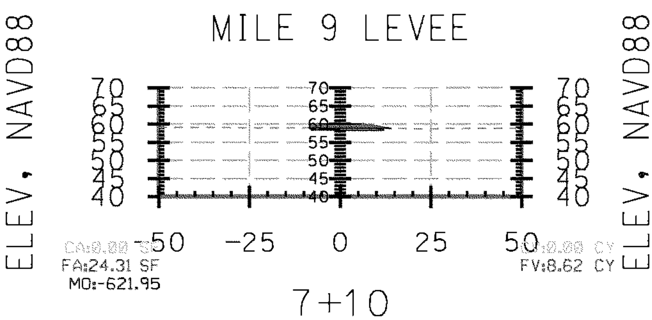



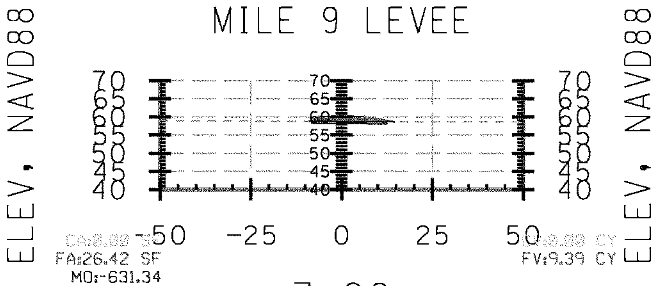
# STA.6+90 TO STA.7+10



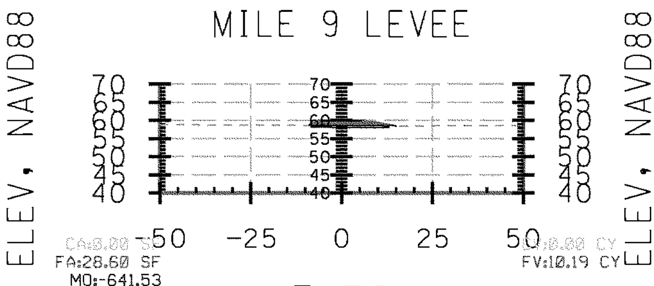



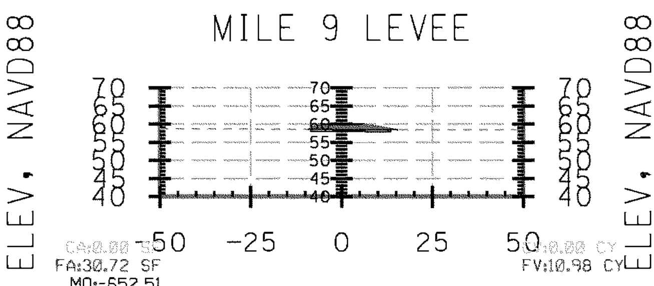
# STA.7+20 TO STA.7+40




7+20

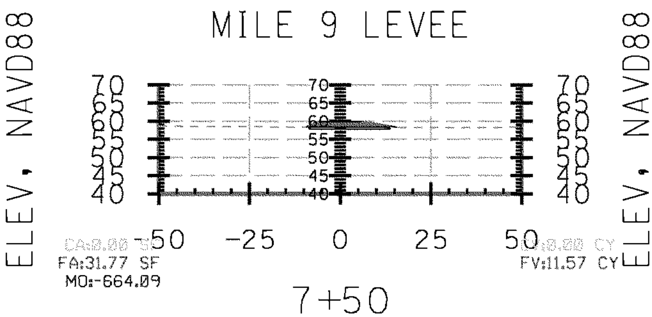


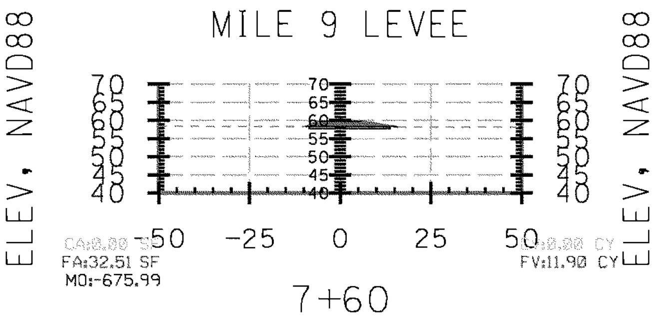

7+30

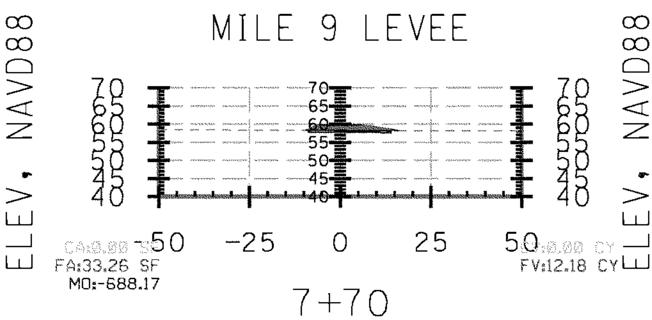



7+40

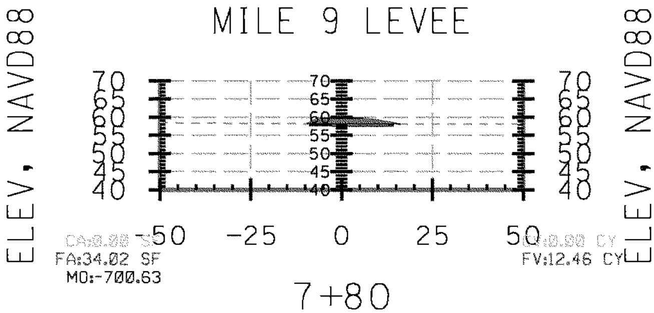
STA.7+50 TO STA.7+70

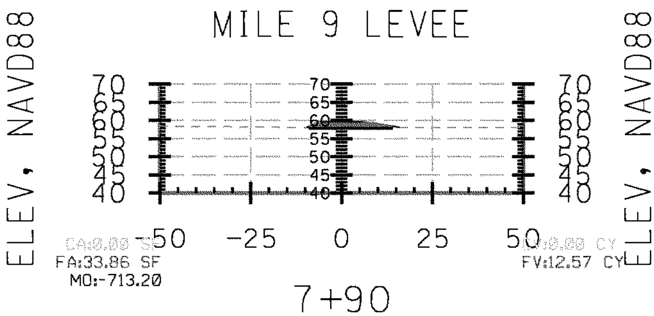


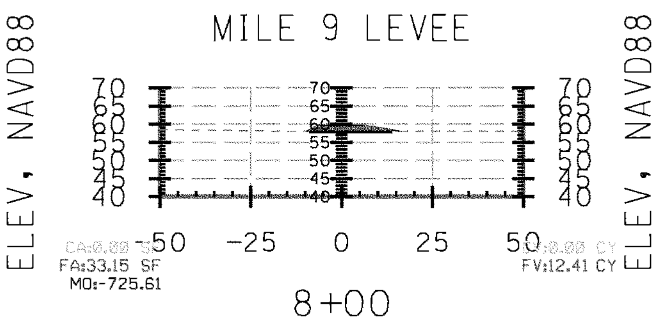



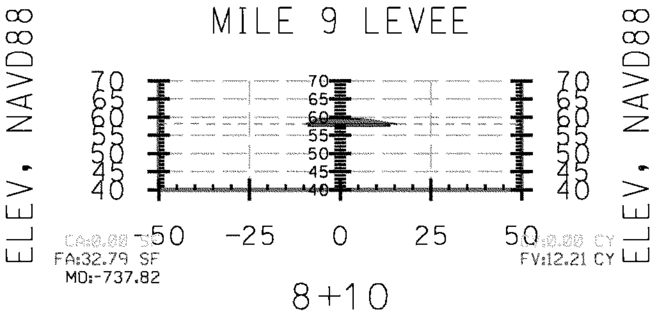
STA.7+80 TO STA.8+00

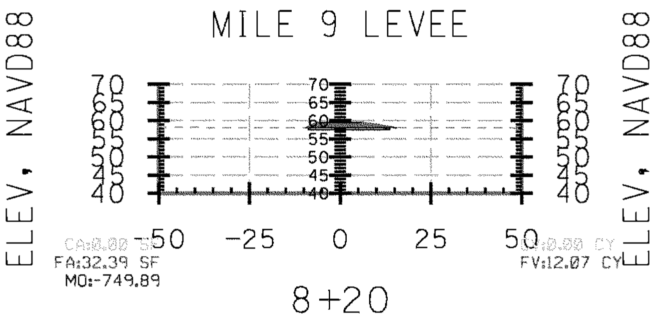


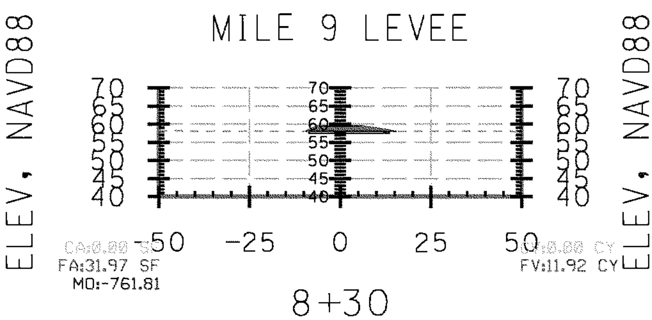



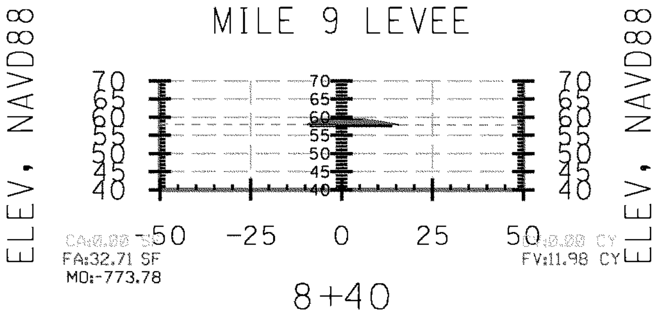
STA.8+10 TO STA.8+30

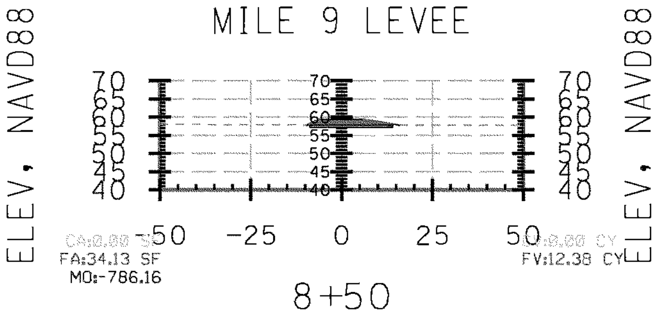


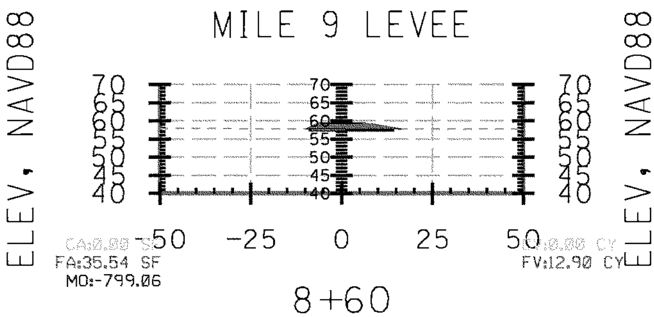



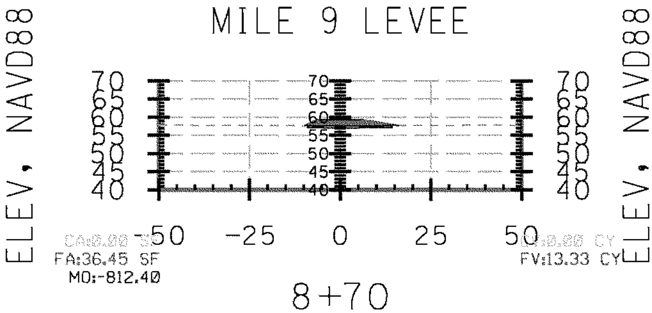
STA.8+40 TO STA.8+60

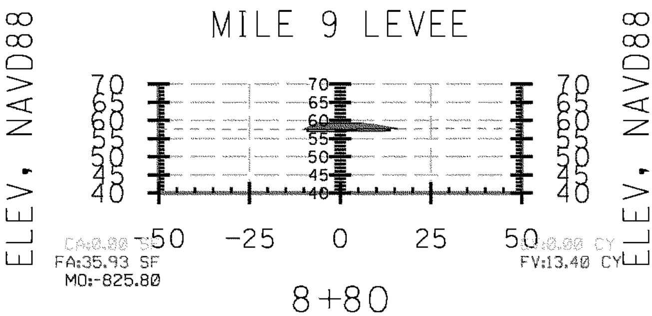


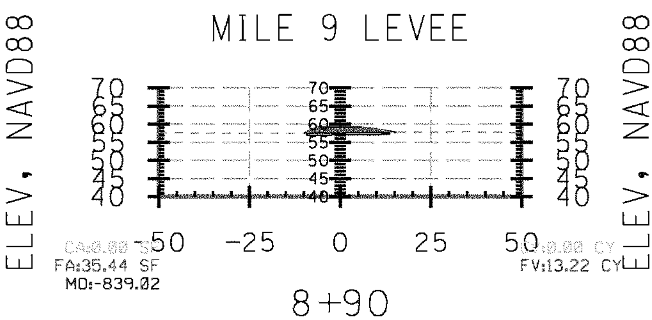



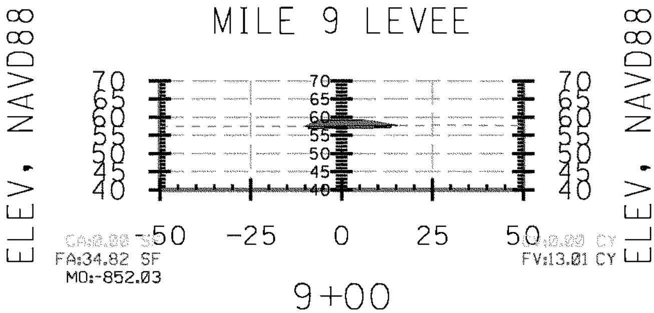
# STA.8+70 TO STA.8+90

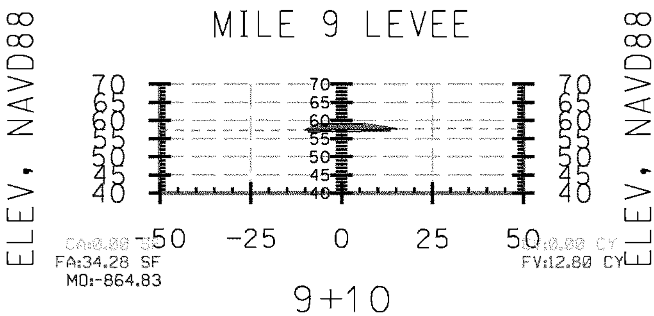


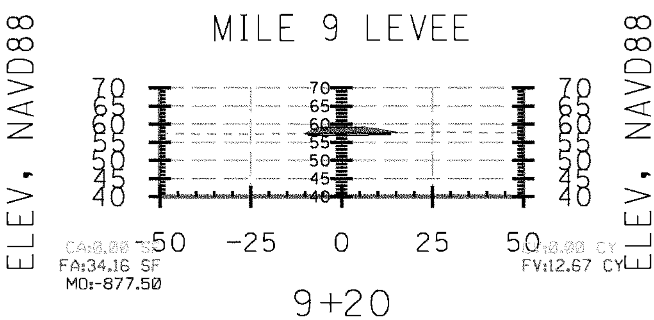



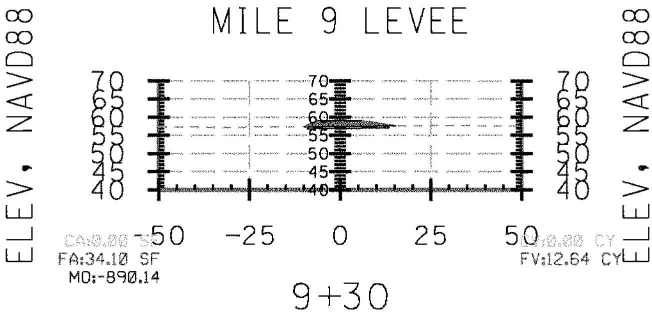
STA.9+00 TO STA.9+20

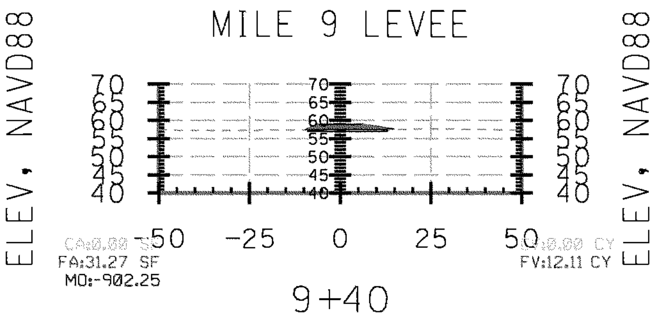


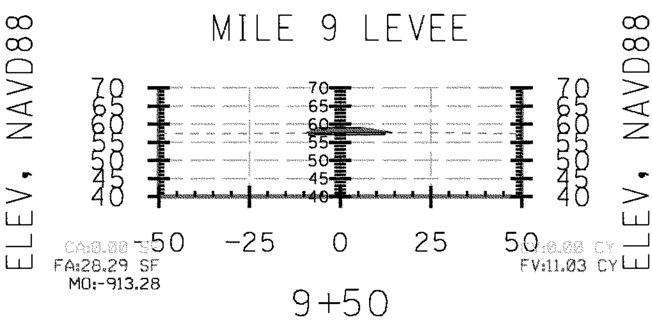



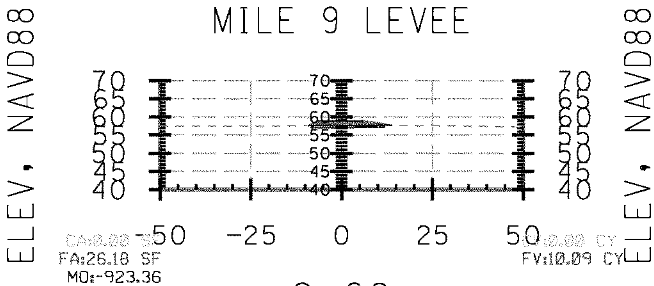
# STA.9+30 TO STA.9+50



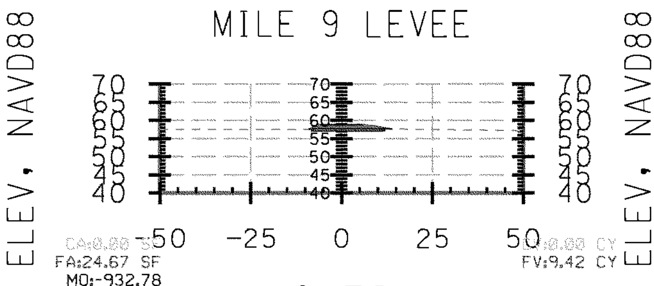



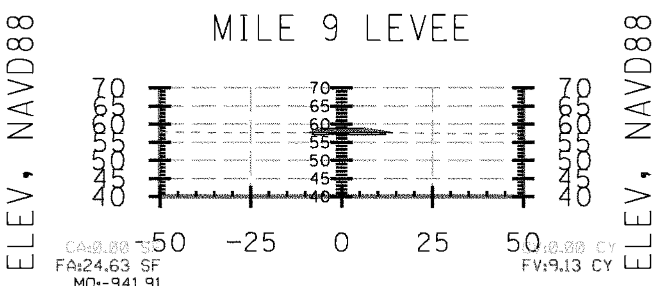
# STA.9+60 TO STA.9+80




9+60

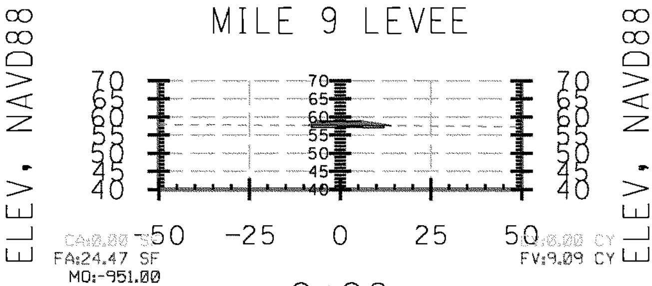



9+70

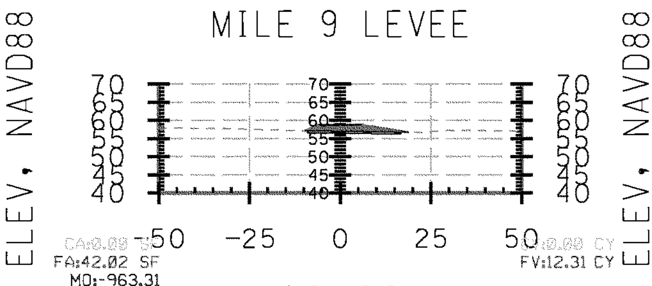



9+80

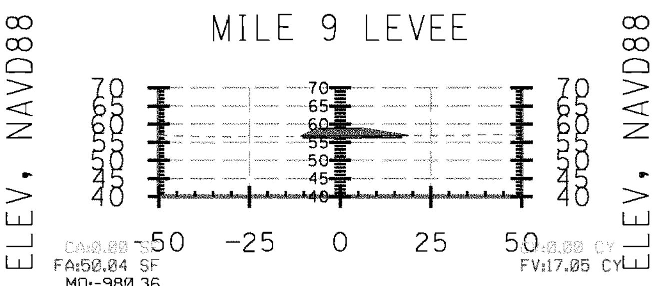
STA.9+90 TO STA.10+10




9+90

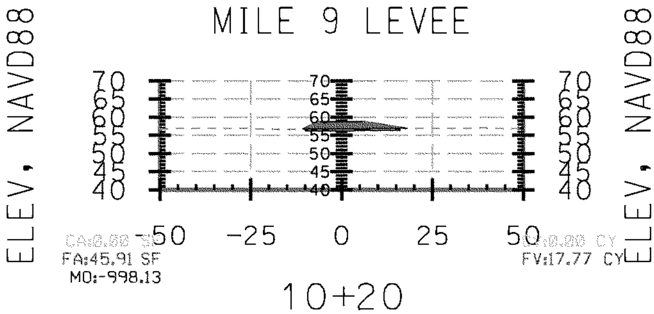


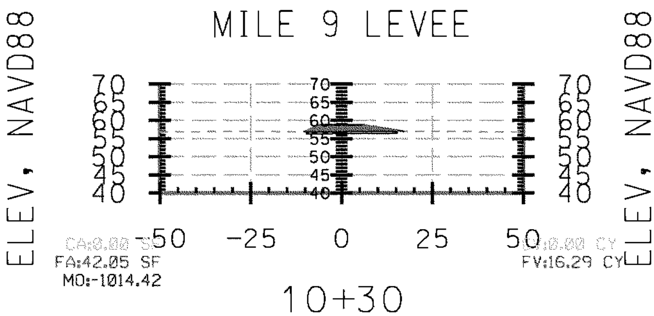

10+00

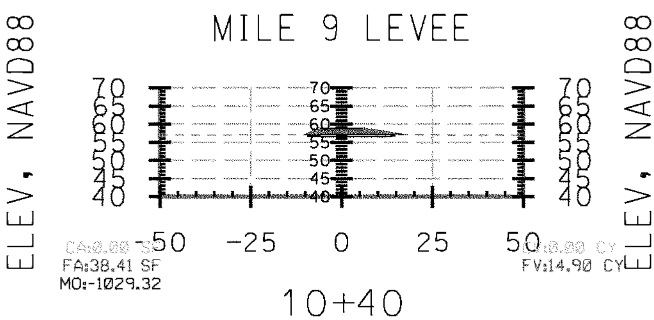



10+10

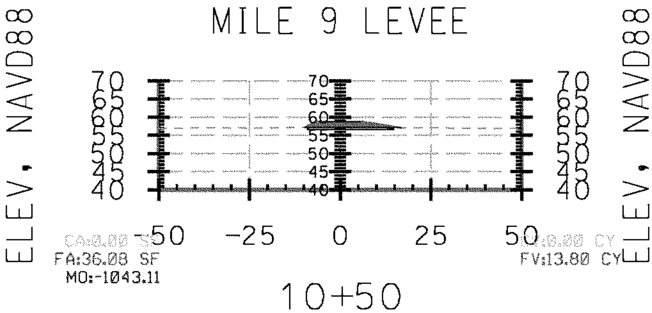
STA.10+20 TO STA.10+40

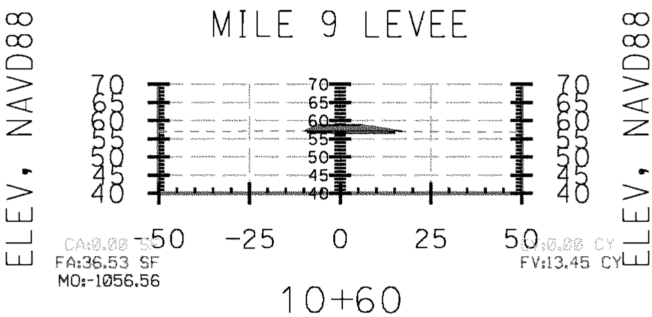


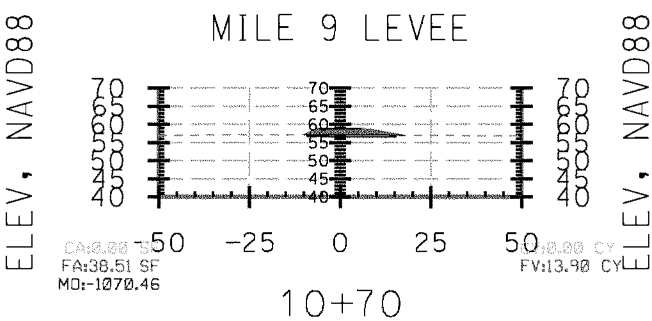



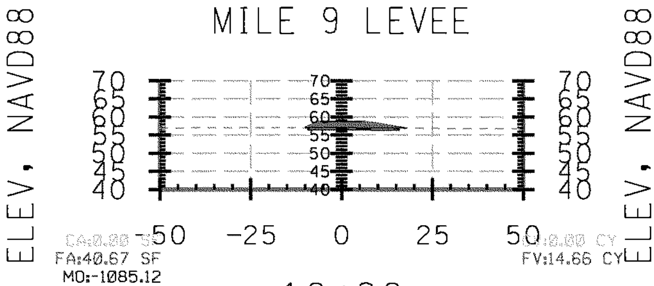
STA.10+50 TO STA.10+70



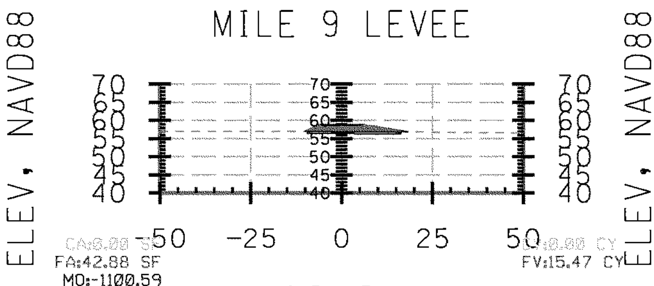



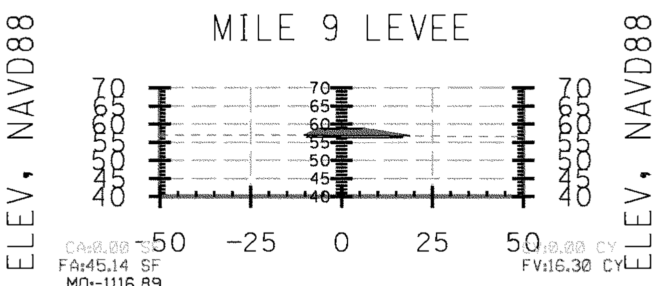
# STA.10+80 TO STA.11+00




10+80

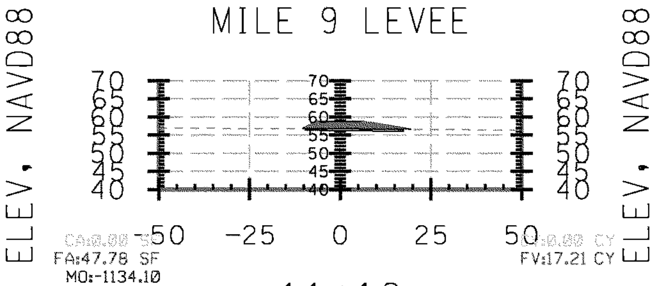



10+90

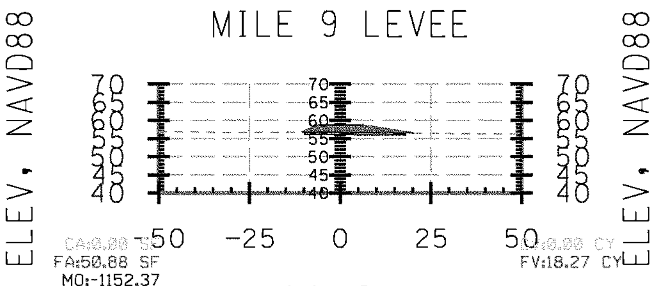



11+00

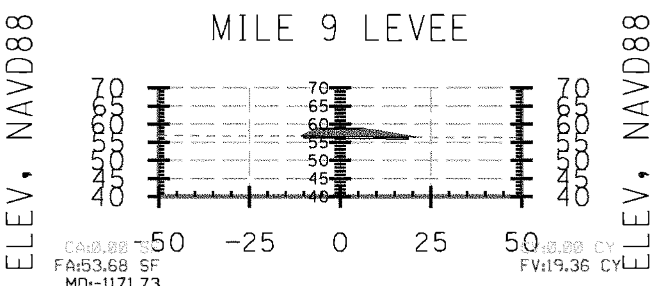
# STA.11+10 TO STA.11+30




11+10

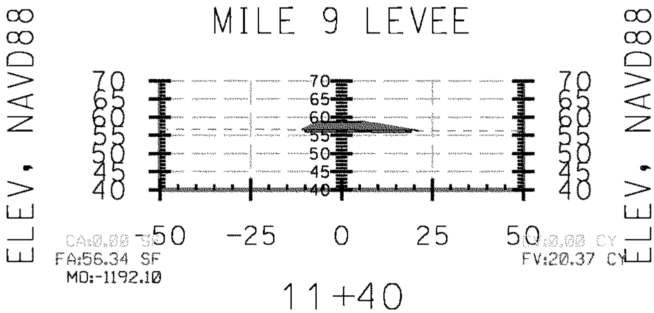


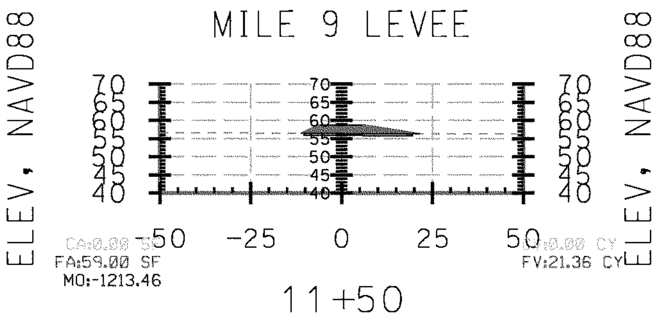

11+20

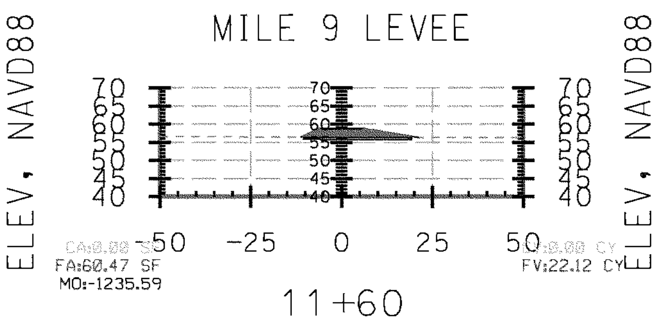



11+30

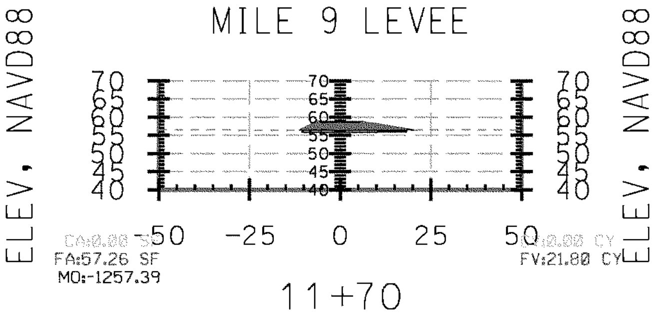
STA.11+40 TO STA.11+60

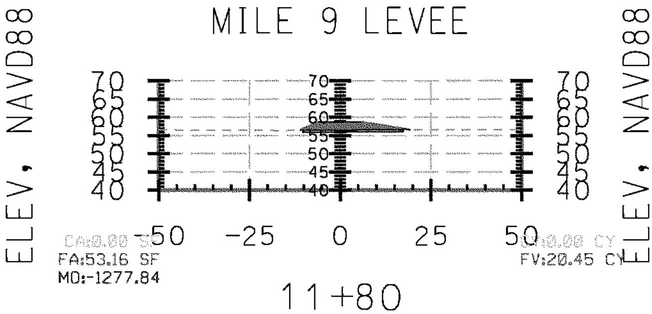


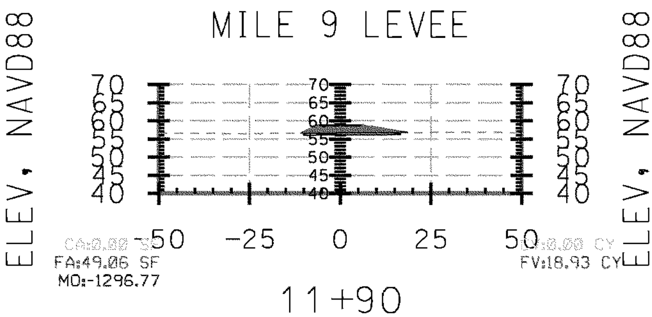



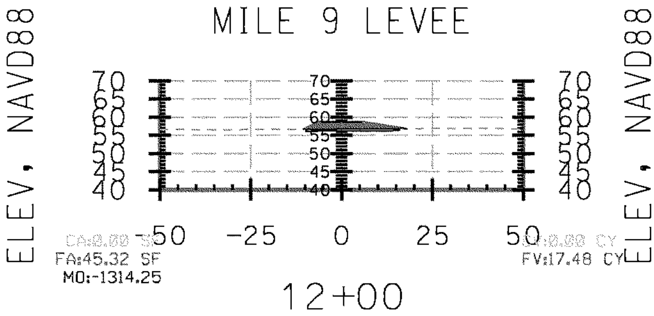
# STA.11+70 TO STA.11+90

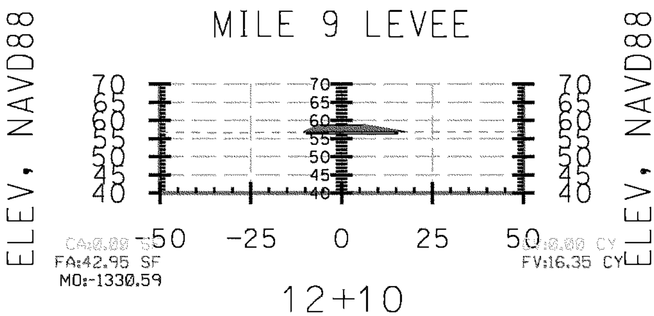


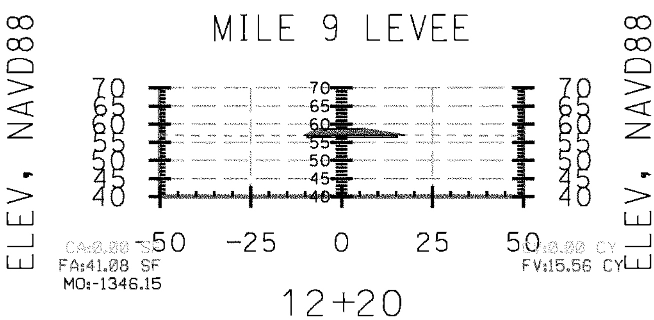



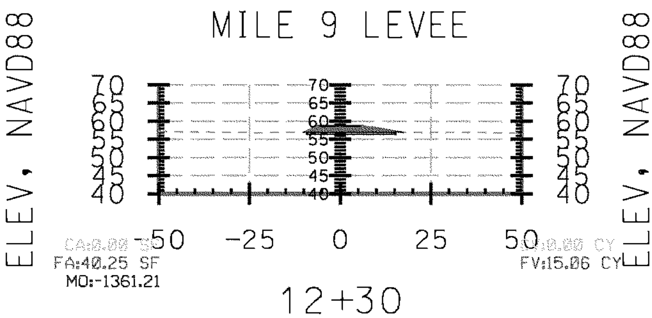
STA.12+00 TO STA.12+20

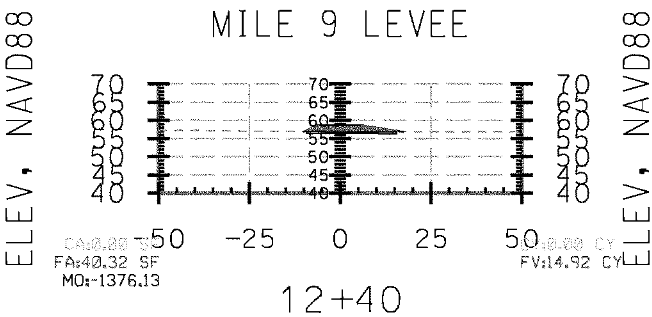


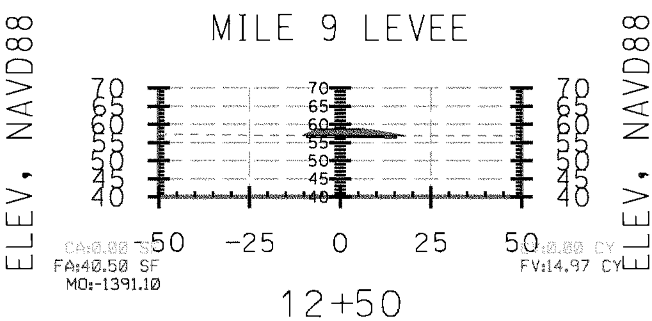



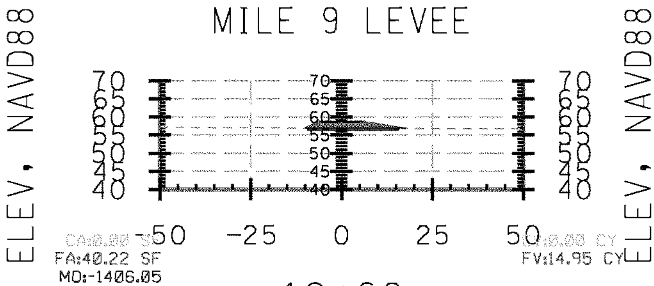
STA.12+30 TO STA.12+50



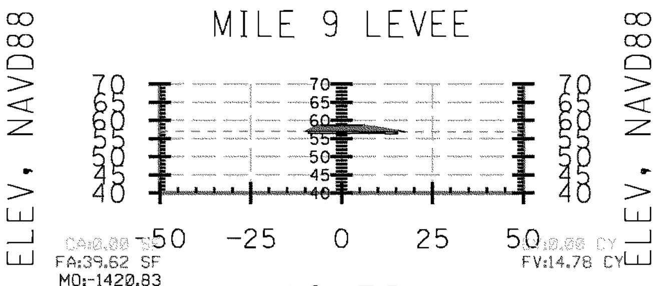



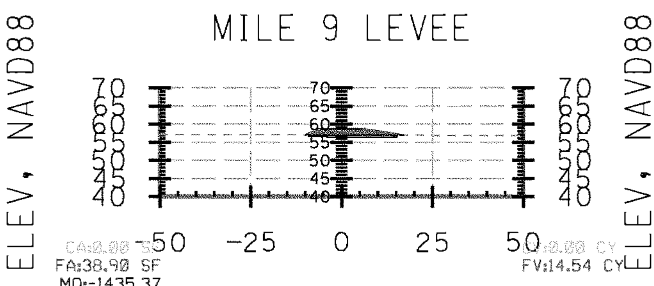
# STA.12+60 TO STA.12+80




12+60

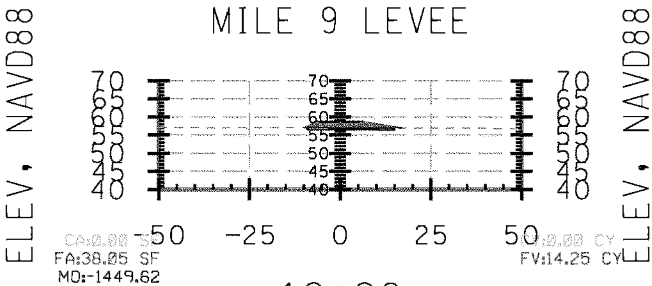



12+70

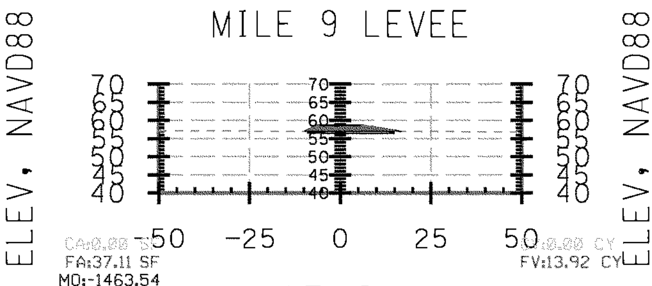



12+80

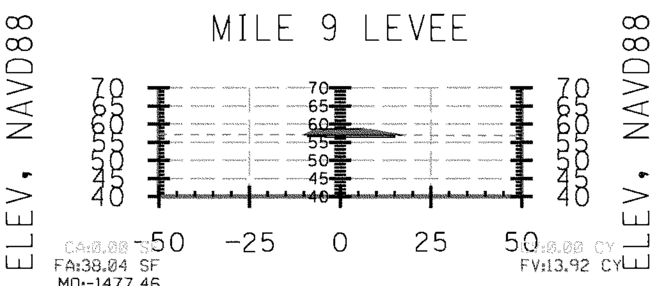
# STA.12+90 TO STA.13+10




12+90

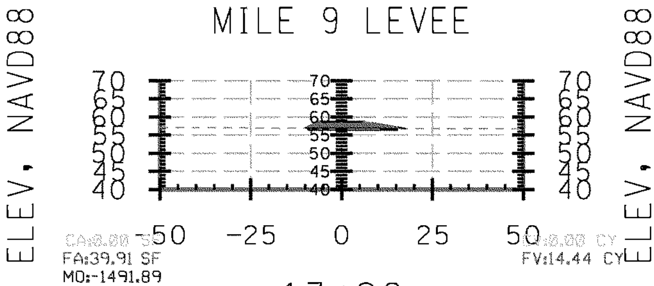



13+00

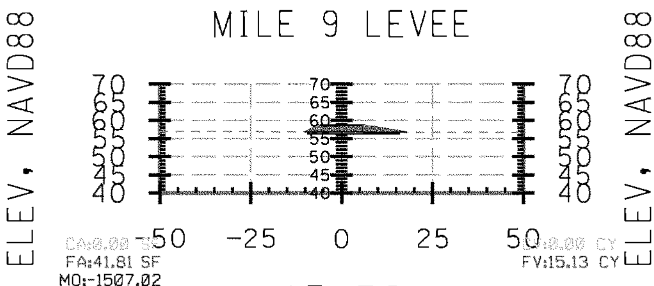



13+10

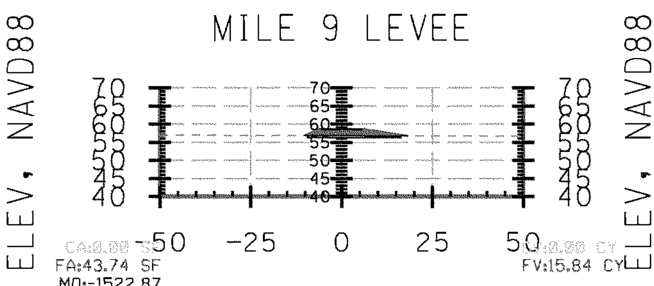
STA.13+20 TO STA.13+40




13+20

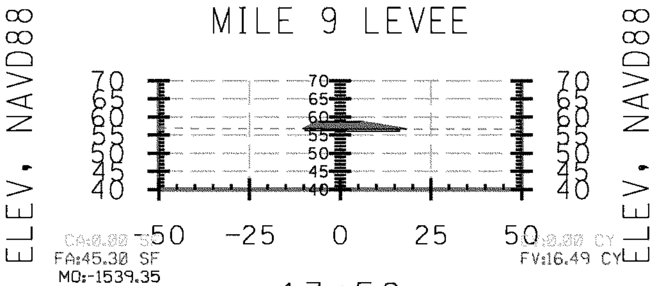



13+30

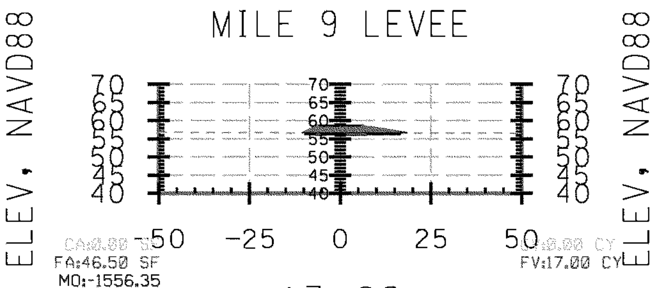



13+40

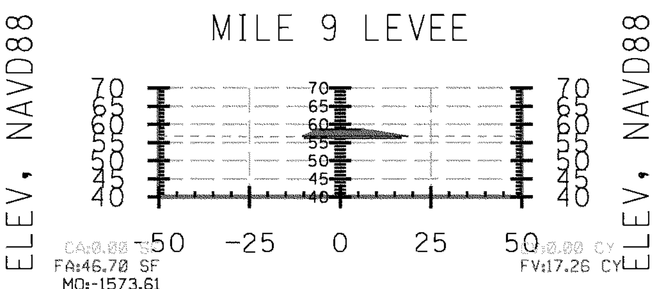
STA.13+50 TO STA.13+70




13+50

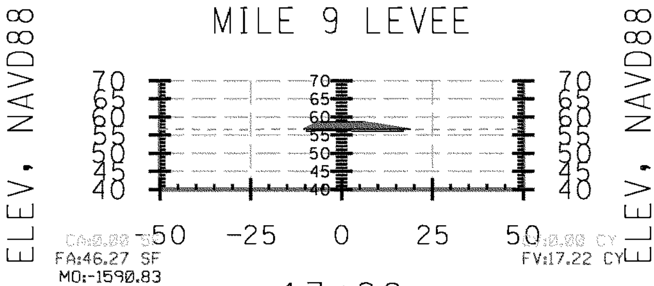



13+60

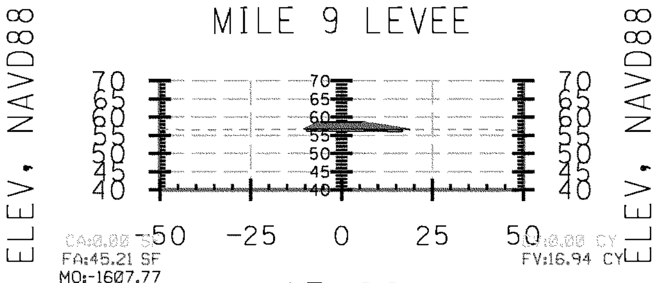



13+70

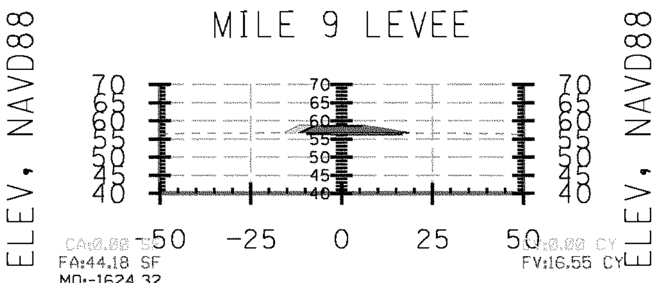
# STA.13+80 TO STA.14+00




13+80

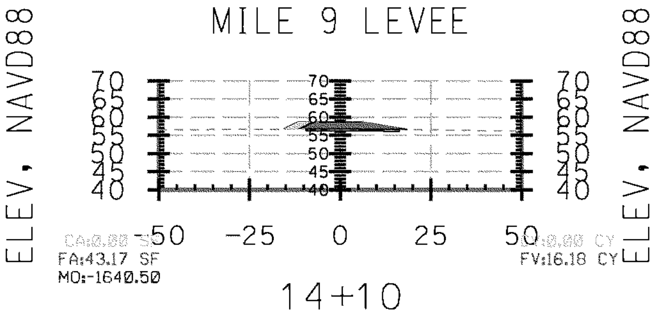


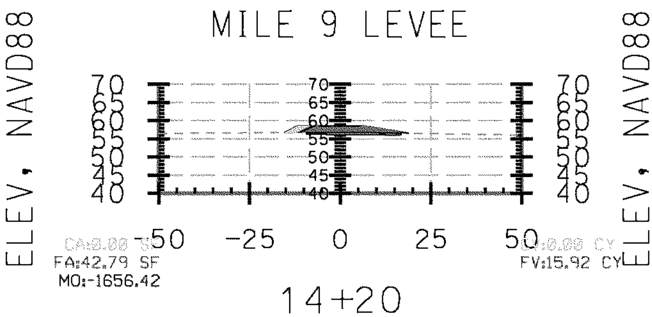

13+90

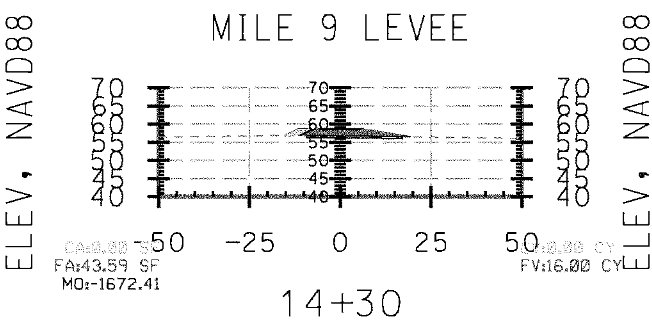



14+00

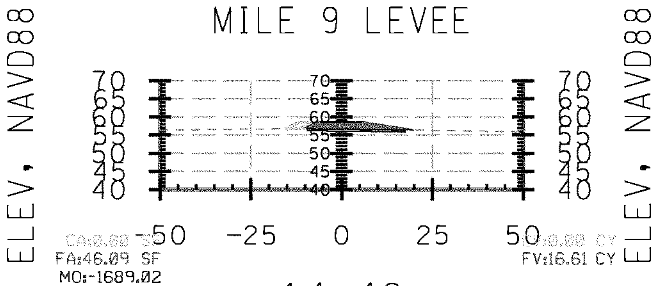
STA.14+10 TO STA.14+30



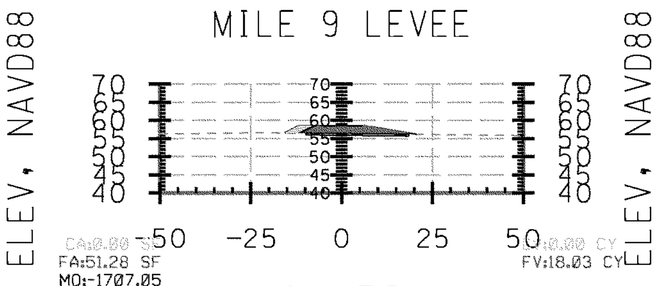



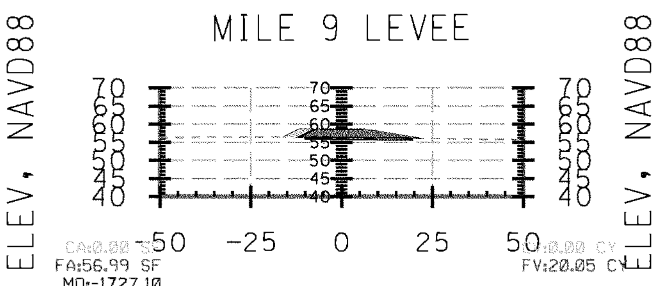
STA.14+40 TO STA.14+60




14+40

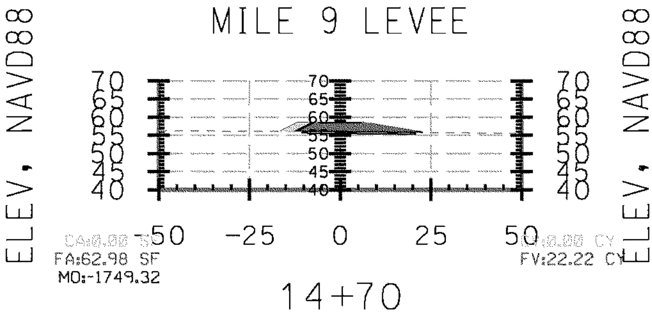


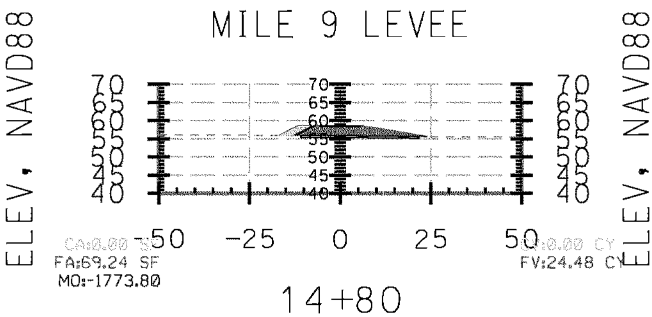

14+50

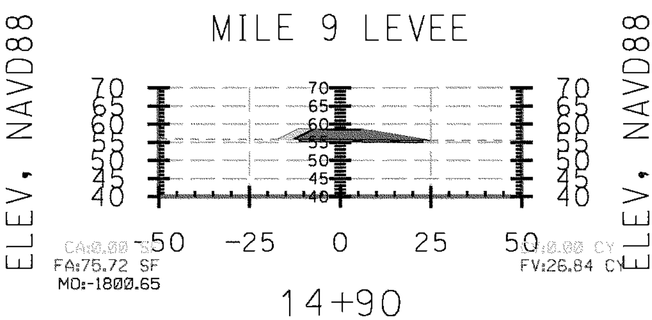



14+60

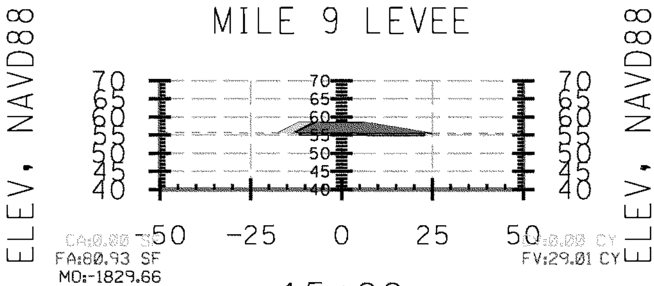
STA.14+70 TO STA.14+90



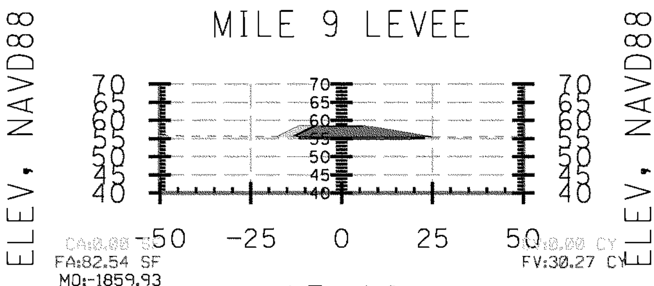



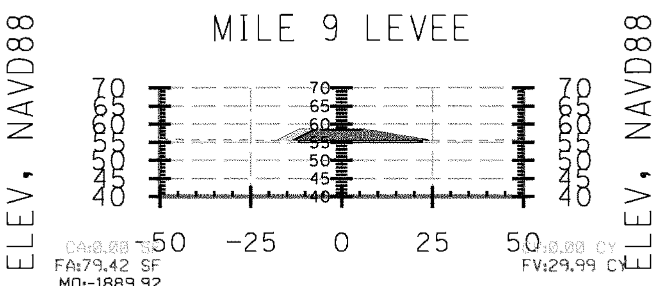
# STA.15+00 TO STA.15+20




15+00

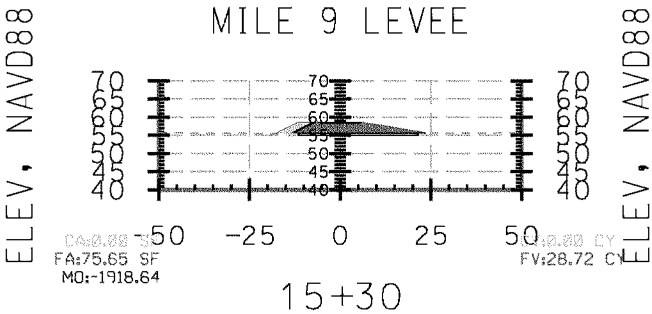


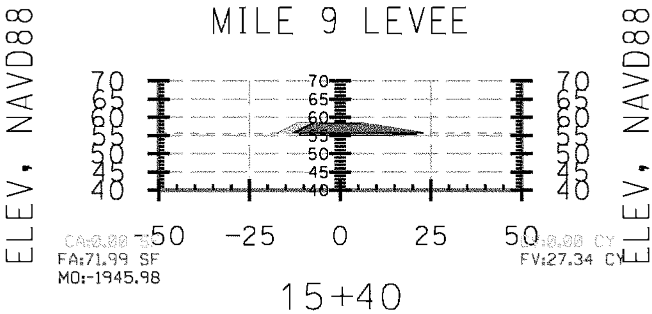

15+10

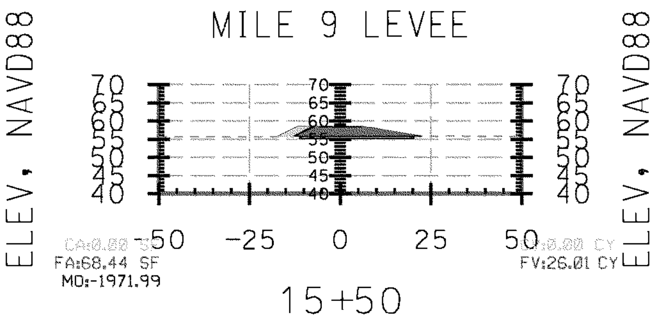



15+20

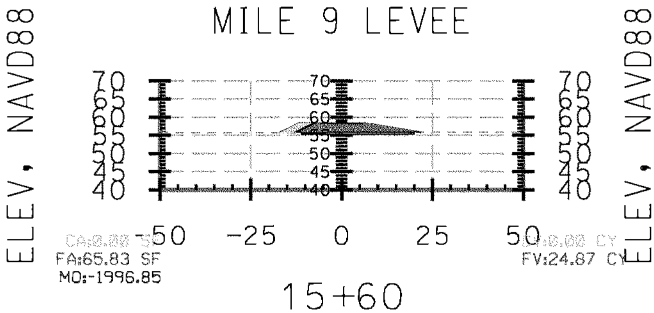
STA.15+30 TO STA.15+50

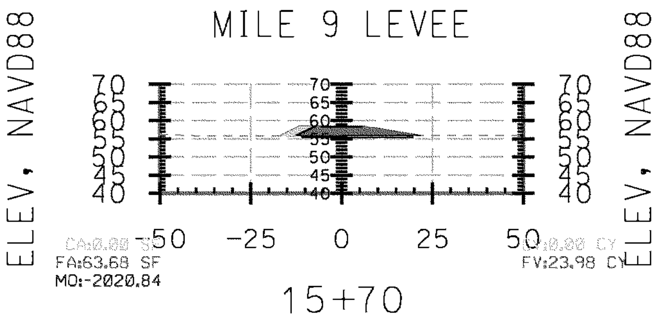


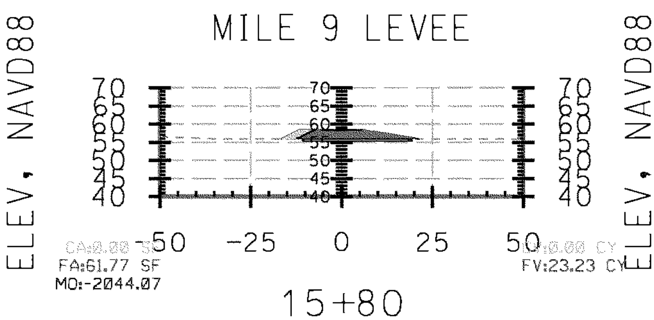



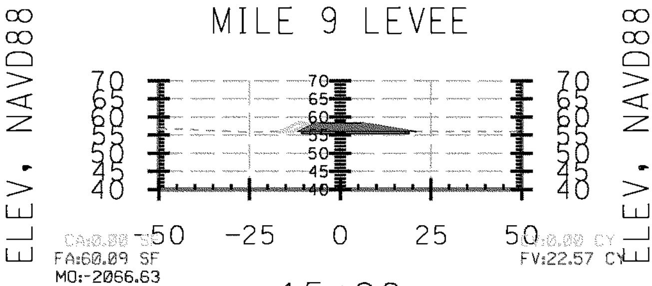
# STA.15+60 TO STA.15+80



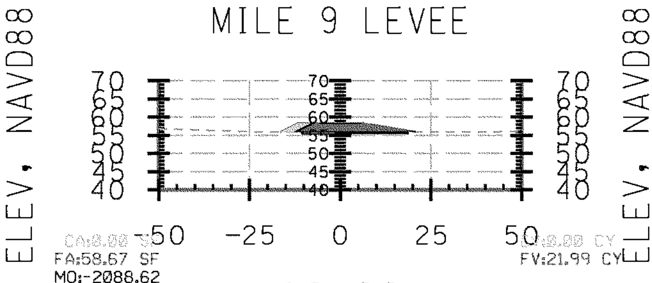



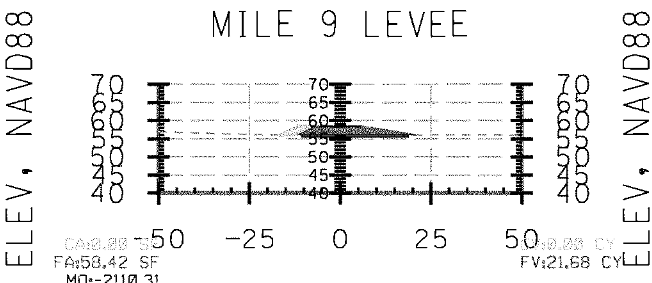
# STA.15+90 TO STA.16+10




15+90

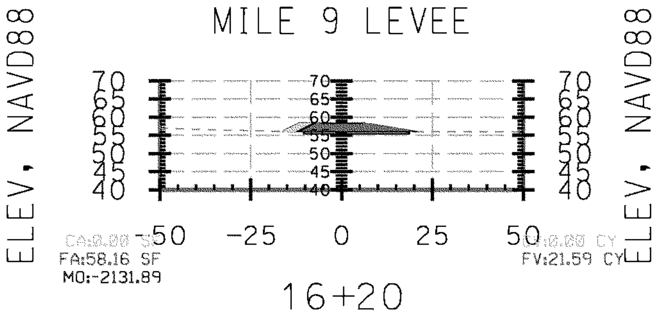


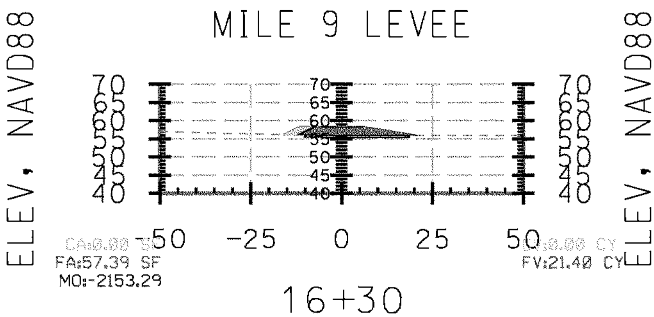

16+00

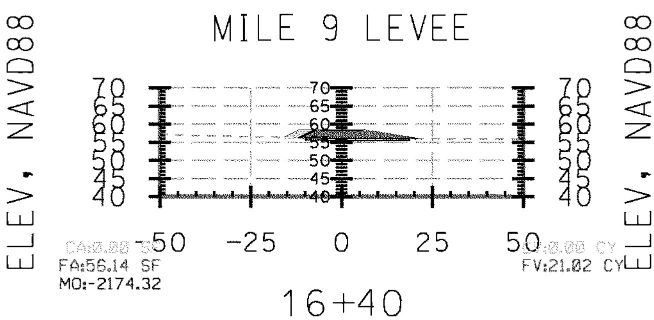



16+10

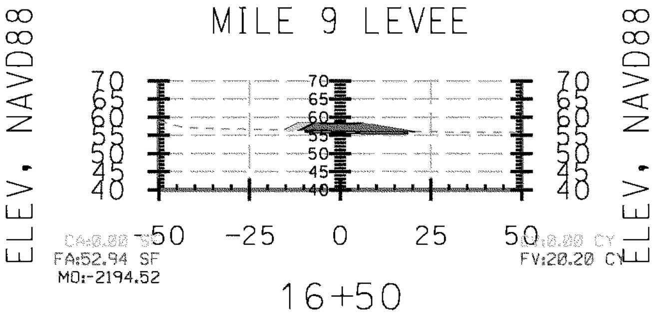
STA.16+20 TO STA.16+40

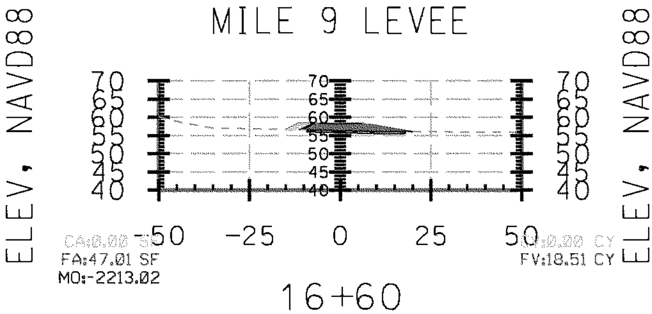


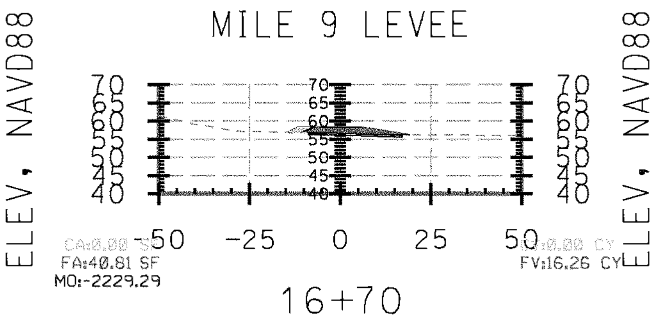



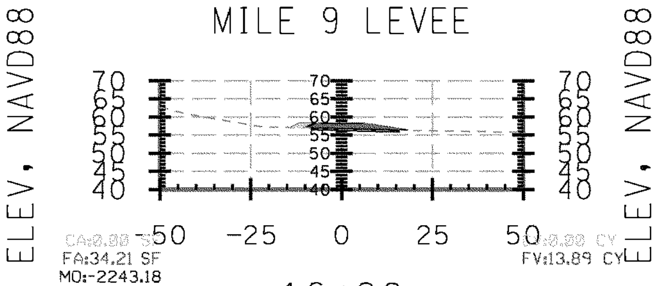
STA.16+50 TO STA.16+70



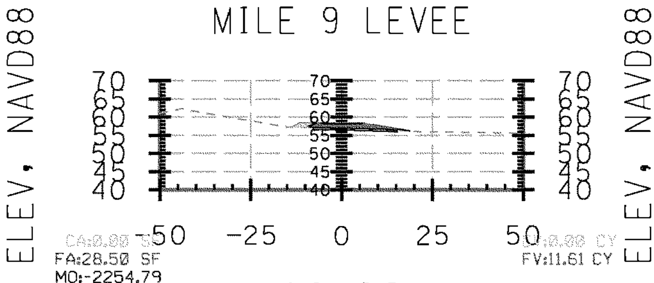



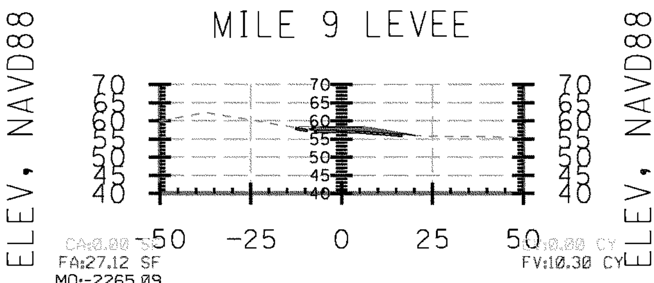
# STA.16+80 TO STA.17+00




16+80

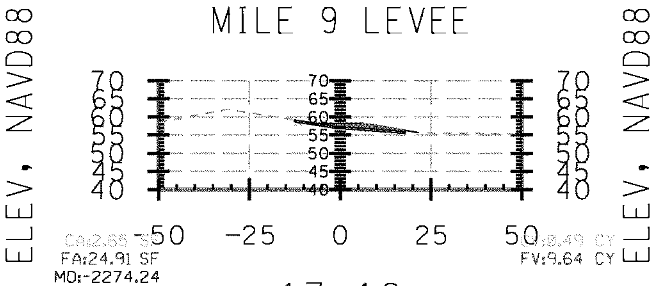



16+90

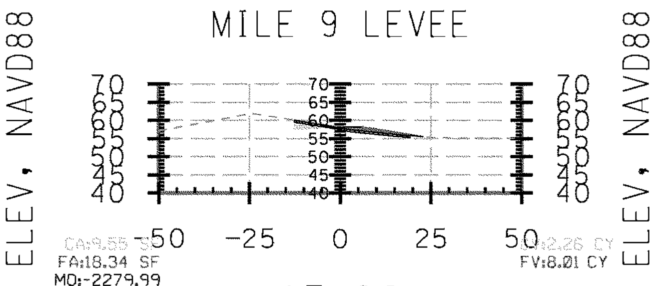



17+00

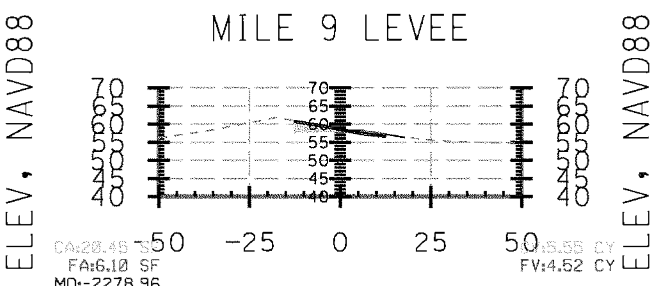
# STA.17+10 TO STA.17+30




17+10

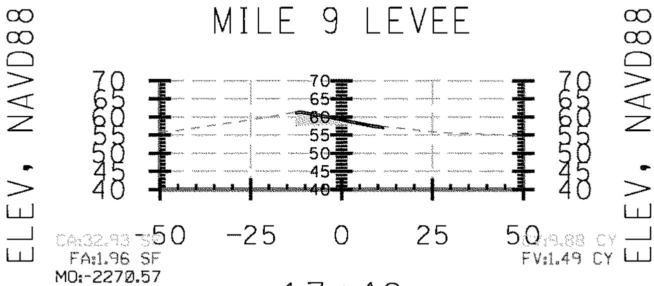



17+20

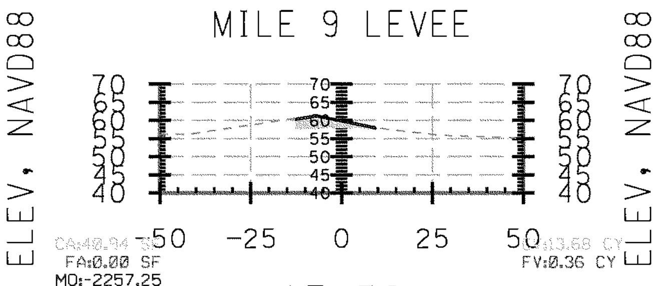



17+30

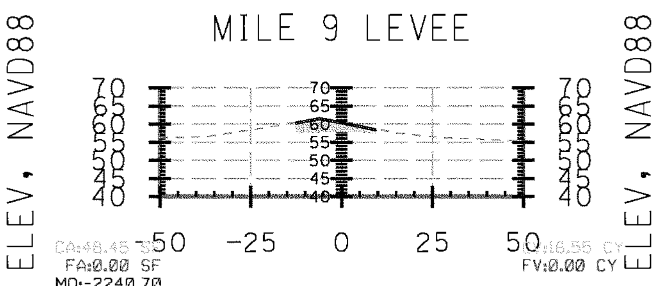
# STA.17+40 TO STA.17+60




17+40

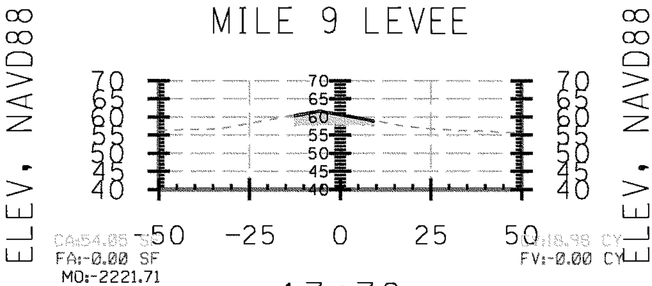



17+50

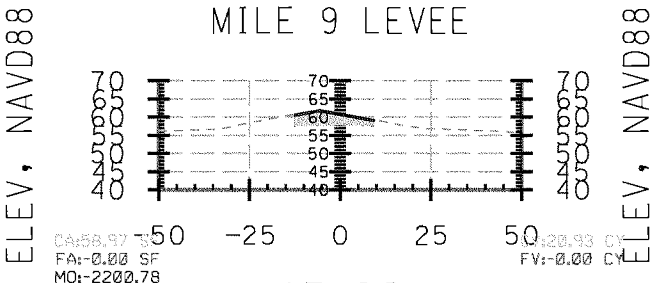



17+60

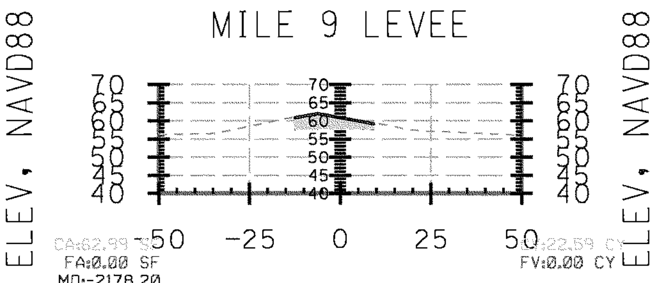
# STA.17+70 TO STA.17+90




17+70

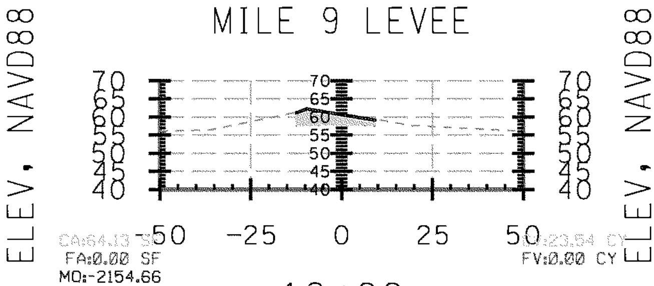



17+80

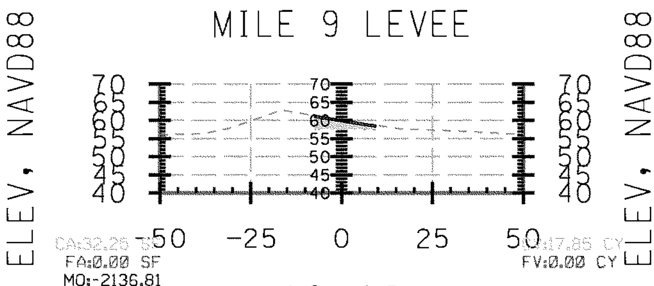



17+90

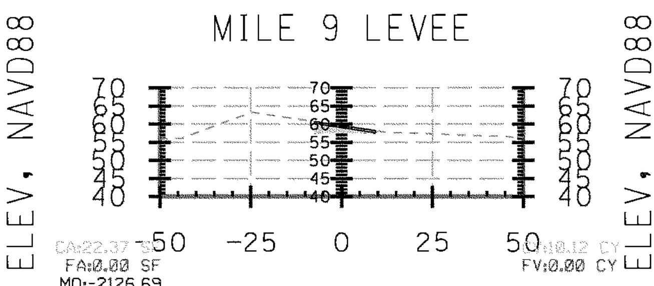
# STA.18+00 TO STA.18+20




18+00

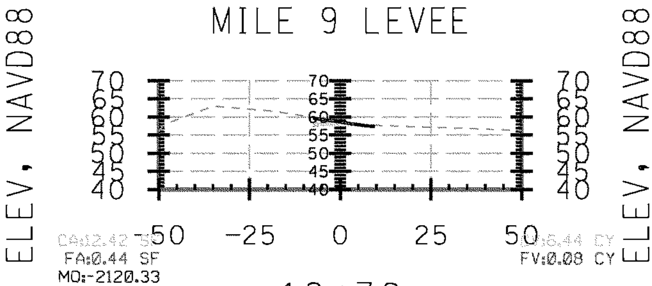



18+10

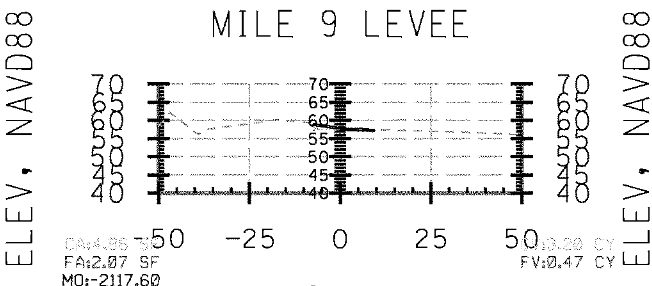



18+20

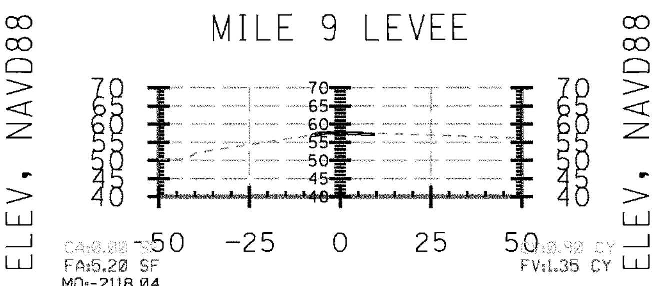
# STA.18+30 TO STA.18+50




18+30

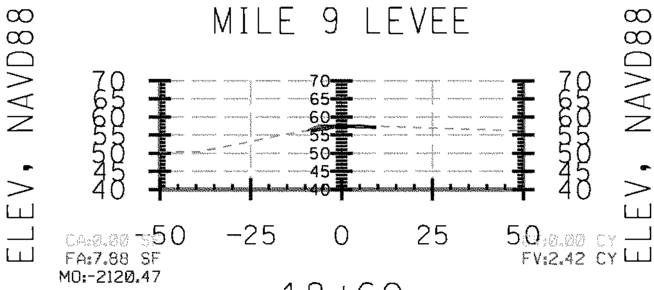



18+40

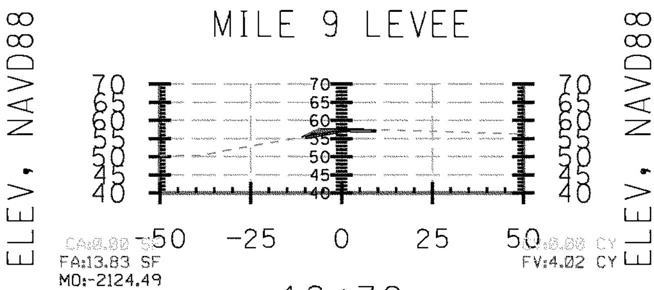



18+50

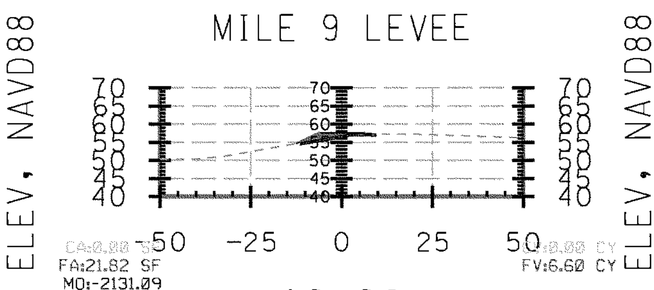
STA.18+60 TO STA.18+80




18+60

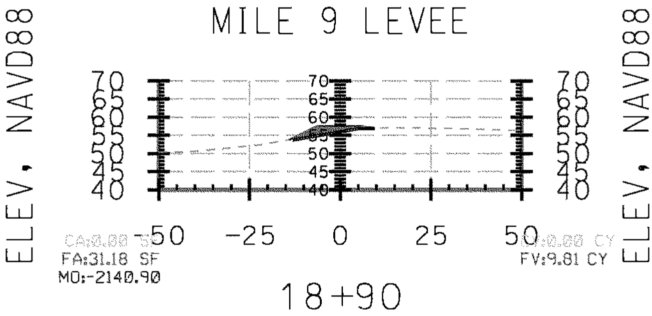


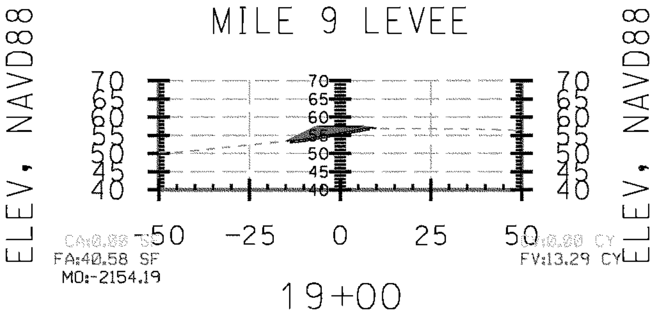

18+70

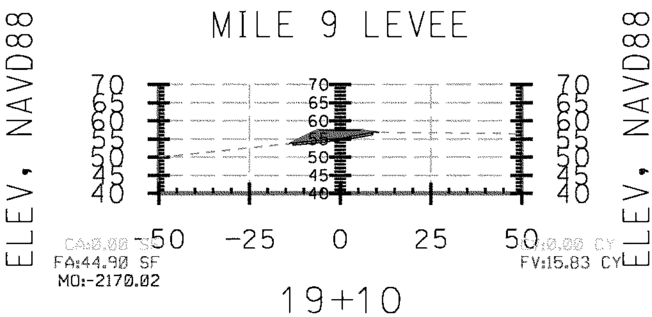



18+80

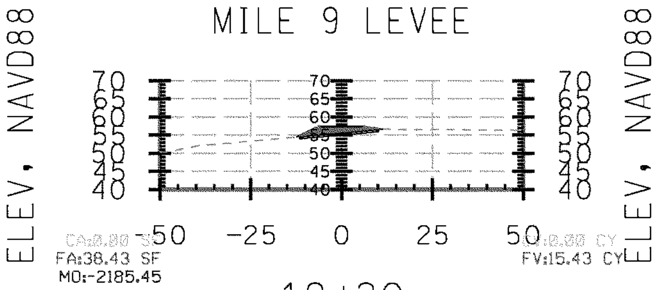
STA.18+90 TO STA.19+10



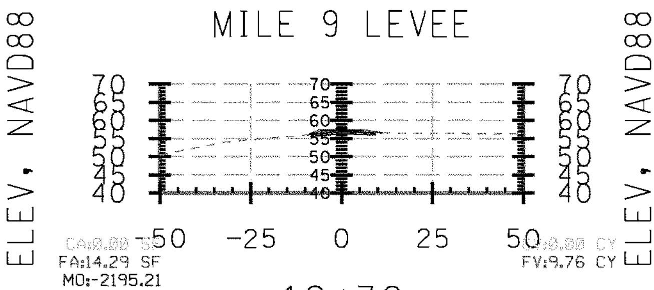



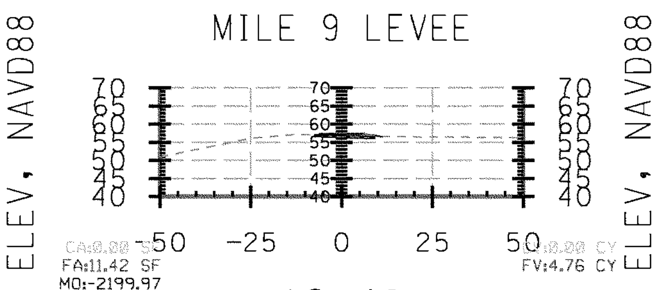
STA.19+20 TO STA.19+40



19+20

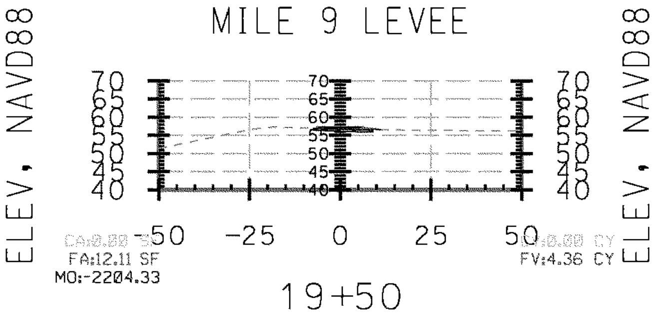


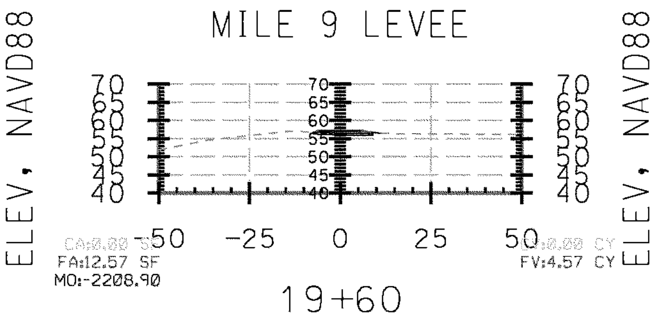
19+30

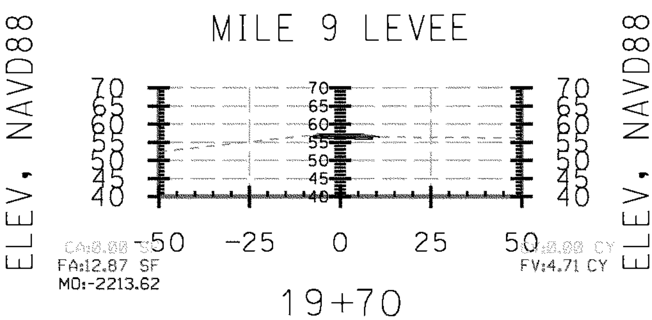


19+40

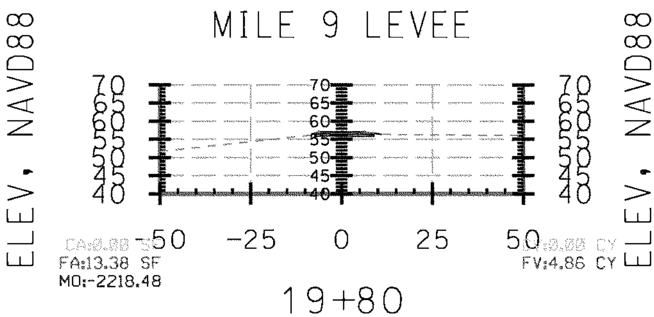
STA.19+50 TO STA.19+70

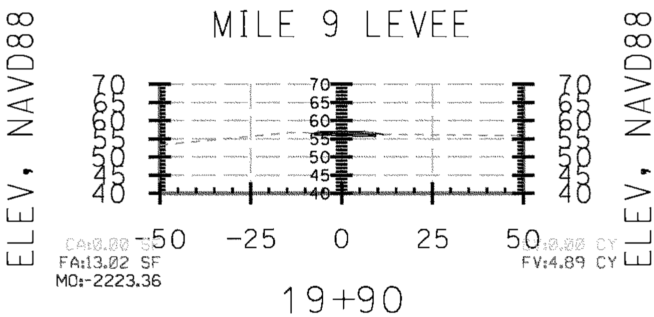


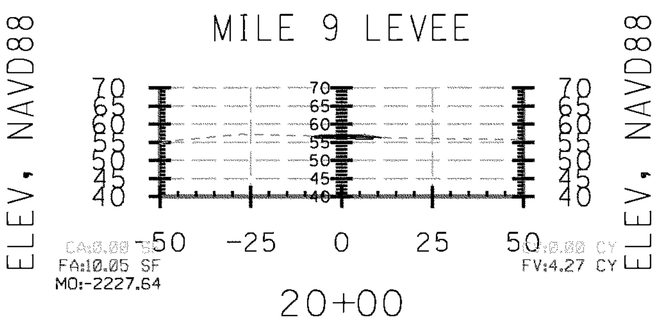



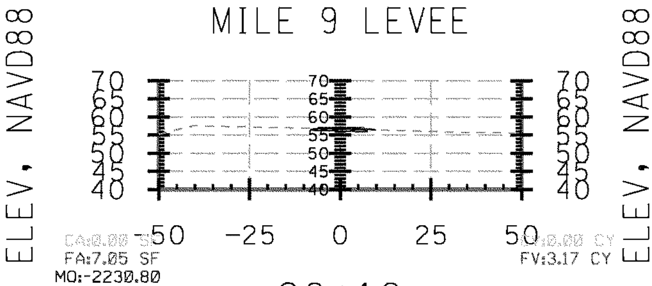
# STA.19+80 TO STA.20+00



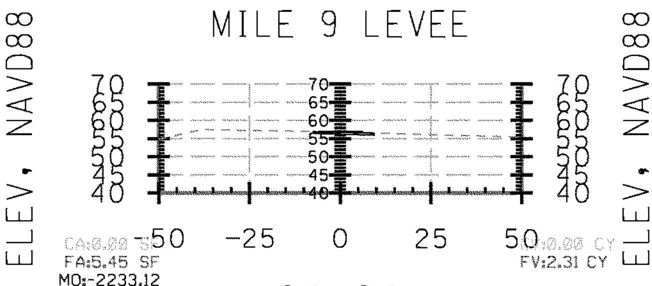



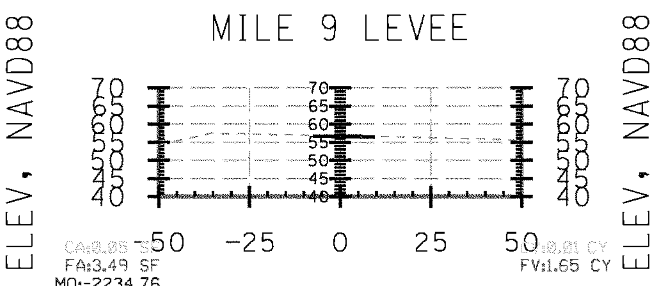
# STA.20+10 TO STA.20+30




20+10

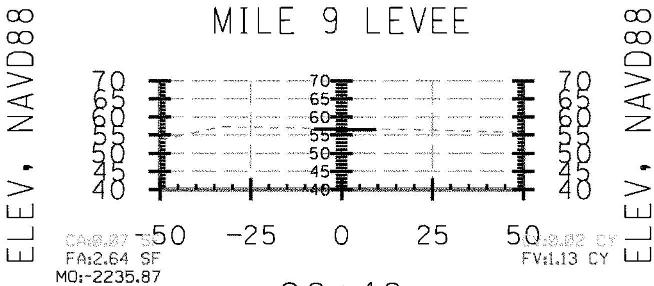



20+20

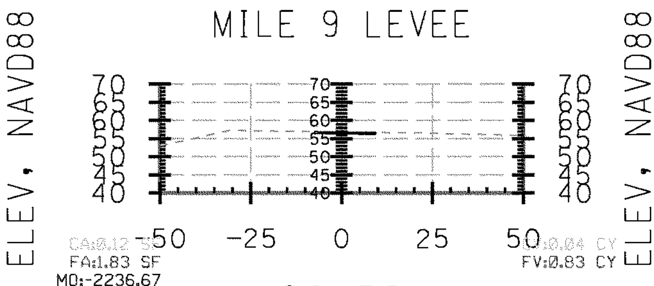



20+30

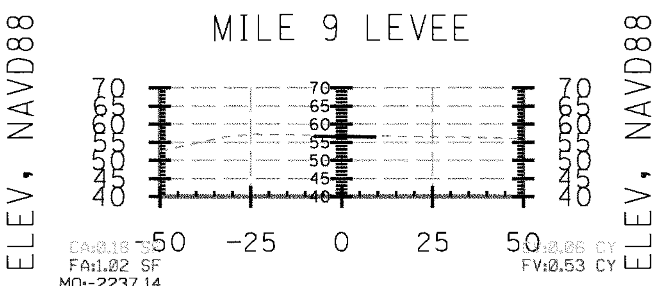
STA.20+40 TO STA.20+60




20+40

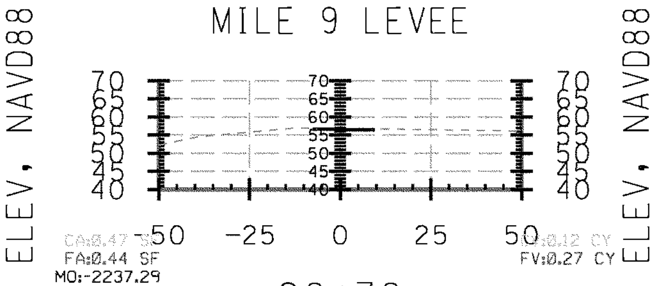



20+50

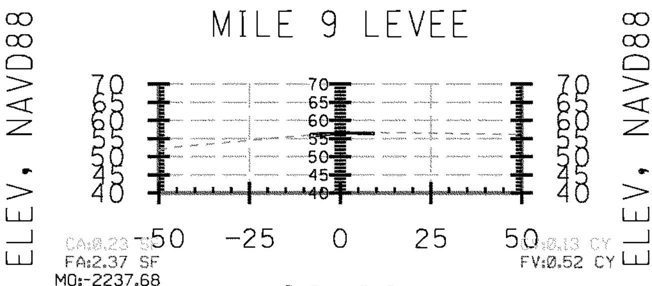



20+60

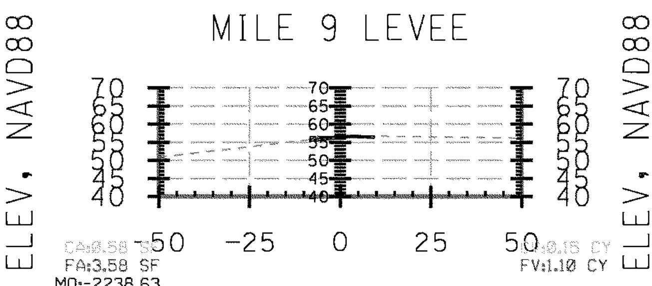
STA.20+70 TO STA.20+90




20+70

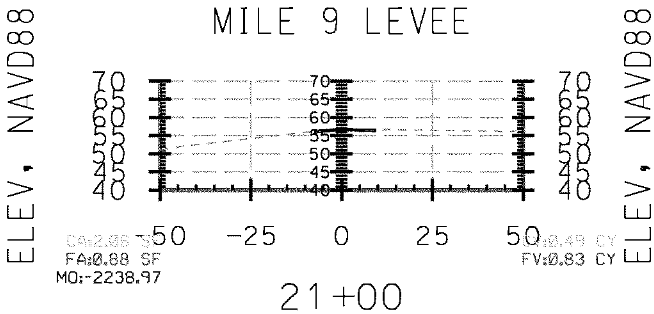


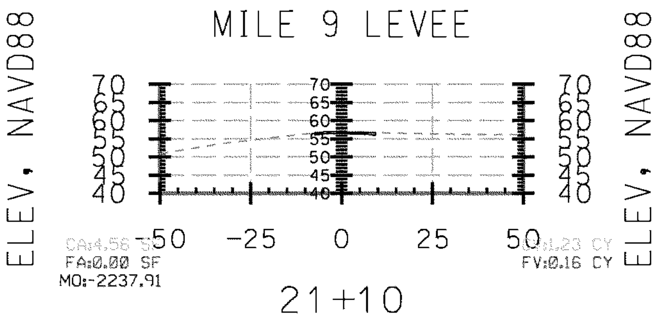

20+80

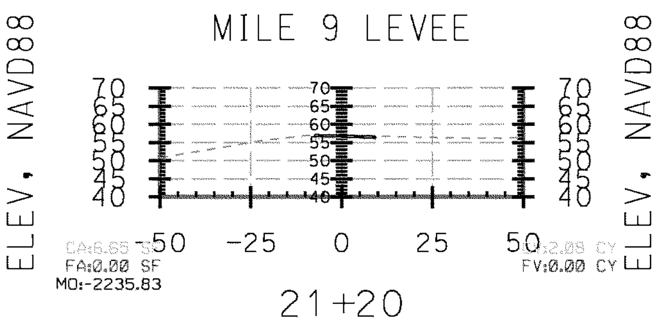



20+90

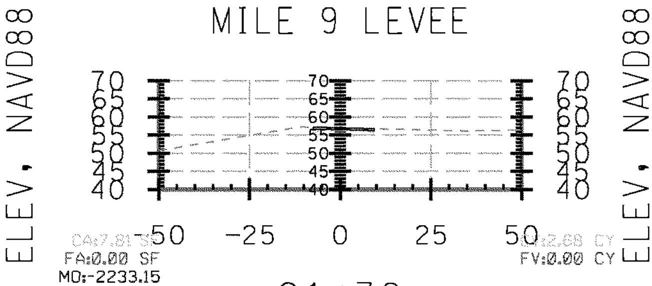
# STA.21+00 TO STA.21+20



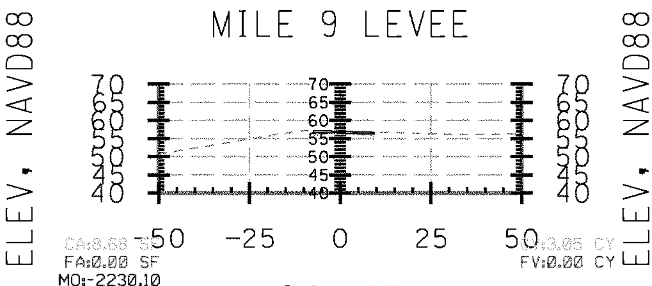



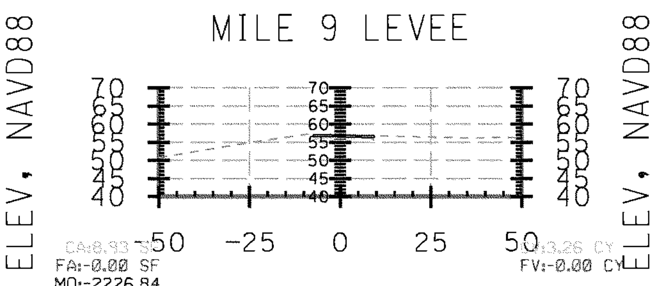
# STA.21+30 TO STA.21+50




21+30

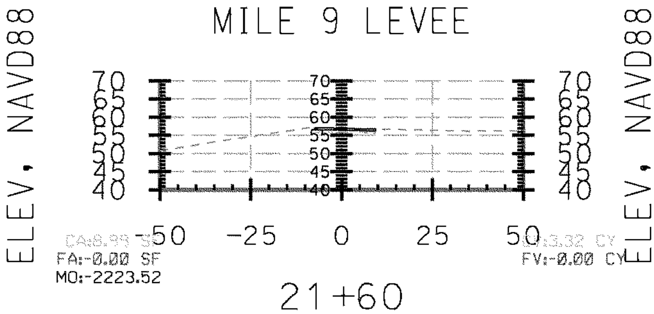


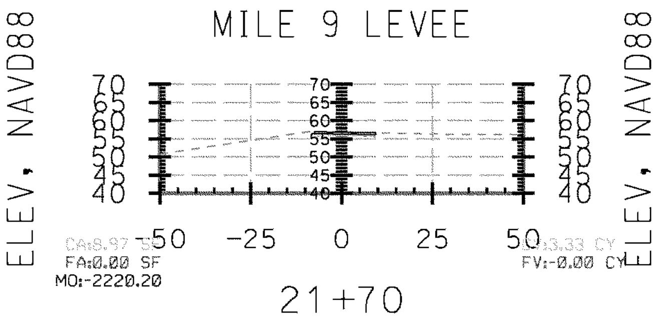

21+40

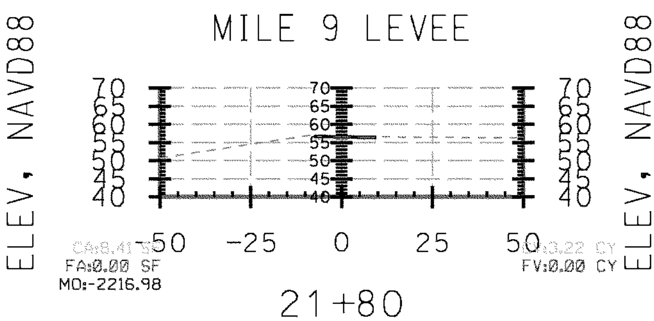



21+50

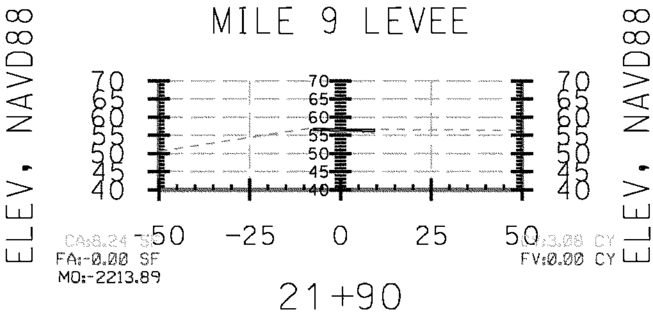
STA.21+60 TO STA.21+80

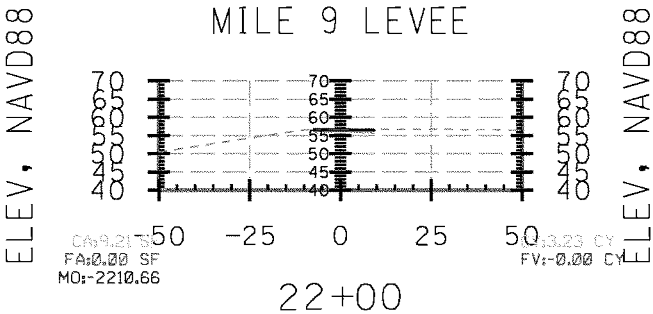


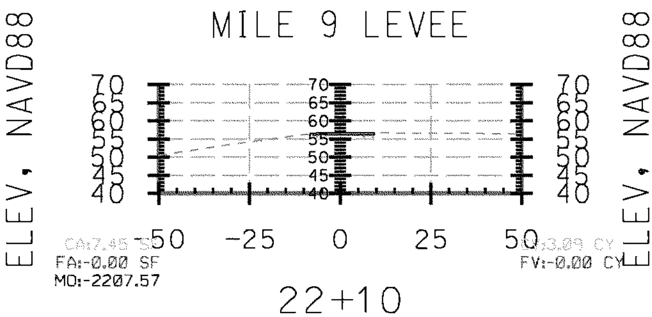



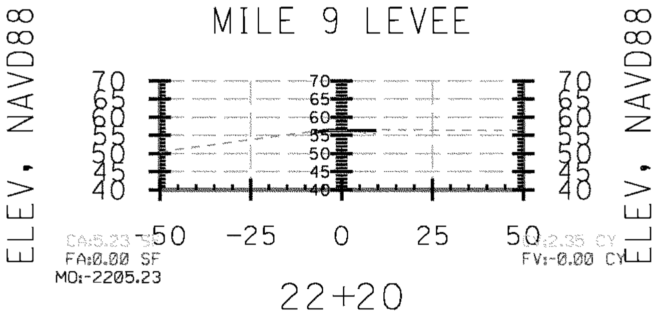
STA.21+90 TO STA.22+10

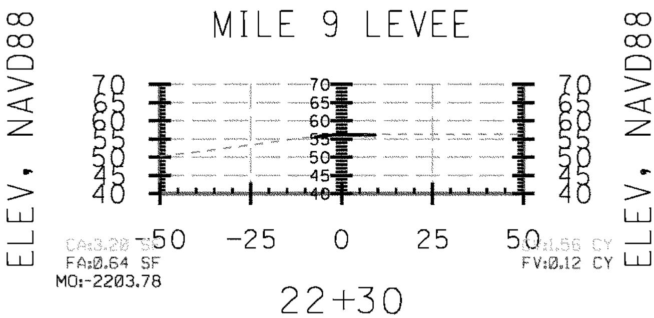


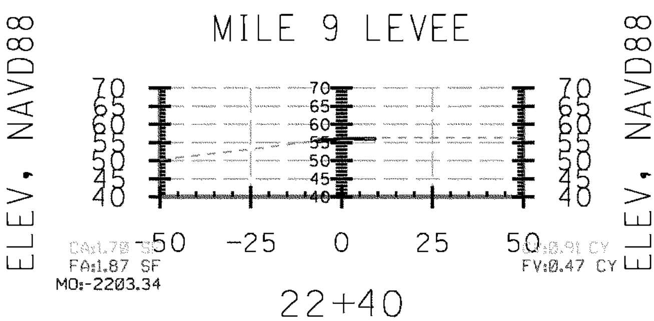



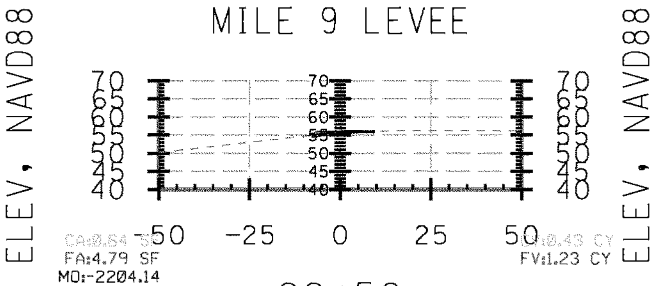
# STA.22+20 TO STA.22+40



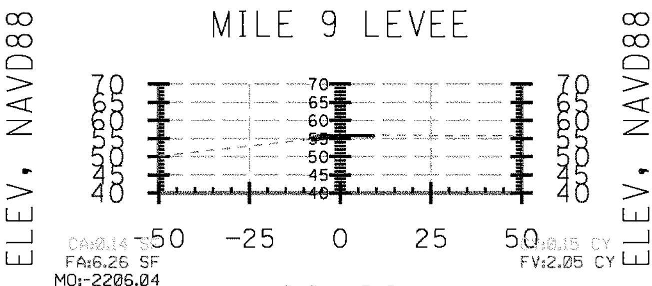



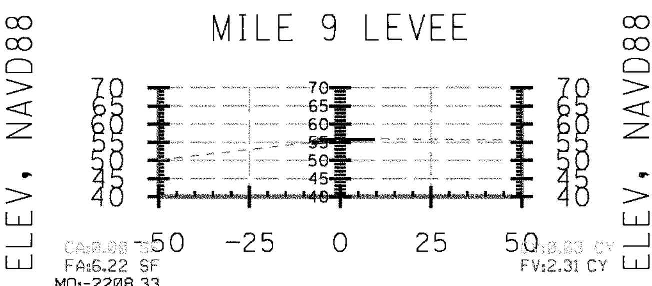
# STA.22+50 TO STA.22+70




22+50

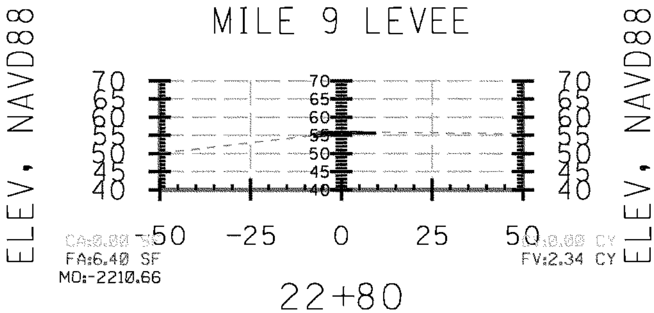


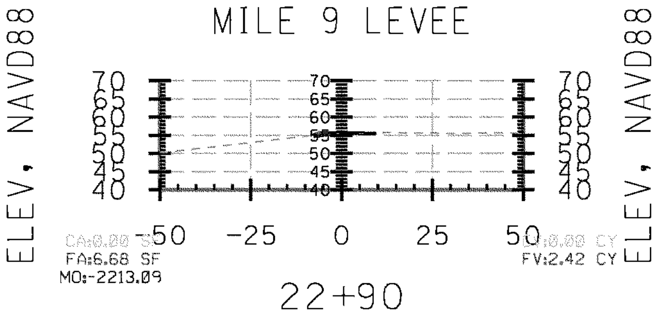

22+60

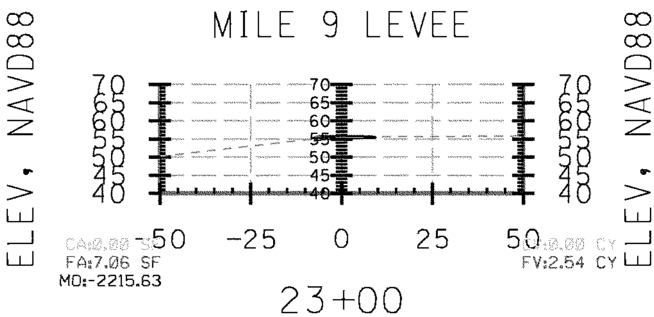



22+70

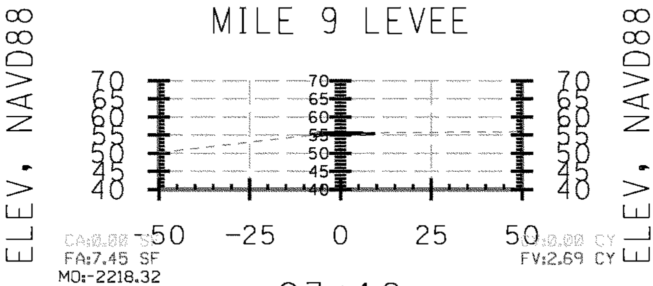
STA.22+80 TO STA.23+00



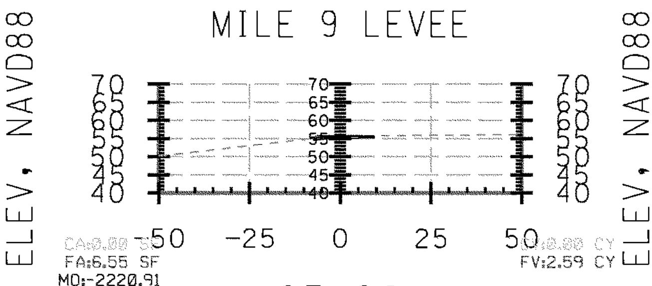



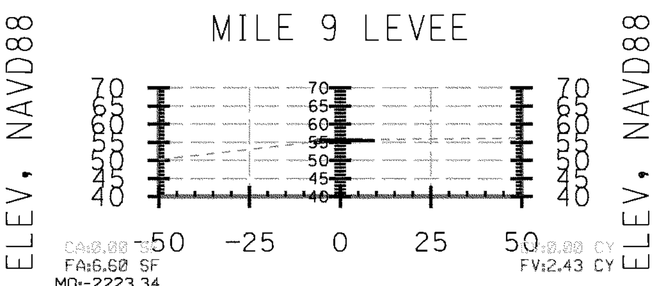
STA.23+10 TO STA.23+30




23+10

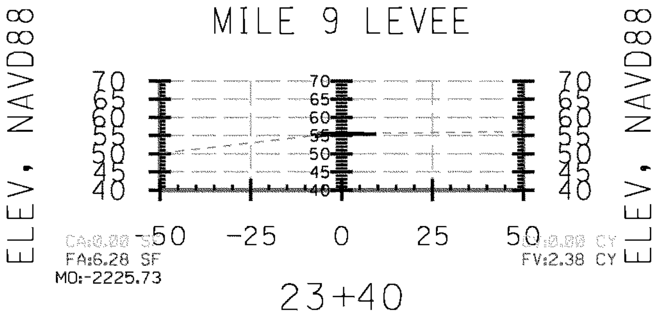


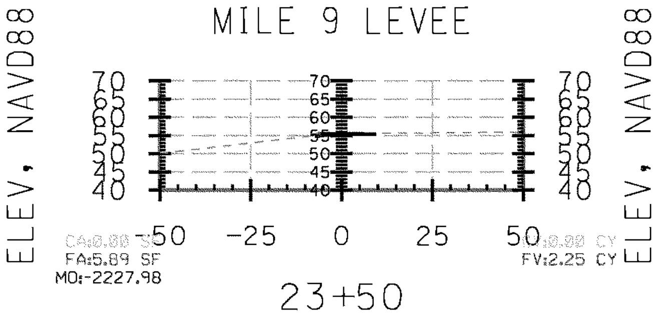

23+20

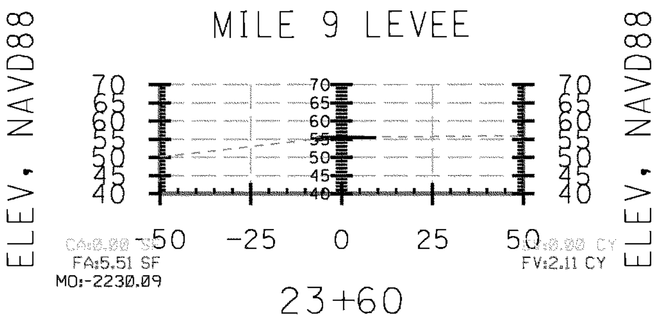



23+30

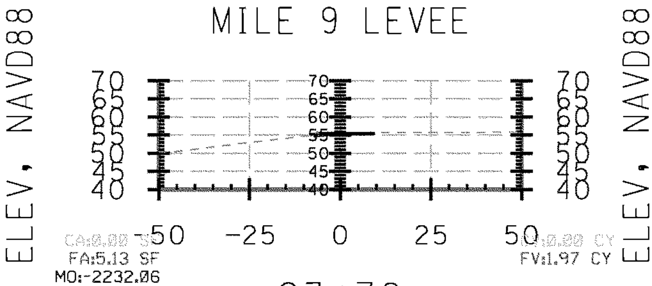
STA.23+40 TO STA.23+60



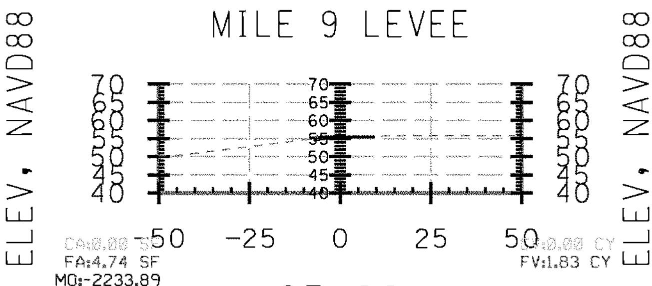



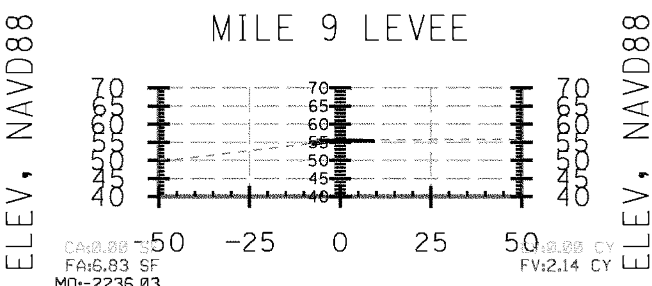
# STA.23+70 TO STA.23+90




23+70

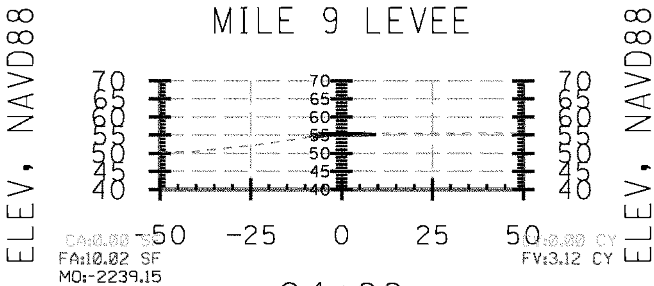



23+80

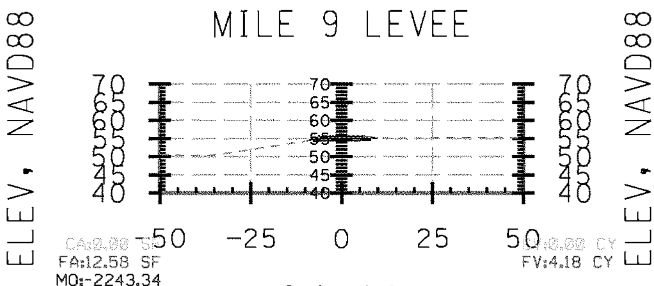



23+90

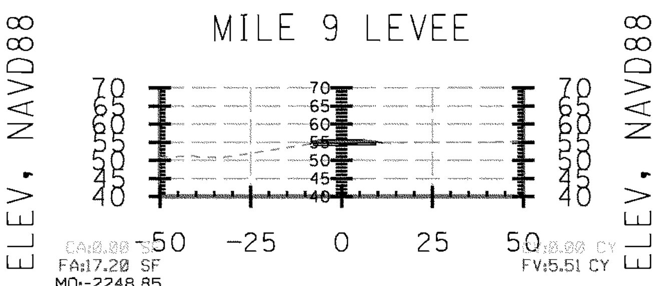
# STA.24+00 TO STA.24+20




24+00

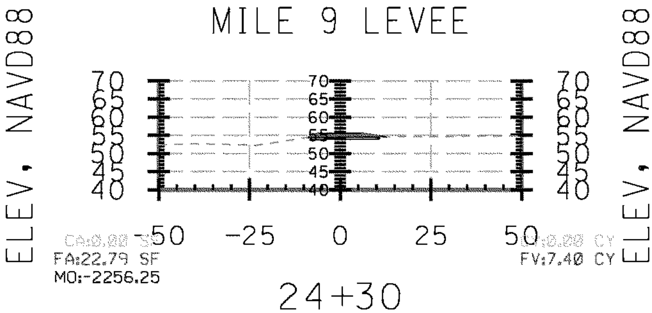


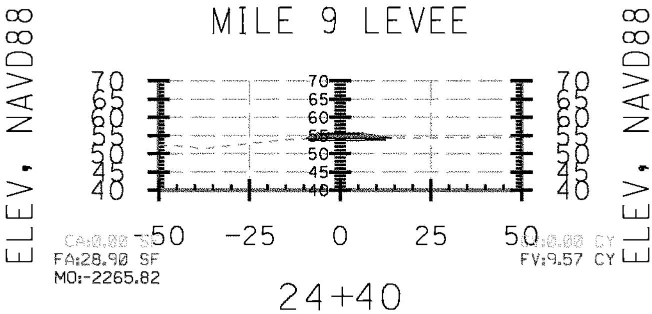

24+10

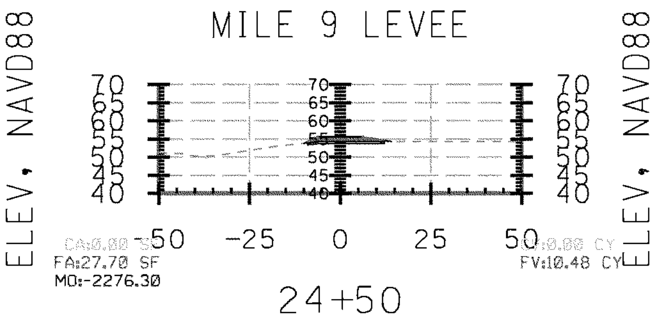



24+20

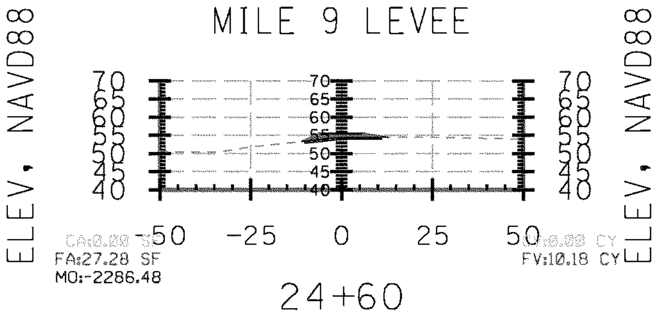
STA.24+30 TO STA.24+50

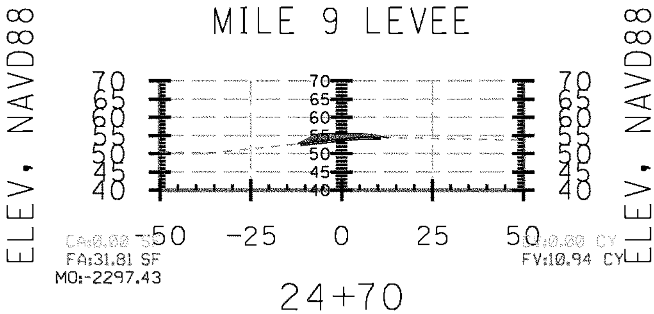


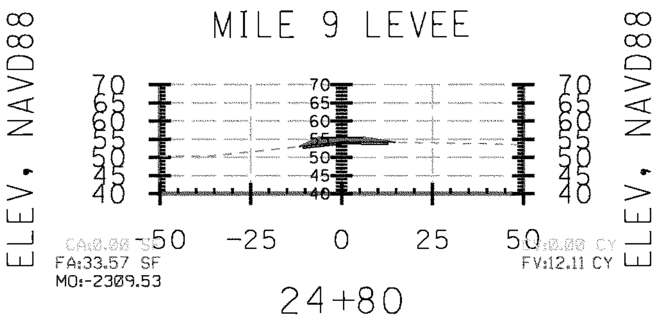



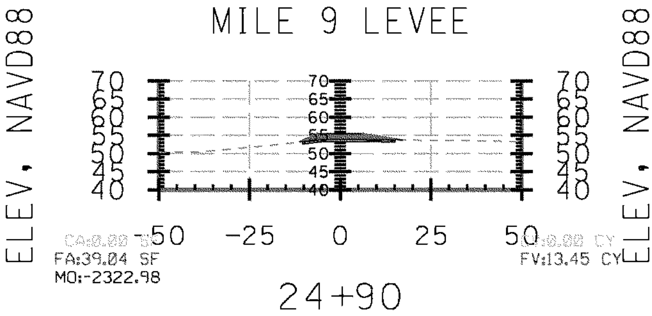
STA.24+60 TO STA.24+80

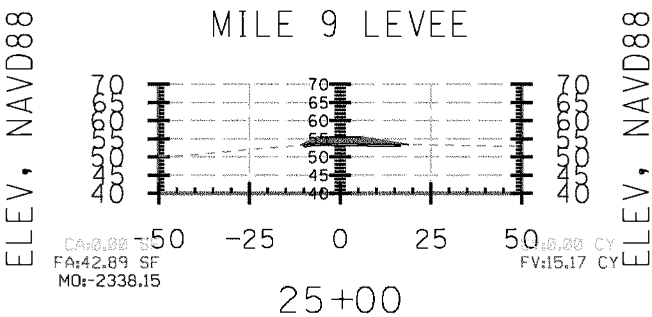


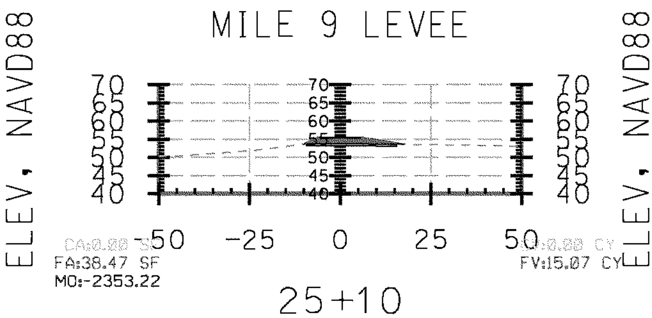



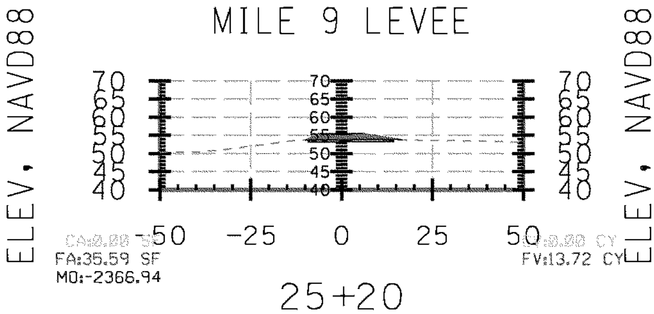
STA.24+90 TO STA.25+10

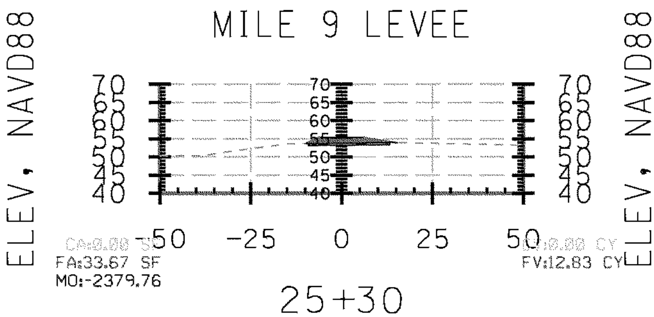


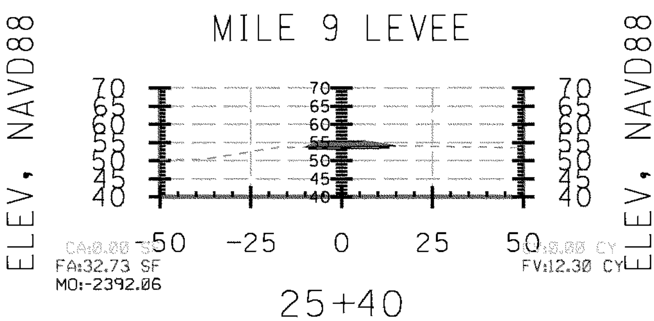



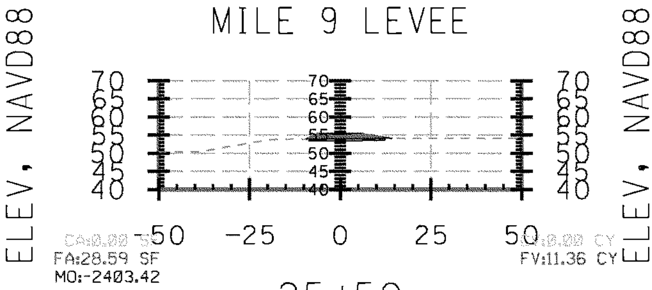
# STA.25+20 TO STA.25+40



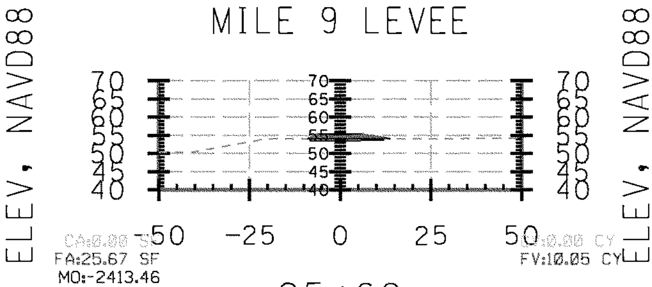



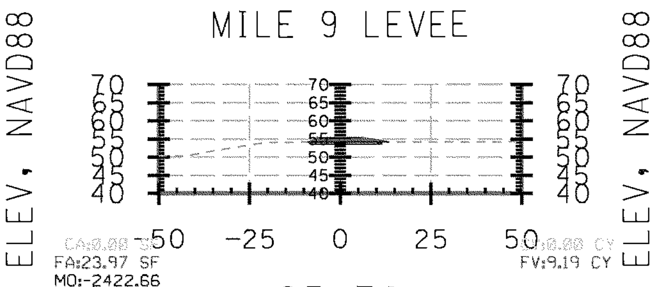
STA.25+50 TO STA.25+70




25+50

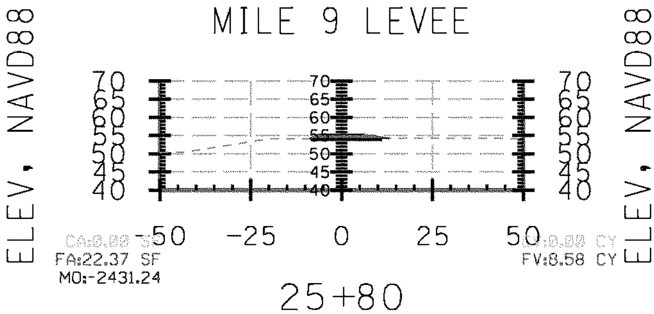


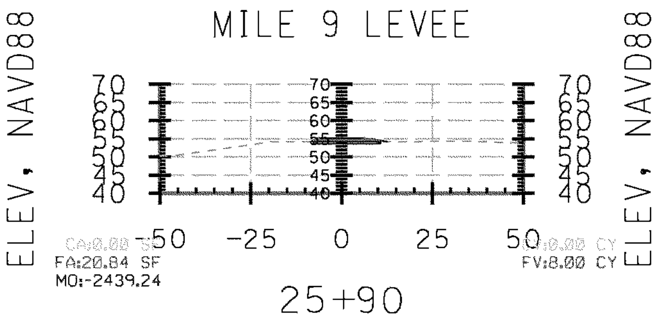

25+60

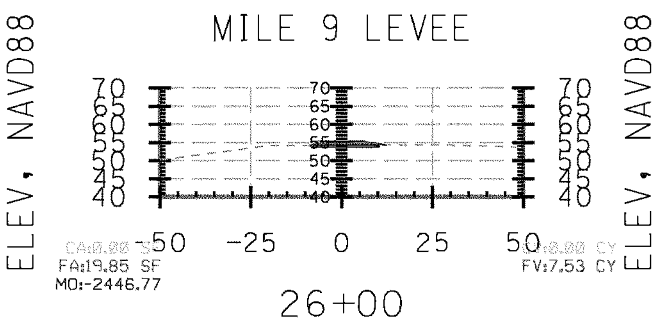



25+70

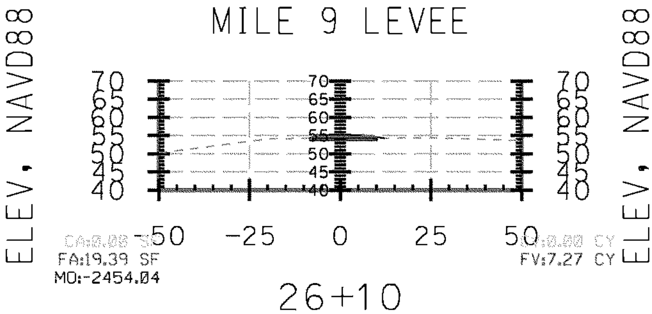
STA.25+80 TO STA.26+00

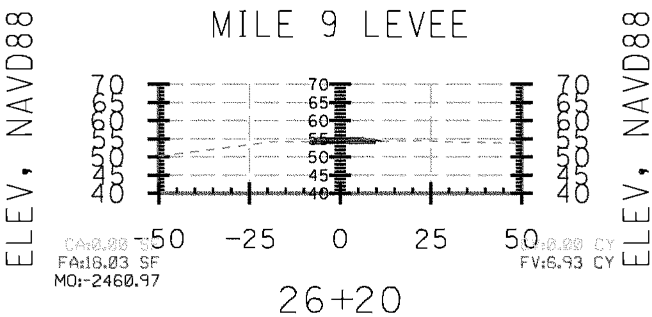


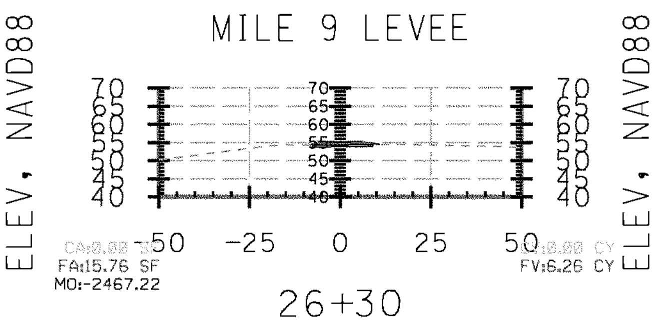



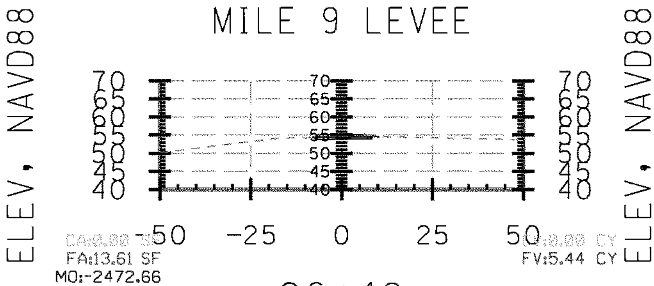
STA.26+10 TO STA.26+30



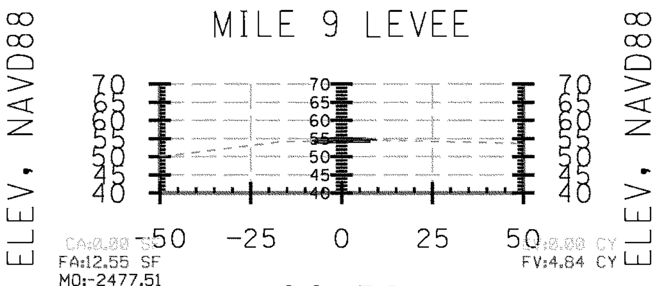



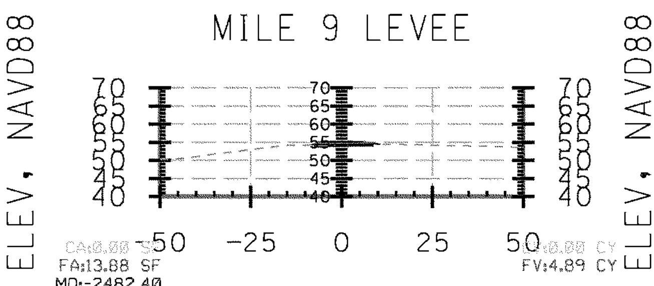
# STA.26+40 TO STA.26+60




26+40

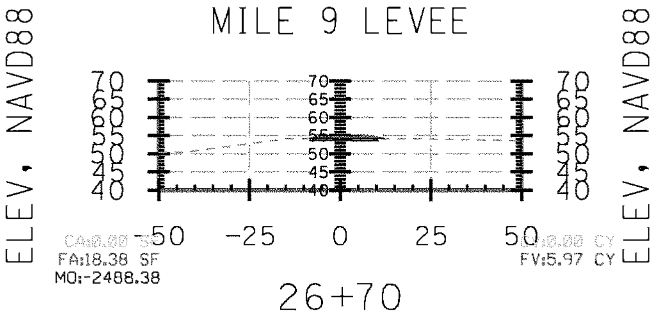


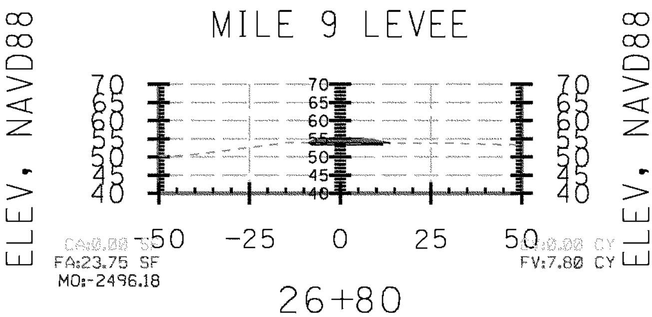

26+50

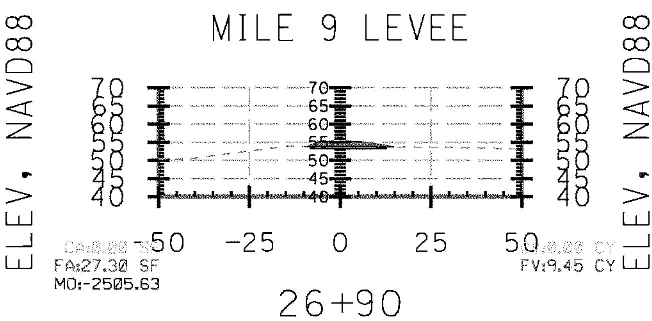



26+60

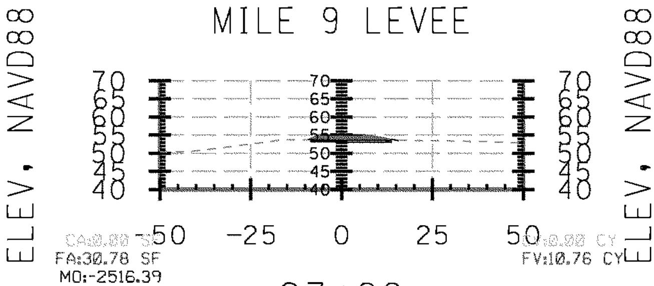
# STA.26+70 TO STA.26+90



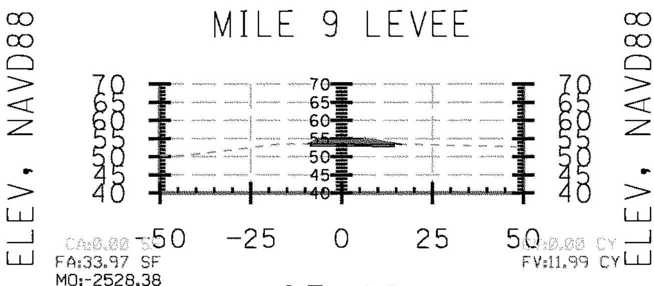



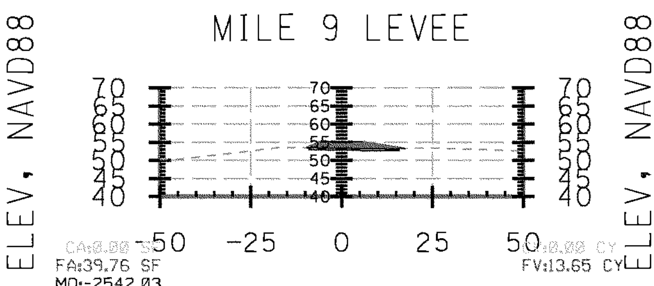
STA.27+00 TO STA.27+20




27+00

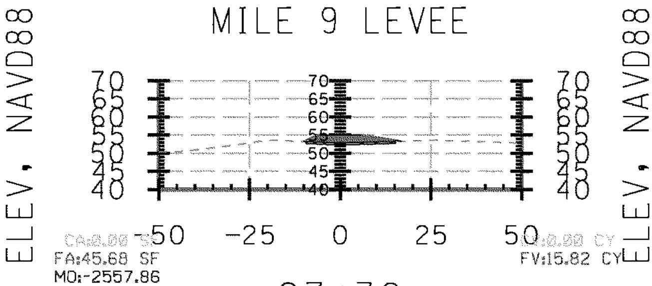



27+10

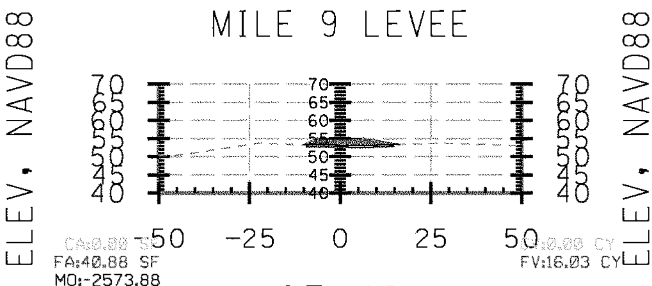



27+20

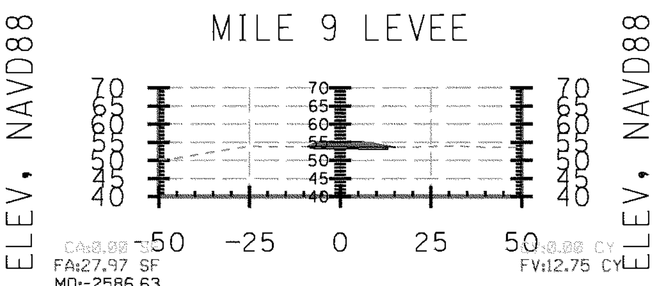
STA.27+30 TO STA.27+50




27+30

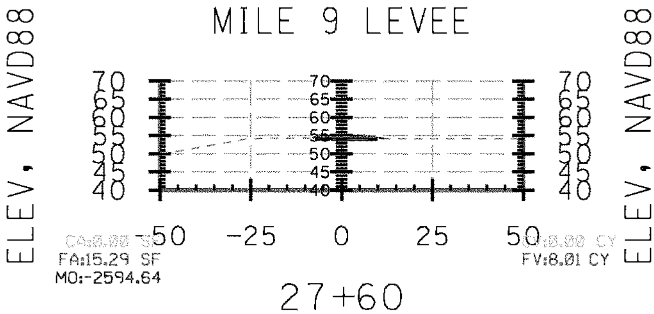


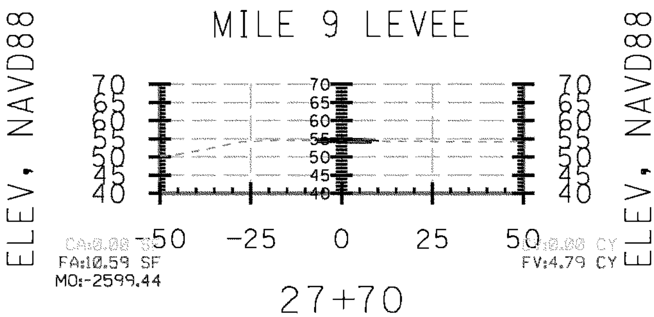

27+40

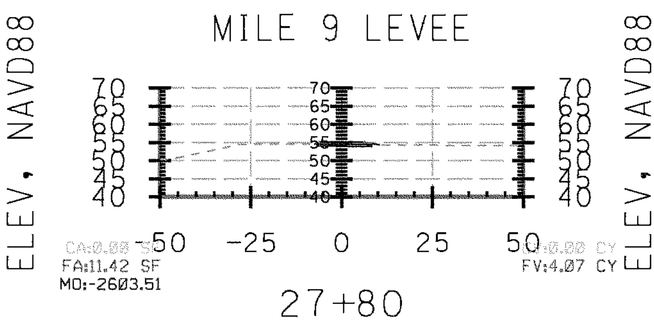



27+50

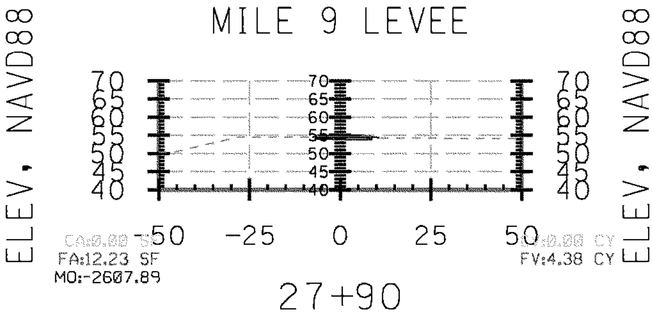
STA.27+60 TO STA.27+80

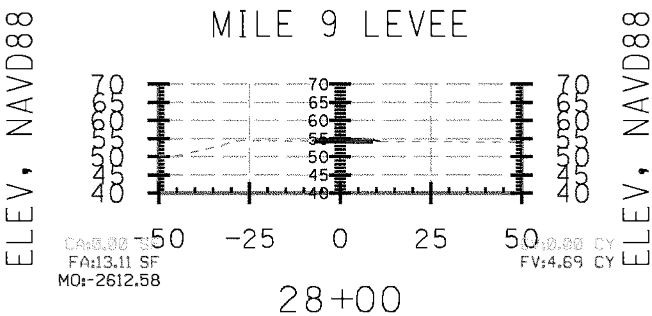


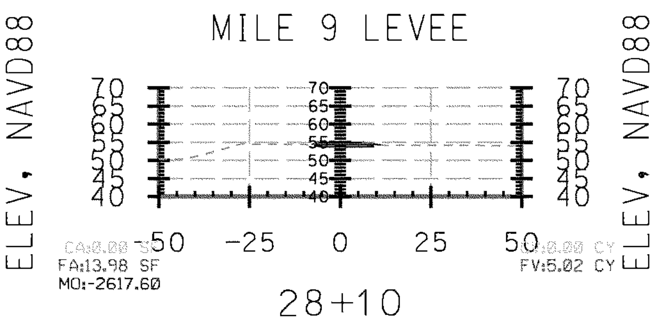



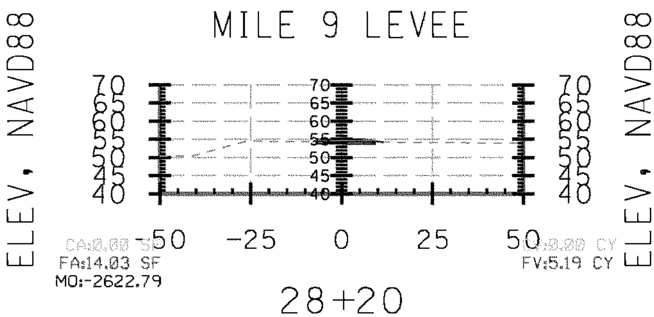
# STA.27+90 TO STA.28+10

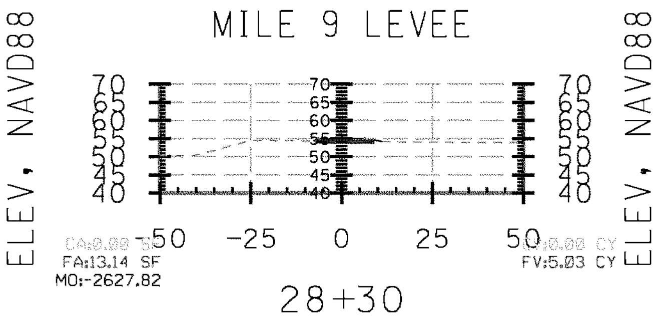


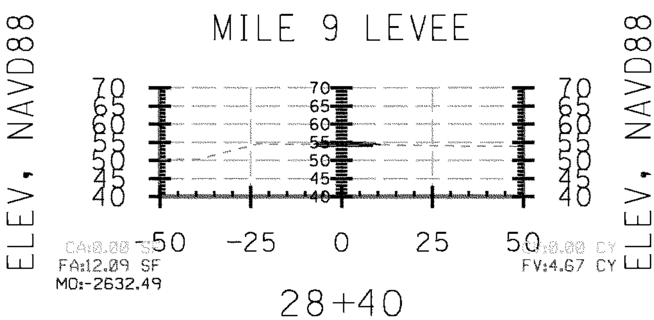



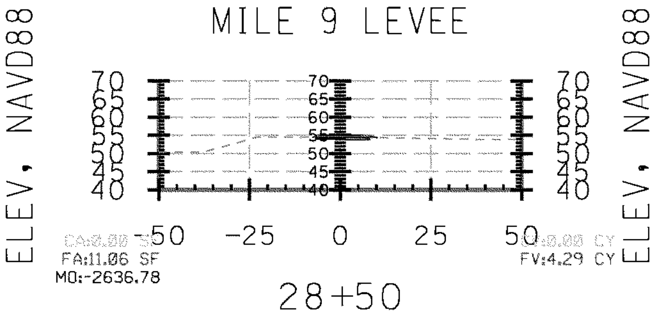
STA.28+20 TO STA.28+40

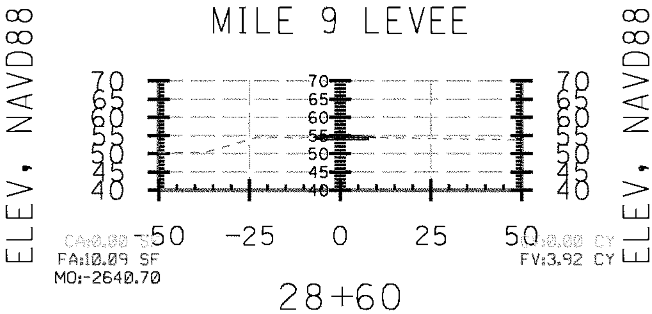


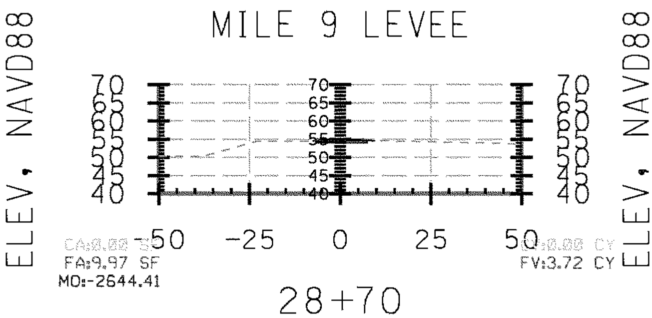



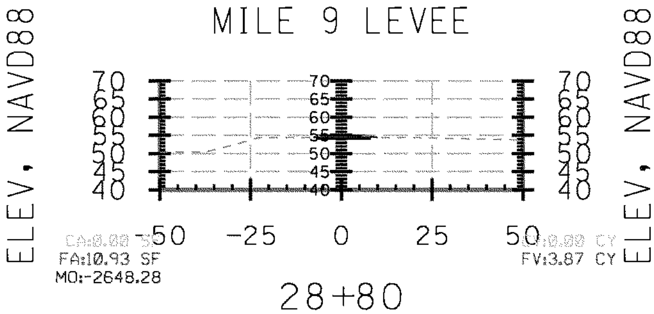
STA.28+50 TO STA.28+70

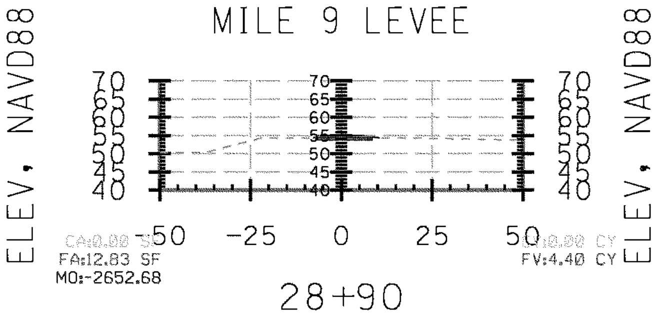


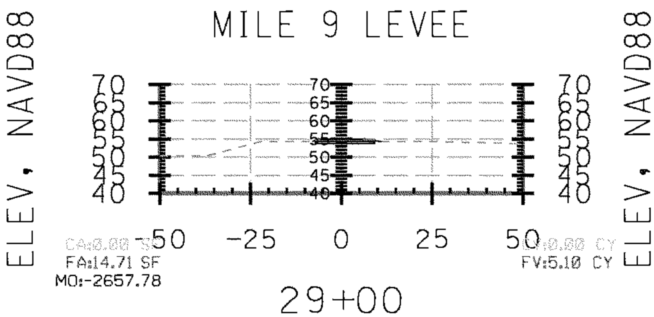



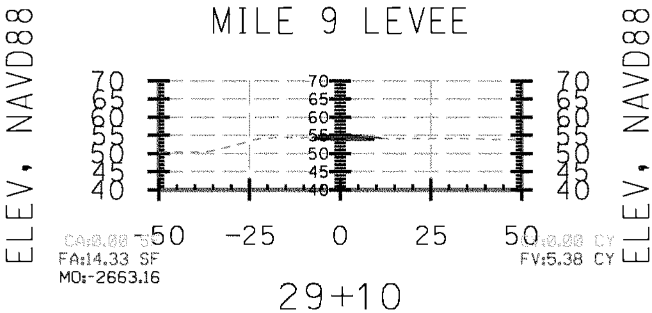
STA.28+80 TO STA.29+00

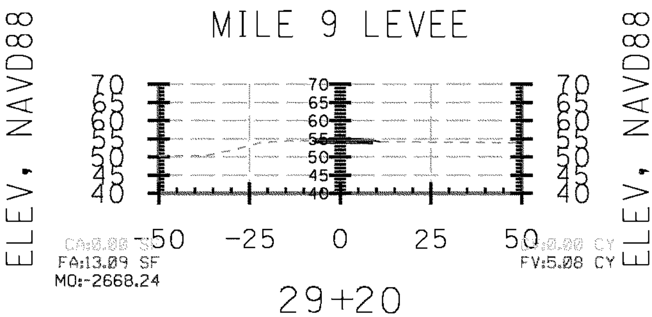


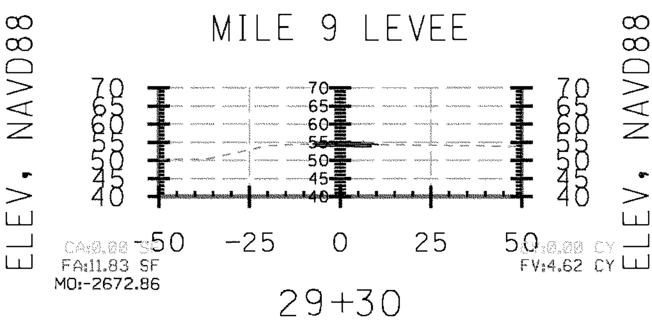



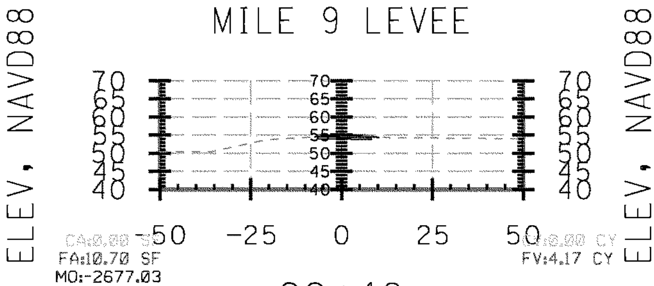
STA.29+10 TO STA.29+30



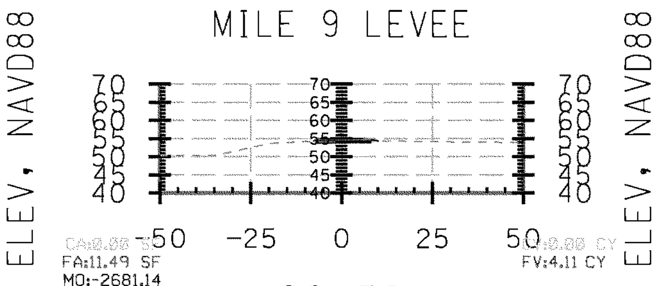



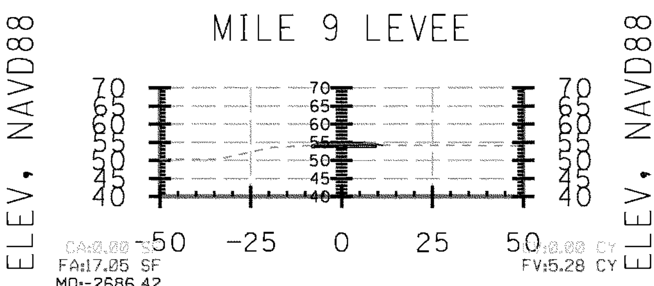
# STA.29+40 TO STA.29+60




29+40

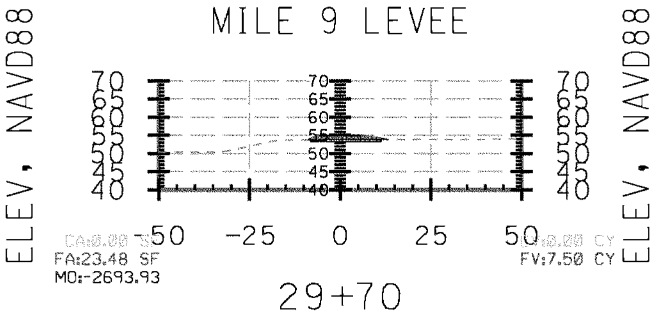


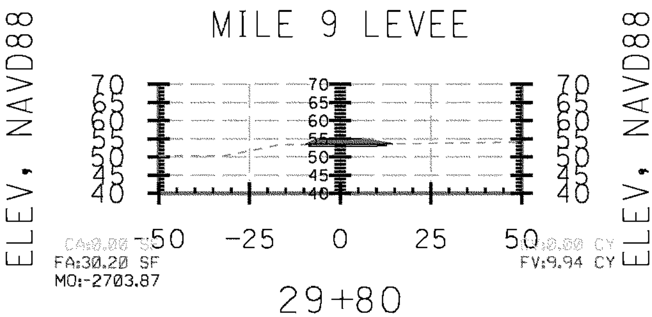

29+50

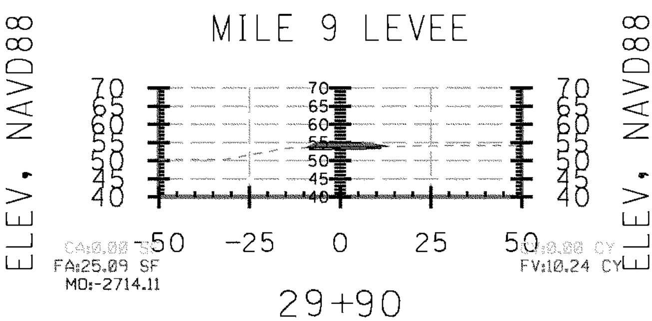



29+60

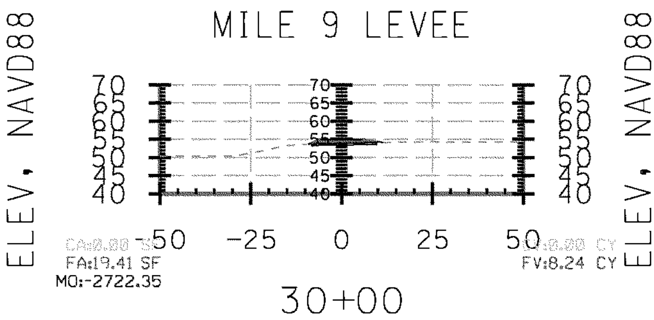
STA.29+70 TO STA.29+90

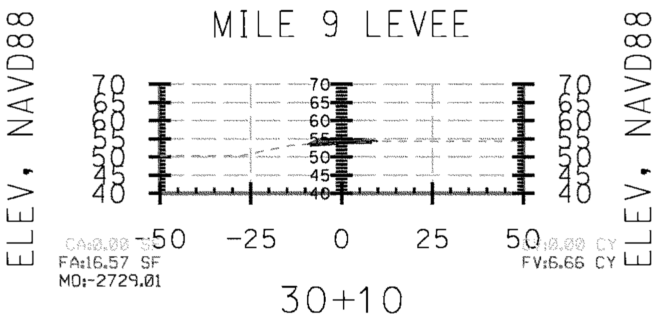


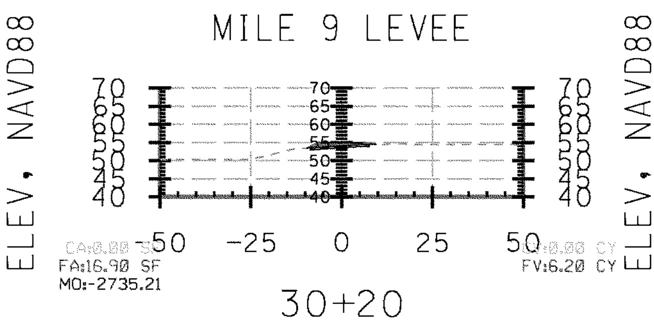



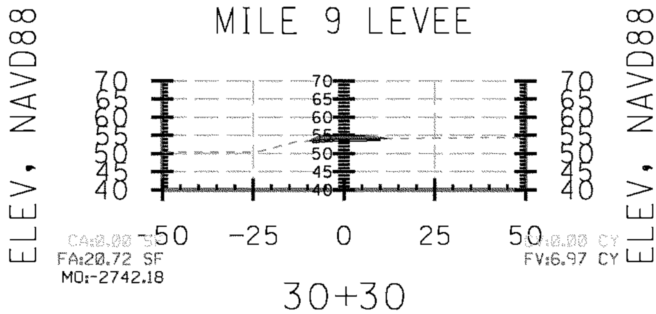
# STA.30+00 TO STA.30+20

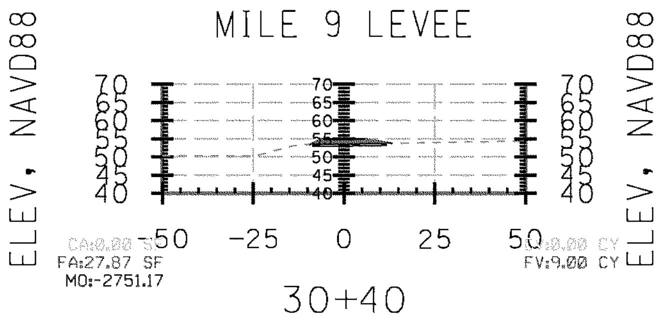


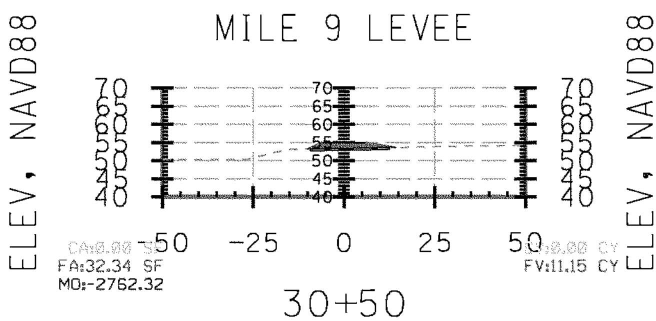



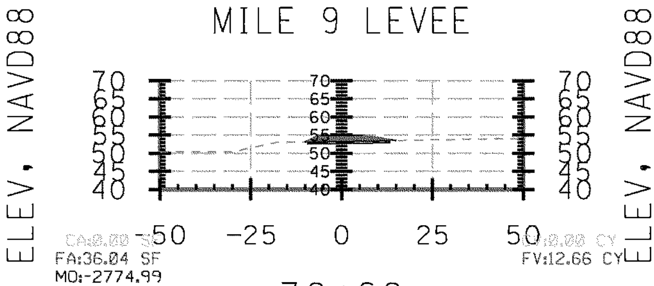
# STA.30+30 TO STA.30+50



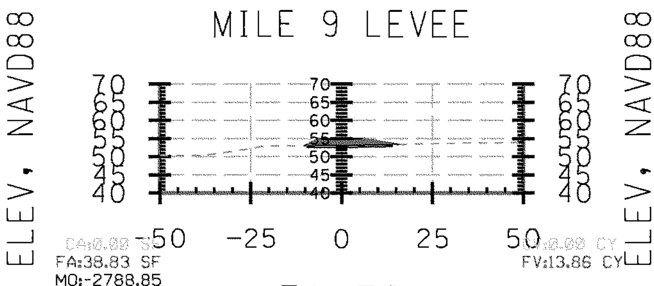



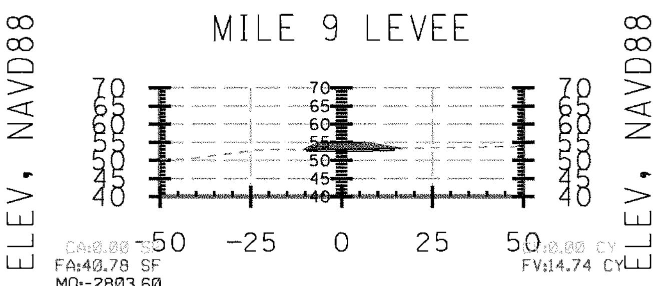
STA.30+60 TO STA.30+80




30+60

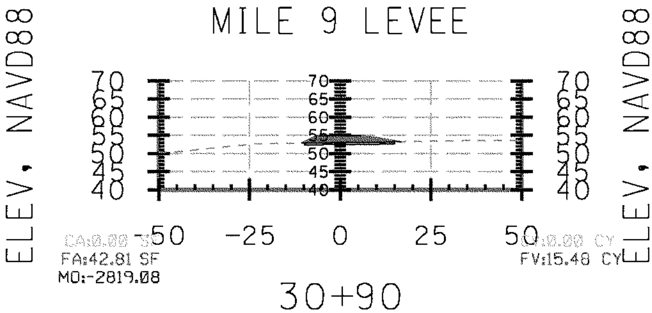


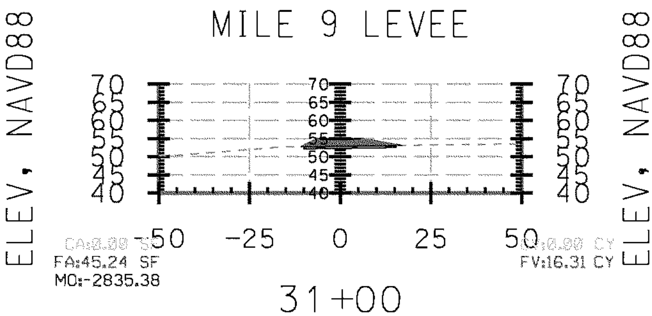

30+70

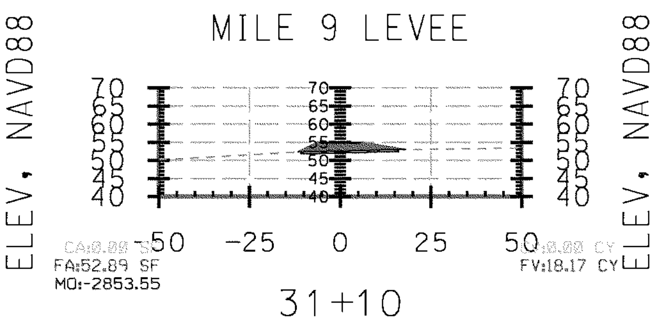



30+80

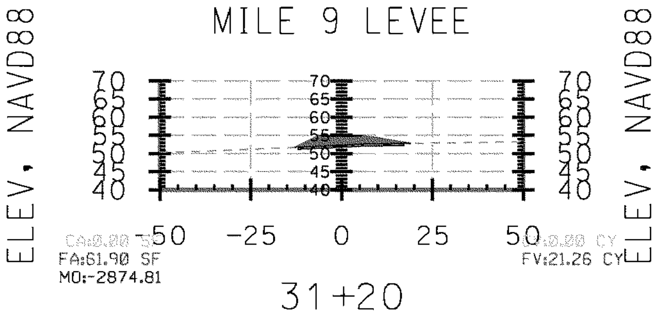
STA.30+90 TO STA.31+10

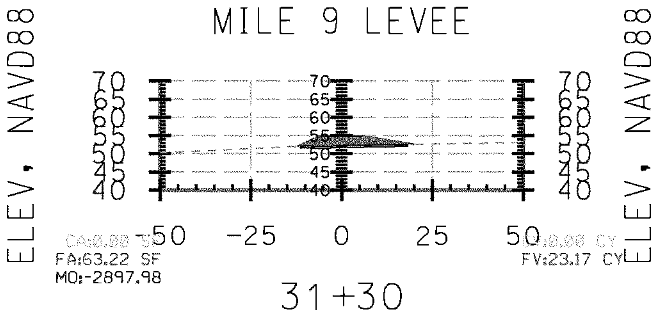


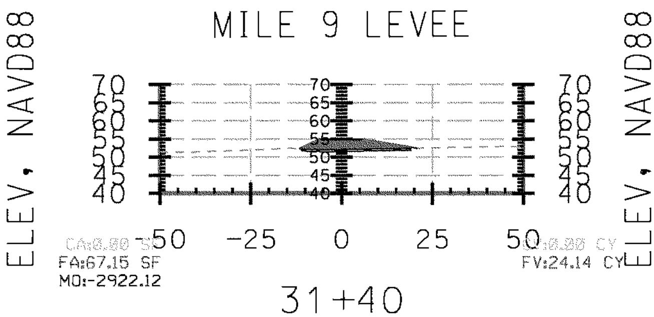



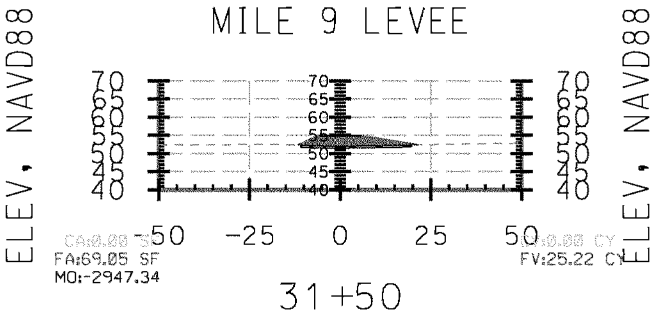
STA.31+20 TO STA.31+40

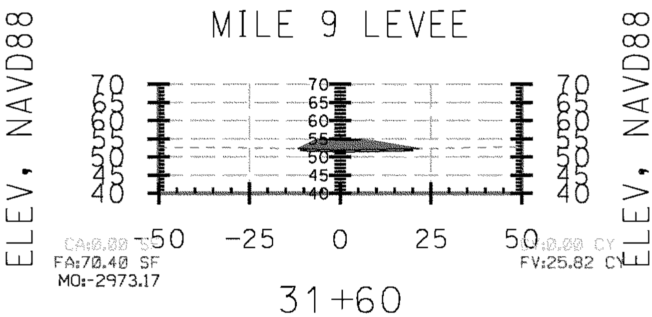


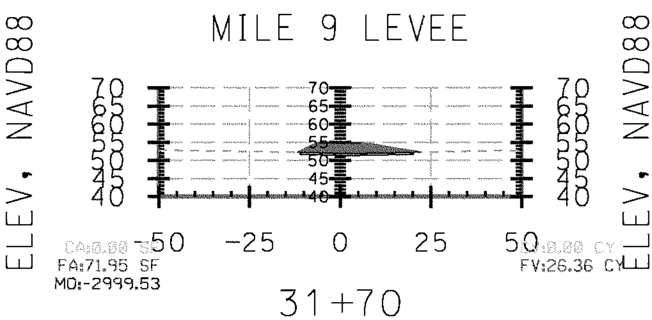



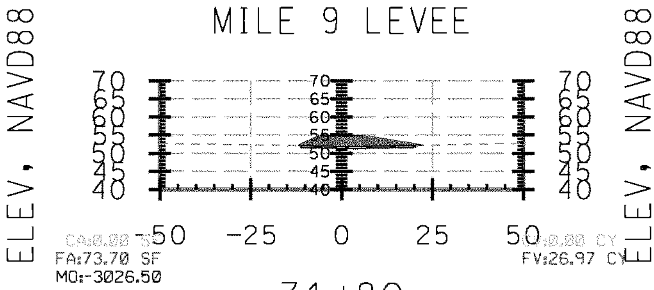
STA.31+50 TO STA.31+70



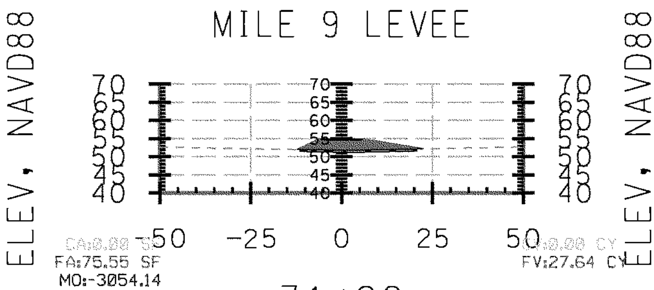



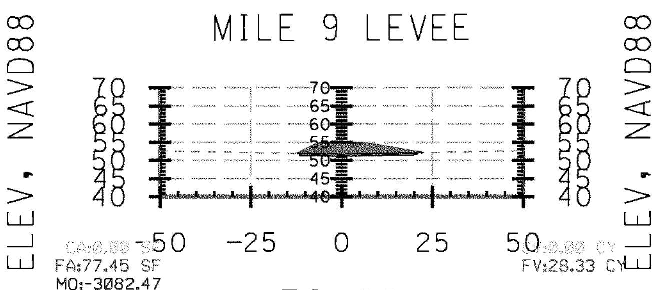
STA.31+80 TO STA.32+00




31+80

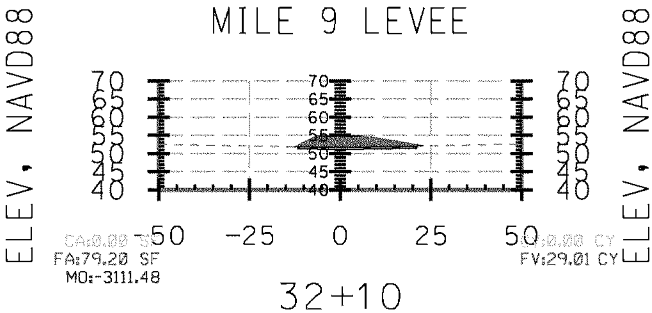


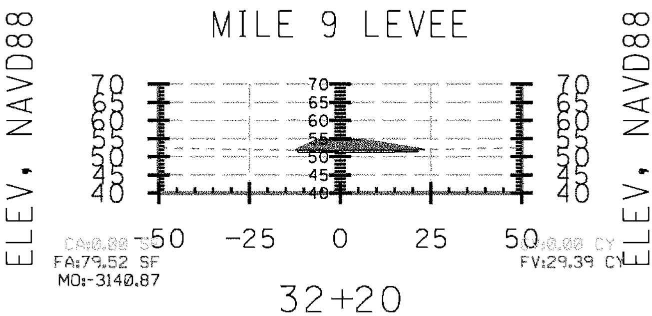

31+90

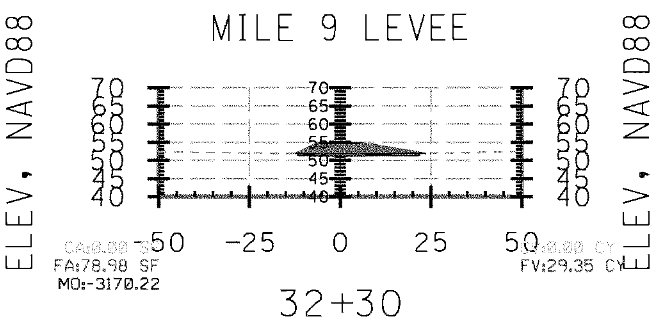



32+00

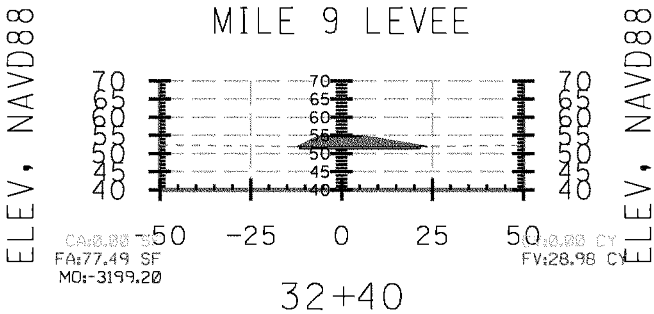
# STA.32+10 TO STA.32+30

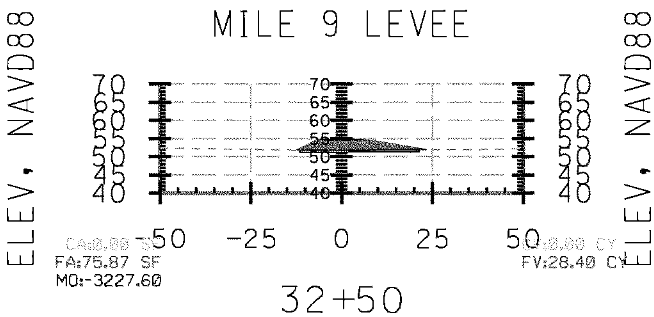


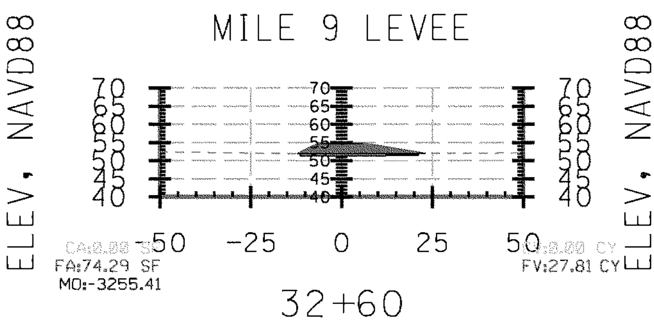



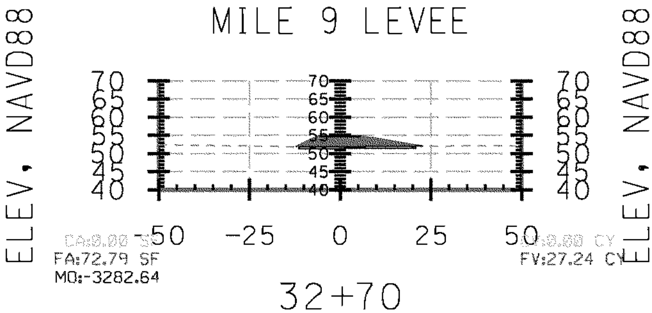
STA.32+40 TO STA.32+60

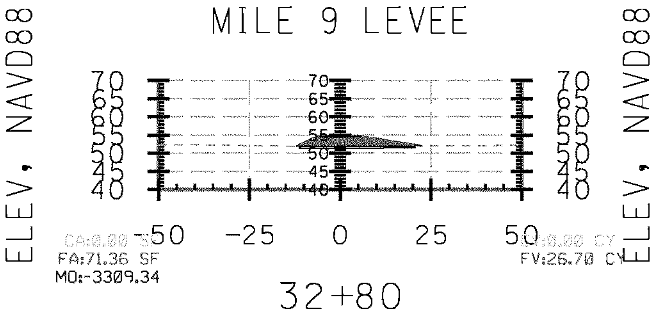


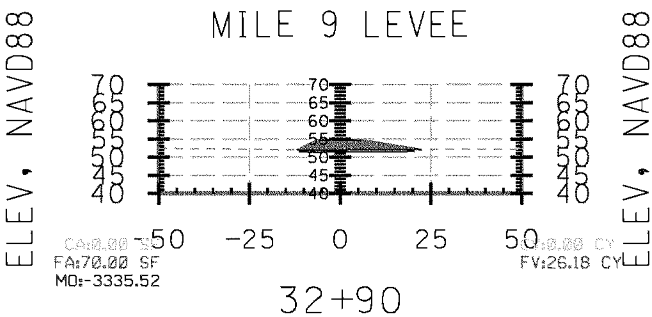



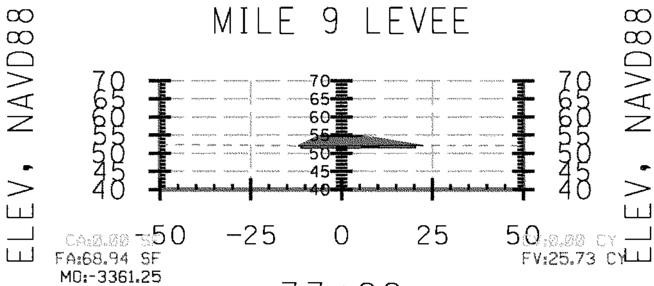
STA.32+70 TO STA.32+90



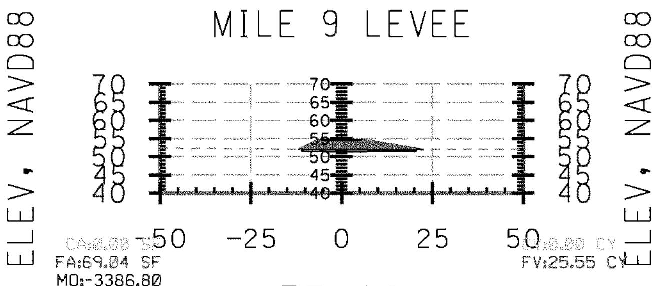



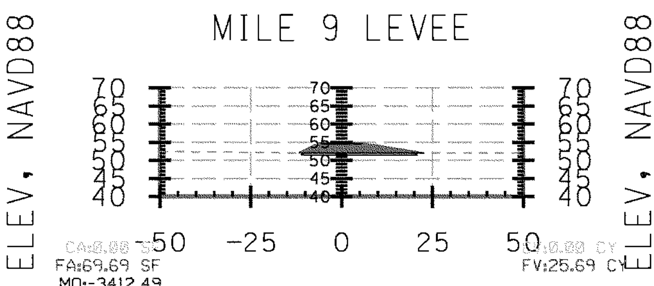
STA.33+00 TO STA.33+20




33+00

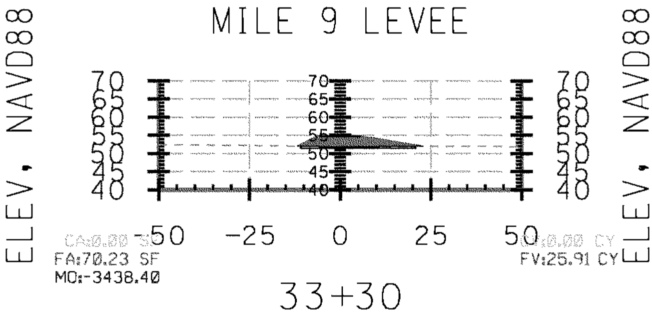


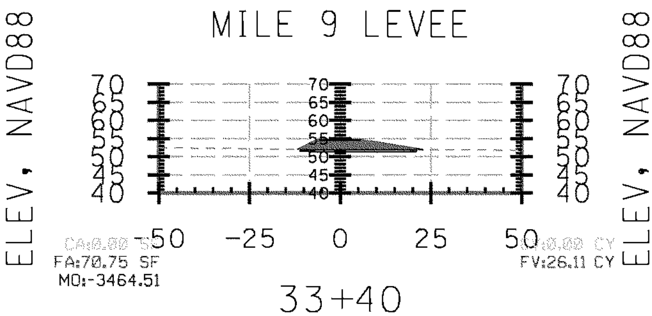

33+10

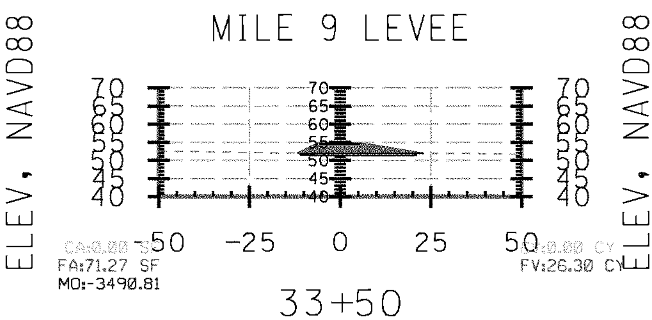



33+20

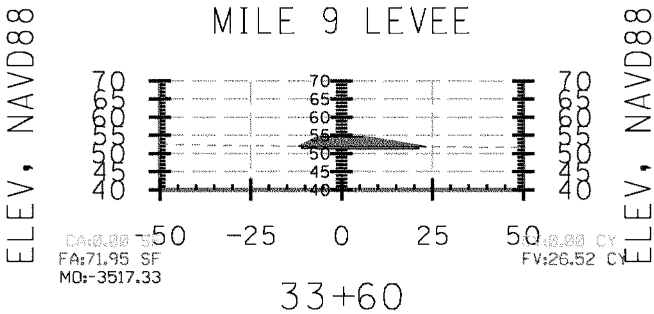
STA.33+30 TO STA.33+50

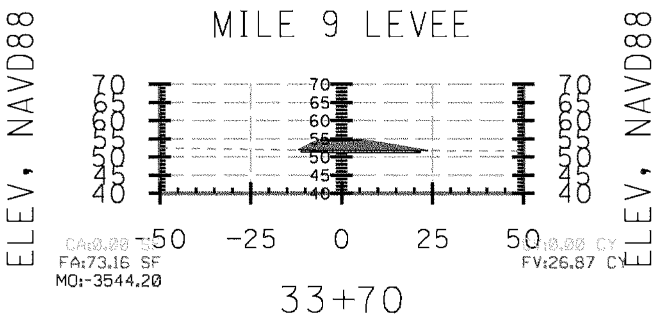


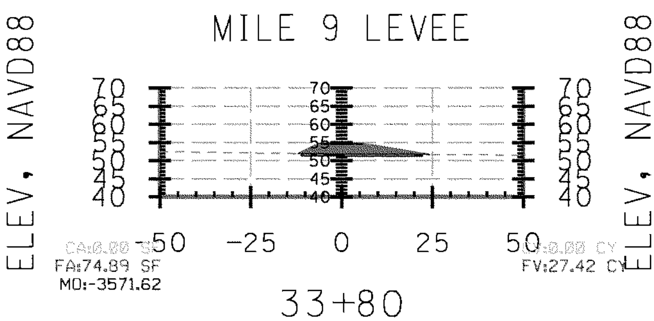



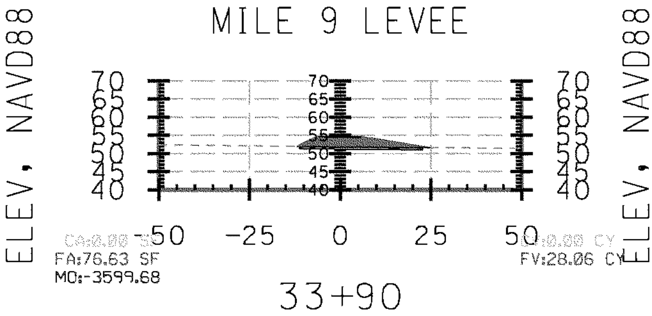
STA.33+60 TO STA.33+80

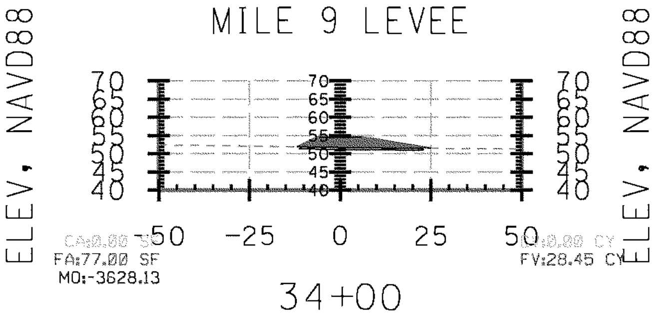


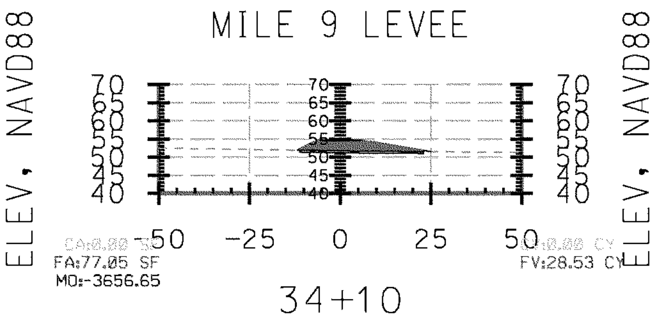



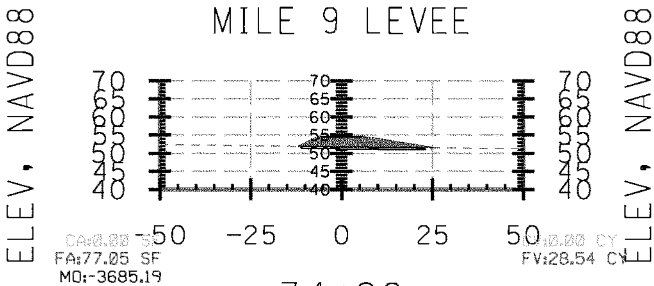
STA.33+90 TO STA.34+10



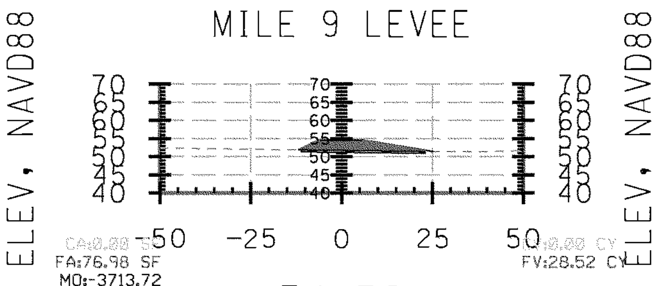



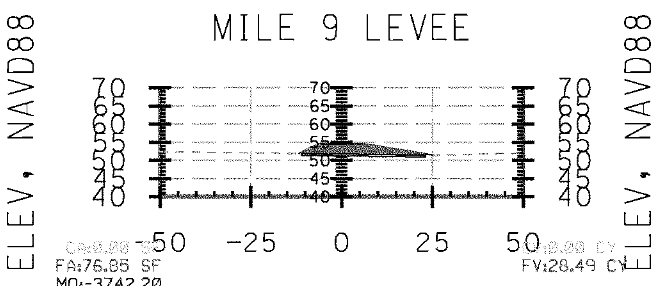
# STA.34+20 TO STA.34+40




34+20

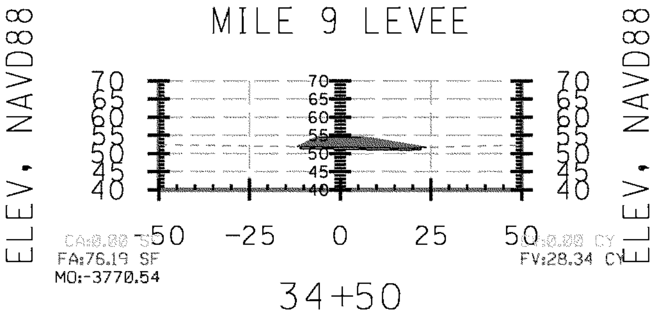


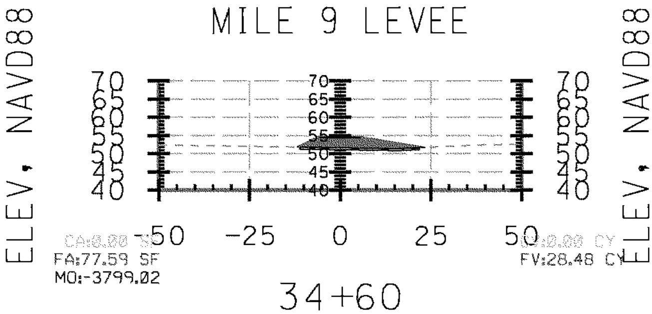

34+30

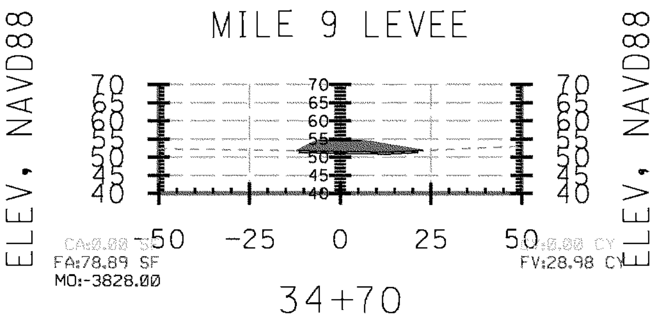



34+40

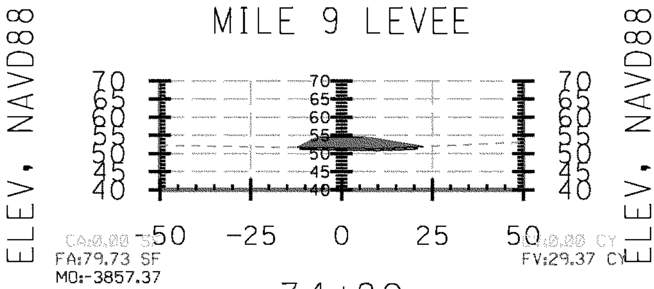
STA.34+50 TO STA.34+70



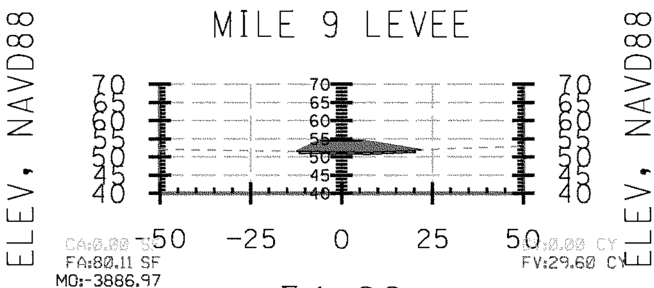



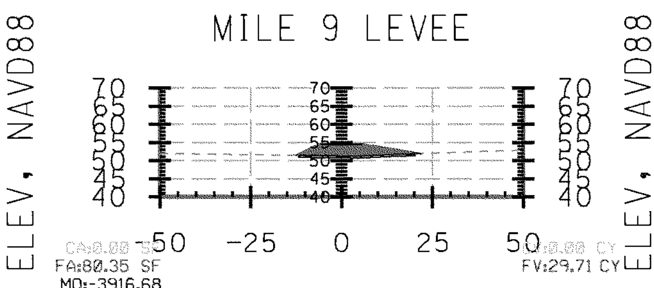
# STA.34+80 TO STA.35+00




34+80

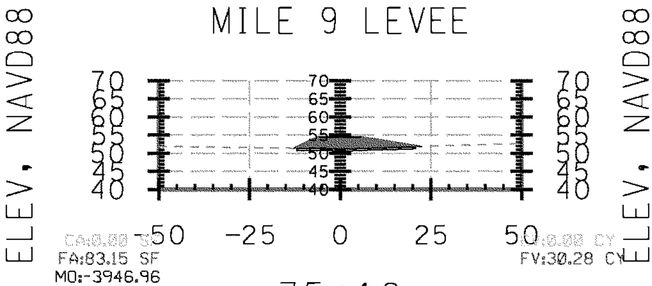



34+90

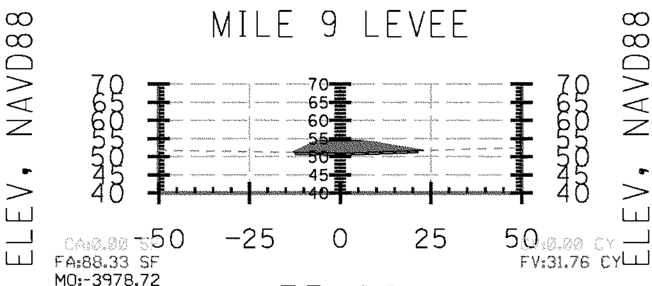



35+00

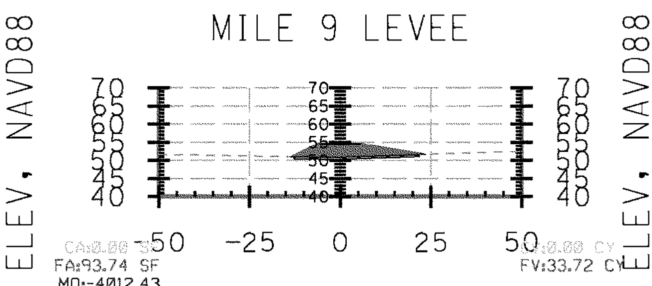
# STA.35+10 TO STA.35+30




35+10

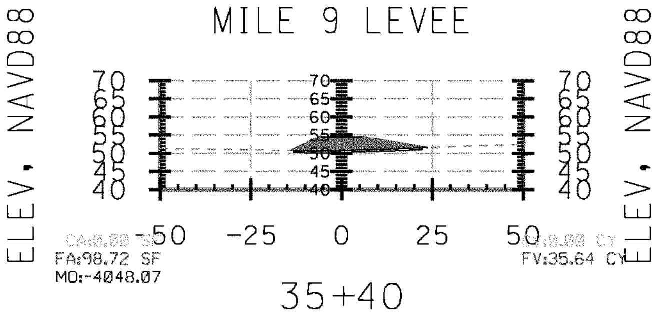


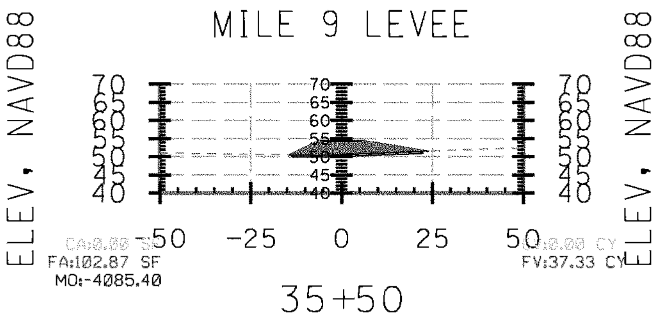

35+20

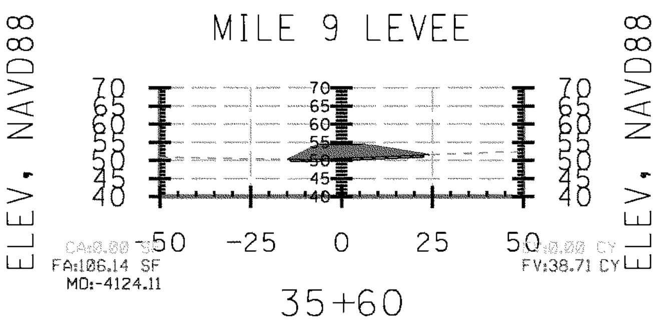



35+30

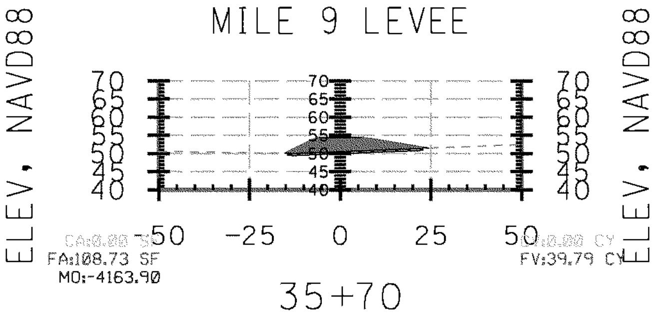
STA.35+40 TO STA.35+60

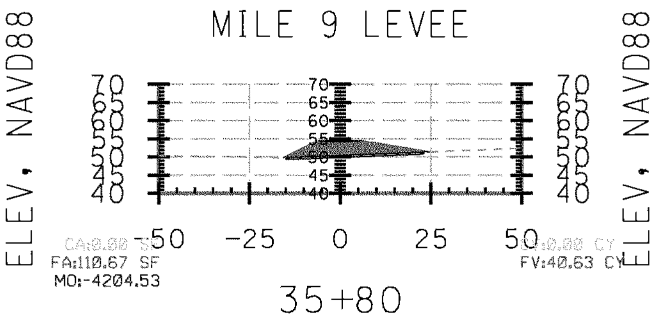


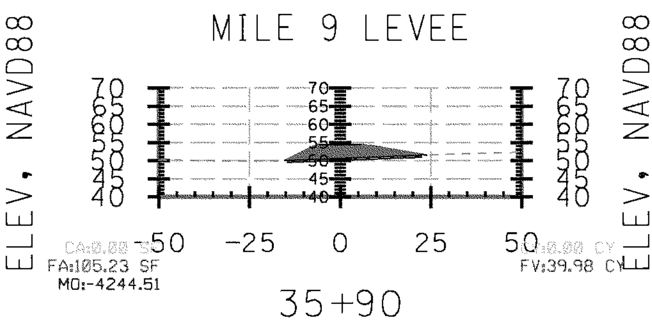



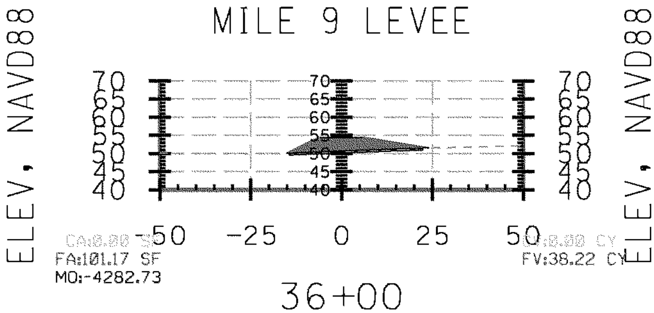
# STA.35+70 TO STA.35+90

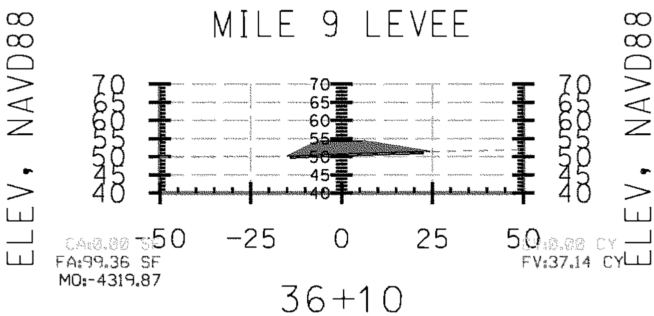


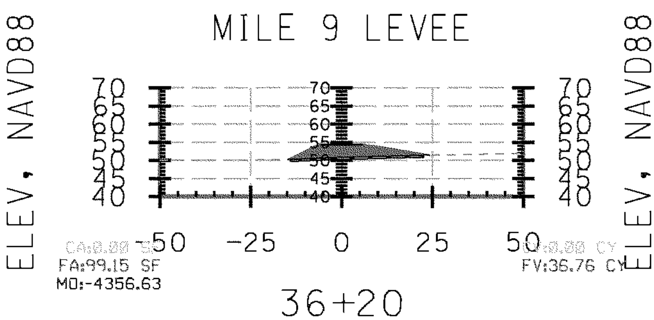



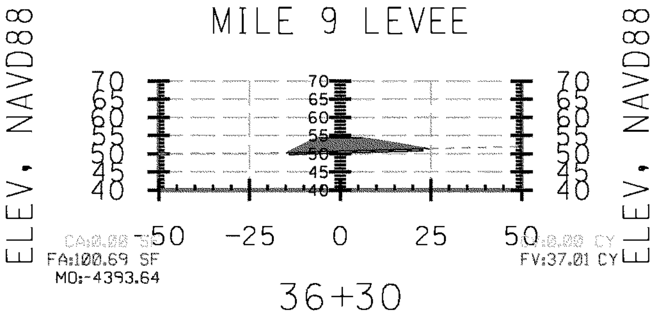
STA.36+00 TO STA.36+20

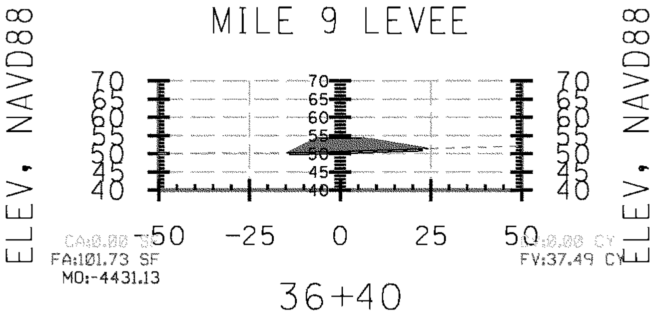


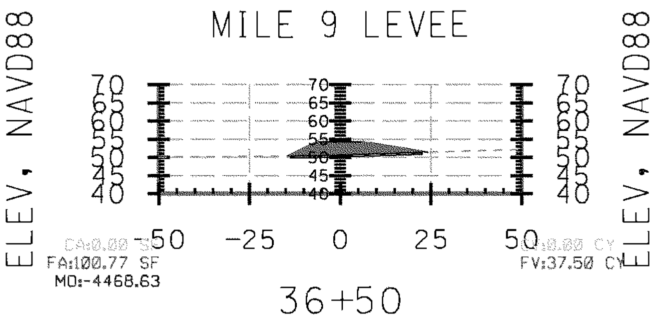



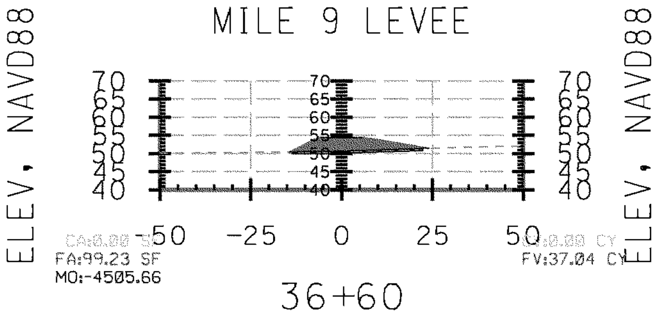
STA.36+30 TO STA.36+50

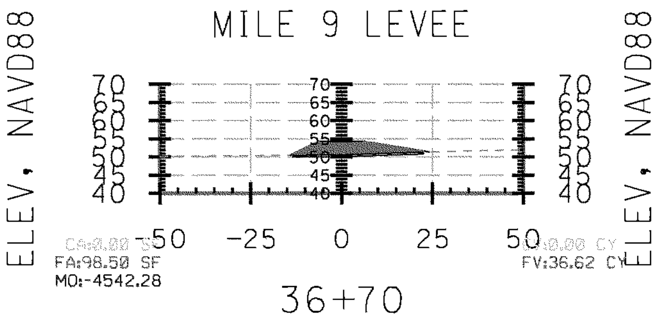


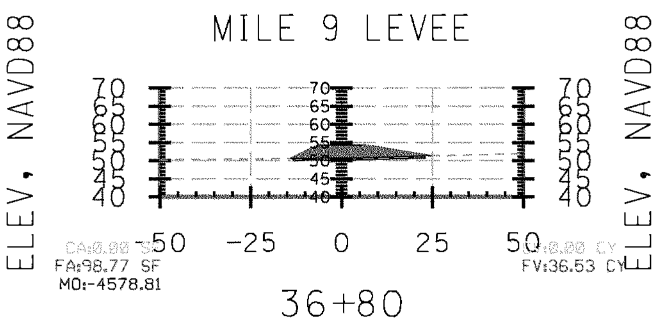



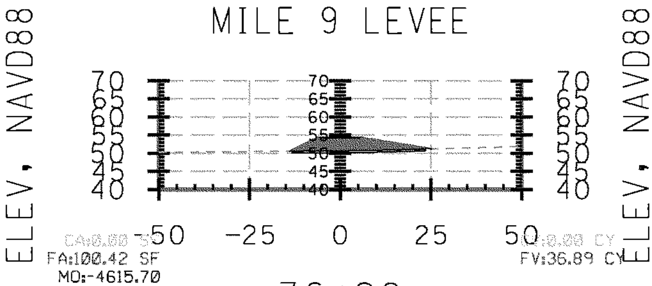
STA.36+60 TO STA.36+80



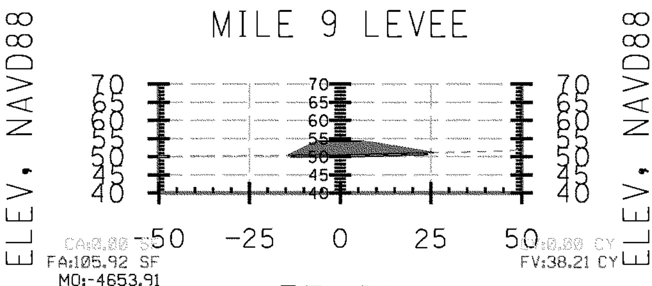



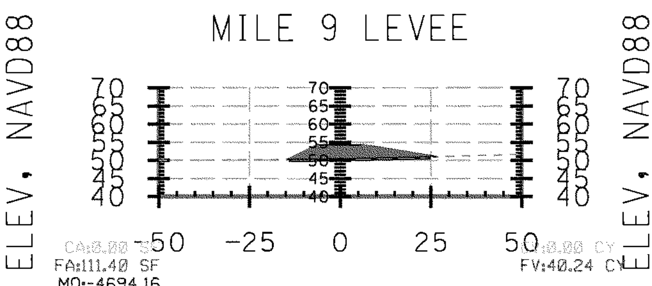
# STA.36+90 TO STA.37+10




36+90

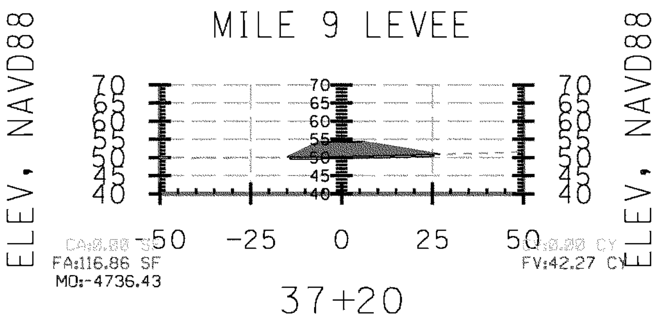


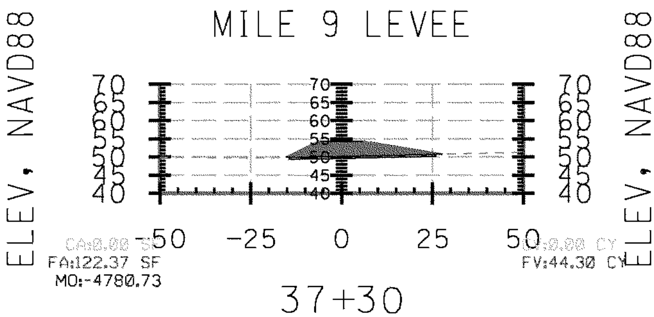

37+00

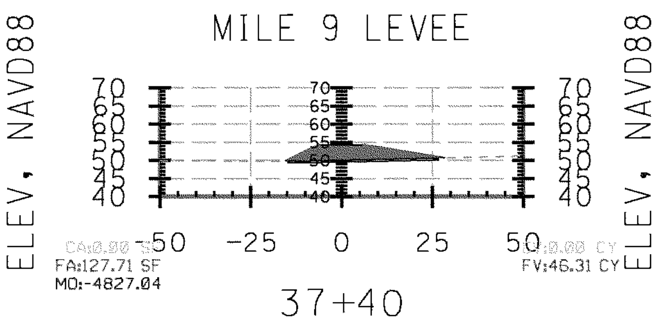



37+10

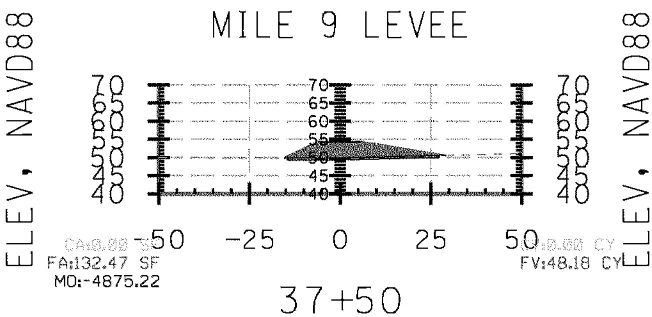
STA.37+20 TO STA.37+40

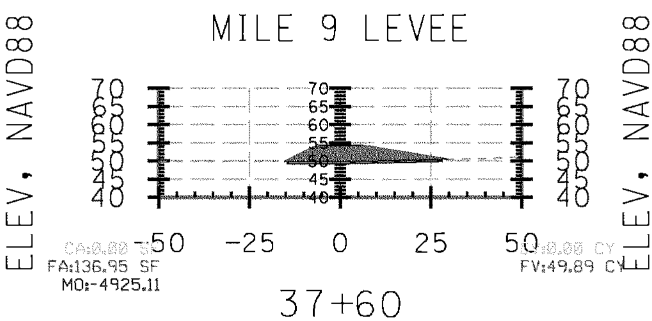


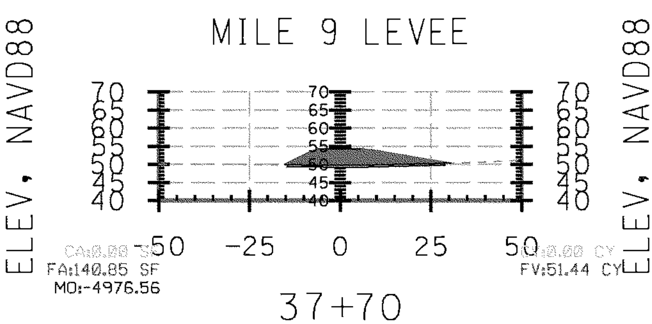



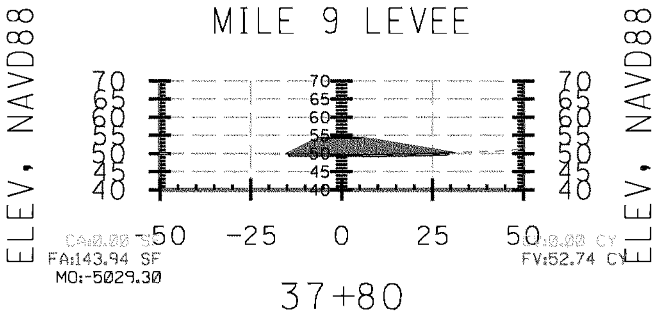
# STA.37+50 TO STA.37+70

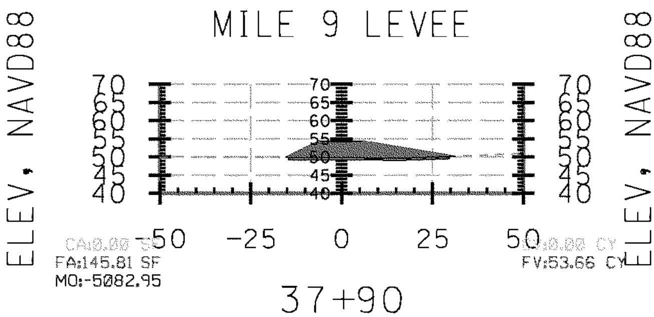


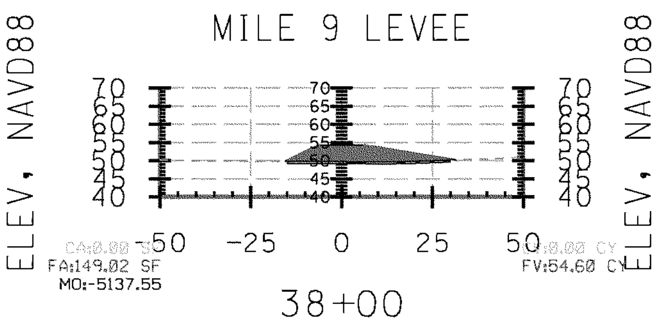



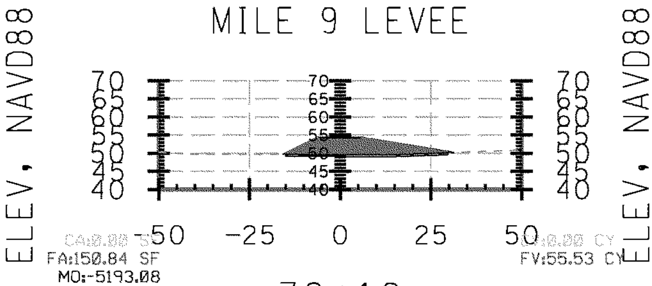
# STA.37+80 TO STA.38+00



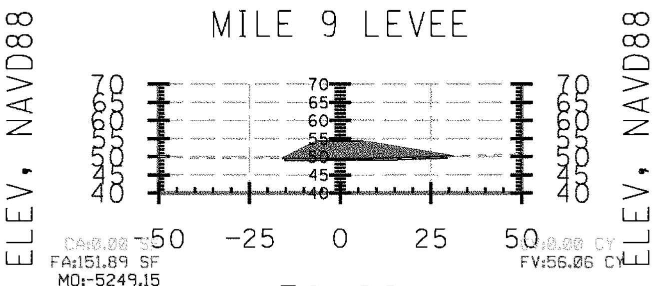



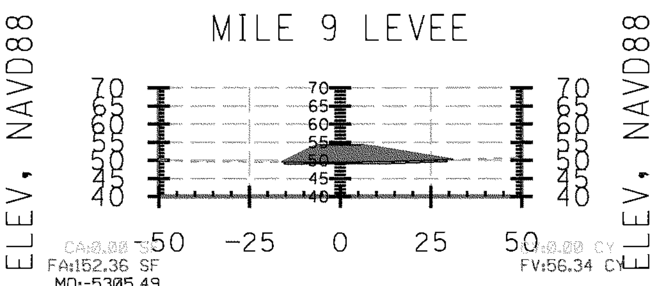
# STA.38+10 TO STA.38+30




38+10

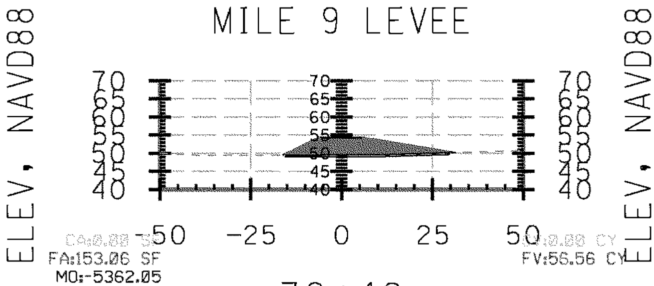



38+20

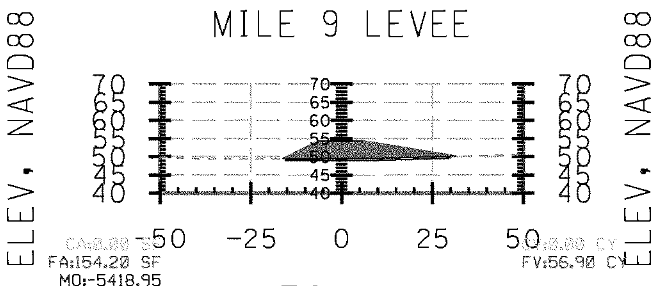



38+30

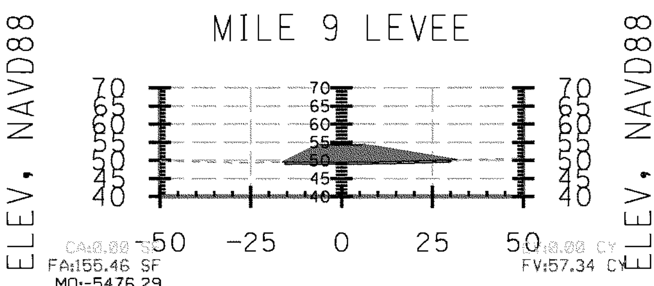
STA.38+40 TO STA.38+60




38+40

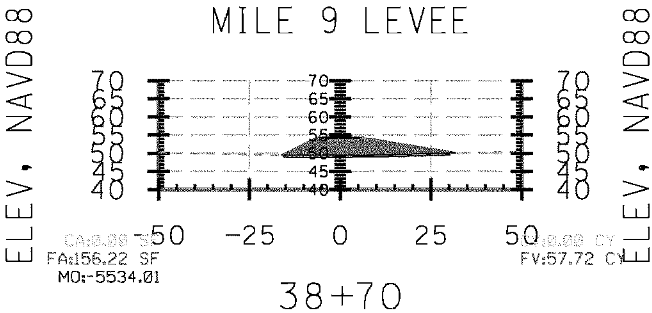


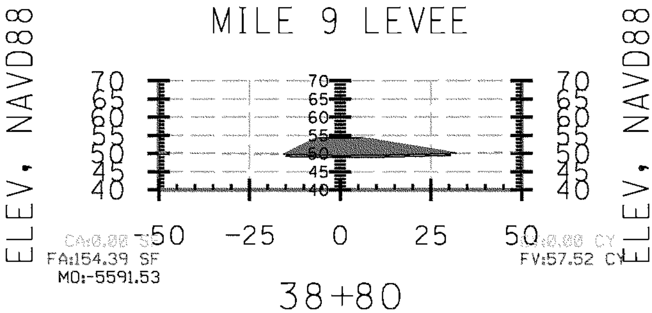

38+50

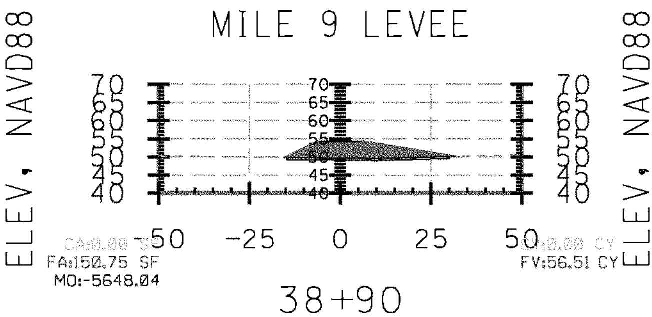



38+60

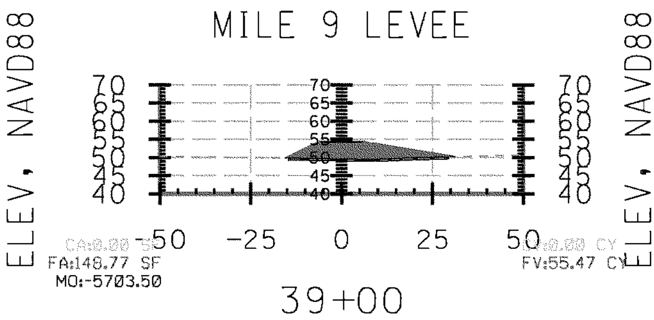
STA.38+70 TO STA.38+90

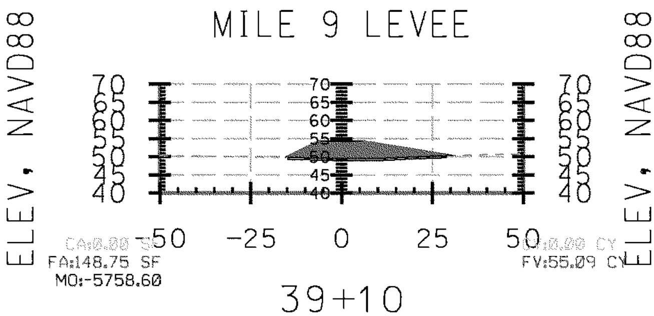


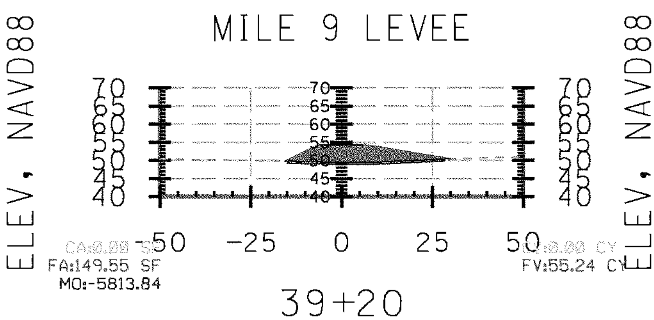



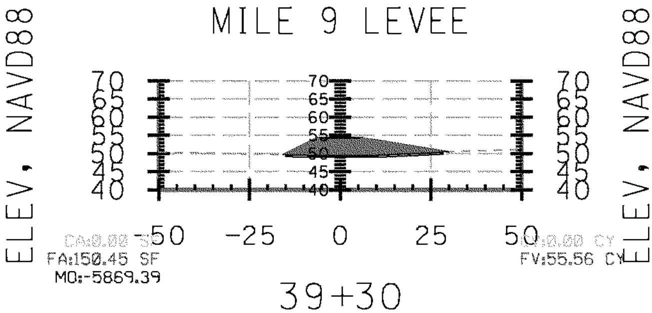
STA.39+00 TO STA.39+20

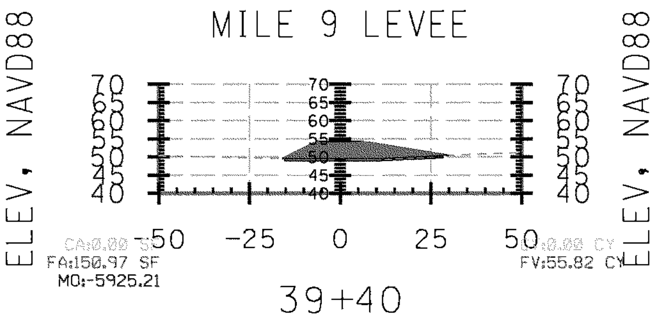


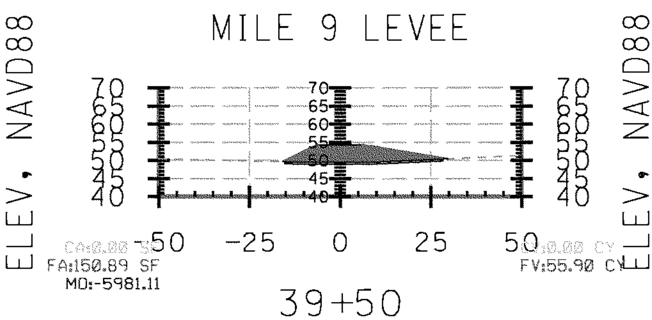



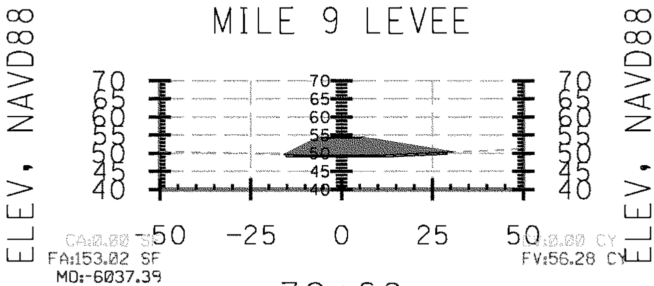
STA.39+30 TO STA.39+50



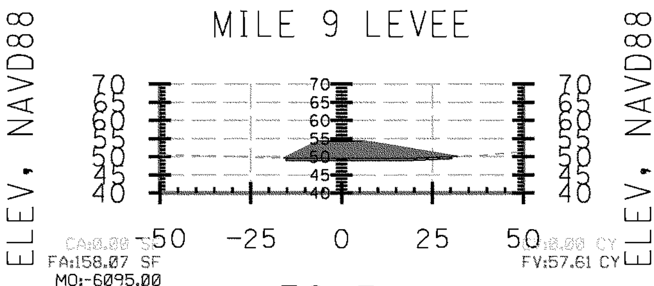



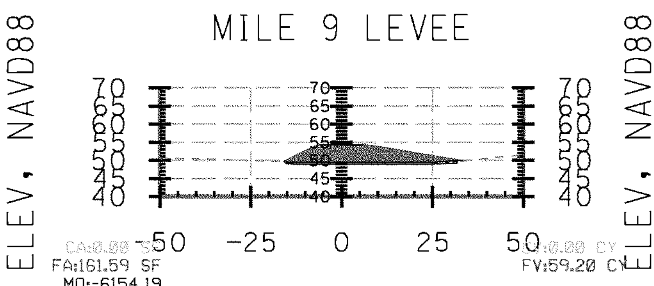
# STA.39+60 TO STA.39+80




39+60

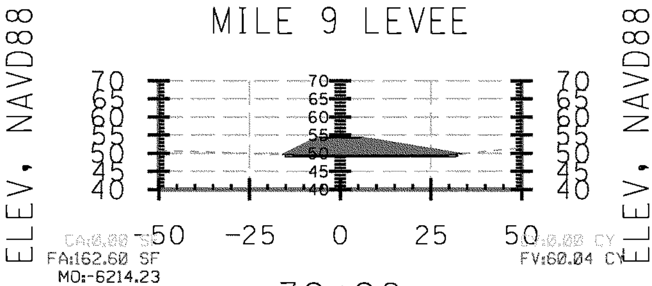



39+70

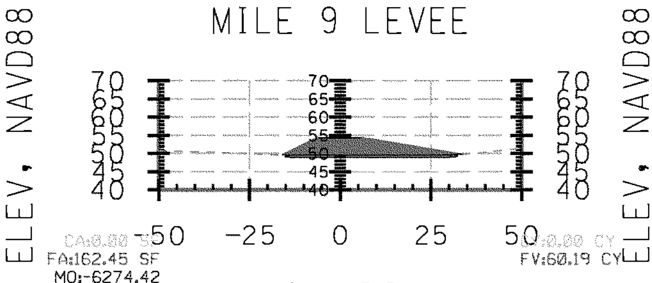



39+80

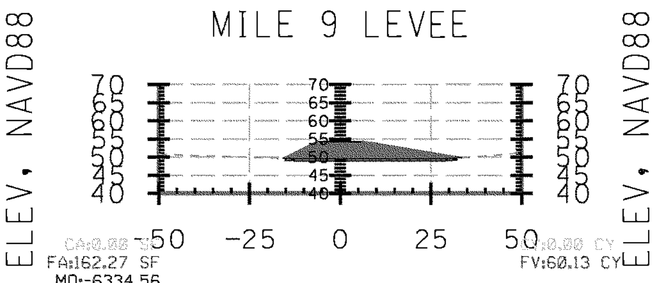
STA.39+90 TO STA.40+10




39+90

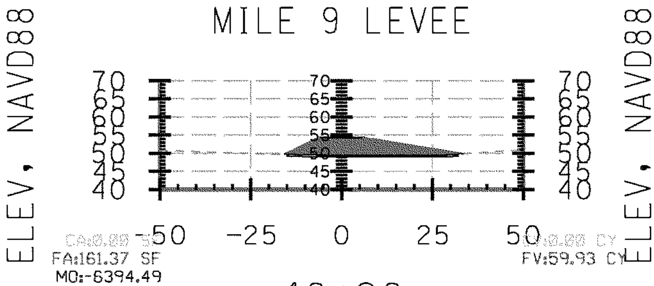



40+00

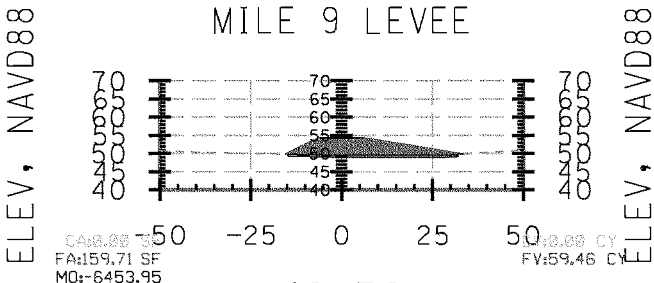



40+10

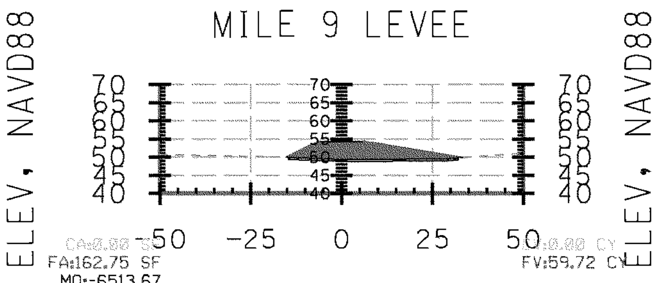
STA.40+20 TO STA.40+40




40+20

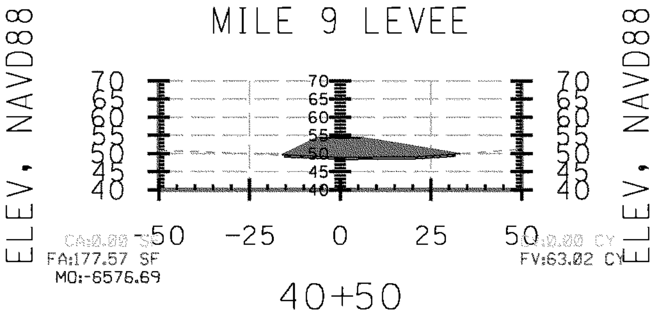


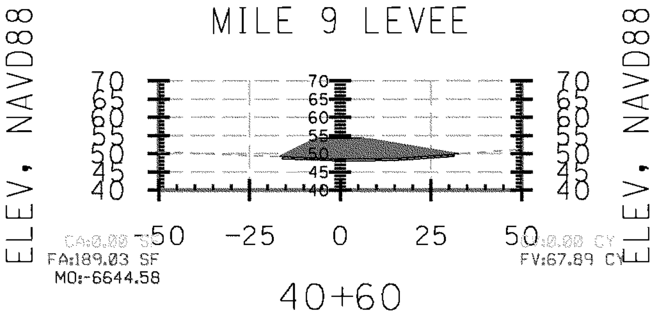

40+30

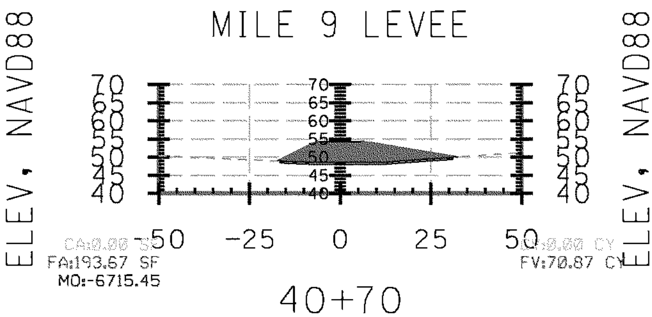



40+40

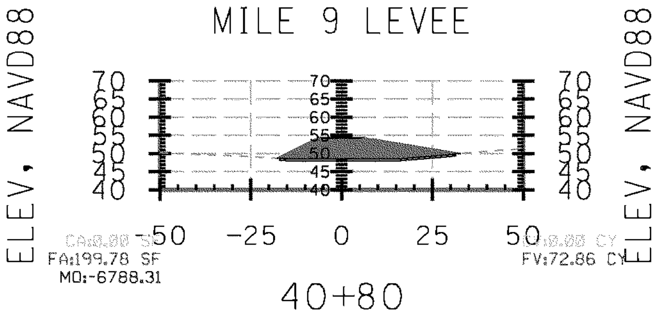
STA.40+50 TO STA.40+70

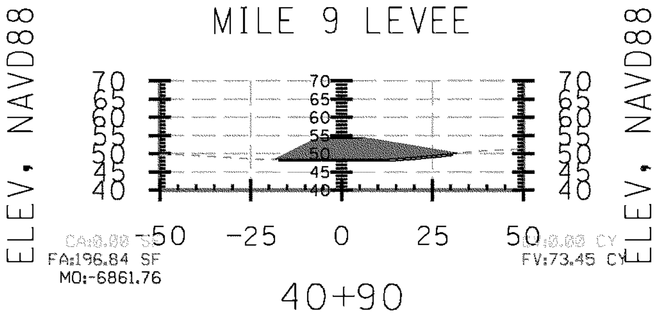


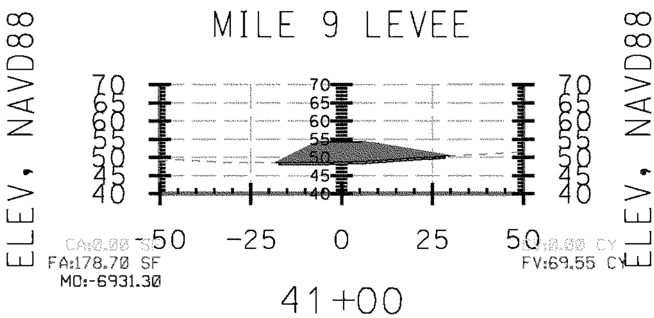



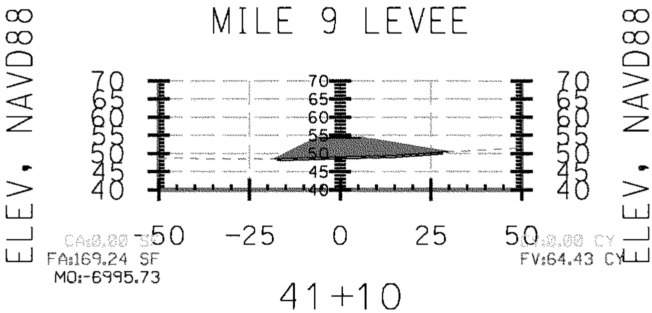
STA.40+80 TO STA.41+00

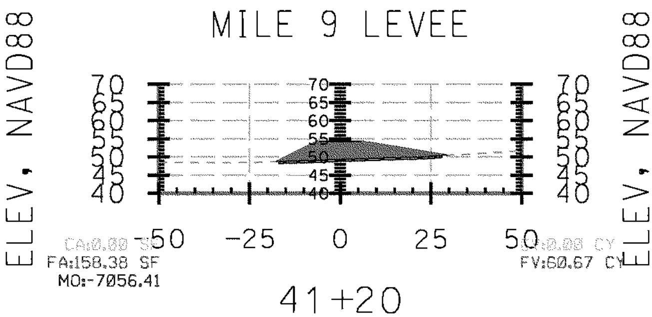


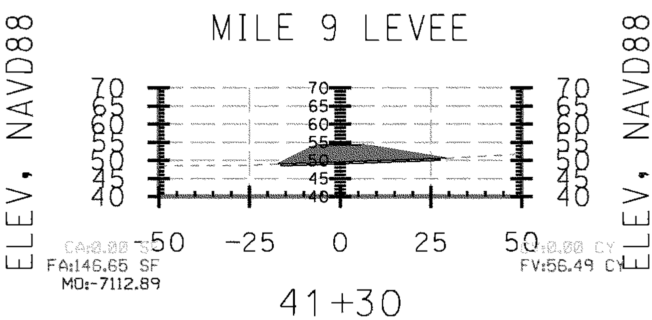



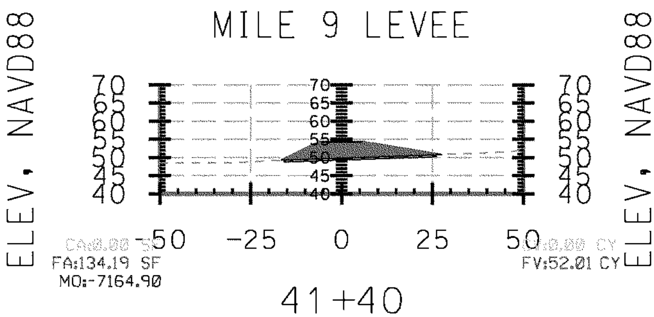
# STA.41+10 TO STA.41+30

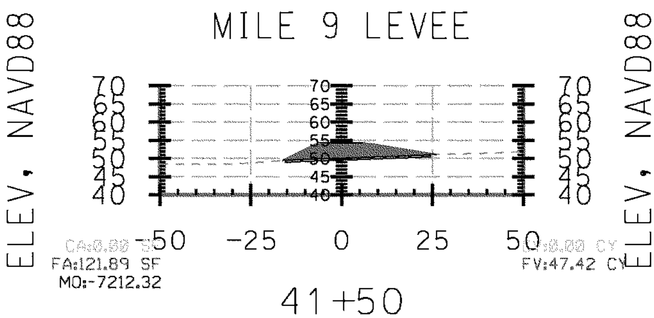


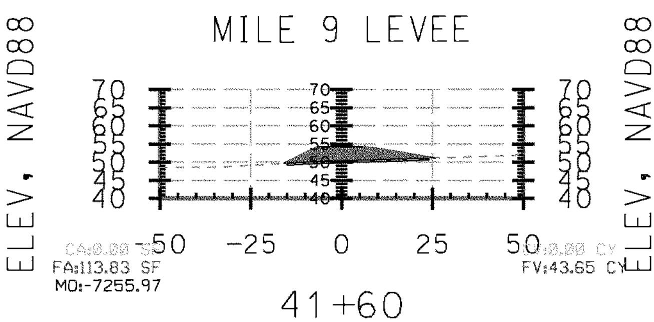



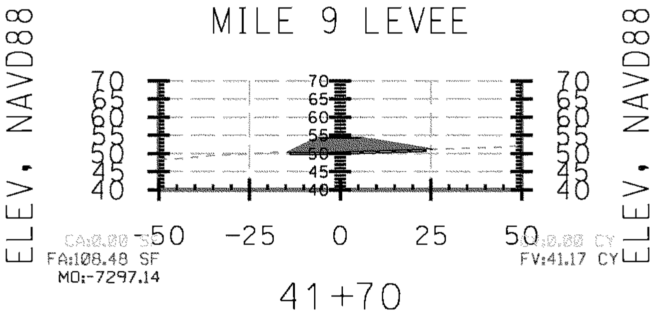
STA.41+40 TO STA.41+60

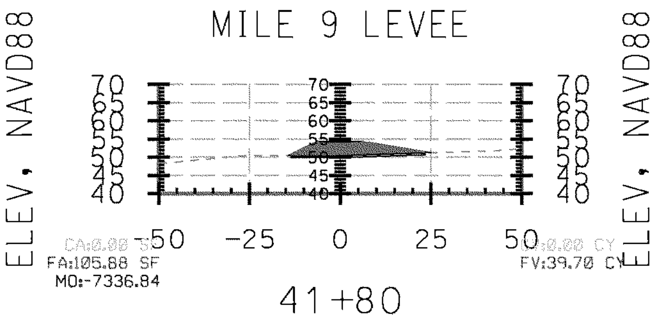


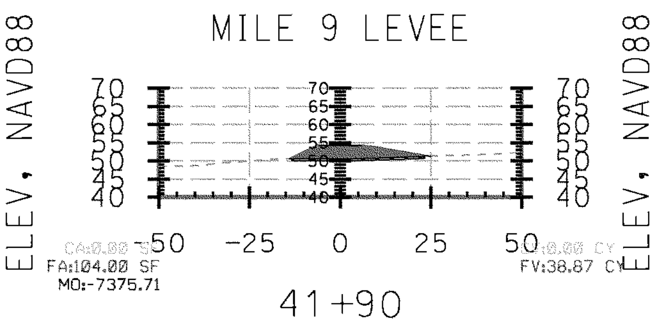



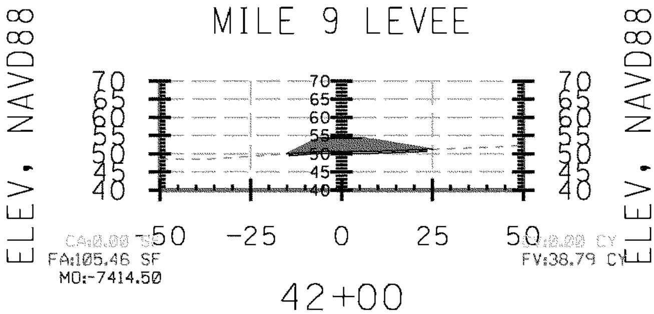
STA.41+70 TO STA.41+90

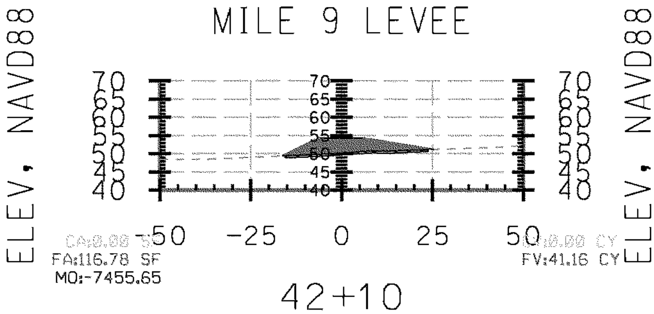


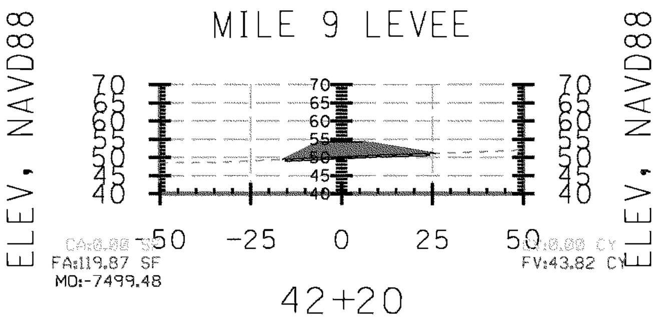



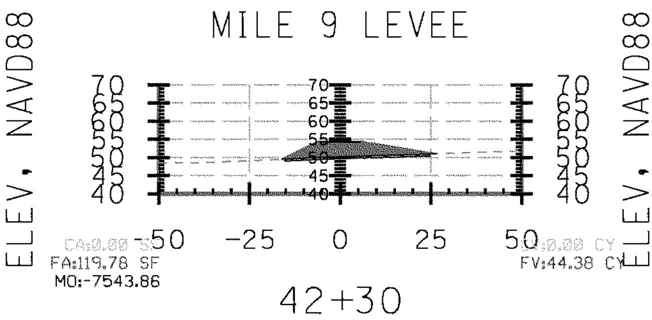
STA.42+00 TO STA.42+20

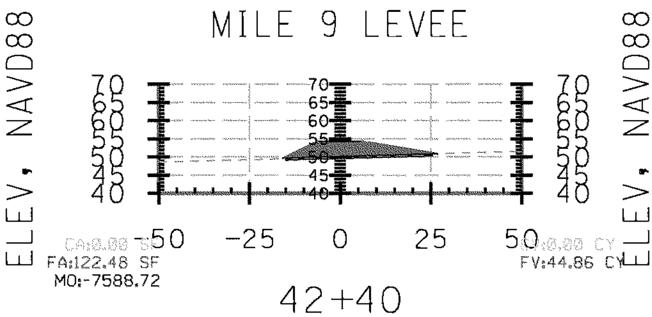


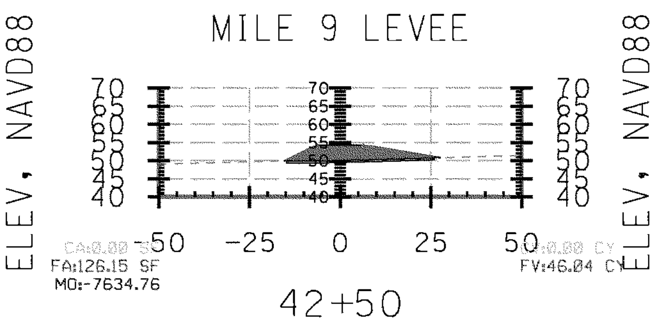



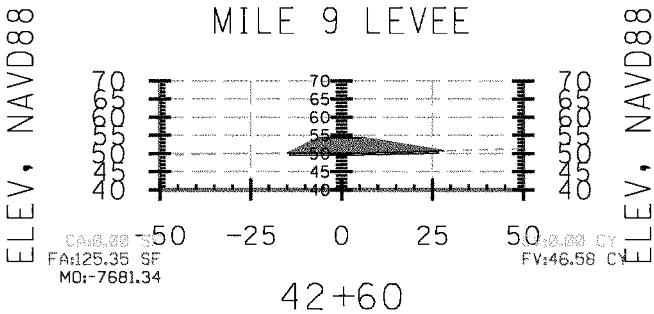
STA.42+30 TO STA.42+50

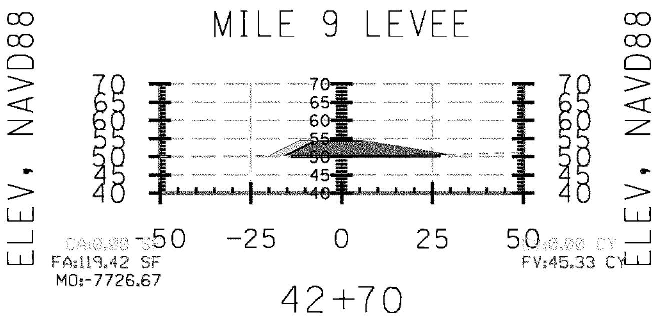


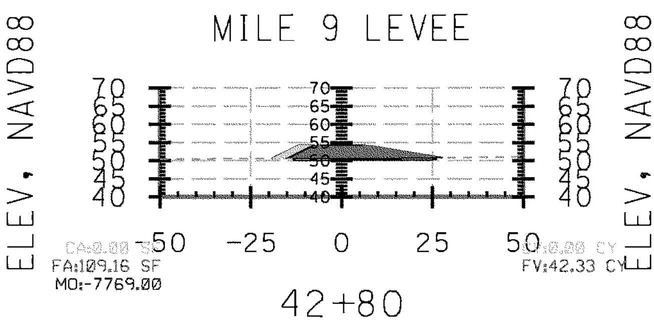



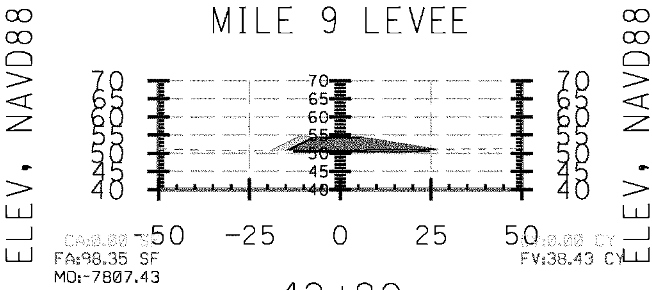
STA.42+60 TO STA.42+80



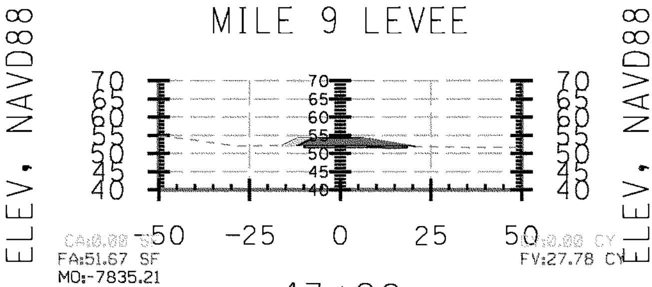



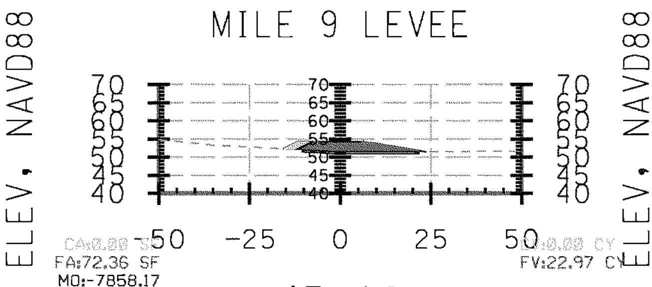
STA.42+90 TO STA.43+10




42+90

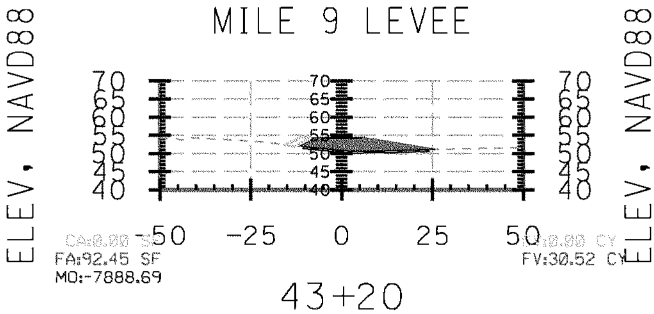


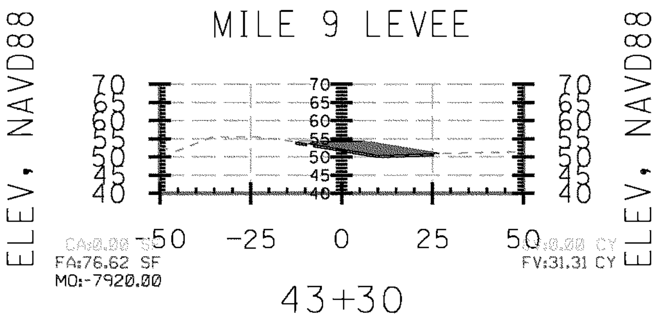

43+00

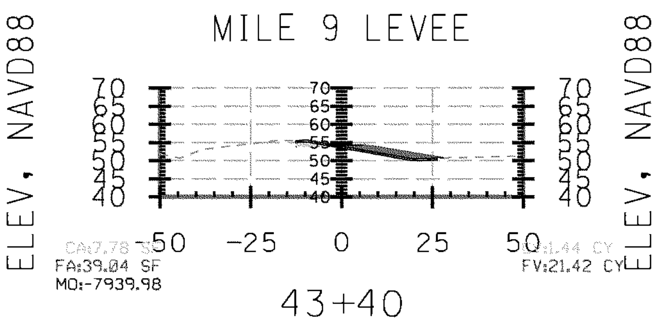



43+10

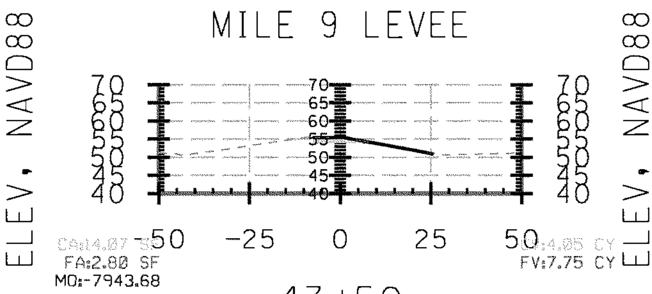
STA.43+20 TO STA.43+40



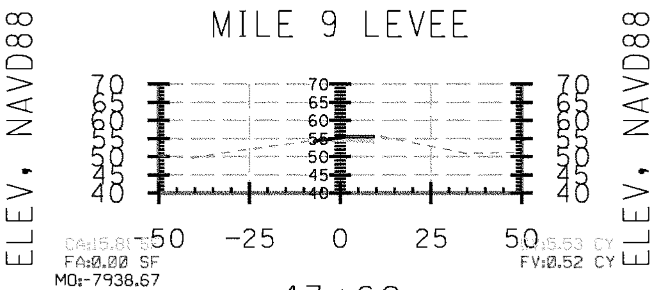



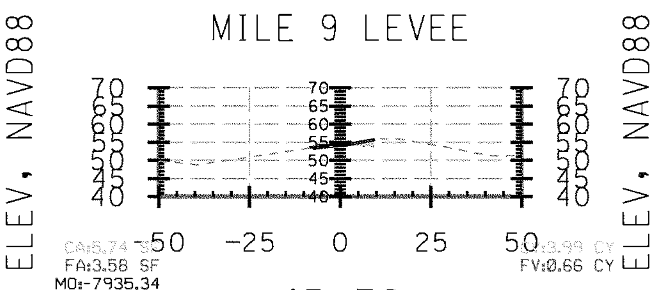
STA.43+50 TO STA.43+70




43+50




43+60




43+70

# Triangle Volume Report

Report Created: 10/28/2014
Time: 4:22pm

**Mode:** Fence
**Input Grid Factor:** 1.000000

---

**Original Surface:** **Skokomish** Last Revised
**Design Surface:** **RM 9 Breach 60**
Cut Factor: 1.000
Fill Factor: 1.000

Cut: 32061.0 cu ft
Fill: 963.0 cu ft
Net: 31098.0 cu ft

Cut: 1187.4 cu yd
Fill: 35.7 cu yd
Net: 1151.8 cu yd

**Original Surface:** **Skokomish** Last Revised
**Design Surface:** **RM 9 Breach 57**
Cut Factor: 1.000
Fill Factor: 1.000

Cut: 43167.6 cu ft
Fill: 232.7 cu ft
Net: 42934.9 cu ft

Cut: 1598.8 cu yd
Fill: 8.6 cu yd
Net: 1590.2 cu yd

**Original Surface:** **Skokomish** Last Revised
**Design Surface:** **RM 9 Breach 56**
Cut Factor: 1.000
Fill Factor: 1.000

Cut: 75421.8 cu ft
Fill: 65.9 cu ft
Net: 75355.9 cu ft

Cut: 2793.4 cu yd
Fill: 2.4 cu yd
Net: 2791.0 cu yd

| | | |
|---|---|---|
| **Original Surface:** | **Skokomish** | Last Revised |
| **Design Surface:** | **RM 9 Breach 51** | |
| Cut Factor: | 1.000 | |
| Fill Factor: | 1.000 | |
| Cut: | 63576.6 cu ft | |
| Fill: | 7553.2 cu ft | |
| Net: | 56023.4 cu ft | |
| Cut: | 2354.7 cu yd | |
| Fill: | 279.7 cu yd | |
| Net: | 2074.9 cu yd | |

# Volumes Report

Report Created: 8/5/2015
Time: 3:05pm

Bentley InRoads Suite V8i (SELECTseries 2), 08.11.07.536

**Cross Section Set Name:** Grange 6000 cfs_2

**Alignment Name:** Grange

**Input Grid Factor:** 1.000000

**Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

**Surface:** Skokomish Last Revised 8/29/2014 5:56:26 AM

**Surface:** Grange Original 6000 cfs overbu Last Revised 8/3/2015 11:10:00 AM

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **0+40.000** | | | | | | | 0.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 3.9 | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (not replaced): | 4.8 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.7 | 0.0 | 1.000 | 0.0 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.4 | 0.0 | 1.000 | 0.0 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+50.000** | | | | | | | -1.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 5.8 | 1.8 | 1.000 | 1.8 | Yes | |
| | Unsuitable (not replaced): | 2.9 | 1.4 | 1.000 | 1.4 | No | |
| | Total Unsuitable: | 8.7 | 3.2 | 1.000 | 3.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+60.000** | | | | | | | -4.3 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.9 | 2.5 | 1.000 | 2.5 | Yes | |
| | Unsuitable (not replaced): | 0.9 | 0.7 | 1.000 | 0.7 | No | |
| | Total Unsuitable: | 8.8 | 3.2 | 1.000 | 3.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+70.000** | | | | | | | -7.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 1.4 | 0.3 | 1.000 | 0.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.9 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.2 | 1.000 | 0.2 | No | |
| | Total Unsuitable: | 8.9 | 3.3 | 1.000 | 3.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+80.000** | | | | | | | -12.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 3.4 | 0.9 | 1.000 | 0.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.4 | 3.4 | 1.000 | 3.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.4 | 3.4 | 1.000 | 3.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+90.000** | | | | | | | -17.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.6 | 1.7 | 1.000 | 1.7 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.9 | 3.6 | 1.000 | 3.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.9 | 3.6 | 1.000 | 3.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+00.000** | | | | | | | -23.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.8 | 2.1 | 1.000 | 2.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.9 | 3.7 | 1.000 | 3.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.9 | 3.7 | 1.000 | 3.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+10.000** | | | | | | | -28.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.4 | 2.1 | 1.000 | 2.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.8 | 3.6 | 1.000 | 3.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.8 | 3.7 | 1.000 | 3.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+20.000** | | | | | | | -34.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.7 | 1.9 | 1.000 | 1.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 9.6 | 3.6 | 1.000 | 3.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.7 | 3.6 | 1.000 | 3.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+30.000** | | | | | | | -39.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 3.8 | 1.6 | 1.000 | 1.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.5 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.5 | 3.6 | 1.000 | 3.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.6 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+40.000** | | | | | | | -44.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 2.8 | 1.2 | 1.000 | 1.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.3 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.3 | 3.5 | 1.000 | 3.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.4 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+50.000** | | | | | | | -48.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 1.7 | 0.8 | 1.000 | 0.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.0 | 3.4 | 1.000 | 3.4 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.1 | 3.4 | 1.000 | 3.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+60.000** | | | | | | | -52.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.7 | 0.4 | 1.000 | 0.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.8 | 3.3 | 1.000 | 3.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 8.8 | 3.3 | 1.000 | 3.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.1 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+70.000** | | | | | | | -55.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.1 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.5 | 3.2 | 1.000 | 3.2 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 8.7 | 3.2 | 1.000 | 3.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+80.000** | | | | | | | -58.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 8.1 | 3.1 | 1.000 | 3.1 | Yes | |
| | Unsuitable (not replaced): | 0.6 | 0.2 | 1.000 | 0.2 | No | |
| | Total Unsuitable: | 8.7 | 3.2 | 1.000 | 3.2 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **1+90.000** | | | | | | | -61.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.6 | 2.9 | 1.000 | 2.9 | Yes | |
| | Unsuitable (not replaced): | 1.1 | 0.3 | 1.000 | 0.3 | No | |
| | Total Unsuitable: | 8.7 | 3.2 | 1.000 | 3.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+00.000** | | | | | | | -64.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.2 | 2.7 | 1.000 | 2.7 | Yes | |
| | Unsuitable (not replaced): | 1.5 | 0.5 | 1.000 | 0.5 | No | |
| | Total Unsuitable: | 8.7 | 3.2 | 1.000 | 3.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+10.000** | | | | | | | -66.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 6.7 | 2.6 | 1.000 | 2.6 | Yes | |
| | Unsuitable (not replaced): | 2.0 | 0.7 | 1.000 | 0.7 | No | |
| | Total Unsuitable: | 8.7 | 3.2 | 1.000 | 3.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+20.000** | | | | | | | -69.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 6.3 | 2.4 | 1.000 | 2.4 | Yes | |
| | Unsuitable (not replaced): | 2.5 | 0.8 | 1.000 | 0.8 | No | |
| | Total Unsuitable: | 8.7 | 3.2 | 1.000 | 3.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+30.000** | | | | | | | -71.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 6.4 | 2.3 | 1.000 | 2.3 | Yes | |
| | Unsuitable (not replaced): | 2.4 | 0.9 | 1.000 | 0.9 | No | |
| | Total Unsuitable: | 8.8 | 3.2 | 1.000 | 3.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+40.000** | | | | | | | -74.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 2.1 | 0.4 | 1.000 | 0.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 7.9 | 2.6 | 1.000 | 2.6 | Yes | |
| | Unsuitable (not replaced): | 1.3 | 0.7 | 1.000 | 0.7 | No | |
| | Total Unsuitable: | 9.2 | 3.3 | 1.000 | 3.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+50.000** | | | | | | | -79.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 6.8 | 1.6 | 1.000 | 1.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.6 | 3.2 | 1.000 | 3.2 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.3 | 1.000 | 0.3 | No | |
| | Total Unsuitable: | 9.7 | 3.5 | 1.000 | 3.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.7 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+60.000** | | | | | | | -86.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 10.4 | 3.2 | 1.000 | 3.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.2 | 3.7 | 1.000 | 3.7 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.3 | 3.7 | 1.000 | 3.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+70.000** | | | | | | | -93.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 8.2 | 3.4 | 1.000 | 3.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.8 | 3.7 | 1.000 | 3.7 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.9 | 3.7 | 1.000 | 3.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.9 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **2+80.000** | | | | | | | -99.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 6.1 | 2.6 | 1.000 | 2.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.4 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 9.6 | 3.6 | 1.000 | 3.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.8 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **2+90.000** | | | | | | | -104.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 4.3 | 1.9 | 1.000 | 1.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.3 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 9.5 | 3.5 | 1.000 | 3.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.6 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+00.000** | | | | | | | -109.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 3.1 | 1.4 | 1.000 | 1.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.5 | 3.5 | 1.000 | 3.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.5 | 3.5 | 1.000 | 3.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.6 | 0.2 | 1.000 | 0.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+10.000** | | | | | | | -114.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 4.0 | 1.3 | 1.000 | 1.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 9.9 | 3.6 | 1.000 | 3.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 9.9 | 3.6 | 1.000 | 3.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.9 | 0.3 | 1.000 | 0.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+20.000** | | | | | | | -120.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 5.8 | 1.8 | 1.000 | 1.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.4 | 3.8 | 1.000 | 3.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.4 | 3.8 | 1.000 | 3.8 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.1 | 0.4 | 1.000 | 0.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+30.000** | | | | | | | -126.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 7.8 | 2.5 | 1.000 | 2.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 10.7 | 3.9 | 1.000 | 3.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 10.7 | 3.9 | 1.000 | 3.9 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.4 | 0.5 | 1.000 | 0.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+40.000** | | | | | | | -133.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 9.6 | 3.2 | 1.000 | 3.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.2 | 4.1 | 1.000 | 4.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.2 | 4.1 | 1.000 | 4.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.7 | 0.6 | 1.000 | 0.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+50.000** | | | | | | | -142.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 11.4 | 3.9 | 1.000 | 3.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 11.6 | 4.2 | 1.000 | 4.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 11.6 | 4.2 | 1.000 | 4.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.0 | 0.7 | 1.000 | 0.7 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+60.000** | | | | | | | -151.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 13.4 | 4.6 | 1.000 | 4.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.0 | 4.4 | 1.000 | 4.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.0 | 4.4 | 1.000 | 4.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.3 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+70.000** | | | | | | | -160.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 15.7 | 5.4 | 1.000 | 5.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 12.3 | 4.5 | 1.000 | 4.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.3 | 4.5 | 1.000 | 4.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.5 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+80.000** | | | | | | | -171.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 18.2 | 6.3 | 1.000 | 6.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.7 | 4.6 | 1.000 | 4.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.7 | 4.6 | 1.000 | 4.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 2.8 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **3+90.000** | | | | | | | -183.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.0 | 7.3 | 1.000 | 7.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.1 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.1 | 4.8 | 1.000 | 4.8 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.0 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+00.000** | | | | | | | -197.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 24.2 | 8.4 | 1.000 | 8.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.4 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 13.4 | 4.9 | 1.000 | 4.9 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+10.000** | | | | | | | -211.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 27.6 | 9.6 | 1.000 | 9.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.8 | 5.0 | 1.000 | 5.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.8 | 5.0 | 1.000 | 5.0 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.5 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+20.000** | | | | | | | -227.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 29.6 | 10.6 | 1.000 | 10.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.3 | 5.2 | 1.000 | 5.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.3 | 5.2 | 1.000 | 5.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 3.9 | 1.4 | 1.000 | 1.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+30.000** | | | | | | | -244.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.2 | 11.4 | 1.000 | 11.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.9 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.9 | 5.4 | 1.000 | 5.4 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.3 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+40.000** | | | | | | | -262.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 35.9 | 12.6 | 1.000 | 12.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.5 | 5.6 | 1.000 | 5.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.5 | 5.6 | 1.000 | 5.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.7 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+50.000** | | | | | | | -282.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 40.8 | 14.2 | 1.000 | 14.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.2 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.2 | 5.9 | 1.000 | 5.9 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.2 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+60.000** | | | | | | | -304.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 45.3 | 16.0 | 1.000 | 16.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.8 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.8 | 5.9 | 1.000 | 5.9 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.5 | 2.0 | 1.000 | 2.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+70.000** | | | | | | | -328.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 49.0 | 17.5 | 1.000 | 17.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.2 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.2 | 5.9 | 1.000 | 5.9 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.8 | 2.1 | 1.000 | 2.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+80.000** | | | | | | | -352.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 52.9 | 18.9 | 1.000 | 18.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.3 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.3 | 6.0 | 1.000 | 6.0 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.2 | 2.2 | 1.000 | 2.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **4+90.000** | | | | | | | -378.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 54.3 | 19.9 | 1.000 | 19.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.0 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.0 | 6.2 | 1.000 | 6.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.0 | 2.3 | 1.000 | 2.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **5+00.000** | | | | | | | -404.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 49.2 | 19.2 | 1.000 | 19.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.8 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.8 | 6.3 | 1.000 | 6.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.6 | 2.1 | 1.000 | 2.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+10.000** | | | | | | | -428.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 45.5 | 17.5 | 1.000 | 17.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.4 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.5 | 6.2 | 1.000 | 6.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.4 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+20.000** | | | | | | | -451.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 50.0 | 17.7 | 1.000 | 17.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.1 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.1 | 6.0 | 1.000 | 6.0 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.1 | 1.9 | 1.000 | 1.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+30.000** | | | | | | | -477.8 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 58.2 | 20.0 | 1.000 | 20.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.9 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.9 | 6.1 | 1.000 | 6.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 5.7 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+40.000** | | | | | | | -507.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 66.0 | 23.0 | 1.000 | 23.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.7 | 6.4 | 1.000 | 6.4 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.8 | 6.4 | 1.000 | 6.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.3 | 2.2 | 1.000 | 2.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **5+50.000** | | | | | | | -536.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 62.1 | 23.7 | 1.000 | 23.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.2 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.2 | 5.9 | 1.000 | 5.9 | | |
| | Filter: | 9.2 | 1.7 | 1.000 | 1.7 | No | |
| | Topsoil: | 2.3 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 2.4 | 0.4 | 1.000 | 0.4 | No | |
| **5+60.000** | | | | | | | -566.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 67.0 | 23.9 | 1.000 | 23.9 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.7 | 5.3 | 1.000 | 5.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.7 | 5.3 | 1.000 | 5.3 | | |
| | Filter: | 10.0 | 3.5 | 1.000 | 3.5 | No | |
| | Topsoil: | 2.4 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.8 | 3.0 | 1.000 | 3.0 | No | |
| **5+70.000** | | | | | | | -596.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 69.6 | 25.3 | 1.000 | 25.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.9 | 5.5 | 1.000 | 5.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.9 | 5.5 | 1.000 | 5.5 | | |
| | Filter: | 10.1 | 3.7 | 1.000 | 3.7 | No | |
| | Topsoil: | 2.5 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 14.3 | 5.2 | 1.000 | 5.2 | No | |
| **5+80.000** | | | | | | | -628.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 71.3 | 26.1 | 1.000 | 26.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.9 | 5.5 | 1.000 | 5.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.9 | 5.5 | 1.000 | 5.5 | | |
| | Filter: | 9.9 | 3.7 | 1.000 | 3.7 | No | |
| | Topsoil: | 2.6 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.9 | 5.2 | 1.000 | 5.2 | No | |
| **5+90.000** | | | | | | | -660.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 73.0 | 26.7 | 1.000 | 26.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 15.0 | 5.5 | 1.000 | 5.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.0 | 5.5 | 1.000 | 5.5 | | |
| | Filter: | 10.0 | 3.7 | 1.000 | 3.7 | No | |
| | Topsoil: | 2.6 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.7 | 5.1 | 1.000 | 5.1 | No | |
| **6+00.000** | | | | | | | -693.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 74.7 | 27.4 | 1.000 | 27.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.1 | 5.6 | 1.000 | 5.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.1 | 5.6 | 1.000 | 5.6 | | |
| | Filter: | 10.1 | 3.7 | 1.000 | 3.7 | No | |
| | Topsoil: | 2.7 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.8 | 5.1 | 1.000 | 5.1 | No | |
| **6+10.000** | | | | | | | -727.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 76.5 | 28.0 | 1.000 | 28.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.2 | 5.6 | 1.000 | 5.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.2 | 5.6 | 1.000 | 5.6 | | |
| | Filter: | 10.2 | 3.8 | 1.000 | 3.8 | No | |
| | Topsoil: | 2.7 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.9 | 5.1 | 1.000 | 5.1 | No | |
| **6+20.000** | | | | | | | -761.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 78.2 | 28.6 | 1.000 | 28.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.0 | 5.6 | 1.000 | 5.6 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.0 | 5.6 | 1.000 | 5.6 | | |
| | Filter: | 10.3 | 3.8 | 1.000 | 3.8 | No | |
| | Topsoil: | 2.7 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 14.1 | 5.2 | 1.000 | 5.2 | No | |
| **6+30.000** | | | | | | | -796.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 79.2 | 29.1 | 1.000 | 29.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.0 | 5.6 | 1.000 | 5.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.0 | 5.6 | 1.000 | 5.6 | | |
| | Filter: | 10.4 | 3.8 | 1.000 | 3.8 | No | |
| | Topsoil: | 2.7 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 14.4 | 5.3 | 1.000 | 5.3 | No | |
| **6+40.000** | | | | | | | -832.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 82.7 | 30.0 | 1.000 | 30.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.9 | 5.7 | 1.000 | 5.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.9 | 5.7 | 1.000 | 5.7 | | |
| | Filter: | 12.6 | 4.3 | 1.000 | 4.3 | No | |
| | Topsoil: | 2.7 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 17.9 | 6.0 | 1.000 | 6.0 | No | |
| **6+50.000** | | | | | | | -868.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 83.0 | 30.7 | 1.000 | 30.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.0 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.0 | 5.9 | 1.000 | 5.9 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 12.8 | 4.7 | 1.000 | 4.7 | No | |
| | Topsoil: | 2.7 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 18.8 | 6.8 | 1.000 | 6.8 | No | |
| **6+60.000** | | | | | | | -905.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 83.4 | 30.8 | 1.000 | 30.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.0 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.0 | 5.9 | 1.000 | 5.9 | | |
| | Filter: | 12.8 | 4.7 | 1.000 | 4.7 | No | |
| | Topsoil: | 2.7 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 18.9 | 7.0 | 1.000 | 7.0 | No | |
| **6+70.000** | | | | | | | -942.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 83.9 | 31.0 | 1.000 | 31.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.0 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.0 | 5.9 | 1.000 | 5.9 | | |
| | Filter: | 12.8 | 4.7 | 1.000 | 4.7 | No | |
| | Topsoil: | 2.8 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 18.9 | 7.0 | 1.000 | 7.0 | No | |
| **6+80.000** | | | | | | | -979.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 84.4 | 31.2 | 1.000 | 31.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.1 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.1 | 5.9 | 1.000 | 5.9 | | |
| | Filter: | 12.9 | 4.8 | 1.000 | 4.8 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 2.8 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 18.9 | 7.0 | 1.000 | 7.0 | No | |
| **6+90.000** | | | | | | | -1016.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 84.9 | 31.3 | 1.000 | 31.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.1 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.1 | 6.0 | 1.000 | 6.0 | | |
| | Filter: | 12.9 | 4.8 | 1.000 | 4.8 | No | |
| | Topsoil: | 2.8 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.0 | 7.0 | 1.000 | 7.0 | No | |
| **7+00.000** | | | | | | | -1054.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 85.3 | 31.5 | 1.000 | 31.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.1 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.1 | 6.0 | 1.000 | 6.0 | | |
| | Filter: | 12.9 | 4.8 | 1.000 | 4.8 | No | |
| | Topsoil: | 2.8 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.0 | 7.0 | 1.000 | 7.0 | No | |
| **7+10.000** | | | | | | | -1091.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 85.3 | 31.6 | 1.000 | 31.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.5 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.5 | 6.0 | 1.000 | 6.0 | | |
| | Filter: | 12.8 | 4.8 | 1.000 | 4.8 | No | |
| | Topsoil: | 2.8 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 18.9 | 7.0 | 1.000 | 7.0 | No | |
| **7+20.000** | | | | | | | -1129.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 85.6 | 31.6 | 1.000 | 31.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.5 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.5 | 6.1 | 1.000 | 6.1 | | |
| | Filter: | 12.8 | 4.7 | 1.000 | 4.7 | No | |
| | Topsoil: | 2.9 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 18.7 | 7.0 | 1.000 | 7.0 | No | |
| **7+30.000** | | | | | | | -1167.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 87.6 | 32.1 | 1.000 | 32.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.6 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.6 | 6.1 | 1.000 | 6.1 | | |
| | Filter: | 12.7 | 4.7 | 1.000 | 4.7 | No | |
| | Topsoil: | 2.9 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 18.6 | 6.9 | 1.000 | 6.9 | No | |
| **7+40.000** | | | | | | | -1206.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 89.9 | 32.9 | 1.000 | 32.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.7 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.7 | 6.2 | 1.000 | 6.2 | | |
| | Filter: | 12.9 | 4.7 | 1.000 | 4.7 | No | |
| | Topsoil: | 3.0 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 18.8 | 6.9 | 1.000 | 6.9 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **7+50.000** | | | | | | | -1246.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 92.0 | 33.7 | 1.000 | 33.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.9 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.9 | 6.2 | 1.000 | 6.2 | | |
| | Filter: | 13.1 | 4.8 | 1.000 | 4.8 | No | |
| | Topsoil: | 3.0 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.1 | 7.0 | 1.000 | 7.0 | No | |
| **7+60.000** | | | | | | | -1287.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 93.8 | 34.4 | 1.000 | 34.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.1 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.1 | 6.3 | 1.000 | 6.3 | | |
| | Filter: | 13.3 | 4.9 | 1.000 | 4.9 | No | |
| | Topsoil: | 3.1 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.3 | 7.1 | 1.000 | 7.1 | No | |
| **7+70.000** | | | | | | | -1328.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 92.6 | 34.5 | 1.000 | 34.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.6 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.6 | 6.2 | 1.000 | 6.2 | | |
| | Filter: | 13.4 | 4.9 | 1.000 | 4.9 | No | |
| | Topsoil: | 2.9 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.5 | 7.2 | 1.000 | 7.2 | No | |
| **7+80.000** | | | | | | | -1368.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 93.9 | 34.5 | 1.000 | 34.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.7 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.7 | 6.2 | 1.000 | 6.2 | | |
| | Filter: | 13.4 | 5.0 | 1.000 | 5.0 | No | |
| | Topsoil: | 3.0 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.4 | 7.2 | 1.000 | 7.2 | No | |
| **7+90.000** | | | | | | | -1410.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 96.4 | 35.2 | 1.000 | 35.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.8 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.8 | 6.2 | 1.000 | 6.2 | | |
| | Filter: | 13.4 | 5.0 | 1.000 | 5.0 | No | |
| | Topsoil: | 3.1 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.4 | 7.2 | 1.000 | 7.2 | No | |
| **8+00.000** | | | | | | | -1452.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 98.5 | 36.1 | 1.000 | 36.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.9 | 6.2 | 1.000 | 6.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.9 | 6.2 | 1.000 | 6.2 | | |
| | Filter: | 13.4 | 5.0 | 1.000 | 5.0 | No | |
| | Topsoil: | 3.1 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.4 | 7.2 | 1.000 | 7.2 | No | |
| **8+10.000** | | | | | | | -1495.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 101.2 | 37.0 | 1.000 | 37.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.0 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.0 | 6.3 | 1.000 | 6.3 | | |
| | Filter: | 13.5 | 5.0 | 1.000 | 5.0 | No | |
| | Topsoil: | 3.2 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.5 | 7.2 | 1.000 | 7.2 | No | |
| **8+20.000** | | | | | | | -1540.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 103.4 | 37.9 | 1.000 | 37.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.2 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.2 | 6.3 | 1.000 | 6.3 | | |
| | Filter: | 13.6 | 5.0 | 1.000 | 5.0 | No | |
| | Topsoil: | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.6 | 7.2 | 1.000 | 7.2 | No | |
| **8+30.000** | | | | | | | -1585.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 105.1 | 38.6 | 1.000 | 38.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.6 | 6.4 | 1.000 | 6.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.6 | 6.4 | 1.000 | 6.4 | | |
| | Filter: | 13.6 | 5.0 | 1.000 | 5.0 | No | |
| | Topsoil: | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.7 | 7.3 | 1.000 | 7.3 | No | |
| **8+40.000** | | | | | | | -1631.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 107.5 | 39.4 | 1.000 | 39.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 17.7 | 6.5 | 1.000 | 6.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.7 | 6.5 | 1.000 | 6.5 | | |
| | Filter: | 13.9 | 5.1 | 1.000 | 5.1 | No | |
| | Topsoil: | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 20.1 | 7.4 | 1.000 | 7.4 | No | |
| **8+50.000** | | | | | | | -1677.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 109.3 | 40.1 | 1.000 | 40.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.9 | 6.6 | 1.000 | 6.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.9 | 6.6 | 1.000 | 6.6 | | |
| | Filter: | 14.4 | 5.2 | 1.000 | 5.2 | No | |
| | Topsoil: | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 20.8 | 7.6 | 1.000 | 7.6 | No | |
| **8+60.000** | | | | | | | -1725.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 109.6 | 40.5 | 1.000 | 40.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.0 | 6.6 | 1.000 | 6.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.0 | 6.7 | 1.000 | 6.7 | | |
| | Filter: | 14.8 | 5.4 | 1.000 | 5.4 | No | |
| | Topsoil: | 3.2 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 21.4 | 7.8 | 1.000 | 7.8 | No | |
| **8+70.000** | | | | | | | -1772.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 108.4 | 40.4 | 1.000 | 40.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.2 | 6.7 | 1.000 | 6.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 18.2 | 6.7 | 1.000 | 6.7 | | |
| | Filter: | 15.2 | 5.6 | 1.000 | 5.6 | No | |
| | Topsoil: | 3.2 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 22.1 | 8.0 | 1.000 | 8.0 | No | |
| **8+80.000** | | | | | | | -1818.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 105.9 | 39.7 | 1.000 | 39.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.1 | 6.7 | 1.000 | 6.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.1 | 6.7 | 1.000 | 6.7 | | |
| | Filter: | 15.4 | 5.7 | 1.000 | 5.7 | No | |
| | Topsoil: | 3.1 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 22.7 | 8.3 | 1.000 | 8.3 | No | |
| **8+90.000** | | | | | | | -1864.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 104.6 | 39.0 | 1.000 | 39.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.0 | 6.7 | 1.000 | 6.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.0 | 6.7 | 1.000 | 6.7 | | |
| | Filter: | 15.2 | 5.7 | 1.000 | 5.7 | No | |
| | Topsoil: | 3.1 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 22.5 | 8.4 | 1.000 | 8.4 | No | |
| **9+00.000** | | | | | | | -1911.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 112.8 | 40.2 | 1.000 | 40.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.6 | 6.8 | 1.000 | 6.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.6 | 6.8 | 1.000 | 6.8 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 15.9 | 5.8 | 1.000 | 5.8 | No | |
| | Topsoil: | 3.3 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 23.5 | 8.5 | 1.000 | 8.5 | No | |
| **9+10.000** | | | | | | | -1969.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 157.5 | 50.0 | 1.000 | 50.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 27.9 | 8.6 | 1.000 | 8.6 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 27.9 | 8.6 | 1.000 | 8.6 | | |
| | Filter: | 0.0 | 2.9 | 1.000 | 2.9 | No | |
| | Topsoil: | 13.2 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 4.4 | 1.000 | 4.4 | No | |
| **9+20.000** | | | | | | | -2039.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 164.7 | 59.7 | 1.000 | 59.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 28.5 | 10.4 | 1.000 | 10.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 28.5 | 10.5 | 1.000 | 10.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.6 | 5.0 | 1.000 | 5.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+30.000** | | | | | | | -2112.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 171.8 | 62.3 | 1.000 | 62.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 29.0 | 10.7 | 1.000 | 10.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 29.1 | 10.7 | 1.000 | 10.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.0 | 5.1 | 1.000 | 5.1 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+40.000** | | | | | | | -2188.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 179.0 | 65.0 | 1.000 | 65.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 29.6 | 10.9 | 1.000 | 10.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 29.6 | 10.9 | 1.000 | 10.9 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.3 | 5.2 | 1.000 | 5.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+50.000** | | | | | | | -2267.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 187.3 | 67.8 | 1.000 | 67.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 30.2 | 11.1 | 1.000 | 11.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 30.2 | 11.1 | 1.000 | 11.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.7 | 5.4 | 1.000 | 5.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+60.000** | | | | | | | -2350.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 202.6 | 72.2 | 1.000 | 72.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 30.2 | 11.2 | 1.000 | 11.2 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 30.3 | 11.2 | 1.000 | 11.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.8 | 5.5 | 1.000 | 5.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **9+70.000** | | | | | | | -2438.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 212.1 | 76.8 | 1.000 | 76.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 29.8 | 11.1 | 1.000 | 11.1 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 30.0 | 11.2 | 1.000 | 11.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.6 | 5.4 | 1.000 | 5.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+80.000** | | | | | | | -2529.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 218.5 | 79.8 | 1.000 | 79.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 29.6 | 11.0 | 1.000 | 11.0 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 29.8 | 11.1 | 1.000 | 11.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.5 | 5.4 | 1.000 | 5.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **9+90.000** | | | | | | | -2622.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 222.2 | 81.6 | 1.000 | 81.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 29.3 | 10.9 | 1.000 | 10.9 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 29.4 | 11.0 | 1.000 | 11.0 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.2 | 5.3 | 1.000 | 5.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+00.000** | | | | | | | -2714.5 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 218.7 | 81.7 | 1.000 | 81.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 28.7 | 10.7 | 1.000 | 10.7 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 28.8 | 10.8 | 1.000 | 10.8 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.8 | 5.2 | 1.000 | 5.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+10.000** | | | | | | | -2807.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 224.6 | 82.1 | 1.000 | 82.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 28.8 | 10.6 | 1.000 | 10.6 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 29.0 | 10.7 | 1.000 | 10.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.0 | 5.1 | 1.000 | 5.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+20.000** | | | | | | | -2901.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 225.4 | 83.3 | 1.000 | 83.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 28.2 | 10.5 | 1.000 | 10.5 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 28.4 | 10.6 | 1.000 | 10.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.6 | 5.1 | 1.000 | 5.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+30.000** | | | | | | | -2994.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 220.1 | 82.5 | 1.000 | 82.5 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 27.6 | 10.3 | 1.000 | 10.3 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 27.8 | 10.4 | 1.000 | 10.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.2 | 5.0 | 1.000 | 5.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+40.000** | | | | | | | -3084.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 215.9 | 80.8 | 1.000 | 80.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.5 | 10.0 | 1.000 | 10.0 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 26.8 | 10.1 | 1.000 | 10.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.8 | 4.8 | 1.000 | 4.8 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+50.000** | | | | | | | -3174.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 213.2 | 79.5 | 1.000 | 79.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.3 | 9.8 | 1.000 | 9.8 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 26.6 | 9.9 | 1.000 | 9.9 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.6 | 4.7 | 1.000 | 4.7 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+60.000** | | | | | | | -3261.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 208.0 | 78.0 | 1.000 | 78.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 26.0 | 9.7 | 1.000 | 9.7 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 26.2 | 9.8 | 1.000 | 9.8 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.4 | 4.6 | 1.000 | 4.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+70.000** | | | | | | | -3347.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 201.9 | 75.9 | 1.000 | 75.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.4 | 9.5 | 1.000 | 9.5 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 25.6 | 9.6 | 1.000 | 9.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.0 | 4.5 | 1.000 | 4.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+80.000** | | | | | | | -3429.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 194.1 | 73.3 | 1.000 | 73.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.7 | 9.3 | 1.000 | 9.3 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 25.0 | 9.4 | 1.000 | 9.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.6 | 4.4 | 1.000 | 4.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **10+90.000** | | | | | | | -3509.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 185.9 | 70.4 | 1.000 | 70.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.1 | 9.0 | 1.000 | 9.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 24.3 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.1 | 4.2 | 1.000 | 4.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+00.000** | | | | | | | -3585.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 177.6 | 67.3 | 1.000 | 67.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.4 | 8.8 | 1.000 | 8.8 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 23.7 | 8.9 | 1.000 | 8.9 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.7 | 4.0 | 1.000 | 4.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+10.000** | | | | | | | -3657.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 168.8 | 64.2 | 1.000 | 64.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.9 | 8.6 | 1.000 | 8.6 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 23.1 | 8.7 | 1.000 | 8.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.3 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+20.000** | | | | | | | -3727.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 159.4 | 60.8 | 1.000 | 60.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.3 | 8.4 | 1.000 | 8.4 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.5 | 8.5 | 1.000 | 8.5 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.9 | 3.7 | 1.000 | 3.7 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+30.000** | | | | | | | -3792.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 149.6 | 57.2 | 1.000 | 57.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.7 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 21.9 | 8.2 | 1.000 | 8.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.5 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+40.000** | | | | | | | -3853.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 139.3 | 53.5 | 1.000 | 53.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.1 | 7.9 | 1.000 | 7.9 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 21.4 | 8.0 | 1.000 | 8.0 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.1 | 3.4 | 1.000 | 3.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+50.000** | | | | | | | -3912.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 132.8 | 50.4 | 1.000 | 50.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.8 | 7.8 | 1.000 | 7.8 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 21.1 | 7.9 | 1.000 | 7.9 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 8.9 | 3.3 | 1.000 | 3.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+60.000** | | | | | | | -3967.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 127.8 | 48.3 | 1.000 | 48.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.6 | 7.7 | 1.000 | 7.7 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 20.9 | 7.8 | 1.000 | 7.8 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.8 | 3.3 | 1.000 | 3.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+70.000** | | | | | | | -4022.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 125.9 | 47.0 | 1.000 | 47.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.4 | 7.6 | 1.000 | 7.6 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 20.7 | 7.7 | 1.000 | 7.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.7 | 3.2 | 1.000 | 3.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+80.000** | | | | | | | -4076.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 124.7 | 46.4 | 1.000 | 46.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.3 | 7.5 | 1.000 | 7.5 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 20.6 | 7.6 | 1.000 | 7.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.6 | 3.2 | 1.000 | 3.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **11+90.000** | | | | | | | -4129.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 122.3 | 45.7 | 1.000 | 45.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.2 | 7.5 | 1.000 | 7.5 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 20.5 | 7.6 | 1.000 | 7.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.5 | 3.2 | 1.000 | 3.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+00.000** | | | | | | | -4181.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 117.6 | 44.4 | 1.000 | 44.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.1 | 7.5 | 1.000 | 7.5 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 20.4 | 7.6 | 1.000 | 7.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+10.000** | | | | | | | -4231.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 113.1 | 42.7 | 1.000 | 42.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.8 | 7.4 | 1.000 | 7.4 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 20.1 | 7.5 | 1.000 | 7.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.2 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **12+20.000** | | | | | | | -4281.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 113.6 | 42.0 | 1.000 | 42.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.1 | 7.4 | 1.000 | 7.4 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 20.3 | 7.5 | 1.000 | 7.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.4 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+30.000** | | | | | | | -4331.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 116.4 | 42.6 | 1.000 | 42.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.4 | 7.5 | 1.000 | 7.5 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 20.6 | 7.6 | 1.000 | 7.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.6 | 3.2 | 1.000 | 3.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+40.000** | | | | | | | -4382.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 120.6 | 43.9 | 1.000 | 43.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.7 | 7.6 | 1.000 | 7.6 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 20.9 | 7.7 | 1.000 | 7.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.8 | 3.2 | 1.000 | 3.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+50.000** | | | | | | | -4435.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 123.4 | 45.2 | 1.000 | 45.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.9 | 7.7 | 1.000 | 7.7 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 21.1 | 7.8 | 1.000 | 7.8 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.9 | 3.3 | 1.000 | 3.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+60.000** | | | | | | | -4487.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 117.9 | 44.7 | 1.000 | 44.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.5 | 7.7 | 1.000 | 7.7 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 20.7 | 7.7 | 1.000 | 7.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.7 | 3.3 | 1.000 | 3.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+70.000** | | | | | | | -4538.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 114.5 | 43.0 | 1.000 | 43.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.6 | 7.6 | 1.000 | 7.6 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 20.7 | 7.7 | 1.000 | 7.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.7 | 3.2 | 1.000 | 3.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+80.000** | | | | | | | -4587.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 111.2 | 41.8 | 1.000 | 41.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.9 | 7.7 | 1.000 | 7.7 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.0 | 7.7 | 1.000 | 7.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.9 | 3.3 | 1.000 | 3.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **12+90.000** | | | | | | | -4637.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 116.1 | 42.1 | 1.000 | 42.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.6 | 7.9 | 1.000 | 7.9 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 21.7 | 7.9 | 1.000 | 7.9 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.1 | 3.3 | 1.000 | 3.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+00.000** | | | | | | | -4691.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 128.8 | 45.4 | 1.000 | 45.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.0 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.2 | 8.1 | 1.000 | 8.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.5 | 3.4 | 1.000 | 3.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+10.000** | | | | | | | -4748.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 134.5 | 48.8 | 1.000 | 48.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 21.9 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.2 | 8.2 | 1.000 | 8.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.4 | 3.5 | 1.000 | 3.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+20.000** | | | | | | | -4805.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 131.9 | 49.3 | 1.000 | 49.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.6 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 21.9 | 8.2 | 1.000 | 8.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.1 | 3.4 | 1.000 | 3.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+30.000** | | | | | | | -4862.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 133.3 | 49.1 | 1.000 | 49.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.9 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.2 | 8.2 | 1.000 | 8.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.4 | 3.4 | 1.000 | 3.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+40.000** | | | | | | | -4919.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 130.6 | 48.9 | 1.000 | 48.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.1 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 22.5 | 8.3 | 1.000 | 8.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.6 | 3.5 | 1.000 | 3.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+50.000** | | | | | | | -4975.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 123.1 | 47.0 | 1.000 | 47.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.1 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.4 | 0.2 | 1.000 | 0.2 | No | |
| | Total Unsuitable: | 22.6 | 8.4 | 1.000 | 8.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.6 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+60.000** | | | | | | | -5029.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 126.2 | 46.2 | 1.000 | 46.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.2 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.4 | 0.2 | 1.000 | 0.2 | No | |
| | Total Unsuitable: | 22.6 | 8.4 | 1.000 | 8.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.6 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+70.000** | | | | | | | -5084.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 128.6 | 47.2 | 1.000 | 47.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.1 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.5 | 8.3 | 1.000 | 8.3 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.6 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+80.000** | | | | | | | -5140.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 130.2 | 47.9 | 1.000 | 47.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.9 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.3 | 8.3 | 1.000 | 8.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.5 | 3.5 | 1.000 | 3.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **13+90.000** | | | | | | | -5197.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 131.0 | 48.4 | 1.000 | 48.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.8 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.2 | 8.2 | 1.000 | 8.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.4 | 3.5 | 1.000 | 3.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **14+00.000** | | | | | | | -5253.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 131.1 | 48.5 | 1.000 | 48.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.8 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.1 | 8.2 | 1.000 | 8.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.3 | 3.5 | 1.000 | 3.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **14+10.000** | | | | | | | -5311.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 133.6 | 49.0 | 1.000 | 49.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.0 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.3 | 8.2 | 1.000 | 8.2 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.5 | 3.5 | 1.000 | 3.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **14+20.000** | | | | | | | -5369.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 136.7 | 50.0 | 1.000 | 50.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.1 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.5 | 8.3 | 1.000 | 8.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.6 | 3.5 | 1.000 | 3.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **14+30.000** | | | | | | | -5428.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 139.3 | 51.1 | 1.000 | 51.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.3 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.6 | 8.3 | 1.000 | 8.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.7 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **14+40.000** | | | | | | | -5488.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 141.9 | 52.1 | 1.000 | 52.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.5 | 8.3 | 1.000 | 8.3 | Yes | |
| | Unsuitable (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 22.8 | 8.4 | 1.000 | 8.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.8 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **14+50.000** | | | | | | | -5550.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 145.7 | 53.3 | 1.000 | 53.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.7 | 8.4 | 1.000 | 8.4 | Yes | |
| | Unsuitable (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 23.1 | 8.5 | 1.000 | 8.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.0 | 3.7 | 1.000 | 3.7 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **14+60.000** | | | | | | | -5610.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 135.2 | 52.0 | 1.000 | 52.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.0 | 7.7 | 1.000 | 7.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 19.0 | 7.8 | 1.000 | 7.8 | | |
| | Filter: | 28.0 | 5.2 | 1.000 | 5.2 | No | |
| | Topsoil: | 0.0 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 39.9 | 7.4 | 1.000 | 7.4 | No | |
| **14+70.000** | | | | | | | -5669.9 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 148.4 | 52.5 | 1.000 | 52.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.8 | 7.2 | 1.000 | 7.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.8 | 7.2 | 1.000 | 7.2 | | |
| | Filter: | 29.9 | 10.7 | 1.000 | 10.7 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 43.6 | 15.5 | 1.000 | 15.5 | No | |
| **14+80.000** | | | | | | | -5735.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 162.6 | 57.6 | 1.000 | 57.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.7 | 7.5 | 1.000 | 7.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.7 | 7.5 | 1.000 | 7.5 | | |
| | Filter: | 31.9 | 11.4 | 1.000 | 11.4 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 46.9 | 16.8 | 1.000 | 16.8 | No | |
| **14+90.000** | | | | | | | -5805.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 176.8 | 62.9 | 1.000 | 62.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.6 | 7.8 | 1.000 | 7.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.6 | 7.8 | 1.000 | 7.8 | | |
| | Filter: | 33.7 | 12.1 | 1.000 | 12.1 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 49.6 | 17.9 | 1.000 | 17.9 | No | |
| **15+00.000** | | | | | | | -5882.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 190.9 | 68.1 | 1.000 | 68.1 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.5 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.5 | 8.2 | 1.000 | 8.2 | | |
| | Filter: | 35.6 | 12.8 | 1.000 | 12.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 52.4 | 18.9 | 1.000 | 18.9 | No | |
| **15+10.000** | | | | | | | -5961.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 191.6 | 70.8 | 1.000 | 70.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.5 | 8.3 | 1.000 | 8.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.5 | 8.3 | 1.000 | 8.3 | | |
| | Filter: | 35.8 | 13.2 | 1.000 | 13.2 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 52.6 | 19.5 | 1.000 | 19.5 | No | |
| **15+20.000** | | | | | | | -6040.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 193.6 | 71.3 | 1.000 | 71.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.6 | 8.4 | 1.000 | 8.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.6 | 8.4 | 1.000 | 8.4 | | |
| | Filter: | 35.9 | 13.3 | 1.000 | 13.3 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 53.0 | 19.6 | 1.000 | 19.6 | No | |
| **15+30.000** | | | | | | | -6121.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 197.3 | 72.4 | 1.000 | 72.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 22.7 | 8.4 | 1.000 | 8.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.7 | 8.4 | 1.000 | 8.4 | | |
| | Filter: | 36.3 | 13.4 | 1.000 | 13.4 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 55.4 | 20.1 | 1.000 | 20.1 | No | |
| **15+40.000** | | | | | | | -6204.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 203.5 | 74.2 | 1.000 | 74.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.6 | 8.6 | 1.000 | 8.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.6 | 8.6 | 1.000 | 8.6 | | |
| | Filter: | 38.5 | 13.9 | 1.000 | 13.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 58.3 | 21.1 | 1.000 | 21.1 | No | |
| **15+50.000** | | | | | | | -6294.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 234.8 | 81.2 | 1.000 | 81.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.1 | 9.0 | 1.000 | 9.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 25.1 | 9.0 | 1.000 | 9.0 | | |
| | Filter: | 41.2 | 14.8 | 1.000 | 14.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 60.8 | 22.1 | 1.000 | 22.1 | No | |
| **15+60.000** | | | | | | | -6390.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 231.6 | 86.4 | 1.000 | 86.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.0 | 9.3 | 1.000 | 9.3 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 25.0 | 9.3 | 1.000 | 9.3 | | |
| | Filter: | 40.9 | 15.2 | 1.000 | 15.2 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 60.4 | 22.5 | 1.000 | 22.5 | No | |
| **15+70.000** | | | | | | | -6483.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 223.0 | 84.2 | 1.000 | 84.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.9 | 9.2 | 1.000 | 9.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.9 | 9.2 | 1.000 | 9.2 | | |
| | Filter: | 40.7 | 15.1 | 1.000 | 15.1 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 60.3 | 22.3 | 1.000 | 22.3 | No | |
| **15+80.000** | | | | | | | -6574.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 215.2 | 81.2 | 1.000 | 81.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.8 | 9.2 | 1.000 | 9.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.8 | 9.2 | 1.000 | 9.2 | | |
| | Filter: | 40.6 | 15.1 | 1.000 | 15.1 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 60.0 | 22.3 | 1.000 | 22.3 | No | |
| **15+90.000** | | | | | | | -6661.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 209.0 | 78.6 | 1.000 | 78.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.7 | 9.2 | 1.000 | 9.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.7 | 9.2 | 1.000 | 9.2 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 40.3 | 15.0 | 1.000 | 15.0 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 59.7 | 22.2 | 1.000 | 22.2 | No | |
| **16+00.000** | | | | | | | -6747.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 205.3 | 76.7 | 1.000 | 76.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.6 | 9.1 | 1.000 | 9.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.6 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 40.1 | 14.9 | 1.000 | 14.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 59.4 | 22.1 | 1.000 | 22.1 | No | |
| **16+10.000** | | | | | | | -6832.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 203.2 | 75.6 | 1.000 | 75.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.6 | 9.1 | 1.000 | 9.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.6 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 40.0 | 14.8 | 1.000 | 14.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 59.1 | 21.9 | 1.000 | 21.9 | No | |
| **16+20.000** | | | | | | | -6916.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 201.5 | 74.9 | 1.000 | 74.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.6 | 9.1 | 1.000 | 9.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.6 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 40.0 | 14.8 | 1.000 | 14.8 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 59.1 | 21.9 | 1.000 | 21.9 | No | |
| **16+30.000** | | | | | | | -7000.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 202.1 | 74.7 | 1.000 | 74.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.5 | 9.1 | 1.000 | 9.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.5 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 39.9 | 14.8 | 1.000 | 14.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 58.9 | 21.9 | 1.000 | 21.9 | No | |
| **16+40.000** | | | | | | | -7084.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 202.6 | 74.9 | 1.000 | 74.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.5 | 9.1 | 1.000 | 9.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.5 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 39.8 | 14.7 | 1.000 | 14.7 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 58.7 | 21.8 | 1.000 | 21.8 | No | |
| **16+50.000** | | | | | | | -7168.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 203.3 | 75.2 | 1.000 | 75.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.4 | 9.1 | 1.000 | 9.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.4 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 39.6 | 14.7 | 1.000 | 14.7 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 58.5 | 21.7 | 1.000 | 21.7 | No | |
| **16+60.000** | | | | | | | -7253.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 203.9 | 75.4 | 1.000 | 75.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.4 | 9.0 | 1.000 | 9.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.4 | 9.0 | 1.000 | 9.0 | | |
| | Filter: | 39.5 | 14.7 | 1.000 | 14.7 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 58.4 | 21.6 | 1.000 | 21.6 | No | |
| **16+70.000** | | | | | | | -7337.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 203.7 | 75.5 | 1.000 | 75.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.4 | 9.0 | 1.000 | 9.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.4 | 9.0 | 1.000 | 9.0 | | |
| | Filter: | 39.4 | 14.6 | 1.000 | 14.6 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 58.2 | 21.6 | 1.000 | 21.6 | No | |
| **16+80.000** | | | | | | | -7422.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 204.2 | 75.5 | 1.000 | 75.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.4 | 9.0 | 1.000 | 9.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.4 | 9.0 | 1.000 | 9.0 | | |
| | Filter: | 39.5 | 14.6 | 1.000 | 14.6 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 58.3 | 21.6 | 1.000 | 21.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **16+90.000** | | | | | | | -7507.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 207.6 | 76.3 | 1.000 | 76.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.5 | 9.0 | 1.000 | 9.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.5 | 9.0 | 1.000 | 9.0 | | |
| | Filter: | 39.6 | 14.6 | 1.000 | 14.6 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 58.6 | 21.7 | 1.000 | 21.7 | No | |
| **17+00.000** | | | | | | | -7594.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 212.1 | 77.7 | 1.000 | 77.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.5 | 9.1 | 1.000 | 9.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.5 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 39.8 | 14.7 | 1.000 | 14.7 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 58.8 | 21.7 | 1.000 | 21.7 | No | |
| **17+10.000** | | | | | | | -7682.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 216.0 | 79.3 | 1.000 | 79.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.6 | 9.1 | 1.000 | 9.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.6 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 39.9 | 14.7 | 1.000 | 14.7 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 59.0 | 21.8 | 1.000 | 21.8 | No | |
| **17+20.000** | | | | | | | -7772.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 219.3 | 80.6 | 1.000 | 80.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.6 | 9.1 | 1.000 | 9.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.6 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 40.0 | 14.8 | 1.000 | 14.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 59.1 | 21.9 | 1.000 | 21.9 | No | |
| **17+30.000** | | | | | | | -7863.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 223.7 | 82.0 | 1.000 | 82.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.7 | 9.1 | 1.000 | 9.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.7 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 40.2 | 14.8 | 1.000 | 14.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 59.4 | 21.9 | 1.000 | 21.9 | No | |
| **17+40.000** | | | | | | | -7957.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 232.4 | 84.5 | 1.000 | 84.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.7 | 9.1 | 1.000 | 9.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.7 | 9.1 | 1.000 | 9.1 | | |
| | Filter: | 40.3 | 14.9 | 1.000 | 14.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 58.8 | 21.9 | 1.000 | 21.9 | No | |
| **17+50.000** | | | | | | | -8053.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 240.5 | 87.6 | 1.000 | 87.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.8 | 9.2 | 1.000 | 9.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.8 | 9.2 | 1.000 | 9.2 | | |
| | Filter: | 40.3 | 14.9 | 1.000 | 14.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 57.2 | 21.5 | 1.000 | 21.5 | No | |
| **17+60.000** | | | | | | | -8154.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 251.1 | 91.0 | 1.000 | 91.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.9 | 9.2 | 1.000 | 9.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.9 | 9.2 | 1.000 | 9.2 | | |
| | Filter: | 39.7 | 14.8 | 1.000 | 14.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 56.0 | 21.0 | 1.000 | 21.0 | No | |
| **17+70.000** | | | | | | | -8257.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 259.6 | 94.6 | 1.000 | 94.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.2 | 9.3 | 1.000 | 9.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 25.2 | 9.3 | 1.000 | 9.3 | | |
| | Filter: | 40.6 | 14.9 | 1.000 | 14.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 57.2 | 21.0 | 1.000 | 21.0 | No | |
| **17+80.000** | | | | | | | -8363.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 262.0 | 96.6 | 1.000 | 96.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 25.5 | 9.4 | 1.000 | 9.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 25.5 | 9.4 | 1.000 | 9.4 | | |
| | Filter: | 41.3 | 15.2 | 1.000 | 15.2 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 58.3 | 21.4 | 1.000 | 21.4 | No | |
| **17+90.000** | | | | | | | -8469.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 260.2 | 96.7 | 1.000 | 96.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.2 | 9.4 | 1.000 | 9.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 25.2 | 9.4 | 1.000 | 9.4 | | |
| | Filter: | 40.9 | 15.2 | 1.000 | 15.2 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 58.5 | 21.6 | 1.000 | 21.6 | No | |
| **18+00.000** | | | | | | | -8575.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 257.7 | 95.9 | 1.000 | 95.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.7 | 9.2 | 1.000 | 9.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.7 | 9.2 | 1.000 | 9.2 | | |
| | Filter: | 39.8 | 14.9 | 1.000 | 14.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 33.6 | 17.1 | 1.000 | 17.1 | No | |
| **18+10.000** | | | | | | | -8685.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 284.8 | 100.5 | 1.000 | 100.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 28.4 | 9.8 | 1.000 | 9.8 | Yes | |
| | Unsuitable (not replaced): | 0.5 | 0.1 | 1.000 | 0.1 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 28.9 | 9.9 | 1.000 | 9.9 | | |
| | Filter: | 0.0 | 7.4 | 1.000 | 7.4 | No | |
| | Topsoil: | 14.2 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 6.2 | 1.000 | 6.2 | No | |
| **18+20.000** | | | | | | | -8796.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 257.6 | 100.5 | 1.000 | 100.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 27.2 | 10.3 | 1.000 | 10.3 | Yes | |
| | Unsuitable (not replaced): | 0.4 | 0.2 | 1.000 | 0.2 | No | |
| | Total Unsuitable: | 27.6 | 10.5 | 1.000 | 10.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.3 | 5.1 | 1.000 | 5.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+30.000** | | | | | | | -8897.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 238.0 | 91.8 | 1.000 | 91.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.3 | 9.9 | 1.000 | 9.9 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 26.7 | 10.1 | 1.000 | 10.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.7 | 4.8 | 1.000 | 4.8 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+40.000** | | | | | | | -8992.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 218.6 | 84.5 | 1.000 | 84.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.5 | 9.6 | 1.000 | 9.6 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 25.8 | 9.7 | 1.000 | 9.7 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.1 | 4.6 | 1.000 | 4.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+50.000** | | | | | | | -9078.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 199.3 | 77.4 | 1.000 | 77.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.5 | 9.4 | 1.000 | 9.4 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 25.7 | 9.5 | 1.000 | 9.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.1 | 4.5 | 1.000 | 4.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+60.000** | | | | | | | -9161.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 194.5 | 72.9 | 1.000 | 72.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.9 | 9.7 | 1.000 | 9.7 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 27.1 | 9.8 | 1.000 | 9.8 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.0 | 4.6 | 1.000 | 4.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+70.000** | | | | | | | -9239.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 173.1 | 68.1 | 1.000 | 68.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.0 | 9.8 | 1.000 | 9.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 26.0 | 9.8 | 1.000 | 9.8 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.3 | 4.7 | 1.000 | 4.7 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+80.000** | | | | | | | -9307.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 147.0 | 59.3 | 1.000 | 59.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.6 | 9.4 | 1.000 | 9.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.6 | 9.4 | 1.000 | 9.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.3 | 4.4 | 1.000 | 4.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+90.000** | | | | | | | -9367.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 124.8 | 50.3 | 1.000 | 50.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.1 | 8.8 | 1.000 | 8.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.2 | 8.8 | 1.000 | 8.8 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.3 | 4.0 | 1.000 | 4.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+00.000** | | | | | | | -9417.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 104.3 | 42.4 | 1.000 | 42.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.5 | 8.3 | 1.000 | 8.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.6 | 8.3 | 1.000 | 8.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.3 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **19+10.000** | | | | | | | -9461.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 89.5 | 35.9 | 1.000 | 35.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.5 | 8.0 | 1.000 | 8.0 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.6 | 8.0 | 1.000 | 8.0 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.2 | 3.4 | 1.000 | 3.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+20.000** | | | | | | | -9500.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 76.7 | 30.8 | 1.000 | 30.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.1 | 7.9 | 1.000 | 7.9 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.2 | 7.9 | 1.000 | 7.9 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.7 | 3.3 | 1.000 | 3.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+30.000** | | | | | | | -9535.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 68.7 | 26.9 | 1.000 | 26.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.5 | 7.7 | 1.000 | 7.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.5 | 7.7 | 1.000 | 7.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.2 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+40.000** | | | | | | | -9566.7 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 62.2 | 24.2 | 1.000 | 24.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.8 | 7.5 | 1.000 | 7.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.8 | 7.5 | 1.000 | 7.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.7 | 2.9 | 1.000 | 2.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+50.000** | | | | | | | -9595.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 54.2 | 21.5 | 1.000 | 21.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.5 | 7.1 | 1.000 | 7.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.5 | 7.1 | 1.000 | 7.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.8 | 2.7 | 1.000 | 2.7 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+60.000** | | | | | | | -9624.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 61.3 | 21.4 | 1.000 | 21.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.5 | 7.4 | 1.000 | 7.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.5 | 7.4 | 1.000 | 7.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 8.8 | 2.9 | 1.000 | 2.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+70.000** | | | | | | | -9662.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 101.2 | 30.1 | 1.000 | 30.1 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.0 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.1 | 8.1 | 1.000 | 8.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.2 | 3.3 | 1.000 | 3.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+80.000** | | | | | | | -9703.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 78.1 | 33.2 | 1.000 | 33.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.3 | 7.7 | 1.000 | 7.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.3 | 7.7 | 1.000 | 7.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 7.3 | 3.1 | 1.000 | 3.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **19+90.000** | | | | | | | -9735.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 60.8 | 25.7 | 1.000 | 25.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.9 | 6.7 | 1.000 | 6.7 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.0 | 6.7 | 1.000 | 6.7 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 6.0 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+00.000** | | | | | | | -9761.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 46.2 | 19.8 | 1.000 | 19.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 15.8 | 6.1 | 1.000 | 6.1 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.9 | 6.1 | 1.000 | 6.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.9 | 2.0 | 1.000 | 2.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+10.000** | | | | | | | -9783.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 41.7 | 16.3 | 1.000 | 16.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.3 | 5.8 | 1.000 | 5.8 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.4 | 5.8 | 1.000 | 5.8 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.6 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+20.000** | | | | | | | -9803.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 37.3 | 14.6 | 1.000 | 14.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.8 | 5.6 | 1.000 | 5.6 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.9 | 5.6 | 1.000 | 5.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.3 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+30.000** | | | | | | | -9822.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 34.0 | 13.2 | 1.000 | 13.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.9 | 5.5 | 1.000 | 5.5 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.9 | 5.5 | 1.000 | 5.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+40.000** | | | | | | | -9840.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.4 | 12.3 | 1.000 | 12.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.7 | 5.5 | 1.000 | 5.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.7 | 5.5 | 1.000 | 5.5 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.1 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+50.000** | | | | | | | -9857.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 31.5 | 11.8 | 1.000 | 11.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.6 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.6 | 5.4 | 1.000 | 5.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+60.000** | | | | | | | -9874.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 30.7 | 11.5 | 1.000 | 11.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.5 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.5 | 5.4 | 1.000 | 5.4 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.0 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+70.000** | | | | | | | -9891.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 30.8 | 11.4 | 1.000 | 11.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.6 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.6 | 5.4 | 1.000 | 5.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+80.000** | | | | | | | -9908.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.2 | 11.7 | 1.000 | 11.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.6 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.6 | 5.4 | 1.000 | 5.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **20+90.000** | | | | | | | -9925.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 33.5 | 12.2 | 1.000 | 12.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.5 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.6 | 5.4 | 1.000 | 5.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **21+00.000** | | | | | | | -9943.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 35.4 | 12.8 | 1.000 | 12.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.4 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.5 | 5.4 | 1.000 | 5.4 | | |
| | Filter: | 5.9 | 1.1 | 1.000 | 1.1 | No | |
| | Topsoil: | 2.6 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 9.4 | 1.7 | 1.000 | 1.7 | No | |
| **21+10.000** | | | | | | | -9963.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 38.6 | 13.7 | 1.000 | 13.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.9 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.9 | 5.4 | 1.000 | 5.4 | | |
| | Filter: | 5.9 | 2.2 | 1.000 | 2.2 | No | |
| | Topsoil: | 2.9 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 9.4 | 3.5 | 1.000 | 3.5 | No | |
| **21+20.000** | | | | | | | -9983.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 43.0 | 15.1 | 1.000 | 15.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.3 | 5.6 | 1.000 | 5.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.4 | 5.6 | 1.000 | 5.6 | | |
| | Filter: | 6.0 | 2.2 | 1.000 | 2.2 | No | |
| | Topsoil: | 3.2 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 9.4 | 3.5 | 1.000 | 3.5 | No | |
| **21+30.000** | | | | | | | -10006.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 47.9 | 16.8 | 1.000 | 16.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.9 | 5.8 | 1.000 | 5.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.0 | 5.8 | 1.000 | 5.8 | | |
| | Filter: | 6.3 | 2.3 | 1.000 | 2.3 | No | |
| | Topsoil: | 3.4 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 9.7 | 3.5 | 1.000 | 3.5 | No | |
| **21+40.000** | | | | | | | -10029.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 43.7 | 17.0 | 1.000 | 17.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.4 | 5.8 | 1.000 | 5.8 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.5 | 5.8 | 1.000 | 5.8 | | |
| | Filter: | 6.0 | 2.3 | 1.000 | 2.3 | No | |
| | Topsoil: | 3.2 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 9.4 | 3.5 | 1.000 | 3.5 | No | |
| **21+50.000** | | | | | | | -10049.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 37.5 | 15.0 | 1.000 | 15.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.7 | 5.6 | 1.000 | 5.6 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.7 | 5.6 | 1.000 | 5.6 | | |
| | Filter: | 5.7 | 2.2 | 1.000 | 2.2 | No | |
| | Topsoil: | 2.8 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 9.0 | 3.4 | 1.000 | 3.4 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **21+60.000** | | | | | | | -10067.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.5 | 13.0 | 1.000 | 13.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.0 | 5.3 | 1.000 | 5.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.0 | 5.3 | 1.000 | 5.3 | | |
| | Filter: | 5.4 | 2.1 | 1.000 | 2.1 | No | |
| | Topsoil: | 2.4 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 8.4 | 3.2 | 1.000 | 3.2 | No | |
| **21+70.000** | | | | | | | -10084.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 29.0 | 11.4 | 1.000 | 11.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.0 | 5.2 | 1.000 | 5.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.0 | 5.2 | 1.000 | 5.2 | | |
| | Filter: | 4.9 | 1.9 | 1.000 | 1.9 | No | |
| | Topsoil: | 2.5 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 7.7 | 3.0 | 1.000 | 3.0 | No | |
| **21+80.000** | | | | | | | -10102.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 41.2 | 13.0 | 1.000 | 13.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.5 | 5.5 | 1.000 | 5.5 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.5 | 5.5 | 1.000 | 5.5 | | |
| | Filter: | 6.0 | 2.0 | 1.000 | 2.0 | No | |
| | Topsoil: | 3.3 | 1.1 | 1.000 | 1.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 9.2 | 3.1 | 1.000 | 3.1 | No | |
| **21+90.000** | | | | | | | -10125.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 49.8 | 16.8 | 1.000 | 16.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.5 | 5.9 | 1.000 | 5.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.5 | 5.9 | 1.000 | 5.9 | | |
| | Filter: | 5.6 | 2.1 | 1.000 | 2.1 | No | |
| | Topsoil: | 4.0 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 8.3 | 3.2 | 1.000 | 3.2 | No | |
| **22+00.000** | | | | | | | -10150.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 50.7 | 18.6 | 1.000 | 18.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.3 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.3 | 6.3 | 1.000 | 6.3 | | |
| | Filter: | 5.0 | 2.0 | 1.000 | 2.0 | No | |
| | Topsoil: | 4.7 | 1.6 | 1.000 | 1.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 7.4 | 2.9 | 1.000 | 2.9 | No | |
| **22+10.000** | | | | | | | -10178.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 63.2 | 21.1 | 1.000 | 21.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.5 | 6.6 | 1.000 | 6.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.5 | 6.6 | 1.000 | 6.6 | | |
| | Filter: | 4.7 | 1.8 | 1.000 | 1.8 | No | |
| | Topsoil: | 5.6 | 1.9 | 1.000 | 1.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 6.9 | 2.7 | 1.000 | 2.7 | No | |
| **22+20.000** | | | | | | | -10213.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 86.5 | 27.7 | 1.000 | 27.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.3 | 7.2 | 1.000 | 7.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.3 | 7.2 | 1.000 | 7.2 | | |
| | Filter: | 6.1 | 2.0 | 1.000 | 2.0 | No | |
| | Topsoil: | 6.4 | 2.2 | 1.000 | 2.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 8.7 | 2.9 | 1.000 | 2.9 | No | |
| **22+30.000** | | | | | | | -10257.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 110.9 | 36.5 | 1.000 | 36.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.9 | 7.8 | 1.000 | 7.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.0 | 7.8 | 1.000 | 7.8 | | |
| | Filter: | 7.4 | 2.5 | 1.000 | 2.5 | No | |
| | Topsoil: | 7.1 | 2.5 | 1.000 | 2.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 10.4 | 3.5 | 1.000 | 3.5 | No | |
| **22+40.000** | | | | | | | -10308.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 116.9 | 42.2 | 1.000 | 42.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.6 | 8.3 | 1.000 | 8.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.7 | 8.3 | 1.000 | 8.3 | | |
| | Filter: | 7.8 | 2.8 | 1.000 | 2.8 | No | |
| | Topsoil: | 7.4 | 2.7 | 1.000 | 2.7 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 11.0 | 4.0 | 1.000 | 4.0 | No | |
| **22+50.000** | | | | | | | -10358.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 111.7 | 42.3 | 1.000 | 42.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 22.8 | 8.4 | 1.000 | 8.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.9 | 8.4 | 1.000 | 8.4 | | |
| | Filter: | 7.8 | 2.9 | 1.000 | 2.9 | No | |
| | Topsoil: | 7.6 | 2.8 | 1.000 | 2.8 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 11.4 | 4.1 | 1.000 | 4.1 | No | |
| **22+60.000** | | | | | | | -10406.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 102.6 | 39.7 | 1.000 | 39.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.8 | 8.4 | 1.000 | 8.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.8 | 8.5 | 1.000 | 8.5 | | |
| | Filter: | 7.1 | 2.8 | 1.000 | 2.8 | No | |
| | Topsoil: | 7.7 | 2.8 | 1.000 | 2.8 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 10.4 | 4.0 | 1.000 | 4.0 | No | |
| **22+70.000** | | | | | | | -10451.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 90.8 | 35.8 | 1.000 | 35.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.7 | 8.4 | 1.000 | 8.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 22.7 | 8.4 | 1.000 | 8.4 | | |
| | Filter: | 6.4 | 2.5 | 1.000 | 2.5 | No | |
| | Topsoil: | 7.9 | 2.9 | 1.000 | 2.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 9.4 | 3.7 | 1.000 | 3.7 | No | |
| **22+80.000** | | | | | | | -10490.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 78.2 | 31.3 | 1.000 | 31.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.7 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 21.7 | 8.2 | 1.000 | 8.2 | | |
| | Filter: | 6.0 | 2.3 | 1.000 | 2.3 | No | |
| | Topsoil: | 7.3 | 2.8 | 1.000 | 2.8 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 8.8 | 3.4 | 1.000 | 3.4 | No | |
| **22+90.000** | | | | | | | -10525.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 69.7 | 27.4 | 1.000 | 27.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 20.4 | 7.8 | 1.000 | 7.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 20.4 | 7.8 | 1.000 | 7.8 | | |
| | Filter: | 5.6 | 2.2 | 1.000 | 2.2 | No | |
| | Topsoil: | 6.6 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 8.2 | 3.1 | 1.000 | 3.1 | No | |
| **23+00.000** | | | | | | | -10557.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 63.2 | 24.6 | 1.000 | 24.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.6 | 7.4 | 1.000 | 7.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.6 | 7.4 | 1.000 | 7.4 | | |
| | Filter: | 5.3 | 2.0 | 1.000 | 2.0 | No | |
| | Topsoil: | 6.2 | 2.4 | 1.000 | 2.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 7.7 | 2.9 | 1.000 | 2.9 | No | |
| **23+10.000** | | | | | | | -10586.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 54.6 | 21.8 | 1.000 | 21.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.1 | 7.0 | 1.000 | 7.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.1 | 7.0 | 1.000 | 7.0 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 4.9 | 1.9 | 1.000 | 1.9 | No | |
| | Topsoil: | 5.2 | 2.1 | 1.000 | 2.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 7.1 | 2.7 | 1.000 | 2.7 | No | |
| **23+20.000** | | | | | | | -10610.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 38.3 | 17.2 | 1.000 | 17.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.9 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.9 | 6.3 | 1.000 | 6.3 | | |
| | Filter: | 4.4 | 1.7 | 1.000 | 1.7 | No | |
| | Topsoil: | 4.0 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 6.6 | 2.5 | 1.000 | 2.5 | No | |
| **23+30.000** | | | | | | | -10629.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 32.5 | 13.1 | 1.000 | 13.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.7 | 5.7 | 1.000 | 5.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.7 | 5.7 | 1.000 | 5.7 | | |
| | Filter: | 4.2 | 1.6 | 1.000 | 1.6 | No | |
| | Topsoil: | 3.2 | 1.3 | 1.000 | 1.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 6.4 | 2.4 | 1.000 | 2.4 | No | |
| **23+40.000** | | | | | | | -10645.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 29.3 | 11.4 | 1.000 | 11.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 14.2 | 5.3 | 1.000 | 5.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 14.2 | 5.3 | 1.000 | 5.3 | | |
| | Filter: | 4.1 | 1.5 | 1.000 | 1.5 | No | |
| | Topsoil: | 2.9 | 1.1 | 1.000 | 1.1 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 6.3 | 2.4 | 1.000 | 2.4 | No | |
| **23+50.000** | | | | | | | -10661.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 26.5 | 10.3 | 1.000 | 10.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.8 | 5.2 | 1.000 | 5.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.8 | 5.2 | 1.000 | 5.2 | | |
| | Filter: | 4.0 | 1.5 | 1.000 | 1.5 | No | |
| | Topsoil: | 2.7 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 6.1 | 2.3 | 1.000 | 2.3 | No | |
| **23+60.000** | | | | | | | -10675.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 24.1 | 9.4 | 1.000 | 9.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.3 | 5.0 | 1.000 | 5.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.3 | 5.0 | 1.000 | 5.0 | | |
| | Filter: | 3.8 | 1.4 | 1.000 | 1.4 | No | |
| | Topsoil: | 2.4 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 5.9 | 2.2 | 1.000 | 2.2 | No | |
| **23+70.000** | | | | | | | -10689.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 21.9 | 8.5 | 1.000 | 8.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.9 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.9 | 4.9 | 1.000 | 4.9 | | |
| | Filter: | 3.6 | 1.4 | 1.000 | 1.4 | No | |
| | Topsoil: | 2.2 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 5.5 | 2.1 | 1.000 | 2.1 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **23+80.000** | | | | | | | -10701.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 19.0 | 7.6 | 1.000 | 7.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.9 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.9 | 4.8 | 1.000 | 4.8 | | |
| | Filter: | 3.0 | 1.2 | 1.000 | 1.2 | No | |
| | Topsoil: | 2.4 | 0.8 | 1.000 | 0.8 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 4.7 | 1.9 | 1.000 | 1.9 | No | |
| **23+90.000** | | | | | | | -10713.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 18.7 | 7.0 | 1.000 | 7.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 12.8 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 12.8 | 4.8 | 1.000 | 4.8 | | |
| | Filter: | 2.5 | 1.0 | 1.000 | 1.0 | No | |
| | Topsoil: | 2.4 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 3.9 | 1.6 | 1.000 | 1.6 | No | |
| **24+00.000** | | | | | | | -10724.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 19.6 | 7.1 | 1.000 | 7.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.0 | 4.8 | 1.000 | 4.8 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.0 | 4.8 | 1.000 | 4.8 | | |
| | Filter: | 2.5 | 0.9 | 1.000 | 0.9 | No | |
| | Topsoil: | 2.5 | 0.9 | 1.000 | 0.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 3.7 | 1.4 | 1.000 | 1.4 | No | |
| **24+10.000** | | | | | | | -10738.0 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 24.0 | 8.1 | 1.000 | 8.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 13.7 | 4.9 | 1.000 | 4.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 13.7 | 4.9 | 1.000 | 4.9 | | |
| | Filter: | 3.0 | 1.0 | 1.000 | 1.0 | No | |
| | Topsoil: | 2.9 | 1.0 | 1.000 | 1.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 4.3 | 1.5 | 1.000 | 1.5 | No | |
| **24+20.000** | | | | | | | -10754.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 35.6 | 11.1 | 1.000 | 11.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 15.5 | 5.4 | 1.000 | 5.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 15.5 | 5.4 | 1.000 | 5.4 | | |
| | Filter: | 3.9 | 1.3 | 1.000 | 1.3 | No | |
| | Topsoil: | 3.8 | 1.2 | 1.000 | 1.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 5.7 | 1.9 | 1.000 | 1.9 | No | |
| **24+30.000** | | | | | | | -10775.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 47.1 | 15.3 | 1.000 | 15.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 16.6 | 6.0 | 1.000 | 6.0 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 16.6 | 6.0 | 1.000 | 6.0 | | |
| | Filter: | 4.8 | 1.6 | 1.000 | 1.6 | No | |
| | Topsoil: | 4.3 | 1.5 | 1.000 | 1.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 7.1 | 2.4 | 1.000 | 2.4 | No | |
| **24+40.000** | | | | | | | -10800.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 54.8 | 18.9 | 1.000 | 18.9 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 17.6 | 6.3 | 1.000 | 6.3 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 17.6 | 6.3 | 1.000 | 6.3 | | |
| | Filter: | 5.8 | 2.0 | 1.000 | 2.0 | No | |
| | Topsoil: | 4.7 | 1.7 | 1.000 | 1.7 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 8.7 | 2.9 | 1.000 | 2.9 | No | |
| **24+50.000** | | | | | | | -10829.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 60.9 | 21.4 | 1.000 | 21.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 18.3 | 6.6 | 1.000 | 6.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 18.3 | 6.6 | 1.000 | 6.6 | | |
| | Filter: | 6.2 | 2.2 | 1.000 | 2.2 | No | |
| | Topsoil: | 5.0 | 1.8 | 1.000 | 1.8 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 9.4 | 3.3 | 1.000 | 3.3 | No | |
| **24+60.000** | | | | | | | -10859.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 67.5 | 23.8 | 1.000 | 23.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 19.0 | 6.9 | 1.000 | 6.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.0 | 6.9 | 1.000 | 6.9 | | |
| | Filter: | 6.7 | 2.4 | 1.000 | 2.4 | No | |
| | Topsoil: | 5.4 | 1.9 | 1.000 | 1.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 10.0 | 3.6 | 1.000 | 3.6 | No | |
| **24+70.000** | | | | | | | -10893.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 74.7 | 26.3 | 1.000 | 26.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 19.7 | 7.2 | 1.000 | 7.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 19.7 | 7.2 | 1.000 | 7.2 | | |
| | Filter: | 7.1 | 2.6 | 1.000 | 2.6 | No | |
| | Topsoil: | 5.7 | 2.1 | 1.000 | 2.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 10.7 | 3.8 | 1.000 | 3.8 | No | |
| **24+80.000** | | | | | | | -10931.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 91.8 | 30.8 | 1.000 | 30.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.4 | 7.6 | 1.000 | 7.6 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 21.5 | 7.6 | 1.000 | 7.6 | | |
| | Filter: | 8.1 | 2.8 | 1.000 | 2.8 | No | |
| | Topsoil: | 6.6 | 2.3 | 1.000 | 2.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 12.1 | 4.2 | 1.000 | 4.2 | No | |
| **24+90.000** | | | | | | | -10977.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 110.7 | 37.5 | 1.000 | 37.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.1 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 23.1 | 8.2 | 1.000 | 8.2 | | |
| | Filter: | 8.9 | 3.2 | 1.000 | 3.2 | No | |
| | Topsoil: | 7.4 | 2.6 | 1.000 | 2.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.3 | 4.7 | 1.000 | 4.7 | No | |
| **25+00.000** | | | | | | | -11030.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 129.8 | 44.5 | 1.000 | 44.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.6 | 8.8 | 1.000 | 8.8 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 24.6 | 8.8 | 1.000 | 8.8 | | |
| | Filter: | 9.5 | 3.4 | 1.000 | 3.4 | No | |
| | Topsoil: | 8.2 | 2.9 | 1.000 | 2.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 14.2 | 5.1 | 1.000 | 5.1 | No | |
| **25+10.000** | | | | | | | -11091.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 147.9 | 51.4 | 1.000 | 51.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.0 | 9.4 | 1.000 | 9.4 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 26.0 | 9.4 | 1.000 | 9.4 | | |
| | Filter: | 10.2 | 3.6 | 1.000 | 3.6 | No | |
| | Topsoil: | 8.9 | 3.2 | 1.000 | 3.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 15.1 | 5.4 | 1.000 | 5.4 | No | |
| **25+20.000** | | | | | | | -11158.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 160.6 | 57.1 | 1.000 | 57.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.6 | 9.7 | 1.000 | 9.7 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 26.6 | 9.7 | 1.000 | 9.7 | | |
| | Filter: | 10.8 | 3.9 | 1.000 | 3.9 | No | |
| | Topsoil: | 9.2 | 3.4 | 1.000 | 3.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 16.0 | 5.8 | 1.000 | 5.8 | No | |
| **25+30.000** | | | | | | | -11228.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 164.9 | 60.3 | 1.000 | 60.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.7 | 9.9 | 1.000 | 9.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 26.7 | 9.9 | 1.000 | 9.9 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 10.0 | 3.8 | 1.000 | 3.8 | No | |
| | Topsoil: | 9.4 | 3.4 | 1.000 | 3.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.5 | 5.5 | 1.000 | 5.5 | No | |
| **25+40.000** | | | | | | | -11298.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 161.1 | 60.4 | 1.000 | 60.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.7 | 9.7 | 1.000 | 9.7 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 25.8 | 9.7 | 1.000 | 9.7 | | |
| | Filter: | 7.2 | 3.2 | 1.000 | 3.2 | No | |
| | Topsoil: | 9.5 | 3.5 | 1.000 | 3.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 9.3 | 4.2 | 1.000 | 4.2 | No | |
| **25+50.000** | | | | | | | -11367.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 158.7 | 59.2 | 1.000 | 59.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.4 | 9.5 | 1.000 | 9.5 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 25.5 | 9.5 | 1.000 | 9.5 | | |
| | Filter: | 6.1 | 2.5 | 1.000 | 2.5 | No | |
| | Topsoil: | 9.6 | 3.5 | 1.000 | 3.5 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 7.6 | 3.1 | 1.000 | 3.1 | No | |
| **25+60.000** | | | | | | | -11435.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 160.9 | 59.2 | 1.000 | 59.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.8 | 9.5 | 1.000 | 9.5 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 25.8 | 9.5 | 1.000 | 9.5 | | |
| | Filter: | 5.6 | 2.2 | 1.000 | 2.2 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 10.0 | 3.6 | 1.000 | 3.6 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 6.9 | 2.7 | 1.000 | 2.7 | No | |
| **25+70.000** | | | | | | | -11505.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 163.0 | 60.0 | 1.000 | 60.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.1 | 9.6 | 1.000 | 9.6 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 26.2 | 9.6 | 1.000 | 9.6 | | |
| | Filter: | 5.2 | 2.0 | 1.000 | 2.0 | No | |
| | Topsoil: | 10.3 | 3.8 | 1.000 | 3.8 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 6.3 | 2.4 | 1.000 | 2.4 | No | |
| **25+80.000** | | | | | | | -11576.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 164.7 | 60.7 | 1.000 | 60.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.5 | 9.7 | 1.000 | 9.7 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 26.6 | 9.8 | 1.000 | 9.8 | | |
| | Filter: | 4.7 | 1.8 | 1.000 | 1.8 | No | |
| | Topsoil: | 10.7 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 5.5 | 2.2 | 1.000 | 2.2 | No | |
| **25+90.000** | | | | | | | -11647.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 165.5 | 61.1 | 1.000 | 61.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.8 | 9.9 | 1.000 | 9.9 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 26.9 | 9.9 | 1.000 | 9.9 | | |
| | Filter: | 4.2 | 1.7 | 1.000 | 1.7 | No | |
| | Topsoil: | 11.1 | 4.0 | 1.000 | 4.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 4.7 | 1.9 | 1.000 | 1.9 | No | |
| **26+00.000** | | | | | | | -11717.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 162.3 | 60.7 | 1.000 | 60.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.8 | 9.9 | 1.000 | 9.9 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 26.9 | 10.0 | 1.000 | 10.0 | | |
| | Filter: | 3.7 | 1.5 | 1.000 | 1.5 | No | |
| | Topsoil: | 11.2 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 4.0 | 1.6 | 1.000 | 1.6 | No | |
| **26+10.000** | | | | | | | -11786.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 155.3 | 58.8 | 1.000 | 58.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.8 | 9.9 | 1.000 | 9.9 | Yes | |
| | Unsuitable (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 26.8 | 9.9 | 1.000 | 9.9 | | |
| | Filter: | 3.2 | 1.3 | 1.000 | 1.3 | No | |
| | Topsoil: | 11.3 | 4.2 | 1.000 | 4.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 3.1 | 1.3 | 1.000 | 1.3 | No | |
| **26+20.000** | | | | | | | -11852.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 147.6 | 56.1 | 1.000 | 56.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 27.3 | 10.0 | 1.000 | 10.0 | Yes | |
| | Unsuitable (not replaced): | 0.2 | 0.0 | 1.000 | 0.0 | No | |
| | Total Unsuitable: | 27.5 | 10.1 | 1.000 | 10.1 | | |
| | Filter: | 2.6 | 1.1 | 1.000 | 1.1 | No | |
| | Topsoil: | 11.1 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 2.5 | 1.0 | 1.000 | 1.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **26+30.000** | | | | | | | -11915.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 139.7 | 53.2 | 1.000 | 53.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 26.5 | 10.0 | 1.000 | 10.0 | Yes | |
| | Unsuitable (not replaced): | 0.7 | 0.2 | 1.000 | 0.2 | No | |
| | Total Unsuitable: | 27.2 | 10.1 | 1.000 | 10.1 | | |
| | Filter: | 2.1 | 0.9 | 1.000 | 0.9 | No | |
| | Topsoil: | 10.9 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 2.1 | 0.8 | 1.000 | 0.8 | No | |
| **26+40.000** | | | | | | | -11975.4 |
| | Normal Cut: | 0.2 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 131.5 | 50.2 | 1.000 | 50.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.7 | 9.7 | 1.000 | 9.7 | Yes | |
| | Unsuitable (not replaced): | 1.2 | 0.4 | 1.000 | 0.4 | No | |
| | Total Unsuitable: | 26.9 | 10.0 | 1.000 | 10.0 | | |
| | Filter: | 1.6 | 0.7 | 1.000 | 0.7 | No | |
| | Topsoil: | 10.6 | 4.0 | 1.000 | 4.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 1.7 | 0.7 | 1.000 | 0.7 | No | |
| **26+50.000** | | | | | | | -12032.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 123.3 | 47.2 | 1.000 | 47.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 25.2 | 9.4 | 1.000 | 9.4 | Yes | |
| | Unsuitable (not replaced): | 0.1 | 0.2 | 1.000 | 0.2 | No | |
| | Total Unsuitable: | 25.3 | 9.7 | 1.000 | 9.7 | | |
| | Filter: | 0.0 | 0.3 | 1.000 | 0.3 | No | |
| | Topsoil: | 10.7 | 4.0 | 1.000 | 4.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.3 | 1.000 | 0.3 | No | |
| **26+60.000** | | | | | | | -12084.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 112.7 | 43.7 | 1.000 | 43.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.7 | 9.2 | 1.000 | 9.2 | Yes | |
| | Unsuitable (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Unsuitable: | 24.9 | 9.3 | 1.000 | 9.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.6 | 4.0 | 1.000 | 4.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+70.000** | | | | | | | -12133.0 |
| | Normal Cut: | 1.1 | 0.2 | 1.000 | 0.2 | Yes | |
| | Normal Fill: | 100.0 | 39.4 | 1.000 | 39.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 23.4 | 8.9 | 1.000 | 8.9 | Yes | |
| | Unsuitable (not replaced): | 1.8 | 0.4 | 1.000 | 0.4 | No | |
| | Total Unsuitable: | 25.2 | 9.3 | 1.000 | 9.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.6 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+80.000** | | | | | | | -12176.2 |
| | Normal Cut: | 3.9 | 0.9 | 1.000 | 0.9 | Yes | |
| | Normal Fill: | 92.6 | 35.7 | 1.000 | 35.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.1 | 8.4 | 1.000 | 8.4 | Yes | |
| | Unsuitable (not replaced): | 3.1 | 0.9 | 1.000 | 0.9 | No | |
| | Total Unsuitable: | 25.2 | 9.3 | 1.000 | 9.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.6 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **26+90.000** | | | | | | | -12216.0 |
| | Normal Cut: | 6.2 | 1.9 | 1.000 | 1.9 | Yes | |
| | Normal Fill: | 88.5 | 33.5 | 1.000 | 33.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.6 | 8.1 | 1.000 | 8.1 | Yes | |
| | Unsuitable (not replaced): | 3.6 | 1.2 | 1.000 | 1.2 | No | |
| | Total Unsuitable: | 25.2 | 9.3 | 1.000 | 9.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.6 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+00.000** | | | | | | | -12253.5 |
| | Normal Cut: | 7.1 | 2.5 | 1.000 | 2.5 | Yes | |
| | Normal Fill: | 84.6 | 32.0 | 1.000 | 32.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.2 | 7.9 | 1.000 | 7.9 | Yes | |
| | Unsuitable (not replaced): | 4.0 | 1.4 | 1.000 | 1.4 | No | |
| | Total Unsuitable: | 25.2 | 9.3 | 1.000 | 9.3 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.6 | 3.9 | 1.000 | 3.9 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+10.000** | | | | | | | -12289.3 |
| | Normal Cut: | 7.8 | 2.8 | 1.000 | 2.8 | Yes | |
| | Normal Fill: | 81.4 | 30.7 | 1.000 | 30.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.2 | 7.9 | 1.000 | 7.9 | Yes | |
| | Unsuitable (not replaced): | 4.5 | 1.6 | 1.000 | 1.6 | No | |
| | Total Unsuitable: | 25.7 | 9.4 | 1.000 | 9.4 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.8 | 4.0 | 1.000 | 4.0 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+20.000** | | | | | | | -12324.3 |
| | Normal Cut: | 8.3 | 3.0 | 1.000 | 3.0 | Yes | |
| | Normal Fill: | 81.0 | 30.1 | 1.000 | 30.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Unsuitable (replaced): | 21.4 | 7.9 | 1.000 | 7.9 | Yes | |
| | Unsuitable (not replaced): | 4.9 | 1.7 | 1.000 | 1.7 | No | |
| | Total Unsuitable: | 26.2 | 9.6 | 1.000 | 9.6 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.2 | 4.1 | 1.000 | 4.1 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+30.000** | | | | | | | -12359.8 |
| | Normal Cut: | 8.7 | 3.1 | 1.000 | 3.1 | Yes | |
| | Normal Fill: | 84.6 | 30.7 | 1.000 | 30.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 21.7 | 8.0 | 1.000 | 8.0 | Yes | |
| | Unsuitable (not replaced): | 5.1 | 1.9 | 1.000 | 1.9 | No | |
| | Total Unsuitable: | 26.8 | 9.8 | 1.000 | 9.8 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.5 | 4.2 | 1.000 | 4.2 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+40.000** | | | | | | | -12396.7 |
| | Normal Cut: | 8.9 | 3.2 | 1.000 | 3.2 | Yes | |
| | Normal Fill: | 88.2 | 32.0 | 1.000 | 32.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 22.5 | 8.2 | 1.000 | 8.2 | Yes | |
| | Unsuitable (not replaced): | 4.7 | 1.8 | 1.000 | 1.8 | No | |
| | Total Unsuitable: | 27.2 | 10.0 | 1.000 | 10.0 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.9 | 4.3 | 1.000 | 4.3 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **27+50.000** | | | | | | | -12436.1 |
| | Normal Cut: | 5.7 | 2.7 | 1.000 | 2.7 | Yes | |
| | Normal Fill: | 92.8 | 33.5 | 1.000 | 33.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Unsuitable (replaced): | 24.0 | 8.6 | 1.000 | 8.6 | Yes | |
| | Unsuitable (not replaced): | 3.6 | 1.5 | 1.000 | 1.5 | No | |

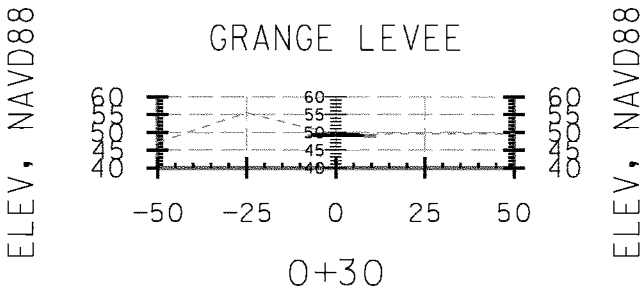
| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Unsuitable: | 27.5 | 10.1 | 1.000 | 10.1 | | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.1 | 4.4 | 1.000 | 4.4 | No | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

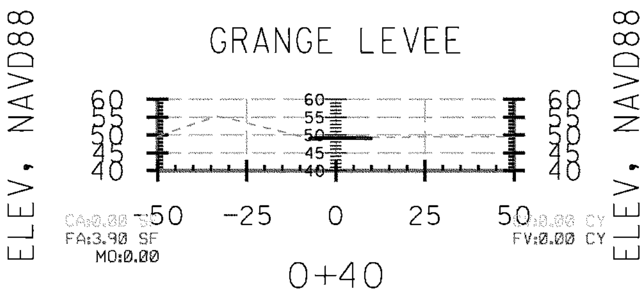
**Totals:**

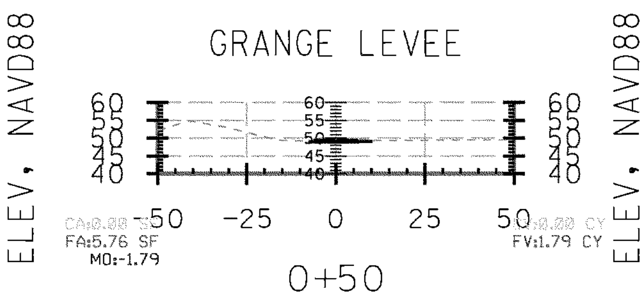
| Type | Volume | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|
| Normal Cut: | 20.4 | 20.4 | Yes | |
| Normal Fill: | 10530.0 | 10530.0 | Yes | |
| Added Cut: | 0.0 | 0.0 | Yes | |
| Added Fill: | 0.0 | 0.0 | Yes | |
| Unsuitable (replaced): | 1926.5 | 1926.5 | Yes | |
| Unsuitable (not replaced): | 26.7 | 26.7 | No | |
| Total Unsuitable: | 1953.3 | 1953.3 | | |
| Filter: | 782.0 | 782.0 | No | |
| Topsoil: | 549.1 | 549.1 | No | |
| Wearing Course: | 439.3 | 439.3 | No | |
| Riprap: | 1127.8 | 1127.8 | No | |

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

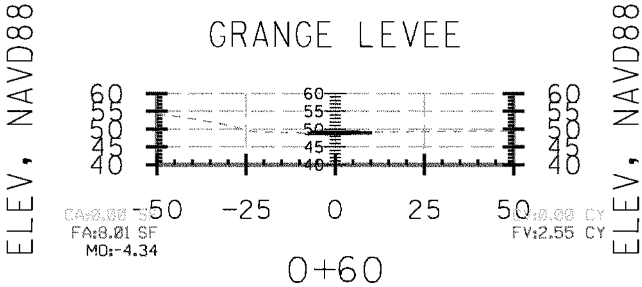
STA.0+30 TO STA.0+50

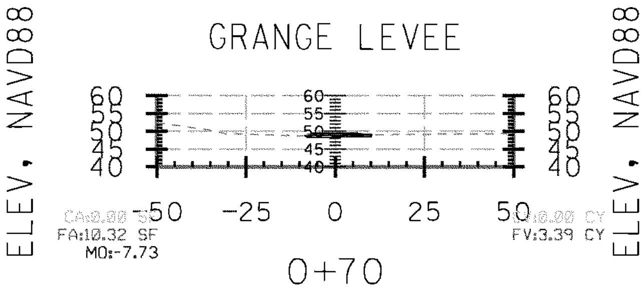


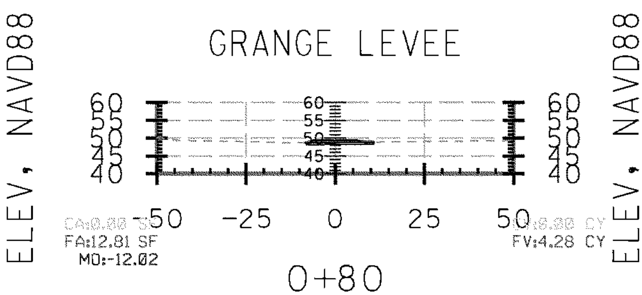



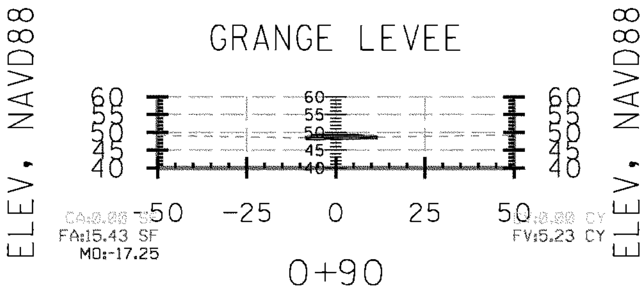
STA.0+60 TO STA.0+80

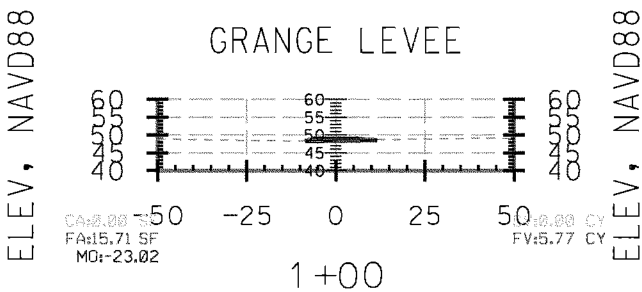


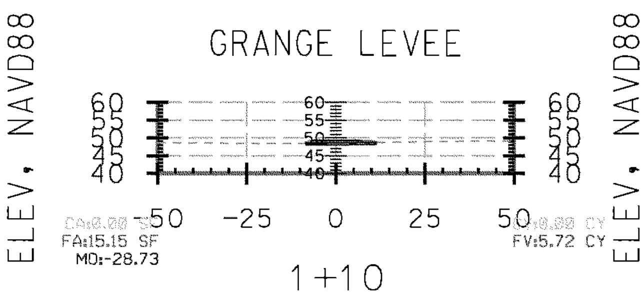



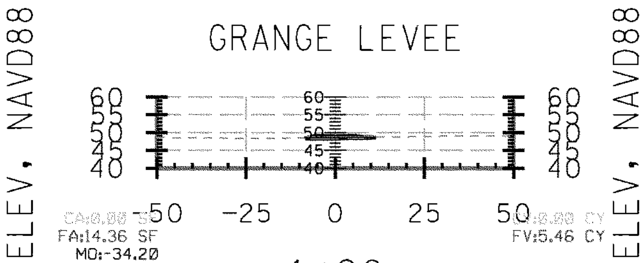
STA.0+90 TO STA.1+10



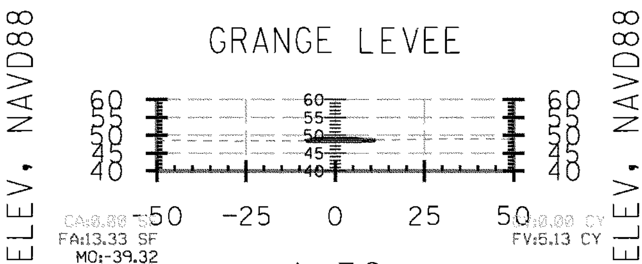



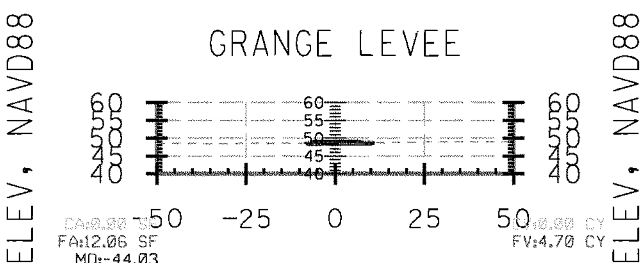
STA.1+20 TO STA.1+40




1+20

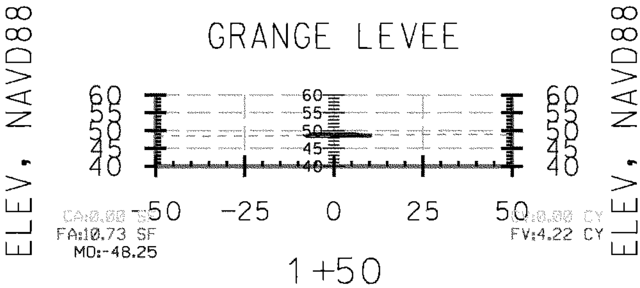


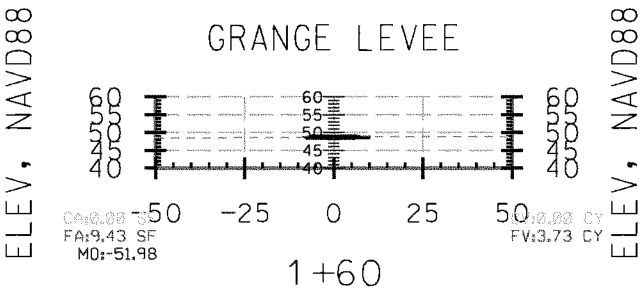

1+30

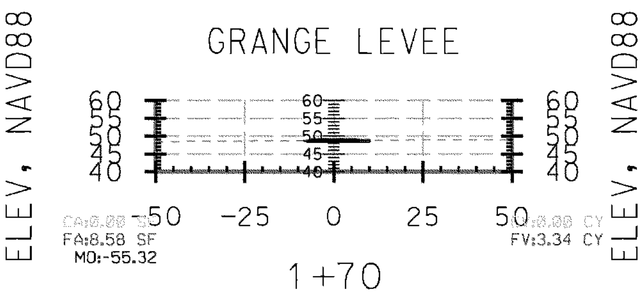



1+40

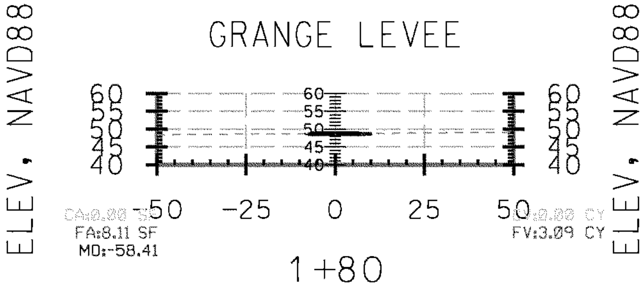
STA.1+50 TO STA.1+70

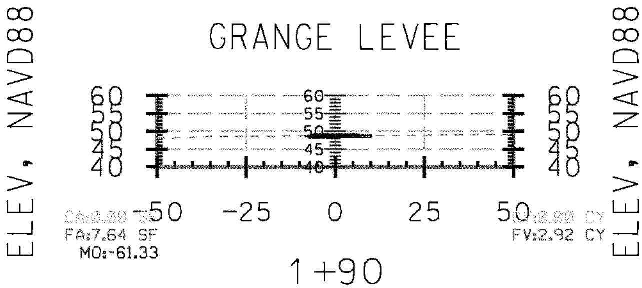


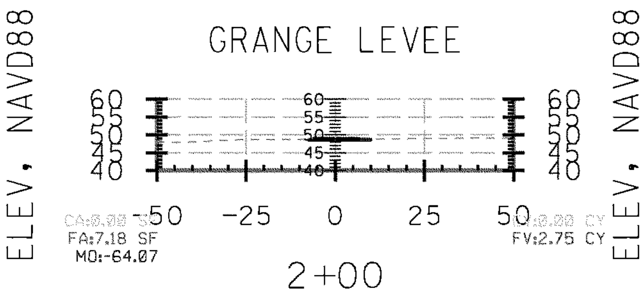



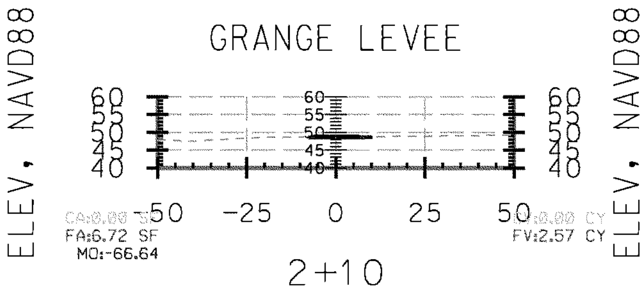
STA.1+80 TO STA.2+00

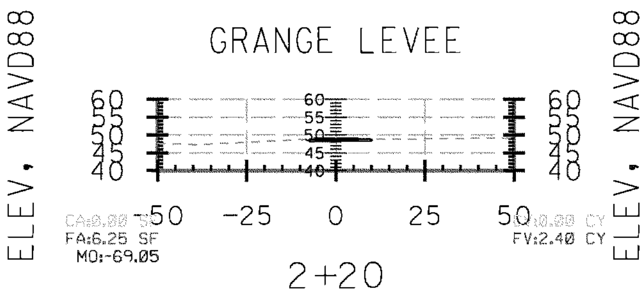


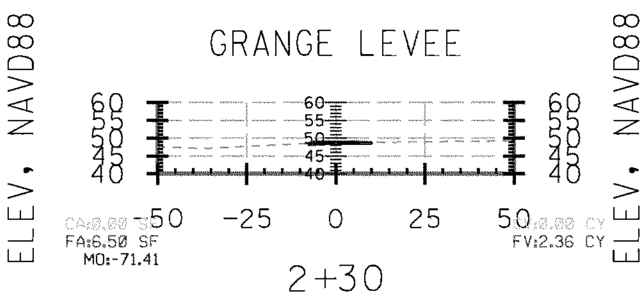



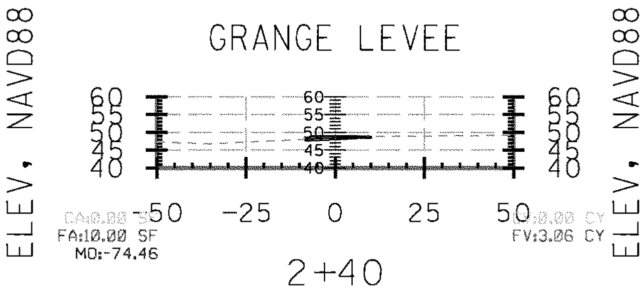
# STA.2+10 TO STA.2+30

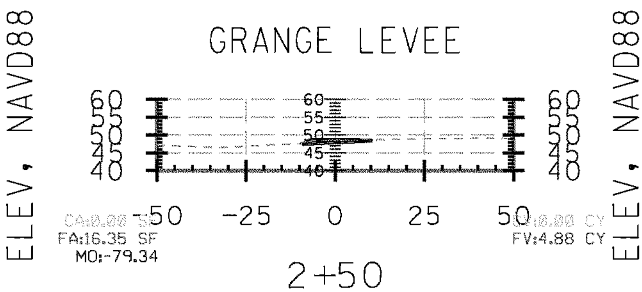


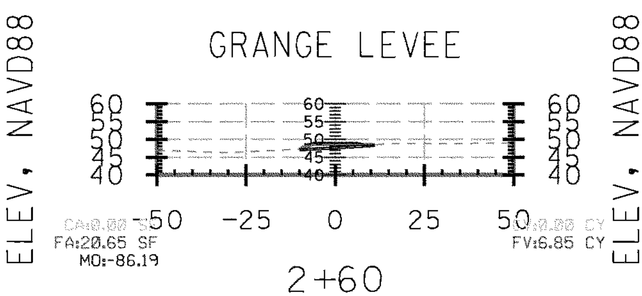



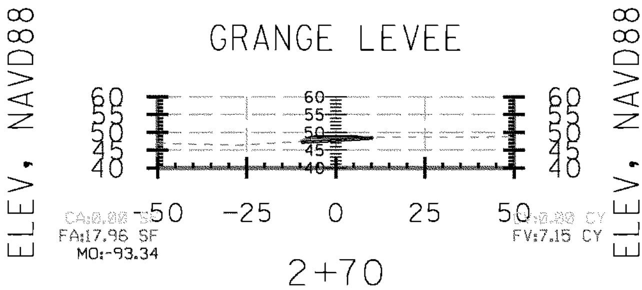
STA.2+40 TO STA.2+60

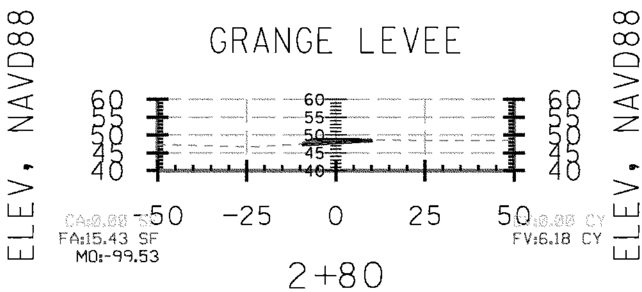


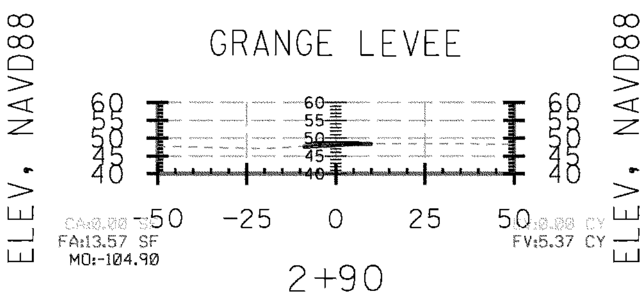



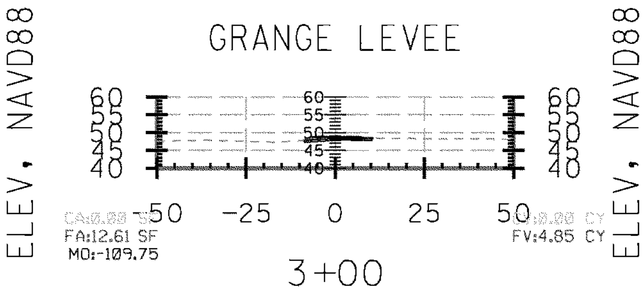
STA.2+70 TO STA.2+90

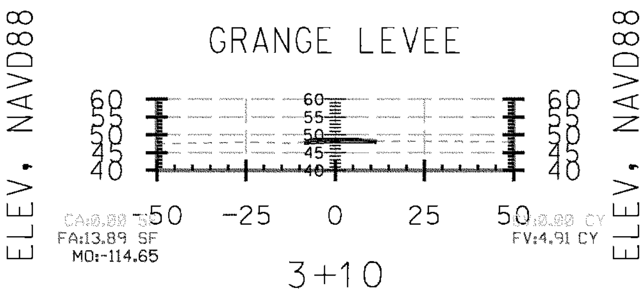


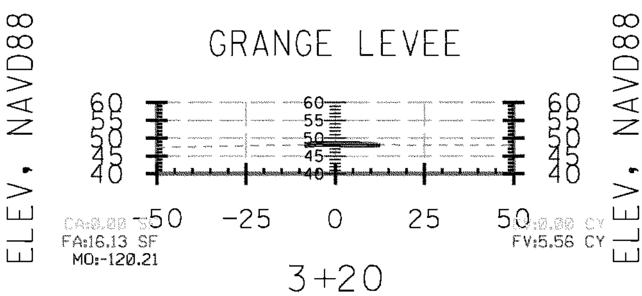



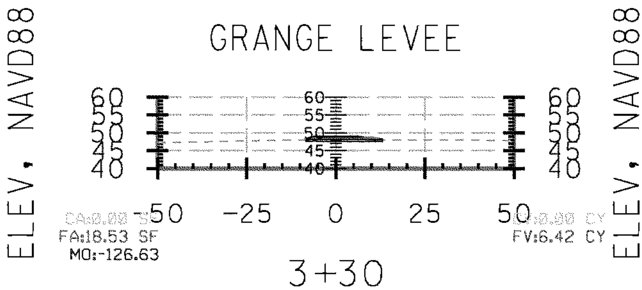
STA.3+00 TO STA.3+20

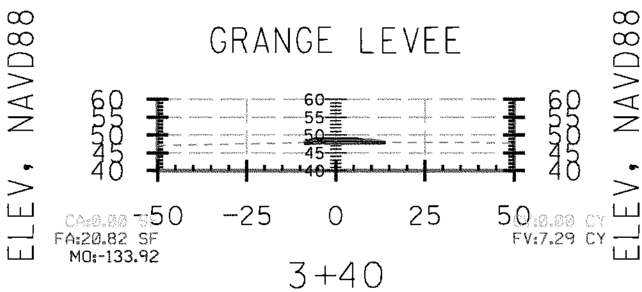


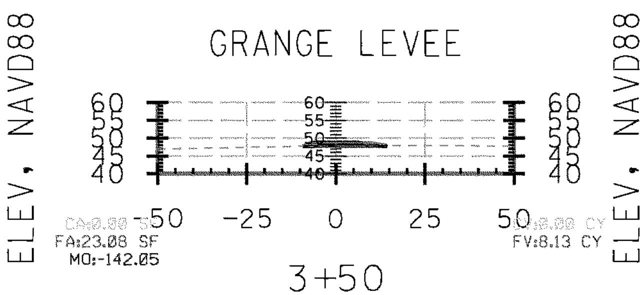



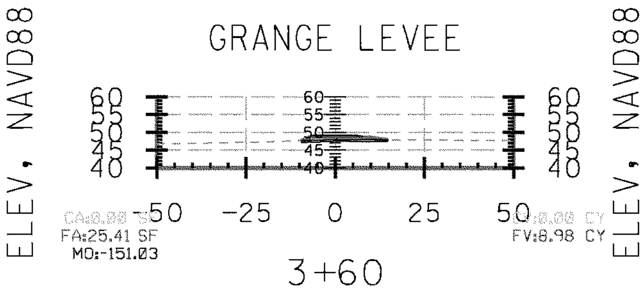
STA.3+30 TO STA.3+50

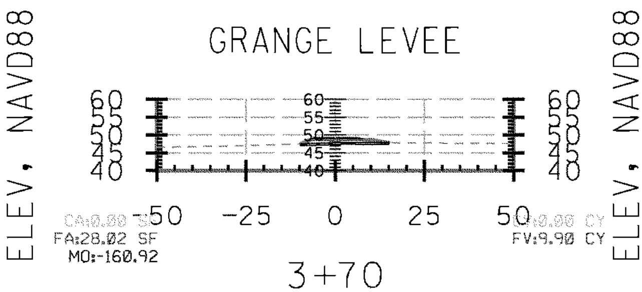


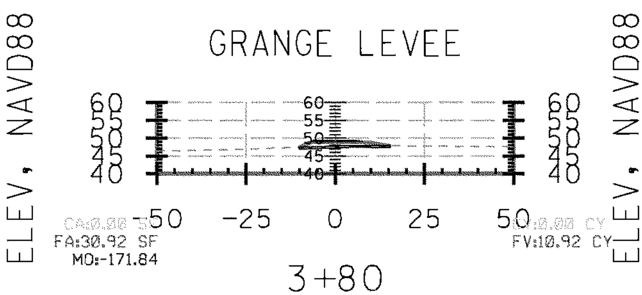



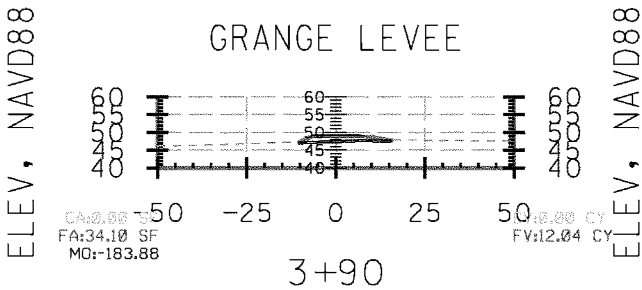
STA.3+60 TO STA.3+80

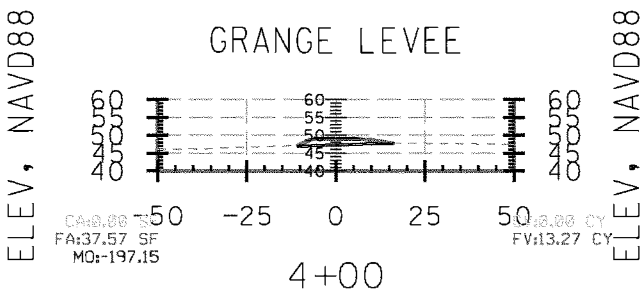


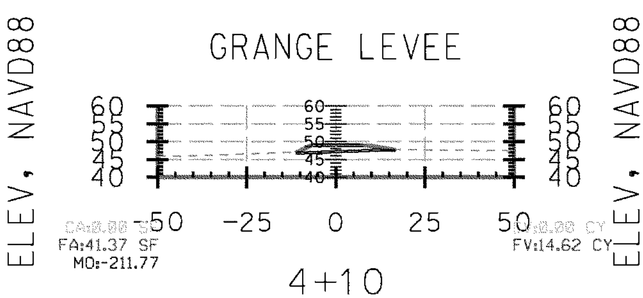



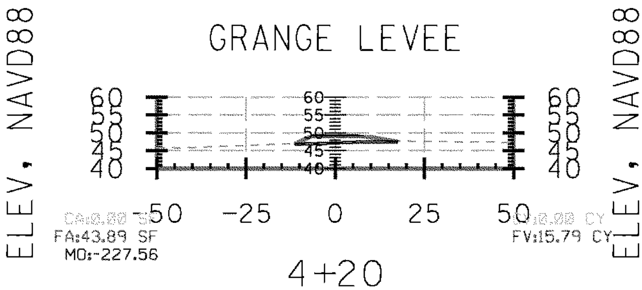
STA.3+90 TO STA.4+10

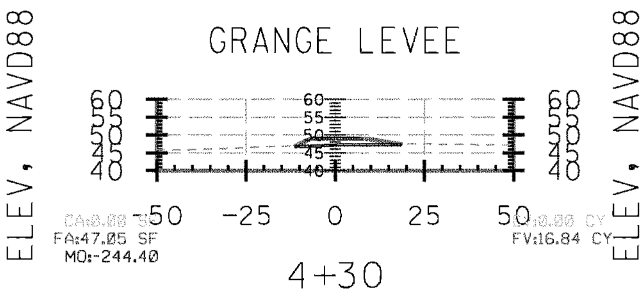


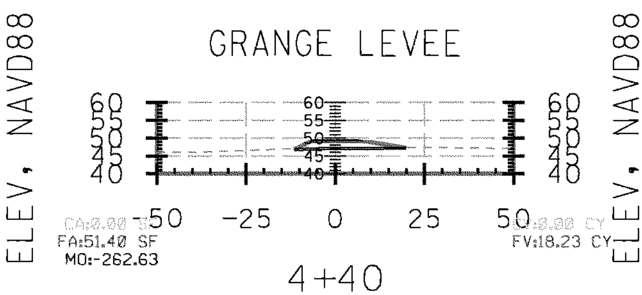



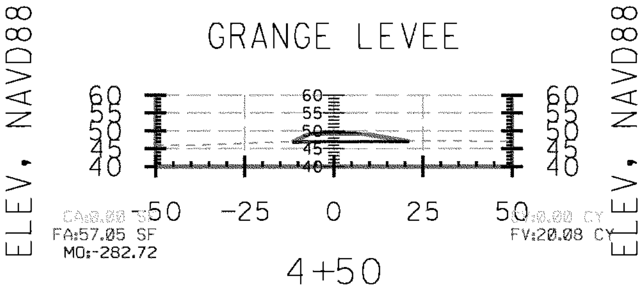
STA.4+20 TO STA.4+40

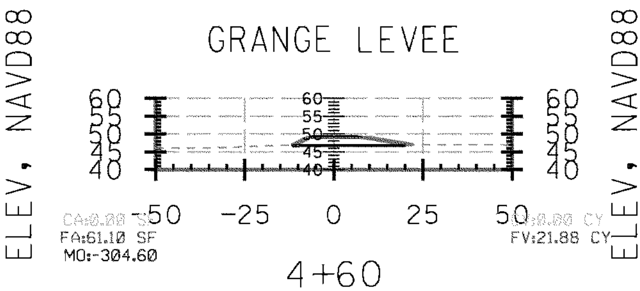


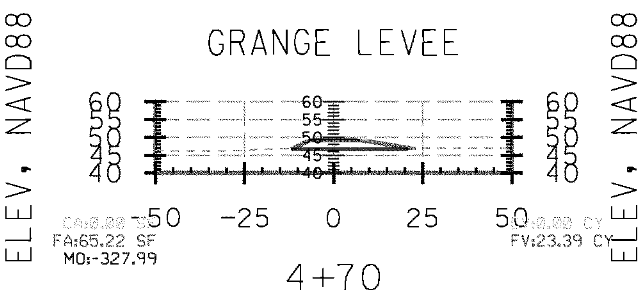



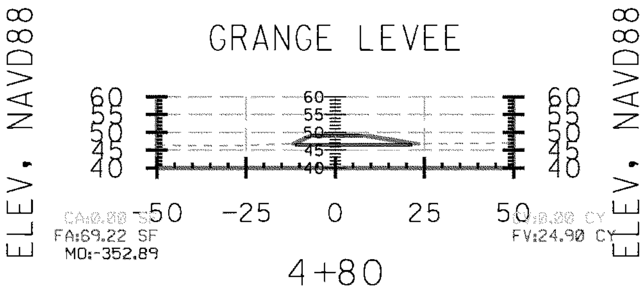
STA.4+50 TO STA.4+70

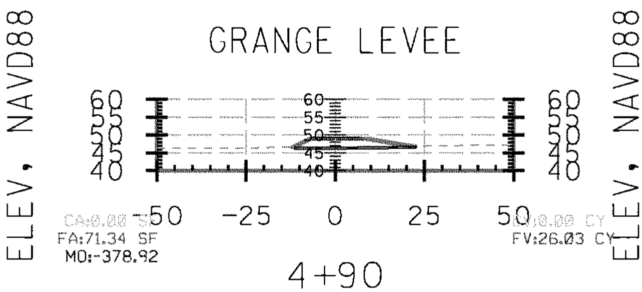


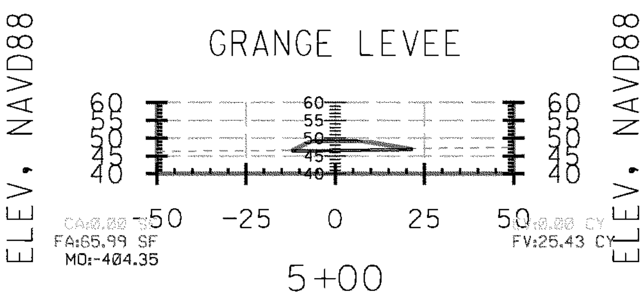



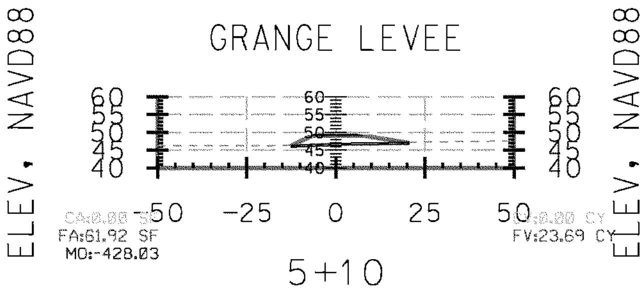
STA.4+80 TO STA.5+00

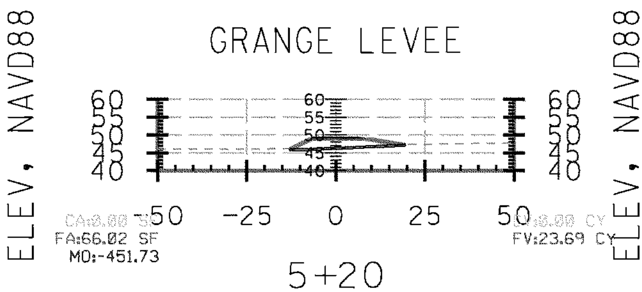


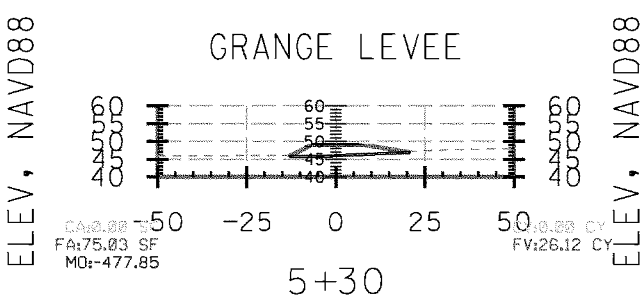



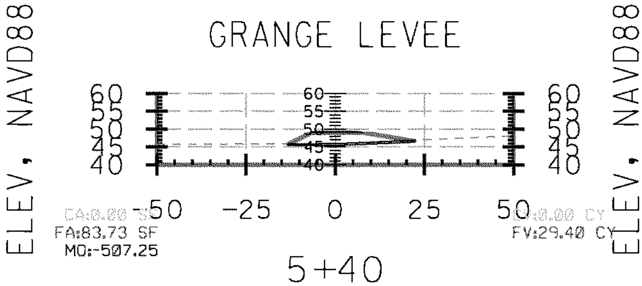
STA.5+10 TO STA.5+30

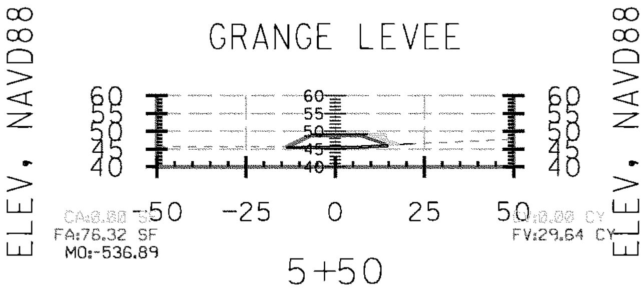


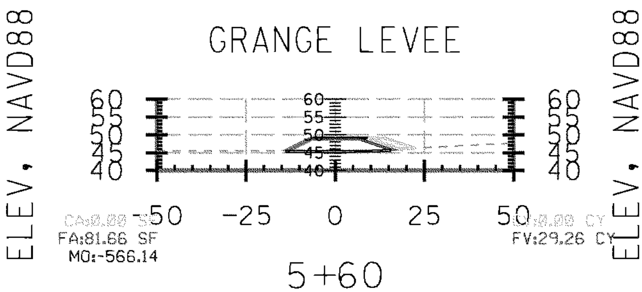



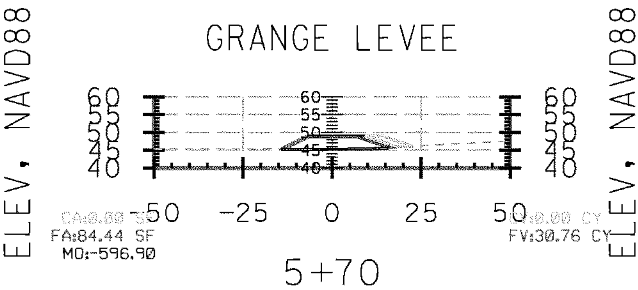
STA.5+40 TO STA.5+60

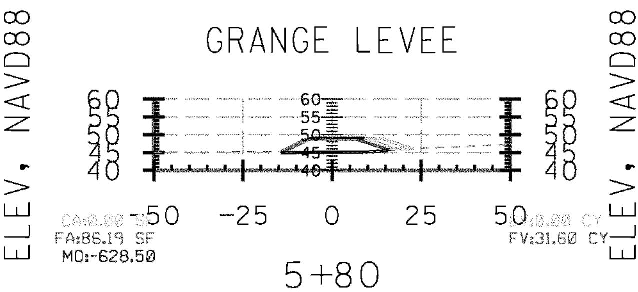


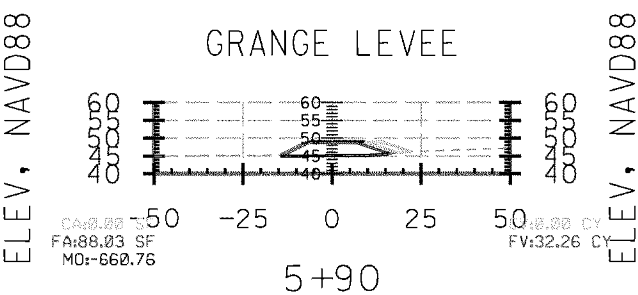



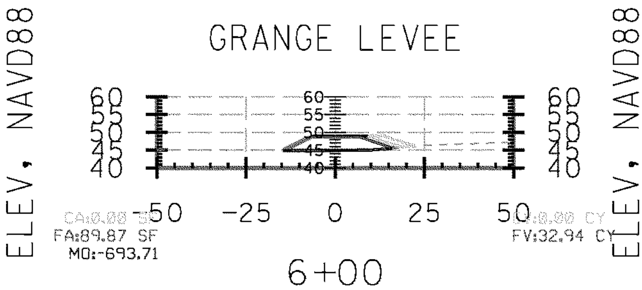
STA.5+70 TO STA.5+90

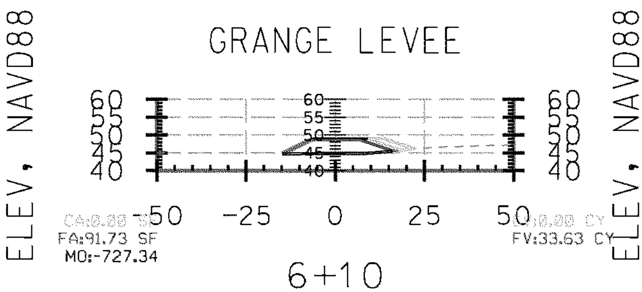


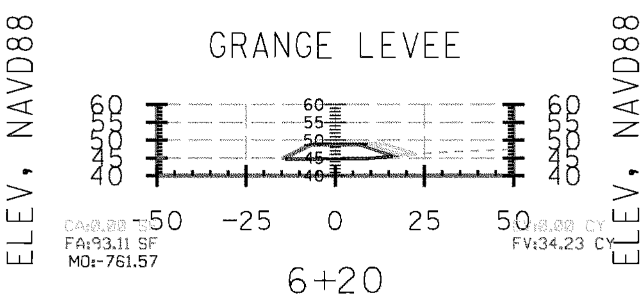



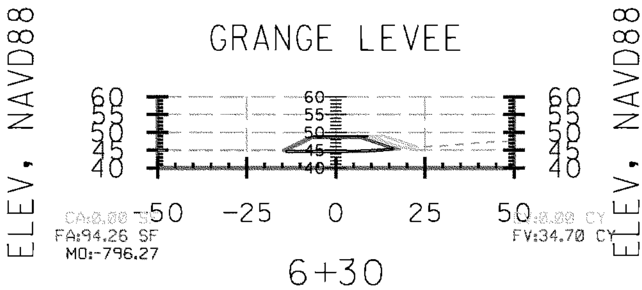
STA.6+00 TO STA.6+20

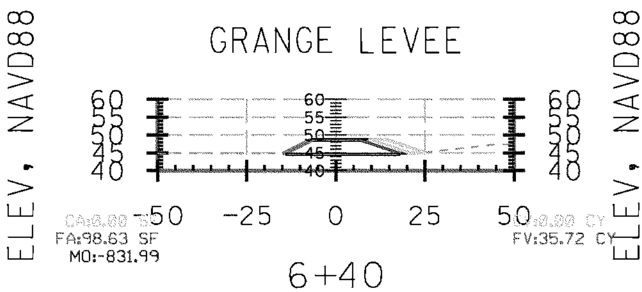


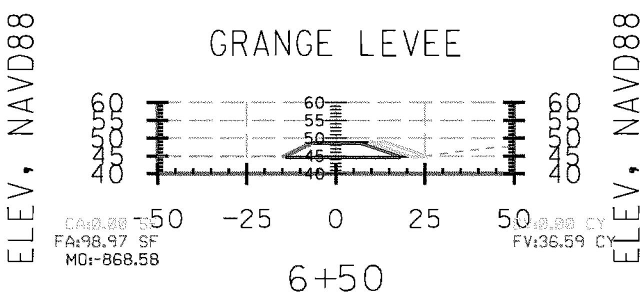



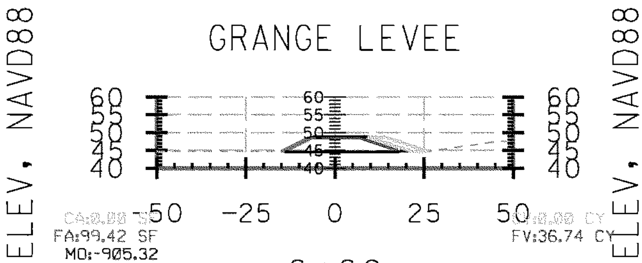
# STA.6+30 TO STA.6+50



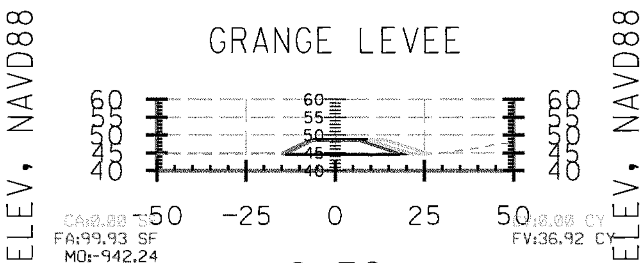



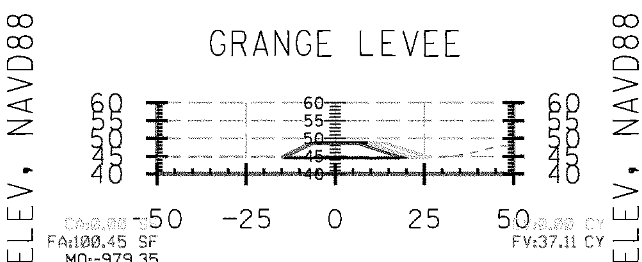
STA.6+60 TO STA.6+80




6+60

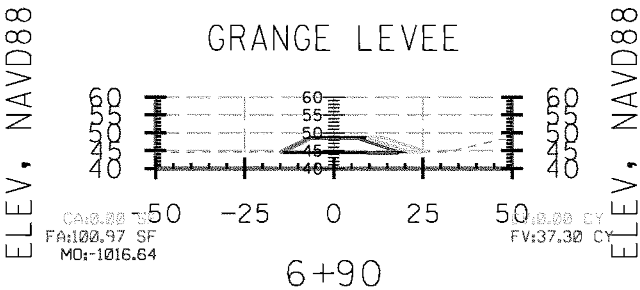


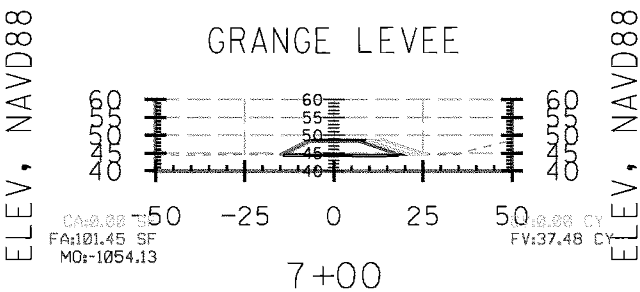

6+70

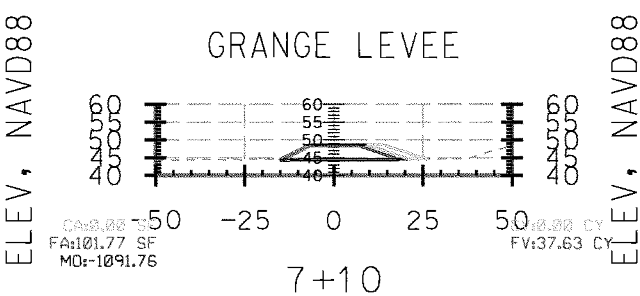



6+80

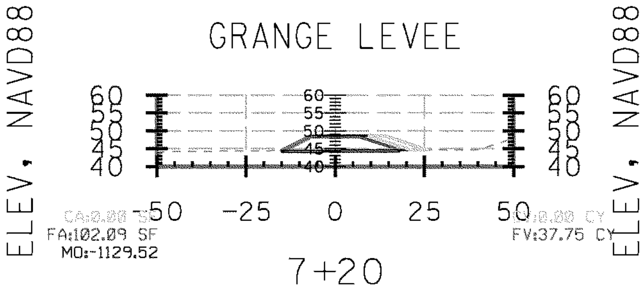
STA.6+90 TO STA.7+10

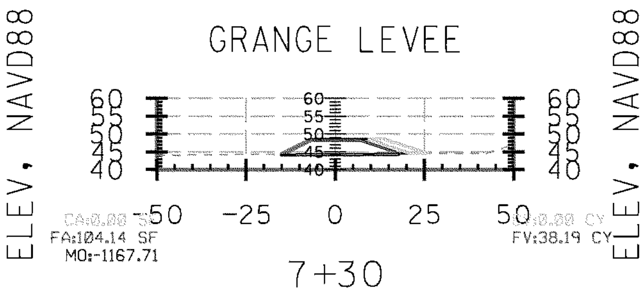


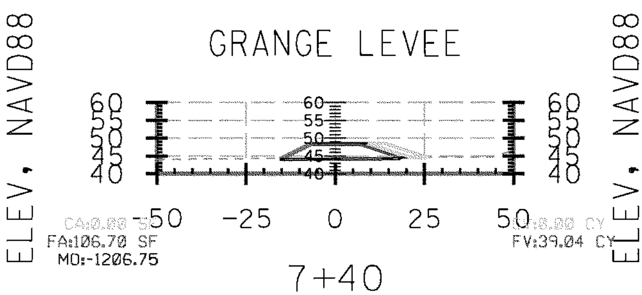



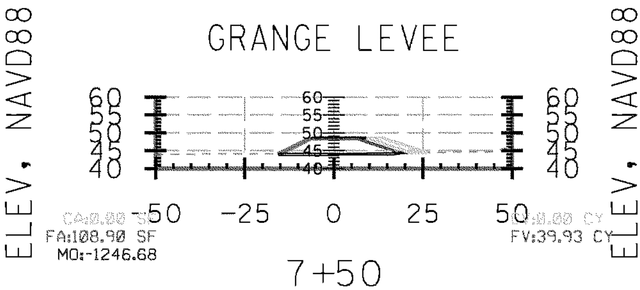
# STA.7+20 TO STA.7+40

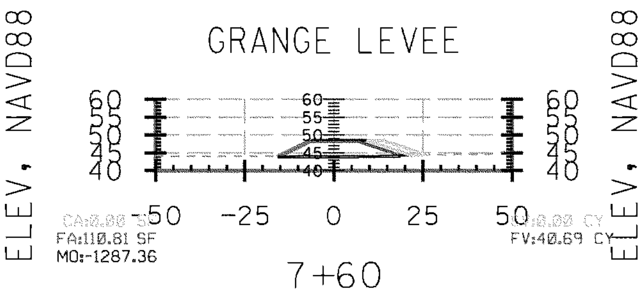


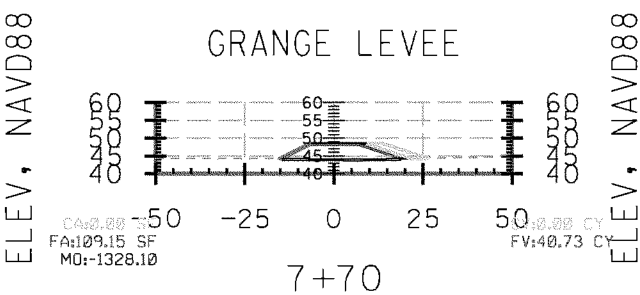



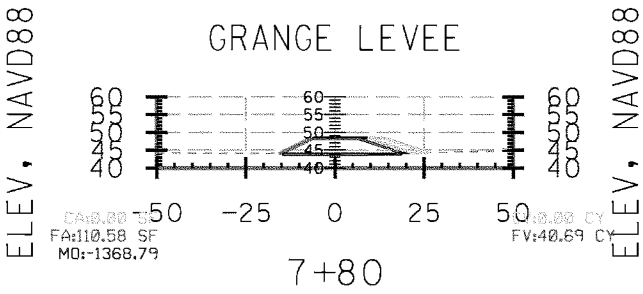
STA.7+50 TO STA.7+70

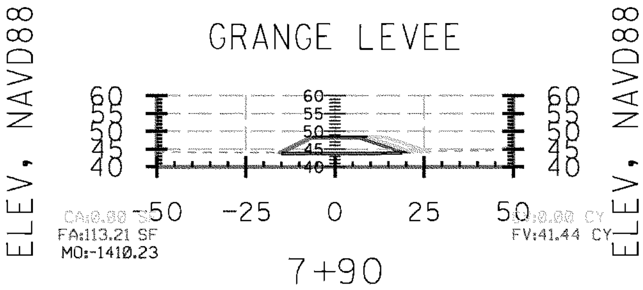


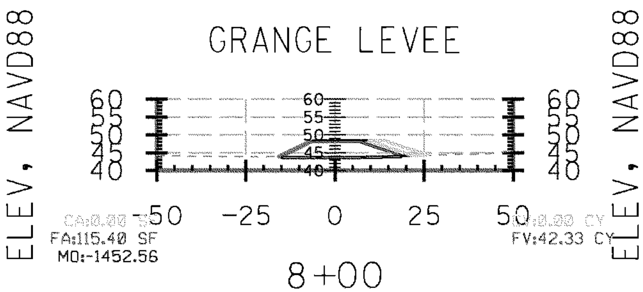



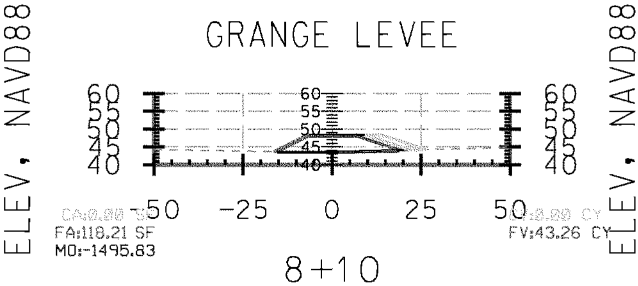
# STA.7+80 TO STA.8+00

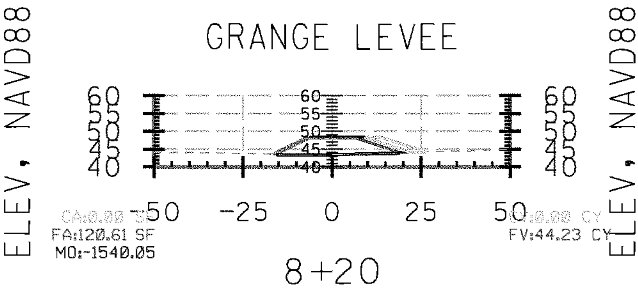


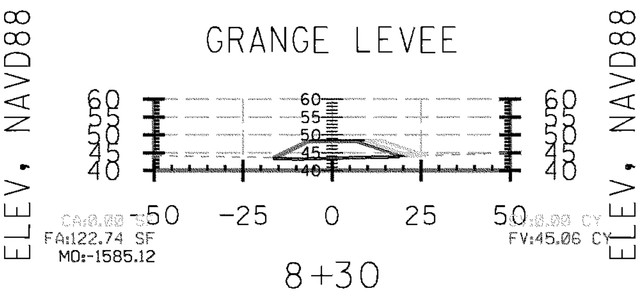



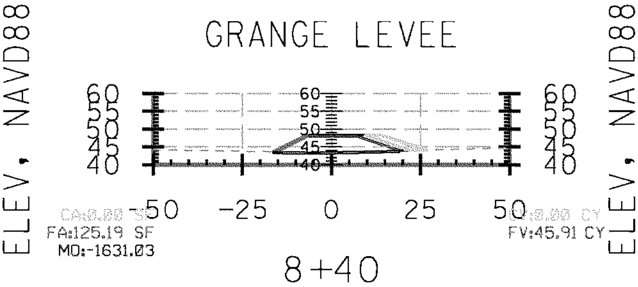
STA.8+10 TO STA.8+30

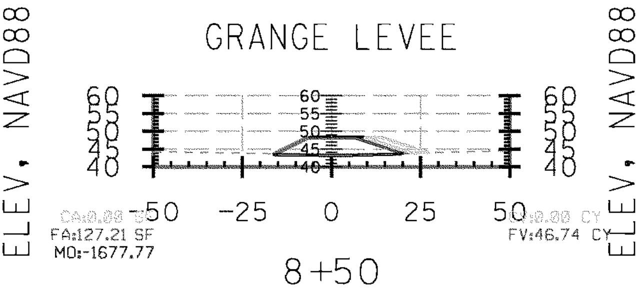


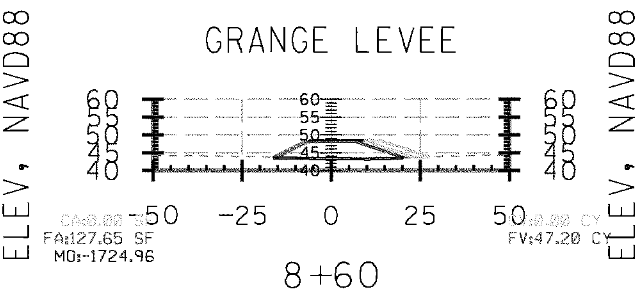



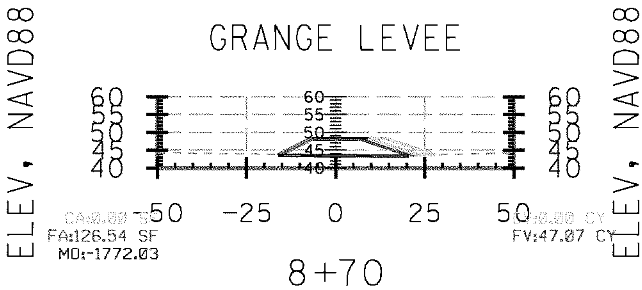
# STA.8+40 TO STA.8+60

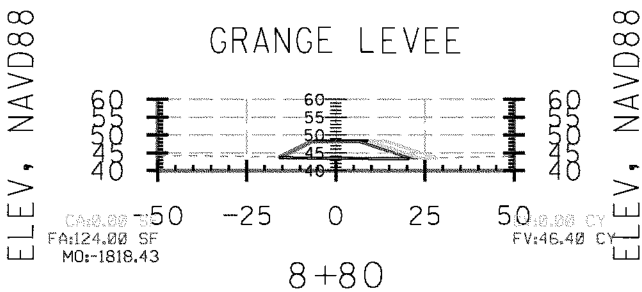


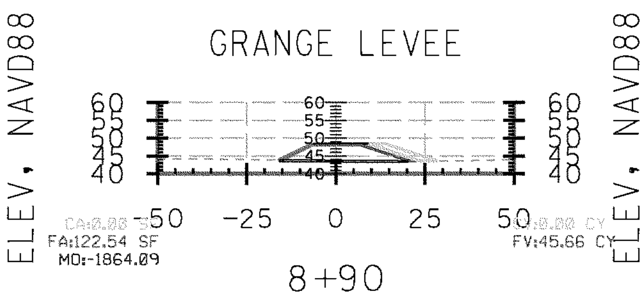



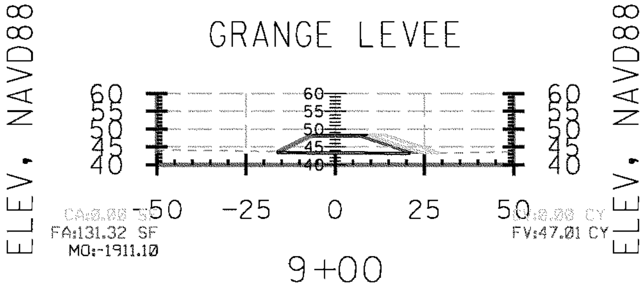
STA.8+70 TO STA.8+90

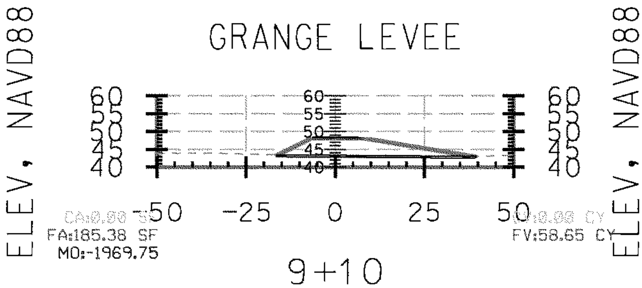


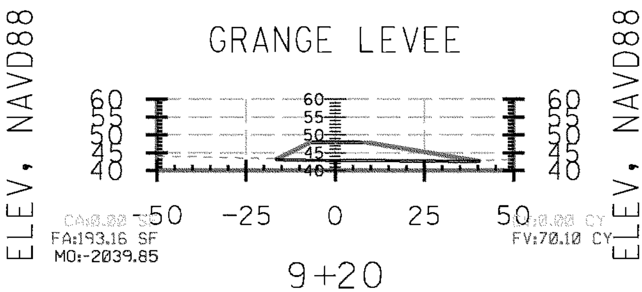



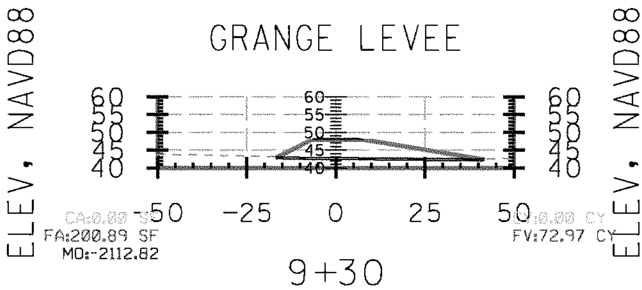
STA.9+00 TO STA.9+20

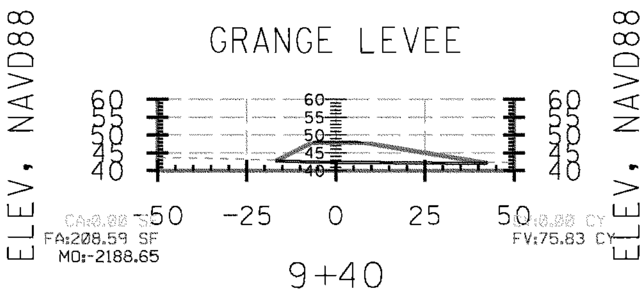


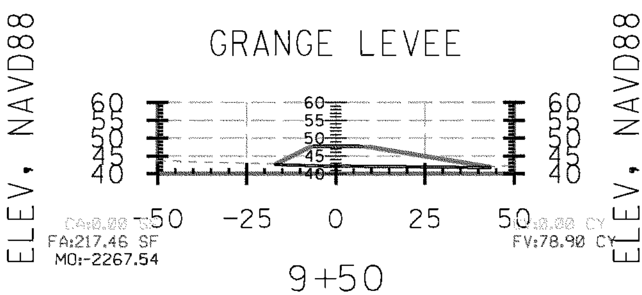



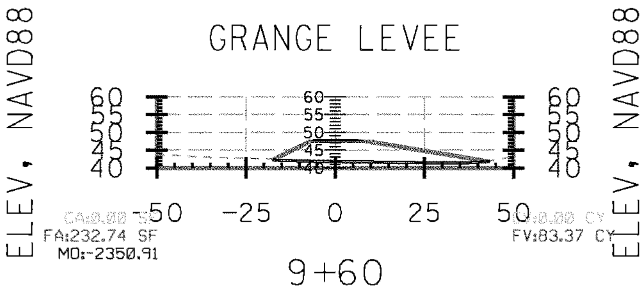
STA.9+30 TO STA.9+50

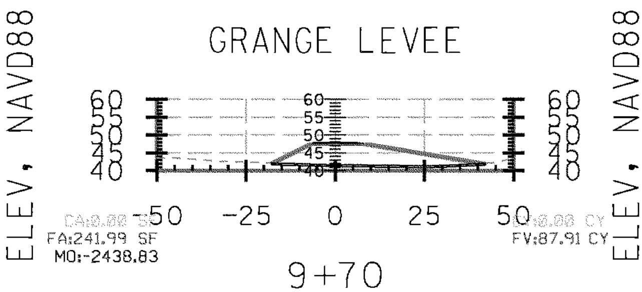


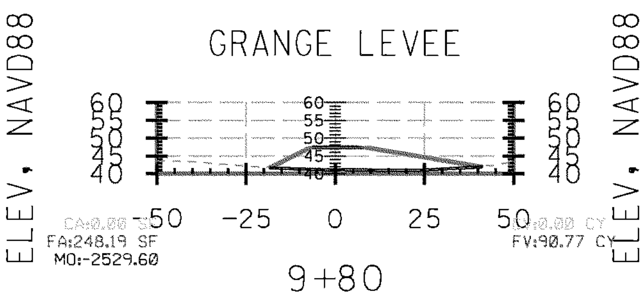



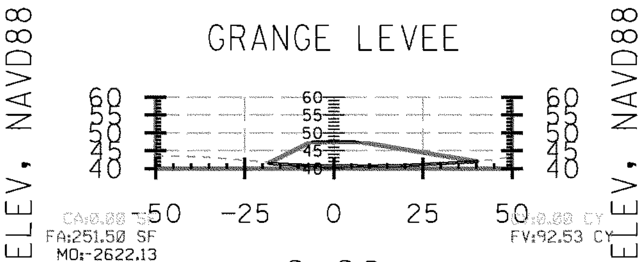
STA.9+60 TO STA.9+80



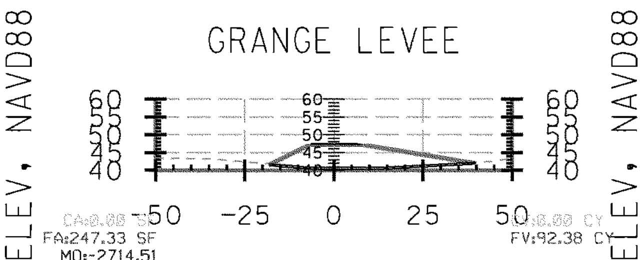



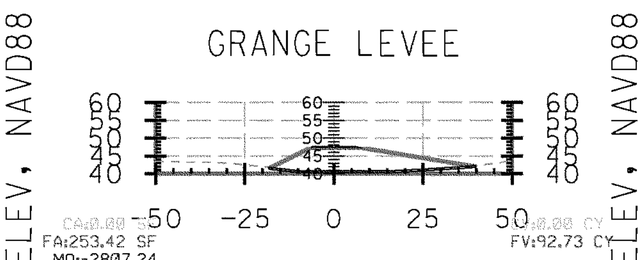
STA.9+90 TO STA.10+10




9+90

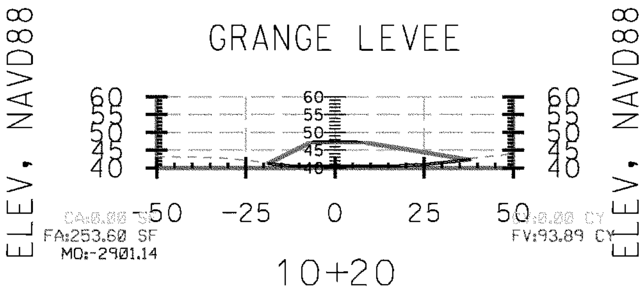


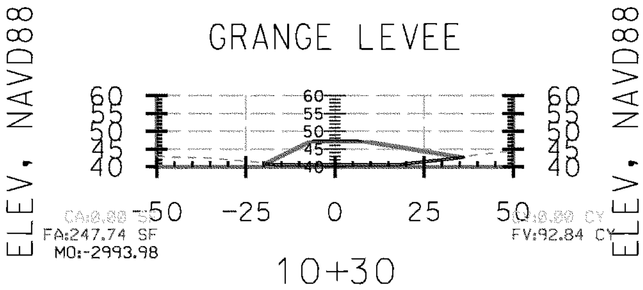

10+00

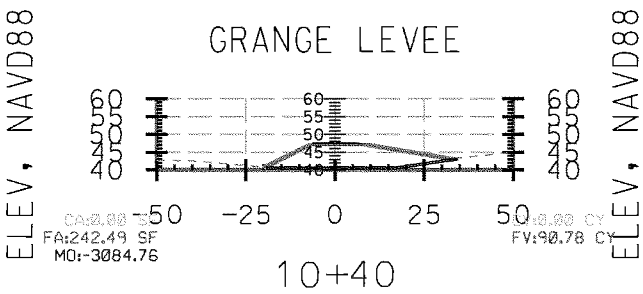



10+10

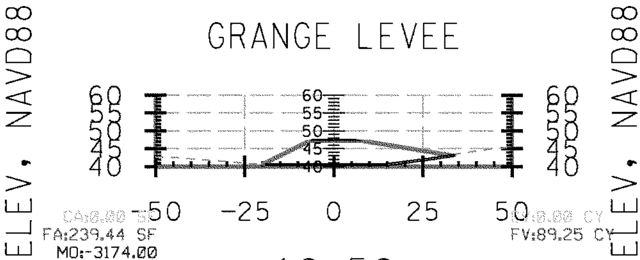
STA.10+20 TO STA.10+40



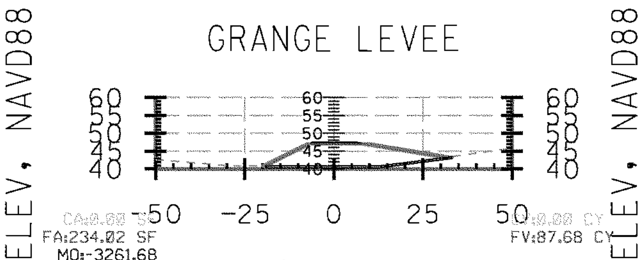



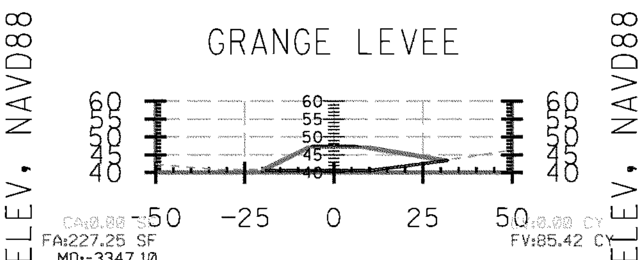
# STA.10+50 TO STA.10+70




10+50

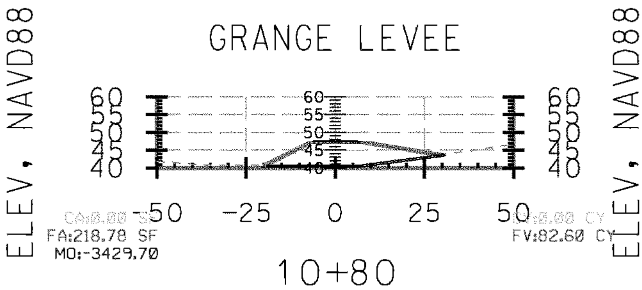


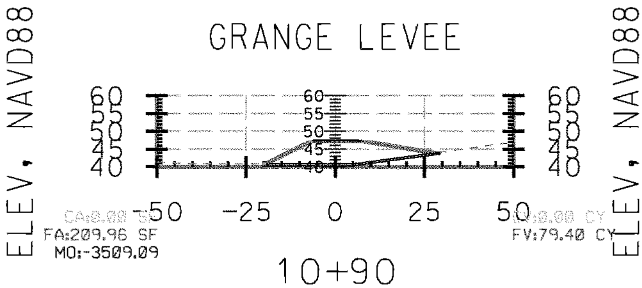

10+60

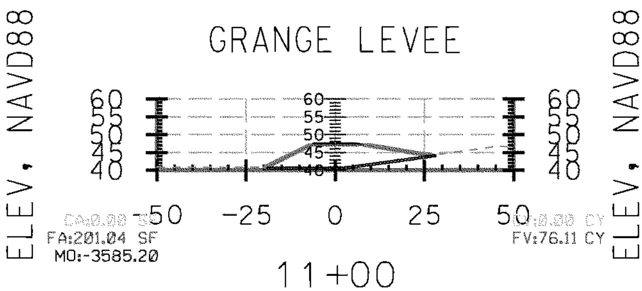



10+70

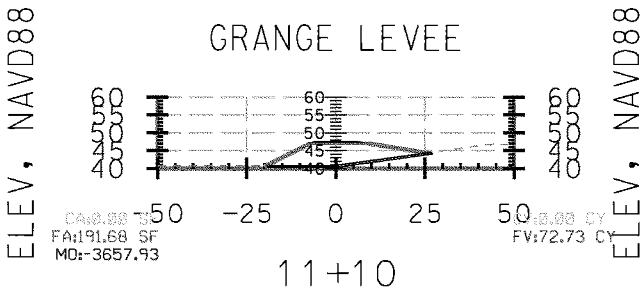
STA.10+80 TO STA.11+00

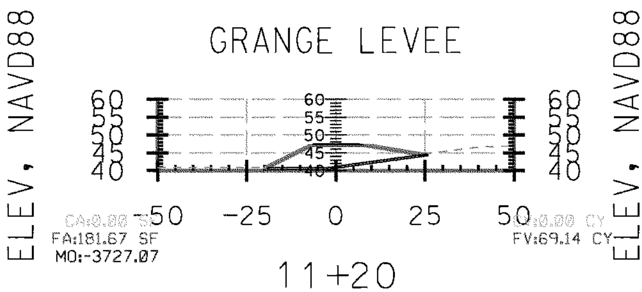


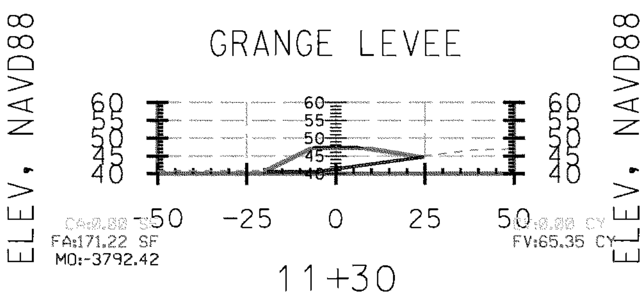



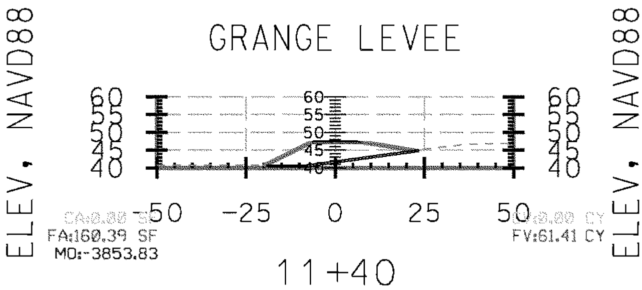
# STA.11+10 TO STA.11+30

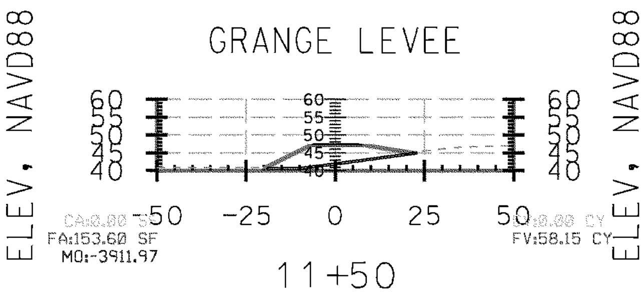


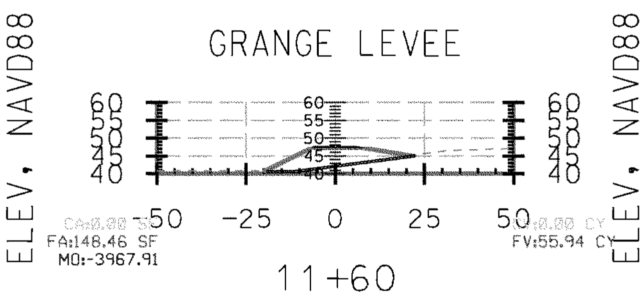



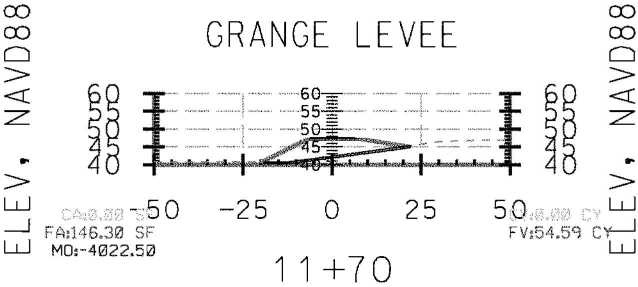
STA.11+40 TO STA.11+60

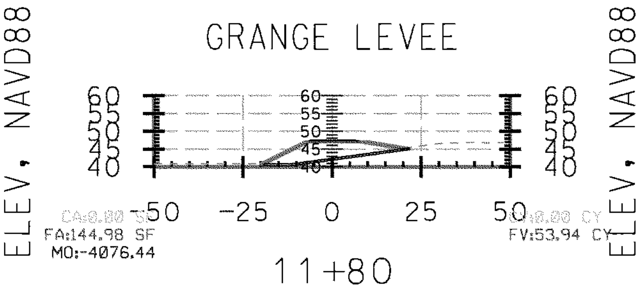


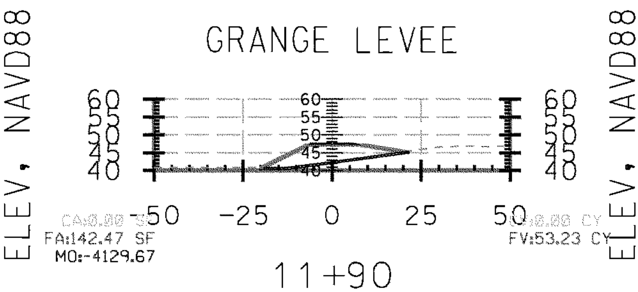



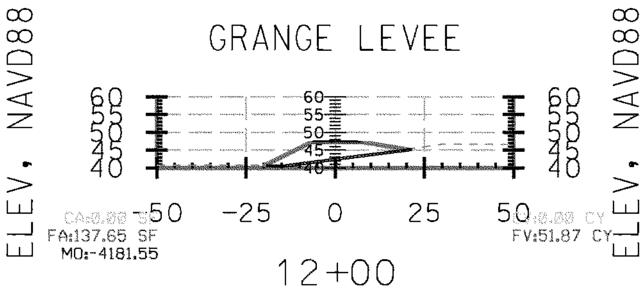
STA.11+70 TO STA.11+90

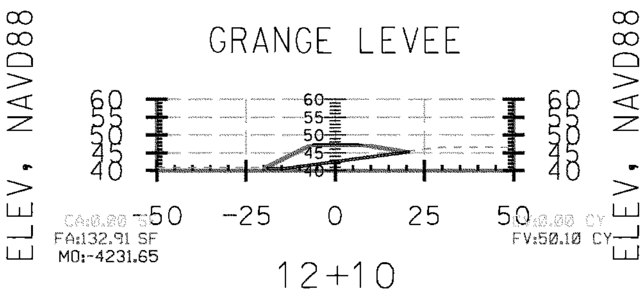


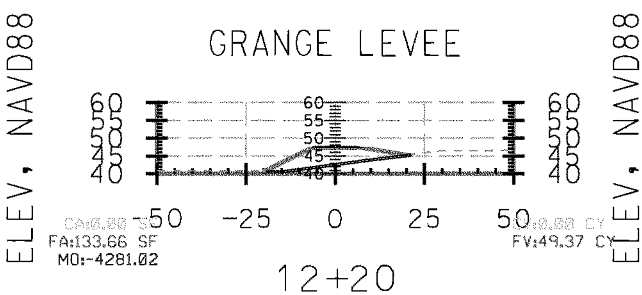



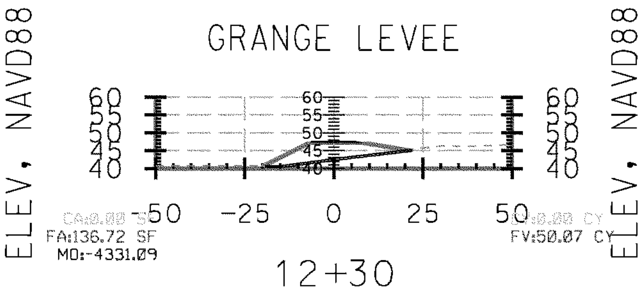
STA.12+00 TO STA.12+20

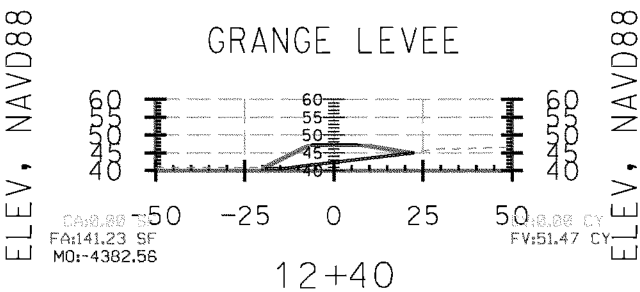


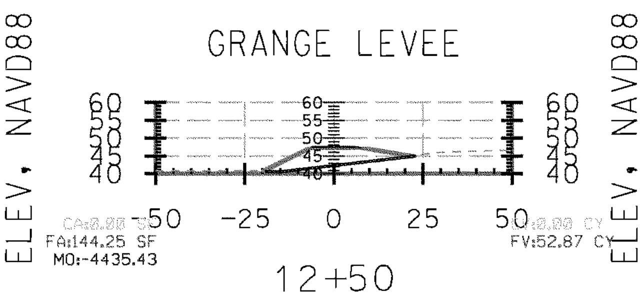



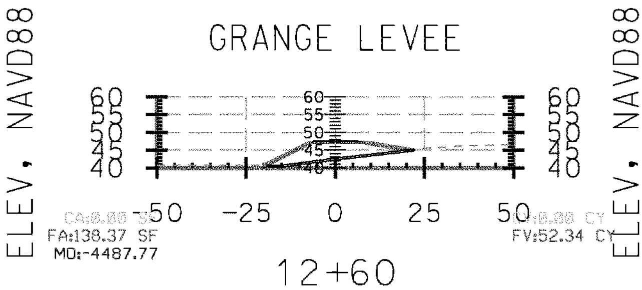
# STA.12+30 TO STA.12+50

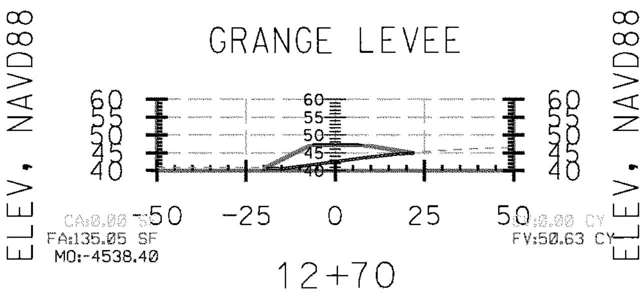


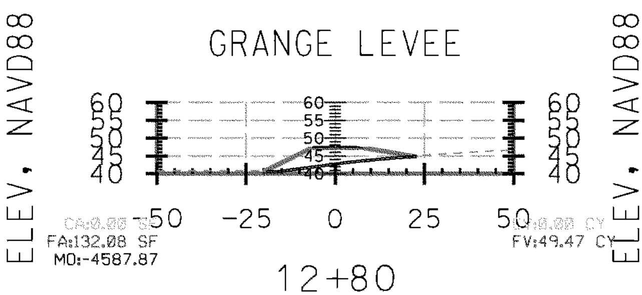



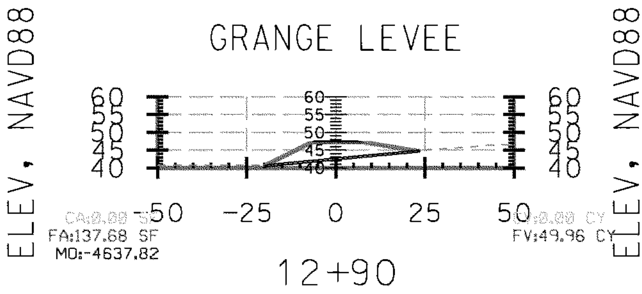
STA.12+60 TO STA.12+80

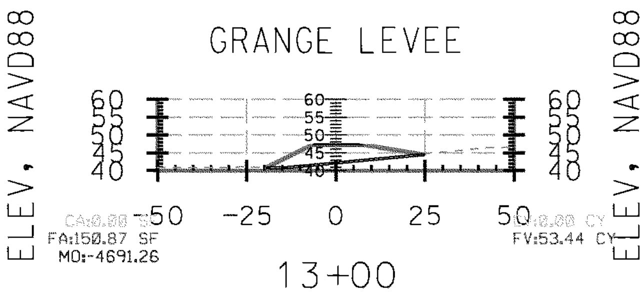


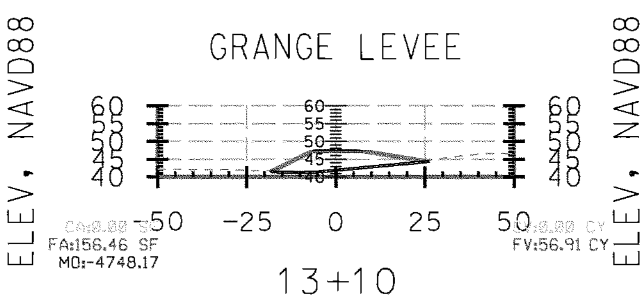



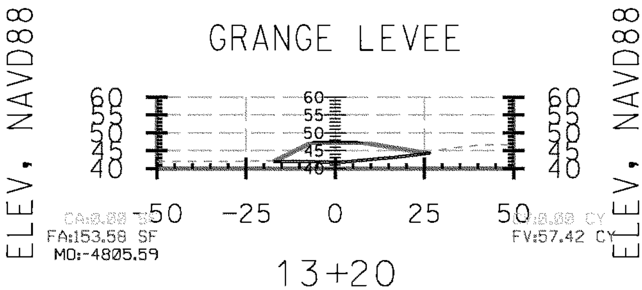
# STA.12+90 TO STA.13+10

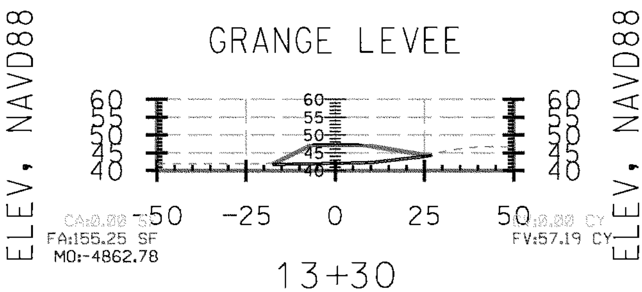


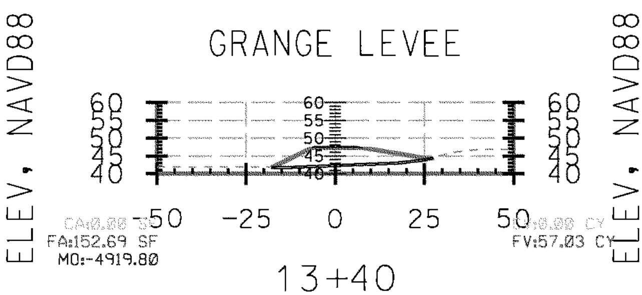



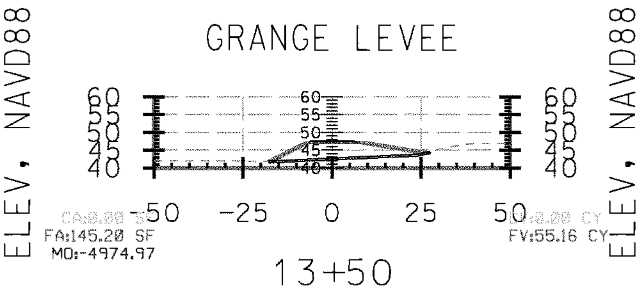
# STA.13+20 TO STA.13+40

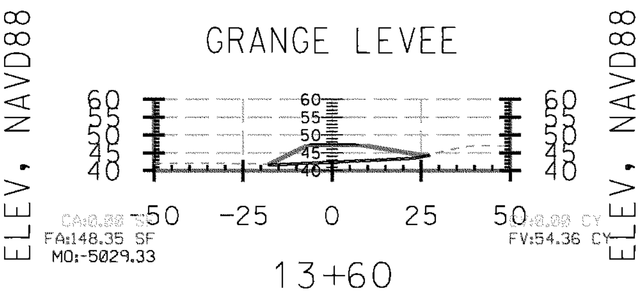


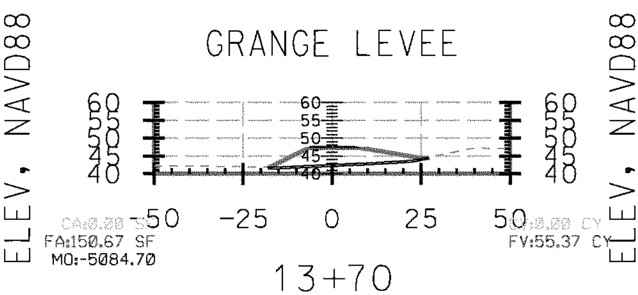



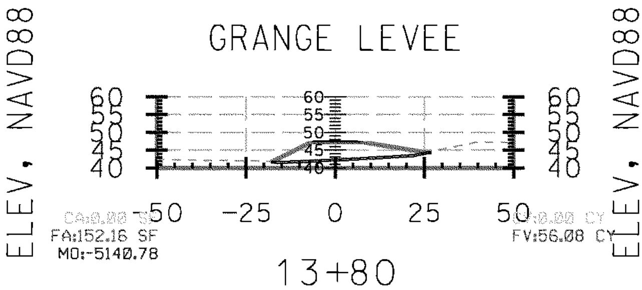
STA.13+50 TO STA.13+70

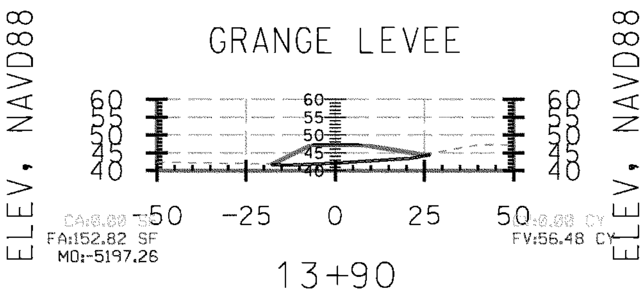


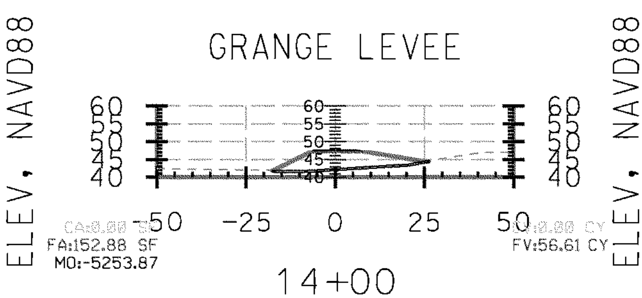



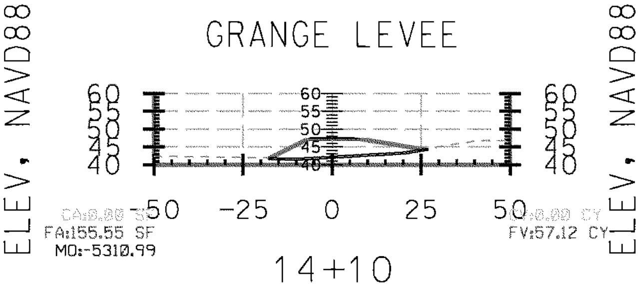
STA.13+80 TO STA.14+00

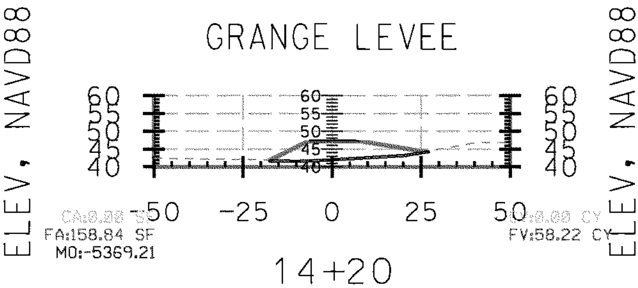


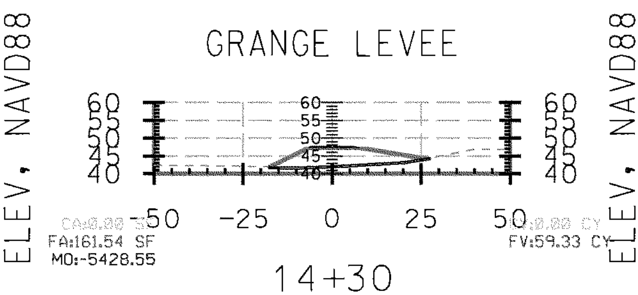



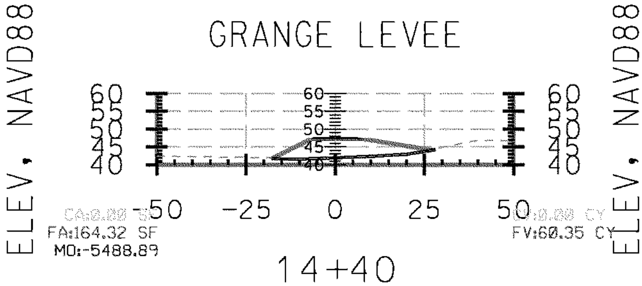
STA.14+10 TO STA.14+30

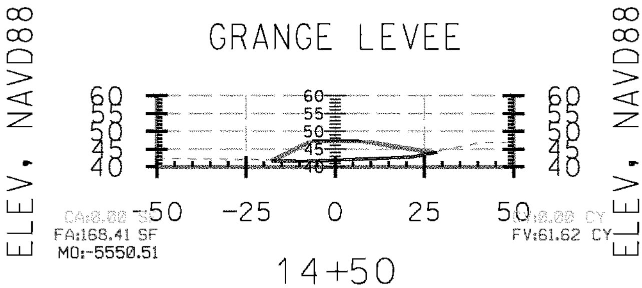


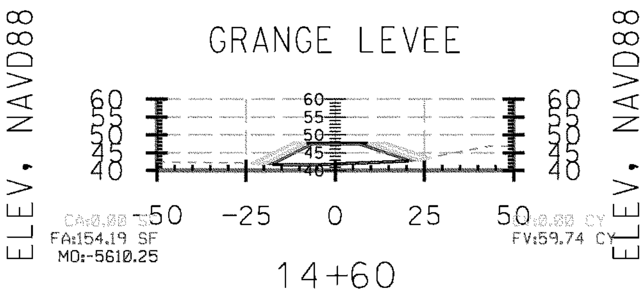



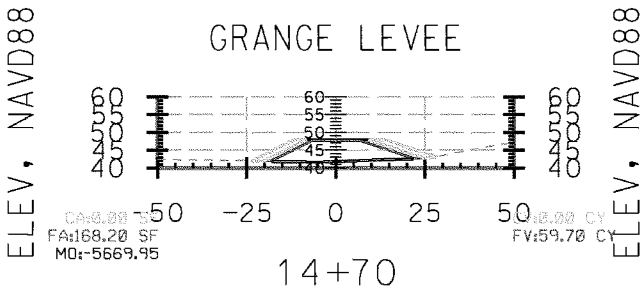
STA.14+40 TO STA.14+60

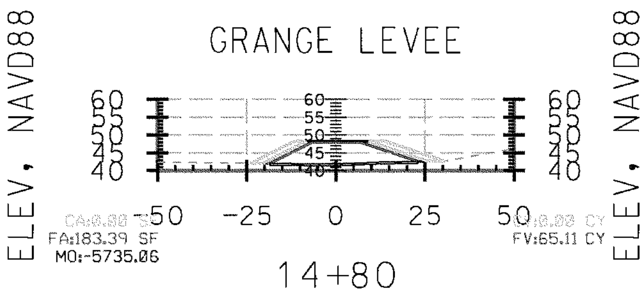


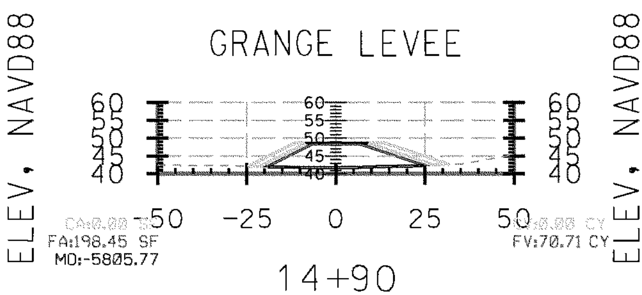



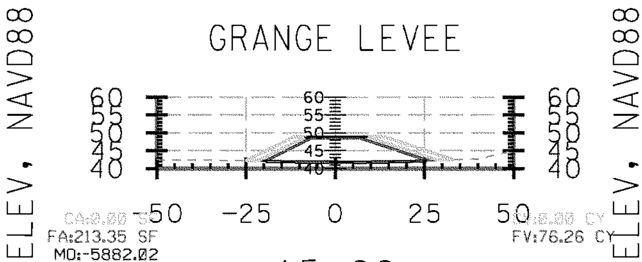
STA.14+70 TO STA.14+90



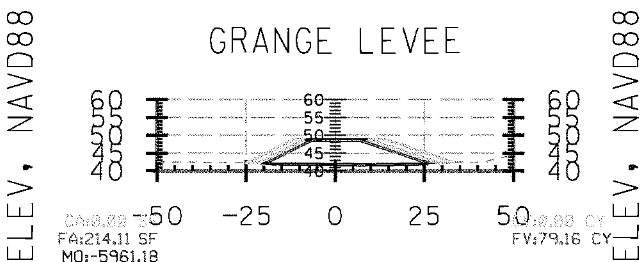



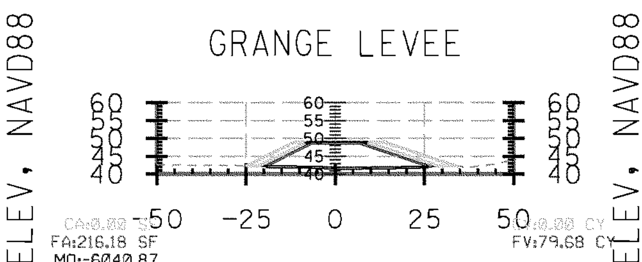
# STA. 15+00 TO STA. 15+20




15+00

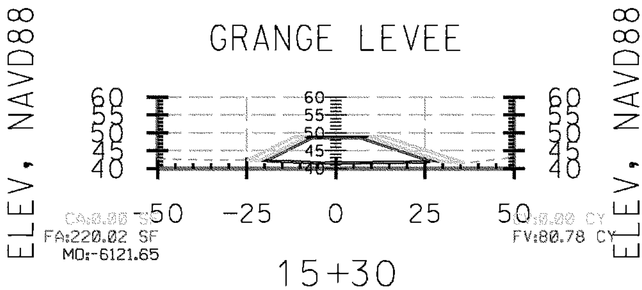


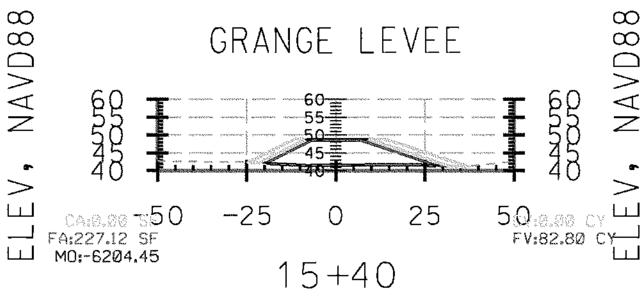

15+10

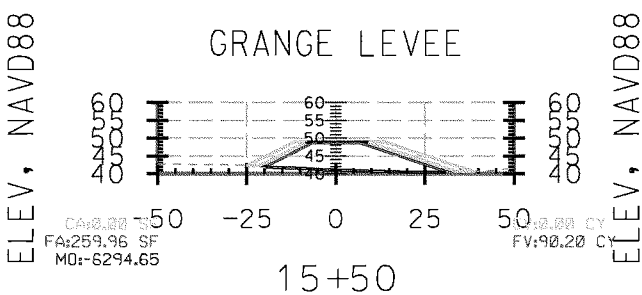



15+20

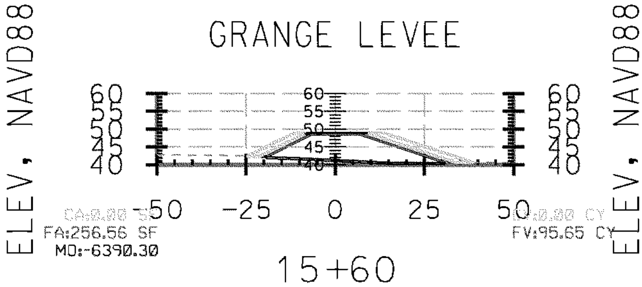
STA.15+30 TO STA.15+50

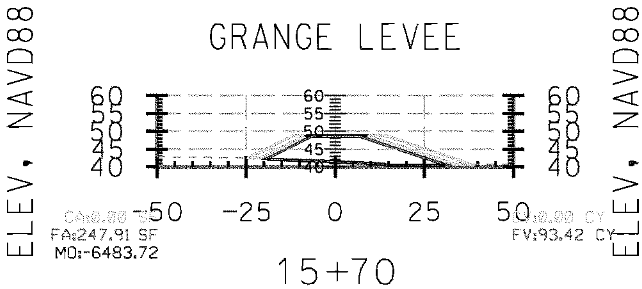


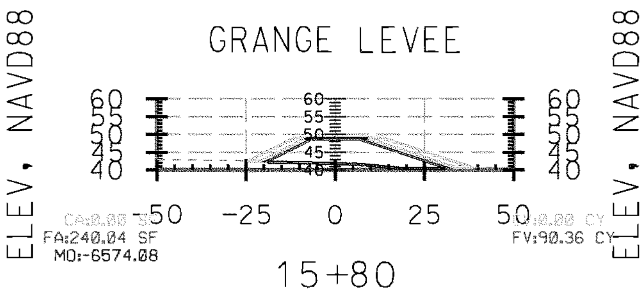



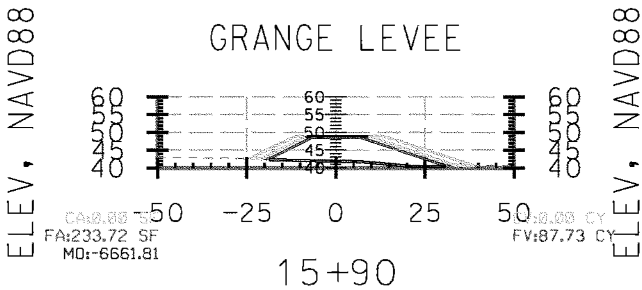
STA.15+60 TO STA.15+80

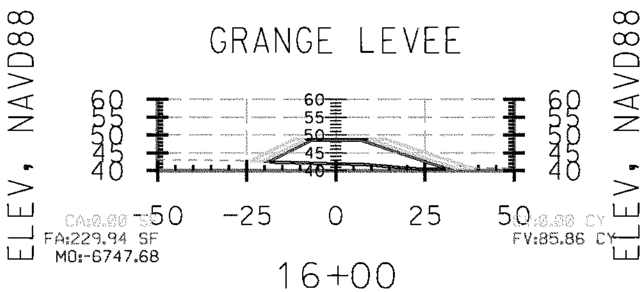


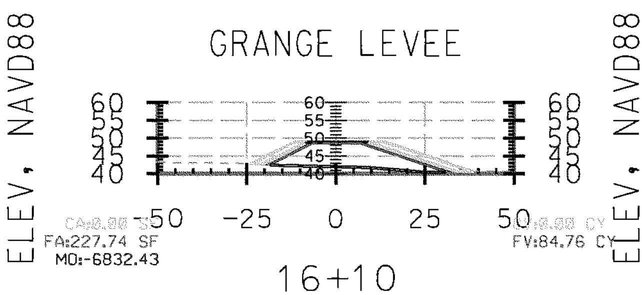



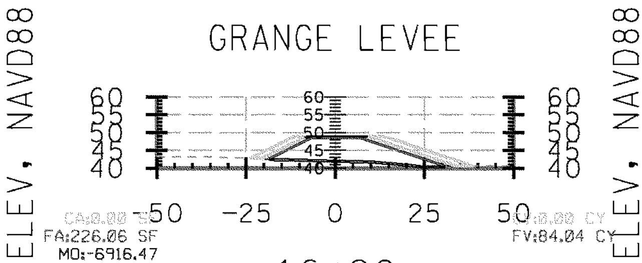
STA.15+90 TO STA.16+10



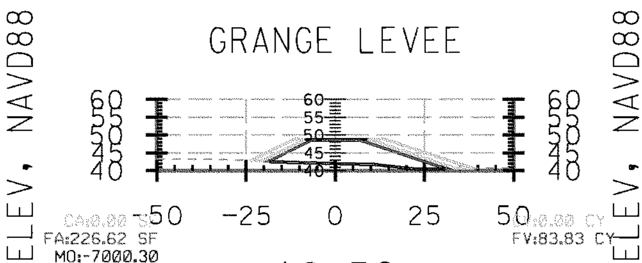



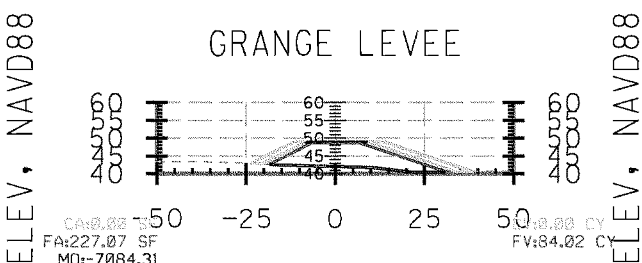
# STA.16+20 TO STA.16+40




16+20

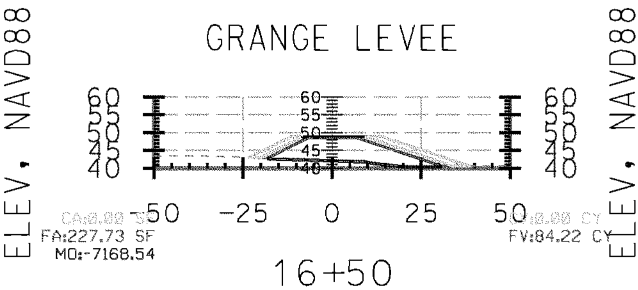


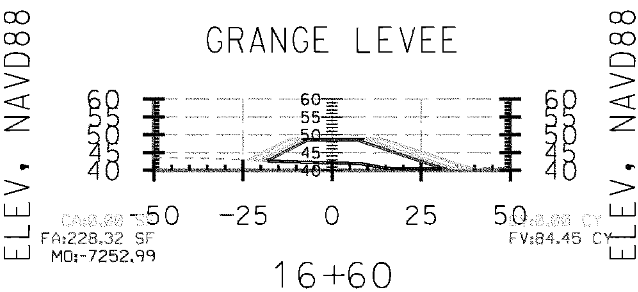

16+30

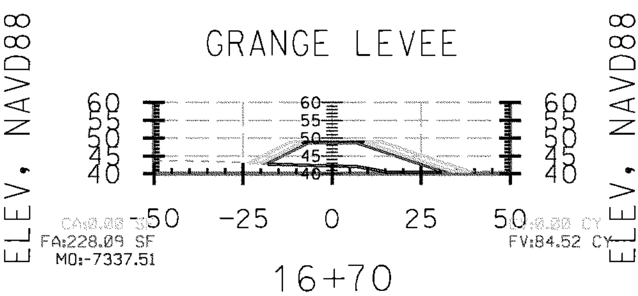



16+40

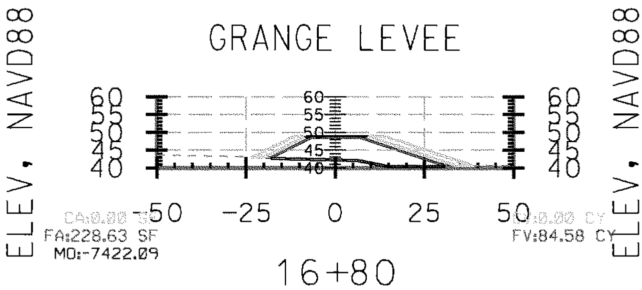
STA.16+50 TO STA.16+70

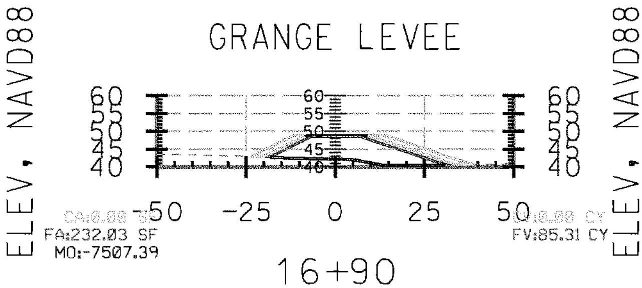


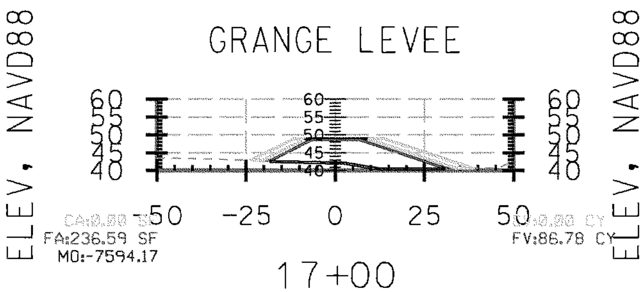



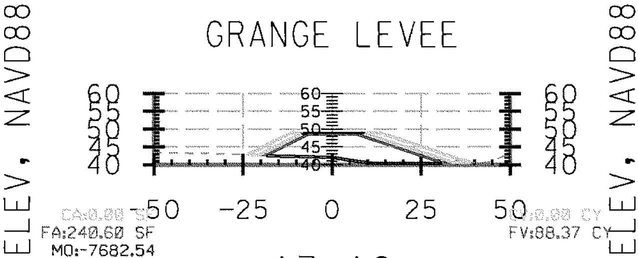
# STA.16+80 TO STA.17+00



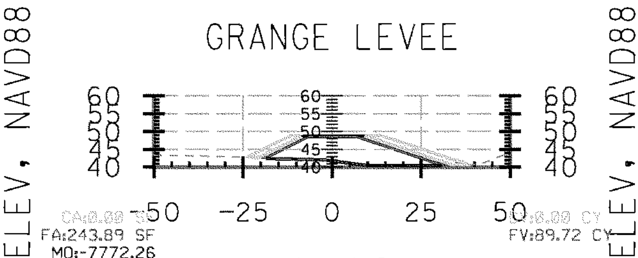



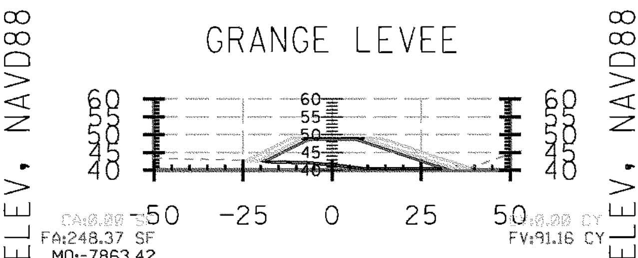
STA.17+10 TO STA.17+30




17+10

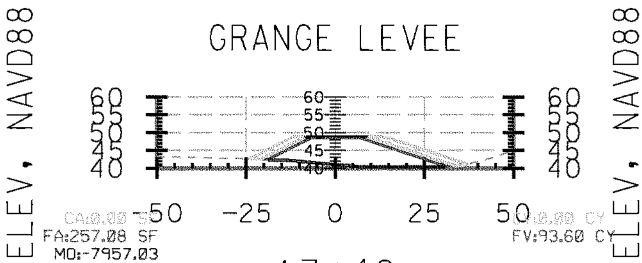



17+20

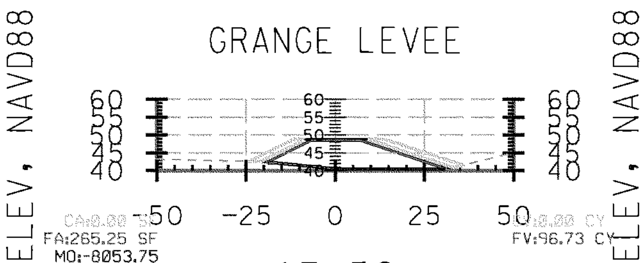



17+30

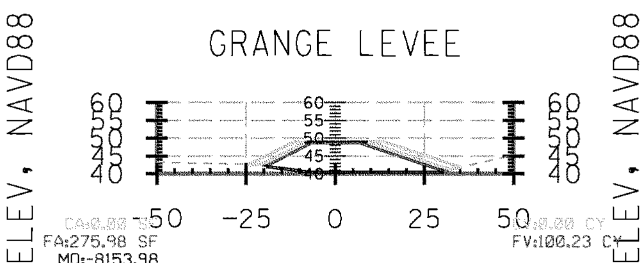
STA.17+40 TO STA.17+60




17+40

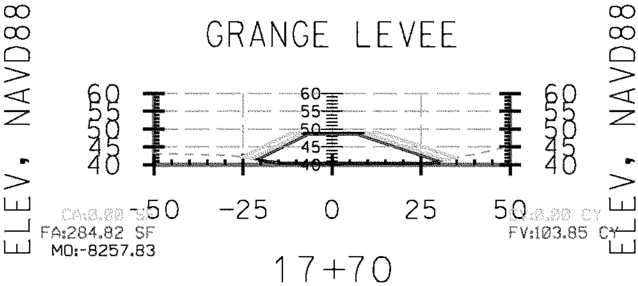


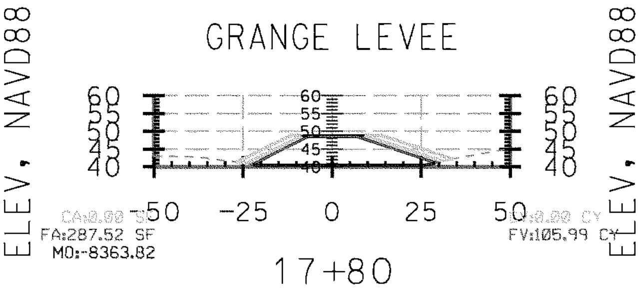

17+50

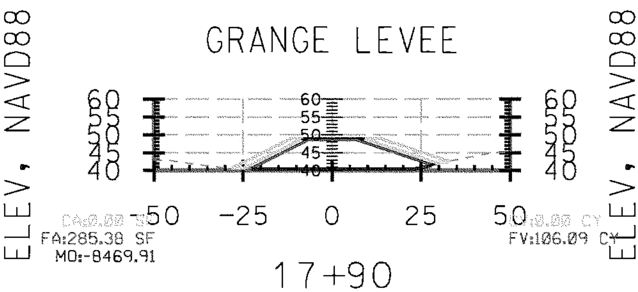



17+60

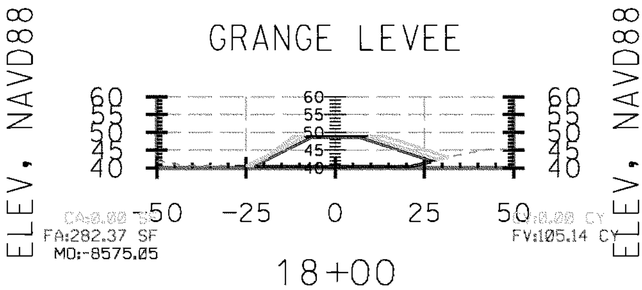
STA.17+70 TO STA.17+90

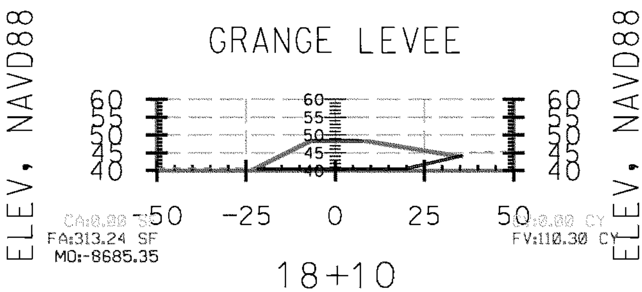


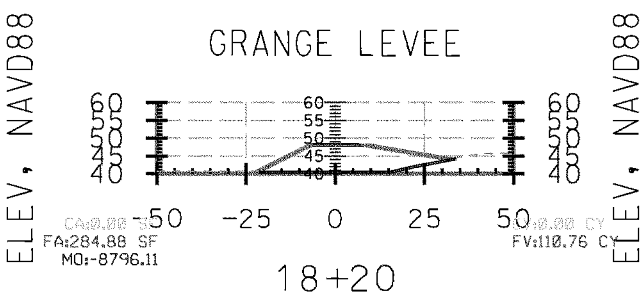



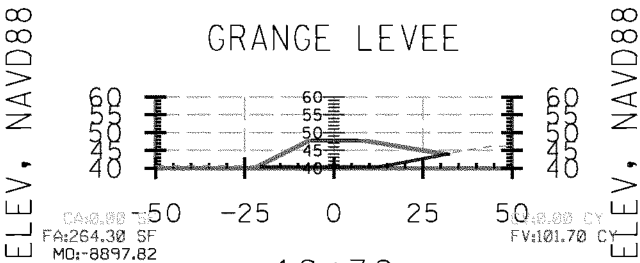
STA.18+00 TO STA.18+20



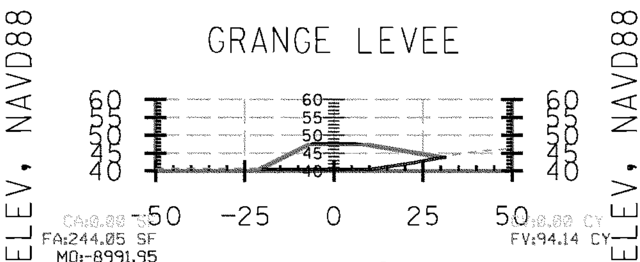



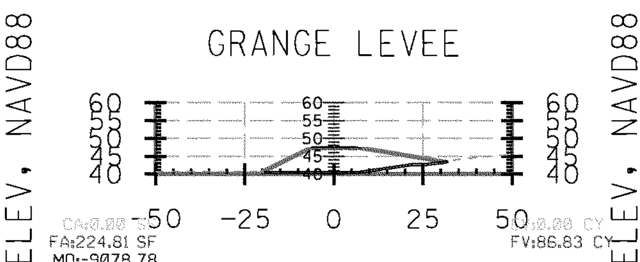
STA.18+30 TO STA.18+50




18+30

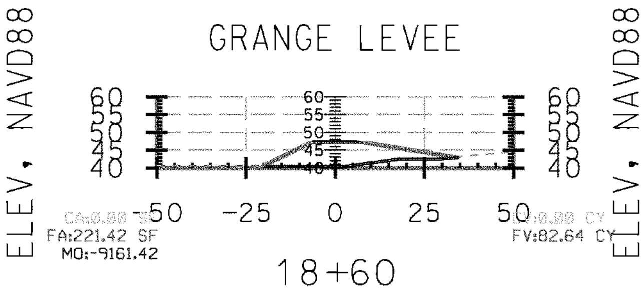


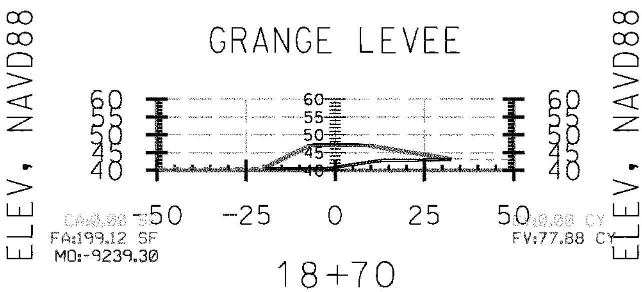

18+40

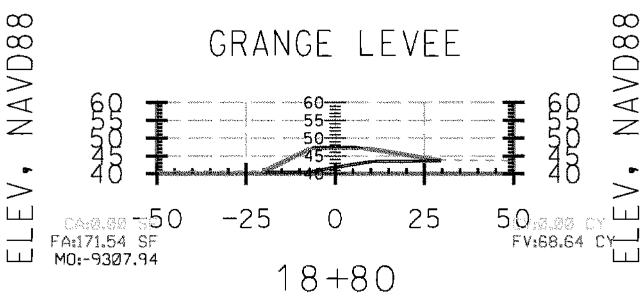



18+50

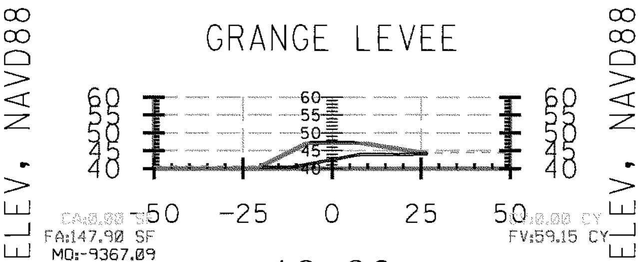
STA.18+60 TO STA.18+80



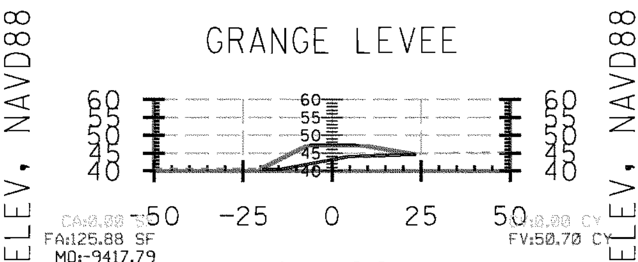



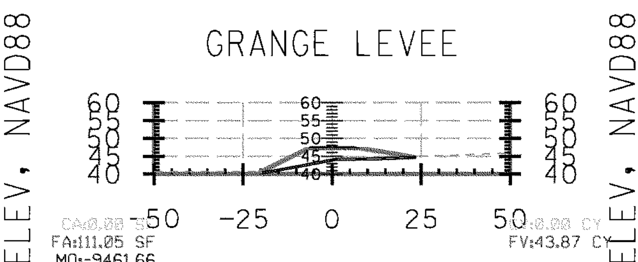
STA.18+90 TO STA.19+10




18+90

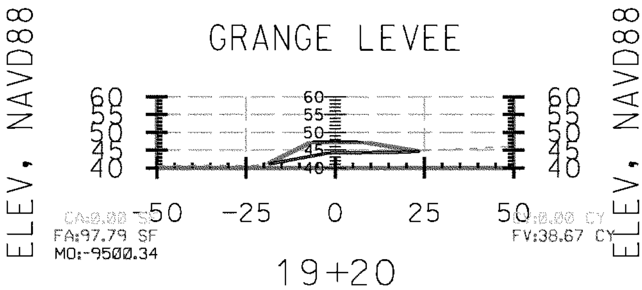


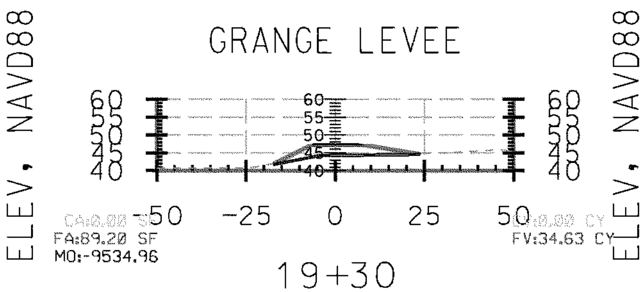

19+00

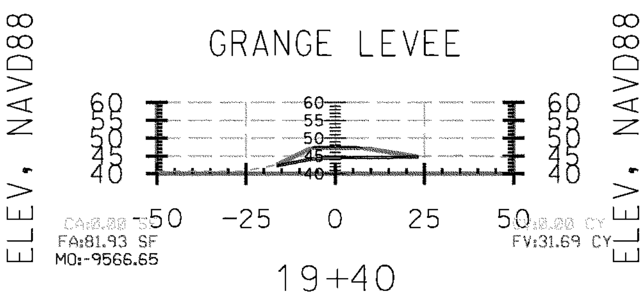



19+10

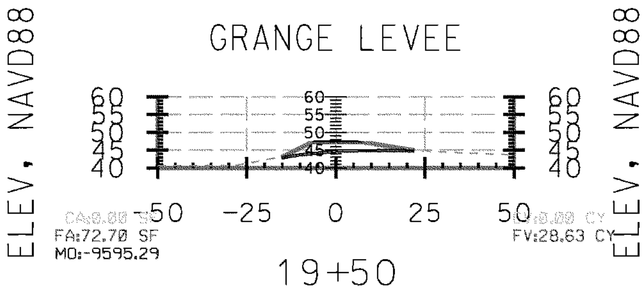
STA.19+20 TO STA.19+40

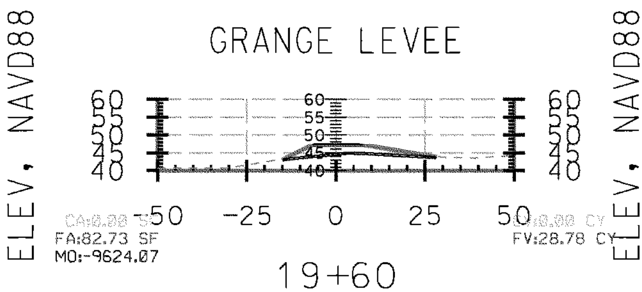


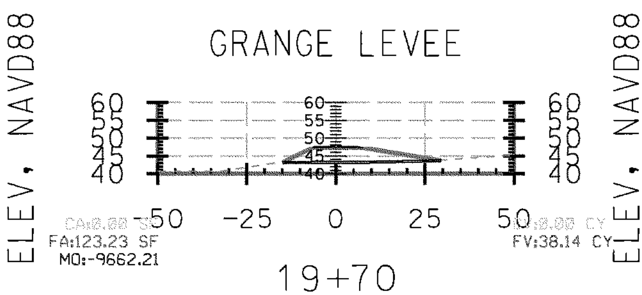



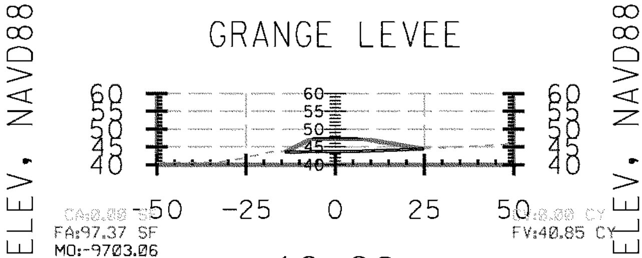
STA.19+50 TO STA.19+70



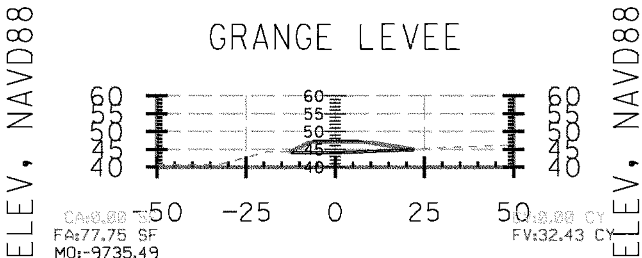



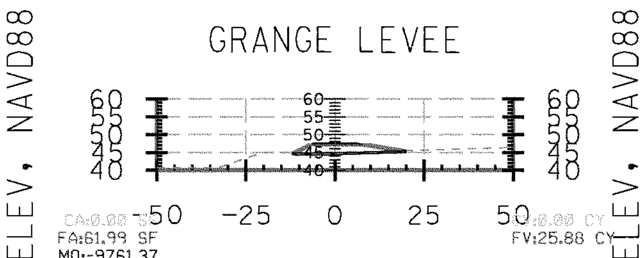
# STA.19+80 TO STA.20+00




19+80

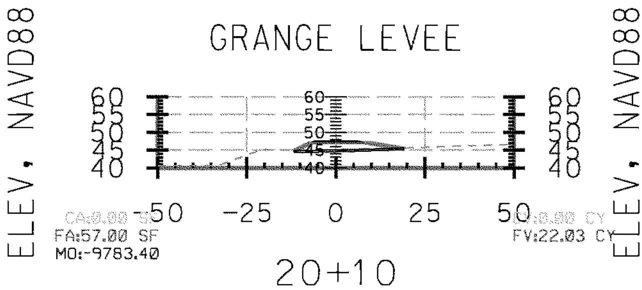


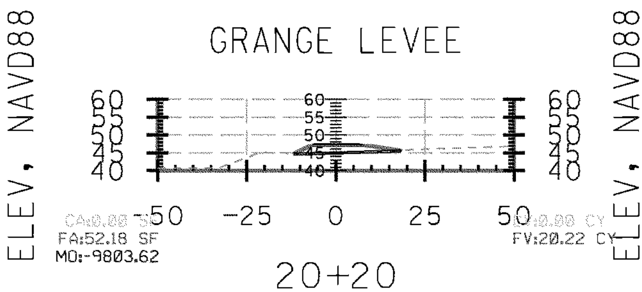

19+90

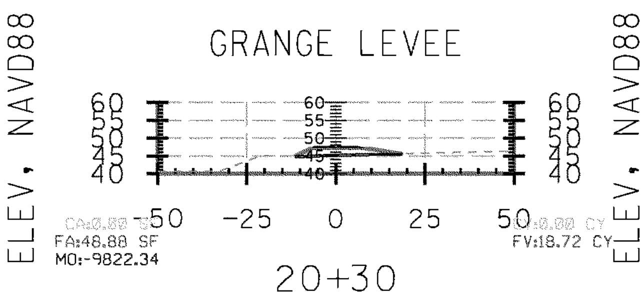



20+00

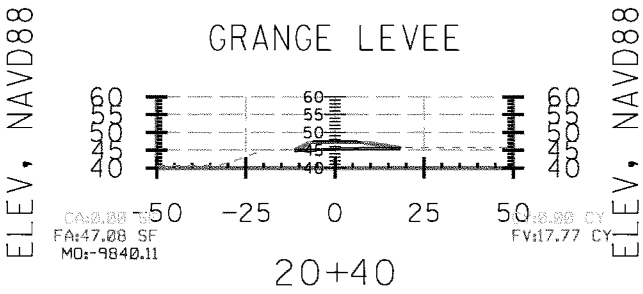
STA.20+10 TO STA.20+30

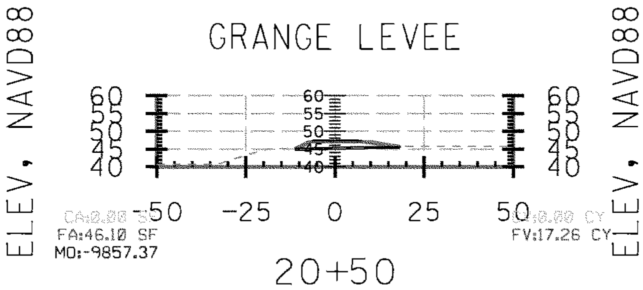


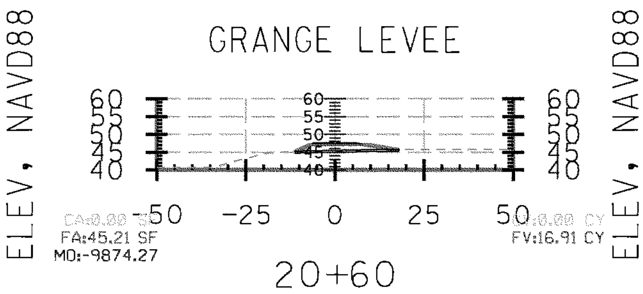



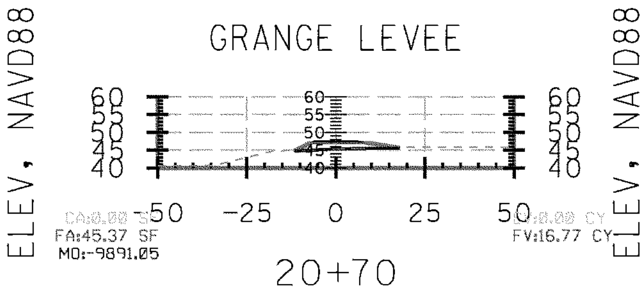
STA.20+40 TO STA.20+60

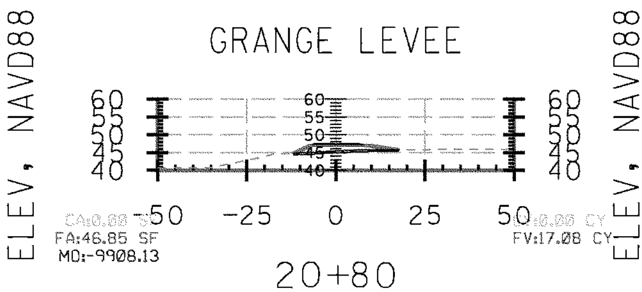


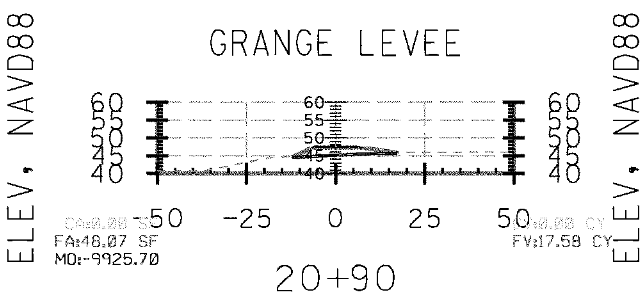



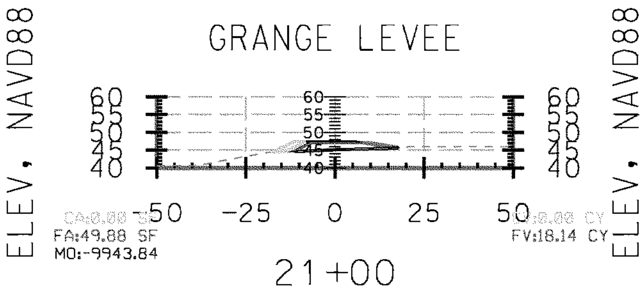
STA.20+70 TO STA.20+90

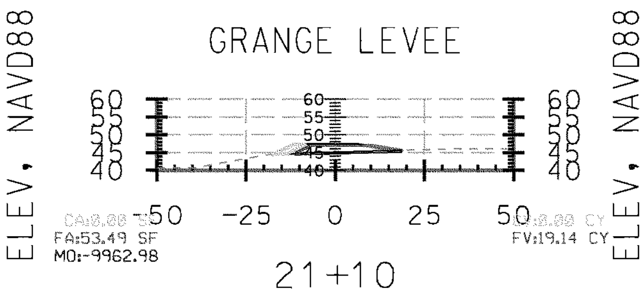


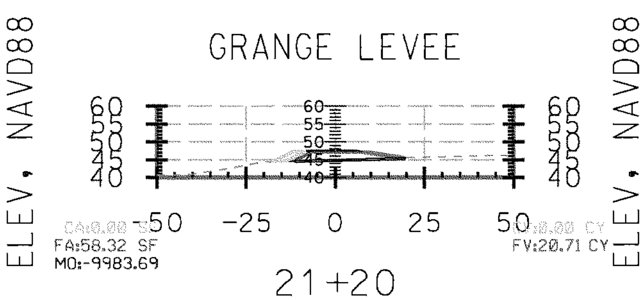



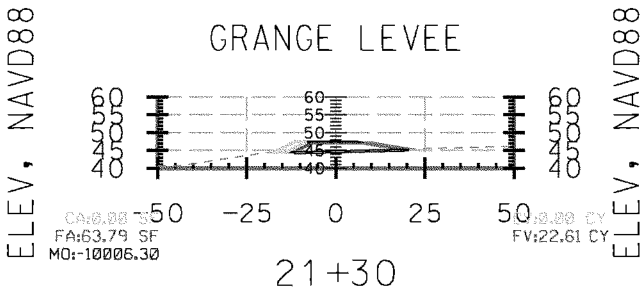
STA.21+00 TO STA.21+20

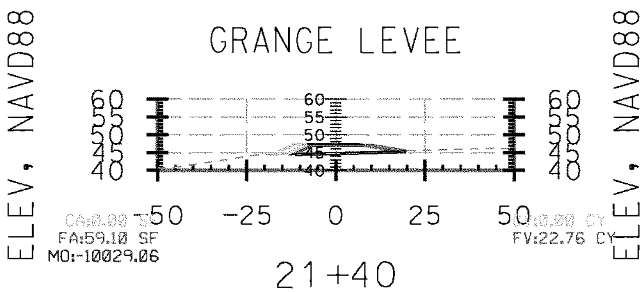


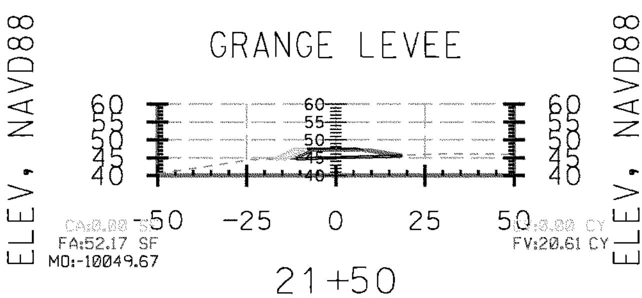



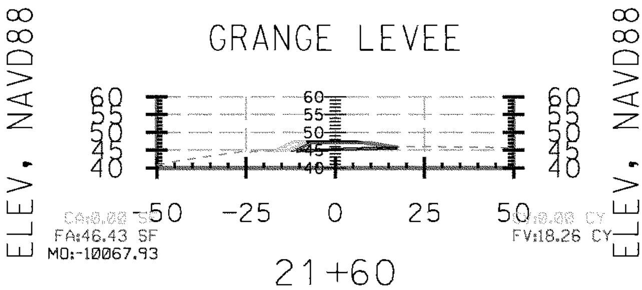
STA.21+30 TO STA.21+50

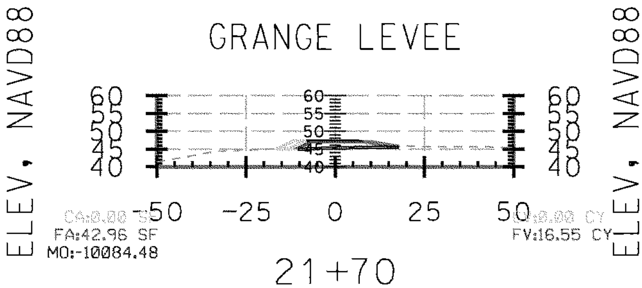


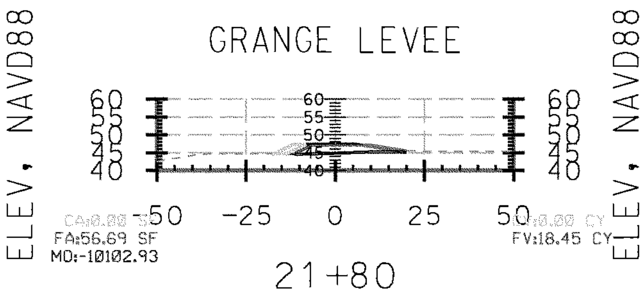



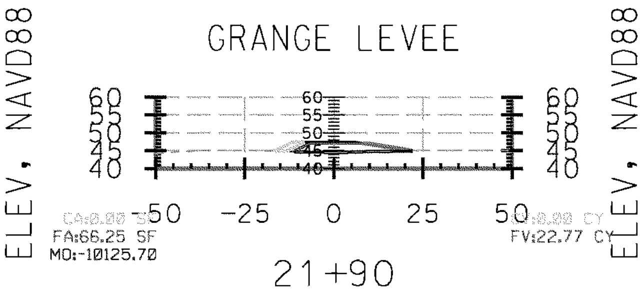
STA.21+60 TO STA.21+80

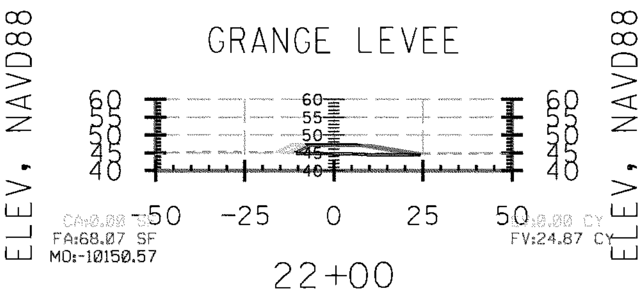


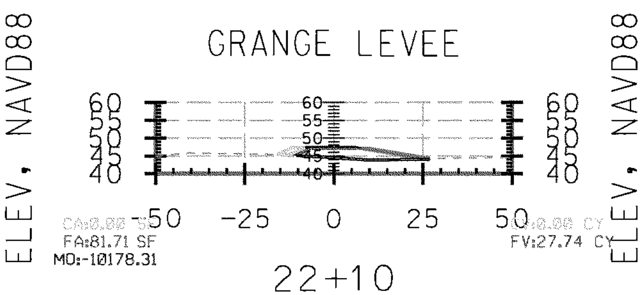



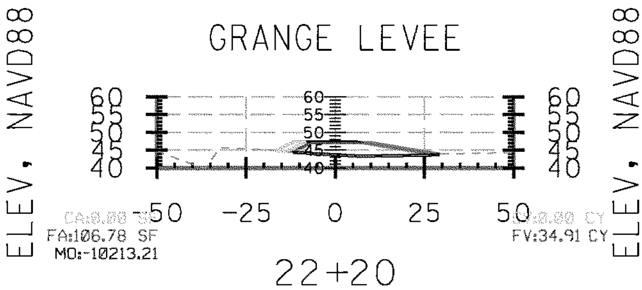
STA.21+90 TO STA.22+10

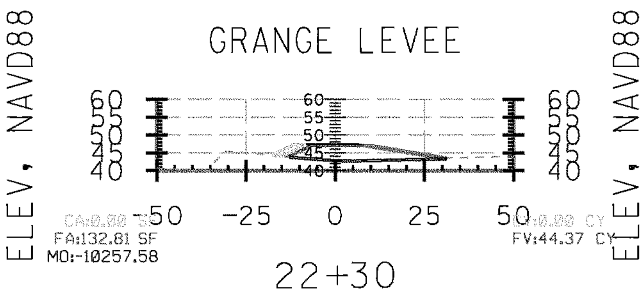


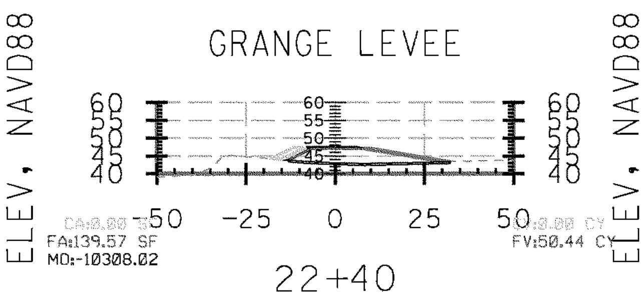



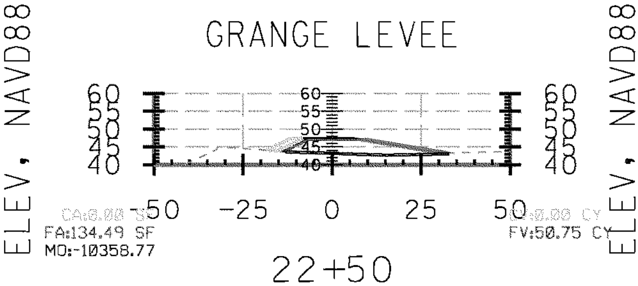
STA.22+20 TO STA.22+40

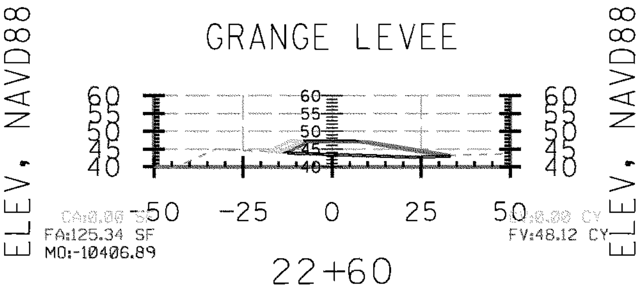


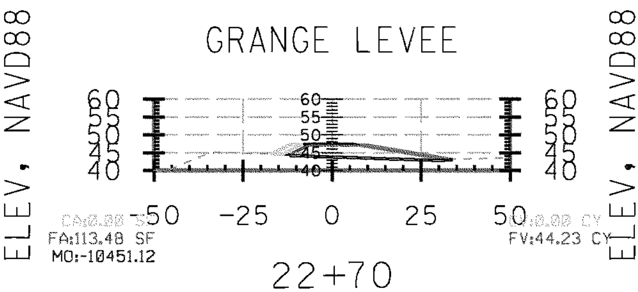



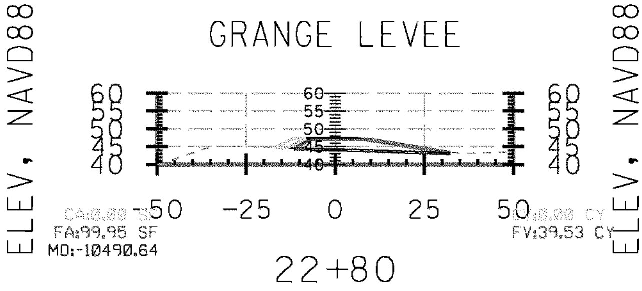
STA.22+50 TO STA.22+70

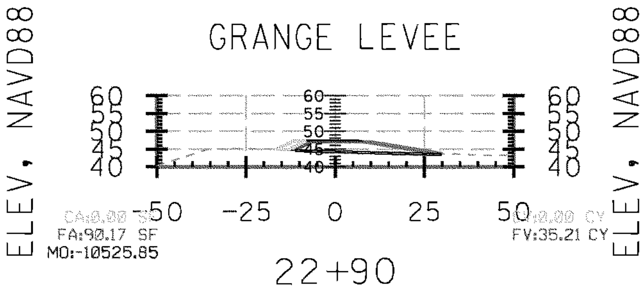


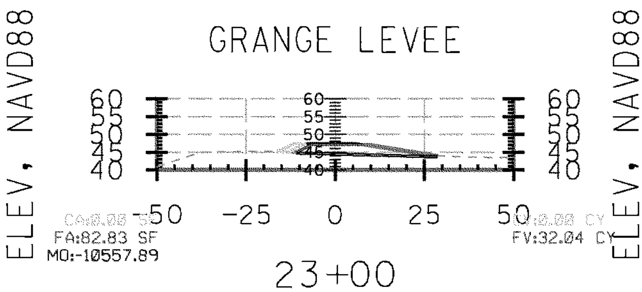



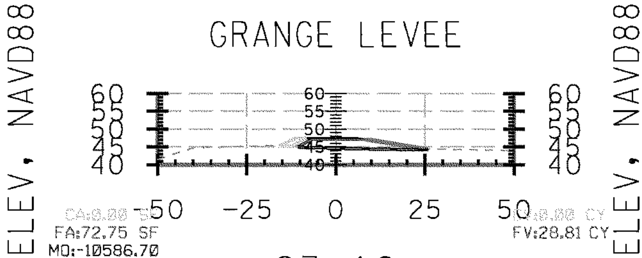
STA.22+80 TO STA.23+00



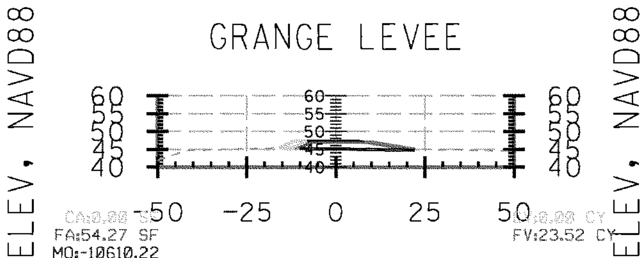



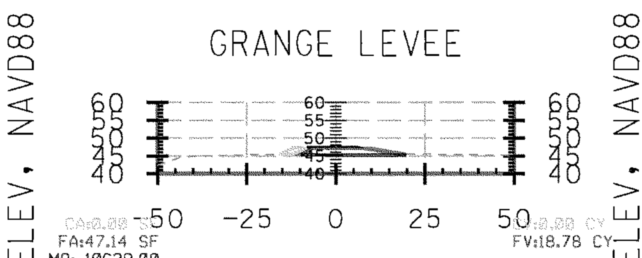
STA.23+10 TO STA.23+30




23+10

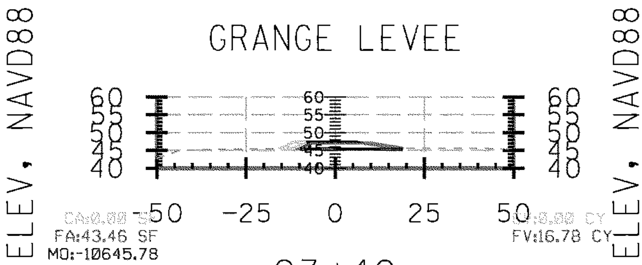



23+20

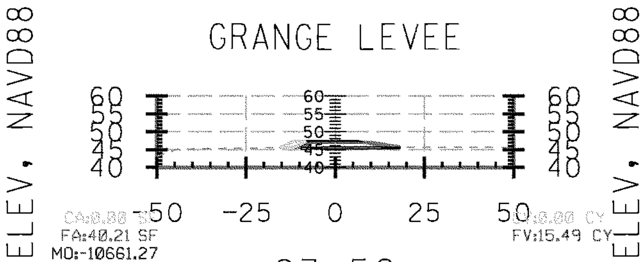



23+30

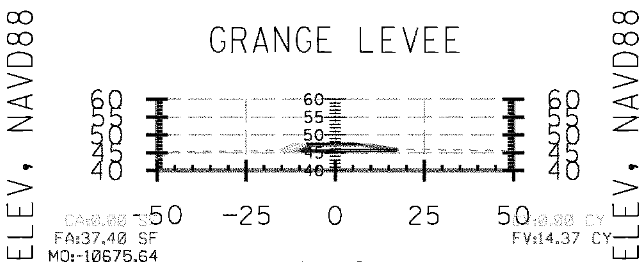
STA.23+40 TO STA.23+60




23+40

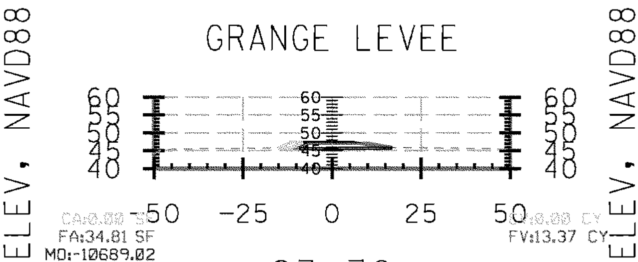



23+50

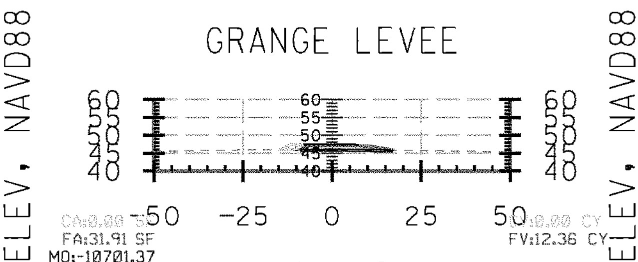



23+60

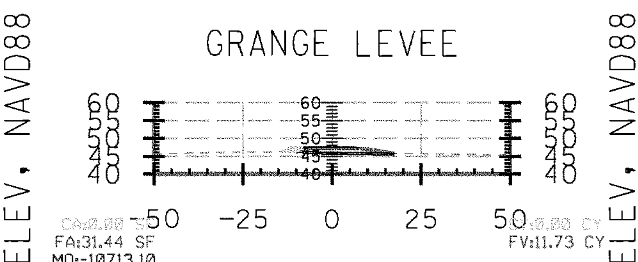
STA.23+70 TO STA.23+90




23+70

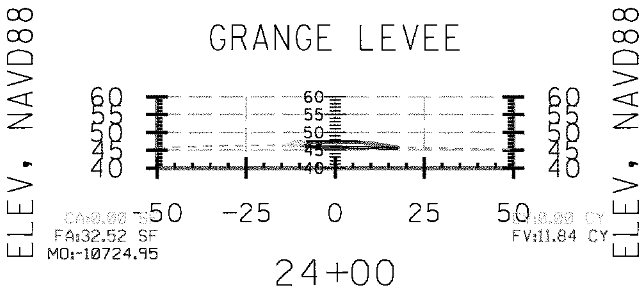


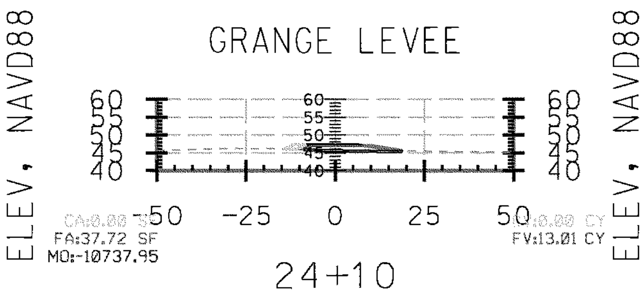

23+80

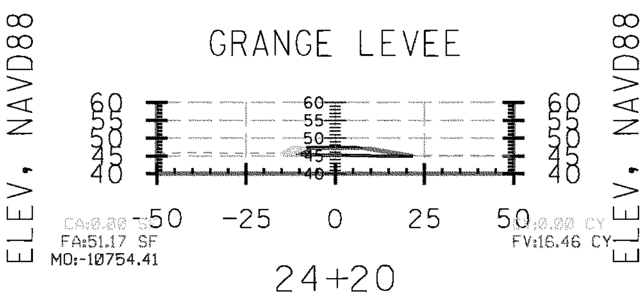



23+90

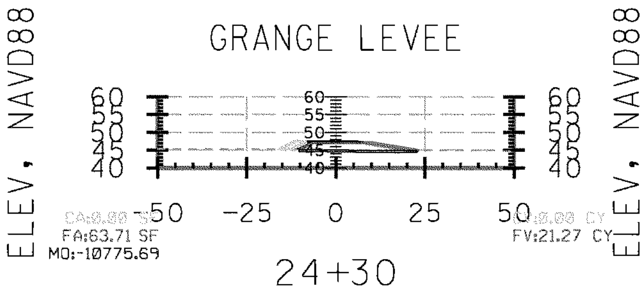
STA.24+00 TO STA.24+20

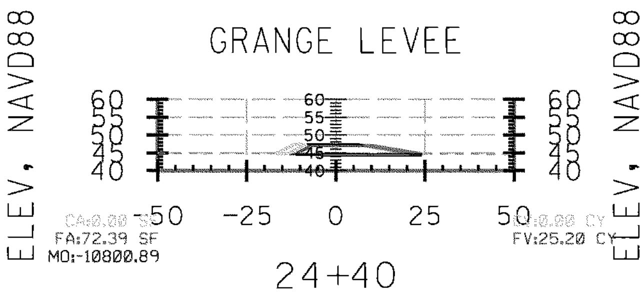


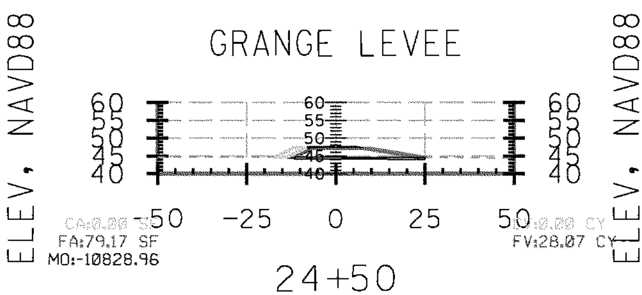



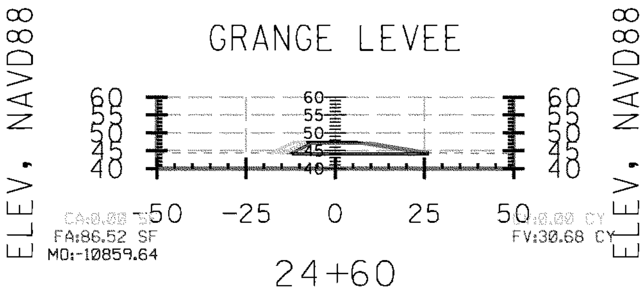
STA.24+30 TO STA.24+50

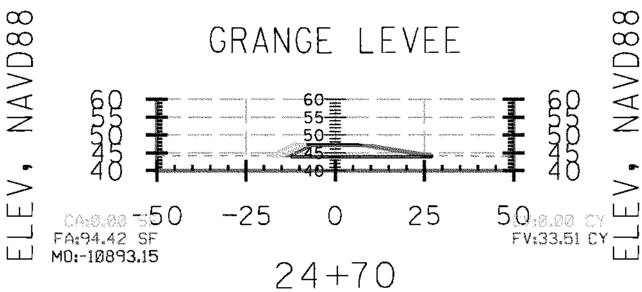


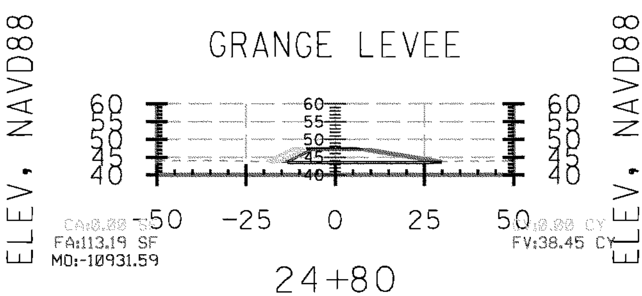



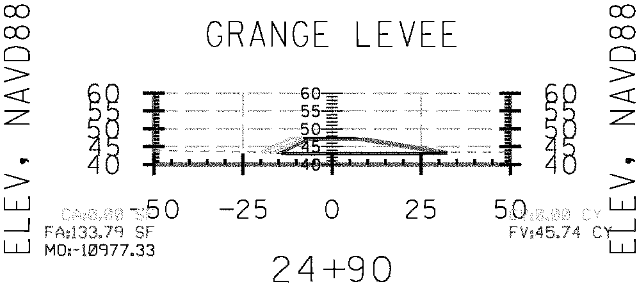
STA.24+60 TO STA.24+80

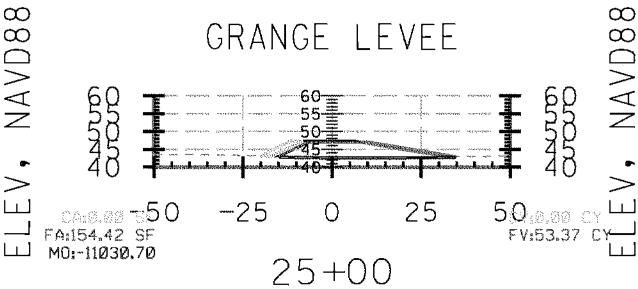


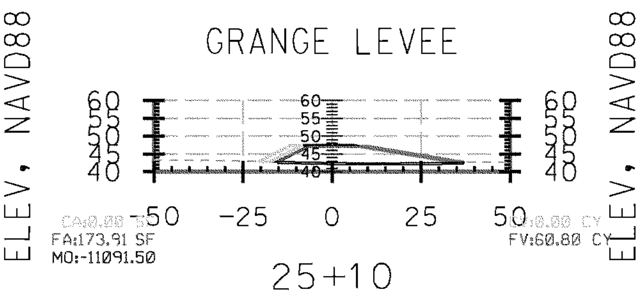



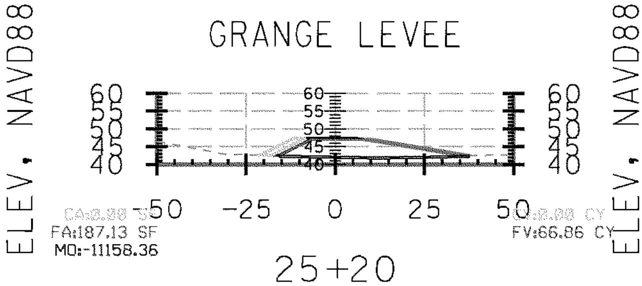
STA.24+90 TO STA.25+10

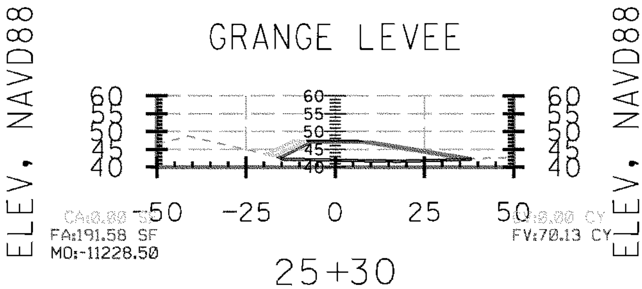


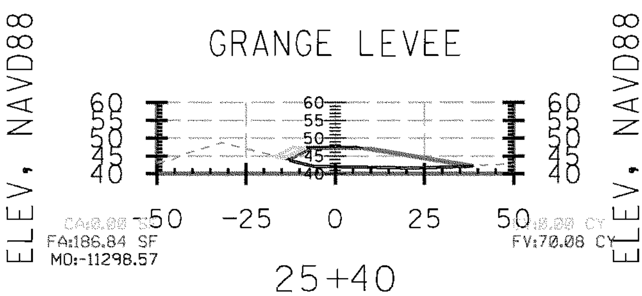



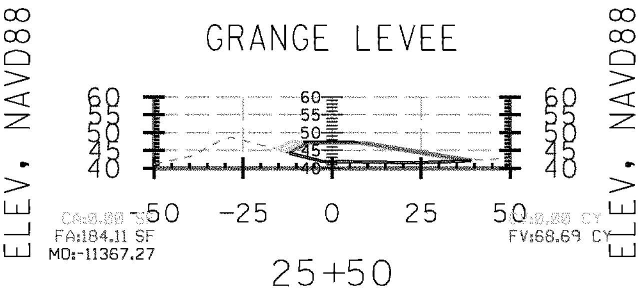
# STA.25+20 TO STA.25+40

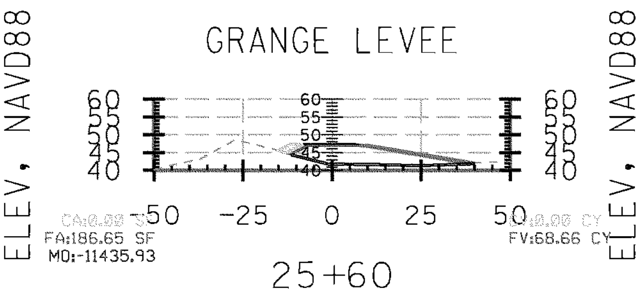


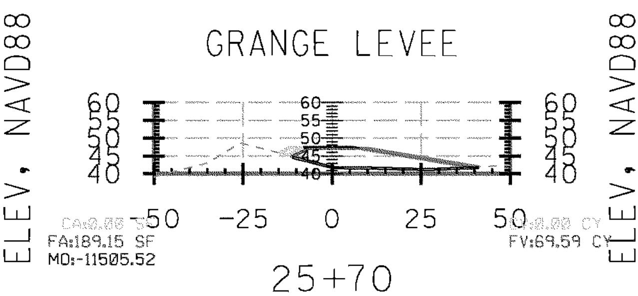



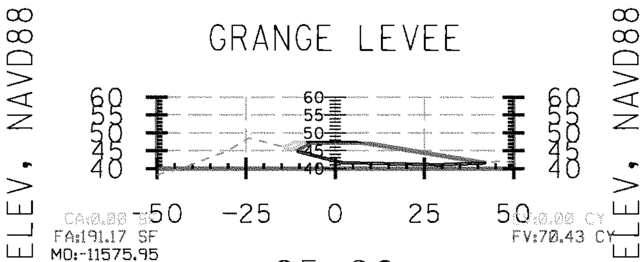
STA.25+50 TO STA.25+70



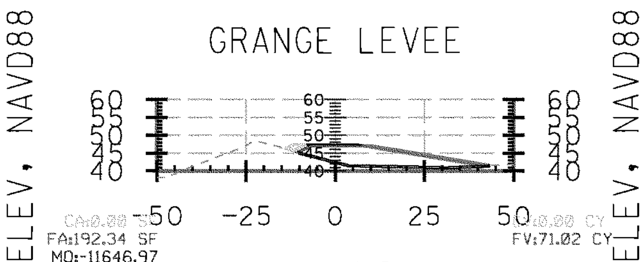



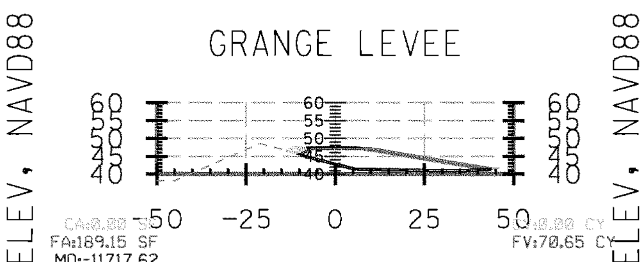
# STA.25+80 TO STA.26+00




25+80

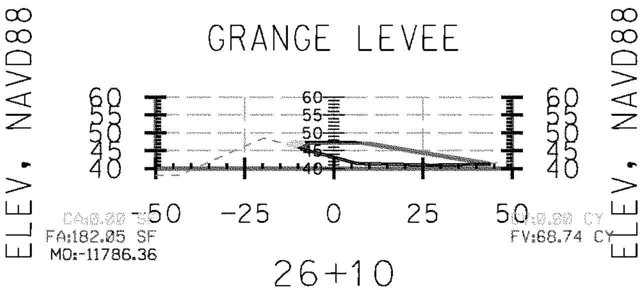


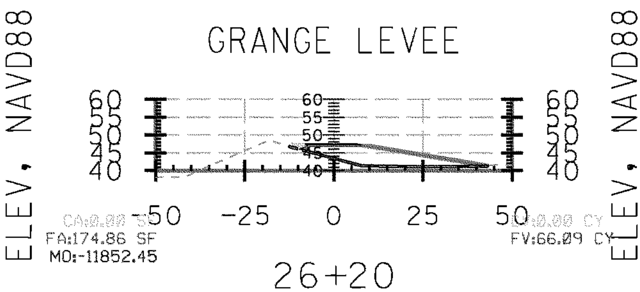

25+90

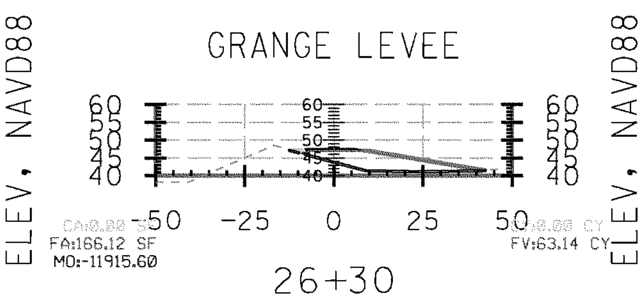



26+00

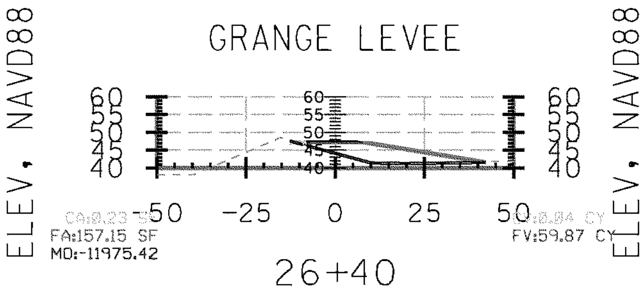
STA.26+10 TO STA.26+30

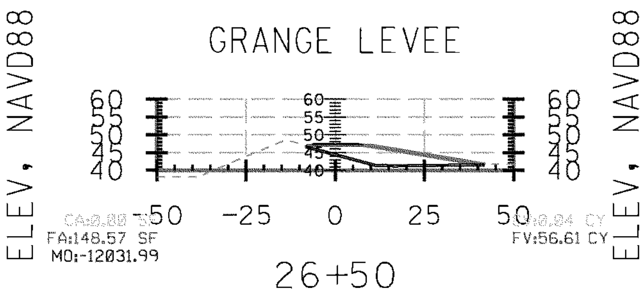


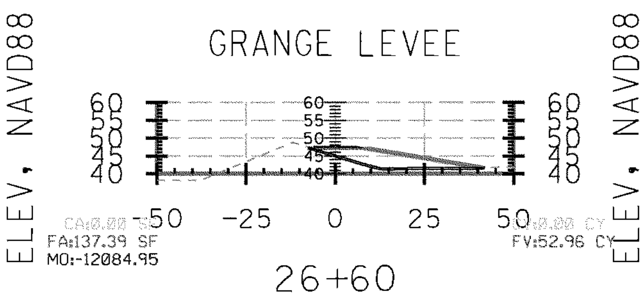



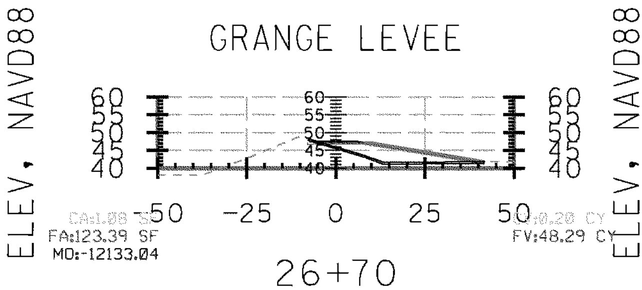
STA.26+40 TO STA.26+60

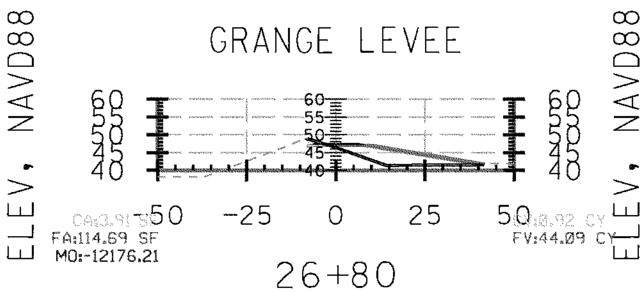


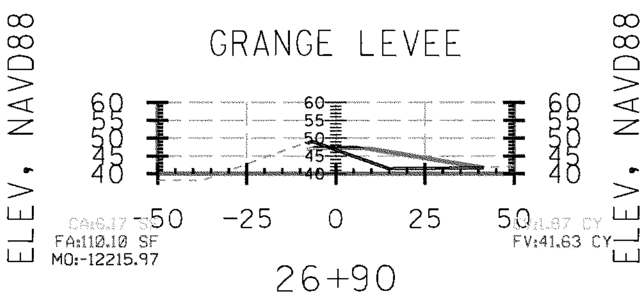



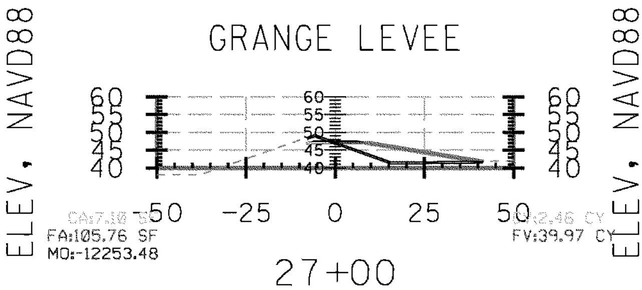
# STA.26+70 TO STA.26+90

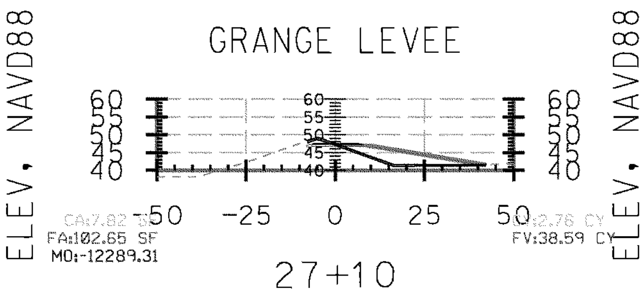


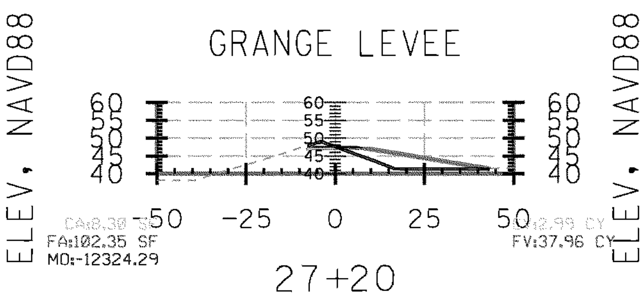



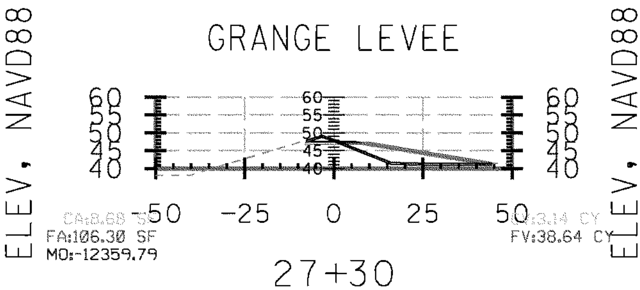
STA.27+00 TO STA.27+20

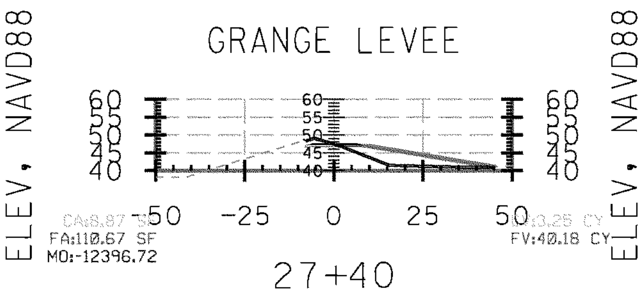


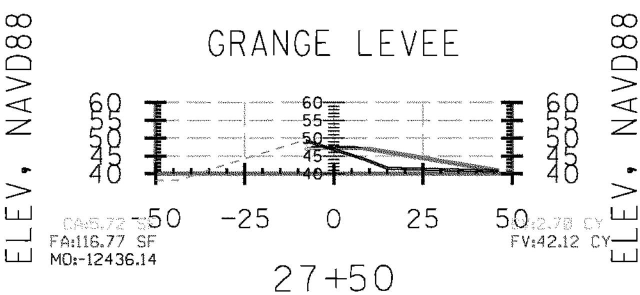



STA.27+30 TO STA.27+50



# Volumes Report

Report Created: 11/1/2014
Time: 2:55pm

Bentley InRoads Suite V8i (SELECTseries 2), 08.11.07.536

**Cross Section Set Name:** Grange

**Alignment Name:** Grange

**Input Grid Factor:** 1.000000

**Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

**Surface:** Skokomish Last Revised 8/29/2014 5:56:26 AM

**Surface:** Grange Original Last Revised 11/1/2014 2:50:55 PM

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **0+10.000** | | | | | | | 0.0 |
| | Normal Cut: | 1.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 77.5 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 20.9 | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (not replaced): | 3.4 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 24.3 | 0.0 | 1.000 | 0.0 | | |
| | Wearing Course: | 4.4 | 0.0 | 1.000 | 0.0 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.0 | 0.0 | 1.000 | 0.0 | No | |
| **0+20.000** | | | | | | | -45.1 |
| | Normal Cut: | 0.0 | 0.2 | 1.000 | 0.2 | Yes | |
| | Normal Fill: | 121.4 | 36.8 | 1.000 | 36.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 24.8 | 8.5 | 1.000 | 8.5 | Yes | |
| | Default (not replaced): | 0.1 | 0.6 | 1.000 | 0.6 | No | |
| | Total Default: | 24.8 | 9.1 | 1.000 | 9.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.6 | 3.8 | 1.000 | 3.8 | No | |
| **0+30.000** | | | | | | | -106.2 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 157.3 | 51.6 | 1.000 | 51.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.4 | 9.5 | 1.000 | 9.5 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 26.5 | 9.5 | 1.000 | 9.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.9 | 4.2 | 1.000 | 4.2 | No | |
| **0+40.000** | | | | | | | -178.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 178.9 | 62.3 | 1.000 | 62.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.8 | 10.1 | 1.000 | 10.1 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.9 | 10.1 | 1.000 | 10.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.1 | 4.6 | 1.000 | 4.6 | No | |
| **0+50.000** | | | | | | | -257.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 190.2 | 68.4 | 1.000 | 68.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.1 | 10.6 | 1.000 | 10.6 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.2 | 10.6 | 1.000 | 10.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.1 | 5.0 | 1.000 | 5.0 | No | |
| **0+60.000** | | | | | | | -340.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 197.3 | 71.8 | 1.000 | 71.8 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.7 | 10.9 | 1.000 | 10.9 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.8 | 10.9 | 1.000 | 10.9 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.5 | 5.3 | 1.000 | 5.3 | No | |
| **0+70.000** | | | | | | | -425.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 205.1 | 74.5 | 1.000 | 74.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.1 | 11.1 | 1.000 | 11.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.2 | 11.1 | 1.000 | 11.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.8 | 5.4 | 1.000 | 5.4 | No | |
| **0+80.000** | | | | | | | -514.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 213.7 | 77.6 | 1.000 | 77.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.6 | 11.3 | 1.000 | 11.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.7 | 11.3 | 1.000 | 11.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.1 | 5.5 | 1.000 | 5.5 | No | |
| **0+90.000** | | | | | | | -606.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 221.3 | 80.6 | 1.000 | 80.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 31.0 | 11.4 | 1.000 | 11.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 31.0 | 11.4 | 1.000 | 11.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.4 | 5.6 | 1.000 | 5.6 | No | |
| **1+00.000** | | | | | | | -700.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 222.8 | 82.2 | 1.000 | 82.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.2 | 11.5 | 1.000 | 11.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 31.2 | 11.5 | 1.000 | 11.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.5 | 5.7 | 1.000 | 5.7 | No | |
| **1+10.000** | | | | | | | -793.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 217.7 | 81.6 | 1.000 | 81.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.9 | 11.5 | 1.000 | 11.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.9 | 11.5 | 1.000 | 11.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.3 | 5.7 | 1.000 | 5.7 | No | |
| **1+20.000** | | | | | | | -884.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 212.3 | 79.6 | 1.000 | 79.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.7 | 11.4 | 1.000 | 11.4 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.7 | 11.4 | 1.000 | 11.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.2 | 5.6 | 1.000 | 5.6 | No | |
| **1+30.000** | | | | | | | -973.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 206.9 | 77.6 | 1.000 | 77.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.5 | 11.3 | 1.000 | 11.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.5 | 11.3 | 1.000 | 11.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.0 | 5.6 | 1.000 | 5.6 | No | |
| **1+40.000** | | | | | | | -1060.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 201.6 | 75.7 | 1.000 | 75.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.4 | 11.3 | 1.000 | 11.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.4 | 11.3 | 1.000 | 11.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.9 | 5.5 | 1.000 | 5.5 | No | |
| **1+50.000** | | | | | | | -1145.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 196.2 | 73.7 | 1.000 | 73.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.2 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.2 | 11.2 | 1.000 | 11.2 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.8 | 5.5 | 1.000 | 5.5 | No | |
| **1+60.000** | | | | | | | -1227.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 190.6 | 71.6 | 1.000 | 71.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.9 | 11.1 | 1.000 | 11.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.9 | 11.1 | 1.000 | 11.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.6 | 5.4 | 1.000 | 5.4 | No | |
| **1+70.000** | | | | | | | -1308.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 184.1 | 69.4 | 1.000 | 69.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.3 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.3 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.1 | 5.3 | 1.000 | 5.3 | No | |
| **1+80.000** | | | | | | | -1386.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 179.1 | 67.2 | 1.000 | 67.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.7 | 10.7 | 1.000 | 10.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.7 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.7 | 5.2 | 1.000 | 5.2 | No | |
| **1+90.000** | | | | | | | -1462.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 174.5 | 65.5 | 1.000 | 65.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.3 | 10.5 | 1.000 | 10.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.3 | 10.6 | 1.000 | 10.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.5 | 5.0 | 1.000 | 5.0 | No | |
| **2+00.000** | | | | | | | -1536.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 170.1 | 63.8 | 1.000 | 63.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.0 | 10.4 | 1.000 | 10.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.0 | 10.4 | 1.000 | 10.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.3 | 5.0 | 1.000 | 5.0 | No | |
| **2+10.000** | | | | | | | -1608.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 165.7 | 62.2 | 1.000 | 62.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.6 | 10.3 | 1.000 | 10.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.7 | 10.3 | 1.000 | 10.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 13.1 | 4.9 | 1.000 | 4.9 | No | |
| **2+20.000** | | | | | | | -1679.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 162.2 | 60.7 | 1.000 | 60.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.6 | 10.2 | 1.000 | 10.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.6 | 10.2 | 1.000 | 10.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.1 | 4.8 | 1.000 | 4.8 | No | |
| **2+30.000** | | | | | | | -1750.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 162.0 | 60.0 | 1.000 | 60.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.7 | 10.2 | 1.000 | 10.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.7 | 10.3 | 1.000 | 10.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.1 | 4.9 | 1.000 | 4.9 | No | |
| **2+40.000** | | | | | | | -1821.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 165.2 | 60.6 | 1.000 | 60.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.8 | 10.3 | 1.000 | 10.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.8 | 10.3 | 1.000 | 10.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.2 | 4.9 | 1.000 | 4.9 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **2+50.000** | | | | | | | -1893.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 171.8 | 62.4 | 1.000 | 62.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.9 | 10.3 | 1.000 | 10.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.9 | 10.3 | 1.000 | 10.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.3 | 4.9 | 1.000 | 4.9 | No | |
| **2+60.000** | | | | | | | -1969.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 178.9 | 64.9 | 1.000 | 64.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.5 | 10.4 | 1.000 | 10.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.6 | 10.5 | 1.000 | 10.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.8 | 5.0 | 1.000 | 5.0 | No | |
| **2+70.000** | | | | | | | -2045.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 174.4 | 65.4 | 1.000 | 65.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.7 | 10.6 | 1.000 | 10.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.7 | 10.6 | 1.000 | 10.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.9 | 5.1 | 1.000 | 5.1 | No | |
| **2+80.000** | | | | | | | -2119.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 170.1 | 63.8 | 1.000 | 63.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.9 | 10.7 | 1.000 | 10.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.9 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.9 | 5.2 | 1.000 | 5.2 | No | |
| **2+90.000** | | | | | | | -2192.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 166.5 | 62.3 | 1.000 | 62.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.8 | 10.7 | 1.000 | 10.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.8 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.9 | 5.2 | 1.000 | 5.2 | No | |
| **3+00.000** | | | | | | | -2264.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 163.6 | 61.1 | 1.000 | 61.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.6 | 10.6 | 1.000 | 10.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.6 | 10.6 | 1.000 | 10.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.7 | 5.1 | 1.000 | 5.1 | No | |
| **3+10.000** | | | | | | | -2335.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 163.3 | 60.5 | 1.000 | 60.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.4 | 10.5 | 1.000 | 10.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.4 | 10.6 | 1.000 | 10.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.6 | 5.0 | 1.000 | 5.0 | No | |
| **3+20.000** | | | | | | | -2406.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 163.0 | 60.4 | 1.000 | 60.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.3 | 10.5 | 1.000 | 10.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.3 | 10.5 | 1.000 | 10.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.5 | 5.0 | 1.000 | 5.0 | No | |
| **3+30.000** | | | | | | | -2477.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 164.5 | 60.6 | 1.000 | 60.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.4 | 10.5 | 1.000 | 10.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.4 | 10.5 | 1.000 | 10.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.6 | 5.0 | 1.000 | 5.0 | No | |
| **3+40.000** | | | | | | | -2549.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 166.5 | 61.3 | 1.000 | 61.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 28.7 | 10.6 | 1.000 | 10.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.7 | 10.6 | 1.000 | 10.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.7 | 5.1 | 1.000 | 5.1 | No | |
| **3+50.000** | | | | | | | -2622.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 168.3 | 62.0 | 1.000 | 62.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.9 | 10.7 | 1.000 | 10.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.9 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.9 | 5.1 | 1.000 | 5.1 | No | |
| **3+60.000** | | | | | | | -2695.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 169.7 | 62.6 | 1.000 | 62.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.1 | 10.7 | 1.000 | 10.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.1 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.0 | 5.2 | 1.000 | 5.2 | No | |
| **3+70.000** | | | | | | | -2769.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 171.1 | 63.1 | 1.000 | 63.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.2 | 10.8 | 1.000 | 10.8 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Default: | 29.2 | 10.8 | 1.000 | 10.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.1 | 5.2 | 1.000 | 5.2 | No | |
| **3+80.000** | | | | | | | -2843.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 172.3 | 63.6 | 1.000 | 63.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.4 | 10.8 | 1.000 | 10.8 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.4 | 10.8 | 1.000 | 10.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.2 | 5.3 | 1.000 | 5.3 | No | |
| **3+90.000** | | | | | | | -2918.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 173.6 | 64.1 | 1.000 | 64.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.4 | 10.9 | 1.000 | 10.9 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.4 | 10.9 | 1.000 | 10.9 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.3 | 5.3 | 1.000 | 5.3 | No | |
| **4+00.000** | | | | | | | -2994.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 175.1 | 64.6 | 1.000 | 64.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.4 | 10.9 | 1.000 | 10.9 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.4 | 10.9 | 1.000 | 10.9 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.3 | 5.3 | 1.000 | 5.3 | No | |
| **4+10.000** | | | | | | | -3070.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 177.6 | 65.3 | 1.000 | 65.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.6 | 10.9 | 1.000 | 10.9 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.6 | 10.9 | 1.000 | 10.9 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.4 | 5.3 | 1.000 | 5.3 | No | |
| **4+20.000** | | | | | | | -3147.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 179.1 | 66.1 | 1.000 | 66.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.8 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.8 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.6 | 5.4 | 1.000 | 5.4 | No | |
| **4+30.000** | | | | | | | -3225.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 180.8 | 66.7 | 1.000 | 66.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.0 | 11.1 | 1.000 | 11.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.0 | 11.1 | 1.000 | 11.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.6 | 5.4 | 1.000 | 5.4 | No | |
| **4+40.000** | | | | | | | -3303.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 183.8 | 67.5 | 1.000 | 67.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.1 | 11.1 | 1.000 | 11.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.1 | 11.1 | 1.000 | 11.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.8 | 5.4 | 1.000 | 5.4 | No | |
| **4+50.000** | | | | | | | -3384.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 188.6 | 69.0 | 1.000 | 69.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.4 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.4 | 11.2 | 1.000 | 11.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.9 | 5.5 | 1.000 | 5.5 | No | |
| **4+60.000** | | | | | | | -3466.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 194.1 | 70.9 | 1.000 | 70.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.6 | 11.3 | 1.000 | 11.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.6 | 11.3 | 1.000 | 11.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.1 | 5.6 | 1.000 | 5.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **4+70.000** | | | | | | | -3550.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 199.8 | 72.9 | 1.000 | 72.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.0 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.0 | 11.2 | 1.000 | 11.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.2 | 5.6 | 1.000 | 5.6 | No | |
| **4+80.000** | | | | | | | -3636.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 204.5 | 74.9 | 1.000 | 74.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.5 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.6 | 11.2 | 1.000 | 11.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.0 | 5.6 | 1.000 | 5.6 | No | |
| **4+90.000** | | | | | | | -3723.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 202.5 | 75.4 | 1.000 | 75.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.0 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.0 | 11.2 | 1.000 | 11.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.7 | 5.5 | 1.000 | 5.5 | No | |
| **5+00.000** | | | | | | | -3807.4 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 193.4 | 73.3 | 1.000 | 73.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.5 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.5 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.3 | 5.4 | 1.000 | 5.4 | No | |
| **5+10.000** | | | | | | | -3888.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 186.9 | 70.4 | 1.000 | 70.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.0 | 10.8 | 1.000 | 10.8 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.0 | 10.8 | 1.000 | 10.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.0 | 5.3 | 1.000 | 5.3 | No | |
| **5+20.000** | | | | | | | -3968.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 188.2 | 69.5 | 1.000 | 69.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.6 | 10.7 | 1.000 | 10.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.6 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.7 | 5.1 | 1.000 | 5.1 | No | |
| **5+30.000** | | | | | | | -4050.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 197.2 | 71.4 | 1.000 | 71.4 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.1 | 10.5 | 1.000 | 10.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.1 | 10.5 | 1.000 | 10.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.5 | 5.0 | 1.000 | 5.0 | No | |
| **5+40.000** | | | | | | | -4133.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 196.4 | 72.9 | 1.000 | 72.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.3 | 10.5 | 1.000 | 10.5 | Yes | |
| | Default (not replaced): | 0.6 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 28.9 | 10.6 | 1.000 | 10.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.0 | 5.1 | 1.000 | 5.1 | No | |
| **5+50.000** | | | | | | | -4212.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 177.6 | 69.3 | 1.000 | 69.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 21.8 | 9.3 | 1.000 | 9.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 21.8 | 9.4 | 1.000 | 9.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 4.6 | 0.9 | 1.000 | 0.9 | No | |
| | Filter: | 18.4 | 3.4 | 1.000 | 3.4 | No | |
| | Topsoil: | 4.8 | 3.5 | 1.000 | 3.5 | No | |
| **5+60.000** | | | | | | | -4287.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 183.5 | 66.9 | 1.000 | 66.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 22.2 | 8.1 | 1.000 | 8.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.2 | 8.1 | 1.000 | 8.1 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 27.0 | 5.9 | 1.000 | 5.9 | No | |
| | Filter: | 18.9 | 6.9 | 1.000 | 6.9 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **5+70.000** | | | | | | | -4364.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 185.6 | 68.4 | 1.000 | 68.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.3 | 8.2 | 1.000 | 8.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.3 | 8.2 | 1.000 | 8.2 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 27.3 | 10.0 | 1.000 | 10.0 | No | |
| | Filter: | 19.1 | 7.0 | 1.000 | 7.0 | No | |
| | Topsoil: | 4.9 | 1.8 | 1.000 | 1.8 | No | |
| **5+80.000** | | | | | | | -4441.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 185.1 | 68.6 | 1.000 | 68.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.3 | 8.3 | 1.000 | 8.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.3 | 8.3 | 1.000 | 8.3 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 27.3 | 10.1 | 1.000 | 10.1 | No | |
| | Filter: | 18.9 | 7.0 | 1.000 | 7.0 | No | |
| | Topsoil: | 4.9 | 1.8 | 1.000 | 1.8 | No | |
| **5+90.000** | | | | | | | -4517.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 184.9 | 68.5 | 1.000 | 68.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.1 | 8.2 | 1.000 | 8.2 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.1 | 8.2 | 1.000 | 8.2 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 26.6 | 10.0 | 1.000 | 10.0 | No | |
| | Filter: | 18.5 | 6.9 | 1.000 | 6.9 | No | |
| | Topsoil: | 4.9 | 1.8 | 1.000 | 1.8 | No | |
| **6+00.000** | | | | | | | -4594.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 185.2 | 68.5 | 1.000 | 68.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.0 | 8.2 | 1.000 | 8.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.0 | 8.2 | 1.000 | 8.2 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 26.0 | 9.7 | 1.000 | 9.7 | No | |
| | Filter: | 18.1 | 6.8 | 1.000 | 6.8 | No | |
| | Topsoil: | 5.0 | 1.8 | 1.000 | 1.8 | No | |
| **6+10.000** | | | | | | | -4671.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 185.6 | 68.7 | 1.000 | 68.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 21.6 | 8.1 | 1.000 | 8.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 21.6 | 8.1 | 1.000 | 8.1 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 25.6 | 9.6 | 1.000 | 9.6 | No | |
| | Filter: | 18.1 | 6.7 | 1.000 | 6.7 | No | |
| | Topsoil: | 5.0 | 1.8 | 1.000 | 1.8 | No | |
| **6+20.000** | | | | | | | -4748.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 185.7 | 68.8 | 1.000 | 68.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 21.6 | 8.0 | 1.000 | 8.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 21.6 | 8.0 | 1.000 | 8.0 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 25.5 | 9.5 | 1.000 | 9.5 | No | |
| | Filter: | 18.1 | 6.7 | 1.000 | 6.7 | No | |
| | Topsoil: | 4.9 | 1.8 | 1.000 | 1.8 | No | |
| **6+30.000** | | | | | | | -4824.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 185.2 | 68.7 | 1.000 | 68.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 21.6 | 8.0 | 1.000 | 8.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 21.6 | 8.0 | 1.000 | 8.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 26.6 | 9.6 | 1.000 | 9.6 | No | |
| | Filter: | 18.4 | 6.8 | 1.000 | 6.8 | No | |
| | Topsoil: | 4.9 | 1.8 | 1.000 | 1.8 | No | |
| **6+40.000** | | | | | | | -4902.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 192.8 | 70.0 | 1.000 | 70.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.6 | 8.2 | 1.000 | 8.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.6 | 8.2 | 1.000 | 8.2 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 28.6 | 10.2 | 1.000 | 10.2 | No | |
| | Filter: | 20.4 | 7.2 | 1.000 | 7.2 | No | |
| | Topsoil: | 4.9 | 1.8 | 1.000 | 1.8 | No | |
| **6+50.000** | | | | | | | -4982.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 192.2 | 71.3 | 1.000 | 71.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.7 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.7 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 28.5 | 10.6 | 1.000 | 10.6 | No | |
| | Filter: | 20.6 | 7.6 | 1.000 | 7.6 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **6+60.000** | | | | | | | -5061.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 190.8 | 70.9 | 1.000 | 70.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.9 | 8.5 | 1.000 | 8.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.9 | 8.5 | 1.000 | 8.5 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 29.3 | 10.7 | 1.000 | 10.7 | No | |
| | Filter: | 21.2 | 7.7 | 1.000 | 7.7 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **6+70.000** | | | | | | | -5140.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 189.2 | 70.4 | 1.000 | 70.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.8 | 8.5 | 1.000 | 8.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.8 | 8.5 | 1.000 | 8.5 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 30.2 | 11.0 | 1.000 | 11.0 | No | |
| | Filter: | 21.5 | 7.9 | 1.000 | 7.9 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **6+80.000** | | | | | | | -5219.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 187.7 | 69.8 | 1.000 | 69.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.7 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.7 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 30.9 | 11.3 | 1.000 | 11.3 | No | |
| | Filter: | 21.4 | 7.9 | 1.000 | 7.9 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **6+90.000** | | | | | | | -5296.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 186.3 | 69.3 | 1.000 | 69.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.6 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.6 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 31.2 | 11.5 | 1.000 | 11.5 | No | |
| | Filter: | 21.3 | 7.9 | 1.000 | 7.9 | No | |
| | Topsoil: | 4.7 | 1.8 | 1.000 | 1.8 | No | |
| **7+00.000** | | | | | | | -5373.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 184.7 | 68.7 | 1.000 | 68.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.9 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.9 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 31.0 | 11.5 | 1.000 | 11.5 | No | |
| | Filter: | 21.1 | 7.8 | 1.000 | 7.8 | No | |
| | Topsoil: | 4.7 | 1.8 | 1.000 | 1.8 | No | |
| **7+10.000** | | | | | | | -5450.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 182.6 | 68.0 | 1.000 | 68.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.8 | 8.5 | 1.000 | 8.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.8 | 8.5 | 1.000 | 8.5 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 30.7 | 11.4 | 1.000 | 11.4 | No | |
| | Filter: | 20.8 | 7.8 | 1.000 | 7.8 | No | |
| | Topsoil: | 4.7 | 1.8 | 1.000 | 1.8 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **7+20.000** | | | | | | | -5526.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 180.9 | 67.3 | 1.000 | 67.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.7 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.7 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 30.3 | 11.3 | 1.000 | 11.3 | No | |
| | Filter: | 20.6 | 7.7 | 1.000 | 7.7 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **7+30.000** | | | | | | | -5601.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 180.9 | 67.0 | 1.000 | 67.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.6 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.6 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 30.0 | 11.2 | 1.000 | 11.2 | No | |
| | Filter: | 20.4 | 7.6 | 1.000 | 7.6 | No | |
| | Topsoil: | 4.7 | 1.8 | 1.000 | 1.8 | No | |
| **7+40.000** | | | | | | | -5677.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 181.9 | 67.2 | 1.000 | 67.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.6 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.6 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 29.7 | 11.0 | 1.000 | 11.0 | No | |
| | Filter: | 20.3 | 7.5 | 1.000 | 7.5 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **7+50.000** | | | | | | | -5752.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 182.6 | 67.5 | 1.000 | 67.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.7 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.7 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 29.7 | 11.0 | 1.000 | 11.0 | No | |
| | Filter: | 20.3 | 7.5 | 1.000 | 7.5 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **7+60.000** | | | | | | | -5829.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 182.9 | 67.7 | 1.000 | 67.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.7 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.7 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 29.7 | 11.0 | 1.000 | 11.0 | No | |
| | Filter: | 20.3 | 7.5 | 1.000 | 7.5 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **7+70.000** | | | | | | | -5904.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 179.1 | 67.0 | 1.000 | 67.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.0 | 8.3 | 1.000 | 8.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.0 | 8.3 | 1.000 | 8.3 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 29.6 | 11.0 | 1.000 | 11.0 | No | |
| | Filter: | 20.3 | 7.5 | 1.000 | 7.5 | No | |
| | Topsoil: | 4.6 | 1.7 | 1.000 | 1.7 | No | |
| **7+80.000** | | | | | | | -5978.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 178.8 | 66.3 | 1.000 | 66.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.0 | 8.2 | 1.000 | 8.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.0 | 8.2 | 1.000 | 8.2 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 29.3 | 10.9 | 1.000 | 10.9 | No | |
| | Filter: | 20.1 | 7.5 | 1.000 | 7.5 | No | |
| | Topsoil: | 4.7 | 1.7 | 1.000 | 1.7 | No | |
| **7+90.000** | | | | | | | -6053.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 179.6 | 66.4 | 1.000 | 66.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.0 | 8.1 | 1.000 | 8.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.0 | 8.1 | 1.000 | 8.1 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 28.9 | 10.8 | 1.000 | 10.8 | No | |
| | Filter: | 19.8 | 7.4 | 1.000 | 7.4 | No | |
| | Topsoil: | 4.7 | 1.7 | 1.000 | 1.7 | No | |
| **8+00.000** | | | | | | | -6127.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 180.0 | 66.6 | 1.000 | 66.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 21.9 | 8.1 | 1.000 | 8.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 21.9 | 8.1 | 1.000 | 8.1 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 28.6 | 10.6 | 1.000 | 10.6 | No | |
| | Filter: | 19.7 | 7.3 | 1.000 | 7.3 | No | |
| | Topsoil: | 4.7 | 1.7 | 1.000 | 1.7 | No | |
| **8+10.000** | | | | | | | -6203.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 183.3 | 67.3 | 1.000 | 67.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 22.1 | 8.2 | 1.000 | 8.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.1 | 8.2 | 1.000 | 8.2 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 28.8 | 10.6 | 1.000 | 10.6 | No | |
| | Filter: | 19.8 | 7.3 | 1.000 | 7.3 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **8+20.000** | | | | | | | -6280.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 186.1 | 68.4 | 1.000 | 68.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.6 | 8.3 | 1.000 | 8.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.6 | 8.3 | 1.000 | 8.3 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 28.9 | 10.7 | 1.000 | 10.7 | No | |
| | Filter: | 19.9 | 7.3 | 1.000 | 7.3 | No | |
| | Topsoil: | 4.9 | 1.8 | 1.000 | 1.8 | No | |
| **8+30.000** | | | | | | | -6357.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 188.1 | 69.3 | 1.000 | 69.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.6 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.6 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 29.0 | 10.7 | 1.000 | 10.7 | No | |
| | Filter: | 19.9 | 7.4 | 1.000 | 7.4 | No | |
| | Topsoil: | 4.9 | 1.8 | 1.000 | 1.8 | No | |
| **8+40.000** | | | | | | | -6436.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 190.8 | 70.2 | 1.000 | 70.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.7 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Default: | 22.7 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 29.4 | 10.8 | 1.000 | 10.8 | No | |
| | Filter: | 20.2 | 7.4 | 1.000 | 7.4 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **8+50.000** | | | | | | | -6515.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 193.4 | 71.1 | 1.000 | 71.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.9 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.9 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 30.0 | 11.0 | 1.000 | 11.0 | No | |
| | Filter: | 20.6 | 7.6 | 1.000 | 7.6 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **8+60.000** | | | | | | | -6596.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 194.3 | 71.8 | 1.000 | 71.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.0 | 8.5 | 1.000 | 8.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.0 | 8.5 | 1.000 | 8.5 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 30.7 | 11.2 | 1.000 | 11.2 | No | |
| | Filter: | 21.1 | 7.7 | 1.000 | 7.7 | No | |
| | Topsoil: | 4.8 | 1.8 | 1.000 | 1.8 | No | |
| **8+70.000** | | | | | | | -6676.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 193.6 | 71.8 | 1.000 | 71.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.2 | 8.6 | 1.000 | 8.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.2 | 8.6 | 1.000 | 8.6 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 31.3 | 11.5 | 1.000 | 11.5 | No | |
| | Filter: | 21.5 | 7.9 | 1.000 | 7.9 | No | |
| | Topsoil: | 4.7 | 1.8 | 1.000 | 1.8 | No | |
| **8+80.000** | | | | | | | -6756.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 191.4 | 71.3 | 1.000 | 71.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.3 | 8.6 | 1.000 | 8.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.3 | 8.6 | 1.000 | 8.6 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 32.0 | 11.7 | 1.000 | 11.7 | No | |
| | Filter: | 22.0 | 8.0 | 1.000 | 8.0 | No | |
| | Topsoil: | 4.7 | 1.7 | 1.000 | 1.7 | No | |
| **8+90.000** | | | | | | | -6835.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 189.7 | 70.6 | 1.000 | 70.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.3 | 8.6 | 1.000 | 8.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.3 | 8.6 | 1.000 | 8.6 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 32.5 | 11.9 | 1.000 | 11.9 | No | |
| | Filter: | 22.0 | 8.1 | 1.000 | 8.1 | No | |
| | Topsoil: | 4.7 | 1.7 | 1.000 | 1.7 | No | |
| **9+00.000** | | | | | | | -6916.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 200.3 | 72.2 | 1.000 | 72.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.8 | 8.7 | 1.000 | 8.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.8 | 8.7 | 1.000 | 8.7 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 33.7 | 12.3 | 1.000 | 12.3 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 22.7 | 8.3 | 1.000 | 8.3 | No | |
| | Topsoil: | 4.9 | 1.8 | 1.000 | 1.8 | No | |
| **9+10.000** | | | | | | | -7012.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 257.8 | 84.8 | 1.000 | 84.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 35.3 | 10.9 | 1.000 | 10.9 | Yes | |
| | Default (not replaced): | 0.2 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 35.5 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 6.2 | 1.000 | 6.2 | No | |
| | Filter: | 0.0 | 4.2 | 1.000 | 4.2 | No | |
| | Topsoil: | 18.4 | 4.3 | 1.000 | 4.3 | No | |
| **9+20.000** | | | | | | | -7127.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 294.7 | 102.3 | 1.000 | 102.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 36.1 | 13.2 | 1.000 | 13.2 | Yes | |
| | Default (not replaced): | 0.1 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 36.1 | 13.3 | 1.000 | 13.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 18.8 | 6.9 | 1.000 | 6.9 | No | |
| **9+30.000** | | | | | | | -7252.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 304.4 | 110.9 | 1.000 | 110.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 36.7 | 13.5 | 1.000 | 13.5 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 36.7 | 13.5 | 1.000 | 13.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 19.2 | 7.0 | 1.000 | 7.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **9+40.000** | | | | | | | -7380.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 314.1 | 114.5 | 1.000 | 114.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 37.2 | 13.7 | 1.000 | 13.7 | Yes | |
| | Default (not replaced): | 0.2 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 37.3 | 13.7 | 1.000 | 13.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 19.6 | 7.2 | 1.000 | 7.2 | No | |
| **9+50.000** | | | | | | | -7512.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 323.2 | 118.0 | 1.000 | 118.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 36.4 | 13.6 | 1.000 | 13.6 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 36.7 | 13.7 | 1.000 | 13.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 19.2 | 7.2 | 1.000 | 7.2 | No | |
| **9+60.000** | | | | | | | -7647.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 336.2 | 122.1 | 1.000 | 122.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 35.5 | 13.3 | 1.000 | 13.3 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 35.8 | 13.4 | 1.000 | 13.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 18.6 | 7.0 | 1.000 | 7.0 | No | |
| **9+70.000** | | | | | | | -7786.9 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 345.0 | 126.2 | 1.000 | 126.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 35.3 | 13.1 | 1.000 | 13.1 | Yes | |
| | Default (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 35.7 | 13.2 | 1.000 | 13.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 18.5 | 6.9 | 1.000 | 6.9 | No | |
| **9+80.000** | | | | | | | -7928.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 351.1 | 128.9 | 1.000 | 128.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 35.3 | 13.1 | 1.000 | 13.1 | Yes | |
| | Default (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 35.7 | 13.2 | 1.000 | 13.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 18.6 | 6.9 | 1.000 | 6.9 | No | |
| **9+90.000** | | | | | | | -8072.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 353.3 | 130.4 | 1.000 | 130.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 35.0 | 13.0 | 1.000 | 13.0 | Yes | |
| | Default (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 35.4 | 13.2 | 1.000 | 13.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 18.4 | 6.8 | 1.000 | 6.8 | No | |
| **10+00.000** | | | | | | | -8214.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 347.3 | 129.7 | 1.000 | 129.7 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 34.7 | 12.9 | 1.000 | 12.9 | Yes | |
| | Default (not replaced): | 0.4 | 0.2 | 1.000 | 0.2 | No | |
| | Total Default: | 35.1 | 13.1 | 1.000 | 13.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 18.1 | 6.8 | 1.000 | 6.8 | No | |
| **10+10.000** | | | | | | | -8357.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 352.2 | 129.5 | 1.000 | 129.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 34.3 | 12.8 | 1.000 | 12.8 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 34.6 | 12.9 | 1.000 | 12.9 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 17.8 | 6.6 | 1.000 | 6.6 | No | |
| **10+20.000** | | | | | | | -8499.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 350.3 | 130.1 | 1.000 | 130.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 33.7 | 12.6 | 1.000 | 12.6 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 34.0 | 12.7 | 1.000 | 12.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 17.4 | 6.5 | 1.000 | 6.5 | No | |
| **10+30.000** | | | | | | | -8640.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 342.7 | 128.3 | 1.000 | 128.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 33.2 | 12.4 | 1.000 | 12.4 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 33.4 | 12.5 | 1.000 | 12.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 17.1 | 6.4 | 1.000 | 6.4 | No | |
| **10+40.000** | | | | | | | -8778.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 335.9 | 125.7 | 1.000 | 125.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.6 | 12.2 | 1.000 | 12.2 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 32.9 | 12.3 | 1.000 | 12.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 16.7 | 6.3 | 1.000 | 6.3 | No | |
| **10+50.000** | | | | | | | -8914.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 331.6 | 123.6 | 1.000 | 123.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.8 | 11.9 | 1.000 | 11.9 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 32.1 | 12.0 | 1.000 | 12.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 16.4 | 6.1 | 1.000 | 6.1 | No | |
| **10+60.000** | | | | | | | -9047.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 325.4 | 121.7 | 1.000 | 121.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.5 | 11.7 | 1.000 | 11.7 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 31.8 | 11.8 | 1.000 | 11.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 16.3 | 6.1 | 1.000 | 6.1 | No | |
| **10+70.000** | | | | | | | -9178.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 316.8 | 118.9 | 1.000 | 118.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.0 | 11.6 | 1.000 | 11.6 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 31.3 | 11.7 | 1.000 | 11.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.9 | 6.0 | 1.000 | 6.0 | No | |
| **10+80.000** | | | | | | | -9304.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 306.2 | 115.4 | 1.000 | 115.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.4 | 11.4 | 1.000 | 11.4 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 30.6 | 11.5 | 1.000 | 11.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.5 | 5.8 | 1.000 | 5.8 | No | |
| **10+90.000** | | | | | | | -9427.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 295.2 | 111.4 | 1.000 | 111.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.7 | 11.1 | 1.000 | 11.1 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 30.0 | 11.2 | 1.000 | 11.2 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.0 | 5.6 | 1.000 | 5.6 | No | |
| **11+00.000** | | | | | | | -9545.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 284.2 | 107.3 | 1.000 | 107.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.1 | 10.9 | 1.000 | 10.9 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 29.3 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.6 | 5.5 | 1.000 | 5.5 | No | |
| **11+10.000** | | | | | | | -9659.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 272.9 | 103.2 | 1.000 | 103.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.5 | 10.6 | 1.000 | 10.6 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 28.7 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.2 | 5.3 | 1.000 | 5.3 | No | |
| **11+20.000** | | | | | | | -9768.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 261.0 | 98.9 | 1.000 | 98.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.9 | 10.4 | 1.000 | 10.4 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 28.1 | 10.5 | 1.000 | 10.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.8 | 5.2 | 1.000 | 5.2 | No | |
| **11+30.000** | | | | | | | -9873.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 248.6 | 94.4 | 1.000 | 94.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.3 | 10.2 | 1.000 | 10.2 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.6 | 10.3 | 1.000 | 10.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.4 | 5.0 | 1.000 | 5.0 | No | |
| **11+40.000** | | | | | | | -9972.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 236.3 | 89.8 | 1.000 | 89.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.9 | 10.1 | 1.000 | 10.1 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.2 | 10.1 | 1.000 | 10.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.1 | 4.9 | 1.000 | 4.9 | No | |
| **11+50.000** | | | | | | | -10068.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 228.3 | 86.0 | 1.000 | 86.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.5 | 9.9 | 1.000 | 9.9 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 26.8 | 10.0 | 1.000 | 10.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 12.9 | 4.8 | 1.000 | 4.8 | No | |
| **11+60.000** | | | | | | | -10162.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 222.5 | 83.5 | 1.000 | 83.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.2 | 9.8 | 1.000 | 9.8 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 26.5 | 9.9 | 1.000 | 9.9 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.7 | 4.7 | 1.000 | 4.7 | No | |
| **11+70.000** | | | | | | | -10253.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 219.6 | 81.9 | 1.000 | 81.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.0 | 9.7 | 1.000 | 9.7 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 26.3 | 9.8 | 1.000 | 9.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.5 | 4.7 | 1.000 | 4.7 | No | |
| **11+80.000** | | | | | | | -10344.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 218.0 | 81.0 | 1.000 | 81.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 25.9 | 9.6 | 1.000 | 9.6 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 26.2 | 9.7 | 1.000 | 9.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.5 | 4.6 | 1.000 | 4.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **11+90.000** | | | | | | | -10434.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 215.1 | 80.2 | 1.000 | 80.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 25.8 | 9.6 | 1.000 | 9.6 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 26.1 | 9.7 | 1.000 | 9.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.4 | 4.6 | 1.000 | 4.6 | No | |
| **12+00.000** | | | | | | | -10522.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 210.0 | 78.7 | 1.000 | 78.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 25.7 | 9.5 | 1.000 | 9.5 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 26.0 | 9.6 | 1.000 | 9.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.3 | 4.6 | 1.000 | 4.6 | No | |
| **12+10.000** | | | | | | | -10608.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 204.6 | 76.8 | 1.000 | 76.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 25.6 | 9.5 | 1.000 | 9.5 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 25.9 | 9.6 | 1.000 | 9.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.3 | 4.6 | 1.000 | 4.6 | No | |
| **12+20.000** | | | | | | | -10694.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 206.3 | 76.1 | 1.000 | 76.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 25.9 | 9.5 | 1.000 | 9.5 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 26.1 | 9.6 | 1.000 | 9.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.5 | 4.6 | 1.000 | 4.6 | No | |
| **12+30.000** | | | | | | | -10781.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 210.3 | 77.1 | 1.000 | 77.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.2 | 9.6 | 1.000 | 9.6 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 26.4 | 9.7 | 1.000 | 9.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.7 | 4.6 | 1.000 | 4.6 | No | |
| **12+40.000** | | | | | | | -10869.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 215.7 | 78.9 | 1.000 | 78.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.5 | 9.8 | 1.000 | 9.8 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 26.7 | 9.8 | 1.000 | 9.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.8 | 4.7 | 1.000 | 4.7 | No | |
| **12+50.000** | | | | | | | -10960.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 219.5 | 80.6 | 1.000 | 80.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.7 | 9.9 | 1.000 | 9.9 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.0 | 9.9 | 1.000 | 9.9 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.0 | 4.8 | 1.000 | 4.8 | No | |
| **12+60.000** | | | | | | | -11050.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 213.1 | 80.1 | 1.000 | 80.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.0 | 9.9 | 1.000 | 9.9 | Yes | |
| | Default (not replaced): | 0.1 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.1 | 10.0 | 1.000 | 10.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.1 | 4.8 | 1.000 | 4.8 | No | |
| **12+70.000** | | | | | | | -11138.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 210.7 | 78.5 | 1.000 | 78.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.3 | 10.1 | 1.000 | 10.1 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.4 | 10.1 | 1.000 | 10.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.3 | 4.9 | 1.000 | 4.9 | No | |
| **12+80.000** | | | | | | | -11226.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 208.8 | 77.7 | 1.000 | 77.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 27.6 | 10.2 | 1.000 | 10.2 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.8 | 10.2 | 1.000 | 10.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.6 | 5.0 | 1.000 | 5.0 | No | |
| **12+90.000** | | | | | | | -11315.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 215.2 | 78.5 | 1.000 | 78.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.9 | 10.3 | 1.000 | 10.3 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.1 | 10.3 | 1.000 | 10.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.8 | 5.1 | 1.000 | 5.1 | No | |
| **13+00.000** | | | | | | | -11408.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 229.1 | 82.3 | 1.000 | 82.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.3 | 10.4 | 1.000 | 10.4 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 28.6 | 10.5 | 1.000 | 10.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.8 | 5.1 | 1.000 | 5.1 | No | |
| **13+10.000** | | | | | | | -11504.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 233.3 | 85.6 | 1.000 | 85.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.3 | 10.3 | 1.000 | 10.3 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Default: | 27.6 | 10.4 | 1.000 | 10.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.1 | 5.0 | 1.000 | 5.0 | No | |
| **13+20.000** | | | | | | | -11599.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 229.4 | 85.7 | 1.000 | 85.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.8 | 10.0 | 1.000 | 10.0 | Yes | |
| | Default (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.2 | 10.1 | 1.000 | 10.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.8 | 4.8 | 1.000 | 4.8 | No | |
| **13+30.000** | | | | | | | -11695.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 231.4 | 85.3 | 1.000 | 85.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.9 | 9.9 | 1.000 | 9.9 | Yes | |
| | Default (not replaced): | 0.4 | 0.2 | 1.000 | 0.2 | No | |
| | Total Default: | 27.3 | 10.1 | 1.000 | 10.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.9 | 4.8 | 1.000 | 4.8 | No | |
| **13+40.000** | | | | | | | -11790.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 229.4 | 85.3 | 1.000 | 85.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.0 | 10.0 | 1.000 | 10.0 | Yes | |
| | Default (not replaced): | 0.4 | 0.2 | 1.000 | 0.2 | No | |
| | Total Default: | 27.5 | 10.1 | 1.000 | 10.1 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.0 | 4.8 | 1.000 | 4.8 | No | |
| **13+50.000** | | | | | | | -11884.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 222.2 | 83.6 | 1.000 | 83.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.1 | 10.0 | 1.000 | 10.0 | Yes | |
| | Default (not replaced): | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Total Default: | 27.5 | 10.2 | 1.000 | 10.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.1 | 4.8 | 1.000 | 4.8 | No | |
| **13+60.000** | | | | | | | -11976.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 225.5 | 82.9 | 1.000 | 82.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.1 | 10.0 | 1.000 | 10.0 | Yes | |
| | Default (not replaced): | 0.5 | 0.2 | 1.000 | 0.2 | No | |
| | Total Default: | 27.6 | 10.2 | 1.000 | 10.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.1 | 4.8 | 1.000 | 4.8 | No | |
| **13+70.000** | | | | | | | -12070.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 227.4 | 83.9 | 1.000 | 83.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.1 | 10.0 | 1.000 | 10.0 | Yes | |
| | Default (not replaced): | 0.4 | 0.2 | 1.000 | 0.2 | No | |
| | Total Default: | 27.5 | 10.2 | 1.000 | 10.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.1 | 4.8 | 1.000 | 4.8 | No | |
| **13+80.000** | | | | | | | -12165.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 228.3 | 84.4 | 1.000 | 84.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.9 | 10.0 | 1.000 | 10.0 | Yes | |
| | Default (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.3 | 10.2 | 1.000 | 10.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.9 | 4.8 | 1.000 | 4.8 | No | |
| **13+90.000** | | | | | | | -12259.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 228.5 | 84.6 | 1.000 | 84.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.8 | 9.9 | 1.000 | 9.9 | Yes | |
| | Default (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.2 | 10.1 | 1.000 | 10.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.8 | 4.8 | 1.000 | 4.8 | No | |
| **14+00.000** | | | | | | | -12354.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 228.9 | 84.7 | 1.000 | 84.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.1 | 10.0 | 1.000 | 10.0 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.4 | 10.1 | 1.000 | 10.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.0 | 4.8 | 1.000 | 4.8 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **14+10.000** | | | | | | | -12449.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 232.3 | 85.4 | 1.000 | 85.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.3 | 10.1 | 1.000 | 10.1 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.6 | 10.2 | 1.000 | 10.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.2 | 4.8 | 1.000 | 4.8 | No | |
| **14+20.000** | | | | | | | -12546.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 236.1 | 86.7 | 1.000 | 86.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.5 | 10.2 | 1.000 | 10.2 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.8 | 10.3 | 1.000 | 10.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.3 | 4.9 | 1.000 | 4.9 | No | |
| **14+30.000** | | | | | | | -12645.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 239.2 | 88.0 | 1.000 | 88.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.5 | 10.2 | 1.000 | 10.2 | Yes | |
| | Default (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.9 | 10.3 | 1.000 | 10.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.3 | 4.9 | 1.000 | 4.9 | No | |
| **14+40.000** | | | | | | | -12744.4 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 242.1 | 89.1 | 1.000 | 89.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.4 | 10.2 | 1.000 | 10.2 | Yes | |
| | Default (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.8 | 10.3 | 1.000 | 10.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.3 | 4.9 | 1.000 | 4.9 | No | |
| **14+50.000** | | | | | | | -12845.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 247.0 | 90.6 | 1.000 | 90.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.7 | 10.2 | 1.000 | 10.2 | Yes | |
| | Default (not replaced): | 0.4 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 28.1 | 10.4 | 1.000 | 10.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 13.4 | 4.9 | 1.000 | 4.9 | No | |
| **14+60.000** | | | | | | | -12942.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 224.8 | 87.4 | 1.000 | 87.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.5 | 9.5 | 1.000 | 9.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 23.5 | 9.6 | 1.000 | 9.6 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 53.0 | 9.8 | 1.000 | 9.8 | No | |
| | Filter: | 37.3 | 6.9 | 1.000 | 6.9 | No | |
| | Topsoil: | 0.0 | 2.5 | 1.000 | 2.5 | No | |
| **14+70.000** | | | | | | | -13037.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 242.1 | 86.5 | 1.000 | 86.5 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 24.7 | 8.9 | 1.000 | 8.9 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 24.7 | 8.9 | 1.000 | 8.9 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 57.0 | 20.4 | 1.000 | 20.4 | No | |
| | Filter: | 39.9 | 14.3 | 1.000 | 14.3 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **14+80.000** | | | | | | | -13139.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 260.3 | 93.0 | 1.000 | 93.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 25.8 | 9.3 | 1.000 | 9.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 25.8 | 9.3 | 1.000 | 9.3 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 61.7 | 22.0 | 1.000 | 22.0 | No | |
| | Filter: | 42.7 | 15.3 | 1.000 | 15.3 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **14+90.000** | | | | | | | -13249.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 278.1 | 99.7 | 1.000 | 99.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.6 | 9.7 | 1.000 | 9.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 26.6 | 9.7 | 1.000 | 9.7 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 65.6 | 23.6 | 1.000 | 23.6 | No | |
| | Filter: | 44.6 | 16.2 | 1.000 | 16.2 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **15+00.000** | | | | | | | -13365.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 295.8 | 106.3 | 1.000 | 106.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 27.5 | 10.0 | 1.000 | 10.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.5 | 10.0 | 1.000 | 10.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 68.6 | 24.9 | 1.000 | 24.9 | No | |
| | Filter: | 46.5 | 16.9 | 1.000 | 16.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **15+10.000** | | | | | | | -13485.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 296.8 | 109.7 | 1.000 | 109.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.6 | 10.2 | 1.000 | 10.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.6 | 10.2 | 1.000 | 10.2 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 69.3 | 25.5 | 1.000 | 25.5 | No | |
| | Filter: | 46.6 | 17.2 | 1.000 | 17.2 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **15+20.000** | | | | | | | -13606.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 299.1 | 110.3 | 1.000 | 110.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.7 | 10.2 | 1.000 | 10.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.7 | 10.2 | 1.000 | 10.2 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 70.9 | 26.0 | 1.000 | 26.0 | No | |
| | Filter: | 47.3 | 17.4 | 1.000 | 17.4 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **15+30.000** | | | | | | | -13728.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 304.7 | 111.8 | 1.000 | 111.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.6 | 10.4 | 1.000 | 10.4 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.6 | 10.4 | 1.000 | 10.4 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 71.9 | 26.4 | 1.000 | 26.4 | No | |
| | Filter: | 49.1 | 17.9 | 1.000 | 17.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **15+40.000** | | | | | | | -13853.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 315.2 | 114.8 | 1.000 | 114.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.5 | 10.8 | 1.000 | 10.8 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.5 | 10.8 | 1.000 | 10.8 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 73.3 | 26.9 | 1.000 | 26.9 | No | |
| | Filter: | 50.4 | 18.4 | 1.000 | 18.4 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **15+50.000** | | | | | | | -13988.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 351.0 | 123.4 | 1.000 | 123.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.2 | 11.1 | 1.000 | 11.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.2 | 11.1 | 1.000 | 11.1 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 76.9 | 27.8 | 1.000 | 27.8 | No | |
| | Filter: | 52.2 | 19.0 | 1.000 | 19.0 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **15+60.000** | | | | | | | -14128.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 347.1 | 129.3 | 1.000 | 129.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.1 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.1 | 11.2 | 1.000 | 11.2 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 77.0 | 28.5 | 1.000 | 28.5 | No | |
| | Filter: | 52.0 | 19.3 | 1.000 | 19.3 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **15+70.000** | | | | | | | -14266.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 338.3 | 126.9 | 1.000 | 126.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.1 | 11.1 | 1.000 | 11.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.1 | 11.1 | 1.000 | 11.1 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 76.9 | 28.5 | 1.000 | 28.5 | No | |
| | Filter: | 51.9 | 19.2 | 1.000 | 19.2 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **15+80.000** | | | | | | | -14401.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 330.2 | 123.8 | 1.000 | 123.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.0 | 11.1 | 1.000 | 11.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.0 | 11.1 | 1.000 | 11.1 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 76.6 | 28.4 | 1.000 | 28.4 | No | |
| | Filter: | 51.7 | 19.2 | 1.000 | 19.2 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **15+90.000** | | | | | | | -14533.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 323.6 | 121.1 | 1.000 | 121.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.9 | 11.1 | 1.000 | 11.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.9 | 11.1 | 1.000 | 11.1 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 76.3 | 28.3 | 1.000 | 28.3 | No | |
| | Filter: | 51.5 | 19.1 | 1.000 | 19.1 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **16+00.000** | | | | | | | -14664.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 319.5 | 119.1 | 1.000 | 119.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.8 | 11.1 | 1.000 | 11.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.8 | 11.1 | 1.000 | 11.1 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 76.0 | 28.2 | 1.000 | 28.2 | No | |
| | Filter: | 51.3 | 19.0 | 1.000 | 19.0 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **16+10.000** | | | | | | | -14792.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 317.1 | 117.9 | 1.000 | 117.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.7 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.7 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 75.7 | 28.1 | 1.000 | 28.1 | No | |
| | Filter: | 51.1 | 19.0 | 1.000 | 19.0 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **16+20.000** | | | | | | | -14921.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 315.4 | 117.1 | 1.000 | 117.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.7 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.7 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 75.6 | 28.0 | 1.000 | 28.0 | No | |
| | Filter: | 51.1 | 18.9 | 1.000 | 18.9 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **16+30.000** | | | | | | | -15048.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 315.7 | 116.9 | 1.000 | 116.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.7 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.7 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 75.4 | 28.0 | 1.000 | 28.0 | No | |
| | Filter: | 51.0 | 18.9 | 1.000 | 18.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **16+40.000** | | | | | | | -15176.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 316.0 | 117.0 | 1.000 | 117.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.6 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.6 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 75.2 | 27.9 | 1.000 | 27.9 | No | |
| | Filter: | 50.8 | 18.8 | 1.000 | 18.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **16+50.000** | | | | | | | -15304.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 316.5 | 117.1 | 1.000 | 117.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.6 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.6 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 75.0 | 27.8 | 1.000 | 27.8 | No | |
| | Filter: | 50.7 | 18.8 | 1.000 | 18.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **16+60.000** | | | | | | | -15433.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 316.9 | 117.3 | 1.000 | 117.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.5 | 10.9 | 1.000 | 10.9 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.5 | 10.9 | 1.000 | 10.9 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 74.9 | 27.8 | 1.000 | 27.8 | No | |
| | Filter: | 50.6 | 18.8 | 1.000 | 18.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **16+70.000** | | | | | | | -15561.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 316.5 | 117.3 | 1.000 | 117.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.5 | 10.9 | 1.000 | 10.9 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.5 | 10.9 | 1.000 | 10.9 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 74.7 | 27.7 | 1.000 | 27.7 | No | |
| | Filter: | 50.5 | 18.7 | 1.000 | 18.7 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **16+80.000** | | | | | | | -15689.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 317.2 | 117.3 | 1.000 | 117.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.5 | 10.9 | 1.000 | 10.9 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.5 | 10.9 | 1.000 | 10.9 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 74.9 | 27.7 | 1.000 | 27.7 | No | |
| | Filter: | 50.6 | 18.7 | 1.000 | 18.7 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **16+90.000** | | | | | | | -15818.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 320.8 | 118.1 | 1.000 | 118.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.6 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.6 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 75.2 | 27.8 | 1.000 | 27.8 | No | |
| | Filter: | 50.7 | 18.8 | 1.000 | 18.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **17+00.000** | | | | | | | -15949.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 325.6 | 119.7 | 1.000 | 119.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.7 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.7 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 75.4 | 27.9 | 1.000 | 27.9 | No | |
| | Filter: | 50.9 | 18.8 | 1.000 | 18.8 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **17+10.000** | | | | | | | -16081.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 329.7 | 121.3 | 1.000 | 121.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.7 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.7 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 75.4 | 27.9 | 1.000 | 27.9 | No | |
| | Filter: | 51.0 | 18.9 | 1.000 | 18.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **17+20.000** | | | | | | | -16215.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 333.2 | 122.8 | 1.000 | 122.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.8 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.8 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 74.5 | 27.8 | 1.000 | 27.8 | No | |
| | Filter: | 51.1 | 18.9 | 1.000 | 18.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **17+30.000** | | | | | | | -16350.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 337.9 | 124.3 | 1.000 | 124.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.8 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.8 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 73.0 | 27.3 | 1.000 | 27.3 | No | |
| | Filter: | 51.1 | 18.9 | 1.000 | 18.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **17+40.000** | | | | | | | -16488.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 346.6 | 126.8 | 1.000 | 126.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.5 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.5 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 71.3 | 26.7 | 1.000 | 26.7 | No | |
| | Filter: | 49.9 | 18.7 | 1.000 | 18.7 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **17+50.000** | | | | | | | -16629.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 353.7 | 129.7 | 1.000 | 129.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 29.0 | 10.8 | 1.000 | 10.8 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.0 | 10.8 | 1.000 | 10.8 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 69.5 | 26.1 | 1.000 | 26.1 | No | |
| | Filter: | 48.7 | 18.3 | 1.000 | 18.3 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **17+60.000** | | | | | | | -16772.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 362.9 | 132.7 | 1.000 | 132.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.6 | 10.7 | 1.000 | 10.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.6 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 68.6 | 25.6 | 1.000 | 25.6 | No | |
| | Filter: | 48.0 | 17.9 | 1.000 | 17.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **17+70.000** | | | | | | | -16919.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 373.0 | 136.3 | 1.000 | 136.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.9 | 10.7 | 1.000 | 10.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.9 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 69.1 | 25.5 | 1.000 | 25.5 | No | |
| | Filter: | 48.6 | 17.9 | 1.000 | 17.9 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **17+80.000** | | | | | | | -17069.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 376.7 | 138.8 | 1.000 | 138.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.3 | 10.8 | 1.000 | 10.8 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Default: | 29.3 | 10.8 | 1.000 | 10.8 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 70.5 | 25.9 | 1.000 | 25.9 | No | |
| | Filter: | 49.4 | 18.2 | 1.000 | 18.2 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **17+90.000** | | | | | | | -17219.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 374.4 | 139.1 | 1.000 | 139.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.3 | 10.8 | 1.000 | 10.8 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.3 | 10.8 | 1.000 | 10.8 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 71.5 | 26.3 | 1.000 | 26.3 | No | |
| | Filter: | 49.8 | 18.4 | 1.000 | 18.4 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+00.000** | | | | | | | -17367.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 369.4 | 137.7 | 1.000 | 137.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.7 | 10.7 | 1.000 | 10.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.7 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.3 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 40.9 | 20.8 | 1.000 | 20.8 | No | |
| | Filter: | 48.4 | 18.2 | 1.000 | 18.2 | No | |
| | Topsoil: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| **18+10.000** | | | | | | | -17523.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 411.1 | 144.5 | 1.000 | 144.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 33.8 | 11.6 | 1.000 | 11.6 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 33.9 | 11.6 | 1.000 | 11.6 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 7.6 | 1.000 | 7.6 | No | |
| | Filter: | 0.0 | 9.0 | 1.000 | 9.0 | No | |
| | Topsoil: | 17.7 | 3.3 | 1.000 | 3.3 | No | |
| **18+20.000** | | | | | | | -17682.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 379.3 | 146.4 | 1.000 | 146.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.5 | 12.3 | 1.000 | 12.3 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 32.8 | 12.3 | 1.000 | 12.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 17.0 | 6.4 | 1.000 | 6.4 | No | |
| **18+30.000** | | | | | | | -17830.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 356.2 | 136.2 | 1.000 | 136.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.7 | 11.9 | 1.000 | 11.9 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 32.0 | 12.0 | 1.000 | 12.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 16.4 | 6.2 | 1.000 | 6.2 | No | |
| **18+40.000** | | | | | | | -17969.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 333.4 | 127.7 | 1.000 | 127.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.9 | 11.6 | 1.000 | 11.6 | Yes | |
| | Default (not replaced): | 0.3 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 31.2 | 11.7 | 1.000 | 11.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.9 | 6.0 | 1.000 | 6.0 | No | |
| **18+50.000** | | | | | | | -18101.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 314.9 | 120.1 | 1.000 | 120.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.3 | 11.5 | 1.000 | 11.5 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 31.5 | 11.6 | 1.000 | 11.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 16.1 | 5.9 | 1.000 | 5.9 | No | |
| **18+60.000** | | | | | | | -18230.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 316.7 | 117.0 | 1.000 | 117.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 33.1 | 11.9 | 1.000 | 11.9 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 33.3 | 12.0 | 1.000 | 12.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 17.3 | 6.2 | 1.000 | 6.2 | No | |
| **18+70.000** | | | | | | | -18356.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 297.6 | 113.8 | 1.000 | 113.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 35.5 | 12.7 | 1.000 | 12.7 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 35.6 | 12.7 | 1.000 | 12.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 18.8 | 6.7 | 1.000 | 6.7 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **18+80.000** | | | | | | | -18473.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 263.4 | 103.9 | 1.000 | 103.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 33.3 | 12.7 | 1.000 | 12.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 33.3 | 12.7 | 1.000 | 12.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 17.2 | 6.7 | 1.000 | 6.7 | No | |
| **18+90.000** | | | | | | | -18577.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 233.5 | 92.0 | 1.000 | 92.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.9 | 11.9 | 1.000 | 11.9 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.9 | 11.9 | 1.000 | 11.9 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.7 | 6.1 | 1.000 | 6.1 | No | |
| **19+00.000** | | | | | | | -18669.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 206.3 | 81.5 | 1.000 | 81.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.3 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.3 | 11.2 | 1.000 | 11.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.6 | 5.6 | 1.000 | 5.6 | No | |
| **19+10.000** | | | | | | | -18753.9 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 190.6 | 73.5 | 1.000 | 73.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.8 | 10.8 | 1.000 | 10.8 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.9 | 10.8 | 1.000 | 10.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.3 | 5.4 | 1.000 | 5.4 | No | |
| **19+20.000** | | | | | | | -18832.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 176.9 | 68.0 | 1.000 | 68.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.9 | 10.7 | 1.000 | 10.7 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.0 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.4 | 5.3 | 1.000 | 5.3 | No | |
| **19+30.000** | | | | | | | -18907.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 167.3 | 63.7 | 1.000 | 63.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.3 | 10.8 | 1.000 | 10.8 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.4 | 10.8 | 1.000 | 10.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.4 | 5.3 | 1.000 | 5.3 | No | |
| **19+40.000** | | | | | | | -18978.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 158.7 | 60.4 | 1.000 | 60.4 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.1 | 10.8 | 1.000 | 10.8 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.1 | 10.8 | 1.000 | 10.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.2 | 5.3 | 1.000 | 5.3 | No | |
| **19+50.000** | | | | | | | -19047.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 152.3 | 57.6 | 1.000 | 57.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.0 | 11.1 | 1.000 | 11.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 31.0 | 11.1 | 1.000 | 11.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.4 | 5.5 | 1.000 | 5.5 | No | |
| **19+60.000** | | | | | | | -19118.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 169.5 | 59.6 | 1.000 | 59.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.9 | 11.6 | 1.000 | 11.6 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 32.0 | 11.7 | 1.000 | 11.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 16.0 | 5.8 | 1.000 | 5.8 | No | |
| **19+70.000** | | | | | | | -19199.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 204.7 | 69.3 | 1.000 | 69.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 29.7 | 11.4 | 1.000 | 11.4 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.8 | 11.5 | 1.000 | 11.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.6 | 5.7 | 1.000 | 5.7 | No | |
| **19+80.000** | | | | | | | -19278.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 170.0 | 69.4 | 1.000 | 69.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.1 | 10.5 | 1.000 | 10.5 | Yes | |
| | Default (not replaced): | 0.1 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 27.2 | 10.6 | 1.000 | 10.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 12.8 | 5.1 | 1.000 | 5.1 | No | |
| **19+90.000** | | | | | | | -19346.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 143.1 | 58.0 | 1.000 | 58.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 24.1 | 9.5 | 1.000 | 9.5 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 24.2 | 9.5 | 1.000 | 9.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 11.0 | 4.4 | 1.000 | 4.4 | No | |
| **20+00.000** | | | | | | | -19404.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 122.5 | 49.2 | 1.000 | 49.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.2 | 8.8 | 1.000 | 8.8 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.3 | 8.8 | 1.000 | 8.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.0 | 3.9 | 1.000 | 3.9 | No | |
| **20+10.000** | | | | | | | -19457.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 115.9 | 44.1 | 1.000 | 44.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.6 | 8.5 | 1.000 | 8.5 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.7 | 8.5 | 1.000 | 8.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.7 | 3.6 | 1.000 | 3.6 | No | |
| **20+20.000** | | | | | | | -19507.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 109.6 | 41.7 | 1.000 | 41.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.1 | 8.3 | 1.000 | 8.3 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.2 | 8.3 | 1.000 | 8.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.3 | 3.5 | 1.000 | 3.5 | No | |
| **20+30.000** | | | | | | | -19555.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 108.0 | 40.3 | 1.000 | 40.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.9 | 8.3 | 1.000 | 8.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.9 | 8.4 | 1.000 | 8.4 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.8 | 3.6 | 1.000 | 3.6 | No | |
| **20+40.000** | | | | | | | -19603.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 106.1 | 39.7 | 1.000 | 39.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.2 | 8.5 | 1.000 | 8.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.2 | 8.5 | 1.000 | 8.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.0 | 3.7 | 1.000 | 3.7 | No | |
| **20+50.000** | | | | | | | -19651.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 104.7 | 39.0 | 1.000 | 39.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.0 | 8.6 | 1.000 | 8.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.0 | 8.6 | 1.000 | 8.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.9 | 3.7 | 1.000 | 3.7 | No | |
| **20+60.000** | | | | | | | -19698.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 103.8 | 38.6 | 1.000 | 38.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.1 | 8.5 | 1.000 | 8.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.1 | 8.5 | 1.000 | 8.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 9.9 | 3.7 | 1.000 | 3.7 | No | |
| **20+70.000** | | | | | | | -19745.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 104.2 | 38.5 | 1.000 | 38.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.2 | 8.6 | 1.000 | 8.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.2 | 8.6 | 1.000 | 8.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.0 | 3.7 | 1.000 | 3.7 | No | |
| **20+80.000** | | | | | | | -19793.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 105.9 | 38.9 | 1.000 | 38.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.2 | 8.6 | 1.000 | 8.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.2 | 8.6 | 1.000 | 8.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 10.0 | 3.7 | 1.000 | 3.7 | No | |
| **20+90.000** | | | | | | | -19841.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 106.7 | 39.4 | 1.000 | 39.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.1 | 8.6 | 1.000 | 8.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.1 | 8.6 | 1.000 | 8.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 10.0 | 3.7 | 1.000 | 3.7 | No | |
| **21+00.000** | | | | | | | -19889.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 108.5 | 39.9 | 1.000 | 39.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.5 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.5 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 18.5 | 3.4 | 1.000 | 3.4 | No | |
| | Filter: | 11.1 | 2.1 | 1.000 | 2.1 | No | |
| | Topsoil: | 6.4 | 3.0 | 1.000 | 3.0 | No | |
| **21+10.000** | | | | | | | -19938.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 113.4 | 41.1 | 1.000 | 41.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.7 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.7 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 18.1 | 6.8 | 1.000 | 6.8 | No | |
| | Filter: | 11.1 | 4.1 | 1.000 | 4.1 | No | |
| | Topsoil: | 6.5 | 2.4 | 1.000 | 2.4 | No | |
| **21+20.000** | | | | | | | -19990.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 119.6 | 43.2 | 1.000 | 43.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.1 | 8.5 | 1.000 | 8.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.2 | 8.5 | 1.000 | 8.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 17.7 | 6.6 | 1.000 | 6.6 | No | |
| | Filter: | 11.1 | 4.1 | 1.000 | 4.1 | No | |
| | Topsoil: | 6.8 | 2.5 | 1.000 | 2.5 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **21+30.000** | | | | | | | -20044.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 126.9 | 45.7 | 1.000 | 45.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.6 | 8.7 | 1.000 | 8.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.7 | 8.7 | 1.000 | 8.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 17.5 | 6.5 | 1.000 | 6.5 | No | |
| | Filter: | 11.3 | 4.1 | 1.000 | 4.1 | No | |
| | Topsoil: | 7.1 | 2.6 | 1.000 | 2.6 | No | |
| **21+40.000** | | | | | | | -20099.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 120.6 | 45.8 | 1.000 | 45.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.1 | 8.7 | 1.000 | 8.7 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.2 | 8.7 | 1.000 | 8.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 17.0 | 6.4 | 1.000 | 6.4 | No | |
| | Filter: | 11.1 | 4.1 | 1.000 | 4.1 | No | |
| | Topsoil: | 6.8 | 2.6 | 1.000 | 2.6 | No | |
| **21+50.000** | | | | | | | -20150.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 111.4 | 42.9 | 1.000 | 42.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.4 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.5 | 8.5 | 1.000 | 8.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 16.6 | 6.2 | 1.000 | 6.2 | No | |
| | Filter: | 10.8 | 4.0 | 1.000 | 4.0 | No | |
| | Topsoil: | 6.4 | 2.5 | 1.000 | 2.5 | No | |
| **21+60.000** | | | | | | | -20198.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 103.9 | 39.9 | 1.000 | 39.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.3 | 8.3 | 1.000 | 8.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.3 | 8.3 | 1.000 | 8.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 16.0 | 6.0 | 1.000 | 6.0 | No | |
| | Filter: | 10.4 | 3.9 | 1.000 | 3.9 | No | |
| | Topsoil: | 6.4 | 2.4 | 1.000 | 2.4 | No | |
| **21+70.000** | | | | | | | -20245.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 102.0 | 38.1 | 1.000 | 38.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.8 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.8 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 15.3 | 5.8 | 1.000 | 5.8 | No | |
| | Filter: | 9.9 | 3.8 | 1.000 | 3.8 | No | |
| | Topsoil: | 6.9 | 2.5 | 1.000 | 2.5 | No | |
| **21+80.000** | | | | | | | -20295.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 120.4 | 41.2 | 1.000 | 41.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 24.2 | 8.7 | 1.000 | 8.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 24.2 | 8.7 | 1.000 | 8.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 16.2 | 5.8 | 1.000 | 5.8 | No | |
| | Filter: | 10.9 | 3.8 | 1.000 | 3.8 | No | |
| | Topsoil: | 7.5 | 2.7 | 1.000 | 2.7 | No | |
| **21+90.000** | | | | | | | -20351.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 132.2 | 46.8 | 1.000 | 46.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 24.8 | 9.1 | 1.000 | 9.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 24.8 | 9.1 | 1.000 | 9.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 15.2 | 5.8 | 1.000 | 5.8 | No | |
| | Filter: | 10.2 | 3.9 | 1.000 | 3.9 | No | |
| | Topsoil: | 8.1 | 2.9 | 1.000 | 2.9 | No | |
| **22+00.000** | | | | | | | -20410.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 136.6 | 49.8 | 1.000 | 49.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 25.5 | 9.3 | 1.000 | 9.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 25.5 | 9.3 | 1.000 | 9.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 14.3 | 5.5 | 1.000 | 5.5 | No | |
| | Filter: | 9.6 | 3.7 | 1.000 | 3.7 | No | |
| | Topsoil: | 8.8 | 3.1 | 1.000 | 3.1 | No | |
| **22+10.000** | | | | | | | -20473.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 153.3 | 53.7 | 1.000 | 53.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.4 | 9.6 | 1.000 | 9.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 26.4 | 9.6 | 1.000 | 9.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.7 | 5.2 | 1.000 | 5.2 | No | |
| | Filter: | 9.2 | 3.5 | 1.000 | 3.5 | No | |
| | Topsoil: | 9.5 | 3.4 | 1.000 | 3.4 | No | |
| **22+20.000** | | | | | | | -20545.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 183.6 | 62.4 | 1.000 | 62.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 27.9 | 10.1 | 1.000 | 10.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.9 | 10.1 | 1.000 | 10.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 15.0 | 5.3 | 1.000 | 5.3 | No | |
| | Filter: | 10.3 | 3.6 | 1.000 | 3.6 | No | |
| | Topsoil: | 10.2 | 3.6 | 1.000 | 3.6 | No | |
| **22+30.000** | | | | | | | -20630.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 214.4 | 73.7 | 1.000 | 73.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.3 | 10.6 | 1.000 | 10.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.4 | 10.6 | 1.000 | 10.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 16.5 | 5.8 | 1.000 | 5.8 | No | |
| | Filter: | 11.4 | 4.0 | 1.000 | 4.0 | No | |
| | Topsoil: | 10.8 | 3.9 | 1.000 | 3.9 | No | |
| **22+40.000** | | | | | | | -20722.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 223.3 | 81.0 | 1.000 | 81.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.0 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.0 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 17.1 | 6.2 | 1.000 | 6.2 | No | |
| | Filter: | 11.8 | 4.3 | 1.000 | 4.3 | No | |
| | Topsoil: | 11.1 | 4.0 | 1.000 | 4.0 | No | |
| **22+50.000** | | | | | | | -20815.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 219.2 | 81.9 | 1.000 | 81.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.3 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Default: | 30.4 | 11.2 | 1.000 | 11.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 17.6 | 6.4 | 1.000 | 6.4 | No | |
| | Filter: | 12.1 | 4.4 | 1.000 | 4.4 | No | |
| | Topsoil: | 11.2 | 4.1 | 1.000 | 4.1 | No | |
| **22+60.000** | | | | | | | -20905.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 209.8 | 79.4 | 1.000 | 79.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.2 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.3 | 11.2 | 1.000 | 11.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 17.0 | 6.4 | 1.000 | 6.4 | No | |
| | Filter: | 11.5 | 4.4 | 1.000 | 4.4 | No | |
| | Topsoil: | 11.4 | 4.2 | 1.000 | 4.2 | No | |
| **22+70.000** | | | | | | | -20992.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 197.8 | 75.5 | 1.000 | 75.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.2 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.2 | 11.2 | 1.000 | 11.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 16.0 | 6.1 | 1.000 | 6.1 | No | |
| | Filter: | 10.8 | 4.1 | 1.000 | 4.1 | No | |
| | Topsoil: | 11.5 | 4.2 | 1.000 | 4.2 | No | |
| **22+80.000** | | | | | | | -21074.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 184.3 | 70.8 | 1.000 | 70.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.2 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.3 | 11.2 | 1.000 | 11.2 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 15.4 | 5.8 | 1.000 | 5.8 | No | |
| | Filter: | 10.4 | 3.9 | 1.000 | 3.9 | No | |
| | Topsoil: | 11.7 | 4.3 | 1.000 | 4.3 | No | |
| **22+90.000** | | | | | | | -21151.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 171.7 | 65.9 | 1.000 | 65.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.2 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 30.2 | 11.2 | 1.000 | 11.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 14.9 | 5.6 | 1.000 | 5.6 | No | |
| | Filter: | 10.1 | 3.8 | 1.000 | 3.8 | No | |
| | Topsoil: | 11.8 | 4.4 | 1.000 | 4.4 | No | |
| **23+00.000** | | | | | | | -21224.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 161.5 | 61.7 | 1.000 | 61.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.2 | 11.0 | 1.000 | 11.0 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.2 | 11.0 | 1.000 | 11.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 14.3 | 5.4 | 1.000 | 5.4 | No | |
| | Filter: | 9.7 | 3.7 | 1.000 | 3.7 | No | |
| | Topsoil: | 11.2 | 4.3 | 1.000 | 4.3 | No | |
| **23+10.000** | | | | | | | -21291.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 145.3 | 56.8 | 1.000 | 56.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.1 | 10.4 | 1.000 | 10.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.1 | 10.4 | 1.000 | 10.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 14.0 | 5.3 | 1.000 | 5.3 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Filter: | 9.4 | 3.5 | 1.000 | 3.5 | No | |
| | Topsoil: | 9.9 | 3.9 | 1.000 | 3.9 | No | |
| **23+20.000** | | | | | | | -21350.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 120.2 | 49.2 | 1.000 | 49.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 25.1 | 9.7 | 1.000 | 9.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 25.1 | 9.7 | 1.000 | 9.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.9 | 5.2 | 1.000 | 5.2 | No | |
| | Filter: | 9.2 | 3.4 | 1.000 | 3.4 | No | |
| | Topsoil: | 8.6 | 3.4 | 1.000 | 3.4 | No | |
| **23+30.000** | | | | | | | -21401.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 107.9 | 42.2 | 1.000 | 42.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 23.2 | 8.9 | 1.000 | 8.9 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 23.2 | 8.9 | 1.000 | 8.9 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.7 | 5.1 | 1.000 | 5.1 | No | |
| | Filter: | 9.0 | 3.4 | 1.000 | 3.4 | No | |
| | Topsoil: | 7.5 | 3.0 | 1.000 | 3.0 | No | |
| **23+40.000** | | | | | | | -21449.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 102.7 | 39.0 | 1.000 | 39.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.8 | 8.5 | 1.000 | 8.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.8 | 8.5 | 1.000 | 8.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.5 | 5.0 | 1.000 | 5.0 | No | |
| | Filter: | 8.9 | 3.3 | 1.000 | 3.3 | No | |
| | Topsoil: | 7.2 | 2.7 | 1.000 | 2.7 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **23+50.000** | | | | | | | -21494.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 98.0 | 37.2 | 1.000 | 37.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.3 | 8.4 | 1.000 | 8.4 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.3 | 8.4 | 1.000 | 8.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.3 | 5.0 | 1.000 | 5.0 | No | |
| | Filter: | 8.8 | 3.3 | 1.000 | 3.3 | No | |
| | Topsoil: | 6.9 | 2.6 | 1.000 | 2.6 | No | |
| **23+60.000** | | | | | | | -21538.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 93.8 | 35.5 | 1.000 | 35.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 21.9 | 8.2 | 1.000 | 8.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 21.9 | 8.2 | 1.000 | 8.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 13.1 | 4.9 | 1.000 | 4.9 | No | |
| | Filter: | 8.7 | 3.2 | 1.000 | 3.2 | No | |
| | Topsoil: | 6.7 | 2.5 | 1.000 | 2.5 | No | |
| **23+70.000** | | | | | | | -21580.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 91.0 | 34.2 | 1.000 | 34.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.0 | 8.1 | 1.000 | 8.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.0 | 8.1 | 1.000 | 8.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 12.7 | 4.8 | 1.000 | 4.8 | No | |
| | Filter: | 8.4 | 3.2 | 1.000 | 3.2 | No | |
| | Topsoil: | 6.8 | 2.5 | 1.000 | 2.5 | No | |
| **23+80.000** | | | | | | | -21622.0 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 88.1 | 33.2 | 1.000 | 33.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.0 | 8.1 | 1.000 | 8.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.0 | 8.1 | 1.000 | 8.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 11.9 | 4.5 | 1.000 | 4.5 | No | |
| | Filter: | 7.8 | 3.0 | 1.000 | 3.0 | No | |
| | Topsoil: | 7.0 | 2.6 | 1.000 | 2.6 | No | |
| **23+90.000** | | | | | | | -21662.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 87.5 | 32.5 | 1.000 | 32.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.0 | 8.1 | 1.000 | 8.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.0 | 8.1 | 1.000 | 8.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 11.1 | 4.2 | 1.000 | 4.2 | No | |
| | Filter: | 7.3 | 2.8 | 1.000 | 2.8 | No | |
| | Topsoil: | 7.1 | 2.6 | 1.000 | 2.6 | No | |
| **24+00.000** | | | | | | | -21703.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 88.9 | 32.7 | 1.000 | 32.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.1 | 8.2 | 1.000 | 8.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.1 | 8.2 | 1.000 | 8.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 10.4 | 4.0 | 1.000 | 4.0 | No | |
| | Filter: | 7.1 | 2.7 | 1.000 | 2.7 | No | |
| | Topsoil: | 7.2 | 2.7 | 1.000 | 2.7 | No | |
| **24+10.000** | | | | | | | -21746.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 96.3 | 34.3 | 1.000 | 34.3 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 22.7 | 8.3 | 1.000 | 8.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 22.7 | 8.3 | 1.000 | 8.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 11.1 | 4.0 | 1.000 | 4.0 | No | |
| | Filter: | 7.5 | 2.7 | 1.000 | 2.7 | No | |
| | Topsoil: | 7.6 | 2.7 | 1.000 | 2.7 | No | |
| **24+20.000** | | | | | | | -21793.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 114.9 | 39.1 | 1.000 | 39.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 24.1 | 8.7 | 1.000 | 8.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 24.1 | 8.7 | 1.000 | 8.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 12.5 | 4.4 | 1.000 | 4.4 | No | |
| | Filter: | 8.4 | 3.0 | 1.000 | 3.0 | No | |
| | Topsoil: | 8.2 | 2.9 | 1.000 | 2.9 | No | |
| **24+30.000** | | | | | | | -21848.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 130.4 | 45.4 | 1.000 | 45.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 25.0 | 9.1 | 1.000 | 9.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 25.0 | 9.1 | 1.000 | 9.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 14.1 | 4.9 | 1.000 | 4.9 | No | |
| | Filter: | 9.4 | 3.3 | 1.000 | 3.3 | No | |
| | Topsoil: | 8.6 | 3.1 | 1.000 | 3.1 | No | |
| **24+40.000** | | | | | | | -21908.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 142.2 | 50.5 | 1.000 | 50.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 26.0 | 9.5 | 1.000 | 9.5 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 26.0 | 9.5 | 1.000 | 9.5 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 15.7 | 5.5 | 1.000 | 5.5 | No | |
| | Filter: | 10.4 | 3.7 | 1.000 | 3.7 | No | |
| | Topsoil: | 8.9 | 3.2 | 1.000 | 3.2 | No | |
| **24+50.000** | | | | | | | -21972.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 151.4 | 54.4 | 1.000 | 54.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 26.8 | 9.8 | 1.000 | 9.8 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 26.8 | 9.8 | 1.000 | 9.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 16.4 | 5.9 | 1.000 | 5.9 | No | |
| | Filter: | 10.9 | 4.0 | 1.000 | 4.0 | No | |
| | Topsoil: | 9.3 | 3.4 | 1.000 | 3.4 | No | |
| **24+60.000** | | | | | | | -22040.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 161.2 | 57.9 | 1.000 | 57.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 27.6 | 10.1 | 1.000 | 10.1 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 27.6 | 10.1 | 1.000 | 10.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 17.1 | 6.2 | 1.000 | 6.2 | No | |
| | Filter: | 11.4 | 4.1 | 1.000 | 4.1 | No | |
| | Topsoil: | 9.7 | 3.5 | 1.000 | 3.5 | No | |
| **24+70.000** | | | | | | | -22112.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 171.5 | 61.6 | 1.000 | 61.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 28.4 | 10.4 | 1.000 | 10.4 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 28.4 | 10.4 | 1.000 | 10.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 17.7 | 6.4 | 1.000 | 6.4 | No | |
| | Filter: | 11.8 | 4.3 | 1.000 | 4.3 | No | |
| | Topsoil: | 10.0 | 3.7 | 1.000 | 3.7 | No | |
| **24+80.000** | | | | | | | -22191.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 194.7 | 67.8 | 1.000 | 67.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 29.6 | 10.7 | 1.000 | 10.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 29.6 | 10.7 | 1.000 | 10.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 19.1 | 6.8 | 1.000 | 6.8 | No | |
| | Filter: | 12.7 | 4.5 | 1.000 | 4.5 | No | |
| | Topsoil: | 10.6 | 3.8 | 1.000 | 3.8 | No | |
| **24+90.000** | | | | | | | -22279.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 220.4 | 76.9 | 1.000 | 76.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.1 | 11.2 | 1.000 | 11.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 31.2 | 11.3 | 1.000 | 11.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 20.0 | 7.2 | 1.000 | 7.2 | No | |
| | Filter: | 13.5 | 4.9 | 1.000 | 4.9 | No | |
| | Topsoil: | 11.4 | 4.1 | 1.000 | 4.1 | No | |
| **25+00.000** | | | | | | | -22377.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 245.9 | 86.4 | 1.000 | 86.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.6 | 11.8 | 1.000 | 11.8 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 32.7 | 11.8 | 1.000 | 11.8 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 20.9 | 7.6 | 1.000 | 7.6 | No | |
| | Filter: | 14.1 | 5.1 | 1.000 | 5.1 | No | |
| | Topsoil: | 12.2 | 4.4 | 1.000 | 4.4 | No | |
| **25+10.000** | | | | | | | -22485.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 269.7 | 95.5 | 1.000 | 95.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 34.0 | 12.3 | 1.000 | 12.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 34.0 | 12.3 | 1.000 | 12.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 21.9 | 7.9 | 1.000 | 7.9 | No | |
| | Filter: | 14.7 | 5.3 | 1.000 | 5.3 | No | |
| | Topsoil: | 12.9 | 4.7 | 1.000 | 4.7 | No | |
| **25+20.000** | | | | | | | -22600.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 284.4 | 102.6 | 1.000 | 102.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 34.3 | 12.7 | 1.000 | 12.7 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 34.4 | 12.7 | 1.000 | 12.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 22.8 | 8.3 | 1.000 | 8.3 | No | |
| | Filter: | 15.3 | 5.6 | 1.000 | 5.6 | No | |
| | Topsoil: | 13.0 | 4.8 | 1.000 | 4.8 | No | |
| **25+30.000** | | | | | | | -22718.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 287.4 | 105.9 | 1.000 | 105.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 33.6 | 12.6 | 1.000 | 12.6 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 33.7 | 12.6 | 1.000 | 12.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Riprap: | 18.4 | 7.6 | 1.000 | 7.6 | No | |
| | Filter: | 13.2 | 5.3 | 1.000 | 5.3 | No | |
| | Topsoil: | 13.0 | 4.8 | 1.000 | 4.8 | No | |
| **25+40.000** | | | | | | | -22836.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 278.9 | 104.9 | 1.000 | 104.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.5 | 12.2 | 1.000 | 12.2 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 32.6 | 12.3 | 1.000 | 12.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 14.0 | 6.0 | 1.000 | 6.0 | No | |
| | Filter: | 10.3 | 4.4 | 1.000 | 4.4 | No | |
| | Topsoil: | 13.1 | 4.8 | 1.000 | 4.8 | No | |
| **25+50.000** | | | | | | | -22950.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 274.8 | 102.5 | 1.000 | 102.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.1 | 12.0 | 1.000 | 12.0 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 32.1 | 12.0 | 1.000 | 12.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 12.3 | 4.9 | 1.000 | 4.9 | No | |
| | Filter: | 9.2 | 3.6 | 1.000 | 3.6 | No | |
| | Topsoil: | 13.1 | 4.8 | 1.000 | 4.8 | No | |
| **25+60.000** | | | | | | | -23064.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 278.3 | 102.4 | 1.000 | 102.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.4 | 11.9 | 1.000 | 11.9 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 32.4 | 12.0 | 1.000 | 12.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 11.6 | 4.4 | 1.000 | 4.4 | No | |
| | Filter: | 8.8 | 3.3 | 1.000 | 3.3 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Topsoil: | 13.4 | 4.9 | 1.000 | 4.9 | No | |
| **25+70.000** | | | | | | | -23180.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 281.9 | 103.7 | 1.000 | 103.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.7 | 12.1 | 1.000 | 12.1 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 32.8 | 12.1 | 1.000 | 12.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 10.9 | 4.2 | 1.000 | 4.2 | No | |
| | Filter: | 8.3 | 3.2 | 1.000 | 3.2 | No | |
| | Topsoil: | 13.8 | 5.0 | 1.000 | 5.0 | No | |
| **25+80.000** | | | | | | | -23297.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 285.0 | 105.0 | 1.000 | 105.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 33.1 | 12.2 | 1.000 | 12.2 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 33.2 | 12.2 | 1.000 | 12.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 10.2 | 3.9 | 1.000 | 3.9 | No | |
| | Filter: | 7.8 | 3.0 | 1.000 | 3.0 | No | |
| | Topsoil: | 14.1 | 5.2 | 1.000 | 5.2 | No | |
| **25+90.000** | | | | | | | -23416.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 286.8 | 105.9 | 1.000 | 105.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 33.3 | 12.3 | 1.000 | 12.3 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 33.4 | 12.3 | 1.000 | 12.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 9.4 | 3.6 | 1.000 | 3.6 | No | |
| | Filter: | 7.3 | 2.8 | 1.000 | 2.8 | No | |
| | Topsoil: | 14.4 | 5.3 | 1.000 | 5.3 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **26+00.000** | | | | | | | -23533.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 283.6 | 105.6 | 1.000 | 105.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 33.3 | 12.3 | 1.000 | 12.3 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 33.4 | 12.4 | 1.000 | 12.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 8.6 | 3.3 | 1.000 | 3.3 | No | |
| | Filter: | 6.8 | 2.6 | 1.000 | 2.6 | No | |
| | Topsoil: | 14.6 | 5.4 | 1.000 | 5.4 | No | |
| **26+10.000** | | | | | | | -23649.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 276.5 | 103.7 | 1.000 | 103.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 33.3 | 12.3 | 1.000 | 12.3 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 33.4 | 12.4 | 1.000 | 12.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 7.8 | 3.0 | 1.000 | 3.0 | No | |
| | Filter: | 6.2 | 2.4 | 1.000 | 2.4 | No | |
| | Topsoil: | 14.7 | 5.4 | 1.000 | 5.4 | No | |
| **26+20.000** | | | | | | | -23763.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 267.6 | 100.7 | 1.000 | 100.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 33.3 | 12.3 | 1.000 | 12.3 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 33.4 | 12.4 | 1.000 | 12.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 7.0 | 2.7 | 1.000 | 2.7 | No | |
| | Filter: | 5.7 | 2.2 | 1.000 | 2.2 | No | |
| | Topsoil: | 14.9 | 5.5 | 1.000 | 5.5 | No | |
| **26+30.000** | | | | | | | -23872.5 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Normal Fill: | 257.3 | 97.2 | 1.000 | 97.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 33.0 | 12.3 | 1.000 | 12.3 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 33.0 | 12.3 | 1.000 | 12.3 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 6.2 | 2.4 | 1.000 | 2.4 | No | |
| | Filter: | 5.2 | 2.0 | 1.000 | 2.0 | No | |
| | Topsoil: | 14.8 | 5.5 | 1.000 | 5.5 | No | |
| **26+40.000** | | | | | | | -23978.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 247.3 | 93.5 | 1.000 | 93.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.7 | 12.2 | 1.000 | 12.2 | Yes | |
| | Default (not replaced): | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 32.7 | 12.2 | 1.000 | 12.2 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 5.4 | 2.1 | 1.000 | 2.1 | No | |
| | Filter: | 4.7 | 1.8 | 1.000 | 1.8 | No | |
| | Topsoil: | 14.7 | 5.5 | 1.000 | 5.5 | No | |
| **26+50.000** | | | | | | | -24080.2 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 238.4 | 89.9 | 1.000 | 89.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.7 | 12.1 | 1.000 | 12.1 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 32.8 | 12.1 | 1.000 | 12.1 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 1.0 | 1.000 | 1.0 | No | |
| | Filter: | 0.0 | 0.9 | 1.000 | 0.9 | No | |
| | Topsoil: | 15.3 | 5.6 | 1.000 | 5.6 | No | |
| **26+60.000** | | | | | | | -24177.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 225.0 | 85.8 | 1.000 | 85.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.0 | 12.0 | 1.000 | 12.0 | Yes | |
| | Default (not replaced): | 0.2 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 32.2 | 12.0 | 1.000 | 12.0 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.4 | 5.7 | 1.000 | 5.7 | No | |
| **26+70.000** | | | | | | | -24270.1 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 209.0 | 80.4 | 1.000 | 80.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.4 | 11.7 | 1.000 | 11.7 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 31.6 | 11.8 | 1.000 | 11.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.9 | 5.6 | 1.000 | 5.6 | No | |
| **26+80.000** | | | | | | | -24356.8 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 197.1 | 75.2 | 1.000 | 75.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 30.8 | 11.5 | 1.000 | 11.5 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 30.9 | 11.6 | 1.000 | 11.6 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.4 | 5.4 | 1.000 | 5.4 | No | |
| **26+90.000** | | | | | | | -24439.7 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 189.8 | 71.6 | 1.000 | 71.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Default (replaced): | 30.4 | 11.3 | 1.000 | 11.3 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 30.5 | 11.4 | 1.000 | 11.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.2 | 5.3 | 1.000 | 5.3 | No | |
| **27+00.000** | | | | | | | -24520.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 184.0 | 69.2 | 1.000 | 69.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.0 | 11.4 | 1.000 | 11.4 | Yes | |
| | Default (not replaced): | 0.1 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 31.1 | 11.4 | 1.000 | 11.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 14.5 | 5.3 | 1.000 | 5.3 | No | |
| **27+10.000** | | | | | | | -24599.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 182.0 | 67.8 | 1.000 | 67.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.4 | 11.7 | 1.000 | 11.7 | Yes | |
| | Default (not replaced): | 0.1 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 32.6 | 11.8 | 1.000 | 11.8 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 15.5 | 5.6 | 1.000 | 5.6 | No | |
| **27+20.000** | | | | | | | -24679.9 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 183.6 | 67.7 | 1.000 | 67.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 34.0 | 12.3 | 1.000 | 12.3 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Total Default: | 34.1 | 12.4 | 1.000 | 12.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 16.5 | 5.9 | 1.000 | 5.9 | No | |
| **27+30.000** | | | | | | | -24764.3 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 203.9 | 71.8 | 1.000 | 71.8 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 34.3 | 12.7 | 1.000 | 12.7 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 34.4 | 12.7 | 1.000 | 12.7 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 1.7 | 3.4 | 1.000 | 3.4 | No | |
| **27+40.000** | | | | | | | -24853.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 209.0 | 76.5 | 1.000 | 76.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 32.2 | 12.3 | 1.000 | 12.3 | Yes | |
| | Default (not replaced): | 0.2 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 32.3 | 12.4 | 1.000 | 12.4 | | |
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.3 | 0.4 | 1.000 | 0.4 | No | |
| **27+50.000** | | | | | | | -24944.4 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 220.2 | 79.5 | 1.000 | 79.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.8 | 11.8 | 1.000 | 11.8 | Yes | |
| | Default (not replaced): | 0.1 | 0.1 | 1.000 | 0.1 | No | |
| | Total Default: | 31.9 | 11.9 | 1.000 | 11.9 | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | Wearing Course: | 4.4 | 1.6 | 1.000 | 1.6 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.0 | 0.1 | 1.000 | 0.1 | No | |
| **27+51.413** | | | | | | | -24957.6 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 222.0 | 11.6 | 1.000 | 11.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Default (replaced): | 31.8 | 1.7 | 1.000 | 1.7 | Yes | |
| | Default (not replaced): | 0.1 | 0.0 | 1.000 | 0.0 | No | |
| | Total Default: | 31.9 | 1.7 | 1.000 | 1.7 | | |
| | Wearing Course: | 4.4 | 0.2 | 1.000 | 0.2 | No | |
| | Riprap: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Filter: | 0.0 | 0.0 | 1.000 | 0.0 | No | |
| | Topsoil: | 0.1 | 0.0 | 1.000 | 0.0 | No | |

| Totals: | Type | Volume | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|
| | Normal Cut: | 0.2 | 0.2 | Yes | |
| | Normal Fill: | 22118.9 | 22118.9 | Yes | |
| | Added Cut: | 0.0 | 0.0 | Yes | |
| | Added Fill: | 0.0 | 0.0 | Yes | |
| | Default (replaced): | 2838.9 | 2838.9 | Yes | |
| | Default (not replaced): | 8.9 | 8.9 | No | |
| | Total Default: | 2847.8 | 2847.8 | | |
| | Wearing Course: | 444.4 | 444.4 | No | |
| | Riprap: | 1598.1 | 1598.1 | No | |
| | Filter: | 1106.8 | 1106.8 | No | |
| | Topsoil: | 1037.4 | 1037.4 | No | |

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

# Volumes Report

Report Created: 11/4/2014
Time: 6:11am

Bentley InRoads Suite V8i (SELECTseries 2), 08.11.07.536

**Cross Section Set Name:** site 9 alt 2 qty

**Alignment Name:** site 9 alt 2

**Input Grid Factor:** 1.000000 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

**Surface:** Skokomish Last Revised 8/29/2014 5:56:26 AM

**Surface:** site 9 channel alt 2 Last Revised 10/8/2014 12:08:46 PM

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **0+00.000** | | | | | | | 0.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **0+10.000** | | | | | | | 0.0 |
| | Normal Cut: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **0+20.000** | | | | | | | -14.4 |
| | Normal Cut: | 4.1 | 0.8 | 1.000 | 0.8 | Yes | |
| | Normal Fill: | 81.9 | 15.2 | 1.000 | 15.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **0+30.000** | | | | | | | -20.2 |
| | Normal Cut: | 48.8 | 9.8 | 1.000 | 9.8 | Yes | |
| | Normal Fill: | 1.9 | 15.5 | 1.000 | 15.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **0+40.000** | | | | | | | -2.4 |
| | Normal Cut: | 49.9 | 18.3 | 1.000 | 18.3 | Yes | |
| | Normal Fill: | 0.6 | 0.5 | 1.000 | 0.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **0+50.000** | | | | | | | 15.7 |
| | Normal Cut: | 49.2 | 18.3 | 1.000 | 18.3 | Yes | |
| | Normal Fill: | 0.8 | 0.3 | 1.000 | 0.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **0+60.000** | | | | | | | 32.2 |
| | Normal Cut: | 43.3 | 17.1 | 1.000 | 17.1 | Yes | |
| | Normal Fill: | 2.9 | 0.7 | 1.000 | 0.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **0+70.000** | | | | | | | 42.8 |
| | Normal Cut: | 20.1 | 11.7 | 1.000 | 11.7 | Yes | |
| | Normal Fill: | 3.3 | 1.1 | 1.000 | 1.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **0+80.000** | | | | | | | 41.7 |
| | Normal Cut: | 0.3 | 3.8 | 1.000 | 3.8 | Yes | |
| | Normal Fill: | 22.9 | 4.9 | 1.000 | 4.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **0+90.000** | | | | | | | 30.8 |
| | Normal Cut: | 2.2 | 0.5 | 1.000 | 0.5 | Yes | |
| | Normal Fill: | 38.0 | 11.3 | 1.000 | 11.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **1+00.000** | | | | | | | 22.4 |
| | Normal Cut: | 6.8 | 1.7 | 1.000 | 1.7 | Yes | |
| | Normal Fill: | 16.4 | 10.1 | 1.000 | 10.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **1+10.000** | | | | | | | 28.0 |
| | Normal Cut: | 41.5 | 9.0 | 1.000 | 9.0 | Yes | |
| | Normal Fill: | 2.2 | 3.5 | 1.000 | 3.5 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | | | | | 53.6 |
| | Normal Cut: | 99.4 | 26.1 | 1.000 | 26.1 | Yes | |
| | Normal Fill: | 0.1 | 0.4 | 1.000 | 0.4 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **1+30.000** | | | | | | | 100.0 |
| | Normal Cut: | 151.1 | 46.4 | 1.000 | 46.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **1+40.000** | | | | | | | 161.8 |
| | Normal Cut: | 183.0 | 61.9 | 1.000 | 61.9 | Yes | |
| | Normal Fill: | 0.3 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **1+50.000** | | | | | | | 232.6 |
| | Normal Cut: | 199.6 | 70.9 | 1.000 | 70.9 | Yes | |
| | Normal Fill: | 0.2 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **1+60.000** | | | | | | | 309.3 |
| | Normal Cut: | 214.6 | 76.7 | 1.000 | 76.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **1+70.000** | | | | | | | 388.7 |
| | Normal Cut: | 214.3 | 79.4 | 1.000 | 79.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **1+80.000** | | | | | | | 466.0 |
| | Normal Cut: | 203.6 | 77.4 | 1.000 | 77.4 | Yes | |
| | Normal Fill: | 0.3 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **1+90.000** | | | | | | | 539.5 |
| | Normal Cut: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 194.5 | 73.7 | 1.000 | 73.7 | Yes | |
| | Normal Fill: | 1.2 | 0.3 | 1.000 | 0.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **2+00.000** | | | | | | | 609.2 |
| | Normal Cut: | 185.2 | 70.3 | 1.000 | 70.3 | Yes | |
| | Normal Fill: | 2.0 | 0.6 | 1.000 | 0.6 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **2+10.000** | | | | | | | 675.9 |
| | Normal Cut: | 179.2 | 67.5 | 1.000 | 67.5 | Yes | |
| | Normal Fill: | 2.0 | 0.7 | 1.000 | 0.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **2+20.000** | | | | | | | 741.4 |
| | Normal Cut: | 179.2 | 66.4 | 1.000 | 66.4 | Yes | |
| | Normal Fill: | 2.7 | 0.9 | 1.000 | 0.9 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **2+30.000** | | | | | | | 807.7 |
| | Normal Cut: | 183.8 | 67.2 | 1.000 | 67.2 | Yes | |
| | Normal Fill: | 2.6 | 1.0 | 1.000 | 1.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **2+40.000** | | | | | | | 876.0 |
| | Normal Cut: | 188.6 | 69.0 | 1.000 | 69.0 | Yes | |
| | Normal Fill: | 1.0 | 0.7 | 1.000 | 0.7 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **2+50.000** | | | | | | | 946.5 |
| | Normal Cut: | 193.1 | 70.7 | 1.000 | 70.7 | Yes | |
| | Normal Fill: | 0.2 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **2+60.000** | | | | | | | 1018.7 |
| | Normal Cut: | 197.1 | 72.2 | 1.000 | 72.2 | Yes | |
| | Normal Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **2+70.000** | | | | | | | 1092.2 |
| | Normal Cut: | 200.0 | 73.5 | 1.000 | 73.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **2+80.000** | | | | | | | 1166.8 |
| | Normal Cut: | 202.8 | 74.6 | 1.000 | 74.6 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **2+90.000** | | | | | | | 1242.4 |
| | Normal Cut: | 205.3 | 75.6 | 1.000 | 75.6 | Yes | |
| | Normal Fill: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **3+00.000** | | | | | | | 1319.1 |
| | Normal Cut: | 209.3 | 76.8 | 1.000 | 76.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **3+10.000** | | | | | | | 1399.2 |
| | Normal Cut: | 223.9 | 80.2 | 1.000 | 80.2 | Yes | |
| | Normal Fill: | 0.6 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **3+20.000** | | | | | | | 1485.1 |
| | Normal Cut: | 241.3 | 86.2 | 1.000 | 86.2 | Yes | |
| | Normal Fill: | 1.0 | 0.3 | 1.000 | 0.3 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **3+30.000** | | | | | | | 1575.9 |
| | Normal Cut: | 250.3 | 91.0 | 1.000 | 91.0 | Yes | |
| | Normal Fill: | 0.1 | 0.2 | 1.000 | 0.2 | Yes | |
| | Added Cut: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **3+40.000** | | | | | | | 1669.9 |
| | Normal Cut: | 257.4 | 94.0 | 1.000 | 94.0 | Yes | |
| | Normal Fill: | 0.2 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **3+50.000** | | | | | | | 1766.5 |
| | Normal Cut: | 264.4 | 96.6 | 1.000 | 96.6 | Yes | |
| | Normal Fill: | 0.1 | 0.1 | 1.000 | 0.1 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **3+60.000** | | | | | | | 1866.2 |
| | Normal Cut: | 274.1 | 99.7 | 1.000 | 99.7 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **3+70.000** | | | | | | | 1969.1 |
| | Normal Cut: | 281.7 | 102.9 | 1.000 | 102.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **3+80.000** | | | | | | | 2074.4 |
| | Normal Cut: | 286.9 | 105.3 | 1.000 | 105.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **3+90.000** | | | | | | | 2181.7 |
| | Normal Cut: | 292.4 | 107.3 | 1.000 | 107.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **4+00.000** | | | | | | | 2289.6 |
| | Normal Cut: | 290.3 | 107.9 | 1.000 | 107.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | | | | | |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | | 0.0 | 1.000 | 0.0 | Yes | |
| **4+10.000** | | | | | | | 2395.9 |
| | Normal Cut: | 283.4 | 106.3 | 1.000 | 106.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **4+20.000** | | | | | | | 2499.7 |
| | Normal Cut: | 277.1 | 103.8 | 1.000 | 103.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **4+30.000** | | | | | | | 2600.1 |
| | Normal Cut: | 265.1 | 100.4 | 1.000 | 100.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **4+40.000** | | | | | | | 2703.0 |
| | Normal Cut: | 290.6 | 102.9 | 1.000 | 102.9 | Yes | |
| | Normal Fill: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **4+50.000** | | | | | | | 2808.4 |
| | Normal Cut: | 278.8 | 105.5 | 1.000 | 105.5 | Yes | |
| | Normal Fill: | 0.1 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **4+60.000** | | | | | | | 2902.5 |
| | Normal Cut: | 229.4 | 94.1 | 1.000 | 94.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **4+70.000** | | | | | | | 2991.9 |
| | Normal Cut: | 253.4 | 89.4 | 1.000 | 89.4 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

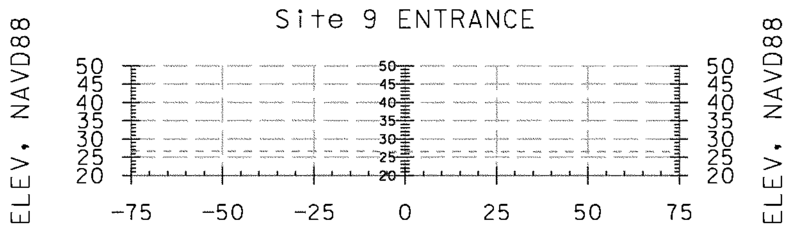
| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| **4+80.000** | | | | | | | 3084.1 |
| | Normal Cut: | 244.1 | 92.1 | 1.000 | 92.1 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **4+90.000** | | | | | | | 3171.8 |
| | Normal Cut: | 229.8 | 87.8 | 1.000 | 87.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **5+00.000** | | | | | | | 3253.1 |
| | Normal Cut: | 209.2 | 81.3 | 1.000 | 81.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **5+10.000** | | | | | | | 3323.9 |
| | Normal Cut: | 173.3 | 70.8 | 1.000 | 70.8 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **5+20.000** | | | | | | | 3383.2 |
| | Normal Cut: | 146.9 | 59.3 | 1.000 | 59.3 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **5+30.000** | | | | | | | 3433.1 |
| | Normal Cut: | 122.5 | 49.9 | 1.000 | 49.9 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **5+40.000** | | | | | | | 3475.3 |
| | Normal Cut: | 105.6 | 42.2 | 1.000 | 42.2 | Yes | |
| | Normal Fill: | 0.2 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **5+50.000** | | | | | | | 3512.8 |

| Station | Type | Area | Volume | Factor | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|---|---|
| | | 97.1 | 37.5 | 1.000 | 37.5 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |
| **5+60.000** | | | | | | | 3530.8 |
| | Normal Cut: | 0.0 | 18.0 | 1.000 | 18.0 | Yes | |
| | Normal Fill: | 0.0 | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Cut: | | 0.0 | 1.000 | 0.0 | Yes | |
| | Added Fill: | | 0.0 | 1.000 | 0.0 | Yes | |

| Totals: | Type | Volume | Adjusted Volume | Included in Mass Ordinate? | Mass Ordinate |
|---|---|---|---|---|---|
| | Normal Cut: | 3599.7 | 3599.7 | Yes | |
| | Normal Fill: | 68.9 | 68.9 | Yes | |
| | Added Cut: | 0.0 | 0.0 | Yes | |
| | Added Fill: | 0.0 | 0.0 | Yes | |

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

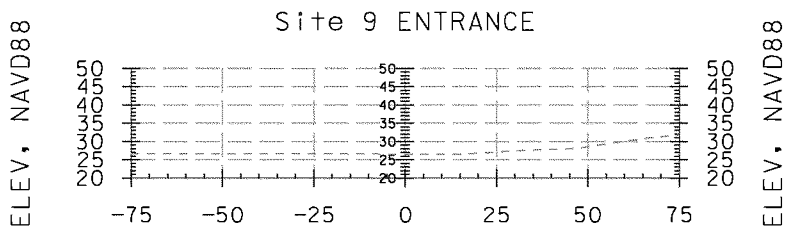
STA.0+00 TO STA.0+20




CA:0.00 SF
FA:0.00 SF
MO:0.00

0+00

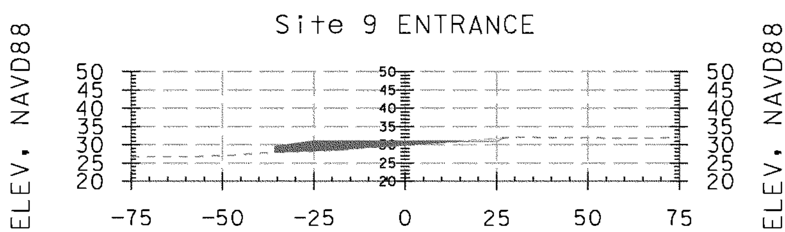
CV:0.00 CY
FV:0.00 CY




CA:0.00 SF
FA:0.00 SF
MO:0.00

0+10

CV:0.00 CY
FV:0.00 CY

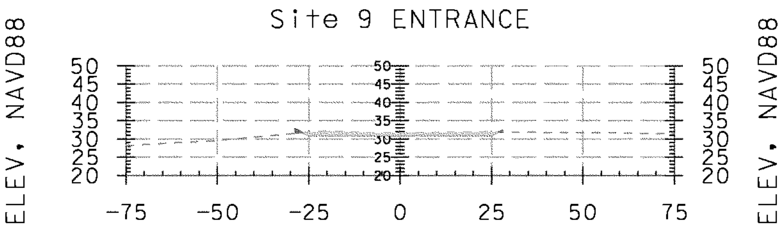



CA:4.06 SF
FA:81.94 SF
MO:-14.42

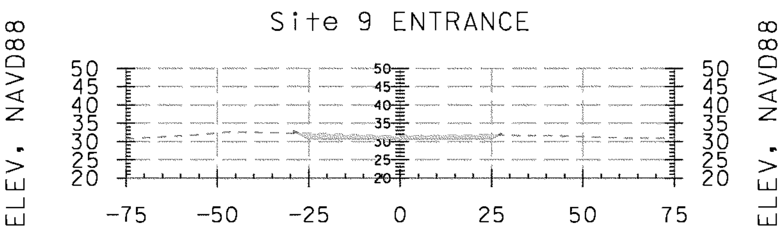
0+20

CV:0.75 CY
FV:15.17 CY

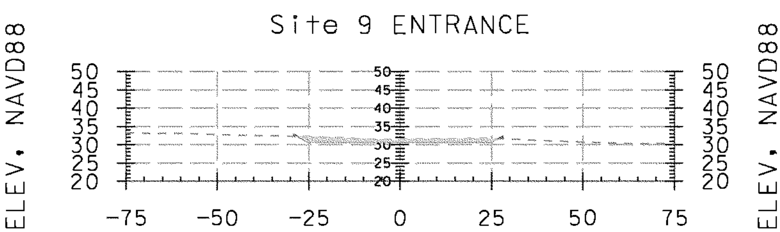
STA.0+30 TO STA.0+50




CA:48.76 SF
FA:1.94 SF
MO:-20.17
0+30
CV:9.78 CY
FV:15.53 CY

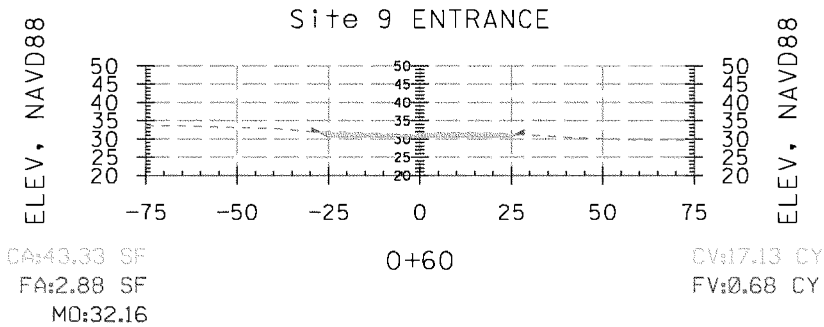


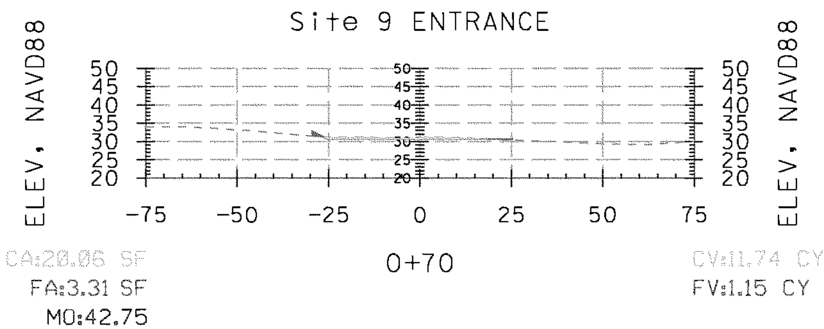

CA:49.87 SF
FA:Ø.61 SF
MO:-2.38
0+40
CV:18.27 CY
FV:Ø.47 CY

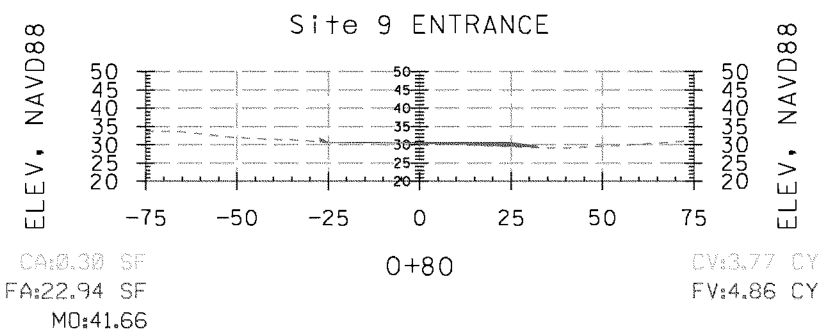



CA:49.19 SF
FA:Ø.79 SF
MO:15.71
0+50
CV:18.34 CY
FV:Ø.26 CY

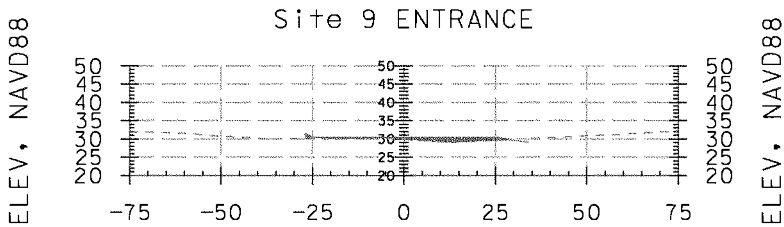
STA.0+60 TO STA.0+80



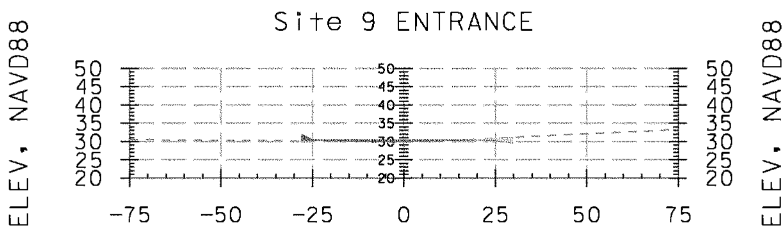
STA.0+90 TO STA.1+10




CA:2.20 SF
FA:37.96 SF
MO:30.85

0+90

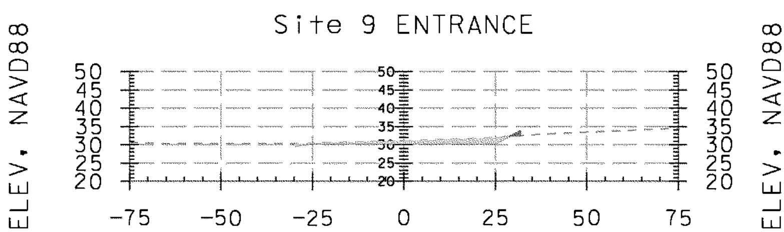
CV:0.46 CY
FV:11.28 CY




CA:6.85 SF
FA:16.44 SF
MO:22.45

1+00

CV:1.68 CY
FV:10.07 CY

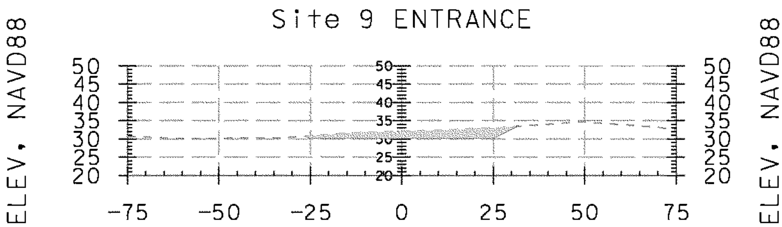



CA:41.54 SF
FA:2.20 SF
MO:27.96

1+10

CV:8.96 CY
FV:3.45 CY

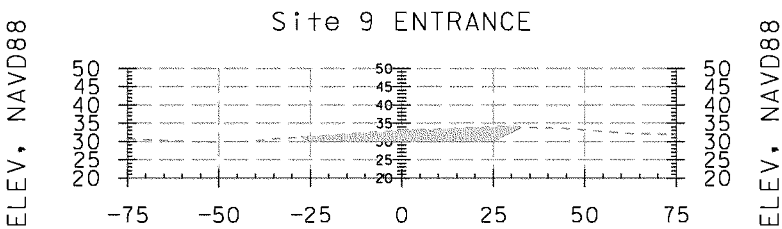
STA.1+20 TO STA.1+40




CA:99.42 SF
FA:0.09 SF
MO:53.64

1+20

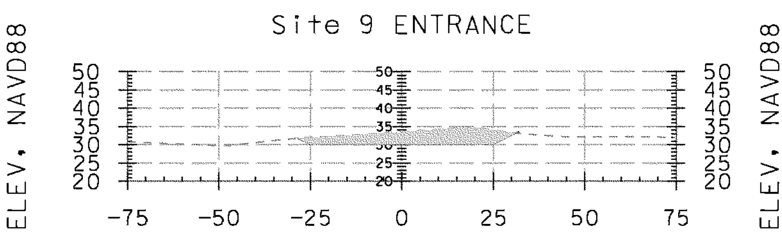
CV:26.10 CY
FV:0.42 CY




CA:151.12 SF
FA:0.02 SF
MO:100.02

1+30

CV:46.40 CY
FV:0.02 CY

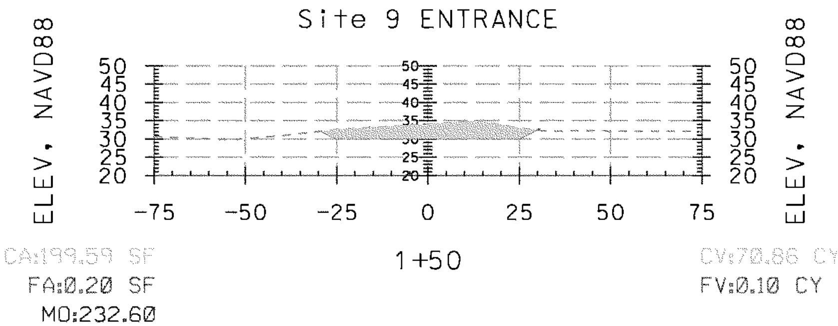


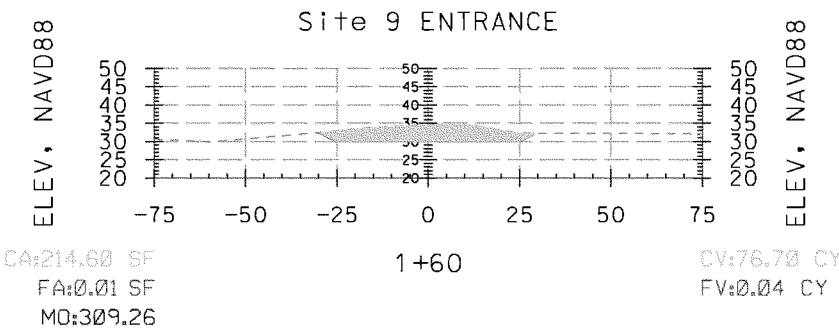

CA:183.05 SF
FA:0.32 SF
MO:161.84

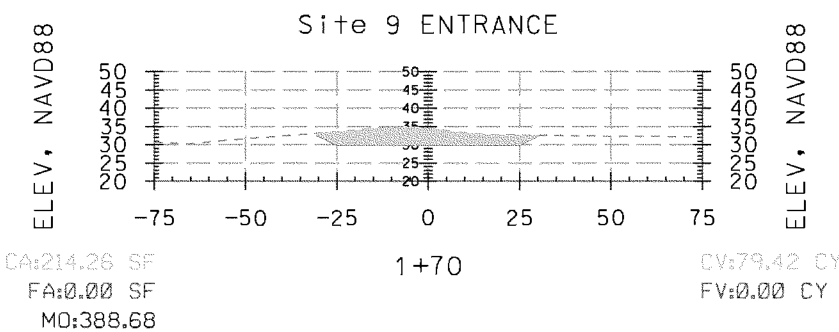
1+40

CV:61.88 CY
FV:0.06 CY

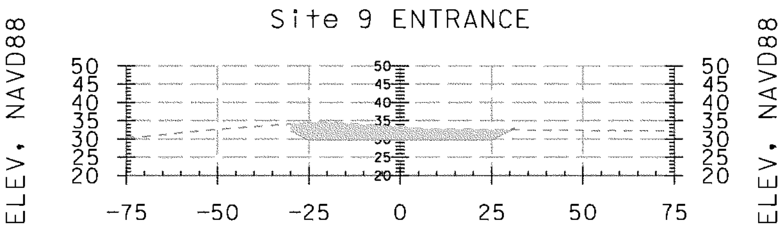
STA.1+50 TO STA.1+70



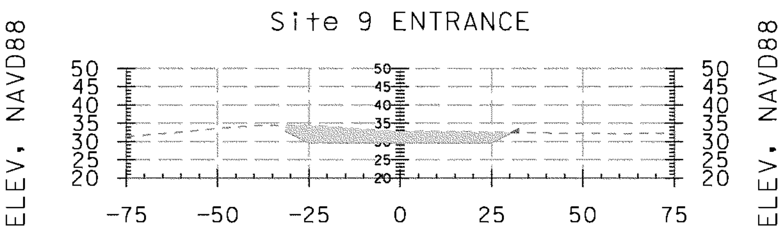
STA.1+80 TO STA.2+00




CA:203.62 SF
FA:0.26 SF
MO:466.02

1+80

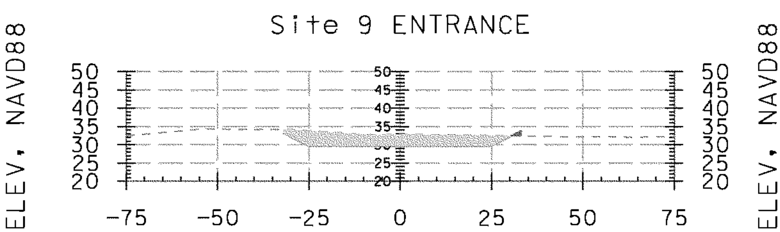
CV:77.38 CY
FV:0.05 CY




CA:194.48 SF
FA:1.20 SF
MO:539.47

1+90

CV:73.72 CY
FV:0.27 CY

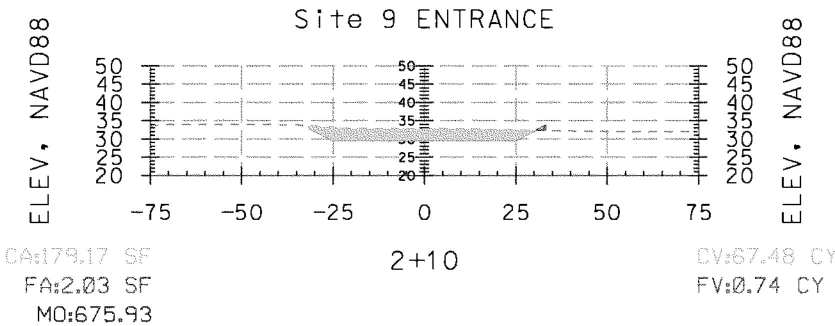


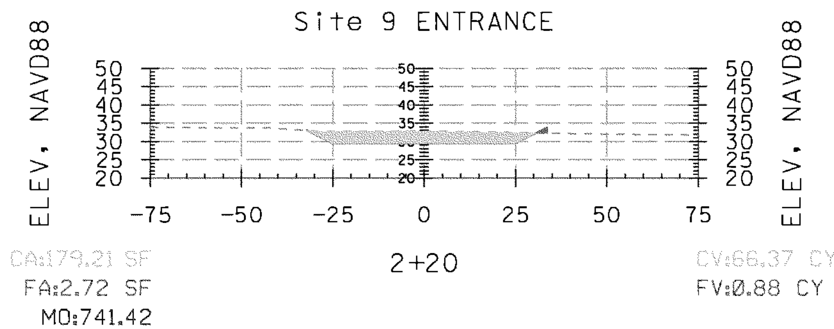

CA:185.21 SF
FA:1.96 SF
MO:609.19

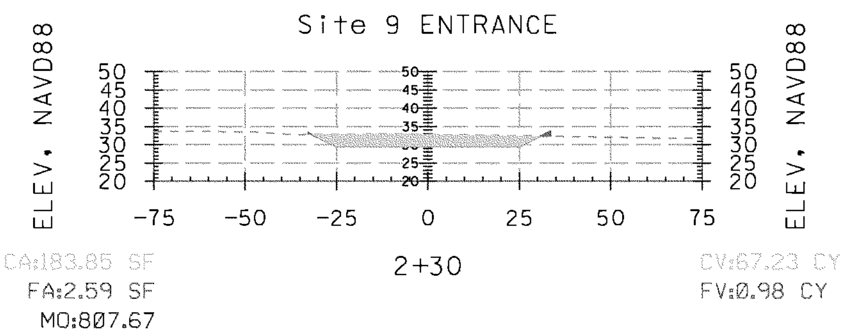
2+00

CV:70.31 CY
FV:0.59 CY

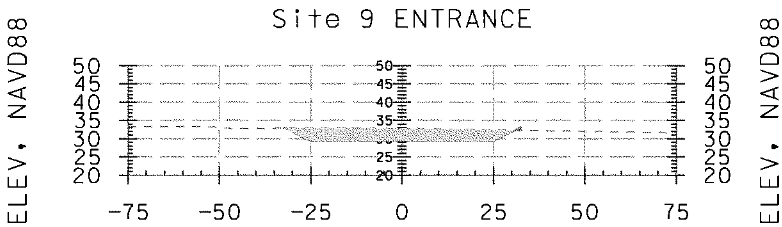
STA.2+10 TO STA.2+30



STA.2+40 TO STA.2+60

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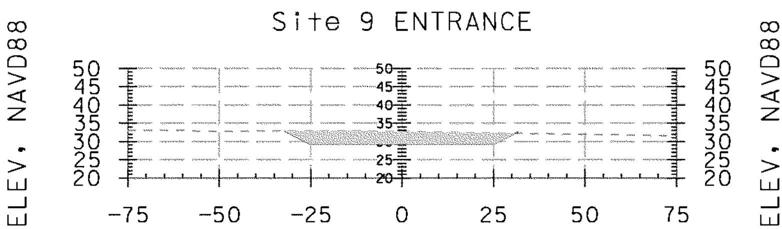
FA:0.98 SF
FV:0.66 CY
MO:875.99

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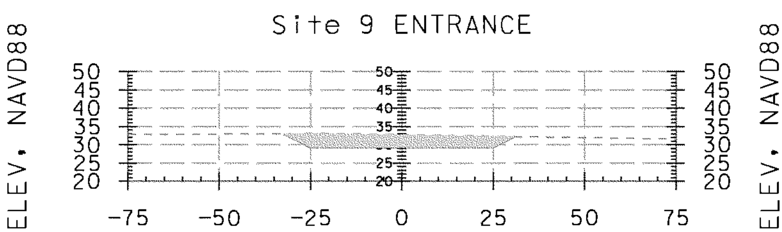


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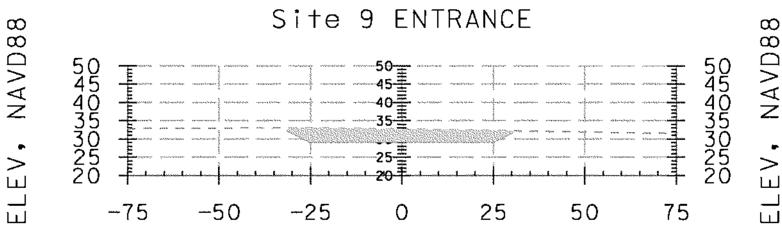
FV:0.03 CY
MO:1018.68

STA.2+70 TO STA.2+90

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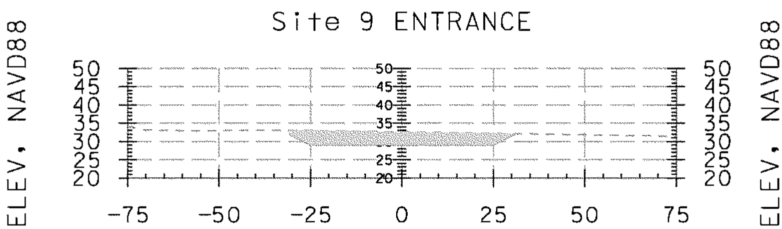
2+70

CV:73.54 CY
FV:0.00 CY

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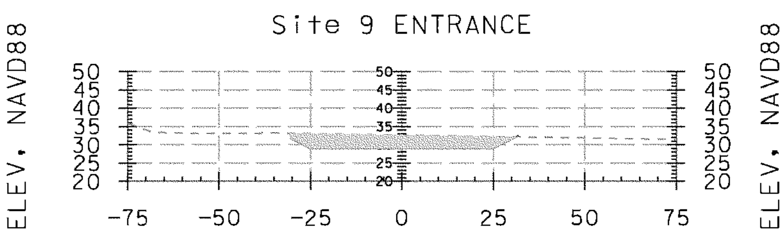
2+80

CV:74.60 CY
FV:0.00 CY

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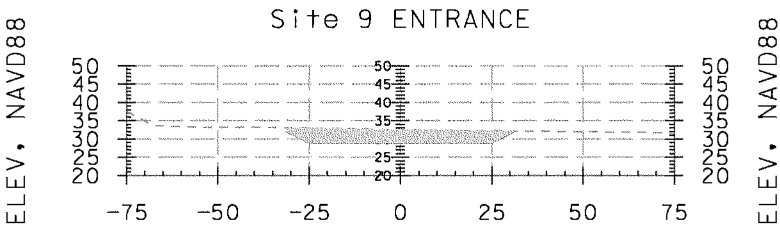
2+90

CV:75.57 CY
FV:0.03 CY

STA.3+00 TO STA.3+20




CA:209.29 SF
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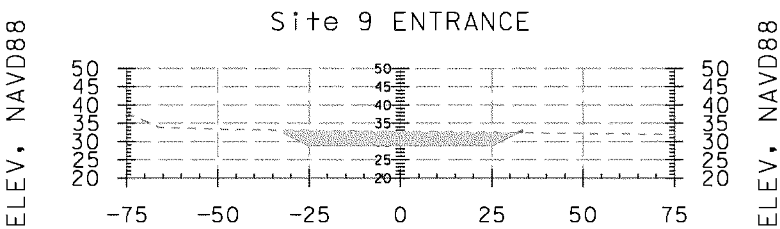
MO:1319.11

3+00

CV:76.77 CY
FV:Ø.Ø3 CY

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3+10

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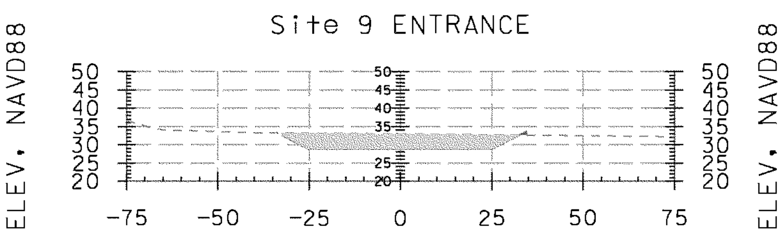
FV:Ø.1Ø CY

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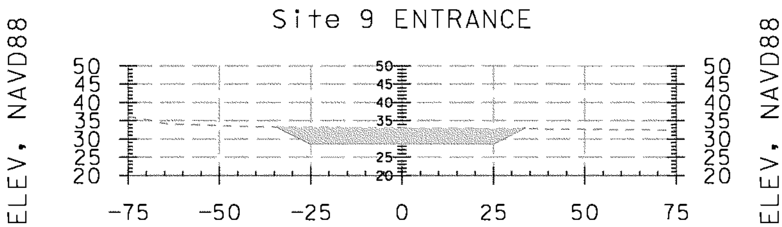
CV:86.16 CY
FV:Ø.28 CY

STA.3+30 TO STA.3+50

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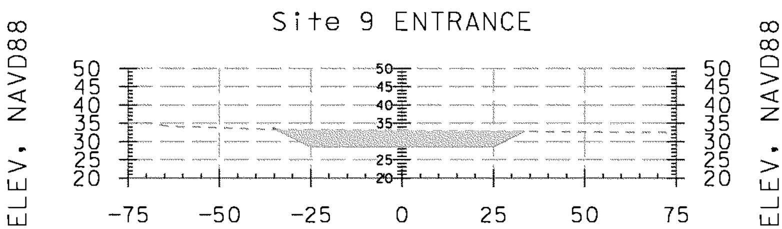
3+30

CV:91.04 CY
FV:0.20 CY

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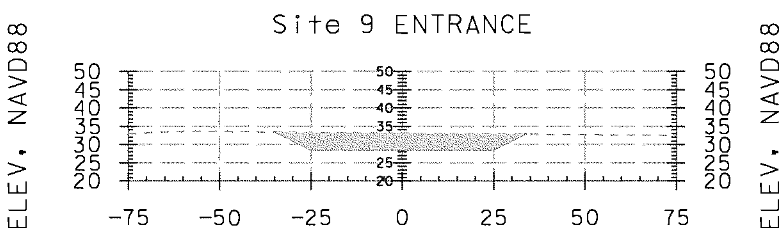
3+40

CV:94.01 CY
FV:0.07 CY

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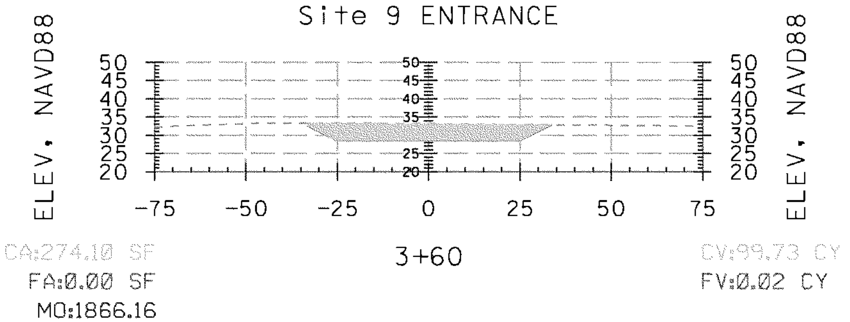
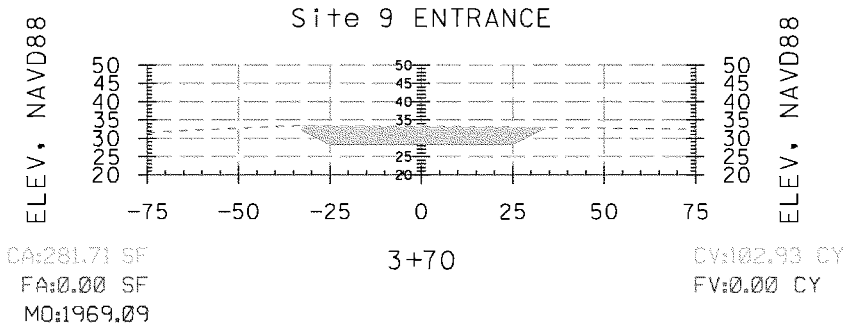
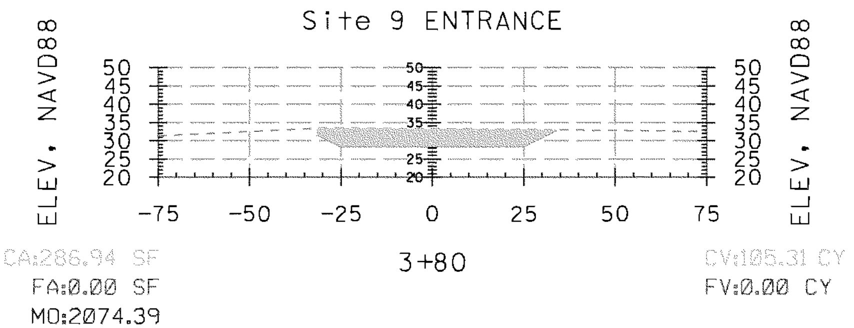
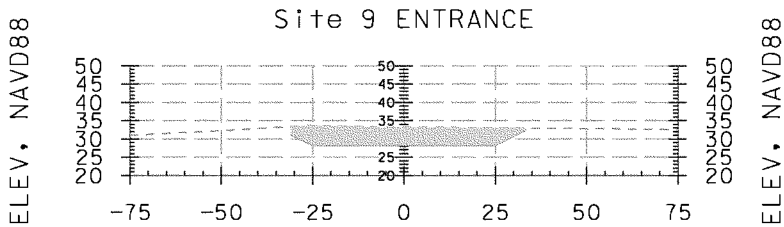
STA.3+60 TO STA.3+80



STA.3+90 TO STA.4+10

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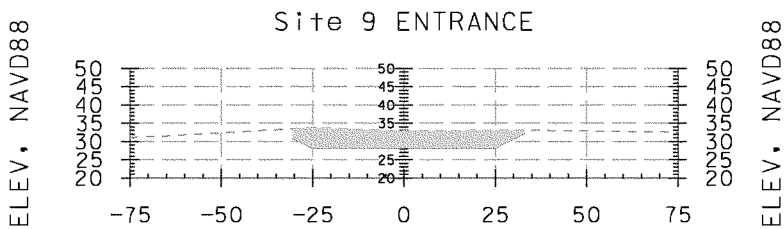
CV:107.29 CY
FV:0.00 CY

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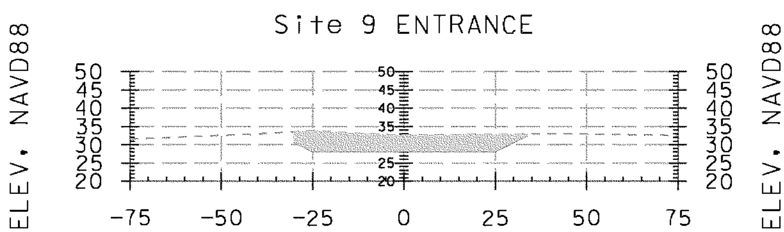
4+00

CV:107.92 CY
FV:0.00 CY

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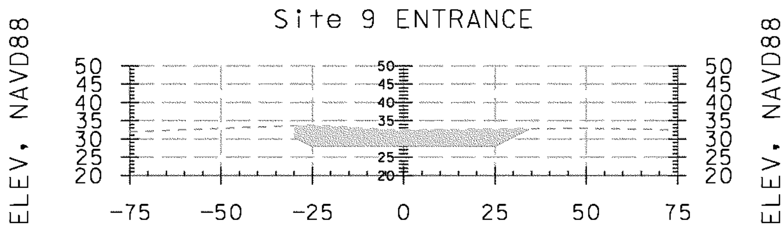
4+10

CV:106.25 CY
FV:0.00 CY

STA.4+20 TO STA.4+40

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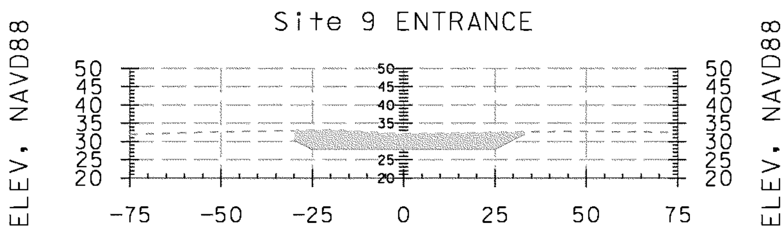
FV:0.00 CY
MO:2499.66

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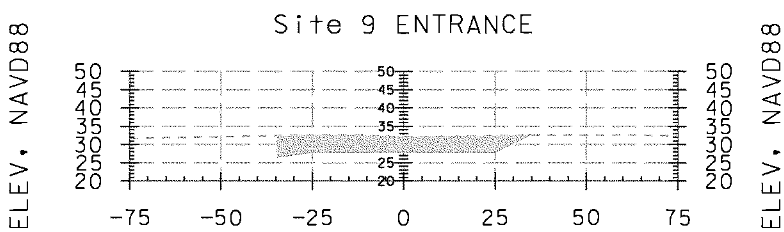
FV:0.00 CY
MO:2600.08

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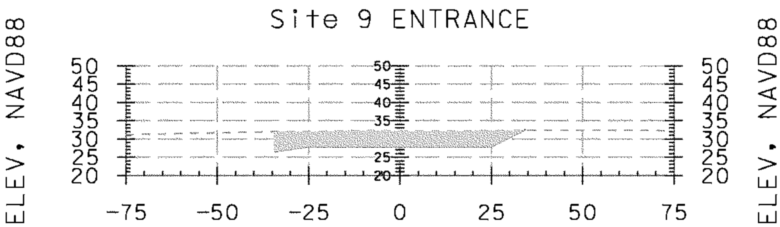
FV:0.01 CY
MO:2702.99

STA.4+50 TO STA.4+70

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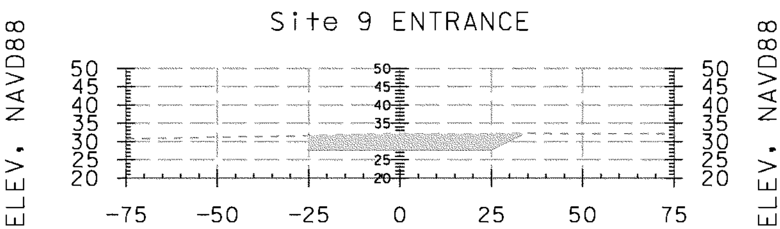
MO:28Ø8.42

4+50

CV:1Ø5.45 CY
FV:Ø.Ø2 CY

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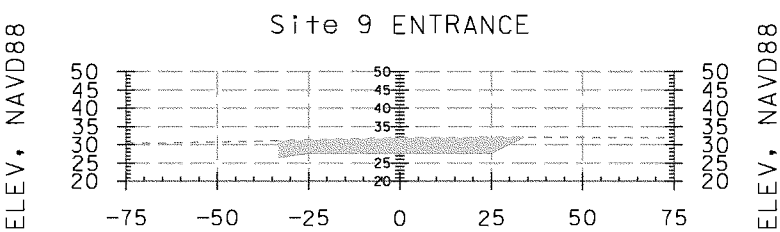
MO:29Ø2.52

4+60

CV:94.11 CY
FV:Ø.Ø1 CY




CA:253.44 SF
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4+70

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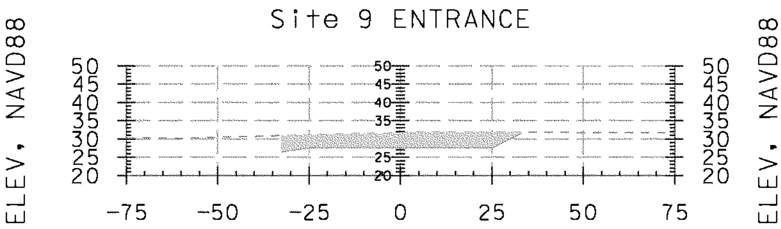
FV:Ø.ØØ CY

STA.4+80 TO STA.5+00

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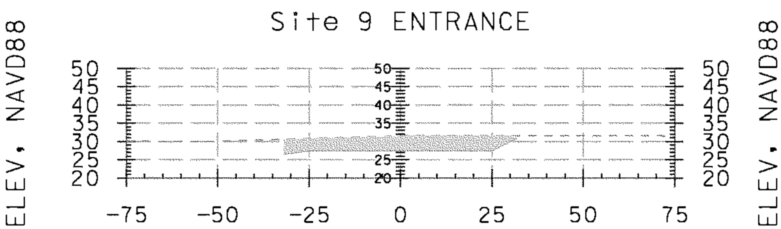


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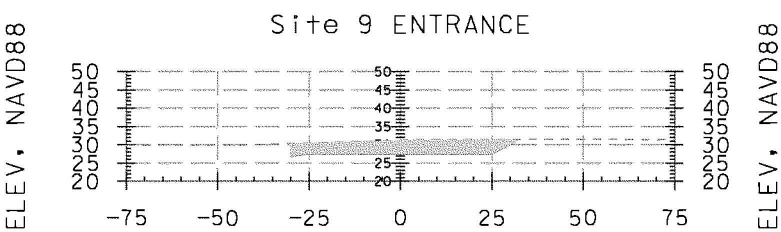


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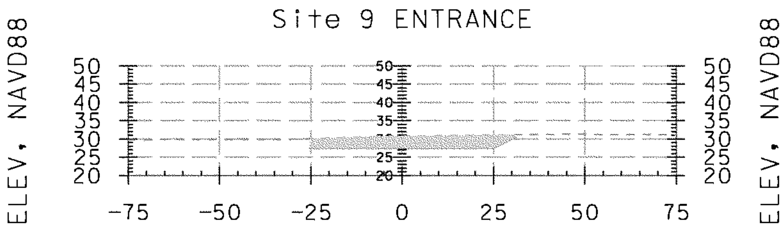
STA.5+10 TO STA.5+30

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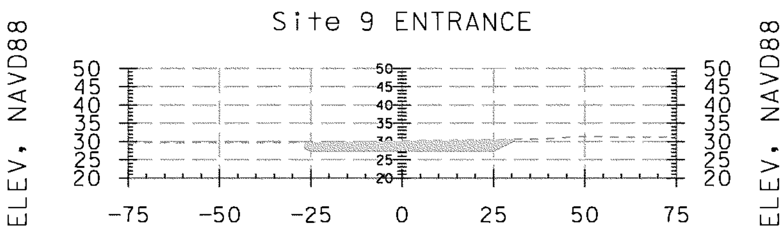
FV:0.00 CY

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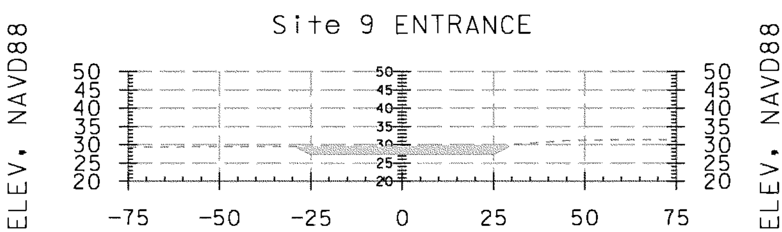


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5+30

CV:49.89 CY
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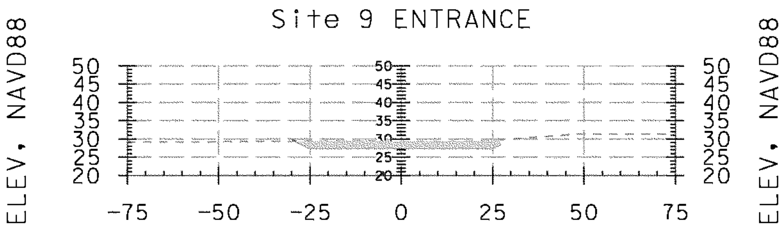
STA.5+40 TO STA.5+60

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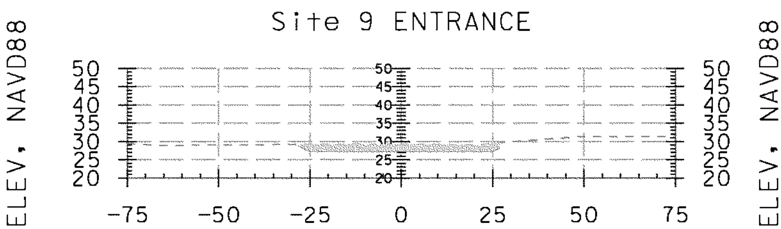


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5+50

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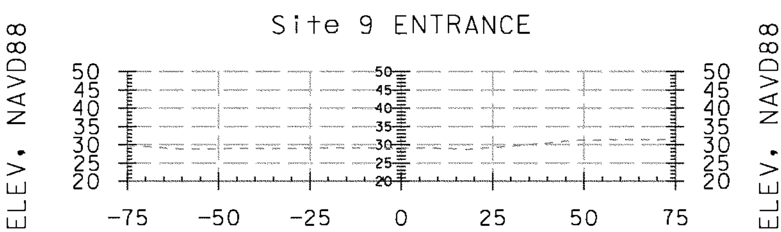


CA:0.00 SF
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MO:3530.82

5+60

CV:17.98 CY
FV:0.00 CY

# Annex H

## *Hydrology and Hydraulics Annex*



Naming conventions for some features included in the recommended plan have evolved over time. The Confluence Levee is locally referred to as the Car Body Levee. The existing agricultural berms, as well as the proposed wetland embankments, near River Mile 9 and the Grange are referred to as "River Mile 9 Levee" and "Grange Levee."

# H-1 Annex to the Engineering Appendix

<u>References</u>

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Collins, 2011. The Floodplain Large Wood Hypothesis: A Mechanism for the Physical and Biotic Structuring of Temperate Forested Alluvial Valleys in the North Pacific.

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USBR, 2014. 2D Modeling of Skokomish River Restoration Concepts for USACE Feasibility Analysis. U.S. Bureau of Reclamation.

## HH ANNEX H-2: Wetland Embankment Analyses

### 1. River Mile 9 wetland Embankment

#### a. Rip Rap Design Calculations: River Mile 9

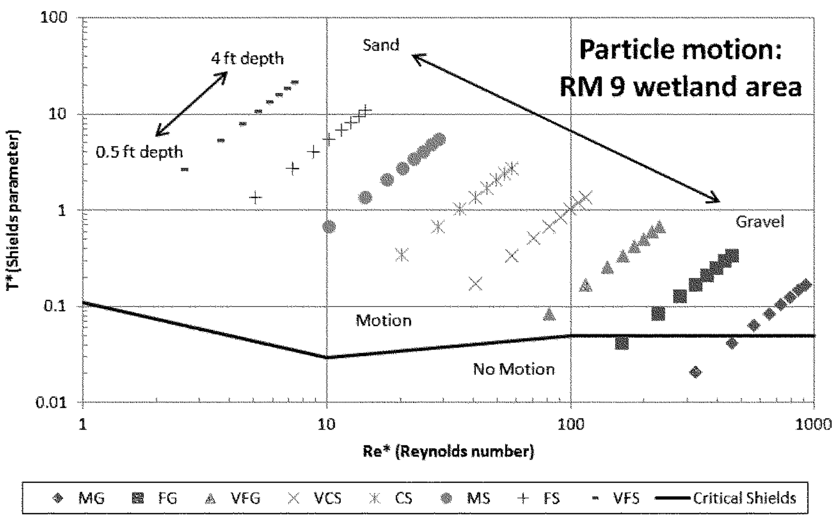
RIPRAP SIZE FOR A GIVEN VELOCITY AND DEPTH

USING GRADED RIPRAP TABLES FROM EM 1110-2-1601

| LAYER | D30CR | DMAXRR | D30 | D50 | D90 | WIDTH | CY/FT | TONS/FT | $/FT |
|---|---|---|---|---|---|---|---|---|---|
| | | # | FT | IN | FT | FT | FT | FT | |
| 3 | 0.58 | 15.00 | 0.61 | 0.73 | 0.88 | 11.18 | 0.776 | 0.040 | 0.00 |

| | | | |
|---|---|---|---|
| RIPRAP SIZE | = LAYER# 3 | DMAX, INCHES = | 15. |
| VELOCITY, FT = | 6.00 | VSS/VAVG = | 1.580 |
| BEND RADIUS,FT = | 230. | TOP WIDTH, FT = | 120. |
| R/W = | 1.917 | VERT VEL CORR, Cv = | 1.226 |
| LOCAL DEPTH, FT= | 5.00 | DESIGN DEPTH = | 4.00 |
| SAFETY FAC, Sf = | 1.10 | STABILITY COEF, Cs = | 0.300 |
| THICKNESS, IN = | 22.50 | THICKNESS COEF, Cv = | 1.250 |
| SIDE SLOPE = | 2.00 | SIDE SLOPE CORR, K1= | 1.180 |
| SP.GR. RIPRAP = | 2.65 | POROSITY, % = | 38.00 |
| CHANNEL TYPE = | NATURAL | COST PER FOOT,$/FT = | 0.00 |

#### b. Sedimentation Analysis: River mile 9



## 2. Grange Wetland Embankment

### a. Rip Rap Design Calculations: Grange

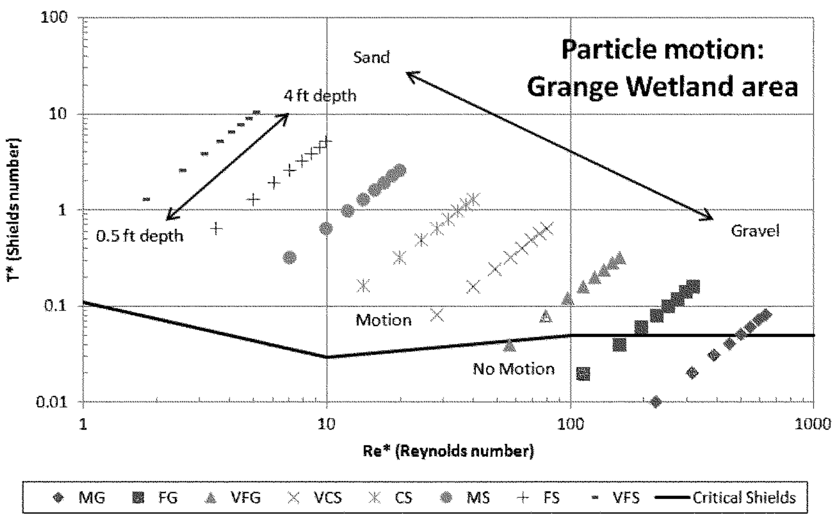
RIPRAP SIZE FOR A GIVEN VELOCITY AND DEPTH

USING GRADED RIPRAP TABLES FROM EM 1110-2-1601

| LAYER | D30CR | DMAXRR | D30 | D50 | D90 | WIDTH | CY/FT | TONS/FT | $/FT |
|---|---|---|---|---|---|---|---|---|---|
| | # | FT | IN | FT | FT | FT | FT | | |
| 3 | 0.56 | 15.00 | 0.61 | 0.73 | 0.88 | 13.42 | 0.932 | 0.048 | 0.00 |

| | | | |
|---|---|---|---|
| RIPRAP SIZE = | LAYER# 3 | DMAX, INCHES = | 15. |
| VELOCITY, FT = | 6.00 | VSS/VAVG = | 1.580 |
| BEND RADIUS,FT = | 430. | TOP WIDTH, FT = | 280. |
| R/W = | 1.536 | VERT VEL CORR, Cv = | 1.246 |
| LOCAL DEPTH, FT= | 6.00 | DESIGN DEPTH = | 4.80 |
| SAFETY FAC, Sf = | 1.10 | STABILITY COEF, Cs = | 0.300 |
| THICKNESS, IN = | 22.50 | THICKNESS COEF, Cv = | 1.250 |
| SIDE SLOPE = | 2.00 | SIDE SLOPE CORR, K1= | 1.180 |
| SP.GR. RIPRAP = | 2.65 | POROSITY, % = | 38.00 |
| CHANNEL TYPE = | NATURAL | COST PER FOOT,$/FT = | 0.00 |

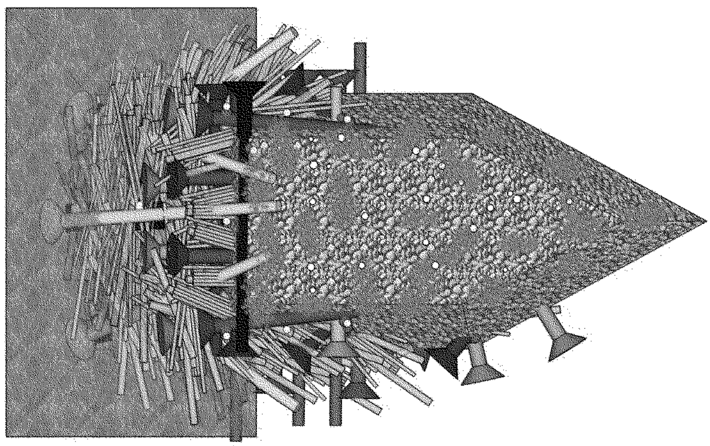
### b. Sedimentation Analysis: Grange

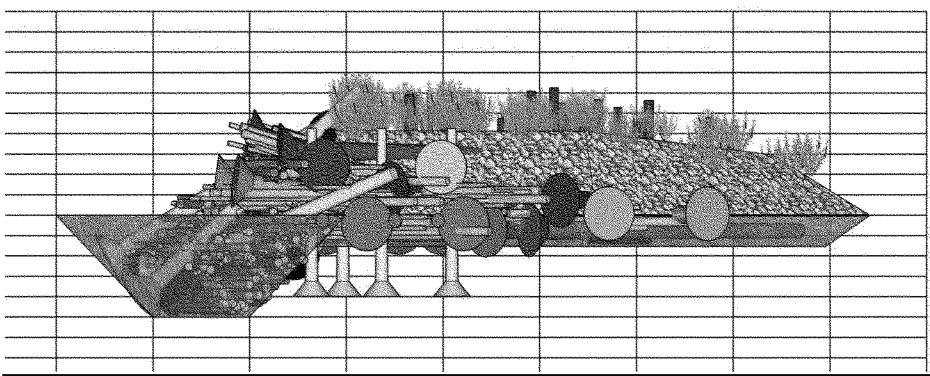


# H-3 Annex to the Engineering Appendix

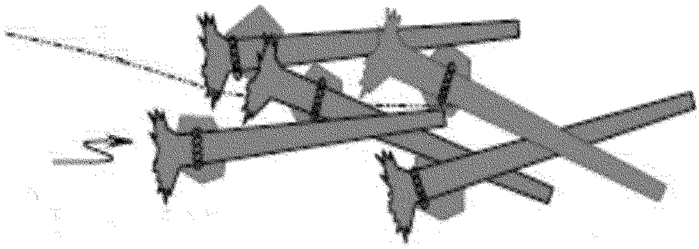
## Preliminary Concept Wood Clusters and ELJ

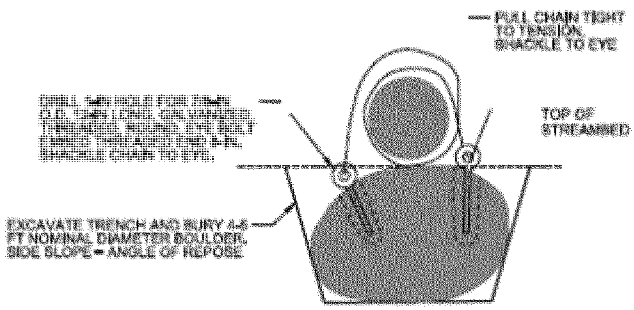
Bar Apex Engineered Log Jam



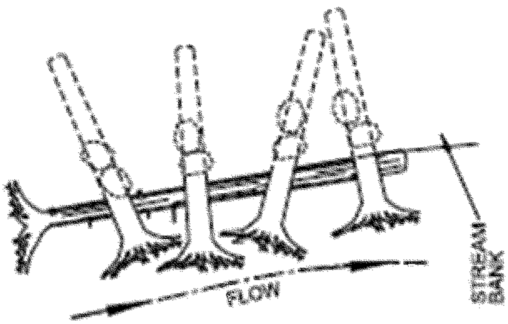


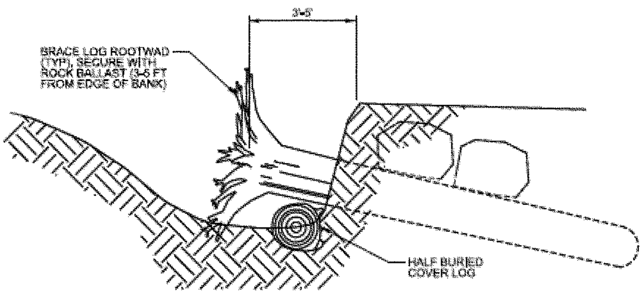
5-Log Channel Cluster



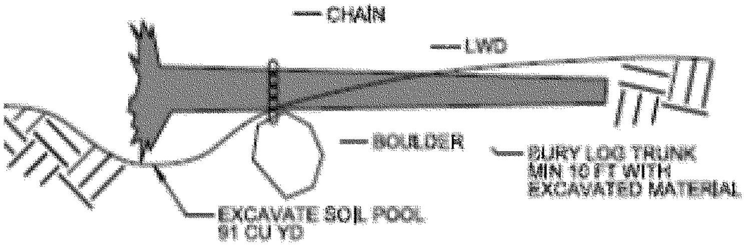


5-Log Bank Cluster

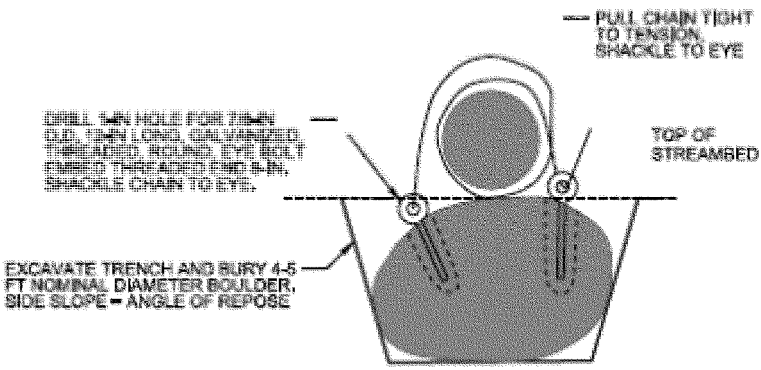


Single Anchored Log



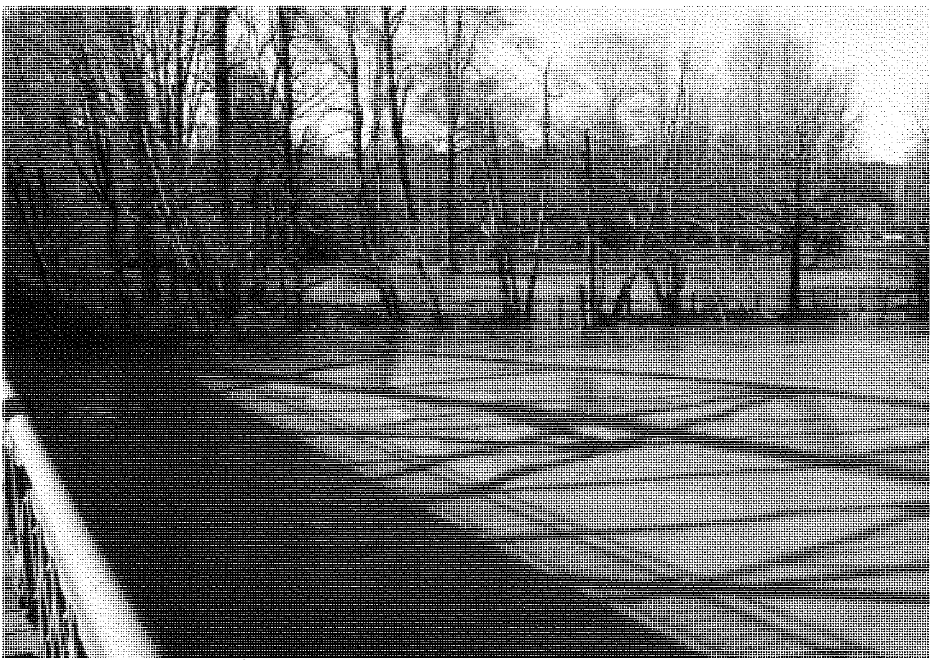

2 SINGLE ANCHORED LOG
NTS



**U.S. Army Corps**
**of Engineers**
Seattle District

# SKOKOMISH RIVER BASIN
# FLOODING AND SEDIMENTATION BASELINE

## FINAL DRAFT



**OCTOBER 2011**

# SKOKOMISH RIVER BASIN
# FLOODING AND SEDIMENTATION BASELINE

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# 1. INTRODUCTION

The Skokomish River valley has a long history of flooding and the problem has steadily grown worse. Richert, in her history of the Skokomish Valley refers to residents reacting to floods in the 1890's and 1900's (Richert, 1964). In 1941, USACE reported that there had been 29 floods in 29 years between 1912 and 1941. The report also states that flooding started when the river reached 13,000 cfs. Now the Skokomish River begins flooding at approximately 4,000 cfs and floods are likely to occur multiple times each year. This increase in flooding has been caused by the long-term accumulation of gravel in the river channels of the South Fork and main stem Skokomish Rivers. The gravel accumulation has recently become large enough that the riverbed has gone dry in late summer in the vicinity of the confluence of the North and South Forks. The dry channel has blocked upstream salmon migration for weeks at a time, until fall rains increase the streamflow. This blockage aggravates the degraded fisheries conditions that have existed since the late 1890's (Richert, 1964).

## 1.1 Purpose

The purpose of this report is to establish the baseline hydraulic and sedimentation conditions in the South Fork and mainstem Skokomish River. The results will provide baselines to evaluate the potential effectiveness and impacts of flood risk management, sediment management, and ecosystem restoration measures. The main components of this effort include: flood profiles, flooded area maps, and sediment transport and deposition analysis. This report will also document the methods used to evaluate flooding and sedimentation. The methods and analysis followed in this investigation satisfy the criteria for a hydrologic, hydraulic, and sediment impact assessment as established in EM 1110-2-1419 *Engineering and Design - Hydrologic Engineering Requirements for Flood Damage Reduction Studies* (USACE 1995) and EM 1110-2-4000 *Sedimentation Investigations of Rivers and Reservoirs* (USACE, 1995).

## 1.2 Study Area

The Skokomish River basin is located in the southeast corner of the Olympic Peninsula in Washington State, and is illustrated in Figure 1. Skokomish watershed is comprised of 3 major tributaries; the North Fork, the South Fork and Vance Creek, and the mainstem Skokomish River. The detailed study area includes the mainstem Skokomish River and the lower 3 miles of the South Fork Skokomish River. Figure 2 illustrates the valley floor, and lists River Miles (RM) for the mainstem, North Fork and South Fork Skokomish Rivers. Environmental concerns focus mainly in the vicinity of the North and South Fork confluence and the mainstem, while flooding impacts the entire valley floor.

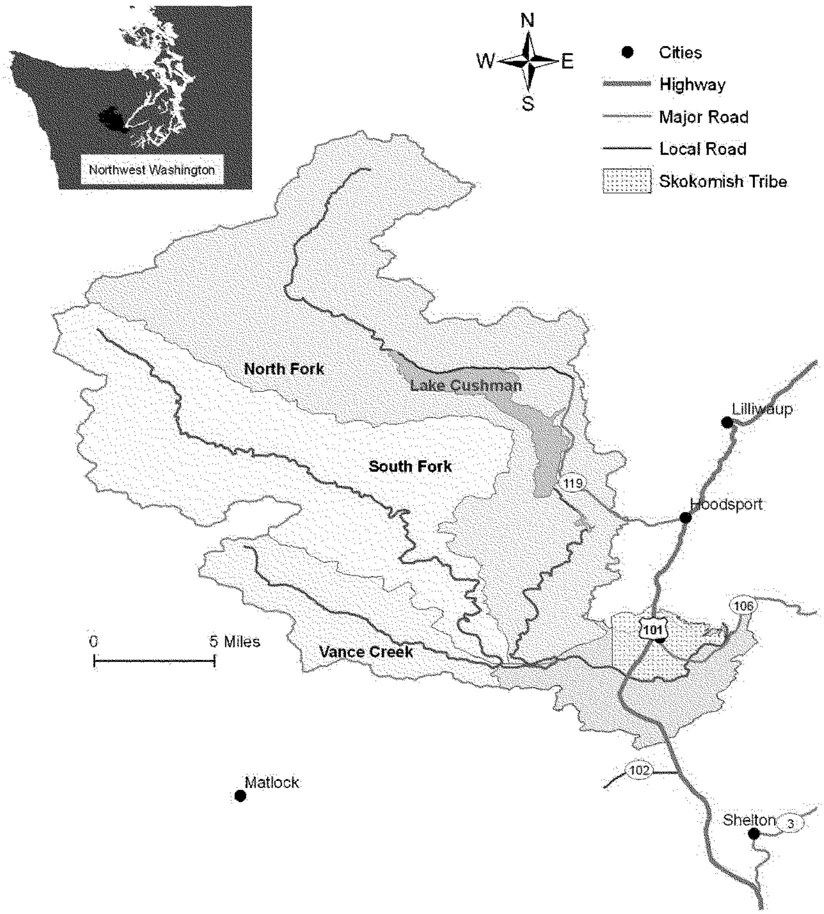


**Figure 1. Skokomish Basin**

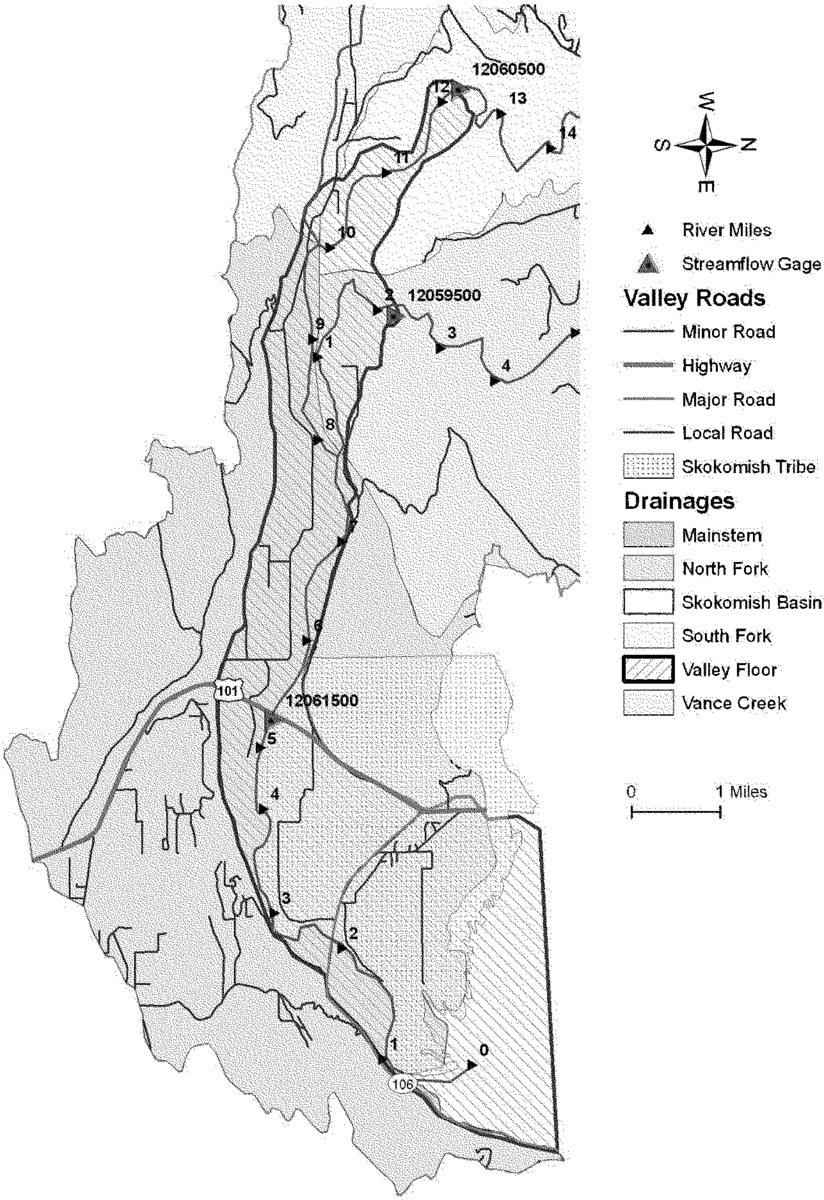


**Figure 2. Skokomish Valley**

## 2. PAST STUDIES

There have been numerous hydraulic and/or sediment studies done in the Skokomish River basin related to flooding, timber harvesting and the Cushman hydro-electric project. Mason County and Federal agencies have actively supported studies to support management of the Skokomish floodplain (HDR, 2005). Federal, State, and private interests have performed numerous investigations of the impacts of timber harvesting and management practices on hydrology and sediment production (Pentec, 1997). Tacoma Public Utilities (TPU) and the Skokomish Tribe both prepared hydraulic and sedimentation reports during the re-licensing process for the Cushman hydro-electric project. Many of those studies were prepared in antagonistic environments and have produced conflicting conclusions about sediment processes.

The earliest flood study was a 1941 USACE report (USACE, 1941). That report noted there had been 29 floods since 1912 (approximately one per year), even with the flood regulation provide by Cushman Hydropower project after 1926. The report states that flooding in the valley begins when the discharge in the main stem reaches 13,000 cfs, and notes "vast amounts of gravel moved by the river in flood stage". USACE considered levees, dredging, and a reservoir as possible actions to reduce flood damages, but concluded that no action was economically justified.

The Federal Emergency Management Agency (FEMA) published the initial Skokomish River Flood Insurance Study (FIS) in 1988, providing one-percent chance exceedance flood elevation and floodway maps for the valley (FEMA, 1988). The one-percent chance exceedance event floodplain covers nearly all the valley floor downstream of the confluence of the South Fork and Vance Creek. The FIS was updated in 1998 and the conventional floodway was replaced with a density floodway (FEMA, 1998). The FIS for the Skokomish Indian Reservation was updated in 2002 (FEMA, 2002).

To help manage the Skokomish River floodplain, Mason County has completed a Comprehensive Flood Hazard Management Plan (CFHMP) (KCM, 1996) and channel avulsion studies (Skillings-Connolly, 1997a, 1997b and 1999, and GeoEngineers, 2006). The CFHMP provides recommendations to reduce flood damages, such as bridge and road modifications for Highways 101 and 106, channel improvements, flood-proofing, and floodplain zoning. Channel improvements included limited dredging, widening, and bank protection on the Skokomish River, and vegetation removal on some tributaries. The avulsion studies assessed the risk, potential mechanisms, and likely locations of channel avulsions. These studies have resulted in Mason County, at the direction of the Western Washington Growth Management Hearings Board, declaring the entire FEMA one-percent chance exceedance flood Skokomish River floodplains to be Special Flood Risk Zones, Floodways, and avulsion risk areas (HDR, 2005).

Federal, State, and private interests have performed numerous investigations of the impacts of timber harvesting and management practices on hydrology and sediment production (Pentec, 1997). Watershed analyses of the South Fork Skokomish River were conducted by the U.S Forest Service (1995), and Simpson Timber and Washington Department of Natural Resources (1997).

The Federal Energy Regulatory Commission (FERC) re-licensing of the Cushman Hydroelectric Project instigated numerous reports on hydrology, hydraulics, and sediment transport as the Skokomish Tribe challenged Tacoma Public Utility's (TPU) environmental impact studies. HARZA Northwest and Simons and Associates (1993), and Simons and Associates (1994, 1995, 1996, 1998a, and 1998b) analyzed flood levels and sediment transport for TPU. Meanwhile, Dawdy (1998), Jay (1992, 1994, 1996, 1998, and 2001) and Watson (1998) addressed hydrologic, hydraulic and sedimentation impacts for the Skokomish Tribe. The potential distance that higher winter releases ("flushing flows") from the Cushman Project could transport bedload in the mainstem Skokomish River was a major point of disagreement.

The U.S. Bureau of Reclamation (Reclamation) recently completed a series of reports on the hydrology, hydraulics, and geomorphology of the Skokomish River basin. While those reports were conducted outside of this USACE study, the scopes of work of both agencies have been carefully coordinated to avoid duplication of effort and to provide the most useful information for stakeholders. Reclamation conducted hydrologic analyses of the South Fork, North Fork, and mainstem Skokomish Rivers in 2007 (Reclamation, 2007) and of Vance Creek in 2009 (Reclamation, 2009c). Those analyses provide the flood frequency data used in this report and are discussed further in Hydrology Section. In 2009, Reclamation completed a geomorphic analysis and 2-dimensional (2-D) flow modeling of the South Fork and mainstem Skokomish Rivers (Reclamation, 2009a and 2009b). The geomorphic analysis examined historic channel positions, soil and sediment characteristics, radiocarbon data, and well logs to develop a geomorphic history of the Skokomish Valley. The report concluded that the river channel had been in a similar position for 400-2,000 years and that the valley had been in an aggradational environment for around 2,000 years. The 2-D hydraulic model provided very detailed information on flood flow patterns and USACE subsequently requested Reclamation to model the baseline floods in the Skokomish Valley.

## 3. GENERAL BASIN CHARACTERISTICS

The Skokomish River basin is located in the southeast corner of the Olympic Peninsula in Washington State. From headwaters in the Olympic Mountains, the North and South Forks flow generally south and southeast respectively, joining near RM 8 to form the Skokomish River that then flows east, discharging into Hood Canal at the Great Bend.

### 3.1 Watershed Description

The Skokomish watershed drains approximately 230 square miles from three major tributary basins, the North Fork (118 square miles), the South Fork (76 square miles) and Vance Creek (29 square miles). Lake Cushman, a large (4000 ac) reservoir in the upper reaches of the North Fork was a natural lake that was dammed and enlarged in 1927 to provide hydropower for TPU.

The upper watershed consists of steep, forested mountains. Above Lake Cushman, most of the North Fork basin is contained by either the Olympic National Park, or is designated Wilderness Area, with minimal development. Below Lake Cushman, much of the land is used for timber production. The South Fork and Vance Creek basins have been heavily logged for timber production.

According to the General Land Office (GLO) survey of 1861, the floodplain consisted of a "forest, swampy and impassible in places, and cut by numerous sloughs which drained the valley into the river" (Canning et al., 1988). The river channel was noted to contain numerous large woody debris jams, some which spanned the channel. Native American tribes inhabited areas near the mouth of the river and Vance Creek, and utilized the river and floodplain for hunting, fishing and foraging. Currently the Skokomish valley is a mix of agriculture and residential, including the Skokomish Indian Reservation that occupies 8.2 square miles in the lower part of Skokomish Valley.

### 3.2 Topography

Northern portions of the Skokomish River basin lie within the southern slopes of the Olympic Mountain Range. The upper reaches of the North and South Forks are located in steep-walled canyons, with the highest peaks in the basins ranging from 4,500 ft to nearly 6,500 ft. (All elevations in this report are in NAVD88 datum.) Mt. Stone and Mt. Skokomish in the North Fork basin are the highest peaks at 6,400 ft and 6,300 ft respectively. Capitol Peak, 5,000 ft, is the highest point in the South Fork basin. The Vance Creek basin lies to the south, just within the foothills of the Olympic Mountains, and has a maximum elevation of around 2,700 ft. All three tributaries enter the valley floor at elevations between 80 and 120 ft. The main valley floor is over a mile wide and slopes to sea level at Hood Canal. While the dominant slope of the valley is downward from west to east, it also has a slight downward slope to the south.

### 3.3 Geology

Two physiographic regions dominate the Skokomish River Watershed, the Olympic Mountains and the Puget Lowlands. The Olympic Mountains are the result of subduction of the Juan de Fuca plate under the North American Plate. Tectonic forces resulted in uplift of the 30 million year old volcanic and sedimentary rocks. Repeated glaciation by both alpine and continental glaciers carved mountain valleys and deposited sediment in the Puget Lowlands.

Continental glaciers scoured, transported and deposited large volumes of sediment during their episodic advance and retreat in the Puget Sound region. Each cycle eroded peaks into plateaus, and deposited this sediment as layers which created the Skokomish valley and the perimeter of Hood Canal. Continental glaciers advanced to a maximum extent of the midpoint of Lake Cushman in the North Fork, the lower third of the South Fork Watershed, and about one half of the Vance creek drainage (Long, 1975). Smaller alpine glaciers occurred on the high slopes of both the North Fork and South Fork watersheds and terminated approximately at the same location as the continental glaciers.

Glacial till was deposited in the Skokomish Valley from both the continental and alpine glaciers. Alpine glaciers carried eroded sediment down the valley, and deposited it in terminal moraines. Continental glaciers were able to carry much larger volumes of sediment as they reshaped land masses, and deposited accumulated sediment at terminal moraines as well. In the Skokomish watershed, the combined sources of loose unconsolidated till from both alpine and continental glaciers have greatly changed the landscape. Lake Cushman, before being enlarged for hydropower was created naturally as the terminal moraine from a continental glacier dammed the North Fork (Long, 1975). On the South Fork, deposited glacial sediment filled the pre-glaciation valley causing the river channel to shift south to its present location (Long, 1975).

Unconsolidated glacial till is prone to landslides as rain soaked top layers become heavier and exceed the stability of the lower layers. This can be found in both landslides and bank failures of the deposited glacial sediment. Each can contribute high loads of sediment to the river system which slowly reworks the materials by erosion and deposition over time.

Following the recession of the last continental glaciers about 14,000 years ago, snowmelt from the alpine glaciers and rainfall runoff has further shaped the valley. Since that time, the Skokomish valley was created by the Skokomish River downcutting nearly 400 feet, and removing approximately 40 billion cubic yards of material into Hood Canal (Pentec 1997). Evidence of repeated fluvial erosion and deposition is visible on parts of N. Sunnyside Road on the North valley wall. Numerous alternating bands of rounded cobbles and gravels with silt/sand stone suggest that the channel has repeatedly shifted locations since the recession of the last glaciers.

While this region is thought to have isostatic rebound totals of near 50 meters (Thorson 1989), current reports put this region in the transition between uplift and subsidence with ground level rates of change likely in the range of -1 to +1 mm/yr (Holdahl et al. 1989; Mitchell et al. 1994; Hyndman and Wang, 1995; Long and Shennan, 1998). Measurements of sea level rise at the National Oceanic and Atmospheric Administration (NOAA) Seattle tide gage with 108 years of data is +2.06 mm/yr (NOAA, 2010a). Combining these two measurements, the Skokomish River base elevation change is between +1 mm/yr to +3 mm/yr.

Episodic shifts in ground surfaces can also be caused by earthquakes. This region contains numerous triggers, and includes fault lines and subduction zones which are capable of earthquakes of magnitudes as high as 7.0 to 9.0+ as measured on a Richter scale (WA DNR 2009). Two major earthquakes (7.0 or greater) are thought to have occurred approximately 1000 years ago on the Seattle fault and a subduction earthquake 300 years ago (8.0-9+) (WA DNR 2009).

Recent interest has been focused on a natural, northwest-trending linear berm first noticed by Brian Collins (Skokomish Tribe) on LiDAR images. State Route 106 follows the top of this berm, and most of the Skokomish Tribal offices are built on it which may explain why these portions are often higher than some flooding. While this is currently being investigated by researchers at University of Washington and Washington Department of Natural Resources (WA DNR), some evidence suggests this berm might be of tectonic origin. Further support can be found in older, tilted and somewhat sheared sedimentary beds that are exposed where the berm runs into the northern Skokomish valley sidewall at the northwest end of the berm (Personal communication with Michael Polenz, 2010).

### 3.4 Climate

Based on weather stations located at Shelton, WA (10 miles SE, Elevation 22 feet and 271feet), Cushman Powerhouse in Potlatch, WA (Elevation 21 feet), and Cushman Dam (Elevation 760 feet), the climate is generally mild with temperate summers and winters. Over 80% of the annual precipitation falls between October and March, with significant snow accumulation above 3,000 ft in elevation. Weather station information for the four NOAA weather stations in the region can be found in Table 1, while monthly mean temperatures and precipitation for these stations can be found in Table 2 (NOAA, 2010b).

**Table 1. Skokomish Weather Station Information**

| | | Period of Record | | | | |
|---|---|---|---|---|---|---|
| Station ID | Station Name | Start | End | Lat | Long | Elev (ft) |
| 451934 | Cushman Dam | 1926 | 1973 | 47.42389° N | 123.21972° W | 760 ft |
| 451939 | Cushman Powerhouse 2 | 1973 | - | 47.37056° N | 123.16° W | 21 ft |
| 457584 | Shelton | 1931 | 1999 | 47.2° N | 123.1° W | 22 ft |
| 457585 | Shelton Sanderson Field | 1999 | - | 47.23° N | 123.13° W | 271 ft |

**Table 2. Skokomish Mean Temperatures and Precipitation**

| Precipitation (in) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CUSHMAN DAM | 16.2 | 11.8 | 10.7 | 6.1 | 3.4 | 2.3 | 1.2 | 1.4 | 3.8 | 9.4 | 14.7 | 17.2 |
| CUSHMAN POWERHOUSE 2 | 13.8 | 10.6 | 9.2 | 5.5 | 3.3 | 1.9 | 1.1 | 1.6 | 2.6 | 7.7 | 15.4 | 15.8 |
| SHELTON | 10.5 | 8.2 | 6.8 | 4.2 | 2.4 | 1.7 | 0.9 | 1.2 | 2.5 | 5.8 | 9.9 | 11.3 |
| SHELTON SANDERSON FLD | 12.4 | 4.2 | 7.0 | 3.6 | 2.6 | 1.0 | 0.9 | 1.4 | 2.1 | 6.8 | 12.1 | 10.9 |

| Temperature (°F) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CUSHMAN DAM | 37.2 | 40.2 | 42.7 | 48.5 | 55.2 | 59.9 | 64.5 | 61.5 | 60.2 | 52.4 | 43.8 | 36.6 |
| CUSHMAN POWERHOUSE 2 | 40.0 | 41.7 | 45.1 | 49.3 | 55.2 | 60.0 | 64.3 | 64.4 | 59.8 | 51.6 | 43.9 | 39.6 |
| SHELTON | 38.9 | 41.6 | 44.7 | 49.5 | 55.7 | 60.4 | 64.7 | 64.7 | 60.0 | 51.7 | 44.1 | 39.9 |
| SHELTON SANDERSON FLD | 39.2 | 40.7 | 43.9 | 47.5 | 54.3 | 59.4 | 65.1 | 64.2 | 58.7 | 50.6 | 42.4 | 38.4 |

Climate variations between basins are largely the result of geographic orientation, elevation, and prevailing direction of approaching storms. Moisture rich air masses from the Pacific Ocean often approach the Olympic Mountains from the Southwest, releasing their moisture due to the effects of orographic lift. Precipitation ranges from between 65 to 80 inches per year in the valley to above 100 inches in the middle reaches. Precipitation maximums are near 120 inches per year in the North Fork, 175 inches per year in Vance Creek and up to 250 inches per year at the upper reaches of the South Fork drainage. Spatial distribution of rainfall can be seen in Figure 3.

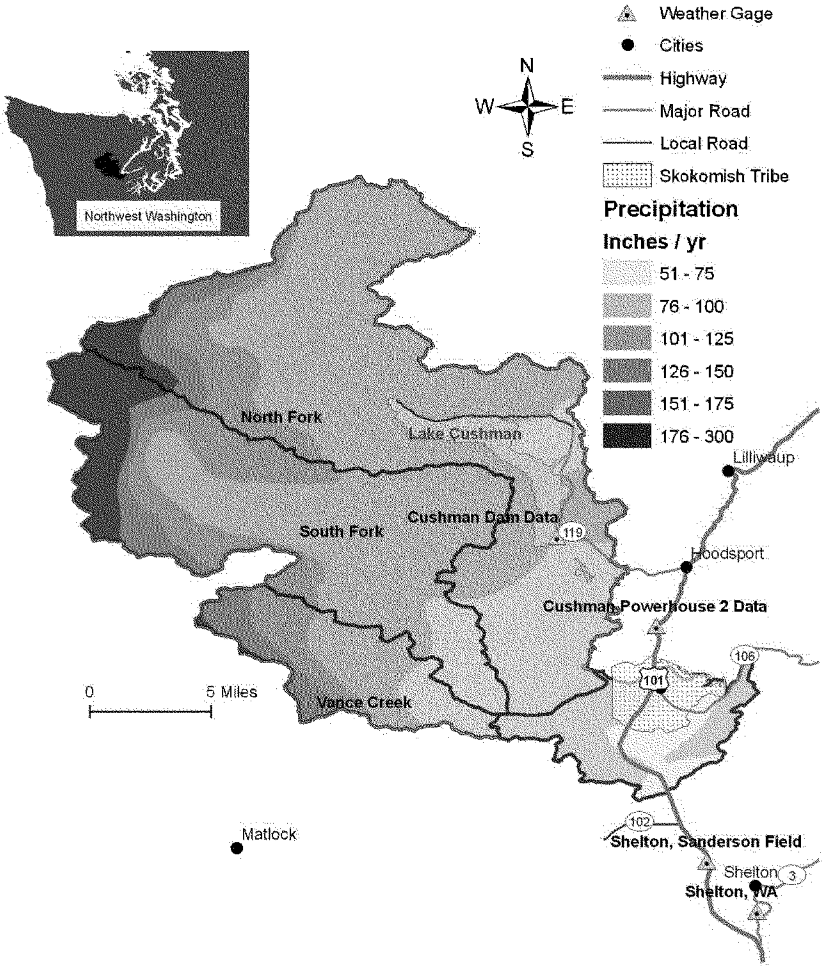


**Figure 3. Skokomish Watershed Annual Precipitation**

**3.5 Human Activities**

European and American settlers first arrived in the valley in 1850s, with the major population growth occurring between 1890 and 1895 (Amato, 1995). The primary human activities that have impacted the rivers have been timber, agriculture, fisheries, hydropower, and transportation. Richert (1964) provides a colorful story of the early pioneer activities in the Skokomish Valley.

Timber harvest initially began in the late 1800's in the valley portions of the Skokomish watershed. Initially, large Douglas fir and cedar trees were cut and then hauled to the river by oxen or horses. The logs were then stored along the river until high flows allowed the logs to be floated to Hood Canal. Floating logs down the Skokomish River required the clearing of numerous natural log jams. In 1891, one jam was described as being 3 miles thick and requiring 18 months to clear (Richert, 1964). As the timber supply dwindled in the valley, harvesting moved gradually up the watershed onto higher, steeper slopes. By 1936 approximately 12,000 acres had been clearcut in the South Fork watershed. Timber harvesting accelerated after 1935, with 46,000 acres being clearcut in the South Fork between 1935 and 1995 (USFS, 1995). Since World War II, there has also been active logging in the Vance Creek and lower North Fork drainages. Lack of access, steeper slopes, and wilderness and National Park lands have protected much of the upper North Fork drainage from logging.

Agriculture began in the valley around 1890 when timber harvesting began to open the floodplain. By the early 1900's most of the Skokomish River floodplain had been converted to pastureland. Floods and bank erosion presented problems for the early farmers. Early attempts to control the river included; clearing debris jams, channel realignments, and bank protection. Rock filled log cribs were used to close side channels, and rock and brush riprap with willows, were used for bank protection in 1935 (Washington (?) Department of Conservation and Development, 1935). In the 1930s and 1940s, the Civilian Conservation Corps (CCC) straightened the channel between RM 4-6 (Canning et al., 1988). The majority of levees were originally constructed in the 1950's and 1960's, and were raised or connected during the 1980's and 1990's (HDR, 2000). Levees, dikes and revetment were built by valley residents using available materials, and were constructed without engineering design or materials. The longest levee is located on the right bank and extends from Swift Creek downstream to about one-half mile downstream of the North Fork confluence (HDR, 2000).

Gravel mining has been done for flood risk management and construction material. The timing and volume of gravel mining are not well documented. Mining areas have included Vance Creek, the North/South Forks confluence, and upstream of Hwy 101 (mined in 1932-32 for highway construction).

Several species of salmon and steelhead are native to the Skokomish River basin. Fishing was an important activity for the Skokomish Tribe long before the Anglo-American settlement of the basin. In the late-1800's, fishing became a popular commercial and recreational activity in the Skokomish River and Hood Canal. By 1899, fish stocks were so depleted that a hatchery was built on the river (Richert, 1964). By 1922, Hood Canal was closed to commercial fishing due to decreased salmon runs (Smoker, et al, 1952). Fish populations remain depressed today and natural runs are supplemented by one state owned fish hatchery and two private fish hatcheries.

TPU's Cushman Hydroelectric Project has altered flows in the North Fork and mainstem Skokomish Rivers, and blocked fish access to the upper North Fork. Historically, 75 percent of the North Fork's annual flow has been diverted out of the drainage to generate electricity. This flow reduction has further reduced the fish habitat in the North Fork. Reservoir storage during flood events has reduced flood discharges in the mainstem Skokomish River. Those flood discharge reductions have in turn altered bedload transport within the North Fork and mainstem.

The construction of highways 101and 106 created embankments that block overbank flood flows. The impact of those embankments has been reduced with the construction of new bridges where SR 101 crosses Purdy Creek and SR 106 crosses the Skokomish River.

## 4. HYDROLOGY

Streamflow characteristics of the Skokomish River basin are primarily driven by rainfall runoff events. Starting in October, winter rains cause an increase in the discharge which peaks between December and the end of January. Streamflow slowly tapers off until approximately the end of July, in which the hydrograph declines to the annual low flow levels from July through September. Upper reaches of the North Fork contain a significant amount of snowpack, which results in a secondary hydrograph peak above Lake Cushman. However, due to flow regulation, median flows downstream of Lake Cushman are greatly reduced and the secondary peak is eliminated.

The South Fork enters the head of the valley at RM 11.5 and is joined by Vance Creek at RM 9.2. Prior to 2004, the South fork/North Fork confluence was at RM 8.4; but after sediment and woody debris blocked that channel, the confluence shifted downstream to RM 7.3 (GeoEngineers, 2006). Since 2004, reaches of the river upstream of the North Fork confluence have gone dry during summer low flow periods due to subsurface flow through many feet of aggraded alluvium.

The hydrologic analysis utilized in this report comes from the U. S. Bureau of Reclamation reports on flood frequency, flow duration and trends for the Skokomish River (Reclamation, 2007) and Vance Creek (Reclamation, 2009c). Reclamation assumed the data followed a log-Pearson Type III (LP-III) distribution. The method of moments was used to estimate the LP-III parameters for peak discharge estimates using Expected Moments Algorithm. Detailed descriptions of the hydrologic analysis are presented in those reports and the pertinent results are summarized in this report.

### 4.1 Streamflow Records

In the Skokomish River basin, there are 5 active U.S. Geological Survey (USGS) streamflow gages. In addition to the 5 active gages, there are 6 decommissioned streamflow gages and one field measurement location on Vance Creek. Gage information including years of recorded data can be found in Table 3 and monthly mean flow for each gage over their respective period of record can be found in Table 4. There is a high degree of uncertainty in the peak discharges for the South Fork and mainstem Skokomish River gages. The South Fork has not been accessible during floods to adequately measure high discharges. On the mainstem Skokomish River, flood discharges are split into four separate channels and cannot be reliably measured. It is important to note that some of the inactive gages only have a few years of record, and caution should be exercised when using this information for statistical analysis. Locations of each gage in the basin can be found in Figure 4.

**Table 3. USGS Streamflow Gage Information**

**Active Gages**

| | | Period of Record | | | | | |
|---|---|---|---|---|---|---|---|
| Station ID | Station Name | Start | End | Lat | Long | Area Sq Mi | Elev (ft) |
| 12056500 | North Fork Skokomish River Below Staircase Rapids | 1924 | 2008 | 47°30'52" | 123°19'43" | 57 | 766 ft |
| 12058800 | North Fork Skokomish River Below lower Cushman Dam | 1988 | 2008 | 47°23'27" | 123°12'30" | | 233 ft |
| 12059500 | North Fork Skokomish River near Potlatch | 1944 | 2008 | 47°19'48" | 123°14'31" | 117 | 66 ft |
| 12060500 | South Fork Skokomish River near Union | 1931, 1995 | 1984, 2008 | 47°20'26 | 123°16'44" | 76 | 106 ft |
| 12061500 | Skokomish River near Potlatch | 1943 | 2008 | 47°18'36 | 123°10'33" | 227 | 14 ft |

**Inactive Gages**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12058000 | Deer Meadow Creek near Hoodsport, WA | 1950 | 1973 | 47°24'56" | 123°13'36" | 2 | 691 ft |
| 12058500 | Dow Creek near Hoodsport | 1950 | 1954 | 47°24'40" | 123°11'15" | 2 | NA |
| 12059000 | McTaggert Creek near Hoodsport | 1950 | 1953 | 47°24'50" | 123°14'25" | 1 | NA |
| 12062500 | Purdy Creek near Union | 1954 | 1960 | 47°18'05" | 123°10'50" | 1 | 32 ft |
| 12057500 | North Fork Skokomish River near Hoodsport, WA | 1913 | 1978 | 47°25'24" | 123°13'16" | 94 | 489 ft |
| 12060000 | South Fork Skokomish River near Potlatch | 1923 | 1964 | 47°23'10" | 123°18'30" | 63 | 459 ft |
| 12061000 | Vance Creek near Potlatch | 1954 | 1985 | 47°19'45" | 123°18'48" | 15 | NA |

**Table 4. USGS Gage Mean Monthly Flows (cfs)**

| Active Gages | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NF S.R. Below Staircase | 716 | 622 | 508 | 514 | 655 | 593 | 336 | 154 | 141 | 371 | 714 | 806 | **511** |
| NF S.R. Below lower Cushman | 77 | 58 | 58 | 71 | 58 | 59 | 58 | 60 | 56 | 54 | 54 | 95 | **63** |
| NF S.R. near Potlatch 1944-1988 | 231 | 214 | 144 | 84 | 51 | 38 | 22 | 13 | 12 | 73 | 190 | 245 | **110** |
| NF S.R. near Potlatch 1989-2008 | 282 | 209 | 171 | 140 | 89 | 77 | 68 | 67 | 63 | 94 | 193 | 312 | **147** |
| SF S.R. near Union | 1,350 | 1,170 | 933 | 741 | 586 | 378 | 222 | 141 | 190 | 537 | 1,160 | 1,500 | **742** |
| S.R. near Potlatch | 2,300 | 2,060 | 1,600 | 1,190 | 835 | 557 | 353 | 253 | 296 | 824 | 1,990 | 2,450 | **1226** |

**Inactive Gages**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Deer Meadow Creek near Hoodsport | 18 | 15 | 12 | 7.3 | 2.9 | 1.7 | 1.2 | 0.92 | 0.85 | 1.9 | 8.5 | 16 | **7** |
| Dow Creek near Hoodsport | 26 | 34 | 10 | 6.1 | 2.5 | 1.2 | 0.56 | 0.32 | 0.29 | 3.6 | 11 | 19 | **10** |
| McTaggert Creek near Hoodsport | 18 | 17 | 4.6 | 3 | 1.3 | 0.4 | 0.02 | 0.01 | 0.02 | 1.5 | 5.3 | 13 | **5** |
| Purdy Creek near Union, WA | 31 | 33 | 32 | 32 | 28 | 22 | 19 | 17 | 15 | 14 | 19 | 25 | **24** |
| North Fork S.R. near Hoodsport | 1249 | 1002 | 758 | 568 | 543 | 598 | 407 | 309 | 493 | 887 | 1175 | 1303 | **774** |
| South Fork S.R. near Potlatch | 1,020 | 1,070 | 675 | 665 | 539 | 349 | 188 | 120 | 151 | 518 | 932 | 1,040 | **606** |

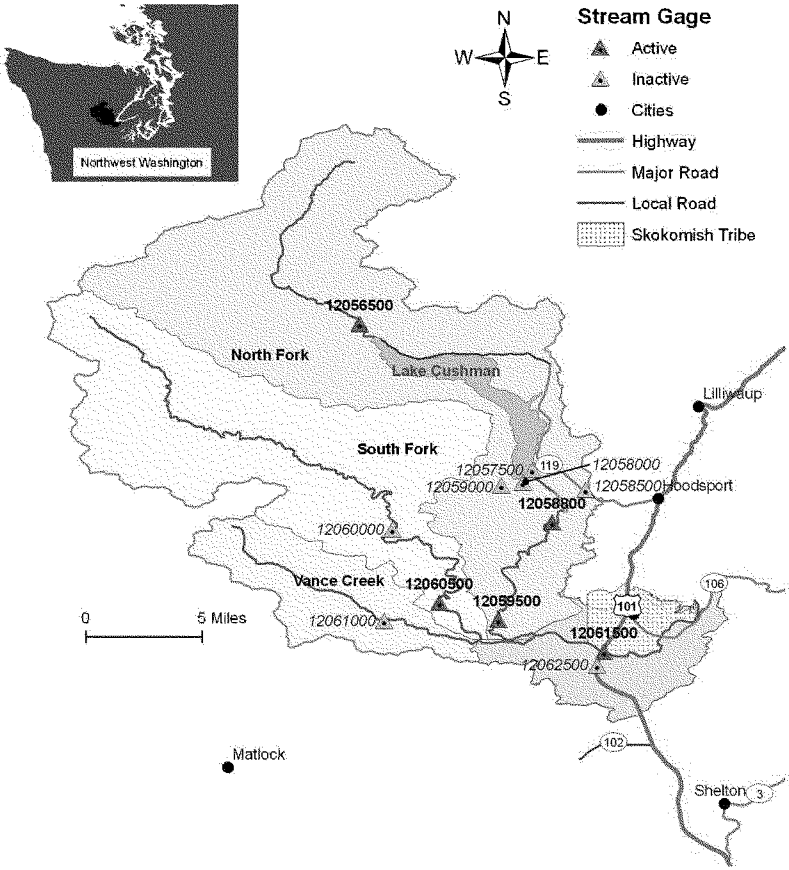


**Figure 4. Skokomish Basin Streamflow Gages**

## 4.2 North Fork

The North Fork Skokomish basin is dominated by Lake Cushman. This was a natural lake that was expanded in 1926 by the addition of a dam at the lower end. A second dam was completed in 1930 downstream of Lake Cushman. TPU diverts water out of the Skokomish basin from the lower dam to Powerhouse Number 2 along the shore of Hood Canal. Basin area above the original dam is 99 square miles, and 119 square miles above the confluence with the South Fork. Between 1913 and 1978, mean annual flow passing below the original dam (Sta No. 12057500) was 774 cfs. For the period between 1989 and 2008, TPU diverted approximately 76% of the North Fork flow. This was computed by mean annual flows for that period from gage 12059500 (147 cfs) in the numerator, and combining mean annual flow from gage 12056500 (528 cfs) with 12059500 (147 cfs) and subtracting gage 12058800 (63 cfs) in the denominator.

4.2.1 Base Flows. It is important to note base flow regulation changes that occurred at TPU's Cushman Power projects. Between creation of the dam and 1988, very small base flows were released from the project. However, starting in 1989, the base flow released to the North Fork was increased to maintain a minimum in-stream flow of 60 cfs, and a new gage was installed (USGS # 12058800). Table 4 divides the period of record for USGS # 12059500 (North Fork near Potlatch) into two time periods to reflect these operational changes.

In January 2009, TPU, Skokomish Tribe and state and federal agencies signed a settlement agreement for the Cushman Project as a part of the Federal Energy Regulatory Commission (FERC) Cushman Project Relicensing (FERC Project No. 460). This agreement resolves litigation against TPU by the Skokomish Tribe, and outlines a minimum volume and distribution of flow releases to the North Fork. The agreement allows some flexibility for modification, but TPU will be responsible for maintaining the following minimum flow requirements found in Table 5 (FERC, 2009). Also incorporated into the document are provisions to allow for releases of "flushing flows" of up to 2,200 cfs for 48 hours, to increase sediment transport in the mainstem.

Table 5. Future Cushman Project minimum flow releases to the North Fork Skokomish River.

| Month | Flow | Month | Flow |
|---|---|---|---|
| January | 150 cfs | July | 100 cfs |
| February | 150 cfs | August | 100 cfs |
| March | 180 cfs | September | 170 cfs |
| April | 180 cfs | October | 180 cfs |
| May | 180 cfs | November | 180 cfs |
| June | 170 cfs | December | 180 cfs |

4.2.2 Flood Frequency. Reclamation (2007) prepared a flood frequency analysis for the North Fork Skokomish River below Staircase Rapids (upstream of Cushman Reservoir. The results of that analysis are listed in Table 6. The TPU Cushman project has substantially reduced flood discharges to the Skokomish Valley; from 1945 through 2006, the peak flow at the North Fork below Staircase Rapids was 24,200 cfs, while after passing through the two reservoirs and diversions, the peak flow at the North Fork at Potlatch during that time period was only 7,740 cfs, a reduction of 68 percent (Those two floods occurred in water years 1950 and 1956, respectively.). For the 62 years of concurrent records, Reclamation found the mean peak flow was reduced by a factor of 3.26, the maximum peak was reduced by a factor of 3.13 and the standard deviation was reduced by a factor of 2.58. Positive trends in annual maximum flows and peaks were observed for the period 1966-2006 on the North Fork Skokomish below Staircase Rapids. Positive trends in peaks were also observed on other rivers in the region, including the Dungeness, Duckabush, and Skykomish for the same period (Reclamation, 2007).

**Table 6. Peak discharge frequency estimates for the North Fork Skokomish River below Staircase Rapids. (From Reclamation, 2007)**

| Annual Exceedance Probability (%) | Return Period (Years) | LP-III Model Estimate (CFS) | 5% Confidence Limit (CFS) | 95% Confidence Limit (CFS) |
|---|---|---|---|---|
| 75 | 1.33 | 4,810 | 4,200 | 5,440 |
| 66.7 | 1.5 | 5,460 | 4,800 | 6,160 |
| 50 | 2 | 6,810 | 6,030 | 7,700 |
| 20 | 5 | 10,500 | 9,250 | 12,100 |
| 10 | 10 | 13,100 | 11,400 | 15,800 |
| 4 | 25 | 16,600 | 14,100 | 21,800 |
| 2 | 50 | 19,300 | 16,000 | 27,500 |
| 1 | 100 | 22,200 | 17,800 | 34,100 |
| 0.5 | 200 | 25,100 | 19,400 | 42,000 |

### 4.3 South Fork

The South Fork Skokomish River is unregulated, and now contributes the majority of the mainstem Skokomish flow. Basin area is approximately 76 square miles. During the 76 years of USGS gage data, the South Fork has a mean annual flow of 742 cfs and is reported to have flashy flows in response to high precipitation events. Compared to the North Fork, the South Fork contributes nearly the same annual discharge, with only 75 percent of the area. This is due to the higher amounts of rainfall in this basin compared to the North Fork. The results of Reclamation's flood frequency analysis are listed in Table 7. Unlike the North Fork, there was no discernable trend in South Fork peak discharges. Previously, Stover and Montgomery (2001) had found no net increase in South Fork peak discharges between the 1930's and 1990's.

**Table 7. Peak discharge frequency estimates for the South Fork Skokomish River near Union. (From Reclamation, 2007)**

| Annual Exceedance Probability (%) | Return Period (Years) | LP-III Model Estimate (CFS) | 5% Confidence Limit (CFS) | 95% Confidence Limit (CFS) |
|---|---|---|---|---|
| 75 | 1.33 | 9,270 | 8,090 | 10,400 |
| 66.7 | 1.5 | 10,300 | 9,090 | 11,500 |
| 50 | 2 | 12,100 | 10,900 | 13,500 |
| 20 | 5 | 16,200 | 14,700 | 17,700 |
| 10 | 10 | 18,400 | 16,800 | 20,600 |
| 4 | 25 | 20,800 | 18,500 | 24,100 |
| 2 | 50 | 22,300 | 19,000 | 26,500 |
| 1 | 100 | 23,700 | 19,100 | 28,900 |
| 0.5 | 200 | 24,900 | 19,100 | 31,400 |

### 4.4 Vance Creek

At only 29 square miles, Vance Creek is considerably smaller than either the North or South Fork's. Vance Creek has an estimated mean annual flow of 249 cfs. Vance Creek discharges an amount comparable to the South Fork Skokomish on a per unit area basis. Reclamation used an inter-basin regression equation between Vance Creek and South Fork Skokomish River to derive the peak flood frequency estimates for Vance Creek listed in Table 8.

**Table 8. Peak discharge frequency estimates for the Vance Creek. (From Reclamation, 2009c)**

| Annual Exceedance Probability (%) | Return Period (Years) | LP-III Model Estimate (CFS) | 5% Confidence Limit (CFS) | 95% Confidence Limit (CFS) |
|---|---|---|---|---|
| 75 | 1.33 | 4,580 | 3,970 | 5,170 |
| 66.7 | 1.5 | 5,120 | 4,490 | 5,740 |
| 50 | 2 | 6,050 | 5,430 | 6,780 |
| 20 | 5 | 8,190 | 7,410 | 8,970 |
| 10 | 10 | 9,330 | 8,500 | 10,480 |
| 4 | 25 | 10,580 | 9,380 | 12,300 |
| 2 | 50 | 11,360 | 9,640 | 13,550 |
| 1 | 100 | 12,090 | 9,700 | 14,800 |
| 0.5 | 200 | 12,820 | 9,700 | 16,100 |

### 4.5 Mainstem Skokomish River

Flows in the mainstem are highly variable under both high and low flow conditions. The mean annual discharge is 1226 cfs. The maximum mean monthly discharge occurs in December and is 2,450 cfs, while the minimum mean monthly discharge occurs in August and is 253 cfs. Since the North Fork confluence shifted from RM 8.4 to RM 7.3 in 2004, the channel between the confluence points has gone dry in late-August and early-September.

**4.5.1 Flood Frequency.** At the USGS gaging site, Reclamation (2009a) estimates the channel capacity at bank full is 4,100 cfs, thus even during small floods most of the upstream flood discharge has left the main channel before reaching the gage site. During large floods the maximum channel capacity at the gage is estimated to be in the range of 6,500-7,000 cfs. Floodwaters exit and re-enter the main channel along the north overbank in the vicinity of the North Fork confluence. On the south side, floodwaters exit the channel starting near Vance Creek and continuing downstream to the gaging site at Hwy 101. The south overbank floodwaters do not re-enter the main channel until RM 3.5 at the Purdy Creek confluence. Most floodwater actually passes under the Purdy Creek bridge on Hwy 101. Downstream of Hwy 101 floodwaters exit to the north and most returns at Hwy 106 (RM 1.9). Reclamation (2007a) mapped the floodwater distribution and flow paths for a range of floods.

The complex flood flow pattern limits the accuracy of Skokomish River flood discharge measurements at Hwy 101 because the discharge is divided into four separate flow paths. For this reason the USGS no-longer publishes Skokomish River peak discharge values above the bankfull condition. Reclamation incorporated these measurement uncertainties into their flood frequency analysis and cautioned that the results presented in Table 9 are considered approximate (Reclamation, 2007). Like the North Fork below Staircase Rapids, a statistically significant, positive trend was found in the annual maximum flows on the Skokomish River for the period 1966-2006.

**Table 9. Annual peak discharge frequency curve for the Skokomish River near Potlatch. Results are approximate and include regulated flows from the North Fork. (From Reclamation (2007))**

| Annual Exceedance Probability (%) | Return Period (Years) | LP-III Model Estimate (CFS) | 5% Confidence Limit (CFS) | 95% Confidence Limit (CFS) |
|---|---|---|---|---|
| 75 | 1.33 | 13,500 | 11,900 | 15,000 |
| 66.7 | 1.5 | 14,900 | 13,300 | 16,500 |
| 50 | 2 | 17,500 | 15,800 | 19,300 |
| 20 | 5 | 23,400 | 21,300 | 25,900 |
| 10 | 10 | 26,900 | 24,400 | 30,400 |
| 4 | 25 | 30,800 | 27,600 | 36,400 |
| 2 | 50 | 33,500 | 29,400 | 40,900 |
| 1 | 100 | 36,000 | 30,800 | 45,400 |
| 0.5 | 200 | 38,300 | 31,900 | 50,000 |

## 5. HYDRAULICS

The Skokomish River valley has a long history of flooding and the problem has steadily grown worse. In 1941, USACE reported that there had been 29 floods in 29 years between 1912 and 1941. Floods are now likely to occur multiple times each year. This increase in flooding has been caused by the long-term accumulation of gravel in the river channels of the South Fork and main stem Skokomish Rivers. Riverbed aggradation is described in Section 6.3 of this report.

Channel capacity at the USGS Highway 101 stream gage (RM 4.8) has been steadily declining due to the ongoing aggradation that has totaled approximately 6 ft since the station was established in 1965. Canning et al. (1988) estimated channel capacity at Highway 101 to have been 11,100 cfs in 1969, shortly after the recent aggradation episode began in this reach of the river, and to have declined to 8,500 cfs in 1988. In 2007, the channel capacity at the Highway 101stream gage was estimated to be only 4,100 cfs (Reclamation, 2007).

Flood problems along the Skokomish River are aggravated by the valley topography that causes floodwater to leave the river and spread across the valley. The predominate valley, and river, slope is a downward trend from west to east. However, there is also a slight downward trend across the floodplain from the north to the south. The general north/south dip is reinforced by the presence of natural levees along the south (right) bank of the Skokomish River. (Natural levees are high ground built-up along riverbanks by the repeated deposition of suspended sediments during floods.) Floodwaters that overflow to the south between RM's 5 and 9 flow south and east across the valley towards Purdy Creek and rejoin the river near RM 3.5, where the main river channel crosses to the south side of the valley.

There is not a continuous, competent, well planned levee system along the Skokomish River. The existing levees, dikes and revetment were built by valley residents to combat local flood problems. The levees were built using available materials, and were constructed without engineering design. Most of the levees along the river were originally constructed in the 1950's and 1960's, and were raised or connected during the 1980's and 1990's (HDR, 2000). The longest levee is located on the right bank and extends from Swift Creek (RM 9) downstream to about one-half mile downstream of the North Fork confluence (RM 7) (HDR, 2000). None of the levees are considered competent enough to provide reliable flood risk reduction, although they do provide some localized relief from the frequent small floods that occur several times a year.

### 5.1 Hydraulic Modeling

When this study was originally scoped, it was planned to use USACE's HEC-RAS, a one-dimensional hydraulic model, to model flooding and bedload transport. However, given the distinct separation of channel and floodplain flows in the Skokomish Valley, it was recognized that two-dimensional (2-D) hydraulic modeling would provide a much better representation of flood hydraulics. In 2009, Reclamation utilized SRH-2D, a 2-D hydraulic model, to model flows in the Skokomish River Valley. The SRH-2D software utilizes a dynamic wave solver to route flow through independent mesh cells and can, therefore, handle multiple water surface elevations and flow paths (Reclamation, 2008). Model outputs include; the extent and depth of flood inundation, current velocities and directions, and flow distributions. A detailed description of this study is presented in Reclamation's report, "Numerical Modeling Results for the Skokomish River, Mason County, Washington. Report No. SRH-2009-24" (Reclamation, 2009a).

Subsequent to the 2009 Reclamation effort, NWS succeed in having SRH-2D added to the "Allowed for Use" category of USACE's inventory of Science and Engineering Technology (SET) Initiative Software and asked Reclamation of perform flood modeling for this study. Reclamation's report on this modeling effort is presented in Appendix A. Maps in Appendix A show the water surface elevation contours and water depths for the 50-, 20-, 10-, 2-, 1-, and 0.2-percent chance exceedance floods.

## 6. FLUVIAL GEOMORPHOLOGY

The Skokomish River channels have undergone notable geomorphic changes since the 1850's. Some of those changes, but unfortunately not all, can be documented from available sources. Richert's (1964) historic account of early pioneers provides a sketch of river conditions around the turn of the 20th century. More recent and technical descriptions of the channels are provided by Stover and Montgomery (2001), GeoEngineers (2006) and Reclamation (2009a). Those sources allow for the limited evaluation of woody debris, channel migration, and riverbed aggradation. However, changes in bedload transport and sediment yields can not be defined from the available data.

### 6.1 Woody Debris

Richert (1964) gives antidotal information about river conditions between the 1880's and 1910. She depicts the river channels as being full of wood debris. Loggers worked to clear the debris jams, so they could transport logs downriver during high discharges. One notable jam, located downstream of the South Fork/Vance Creek confluence (RM 10), was described as being "three mile thick, having been forming for 50 years". That debris jam was cleared in 1891/92 and Richert referred to continuing jam removal in 1903.

Stover and Montgomery (2001) reviewed USGS Discharge Sheets for the South Fork gaging station (RM 12) from the 1930's through 1984. They note large amounts of logs and debris in the river in 1939 and debris removal in 1940. Near channel logging and in channel logging disturbances in the South Fork were observed as late as 1956. They note channel incision around the South Fork gage following LWD removal. Stover and Montgomery also reviewed USGS records for the mainstem Skokomish River gaging station from 1932 to 1997. However, they do not mention wood debris as an influencing factor at the mainstem Skokomish River gaging station (RM 5.5).

The vast amount of natural LWD probably produced very high hydraulic roughness and structural stability in the river channels. As LWD was removed, it is likely that channel velocities increased and sediment stored around log jams was released to the river. Those changes would have altered the bedload transport and deposition patterns.

Today, large woody debris can be found scattered throughout the lower South Fork and mainstem channels. There are some small jams, but no large, channel-spanning debris jams exist today.

### 6.2 Channel Migration

Skokomish River channel migration has been confined to a narrow band along its present course for 400-2,000 years (Reclamation, 2009a). Using historic maps and aerial photography, Reclamation mapped the river channels for several time periods beginning in 1861. Figure 5 shows Reclamation's mapping of those historic channels.

The active channel migration presented bank erosion problems for farmers in the 1800's (Richert, 1964). Early attempts to control river migration included; clearing debris jams, channel realignments, and bank protection. Rock filled log cribs were used to close side channels (such as one at the North Fork confluence), and rock and brush riprap with willows, were used for bank protection in the 1930's (Washington (?) Department of Conservation and Development, 1935). In the 1930s and 1940s, the Civilian Conservation Corps (CCC) straightened the channel between RM 4-6 (Canning et al., 1988). Scattered locations are currently protected by bank armor, such as the County road at the "Dips" (RM 9, just downstream of the mouth of Vance Creek) and portions of the right bank levee between Swift Creek and the North Fork (HDR, 2001). The efforts to control bank erosion have altered the course of the rivers, but have not stopped the channel migration. GeoEngineers (2006) found some river bends to be migrating downstream at rates of up to: 7 feet per year on Vance Creek, 12 feet per year on the South Fork and between 10 and 26 feet per year on the mainstem. Lateral migration rates averaged 7 feet per year on Vance Creek and 9 feet per year on the South Fork. On the mainstem, lateral migration rates varied from 0 feet per year in the vicinity of Highway 101 (RM 4-6), up to 9 feet per year between the old and new North Fork confluences (RM 8-9). The North Fork was found to be generally stable with downstream and lateral migration rates around 1 foot per year due to flow regulation and diversion. In 2003, the confluence of the North Fork with the South Fork shifted downstream by about 1 mile after the old mouth was blocked by sediment.

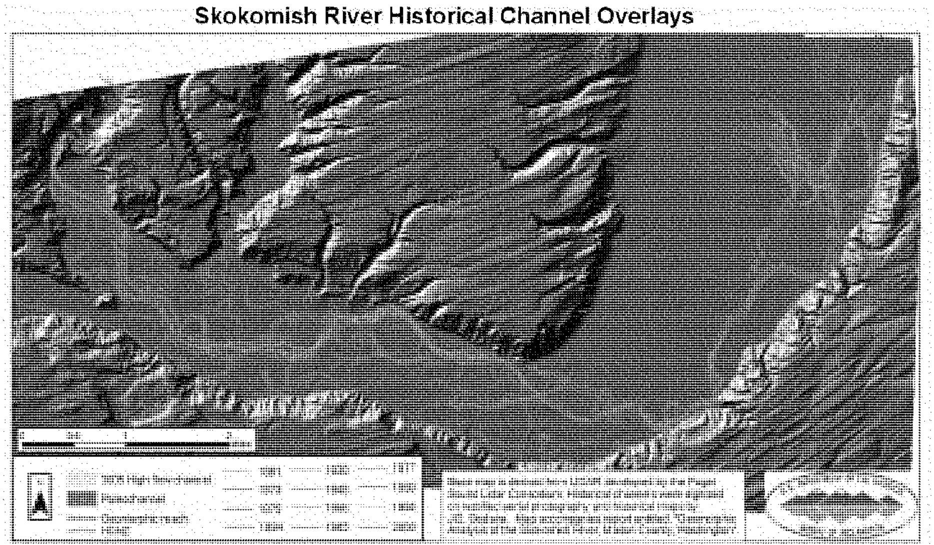


**Figure 5. Skokomish River Historic Channels (from Reclamation 2009a)**

### 6.3 Riverbed Aggradation

Riverbed aggradation, and the resulting loss of discharge capacity, is a critical geomorphic parameter that can be only incompletely evaluated. Richert (1964) does not provide any information about the river channel dimensions or possible aggradation, but does refer to flooding prior to 1900. The nearly annual occurrence of flooding after 1912 (USACE, 1941) suggests an undersized channel existed at that time. A comparison to flood discharges pre- and post-1912 could provide clues to changes in the river channels, but the pre-1912 records are inadequate such a comparison.

There are no channel measurements available for the South Fork and mainstem Skokomish rivers until the 1930's. USGS stream gaging activities provide frequent bed surveys at the South Fork (RM 12) and mainstem (RM 5.3 and 4.8) gaging sites beginning in 1932. Channel cross-section surveys are available for the mainstem and lower South Fork (RM 0-11) for 1994 (KCM, 1996) and 2007 (Tetra-Tech, 2007).

**6.3.1 USGS Gaging Sites Stage/Discharge Analysis.** Stover and Montgomery (2001) examined the USGS stage/discharge records to determine riverbed changes at both the South Fork and mainstem Skokomish River USGS stations. They found the base elevation of the South Fork bed to have been fairly stable between 1932 and 1940, then fell by over 3 ft between 1940 and 1964, and then to have become relatively stable again from 1964 to 1984. Throughout this period, the bed elevations oscillated by 1-2 ft.

Figure 6 shows some of the stage and discharge measurements taken by the USGS at the South Fork gage from 1959 to 2009. This record can be used to evaluate bed elevation changes by equating changes in stage for a given discharge to a change in average bed elevation. The highest recorded stages are those from 1959, during the period of declining bed elevations indentified by Stover and Montgomery. Between 1959 and 1969, the bed appears to have degraded by approximately 0.5 feet, and stayed at or near this elevation until 1996. Between 1996 and 2000, the channel bed degraded by approximately 0.8 feet, and then stayed at that level until after 2007. Provisional USGS data for 2009 suggest that at the South Fork gaging site the channel bed has risen to the elevation range observed between 1969 and 1996, but elevations have not returned to the higher 1959 levels. The annual and shorter time period oscillations in bed elevation, suggest active bedload transport is occurring through this reach. The data do not show any clear long term trend of degradation or aggradation since 1964, indicating a relatively consistent bedload supply, in balance with the transport capacity.

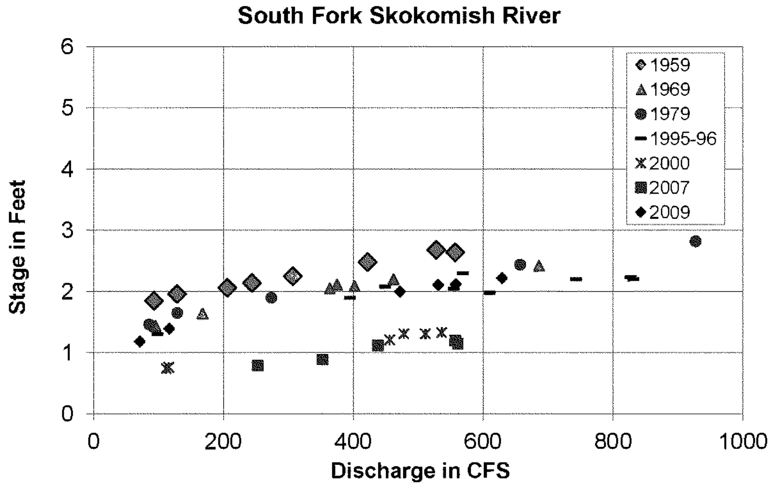


**Figure 6. Stage/discharge measurements at the USGS South Fork Skokomish gage. Stage changes for a given discharge indicate channel scour or deposition. Data for 2009 is provisional.**

At the mainstem Skokomish River gage, Stover and Montgomery (2001) describe a much different pattern in bed elevation changes. The riverbed incised nearly 2 ft between 1932 and 1934, a period that corresponds to gravel mining near the gage. Between 1938 and 1944, the riverbed rose about 1 ft and then changed little until 1964, even though there were short term bed oscillations of over 3 ft between 1944 and 1964. In 1965, the bed began a prolonged, steady rise in elevation. Stover and Montgomery identified a rise of over 4 ft between 1965 and 1997.

Figure 7 shows the stage/discharge relationships measured by the USGS at the mainstem Skokomish River gage from 1984 to 2009. That graph indicates the aggrading trend has continued through 2009, with an additional 1.5 ft increase in stage between 1994 and 2007. This equates to total aggradation of about 5.5 ft between 1965 and 2007, or 0.14 ft per year. Data plotted for 2009 is provisional, and has not been certified by USGS, but show another near half-foot of aggradation since 2007 at this location.

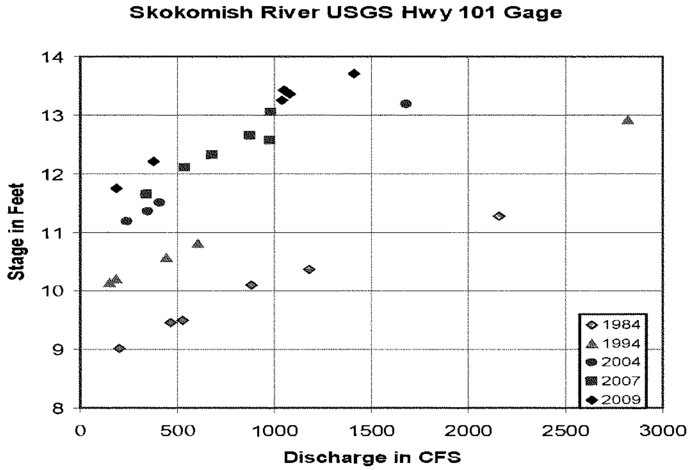


**Figure 7. Stage/discharge measurements at the USGS Skokomish River gage. Stage changes for a given discharge indicate channel scour or deposition. Data for 2009 is provisional.**

**6.3.2 Channel Cross-section Surveys.** A spatially broader (RM 0-11), but more general evaluation of riverbed elevation changes can be made by comparing the channel cross-section surveys taken in 1994 and 2007. Not all cross-sections could be compared because of limited detail in some of the 1994 cross-sections and the degree of shifting in the channel alignment between surveys. Figure 8 shows the bed elevation changes for cross-sections that could be reliably compared. The average overall bed elevation increase is approximately 1 ft. Cross-section elevation increases around the Hwy 101 gage ranged from 0-1.5 ft, compared to the 1.5 ft rise calculated from the Hwy 101 gage records.

Figure 8 shows aggradation to be occurring throughout the river from Highway 106 to the upper study limit on the South Fork. The bed elevation changes in Figure 8 were combined with typical channel widths to estimate that the 1994-2007 deposition volume is between 400,000 and 550,000 cubic yards. That equates to an average annual deposition rate in the range of 30,000 to 40,000 cubic yards per year. Approximately half of that total has been accumulated in the river reach starting about a half-mile downstream of the old North Fork confluence (RM 7.5) and extending a short distance upstream of Vance Creek (RM 9.5). The remainder of the sediment is spread somewhat uniformly through the rest of the study reach.

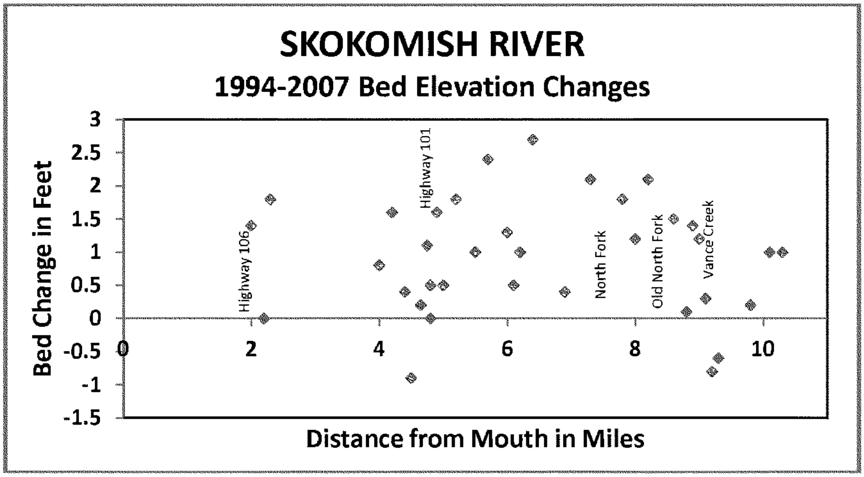


**Figure 8. Cross-section bed elevation changes between 1994 and 2007.**

Recent bedload deposition has occurred throughout the lower 9 miles of the South Fork and mainstem Skokomish Rivers. It is unclear if this has historically been the case. The South Fork gage site bed elevations fell 3 ft between 1940 and 1964, but have been relatively stable since then. The mainstem gage riverbed elevation was stable prior to 1965 and has been rising steadily since 1965. The apparent stability prior to 1965 may be due to the earlier gravel mining near the gage, but this can not be confirmed. The side channel cutoffs would also have altered the sediment deposition patterns. No historic channel cross-sections are available to compare to the 1994 and 2007 cross-sections.

### 6.4 Sediment Sources

The sediment supply to the aggrading reach of the Skokomish River likely originates from several sources, including mass wasting and bank erosion in the upper watersheds, and bank and terrace erosion along the lower reaches of the South Fork and Vance Creek. The most thorough evaluation of sediment supply in the Skokomish River Basin was made by Simpson Timber Company and Washington Department of Natural Resources (ST/WDNR) (1997).

ST/WDNR identified mass wasting sites in the South Fork watershed. They considered the pre-1946 time period to represent pre-logging conditions when there was minimal upper watershed human disturbance. The post-1946 time period included any impacts due to logging activities. They identified 307 pre-1946 mass wasting sites and calculated that they delivered approximately 460 thousand cubic yards (kcy) of sediment to stream channels. Post-1946 they identified 330 mass wasting sites that yielded 300 kcy to the stream channels. ST/WDNR concluded that pre- and post-logging mass wasting rates were similar, with the limitation that the time period for the pre-logging mass wasting was uncertain. The 300 kcy of post-logging mass wasting was split between the South Fork (160 kcy) and Vance Creek (140 kcy). The post-logging mass wasting has generally increased the sediment supply to he upper watershed channels. Approximately 50 kcy of the post-logging (post-1946) South Fork mass wasting occurred in the upper watershed (upstream of RM 25 measured from the mouth of the Skokomish River), where the residence time (the time sediment would remain in the reach before being transported downstream) was estimated to be over 90 years (ST/WDNR, 1997).

ST/WDNR (1997) also assessed the volume of sediment in the South Fork and Vance Creek channels. The South Fork contains 2 million cubic yards (mcy) of active channel sediment upstream of RM 11 and an additional 750 kcy between RM's 8 and 11. In Vance Creek, the active channel sediment volume was 480 kcy. The post-logging mass wasting would account for less than 10 percent of the South Fork active channel sediment and less than 30 percent of Vance Creek's. In addition to the 750 kcy of active channel sediment in the South Fork downstream of RM 11, SR/WDNR (1997) identified 800 kcy of active terrace sediment between RM's 8-11.

### 6.5 Sediment Yields

ST/WDNR (1997) reported estimated bedload transport rate ranges of 14-26 kcy/year for the South Fork and 7-12 kcy/year for Vance Creek. Those estimates compare very favorably to the 30-40 kcy/year of average annual deposition in the Main Stem and lower South Fork channels estimated from the 1994/2007 cross-section surveys by this study.

ST/WDNR (1997) estimated sediment residence times in the upper South Fork (approximately upstream of RM 25) at 92 to 160 years and in the middle South Fork (RM's 14-25) at 23-40 years. With high residence times above the Skokomish Valley, sediment from the upper South Fork channel may not reach the lower South Fork for another 20 to 160 years. Between RM 11 and the confluence with Vance Creek, the residence time was estimated at 42 to 70 years (ST/WDNR, 1997). Therefore, sediment yields from the upper South Fork to the mainstem Skokomish River can be expected to continue for 60 to 230 years.

While the sediment is rapidly transported through the Vance Creek gorge section, residence times immediately below the gorge have been estimated at 42 to 71 years. Sediment residence times below the W. Skokomish Valley Rd Bridge were determined to likely be much longer, leading ST/WDNR to conclude that only limited amounts of timber harvest related sediment from Vance Creek have been delivered to the mainstem Skokomish River (ST/WDNR, 1997).

Sediment characteristics on the North Fork are unique, and are impacted by the operation of Cushman Hydropower Projects. Lake Cushman acted as a sediment trap long before TPU dammed and enlarged the lake. Historically, flows below Lake Cushman would have transported sediment in a similar manner to the South Fork. Currently, only limited flows are allowed to continue down the North Fork, and therefore have a reduced ability to transport sediment to the mainstem channel.

Given the abundant sediment supply and long resident times of the South Fork and Vance Creek, bedload yields can be expected to continue at the current average of 30-40 kcy/yr for many decades. The ultimate timing and rate of delivery will depend on the frequency of large storms capable of generating high bedload transport.

### 6.7 Sediment Modeling

Bedload transport modeling was completed using HEC-RAS 4.1, which incorporates bedload transport equations into a quasi-unsteady 1D flow model of the Skokomish River. The bedload transport function used in this model was the Meyer-Peter Muller (MPM) equation (1948). The MPM bedload equation is widely used in river engineering investigations and is well suited for gravel bedded rivers. The following is a summary of the modeling results. Detailed descriptions of the modeling methods and results are given in Appendix B.

The HEC-RAS hydraulic model was calibrated to the stage/discharge measurements at the USGS mainstem gage (RM 4.8). The hydraulic model matches the gage stage/discharge curve very well up to 5,200 cfs, but does not produce discharges above 5,200 cfs at the gage. The channel discharges at points along the river were also compared to the results of Reclamation's 2-D model (2009a). The two models produced very similar channel discharge patterns.

The computed bedload transport rates are highly correlated with the channel discharge during floods; the bedload transport capacity falls as the river channel loses water to the floodplain and increased when water entered the channel. The modeling results presented in Figure 9, shows the wide variations in channel discharge and bedload transport along the river and between high and low discharges. The modeling results indicate that large amounts of bedload are transported into the lower South Fork during high discharge storm events and that most of that material is deposited upstream of the North Fork confluence. During floods, disposition is predicted throughout the lower South Fork and Skokomish rivers, except for short reaches downstream of the Vance Creek and North Fork confluences.

The model results indicate small volumes of bedload may be re-distributed in the lower South Fork and mainstem during the extended periods of discharges in the 3,000-4,500 cfs range. Those discharges are at or slightly over bankfull discharges and can occur before and after flood peaks or just following a rain storm. The modeling results indicate very little bedload is ever transported downstream of the Purdy Creek confluence area.

The bedload model can be used to evaluate potential responses to changes in channel geometry, such as islands, dredging, or levee set-backs. The model can also be used to evaluate changes in flow regime, such as the new Cushman flows. Without historic channel geometry, the model can not be used to back-calculate past riverbed aggradation.

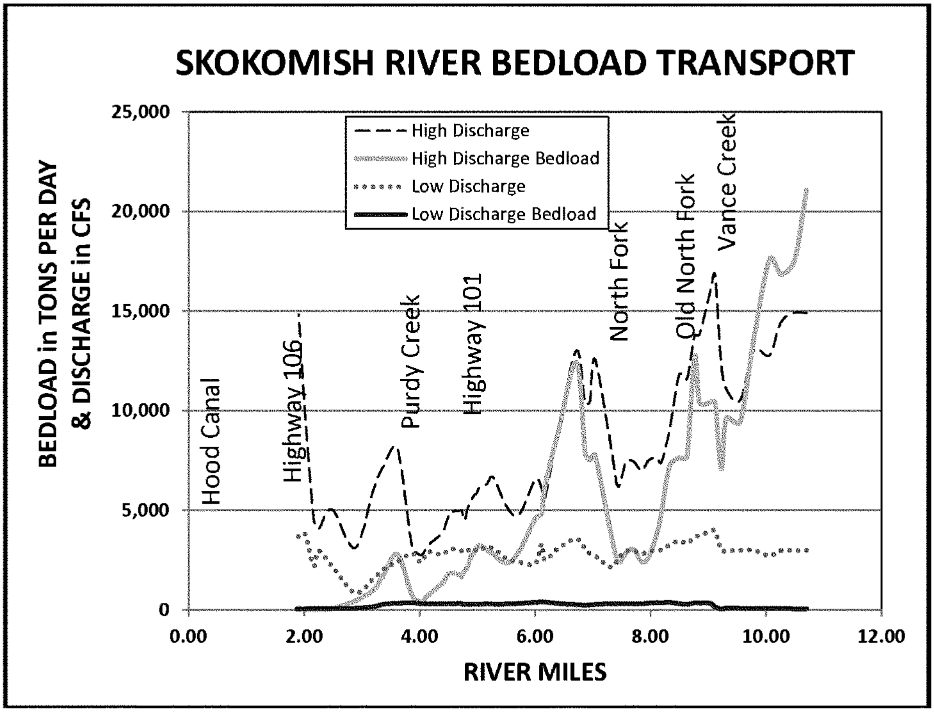


**Figure 9. Skokomish River bedload modeling results showing the water and bedload discharges for high and low river discharge conditions.**

## 7. UNCERTAINTIES AND DATA GAPS

There are limitations in the hydrology, sediment, and topographic data used in this study. Each of those data limitations affects the reliability of the study results.

The accuracy of hydraulic modeling depends on the accuracy of channel cross section and floodplain topography data. Reclamation's 2-D floodplain model and USACE's bedload transport model utilize the most recent channel survey (summer 2007), however that survey does not extend yet downstream of RM 2 to the mouth of the Skokomish River. Both models used the 1994, 2-ft contour maps (Walker, 1994) for overbank topography and could benefit from more detailed surveys of the riverbanks and floodplain flow paths, including Purdy, Weaver, and Skabob creeks. The floodplain modeling could also be improved with additional high water mark data and measurements of the flow distribution in the river channel and floodplain flow paths.

HEC-RAS uses cross-section average hydraulic and sediment size parameters to calculate bedload. This study utilized the Meyer-Peter Muller bedload transport function, a generalized, empirical equation that calculates bedload movement in a river. The Meyer-Peter Muller function produced a good match to observed bedload transport rates at Hwy 101, but was not able to transport the large 16-64 mm particles collected in the bedload measurements. The primary data limitations in this study were the lack of defined inflowing sediment load curves for the South Fork and Vance Creek, the flow distribution in the river channel and floodplain during floods, and channel survey data downstream of RM 2. Those data limitations contribute to the uncertainty of the bedload deposition patterns predicted by the modeling.

There is uncertainty in the peak discharges for the South Fork and mainstem Skokomish River gages. The South Fork has not been accessible during floods to adequately measure high discharges. On the mainstem Skokomish River, flood discharges are split into four separate channels and cannot be reliably measured. The uncertainty of the recorded peak discharges increases the uncertainty of the flood frequency analysis.

When describing the history of the Skokomish River fluvial geomorphology, the channel alignment can be mapped back to the 1800's, but the channel cross-section geometry, flood peaks and frequency, and bedload processes can not be defined that far back. Changes in riverbed elevations can only be evaluated back to the 1930's, and then only at two USGS gage sites. A broader riverbed elevation comparison can be made for 1994-2007, but that does not allow for an evaluation of historic patterns. It is therefore impossible to clearly define how the bedload transport and deposition patterns have changed over time.

## 8. SUMMARY

Riverbed aggradation caused by bedload deposition has aggravated flooding in the Skokomish Valley. The total duration of active riverbed aggradation is unknown, but it has been documented that mainstem aggradation has been underway since at least 1965. It is likely that aggradation was underway prior to 1912 as the frequent flooding experienced at that time suggests an undersized channel already existed. The headwaters of the Skokomish basin contain large volumes of glacially derived unconsolidated sediment. During storms, gravel and cobbles eroded from landslide deposits and active river channels in the upper watershed are slowly transported to the Skokomish Valley channels as bedload. It may take over 90 years for bedload to move from the headwaters of the South Fork and Vance Creek to the Skokomish Valley. In the valley, the South Fork and mainstem Skokomish rivers do not have enough stream energy to transport the incoming bedload to Hood Canal; thus bedload sediment has accumulated in the channels of the South Fork and mainstem Skokomish rivers causing the riverbeds to aggrade. Channel surveys and bedload modeling both indicate that most bedload deposition occurs in the channel upstream of the current North Fork confluence (RM 7.3). Modeling indicates bedload transport is highly correlated to the channel discharge, thus deposition occurs where floodwater flows to the overbanks. The South Fork and mainstem channels have occupied a narrow band along their current alignments for at least 400 years.

The Skokomish River Valley has experienced frequent flooding since at least the early 1900's. The flooding is fueled by abundant precipitation in the headwaters of the South Fork and Vance Creek that averages over 150 inches per year. Riverbed aggradation has worsened flooding in the valley. The channel capacity around RM 5 is estimated to have declined from 13,000 cfs in 1941, to 11,000 cfs in 1969, to only 4,000 cfs today. Flood frequency has increased from around one flood per year in the early 1900's to approximately 3-5 floods per year today. Flooding impacts much of the valley floor, as upstream of Hwy 101 (RM 4.8) floodwaters leave the main channel, and flow south and east across the valley toward Purdy Creek. Downstream of Hwy 101, floods spread across the extensive wetlands on both sides of the river. Because of the broad floodplain, overbank depths tend to be shallow; in many areas flooding is less than 2 ft deep during most floods.

Human activities have altered hydrologic and sediment processes in a variety of ways. Around the turn of the twentieth century, loggers cleared log jams, removed riparian trees, and transported logs in the Skokomish Valley river channels. Those types of actions tend to simplify the channel structure and de-stabilize the river channels. The upper watersheds of the South Fork and Vance Creek were heavily logged between 1935 and 1995, adding to the upper basin sediment supply. Stream stabilization measures, such as bank protection and side-channel closers, have been constructed on Vance Creek, and the South Fork and mainstem Skokomish rivers to protect farmlands from erosion. Limited levees and channel straightening have been implemented to provide localized flood damage reduction. Since 1926, the TPU Cushman Project has reduced discharges in the North Fork over the entire annual hydrograph: from base flows to flood peaks. The flood peak reductions from the Cushman Project have also lowered flood peaks, and probably the frequency of floods, in the mainstem Skokomish River. The reduced flood peaks likely reduced bedload transport in the mainstem, but the magnitude of the reduction is undefined. The Hwy 101 and 106 causeways disrupt floodplain flows, but their impacts on flood elevations are now minimal due to the discharge capacity of the new bridges.

The geomorphic changes caused by human activities have altered the stream habitats. The removal of LWD, disturbance of the streambanks, bank protection, side-channel closures, and flow regulation by the Cushman Project have all contributed to altering the bedload transport and deposition in the South Fork, Vance Creek and the main stem Skokomish River. The removal of LWD has simplified the stream habitat, reducing the occurrence of deep pools that provide sheltered areas for spawning adults and juvenile salmon. Logging activities that disturbed the streambanks and the protection of agricultural lands from erosion lead to construction of bank protection measures. Those measures slowed the migration of the channel and reduced streamside vegetation. Side channel closures eliminated fish access to slack-water, an important rearing habitat.

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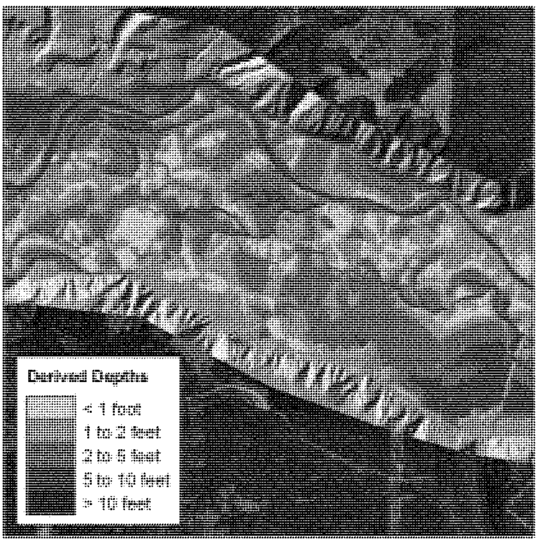
# Appendix A: Reclamation 2-D Floodplain Modeling Report

RECLAMATION
*Managing Water in the West*

Technical Report No. SRH-2011-10

# 2D Hydraulic Modeling of Skokomish River including Vance Creek



# Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

# 2D Hydraulic Modeling of Skokomish River including Vance Creek

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**Bureau of Reclamation**
**Technical Service Center**
**Denver, Colorado**

## Technical Report No. SRH-2011-10

Peer Review Certification: This document has been peer reviewed per guidelines established by the Technical Service Center and is believed to be in accordance with the service agreement and standards of the profession.

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## Acknowledgements

The authors would like to acknowledge the prior modeling work accomplished by Cassie Klumpp of the Sedimentation and River Hydraulics Group that served as a baseline model for this effort. We would like to thank the staff at ACOE for funding support and providing the model input data that was utilized for this effort. We would like to acknowledge the efforts of Mason County Conservation District and the Skokomish Tribal Nation for their assistance with field surveys and support for this effort.

# 1.0 Introduction

The Skokomish River is located at the southeastern portion of the Olympic peninsula in Washington State near the southern extent of the Hood Canal. The river flows east from its headwaters in the Olympic Mountains and descends through narrow gorges to the Skokomish valley. The Skokomish Tribe requested technical assistance from the Sedimentation and River Hydraulics Group at the Bureau of Reclamation to complete a two-dimensional (2D) hydraulic model for the mainstem Skokomish River. The objective of the model is to evaluate channel capacity and overbank flooding locations for the mainstem Skokomish River. The results are to be used in conjunction with one-dimensional hydraulic and sediment transport modeling being accomplished on the same reach of river by the U.S. Army Corps of Engineers (USACE).

To meet this request, an initial 2D model study was funded by Reclamation in 2009 for the lower 10 miles of the Skokomish River and floodplain (Klumpp, 2009). This modeling effort did not incorporate flow input from two major tributaries, Vance Creek or the North Fork Skokomish River due to a lack of topographic and flow data available. The 2009 model also did not incorporate the recently completed Highway 101 Bridge widening on Purdy Creek. In October 2009, USACE funded Reclamation to refine the model to incorporate new topography collected by Reclamation on Vance Creek, the Purdy Creek Bridge widening, along with adding flow inputs at Vance Creek and the North Fork. The new model boundary extends 4 miles up Vance Creek (Figure 1). The model results presented in this report will be used to support an economic analysis of flood impacts in the lower 10 miles of the Skokomish valley. The accuracy of model results is limited because the topography used in the Skokomish valley was primarily taken from a 1998 photogrammetric survey while the bathymetric information was taken from 2007 cross section data. The purpose of this study is to provide a coarse-scale inundation mapping and to determine critical locations where the Skokomish River starts to flow out of bank as river discharges increase.

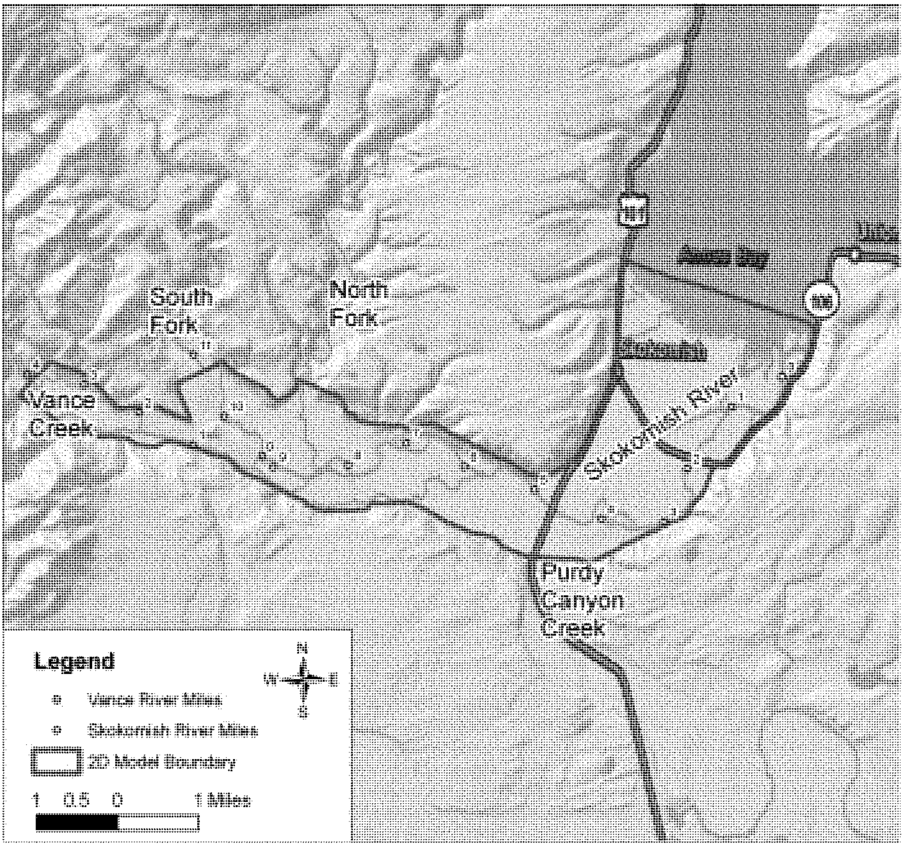


**Figure 5. Location map showing the Vance Creek and Skokomish River model boundary.**

# 2.0 Model Input Data

This section describes discharge, topography, and tide data used for the model. All data are provided in English units with a datum of Washington State Plane South, NAD 1983 and NAVD 1988 feet.

## *2.1 Discharge*

Steady state flow was assumed in all simulations, such that only one discharge value is needed for each flow input location for each model run. Flow input locations were the South Fork Skokomish River, Vance Creek, and North Fork Skokomish River. This approach assumes that all flow originates from one of these sources. Additionally, this modeling effort does not include effects of groundwater losses or gains, which in some cases may substantially alter flood magnitudes and timing since a large portion of the Skokomish River goes overbank into the valley floor.

There are 4 active, relatively long-term USGS gaging stations in the Skokomish Valley (Figure 2). Peak discharge frequency analysis of the 2- through 200-year floods was accomplished for these 4 gages based on gage data through 2006 (England, 2007; Figure 3 and Figure 4). Additionally, the 500-year flood values of 26,400 cfs for South Fork and 41,000 cfs for Skokomish River at Potlatch were generated (Appendix A, England, 2007). This analysis was used to generate input flow values for the South Fork. The North Fork values were set at a constant 200 cfs as specified by USACE due to regulation from upstream dams.

Vance Creek does not have a stream gage and has only a few historical measurements. Flood frequency estimates were generated for Vance Creek by Reclamation for a concurrent study, but were largely based on the South Fork and Potlatch gage data (Kimbrel, 2009). Therefore, for this 2D model effort, the Vance Creek flood values were derived by subtracting each South Fork flood value from the equivalent Potlatch flood value. This assumes that the peaks for each modeled flood occur at the same time on Vance Creek as the South Fork, and does not account for any variation in timing.

The flood estimates are based upon data up to and including 2006, and large floods occurred in December 2007 and November 2009; however, peak values are not currently available for these floods on the USGS web site. Real-time stage values were 18.1 ft for the 2007 flood (new record high) and 17.1 ft for the 2009 flood at the USGS gaging station at Potlatch on the mainstem Skokomish River (at Highway 101 bridge crossing).

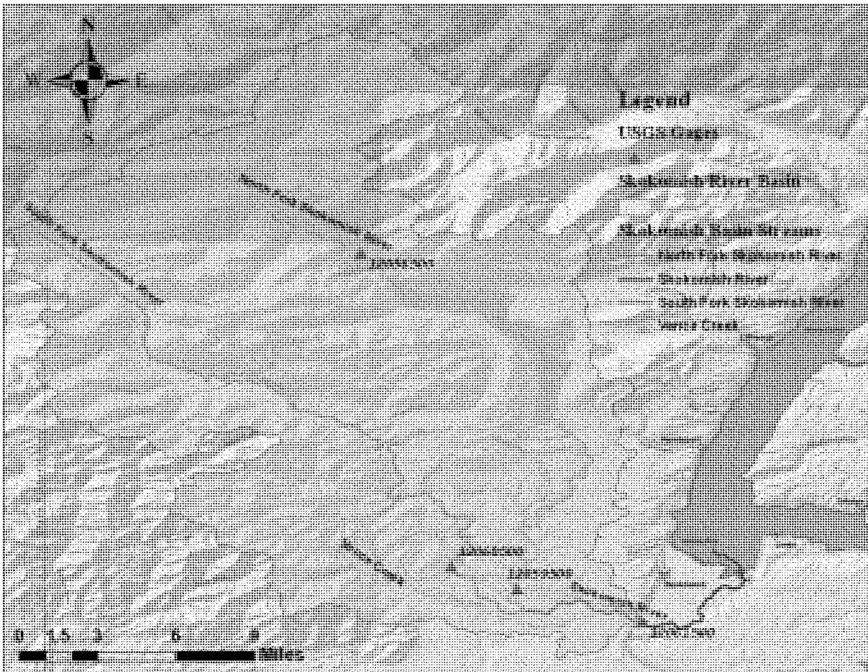


**Figure 6. Location of USGS gaging stations in Skokomish River Basin, WA reproduced from Kimbrel (2009).**

| Annual Exceedance Probability (%) | Return Period (years) | Peak Discharge ($ft^3/s$) | | |
|---|---|---|---|---|
| | | LP-III Model Estimate | 5% Confidence Limit | 95% Confidence Limit |
| 75 | 1.33 | 9,270 | 8,090 | 10,400 |
| 66.7 | 1.5 | 10,300 | 9,090 | 11,500 |
| 50 | 2 | 12,100 | 10,900 | 13,500 |
| 20 | 5 | 16,200 | 14,700 | 17,700 |
| 10 | 10 | 18,400 | 16,800 | 20,600 |
| 4 | 25 | 20,800 | 18,500 | 24,100 |
| 2 | 50 | 22,300 | 19,000 | 26,500 |
| 1 | 100 | 23,700 | 19,100 | 28,900 |
| 0.5 | 200 | 24,900 | 19,100 | 31,400 |

**Figure 7. Peak discharge frequency estimates for the South Fork Skokomish River near Union (reproduced from England, 2007).**

| Annual Exceedance Probability (%) | Return Period (years) | Peak Discharge (ft³/s) | | |
|---|---|---|---|---|
| | | LP-III Model Estimate | 5% Confidence Limit | 95% Confidence Limit |
| 75 | 1.33 | 13,500 | 11,900 | 15,000 |
| 66.7 | 1.5 | 14,900 | 13,300 | 16,500 |
| 50 | 2 | 17,500 | 15,800 | 19,300 |
| 20 | 5 | 23,400 | 21,300 | 25,900 |
| 10 | 10 | 26,900 | 24,400 | 30,400 |
| 4 | 25 | 30,800 | 27,600 | 36,400 |
| 2 | 50 | 33,500 | 29,400 | 40,900 |
| 1 | 100 | 36,000 | 30,800 | 45,400 |
| 0.5 | 200 | 38,300 | 31,900 | 50,000 |

**Figure 8. Peak discharge frequency estimates for the Skokomish River near Potlatch (reproduced from England, 2007).**

## *2.2 Topography*

Four different data sources were used to develop a topographic surface for 2D mesh development:

- 1994 Photogrammetry 2-ft Contour Map
  Source: Bell Walker & Associates
  Description: A Photogrammetry model was built with a stereoscopic drafting station using GPS registered aerial photography. Extends upstream to approximately RM 1 on Vance Creek and 11 on Skokomish River.
- 2002 Bare-earth LiDAR
  Source: Puget Sound LiDAR Consortium
  Description: Bare-earth LiDAR containing the X, Y, Z values of all the LiDAR returns classified as ground.
- 2007 In-channel ground survey of Skokomish River
  Source: USACE, October 2007
  Description: Top of bank to top of bank cross section surveys from RM 10 to 2.
- 2009 In-channel ground survey of Vance Creek
  Source: Bureau of Reclamation, July 2009
  Description: In-channel cross-section data for RM 0 to 4 of Vance Creek. Generally does not include top of bank.

To develop the topographic surface, the 1994 Photogrammtery contour data was used as the baseline data set. The 1994 Photogrammtery data set was specified by USACE instead of the 2002 LiDAR data because of concerns that the LiDAR did not have a thorough post-processing effort to remove vegetation. The 2009 model report reported that the model mesh built from the LiDAR dataset typically had a water surface elevation about 1 foot higher than the model mesh built from the Photogrammetry dataset. In addition, the bank elevations in the LiDAR data are higher because the vegetation was removed and the higher bank elevations increase the computed conveyance in the main channel. The Photogrammetry is considered to have a more accurate representation of the channel bank elevations, relative to 1994 conditions.

Where photogrammetry data was not available within the mesh boundary, such as above RM 1on Vance Creek, the bare-earth 2002 LiDAR data was used. The following refinements were then made before generating a continuous above and below water surface in a geographical information system (GIS):

- The below water portions of the Skokomish River and Vance Creek were delineated and photogrammetry and LiDAR data within these bounds were deleted.
- For the mainstem Skokomish River, the photogrammetry contours were replaced with a set of channel elevation points based on the 2007 cross-section data and interpolated points between cross sections (Klumpp and Bountry, 2009).
- For Vance Creek, the photogrammetry contours and LiDAR data were replaced with a set of channel elevation points based on the 2009 cross-section data and interpolated points between cross sections.
- Between RM 2 and 0, where no channel survey data was available, topographic elevations were estimated by creating a sloped channel that smoothly transition from 6 ft at RM 2 to 0 ft at RM 0.
- At the Purdy Creek bridge embankment, a design drawing provided by USACE (generated by WDOT) was used to estimate the stream geometry after the bridge was completed in late 2009. No as-built data was available, and, therefore, photogrammetry was utilized for the side channel which does not include the channel elevations below water.

In summary, the limitations of the topographic data sets are:

- No survey data was available for the below water portions of the Skokomish channel downstream of RM 2.
- No survey data was available for the North Fork that represents recent channel changes or wetted areas.
- Hydraulic controls (riffles) on the mainstem channels that influence water surface elevation may have been missed if they were not captured by the cross-section surveys.

- In many densely vegetated areas LiDAR data did not have vegetation removed in the bare earth model.
- Photogrammetry data is over a decade old.
- Channel survey data was not available for wetted areas of the floodplain, including Purdy Creek, Weaver Creek, and Skabob Creek. Some 1D cross-sections are available but are over a decade old and the original survey data could not be located to geo-reference the information.

## 2.3 Tide Data

The Seattle District of USACE provided tide data retrieved from the nearest NOAA web site which is located at Union in the Hood Canal, Washington (Station ID: 9445478) (http://www.tidesandcurrents.noaa.gov). USACE specified that a typical high tide of 12 ft (MLLW) should be utilized for scope of work. The value of 12 ft was converted to a value of 9.2 ft to be in the same NAVD 88 vertical datum as the topographic data (subtraction of 2.84 ft based on the Union benchmark sheet; verbal communication from NOAA, January 2010). A typical daily hydrograph of the tide from the latter part of January 2010 is shown in Figure 5 (written communication from USACE, December, 2009).

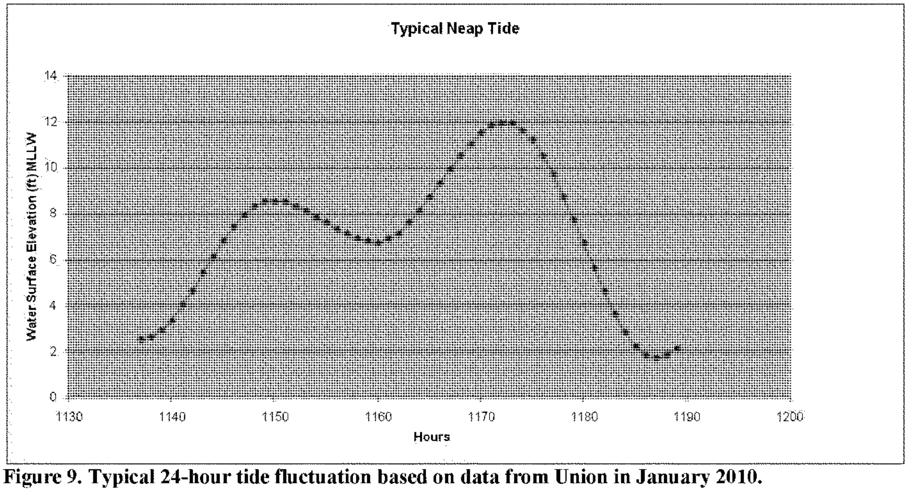


**Figure 9. Typical 24-hour tide fluctuation based on data from Union in January 2010.**

## 2.4 Manning's Roughness

Roughness values for the floodplain were based on values presented in the 2009 modeling study (Klumpp and Bountry, 2009). Manning's roughness values for Skokomish River and Vance Creek were computed based on a relationship between the measured $D_{50}$ of the bed-material and the average hydraulic radius of the main channel computed from a 1D HEC-RAS model (Lopez and Barragán, 2008; Morvan et al, 2008).

The bed-material data consisted of 14 samples on the Skokomish River (RM 0.3 to 11) collected in 2006 and 9 samples on Vance Creek (RM 0.04 to 3.55) collected in 2009. The measured $D_{50}$ varied from 9 to 84 mm on the Skokomish River and from 17 to 82 mm on Vance Creek. For both rivers, the bed material sediment sizes decreased in the downstream direction, which results in a decrease in Manning's n value in the downstream direction (Figure 6 and Figure 7). Roughness values on the Skokomish River were slightly modified from values used in the prior 2009 modeling effort.

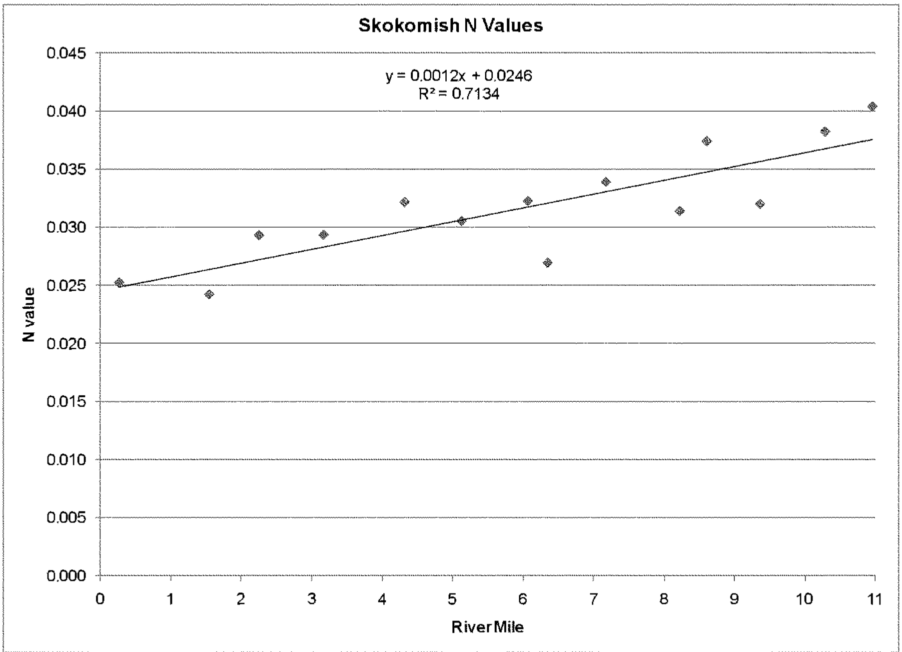


**Figure 10. Correlation of roughness (n) value by river mile based on variation in the measured $D_{50}$ of bed sediment along the Skokomish River.**

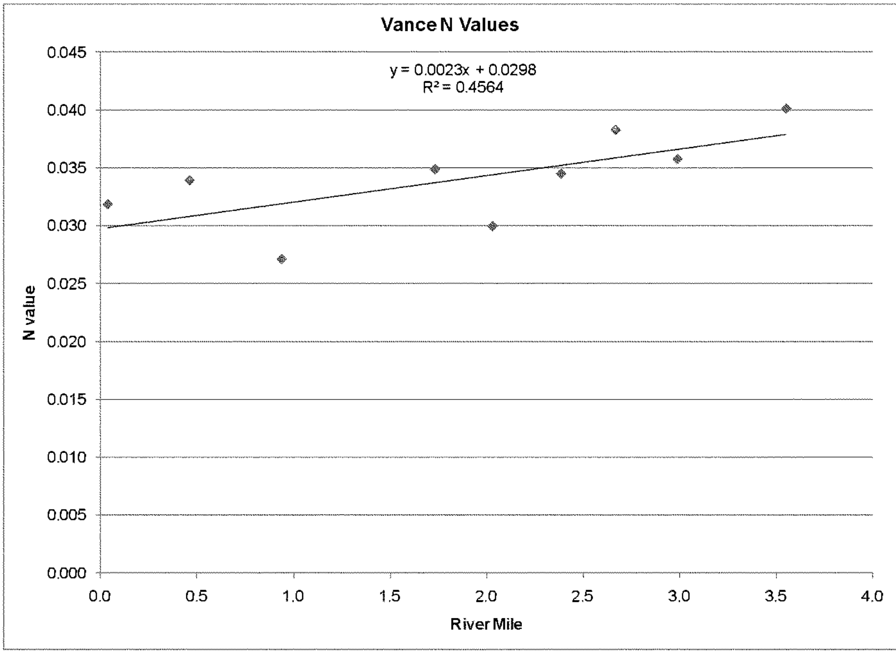


**Figure 11. Correlation of roughness (n) value by river mile based on variation in the measured $D_{50}$ of bed sediment along Vance Creek.**

# 3.0 Model Description and Setup

A two dimensional (2D) numerical model, SRH-2D v2, was used for analysis of the Skokomish River (Lai, 2006; **http://www.usbr.gov/pmts/sediment/model/srh2d/index.html**). SRH-2D solves the 2D depth-averaged form of the dynamic wave equations. The dynamic wave equations are the standard St. Venant depth-averaged shallow water equations. The model utilizes an implicit scheme to achieve solution robustness and efficiency. Steady flow was utilized for the model described in this report. All flow regimes, i.e., subcritical, transcritical, and supercritical flows, were simulated simultaneously. The following sections document the model domain, generation of the model mesh, roughness delineation, model parameters, and boundary conditions.

## *3.1 Model Domain*

Because of new topographic data available from the July 2009 surveys, the model was extended farther upstream on Vance Creek to about RM 4. The model was also extended a short distance up South Fork to include the upstream extent of available 2007 channel survey data provided from USACE. The model extent is shown in Figure 1.

## *3.2 Mesh Development*

The mesh was developed using a combination of quadrilateral and triangular elements in the SMS software (version 10.1) (Figure 8). The mesh was generated by first dividing the study reaches into unique polygons based on roughness variations (see next report section). Channel polygons were further sub-divided to orient cells parallel to the direction of flow and perpendicular to banks. Polygons were then refined to distinguish areas where levees and major roads are present. Elevations were generated for the mesh nodes by utilizing the 4 topographic data sources described in Section 2.2.

The mesh has the following features:

- Unstructured mesh with quadrilateral and triangular element configurations
- Existing conditions mesh
    - 174,162 elements (mesh cells)
    - 153,843 nodes
    - Typical cell size of 10 ft by 30 ft in the river area varying up to 75 by 75 ft in the floodplain where less topographic relief occurs
- 15 quadrilateral cells are generally used to defined the active, unvegetated channel perpendicular to flow.
- Tightest density of cells used in channel areas and where rapid changes in elevation occur that may influence floodplain inundation

- Lesser density of cells was used in floodplain areas where there is less elevation change (topographic relief).

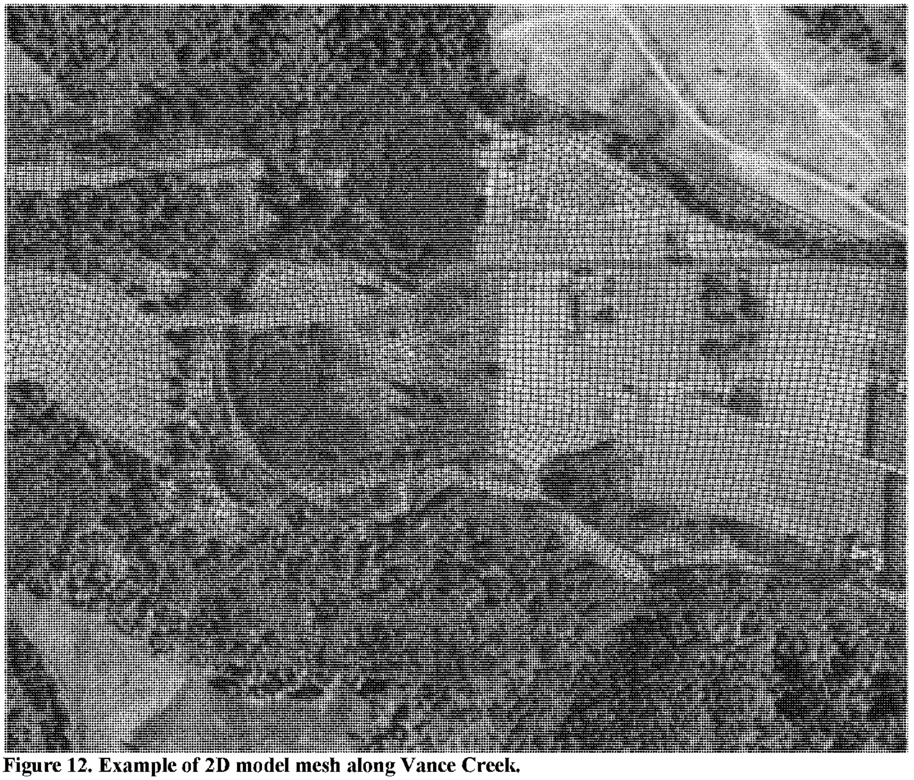

**Figure 12. Example of 2D model mesh along Vance Creek.**

## *3.3 Roughness Delineation*

Delineation of roughness for the model mesh was based on mapping and values from the 2009 modeling effort with the exception of the following updates:

- Roughness values for the main channel were updated based on trends in the $D_{50}$ and channel hydraulics for the Skokomish River and Vance Creek (see Section 2.3). The same roughness boundaries were utilized as the 2009 study.
- New floodplain areas where the mesh was extended 3 miles upstream on Vance Creek and about 0.5 miles on South Fork were delineated based on 2006 aerial photography.
- The Purdy Creek bridge widening area was refined to distinguish Purdy Creek and Weaver Creek.

- The estuary was modified to further refine areas of cleared vegetation.

**Table 6. List of roughness values utilized in existing conditions model.**

| Material Number Designated in Mesh | Manning's Roughness Value | Description |
|---|---|---|
| 1 | .036 | Skokomish RM 9-10 |
| 2 | .032 | Skokomish RM 4-8 |
| 3 | .028 | Skokomish RM 2-3, Purdy Creek Area |
| 4 | .030 | Crop land, cleared vegetation areas |
| 5 | .08 | Vegetated |
| 6 | .015 | Roads |
| 7 | .05 | Levees |
| 8 | .032 | Vance RM 0 to 1.5, includes historical Vance Creek channel near present confluence with Skokomish River |
| 9 | .034 | Vance RM 1.5 to 2.5 |
| 10 | .037 | Vance RM 2.5 to 3.5 |
| 11 | .039 | Vance RM 3.5 to 4 |
| 12 | .026 | Skokomish RM 0 to 1 |

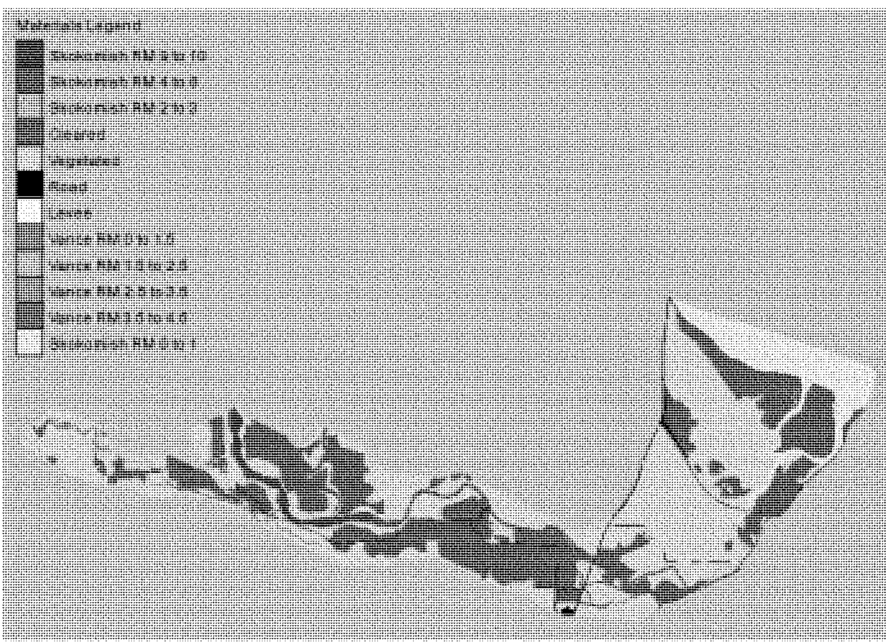

**Figure 13. Delineation of roughness boundaries in 2D model mesh.**

### 3.4 Model Parameters

Model runs used a time step of 0.5 second. Computations were continued until model results for discharge at monitoring lines and water surface elevations at monitoring points stabilized and differences in results between time steps were negligible. Model runs were usually started with no flow in the river, except for a few cases where refinements were made and a previous model solution was available as a starting condition.

### 3.5 Boundary Conditions

The upstream model boundary included incoming flow at the South Fork, Vance Creek, and North Fork as designated in Table 2 (see Section 2.2 for how the values were determined). The downstream model boundary consisted of a tidal elevation of 9.2 ft (see Section 2.3).

**Table 7. List of model input data for discharge boundaries.**

| Return Period | North Fork | South Fork | Vance Creek | Main Stem |
|---|---|---|---|---|
| year | cfs | cfs | cfs | cfs |
| 2 | 200 | 12,100 | 5,200 | 17,500 |
| 5 | 200 | 16,200 | 7,000 | 23,400 |
| 10 | 200 | 18,400 | 8,300 | 26,900 |
| 50 | 200 | 22,300 | 11,000 | 33,500 |
| 100 | 200 | 23,700 | 12,100 | 36,000 |
| 500 | 200 | 26,400 | 14,400 | 41,000 |

# 4.0 Model Sensitivity and Comparison to Measured Data

This report section evaluates the sensitivity of computed water surface elevation to varying Manning's roughness values and the comparison to measured high water marks collected during historical floods.

## *4.1 Sensitivity to Manning's Roughness Values*

The sensitivity of the model results in the main channel to changes in Manning's n values was analyzed in the 2009 (Klumpp and Bountry, 2009). Manning's n values were increased by 10 percent and decreased by 20 percent in the main channel. A flow of 2,000 cfs was simulated because the scope of this effort was to understand main channel capacity and overbank flow locations. The average difference between the water surface elevations using different Manning's n was approximately 0.1 feet.

For the new modeling effort, n values were increased everywhere (main channel and floodplain) by 20% and compared to the values listed in Section 3.3 at 36,000 cfs. A total flow of 36,000 cfs (100-year flood) was used as an indicator of sensitivity because the scope of this effort is to estimate the depth of flood inundation on the valley floor. This resulted in a mean 0.3 ft increase in water surface elevation. Specific to the nodes within the Vance Creek active channel, there was a 0.4 ft mean increase in water surface elevation. Specific to the nodes within the Skokomish River main channel there was a 0.2 ft mean increase in water surface elevation. The largest deviation of 2 to 3 ft between model results occurred along the model edge of the wetted area on river right around RM 1.5 where a road is present. Water surface elevations in this area had a variation of 1 to 2 ft and it appears the model had difficulty stabilizing whether to overtop the road.

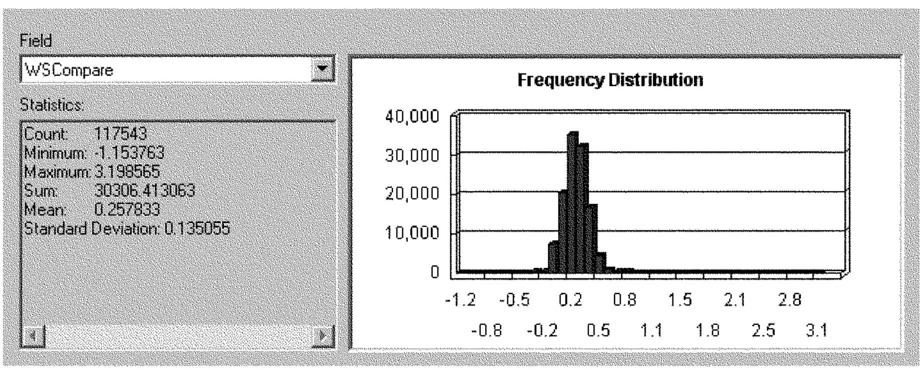


**Figure 14. Comparison of all nodes within wetted 100-year flood model results between baseline N values and all N values increased by 20%. The graph indicates the number of compuational cells within given bins of water surface elevation increases.**

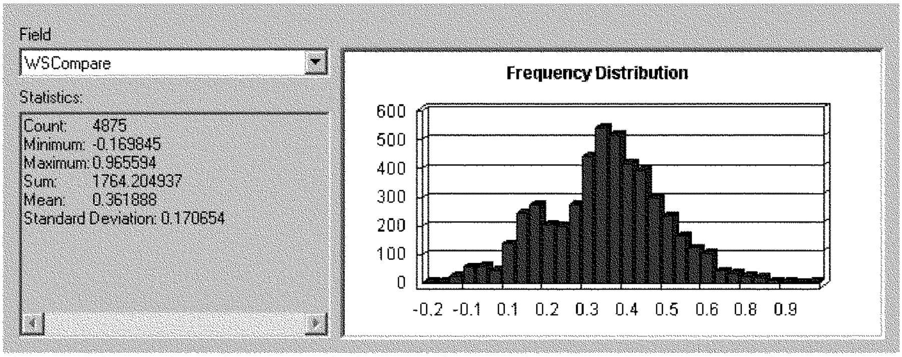


**Figure 15. Comparison of all nodes within Vance Creek main channel wetted 100-year flood model results between baseline N values and all N values increased by 20%. The graph indicates the number of compuational cells within given bins of water surface elevation increases.**

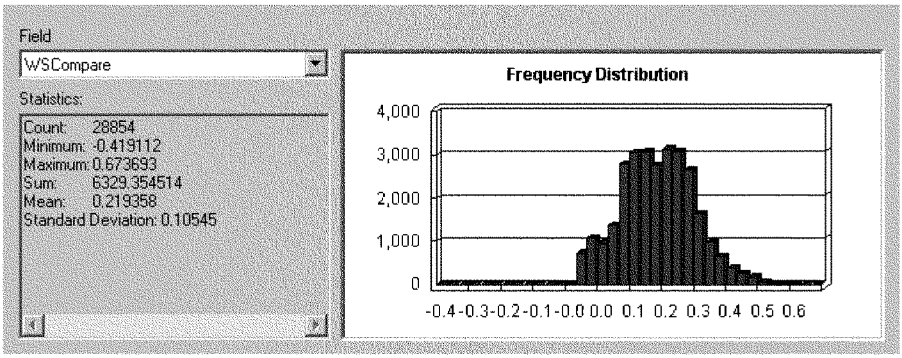


**Figure 16. Comparison of all nodes within Skokomish River main channel wetted 100-year flood model results between baseline N values and all N values increased by 20%. The graph indicates the number of compuational cells within given bins of water surface elevation increases.**

## *4.2 Comparison to Measured High Water Marks*

The 2009 model of the Skokomish River was compared to measured water surfaces collected during a low flow of 370 cfs, and a limited number of available measured water surface elevation values collected at unique locations during the 1997, 1999, and 2007 floods. No additional high water elevation data has been collected.

In this study, the model was compared to the measured high water marks of the 2007 flood because occurred shortly after the channel survey data was collected in 2007. The 2007 high water marks were provided by USACE. Flows for this flood have not been officially documented by USGS, but are estimated to have exceeded 22,000 cfs. The flood set a new stream gage height record so it is possible that the flow was larger than the one-percent chance exceedance flood. The high water marks were compared to the one-percent chance exceedance flood of 36,000 cfs (represents total flow at USGS Gage at Potlatch). Comparison of measured data and model data are summarized in Table 3.

For all but the location at RM 9.8 and 10, the modeled values are 0.5 to 2.5 ft below the measured high water marks. The upstream-most two locations showed more inundation than the field data. High water marks are subject to uncertainty, but these results suggest that the model roughness may be too low in the channel and/or floodplain, the 2007 flood input discharge values need to be resolved, the topography may be inaccurate relative to 2007 conditions, or the topography does not contain enough detail of features that influence hydraulics (e.g. infrastructure in the floodplain, riffles in the main channel, levees along banks, etc). Increasing roughness resulted in a mean increase in water surface elevation of only 0.3 ft, so it is likely that the topography needs to be further resolved to more accurately represent channel banks and bounding levees, along with determination of the actual river discharge values.

**Table 8. Comparison of measured to computed high water mark elevations (HWM) for the December 2007 flood.**

| USACE Benchmark | Skokomish River Mile | HWM Elevation (feet) | Computed Water Surface Elevation 36,000 cfs (ft) |
|---|---|---|---|
| 21 | 10 | DRY | WET |
| 20 | 9.8 | 83.1 | 85.1 |
| 14A | 8.4 | 61.1 | 59.3 |
| 14B | 8.4 | 61.9 | 60.8 |
| 13A | 8.1 | 56.2 | 55.7 |
| 13B | 8.1 | 59.0 | 57.4 |
| 10A | 7.6 | 54.0 | 52.6 |
| 10B | 7.6 | 54.1 | 52.3 |
| 8 | 7.1 | 49.3 | 48.4 |
| 4 | 6 | 39.9 | 39.5 |
| 3 | 5.8 | 37.9 | 36.8 |

Measured high water mark values from the 1999 flood of 16,400 cfs with an unknown tide level was compared to the model run for the 2-year flood of 17,500 cfs with a tide level of 9.2 ft (Table 4). Measured values were available for locations near Highway 101 (RM 4.7) and near SR 106 (RM 1.9). Models results ranged from 1.4 ft below the measured value to 0.4 ft above it, except for Skokob Creek which was markedly different. Skokob Creek differences may be due to the lack of definition in the 2D model mesh, the lack of channel topography available, and the influence from the tide and local backwater from the culvert under the SR106 bridge crossing that was not modeled in the 2D model.

**Table 9. Comparison of measured to computed high water mark elevations (HWM) for the January 1999 flood.**

| **Location** | **Measured data from 16,400 cfs 1999 flood** | **2D Model Data for 17,500 cfs** | **Notes** |
|---|---|---|---|
| Skokomish River upstream of US 101 | 30.9 | 29.5 | |
| Weaver Creek upstream of US 101 | 28 | 28.2 | No Weaver Creek channel bottom data in 2D model |
| Weaver Creek downstream of US 101 | 26.5 | 27.1 | |
| Purdy Creek upstream of US 101 | 28.2 | 28 | No Purdy Creek channel bottom data in 2D model; 2D model includes 2009 bridge widening |
| Purdy Creek downstream of US 101 | 27.2 | 27.9 | |
| Skobob Creek upstream of SR 106 | 21.1 | 16.9 | No Skobob Creek channel bottom data in 2D model; influenced by tide level set in model |
| Skokob Creek downstream of SR 106 | 14.2 | DRY | |
| Skokomish River upstream of SR 106 | 14.4 | 15.3 | |

# 5.0 Model Results

The solved 2D variables at each grid node include water surface elevation, water depth, depth-averaged velocity, Froude number, and shear stress. Model output can also be generated to provide flow inundation area and velocity vectors. Model results for RM 0 to 2 should be used with the caveat that channel elevations were estimated and need to be updated in the future to accurately model this region. Additionally, model results near the upstream and downstream boundaries of the model should not be utilized. Road crossings were modeled as open channel flow. Therefore, floods that may overtop road crossings and result in pressurized flow may have a larger local backwater in reality than shown in the model.

## *5.1 Inundation Mapping and GIS Files*

The inundation map of each modeled flood can be viewed by plotting an ARC GIS file representing the water surface elevation results. Because the model mesh was fairly coarse in the floodplain, inundation results are approximate and should be considered to have a 50 to 100 ft horizontal accuracy. Individual houses and small infrastructure were generally not represented in the ground elevation topography, and therefore were not modeled. Large levees and roads were incorporated into the model mesh, but the data is between 3 and 15 years old and in some areas conditions have likely changed. Model results compared within a couple feet of available measured data, but channel capacity has reduced over time (England 2007) and only a few recently measured data points are available (Klumpp and Bountry, 2009). The absolute accuracy of the model results was not evaluated.

To assist with inundation interpretations, model results were post-processed in GIS to develop 5-ft raster grid files of water depth for each model run (e.g. 2-year, 5-year, 10-year, 50-year, 100-year, and 500-year floods). An example image of the raster is provided in Figure 13. The methodology to develop the raster grid of water depth was to first generate a water surface elevation tin from the model results. A 5-ft raster grid was then made from the ground elevation data (Photogrammetry, channel survey data, and LiDAR). A water surface elevation value was then computed at each 5-ft raster location from the tin of model results. A depth was computed by subtracting the ground elevation from the water surface elevation tin value at each 5-ft raster cell.

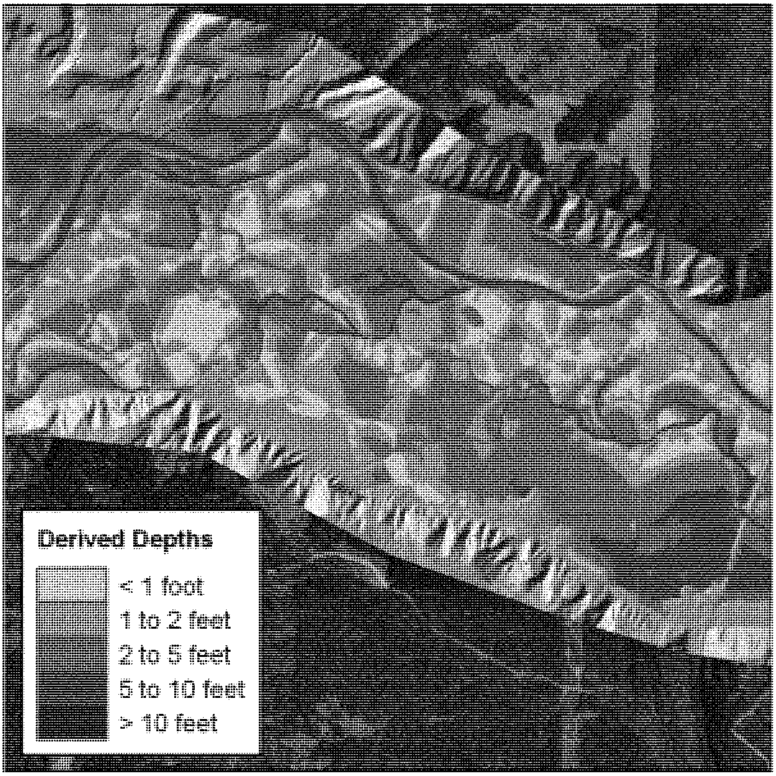


**Figure 17. Example figure of post-processed 5-ft raster grid of computed water depths at the 5-year flood (blue coloring) plotted on the ground elevation terrain (grey coloring) with the 2006 aerial photograph in the background.**

## *5.2 Channel Capacity*

The discharge conveyed in the mainstem Skokomish River and Vance Creek were computed by river mile for the 2-year flood of 17,500 cfs and the 100-year flood of 36,000 cfs (Figure 14 and Figure 15). The discharge values were also plotted as a percentage of the 2- and 100-year flood peaks (Figure 16 and Figure 17). For Skokomish, the percentage is computed relative to the computed flood peaks for the USGS gage at Potlatch near the Hwy 101 Bridge at RM 4.7. The exception is RM 10, which was computed relative to only the South Fork peak since the confluence with Vance Creek does not begin until RM 9.2. Vance Creek discharge values were computed relative to peak flow values for Vance Creek. The Skokomish River reduces its channel discharge capacity relative to the flood peaks between RM 9 and 8, regains some of it by RM 7, and then reduces it again in the downstream direction. Vance Creek has a large channel capacity relative to the 2-year flood between RM 3 and 1, but downstream of RM 1 reduces by about half.

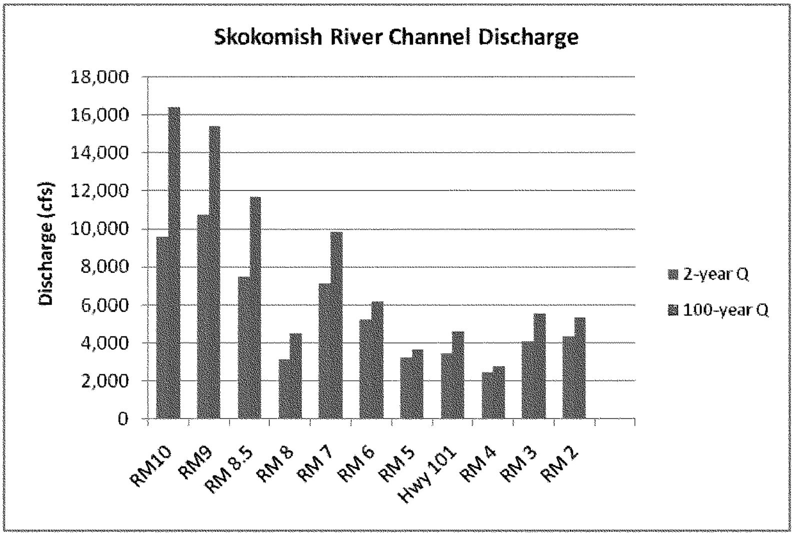


**Figure 18. Channel capacity of mainstem Skokomish River by river mile at the 2-year flood.**

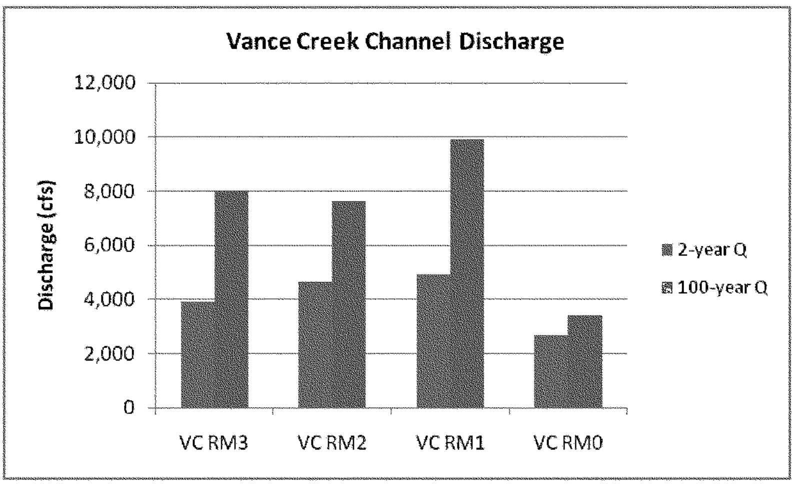


**Figure 19. Channel capacity of the mainstem Vance Creek by river mile for the 2-year flood.**

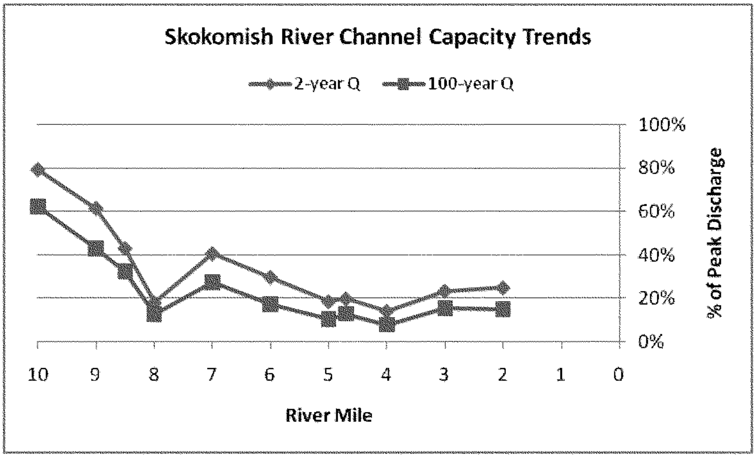


**Figure 20. Percentage of 2-year and 100-year flood peaks (at USGS gage at Potlatch) being conveyed by the mainstem Skokomish River.**

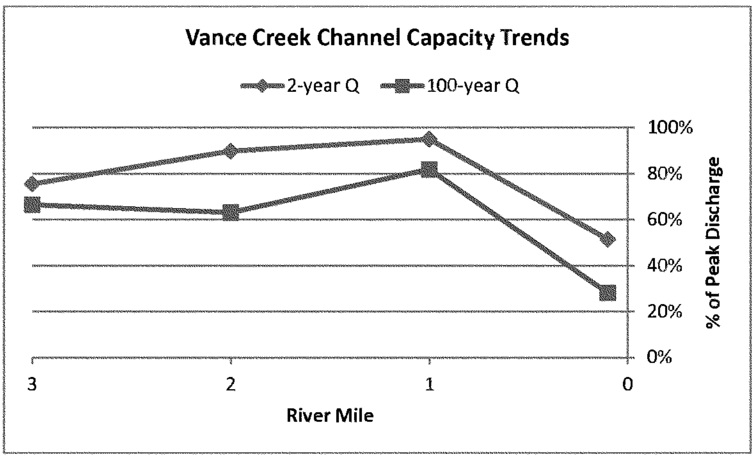


**Figure 21. Percentage of 2-year and 100-year flood peaks being conveyed by the mainstem Vance Creek.**

## *5.3 Water-Surface Elevation Images*

Images of water elevation results were generated with either 1-ft or 2-ft contours on 2006 aerial photography. Model results of water surface elevation are shown for the Skokomish River from RM 0 to 2 in Figure 18 to Figure 23, from RM 2 to 6.5 in Figure 24 to Figure 29, from RM 6.5 to 10.5 in Figure 30 to Figure 35, and for Vance Creek in Figure 36 to Figure 41.

### 5.4 Water Depth Images

Images of water depth results from the 2D model were generated for each model run and plotted on 2006 aerial photography. These are the original model results rather than the post-processed 5-ft raster grid described in Section 5.1. Water depths range from 0 to 18 ft, but generally are less than 12 ft and, therefore, are plotted from 0 to 12 ft in the figures, with depths greater than 12 ft shown as the same color. Model results of water depths are shown for the Skokomish River from RM 0 to 2 in Figure 42 to Figure 47, from RM 2 to 6.5 in Figure 48 to Figure 53, from RM 6.5 to 10.5 in Figure 54 to Figure 59, and for Vance Creek in Figure 60 to Figure 65.

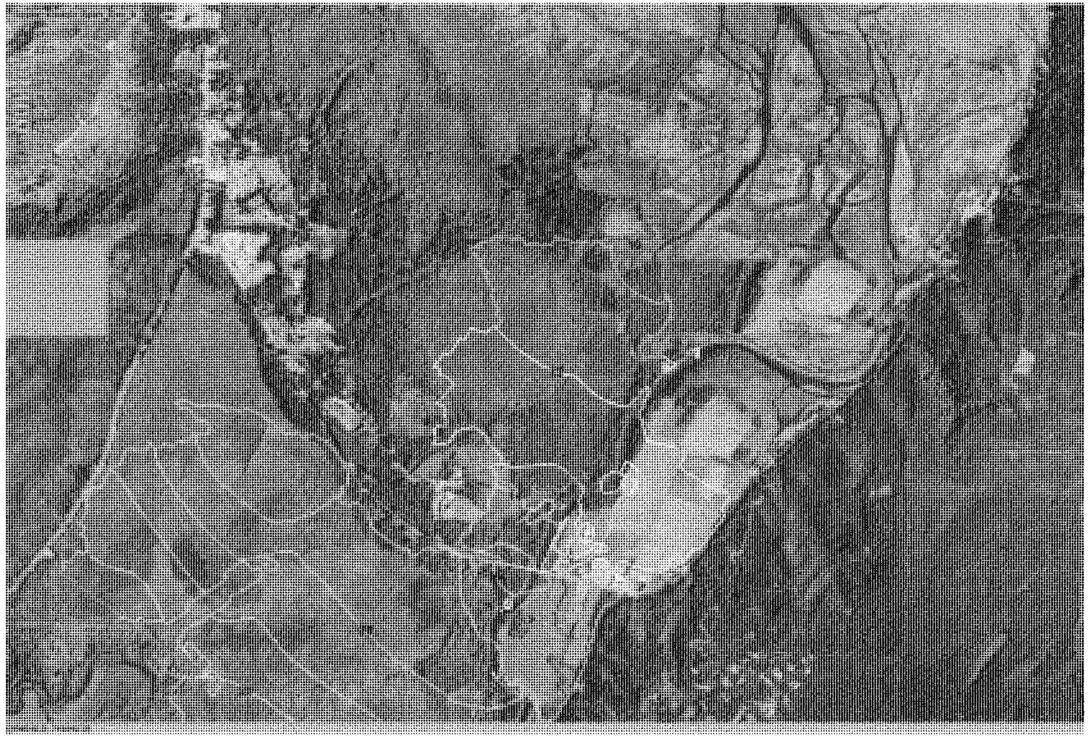

Figure 22. Model results for river mile 0 to 2 showing water surface elevation contours (1ft) at the 2-year flood.

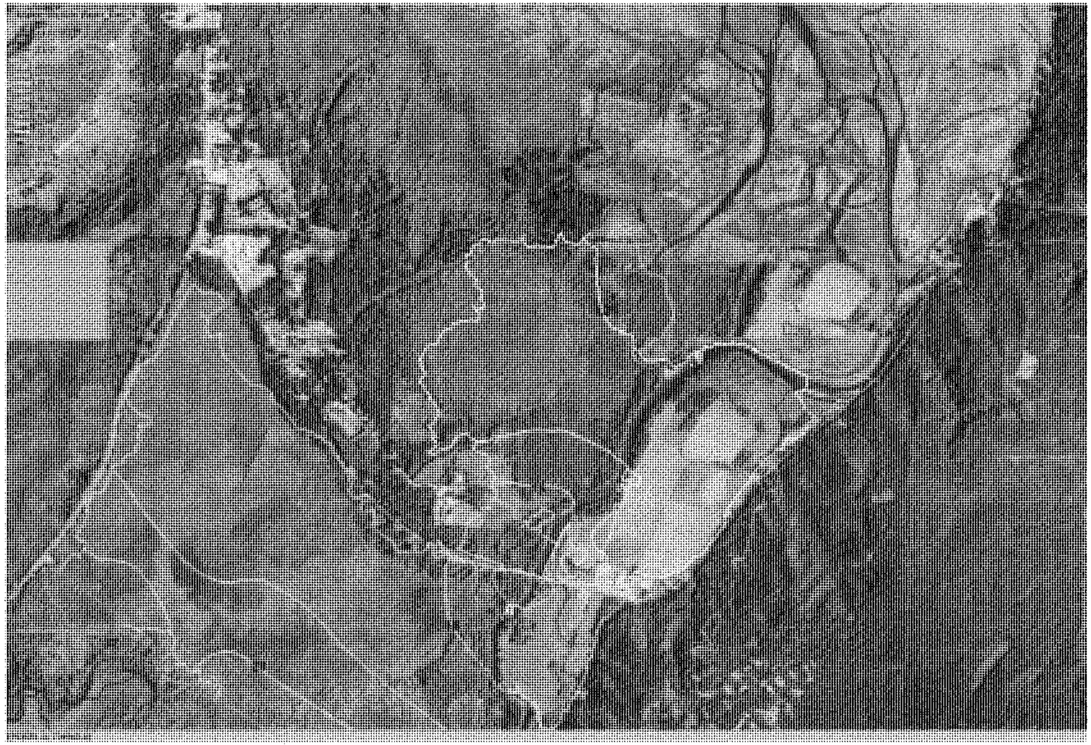

Figure 23. Model results for river mile 0 to 2 showing water surface elevation contours (1ft) at the 5-year flood.

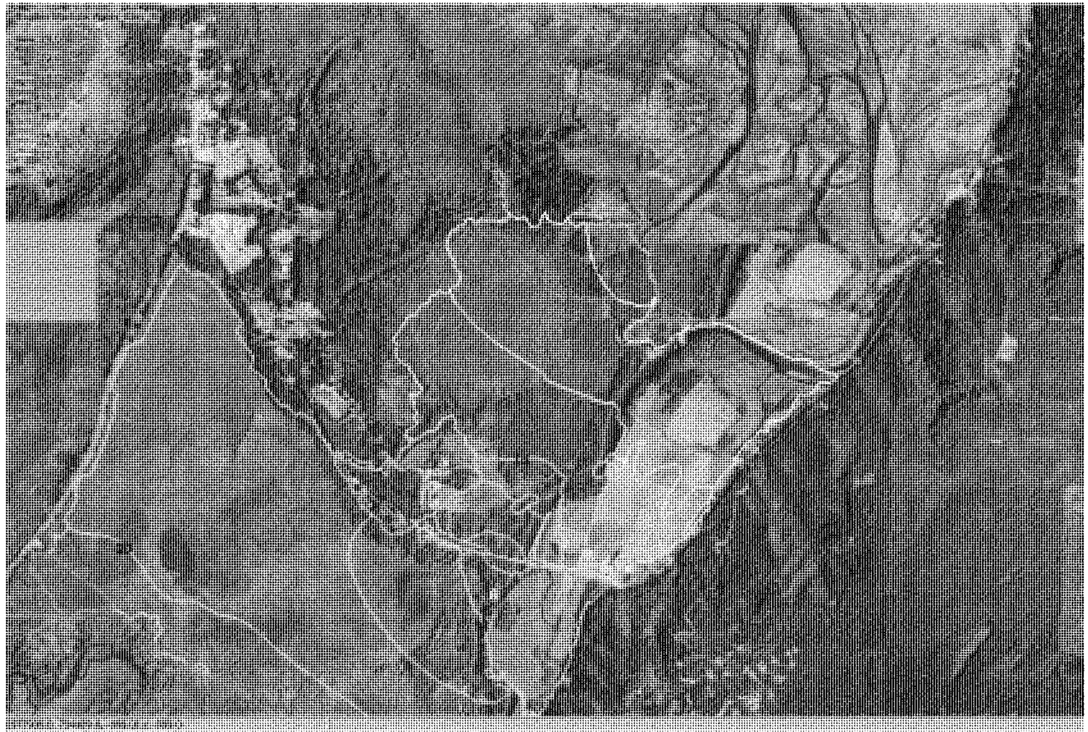

Figure 24. Model results for river mile 0 to 2 showing water surface elevation contours (1ft) at the 10-year flood.

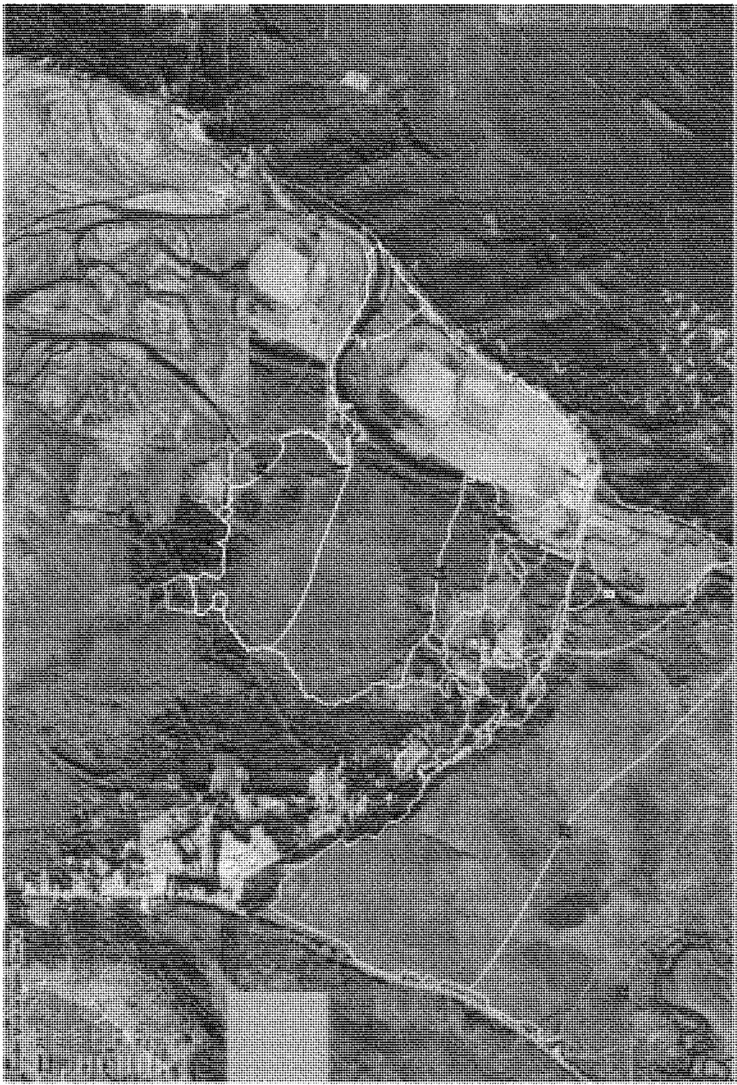

**Figure 25. Model results for river mile 0 to 2 showing water surface elevation contours (1ft) at the 50-year flood.**

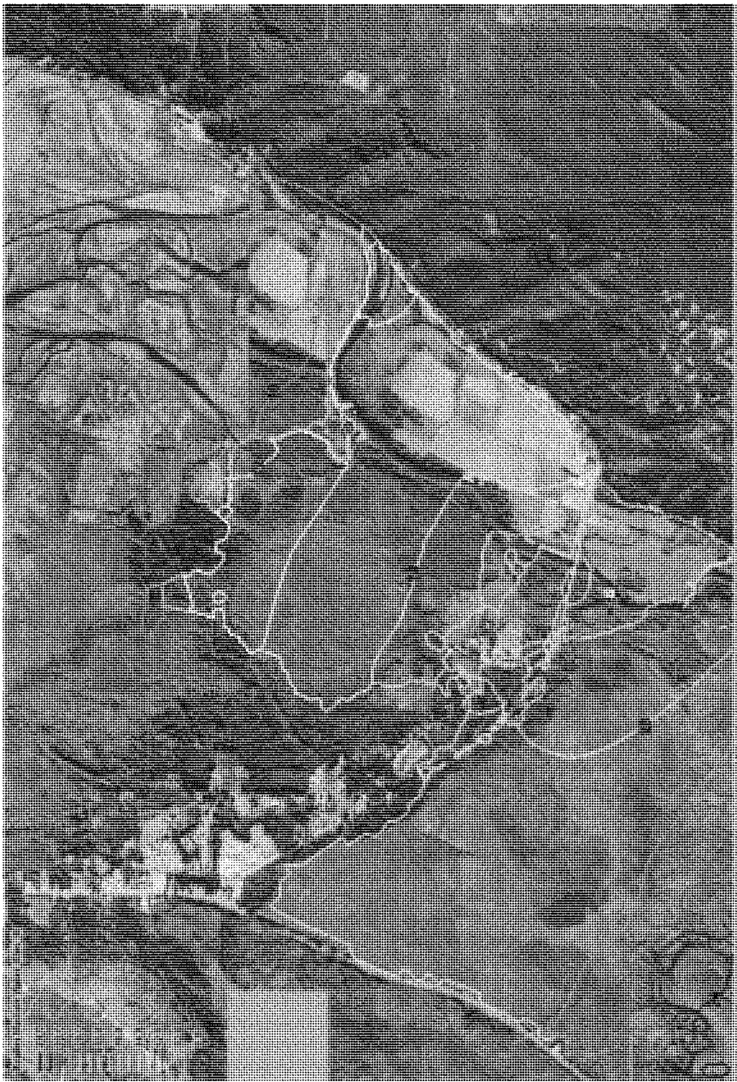

**Figure 26. Model results for river mile 0 to 2 showing water surface elevation contours (1ft) at the 100-year flood.**

**Figure 27. Model results for river mile 0 to 2 showing water surface elevation coutours (1ft) at the 500-year flood.**

Figure 28. Model results for river mile 2 to 6.5 showing water surface elevation contours (1ft) at the 2-year flood.

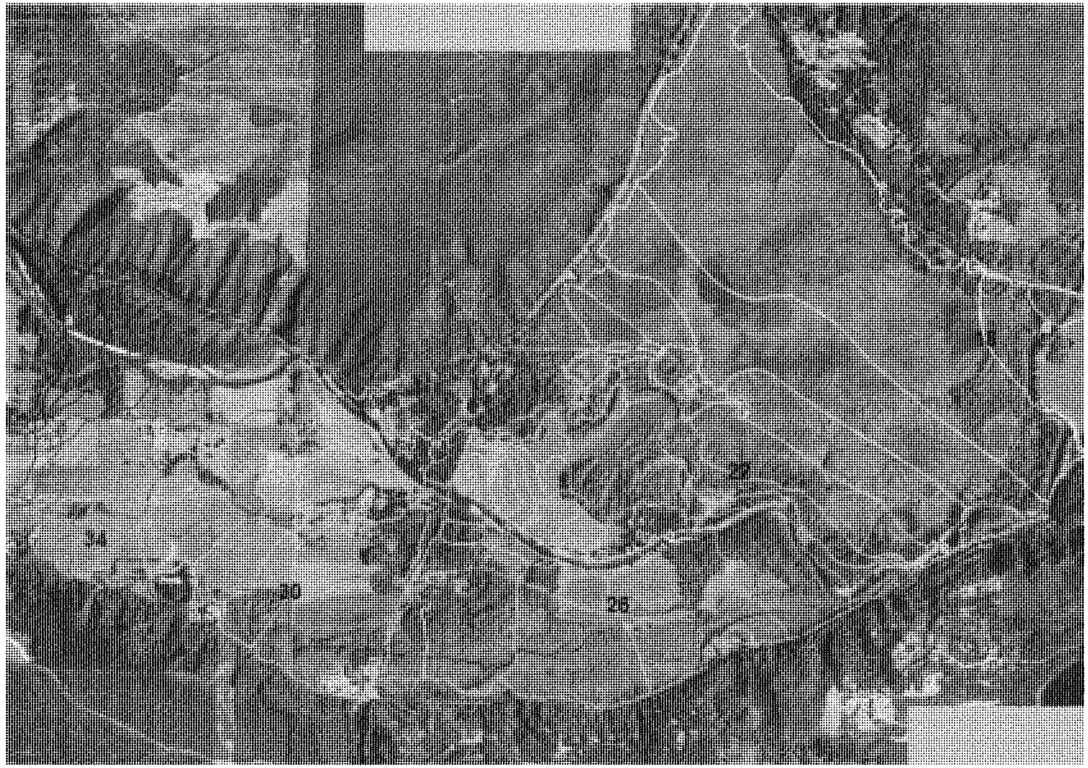


**Figure 29. Model results for river mile 2 to 6.5 showing water surface elevation contours (1ft) at the 5-year flood.**


**Figure 30. Model results for river mile 2 to 6.5 showing water surface elevation contours (1ft) at the 10-year flood.**


Figure 31. Model results for river mile 2 to 6.5 showing water surface elevation contours (1ft) at the 50-year flood.

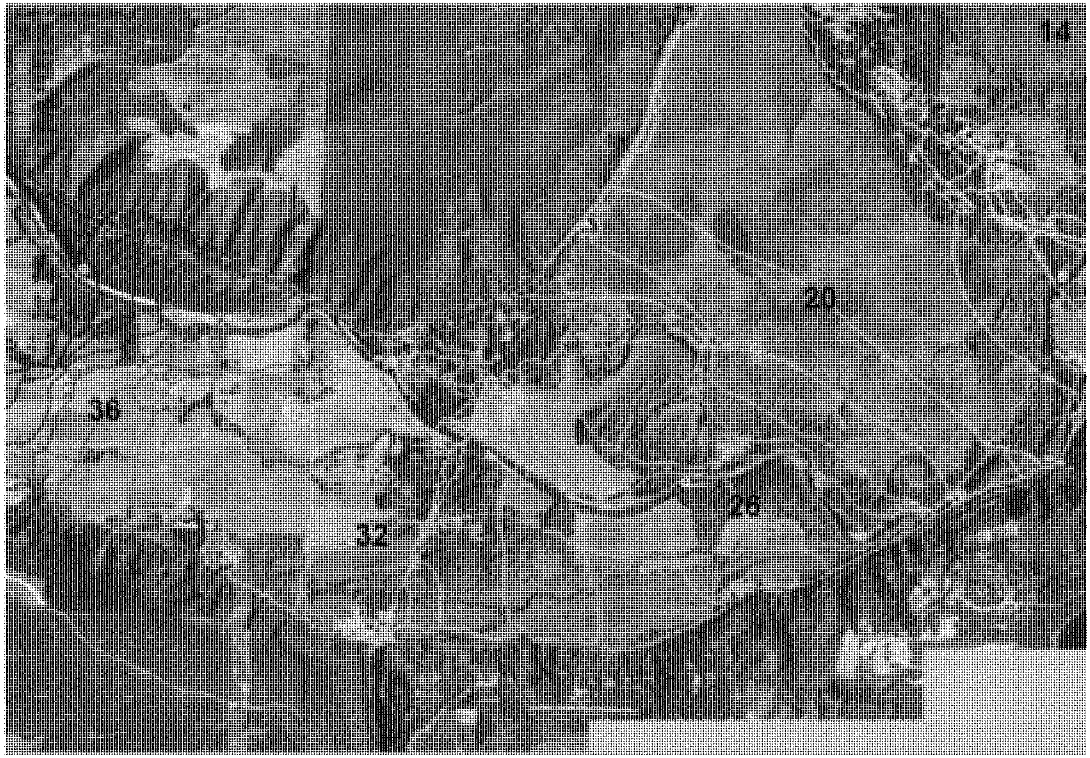


Figure 32. Model results for river mile 2 to 6.5 showing water surface elevation contours (1ft) at the 100-year flood.

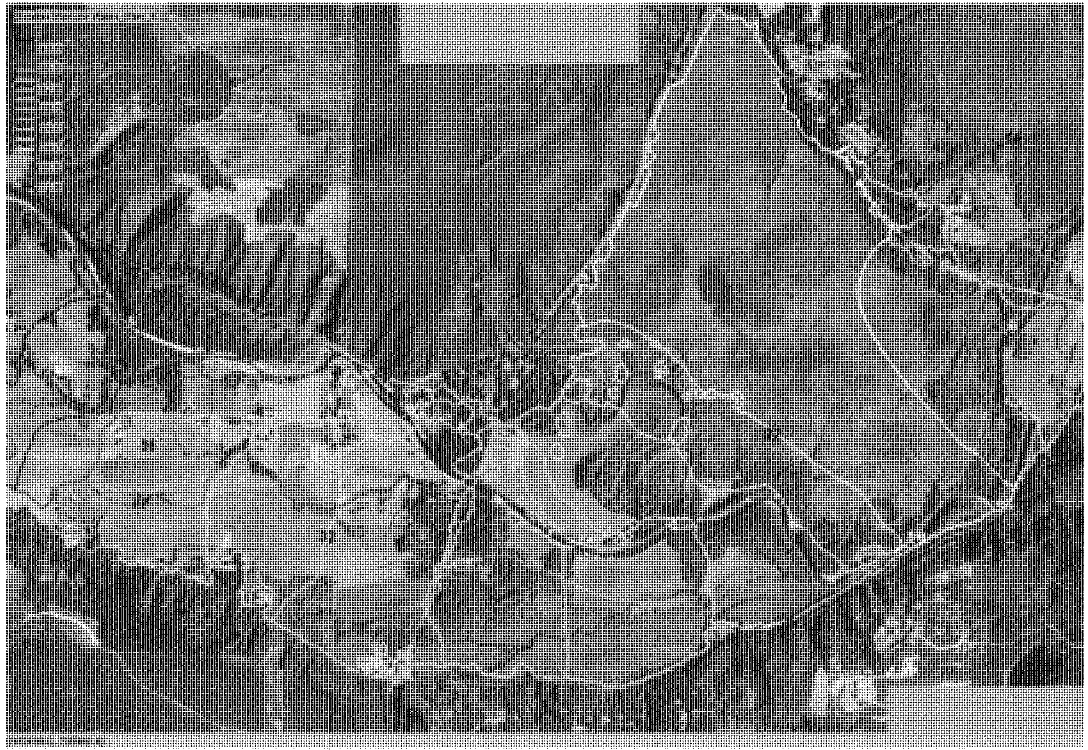

**Figure 33. Model results for river mile 2 to 6.5 showing water surface elevation contours (1ft) at the 500-year flood.**

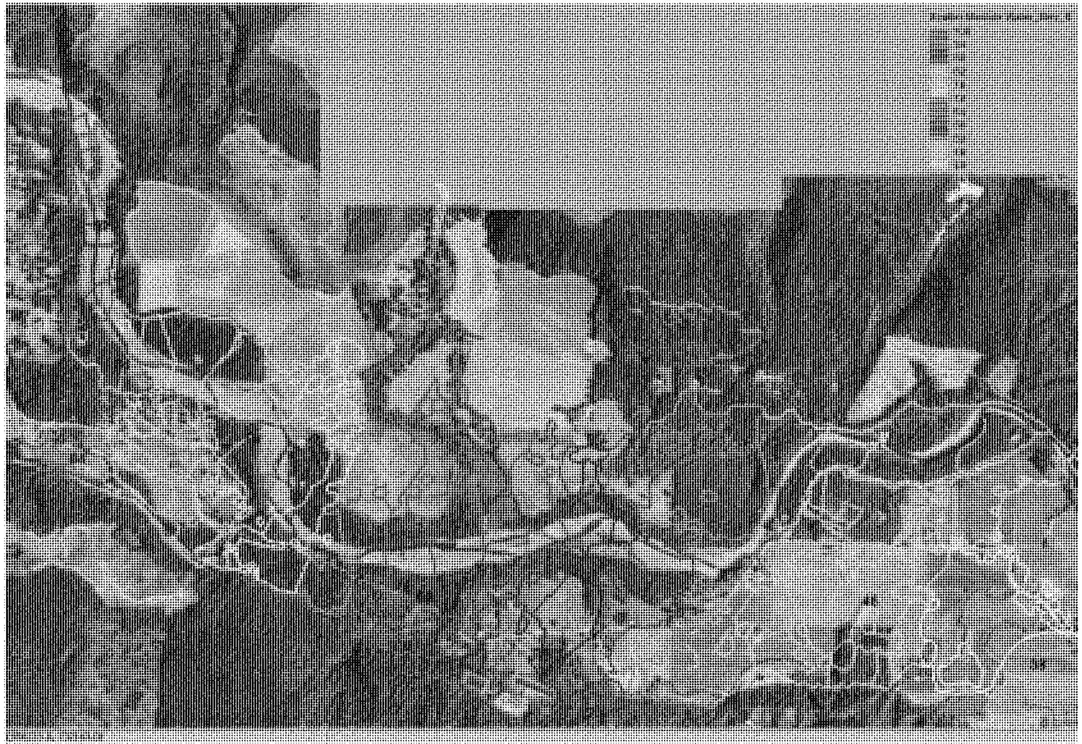

Figure 34. Model results for river mile 6.5 to 10.5 showing water surface elevation contours (2 ft) at the 2-year flood.

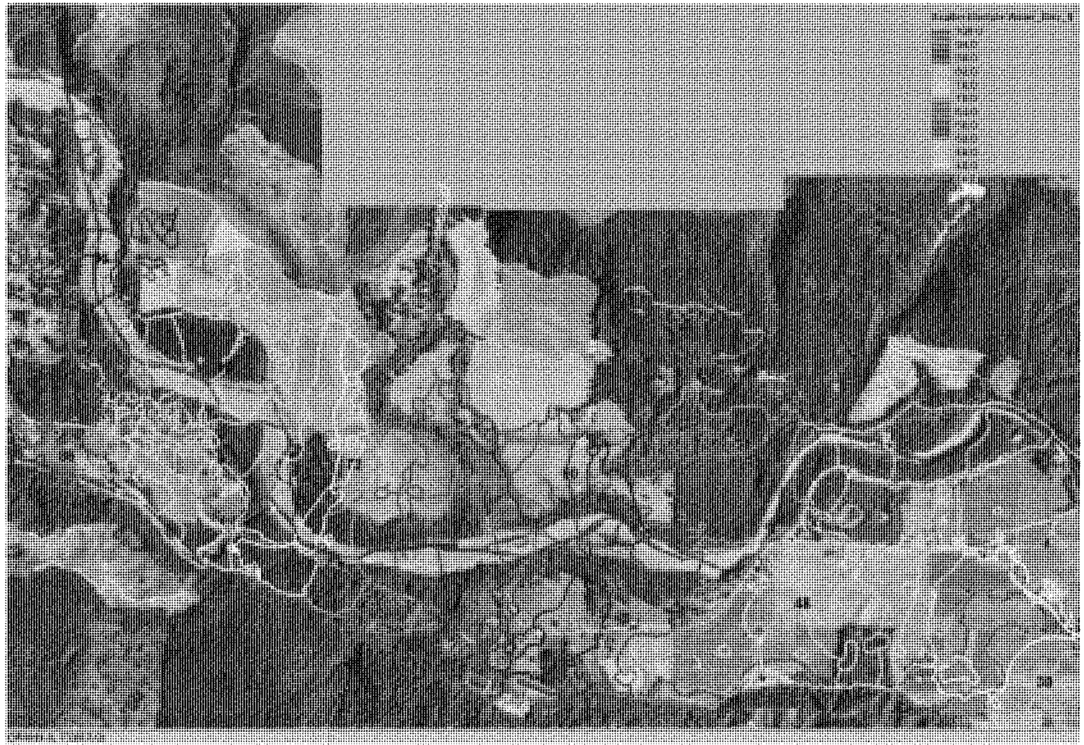

Figure 35. Model results for river mile 6.5 to 10.5 showing water surface elevation contours (2 ft) at the 5-year flood.

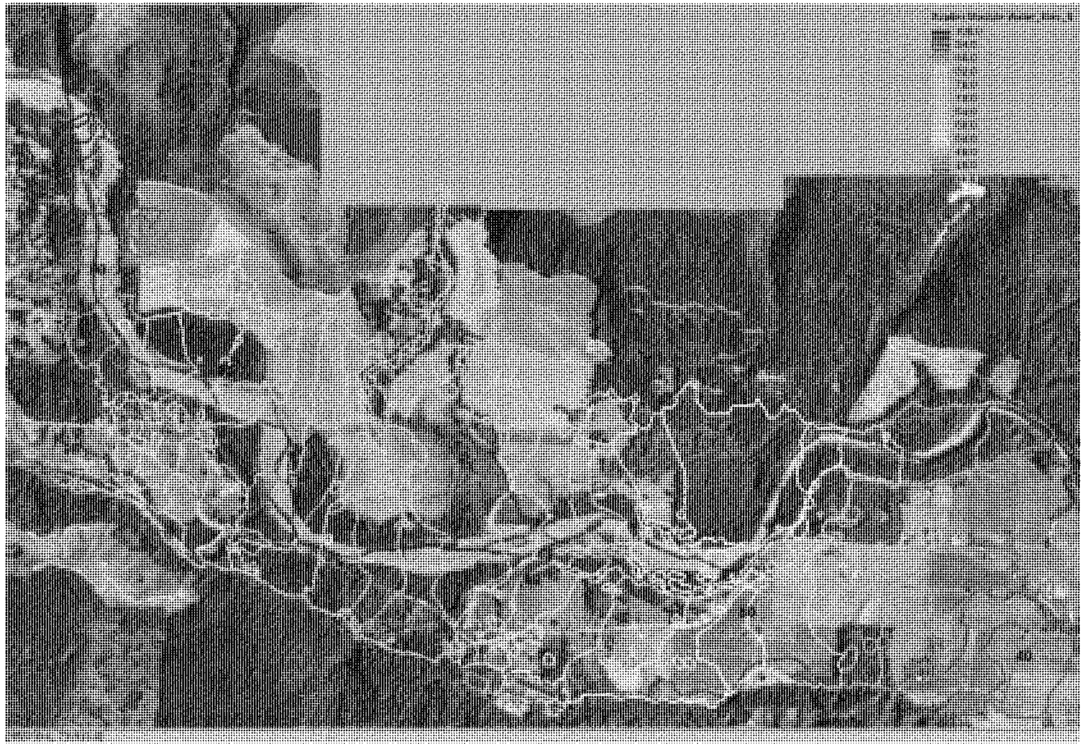

**Figure 36. Model results for river mile 6.5 to 10.5 showing water surface elevation contours (2 ft) at the 10-year flood.**

Figure 37. Model results for river mile 6.5 to 10.5 showing water surface elevation contours (2 ft) at the 50-year flood.

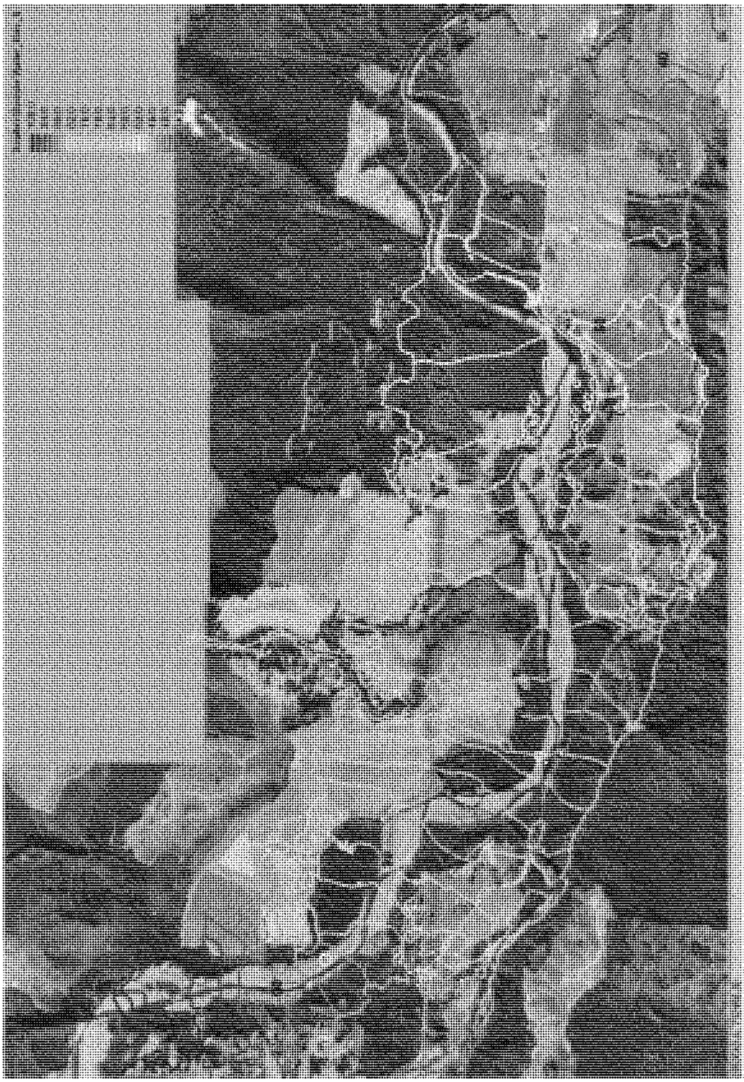

**Figure 38. Model results for river mile 6.5 to 10.5 showing water surface elevation contours (2 ft) at the 100-year flood.**

Figure 39. Model results for river mile 6.5 to 10.5 showing water surface elevation contours (2 ft) at the 500-year flood.

**Figure 40. Model results for Vance Creek showing water surface elevation contours (2 ft) at the 2 year flood.**

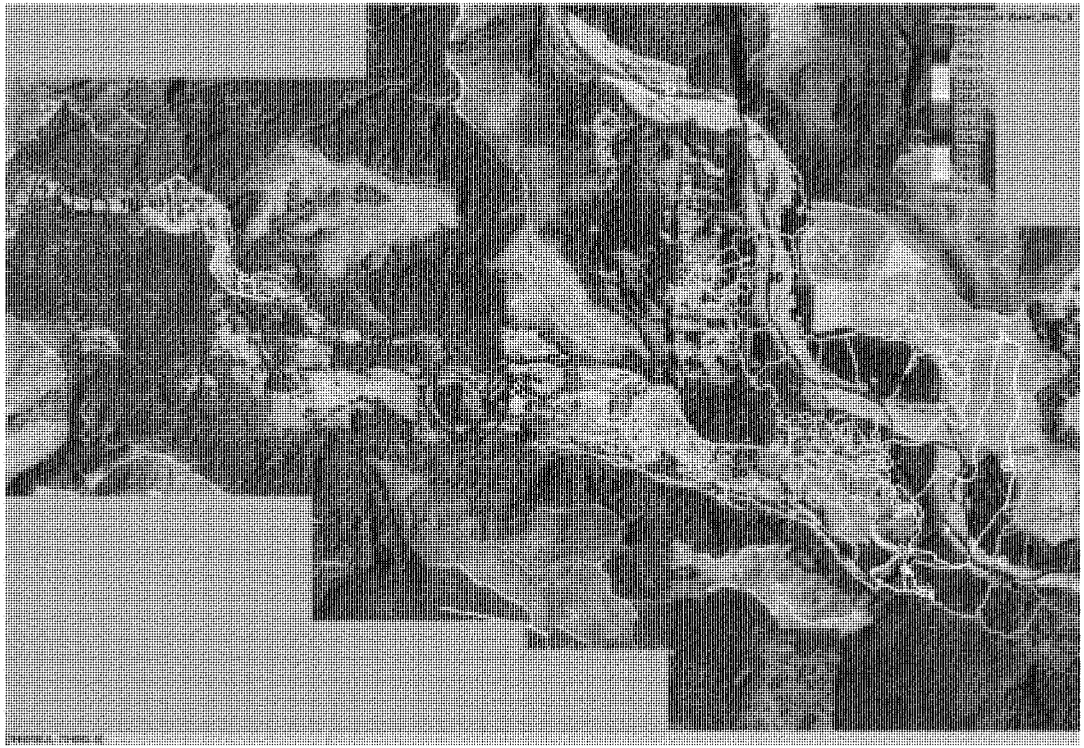

Figure 41. Model results for Vance Creek showing water surface elevation contours (2 ft) at the 5 year flood.

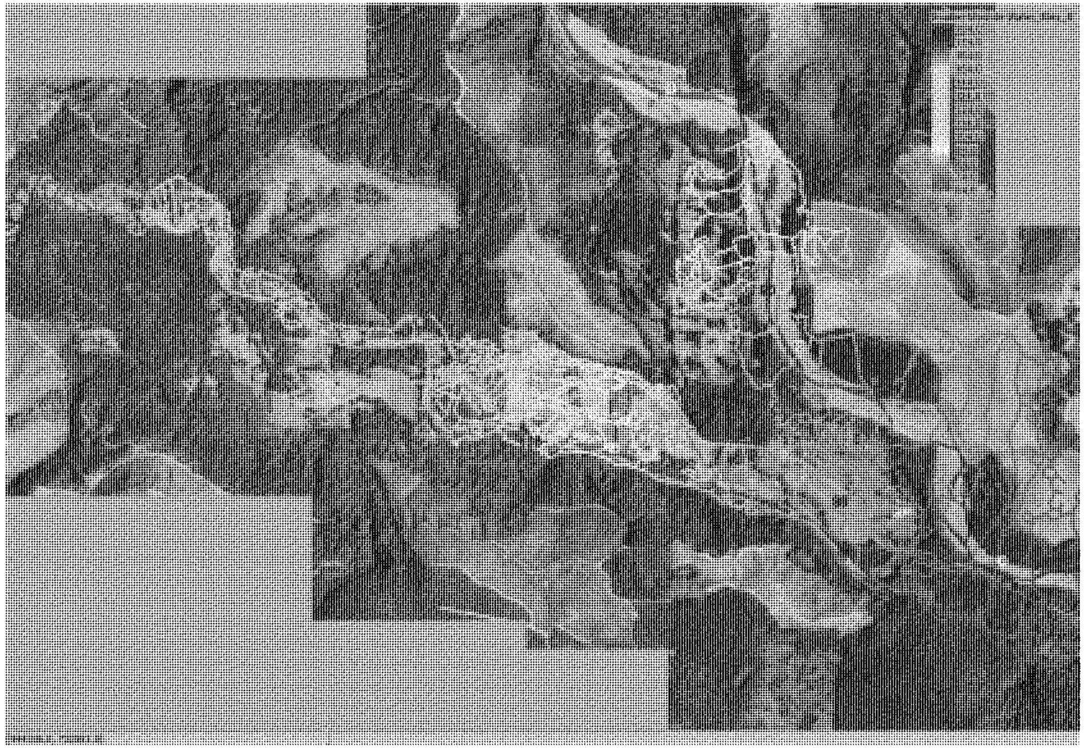

Figure 42. Model results for Vance Creek showing water surface elevation contours (2 ft) at the 10 year flood.

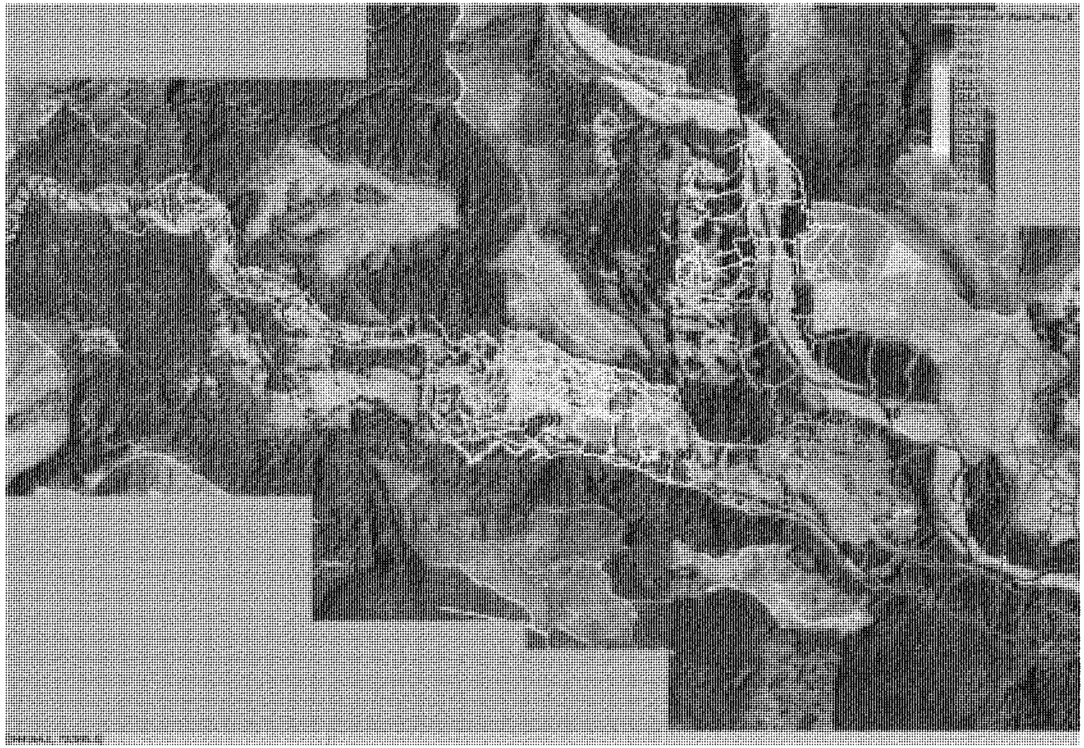

Figure 43. Model results for Vance Creek showing water surface elevation contours (2 ft) at the 50 year flood.

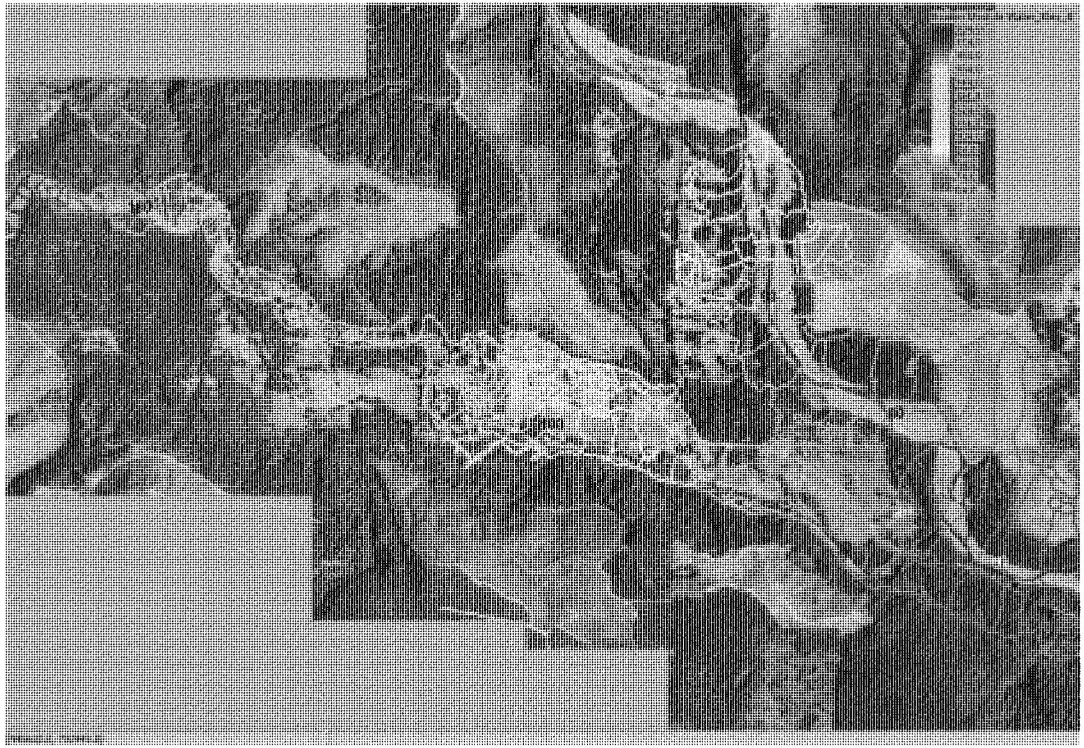

Figure 44. Model results for Vance Creek showing water surface elevation contours (2 ft) at the 100 year flood.

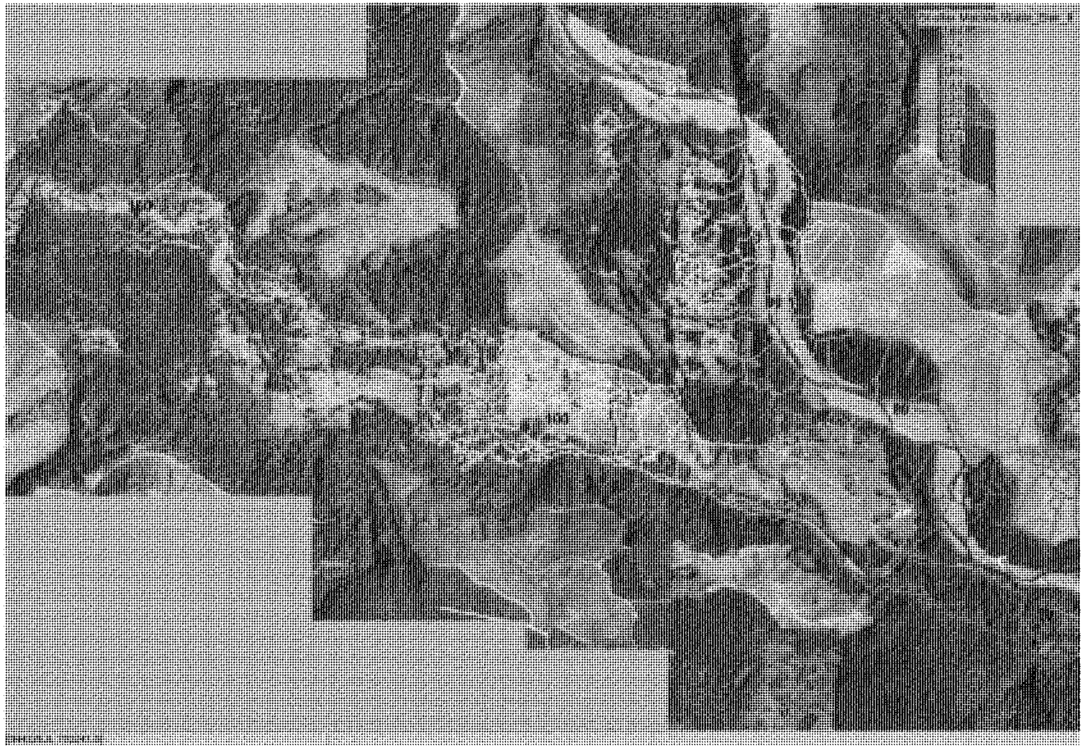

**Figure 45. Model results for Vance Creek showing water surface elevation contours (2 ft) at the 500 year flood.**

Figure 46. Model results for river mile 0 to 2 showing water depth at the 2-year flood.

**Figure 47. Model results for river mile 0 to 2 showing water depth at the 5-year flood.**

Figure 48. Model results for river mile 0 to 2 showing water depth at the 10-year flood.

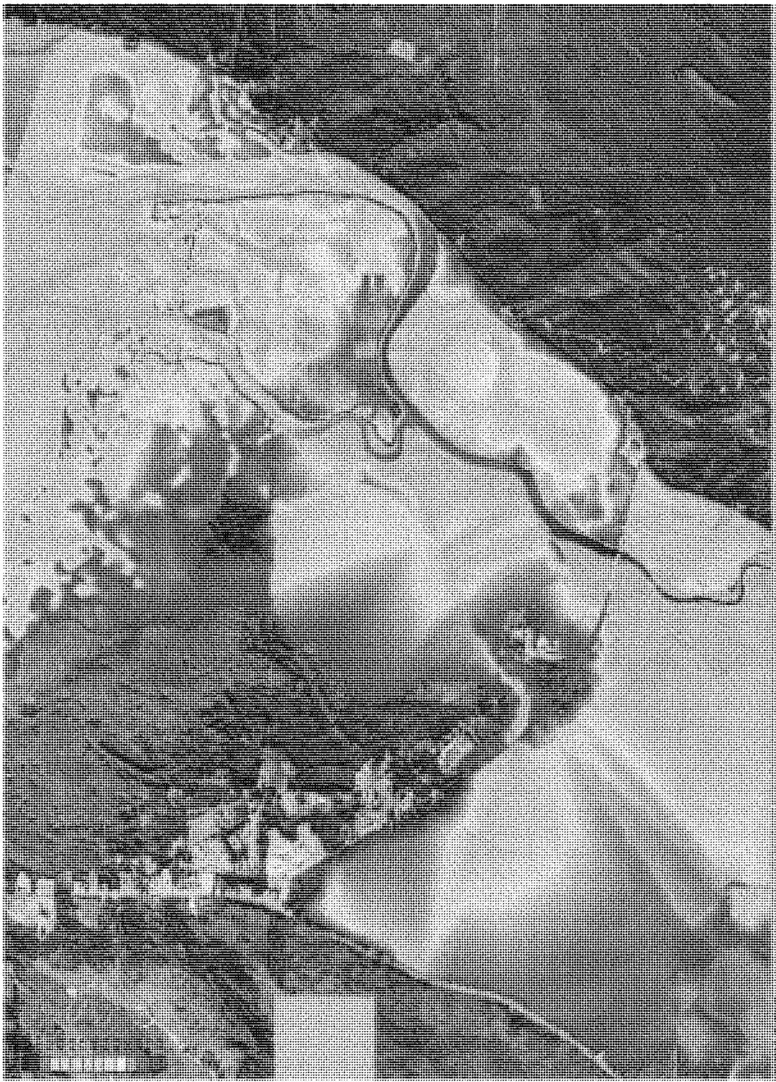

**Figure 49. Model results for river mile 0 to 2 showing water depth at the 50-year flood.**

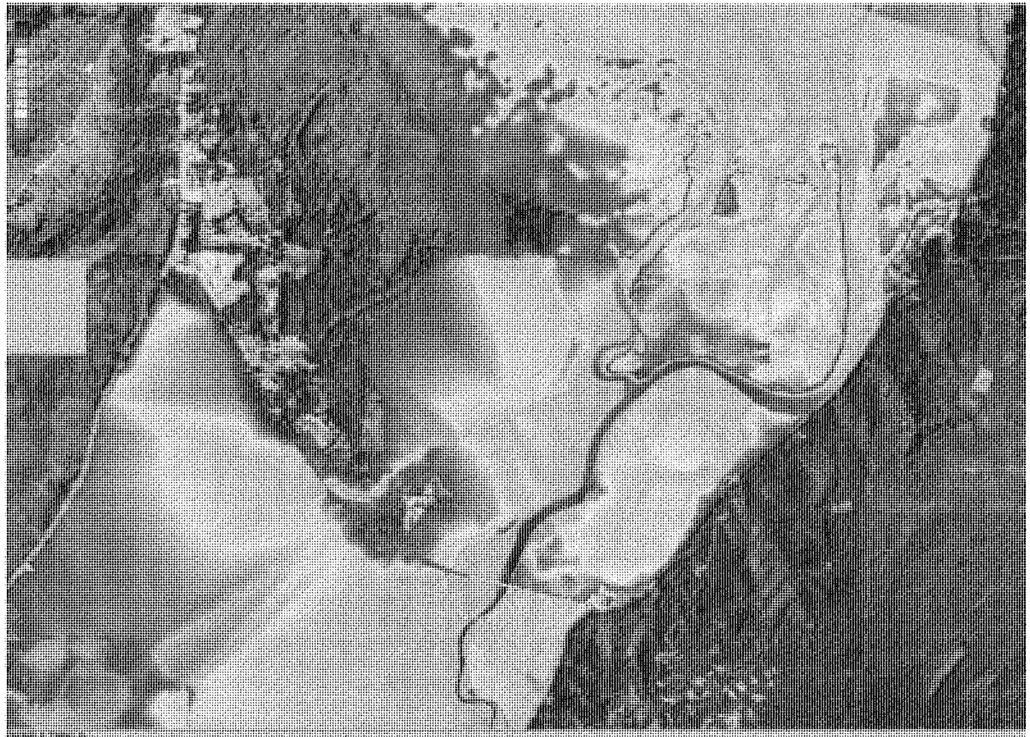

Figure 50. Model results for river mile 0 to 2 showing water depth at the 100-year flood.

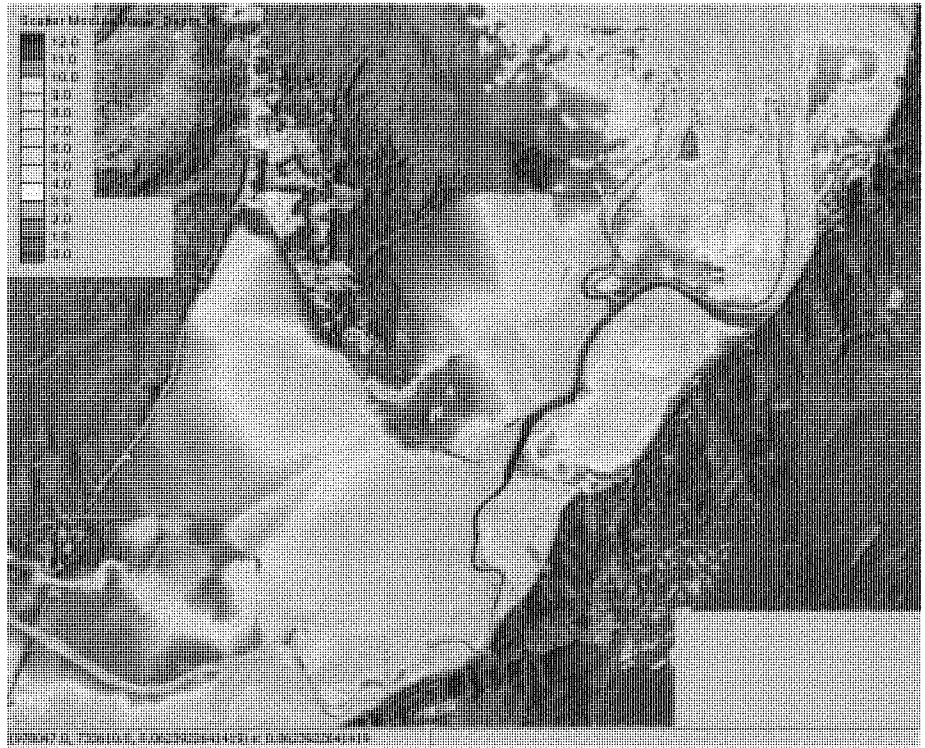

Figure 51. Model results for river mile 0 to 2 showing water depth at the 500-year flood.

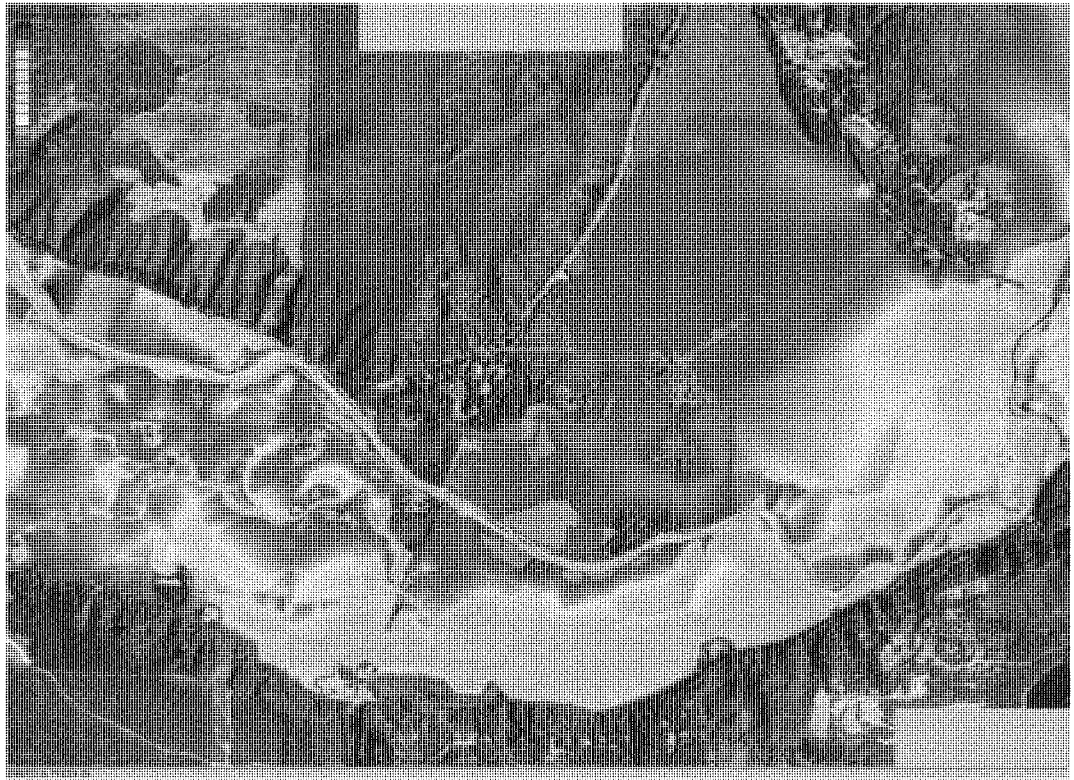

Figure 52. Model results for river mile 2 to 6.5 showing water depth at the 2-year flood.

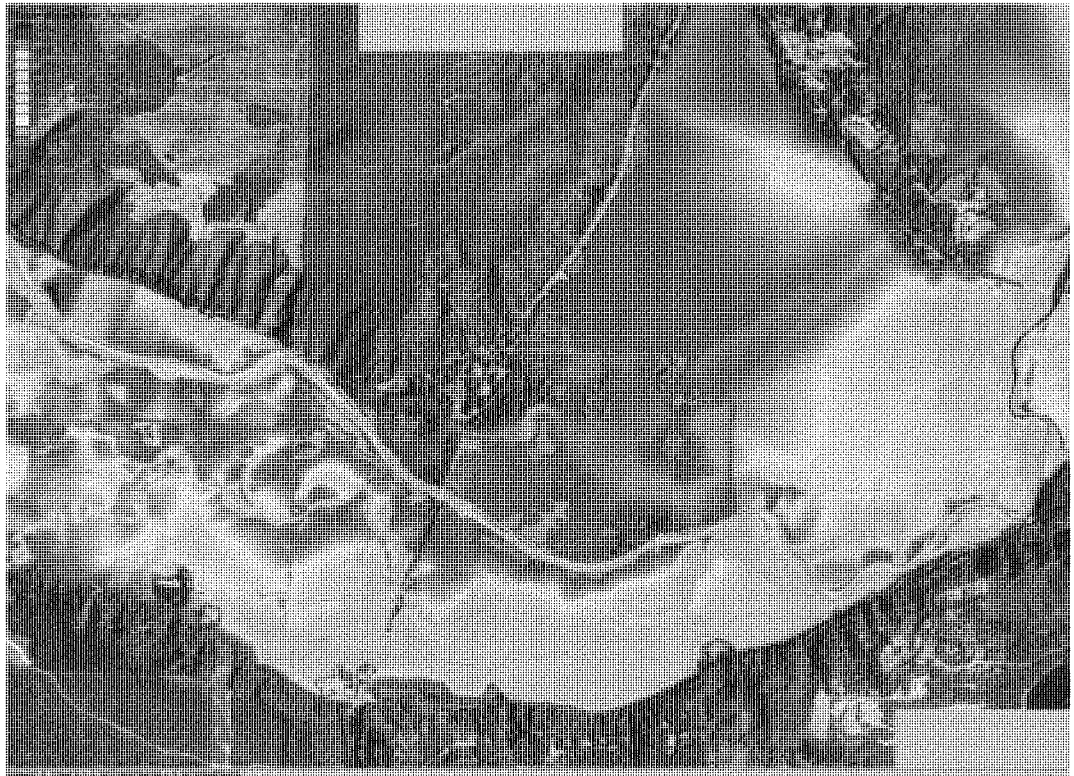

Figure 53. Model results for river mile 2 to 6.5 showing water depth at the 5-year flood.

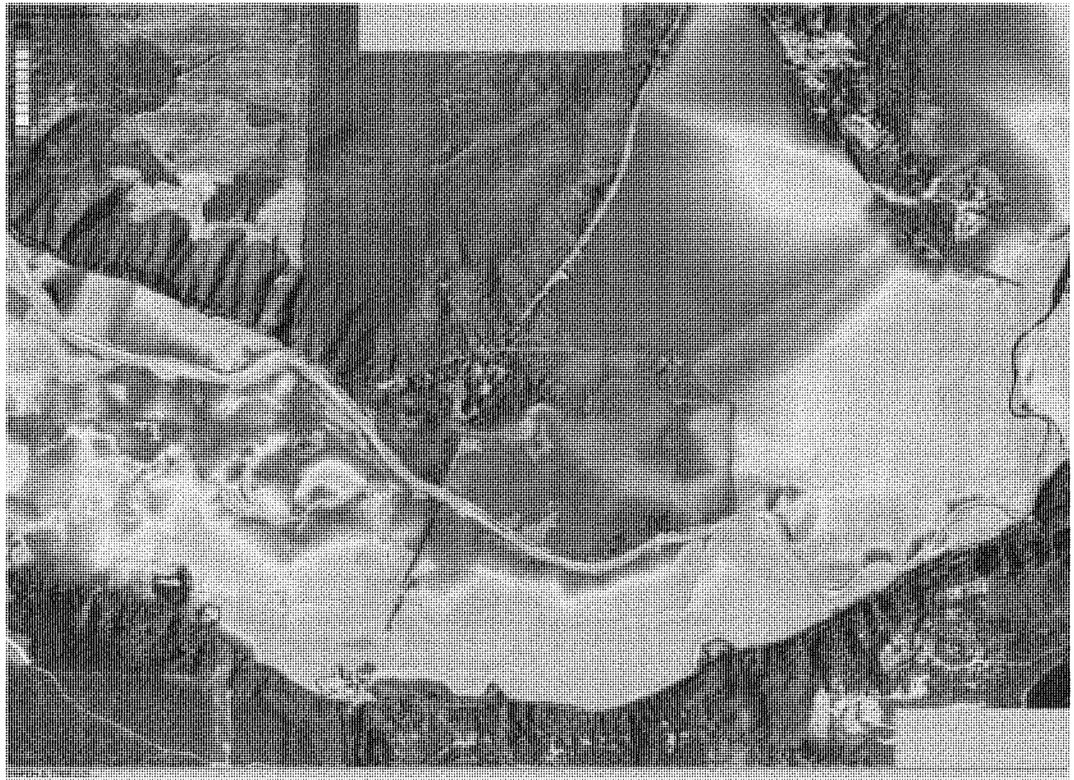

Figure 54. Model results for river mile 2 to 6.5 showing water depth at the 10-year flood.

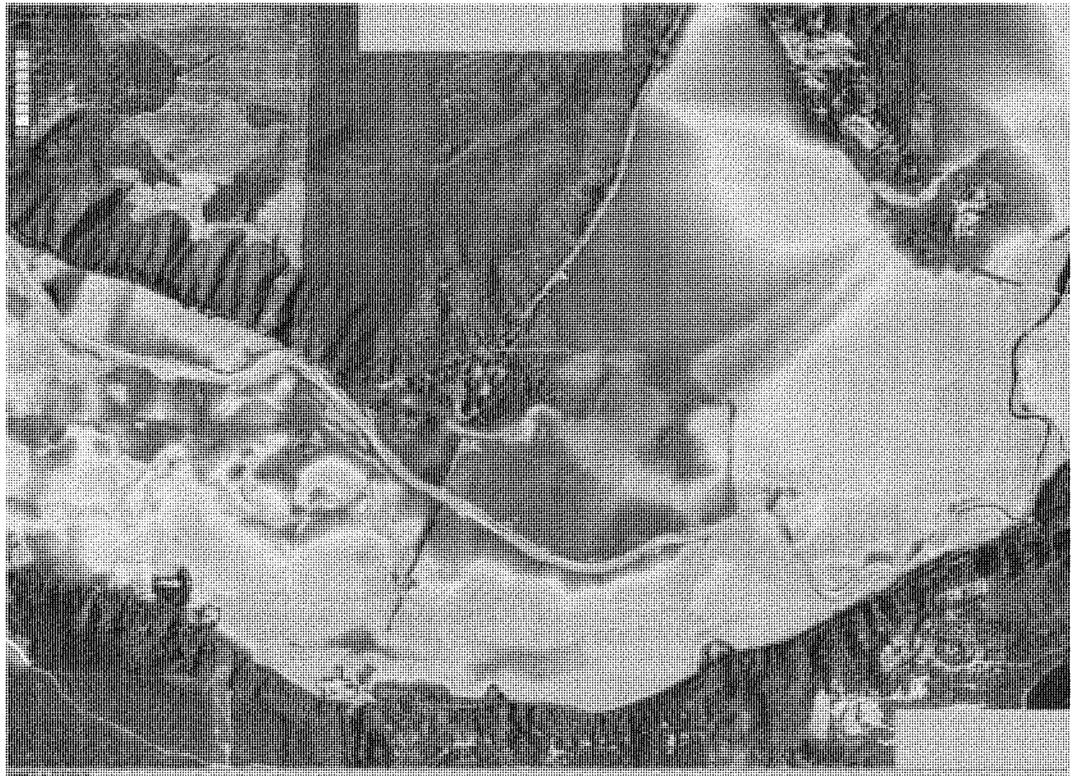

**Figure 55. Model results for river mile 2 to 6.5 showing water depth at the 50-year flood.**

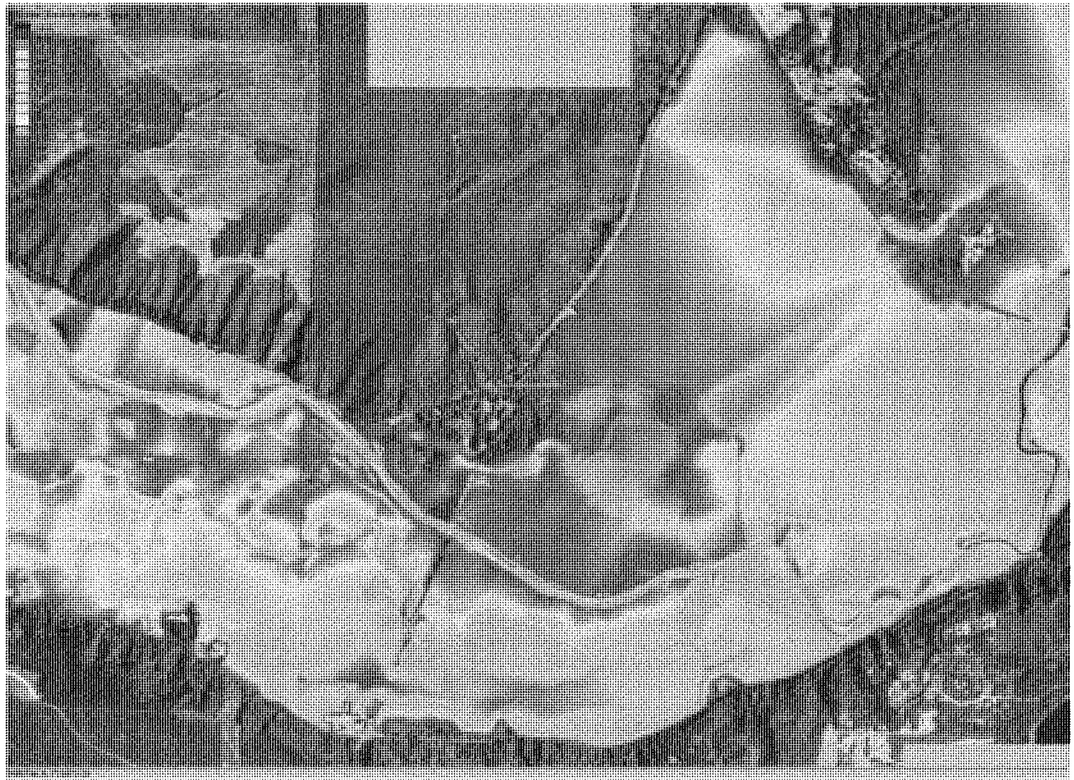

Figure 56. Model results for river mile 2 to 6.5 showing water depth at the 100-year flood.

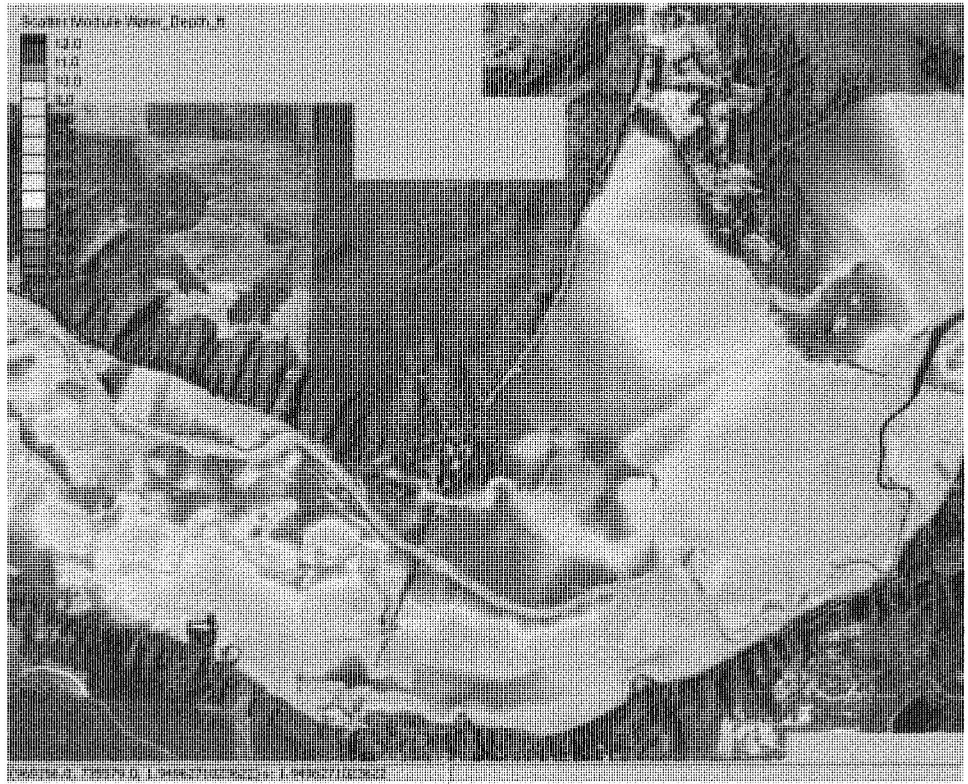

Figure 57. Model results for river mile 2 to 6.5 showing water depth at the 500-year flood.

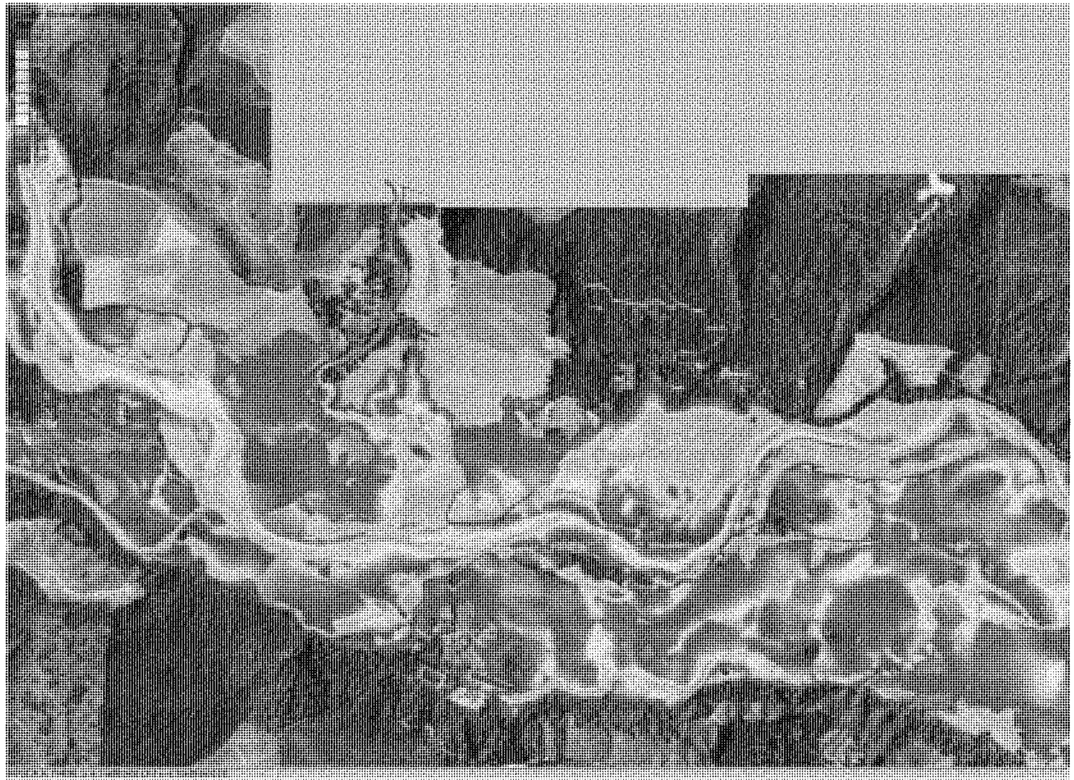

Figure 58. Model results for river mile 6.5 to 10.5 showing water depth at the 2-year flood.

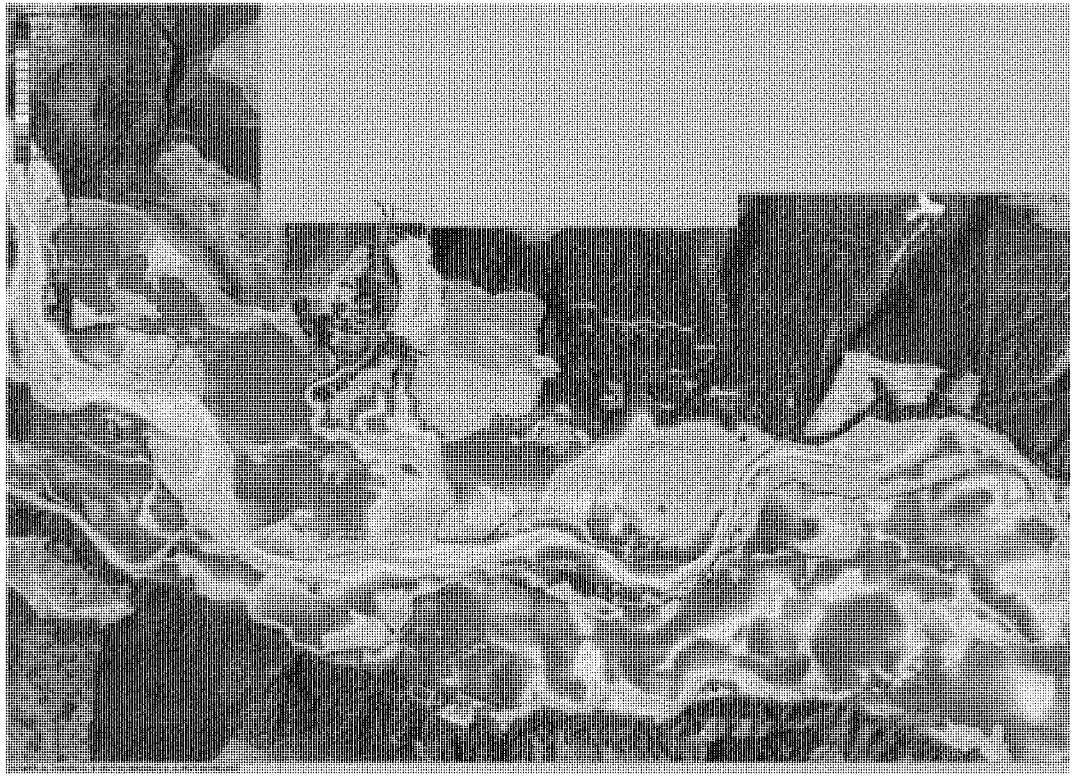

Figure 59. Model results for river mile 6.5 to 10.5 showing water depth at the 5-year flood.

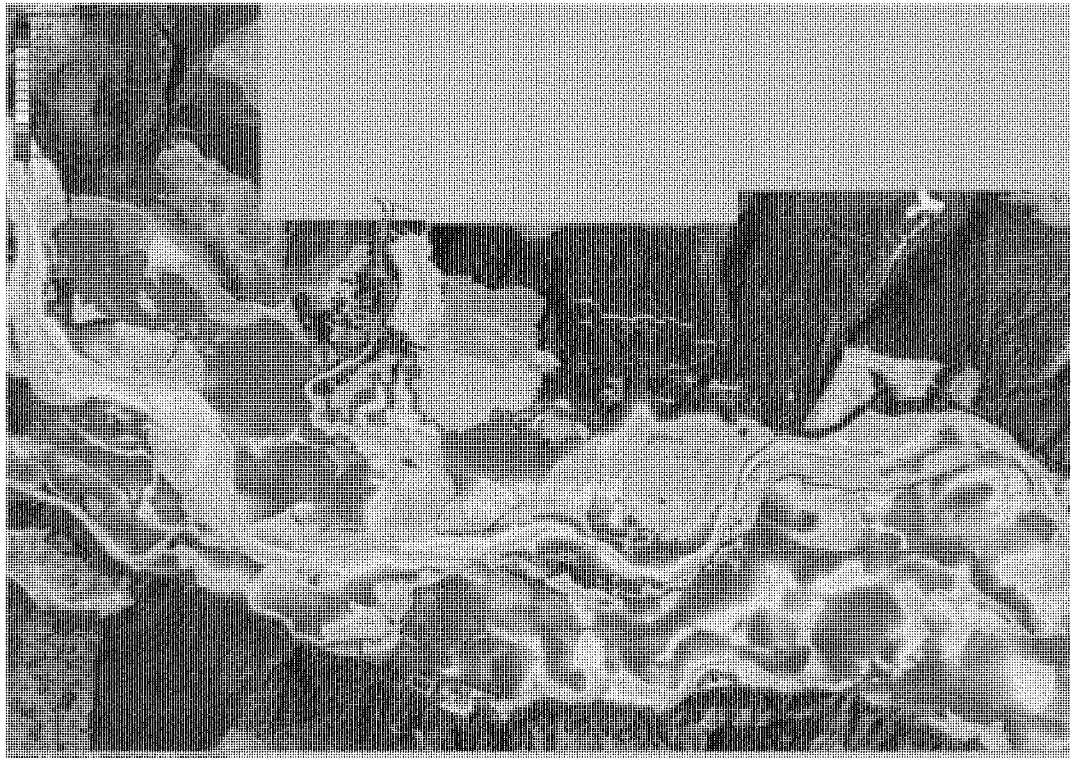

Figure 60. Model results for river mile 6.5 to 10.5 showing water depth at the 10-year flood.

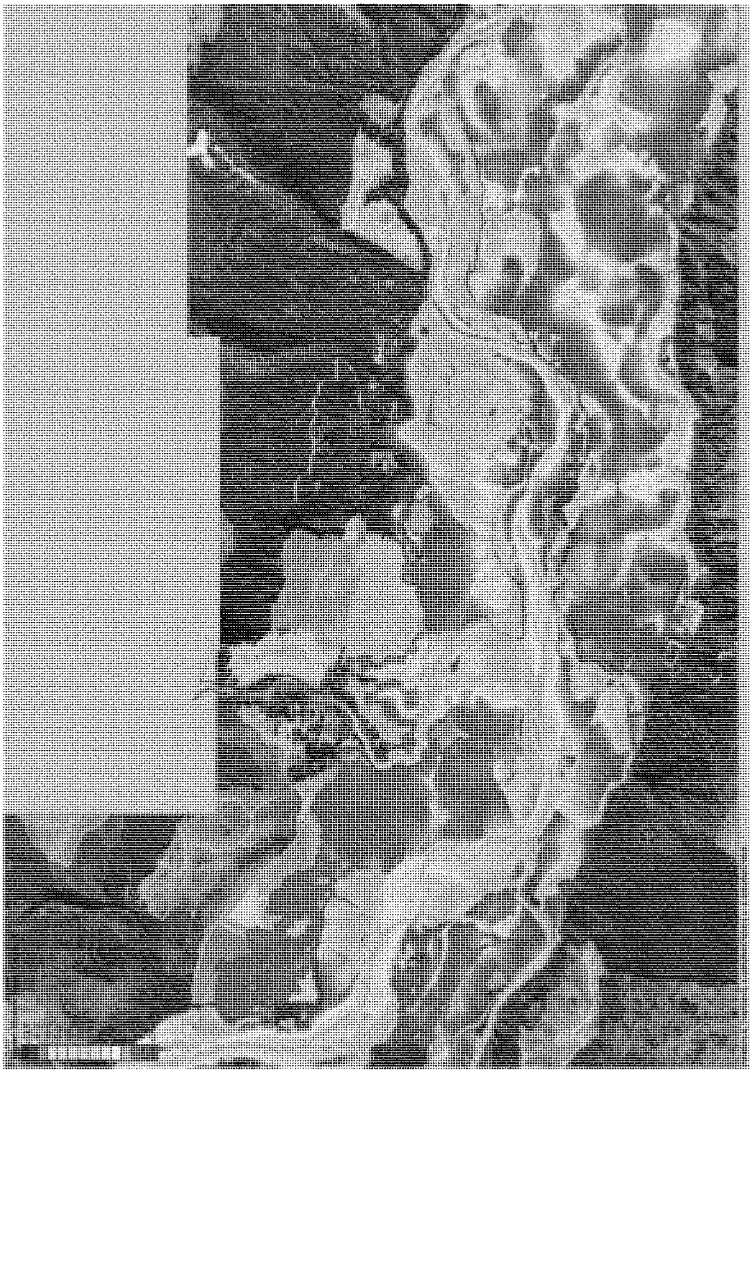

Figure 61. Model results for river mile 6.5 to 10.5 showing water depth at the 50-year flood.

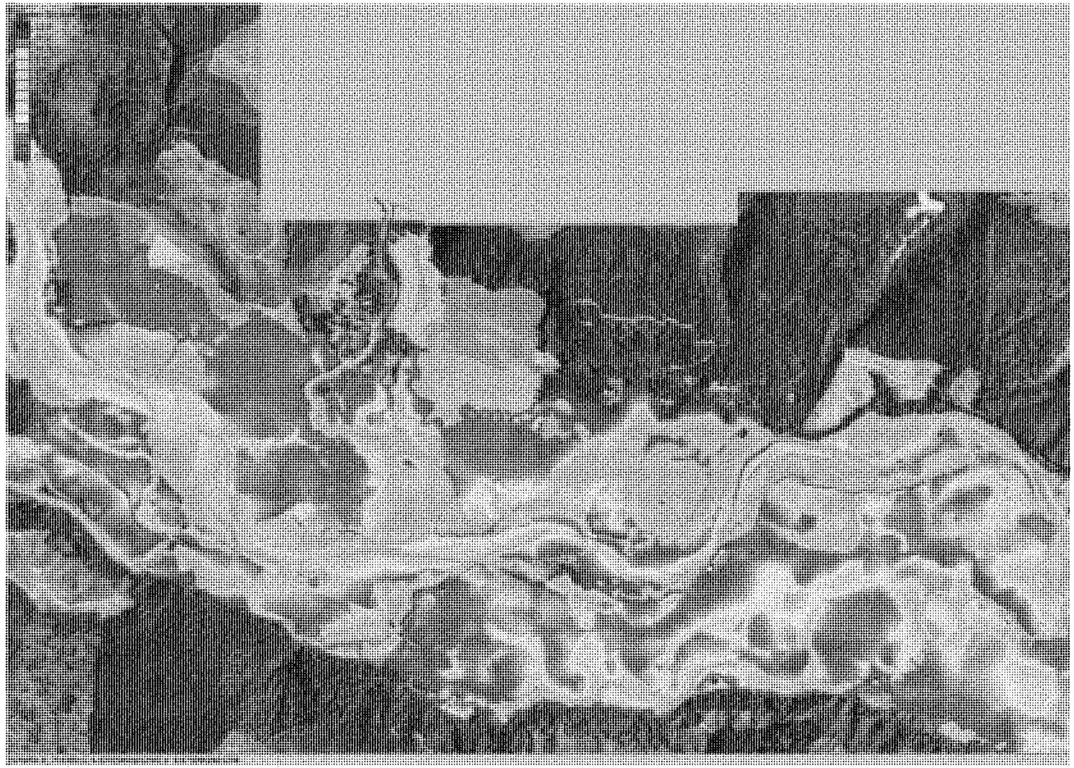

Figure 62. Model results for river mile 6.5 to 10.5 showing water depth at the 100-year flood.

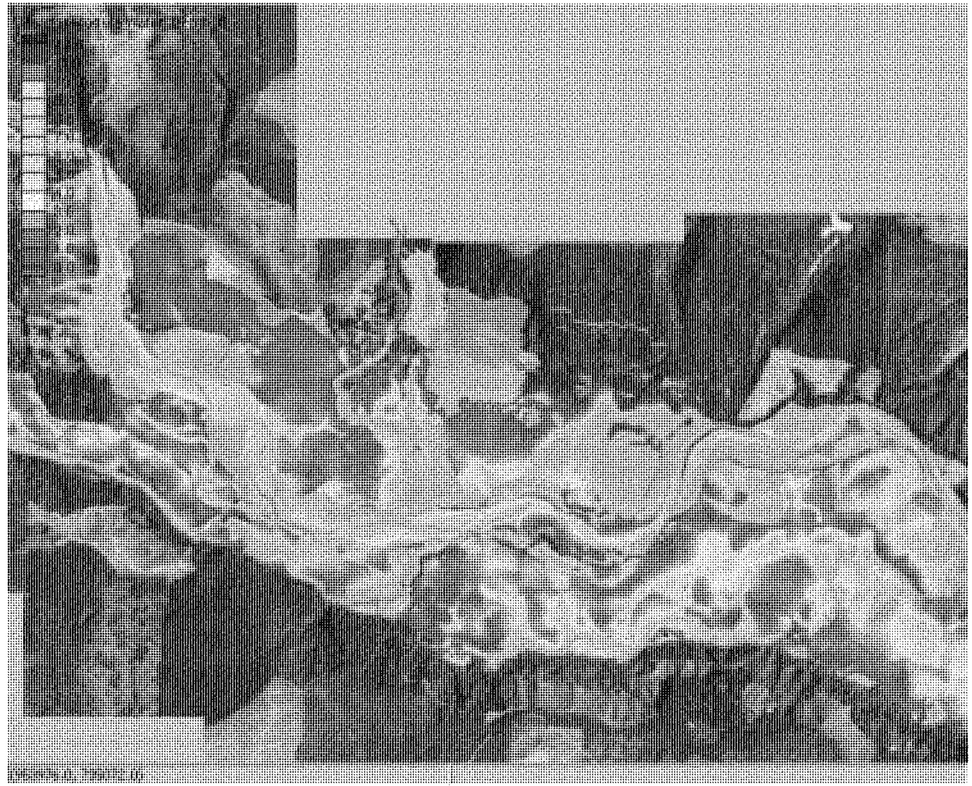

Figure 63. Model results for river mile 6.5 to 10.5 showing water depth at the 500-year flood.

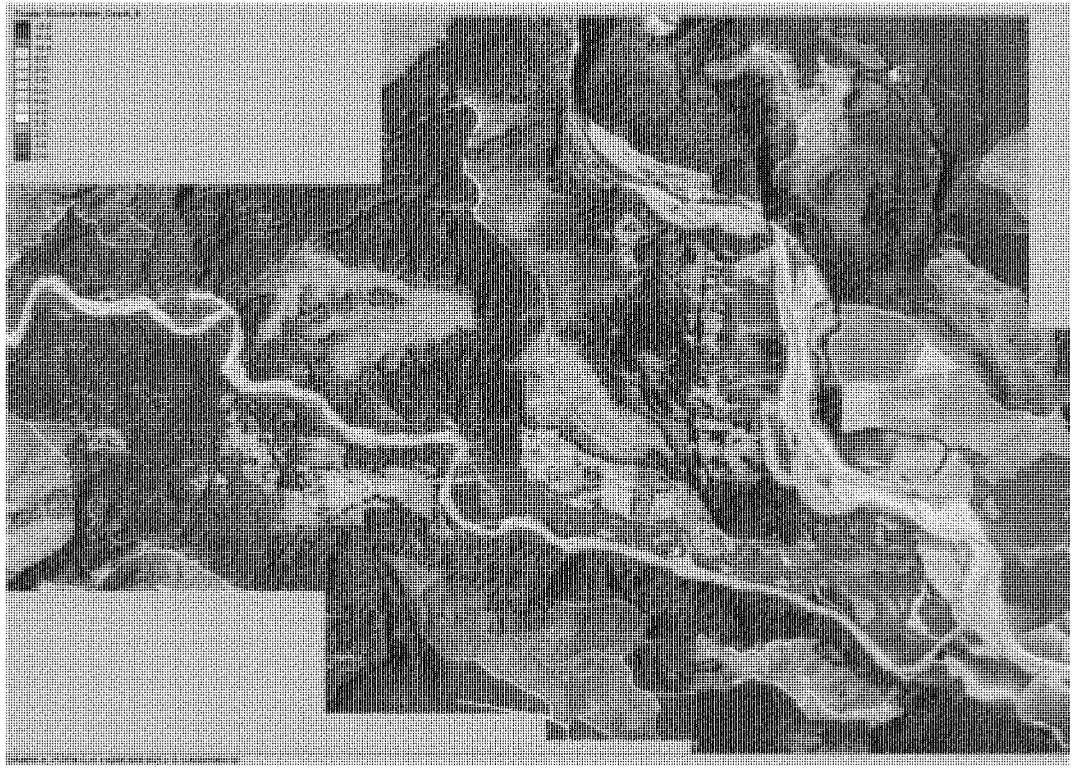

Figure 64. Model results for Vance Creek showing water depth at the 2-year flood.

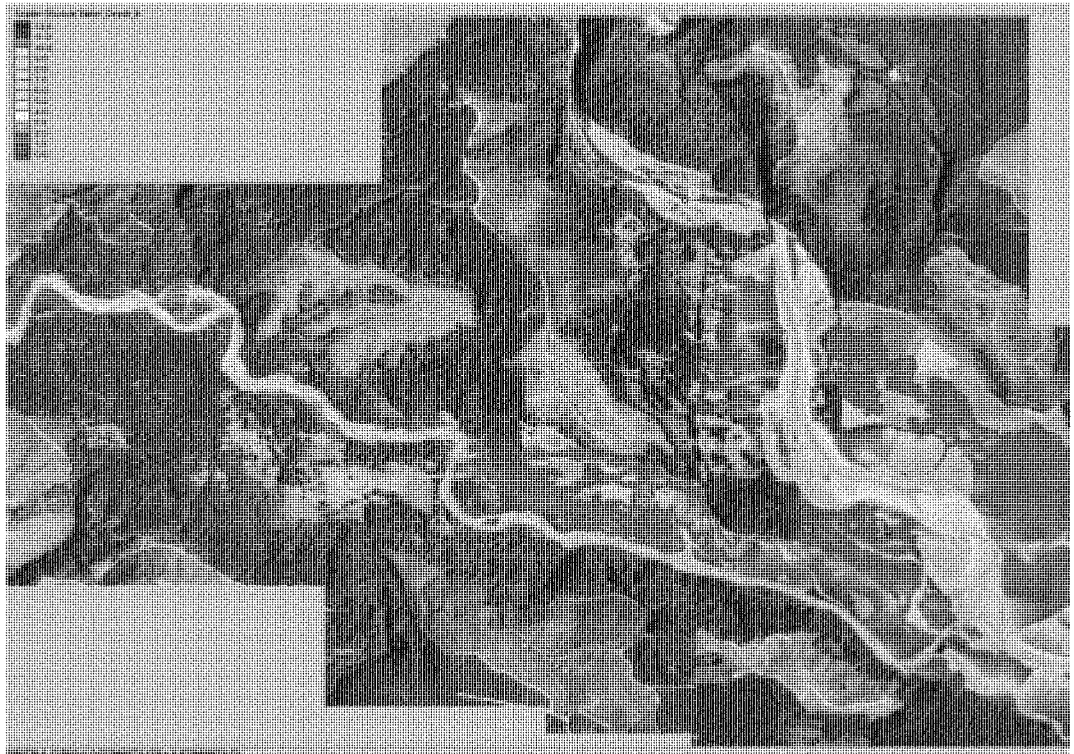

**Figure 65. Model results for Vance Creek showing water depth at the 5-year flood.**

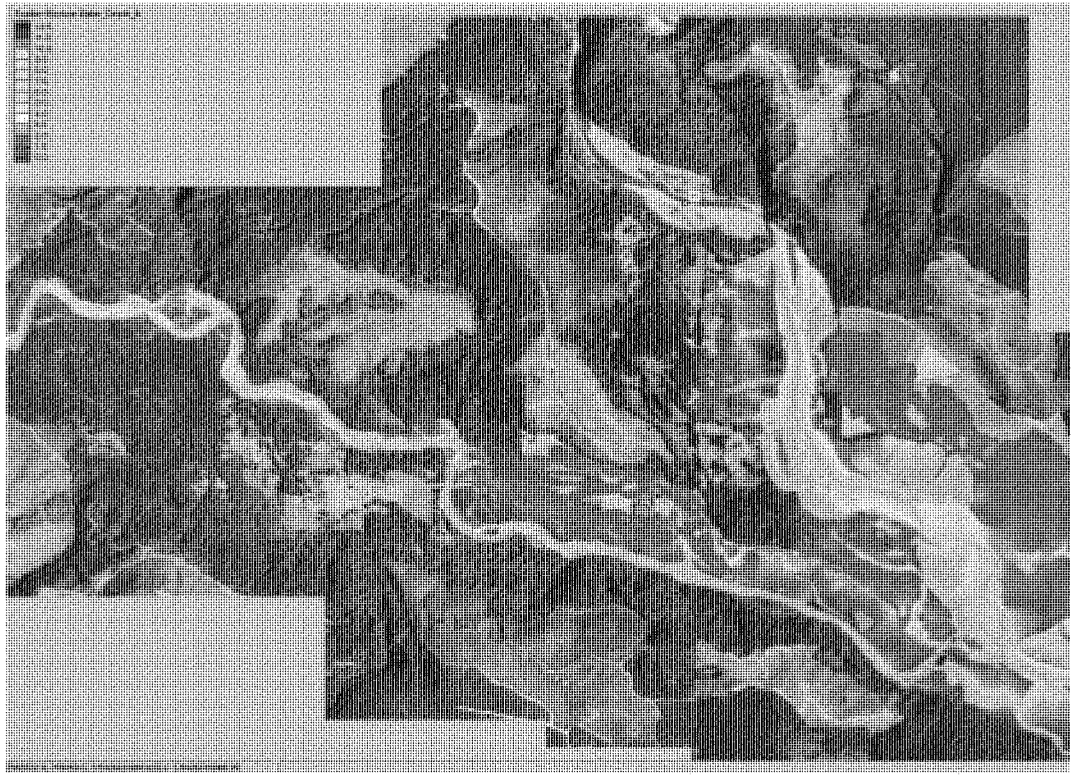

Figure 66. Model results for Vance Creek showing water depth at the 10-year flood.

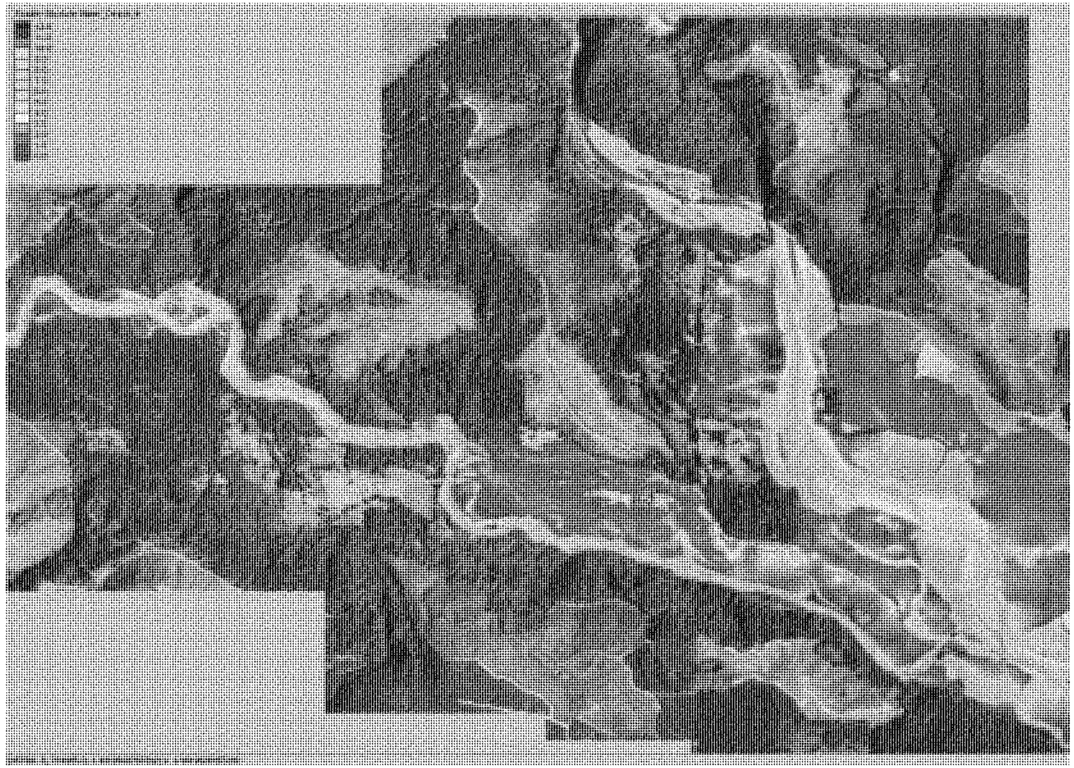

Figure 67. Model results for Vance Creek showing water depth at the 50-year flood.

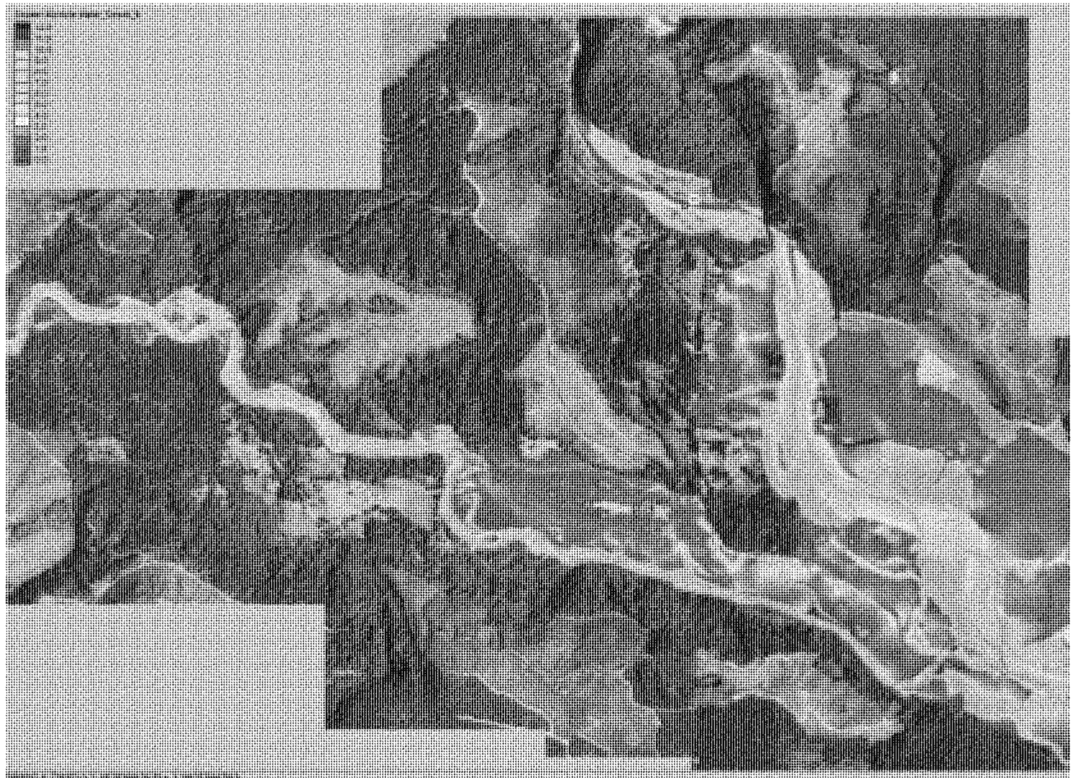

**Figure 68. Model results for Vance Creek showing water depth at the 100-year flood.**

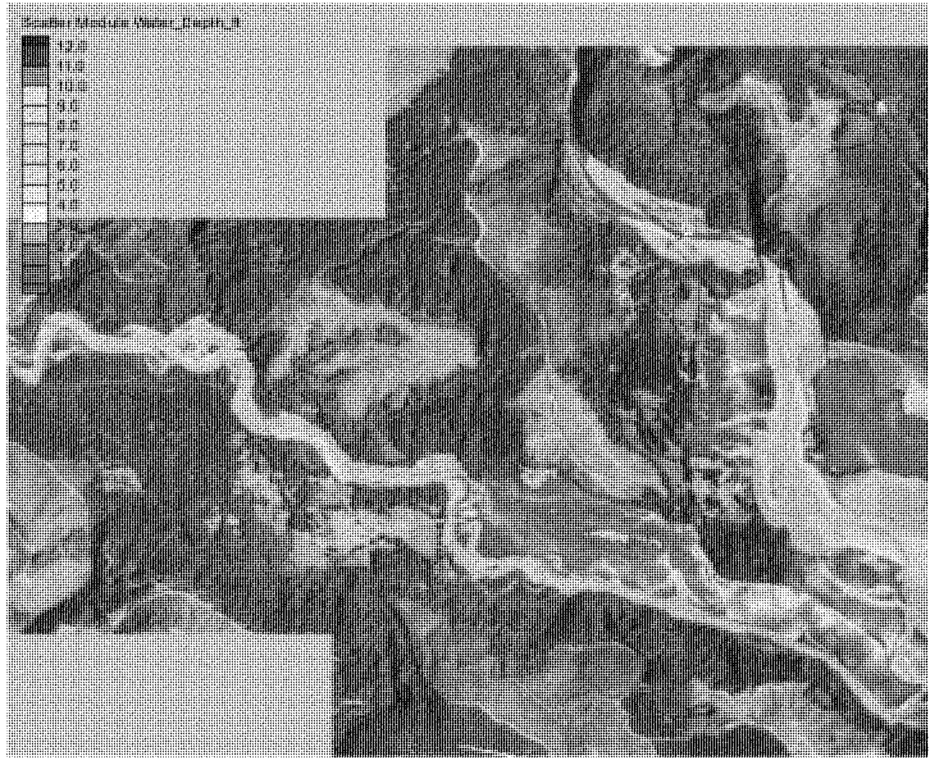


**Figure 69. Model results for Vance Creek showing water depth at the 500-year flood.**

# 6.0 Model Summary

An existing 2D model was refined to incorporate new topography collected by Reclamation on Vance Creek, the Purdy Creek Bridge widening, along with adding flow inputs at Vance Creek and the North Fork. The new 2D model covers the lower 4 miles of Vance Creek and the downstream-most 10 miles of the South Fork and mainstem Skokomish River. The 2D model accommodates lateral variation in water surface elevations. The 2D model output was used to generate coarse-scale inundation mapping and to determine critical locations where the Skokomish River starts to flow out of bank as river discharges increase.

Model results indicate the mainstem Skokomish River reduces its channel discharge capacity between RM 9 and 8, regains some capacity by RM 7, and then reduces capacity again in the downstream direction. Vance Creek has a large channel capacity relative to the 2-year flood between RM 3 and 1, but downstream of RM 1 reduces by about half. Water depths range from 0 to 18 ft, but generally are less than 12 ft for the floods modeled. To assist with inundation interpretations, model results were post-processed in GIS to develop 5-ft raster grid files of water depth for each model run (e.g. 2-year, 5-year, 10-year, 50-year, 100-year, and 500-year floods).

# 7.0 Uncertainty and Data Collection Recommendations

All numerical hydraulic models have uncertainty due to potential error in topography, discharge, representation of roughness, and to a lesser degree computational procedures. Roughness uncertainty in predicted water elevation results for this effort is estimated to be less than 0.5 ft. The largest potential uncertainty of the Skokomish 2D model is accurate representation of complex topography, particularly features that control when flow spills out of the main channel into overbank areas. Model results for RM 0 to 2 should be used with the caveat that channel elevations were estimated and need to be updated in the future to accurately model this region. Road crossings were modeled as open channel flow. Therefore, floods that may overtop road crossings and result in pressurized flow may have a larger local backwater in reality than shown in the model.

If it is of interest to further improve the2D model, the following steps could be considered for implementation and prioritized based on where it is most critical to reduce uncertainty:

- Collect and incorporate new topographic data to address data gaps:
    - Below water portions of the Skokomish channel downstream of RM 2 (no data currently available)
    - Profiles along top of bank of mainstem channels and levees to validate and refine overbank flow potential (currently uses 1998 photogrammetry)

- o North Fork channel and floodplain (no data currently available)
- o Hydraulic controls (riffles and channel widening/narrowing) on the mainstem channels that influence water surface elevation (focus on gaps between 2007 cross-section survey locations or where change in bed elevation or width is significantly different)
- o Channel survey data for wetted channel areas of the floodplain, including Purdy Creek, Weaver Creek, and Skabob Creek (not well represented in photogrammetry where channels were flowing with water at time of data collection)

- Collect new high water elevations with a more robust discharge measurement at numerous locations along the mainstem channel that correlate in time with updated topographic data
- As a lower priority, collect new LiDAR or photogrammetry data at a low river flow that is processed to remove vegetation and more accurately represents bank elevations and floodplain topography, along with in-channel bars and islands that are exposed at low flow. This task would ideally be accomplished in a similar timeframe but slightly higher flow river survey (to have overlapping data) that collects longitudinal profiles to represent the wetted channel.

## 8.0 References

England, J., 2007, Flood frequency, flow duration, and trends; Skokomish Geomorphic Study, Skokomish River, WA, Bureau of Reclamation, Denver, CO.

Kimbrel, S., 2009, Flood frequency study, Vance Creek, Washington, Bureau of Reclamation, Denver, CO.

Klumpp, C., and J. Bountry, 2009, Numerical Modeling Results for the Skokomish River Mason County, Washington, Bureau of Reclamation, Denver, CO.

# Appendix B: Bedload Transport Modeling

Sediment transport modeling is another tool that can aid in understanding the sedimentation and geomorphic processes of a river. In the Skokomish River, the dominant channel sedimentation processes are bedload transport and deposition. Modeling was conducted for the main channel bedload transport, and did not include suspended sediments or overbank sedimentation. Bedload modeling utilizes channel geometry, hydraulic roughness, water discharge, bed material sizes and sediment load characteristics to compute bedload transport, erosion, and deposition along a river channel. The bedload transport modeling combined with the hydraulic modeling, sediment budget, and riverbed change analysis will provide information to inform the design of flood risk reduction alternatives and the analysis of potential geomorphic changes and related changes in physical habitats.

Bedload is the movement of sediment particles rolling, sliding, or bouncing along the riverbed. Under base flows the riverbed is generally stable, with little or no bedload transport. As stream discharge increases, particles on the riverbed surface are put into motion by the increasing force of the flowing water. The smaller particles require less energy to initiate motion and begin to move before the larger particles. Conversely, the larger particles deposit first, when the river still has enough energy to transport the smaller particles. Smaller particles are often eroded from the bed surface by modest discharges, resulting in the formation of a coarse surface layer, commonly referred to as armoring. Bedload moves much slower the water carrying it and individual particles generally move only short distances, on the order of 100's of feet a year.

MODELING APPROACH

Bedload transport modeling utilizes empirical equations to simulate the movement of bed material along the riverbed. USACE's one-dimensional sediment transport model HEC-RAS 4.1 was chosen for this investigation. HEC-RAS utilizes steady-state hydraulic calculations to generate quasi-unsteady sediment transport. For a given flow condition, HEC-RAS calculates the energy slope, velocity, and depth at each river cross-section. Those variables are then combined with the bed material gradations and a selected sediment transport equation to calculate transport rates at each cross-section. The difference in transport rates between cross-sections determines the resulting erosion or deposition. The sediment transport rates are calculated by grain size, allowing for the downstream sorting of the sand and gravel.

The accuracy and usefulness of the modeling depends on how well the equations reproduce the observed sediment behavior of the river. The bedload transport equation used in this model was the Meyer-Peter Muller (MPM) equation (1948). The MPM bedload equation is widely used in river engineering investigations and is well suited for gravel bedded rivers. The MPM equation calculates bedload transport by comparing the forces at the riverbed generated by the water, to the force required to initiate motion of the bed material particles.

Judging the accuracy of the model results depends on the type and amount of available data. For the Skokomish River the available data consists of the 1994-2007 bed elevation changes, a limited amount of bedload measurements, bed material samples, and streamflow measurements.

Several different combinations of factors were modeled to refine the performance of the model. The most significant alternative comparisons made in this analysis were between the MPM equation and a modified version of MPM (Wong and Parker, 2006), and between surface and sub-surface material gradations.

**MODEL DATABASE**

Model Geometry

The HEC-RAS model used in this analysis covers the river from RM 2 to near RM 11. KCM (1997) developed the original one-dimensional, steady state model using HEC-2. That model was later updated by CES (1999) and WEST (2006). For this bedload analysis USACE again updated the model with new channel cross-section surveys between RM's 2 and 11 completed by Pacific Geomatic Services in 2007. Lateral weirs were used along the channel to simulate the diversion of flood waters from the main river channel. Active flow areas were limited to those along the river that influenced the amount of water in the main channel.

Bed Material

The bed material gradation is an important factor in the bedload transport calculations. The potential transport for each grain size is adjusted by the percent of the total bed composed of that size class to arrive at the computed transport.

The South Fork and main stem Skokomish River are high energy streams with coarse grained riverbeds. The bed material is predominately gravel, with small amounts of sand and cobbles. The median grain size, $D_{50}$, of bed material samples collected by Reclamation (2009a) are shown in Figure B-1. As B- 1 shows, the surface sediment layer is coarser than the sub-surface material, and both become finer in the downstream direction.

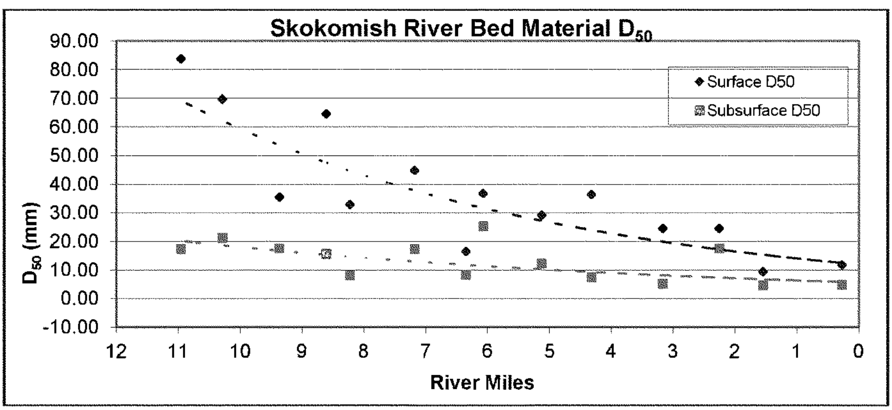


Figure B-1. Surface and sub-surface sediment D50's for the South Fork and Skokomish Rivers (Reclamation, 2009a).

Bed sediments throughout the reach varied widely and range from sands to cobbles, depending on local flow conditions. The sediment gradations shown in Figure B-2, taken near the old North Fork confluence (RM 8.4) (Reclamation, 2009a) are typical of those found throughout the river. They show strong bed armoring patterns, with a majority of surface layer being a mix of coarse gravels and some cobbles. The sub-surface layers were generally gravelly with some sands found in the matrix. The coarse surface layer restricts bedload transport until the discharge increases enough to mobilize it and expose the sub-surface material. The available stream energy is then higher than required to mobilize the smaller sub-surface sediments and the sub-surface material erodes relatively rapidly.

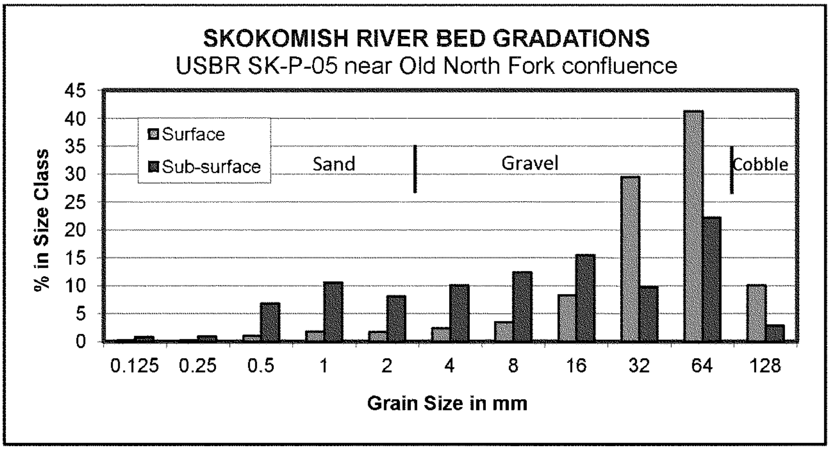


Figure B-2. Bed gradations near Old North Fork confluence (RM 8.5) (Reclamation 2009a)

Bedload Measurements

The Skokomish River is unusual, in that there are actual bedload measurements available for this river. Bedload measurements have been taken the Skokomish River by Simons and Associates (SA), and the USGS. The initial bedload samples were collected by SA in 1996, as part of their work for TPU. SA collected bedload data at the USGS gaging sites on the South Fork and main stem, and on the main stem at Highway 106. USACE identified a need for current bedload measurements to support this study and entered into an agreement with the USGS to measure bedload on the main stem at Highways 101 and 106.

The SA bedload data, shown in Figures B-3 and B-4, indicates there was little bedload transport at any of the three sites when discharges were below 2,000 cfs. Between 2,000 cfs and 4,000 cfs bedload transport began to increase, but remain below 800 tons/day on the South Fork and 500 tons/day on the main stem. Given the steeper slope on the South Fork, it would be expected to transport more bedload for the same discharge than the main stem. SA did not report any bedload data on the South Fork for discharges over 4,000 cfs. The 4,000 cfs discharge is frequently exceeded during winter storms and is well below the 12,100 cfs peak of a 50-percent chance exceedance flood on the South Fork. Based on the data for the main stem at Highway 101 that indicates bedload increases rapidly for discharges over 4,000 cfs, there is not enough bedload data for the South Fork to estimate the transport rates above 4,000 cfs. Lacking sufficient bedload measurements, the South Fork bedload inflows were calculated based on equilibrium transport at the upstream cross-section. This method uses the bed material gradation and hydraulic conditions to calculate the bedload inflow, but does not alter the initial cross-section conditions during the model run.

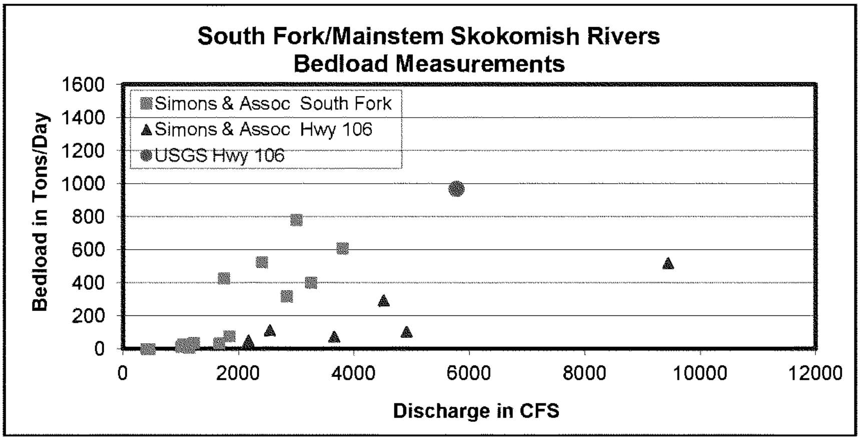


Figure B-3. Measured bedload transport at the South Fork USGS gaging site and on the main stem Skokomish River at Highway 106.

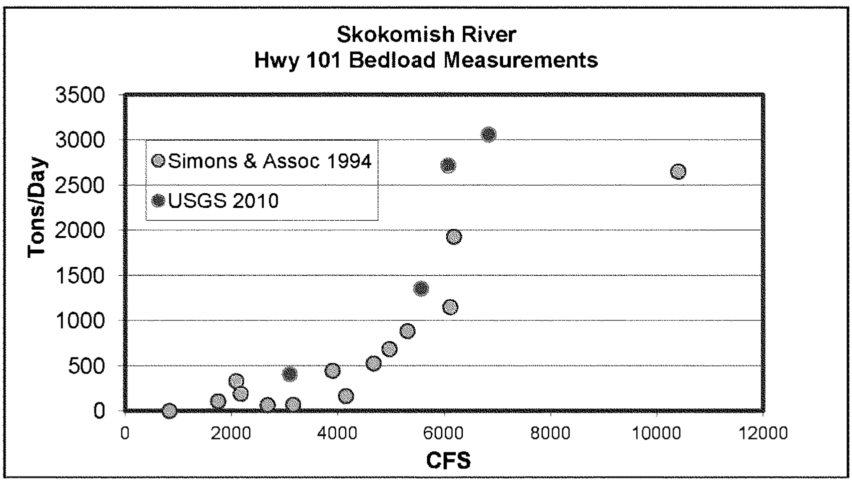


Figure B-4. Measured bedload transport on the main stem Skokomish River at Highway 101.

The best data set is the one for the main stem Skokomish River at Highway 101. There the 1994 SA data has been supplemented by the USGS 2010 data (Figure B-4). The measurements cover river discharges that range from near base flows to flows well above flood stage. The SA and USGS data are very consistent and show a rapid rise in bedload transport from around 500 tons/day at 4,500 cfs to about 2,700 tons/day at 6,000 cfs. The measurements cover nearly the maximum discharges expected to occur at this site as most flood water is diverted out of the river before it reaches Hwy 101. The increase in bedload transport above 4,500 cfs suggests the main stem bed is generally armored for discharges up to about 4,500 cfs, and that the armor begins to breakup and the sub-surface sediments are mobilized as discharges rise above 4,500 cfs. The 4,500 cfs discharge is approximately the bank-full discharge at this site. The bedload data for the Hwy 101 site also includes the size distribution of the bedload. Figure B-5 show a typical size distribution for bedload sampled in 2010. The bedload data confirms that particles up to at least 64 mm are being transported by the river.

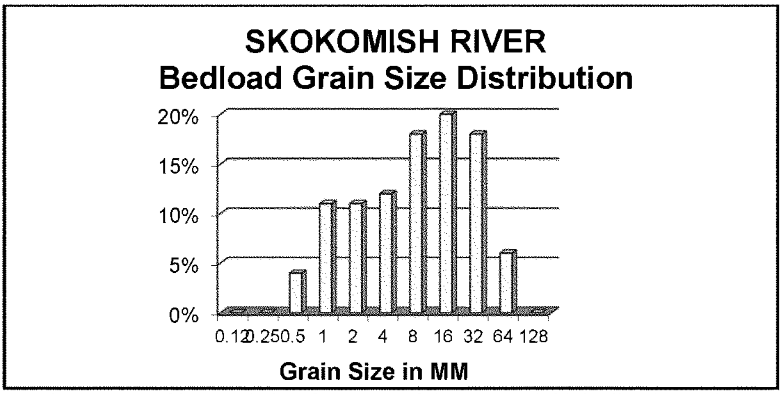


Figure B-5. Size gradation from one of the 2010 USGS bedload samples.

Measured bedload transport is lowest at the Hwy 106 site on the main stem. The SA and USGS data are not as consistent here as at Hwy 101, but both show lower bedload transport rates. The Hwy 106 discharge is influenced by the tides in Hood Canal and this complicates the bedload transport. Much more data would have to be collected at Hwy 106 to establish the relationships between tidal stage, river discharge, and bedload transport.

Hydrology

Discharges used as inflows in this bedload transport modeling were derived from Reclamation's hydrologic analysis (2007). The discharges for the South Fork stream gaging site were the inflows at the upstream model boundary. Tributary inflows were developed for the North Fork and Vance Creek, and the total inflows were compared to the main stem gage site discharges. Annual bedload transport was computed using the annual flow duration curves and flood hydrographs were used for individual flood events. Discharges varied widely along the modeled channel as tributaries entered, and flood waters exited and re-entered the main channel.

## MODEL PERFORMANCE

It is desirable to calibrate any hydraulic model to observed data to insure it is accurately reproducing what actually happens on the river. Water surface profile models are usually calibrated to high water marks from past floods and/or to stage/discharge rating curves at USGS gaging sites. The Skokomish River bedload transport model results can only be compared to observed data at the main stem USGS gage at Hwy 101. There are stage/discharge and bedload transport measurements available at that site that can be compared to the model results. While those comparisons are very useful, they are not adequate to justify a high degree of accuracy or precision in the model results due to the large variations in discharge and bedload transport found in the Skokomish River. Other comparisons that can be made to evaluate the model performance are; to the flow patterns in Reclamation's 2-D hydraulic model, and the observed deposition in the river. These are broader, more generalized comparisons, but they are still useful.

Hydraulic

During floods, much of the Skokomish River's discharge is diverted out of the river channel before it reaches the USGS gaging site at Hwy 101. The highest discharge measured by the UGS in the last five years was 6,840 cfs, measured during bedload sampling in January 2010. The hydraulic calculations in the bedload transport model include the diversion of flood water from the channel, resulting in similarly reduced flood discharges at the gage site. Figure B-6 shows the relationship between the measured and computed water surface elevations at the Skokomish River gage. The match is very good, up to the maximum computed discharge of 5,200 cfs. The HEC-RAS model's inability to produce more than 5,200 cfs at the Hwy 101 bridge appears to be related to top of bank elevations upstream of the bridge. The model results are more uniform than the measurements. The small irregularities in the measured data may be due to changes in the riverbed elevation.

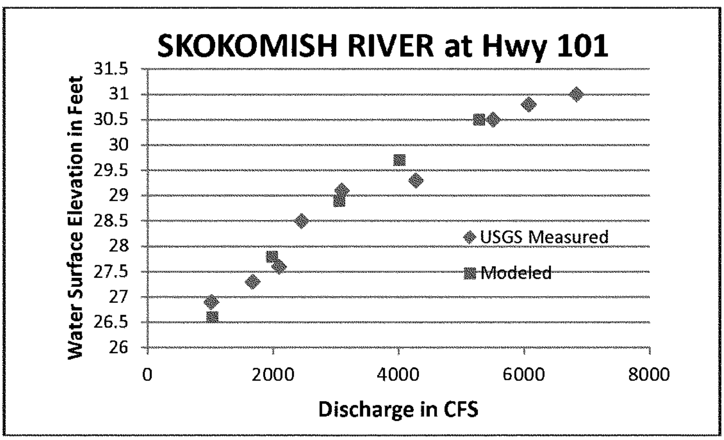

Figure B-6. Measured and modeled water surface elevations for the USGS Skokomish River gage at Hwy 101.

A Manning's roughness value of 0.030 was used for most of the Skokomish River channel downstream of the North Fork (RM 7.3). The exception was a reach between RM's 2 and 3 where Manning's roughness was raise to 0.042 to account for a confined channel with vegetation and LWD. On the South Fork, Manning's roughness was raised slightly to 0.032. In the vicinity of the old North Fork confluence (RM 8-8.5) the channel roughness was subdivided, with values of 0.04-0.06 used to represent vegetation and/or accumulations of LWD present within this wide channel reach. Ineffective flow areas and lateral weirs were used to limit the overbank flow to areas adjacent to the channel. A Manning's roughness of 0.12 was generally used for the riparian forests adjacent to the channel. Downstream of RM 5 values of 0.6-0.8 were used for overbank wetlands. These Manning's roughness values produced a good match to the measured stage/discharge values at the USGS gage at Hwy 101, shown in Figure B-6.

The other useful comparison that can be made is the channel discharges computed by HEC-RAS and Reclamation's 2-D model. Channel discharges vary along the river as tributaries enter, and flood waters leave and re-enter the main channel. The 2-D model better represents the irregular topography and hydraulic roughness of the river and floodplain. This gives it significant advantages in computing the distribution of flow in the river channel and floodplain. Comparing the HEC-RAS channel discharge to the 2-D model's channel discharge gives an indication of how well the HEC-RAS results represent the changing conditions along the river. Table B-1 lists the channel discharges for similar flows from Reclamation's 2-D model and HEC-RAS. The results follow the same pattern, but HEC-RAS tends to keeps slightly more discharge in the river channel.

Table B-1. Modeled channel discharges from Reclamation, 2011, and the HEC-RAS model used to compute bedload transport.

| *River Mile* | *Reclamation 2-D Model Discharge in CFS* | *HEC-RAS 1-D Model Discharge in CFS* |
|---|---|---|
| 10 | 9,600 | 8,500 |
| 9 | 10,800 | 11,900 |
| 8 | 3,200 | 6,000 |
| 7 | 7,200 | 8,400 |
| 6 | 5,200 | 5,000 |
| 5 | 3,200 | 4,900 |
| 4 | 2,400 | 3,000 |
| 3 | 4,000 | 2,400 |
| 2 | 4,000 | 10,700 |

Bedload

Computed bedload transport rates can be very sensitive to the transport function and bed material gradations used in the modeling. This study used two bedload transport functions and two bed material gradations to investigate a range of potential transport conditions. The two transport functions were the MPM (1948) and a modified version of MPM (mod-MPM) (Wong and

Parker, 2006). Both equations were used to compute bedload using the sub-surface bed material gradations. Additionally, the MPM equation was used to compute bedload using the coarser, surface bed material gradations. The computed bedload transport rates and gradations can be compared to the measured values on the Skokomish River at Hwy 101.

**Transport Rate.** Computed bedload transport rates for the Skokomish River at Hwy 101 for the three model runs are plotted in Figure B-7, along with the measured bedload transport rates. The MPM results show much higher bedload transport rates for the finer, sub-surface material gradation (MPM sub-surface) than for the surface gradation (MPM surface). The MPM surface results match the measured rates very well below 4,500 cfs when the riverbed is armored. However, above 4,500 cfs the PMP surface rates begin to fall below the measured bedload. The MPM sub-surface rates are higher than the measured rates, but are approaching the measured rates above 5,000 cfs. The mod-MPM with sub-surface gradations (mod-MPM sub-surface) results also match the measured bedload very well up to about 5,200 cfs. The bedload transport measurements extend up to 3,100 tons/day at 6,480 cfs, but the HEC-RAS model, in its present form, does not generate that high of a discharge at Hwy 101.

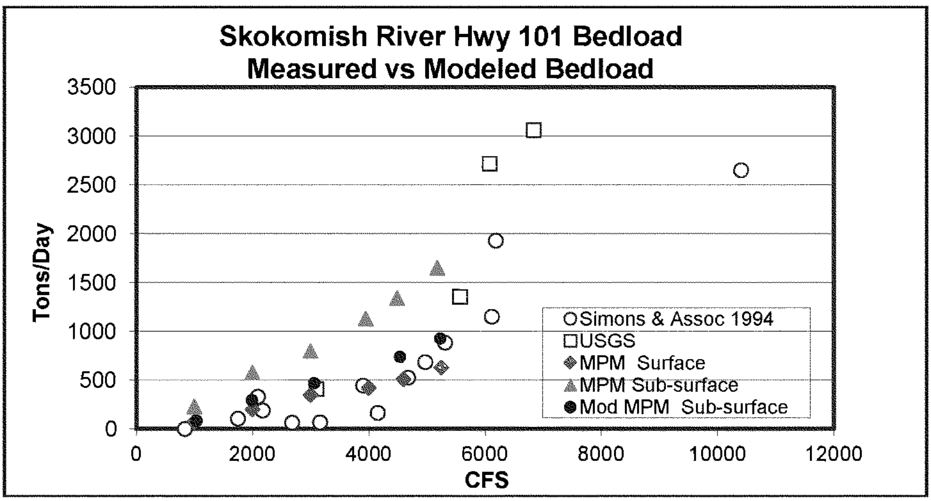


Figure B-7. Computed and measured bedload transport on the main stem Skokomish River at Highway 101 (RM 4.8).

**Gradation.** The transport rate is not the only bedload performance measure that can be made on the Skokomish River. The gradation of the computed bedload transport can be compared to the measured bedload and bed material gradations of the river. Figure B-8 shows the MPM surface and MPM sub-surface model transport gradations computer for approximately 5,100 cfs, and a comparable USGS 2010 gradation for the Skokomish River at Hwy 101. While both transport models predicted the bedload rate quite well, neither of them matches the gradation very well. The models do not calculate enough shear stress (Shear stress is a measure of the hydraulic force on the riverbed; defined as the product of the specific weight of water, the hydraulic radius and slope) at Hwy 101 to transport particles larger than 8 mm, despite the fact that the USGS measurements indicate that nearly half the bedload at 5,100 cfs is composed of particles between 8 and 64 mm. Figures B-9 and B-10 show the variation in bedload gradation with the surface and sub-surface bed material gradations. In both cases, the bedload is finer than the associated bed material gradation. The discrepancy between bedload gradations and bed material gradations exists throughout the model. Because this is a persistent discrepancy, its impact on the overall deposition volumes and pattern are judged to be minimal.

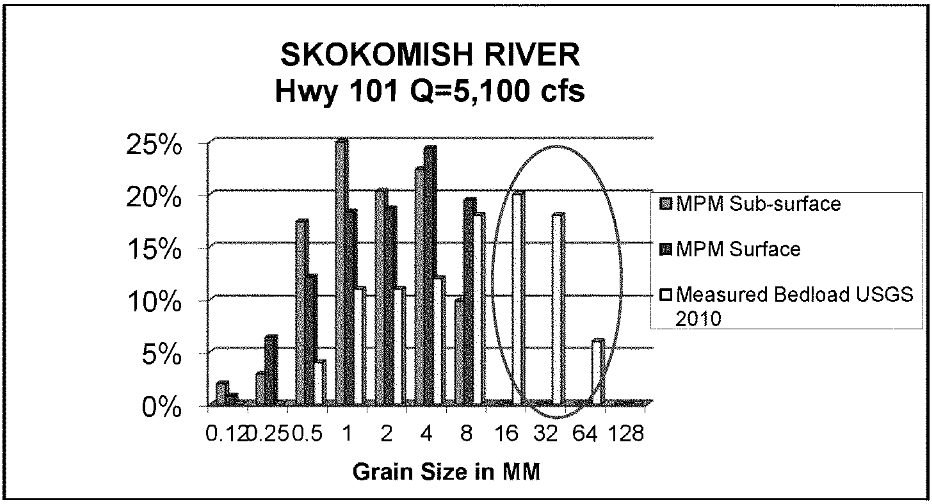


Figure B-8. Computed and measured bedload gradations for the Skokomish River at Hwy 101.

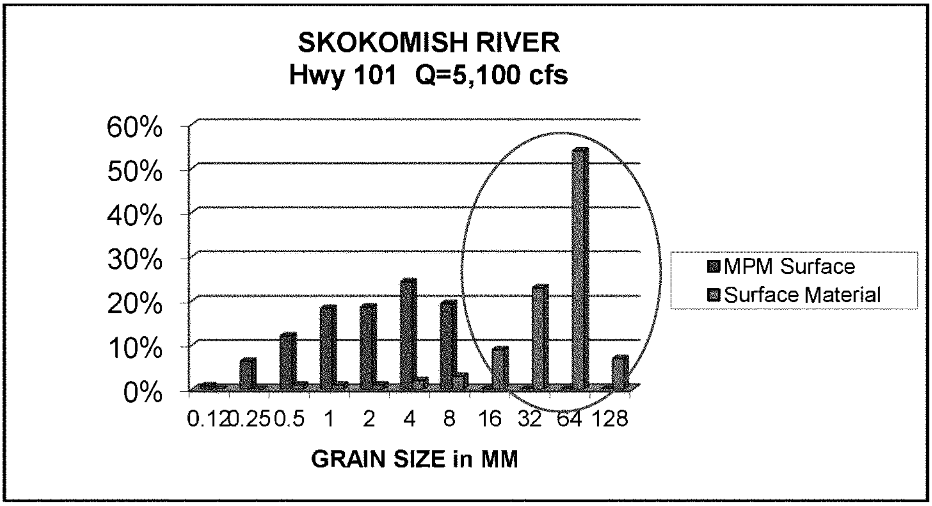


Figure B-9. Computed bedload gradation and surface bed material gradation for the Skokomish River at Hwy 101.

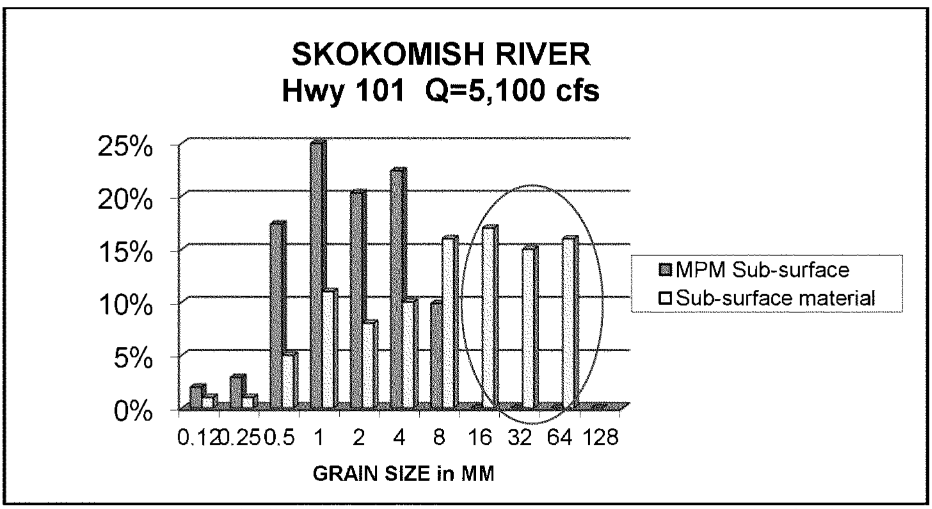


Figure B-10. Computed bedload gradation and sub-surface bed material gradation for the Skokomish River at Hwy 101.

**MODEL RESULTS**

Three model senarioes, MPM sub-surface, MPM surface, and mod-MPM sub-surface, were examined to cover the expected range of bedload transport conditions. Each senarioe begins near RM 2 on the Skokomish River and runs upstream to near RM 11 on the South Fork. The annual flow duration curves (Reclamation, 2007) were shaped into a single hydrograph, with discharges distraibuted between the South Fork, Vance Creek, and the North Fork.

Figures B-11 show the results of the MPM runs for surface and sub-surface bed material gradations, and discharges in the 3-4,000 cfs range. This discharge range would occur at the beginning and end of large storms, or near the peak of small storms. The channel discharge fluctuates around 3,000 cfs as water moves in and out of the main channel. The sub-surface material produced high transport upstream of the old North Fork confluence, a rapid drop in transport (deposition) near the old North Fork confluence, and the relatively steady transport down to RM 4, where transport dropped to near zero. The surface material produced very little bedload upstream of Vance Creek, transport increased (scour) between Vance Creek and the old North Fork confluence, was steady down to RM 4, and then decreased to near zero at RM 3. Based on the computed bedload at Hwy 101, the MPM surface scenario is judged to be the most representitive of bedlaod transport in this 3-4,000 cfs discharge range.

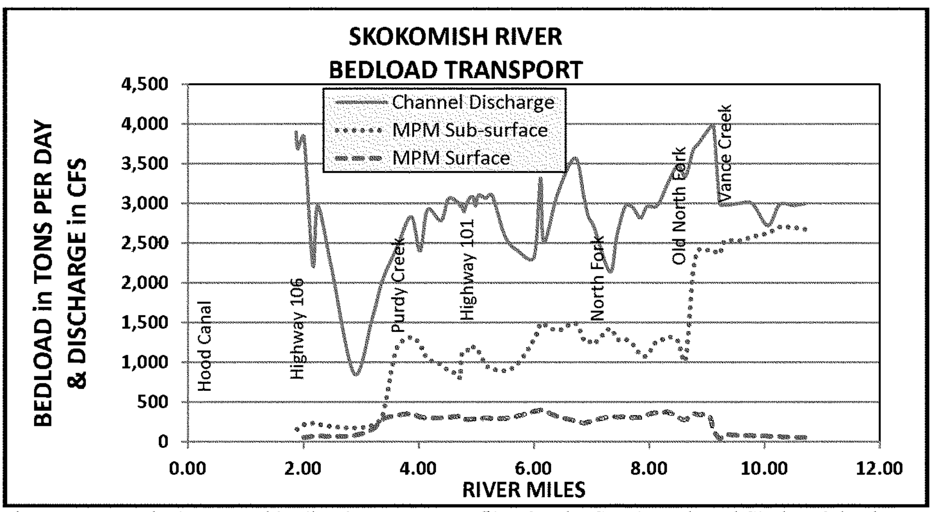


Figure B-11. Discharge and bedload transport profiles for the South Fork and Skokomish Rivers for discharges in the 3- 4,000 cfs range comparing surface and sub-surface gradation results.

Figures B-12 show the results of the MPM runs for surface and sub-surface bed material gradations, and discharges in the 15,000 cfs range. This discharge range would occur around the peak of a 50- to 20-percent chance exceedance flood. The channel discharge decreases in the downstream direction, except at Vance Creek and at the North Fork confluence, where South

Fork overbank floodwaters and North Fork discharges enter the main stem. The MPM sub-surface scenario produced bedload transport rates that are highly correlated with the channel discharge during floods. The MPM sub-surface bedload is highest at the upstream boundary on the South Fork and steadily declines as floodwater leaves the main channel. The MPM sub-surface calculations temporaryly increased bedload downstream of Vance Creek and the North Fork confluences where water enters the main channel. The erosion downstream of Vance Creek may be a modeling anomally caused by inputting the Vance Creek inflow directly into the main river channel. Some Vance Creek flow may actually go into the floodplain before reaching the South Fork channel. The MPM sub-surface transport dropped to near zero around RM 3.

The MPM surface scenario produced much lower bedload transport for the higher discharge conditions. The MPM surface bedload also increases at Vance Creek and the North Fork confluence, then decreased to near zero at RM 3. Based on the computed bedload at Hwy 101, the MPM sub-surface scenario is judged to be the most representitive of bedlaod transport in the 15,000 cfs discharge range.

Figures B-13 and B-14 show the results for the MPM and mod-MPM sub-surface scenarios. The mod-MPM produced results that followed the same trends as the MPM sub-surface model, only with about half the bedload transport. The mod-MPM results are similar to the MPM surface results for 3-4,000 cfs, except it generates higher transport upstream of Vance Creek.

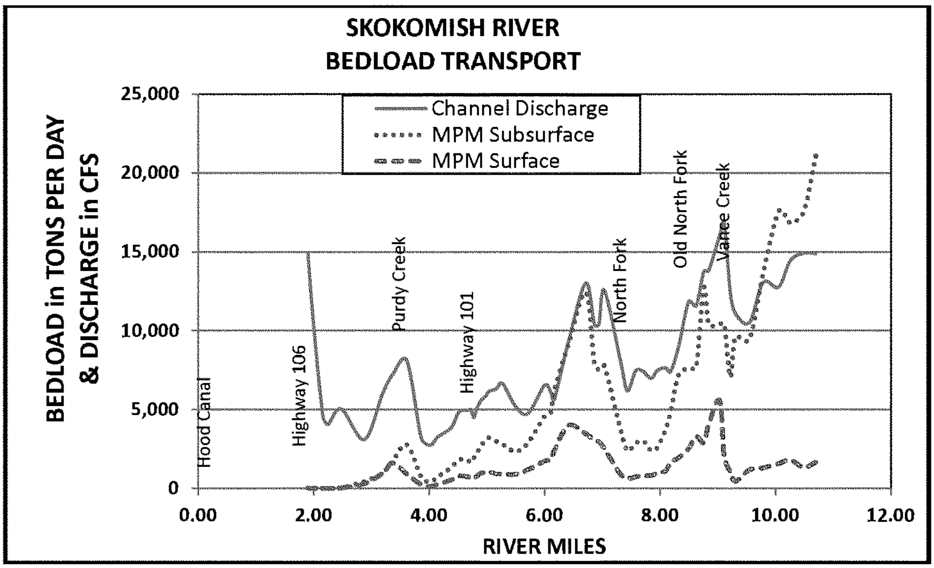


Figure B-12. Discharge and bedload transport profiles for the South Fork and Skokomish Rivers for discharges in the 15,000 cfs range comparing surface and sub-surface gradation results.

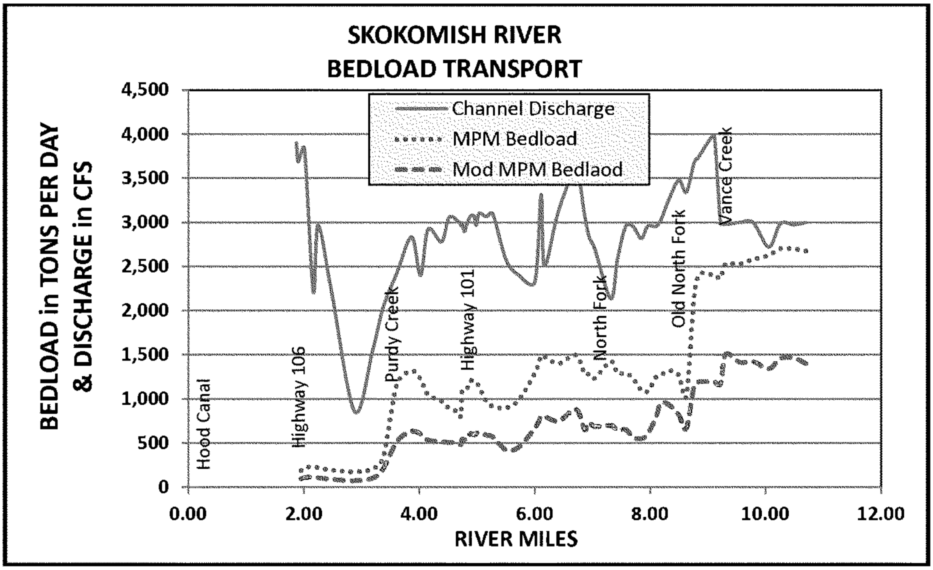


Figure B-13. Discharge and bedload transport profiles for the South Fork and Skokomish Rivers for discharges in the 3- 4,000 cfs range comparing MPM and Mod-MPM sub-surface results.

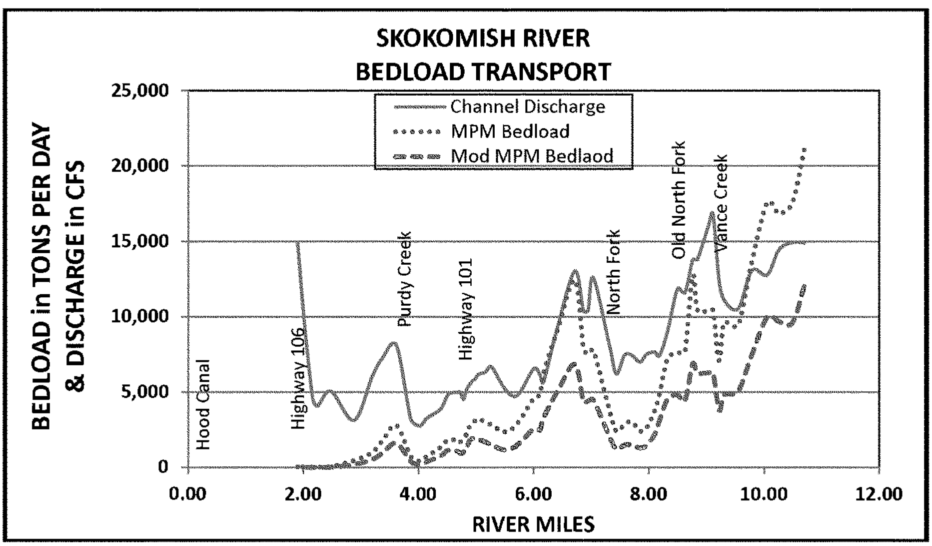


Figure B-14. Discharge and bedload transport profiles for the South Fork and Skokomish Rivers for discharges in the 15,000 cfs range comparing MPM and Mod-MPM sub-surface results.

In addition to deposition patterns along the river, the model results can provide insights into the timing of bedload transport. Table B-2 lists the bedload transport for the highest 22 days of an average year for three locations. The judgment of what model run, MPM surface or MPM sub-surface, best represents the bedload for the given discharge was based on the bedload measurements at Hwy 101 (RM 4.8). The discharges for the South Fork near RM 11 were derived from Reclamation's flow duration curve for the South Fork gage. Discharges for the other two locations come from modeling runs that begin with the South Fork inflows, but compute the change in channel discharge due to water entering or leaving to the overbank. The bedload transport rates for discharges less than bankfull come from MPM surface runs and reflect supply limited bedload transport. Whereas bedload rates for discharges above bankfull come from MPM sub-surface runs that are transport capability limited.

Near RM 11 in the South Fork, on average, each year the highest 48 hours of flood discharges (The highest 48 hours is defined by the flow duration curve and does not necessarily consist of 48 consecutive hours of flow every year.) transport an estimated 90 percent of the average annual bedload. Upstream of the North Fork confluence (RM 8), the flood peaks and bedload transport are significantly reduced and the South Fork only transports an estimated 40 percent of the average annual bedload during the highest 48 hours of flood discharges. On the Skokomish River at Hwy 101 (RM 4.8) the flood peaks are further reduced and an estimated 35 percent of the average annual bedload is transported during the highest 48 hours of flood discharges. In the main stem and lower mile of the South Fork, discharges at or slightly over bankfull (3,000-4,500 cfs) may occur for a total of about six days each year and transport 30-40 percent of the local average annual bedload. The transport rates are lower during this six day period, but the longer duration results in total transport comparable to the 48 hours of flood discharges.

Table B-2. Bedload transport for the highest 22 days derived from Reclamation's flow duration curve for the South Fork gage.

| | South Fork near RM 11 | | | South Fork near RM 8 | | | Skokomish River at Hwy 101 | | |
|---|---|---|---|---|---|---|---|---|---|
| Time Hours | Discharge CFS | Bedload Tons/Day | Bedload Tons | Discharge CFS | Bedload Tons/Day | Bedload Tons | Discharge CFS | Bedload Tons/Day | Bedload Tons |
| 240 | 800 | 10 | 100 | 960 | 125 | 1300 | 1000 | 70 | 700 |
| 96 | 1600 | 30 | 120 | 1800 | 170 | 700 | 2000 | 200 | 800 |
| 96 | 3000 | 60 | 240 | 2950 | 260 | 1000 | 3000 | 340 | 1400 |
| 20 | 4900 | 4100 | 3400 | 4400 | 430 | 360 | 4000 | 400 | 330 |
| 7 | 7400 | 5900 | 1700 | 5400 | 1620 | 470 | 4400 | 1300 | 380 |
| 1 | 9900 | 8400 | 350 | 6200 | 1800 | 75 | 4700 | 1400 | 60 |
| 1 | 14800 | 15200 | 600 | 7400 | 2350 | 100 | 5080 | 1600 | 70 |
| 1 | 15800 | 17000 | 700 | 7500 | 2420 | 100 | 5100 | 1600 | 70 |
| 1 | 14800 | 15200 | 600 | 7400 | 2350 | 100 | 5080 | 1600 | 70 |
| 2 | 9900 | 8400 | 700 | 6200 | 1800 | 150 | 4700 | 1400 | 120 |
| 14 | 7400 | 5900 | 3400 | 5400 | 1620 | 950 | 4400 | 1300 | 760 |
| 40 | 4900 | 110 | 200 | 4400 | 430 | 720 | 4000 | 500 | 830 |
| TOTAL | | | 12110 | | | 6025 | | | 5590 |

## MODELING CONCLUSIONS

None of the three bedload modeling scenarios can adequately simulate bedload over the full range of Skokomish River discharges. This is due to what appears to be a bimodal transport regime in the main stem Skokomish River, where the larger surface sediments armor the riverbed for discharges up to approximately 4,500 cfs. The MPM sub-surface results suggest that below 4,500 cfs the Skokomish River has enough energy to transport more bedload than is available, and is therefore supply limited by the bed armor. It is likely that below 4,500 cfs only the smaller surface sediments in the river channel are being transported. As discharges increase above 4,500 cfs the surface armor is mobilized, exposing more of the finer sub-surface material. The sub-surface material is then eroded and entrained into the bedload, causing the bedload transport rate to increase rapidly. Bedload transport below 4,500 cfs is best represented by the MPM surface scenario and above 4,500 cfs by the MPM sub-surface scenario.

The computed bedload transport rates are highly correlated with the channel discharge during floods. The modeling results indicate that large amounts of bedload are transported into the lower South Fork during high discharge storm events and most of that material is deposited upstream of the North Fork confluence. During floods disposition would occur throughout the lower South Fork and Skokomish rivers, except for short reaches downstream of the Vance Creek and North Fork confluences. The erosion downstream of Vance Creek may be a modeling anomaly produced by inputting all the Vance Creek discharge directly into the South Fork channel.

The model results indicate small volumes of bedload may be re-distributed in the lower South Fork and main stem during the extended periods of flows in the 3,000-4,500 cfs range. Those discharges are at or slightly above bankfull discharge and can occur before and after flood peaks or just following a small rain storm. The modeling results indicate very little bedload is ever transported downstream of the Purdy Creek confluence area.

## MODEL LIMITATIONS AND UNCERTAINTIES

The HEC-RAS model used in this analysis has limitations that result from the structure of the program and the available data. The structure of the model limits the river conditions that can be modeled, while the available data limits the reliability of this specific model study.

The structural limitations of HEC-RAS bedload modeling include the capabilities of the transport functions and the hydraulic computations. The MPM bedload function, like almost all other bedload functions, is a generalized, empirical equation that does not incorporate all the physical processes that influence bedload movement in a river. The MPM function produced a good match to observed bedload transport rates at Hwy 101, but was also not able to transport the large 16-64 mm particles collected in the bedload measurements.

HEC-RAS uses cross-section average hydraulic and sediment size parameters to calculate bedload. This is not consistent with the depth, velocity, and turbulence variations that occur across a river. The scale of the calculations, roughly 500 ft between cross-sections in this model, also eliminates the localized changes in hydraulic parameters that can influence bedload transport. HEC-RAS calculates average bed elevations changes and adjusts the entire channel bottom to account for scour or deposition.

The primary data limitations in this study were the lack of defined inflowing sediment load curves for the South Fork and Vance Creek, the flow distribution during floods, and channel survey data downstream of RM 2.

Without measured South Fork bedload data, the model computed an equilibrium load at the upstream boundary. The incoming bedload originates in channels that have much different hydraulic and sediment conditions than the South Fork boundary cross-section. Without bedload data for the South Fork, it is not possible to better define the inflowing bedload.

There are no measurements of the various inflows and flow diversions that occur during floods. This model was compared to the 2-D model results (Reclamation, 2009b) to evaluate the overbank diversions. The two models produce similar flow patterns and the comparison is very helpful, but actual measurements would improve on this important model result.

There is also not adequate survey information on channel geometry downstream from RM 2 on the mainstem. That geometry will have to be added to the model to determine how much bedload can reach Annas Bay.

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SKOKOMISH RIVER
CAR BODY REMOVAL SEDIMENTATION

The Car Body Removal measure will result in more water and sediment being diverted into the existing North Fork channel near RM 9. The small diversion channel and LWD structures shown in Figure 1 are planned to be constructed in the South Fork near RM 9 to divert all flows below 250 cfs into the North Fork channel. The South Fork channel will remain active for discharges over 2,000 cfs to help maintain the existing distribution of potential flood discharges. The flow split between the North and South Fork channels is likely to evolve over time as wood is recruited.

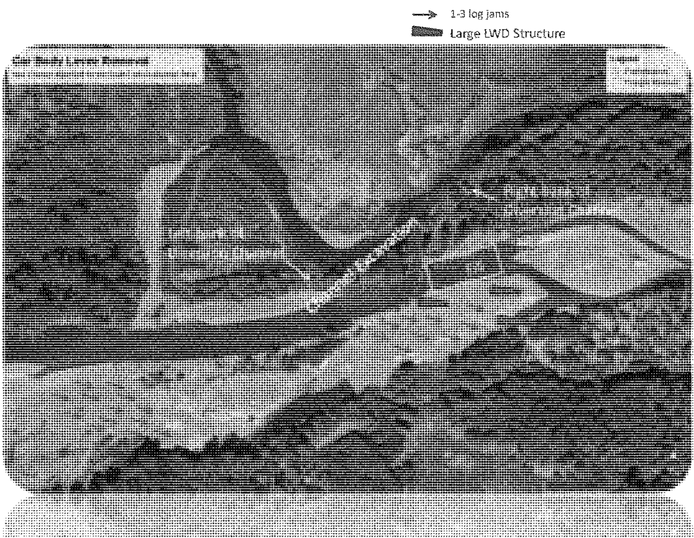


Figure 1. Car Body Removal with South Fork diversion.

A HEC-RAS bedload transport model was developed that incorporated the North Fork channel, the Car Body Levee removal and the diversion into the South Fork/main stem model. The flow split at the diversion was accomplished with a lateral weir across the South Fork and the main flow path directed into the North Fork channel. Bedload followed the main flow path into the North Fork channel. North Fork and overland flows from upstream entered the North Fork channel at the RM 9 diversion point. Over the first 0.3-0.4 mi downstream of the diversion, the North Fork discharges are contained in a relatively narrow channel and floodplain. Downstream of that reach the channel enters a forested wetland area and the flow spreads out over a broad area. As the flow spreads, the amount of water in the channel fluctuates. The South/North channel split and the channel discharge fluctuations during a 2-yr flood are shown on Figure 1. As Figure 2 shows, there is a large loss of channel discharge around the old North Fork confluence during a 2-yr flood, as flood waters spread across the north and south floodplains. This loss of channel discharge occurs under both existing and future with project conditions. The North Fork channel is smaller than the South Fork channel and thus retains less discharge within the channel.

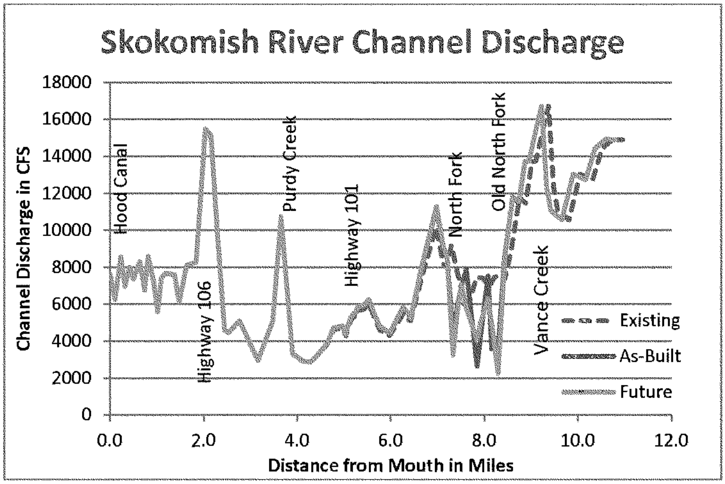


Figure 2. Skokomish River channel discharges during a 2-year flood. The Car Body Removal shortens the channel by about 0.2 miles.

The existing distribution of flood waters to the floodplains upstream of, and around, the old North Fork confluence causes a large reduction in bedload transport as shown in Figure 3. This condition would generally continue with the Car Body Removal, however, there would be a slight downstream shift of the minimum transport location. In the vicinity of the diversion channel, river and overbank discharges are combined in a relatively narrow section that would have high enough velocities to transport the incoming bedload. About 0.4 mi downstream of the diversion the flow spreads out and bedload transport drops to a minimum. This indicates that there would be an accumulation of sediment in the lower 0.6 mi of the North Fork channel. A future condition, assuming a broad, shallow channel produced by sediment accumulation, was modeled to see if the bedload transport would change over time. As Figure 3 shows, a slight decrease in bedload transport may occur in the North Fork channel as it fills with sediment as a result of shallow flow conditions. The predicted deposition would keep the channel unstable for the foreseeable future, generating a shifting, sand/gravel riverbed similar to the one that currently exists in the South Fork channel.

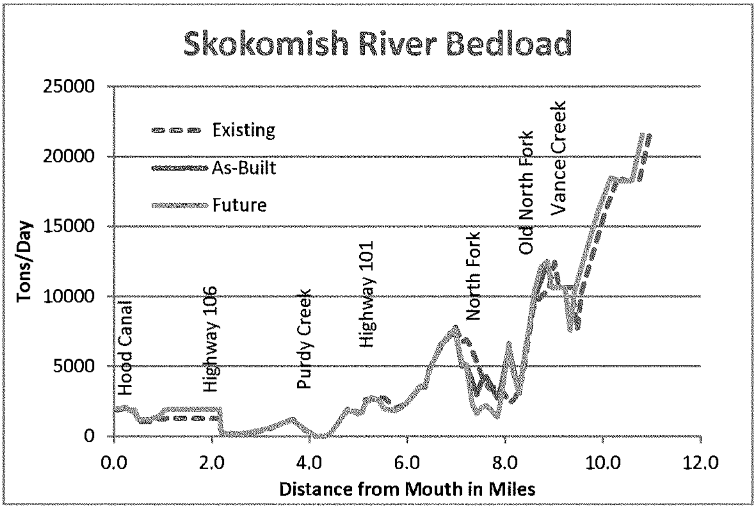


Figure 3. Skokomish River bedload transport during a 2-year flood peak.

RECLAMATION
*Managing Water in the West*

Technical Report No. SRH-2014-29

# 2D Modeling of Skokomish River Restoration Concepts for USACE Feasibility Analysis

# Skokomish River, Mason County Washington

U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center
Denver, Colorado

December 2014

# Mission Statement

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Cover Photo: Looking upstream at former North Fork channel path in July 2012.

# 2D Modeling of Skokomish River Restoration Concepts for USACE Feasibility Analysis

# Skokomish River, Mason County Washington

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Peer Review Certification: This document has been peer reviewed per guidelines established by the Technical Service Center and is believed to be in accordance with the service agreement and standards of the profession.

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# 1.0 Introduction

The Skokomish River is located at the southeastern portion of the Olympic Peninsula in Washington State near the southern extent of the Hood Canal. The river flows east from its headwaters in the Olympic Mountains and descends through narrow gorges to the Skokomish Valley. A two-dimensional (2D) model was generated by Reclamation's Technical Service Center (TSC) of the mainstem Skokomish River and Vance Creek in partnership with the Skokomish Indian Nation and the United States Army Corps of Engineers (USACE) Seattle District as part of a technical assistance to tribes program (Klumpp and Bountry, 2009; Bountry et al, 2011). The 2D model output was used to evaluate hydraulics and sediment transport capacity for evaluating existing river discharge capacity and overbank flooding locations.

USACE has requested the performance of additional model iterations for feasibility level in-channel restoration project concepts which are being evaluated by USACE Seattle District as part of an ongoing General Investigation feasibility study for the Skokomish River Basin. The study has identified a "recommended plan" which includes the restoration project concepts described throughout this report. The study area for modeling is contained within the lower 10 miles of the river (Figure 1). The topographic surface was updated for this modeling effort with more recent topography where available.

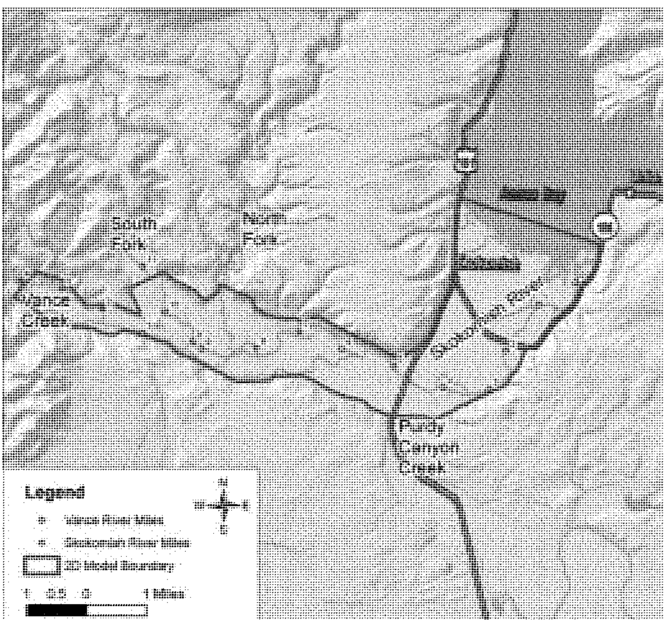



**Figure 1. Location map of 2D model domain within the Skokomish Watershed.**

## 2.0 Model Scenarios

USACE provided the TSC a list of feasibility level restoration design options being evaluated between RM 7 and 11 along the Skokomish River. These options are included in USACE's recommended plan associated with the ongoing General Investigation feasibility study for the Skokomish River Basin. Restoration options are proposed to increase biological productivity, with improvement to low-flow connectivity, floodplain connectivity, and hydraulic complexity. These scenarios involve levee removal, levee breaching, new levee setback, placement of large wood features, and diversion of flow through channel excavation (RM 7 to 9 shown in Figure 2 and RM 9 to 11 in Figure 3). These scenarios were modeled in various combinations as shown in Table 1 and are further described below. Each scenario involved topographic changes to the model mesh and in some cases alteration of roughness values used to compute hydraulics. The proposed changes are conceptual, intended to help inform feasibility level analyses, and are subject to change based on local stakeholder, permitting, and landowner input.

An additional restoration option being considered in the feasibility study is to improve the low-flow hydraulic connection of a side channel near the Highway 101 Bridge on river left of the mainstem Skokomish River (RM 5) (Figure 4). No topographic changes were made for the 2D model runs for this scope of work. Side channel bathymetry is not currently available. However, model results are presented of current conditions that may assist with future design.

**Table 1. List of 2D model scenarios.**

| Run | Car Body Levee Removed | RM9 Levee and Grange Levee Breached | RM9 Levee and Grange Levee Setback | Divert more flow into North Fork | Wood features adjacent to North Fork Diversion | Wood features upstream North Fork Diversion | File Name |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | existQ |
| 2 | X | | | | | | carbodyQ |
| 3 | X | X | | | | | Breach |
| 4 | X | X | X | | | | Setback |
| 5 | X | | | X | X | | NoCBdiversionQ |
| 6 | X | X | | X | X | | Breachdiversion |
| 7 | X | X | X | X | X | X | AllQ |
| 8 | X | X | X | X | X | X | AllnQ |

## Model Options near South and North Fork Confluence

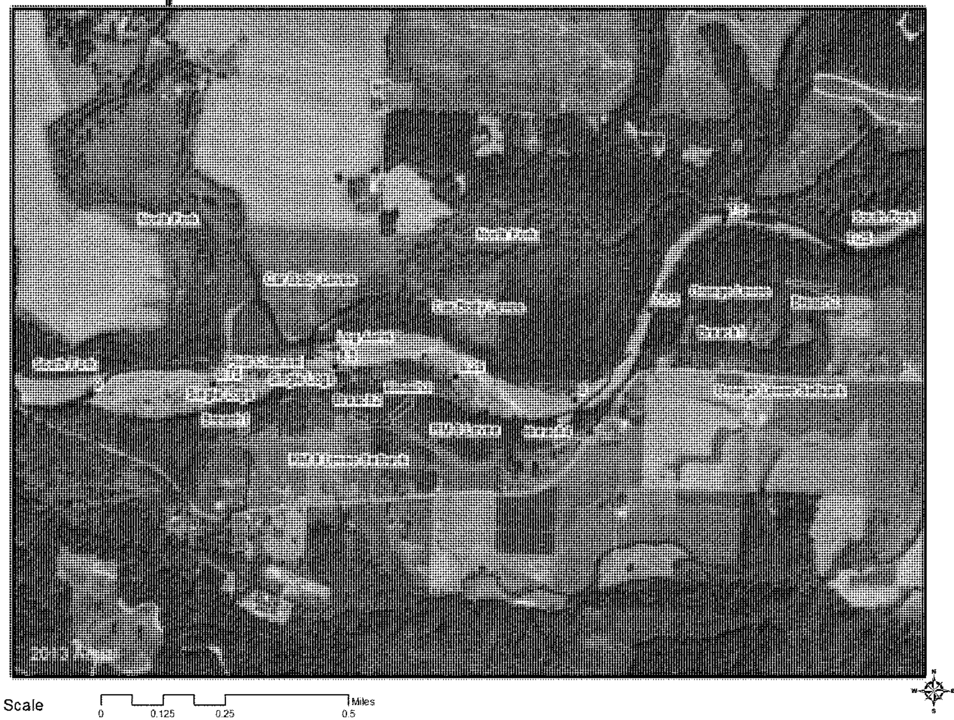



**Figure 2. Proposed restoration options near South Fork and North Fork Skokomish confluence.**

## Model Options Upstream of North Fork Confluence

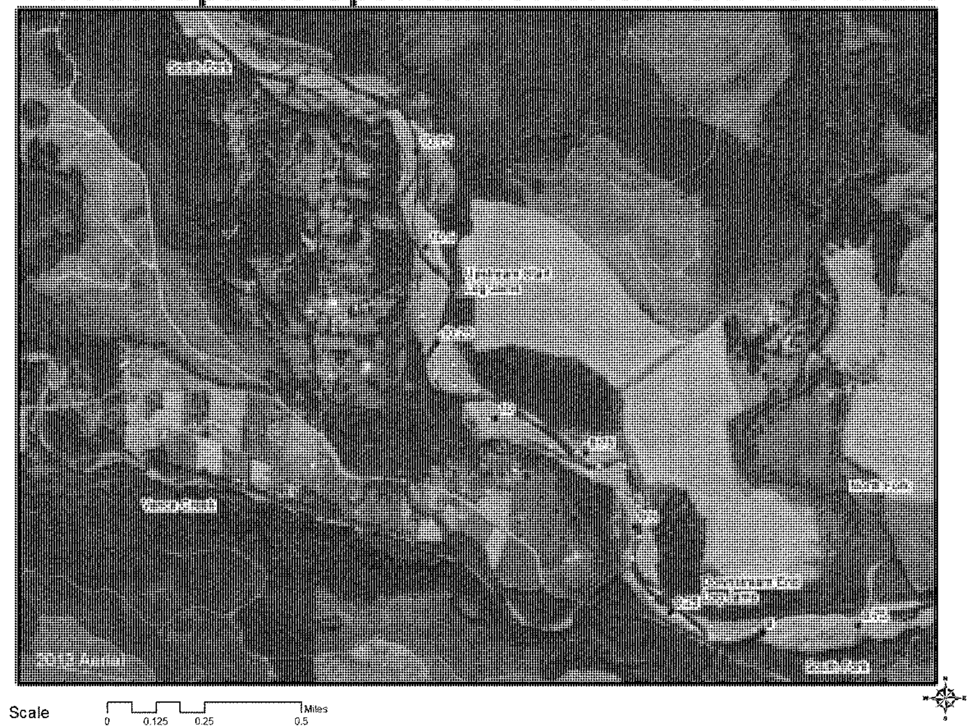



**Figure 3. Proposed log jam locations from RM 9 to 10.5.**


**Figure 4. Location of proposed channel reconnection near RM 5 (black arrow) on river left (looking downstream) that passes through Highway 101. River flow travels from left to right in the photograph.**

### *Run 1: Existing Conditions*

The existing condition model is based on best available channel bathymetry (2007 to 2012) and floodplain topography (2002 or 2011). This run is used for relative comparison to proposed restoration alternatives.

### *Run 2: Car Body Levee Removal*

The Car Body Levee has been in place for many decades. It is approximately 4,600 ft long and has been breached in a few locations (see Appendix B for profile). In this scenario the remaining Car Body Levee segments are "removed" from the terrain to predict changes in hydraulic connectivity among the surrounding channels and floodplain (Figure 5). The levee is removed down to existing ground as represented by 2002 LiDAR. In recent years the Car Body Levee has already breached in a few locations, so this scenario includes removal of the remaining levee feature (see Appendix B for more details).

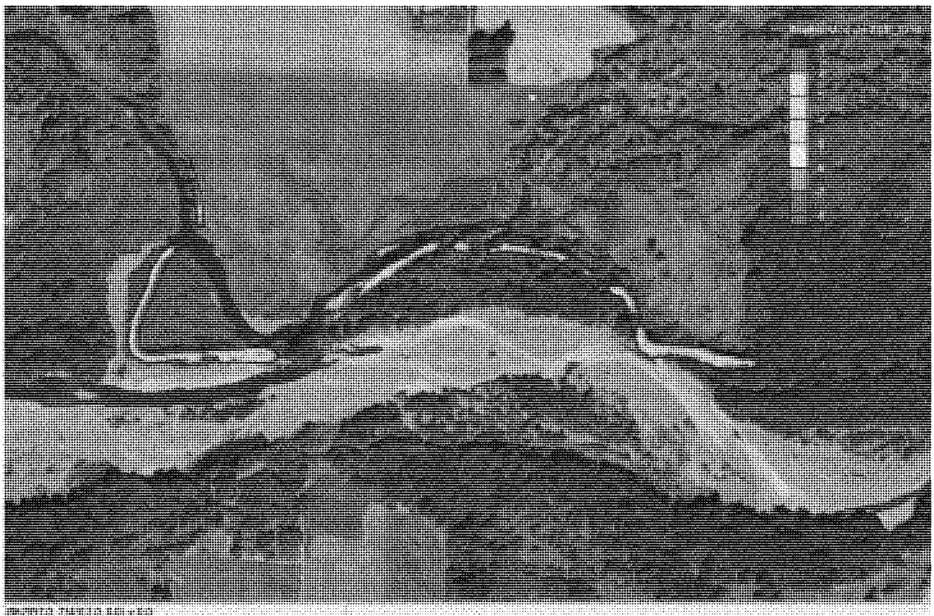


**Figure 5. Change in topographic representation (feet) in model mesh from removal of Car Body Levee.**

### *Run 3: RM 9 and Grange Levee Breaches with Car Body Levee Removal*

For this scenario, in addition to the removal of the Car Body Levee, breaches are made in the RM 9 and Grange Levees. The RM 9 Levee has also been locally known as the "Church Dike" at the downstream end along the W Skokomish Valley road. An additional levee segment extends for another 800 ft upstream of what is delineated in

Figure 2, and there are additional levee sections that connect the downstream end of the delineated RM 9 Levee with the Grange Levee based on previous mapping (Godaire et al, 2009). Upstream of RM 8.3, the RM 9 Levee was noted to be constructed in the 1968, and rebuilt in the 1970s and 1980s (Godaire et al, 2009). Downstream of RM 8.3, the RM 9 and Grange Levee sections are documented to be built in the 1980s and 1990s. Based on a previous geomorphic study, the Grange Levee extends an additional 1,600 ft downstream of what USACE has identified as the downstream boundary of the Grange Levee in Figure 2 (Godaire et al, 2009). This model run evaluates the amount of floodplain connectivity that will occur as a result of the breaches. Four breaches are proposed in the RM 9 Levee and two breaches are proposed in the Grange Levee. The breaches vary in length. The breaches are taken down to existing ground level on either side of the levee based on 2002 LIDAR elevations. Note that in some locations there are already low spots in the RM 9 and Grange Levees in the 2002 LiDAR data (see Appendix B for profiles).

### *Run 4: RM 9 and Grange Levee Breaches and Setback with Car Body Levee Removal*

In this model run, two additional setback levees are constructed farther from the river that tie into the RM 9 and Grange Levees existing alignments. The setback levees are intended to contain moderate flows passing through the proposed breaches. The setback levees are not proposed to contain the 100-year flood, but rather similar protection levels as the RM 9 and Grange Levees. The proposed alignments are for modeling and analysis purposes and are subject to change based on local stakeholder and landowner input.

### *Run 5: Diversion into North Fork with Car Body Levee Removal*

This alternative is intended to encourage more low to moderate flows to be diverted from the South Fork mainstem into the North Fork channel near RM 8.6. Between 2006 and 2007, the North Fork reconnected into a historical Skokomish channel path, creating a mile long channel that returns to the South Fork near RM 7.5 (Figure 6). The South Fork mainstem in this area can go subsurface at low flows creating a lack of surface flow connectivity and a barrier to fish. The South Fork channel is also perched a few feet higher than the new North Fork channel path. There is already an approximately 50 ft wide breach that allows from the South Fork into the North Fork channel, and this alternative would further widen that breach area. High flows would still pass down the South Fork mainstem as well as the North Fork channel path. To encourage the diversion to be maintained and limit flow going down South Fork path, this alternative includes installing seven log jams (105 ft x 45 ft) in the mainstem South Fork Skokomish and placing several large logs on adjacent gravel bars (89,600 $ft^2$ and 48,100 $ft^2$ areas). At the guidance of USACE, for this conceptual run the log jams were set at a uniform top elevation of 61 ft, which is on average 3 ft above the existing channel bed. The topography used to represent the diversion in the model terrain was a simple trapezoidal channel that represents an excavator digging out a pilot channel to initiate more flow transfer. The conceptual channel is about 900 ft long and represents an area of 120,600 $ft^2$. The channel was "cut" in the model terrain to connect the existing South Fork average channel bottom with the existing North Fork average channel bottom. Because of the large amount of coarse sediment present in this area, which can be remobilized at higher flows, it is expected that this geometry would evolve during high flows. This run is combined with only the Car Body Levee removal and does not include any modifications to the RM 9 or Grange Levees.

**Figure 6. Looking across at downstream confluence near RM 7.5 where North Fork enters South Fork Skokomish River.**

### *Run 6: Diversion into North Fork with Car Body Levee Removal and RM 9 and Grange Levee Breaches*

This scenario combines the South Fork to North Fork flow diversion described in Run 5 with the Car Body Levee removal (Run 2), and breaches in the RM 9 and Grange Levees (Run 3).

### *Runs 7 and 8: Large Wood Placement in RM 9 to 10.5 and Diversion Channel and Levee Modifications*

In Runs 7 and 8, 24 small log jams (20 ft x 20 ft) are added upstream of the North Fork confluence between RM 9 to 10.5 (Figure 3). Two alternatives were done, one with no change to roughness (Run 7) other than the location of the log jam; a second with the middle swath of channel modeled with increased roughness to simulate high density placement of large logs and root wads along the low-flow channel (Run 8). The intent of this run was to analyze localized shear stress change on channel banks, but topography is not detailed enough to analyze at this level of detail. The run can be used to look at relative change at the channel segment scale, but localized hydraulics are not well represented in the model. This run includes all other restoration options including the channel cut to divert more flow into the North Fork from the South Fork, RM 9 and Grange Levees breached and setback, along with the Car Body Levee removed. The log jams were set at 4 ft above the existing ground. Local scour that may result from installation of wood (e.g. obstructions to flow) was not included in this conceptual run.

# 3.0 Model Description

A fixed bed version of the two- dimensional (2D) numerical model, SRH-2D v2.0, was used for analysis of the Skokomish River (Lai, 2008; www.usbr.gov/pmts/sediment/model/srh2d/index.html). SRH-2D solves the 2D depth-averaged form of the dynamic wave equations. The dynamic wave equations are the standard St. Venant depth-averaged shallow water equations. The model utilizes an implicit scheme to achieve solution robustness and efficiency. Steady flow was utilized for the model described in this report. All flow regimes, i.e., subcritical, transcritical, and supercritical flows, were simulated simultaneously. The following sections document the model domain, generation of the model mesh, roughness delineation, model parameters, and boundary conditions.

## *3.1 Model Domain*

The model includes 11 river miles on the mainstem Skokomish River exiting to the estuary, 4 river miles on Vance Creek, and just over 2 river miles on the North Fork Skokomish River (see Figure 1). The upstream extent of each main channel was based on where available survey data was present. The model extends laterally to include the entire Skokomish Valley such that the 100-year flood is within the model domain. The downstream end of the model is the estuary in the Hood Canal, although bathymetric data from the tidal area was not included beyond the mouth of the river.

## *3.2 Mesh Development*

The mesh was developed using a combination of quadrilateral and triangular elements in the SMS software (Aquaveo, 2014) (Figure 7). The mesh was generated by first dividing the study reaches into unique polygons based on roughness variations. Channel polygons were further sub-divided to orient cells parallel to the direction of flow and perpendicular to banks. Polygons were then refined to distinguish areas where levees and major roads are present. Elevations were generated for the mesh nodes by utilizing the topographic Terrain.

The mesh has the following features:

- Unstructured mesh with quadrilateral and triangular element configurations:
    - 451,541 elements (mesh cells) comprised of 323,673 quadrilateral elements and 127,868 triangular elements,
    - 388,934 nodes,
    - Typical cell size of 10 ft by 30 ft in the river area varying up to 75 by 75 ft in the floodplain where less topographic relief occurs.
- 15 ft x 30 ft quadrilateral cells are generally used to defined the active, unvegetated channel perpendicular to flow,
- Minimum of five quadrilateral cells used to define small wetted channels in floodplain or narrow segments of river,

- Tightest density of cells used in channel areas and where rapid changes in elevation occur that may influence floodplain inundation,
- Lesser density of cells was used in floodplain areas where there is less elevation change (topographic relief),
- Levee areas were separately meshed to ensure tight density and capture of top of levee elevations (5 ft x 15 ft elements).

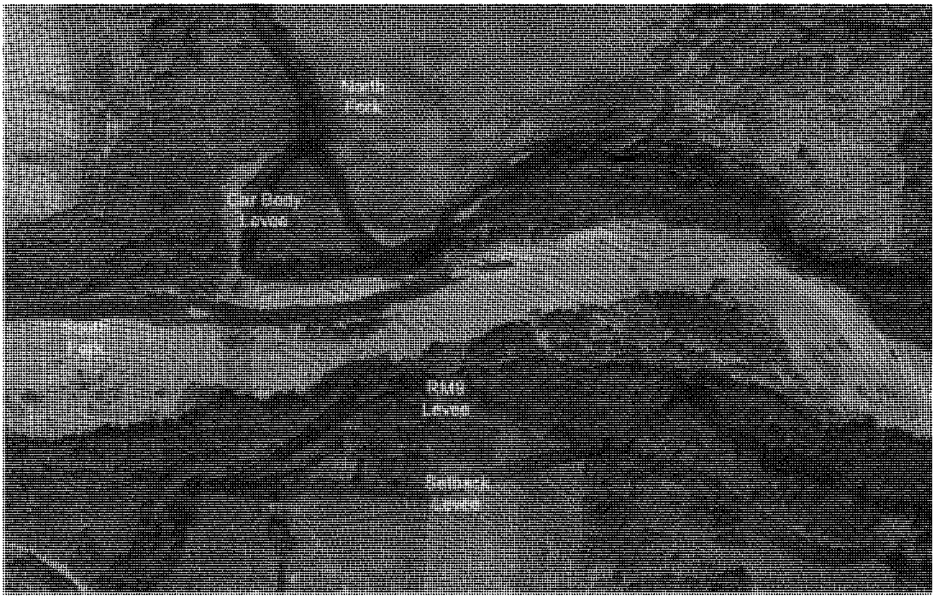



**Figure 7. Example of 2D model mesh along North and South Fork Skokomish confluence near Car Body and RM 9 Levee.**

## *3.3 Discharge: Upstream Boundaries*

Steady state flow was assumed in all simulations, such that only one discharge value is needed for each flow input location for each model run. Flow input locations include the South Fork Skokomish River, Vance Creek, and North Fork Skokomish River (Table 2). Other tributaries were not considered for this analysis. Peak flow values were determined based on previous hydrologic studies and are further explained in Appendix A (England, 2007). The winter flow and moderate storm discharge were specified by USACE.

**Table 2. List of model input data for incoming discharge.**

| Description | South Fork (cfs) | Vance Creek (cfs) | North Fork (cfs) | Total (cfs) |
|---|---|---|---|---|
| Typical winter flow | 1,400 | 600 | 200 | 2,200 |
| Moderate storm discharge | 4,200 | 1,800 | 200 | 6,200 |
| 2-year flood | 12,100 | 5,200 | 200 | 17,500 |
| 10-year flood | 18,400 | 8,300 | 200 | 26,900 |
| 100-year flood | 23,700 | 12,100 | 200 | 36,000 |

## *3.4 Tide Data: Downstream Boundary*

The Seattle District of USACE provided tide data retrieved from the nearest NOAA web site, which is located at Union in the Hood Canal, Washington (Station ID: 9445478) (http://www.tidesandcurrents.noaa.gov). A typical daily hydrograph of the tide from the latter part of January 2010 is shown in Figure 8 (written communication from USACE, December, 2009). For the steady flow 2D modeling presented in this report, USACE requested a constant tide of 9.2 ft (NAVD88) be used as a downstream boundary condition. The tidal influence does not extend upstream into the proposed restoration scenarios incorporated in the 2D model, but does affect model results in the estuary at the downstream-most section of the Skokomish River which may have future restoration activities dependent on modeling results.

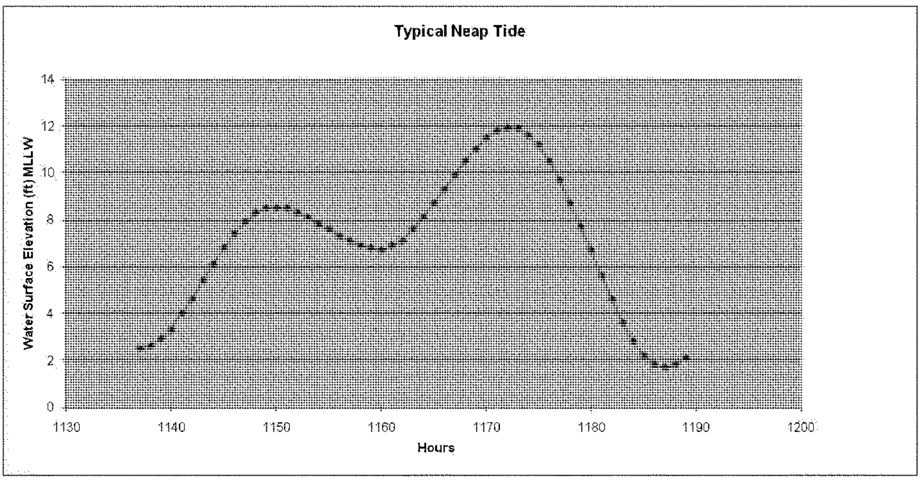



**Figure 8. Typical 24-hour tide fluctuation based on data from Union. WA in January 2010.**

## *3.5 Topography*

An existing condition ArcGIS Terrain was developed for the 2D modeling. Elevations in the Terrain are applied to mesh nodes for the 2D model runs. The South Fork Skokomish downstream to the estuary (11 river miles), North Fork Skokomish (2.3 river miles), and Vance Creek (4 river miles) were based on 2007 to 2012 channel survey cross-section data (Appendix B). Cross-section spacing ranged from 200 to 1,000 ft and interpolations had to be done to represent channel bathymetry between cross-sections (see Appendix B).

Floodplain area topography from RM 0 to 5.25 was represented by 2011 LiDAR, and RM 5.25 to RM 11 was represented by 2002 LiDAR. Floodplain channels that appeared to be wet in aerial photography were delineated and lowered by 1 ft from elevations represented by LiDAR (which does not penetrate water).

Proposed features that affect topography include levee removal, levee breaches, levee setbacks, channel excavation, and placement of large wood features. Proposed levee alterations were based on feasibility level designs provided by USACE (see Appendix B). Proposed in-channel large wood features were integrated into the Terrain as uniform height obstructions as delineated by polygons, which were provided by USACE. Single logs are also proposed for placement on gravel bars in the feasibility design. However, the log sizes were smaller than the current 2D model element size and, therefore, could not be accurately represented by topographic adjustments. Instead, placement of multiple log features was represented by increasing the model bed roughness.

### *3.6 Manning's Roughness*

Roughness values for the Skokomish channel and floodplain were based on values presented in the 2011 modeling study with modifications as described below (Table 3; Bountry et al, 2011). Roughness polygons were delineated in the Surface-water Modeling System (SMS) mesh development program (Aquaveo, 2014) to differentiate the active channel, vegetated floodplain, roadways, and cleared areas (Figure 9). Proposed areas for large wood placement were also delineated and assigned an increased roughness. Literature is not available for large wood roughness values, so values were rounded to one significant digit and set based on the range of roughness for heavy brush in a floodplain of 0.075 +/- 0.025 (Wilcox, 1997). This assumption may be conservatively high if the wood is sparse and a small percentage of the water depth at higher flows.

**Table 3. List of roughness values utilized in existing conditions model.**

| Material Number Designated in Mesh | Manning's Roughness Value | Description |
|---|---|---|
| 1 | .036 | South Fork Skokomish RM 8 to 10 |
| 2 | .032 | South Fork Skokomish RM 3 to 8 |
| 3 | .028 | South Fork Skokomish RM 2 to 3 |
| 4 | .026 | South Fork Skokomish RM 0 to 2 |
| 5 | .08 | Heavy vegetation |
| 6 | .015 | Roads |
| 8 | .032 | Vance Creek RM 0 to 1.5 |
| 9 | .034 | Vance Creek RM 1.5 to 2.5 |
| 10 | .037 | Vance Creek RM 2.5 to 3.5 |
| 11 | .039 | Vance Creek RM 3.5 to 4.5 |
| 12 | .03 | Low to medium vegetation |
| 13 and 14 | .04 | North Fork channel |

| Material Number Designated in Mesh | Manning's Roughness Value | Description |
|---|---|---|
| 15 | .08 | Proposed loose wood on gravel bars |
| 16 | .1 | Proposed in-channel log jams |


**Figure 9. Delineation of roughness boundaries in existing conditions 2D model mesh.**

Manning's roughness values for Skokomish River and Vance Creek were computed based on a relationship between the measured $D_{50}$ of the bed-material and the average hydraulic radius of the main channel (Lopez and Barragán, 2008; Morvan et al, 2008). The hydraulic radius was computed from a one-dimensional (1D) HEC-RAS hydraulic model. The bed-material data consisted of 14 samples on the Skokomish River (RM 0.3 to 11) collected in 2006 and 9 samples on Vance Creek (RM 0.04 to 3.55) collected in 2009 by Reclamation (Figure 10). The measured $D_{50}$ varied from 9 to 84 mm on the Skokomish River and from 17 to 82 mm on Vance Creek. For both rivers, the bed material sediment sizes decreased in the downstream direction, which results in a decrease in Manning's n value in the downstream direction (Figure 11 and Figure 12).

Roughness values for the North Fork Skokomish River were estimated at 0.04 to represent gravel-bed in upper portion or marshy-vegetated conditions in lower portion. Bed-material or channel vegetation data was not available for the North Fork and a site visit was not funded as part of the scope of work.

Figure 10. Example bed-material collection site on Vance Creek in 2009.

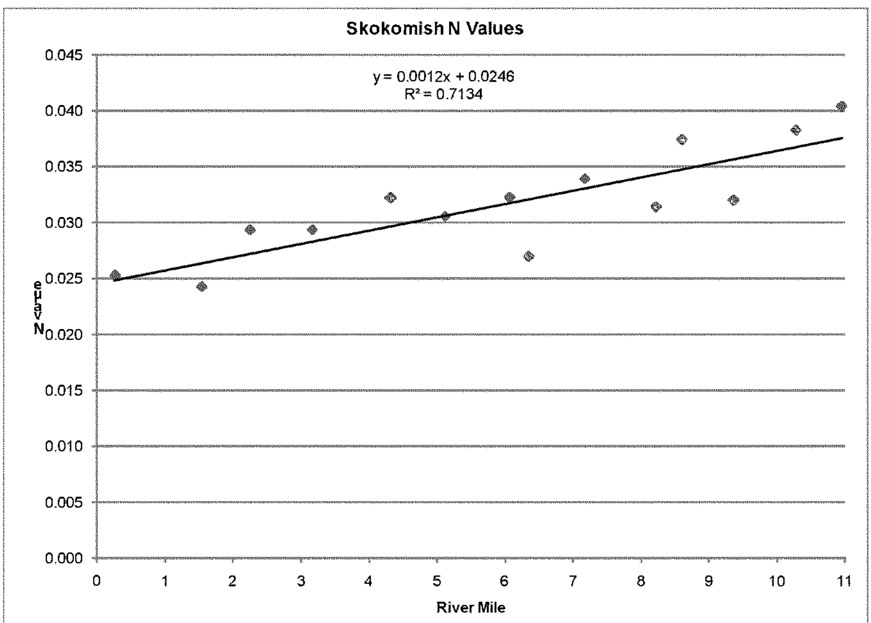



**Figure 11. Correlation of roughness (N) value by river mile based on variation in the measured $D_{50}$ of bed sediment along the Skokomish River.**

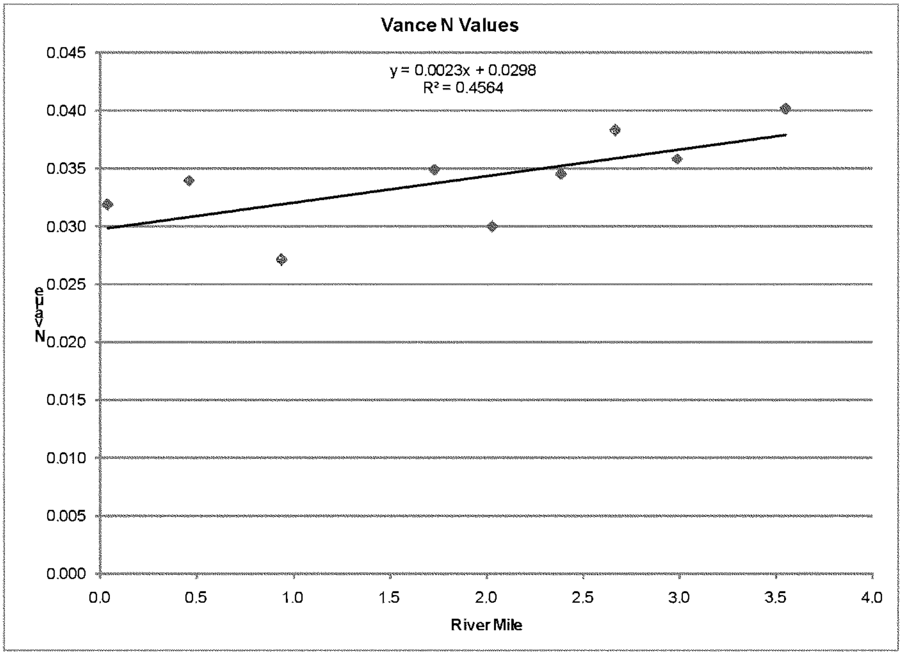



**Figure 12. Correlation of roughness (N) value by river mile based on variation in the measured $D_{50}$ of bed sediment along Vance Creek.**

Roughness values for the floodplain were varied based on whether it was delineated as vegetated, cleared, or roadway. Roughness on levee sections were not distinguished, but rather designated as vegetated in most areas. Further refinement of roughness values was not done because there is very limited water surface elevation data to calibrate roughness values. A comparison was done to high water marks, but no adjustment to roughness was made because of uncertainty with the discharge values associated with the high water marks (see Section 3.8).

In the proposed conditions, new levees, a channel diversion, and large wood features are added to the Terrain. Areas within the proposed levee removal, breach locations, channel diversion, and two new levee setbacks were not modified to have a different roughness. This could be easily updated in the design stage once more information is available to determine the new levee surface material (e.g. rock, grass, vegetated, etc.) or if more measured water stage data is available. Roughness was set at 0.1 for the footprint of the proposed constructed log jam features modeled as topographic obstructions. There is currently poor guidance on roughness values for woody debris, partly because it is in reality dependent on the type of wood (smooth logs, natural wood, logs with root wads and branches, etc.) and flow depth around the feature. Areas with loose wood would have the most impact on roughness at low flows, and less impact at higher flows. There is also already some loose wood and a few log jams on bars and within the channel that are "built in" to the Reach-assigned roughness values. Existing log jams were not separately delineated. Channel bar areas with proposed new single logs that would be designed to be non-mobile were set at a roughness value of 0.08. It is likely that during a flood condition the roughness value would be less as flow depths increase and the logs cause less resistance to flow.

To test the sensitivity of roughness values on computed water surface elevation, all roughness values were increased by 10% and resulting water surface elevations are compared to original values (Figure 13). The average increase in the 100-year flood water surface was 0.14 ft with a standard deviation of 0.07 ft for 324,533 points that were wet in both runs. Results were separated into mesh nodes upstream and downstream of Highway 101 and for the area only within the mainstem active channels (53,063 points) to see if there were any notable differences, but within two significant digits the statistics of water surface change were the same as for the whole mesh. Local differences in smaller spatial areas do exist as seen in Figure 13.

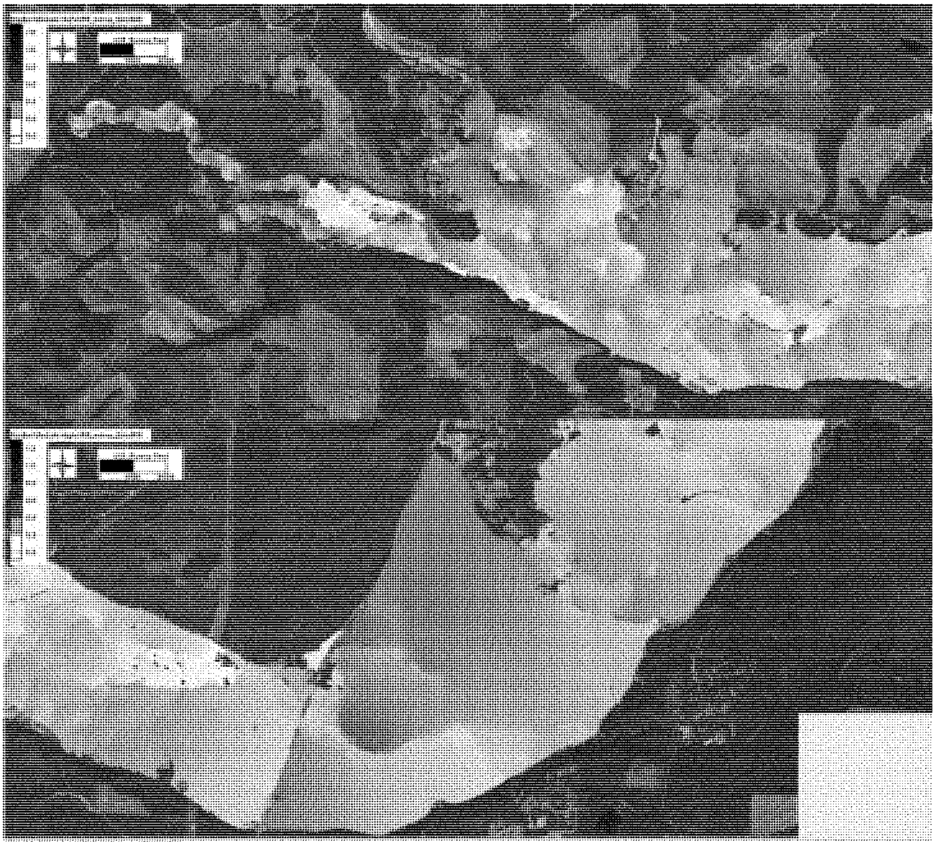


**Figure 13. Resulting increase in water surface elevation at 35,800 cfs resulting from 10% increase in all roughness values for existing conditions.**

## *3.7 Model Parameters*

Model runs used a time step of 0.5 second. Computations were continued until model results for discharge at set monitoring lines and water surface elevations at set monitoring points stabilized and differences in results between time steps were negligible. Model runs were usually started with no flow in the river, except for a few cases where refinements were made and a previous model solution was available as a starting condition.

### *3.8 Comparison to Measured High Water Marks*

The 2009 model of the Skokomish River was compared to measured water surfaces collected during a low flow of 370 cfs, and a limited number of available measured water surface elevation values collected at unique locations during the 2007 flood. No additional high water elevation data has been collected since that time. Older data from a 1999 flood upstream and downstream of channels passing through the Highway 101 Road and SR106 Roadway are available but the channel topography and bridge openings have changed such that a valid comparison is not possible.

The 2007 high water marks were provided by USACE. Flows for this flood have not been officially documented by USGS, but are estimated to have exceeded 22,000 cfs. The flood set a new stream gage height record so it is possible that the flow was larger than the 100-yr flood. The high water marks were compared to the 100-year flood of 36,000 cfs (represents total flow at USGS Gage at Potlatch). The high water marks were generally collected near structures. However, when post-processing LiDAR to bare-earth data, which was used in this study for modeling, structures are generally removed and elevations based on nearby ground returns. Therefore, the 2D model results represent average water surface elevation not affected by the locally raised elevations from the structures. If detailed survey data or raw LiDAR was available, the structures could be inserted back into the terrain for modeling to improve accuracy.

Previous modeling using 1994 photogrammetry in the floodplain and 2007 channel data resulted in modeled values 0.5 to 2.5 ft below the measured high water marks, except for one location that was 2 ft higher. New computed values with 2002 LiDAR and 2007 to 2012 channel data range from 1.4 ft lower to 1.5 ft higher relative to measured conditions (Table 4) and do not show a consistent trend. Determination of high water marks have uncertainty and localized topographic influences as illustrated at the two measurements at location 13 that are spatially close but 3 feet different in measured water surface elevation. Additional hypotheses on the differences between predicted and measured values include that the 2007 flood input discharge values need to be better determined, the 2002 LiDAR topography may be inaccurately higher than actual ground elevations, and the LiDAR topography and model mesh do not contain enough detail of features that influence local hydraulics (e.g. infrastructure in the floodplain, riffles in the main channel, levees along banks, etc.). Adjusting model roughness values could also influence results 0 to 0.5 ft of water surface change.

**Table 4. Comparison of measured to computed high water mark elevations (HWM) for the December 2007 flood.**

| USACE Benchmark | Approximate Skokomish River Mile | High Water Elevation in Floodplain (feet) | Computed Water Surface Elevation 36,000 cfs (feet) | Difference from Measured (feet) |
|---|---|---|---|---|
| 20 | 10 | 83.1 | 84.6 | +1.5 |
| 14North | 8.7 | 61.9 | 61.4 | -0.5 |
| 14South | 8.7 | 61.1 | 61.6 | +0.5 |
| 13South | 8.3 | 56.2 | 56.3 | +0.1 |
| 13North | 8.4 | 59.0 | 57.6 | -1.4 |
| 10North | 8 | 54.0 | 54.2 | +0.2 |
| 10South | 8 | 54.1 | 52.7 to 53.5 | -0.6 to -1.4 |
| 8 | 7.5 | 49.3 | 49.2 | -0.1 |
| 4 | 6.5 | 39.9 | 40.1 | +0.2 |
| 3 | 6.2 | 37.9 | 37.1 | -0.8 |

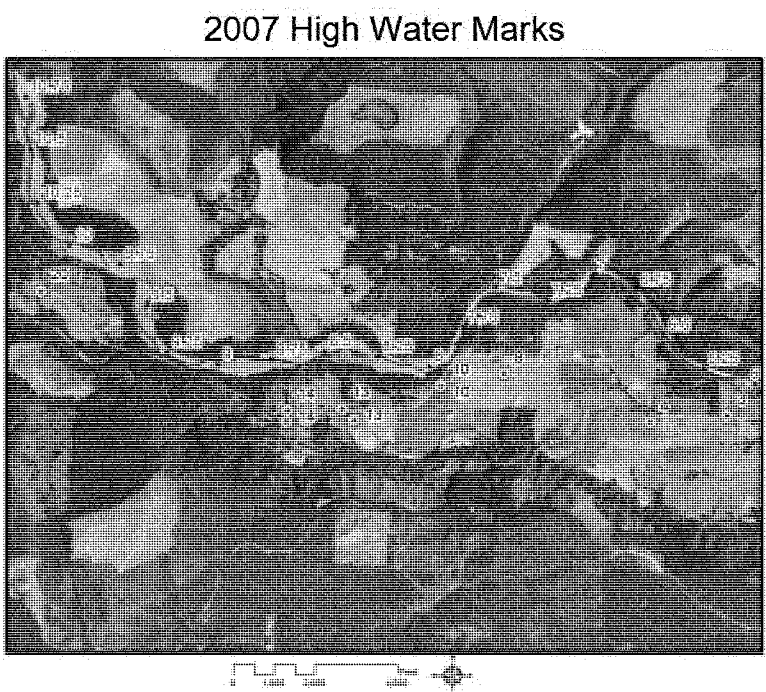



**Figure 14. Locations of surveyed 2007 high water marks (green circles) after the flood on a 2006 aerial photograph. River miles are shown in blue.**

# 4.0 Geomorphic Context

The 2D model fixed-bed version used for this study does not simulate channel migration, bank erosion, or sediment transport along the channel bed. Therefore, this report section presents channel slopes, historical channel changes, and large wood observations for context in interpreting fixed-bed 2D model results. Additional geomorphic background information can be found in Godaire et al, 2009.

## *4.1 Channel Slopes*

Longitudinal profiles and average channel bottom slopes representing the interpolated channel surface are shown in Figure 15 (South and North Fork Skokomish) and Figure 16 (Vance Creek). The slope of the mainstem Skokomish River is 0.0003 ft/ft near the mouth where it enters the estuary, increases to 0.0013 ft/ft in the reach between RM 2.5 to 7.5, doubles to 0.0025 between RM 7.5 (where the North Fork enters the South Fork mainstem channel) to RM 9.5 (where Vance Creek currently enters the mainstem), and is slightly steeper between RM 9.5 to 11 at .0032 ft/ft at the upstream of the 2D model domain. The downstream-most 2.5 river miles of the North Fork channel has an average slope of 0.0023, similar to the South Fork channel it runs adjacent to in this reach. Vance Creek is overall steeper, with slopes ranging from 0.0039 near the confluence with the South Fork Skokomish to 0.0091 at the upstream end of the valley before it transitions to a more confined section.

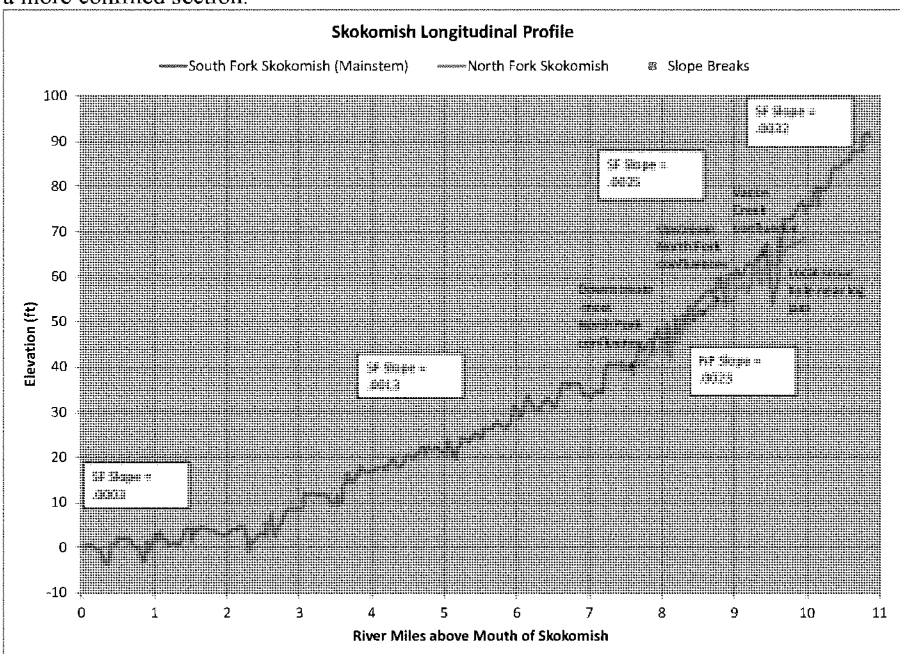



**Figure 15. Longitudinal profile of South Fork (mainstem) and North Fork Skokomish channels.**

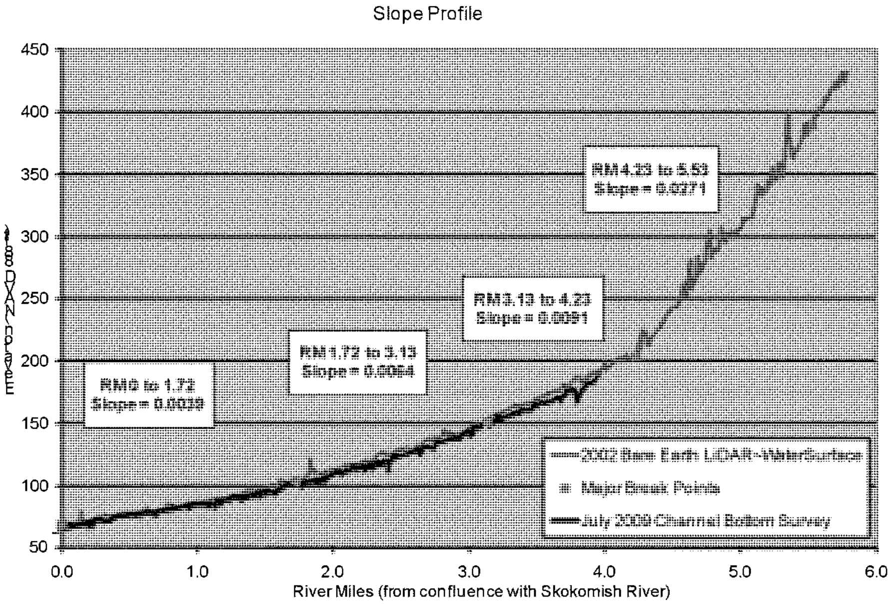



**Figure 16. Longitudinal slope profile of Vance Creek.**

## *4.2 Historical Channels at Proposed Restoration Locations*

The confluence area of the North and South Fork Skokomish channels was modified as early as the 1930s based on a 1935 flood control map showing proposed features and vegetation clearing evident in 1938 aerial photographs (Figure 17). Several wing dams blocking off channels, stone dams to limit overbank flow, and bank protection occurred. The North Fork entered the South Fork near RM 8.75 in 1938. Although the construction date is unknown, the downstream portion of the Car Body Levee is located at the edge of the 1938 unvegetated (active) channel, likely built to limit further channel migration and reduce flooding. In the 1965 aerial, an overbank channel is visible that started the initiation of a new North Fork confluence and channel path (Figure 58 in Appendix C). The channel path appeared wider and wetter by 2004, and in 2007 the low-flow North Fork channel switched to the new path and fully connected to a former slough within the 1930s unvegetated South Fork channel (Figure 59 and Figure 60 in Appendix C). This created a mile-long channel that did not have a full reconnection with the South Fork until RM 7.5.

The South Fork channel has been very dynamic over the last several decades between RM 6 and 10, often changing low-flow paths and experiencing bank erosion in several locations.

The low-flow channel has had anecdotal periods of disconnected surface flow (e.g. subsurface flow) between RM 7.5 to 8.5, which is also visible on the 1994, 2009, and 2013 aerial photographs (see Figure 60 and Figure 61 in Appendix C). Bank erosion is noted as one of the contributors to excess sediment supply within the channel in this segment of river (literature review summarized in Godaire et al, 2009). The unvegetated South Fork channel in 1938 was variable in width likely owing to dynamically eroding banks. One of the narrower sections at 500 ft wide between floodplain banks occurred at RM 8.6 just downstream of the North Fork confluence. One of the widest sections occurred not far downstream near RM 8 that was over ½ mile wide. Based on the large amount of unvegetated channel, this area may have been recently experienced a high flow and/or have been logged prior to the 1938 aerial photograph. Continued bank erosion has occurred since 1938, but in many locations has been limited due to the levee construction. In the 1956 aerial, many channel meanders appear to be cut off relative to the position in the 1946 aerial. It is not known if channel dredging or straightening occurred. Beginning in 1968 and continuing in the 1970s to 1990s, levees were constructed along the right side of river to prevent overbank flooding, although none were designed to protect against the 100-year flood.

The proposed breach locations in the RM 9 and Grange Levees vary in context of historical channel morphology. For example, the Grange Levee cut across a former channel path and the proposed breaches are located along the former channel alignment at both the entrance and exit which may help with restoration of continuous flow paths. The proposed breach near RM 8 in the RM 9 Levee is in a channel path visible in the 1938 aerial photograph which is topographically lower than nearby floodplain surfaces. The next upstream RM 9 breach appears to be on a higher surface at the edge of the location of historical channels since at least 1938 (referred to in Figure 17 as HCMZ; GeoEngineers, Inc., 2006). It may be informative to field check the proposed breach locations and investigate if they are located near lower elevation areas relative to the main channel (e.g. former channel paths) to maximize flow connectivity on both the rising and falling limb of higher flows. Areas of former channel paths may also offer opportunities for channel migration and restoration of process. Breaches in higher elevation areas may assist with overbank flow relief and floodplain connectivity.

The area of proposed channel reconnection near RM 5 had several channel paths visible in the 1938 aerial photograph and was shown as a large overflow path in the 1935 map and the HCMZ where historical channel occupation occurred over the last several decades (Figure 18). There is a revetment at the upstream entrance to the former channel path near RM 5.25. The downstream end of the overflow channel path at RM 4.25 to 4.5 exited into a mainstem meander, but appears to have had the channel straightened between 1938 and 1946, abandoning the former meander (Figure 62 in Appendix C). However the 1935 map does show an overflow path at the straightening location that may have helped the avulsion or been used as a new path and the old path blocked off. The mainstem channel throughout this proposed restoration area has remained in the same general path with limited bank erosion since 1946 (Figure 62 to Figure 64 in Appendix C).

A prior geomorphic study (Godaire et al, 2009), indicates locations of channel constriction induced from levees cause upstream backwater and, combined with vegetation and wood removal, possibly exasperates tendencies toward aggradation and lack of a defined low-flow channel. In addition, the valley is relatively young in this area, with limited evidence of terraces particularly on the south side of the current mainstem (Figure 17). The current South Fork channel is currently perched higher above the North Fork and many areas of the valley bottom to the south. The potential for avulsion has been identified in past studies, particularly to the south where other flow paths such as Weaver and Purdy Creek already exist. Recently, the Highway 101 Bridge was widened where Purdy Creek passes through in case the river does breach one or more of the lower elevation floodplain surfaces and increase water flow to this path in the future. Reducing levee constrictions through proposed breaches and removal along with increasing more flow to the North Fork path will help reduce backwater tendencies from constriction points. However, the long-term risk of avulsion will still be present because the south side of the valley is relatively lower in most of the valley between RM 8 and 3.

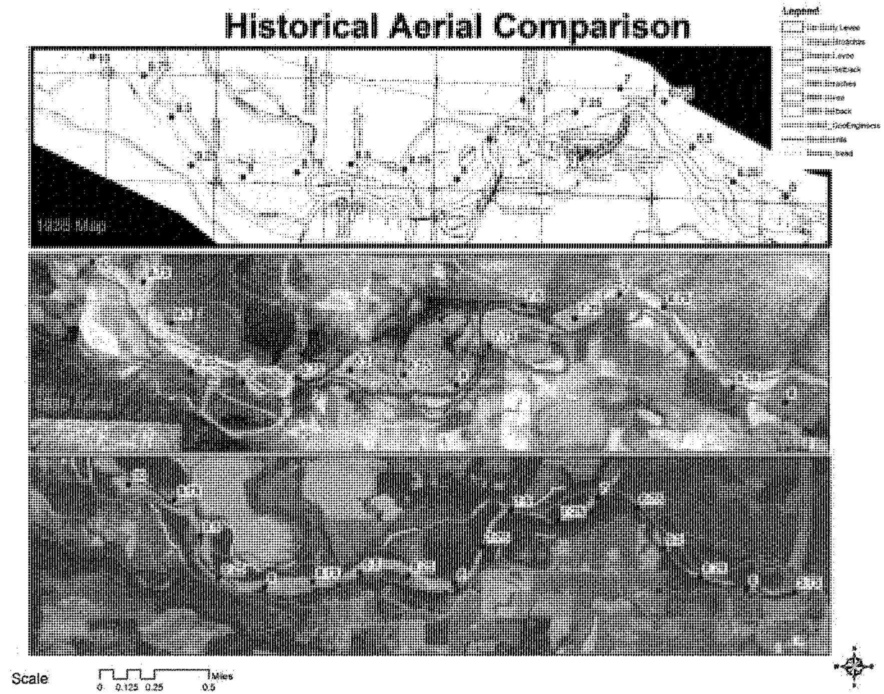



**Figure 17. Historical comparison between 1938 and 2013 for RM 6 to 10 with revetments and terrace treads from Godaire et al 2009 and historical channel migration zone as mapped by GeoEngineers (2006). Two additional potential historical channel paths outside of the identified HCMZ are shown with "?".**

Historical Aerial Comparison

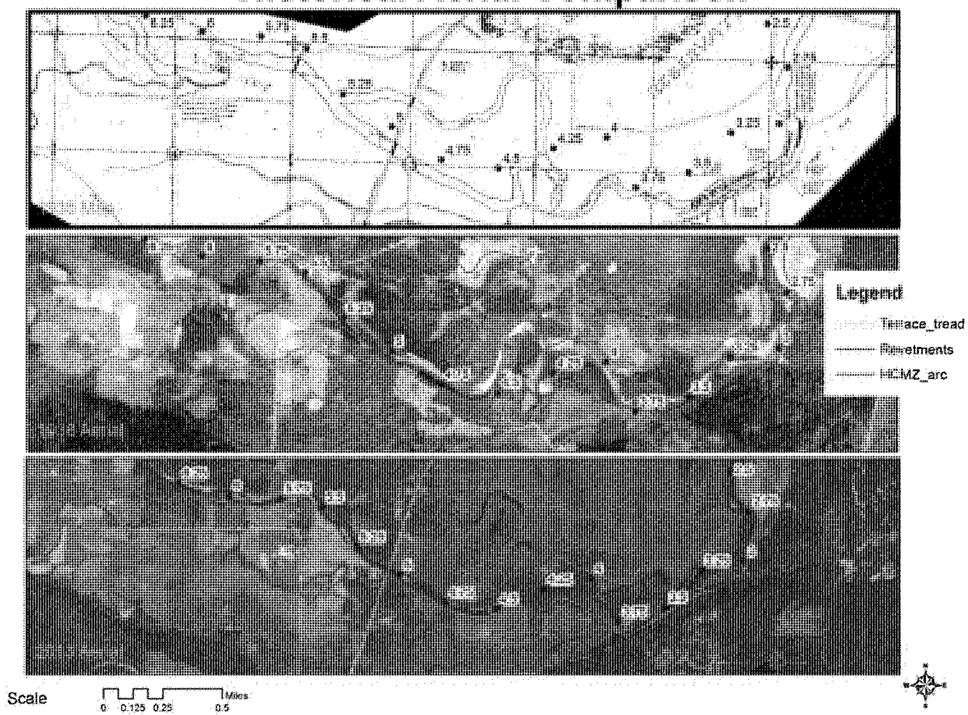



**Figure 18. Historical comparison between 1938 and 2013 for RM 3 to 6 with revetments and terrace treads from Godaire et al 2009 and historical channel migration zone as mapped by GeoEngineers. Note that no terrace treads were mapped in this section of relatively low relief valley bottom.**

### *4.3 Large Wood in Channel*

This section provides observations of large wood from 2005 and 2012 to provide context of natural wood occurrence and formations for proposed large wood restoration features. Observations of large wood for the South Fork Skokomish were noted on a 2005 aerial photograph in a recent geomorphic study (Godaire et al, 2009). These presumably natural log jams generally were located along the edges of the active channel and consisted of at least 5-10 large pieces of wood oriented perpendicular to the primary flow direction. There were 60 jams mapped in 2005 between roughly RM 1 and 11, which is on average 5 to 6 jams per river mile. While a few large jams of wood were located on mid-channel gravel bars, the majority was found blocking side channels or pinned against banks in areas of secondary flow. Previous reports document the historical removal of large woody debris along the Skokomish River, which suggests that the woody debris that occupies the present river channel is only a fraction of what naturally occurred prior to the start of land clearing and agricultural practices in the watershed (Godaire et al, 2009). Historical accounts also report log jams that extended for miles upriver and took more than 50 years to accumulate and travel down the river (Richert, 1964).

In July 2012, observations of channel conditions and wood presence were made near the North and South Fork confluence during a channel survey. There were numerous examples of unvegetated gravel bars with little wood and the channel areas with shallow depths and uniform gravel material on the bed. However, there were several examples of large wood deposits and log jams creating local scour and helping to shape the surfaces adjacent to the low-flow channel (Figure 19). Single logs and log jams are generally tens of feet long with additional smaller wood collected on key members. One example log jam in both the 2005 and 2013 aerial photograph is located near RM 9.5 where it is tied into the right bank and is 120 ft x 70 ft in its footprint (Figure 20). Just upstream along the road on river left, root wads were installed in 2000. Many of the gravel bars with wood pieces have developed more vegetation in the last 10 years. Particularly in wider active channel reaches, examples of gravel bars with increased vegetation in the last decade can be seen just downstream of RM 9.5, RM 9, RM 8.5, and RM 6 on river right (see Figure 60 and Figure 61 in Appendix C).

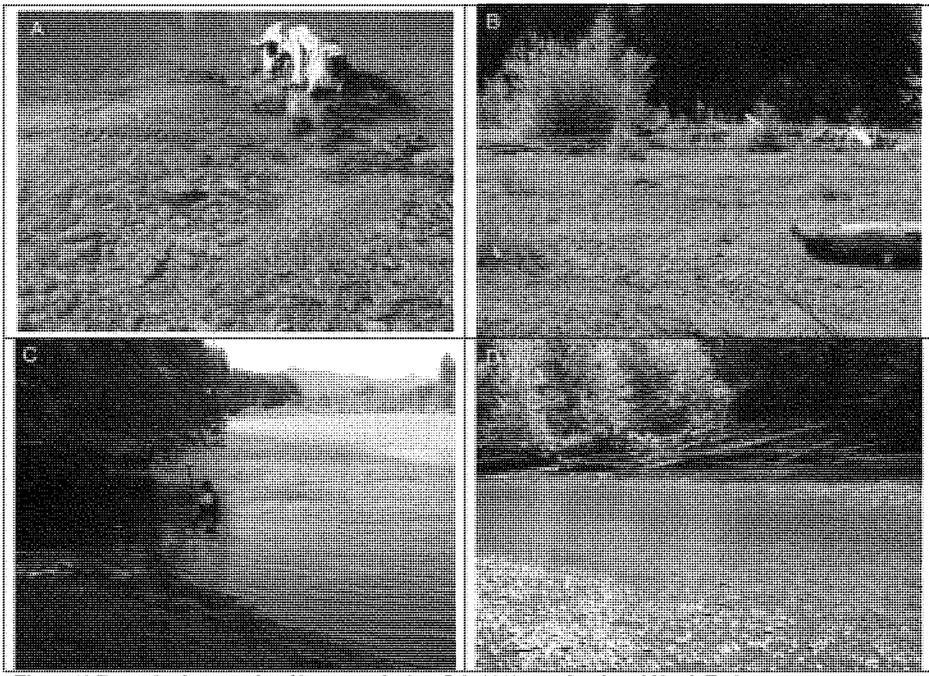


**Figure 19 Example photographs of large wood taken July 2012 near South and North Fork confluence. A: Local scour around stump located mid-channel near RM 8.75 to 9, exposing coarser material in channel bed; B: Floated wood along riser between low-flow channel and vegetated bar along right bank between RM 8.75 and 9 with surveyor for scale; C: Deep thalweg near vegetated bank with wood between RM 7.75 to 8 in South Fork mainstem between upstream and downstream North Fork confluences. D: Log jam creating scour hole in low-flow channel near RM 7.25 downstream of North Fork return to South Fork mainstem.**

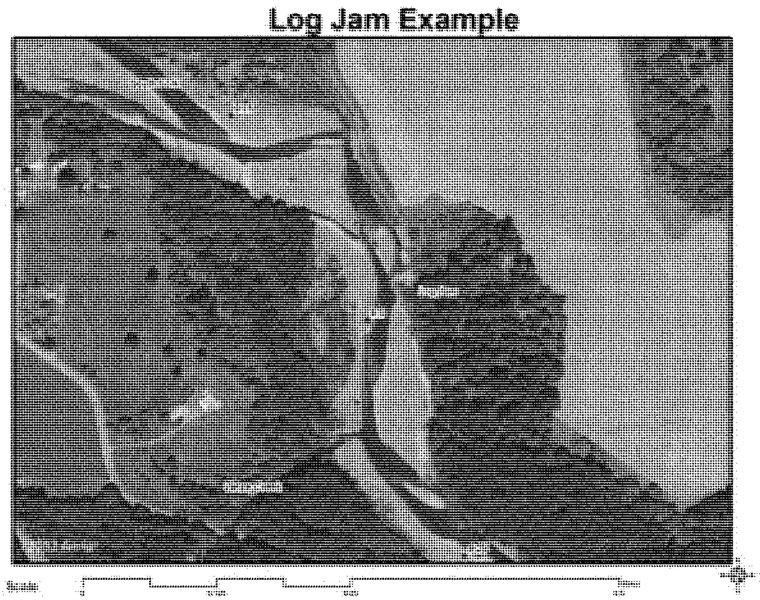



**Figure 20. Example log jam that has been in place since at least 2005 near RM 9.5.**

# 5.0 Model Results

In this section, proposed restoration alternatives are contrasted with existing conditions to evaluate change in flow connectivity and patterns, water stage, and depth-averaged velocity. Select discharge results are presented for each scenario to highlight relative comparisons and key findings. Model results for all discharges and scenarios are available in ASCII or GIS format and can be requested from the report author. All model output data are provided in English units with a projection and datum of Washington State Plane South, NAD 1983 and NAVD 1988 feet. The model results provide insight to relative changes in hydraulic conditions for fixed-bed channel topography. The model does not simulate channel changes in bed elevation (incision or aggradation), bank erosion (widening), or vegetation growth. These physical processes will occur along the proposed restoration reaches, and interpretations are linked with potential morphological changes where possible.

## *5.1 Car Body Levee Removal (Run 2)*

In existing conditions before the levee is removed, more flow passes into the North Fork than into the downstream South Fork channel because the South Fork is currently perched a few feet higher than the North Fork channel. At the 2-year flood (17,500 cfs) a little less than double the flow goes toward the North Fork (note that nearly two-thirds goes overbank and does not flow in either channel). With the Car Body Levee removed, there is increased connectivity between RM 8.5 and 8.75 interconnecting the North Fork and South Fork channels. Flow being directed into the North Fork from the South Fork increases by a little less than 5 % of the 2-year flood. Water depths change more than 0.5 ft at the 2-year flood in the vicinity of the upstream South and North Fork confluence near RM 8.5 to 8.75 (Figure 21). The largest water depth changes are along the levee footprint which is dry in existing conditions. There is also an extended area of increased water depth in the channel and low floodplain adjacent to the North Fork path between RM 8.75 and 7, but the depth increases at the 2-year flood are all less than 0.5 ft (shown as royal blue in Figure 22).There is a corresponding decrease of water depth in the mainstem South Fork, mostly less than 0.5 ft, but up to 1 ft just upstream of the Car Body Levee where backwater conditions are caused by the levee in existing conditions. The 100-year flood (35,800 cfs) has a similar extent of depth change, with majority of the area being less than a 0.5 ft increase and the segment between RM 8.5 to 8.75 having the largest changes where the levee removal increases connectivity to the north side of the valley (Figure 24).

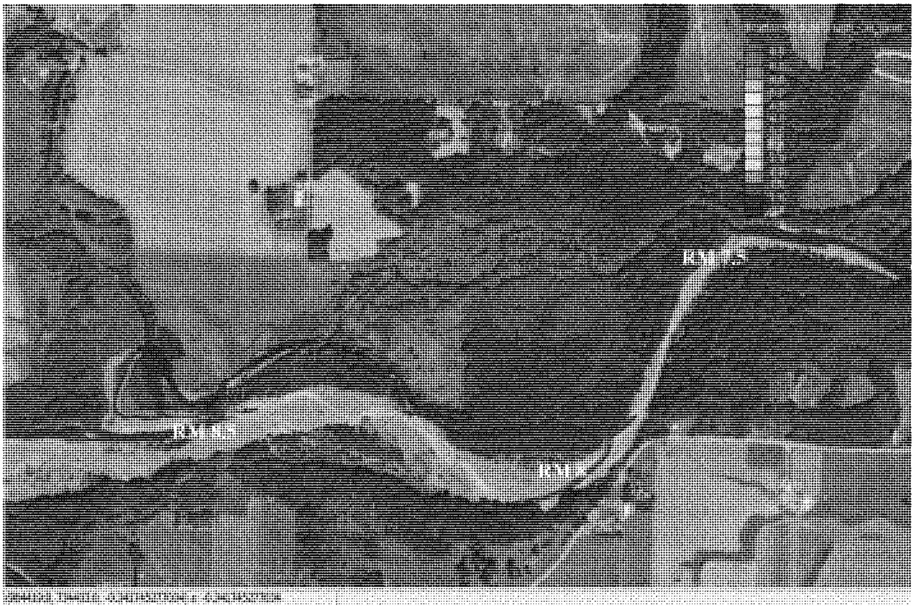


Figure 21. Change in water depth greater than 0.5 ft from removal of Car Body Levee at 17,500 cfs (2-yr flood). Footprint of Car Body Levee is shown in black outline.

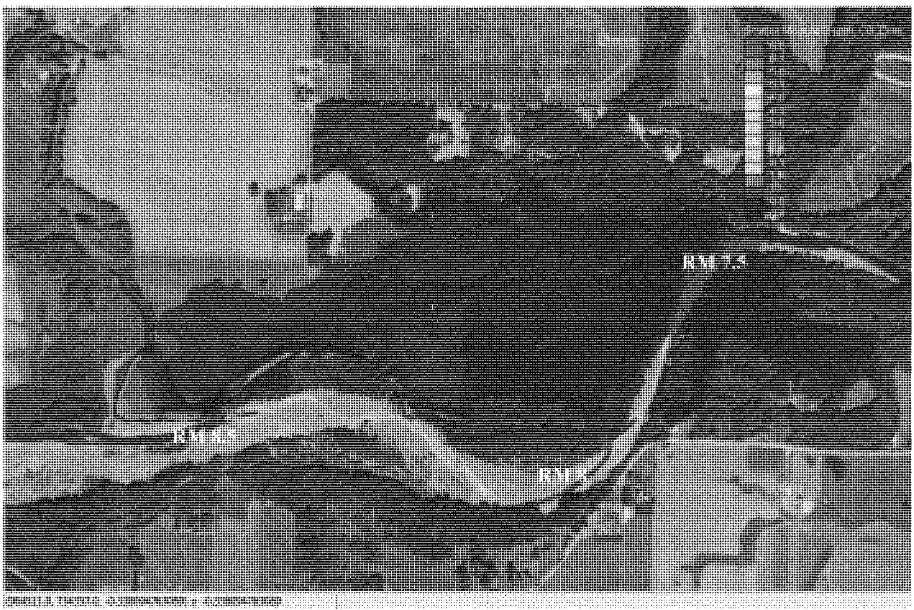



Figure 22. Change in water depth greater than 0.1 ft resulting from removal of Car Body Levee at 17,500 cfs (2-yr flood). Footprint of Car Body Levee is shown in black outline.

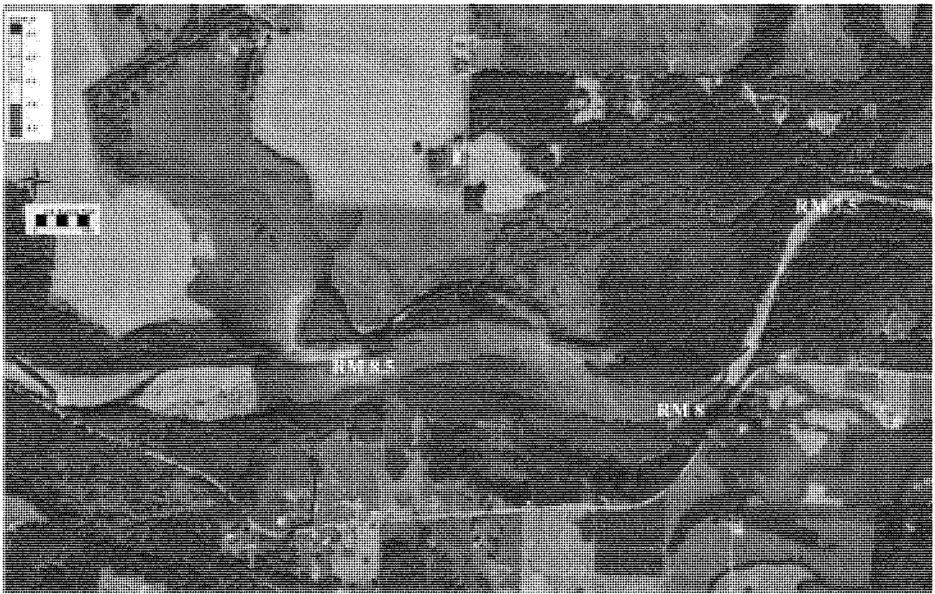


**Figure 23. Reduction in water depth greater than 0.1 ft from removal of Car Body Levee at 17,500 cfs (2-yr flood). Footprint of Car Body Levee is shown in black outline.**

**Figure 24. Change in water depth greater than 0.1 ft from removal of Car Body Levee at 35,800 cfs (100-yr flood).**

The Car Body Levee removal area represents former active channel in 1938 that is now partially occupied by the North Fork (see Figure 17). As a result, there is not much elevation relief between the South and North Fork channels. However, in the most recent topography used for modeling the South Fork is perched up to four feet higher than the North Fork across the valley, creating a lag of when the same elevation occurs in the South Fork as the North Fork (Figure 25). Modeled water flow paths illustrate a trend that follows the elevation data, flowing from the South Fork mainstem toward the North Fork channel between RM 9 to 8 (upstream of Location A in Figure 26 and Figure 27). There are multiple locations where flow goes into side channels or overbank across the low floodplain including location A and B. Location A is a 50-ft wide breach that has been growing in the last few years. At the 2-year flood (17,500 cfs), velocities are high in the South Fork approaching the breach (location A) into the North Fork, indicating this flow path has potential to continue to become larger with levee removal. Location B may become a more prominent flow path from the South Fork to North Fork following levee removal. Location C has high velocities on either side of the floodplain, but depths at the 2-year flood are about 2 to 3 ft, half that of the main channel average depths in this area. As more flow is transferred into the North Fork, channel migration is likely in this area. At Location D, flow depths are 4 to 6 ft at the 2-year flood and this area is also likely to be dynamic in the near future with the high velocities present in this side channel.

Starting at RM 8 (elevation 47 in Figure 25), flow patterns begin to reverse and overbank flows trend back towards the South Fork from the North Fork. Even with levee removal, the channel is likely to continue to push more flow toward the North Fork in the near future. At RM 7.5, the North Fork mainstem confluences back to the South Fork and high velocities occur as the combined flow runs along a high bank on river left. There is a potential breach location at RM 8 to the right where a levee known as "Church Dike" has failed in the past and had to be repaired (Godaire et al, 2009). This floodplain is relatively low in elevation compared to the mainstem and flow easily overtops and flows along a path to the southeast. Allowing more flow to pass into the North Fork channel and onto the right floodplain with levee breaches may help slow erosion risk at RM 8, particularly during smaller floods. However, even with the North Fork channel conveying more flow, during larger peaks a substantial amount of flow still goes overbank into the right floodplain at RM 8. Consideration of monitoring at this location for erosion and avulsion risk should be included and future restoration planning may be needed to address the RM 8 location through road and levee setback or increased erosion and/or flood protection.

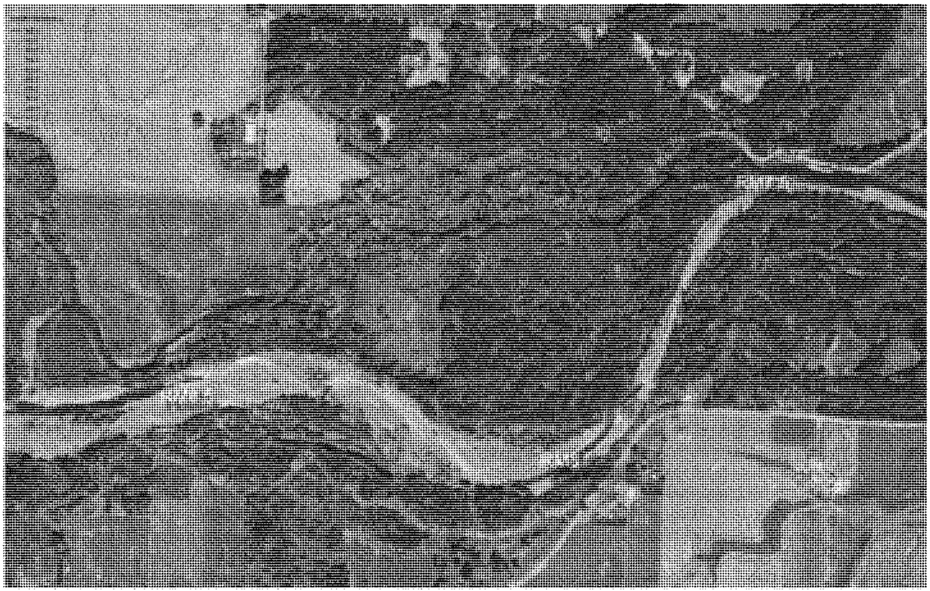


Figure 25. Elevation (feet) comparison between North and South Fork channels near confluence. Comparable elevation values in each channel are shown in larger red text illustrating that the South Fork is perched a few feet above the North Fork Channel for the left half of the figure.

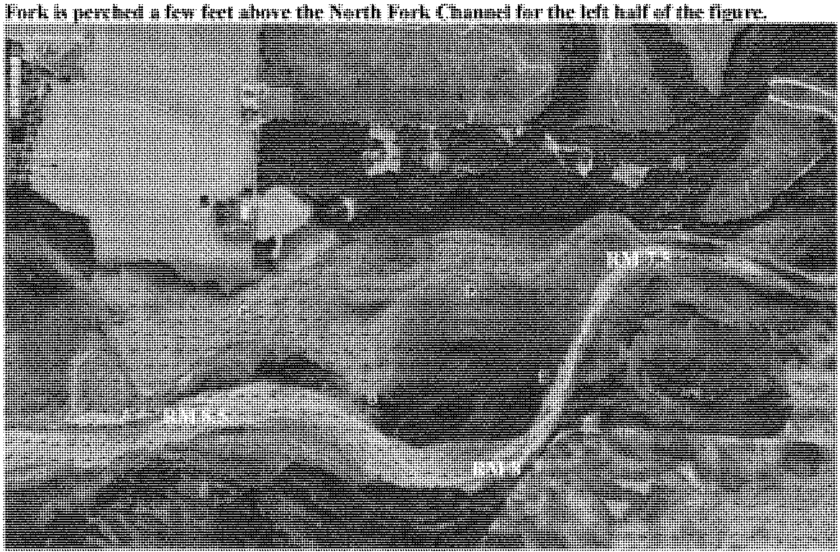


Figure 26. Depth-averaged velocity at 17,500 cfs (2-yr flood) near North Fork confluence with Car Body Levee removed showing potential areas of channel change. Velocity arrows indicate general flow patterns. A. High velocity in present South Fork mainstem approaching breach into North Fork. B. High velocity flow path from South Fork toward North Fork channel. C. High velocity on left and right floodplain adjacent to North Fork channel. D. High velocity in side channel adjacent to North Fork. E. Transition from flow patterns trending back to South Fork from North Fork.

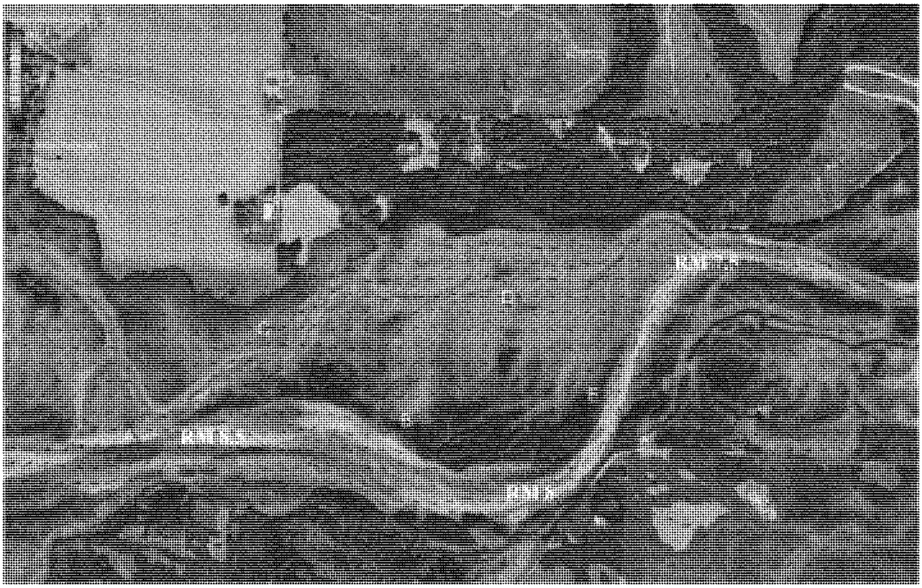


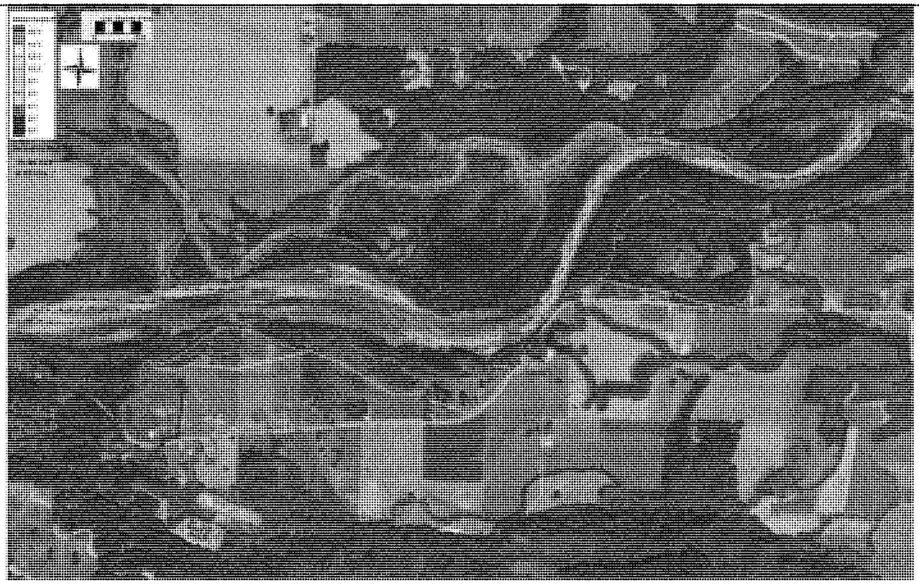
**Figure 27. Water depths at 17,500 cfs (2-yr flood) near North Fork confluence with Car Body Levee removed. Velocity arrows indicate general flow patterns. High velocity locations (see previous figure) are combined with relatively deeper water depths (4 to 6 ft) at locations A and D. Locations B and C have relatively higher velocities but shallower depths from 2 to 3 ft.**

## *5.2 RM 9 and Grange Levee Breaches with Setback and with Car Body Levee Removal (Run 3 and Run 4)*

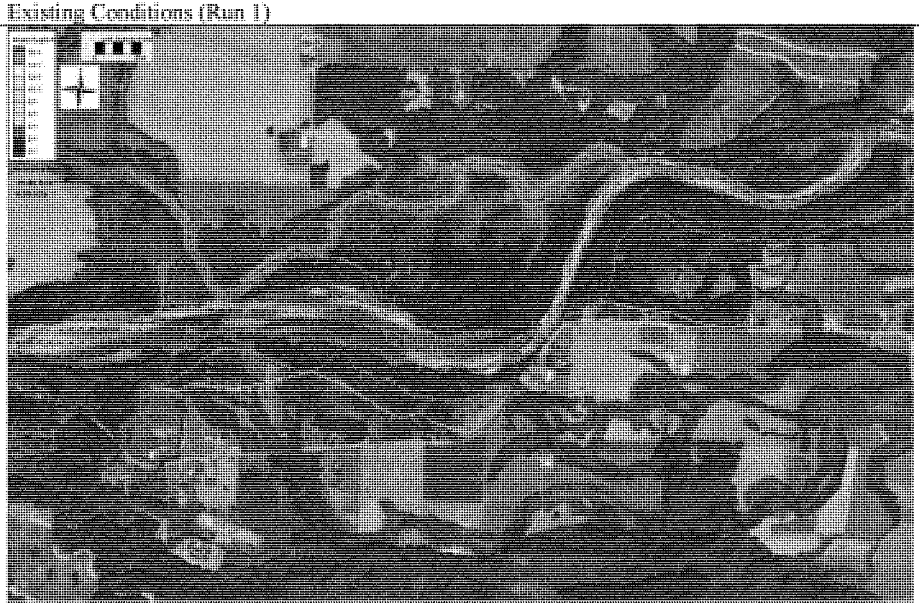
In this scenario, in addition the removal of the Car Body Levee, the RM 9 and Grange Levees are breached. A second model run is done where two new setback levees are added to help contain the new flow passing through the breaches (also includes removal of Car Body Levee).

With existing conditions, levee breach (Run 3), and levee setback (Run 4) model runs at 2,200 cfs, there is limited overbank flow into the southern floodplain (to the right of the Skokomish River) until downstream of both the RM 9 and Grange Levees. At 6,200 cfs (moderate storm discharge), flow begins to overtop the banks and flow across the floodplain, but the RM 9 and Grange Levees are not overtopped (Figure 28). In existing conditions, there is a very small amount of flow that routes around the upstream and downstream ends of the RM 9 Levee to the south floodplain, but no flow passes through the levee. The upstream flow path becomes more prominent at the 2-year flood (17,500 cfs), routing flow into Weaver Creek that flows along the southern edge of the valley (Figure 29). The breaches in the RM 9 Levee are effective at increasing the number of flow paths that travel across the floodplain south away from the mainstem. The more prominent low spots in the valley can be seen in the 6,200 cfs run, and at the 2-year flood (17,500 cfs) most areas are wet. The setback levee does reduce the number of flow paths going south, limiting the flow to fewer overtopping areas on the new levee. At the 100-year flood (35,800 cfs), the setback levees are overtopped in most locations. The upper portion of floodplain opened up by the RM 9 breaches has a higher floodplain relative to the mainstem and has shallower depths. The downstream-half follows former channel paths and has a deeper flow path from upstream to downstream along the setback levee. The setback levee may act like a weir at some flows, with flow spilling over the top to the other side until flows on the other side "catch up" in water stage from other flows routed around the levee. The southern (landward) side of the setback levee may be at risk for erosion at certain flow levels when the there is a higher water stage on the riverward side than landward side.

Along the road (locally known as Church Dike) between the RM 9 and Grange Levees, there is a location of overtopping at RM 8. The road is located on the outside of an existing meander bend where flow would tend to overtop the bank. Downstream of the RM 9 Levee, flow routes through an existing low spot in the Grange Levee in the existing condition at 6,200 cfs. At the 2-year flood (17,500 cfs), flow inundation and connectivity occurs at multiple locations in the south floodplain near the Grange Levee, although the levee does limit the connectivity. The breaches do increase the area of flow inundation passing into the south floodplain into the former channel path. The setback levee that runs along the outside of the historical channel path (near word "setback" in Figure 29) does contain a large portion of the flow passing through the Grange Levee breaches, but at one location does overtop and more flow travels to the south toward Purdy Creek. Upstream of the RM 9 Levee and through the new breaches, flow goes overbank into the right floodplain and follows floodplain channel paths including Weaver Creek. This results because the southern part of the valley is lower elevation than the current South Fork mainstem. Downstream of the Grange Levee there are other locations where the flow travels from the mainstem Skokomish toward the south and into Weaver Creek. Similar to the RM 9 Levee, the southern (landward) side of the setback Grange Levee may be at risk for erosion at certain flow levels when the there is a higher water stage on the riverward side than landward side, particularly where flow spills over the levee at the southern-most point along the road.



Existing Conditions (Run 1)



Levee Breaches (Run 3)

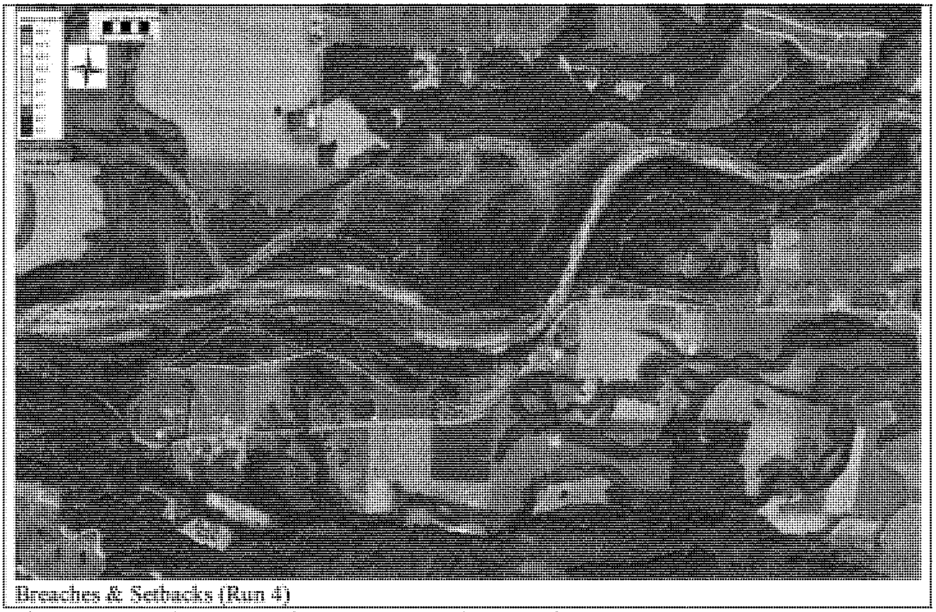
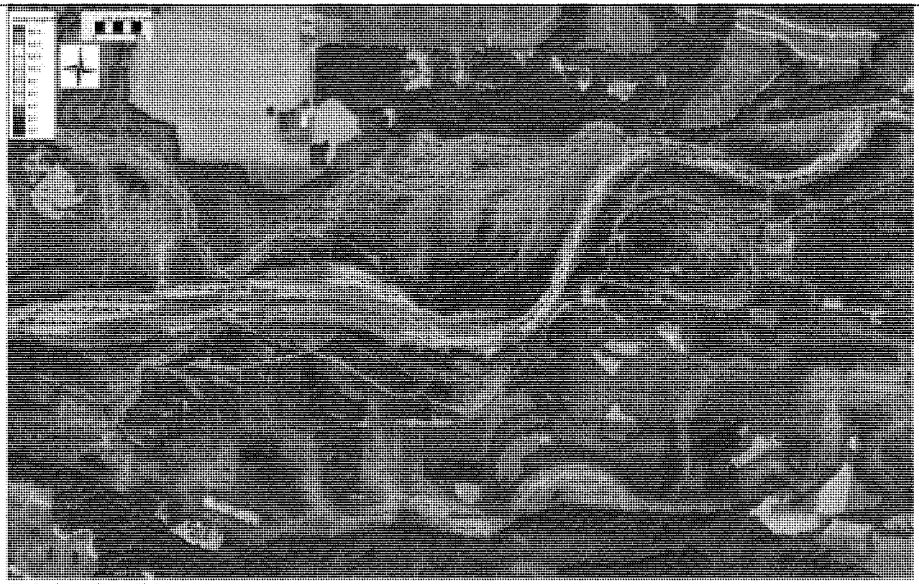
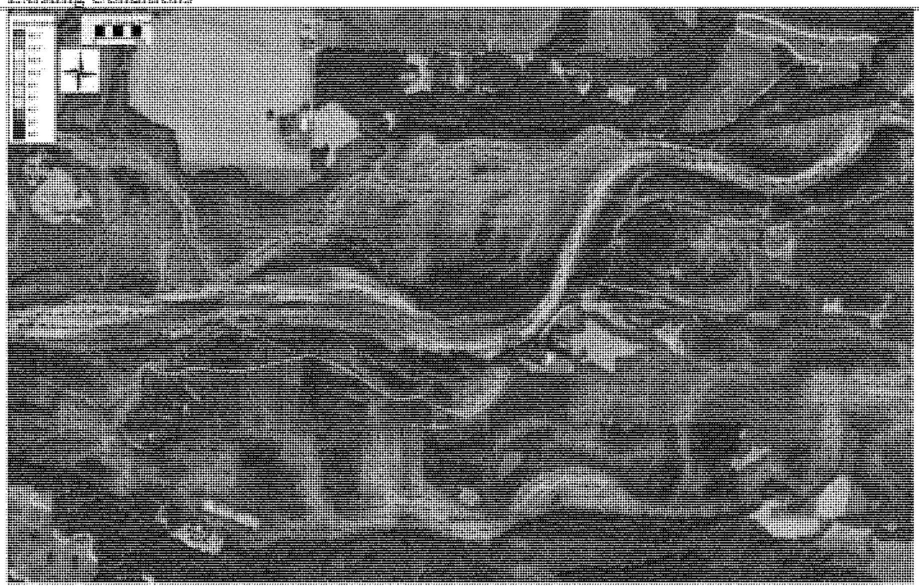



**Figure 28. Comparison at 6,200 cfs (moderate storm discharge) of water depths near RM 9 and Grange Levees for existing conditions, breached levee conditions, and breached conditions with setback levees built. Existing and setback levees shown in yellow dashed or solid outline, respectively. Breach locations in red circles. Velocity vectors indicate flow direction.**



Existing Conditions



Levee Breaches

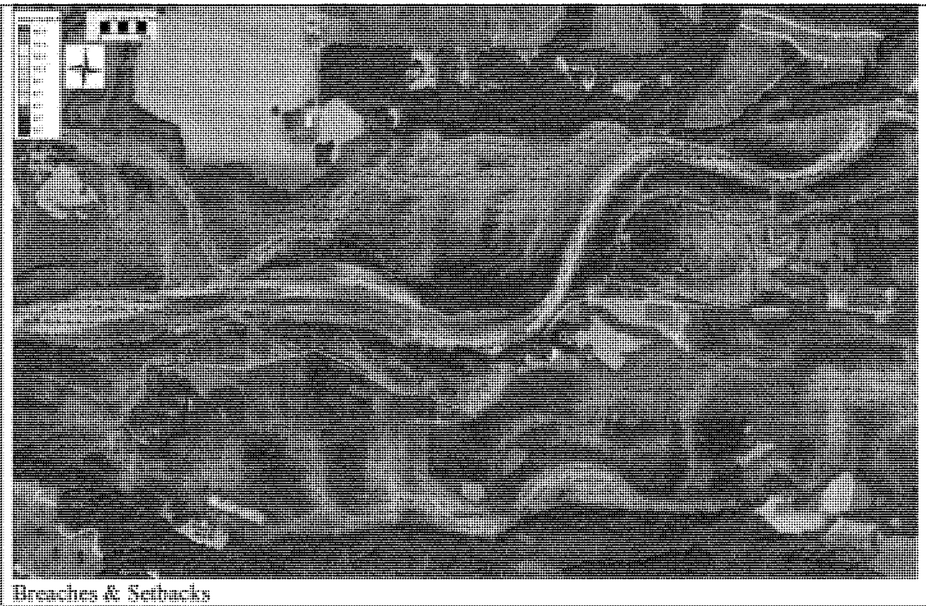
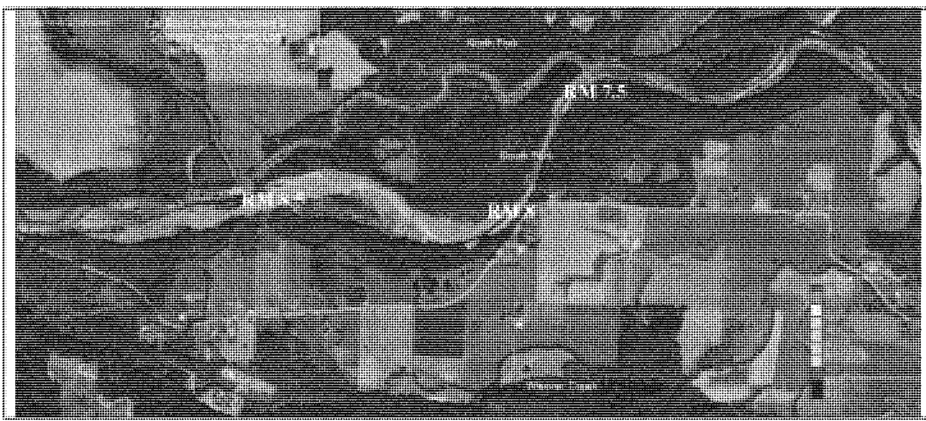



**Figure 29. Comparison at 2-year flood of water depths near RM 9 and Grange Levees for existing conditions, breached levee condtions, and breached conditions with setback levees built. All runs include Car Body Levee removed. Existing and setback levees shown in yellow dashed or solid outline, respectively. Breach locations in red circles. Velocity vectors indicate flow direction.**

## *5.3 Diversion into North Fork with Car Body Levee Removal (Run 5)*

This scenario adds a diversion channel into the North Fork with large wood features in the mainstem Skokomish just downstream, in addition to the Car Body Levee removal. No changes are made to the existing RM 9 or Grange Levees. With the Car Body Levee removed and a small pilot channel to simulate more flow diverted into the North Fork channel, the modeled flow is all directed into the North Fork at 2,200 cfs from the South Fork and Vance Creek (Figure 30). Backwater occurs in the upstream direction of the South Fork mainstem where the North Fork re-enters. Low-flow may still pass down the South Fork depending on the configuration of the diversion, and whether it is sustained over time after high flows occur. However, because the South Fork is currently perched higher in this area, there is a reasonable chance the low-flow will progress toward and be sustained in the North Fork channel in the short-term, even without a diversion. Any pilot channel dug or breaching of remaining Car Body Levee and wood will help encourage more flow to go toward the North Fork. Long-term channel evolution is likely, and low-flow channels will likely alternate among the wider, more connected fluvial channels and floodplain area. If sediment aggradation occurs in the North Fork channel after several years of increased sediment load transported into this path, this alteration could include more conveyance back into the South Fork path, into side channels, or formation of a new channel path through channel migration and bank erosion.

At 6,200 cfs, flow is no longer contained in the pilot channel and a portion passes down the South Fork mainstem. Flow still spills out onto the south (right) floodplain because of upstream overbank flow occurring before the river reaches the diversion. At the 2-year flood flow is fully wetted both the North Fork and South Fork mainstem channels, with a portion of the flow still passing down valley to Weaver Creek due to upstream overbank flow. The proposed log jams just downstream of the confluence interact with modeled flows of 6,200 cfs and larger causing an obstruction for flow passing down the South Fork (Figure 31). At the 2-year flood (17,500 cfs), water stage increases toward the North Fork and decreases to the south as a result of the levee removal (Figure 32 and Figure 33). The water backed up behind the Car Body Levee is reduced, along with flow in the South Fork mainstem downstream of the new pilot channel and adjacent floodplain. When the pilot channel is additionally constructed, water stage reduces even further to the south but increases over a larger extent in the North Fork channel. However, the increase in water stage is less than a foot in most areas.



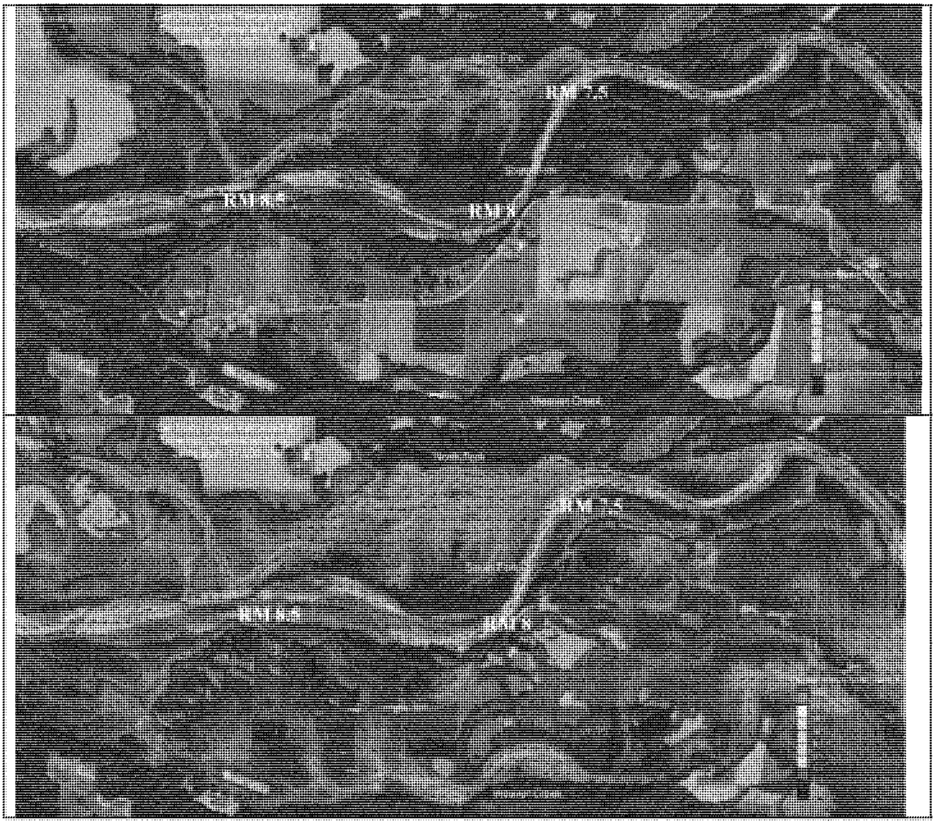


**Figure 30. Comparison of three flows for model scenario with Car Body Levee Removed and flow diverted into the North Fork River with log jams constructed in mainstem South Fork below confluence.**

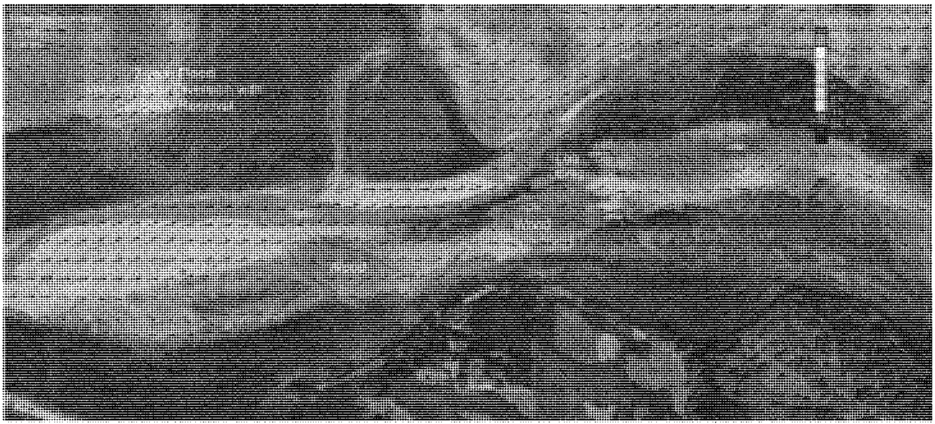


**Figure 31. Depth-averaged velocity at the two-year flood (17,500 cfs) near proposed log jams just downstream of North and South Fork confluence.**

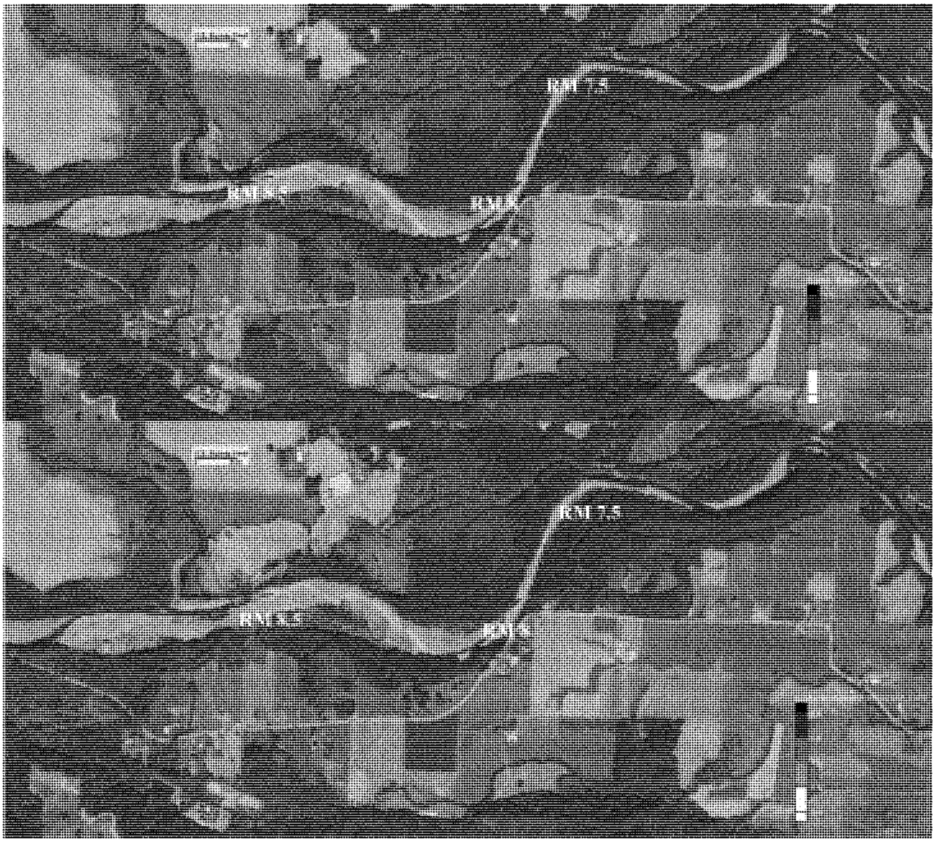



**Figure 32. Increase in water stage greater than 0.5 ft at 2-year flood from existing conditions to removal of Car Body Levee (image A) and additionally digging a pilot channel and adding log jams (image B) to increase flow into North Fork.**

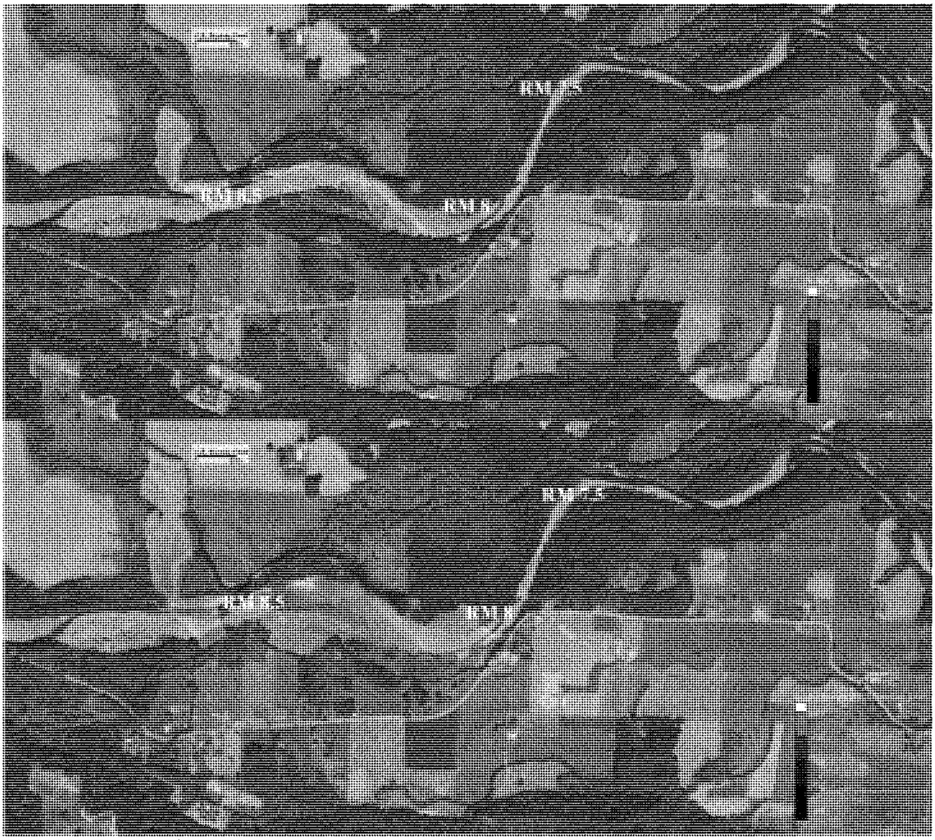


**Figure 33. Decrease in water stage greater than +/- 0.5 ft at 2-year flood (17,500 cfs) from existing conditions to removal of Car Body Levee (image C) and additionally digging a pilot channel and adding log jams (image D) to increase flow into North Fork.**

## *5.4 Diversion into North Fork with Car Body Levee Removal and RM 9 and Grange Levee Breaches (Run 6)*

In this scenario, the diversion into the North Fork is combined with removal of the Car Body Levee and additionally breaching the RM 9 and Grange Levees. No setback levees are constructed. When the levees are breached, additional flow passes into the right (south) floodplain, decreasing water stage in the mainstem South Fork Skokomish and increasing in a few locations of the right floodplain where flow passes through the breaches (Figure 34). Increases in water stage occur near the Car Body Levee where it is removed, as shown in prior model runs of this proposed action.

**Figure 34. Change in water stage greater than +/- 0.5 ft at 2-year flood from existing conditions to removal of Car Body Levee and breaching of the RM 9 and Grange Levees. Areas of increased stage are shown in bottom figure (red) and areas of decreased stage are shown in top figure (blue).**

## *5.5 Large Wood Placement in RM 9 to 10.5 and Diversion Channel and Levee Modifications (Run 7 and Run 8)*

In this scenario, all restoration options are implemented with additional large wood features between RM 9 and 10.5 upstream of the North Fork pilot channel diversion. Finer mesh resolution would be needed a with higher resolution topography (rather than interpolated between cross-sections) to improve resolution of wood features in this reach. Therefore, two model results are shown at the 2-year flood to show a potential range in hydraulic response from wood placement: one scenario with extensive very dense loose wood placement along middle third of active channel in addition to small log jams, and one with only the small log jams and no other change. Small log jam features (20 ft x 20 ft) only affect a couple mesh nodes and do not significantly impact hydraulics at the two-year flood.

With the denser wood simulation and all restoration options implemented, water stage decreases near the Car Body Levee and in the downstream South Fork mainstem for about one mile (Figure 35). Water stage increases a few tenths of a foot to a couple feet in the upstream RM 9 to 10.5 (where high density wood is placed), and in both floodplains where levees are removed are breached and more flow connectivity occurs after restoration projects are implemented. Velocity reductions and increases relative to existing conditions at the two-year flood show similar spatial patterns as the water stage (Figure 36 and Figure 37). Although localized hydraulics cannot be provided due to limitations in topography, the results provide general indications of of water stage changes. In regards to velocity, the results indicate the general pattern will be to reduce velocity with more "roughness" in the channel, which could be accomplished with additional large wood. However, the results indicate the wood needs to be high density and/or large relative to the channel width to impact flows at the 2-year flood and greater.

The mobility of wood was not addressed in this model study but should be considered in design stage. Single logs that can be mobilized during high flows have potential to deposit at narrow flow path entrances such as the proposed diversion between the South Fork and North Fork. More consideration and analysis is also needed for determination of design height of proposed log jams to ensure they meet design objectives and not fail due to overtopping, undercutting, or outflanking. Alternative placement of wood features could be considered that works with current depositional features and banks, such as placing log jams at heads of forming islands or bars. Another concept could be a pilot project that loads the river with logs that can then form downstream log jams. Key pieces could be placed that then build larger features with the supplied logs.

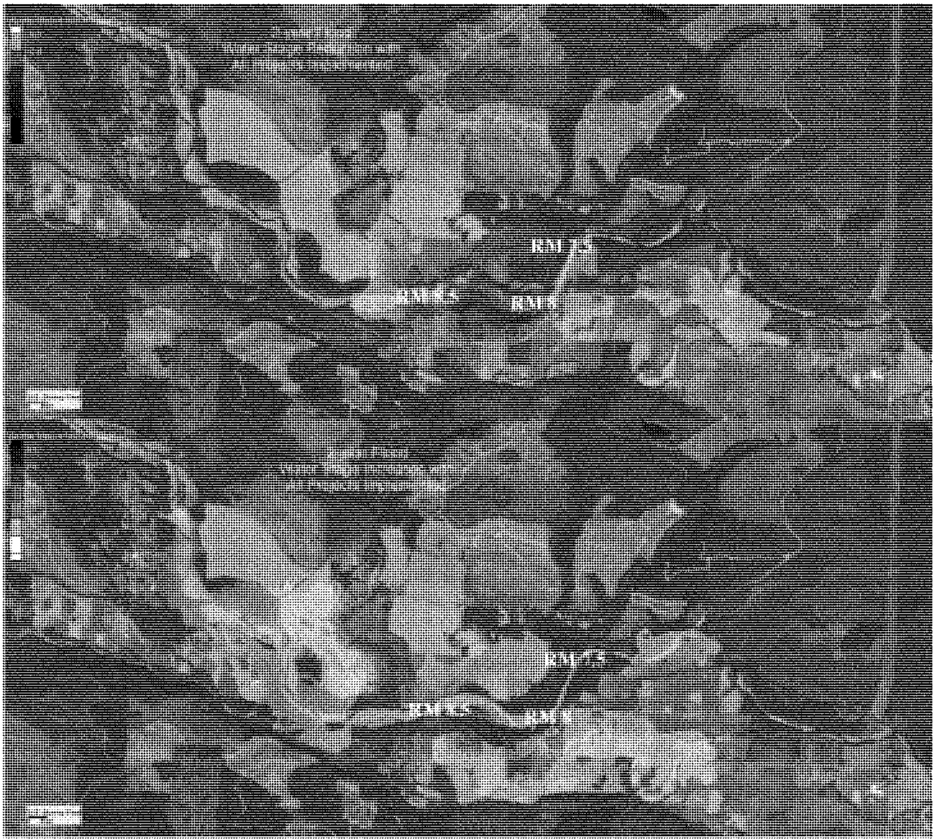


**Figure 35. Change in water stage with all restoration options implemented and high density wood placed in RM 9 to 10.5. Top image shows reduction in water stage relative to existing model results (blue colors); bottom image shows increases in water stage (red colors).**

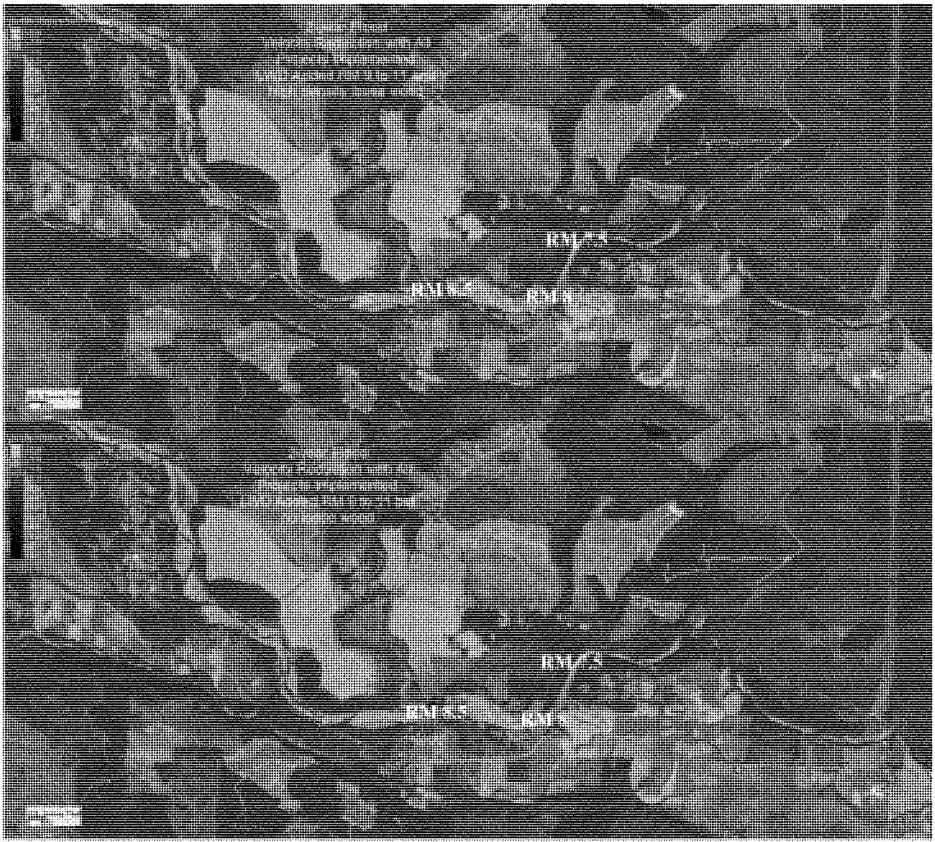


Figure 36. Areas of velocity reduction at two-year flood with all restoration options for high density (top image) and low density (bottom image) wood simulated in RM 9 to 10.5.

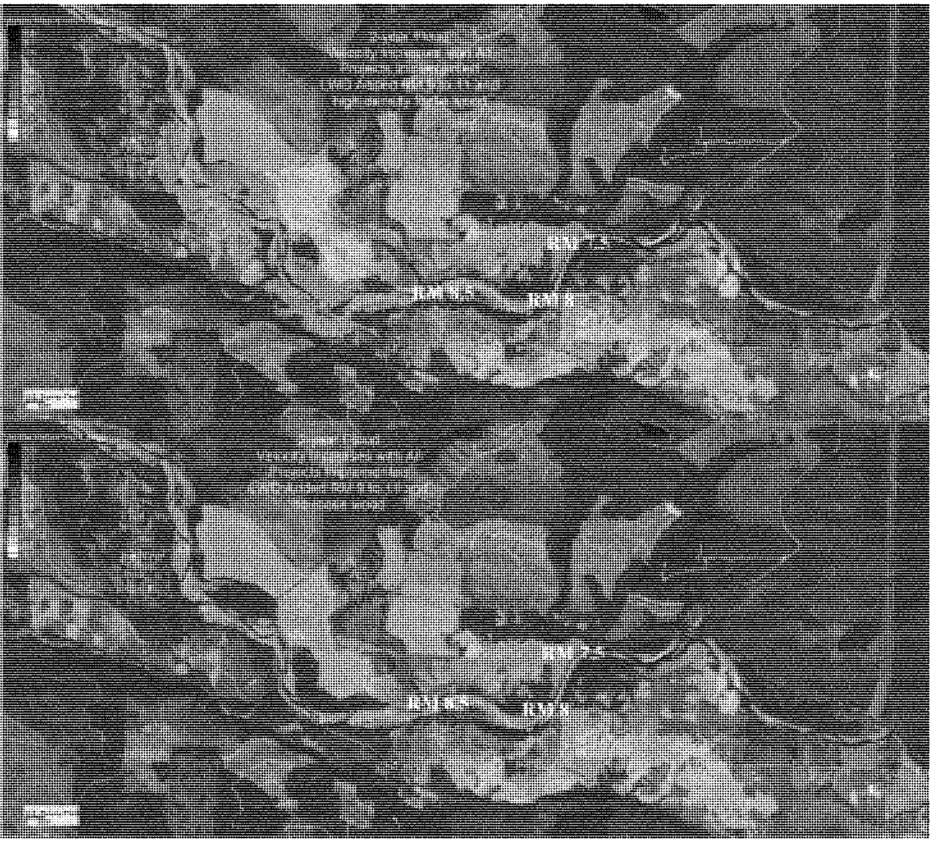


**Figure 37. Areas of velocity increase at two-year flood with all restoration options for high density (top image) and low density (bottom image) wood simulated in RM 9 to 10.5.**

## *5.6 RM 5 Channel and Wetland Reconnection*

A set of side channels and wetland areas on river left (north) of the mainstem Skokomish near RM 5 (Highway 101 Bridge) are proposed for improved reconnection to the mainstem. No alterations were done to the model terrain because design data was not available and there is no bathymetry available for the side channels. In this area, the valley topography is higher on the left (north) side of the mainstem than the right (south) side. The narrow side channel bottom elevations were estimated by subtracting 1 ft from LiDAR elevations, although there are several areas that are likely deeper. The 2011 LiDAR was used for the majority of the side channel but the upstream segment above Highway 101 was partially represented by 2002 LiDAR. The paths under Highway 101 and 106 may not be well represented and would also require survey data to more accurately represent current hydraulic connectivity. A revetment is present near the upstream entrance to the channel network, but it is not known how well it is represented in the LiDAR.

Existing conditions are shown for the Moderate Storm (6,200 cfs) and the 2-year flood (17,500 cfs) to show present connectivity (Figure 38 and Figure 39). At 6,200 cfs water does flow into the side channel and the model indicates there is some recirculation caused upstream of Highway 101 on the left side by the road embankment. On river right, deeper flow passes through two Highway 101 openings at Purdy Creek and Weaver Creek. At the 2-year flood similar patterns occurred with more water continuing to pass on the southern side down the valley than the northern side. Currently there is a lot of recirculating flow between Highway 101 and 106 in the left floodplain. Combining the side channel reconnection with additional revetment breaches and channel reconnections throughout this area may help improve overall flow connectivity and ecosystem function. Less connectivity may occur with increased recirculation, encouraging more sedimentation and marshy environments.

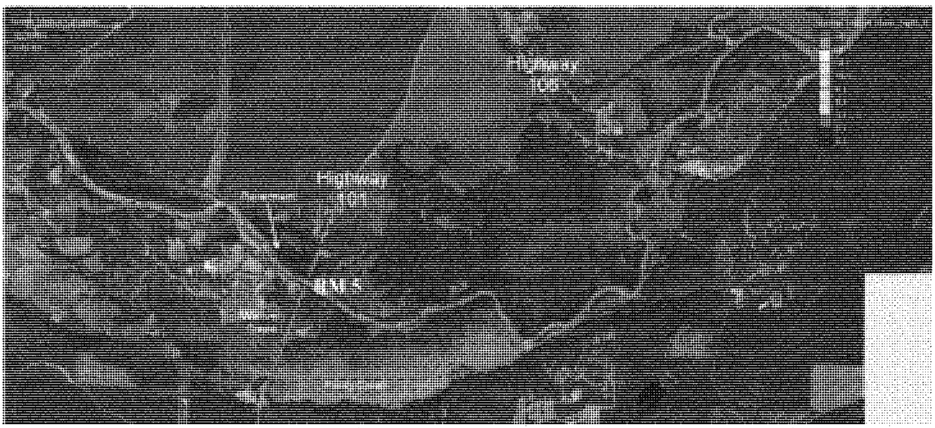


**Figure 38. Water depths for existing conditions at 6,200 cfs near RM 5 showing some connectivity with proposed side channel reconnection area on river left, but majority of flow passing in right floodplain (bottom of figure).**

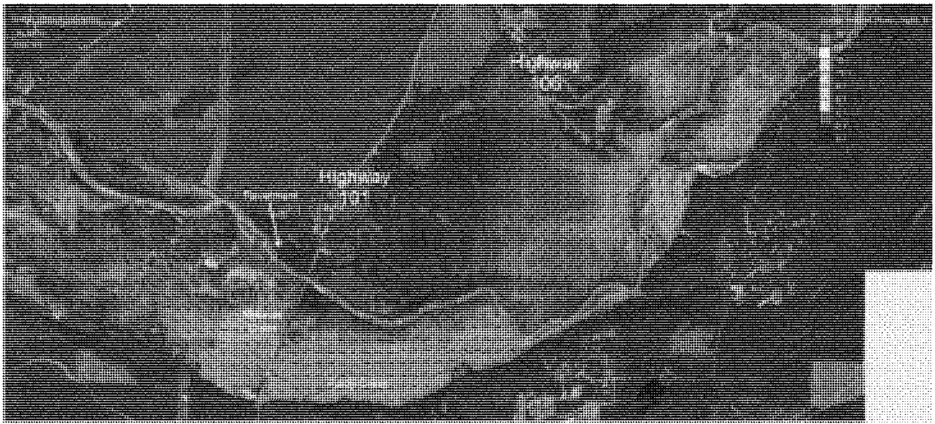



Figure 39. Water depths and flow paths at 2-year flood near Highway 101.

# 6.0 Discussion and Summary

A 2D hydraulic model was applied to the lower Skokomish River Valley in Mason County. The model Terrain was updated with the best available topography ranging from 2002 to 2012. The 2D model was applied to look at relative changes in water stage, depth-averaged velocity, and flow patterns for proposed restoration scenarios in the feasibility stage of design and analysis. The model applied in this study is fixed-bed and does not address sediment transport or related channel bed changes (aggradation or incision), channel migration, and bank erosion. Therefore, historical geomorphic trends and sediment transport considerations were incorporated to provide context for numerical model results. The restoration scenarios modeled include removing or breaching three large levees near RM 7 to 9, increasing flow diverted into the North Fork channel from the South Fork near RM 8.5 and adding some large wood features at the confluence, and adding large wood between RM 9 to 10.5. An additional option of improving the hydraulic connection of a side channel near RM 5 was not modeled, but existing conditions results from the model were presented to help inform potential future design.

In existing conditions, significant flow losses occur in the mainstem river in the downstream direction because of limited channel capacity. The present channel capacity near the South and North Fork confluence is about 1,500 to 2,500 cfs before it starts spilling overbank. Model results indicate that sharp bends in the river resulting from bank revetments and levees influence overbank flooding, along with constrictions where the river runs against naturally occurring bedrock hillslopes. The present channel conveys as low as one-quarter of the 2-year flood near RM 5 where the channel is shallow with little topographic relief between the channel bottom and adjacent floodplain. In other locations up to one-half to two-thirds of the 2-year flood is conveyed such as locations RM 9 to 10 and RM 2.3 where the mainstem channel is wider or deeper, respectively.

The removal of the Car Body Levee near RM 9 increases connectivity between the existing active channels and the left (north) floodplain. With the levee removal and a pilot channel, more flow is diverted into the North Fork channel (about 1,000 cfs at two-year flood for the conceptual pilot channel used in model). Water stage does correspondingly increase in the North Fork area and decrease in the current mainstem Skokomish path as a result of altered flow patterns. Velocities are high approaching the confluence of the South and North Fork channels and the South Fork is currently perched higher than the North Fork channel at the confluence and for ½ mile downstream. With current conditions, the South Fork mainstem is perched and it is likely more flow will continue to pass into the lower North Fork channel regardless of whether a pilot channel is excavated. However, the pilot channel will help initiate a faster transition to this process. Depending on how long it takes to get to project implementation, the need for a pilot channel should be revisited because it is possible the river will do the work to increase connectivity on its own in the next couple of years. If a pilot channel is still needed, it is likely only a simple, small pilot channel will further the headcut process at the confluence and improve connectivity between the two paths. As more flow is diverted into the newer North Fork path, there will essentially be two South Fork mainstem channels that are commonly inundated.

The right floodplain where the RM 9 and Grange Levees are located has variable topography including old mainstem channels, overflow channels, and higher elevation floodplain. In existing conditions, the elevations along the south side of the valley are similar and in some cases lower than the mainstem Skokomish between RM 5 and 9. This results in extensive flood flow going overbank into the floodplain, particularly established flow paths that such as Weaver Creek. There is also areas where the river has eroded in the past and will continue to pose avulsion risks such as at RM 8 near the Church Dike, located between what is labeled in this report as the RM 9 and Grange Levees. Model results show increased right (south) floodplain connectivity from the proposed RM 9 and Grange Levee breaches. Breach locations will be most effective in improving connectivity of flow paths when they can follow existing lower elevation flow paths (relative to the river) and incorporate both an entrance and exit. These paths may change over time as the river migrates and evolves, but for initial high flows following breaching this will improve connectivity and reduce risk of stranding fish. Breaches along higher floodplain areas may also be field checked for swales and overflow paths to improve connectivity to existing channel networks within the floodplain.

New setback levee segments near low-elevation historic channels should be built with the anticipation that in the future the river may at some point run along the levee. This may require burial of rock material below the existing ground to limit future erosion and breaching. The southern (landward) side of the setback RM 9 and Grange Levees may be at risk for erosion at certain flow levels when there is a higher water stage on the riverward side than landward side. One example is where flow spills over the levee at the southern-most point of the RM 9 Levee along the road (river mile 8). These setback levee sections could be evaluated for erosion risk and potentially reinforced with larger material, or could be raised at sections prone to overtopping. Model results indicate the proposed RM 9 setback crest elevations may have minor overtopping at 6,200 cfs. The design intent was to not be overtopped until a 2-year flood, indicating additional adjustments may be needed for the next phase of design.

Addition of wood needs to be further evaluated to ensure project objectives are met at each proposed location. Natural wood is present in this modeled reach in both single loose logs, stumps, and in some locations log jams. The logs and jams that are able to influence hydraulics and improve morphology and habitat function are tens of feet in size, often over hundred feet. Small wood and root wad features could be implemented but should avoid high energy areas in the active channel. Smaller features are likely to have more sustainability being built into banks or along vegetated islands. New log jams should consider being comparable in size to existing log jams and be placed in areas that mimic where existing jams occur. Examples are along heads of higher relief gravel bars that can benefit from key logs to help form bigger structures. A pilot project may be an option to consider that would supplement a few key logs at the upstream end of the restoration reach and then allow the river to do the work to deposit them (near RM 9.5 to 9.75 left bank could be an option). In addition, a few key log jams could be placed at the heads of depositional bars or islands that could build over time from the supplemental logs or natural supply. If successful, this could be followed up with more wood loading of various sizes to supplement low levels of current wood supply in this portion of the system.

It should be anticipated that channel position today (2014) will change as a result of implemented restoration scenarios. Breaching existing levees will allow more flow connectivity between the river, old channels, and floodplain within the footprint constrained by natural geologic features or setback levees. Increased flow connectivity expands the river corridor in which it can migrate, build depositional features, form more side and overflow channels, and recruit and grow vegetation and wood. Because of high sediment loads and a large portion of flow that goes overbank, it is likely that opening more floodplain will allow the river to expand and occupy old channels or form new channels. Channel evolution is part of restoring remnants of natural process, and giving the river a bigger footprint is likely to lead to improved ecosystem function.

Recommendations for improving model capabilities and understanding of channel migration trends for future efforts such as the design stage include:

1. Obtain sediment gradation data and photographs of channel conditions on the North Fork channel within the model domain for determination of channel roughness values.
2. Replace 2002 LiDAR with new topography (such as LiDAR) during low-flow and leaf-off conditions and include a rigorous post-processing routine to remove vegetation. This will improve representation of exposed channel areas (e.g. gravel bars and islands), channel banks that control overbank flow, and floodplain topography.
3. Collect more detailed channel bathymetry in areas of proposed restoration projects that can be used to generate a continuous topographic surface. This could include more densely spaced cross-sections and/or longitudinal bathymetric profiles collected by boat.
4. Collect bathymetry to represent channel bottom elevations in any significant floodplain channels that convey flood flow such as Purdy Creek, Weaver Creek, and Skabob Creek.
5. Collect more detailed topographic data on proposed levee removal and breach areas.
6. Collect water surface elevations at moderate and high flows to improve model calibration with current conditions.
7. Collect water stage and discharge data in any significant floodplain channels that convey flood flow such as Purdy Creek, Weaver Creek, and Skabob Creek.
8. Every 5 to 10 years, repeat topography and active channel sediment gradation data to further analyze trends in whether the river is aggrading and potential risks for channel avulsion.

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# Appendix A: Discharge Data for 2D Model

The 2D model was run with steady flow discharges. Incoming discharge was accounted for in the 2D model to represent the three largest drainages of the South Fork Skokomish, Vance Creek, and the North Fork Skokomish (Figure 40). Discharge input from smaller tributaries or groundwater exchanges was not included in this modeling effort. To generate the discharge data, available USGS gaging station data was utilized. There are 4 active, relatively long-term USGS gaging stations in the Skokomish Valley (Figure 40). Peak discharge frequency analysis of the 2- through 200-year floods was accomplished for these 4 gages based on gage data through 2006 (England, 2007).

The peak discharge frequency estimates are based upon data up to and including 2006. Because a large portion of flood waters spill out of the channel onto the floodplain, a rating curve for discharge-stage rating curve beyond the bankfull stage of 16.4 ft is not currently available at USGS Skokomish gage at Potlatch (12061500). The largest flood stage on record occurred in December 2007 with a recorded river stage of 18.16 ft (gage 12061500). Every water year since 2006 (through water year 2013) has had recorded annual flood stage that exceeds 16.4 ft.

Frequency estimates from USGS gage 12060500 were used to generate incoming peak discharge for the South Fork Skokomish at the upstream end of the 2D model (England, 2007). Vance Creek does not have a stream gage and has only a few historical measurements. Flood frequency estimates were generated for Vance Creek largely based on the USGS gage data (Kimbrel, 2009). Because it is unknown if the timing of peak floods would occur simultaneously, for modeling purposes Vance Creek flood values were derived by simply subtracting each South Fork computed flood peak at USGS gage 12060500 from the equivalent mainstem Skokomish flood peak at USGS gage 12061500 (located downstream of the Vance Creek and South Fork confluence).

Flows on the North Fork Skokomish are regulated by two dams operated by the City of Tacoma. In recent years flow releases have been altered from historical releases. The most recent water year flows ranged from 100 to 4,000 cfs (Figure 43). Because of the uncertainty of flow release timing, the North Fork discharge values for the 2D model were uniformly set at a constant 200 cfs as specified by USACE. For peak flows, the 200 cfs was simply subtracted from the total flow before computing the remaining peak flow allotted to Vance Creek. This approach could be revisited and updated for future design phases with actual flow data that can vary throughout the year and a more robust basin flow model to account for more complex flow routing during storm events.

Two additional flows were modeled at 2,000 and 6,000 cfs at the request of ACOE to represent two seasonal flows in a non-flood stage. For these flows, a simple rounded percentage of flow distribution (based on peak flows) of 70% South Fork and 30% Vance Creek was used for modeling, and then 200 cfs additional flow added from the North Fork.

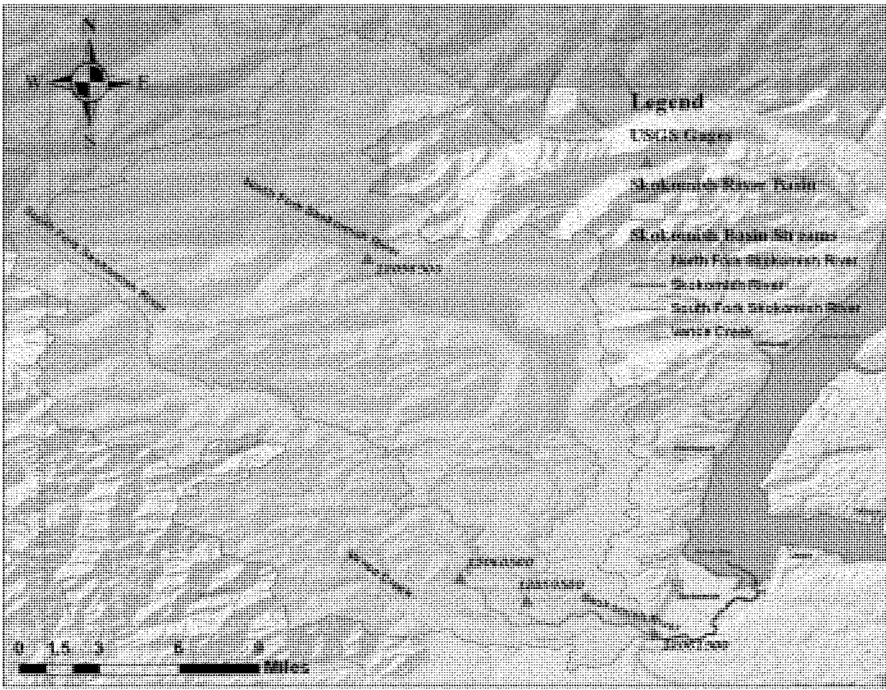



**Figure 40. Location of USGS gaging stations in Skokomish River Basin, WA reproduced from Kimbrel (2009).**

| Annual Exceedance Probability (%) | Return Period (years) | Peak Discharge (ft³/s) | | |
|---|---|---|---|---|
| | | LP-III Model Estimate | 5% Confidence Limit | 95% Confidence Limit |
| 75 | 1.33 | 9,270 | 8,090 | 10,400 |
| 66.7 | 1.5 | 10,300 | 9,090 | 11,500 |
| 50 | 2 | 12,100 | 10,900 | 13,500 |
| 20 | 5 | 16,200 | 14,700 | 17,700 |
| 10 | 10 | 18,400 | 16,800 | 20,600 |
| 4 | 25 | 20,800 | 18,500 | 24,100 |
| 2 | 50 | 22,300 | 19,000 | 26,500 |
| 1 | 100 | 23,700 | 19,100 | 28,900 |
| 0.5 | 200 | 24,900 | 19,100 | 31,400 |

**Figure 41. Peak discharge frequency estimates for the South Fork Skokomish River near Union (12060500) (reproduced from England, 2007).**

| Annual Exceedance Probability (%) | Return Period (years) | Peak Discharge (ft³/s) | | |
|---|---|---|---|---|
| | | LP-III Model Estimate | 5% Confidence Limit | 95% Confidence Limit |
| 75 | 1.33 | 13,500 | 11,900 | 15,000 |
| 66.7 | 1.5 | 14,900 | 13,300 | 16,500 |
| 50 | 2 | 17,500 | 15,800 | 19,300 |
| 20 | 5 | 23,400 | 21,300 | 25,900 |
| 10 | 10 | 26,900 | 24,400 | 30,400 |
| 4 | 25 | 30,800 | 27,600 | 36,400 |
| 2 | 50 | 33,500 | 29,400 | 40,900 |
| 1 | 100 | 36,000 | 30,800 | 45,400 |
| 0.5 | 200 | 38,300 | 31,900 | 50,000 |

**Figure 42. Peak discharge frequency estimates for the Skokomish River near Potlatch (12061500) (reproduced from England, 2007).**

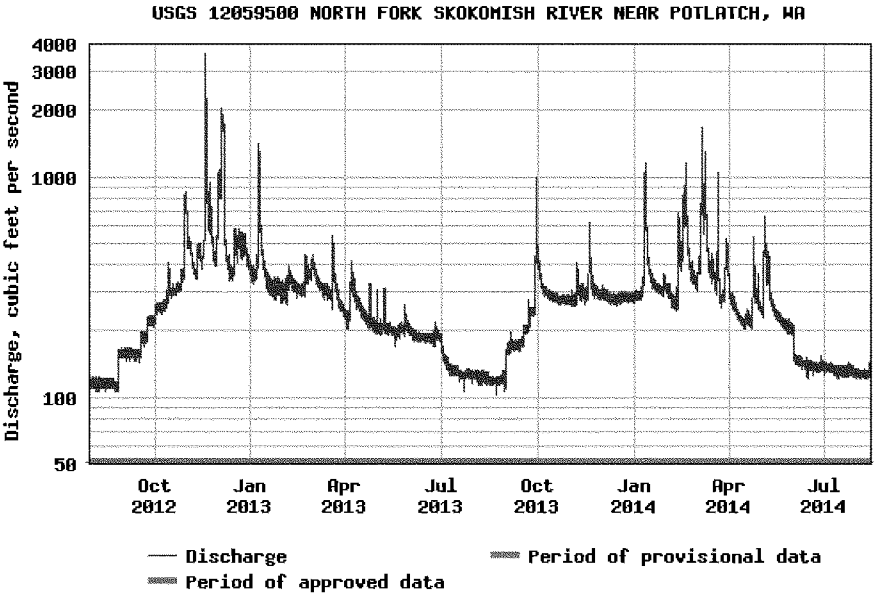



**Figure 43. Recent real-time discharge data for North Fork Skokomish River at USGS gage 12059500.**

# Appendix B: Topographic Data for Existing Conditions

A topographic surface called a Terrain was generated in ESRI ArcGIS Version 10.2 to represent elevations across the Skokomish valley and river channel. The model mesh elevations were determined by sampling the Terrain at each node location. A Terrain dataset is a multi-resolution, TIN-based surface built from measurements stored as features in a geodatabase in ArcGIS. A Terrain dataset in the geodatabase references the original feature classes (e.g. survey data such as LiDAR or channel elevation points). It doesn't actually store a surface as a raster or TIN. Rather, it organizes the data for fast retrieval and derives a TIN surface on the fly. This organization involves the creation of Terrain "pyramids" that are used to quickly retrieve only the data necessary to construct a surface of the required level of detail for a given area of interest from the geodatabase. The appropriate pyramid level is used relative to the current display scale or can be chosen by the user in analysis functions, so the appropriate level of resolution is used to satisfy accuracy requirements.

The Terrain was based on best available data ranging from a survey date of 2002 to 2012. The datum utilized for the final Terrain was Washington State Plane Coordinates South (NAD83), NAVD88, U.S. Survey Feet. The geoid utilized was Geoid03 where metadata is available. The data is appropriate for feasibility level analysis, but should be supplemented with newer and denser data for design level analysis, particularly in the areas of proposed alterations.

The major limitations of the topographic data sets are:

- The Skokomish River is very active with a high sediment load. Older topography may poorly represent current conditions.
- Channel bathymetry was based on cross-sections that were spaced up to 1,000 ft apart. Interpolations between cross-sections may not accurately represent local channel topography, but rather average conditions. Critical hydraulic controls (riffles) on the mainstem channel that influence water surface elevation may have been missed if they were not captured by the cross-section surveys.
- In many densely vegetated overbank areas the 2002 LiDAR data upstream of RM 5.25 either did not penetrate the canopy so no data is available, or vegetation was not removed in the bare earth model. This may result in data gaps or higher elevations along the channel bank, which would impact when flows are predicted to overtop the bank onto the floodplain and vice versa.
- Channel survey data was not available for wetted areas of the floodplain, including Purdy Creek, Weaver Creek, and Skabob Creek. Some 1D cross-sections are available but are over a decade old and the original survey data could not be located to geo-reference the information. These areas were based on LIDAR data minus 1 ft and do not accurately represent channel bottom elevations.

**Table 5. List of input survey data used for development of a terrain for 2D modeling.**

| Coverage | Date | Data Type | Native Projection & Datum | Source |
|---|---|---|---|---|
| Skokomish valley (RM 0 to RM 13) | 2002 | Bare-earth LiDAR 6-ft DEM | Washington State Plane North FIPS 4601, NAD83(HARN), NAVD88, geoid unknown, feet | Puget Sound LiDAR Consortium |
| Skokomish valley (estuary at RM 0 to RM 5.25) | November 25, 2011 (low tide event) | Bare-earth LiDAR, 1-meter DEM | UTM Zone 10, NAD83 (CORS96), NAVD88 (geoid03), meters | USGS, Nature Conservancy and Watershed Sciences |
| Mainstem Skokomish RM 2 to 11 | October 2007 | Channel cross-sections (200 to 1,000 ft apart) | Washington State Plane South, NAD83, NAVD88, feet | USACE |
| Vance Creek RM 0 to 4 | July 2009 | Channel cross-sections (500 to 1,000 ft apart) | Washington State Plane South, NAD83 (CORS96), NAVD88, feet | Reclamation |
| North Fork RM 0 to 2.3 | 2011 | Channel cross-sections (500 to 1,000 ft apart) | Washington State Plane South, NAD83 (CORS96), NAVD88, feet | Mason County Conservation District |
| Skokomish RM 0 to 2.25 in two main estuary channels | 2011 | Channel cross-sections (400 to 800 ft apart) | Washington State Plane South, NAD83 (CORS96), NAVD88, feet | Mason County Conservation District |
| Skokomish RM 7.25 to 9.25 | July 2012 | Channel cross-sections (re-occupied in-channel portion of 2007 cross-sections) | Washington State Plane South, NAD83 (CORS96), NAVD88, feet | Reclamation |

## Skokomish Terrain Data Sources

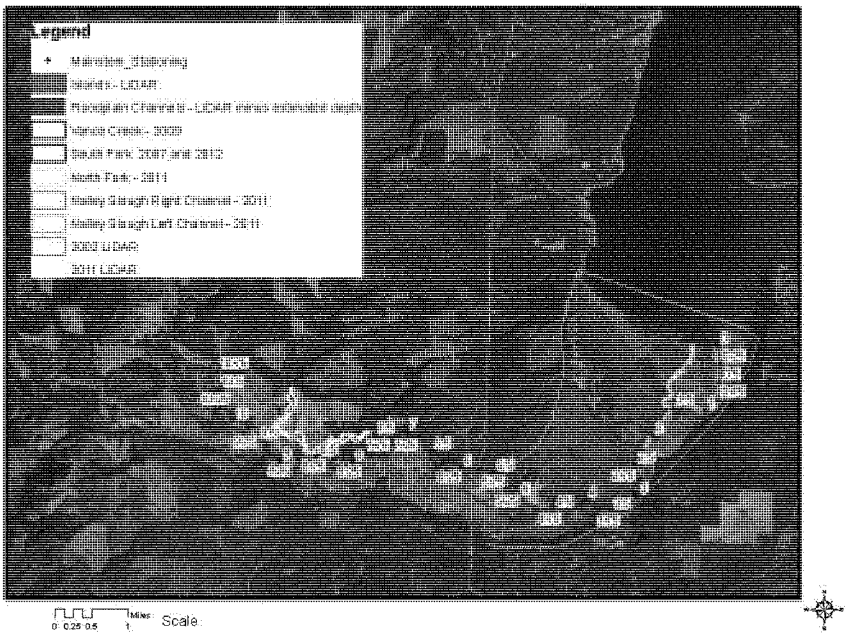



**Figure 44. Data sources utilized for model terrain.**

### *Channel Topography*

For the mainstem Skokomish River, North Fork Skokomish River, Nalley Slough Channels (downstream-most two channels of Skokomish River) and Vance Creek channel topography was represented by a raster generated from the most recent available cross-section data and interpolated data between cross-sections. Cross-section data varied in collection date including 2007, 2011, and 2012. Interpolation between cross-sections was accomplished for each river segment in GIS using an in-house interpolation tool. The interpolation tool relies on a quadrant based inverse distance weighting (IDW) between survey data and accounts for linear distance along the channel flow path. The user defines the flow path and a boundary polygon to limit interpolation sample areas. The user also defines the lateral and longitudinal search distance from which to sample and produce interpolated data. Interpolated data was generated every 10 ft laterally across the channel and every 50 ft longitudinally. The final step was to build a 5-ft raster using the 2007/2011/2012 cross-section data and the interpolated data to generate elevations every 5 ft for the terrain because a continuous surface is required. Because the Skokomish is braided in many areas with multiple channels that have complex alignments, the interpolation does not accurately represent the alignment or localized scour holes in the low-flow channel. The Terrain does represent the average channel elevations in a given segment. Additional data including a longitudinal profile and denser data on exposed bars (such as LiDAR) would be recommended to improve representation of the channel topography. Additional details are provided below for localized areas of the terrain.

Vance Creek Mouth
No survey data was available between the downstream-most bridge and the confluence with the South Fork Skokomish River. Field observations indicate substantial deposition with flows that go subsurface in this location in low-flow periods. Elevation data was estimated to represent these observations.

North Fork and South Fork Confluence
The location of the North and South Fork Skokomish River is a proposed restoration site included in the 2D modeling, but there is limited survey data to represent it. Two locations had to be estimated to represent the most recent conditions based on anecdotal information (Figure 45). The first location, noted as A in Figure 45, is a former channel that is dry at low-flow but still conveys water at higher flows. One cross-section is available at the downstream end of the former channel from July 2012 and one in the middle of the abandoned channel from 2011 (Figure 46). Karl Eriksen (USACE) noted the gravel bar at the former upstream entrance was about 18 inches perched above the water surface of the North Fork channel during a field visit at low flows. This observation was used as a guide to estimate an additional cross-section at the upstream end of the abandoned channel for use in interpolation.

At location C in Figure 45, the South Fork has breached the Car Body Levee and is partially connected with the North Fork channel. Karl Eriksen (USACE) noted between 2011 and 2013 this breach (location C) formed at the outside of the North Fork meander bend and an approximately 50 ft wide connected channel is present with large wood. Karl Eriksen noted during a field visit in 2013 there appeared to be a 1 ft head difference between the North Fork and South Fork through the breach. There are no cross-section data available for this location. Prior to the 2013 aerial being available, the breach location was estimated to be at location "B" and a set of estimated elevations included in the terrain. Survey data could be collected to more accurately represent the breach location and channel topography for future design modeling.

## Data Available at North Fork Confluence

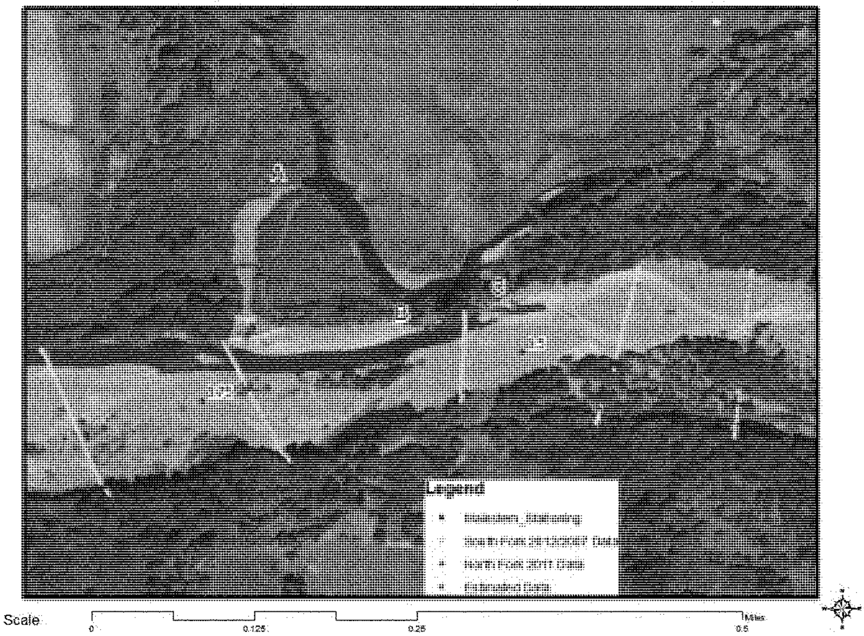



**Figure 45. Available data at confluence of South Fork and North Fork Skokomish Rivers. Location A and B represent areas of estimated data. Location C represents a recent breach locations of Car Body Levee.**

**Figure 46. Looking downstream from within former confluence of North and South Fork Skokomish River near RM 8.75. South Fork is visible with low-flow wetted channel and is traveling from right to left in photograph. Photograph taken July 2012.**

Tidal Area

The tidal area was represented solely by November 2011 LIDAR. At downstream end of Skokomish River where cross-section data is no longer available, there is a slight rise where it connects with 2011 LIDAR. This occurs because the LIDAR represents water surface or exposed sediment. The 2011 LiDAR was flown during low-tide, so many shallow areas are exposed. A fairly high tide was used in the modeling effort, so topographic effects in the estuary are generally inundated and should not affect upstream conditions in this study. USGS has recently collected bathymetric data in the tidal area (Eric Grossman, USGS, personal communication, 2014). This data could be incorporated in future efforts if important to improve topographic representation.

## *Floodplain Areas*

Floodplain areas in the terrain were based on LiDAR from either 2002 or 2011. A few of the larger channels in the floodplain that appeared to have water in them in the LiDAR dataset (based on a smooth surface) were delineated. Elevation points within the channel boundaries had one foot subtracted from the LiDAR elevation to represent a minimal potential depth below water. Actual survey data would be needed to improve this estimation.

<u>2002 LiDAR</u>

The 2002 LiDAR data was utilized from approximately RM 5.25 to RM 11 to represent floodplain elevations outside of the active channel. The 2002 LiDAR data was downloaded from http://pugetsoundlidar.ess.washington.edu/. The 6-ft rasters were used in the Skokomish Terrain. The rasters were organized by USGS quarter quadrangles and had overlapping data in several of the files that appeared to be bad data when compared against each other. An alternative data set is available from 1994, but this data set has data gaps within the model Terrain area and is 8 years older than the 2002 LiDAR. Neither data set represents below water elevations and when comparing the data, elevations differ substantially (Figure 47). The LIDAR does indicate some areas of lower channel elevation in 2002 than the photogrammetry from 1994 within the active channel. Many of these lower areas are where gravel bars or islands were eroded between 1994 and 2002 (see historical aerial comparison in Appendix C). Another cause for varying elevation in the river is change in river flow. Areas of lowering along the edge of the channel may be due to lateral bank erosion of higher surfaces.

The LiDAR has the following limitations that increase uncertainty in model results:

1. Data was collected in 2002 and in some locations the floodplain elevations may have changed since this collection date due to land use activities and river erosion.
2. In heavily vegetated areas, no LiDAR points were collected and the raster has to rely on interpolation between available points.
3. Although the LiDAR is reported to represent bare-earth (e.g. only points passing through to the ground), in many areas the LIDAR appears to be higher than other data sets such as the 1994 photogrammetry or Real-Time-Kinematic (RTK) ground points, indicating the LiDAR dataset may not have been processed to remove the tops of canopy in densely vegetated areas.
4. The model mesh built from the 2002 LiDAR dataset typically had a water surface elevation about 1 foot higher than a model mesh built from a 1994 photogrammetry dataset (Klumpp, 2009). The bank elevations in the 2002 LiDAR data may be higher because of post-processing that did not remove dense vegetation, resulting in increased conveyance in the main channel before overtopping is computed to occur.

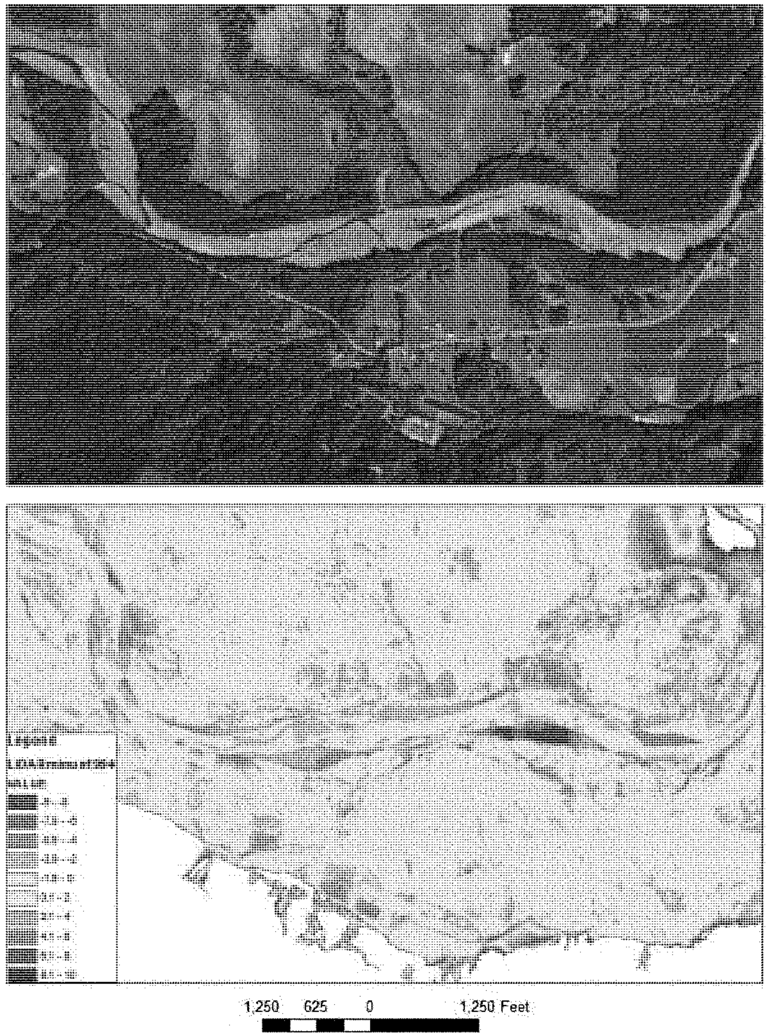



**Figure 47. Example differences (ft) between 2002 LiDAR and 1994 photogrammetry available to represent floodplain upstream of Highway 106 Bridge. Blue areas represent locations where LiDAR elevations are higher than the photogrammetry and generally correlate with vegetated areas. Red areas represent locations where LiDAR is lower than the photogrammetry.**

<u>2011 LiDAR</u>

LiDAR data from 2011 was available to represent the floodplain topography from the estuary at the river mouth (RM 0) upstream to RM 5.25, about 900 ft upstream of the

Highway 101 Bridge (Watershed Sciences, 2012). An average ground point density of 2.6 points per $m^2$ were collected with a Root Mean Squared Error (RMSE) vertical absolute accuracy (compared to RTK ground points) of 0.04 m and a standard deviation of 0.08 m (1.96 sigma).

The 2011 LiDAR qualitatively appeared to represent most infrastructure visible on aerial photography. One exception was at the Purdy Creek Highway 101 Bridge, where the embankment was removed during post-processing resulting in a wider width than is shown on design drawings from Washington Department of Transportation (WSDOT, 2008). For development of the Terrain, it was assumed that the two areas outlined in orange in Figure 48 and Figure 49 should be embankment that blocks conveyance of flow, and only the area between the orange outlines represents the bridge opening. The 2011 LiDAR points within the orange outlines were uniformly adjusted to match the next top of roadway embankment 2011 LiDAR elevation on either side of the outlined areas: 36.5 ft on river left; and 38.4 ft on river right. These adjusted values were utilized in the model terrain.

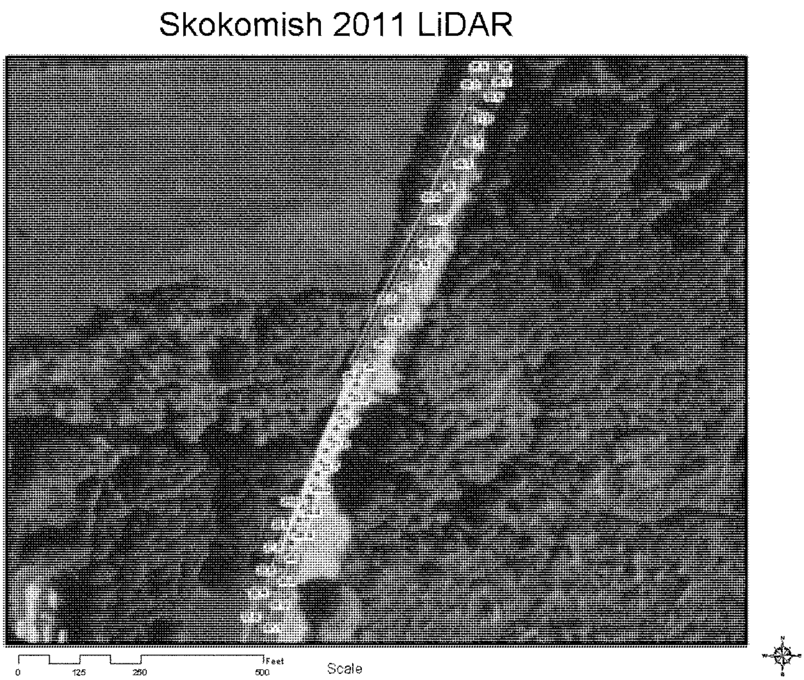



**Figure 48. 2011 LiDAR elevations at Purdy Creek Bridge on Highway 101 before adjusting. Background is 2009 aerial photograph during construction phase. Flow is from left to right.**

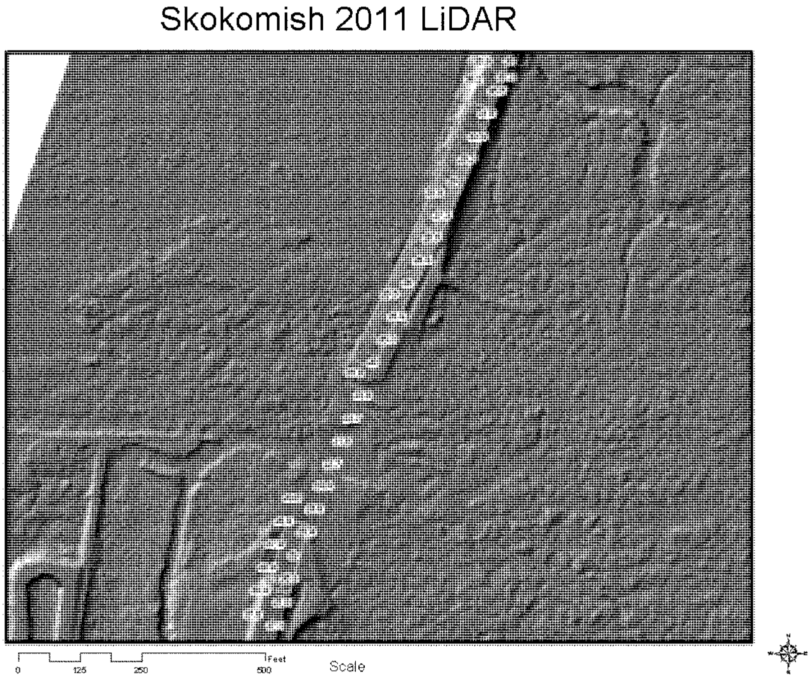



**Figure 49. 2011 LiDAR elevations along top of Highway 101 through Purdy Creek prior to adjusting. Background is hillshade of 2011 LiDAR. Flow is from left to right.**

## *Floodplain Levees (Car Body Levee, Grange Levee, RM 9 Levee)*

The existing floodplain levees were represented by 2002 LiDAR data at the request of USACE as this is the most recent available data. Other data set alternatives are 10-m USGS DEM data which is too coarse to represent the levees, and a 1994 photogrammetric contour map which may be useful for comparison during the design phase. The Car Body Levee had to be modified from the 2002 LiDAR in areas where the North Fork channel has breached the levee since 2002. In these areas, interpolated channel bathymetry from 2011 North Fork cross-section data was used and LiDAR points were deleted.

Three levees were identified to analyze for potential modification as part of the feasibility analysis. The Car Body Levee is proposed to be removed. The RM9 and Grange Levees are proposed for breaching with two new setback levees to contain the flows passing through the breach areas. USACE generated images showing proposed breach locations and profiles of the top of levee, riverward side, and landward side based on 1994 photogrammetry (Figure 50, Figure 51 and Figure 54). Also presented are profiles and breach locations based on 2002 LiDAR (used in modeling) for the RM9 and Grange Levees (Figure 52 and Figure 55). Setback levee profiles and locations are shown in Figure 53 and Figure 56.

Levee Removal and Breaches

To model the removal of the Car Body Levee, elevation points within the remaining levee area based on 2002 LiDAR were removed from the Terrain (Figure 50). Triangulation was done by ArcGIS to interpolate elevations in the removal area based on nearby ground elevations. A similar method was done for breach areas in the RM9 and Grange Levees. There were some exceptions in the RM9 Levee breaches where elevation points were added to represent "breached" ground elevations to create a rectangular shape through the breach and limit triangulation between remaining top of levee points. Several existing low spots were noted in the RM 9 Levee and Grange Levees in the 2002 LiDAR that may already be breached (Figure 52 and Figure 55). The Grange Levee has water shown at a low spot in a 2013 aerial photograph where an existing breach may be present (location C in Figure 54 around station 500). The low spots on the RM 9 Levee were vegetated and would need to be field checked.

Setback levees

To model setback levees, USACE provided top of levee profile elevations and alignment locations (Figure 53 and Figure 56). No width or slope specifications were provided at the time of 2D modeling. Breaklines with elevation values were created to represent the top of levee setbacks. For purposes of developing the terrain, a 10-ft levee top width was assumed using the profile elevations provided by USACE. The toe of the setback levee was offset 20 ft from the edge of the top width on either side. LiDAR elevation points between the toe and top width of each setback levee were removed, and the terrain was based on triangulation by ArcGIS. After the first iteration of modeling, it was requested by USACE to raise the low spot on RM 9 setback top of levee profile by 0.5 ft between A and B from what is shown in Figure 53.

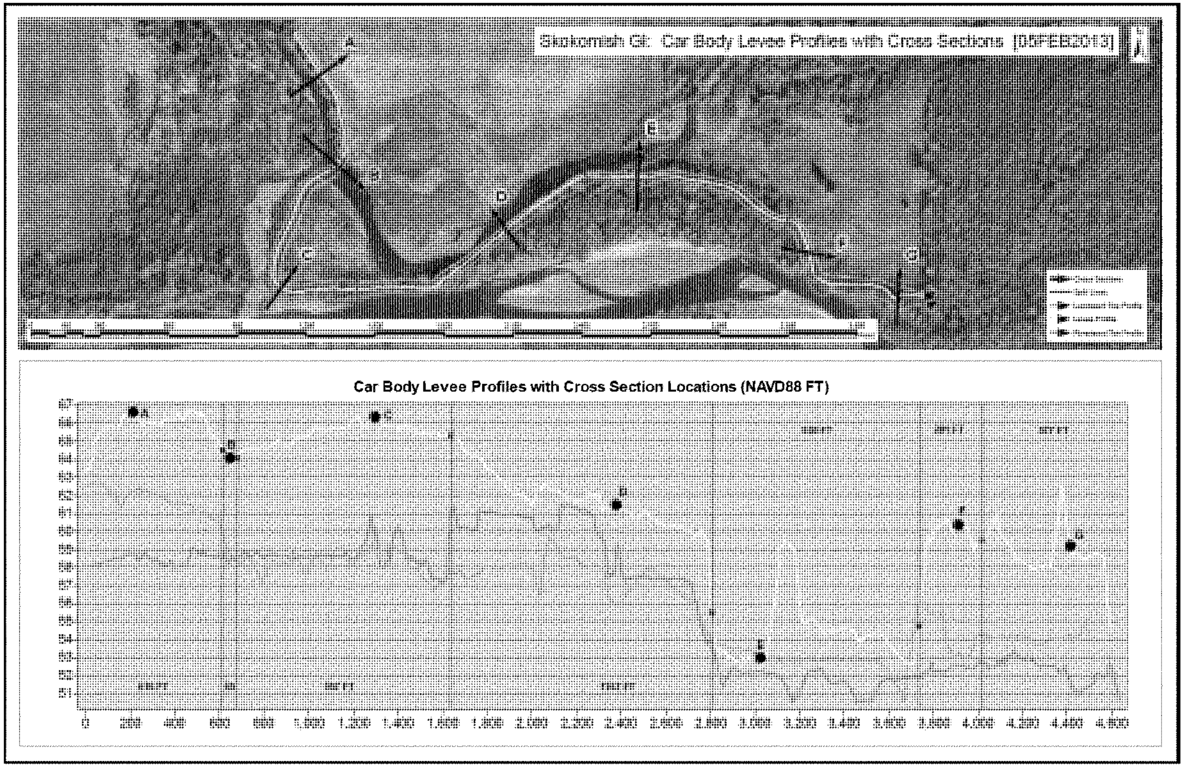



**Figure 50. Elevation profiles (1994 photogrammetry) along existing Car Body Levee. Generated by USACE.**

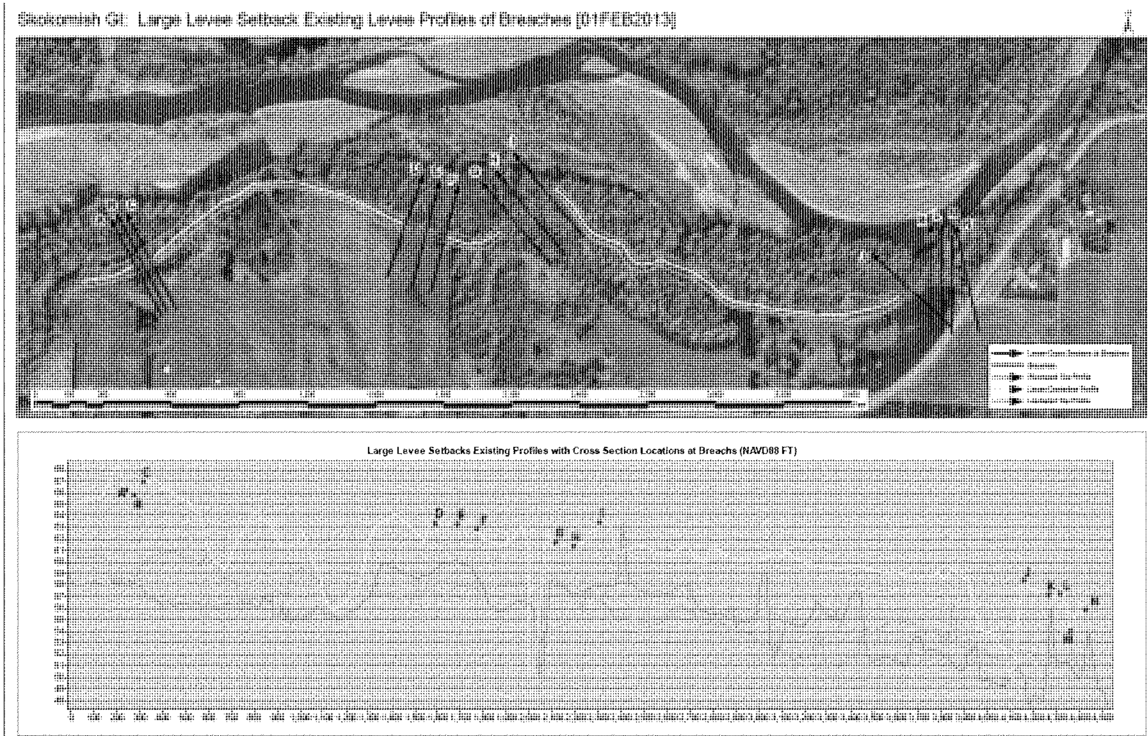



**Figure 51. Elevation profiles and breach locations for existing RM 9 Levee (e.g. large levee) based on 1994 photogrammetry data. Generated by USACE.**

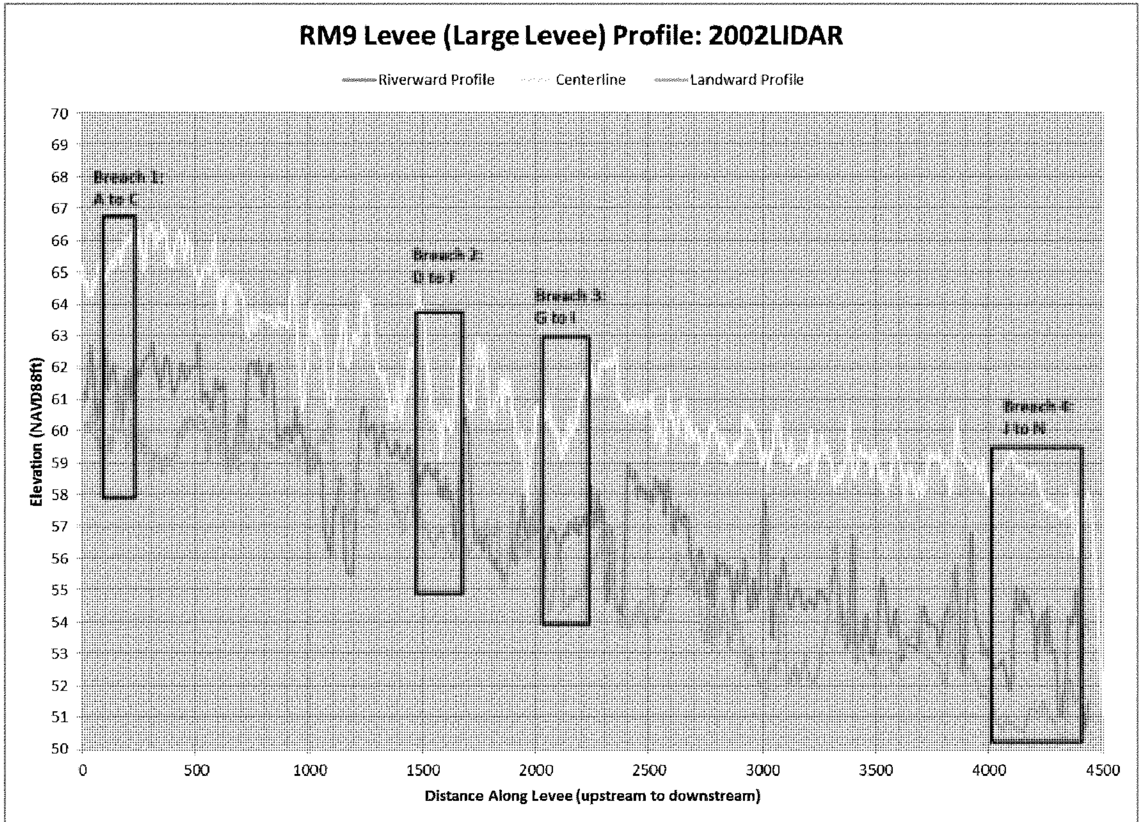



**Figure 52. Elevation profiles (2002 LiDAR) along existing RM 9 Levee (Large Levee). Breach locations set to match Figure 51.**

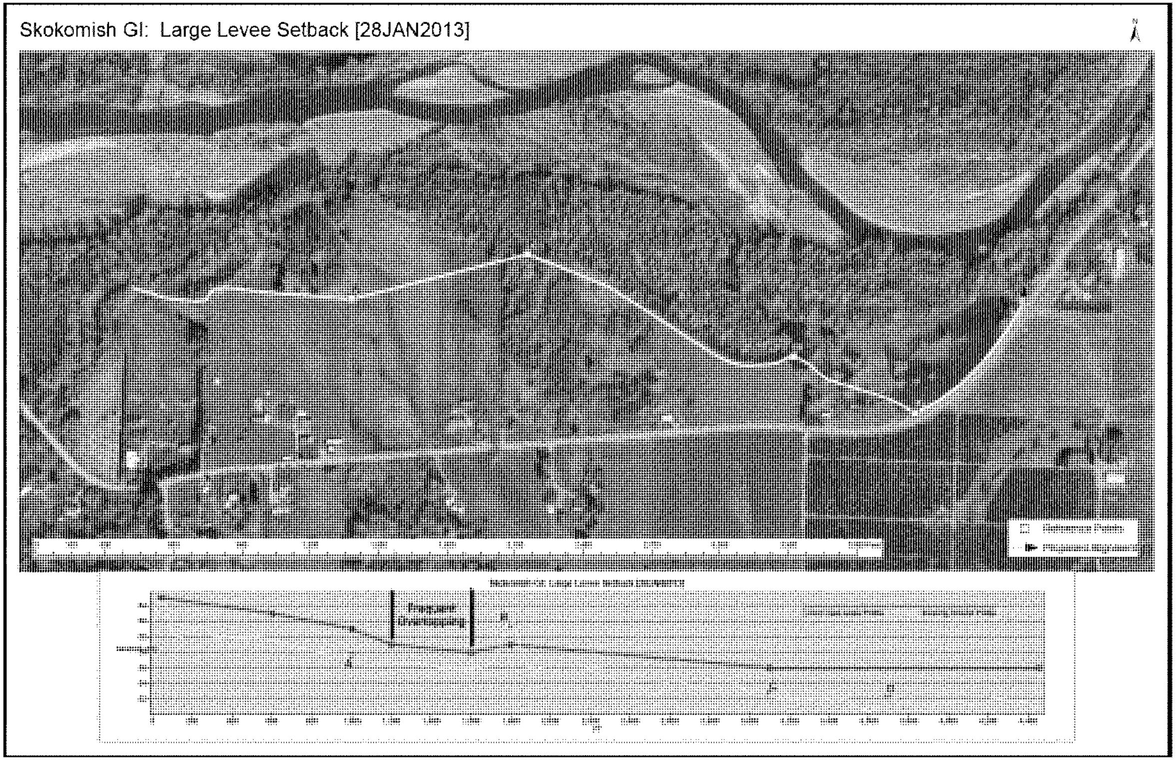



**Figure 53. RM9 (Large Levee) proposed setback location and top of levee elevations (1994 photogrammetry). Generated by USACE. Note that the final setback terrain incorporated a 0.5 ft rise in new levee profile where “frequent overtopping” is identified in above figure.**

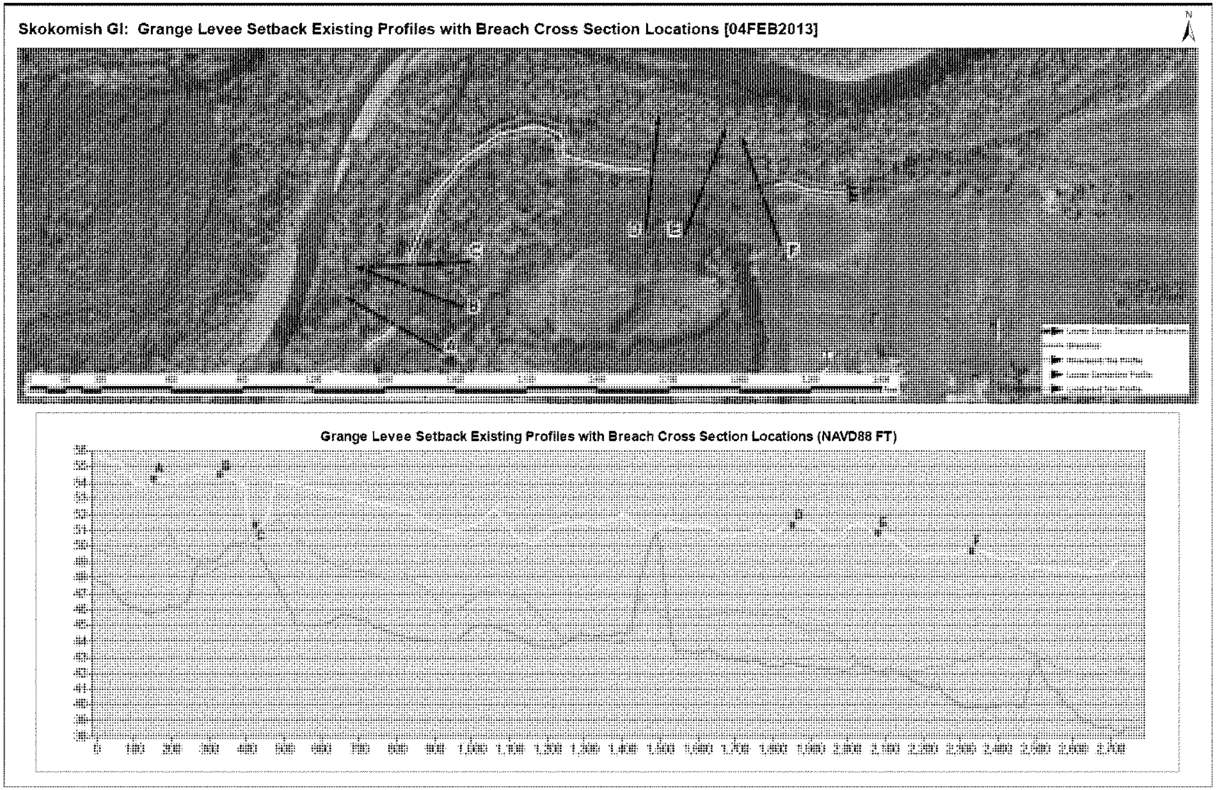


Figure 54. Elevation profiles (1994 photogrammetry) and proposed breach locations along existing Grange Levee. Generated by USACE.

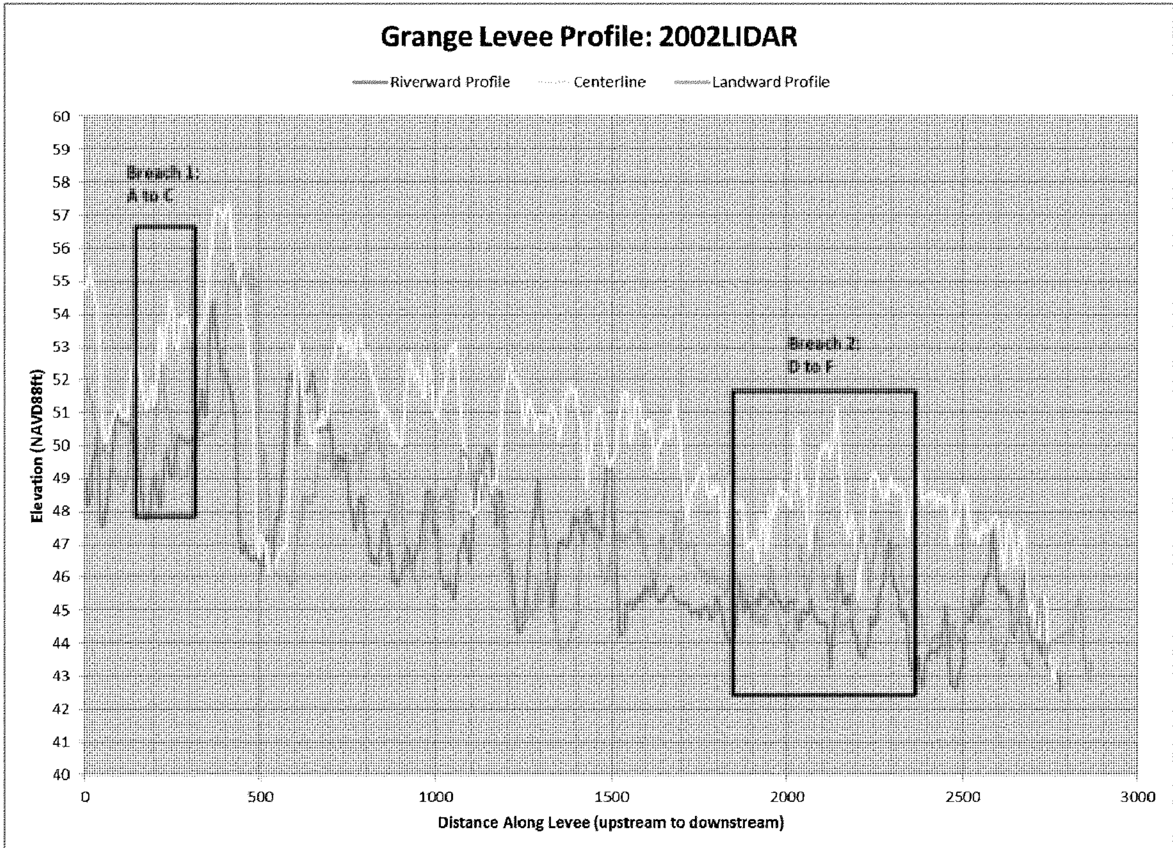



**Figure 55. Elevation profiles (2002 LiDAR) along existing Grange Levee. Breach locations set to match Figure 54.**

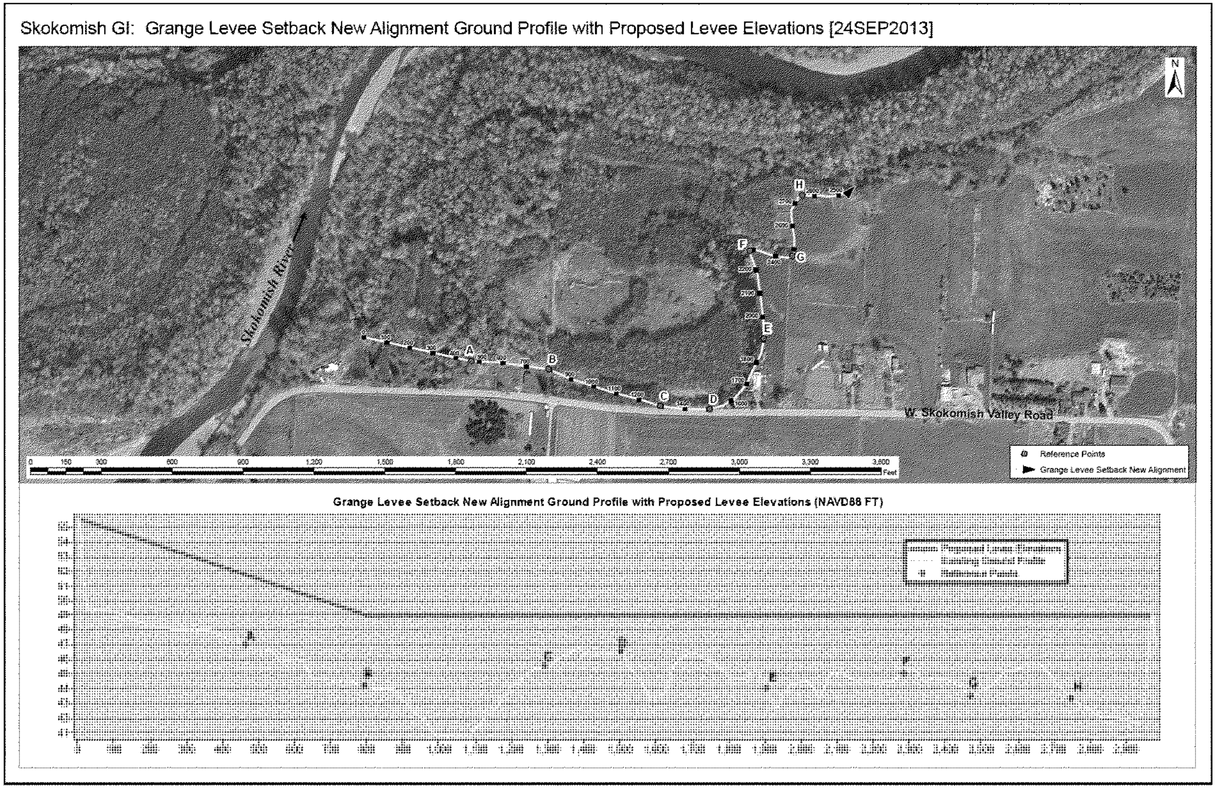



Figure 56. Grange Levee proposed setback location and top of levee elevations for 2D modeling. Generated by USACE.

# Appendix C: Historical Aerial Photograph Comparisons in Proposed Restoration Areas

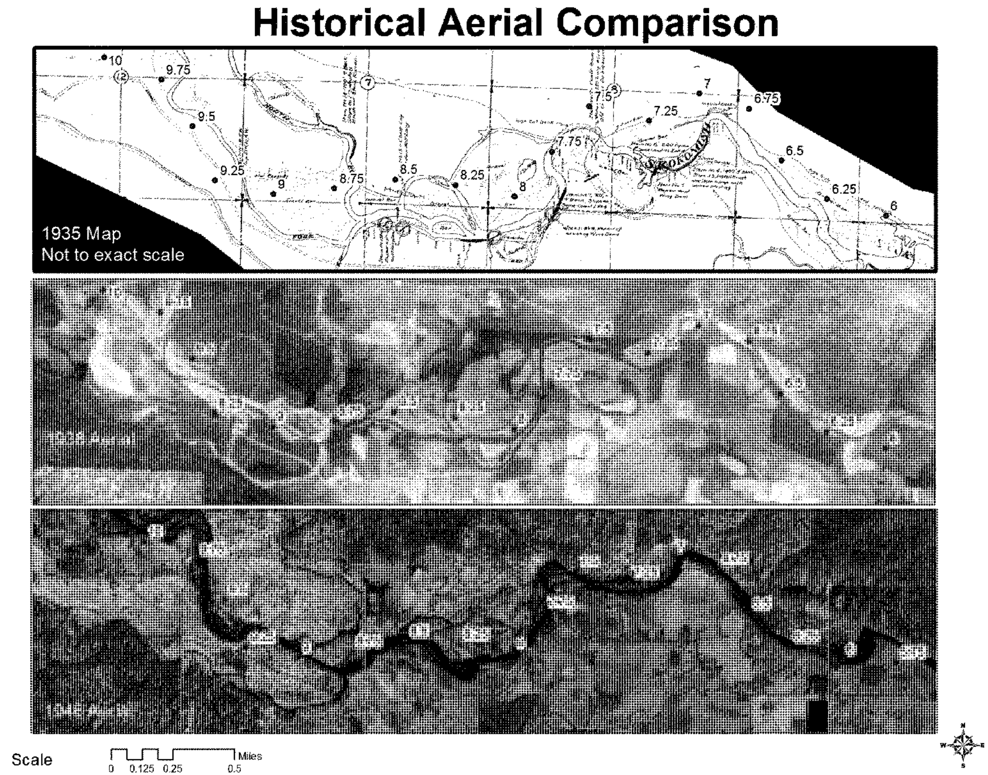



Figure 57. Historical channels from 1935 to 1946 at RM 6 to 10.

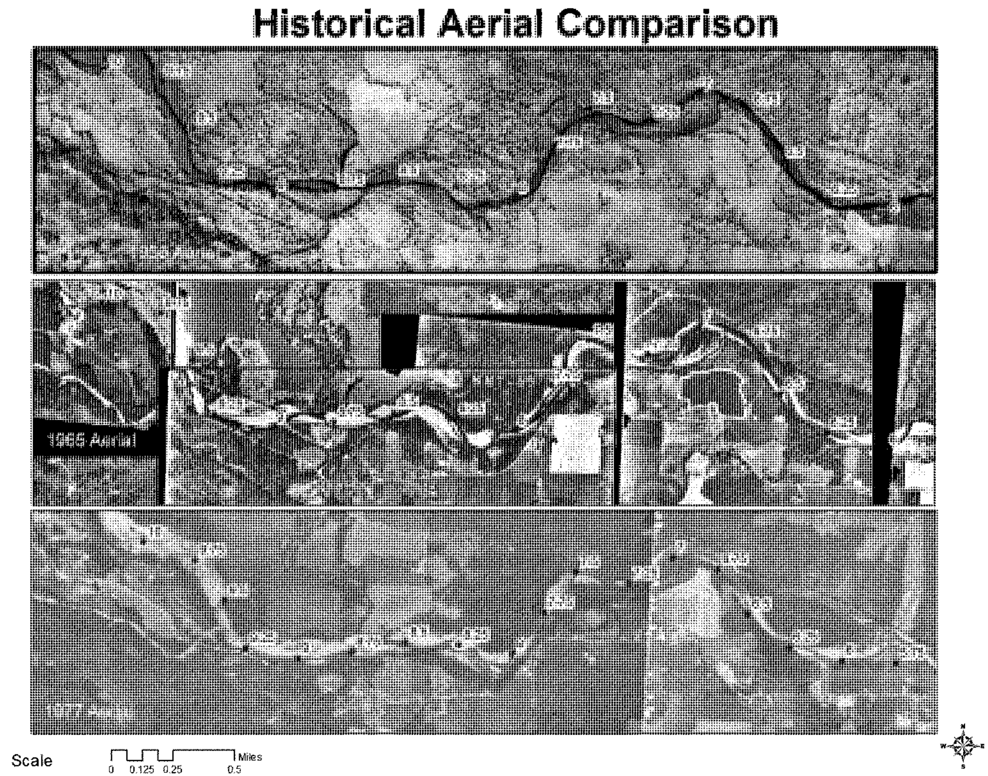



Figure 58. Historical channels from 1956 to 1977 at RM 6 to 10.

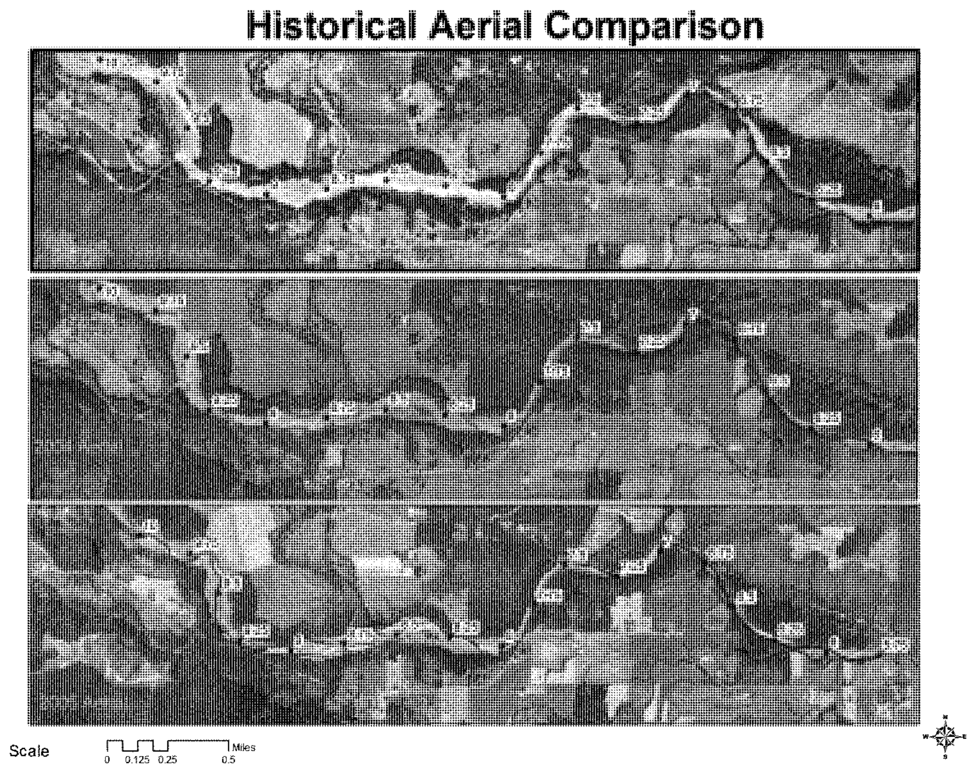



**Figure 59. Historical channels from 1994 to 2005 at RM 6 to 10.**

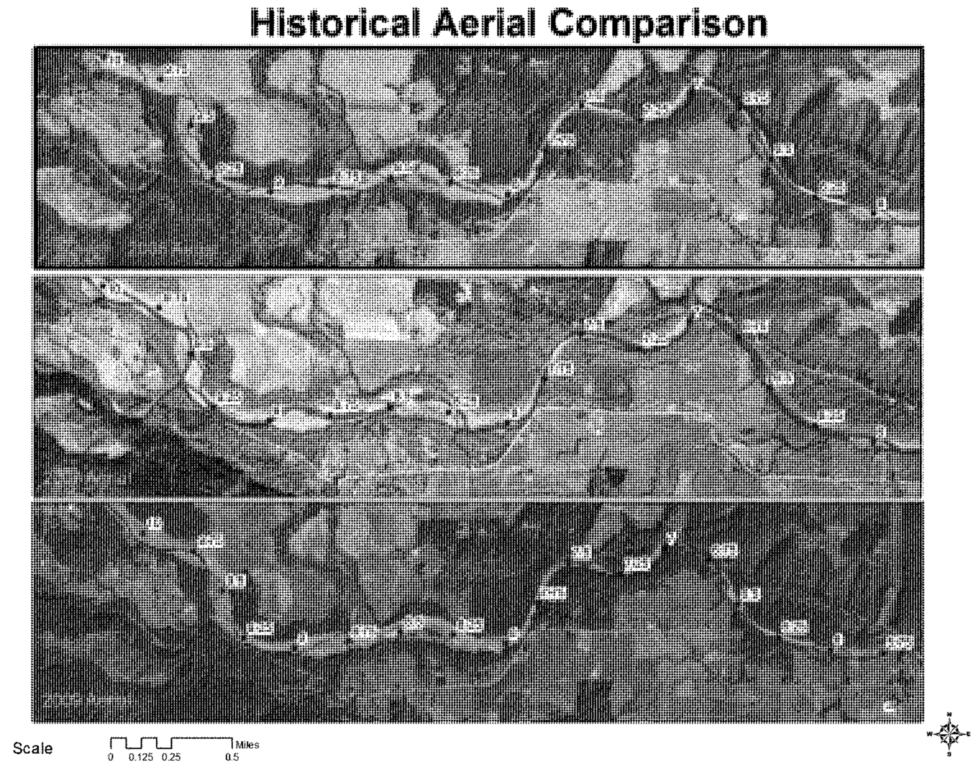



Figure 60. Historical channels from 2006 to 2009 at RM 6 to 10.

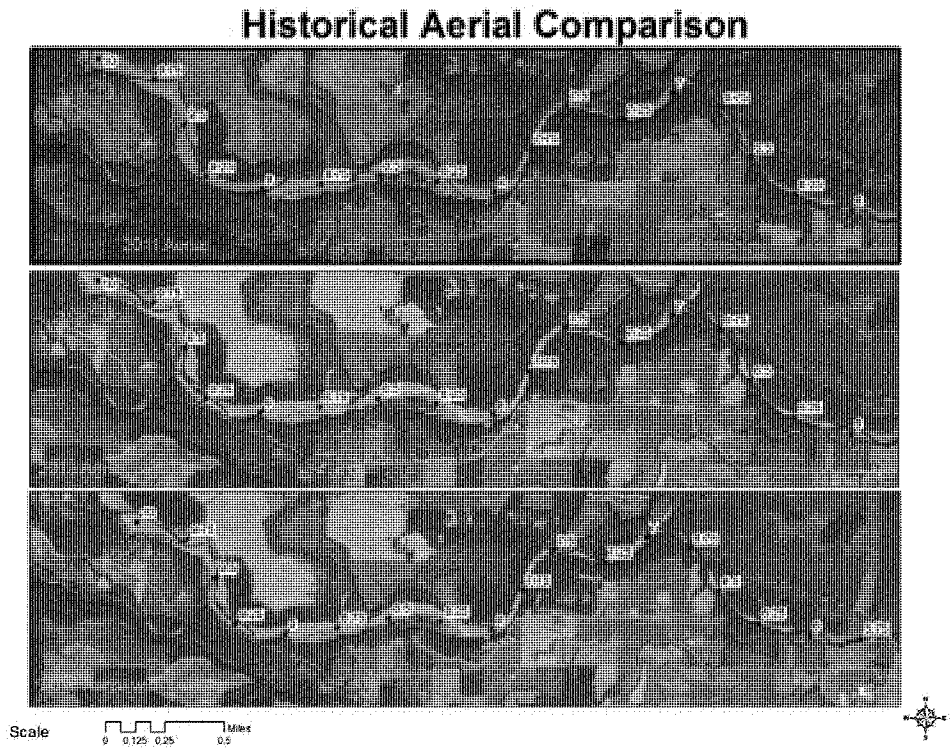



**Figure 61. Historical channels from 2011 to 2013 at RM 6 to 10 and levee modifications (purple = existing levees; green = proposed breaches; blue = proposed setbacks).**

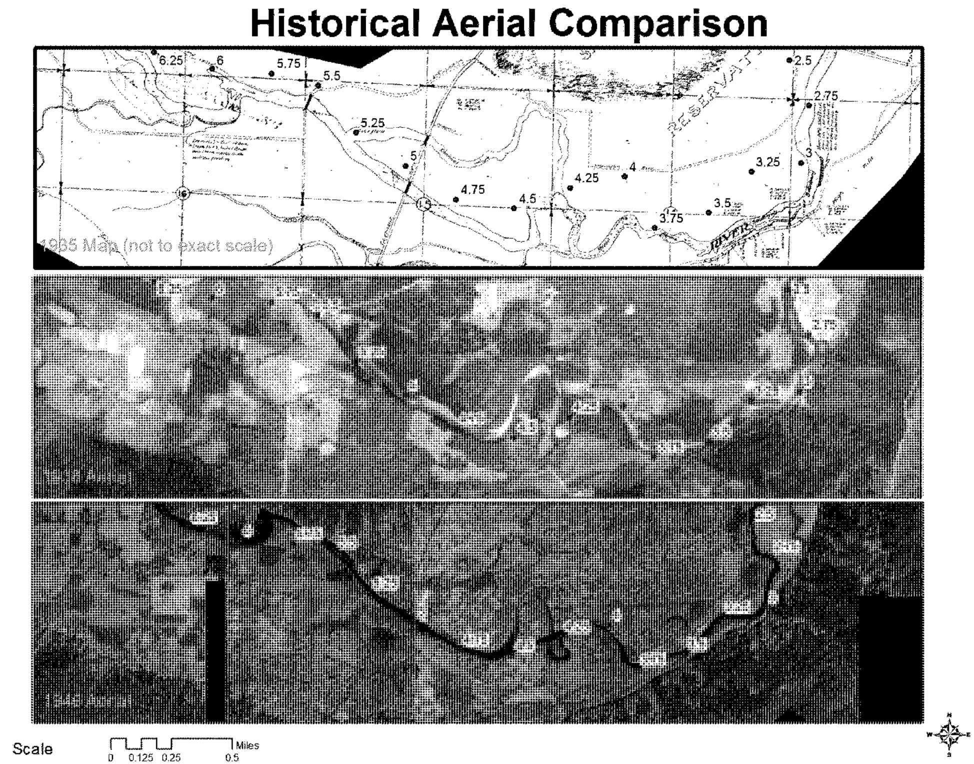



**Figure 62. Historical channels from 1935 to 1946 at RM 3 to 6.**

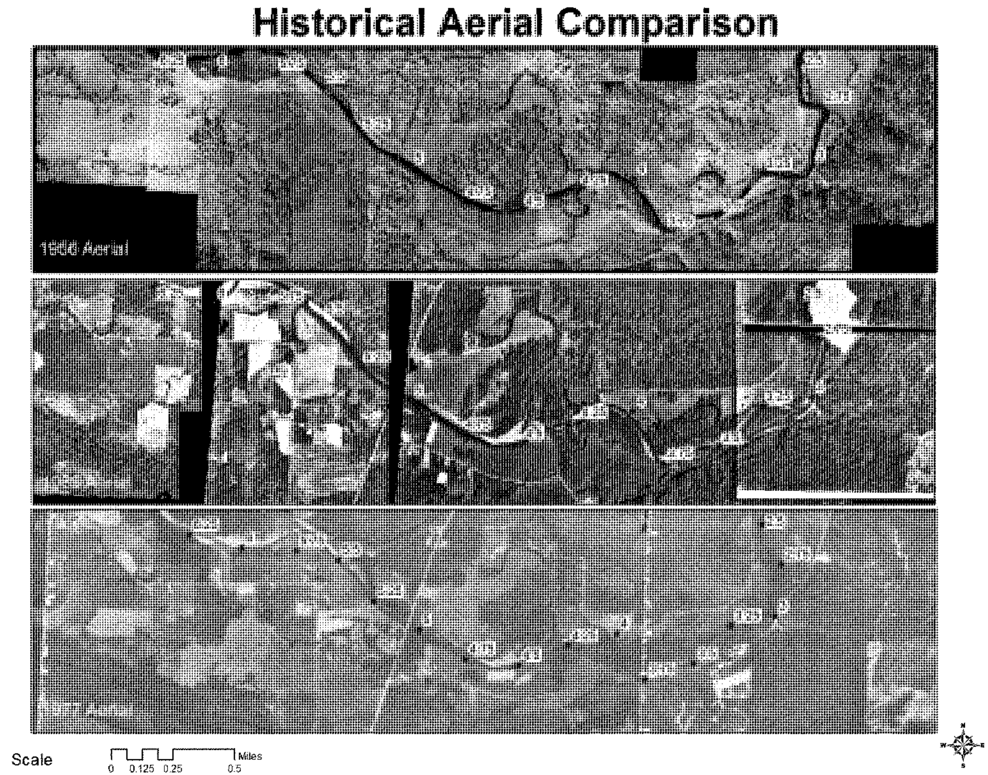



**Figure 63. Historical channels from 1956 to 1977 at RM 3 to 6.**

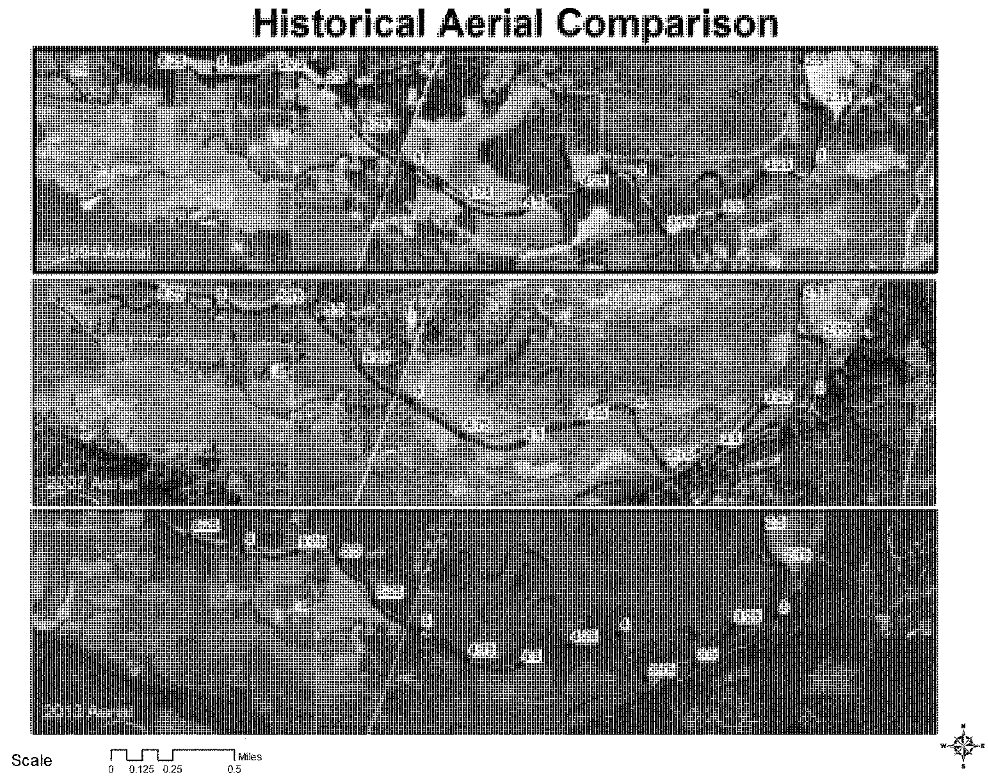



**Figure 64. Historical channels from 1994 to 2013 at RM 3 to 6.**

# SKOKOMISH RIVER BASIN
# MASON COUNTY, WASHINGTON
# ECOSYSTEM RESTORATION

## APPENDIX I

## HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE ASSESSMENT

## Integrated Feasibility Report and Environmental Impact Statement

US Army Corps of Engineers®
Seattle District

# Skokomish River General Investigation Feasibility Study

# Hazardous, Toxic, and Radioactive Waste Assessment

February 23, 2015

# Skokomish General Investigation Feasibility Study Hazardous, Toxic, and Radioactive Waste Assessment

## Executive Summary

The Skokomish River, located in Mason County, Washington is the primary drainage basin for the southeast region of the Olympic Peninsula. The river flows from its headwaters in the Olympic Mountains to Hood Canal. The basin consists of 80 mainstream river miles and 260 miles of tributaries. The primary concern to be addressed in this study is ecosystem degradation in the Skokomish River Basin, which includes the Skokomish Indian Reservation. High sediment load, reduced flows, and encroachment on the floodplain by man-made structures are causing continued degradation of natural ecosystem structures, functions, and processes necessary to support critical fish and wildlife habitat throughout the basin. The decline in populations has resulted in the listing of four anadromous fish species under the Endangered Species Act (ESA) (i.e., Chinook salmon, chum salmon, steelhead, and bull trout) that use the river as their primary habitat. The U.S. Army Corps of Engineers is preparing an Integrated Feasibility Report/Environmental Impact Statement (FR/EIS) for proposed ecosystem restoration in the Skokomish River Basin. The Skokomish Indian Tribe and Mason County are the non-Federal sponsors for the project. The Hazardous, Toxic, and Radioactive Waste (HTRW) Assessment was conducted in conformance with the pertinent procedures and limitations of the American Society for Testing and Materials international (ASTM) Standards E 1527 – 13 and ER 1165-2-132, *Hazardous, Toxic, and Radioactive Waste Guidance for Civil Works Projects.*

This HTRW Assessment is limited to identifying known and suspected HTRW issues that may impact project decisions. As part of this HTRW assessment, an HTRW Phase II investigation was performed at the Confluence Levee, locally known as 'Car Body Levee'. The site reconnaissance occurred August 5, 2014 and no visual or olfactory evidence of HTRW releases was observed.

This assessment has revealed no evidence of HTRW contamination or potential for HTRW releases in connection with the area identified in the Skokomish recommended restoration plan.

# SKOKOMISH GENERAL INVESTIGATION FEASIBILITY STUDY HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE ASSESSMENT

Contents

# 1.0 Introduction

## 1.1 Involved Parties

The U.S. Army Corps of Engineers - Seattle District (Corps) and the non-Federal Sponsors – the Skokomish Indian Tribe from here on referred to as the "Tribe" and Mason County are currently engaged in a General Investigation (GI) Feasibility Study (FS) for the Skokomish River basin located in the southwestern portion of Puget Sound in northwestern Washington, primarily in Mason County and the Skokomish Indian Reservation. The primary concern to be addressed in this study is ecosystem degradation in the Skokomish River Basin, which includes the Skokomish Indian Reservation. High sediment load, reduced flows, and encroachment on the floodplain by man-made structures are causing continued degradation of natural ecosystem structures, functions, and processes necessary to support critical fish and wildlife habitat throughout the basin. The Corps signed a cost-sharing agreement with the Tribe and Mason County under the Corps' ecosystem restoration authority. The FS will result in a feasibility report integrated with an environmental impact statement (EIS) that will assess various alternatives and potential environmental impacts associated with the ecosystem restoration project.

## 1.2 Authority

The Skokomish River General Investigation GI/FS for the Skokomish River Basin is being conducted under the authority of Section 209 of the Flood Control Act of 1962.

## 1.3 Guidance and Policy

The Corps Engineering Regulation (ER) providing policy on Corps involvement in ecosystem restoration and protection through Civil Works programs and activities is contained in ER 1165-2-501 *Civil Works Ecosystem Restoration Policy.* Corps policy providing guidance for consideration of issues and problems associated with HTRW, as defined in this regulation, which may be located within project boundaries or may affect or be affected by Corps Civil Works projects is contained in ER 1165-2-132, *Hazardous, Toxic, and Radioactive Waste Guidance for Civil Works Projects*, which defines HTRW as "...any material listed as a 'hazardous substance' under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)." ASTM International (ASTM) Standard E 1527-13 *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* provides a comprehensive guide for conducting a Hazardous, Toxic, and Radioactive Waste (HTRW) Assessment. An assessment identifies known or suspected releases of hazardous substances (recognized environmental conditions) based on records review, site visit, and interviews.

## 1.4 Scope of Work

The Skokomish River GI is a basin-wide study; however, work by other entities constrains the limit of Corps' involvement to actions primarily in the lower Skokomish River Valley. This HTRW assessment documents known and suspected HTRW sites discovered through a search and review of all reasonably attainable federal, state, and local government information and records. An investigation of each property identified in the proposed alternative involved analysis of historical media including historical aerial photographs, a review of historical records, interviews, and visual site inspections of the properties to identify any recognized environmental condition, as defined in ASTM Standard E 1527-13.

A geotechnical and HTRW investigation was performed at one recommended alternative area to identify if evidence of a potential release was present where car bodies were embedded in the levee. Activities associated with the HTRW investigation included brush clearing, physical evaluation of the car bodies and levee, hand-auger borings in locations where contaminated soil may be present, and background soil and sediment sampling.

## 1.5 Significant Assumptions

This report provides an overview of known and suspected environmental concerns, both past and present, based on availability of information at the time of the assessment. It is possible that unreported disposal of waste or illegal activities impairing the environmental status of the property may have occurred which could not be identified.

## 1.6 Limitations and Exceptions

This HTRW Assessment is limited to documenting known and suspected HTRW sites on or adjacent to the proposed alternatives that may affect the proposed alternatives as per ER 1165-2-501 and ER 1165-2-132.

## 1.7 Special Terms and Conditions

No special terms or conditions significant with respect to ER 1165-2-132 and ASTM E 1527-13 standards were made.

## 1.8 User Reliance

In accordance with ASTM E 1527-13 Section 7.5.2.1 "Reliance," the environmental professional is not required to independently verify the information provided by various sources but may rely on the information unless there is actual knowledge that certain information is incorrect or unless it is obvious that certain information is incorrect based on other information obtained during the course of the investigation or otherwise actually known to the investigators conducting the assessment. At the present time all information identified to complete this preliminary assessment appears to be usable for its intended purposes.

# 2.0 Site Description

## 2.1 Location and Legal Description

The Skokomish River watershed covers approximately 240 square miles on the southeastern Olympic Peninsula and consists of three river sections which include the main stem of Skokomish River, the North Fork, and the South Fork. The North Fork originates in the northeastern section of the watershed where the majority of the river is diverted to Hood Canal by the Cushman Project. The South Fork originates in the southeastern section of the watershed in the Olympic Mountains, and drains an area of about 124 square miles. Flows of the South Fork are unregulated. With the Cushman Project diverting the majority of the North Fork flow, nearly all the flow of the main stem is fed by the South Fork. The main stem of the Skokomish River has a drainage of about 240 square miles and begins at the junction of the North and South Forks, about 9 miles upstream of Hood Canal. The main stem generally flows southeast and within the lower Skokomish River Valley where it flows through the Skokomish Indian Reservation into Annas Bay, Hood Canal.

The recommended alternative includes five project areas: Confluence Levee Removal, Upstream Large Woody Debris (LWD) Installation, Side Channel Reconnection, Wetland Restoration at River Mile 9, and Wetland Restoration at Grange (Figure 1). A legal description of these properties has not yet been provided, however, the legal descriptions are not expected to affect the professional determination provided herein.

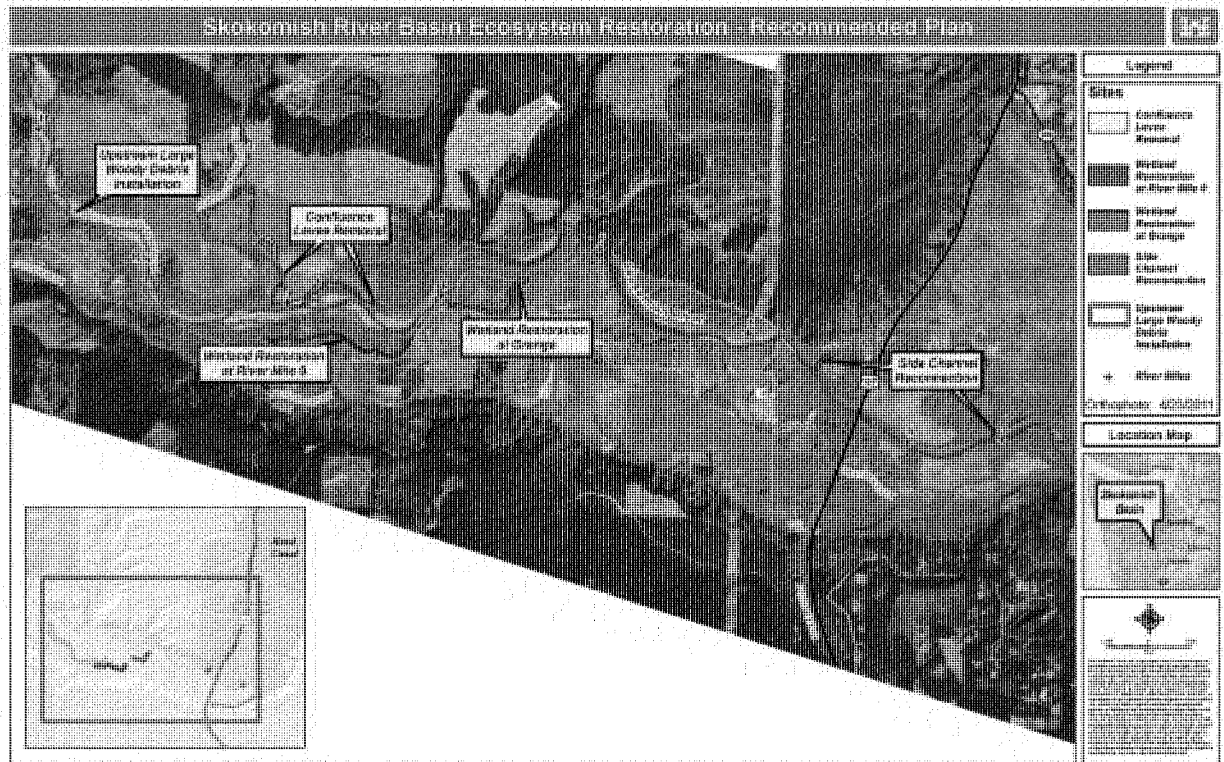



**Figure 1 Map of Recommended Alternatives**

## 2.2 Site and Vicinity General Characteristics

In general, the Skokomish area being considered for habitat restoration includes forested areas, agricultural areas, and private property.

The Confluence Levee Removal area is at the confluence of the North Fork and South Fork of the Skokomish River. The Confluence Levee is locally known as the Car Body Levee. The existing levee is approximately 5,400 ft long and covered in dense vegetation. Four rusted, abandoned car bodies were visually identified in the structure of the levee. (A description of the car bodies is included in Annex B-1 of Appendix H).

The area referred to as Upstream LWD Installation is located between river mile 9 and river mile 11. The area impacted is located within the Skokomish River channel. The river is surrounded on both sides by trees and shrubs.

The area referred to as the Side Channel Reconstruction area is an abandoned side channel that lies between river mile 4 and river mile 5.6. This area is bordered by the Skokomish River and vacant forested land.

The area referred to as Wetland Restoration at River Mile 9 is located at river mile 9 and is bordered by the South Fork of the Skokomish River and agricultural land. This area is mostly riparian land and consists of an existing agricultural berm.

The area referred to as Wetland Restoration at Grange area is located from river mile 7.5-8. This area is mostly riparian and consists of an existing agricultural berm. It is bordered by the Skokomish River and agricultural lands.

## 2.3 Regional and Site Geology

The site is located adjacent to the Skokomish River in a broad, (approximately ¾-mile wide) flat river valley about 5 miles southwest of the river's delta as it enters the Hood Canal. Geologic mapping for the site was obtained from the Geologic Map of the Skokomish Valley and Union 7.5-minute Quadrangles, Mason County, Washington (Polenz et al. 2010). Near-surface geology at the site is mapped as Quaternary age alluvium (Qa). Alluvium at the site typically consists of loose to medium dense, silty sand with gravel. Hills above the river valley (to the north and south) are generally mapped as glacial till (Qgt) with various ice contact deposits mapped between the upland glacial till and lowland alluvium. Occasional peat (Qp) zones are mapped in the valley, although not in the vicinity of the explorations for this study.

## 2.4 Uses of the Property

General property uses of the Skokomish area being considered for this study include natural forest/river habitat, timberland, agricultural uses (hay production, cattle grazing, and other crops), private homeownership, and some small businesses.

## 2.5 Uses of Adjoining Property

Uses of adjoining properties include those listed in section 2.3.

## 2.6 Descriptions of the Structures, Roads, Other Improvements on the Site

Structures in the study area include residential and non-residential buildings. Non-residential structures in the study area include schools, barns and other farming-related buildings, tribal services buildings such as a health clinic and administrative offices, a fish hatchery that covers roughly 6 acres, a fire station, the local Grange Hall, and a church. The area surrounding the lower river and estuary is Skokomish Tribe reservation land. There are no structures located directly on the properties being considered for the recommended alternative.

The existing Highway 101 Bridge is in the vicinity of the Side Channel Reconnection site and is estimated to be adequate in width and height to convey flows associated with this restoration project.

There are multiple levees, dikes and revetments that were built by valley residents to combat local flood problems. The levees were built using available materials, and were constructed without engineering design. Most of the levees along the river were originally constructed in the 1950s and 1960s, and were raised or connected during the 1980s and 1990s.

# 3.0 Records Review

## 3.1 Standard Environmental Records

Known and suspected contaminated sites were assessed using Standard environmental record sources (electronic databases). The following list of sources was accessed on January 11, 2011.

- U.S. Environmental Protection Agency's EnviroMapper at http://www.epa.gov/emefdata/em4ef.home. Provides information about environmental activities that may affect air, water, and land.
- Resource Conservation and Recovery Act (RCRAInfo)at http://www.epa.gov/enviro/html/rcris/rcris_query_java.html. Provides information about facilities that store, treat, or dispose of municipal or industrial waste. While a facility may be identified as using materials through reporting requirements, they may not be contaminated;
- Washington State Department of Ecology's Facilities Site Access at http://www.ecy.wa.gov/fs/. Provides known regulated state and federal cleanup sites, hazardous waste generators, hazardous and solid waste management facilities, licensed laboratories, farms that draw water from a well, and underground storage tanks that have an active or potential impact on the environment.; and
- Washington State Department of Ecology's Integrated Site Information System - Web Reporting (ISIS) databases at < https://fortress.wa.gov/ecy/tcpwebreporting/reports.aspx>. List of confirmed and suspected contaminated sites in multiple programs. Some of these sites may be active and some may be closed because cleanup was completed.

The standard environmental search results are displayed on Figure 2. Table 1 details the database search results by further describing the sites displayed on Figure 2. All but two of the listed sites are either remediated and closed or are permitted generators without known contamination. One site is a fish hatchery awaiting soil cleanup and one is a Washington State Department of Transportation (WSDOT) brownfields site. Neither site is expected to impact the project location.

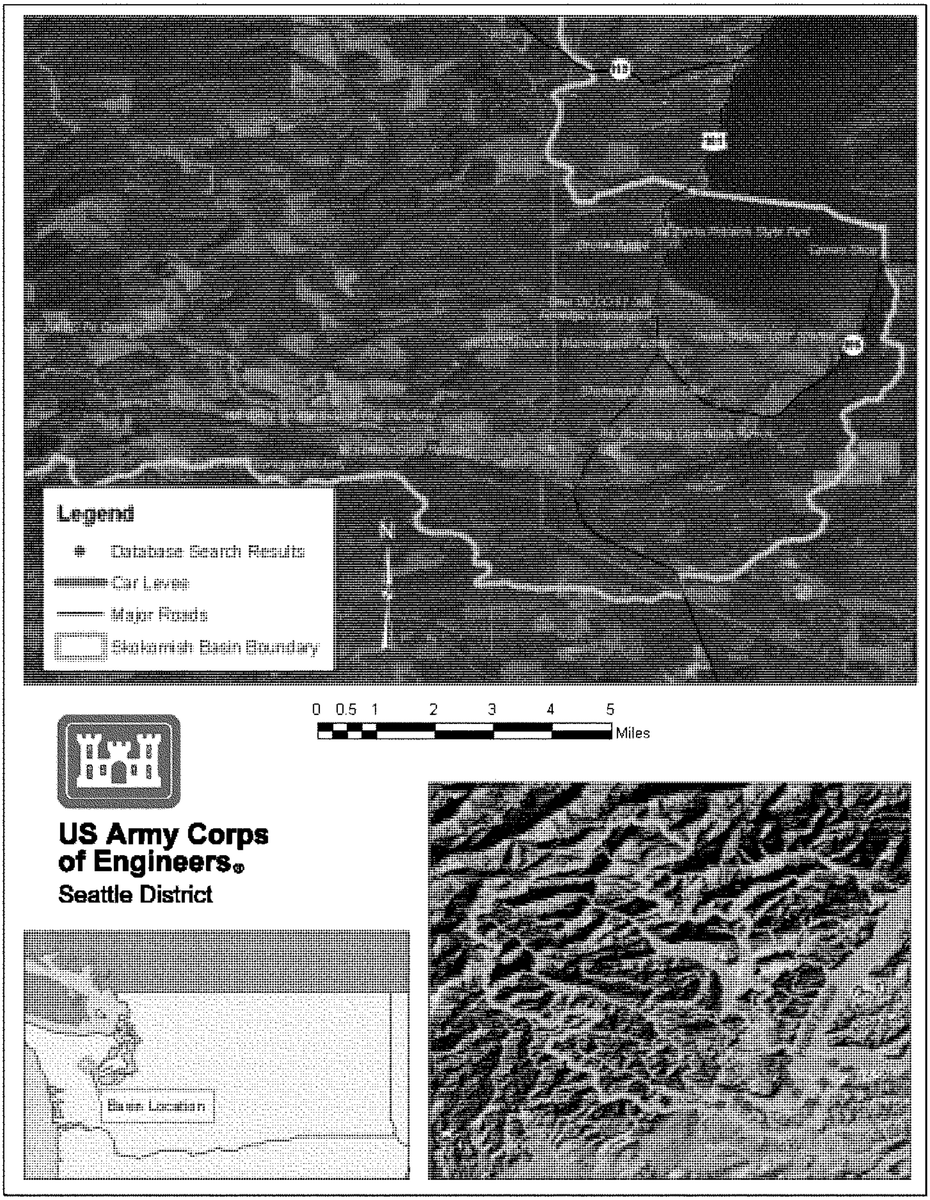



**Figure 2 Facilities Locations**

**Table 1 Facilities details**

| *Name* | *Address* | *Notes* |
|---|---|---|
| WA DFW George Adams Fish Hatchery | W 40 Skokomish Valley Rd. Shelton, WA 98584 | Emergency/Haz Chem Rpt TIER2[1]; Hazardous Waste Generator - Conditionally Exempt small Quantity Generator; and Upland Fish Hatchery GP[2] |
| WA DFW Eells Springs Hatchery | 7570 W. Eells Hill Rd. Shelton, WA 98584-9758 | Emergency/Haz Chem Rpt TIER2[1] and Upland Fish Hatchery GP[2] |
| McKernan State Hatchery | 411 W. Deyette Rd. Shelton, WA 98584-9760 | UST LUST Facility: 1,000 gallon diesel tank was removed (1999) The site is currently awaiting cleanup. Upland Fish Hatchery GP[2] |
| WA Parks Potlatch State Park | N. 21020 HWY 101 Shelton, WA 98584 | UST reported removed. No closure date recorded. |
| Union Station | E 4941 ½ HWY 106Union WA 98592 | Closure in progress of three USTs. |
| Cameo Shop | 6843 E. Hwy 106 Union, WA 98592 | Three leaded gasoline USTs where removed. No closure date recorded. |
| Becon Marina AKA: CBM Sales Inc. | E 5561 Hwy 101 Union, WA 98592-0337 | 2 USTs (2,000 gal diesel and 1,500 gal leaded gasoline) removed. No closed date recorded. |
| Time Oil CO 01 366 | N. 19930 Hwy 101 Shelton, WA 98584 | Emergency/Haz Chem Rpt TIER2[1] |
| Ferrellgas Hoodsport | N. 19920 Hwy 101 Shelton WA, 98584 | Emergency/Haz Chem Rpt TIER2[1] |
| Bio Recycling Corp North Ranch | 820 E Webb Hill Rd. Union WA, 98592 | Enforcement Final (Ecology Program W2R). An Enforcement action (i.e. Penalty, Order, Notice) was finalized, issued to the respective party, indicating the enforcement action was taken (2/10/2009; no end date recorded) |
| Skokomish Health Clinic | N 100 Tribal Center Road Shelton, WA 98584 | RCRA Hazardous Waste Generator, Large Quantity Generator. |
| WSDOT Potlatch Maintenance Facility | Unknown Skokomish Indian Reservation | A Brownfields site in which a phase I assessment was completed in 2005. No further progress is reported. |
| US DA FS Fir Creek | T21N R5W S3, Hoodsport WA 98548 | Hazardous Waste Generator, Large Quantity Generator |

*1 Businesses that store 10,000 pounds or more of a hazardous chemical or 500 pounds or less, depending on the chemical, of an extremely hazardous chemical on site at any one time must report annually. Reports are sent to the State Emergency Response Commission (represented by Washington State Department of Ecology) Local Emergency Planning Committees, and local fire departments for emergency planning (product, not waste).*

*2 General permits issued to operators of upland fin-fish hatching and rearing operations to regulate discharges to state waters.*

## 3.2 User Provided Information

There is no user supplied information in this HTRW Assessment. Title records, environmental liens, and owner information will be identified during later phases of the feasibility study.

## 3.3 Historical Records

### 3.3.1 Historic Photographs

Historical aerial photos of the sites identified in the recommended alternative were obtained from Google earth. The aerial photos show that land use has remained mostly farm land. There have been some changes to the forested areas over the last 20 years. There is no evidence of activities that would have caused HTRW contamination or could potentially cause a release. Figures 3 through 8 are historical and recent aerial photographs of the five project areas.

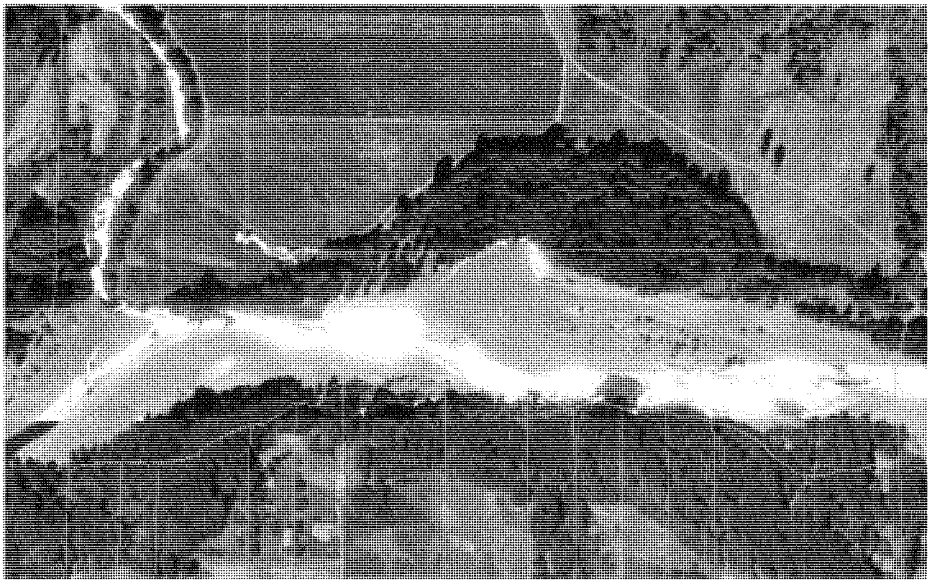


**Figure 3 Confluence Levee Removal area circa 1994 (U.S. Geological Survey)**

**Figure 4 Confluence Levee Removal area circa 2013 (U.S. Geological Survey)**

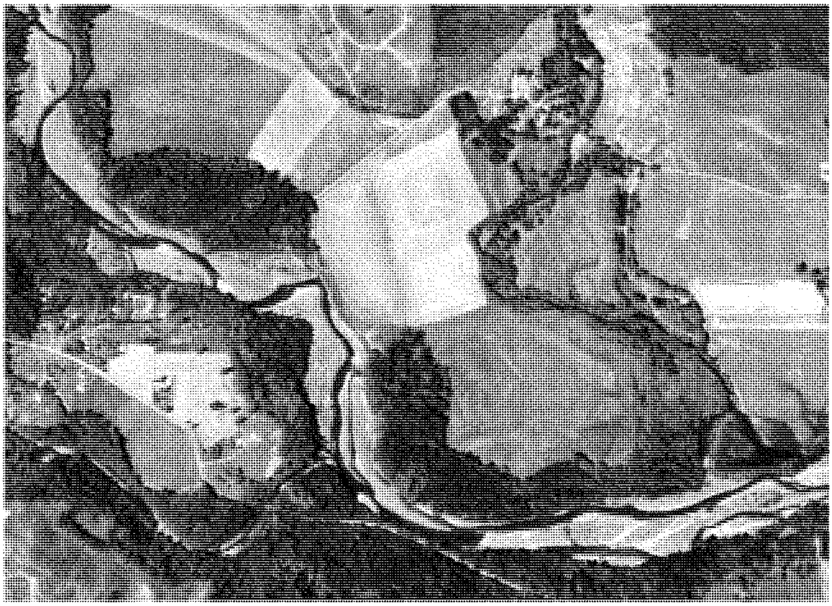


**Figure 5 Upstream Large Woody Debris Installation area circa 2005 (U.S. Geological Survey)**

**Figure 6 Upstream Large Woody Debris Installation area circa 2013 (U.S. Geological Survey)**

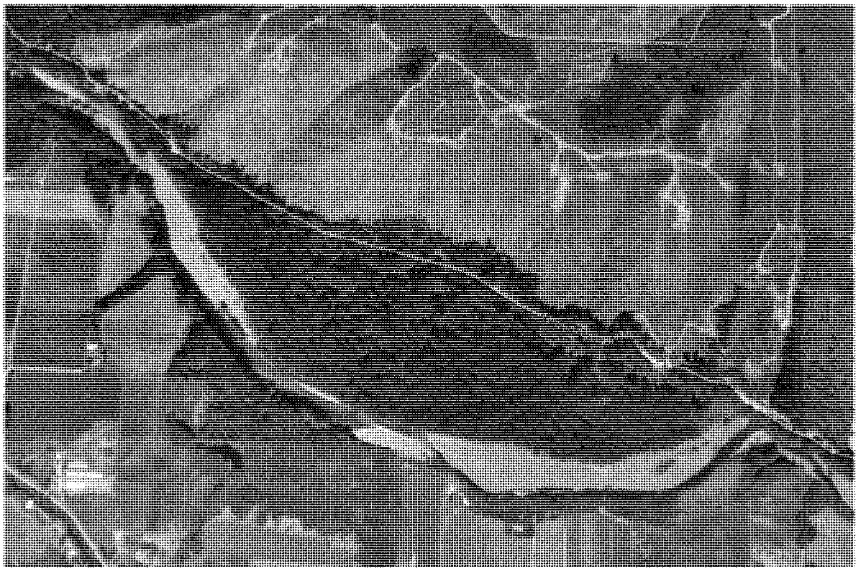


**Figure 7 Side Channel Reconnection area circa 1994 (U.S. Geological Survey)**

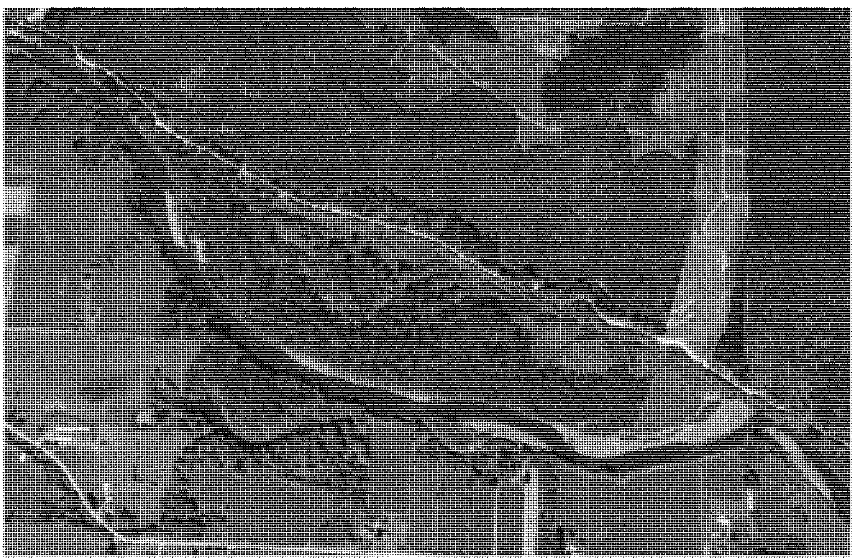


**Figure 8 Side Channel Reconnection area circa 2013 (U.S. Geological Survey)**

**Figure 9 Wetland Restoration at River Mile 9 area circa 1994 (U.S. Geological Survey)**

**Figure 10 Wetland Restoration at River Mile 9 area circa 2013 (U.S. Geological Survey)**


**Figure 11 Wetland Restoration at Grange area circa 1994 (U.S. Geological Survey)**


**Figure 12 Wetland Restoration at Grange area circa 2013 (U.S. Geological Survey)**

### 3.3.2 Historic maps

There are no historical maps included in the HTRW Assessment. Based on aerial photos, land use was not changed sufficiently in any of the five areas to warrant a search for historic maps. The historical use of the subject property was researched through other standard sources.

## 4.0 Site Reconnaissance

A site reconnaissance was performed on August 5, 2014 per section 9 of ASTM E 1527 – 13. The objective of the site visit was to determine if any evidence of a release could be identified at any of the alternative locations. Sites visited during reconnaissance included: Confluence Levee Removal area, the Upstream LWD Installation area, the Wetland Restoration at River Mile 9 area and the Wetland Restoration at Grange area. Due to access limitations, the Side Channel Reconnection area was not visited during the site visit.

### 4.1 Methodology and Limiting Conditions

The project team systematically observed the recommended plan project and adjacent areas. Some of the limiting conditions included the depth of the river and the thickness of trees and shrubs on the levees that prevented visual observation of soil conditions.

### 4.2 General Site Setting

Current and past property uses observed were residential, agricultural farm land, and forested/ river habitat. The Skokomish River valley is mostly flat topography with mostly silty sand and gravel soil composition.

Structures observed were mostly residential. There were some barns and abandoned homes observed. The roads consist of pavement and gravel, and are well maintained.

### 4.3 Interior and Exterior Observations

There were no interior inspections performed as part of this HTRW Assessment. There are no buildings located on the properties of interest and adjacent properties are residential or agricultural farm land. There were no buildings identified that would be expected to contain hazardous material.

During the site visit on August 5, 2014, observations were made of the Confluence Levee Removal area, the Upstream Large Woody Debris Installation area Wetland Restoration at River Mile 9 area, and Wetland Restoration at Grange area. There were no past or current uses observed or suspected that would indicate the presence of hazardous substances. There were no odors, pools of liquid, drums, or storage tanks observed.

### 4.4 Float Trip Observations (Summer 2010)

Members of the project team conducted a float trip through the main stem of the Skokomish River on 30 July 2010 (the HTRW assessor did not attend). The team noted two (2) levee areas containing junked automobiles; 1) in the main stem approximately a half-mile east of Highway 101 and, 2) in the north fork, near the confluence with the main stem. .

### 4.5 Interviews and Letters

An interview was performed with Rich Geiger of Mason County. Mr. Geiger was not aware of any current or historical uses of the project area that would suggest hazardous substance use. Rich spoke with the owner of the Confluence Levee and was told there is a potential for more car bodies to be uncovered with the removal of the levee; however, there should not be any concern about HTRW releases based on results from the physical investigation. Mr. Geiger was aware of permits in the project area for the placement of large woody debris and bank armoring as part of restoration activities.

A letter from EPA Region 10, dated April 7, 2014, supported and encouraged the removal of the Confluence Levee. At the time the letter from EPA was written, the recommended plan referred to the Confluence Levee as the Car Body Levee. Frequent inundation of the levee in recent decades, and results from the site investigation were used as the rationale for very low concern of HTRW releases at this location.

A review of Department of Ecology's toxic cleanup site database confirmed that the Confluence Levee Removal area of the Skokomish River Basin contains no known HTRW as described in a letter from Washington Department of Ecology, dated April 7, 2014. At the time the letter from the Department of Ecology was written, the recommended plan referred to the Confluence Levee as the Car Body Levee.

The Mason County interview summary and letter from EPA Region 10 and Department of Ecology are provided in Appendix A.

## 5.0 HTRW Phase II Investigation of Confluence Levee

Mason County contracted Landau Associates to conduct an HTRW investigation at Confluence Levee (Mason County 2014) (see Annex B-1 of Appendix H for details and photos). Naming conventions for some features included in the recommended plan have evolved over time. At the time the repot was written the Confluence Levee was referred to as the Car Body Levee. During the investigation, the visible car bodies were observed with the following results. Two of the four car bodies did not contain engines, two of the cars did not have fuel tanks, and none of the cars had batteries. No tires were visible on any of the cars. One fuel tank was visible and it was empty. There was no visible or olfactory evidence of petroleum contaminated soil. The site was heavily vegetated suggesting that soils in the area around the car bodies were not contaminated.

Shallow soil samples (top 6 inches) were collected along the crest of the levee, at the location of the four identified car bodies, and at a downed telephone pole in an attempt to sample soil with the highest likelihood of containing contamination. Samples were tested for VOCs, lead, total petroleum hydro carbons- gasoline range, and total petroleum hydrocarbons- diesel range. Background samples were also collected for comparison. A photo-ionization detector (PID) was used to identify volatile organic compounds during boring. Results for 33 soil samples were compared to the Model Toxic Control Act (MTCA) Method A Soil Cleanup Levels for unrestricted use which establish administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances have come to be located.

There were no soil chemical detections above the MTCA Method A Soil Cleanup Levels and no volatile organics identified with the PID. The proposed action alternatives would not create any hazard to the public or the environment through transport, use, or disposal of hazardous materials. There are no identified CERCLA-regulated substances involved with any of the proposed restoration sites. The four cars at the Confluence Levee have been present in the levee for decades and investigation results indicate that there is no hazardous or toxic waste resulting from the abandoned car bodies. The Washington Department of Ecology has provided a letter confirming that there are no active or proposed cleanup sites within the Skokomish River Basin.

## 6.0 Findings and Conclusion

This assessment did not reveal evidence of known or suspected HTRW contamination or potential for HTRW releases in connection with the area identified in the Skokomish recommended restoration plan.

The known, suspected, and potential releases shown in Table 1 include underground storage tanks, storage of hazardous chemicals, known surface water discharges, and listings as hazardous waste facilities. There do not appear to be any significant or ongoing point sources. Non-point sources may include agricultural runoff to surface waters. There does not appear to be any information indicating an impact from non-point sources on soil, surface water or sediment.

An HTRW Assessment of the project area was performed in July 2014 in conformance with the scope and limitations of ASTM Standard E 1527-13. There were no sampling results that warranted further evaluation or investigation within the footprint of the recommended plan, including the Confluence Levee Removal site. At this time, the cars are assumed to be solid waste that will be disposed of by the Non-Federal Sponsors at an appropriate disposal site.

This report concludes that recognized environmental conditions that pose an immediate risk to human or ecological heath due to current or past activities were not observed within the project area, adjacent properties, or known hazardous substances or petroleum products releases nearby within the limitation of this HTRW Assessment.

## 7.0 References

Mason County Department of Public Works. 2014. *Final Geotechnical Data Report Geotechnical and HTRW Investigation*, Skokomish General Investigation, Skokomish Washington.

Polenz, M., et. al. 2010. *Geologic Map of the Skokomish Valley and Union 7.5-Minute Quadrangles, Mason County, Washington.* Washington Division of Geology and Earth Resources, Open File Report 2010-3, scale 1:24,000. June.

## 8.0 Signature & Qualification Page

I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in 312.10 of 40 Code of Federal Register (CFR) 312 and the ASTM Standard.

I have the specific qualifications, based on education, training, and experience to asses a property of the nature, history, and setting of the Property. I have developed and performed the Hazardous, Toxic, and Radioactive Waste Assessment in conformance with the ASTM and CERCLA standards and practices set forth in 40 CFR 312 and the ASTM standard.

**PREPARED BY:**

Karah Haskins
Physical Scientist

## 9.0 Assessors Professional Experience

### Karah Haskins, Physical Scientist

*Education:*

University of Washington, BS, Earth and Space Science, 2012

*Brief Summary of Relevant Experience:*

Ms. Haskins has spent five years working for the U.S. Army Corps of Engineers - Seattle District as a Physical Scientist for the Environmental Engineering and Technology branch. She provides technical expertise and guidance for the remediation of hazardous and toxic waste in groundwater, soil, and sediments sites for Department of Defense cleanup programs and the EPA CERCLA (Superfund) program.

## APPENDIX A:

Mason County Interview Summary

EPA Region 10 Letter

Department of Ecology Letter

| Interview Record | | | | |
|---|---|---|---|---|
| **Site: Skokomish GI** | | | | |

Interview Type: Phone
Location of Visit: n/a
Date: January 7, 2015
Time: 0930-0945

**Interviewers**

| Name | Title | Organization |
|---|---|---|
| Karah Haskins | Physical Scientist | USACE |

**Interviewees**

| Name | Organization | Title | Telephone | Email |
|---|---|---|---|---|
| Rich Geiger | Mason County | | 360-427-9436 Ext 118 | rjgeiger@masoncd.org |

**Summary of Conversation**

OBJECTIVE: The objective of the interview is to obtain information indicating presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment

1. What is your knowledge of prior and current uses of the project area?

   Rich spoke with previous owner of "Car body levee". He was told that there are potentially more car bodies that are covered with sediment, but there should not be a concern about pollutants based on previous survey of the area. During removal of "Car body levee" care should be taken for encountering more car bodies.

   The other properties are historical agriculture land and there is no record of any releases to these areas.

2. What is your knowledge of prior and current uses of adjacent properties to the project area?

   In between the old confluence due south at the intersection of W Skokomish Valley Rd there is a former 76 gas station. Rich noted that it was probably not properly decommissioned and that it is not close to the from the project areas. There have been no reports of closure or releases at the 76 Station.

3. Are you aware of any releases to the project area or surrounding areas?

   There have been no releases…

4. Are you aware of any environmental reports written for the project area or surrounding areas? Such as, Environmental site assessment reports, environmental compliance audit reports, environmental permits (HW disposal permits, NPDES permits, etc), community right-to-know plans, risk assessments, etc.

5. There have been several projects that include permits to place woody debris and bank armoring upstream of River Mile 9 On the other side of the RM 9 there were dike repairs that occurred under emergency circumstances and were later permitted.

6. Any other information that might be pertinent to the site assessment?

   The facilities identified in the records search are not a concern. They are not located near any of the project areas.

**Additional Site-Specific Comments**

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION 10**
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ECOSYSTEMS, TRIBAL AND
PUBLIC AFFAIRS

April 7, 2014

Ms. Nancy C. Gleason
U.S. Army Corps of Engineers
CENWS-EN-ER
P.O. Box 3755
Seattle, Washington 98124

Re: Skokomish River Basin Ecosystem Restoration Draft Integrated Feasibility Report and Environmental Impact Statement – EPA Region 10 Project Number 10-056-COE

Dear Ms. Gleason:

The U.S. Environmental Protection Agency has reviewed the Skokomish River Basin Ecosystem Restoration Draft Integrated Feasibility Report and Environmental Impact Statement (DEIS). We are submitting comments in accordance with our responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act. We appreciate this opportunity to review the proposed restoration plans.

In order to address significant degradation of natural processes that sustain ecological functions of the watershed, the Corps of Engineers proposes to take actions that restore aquatic ecosystem processes, structure, and function in the lower 11 river miles of the Skokomish River Basin. The Corps conducted a General Investigation and Feasibility Study which revealed the need for and potential solutions to providing year-round fish passage around the confluence of the North and South Forks, reconnecting and restoring side channel and tributary networks, improving riparian and floodplain habitats, and improving pool depth and frequency.

In addition to the No Action Alternative, five action alternatives are proposed. Three of these (Alternatives 7, 23, and 28) stem from the base action of removing the car body levee on the north side of the mainstem; two (Alternatives 45 and 60) stem from the base action of riverbed excavation or dredging. Both base actions would include limited placement of large woody debris (LWD). These alternatives were developed through a cost-effectiveness/incremental cost analysis (CE/ICA), whereby the Corps included a progressive number and array of restoration actions or increments within the Basin to meet the purpose and need. The Tentatively Selected Plan, also known as the Preferred Alternative, is Alternative 27, which is the same as Alternative 28 but without the Dips Road Setback increment.

We are rating the Draft EIS and its Preferred Alternative 27 as LO, Lack of Objections. An explanation of the EPA rating system is enclosed for your use. We support the Corps' efforts to restore ecosystem process, structure, and function in the lower Skokomish River Basin and appreciate that the Skokomish Tribe, resource agencies, and Mason County have been involved in the watershed studies and the generation of alternatives. To ensure that intended outcomes are achieved, we recommend that the Preferred Alternative be selected, implemented, and subsequently monitored, evaluated and, where necessary, modified, with continued hands-on involvement of these same partners.

We agree, as stated in the DEIS, that the broad-scale alteration of the river bottom that would result from the Riverbed Excavation Alternatives 45 and 60 would cause significant risk to salmon habitat, and we do not support their selection. We do support the full range of actions and increments included in Alternative 28, and encourage project partners to seek alternative funding sources to implement the Dips Road Setback as well as the other proposed increments contained in Alternative 27.

In the enclosure, we offer additional comments and recommendations for your consideration in preparing the Final EIS. We thank you for the opportunity to review the Skokomish River Basin Draft Feasibility Report and Ecosystem Restoration EIS, and look forward to successful implementation. If you would like to discuss these comments or need more information, please contact me at 206-553-1601 or via electronic mail at reichgott.christine@epa.gov, or Elaine Somers of my staff at 206-553-2966 or via electronic mail at somers.elaine@epa.gov.

Sincerely,

Christine B. Reichgott

Christine B. Reichgott, Manager
Environmental Review and Sediment Management Unit

Enclosure

**U.S. Environmental Protection Agency**
**Detailed Comments for the**
**Skokomish River Basin Draft Integrated Feasibility Report and EIS**

**Upper Watershed Characterization – current condition and trend**
While problems, opportunities, and objectives for restoration are examined within the context of the entire watershed, the focus of the proposed project is within the lower 11 miles of the watershed. The Draft EIS discusses the activities that have led to degradation within the Skokomish River Basin, including those that have affected the upper South Fork Skokomish, but provides little information regarding the restoration actions that have occurred in the upper watershed. It would be helpful to include more information regarding the historic and current restoration efforts upstream of the project area, because the condition of the upper watershed has bearing on the success of efforts downstream.

*Recommendation:* In the Affected Environment and Environmental Consequences sections of the EIS, include more information regarding the nature and location of historic and current restoration actions in the upper South Fork Skokomish and the resulting ecological conditions and trends that would contribute to the relative success of the proposed actions.

**Water Quality**
Adequate water quality and appropriate water temperatures are among the basic requirements for anadromous fish in the system (p. 73). Water quality problems noted in the project area include warm temperatures, low dissolved oxygen, and high levels of bacteria and nutrients. These factors also contribute to low oxygen conditions in Hood Canal. The location and design of restoration actions can contribute to reducing these water quality problems in the project area and estuary.

*Recommendation:* As project design is refined, locate and design restoration actions, such as levee setbacks and riparian plantings, to reduce pollutant inputs and improve water quality within the project area and downstream estuary to the maximum possible extent.

**Large Woody Debris**
The Draft EIS (p. 22) states that the general goal is to use 64 logs per river mile that are two to three feet in diameter and 15 to 30 feet long for constructing engineered log jams (ELJs). Because these are large logs, it is important to ensure that restoration actions in the project area do not result in loss of important late old structure trees/stands elsewhere with associated ecological impacts.

*Recommendation:* Be mindful of the origin and associated impacts of obtaining large logs for the ELJs. To minimize impacts, consider sourcing logs that are certified by the Forest Stewardship Council, or that are obtained from federal lands administered under the Northwest Forest Plan. Tree root wads, where obtainable, are also valuable in ELJs.

**Hazardous, Toxic Waste**
While Corps policy regarding Hazardous, Toxic, and Radioactive Waste sites allows consideration of alternative project plans that avoid HTRW sites (Appendix 1, p. 1), we wish to convey that we fully support and encourage the removal of the car body levee as a base action for the proposed Skokomish ecosystem restoration. Due to the current lack of information regarding potential soil/water/sediment contamination from the 1950s-era cars used to construct the car body levee and the fact that this has been frequently inundated in recent decades, we have no basis upon which to register a high level of concern for residual contamination. However, when the Corps conducts sampling this summer, we offer the following recommendations:

*Recommendations:*

- Research the types of contaminants typically found in junk yards beneath car storage areas and test for those components. This should include metals, petroleum products, and antifreeze.
- Test the soil and sediments both upstream and downstream of the car body mass. If there is no detection upstream, use the results as a control or background sample. Then test beneath and downstream of the car bodies for the same suite of analytes.
- Report any contamination encountered to the Washington Department of Ecology hotline. For further information, contact Kris Grinnell at Ecology at 360-407-7382.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
*PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000*
*711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341*

Mamie Brouwer
Project Manager, Civil Works Branch
U.S. Army Corps of Engineers
Seattle District, CENWS-PM-CP-CJ
P.O. Box 3755
Seattle, WA 98124

Dear Ms. Brouwer,

This letter is intended to provide the Corps of Engineers with additional information regarding the car body levee site proposed as part of the Skokomish River Basin Ecosystem Restoration General Investigation (GI) Study. The GI study team recently identified the Tentatively Selected Plan (TSP) which includes removal of a car body levee near the confluence of the North and South Forks of the Skokomish River. The Seattle District has requested confirmation from the Washington Department of Ecology that the proposed car body levee project site contains no known hazardous or toxic waste.

A review of Department of Ecology's toxic cleanup site database has confirmed that the car body levee area of the Skokomish River Basin contains no known hazardous or toxic waste. There are no cleanup projects active or proposed at this site at this time, and there are no active cleanup sites within the Skokomish River Basin.

Should hazardous or toxic waste be discovered during the removal of the levee, that discovery should be reported to Ecology following the procedures for reporting a spill outlined on Ecology's website: http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm.

Respectfully,

Kristopher M. Grinnell
Toxics Cleanup Program
Washington Department of Ecology

# SKOKOMISH RIVER BASIN
# MASON COUNTY, WASHINGTON
# ECOSYSTEM RESTORATION

## APPENDIX J

## REAL ESTATE PLAN

## Integrated Feasibility Report and Environmental Impact Statement

US Army Corps
of Engineers®
Seattle District

US Army Corps
of Engineers
Seattle District

# REAL ESTATE PLAN

# Skokomish River Basin Integrated Feasibility Report and Environmental Impact Statement

## Mason County, Washington

**Project Partners:**
- U.S. Army Corps of Engineers
- Mason County
- Skokomish Indian Tribe
- Washington State Department of Natural Resources

**Real Estate Division**
**Seattle District**
**U.S. Army Corps of Engineers**

**May 2015**

# REAL ESTATE PLAN

# Skokomish River Basin Integrated Feasibility Report and Environmental Impact Statement

**Mason County, Washington**

**Table of Contents**

# REAL ESTATE PLAN

# Skokomish River Basin Integrated Feasibility Report and Environmental Impact Statement

**Mason County, Washington**

## 1.0 INTRODUCTION

### *1.1 Real Estate Plan Purpose*

This Real Estate Plan (REP) is presented in support of the Skokomish River Basin Integrated Feasibility Report and Environmental Impact Statement, dated February, 2015. The purpose of the REP is to identify lands, easements, rights-of-way and disposal (LERD) necessary to support construction, operation and maintenance of the proposed project and to assess the non-Federal Sponsor's (NFS) capability for LERD acquisition. The Feasibility Study for the Skokomish River Basin is being conducted under the Authority of Section 209 of the River and Harbor Act of 1962, Public Law 87-874 (Puget Sound and Adjacent Waters).

The information contained herein is tentative in nature for planning purposes only. The final real property acquisitions are subject to change after approval of the Feasibility Report and signing of the Project Partnership Agreement (PPA).

A draft Real Estate Plan for this project was written in September 2013 to address the real estate requirements as they were known at that time.

### *1.2 General Project Background and Description*

The Skokomish River system is the primary drainage basin for the southeast region of the Olympic Peninsula, carrying flow from its headwaters in the Olympic Mountains to its outlet in Hood Canal. The River consists of 80 river-miles, including the main-stem, North and South Forks and Vance Creek, and 260 miles of tributaries. The river collects drainage from an approximate 240 square mile drainage basin and eventually flows into southern Hood Canal, an arm of Puget Sound. Construction of Cushman Dam on the North Fork in the early 1900's has nearly eliminated flows in the North Fork. As a result the ecosystem has been negatively affected and experienced significant degradation. The purpose of the feasibility study is to investigate and formulate a solution or solutions to address ecosystem restoration in the Skokomish River Basin.

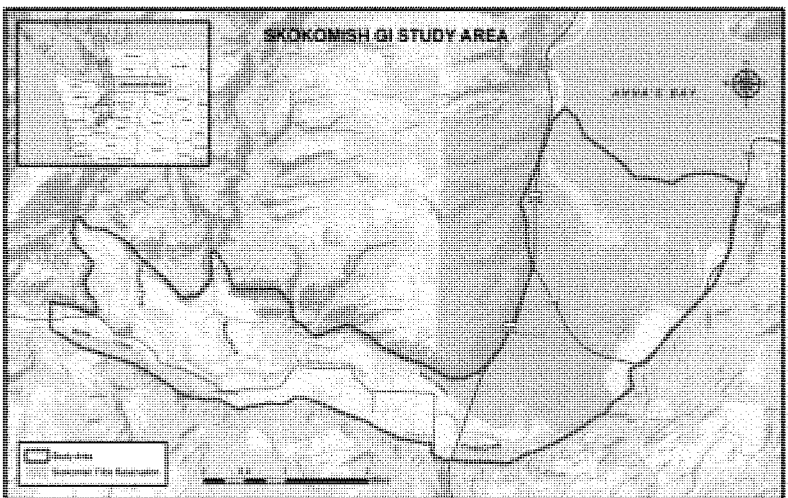
The recommended alternative proposes removal of the Confluence Levee on the north side of the mainstem near the original North Fork confluence, as well as the restoration of additional channel and riverbed habitat features. This alternative primarily addresses the project objective of restoring a continuous low flow channel as mainstem flows would naturally divert into the current North Fork channel. A portion of flood flows would continue to flow in the existing channel.

Specifically, the recommended plan includes the following activities as depicted on the Real Estate maps (See Exhibit A):

- Remove the Confluence Levee and reconnect channel on North Fork of Skokomish River
- Improve the connection of an existing abandoned side channel in the vicinity of Hwy 101
- Upstream Large Woody Debris (LWD) installation from River Mile (RM) #9-11
- Wetland Restoration at Grange
- Wetland Restoration at River Mile 9

### *1.3 Project Location*

The Skokomish River Valley is located in northwest Washington, in Mason County and the Skokomish Indian Reservation is along the southeast portion of the Olympic Peninsula. The overall GI study area is shown below:




### *1.4 Non-Federal Sponsor*

The Non-Federal Sponsors (NFSs) for this project are Mason County and the Skokomish Indian Tribe. The project sponsors entered into a Feasibility Cost Sharing Agreement (FCSA) with the U.S. Army Corps of Engineers, Seattle District on July 6, 2006. In addition, the Washington State Department of Natural Resources (WDNR) claims ownership of the riverbed associated with the Upstream Large Woody Debris (LWD) project increment between River Mile 9-11, and has indicated they will be a co-sponsor to the PPA for the sole purpose of providing aquatic lands associated with placement of Large Wood Debris (Upstream LWD Area) (See Exhibit B).

## 2.0 Description of Lands, Easements, Rights-of-Way and Disposal (LERD)

The local sponsors must provide the appropriate realty interests in all lands required for the construction, operation and maintenance of the project. Based on the current feasibility level of design, the project features impact a combination of private and public-owned property. An estimated 105 parcels, consisting of approximately 48 landowners, will be affected by this project. Of that amount, there are 44 private landowners, Skokomish Tribal ownership and 3 public entities – Mason County, WDNR and Washington State Department of Transportation (WSDOT). *(NOTE: The impact to WSDOT Right-of-Way is not anticipated to be part of the final design.)*

The purpose of this project is ecosystem restoration. As a result, the majority of the project lands will be provided in fee by the NFS to ensure the ecosystem restoration benefits of the project remain under the control of the NFS to be monitored and maintained. A perpetual channel improvement easement will be necessary for the Side Channel Reconnection project increment to ensure the connection remains open and unimpeded for flowage. Perpetual Road easements will be required for construction and to allow for future operation and maintenance of the project features. In addition to the staging areas, a standard temporary work area easement will also be acquired for construction during the removal of the Confluence Levee.

The tables below identify the acreages, parcels affected, ownership, proposed estate(s) and estimated value for each of the project increments. This information is tentative in nature and will be revised following feasibility level design:

**Confluence Levee Removal**

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 199 | 421073400010 | Private | 0.37 | TWA |
| 200 | 421074400010 | Private | 3.05 | Fee |
| 200 | 421074400010 | Private | 0.02 | Perpetual Road Easement |
| 200 | 421074400010 | Private | 2.12 | TWA |
| 201 | 421073100010 | Private | 1.62 | Fee |
| 201 | 421073100010 | Private | 0.11 | Perpetual Road Easement |
| 201 | 421073100010 | Private | 0.13 | Perpetual Road Easement |
| 201 | 421073100010 | Private | 1.24 | TWA |
| 202 | 421074300010 | Private | 6.30 | Fee |

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 202 | 421074300010 | Private | 0.16 | Perpetual Road Easement |
| 202 | 421074300010 | Private | 0.26 | Perpetual Road Easement |
| 202 | 421074300010 | Private | 1.20 | TWA (Const) |
| 202 | 421074300010 | Private | 1.08 | TWA |
| 237 | 421182222222 | Unknown | 0.05 | Fee |
| 237 | 421182222222 | Unknown | 0.00 | TWA |
| 250 | 421074200010 | Private | 0.20 | Perpetual Road Easement |
| 252 | 421074100000 | Private | 0.09 | Perpetual Road Easement |
| 253 | 421074200020 | Private | 0.06 | Perpetual Road Easement |
| TOTALS *(rounded)* | | | 18 acres *(Estimated Value: $41,470)* | ----- |

**Wetland Restoration at Grange**

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 28 | 421171100050 | Private | 0.00 | Perpetual Road Easement |
| 30 | 421172100000 | Private | 0.01 | Fee |
| 31 | 421084300050 | Private | 0.11 | Fee |
| 36 | 421084300060 | Private | 0.58 | Fee |
| 36 | 421084300060 | Private | 1.26 | Fee |
| 38 | 421083400000 | Private | 0.61 | Fee |
| 38 | 421083400000 | Private | 0.05 | Perpetual Road Easement |
| 38 | 421083400000 | Private | 0.04 | Fee |

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 38 | 421083400000 | Private | 0.23 | TWA |
| 41 | 421084300010 | Private | 2.48 | Fee |
| 41 | 421084300010 | Private | 0.00 | Perpetual Road Easement |
| 41 | 421084300010 | Private | 0.75 | Fee |
| 41 | 421084300010 | Private | 0.11 | TWA |
| 43 | 421084300000 | Private | 25.56 | Fee |
| 43 | 421084300000 | Private | 1.16 | Fee |
| 44 | 421083400060 | Mason County | 8.28 | Fee |
| 44 | 421083400060 | Mason County | 0.65 | Fee |
| 45 | 421084400030 | Private | 2.93 | Fee |
| 45 | 421084400030 | Private | 0.22 | Perpetual Road Easement |
| 45 | 421084400030 | Private | 0.21 | TWA |
| 47 | 421084300000 | Private | 1.36 | Fee |
| 89 | 421088888888 | Unknown | 2.19 | Fee |
| 161 | 421171200000 | Private | 0.57 | Fee |
| 210 | 421172100000 | Private | 0.00 | Perpetual Road Easement |
| 211 | 421083400040 | Private | 5.73 | Fee |
| 211 | 421083400040 | Private | 0.71 | Fee |
| 212 | 421083400050 | Private | 5.89 | Fee |
| 212 | 421083400050 | Private | 0.34 | Fee |
| 254 | 421084400000 | Private | 1.87 | Fee |
| 255 | 421084100000 | Private | 0.72 | Fee |
| TOTALS *(rounded)* | | | 65 acres *(Estimated Value: $208,880* | ----- |

**Wetland Restoration at River Mile 9**

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 18 | 421181200270 | Private | 0.12 | Fee |
| 20 | 421181100051 | Mason County | 1.76 | Fee |
| 20 | 421181100051 | Mason County | 0.28 | Fee |
| 21 | 421181200000 | Private | 2.67 | Fee |
| 21 | 421181200000 | Private | 0.57 | Fee |
| 22 | 421181100050 | Private | 1.51 | Fee |
| 22 | 421181100050 | Private | 0.23 | Fee |
| 23 | 421181100110 | Mason County | 1.34 | Fee |
| 23 | 421181100110 | Mason County | 0.25 | Fee |
| 24 | 421181100060 | Private | 1.22 | Fee |
| 24 | 421181100060 | Private | 0.20 | Fee |
| 25 | 421181200280 | Mason County | 1.75 | Fee |
| 25 | 421181200280 | Mason County | 0.26 | Fee |
| 26 | 421181200280 | Mason County | 2.17 | Fee |
| 26 | 421181200280 | Mason County | 0.01 | Perpetual Road Easement |
| 26 | 421181200280 | Mason County | 0.18 | Fee |
| 27 | 421181200030 | Private | 2.83 | Fee |
| 27 | 421181200030 | Private | 0.46 | Fee |
| 29 | 421181200010 | Private | 4.88 | Fee |
| 29 | 421181200010 | Private | 0.16 | Perpetual Road Easement |
| 29 | 421181200010 | Private | 0.58 | Fee |
| 88 | 421172222222 | Unknown | 0.38 | Fee |
| 193 | 421182100200 | Private | 1.05 | Fee |
| 193 | 421182100200 | Private | 0.20 | Fee |
| 202 | 421074300010 | Private | 0.12 | Fee |

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 204 | 421172300000 | Private | 0.04 | Fee |
| 205 | 421172200070 | Private | 0.66 | Fee |
| 205 | 421172200070 | Private | 0.19 | Fee |
| 206 | 421172200090 | Private | 3.37 | Fee |
| 206 | 421172200090 | Private | 0.55 | Fee |
| 207 | 421181100000 | Private | 7.96 | Fee |
| 207 | 421181100000 | Private | 1.08 | Fee |
| 208 | 421172200000 | Private | 6.73 | Fee |
| 208 | 421172200000 | Private | 1.34 | Fee |
| 237 | 421182222222 | Unknown | 12.52 | Fee |
| 244 | 421182100230 | Private | 0.00 | Fee |
| 245 | 421182100220 | Private | 0.99 | Fee |
| 245 | 421182100220 | Private | 0.31 | Fee |
| TOTALS *(rounded)* | | | 61 acres *(Estimated Value: $224,310)* | ----- |

**Side Channel Reconnection**

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 96 | 421100060000 | Skokomish Tribe | 0.32 | Perpetual Road Easement |
| 99 | 421150060000 | Skokomish Tribe | 0.01 | Perpetual Road Easement |
| 100 | 421152200050 | Private | 0.72 | Perpetual Channel Improvement Easement |
| 100 | 421152200050 | Private | 0.06 | Perpetual Road Easement |
| 101 | 421152100080 | Private | 0.56 | Perpetual Channel Improvement Easement |

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 102 | 421152400010 | Private | 0.77 | Perpetual Channel Improvement Easement |
| 103 | 421152100070 | Private | 0.78 | Perpetual Channel Improvement Easement |
| 107 | 421142300000 | Skokomish Tribe | 0.20 | Perpetual Road Easement |
| 119 | 421154100000 | Skokomish Tribe | 0.28 | Perpetual Channel Improvement Easement |
| 119 | 421154100000 | Skokomish Tribe | 0.28 | Perpetual Road Easement |
| 135 | 421150060000 | Skokomish Tribe | 0.02 | TWA |
| 136 | 421159999999 | Unknown | 0.02 | TWA |
| 153 | 421151200000 | Skokomish Tribe | 0.03 | Perpetual Road Easement |
| 156 | 421151200000 | Skokomish Tribe | 0.00 | Perpetual Road Easement |
| 158 | 421151200010 | Unknown | 0.02 | Perpetual Road Easement |
| 174 | 421104000000 | Skokomish Tribe | 0.16 | Perpetual Road Easement |
| 176 | 421100060010 | State of Washington | 0.00 | Perpetual Road Easement |
| 178 | 421151100000 | Private | 0.09 | Perpetual Road Easement |
| 179 | 421150060000 | Skokomish Tribe | 0.04 | Perpetual Road Easement |
| 182 | 421142400009 | Skokomish Tribe | 0.04 | Perpetual Road Easement |
| 184 | 421142200005 | Skokomish Tribe | 0.05 | Perpetual Road Easement |
| 185 | 421142200006 | Skokomish Tribe | 0.27 | Perpetual Road Easement |

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 186 | 421142200005 | Skokomish Tribe | 0.16 | Perpetual Road Easement |
| 188 | 421140060010 | Mason County | 0.35 | Perpetual Road Easement |
| TOTALS *(rounded)* | | | 5 acres *(Estimated Value: $21,840* | ------- |

*NOTE: The $0 values are a result of the affected acreage being a portion of a previous 2009 Federally-funded Road Restoration Project (USFW #13410-7-J005). As a result, no crediting value is available for these parcels.*

**Upstream Large Woody Debris (LWD) Installation**

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 35 | 421182100220 | WDNR | 0.01 | Fee |
| 48 | 521124400000 | WDNR | 8.26 | Fee |
| 53 | 521124200050 | WDNR | 0.30 | Fee |
| 56 | 521124200010 | WDNR | 7.97 | Fee |
| 60 | 521124100000 | WDNR | 3.09 | Fee |
| 60 | 521124100000 | Private | 0.27 | Perpetual Road Easement |
| 61 | 521124200000 | WDNR | 0.00 | Fee |
| 62 | 521124200030 | WDNR | 0.99 | Fee |
| 63 | 521124200040 | WDNR | 1.08 | Fee |
| 64 | 521124200020 | WDNR | 1.15 | Fee |
| 65 | 521123100010 | WDNR | 1.22 | Fee |
| 66 | 521123100260 | WDNR | 1.27 | Fee |
| 67 | 521123100240 | WDNR | 1.30 | Fee |
| 68 | 521123100250 | WDNR | 1.20 | Fee |
| 69 | 521123100230 | WDNR | 1.00 | Fee |
| 70 | 521123100000 | WDNR | 0.23 | Fee |

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 76 | 521122400000 | WDNR | 0.64 | Fee |
| 77 | 521122400010 | WDNR | 0.44 | Fee |
| 78 | 521122400020 | WDNR | 12.18 | Fee |
| 79 | 521122300030 | Private | 0.13 | Perpetual Road Easement |
| 80 | 521122200000 | Private | 0.23 | Perpetual Road Easement |
| 81 | 521122200040 | WDNR | 0.00 | Fee |
| 86 | 521121000000 | Private | 0.45 | Perpetual Road Easement |
| 87 | 521122100000 | WDNR | 3.55 | Fee |
| 87 | 521122100000 | Private | 0.05 | Perpetual Road Easement |
| 157 | 421182100230 | WDNR | 8.00 | Fee |
| 169 | 521123100210 | WDNR | 0.55 | Fee |
| 170 | 521123100020 | WDNR | 1.04 | Fee |
| 194 | 421072100010 | Private | 0.11 | Perpetual Road Easement |
| 195 | 421182100230 | WDNR | 8.80 | Fee |
| 197 | 421073200010 | WDNR | 1.85 | Fee |
| 197 | 421073200010 | Private | 0.04 | Perpetual Road Easement |
| 198 | 421073400020 | Private | 0.09 | Perpetual Road Easement |
| 199 | 421073400010 | Private | 0.10 | Perpetual Road Easement |
| 200 | 421074400010 | Private | 0.01 | Perpetual Road Easement |
| 201 | 42107399910 | WDNR | 0.00 | Fee |
| 201 | 42107399910 | Private | 0.11 | Perpetual Road Easement |
| 202 | 421074300010 | Private | 0.26 | Perpetual Road Easement |
| 220 | 531131000010 | WDNR | 3.66 | Fee |
| 220 | 531131000010 | Private | 0.01 | Perpetual Road Easement |

| Map Key ID# | Parcel ID | Owner | Project Acres | Proposed Estate |
|---|---|---|---|---|
| 235 | 421070004000 | WDNR | 6.39 | Fee |
| 235 | 421070004000 | Skokomish Farms, Inc | 0.43 | Perpetual Road Easement |
| 235 | 421070004000 | Skokomish Farms, Inc | 0.07 | Perpetual Road Easement |
| 237 | 421182222222 | WDNR | 11.04 | Fee |
| TOTALS *(rounded)* | | | 90 acres *(Estimated Value: $204,890* | ------ |

*Note: For the parcels listed above, WDNR claims aquatic ownership for that part of the parcel located in the Skokomish River riverbed.*

### *2.1 Access*

There are a number of access points to the various project sites, depending on the respective project increment. Access to the various sites is shown in Exhibit A and consists of both public access, as well as perpetual road easements that will need to be acquired by the NFS prior to project construction.

### *2.2 Staging*

Where possible, the staging areas have been located within the project footprint. Additional staging areas outside of the project footprint have been identified and are shown in Exhibit A. The NFS will be required to acquire a standard Temporary Work Area Easement to address these staging areas.

### *2.3 Borrow*

The County plans to provide as much of the soil borrow material by utilizing, to the degree possible, stockpiled material resulting from landslide slope re-grading projects. Another potential source being considered is to develop a borrow pit on County land south of the Skokomish Valley. Any remaining borrow material required, as well as all rock armor material, would be obtained from commercial borrow sources not yet identified. The wood for the Large Wood Debris (LWD) placement will also be provided from a source to be identified during the final design phase.

### *2.4 Disposal*

Suitable excavated materials may be re-utilized within the proposed project footprint as much as feasible. Any unused material will be disposed of at a commercial disposal site to be identified during pre-construction, engineering and design phase (PED).

## 3.0 Non-Federal Sponsor Owned LERD

Of the approximate 240 acres of land currently estimated for the project, the NFS organizations own almost half of the lands that lie within the project footprint. The approximate acreage currently owned by the NFS is listed below:

- Mason County 20 acres Perpetual Road Easement/Fee
- Skokomish Tribe 2 acres Fee
- WDNR 90 acres Fee *(Aquatic lands)*

These lands are sufficient and available for the project. At this time, no disposal area(s) have been identified, but will be addressed during the PED phase. As they do not currently have all the land acquired for the project, the NFS will be required to acquire additional lands for the project prior to construction, however, they have been advised of the risk of acquiring additional lands prior to signing the Project Partnership Agreement (PPA) *(See Section 20).*

## 4.0 Estates

The following standard estates are proposed for the project.

**Fee** – The fee simple title to the land described in Exhibit ____/Section _____, Subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

**Perpetual Road Easement** -- A perpetual exclusive easement and right-of-way in, on, over and across the land described in Exhibit A for the location, construction, operation, maintenance, alteration, replacement of roads and appurtenances thereto; together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions and other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the owners, their heirs and assigns, the right to cross over or under the right-of-way as access to their adjoining land at the locations indicated in Exhibit A subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

**Temporary Work Area Easement** -- A temporary easement and right-of-way in, on, over and across the land described in Exhibit A for a period not to exceed _______(___) years, beginning with date of possession of the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a work area, including the right to borrow and/or deposit fill, spoil and waste material thereon, move store and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the ________________________ Project, together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

**Perpetual Channel Improvement Easement** -- A perpetual and assignable right and easement to construct, operate, and maintain channel improvement works on, over, and across (the land described in Schedule A) (Tracts Nos. ____, _______, and ________) for the purposes as authorized by the Act of Congress approved ________________, including the right to clear, cut, fell, remove, and dispose of any and all timber, trees, underbrush, buildings, improvements, and/or other obstructions therefrom; to excavate, dredge, cut away, and remove any or all of said land and to place thereon dredge or spoil material; and for such other purposes as may be required in connection with said work of improvement; reserving, however, to the owners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads, and pipelines. *(NOTE: Assumes sponsor performs O&M on channels upon completion of project.)*

## 5.0 Non-Standard Estates

The Washington State Department of Natural Resources (WDNR) claims ownership of the riverbed for River Mile (RM 9-11) of the Skokomish River (See Exhibit B), and has indicated that they will be a co-signer to the PPA for the sole purpose of providing aquatic land associated with placement of the Upstream Large Wood Debris (LWD). As a result, there are no Non-Standard Estates required for the project.

## 6.0 Existing Federal Projects Within the LERD Required for the Project

No existing Federal projects are located within the LERD required for the project footprint.

## 7.0 Federally Owned Lands with the LERD

There are no federally owned lands included within the LERD required for the project.

## 8.0 Navigational Servitude

The project is not located within any navigable watercourses. Only RM 0-3 of the Skokomish River is considered to be navigable *(Corps of Engineers, Regulatory Branch).* Therefore Federal Navigational Servitude will not be invoked for this project.

## 9.0 Maps

A set of maps that clearly delineates the real estate requirements to support the selected plan for the Skokomish River project was developed by NWS-RE from feasibility level design maps and is attached as Exhibit A to this report. The real estate maps depict the project area, the various interests and estates required for the project.

## 10.0 Induced Flooding

Based on hydraulic modeling, a preliminary Physical Takings Analysis was prepared by District Counsel, which concluded that a Takings could occur on adjacent lands due to induced flooding caused by the proposed project, but it will be confined to the proposed real estate footprint (Exhibit A). For more information, please see the Hydrology Appendix to the main report.

## 11.0 Baseline Cost Estimate for Real Estate (BCERE)

The estimated total cost for Real Estate acquisition is $1,686,600. This includes $806,600 for the project land values and $880,000 for estimated administrative costs. Estimated lands and damages values were sourced from a Gross Appraisal Report dated February 4, 2015 by USACE

Appraiser Karen R. Peterson, Seattle, WA. A final acquisition appraisal will be performed during PED to reflect the final design and updated project land values.

The administrative costs for the proposed project reflect the anticipated difficulties of completing the real estate acquisitions. There are multiple landowners involving private, public and tribal entities. Reaching agreements of the real estate requirements that is acceptable to all of the landowners may be a lengthy process. It is impossible to predict where negotiations might conclude with them. Therefore, a liberal contingency of 15% is being added to the total estimated administrative cost in the Summary Table below:

**BCERE SUMMARY TABLE**

| Proposed Estate | Acreages | Lands/Damages Cost | NFS LERD Admin Cost | Total NFS Costs | Federal Admin Costs |
|---|---|---|---|---|---|
| Fee | 222.78 | $669,667 | $426,750 | $1,096,417 | $300,000 |
| Perpetual Road Easement | 5.68 | $11,176 | $6,000 | $17,176 | $4,000 |
| Temporary Work/Construction Area (TWA) | 6.60 | $1,663 | $1,200 | $2,863 | $1,000 |
| Channel Improvement Easement | 3.11 | $18,883 | $15,000 | $33,883 | $10,000 |
| Subtotals | 238.17 | $701,389 | $448,950 | $1,150,339 | $316,250 |
| 15% Contingency | [redacted] | $105,208 | $ 67,343 | $ 172,551 | $ 47,438 |
| **PROJECT TOTAL *(rounded)*** | **240** | **$806,600** | **$516,300** | **$1,322,900** | **$363,700** |

## 12.0 Relocation Benefits Per P.L. 91-646 for Displaced Residences, Businesses and Farms

There are no persons, farms or businesses that will be displaced because of the proposed project.

## 13.0 Mineral Activity

There are no known outstanding mineral interests or active mining operations in the project area that could affect implementation of the project *(Mason County Conservation District)*.

## 14.0 Non-Federal Sponsor Assessment

Both sponsors have confirmed they have the capability to execute the Power of Eminent Domain. However, because there are willing sellers in the proposed project area, the sponsors do not anticipate it will be necessary to use condemnation to obtain the real property interests required for the recommended plan. Exhibit C provides an assessment of the NFS' real estate acquisition capability.

## 15.0 Zoning Ordinances in Lieu of Acquisition

No zoning ordinances are currently proposed in lieu of, or to facilitate LERD acquisition in connection with this project.

## 16.0 Schedule

The following acquisition schedule is based on the premise that the project will impact approximately 105 parcels. A detailed acquisition schedule will be prepared during PED upon completion of the 95% design. The schedule below provides the estimated total amount of time to complete the real estate tasks based on preliminary information available at this time:

- Mapping 1 year
- Obtain title and appraisals 3 years
- Negotiations 4 years
- Closing and Recording 2 years

## 17.0 Facility and Utility Relocation/Alteration

There are no anticipated relocations of utilities, roads, railroads, cemeteries, or any other improvements.

ANY CONCLUSION OR CATEGORIZATION CONTAINED IN THIS REAL ESTATE PLAN, OR ELSEWHERE IN THIS PROJECT REPORT, THAT AN ITEM IS A UTILITY OR FACILITY RELOCATION TO BE PERFORMED BY THE NON-FEDERAL SPONSOR AS PART OF ITS LERD RESPONSIBILITIES IS PRELIMINARY ONLY. THE GOVERNMENT WILL MAKE A FINAL DETERMINATION OF THE RELOCATIONS NECESSARY FOR THE CONSTRUCTION, OPERATION, OR MAINTENANCE OF THE PROJECT AFTER FURTHER ANALYSIS AND COMPLETION AND APPROVAL OF FINAL ATTORNEY'S OPINIONS OF COMPENSABILITY FOR EACH OF THE IMPACTED UTILITIES AND FACILITIES.

## 18.0 HTRW and other Environmental Considerations

A Phase II HTRW investigation was completed by the Corps of Engineers in July 2014. There were no sampling results that warranted further evaluation or investigation within the footprint of the recommended plan. Please refer to Appendix I (HTRW) for additional information.

## 19.0 Land Owner Attitude

In general, public support is mixed. There have been some owners who have been resistant to/denied granting Rights-of-Entry for initial investigative surveys, i.e., Cultural Resources. The Corps and NFS continue to inform and respond to public input and inquiries, as applicable.

## 20.0 Risks Associated with Advanced Land Acquisition

The NFS have been notified in writing of the risks of acquiring any additional lands for the project prior to the execution of the PPA *(Risk letters were sent to Mason County and the Skokomish Tribe on October 30, 2013).*

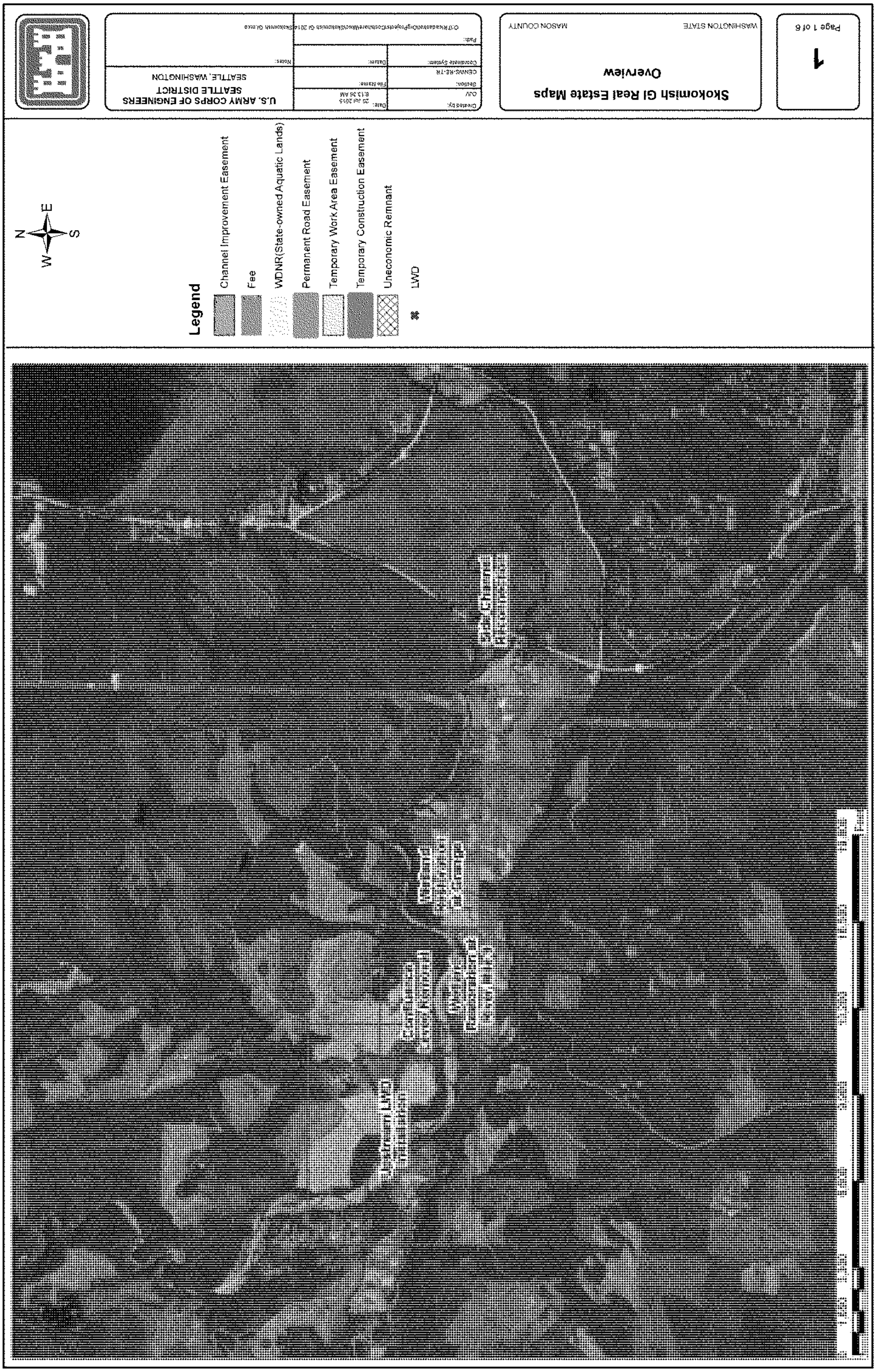
## 21.0 Outstanding Third Party Interests

All property interests acquired in support of the proposed project must take priority over any competing third party interests that could defeat or impair the NFS' title to the property or interfere with construction, operation and maintenance of the project. Such third party interests should be cleared from title, or subordinated to the interests being made available to the project by the NFS. Outstanding third party interests are unknown at this time.

All lands necessary for project implementation shall be made available by the NFS to the Corps by a Certification of Lands and Authorization for Entry, Attorney's Certificate of Authority, and Outstanding Third Party Risk Analysis documents (See, Exhibit D). Within 180 days after certifying project lands available, the NFS shall provide to the Crops all LERD crediting documentation necessary to support their claim for credit

# EXHIBIT A

# REAL ESTATE MAPS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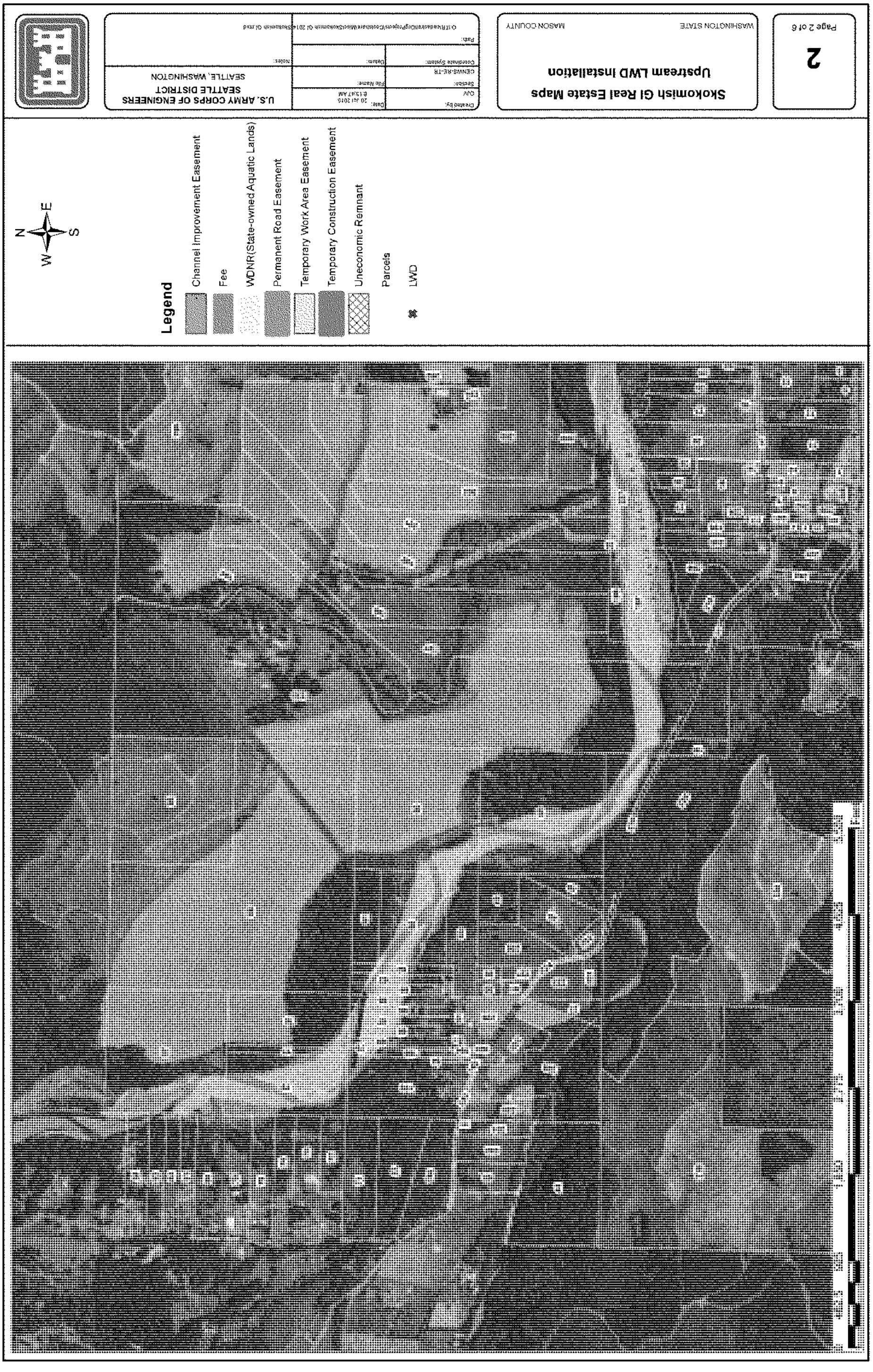
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Upstream LWD Installation
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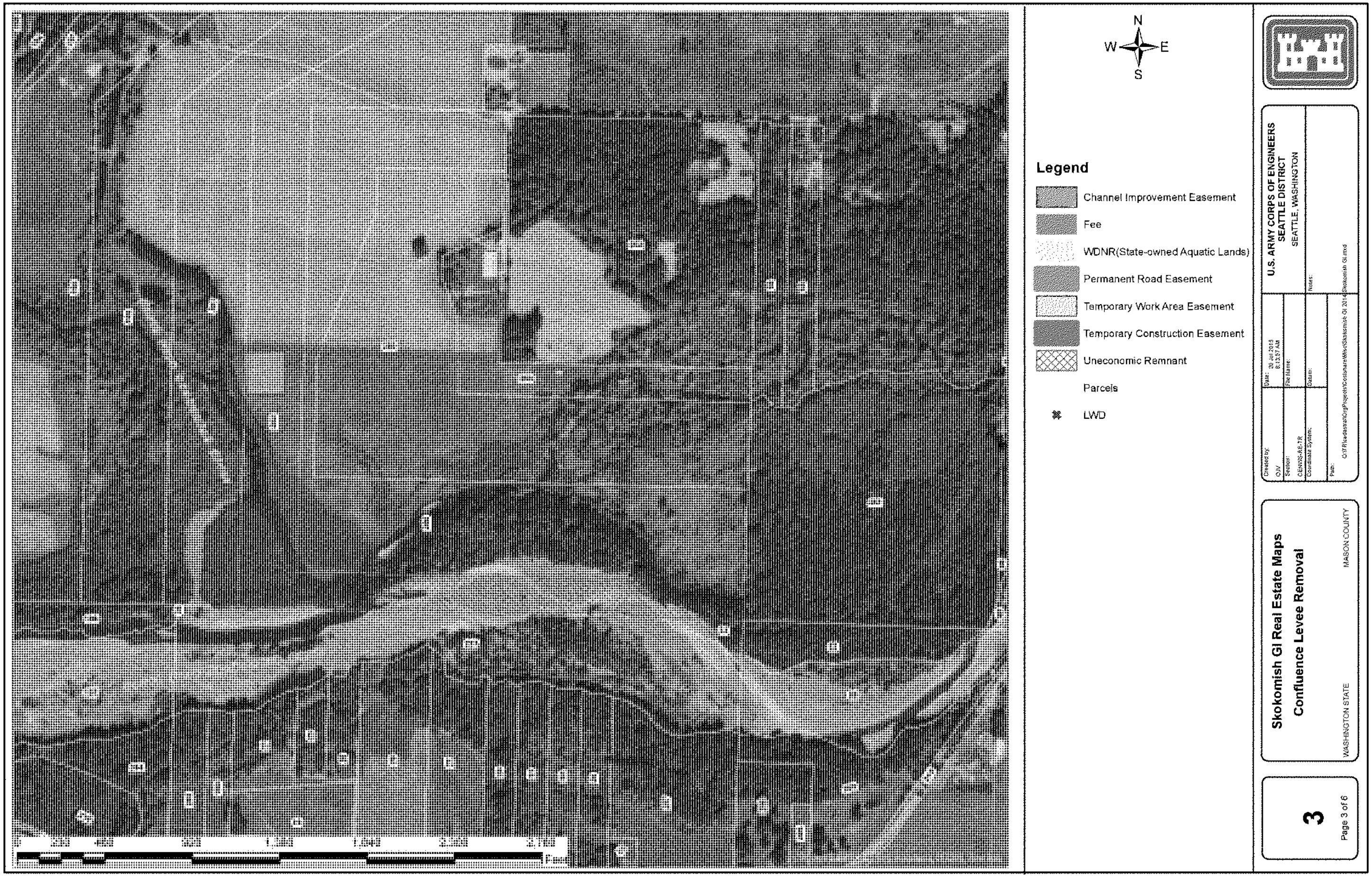
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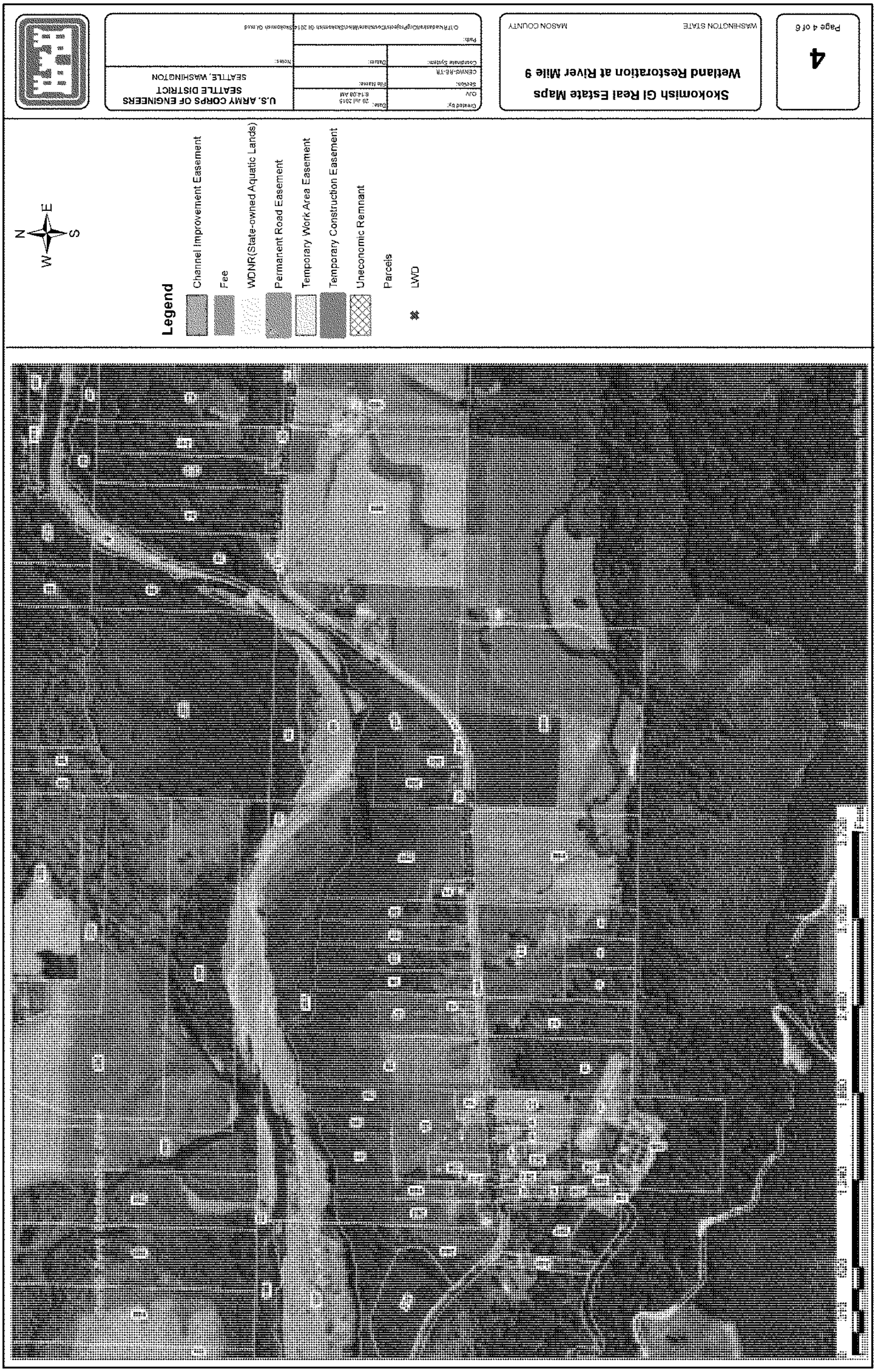

Skokomish GI Real Estate Maps
Wetland Restoration at River Mile 9
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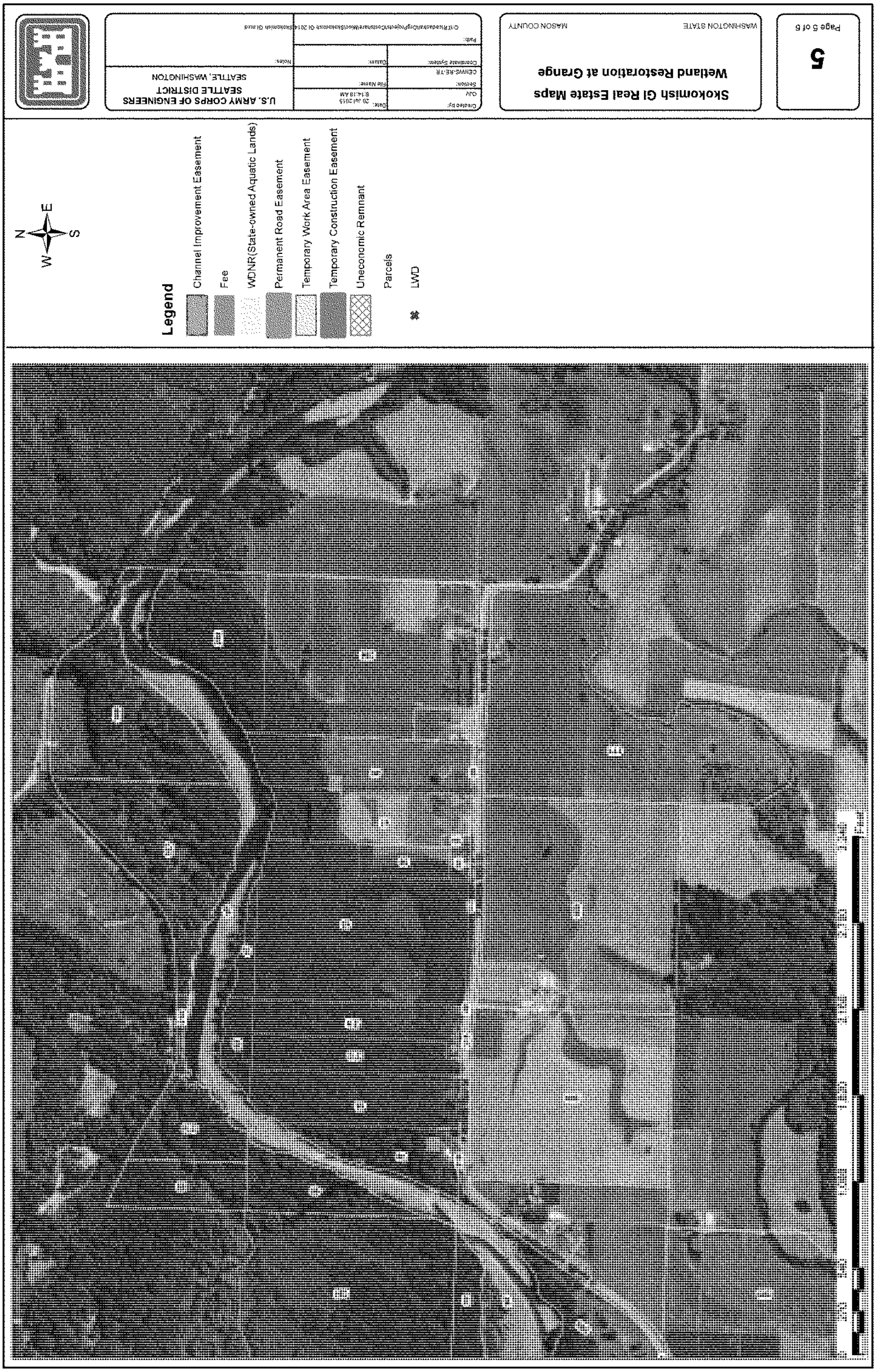
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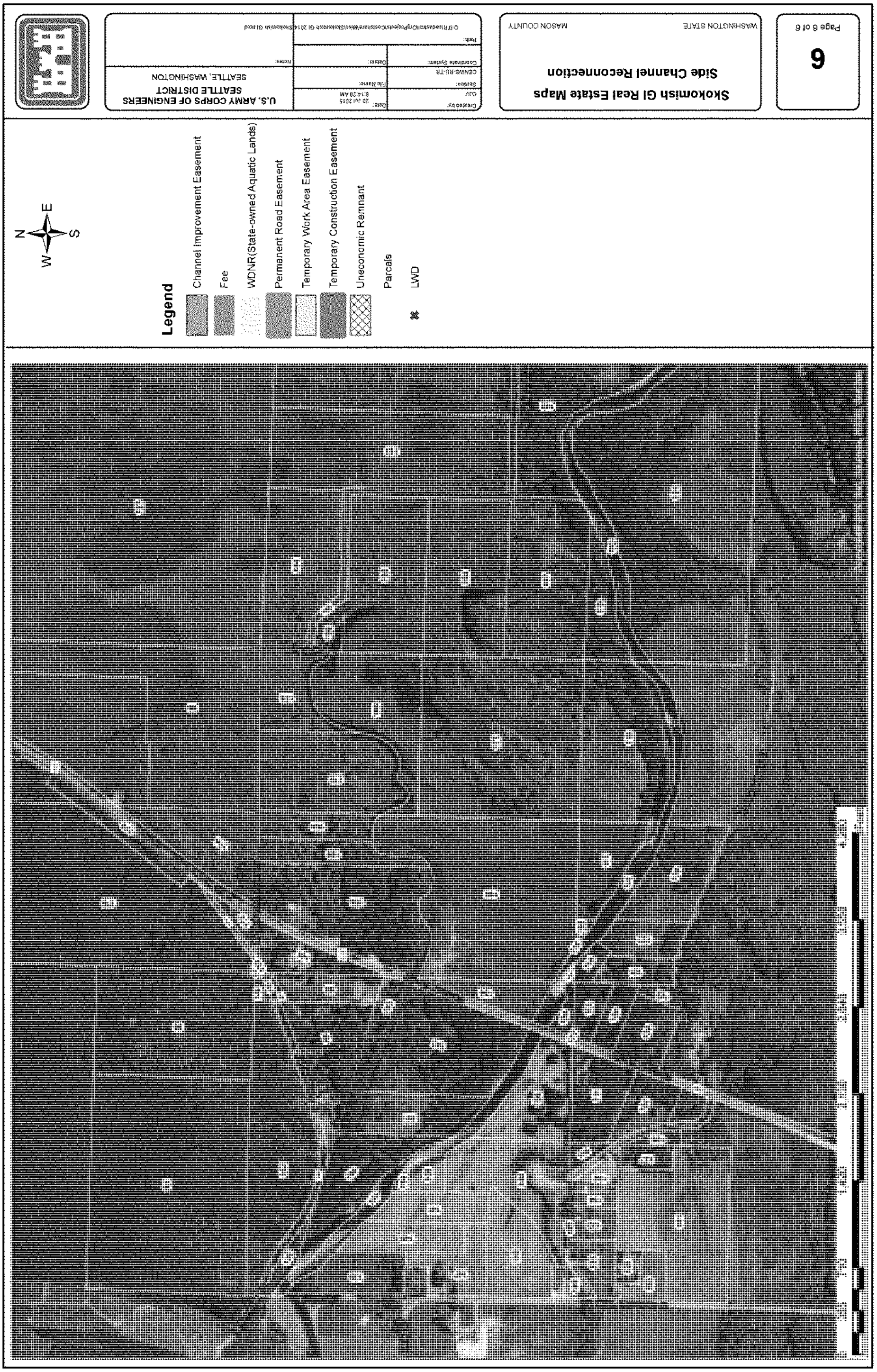
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Side Channel Reconnection
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| ID # | Project Site Name | County Assessor's Tax Parcel ID | Real Property Rights for Analysis | Ostensible Owners Last Name | Type of Ownership | State or Federal Rule (NFS Did Not Acquire for Project) | Project Real Property Land Size to be Analyzed (Est. AC) | Fee Simple Lands | Perpetual Access Road Easement, Joint Use | Perpetual Flowage Easement, Occasional Flooding | Perpetual Channel Improvement Easement | TWA Temporary 3yr Construction Easement | TWA Temporary 3yr Staging Area Easement | Apparent Project Footprint Current Land Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | Upstream LWD | 421182100220 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 0.01 | 0.01 | | | | | | Aquatic Lands |
| 48 | Upstream LWD | 521124400000 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 8.26 | 8.26 | | | | | | Aquatic Lands |
| 60 | Upstream LWD | 521124100000 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 3.09 | 3.09 | | | | | | Aquatic Lands |
| 76 | Upstream LWD | 521122400000 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 0.64 | 0.64 | | | | | | Aquatic Lands |
| 87 | Upstream LWD | 521122100000 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 3.55 | 3.55 | | | | | | Aquatic Lands |
| 235 | Upstream LWD | 421070004000 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 6.39 | 6.39 | | | | | | Aquatic Lands |
| 53 | Upstream LWD | 521124200050 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 0.30 | 0.30 | | | | | | Aquatic Lands |
| 56 | Upstream LWD | 521124200010 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 7.97 | 7.97 | | | | | | Aquatic Lands |
| 62 | Upstream LWD | 521124200030 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 0.99 | 0.99 | | | | | | Aquatic Lands |
| 61 | Upstream LWD | 521124200000 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 0.00 | 0.00 | | | | | | Aquatic Lands |
| 63 | Upstream LWD | 521124200040 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 1.08 | 1.08 | | | | | | Aquatic Lands |
| 64 | Upstream LWD | 521124200020 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 1.15 | 1.15 | | | | | | Aquatic Lands |
| 65 | Upstream LWD | 521123100010 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 1.22 | 1.22 | | | | | | Aquatic Lands |

| ID # | Project Site Name | County Assessor's Tax Parcel ID | Real Property Rights for Analysis | Ostensible Owners Last Name | Type of Ownership | State or Federal Rule (NFS Did Not Acquire for Project) | Project Real Property Land Size to be Analyzed (Est. AC) | Fee Simple Lands | Perpetual Access Road Easement, Joint Use | Perpetual Flowage Easement, Occasional Flooding | Perpetual Channel Improvement Easement | TWA Temporary 3yr Construction Easement | TWA Temporary 3yr Staging Area Easement | Apparent Project Footprint Current Land Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 66 | Upstream LWD | 521123100260 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 1.27 | 1.27 | | | | | | Aquatic Lands |
| 67 | Upstream LWD | 521123100240 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 1.30 | 1.30 | | | | | | Aquatic Lands |
| 68 | Upstream LWD | 521123100250 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 1.20 | 1.20 | | | | | | Aquatic Lands |
| 69 | Upstream LWD | 521123100230 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 1.00 | 1.00 | | | | | | Aquatic Lands |
| 70 | Upstream LWD | 521123100000 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 0.23 | 0.23 | | | | | | Aquatic Lands |
| 77 | Upstream LWD | 521122400010 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 0.44 | 0.44 | | | | | | Aquatic Lands |
| 169 | Upstream LWD | 521123100210 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 0.55 | 0.55 | | | | | | Aquatic Lands |
| 78 | Upstream LWD | 521122400020 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 12.18 | 12.18 | | | | | | Aquatic Lands |
| 170 | Upstream LWD | 521123100020 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 1.04 | 1.04 | | | | | | Aquatic Lands |
| 81 | Upstream LWD | 521122200040 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 0.00 | 0.00 | | | | | | Aquatic Lands |
| 157 | Upstream LWD | 421182100230 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 8.00 | 8.00 | | | | | | Aquatic Lands |
| 195 | Upstream LWD | 421182100230 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 8.80 | 8.80 | | | | | | Aquatic Lands |
| 220 | Upstream LWD | 521131000010 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 3.66 | 3.66 | | | | | | Aquatic Lands |
| 197 | Upstream LWD | 421073200010 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 1.85 | 1.85 | | | | | | Aquatic Lands |

| ID # | Project Site Name | County Assessor's Tax Parcel ID | Real Property Rights for Analysis | Ostensible Owners Last Name | Type of Ownership | State or Federal Rule (NFS Did Not Acquire for Project) | Project Real Property Land Size to be Analyzed (Est. AC) | Fee Simple Lands | Perpetual Access Road Easement, Joint Use | Perpetual Flowage Easement, Occasional Flooding | Perpetual Channel Improvement Easement | TWA Temporary 3yr Construction Easement | TWA Temporary 3yr Staging Area Easement | Apparent Project Footprint Current Land Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 201 | Upstream LWD | 421073100010 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 0.00 | 0.00 | | | | | | Aquatic Lands |
| 237 | Upstream LWD | 421182222222 | Fee Simple | WA DNR | Public - NFS | Fed Rule | 11.04 | 11.04 | | | | | | Aquatic Lands |
| 60 | Upstream LWD | 521124100000 | Road Esmt | SKOKOMISH FARMS INC | Private | State Rule | 0.27 | | 0.27 | | | | | Natural Resource - Non-buildable |
| 86 | Upstream LWD | 521121000000 | Road Esmt | SKOKOMISH FARMS INC | Private | State Rule | 0.45 | | 0.45 | | | | | Road ROW |
| 87 | Upstream LWD | 521122100000 | Road Esmt | SKOKOMISH FARMS INC | Private | State Rule | 0.05 | | 0.05 | | | | | Aquatic Lands |
| 235 | Upstream LWD | 421070004000 | Road Esmt | SKOKOMISH FARMS INC | Private | State Rule | 0.43 | | 0.43 | | | | | Road ROW |
| 235 | Upstream LWD | 421070004000 | Road Esmt | SKOKOMISH FARMS INC | Private | State Rule | 0.07 | | 0.07 | | | | | Natural Resource - Non-buildable |
| 79 | Upstream LWD | 521122300030 | Road Esmt | GEORGE | Private | State Rule | 0.13 | | 0.13 | | | | | Rural Residential |
| 80 | Upstream LWD | 521122200000 | Road Esmt | TRESNER | Private | State Rule | 0.23 | | 0.23 | | | | | Rural Residential |
| 220 | Upstream LWD | 521131000010 | Road Esmt | CASCADE LAND CONSERVANCY | Private | State Rule | 0.01 | | 0.01 | | | | | Natural Resource - Non-buildable |
| 194 | Upstream LWD | 421072100010 | Road Esmt | KREGENOW | Private | State Rule | 0.11 | | 0.11 | | | | | Road ROW |
| 197 | Upstream LWD | 421073200010 | Road Esmt | MILLER | Private | State Rule | 0.04 | | 0.04 | | | | | Road ROW |
| 198 | Upstream LWD | 421073400020 | Road Esmt | FOO | Private | State Rule | 0.09 | | 0.09 | | | | | Road ROW |
| 199 | Upstream LWD | 421073400010 | Road Esmt | SWARTWOOD PSP | Private | State Rule | 0.10 | | 0.10 | | | | | Road ROW |
| 200 | Upstream LWD | 421074400010 | Road Esmt | COURTNIER | Private | State Rule | 0.01 | | 0.01 | | | | | Road ROW |
| 201 | Upstream LWD | 421073100010 | Road Esmt | NOVAXX INC | Private | State Rule | 0.11 | | 0.11 | | | | | Road ROW |
| 202 | Upstream LWD | 421074300010 | Road Esmt | BONANOMI | Private | State Rule | 0.26 | | 0.26 | | | | | Road ROW |

| ID # | Project Site Name | County Assessor's Tax Parcel ID | Real Property Rights for Analysis | Ostensible Owners Last Name | Type of Ownership | State or Federal Rule (NFS Did Not Acquire for Project) | Project Real Property Land Size to be Analyzed (Est. AC) | Fee Simple Lands | Perpetual Access Road Easement, Joint Use | Perpetual Flowage Easement, Occasional Flooding | Perpetual Channel Improvement Easement | TWA Temporary 3yr Construction Easement | TWA Temporary 3yr Staging Area Easement | Apparent Project Footprint Current Land Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 199 | Confluence Removal | 421073400010 | Temporary Construction Easement | SWARTWOOD PSP | Private | State Rule | 0.37 | | | | | 0.37 | | Existing |
| 200 | Confluence Removal | 421074400010 | Fee | COURTNIER | Private | State Rule | 3.05 | 3.05 | | | | | | Natural Resource - Grasslands & Aquatic Lands - Non-buildable |
| 200 | Confluence Removal | 421074400010 | Road Esmt | COURTNIER | Private | State Rule | 0.02 | | 0.02 | | | | | Road ROW |
| 200 | Confluence Removal | 421074400010 | Temporary Construction Easement | COURTNIER | Private | State Rule | 2.12 | | | | | 2.12 | | Existing |
| 201 | Confluence Removal | 421073100010 | Fee | NOVAXX INC | Private | State Rule | 1.62 | 1.62 | | | | | | Aquatic Lands |
| 201 | Confluence Removal | 421073100010 | Road Esmt | NOVAXX INC | Private | State Rule | 0.11 | | 0.11 | | | | | Road ROW |
| 201 | Confluence Removal | 421073100010 | Road Esmt | NOVAXX INC | Private | State Rule | 0.13 | | 0.13 | | | | | Road ROW & Existing |
| 201 | Confluence Removal | 421073100010 | Temporary Construction Easement | NOVAXX INC | Private | State Rule | 1.24 | | | | | 1.24 | | Existing |
| 202 | Confluence Removal | 421074300010 | Fee | BONANOMI | Private | State Rule | 6.30 | 6.30 | | | | | | Natural Resource - Aquatic Lands |
| 202 | Confluence Removal | 421074300010 | Temporary Construction Easement | BONANOMI | Private | State Rule | 1.20 | | | | | 1.20 | | Existing |
| 202 | Confluence Removal | 421074300010 | Temporary Work Area Easement | BONANOMI | Private | State Rule | 1.08 | | | | | | 1.08 | Natural Resource - Grasslands |
| 202 | Confluence Removal | 421074300010 | Road Esmt | BONANOMI | Private | State Rule | 0.16 | | 0.16 | | | | | Road ROW & Existing |
| 202 | Confluence Removal | 421074300010 | Road Esmt | BONANOMI | Private | State Rule | 0.26 | | 0.26 | | | | | Road ROW |
| 237 | Confluence Removal | 421182222222 | Fee | UNKNOWN | Private | State Rule | 0.05 | 0.05 | | | | | | Natural Resource - Aquatic Lands |
| 237 | Confluence Removal | 421182222222 | Temporary Construction Easement | UNKNOWN | Private | State Rule | 0.00 | | | | | 0.00 | | Existing |
| 250 | Confluence Removal | 421074200010 | Road Esmt | FIELDSON | Private | State Rule | 0.20 | | 0.20 | | | | | Road ROW |
| 252 | Confluence Removal | 421074100000 | Road Esmt | METCALF ET AL | Private | State Rule | 0.09 | | 0.09 | | | | | Road ROW |
| 253 | Confluence Removal | 421074200020 | Road Esmt | RICHERT | Private | State Rule | 0.06 | | 0.06 | | | | | Road ROW |
| 18 | River Mile 9 | 421181200270 | Fee | GRISEL | Private | State Rule | 0.12 | 0.12 | | | | | | Natural Resource - Ag Lands |
| 20 | River Mile 9 | 421181100051 | Fee | MASON COUNTY | Public - NFS | Fed Rule | 1.76 | 1.76 | | | | | | Natural Resource - Non-buildable |

| ID # | Project Site Name | County Assessor's Tax Parcel ID | Real Property Rights for Analysis | Ostensible Owners Last Name | Type of Ownership | State or Federal Rule (NFS Did Not Acquire for Project) | Project Real Property Land Size to be Analyzed (Est. AC) | Fee Simple Lands | Perpetual Access Road Easement, Joint Use | Perpetual Flowage Easement, Occasional Flooding | Perpetual Channel Improvement Easement | TWA Temporary 3yr Construction Easement | TWA Temporary 3yr Staging Area Easement | Apparent Project Footprint Current Land Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | River Mile 9 | 421181100051 | Fee | MASON COUNTY | Public - NFS | Fed Rule | 0.28 | 0.28 | | | | | | Natural Resource - Non-buildable |
| 23 | River Mile 9 | 421181100110 | Fee | MASON COUNTY | Public - NFS | Fed Rule | 1.34 | 1.34 | | | | | | Natural Resource - Non-buildable |
| 23 | River Mile 9 | 421181100110 | Fee | MASON COUNTY | Public - NFS | Fed Rule | 0.25 | 0.25 | | | | | | Natural Resource - Non-buildable |
| 25 | River Mile 9 | 421181200280 | Fee | MASON COUNTY | Public - NFS | Fed Rule | 1.75 | 1.75 | | | | | | Natural Resource - Non-buildable |
| 25 | River Mile 9 | 421181200280 | Fee | MASON COUNTY | Public - NFS | Fed Rule | 0.26 | 0.26 | | | | | | Natural Resource - Non-buildable |
| 26 | River Mile 9 | 421181200290 | Fee | MASON COUNTY | Public - NFS | Fed Rule | 2.17 | 2.17 | | | | | | Natural Resource - Non-buildable |
| 26 | River Mile 9 | 421181200290 | Road Esmt | MASON COUNTY | Public - NFS | Fed Rule | 0.01 | | 0.01 | | | | | Natural Resource - Non-buildable |
| 26 | River Mile 9 | 421181200290 | Fee | MASON COUNTY | Public - NFS | Fed Rule | 0.18 | 0.18 | | | | | | Natural Resource - Non-buildable |
| 21 | River Mile 9 | 421181200000 | Fee | PICKARD | Private | State Rule | 2.67 | 2.67 | | | | | | Natural Resource - Non-buildable |
| 21 | River Mile 9 | 421181200000 | Fee | PICKARD | Private | State Rule | 0.57 | 0.57 | | | | | | Natural Resource - Non-buildable |
| 22 | River Mile 9 | 421181100050 | Fee | ESTATE OF ALFRED TUMIN | Private | State Rule | 1.51 | 1.51 | | | | | | Natural Resource - Non-buildable |
| 22 | River Mile 9 | 421181100050 | Fee | ESTATE OF ALFRED TUMIN | Private | State Rule | 0.23 | 0.23 | | | | | | Natural Resource - Non-buildable |
| 24 | River Mile 9 | 421181100060 | Fee | FROYLAND | Private | State Rule | 1.22 | 1.22 | | | | | | Natural Resource - Non-buildable |
| 24 | River Mile 9 | 421181100060 | Fee | FROYLAND | Private | State Rule | 0.20 | 0.20 | | | | | | Natural Resource - Non-buildable |

| ID # | Project Site Name | County Assessor's Tax Parcel ID | Real Property Rights for Analysis | Ostensible Owners Last Name | Type of Ownership | State or Federal Rule (NFS Did Not Acquire for Project) | Project Real Property Land Size to be Analyzed (Est. AC) | Fee Simple Lands | Perpetual Access Road Easement, Joint Use | Perpetual Flowage Easement, Occasional Flooding | Perpetual Channel Improvement Easement | TWA Temporary 3yr Construction Easement | TWA Temporary 3yr Staging Area Easement | Apparent Project Footprint Current Land Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | River Mile 9 | 421181200030 | Fee | TWIDWELL | Private | State Rule | 2.83 | 2.83 | | | | | | Natural Resource - Non-buildable |
| 27 | River Mile 9 | 421181200030 | Fee | TWIDWELL | Private | State Rule | 0.46 | 0.46 | | | | | | Natural Resource - Ag Lands |
| 29 | River Mile 9 | 421181200010 | Fee | JOHNSTON ET AL | Private | State Rule | 4.88 | 4.88 | | | | | | Natural Resource - Non-buildable |
| 29 | River Mile 9 | 421181200010 | Road Esmt | JOHNSTON ET AL | Private | State Rule | 0.16 | | 0.16 | | | | | Natural Resource - Ag Lands |
| 29 | River Mile 9 | 421181200010 | Fee | JOHNSTON ET AL | Private | State Rule | 0.58 | 0.58 | | | | | | Natural Resource - Ag Lands |
| 88 | River Mile 9 | 421172222222 | Fee | UNKNOWN | Private | State Rule | 0.38 | 0.38 | | | | | | Natural Resource - Aquatic Lands |
| 237 | River Mile 9 | 421182222222 | Fee | UNKNOWN | Private | State Rule | 12.52 | 12.52 | | | | | | Natural Resource - Aquatic Lands |
| 193 | River Mile 9 | 421182100200 | Fee | GORNY | Private | State Rule | 1.05 | 1.05 | | | | | | Natural Resource - Non-buildable |
| 193 | River Mile 9 | 421182100200 | Fee | GORNY | Private | State Rule | 0.20 | 0.20 | | | | | | Natural Resource - Non-buildable |
| 245 | River Mile 9 | 421182100220 | Fee | GORNY | Private | State Rule | 0.99 | 0.99 | | | | | | Natural Resource - Non-buildable |
| 245 | River Mile 9 | 421182100220 | Fee | GORNY | Private | State Rule | 0.31 | 0.31 | | | | | | Natural Resource - Non-buildable |
| 202 | River Mile 9 | 421074300010 | Fee | BONANOMI | Private | State Rule | 0.12 | 0.12 | | | | | | Natural Resource - Aquatic Lands |
| 204 | River Mile 9 | 421172300000 | Fee | JOHNSON | Private | State Rule | 0.04 | 0.04 | | | | | | Natural Resource - Non-buildable |
| 208 | River Mile 9 | 421172200000 | Fee | JOHNSON | Private | State Rule | 6.73 | 6.73 | | | | | | Natural Resource - Non-buildable |
| 208 | River Mile 9 | 421172200000 | Fee | JOHNSON | Private | State Rule | 1.34 | 1.34 | | | | | | Natural Resource - Non-buildable |
| 205 | River Mile 9 | 421172200070 | Fee | JOHNSON | Private | State Rule | 0.66 | 0.66 | | | | | | Natural Resource - Non-buildable |
| 205 | River Mile 9 | 421172200070 | Fee | JOHNSON | Private | State Rule | 0.19 | 0.19 | | | | | | Natural Resource - Non-buildable |
| 206 | River Mile 9 | 421172200090 | Fee | JOHNSON | Private | State Rule | 3.37 | 3.37 | | | | | | Natural Resource - Non-buildable |
| 206 | River Mile 9 | 421172200090 | Fee | JOHNSON | Private | State Rule | 0.55 | 0.55 | | | | | | Natural Resource - Non-buildable |

| ID # | Project Site Name | County Assessor's Tax Parcel ID | Real Property Rights for Analysis | Ostensible Owners Last Name | Type of Ownership | State or Federal Rule (NFS Did Not Acquire for Project) | Project Real Property Land Size to be Analyzed (Est. AC) | Fee Simple Lands | Perpetual Access Road Easement, Joint Use | Perpetual Flowage Easement, Occasional Flooding | Perpetual Channel Improvement Easement | TWA Temporary 3yr Construction Easement | TWA Temporary 3yr Staging Area Easement | Apparent Project Footprint Current Land Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 207 | River Mile 9 | 421181100000 | Fee | JOHNSON | Private | State Rule | 7.96 | 7.96 | | | | | | Natural Resource - Non-buildable |
| 207 | River Mile 9 | 421181100000 | Fee | JOHNSON | Private | State Rule | 1.08 | 1.08 | | | | | | Natural Resource - Non-buildable |
| 244 | River Mile 9 | 421182100230 | Fee | CASCADE LAND CONSERVANCY | Private | State Rule | 0.00 | 0.00 | | | | | | Natural Resource - Non-buildable |

| ID # | Project Site Name | County Assessor's Tax Parcel ID | Real Property Rights for Analysis | Ostensible Owners Last Name | Type of Ownership | State or Federal Rule (NFS Did Not Acquire for Project) | Project Real Property Land Size to be Analyzed (Est. AC) | Fee Simple Lands | Perpetual Access Road Easement, Joint Use | Perpetual Flowage Easement, Occasional Flooding | Perpetual Channel Improvement Easement | TWA Temporary 3yr Construction Easement | TWA Temporary 3yr Staging Area Easement | Apparent Project Footprint Current Land Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | Grange | 421171100050 | Road Esmt | PETZ | Private | State Rule | 0.00 | | 0.00 | | | | | Natural Resource - Ag Lands |
| 45 | Grange | 421084400030 | Fee | PETZ | Private | State Rule | 2.93 | 2.93 | | | | | | Natural Resource - Non-buildable |
| 45 | Grange | 421084400030 | Road Esmt | PETZ | Private | State Rule | 0.22 | | 0.22 | | | | | Natural Resource - Ag Lands |
| 45 | Grange | 421084400030 | Temporary Work Area Easement | PETZ | Private | State Rule | 0.21 | | | | | | 0.21 | Natural Resource - Ag Lands |
| 30 | Grange | 421172100000 | Fee | RICHERT | Private | State Rule | 0.01 | 0.01 | | | | | | Natural Resource - Non-buildable |
| 43 | Grange | 421084300000 | Fee | RICHERT | Private | State Rule | 25.56 | 25.56 | | | | | | Natural Resource - Non-buildable |
| 43 | Grange | 421084300000 | Fee | RICHERT | Private | State Rule | 1.16 | 1.16 | | | | | | Natural Resource - Non-buildable |
| 161 | Grange | 421171200000 | Fee | RICHERT | Private | State Rule | 0.57 | 0.57 | | | | | | Natural Resource - Non-buildable |
| 210 | Grange | 421172100000 | Road Esmt | RICHERT | Private | State Rule | 0.00 | | 0.00 | | | | | Rural Residential |
| 31 | Grange | 421084300050 | Fee | SYTSMA | Private | State Rule | 0.11 | 0.11 | | | | | | Natural Resource - Non-buildable |
| 36 | Grange | 421084300060 | Fee | SYTSMA | Private | State Rule | 0.58 | 0.58 | | | | | | Natural Resource - Non-buildable |
| 36 | Grange | 421084300060 | Fee | SYTSMA | Private | State Rule | 1.26 | 1.26 | | | | | | Natural Resource - Non-buildable |
| 38 | Grange | 421083400000 | Fee | KEALY | Private | State Rule | 0.61 | 0.61 | | | | | | Natural Resource - Non-buildable |
| 38 | Grange | 421083400000 | Road Esmt | KEALY | Private | State Rule | 0.05 | | 0.05 | | | | | Rural Residential |
| 38 | Grange | 421083400000 | Fee | KEALY | Private | State Rule | 0.04 | 0.04 | | | | | | Natural Resource - Non-buildable |
| 38 | Grange | 421083400000 | Temporary Work Area Easement | KEALY | Private | State Rule | 0.23 | | | | | | 0.23 | Rural Residential |
| 41 | Grange | 421084300010 | Fee | MARTIN-KEATING | Private | State Rule | 2.48 | 2.48 | | | | | | Natural Resource - Non-buildable |
| 41 | Grange | 421084300010 | Road Esmt | MARTIN-KEATING | Private | State Rule | 0.00 | | 0.00 | | | | | Natural Resource - Ag Lands |

| ID # | Project Site Name | County Assessor's Tax Parcel ID | Real Property Rights for Analysis | Ostensible Owners Last Name | Type of Ownership | State or Federal Rule (NFS Did Not Acquire for Project) | Project Real Property Land Size to be Analyzed (Est. AC) | Fee Simple Lands | Perpetual Access Road Easement, Joint Use | Perpetual Flowage Easement, Occasional Flooding | Perpetual Channel Improvement Easement | TWA Temporary 3yr Construction Easement | TWA Temporary 3yr Staging Area Easement | Apparent Project Footprint Current Land Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | Grange | 421084300010 | Fee | MARTIN-KEATING | Private | State Rule | 0.75 | 0.75 | | | | | | Natural Resource - Ag Lands |
| 41 | Grange | 421084300010 | Temporary Work Area Easement | MARTIN-KEATING | Private | State Rule | 0.11 | | | | | | 0.11 | Natural Resource - Ag Lands |
| 44 | Grange | 421083400060 | Fee | MASON COUNTY | Public - NFS | Fed Rule | 8.28 | 8.28 | | | | | | Natural Resource - Non-buildable |
| 44 | Grange | 421083400060 | Fee | MASON COUNTY | Public - NFS | Fed Rule | 0.65 | 0.65 | | | | | | Natural Resource - Non-buildable |
| 47 | Grange | 421084200000 | Fee | GREEN DIAMOND RESOURCE COMPANY | Private | State Rule | 1.36 | 1.36 | | | | | | Natural Resource - Non-buildable |
| 89 | Grange | 421088888888 | Fee | UNKNOWN | Private | State Rule | 2.19 | 2.19 | | | | | | Natural Resource - Non-buildable |
| 211 | Grange | 421083400040 | Fee | WILMUS | Private | State Rule | 5.73 | 5.73 | | | | | | Natural Resource - Non-buildable |
| 211 | Grange | 421083400040 | Fee | WILMUS | Private | State Rule | 0.71 | 0.71 | | | | | | Natural Resource - Non-buildable |
| 212 | Grange | 421083400050 | Fee | WATERMAN TRUSTEE ET AL | Private | State Rule | 5.89 | 5.89 | | | | | | Natural Resource - Non-buildable |
| 212 | Grange | 421083400050 | Fee | WATERMAN TRUSTEE ET AL | Private | State Rule | 0.34 | 0.34 | | | | | | Natural Resource - Non-buildable |
| 254 | Grange | 421084400000 | Perpetual Flowage Easement | HUNTER BROTHERS LLC | Private | State Rule | 1.87 | 1.87 | | | | | | Natural Resource - Non-buildable |
| 255 | Grange | 421084100000 | Perpetual Flowage Easement | HUNTER ET AL | Private | State Rule | 0.72 | 0.72 | | | | | | Natural Resource - Non-buildable |
| 96 | Side Channel Reconnection | 421100060000 | Road Esmt | U.S.A. IN TRUST /SKOKOMISH TRB | Indian Country - NFS | Fed Rule | 0.32 | | 0.32 | | | | | Road ROW |
| 99 | Side Channel Reconnection | 421150060000 | Road Esmt | U.S.A. IN TRUST /SKOKOMISH TRB | Indian Country - NFS | Fed Rule | 0.01 | | 0.01 | | | | | Rural Residential |
| 135 | Side Channel Reconnection | 421150060000 | Temporary Work Area Easement | U.S.A. IN TRUST /SKOKOMISH TRB | Indian Country - NFS | Fed Rule | 0.02 | | | | | | 0.02 | Rural Residential |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 153 | Side Channel Reconnection | 421151200000 | Road Esmt | U.S.A. IN TRUST /SKOKOMISH TRB | Indian Country - NFS | Fed Rule | 0.03 | | 0.03 | | | | | Road ROW |
| 156 | Side Channel Reconnection | 421151200000 | Road Esmt | U.S.A. IN TRUST /SKOKOMISH TRB | Indian Country - NFS | Fed Rule | 0.00 | | 0.00 | | | | | Road ROW |
| 179 | Side Channel Reconnection | 421150060000 | Road Esmt | U.S.A. IN TRUST /SKOKOMISH TRB | Indian Country - NFS | Fed Rule | 0.04 | | 0.04 | | | | | Road ROW |
| 182 | Side Channel Reconnection | 421142400009 | Road Esmt | U.S.A. IN TRUST /SKOKOMISH TRB | Indian Country - NFS | Fed Rule | 0.04 | | 0.04 | | | | | Natural Resource |
| 184 | Side Channel Reconnection | 421142200005 | Road Esmt | U.S.A. IN TRUST /SKOKOMISH TRB | Indian Country - NFS | Fed Rule | 0.05 | | 0.05 | | | | | Road ROW |
| 185 | Side Channel Reconnection | 421142200006 | Road Esmt | U.S.A. IN TRUST /SKOKOMISH TRB | Indian Country - NFS | Fed Rule | 0.27 | | 0.27 | | | | | Road ROW |

| ID # | Project Site Name | County Assessor's Tax Parcel ID | Real Property Rights for Analysis | Ostensible Owners Last Name | Type of Ownership | State or Federal Rule (NFS Did Not Acquire for Project) | Project Real Property Land Size to be Analyzed (Est. AC) | Fee Simple Lands | Perpetual Access Road Easement, Joint Use | Perpetual Flowage Easement, Occasional Flooding | Perpetual Channel Improvement Easement | TWA Temporary 3yr Construction Easement | TWA Temporary 3yr Staging Area Easement | Apparent Project Footprint Current Land Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 186 | Side Channel Reconnection | 421142200005 | Road Esmt | U.S.A. IN TRUST /SKOKOMISH TRB | Indian Country - NFS | Fed Rule | 0.16 | | 0.16 | | | | | Road ROW |
| 107 | Side Channel Reconnection | 421142300000 | Road Esmt | SKOKOMISH INDIAN TRIBE | Indian Country - NFS | Fed Rule | 0.20 | | 0.20 | | | | | Natural Resource |
| 119 | Side Channel Reconnection | 421154100000 | Channel Improvement Easement | SKOKOMISH INDIAN TRIBE | Indian Country - NFS | Fed Rule | 0.28 | | | | 0.28 | | | Natural Resource |
| 119 | Side Channel Reconnection | 421154100000 | Road Esmt | SKOKOMISH INDIAN TRIBE | Indian Country - NFS | Fed Rule | 0.05 | | 0.05 | | | | | Natural Resource |
| 174 | Side Channel Reconnection | 421104000000 | Road Esmt | SKOKOMISH INDIAN TRIBE | Indian Country - NFS | Fed Rule | 0.16 | | 0.16 | | | | | Road ROW |
| 100 | Side Channel Reconnection | 421152200050 | Channel Improvement Easement | VANOVERBEKE | Private | State Rule | 0.72 | | | | 0.72 | | | Rural Residential |
| 100 | Side Channel Reconnection | 421152200050 | Road Esmt | VANOVERBEKE | Private | State Rule | 0.06 | | 0.06 | | | | | Rural Residential |
| 101 | Side Channel Reconnection | 421152100080 | Channel Improvement Easement | VANOVERBEKE | Private | State Rule | 0.56 | | | | 0.56 | | | Rural Residential |
| 102 | Side Channel Reconnection | 421152400010 | Channel Improvement Easement | TRAUTNER | Private | State Rule | 0.77 | | | | 0.77 | | | Natural Resource |
| 103 | Side Channel Reconnection | 421152100070 | Channel Improvement Easement | TWIDDY | Private | State Rule | 0.78 | | | | 0.78 | | | Rural Residential |
| 136 | Side Channel Reconnection | 421159999999 | Temporary Work Area Easement | UNKNOWN | Private | State Rule | 0.02 | | | | | | 0.02 | Natural Resource |
| 158 | Side Channel Reconnection | 421151200010 | Road Esmt | UNKNOWN | Private | State Rule | 0.02 | | 0.02 | | | | | Road ROW |
| 176 | Side Channel Reconnection | 421100060010 | Road Esmt | STATE OF WASHINGTON | Public - NFS | Fed Rule | 0.00 | | 0.00 | | | | | Road ROW |
| 178 | Side Channel Reconnection | 421151100000 | Road Esmt | STROBEL | Private | State Rule | 0.09 | | 0.09 | | | | | Road ROW |

| ID # | Project Site Name | County Assessor's Tax Parcel ID | Real Property Rights for Analysis | Ostensible Owners Last Name | Type of Ownership | State or Federal Rule (NFS Did Not Acquire for Project) | Project Real Property Land Size to be Analyzed (Est. AC) | Fee Simple Lands | Perpetual Access Road Easement, Joint Use | Perpetual Flowage Easement, Occasional Flooding | Perpetual Channel Improvement Easement | TWA Temporary 3yr Construction Easement | TWA Temporary 3yr Staging Area Easement | Apparent Project Footprint Current Land Use |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 188 | Side Channel Reconnection | 421140060010 | Road Esmt | MASON COUNTY | Public - NFS | Fed Rule | 0.35 | | 0.35 | | | | | Road ROW |
| | | | | Sub-Totals | | | 238.16 | 222.78 | 5.67 | 0.00 | 3.11 | 4.93 | 1.67 | |
| | Various Key Project Design Elements of Five Sites: Deconstruct existing , 3 side channel or tributary restorations, placement of large woody debris (LWD) in upstream reaches of river | | | | | | | | | | | | | |
| | and construct 2 wetland embankments to improve habitat connectivity in the floodplain, improving habitat quality, river function, & water quality. | | | | | | | | | | | | | |
| | Extraordinary Assumption: The attached Project Real Estate mapping dated 3 FEB 2015 is correct and the best data available; mapping locations, estates, acreages, ownerships, etc. | | | | | | | | | | | | | |
| | Extraordinary Assumption: The Project may create "legal non-conforming lots", if the land was buildable prior to the Federal Project, the land/lots will be "buildable" after the Project construction. | | | | | | | | | | | | | |
| | Extraordinary Assumption: The public roads including the previously Federal funded Road Restoration Project USFW #13410-7-J005, that are primitive roads and maybe seasonally passable, will be adequately developed and maintained for Project construction use and perpetual year-round O&M. | | | | | | | | | | | | | |
| | Extraordinary Assumption: That the proposed Project design will not cause additional and/or atypical flooding damages to the adjoining properties. | | | | | | | | | | | | | |
| | Hypothetical Condition: Lacking title information, this appraisal scenario assumes the Washington State Department of Natural Resources (DNR) owns the aquatic lands as identified and will become a NFS, providing the lands for this Federal Project. | | | | | | | | | | | | | |
| | Hypothetical Condition: Based on an "As-Clean" condition with no significant hazardous materials/contamination due to previous and/or adjacent land uses. | | | | | | | | | | | | | |

# EXHIBIT B

# WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES (WDNR) CORRESPONDENCE

WASHINGTON STATE DEPARTMENT OF
**Natural Resources**
Peter Goldmark · Commissioner of Public Lands

**EXHIBIT B**

Caring for
your natural resources
... now and forever

January 29, 2015

Diane B. Hintz, Realty Specialist
US Army Corp. of Engineers, Seattle District
PO Box 3755
Seattle, WA 98124-3755

Subject: Skokomish River Large Woody Debris Placement at Miles 9-11

Dear Mrs. Hintz:

Thank You for the opportunity to provide comments on the project located at river miles 9-11 on the Skokomish South Fork, Mason County, Washington.

The Department of Natural Resources (DNR) is steward of Washington's aquatic lands and their resources. Aquatic lands are managed for current and future citizens of the state to sustain long-term ecosystem and economic vitality, and to ensure access to the aquatic lands and the benefits derived from them. Washington DNR's management authority derives from the State's Constitution (Articles XV, XVII, XXVII), Revised Code (RCW 79.02 and 79.105) and Administrative Code (WAC 332-30). As proprietary manager of state-owned aquatic lands, DNR has been directed to manage the lands "...for the benefit of the public" in a manner that provides "...a balance of public benefits for all citizens of the state" that includes"

Encouraging direct public use and access

Fostering water-dependent uses

Ensuring environmental protection, and

Utilizing renewable resources.

In addition, generating revenue in a manner consistent with subsections 1) through 4) of this section is a public benefit (RCW 79.105.030).

**EXHIBIT B**



DNR has completed a preliminary review of your project. The project is located on bedlands of the Skokomish River owned by the State of Washington and managed by DNR. The Department has reviewed the Project Partnership Agreement (PPA) and agrees that the PPA is the appropriate use authorization for this project.

I am available to meet with regulatory agencies to discuss the proposal in an effort to meet mutual goals while avoiding unnecessary expense or delays in the review of project proposals. Please do not hesitate to call me at 360-584-8103 or email me at shannon.soto@dnr.wa.gov should you need additional information, or to arrange a meeting.

DNR reserves the right to comment on future amendments and revisions to this proposal.

Sincerely,

Donna Bernbe for

Shannon Soto, Land Manager

c: Mason County Conservation District
District File

# EXHIBIT C

# ASSESSMENT OF NON-FEDERAL SPONSOR REAL ESTATE ACQUISITION CAPABILITY

**EXHIBIT C**

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

# SKOKOMISH RIVER BASIN ECOSYSTEM RESTORATION GENERAL INVESTIGATION PROJECT

## ASSESSMENT OF NON-FEDERAL SPONSOR'S REAL ESTATE ACQUISITION CAPABILITY

Mason County

I. **Legal Authority:**

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? **YES**

b. Does the sponsor have the power of eminent domain for this project? **YES but do not plan to use it for the project.**

c. Does the sponsor have "quick-take" authority for this project? **YES but do not plan to use it for the project.**

d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundary? **YES**

e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? **YES**

II. **Human Resources Requirements:**

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended? **NO**

b. If the answer to II.a. is "yes," has a reasonable plan been developed to provide such training? **N/A**

c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? **YES**

d. Is the sponsor's projected in-house staff level sufficient considering its other work load, if any, and the project schedule? **YES**

e. Can the sponsor obtain contractor support, if required, in a timely fashion? **YES**

f. Will the sponsor likely request USACE assistance in acquiring real estate? **NO** (If "yes," provide description).

III. **Other Project Variables:**

**EXHIBIT C**

a. Will the sponsor's staff be located within reasonable proximity to the project site? **YES**

b. Has the sponsor approved the project/real estate schedule/milestones? **YES**

Sections I, II, III prepared by:

Catherine Bennett
Catherine Bennett, ARWP
Right of Way Agent

Sections I, II, III reviewed/approved by NFS

Brian K. Matthews, PE
Director

---

***Sections IV/V to be completed jointly by NFS and USACE Real Estate Specialist***

IV. **Overall Assessment:**

a. Has the sponsor performed satisfactorily on other USACE projects?
YES/NO NA → no prior projects

b. With regard to this project, the sponsor is anticipated to be:

___ Highly capable
X Fully capable → very responsive during project
___ Moderately capable
___ Marginally capable
___ Insufficiently capable. (If sponsor is believed to be "insufficiently capable" provide explanation).

V. **Coordination:**

a. Has this assessment been coordinated with the sponsor? (YES)/NO

b. Does the sponsor concur with this assessment? (YES)/NO
(If "no," provide explanation).

Prepared by:

Diane B. Hintz
Diane B. Hintz
Realty Specialist

02/20/2015
Date

Reviewed and approved by:

FOR Christopher D. Borton
Chief, Real Estate Division

02/20/2015
Date

EXHIBIT C

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

# SKOKOMISH RIVER BASIN ECOSYSTEM RESTORATION GENERAL INVESTIGATION PROJECT

## ASSESSMENT OF NON-FEDERAL SPONSOR'S REAL ESTATE ACQUISITION CAPABILITY

Skokomish Tribe

I. **Legal Authority:**

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? YES

b. Does the sponsor have the power of eminent domain for this project? YES

c. Does the sponsor have "quick-take" authority for this project? NO

d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundary? YES

e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? YES

II. **Human Resources Requirements:**

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended? YES

b. If the answer to II.a. is "yes," has a reasonable plan been developed to provide such training? NO

c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? YES

d. Is the sponsor's projected in-house staff level sufficient considering its other work load, if any, and the project schedule? YES

e. Can the sponsor obtain contractor support, if required, in a timely fashion? YES

f. Will the sponsor likely request USACE assistance in acquiring real estate? NO (If "yes," provide description).

III. **Other Project Variables:**

**EXHIBIT C**

a. Will the sponsor's staff be located within reasonable proximity to the project site? **YES**

b. Has the sponsor approved the project/real estate schedule/milestones? **YES**

| | |
|---|---|
| Sections I, II, III prepared by:<br>Joseph Pavel, Director<br>Skokomish Dept. Natural Resources | Sections I, II, III reviewed/approved by NFS<br>Joseph Pavel, Director<br>Skokomish Dept. Natural Resources |
| ______________________<br>Name of Preparer<br>Title of Preparer | Joseph Pavel<br>Name of NFS Signatoree<br>Title of NFS Signatoree |

***Sections IV/V to be completed jointly by NFS and USACE Real Estate Specialist***

IV. **Overall Assessment:**

a. Has the sponsor performed satisfactorily on other USACE projects?
**(YES)/NO** Estuary Restoration project.

b. With regard to this project, the sponsor is anticipated to be:
- X Highly capable
- ___ Fully capable
- ___ Moderately capable
- ___ Marginally capable
- ___ Insufficiently capable. (If sponsor is believed to be "insufficiently capable" provide explanation).

V. **Coordination:**

a. Has this assessment been coordinated with the sponsor? **(YES)/NO**

b. Does the sponsor concur with this assessment? **(YES)/NO**
(If "no," provide explanation).

Prepared by:

Diane B. Hintz      2/20/2015
Diane B. Hintz      Date
Realty Specialist

Reviewed and approved by:

     2/20/2015
FOR Christopher D. Borton      Date
Chief, Real Estate Division

# EXHIBIT D

# DRAFT CERTIFICATION OF LANDS, ATTORNEY'S CERTIFICATE AND THIRD PARTY RISK ANALYSIS

# CERTIFICATION OF LANDS

DATE

Department of the Army
Seattle District, Corps of Engineers
ATTN: Real Estate Division
Post Office Box 3755
Seattle, Washington 98124-3755

RE: Certification of Lands and Authorization for Entry for ________________________Project

Dear Sir:

By Project Cooperation Agreement dated the ____________ day of ___________________ 201__, ____________________________assumed full responsibility to fulfill the requirements of non-federal cooperation as specified therein and in accordance with the Water Resources Development Act of 1986, as amended.

This is to certify that ____________________has sufficient title and interest in the lands hereinafter shown on Exhibit A, attached, in order to enable _________________ comply with the aforesaid requirements of non-federal cooperation.

Said lands and/or interest therein are owned or have been acquired by_________________ _____, and are to be used for the construction, maintenance and operation of the above referenced project and include but are not limited to the following specifically enumerated rights and uses, except as hereinafter noted:

**Fee** – The fee simple title to (the land described in Schedule A) (Tracts Nos. ,and ), Subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

**Perpetual Road Easement** -- A perpetual exclusive easement and right-of-way in, on, over and across the land described in Exhibit A for the location, construction, operation, maintenance, alteration, replacement of roads and appurtenances thereto; together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions and other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the owners, their heirs and assigns, the right to cross over or under the right-of-way as access to their adjoining land at the locations indicated in Exhibit A subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines

**<u>Temporary Work Area Easement --</u>** A temporary easement and right-of-way in, on, over and across the land described in Exhibit A for a period not to exceed _______(___) years, beginning with date of possession of the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a work area, including the right to borrow and/or deposit fill, spoil and waste material thereon, move store and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the _______________________, together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

**<u>Perpetual Channel Improvement Easement</u>** -- A perpetual and assignable right and easement to construct, operate, and maintain channel improvement works on, over, and across (the land described in Schedule A) (Tracts Nos. ____, ______, and ________) for the purposes as authorized by the Act of Congress approved _______________, including the right to clear, cut, fell, remove, and dispose of any and all timber, trees, underbrush, buildings, improvements, and/or other obstructions therefrom; to excavate, dredge, cut away, and remove any or all of said land and to place thereon dredge or spoil material; and for such other purposes as may be required in connection with said work of improvement; reserving, however, to the owners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads, and pipelines.

**<u>Perpetual Flowage Easement *(Occasional Flooding)*</u>** – The perpetual right, power, privilege and easement occasionally to overflow, flood and submerge the land described in Exhibit A in connection with the operation and maintenance of the project as authorized by the Act of Congress approved _________________________________, together with all right, title and interest in and to the structure; and improvements now situated on the land, except fencing (and also excepting _________________________ (here identify those structures not designed for human habitation which the District Engineer determines may remain on the land)); provided that no structures for human habitation shall be constructed or maintained on the land, that no other structures shall be constructed or maintained on the land except as may be approved in writing by the representative of the United States in charge of the project, and that no excavation shall be conducted and no landfill placed on the land without such approval as to the location and method of excavation and or placement of landfill; the above estate is taken subject to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used and enjoyed without interfering with the use of the project for the purposes authorized by Congress or abridging the rights and easement hereby acquired; provided further that any use of the land shall be subject to Federal and State laws with respect to pollution.

________________________________does hereby grant to the United States of America, its representatives, agents and contractors, an irrevocable right, privilege and permission to enter upon the lands hereinbefore mentioned for project purposes.

________________________________certifies to the United States of America that any lands acquired subsequent to the execution of the Project Cooperation Agreement that are necessary for this project have been accomplished in compliance with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (Public Law 91-646) as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR, Part 24.

__________________NFS______________________

By: ____________________________________ DATE: _______________________

*****

## ATTORNEY'S CERTIFICATE

I, ________________________________, an attorney admitted to practice law in the State of Washington, certify that:

I am the attorney for the __________________________________________.

I have examined the title to __________________________________________[Parcel #] of land identified by the U.S. Army Corps of Engineers as needed for the ____________________ _________Project and included in the Certification of Lands and Authorization For Entry document to which this Certificate is appended.

_______________________________________________is vested with sufficient title and interest in the described lands required by the United States of America to support the construction, operation, and maintenance of the ________________________________________ Project.

There [ ] are (see attached risk analysis) [ ] are no outstanding third party interests of record that could defeat or impair the title and interests of _____________in and to the lands described, or interfere with construction, operation, and maintenance of the Project. Such interests include, but are not limited to, public roads and highways, public utilities, railroads, pipelines, other public and private rights of way, liens and judgments. To the extent such interests existed prior to acquisition of the described lands by ________________such interests have either been cleared or subordinated to the title and interests so acquired.

__________has authority to grant the Certification of Lands and Authorization For Entry to which this Certificate is appended; that said Certification of Lands and authorization for entry is executed by the proper duly authorized authority; and that the authorization for entry is in sufficient form to grant the authorization therein stated.

DATED AND SIGNED at ____________________________, this ____ day of __________ 201__.

___________________________________

NAME
TITLE

*****

# RISK ANALYSIS FOR OUTSTANDING THIRD PARTY INTERESTS

RE: Certification of Lands and Authorization for Entry for ____________________________Project

There are outstanding third party interests of record in and to the lands required for the Project. An evaluation of those interests is as follows:

1. **IDENTIFICATION OF THIRD PARTY INTERESTS**:

2. **ASSESSMENT:** (Discuss whether the exercise of that interest is likely to physically impair the Project. Discuss the legal implications if the interest is not cleared or subordinated. Discuss the practical impediments to the exercise of the interest such as any required permits, land use restrictions, or compensation.)

3. **PLAN TO RESOLVE:** (Discuss recourse available to protect the Project in the event the outstanding interest is exercised).

*Signed:*

______________________________ DATE ________________________

NAME
TITLE

# SKOKOMISH RIVER BASIN
# MASON COUNTY, WASHINGTON
# ECOSYSTEM RESTORATION

## APPENDIX K

## COST ESTIMATE

## Integrated Feasibility Report and Environmental Impact Statement

US Army Corps of Engineers®
Seattle District

**APPENDX K – COST ENGINEERING**

**Skokomish River Basin Ecosystem Restoration**
**Integrated Feasibility Report / Environmental Impact Statement**

# INTRODUCTION

The purpose of this appendix is to document and present the detailed cost estimate prepared in support of the Skokomish River Basin Feasibility Study. The Skokomish River Basin is located on Hood Canal, a natural fjord-like arm of the Puget Sound and water of national significance. The Skokomish River is the largest source of freshwater to Hood Canal as it flows into Annas Bay and of critical importance in the overall health of Hood Canal. The Skokomish Tribe and Mason County are the local sponsors partnering with the U.S. Army Corps of Engineers for this project.

# RECOMMENDED PLAN

### DEVELOPMENT

Project scope for the recommended plan was developed by the PDT during the alternative and feasibility phases. Changes were made throughout the development of the Feasibility Phase, including significant reductions in feature scope. The primary focus of the Cost Engineering team was to develop a baseline cost estimate, comprehensive risk analysis, and project schedule.

The cost estimate package was developed in accordance with the requirements laid out in ER 1110-2-1302 "Civil Works Cost Engineering." Specifically, the estimate was developed to a Class 3 level in order to comply with the requirements for a budget estimate that can be used for authorization.

The recommended plan for ecosystem restoration includes removal of a levee near the confluence of the North and South Forks of the Skokomish River to allow for year-round fish passage, installation of large woody debris and engineered logjams, a side channel reconnection, and wetland restoration at two sites. This plan reasonably maximizes environmental benefits considering cost effectiveness and incremental cost analyses, significance of outputs, completeness, efficiency, effectiveness and acceptability. A more detailed discussion of project features included in the recommended plan is included in the Feasibility Report/Environmental Impact Statement (FR/EIS) and Engineering Appendix.

# FEASIBILITY COST ENGINEERING

### PRICE LEVEL

The three categories of cost contained in the Total Project Cost Summary (TPCS) are "Estimated Cost," "Project First Cost," and "Total Project Cost." The estimated cost, which is the cost calculated in MCACES (MII), is based on a price level of October 2014. The Project First Cost, or in other words the value the project is actually authorized at, is set at October 2015. Lastly, the date point of the Total Project Cost which is the cost the government will pay at the midpoint of construction for each alternative.

Escalation is based on the September 2014 Civil Works Construction Cost Index System (CWCCIS), EM 1110-2-1304.

The cost of the recommended plan is considered fair and reasonable, provided the construction is done by a prudent and well equipped contractor.

**COST ESTIMATE STRUCTURE**

The cost estimate for the selected plan was prepared by the Cost Engineering Section within Seattle District. The overall structure of the cost estimate is dictated by the Civil Works – Work Breakdown Structure. This structure is followed down to the sub-feature level (e.g. feature 11 Levees and Floodwalls, followed by sub-feature 1101 Levees.) The remainder of the estimate structure is based on the expected construction methodology and phasing techniques as determined by the PDT. Note that all construction work for this project occurs under CWWBS account 06 Fish and Wildlife Facilities, and sub-account Wildlife Facilities and Sanctuaries.

Project features in the total project cost summary (TPCS) are in accordance with the CWWBS.

Contingencies are added to the cost estimates in the TPCS based on the results of the cost and schedule risk analysis performed on November 20, 2014 and refined on August 5, 2015. The contingencies for each increment and base were calculated separately and are included as an attachment to this appendix.

Escalation factors to the Effective Price Level Date and the Fully Funded Project Estimate Amount through the end of construction have also been included as part of the TPCS. The inflation was based on an assumed authorization date of October 2015.

**ESTIMATING SCOPE METHODOLOGY**

*Features of Work*

As described above, the recommended plan for ecosystem restoration includes removal of a levee near the confluence of the North and South Forks of the Skokomish River to allow for year-round fish passage, installation of large woody debris and engineered logjams, a side channel reconnection, and wetland restoration at two sites. A more detailed discussion of project features included in the recommended plan follows:

Large Woody Debris (LWD):

This plan component includes placement and installation of LWD in the river channel throughout two miles of river at the upstream end of the study area. This work will be done in a variety of arrangements including single logs secured with boulders, 5-log channel clusters, and larger bar apex engineered logjams that are secured by wooden piles. These placements are not close to a staging area, and will require double handling in order to be placed in their current locations.

Levee Breaches and Removal:

This plan component includes removal of the 5,400-foot long Confluence Levee in the vicinity of the North Fork and South Fork confluence and diversion of flow from the South Fork into the North Fork through a small diversion channel. Engineered logjams installed at the diversion will aid in directing flows to the North Fork channel and will provide fish habitat. This work will occur through the use of mechanical excavation, with haul to an off-site disposal point. At this time commercial disposal is assumed to be available within 15 miles from the staging area. Depending on the location of the levee, off-road dump trucks and multiple handlings of material will be used.

Wetland Restoration:
Two wetland restoration sites - River Mile 9 and Grange – are included in the recommended plan. An existing agricultural berm will be breached and a new wetland embankment will be constructed landward (south) varying distances. Wetland embankments are expected to be constructed with commercially purchased material, prior to the removal of existing agricultural berms. All wetland embankments will have some overexcavation, and material placement is assumed to occur in six inch lifts of soil. Placement will be done by mechanical excavator, with support from bull dozers and compactors. Top soil and hydroseed will be placed on the newly constructed wetland embankments. Similar to the removed berms and confluence levee removal, some locations will require the use of off-road dump trucks and multiple handlings of material. Purchased fill is currently assumed, however the risk analysis process considers the possibility of material provided by other sources. Elsewhere in the FR/EIS, wetland embankments are referred to as "Wetland Restoration," due to their larger ecosystem benefits. In order to better document their specific construction requirements, these structures are referred to as "Setback Levees" in this appendix.

Side Channel Reconnection:
This plan component involves excavation of a historical side channel's inlet and outlet, allowing the mainstem of the Skokomish River to be reconnected to a large wetland area. Significant effort will need to be made in order to get access to the reconnection. Roads out to the work area are in poor condition and will require significant improvement. Other work will include excavation at the inlet and outlet, placement of log clusters, and plantings throughout the restored area.

*Estimating Techniques*
The majority of the cost items used in the estimate are custom crews based on local labor costs and equipment from the most recent EP 1110-1-8 available for Region VIII. Production rate calculations were done for individual tasks. Vendor quotes for material were obtained assist in determining appropriate costs, and these were evaluated against historical precedent and engineering judgment.

Smaller cost items were estimated through the use of the MII English Costbook. Appropriate care was taken to evaluate costs with consideration for site remoteness and the ease of access for the feature of work.

With regard to overtime, it is currently assumed the contractor will follow a six day per week and ten hours per day schedule. The suitability of this may change based on the feature of work, and will be reevaluated during PED. However, longer hours will likely require site lighting, but more importantly, additional hours will start to impact crew production rates and would likely increase project costs.

The overall production rate for the project was not adjusted. Instead individual tasks were evaluated and modified as necessary. This gives a more exact understanding of the project cost and schedule. However, the risk of large scale impacts to the project's efficiency is evaluated within the Cost Risk Analysis.

**PROJECT ACQUISITION STRATEGY**

Assumptions were made regarding the project acquisition strategy at this phase of design. Proposal evaluation is estimated to be Best Value not low bidder. While the construction cost estimated to be less than $20M, the project is estimated to be awarded in multiple contract actions through the use of small business or otherwise restricted bidding. With the general scope of this work, it is a reasonable assumption that this project could be a small business targeted project. The risks involved with more restricted bidding strategies are captured in the risk analysis under the Acquisition category.

**CONTRACTOR AND INDIRECT COST CONSIDERATIONS**

The cost estimator assumed the work is done by a sub contractor which performs the major features of project work. Administration and general work will be accomplished by the prime contractor. This arrangement makes for two levels of contracting and two levels of markup costs (job office overhead, home office overhead, profit, bond, and B&O tax) for most features of the project.

The mark ups used for the Prime and Sub contractor are included as an attachment to this appendix.

**PLANNING, ENGINEERING, AND DESIGN**

The Planning, Engineering and Design (PED) costs are costs to develop the project from the point the project is approved, to when solicitation is completed. This work includes detailed surveys, soil investigations and preparation of the plans and specifications to guide the contractor to construct the project. These costs were estimated by PDT members with their best professional judgment for the level of effort that would be required.

**CONSTRUCTION MANAGEMENT**

The Construction Management (CM) costs are determined as a percent of the estimated construction costs. As with the PED costs this percentage was determined through discussions with the PDT and are included in the TPCS reports for each Alternative.

**CONTINGENCY**

Current regulations require formal analyses of schedule and costs risks for projects over $40 million. However, the cost of this project does not exceed that limit, and an abbreviated risk analysis was done. This process is still intended to capture all significant cost and schedule risks for the project. The risk register is available as an attachment to this appendix.

Contingency for 01 Real Estate costs was determined by Real Estate personnel and contingency for PED and CM costs was determined in consultation with the Project Manager.

The purpose of contingencies is an added cost included in the cost estimate to cover unknowns. Unknowns could include:

- Variations in quantities used for levees and earthwork construction
- Imperfections related to current survey data
- Variations in production rates for different features
- Material availability and locations

**PROJECT SCHEDULE**

The project schedule for major feature was developed by the cost engineer based on MII calculated durations. Sequencing for the project was based on discussions with the PDT. The project schedule is attached to this appendix. Per discussions with the team biologist there is a presumed construction window of 15 Jul to 15 Sep for all in water work based on an estimated fish window for the river basin. This scheduling consideration was applied to the construction schedules for the recommended plan to provide the most accurate project duration prediction possible at this level of design.

**FINAL FEASIBILITY ESTIMATE**

The final feasibility cost estimate as presented in the following Total Project Cost Summary (TPCS) for is as follows:

Cost of Skokomish River Basin Ecosystem Restoration
Mason County, Washington
2015 Feasibility Report / Environmental Impact Statement

FY 2016 Price Level $19,664,000
Fully Funded Amount $21,712,000

**ATTACHMENTS**

CW MCX CERTIFIED TPCS
PROJECT SCHEDULE
MCACES REPORT
CSRA RISK REGISTER

**NOTES: NAMING CONVENTIONS**

Naming conventions for some features included in the recommended plan have evolved over time. The table below indicates the naming conventions used in the Final FR/EIS compared to those presented in this appendix.

| FR/EIS Naming Convention | Cost Engineering Appendix Naming Convention |
|---|---|
| Confluence Levee Removal | Car Body Levee Removal |
| Upstream Large Woody Debris Installation | Upstream LWD |
| Wetland Restoration at River Mile 9 | RM 9 Levee Breach & Setback |
| Wetland Restoration at Grange | Grange Levee Setback |
| Side Channel Reconnection | River Mile 5 Reconnection |

# WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

## COST AGENCY TECHNICAL REVIEW

## CERTIFICATION STATEMENT

For Project No. 394832

NWS – Skokomish River Basin Feasibility Study

The Skokomish River Basin Feasibility Study, as presented by Seattle District, has undergone a successful Cost Agency Technical Review (Cost ATR), performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of August 11, 2015, the Cost MCX certifies the estimated total project cost of:

| | |
|---|---|
| FY 16 Price Level: | $19,664,000 |
| Fully Funded Amount: | $21,712,000 |

It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management throughout the life of the project.

CALLAN.KIM.C.1231558221

Digitally signed by CALLAN.KIM.C.1231558221
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=CALLAN.KIM.C.1231558221
Date: 2015.08.11 13:29:56 -07'00'

For **Kim C. Callan, PE, CCE, PM**
**Chief, Cost Engineering MCX**
**Walla Walla District**

**** TOTAL PROJECT COST SUMMARY ****

Printed:8/11/2015
Page 1 of 6

**PROJECT:** **Skokomish River Basin Feasibility Study**
PROJECT NO: 394832
LOCATION: Skokomish River Basin, Washington

DISTRICT: NWS Seattle PREPARED: 4/27/2015
POC: CHIEF, COST ENGINEERING, John Dudgeon

This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

| Civil Works Work Breakdown Structure | | ESTIMATED COST | | | | PROJECT FIRST COST (Constant Dollar Basis) | | | | | | TOTAL PROJECT COST (FULLY FUNDED) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Program Year (Budget EC): 2016<br>Effective Price Level Date: 1 OCT 15 | | | | | | | | | |
| WBS NUMBER<br>A | Civil Works Feature & Sub-Feature Description<br>B | COST ($K)<br>C | CNTG ($K)<br>D | CNTG (%)<br>E | TOTAL ($K)<br>F | ESC (%)<br>G | COST ($K)<br>H | CNTG ($K)<br>I | TOTAL ($K)<br>J | Spent Thru: 10/1/2014 ($K) | TOTAL FIRST COST ($K) | ESC (%) | COST ($K)<br>M | CNTG ($K)<br>N | FULL ($K)<br>O |
| **06** | FISH & WILDLIFE FACILITIES | $8,595 | $4,211 | 49% | $12,806 | 1.5% | $8,720 | $4,273 | $12,992 | $0 | $12,992 | 8.9% | $9,496 | $4,653 | $14,149 |
| **06** | Monitoring | $277 | $97 | 35% | $374 | 2.3% | $283 | $99 | $383 | $0 | $383 | 28.7% | $365 | $128 | $492 |
| **06** | Adapative Management | $85 | $42 | 49% | $127 | 1.5% | $87 | $42 | $129 | $0 | $129 | 8.9% | $94 | $46 | $141 |
| | **CONSTRUCTION ESTIMATE TOTALS:** | $8,957 | $4,350 | | $13,307 | 1.5% | $9,090 | $4,414 | $13,504 | $0 | $13,504 | 9.5% | $9,955 | $4,827 | $14,782 |
| **01** | LANDS AND DAMAGES | $1,467 | $220 | 15% | $1,687 | 1.5% | $1,488 | $223 | $1,711 | $0 | $1,711 | 4.7% | $1,557 | $234 | $1,791 |
| **30** | PLANNING, ENGINEERING & DESIGN | $1,713 | $832 | 49% | $2,545 | 2.3% | $1,752 | $851 | $2,604 | $0 | $2,604 | 13.2% | $1,983 | $963 | $2,946 |
| **31** | CONSTRUCTION MANAGEMENT | $1,214 | $590 | 49% | $1,804 | 2.3% | $1,242 | $603 | $1,846 | $0 | $1,846 | 18.9% | $1,477 | $717 | $2,194 |
| | **PROJECT COST TOTALS:** | $13,351 | $5,992 | 45% | $19,343 | | $13,572 | $6,092 | **$19,664** | $0 | **$19,664** | 10.4% | $14,972 | $6,741 | $21,712 |

__________ CHIEF, COST ENGINEERING, John Dudgeon

__________ PROJECT MANAGER, Rachel Mesko

__________ CHIEF, REAL ESTATE, Chris Borton

__________ CHIEF, PLANNING, Valerie Ringold

__________ CHIEF, ENGINEERING, JoAnn Walls

__________ CHIEF, OPERATIONS, Elizabeth Coffey

__________ CHIEF, CONSTRUCTION, Arill Berg

__________ CHIEF, CONTRACTING, David Williams

__________ CHIEF, PPMD & DDEPM, Olton Swanson

| | | |
|---|---|---|
| ESTIMATED FEDERAL COST: | **65%** | **$14,113** |
| ESTIMATED NON-FEDERAL COST: | **35%** | **$7,599** |
| **ESTIMATED TOTAL PROJECT COST:** | | **$21,712** |

**ANNUAL O&M ESTIMATE (LOCAL SPONSOR)___ $10**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: **Skokomish River Basin Feasibility Study**
LOCATION: Skokomish River Basin, Washington
This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

DISTRICT: NWS Seattle
POC: CHIEF, COST ENGINEERING, John Dudgeon
PREPARED: 4/27/2015

| Civil Works Work Breakdown Structure | | ESTIMATED COST | | | | PROJECT FIRST COST (Constant Dollar Basis) | | | | TOTAL PROJECT COST (FULLY FUNDED) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate Prepared: | | | 1-Oct-14 | Program Year (Budget EC): | | | 2016 | | | | | |
| | | Effective Price Level: | | | 1-Oct-14 | Effective Price Level Date: | | | 1 OCT 15 | | | | | |
| | | | | RISK BASED | | | | | | | | | | |
| WBS NUMBER | Civil Works Feature & Sub-Feature Description | COST ($K) | CNTG ($K) | CNTG (%) | TOTAL ($K) | ESC (%) | COST ($K) | CNTG ($K) | TOTAL ($K) | Mid-Point Date | ESC (%) | COST ($K) | CNTG ($K) | FULL ($K) |
| *A* | *B* | *C* | *D* | *E* | *F* | *G* | *H* | *I* | *J* | *P* | *L* | *M* | *N* | *O* |
| | **Upstream LWD** | | | | | | | | | | | | | |
| **06** | FISH & WILDLIFE FACILITIES | $2,789 | $1,366 | 49% | $4,155 | 1.5% | $2,829 | $1,386 | $4,216 | 2020Q3 | 8.9% | $3,081 | $1,510 | $4,591 |
| **06** | Monitoring | $89 | $31 | 35% | $120 | 2.3% | $91 | $32 | $123 | 2022Q3 | 28.7% | $117 | $41 | $158 |
| **06** | Adaptive Management | $28 | $14 | 49% | $42 | 1.5% | $28 | $14 | $42 | 2020Q3 | 8.9% | $31 | $15 | $46 |
| | **CONSTRUCTION ESTIMATE TOTALS:** | $2,906 | $1,411 | 49% | **$4,317** | | $2,949 | $1,432 | $4,381 | | | $3,229 | $1,566 | $4,795 |
| **01** | LANDS AND DAMAGES | $358 | $54 | 15% | $412 | 1.5% | $363 | $54 | $418 | 2018Q3 | 4.7% | $380 | $57 | $437 |
| **30** | PLANNING, ENGINEERING & DESIGN | | | | | | | | | | | | | |
| *0.8%* | Project Management | $24 | $12 | 49% | $36 | 2.3% | $25 | $12 | $37 | 2018Q3 | 9.9% | $27 | $13 | $41 |
| *0.4%* | Planning & Environmental Compliance | $12 | $6 | 49% | $18 | 2.3% | $13 | $6 | $19 | 2018Q3 | 9.9% | $14 | $7 | $21 |
| *7.7%* | Engineering & Design | $223 | $108 | 49% | $332 | 2.3% | $228 | $111 | $339 | 2018Q3 | 9.9% | $251 | $122 | $373 |
| *2.2%* | Reviews, ATRs, IEPRs, VE | $65 | $32 | 49% | $96 | 2.3% | $66 | $32 | $99 | 2018Q3 | 9.9% | $73 | $35 | $108 |
| *0.3%* | Life Cycle Updates (cost, schedule, risks) | $8 | $4 | 49% | $12 | 2.3% | $8 | $4 | $12 | 2018Q3 | 9.9% | $9 | $4 | $14 |
| *0.7%* | Contracting & Reprographics | $19 | $9 | 49% | $29 | 2.3% | $20 | $10 | $30 | 2018Q3 | 9.9% | $22 | $11 | $33 |
| *5.0%* | Engineering During Construction | $145 | $71 | 49% | $216 | 2.3% | $149 | $72 | $221 | 2020Q3 | 18.9% | $177 | $86 | $263 |
| *2.0%* | Planning During Construction | $58 | $28 | 49% | $86 | 2.3% | $59 | $29 | $88 | 2020Q3 | 18.9% | $71 | $34 | $105 |
| *0.0%* | Project Operations | $0 | $0 | 49% | $0 | 0.0% | $0 | $0 | $0 | 0 | 0.0% | $0 | $0 | $0 |
| **31** | CONSTRUCTION MANAGEMENT | | | | | | | | | | | | | |
| *10.6%* | Construction Management | $307 | $149 | 49% | $456 | 2.3% | $314 | $152 | $466 | 2020Q3 | 18.9% | $373 | $181 | $554 |
| *0.0%* | Project Operation: | $0 | $0 | 49% | $0 | 0.0% | $0 | $0 | $0 | 0 | 0.0% | $0 | $0 | $0 |
| *3.0%* | Project Management | $87 | $42 | 49% | $130 | 2.3% | $89 | $43 | $133 | 2020Q3 | 18.9% | $106 | $51 | $158 |
| | **CONTRACT COST TOTALS:** | $4,214 | $1,926 | | **$6,140** | | $4,284 | $1,959 | $6,242 | | | $4,732 | $2,168 | **$6,900** |

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: **Skokomish River Basin Feasibility Study**
LOCATION: Skokomish River Basin, Washington

DISTRICT: NWS Seattle
POC: CHIEF, COST ENGINEERING, John Dudgeon
PREPARED: 4/27/2015

This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

| Civil Works Work Breakdown Structure | | ESTIMATED COST | | | | PROJECT FIRST COST | | | | TOTAL PROJECT COST (FULLY FUNDED) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate Prepared: | | | **10/1/2014** | Program Year (Budget EC): | | | 2016 | | | | | |
| | | Effective Price Level: | | | 10/1/2014 | Effective Price Level Date: | | | 1 OCT 15 | | | | | |
| WBS NUMBER | Civil Works Feature & Sub-Feature Description | COST ($K) | CNTG ($K) | CNTG (%) | TOTAL ($K) | ESC (%) | COST ($K) | CNTG ($K) | TOTAL ($K) | Mid-Point Date | ESC (%) | COST ($K) | CNTG ($K) | FULL ($K) |
| *A* | *B* | *C* | *D* | *E* | *F* | *G* | *H* | *I* | *J* | *P* | *L* | *M* | *N* | *O* |
| | **Car Body Levee Removal** | | | | | | | | | | | | | |
| **06** | FISH & WILDLIFE FACILITIES | $1,937 | $949 | 49% | $2,886 | 1.5% | $1,965 | $963 | $2,928 | 2020Q3 | 8.9% | $2,140 | $1,049 | $3,189 |
| **06** | Monitoring | $62 | $22 | 35% | $84 | 2.3% | $63 | $22 | $86 | 2022Q3 | 28.7% | $82 | $29 | $110 |
| **06** | Adaptive Management | $19 | $9 | 49% | $29 | 1.5% | $20 | $10 | $29 | 2020Q3 | 8.9% | $21 | $10 | $32 |
| | **CONSTRUCTION ESTIMATE TOTALS:** | $2,019 | $980 | 49% | **$2,999** | | $2,048 | $995 | $3,043 | | | $2,243 | $1,088 | $3,331 |
| **01** | LANDS AND DAMAGES | $195 | $29 | 15% | $224 | 1.5% | $197 | $30 | $227 | 2018Q3 | 4.7% | $207 | $31 | $238 |
| **30** | PLANNING, ENGINEERING & DESIGN | | | | | | | | | | | | | |
| *0.8%* | Project Management | $17 | $8 | 49% | $25 | 2.3% | $17 | $8 | $26 | 2018Q3 | 9.9% | $19 | $9 | $28 |
| *0.4%* | Planning & Environmental Compliance | $9 | $4 | 49% | $13 | 2.3% | $9 | $4 | $13 | 2018Q3 | 9.9% | $10 | $5 | $14 |
| *7.7%* | Engineering & Design | $155 | $75 | 49% | $230 | 2.3% | $159 | $77 | $236 | 2018Q3 | 9.9% | $174 | $85 | $259 |
| *2.2%* | Reviews, ATRs, IEPRs, VE | $45 | $22 | 49% | $67 | 2.3% | $46 | $22 | $69 | 2018Q3 | 9.9% | $51 | $25 | $75 |
| *0.3%* | Life Cycle Updates (cost, schedule, risks) | $6 | $3 | 49% | $8 | 2.3% | $6 | $3 | $9 | 2018Q3 | 9.9% | $6 | $3 | $9 |
| *0.7%* | Contracting & Reprographics | $14 | $7 | 49% | $20 | 2.3% | $14 | $7 | $21 | 2018Q3 | 9.9% | $15 | $7 | $23 |
| *5.0%* | Engineering During Construction | $101 | $49 | 49% | $150 | 2.3% | $103 | $50 | $153 | 2020Q3 | 18.9% | $123 | $60 | $182 |
| *2.0%* | Planning During Construction | $40 | $20 | 49% | $60 | 2.3% | $41 | $20 | $61 | 2020Q3 | 18.9% | $49 | $24 | $73 |
| *0.0%* | Project Operations | $0 | $0 | 49% | $0 | 0.0% | $0 | $0 | $0 | 0 | 0.0% | $0 | $0 | $0 |
| **31** | CONSTRUCTION MANAGEMENT | | | | | | | | | | | | | |
| *10.6%* | Construction Management | $213 | $104 | 49% | $317 | 2.3% | $218 | $106 | $324 | 2020Q3 | 18.9% | $259 | $126 | $385 |
| *0.0%* | Project Operation: | $0 | $0 | 49% | $0 | 0.0% | $0 | $0 | $0 | 0 | 0.0% | $0 | $0 | $0 |
| *3.0%* | Project Management | $61 | $29 | 49% | $90 | 2.3% | $62 | $30 | $92 | 2020Q3 | 18.9% | $74 | $36 | $109 |
| | **CONTRACT COST TOTALS:** | $2,873 | $1,330 | | **$4,203** | | $2,921 | $1,352 | $4,273 | | | $3,230 | $1,498 | **$4,727** |

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: **Skokomish River Basin Feasibility Study** DISTRICT: NWS Seattle PREPARED: 4/27/2015

LOCATION: Skokomish River Basin, Washington POC: CHIEF, COST ENGINEERING, John Dudgeon

This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

| Civil Works Work Breakdown Structure | | ESTIMATED COST | | | | PROJECT FIRST COST | | | | TOTAL PROJECT COST (FULLY FUNDED) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate Prepared: / Effective Price Level: | | | 10/1/2014 / 10/1/2014 | Program Year (Budget EC): / Effective Price Level Date: | | | 2016 / 1 OCT 15 | | | | | |
| WBS NUMBER | Civil Works Feature & Sub-Feature Description | COST ($K) | CNTG ($K) | CNTG (%) | TOTAL ($K) | ESC (%) | COST ($K) | CNTG ($K) | TOTAL ($K) | Mid-Point Date | ESC (%) | COST ($K) | CNTG ($K) | FULL ($K) |
| *A* | *B* | *C* | *D* | *E* | *F* | *G* | *H* | *I* | *J* | *P* | *L* | *M* | *N* | *O* |
| | **River Mile 5 Reconnection** | | | | | | | | | | | | | |
| **06** | FISH & WILDLIFE FACILITIES | $818 | $401 | 49% | $1,218 | 1.5% | $830 | $406 | $1,236 | 2020Q3 | 8.9% | $903 | $443 | $1,346 |
| **06** | Monitoring | $26 | $9 | 35% | $35 | 2.3% | $27 | $9 | $36 | 2020Q3 | 28.7% | $34 | $12 | $46 |
| **06** | Adaptive Management | $8 | $4 | 49% | $12 | 1.5% | $8 | $4 | $12 | 2020Q3 | 8.9% | $9 | $4 | $13 |
| | **CONSTRUCTION ESTIMATE TOTALS:** | $852 | $414 | 49% | **$1,265** | | $864 | $420 | $1,284 | | | $946 | $459 | $1,405 |
| **01** | LANDS AND DAMAGES | $175 | $26 | 15% | $201 | 1.5% | $177 | $27 | $204 | 2018Q3 | 4.7% | $186 | $28 | $214 |
| **30** | PLANNING, ENGINEERING & DESIGN | | | | | | | | | | | | | |
| *0.8%* | Project Management | $7 | $3 | 49% | $11 | 2.3% | $7 | $4 | $11 | 2018Q3 | 9.9% | $8 | $4 | $12 |
| *0.4%* | Planning & Environmental Compliance | $4 | $2 | 49% | $5 | 2.3% | $4 | $2 | $5 | 2018Q3 | 9.9% | $4 | $2 | $6 |
| *7.7%* | Engineering & Design | $65 | $32 | 49% | $97 | 2.3% | $67 | $33 | $99 | 2018Q3 | 9.9% | $74 | $36 | $109 |
| *2.2%* | Reviews, ATRs, IEPRs, VE | $19 | $9 | 49% | $28 | 2.3% | $19 | $9 | $29 | 2018Q3 | 9.9% | $21 | $10 | $32 |
| *0.3%* | Life Cycle Updates (cost, schedule, risks) | $2 | $1 | 49% | $4 | 2.3% | $2 | $1 | $4 | 2018Q3 | 9.9% | $3 | $1 | $4 |
| *0.7%* | Contracting & Reprographics | $6 | $3 | 49% | $8 | 2.3% | $6 | $3 | $9 | 2018Q3 | 9.9% | $6 | $3 | $10 |
| *5.0%* | Engineering During Construction | $43 | $21 | 49% | $63 | 2.3% | $44 | $21 | $65 | 2020Q3 | 18.9% | $52 | $25 | $77 |
| *2.0%* | Planning During Construction | $17 | $8 | 49% | $25 | 2.3% | $17 | $8 | $26 | 2020Q3 | 18.9% | $21 | $10 | $31 |
| *0.0%* | Project Operations | $0 | $0 | 49% | $0 | 0.0% | $0 | $0 | $0 | 0 | 0.0% | $0 | $0 | $0 |
| **31** | CONSTRUCTION MANAGEMENT | | | | | | | | | | | | | |
| *10.6%* | Construction Management | $90 | $44 | 49% | $134 | 2.3% | $92 | $45 | $137 | 2020Q3 | 18.9% | $109 | $53 | $163 |
| *0.0%* | Project Operation: | $0 | $0 | 49% | $0 | 0.0% | $0 | $0 | $0 | 0 | 0.0% | $0 | $0 | $0 |
| *3.0%* | Project Management | $26 | $12 | 49% | $38 | 2.3% | $26 | $13 | $39 | 2020Q3 | 18.9% | $31 | $15 | $46 |
| | **CONTRACT COST TOTALS:** | $1,305 | $575 | | **$1,880** | | $1,327 | $585 | $1,911 | | | $1,461 | $647 | **$2,108** |

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: **Skokomish River Basin Feasibility Study**
LOCATION: Skokomish River Basin, Washington

DISTRICT: NWS Seattle PREPARED: 4/27/2015
POC: CHIEF, COST ENGINEERING, John Dudgeon

This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

| Civil Works Work Breakdown Structure | | ESTIMATED COST | | | | PROJECT FIRST COST | | | | TOTAL PROJECT COST (FULLY FUNDED) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate Prepared: | | | **10/1/2014** | Program Year (Budget EC): | | | 2016 | | | | | |
| | | Effective Price Level: | | | 10/1/2014 | Effective Price Level Date: | | | 1 OCT 15 | | | | | |
| WBS NUMBER | Civil Works Feature & Sub-Feature Description | COST ($K) | CNTG ($K) | CNTG (%) | TOTAL ($K) | ESC (%) | COST ($K) | CNTG ($K) | TOTAL ($K) | Mid-Point Date | ESC (%) | COST ($K) | CNTG ($K) | FULL ($K) |
| *A* | *B* | *C* | *D* | *E* | *F* | *G* | *H* | *I* | *J* | *P* | *L* | *M* | *N* | *O* |
| | **RM 9 Levee Breach & Setback** | | | | | | | | | | | | | |
| **06** | FISH & WILDLIFE FACILITIES | $1,515 | $742 | 49% | $2,257 | 1.5% | $1,537 | $753 | $2,290 | 2020Q3 | 8.9% | $1,674 | $820 | $2,494 |
| **06** | Monitoring | $49 | $17 | 35% | $66 | 2.3% | $50 | $18 | $68 | 2020Q3 | 28.7% | $65 | $23 | $87 |
| **06** | Adaptive Management | $15 | $7 | 49% | $22 | 1.5% | $15 | $7 | $23 | 2020Q3 | 8.9% | $17 | $8 | $25 |
| | **CONSTRUCTION ESTIMATE TOTALS:** | $1,579 | $767 | 49% | **$2,346** | | $1,602 | $778 | $2,380 | | | $1,755 | $851 | $2,605 |
| **01** | LANDS AND DAMAGES | $377 | $57 | 15% | $434 | 1.5% | $383 | $57 | $440 | 2018Q3 | 4.7% | $401 | $60 | $461 |
| **30** | PLANNING, ENGINEERING & DESIGN | | | | | | | | | | | | | |
| *0.5%* | Project Management | $13 | $6 | 49% | $20 | 2.3% | $14 | $7 | $20 | 2018Q3 | 9.9% | $15 | $7 | $22 |
| *0.2%* | Planning & Environmental Compliance | $7 | $3 | 49% | $10 | 2.3% | $7 | $3 | $10 | 2018Q3 | 9.9% | $8 | $4 | $11 |
| *4.2%* | Engineering & Design | $121 | $59 | 49% | $180 | 2.3% | $124 | $60 | $184 | 2018Q3 | 9.9% | $136 | $66 | $203 |
| *1.2%* | Reviews, ATRs, IEPRs, VE | $35 | $17 | 49% | $52 | 2.3% | $36 | $18 | $54 | 2018Q3 | 9.9% | $40 | $19 | $59 |
| *0.2%* | Life Cycle Updates (cost, schedule, risks) | $4 | $2 | 49% | $7 | 2.3% | $5 | $2 | $7 | 2018Q3 | 9.9% | $5 | $2 | $7 |
| *0.4%* | Contracting & Reprographics | $11 | $5 | 49% | $16 | 2.3% | $11 | $5 | $16 | 2018Q3 | 9.9% | $12 | $6 | $18 |
| *2.7%* | Engineering During Construction | $79 | $38 | 49% | $117 | 2.3% | $81 | $39 | $120 | 2020Q3 | 18.9% | $96 | $47 | $143 |
| *1.1%* | Planning During Construction | $32 | $15 | 49% | $47 | 2.3% | $32 | $16 | $48 | 2020Q3 | 18.9% | $38 | $19 | $57 |
| *0.0%* | Project Operations | $0 | $0 | 49% | $0 | 0.0% | $0 | $0 | $0 | 0 | 0.0% | $0 | $0 | $0 |
| **31** | CONSTRUCTION MANAGEMENT | | | | | | | | | | | | | |
| *10.6%* | Construction Management | $167 | $81 | 49% | $248 | 2.3% | $171 | $83 | $253 | 2020Q3 | 18.9% | $203 | $98 | $301 |
| *0.0%* | Project Operation: | $0 | $0 | 49% | $0 | 0.0% | $0 | $0 | $0 | 0 | 0.0% | $0 | $0 | $0 |
| *3.0%* | Project Management | $47 | $23 | 49% | $70 | 2.3% | $48 | $24 | $72 | 2020Q3 | 18.9% | $58 | $28 | $86 |
| | **CONTRACT COST TOTALS:** | $2,472 | $1,074 | | **$3,546** | | $2,513 | $1,092 | $3,605 | | | $2,765 | $1,207 | **$3,972** |

**** TOTAL PROJECT COST SUMMARY ****



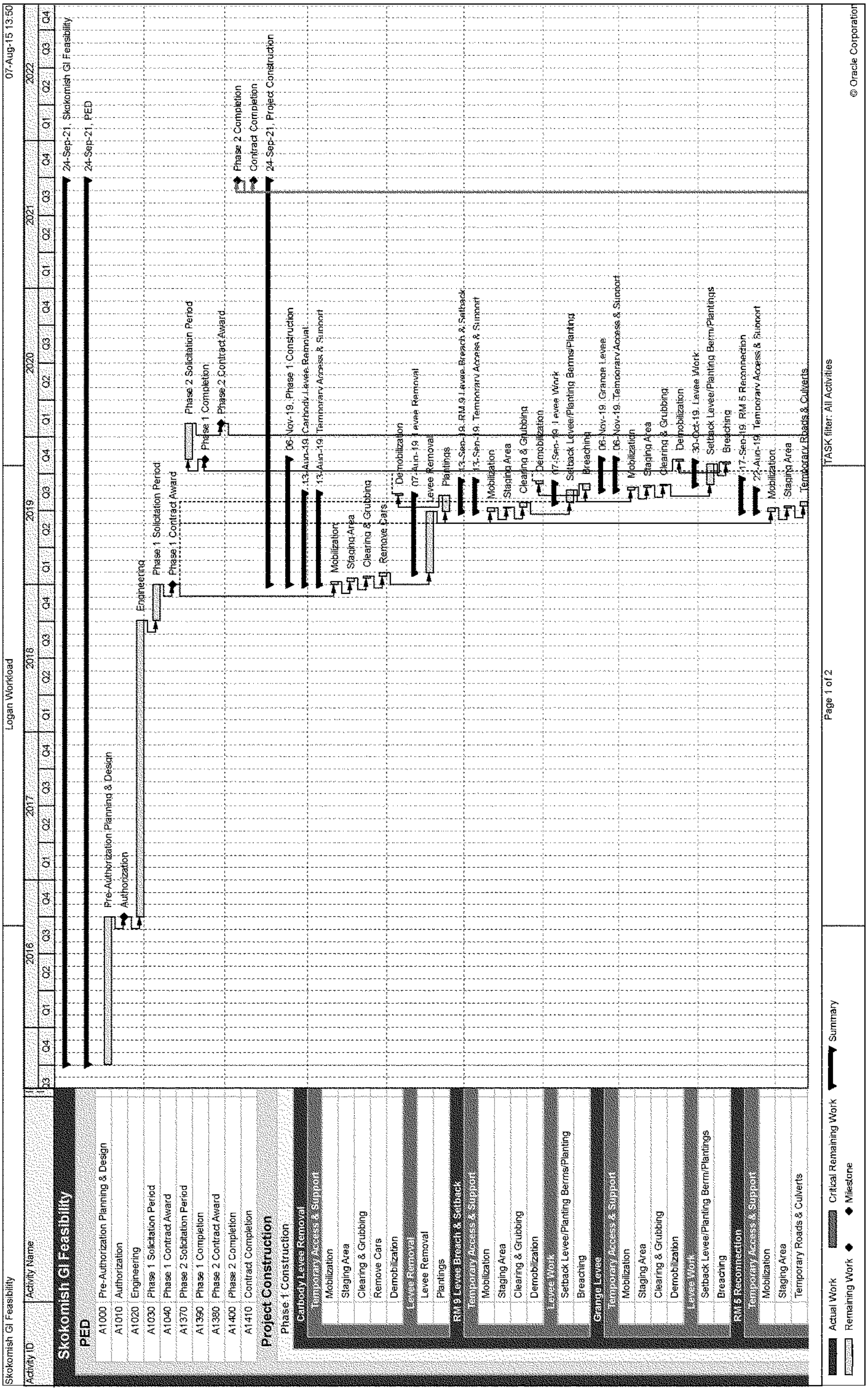
**** CONTRACT COST SUMMARY ****

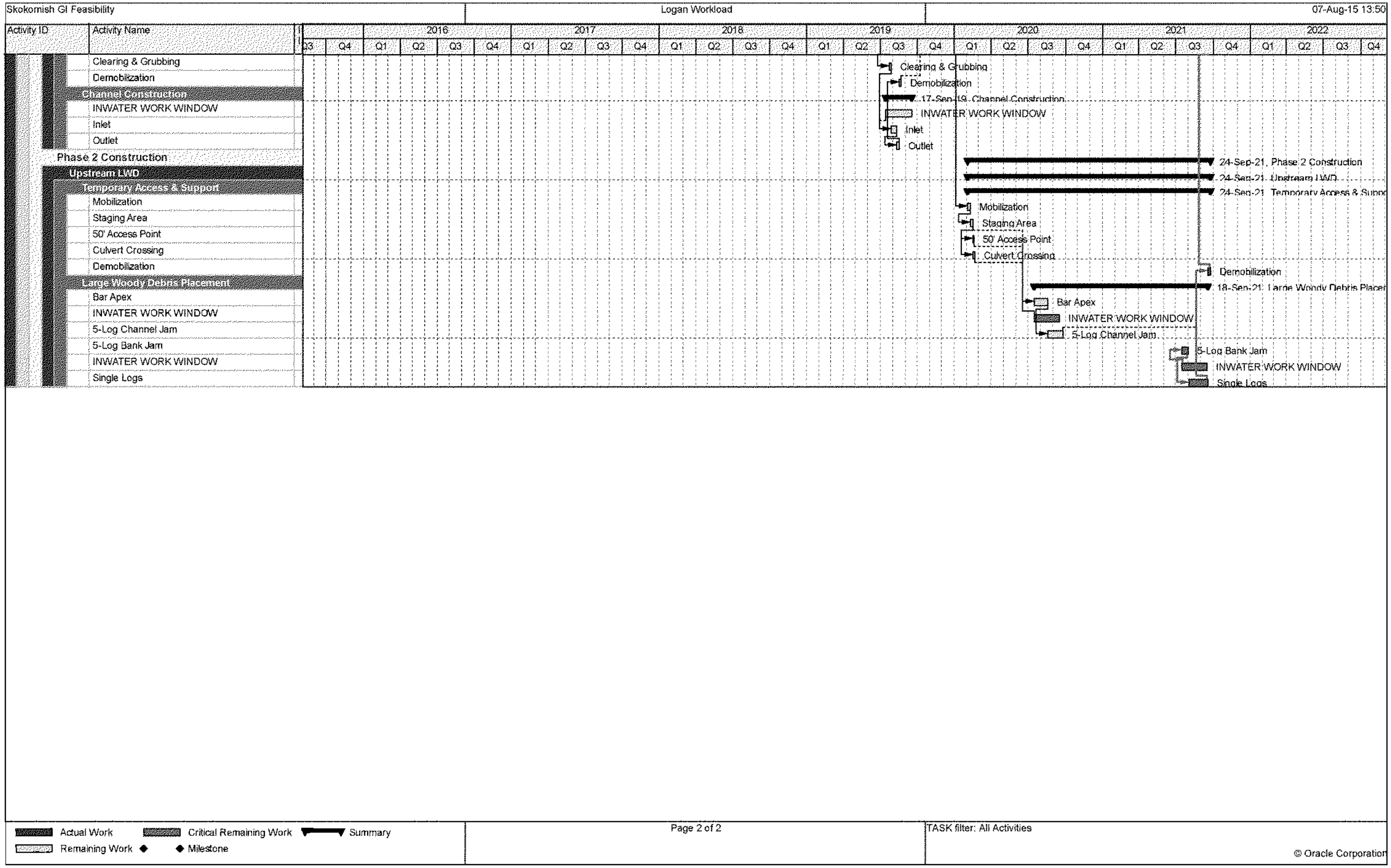
PROJECT: **Skokomish River Basin Feasibility Study** DISTRICT: NWS Seattle PREPARED: 4/27/2015

LOCATION: Skokomish River Basin, Washington POC: CHIEF, COST ENGINEERING, John Dudgeon

This Estimate reflects the scope and schedule in report; Feasibility Report and Appendices

| Civil Works Work Breakdown Structure | | ESTIMATED COST | | | | PROJECT FIRST COST | | | | TOTAL PROJECT COST (FULLY FUNDED) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate Prepared: | | | 10/1/2014 | Program Year (Budget EC): | | | 2016 | | | | | |
| | | Effective Price Level: | | | 10/1/2014 | Effective Price Level Date: | | | 1 OCT 15 | | | | | |
| WBS NUMBER A | Civil Works Feature & Sub-Feature Description B | COST ($K) C | CNTG ($K) D | CNTG (%) E | TOTAL ($K) F | ESC (%) G | COST ($K) H | CNTG ($K) I | TOTAL ($K) J | Mid-Point Date P | ESC (%) L | COST ($K) M | CNTG ($K) N | FULL ($K) O |
| | **Grange Levee Setback** | | | | | | | | | | | | | |
| **06** | FISH & WILDLIFE FACILITIES | $1,536 | $753 | 49% | $2,289 | 1.5% | $1,559 | $764 | $2,322 | 2020Q3 | 8.9% | $1,697 | $832 | $2,529 |
| **06** | Monitoring | $51 | $18 | 35% | $69 | 2.3% | $52 | $18 | $70 | 2020Q3 | 28.7% | $67 | $24 | $91 |
| **06** | Adaptive Management | $15 | $7 | 49% | $22 | 1.5% | $15 | $7 | $23 | 2020Q3 | 8.9% | $17 | $8 | $25 |
| | **CONSTRUCTION ESTIMATE TOTALS:** | $1,602 | $778 | 49% | **$2,380** | | $1,626 | $789 | $2,415 | | | $1,781 | $863 | $2,644 |
| **01** | LANDS AND DAMAGES | $362 | $54 | 15% | $416 | 1.5% | $367 | $55 | $422 | 2018Q3 | 4.7% | $384 | $58 | $442 |
| **30** | PLANNING, ENGINEERING & DESIGN | | | | | | | | | | | | | |
| *0.5%* | Project Management | $13 | $7 | 49% | $20 | 2.3% | $14 | $7 | $20 | 2018Q3 | 9.9% | $15 | $7 | $22 |
| *0.2%* | Planning & Environmental Compliance | $7 | $3 | 49% | $10 | 2.3% | $7 | $3 | $10 | 2018Q3 | 9.9% | $8 | $4 | $11 |
| *4.2%* | Engineering & Design | $123 | $60 | 49% | $183 | 2.3% | $126 | $61 | $187 | 2018Q3 | 9.9% | $138 | $67 | $205 |
| *1.2%* | Reviews, ATRs, IEPRs, VE | $36 | $17 | 49% | $53 | 2.3% | $37 | $18 | $54 | 2018Q3 | 9.9% | $40 | $20 | $60 |
| *0.2%* | Life Cycle Updates (cost, schedule, risks) | $4 | $2 | 49% | $7 | 2.3% | $5 | $2 | $7 | 2018Q3 | 9.9% | $5 | $2 | $7 |
| *0.4%* | Contracting & Reprographics | $11 | $5 | 49% | $16 | 2.3% | $11 | $5 | $16 | 2018Q3 | 9.9% | $12 | $6 | $18 |
| *2.8%* | Engineering During Construction | $80 | $39 | 49% | $119 | 2.3% | $82 | $40 | $122 | 2020Q3 | 18.9% | $97 | $47 | $145 |
| *1.1%* | Planning During Construction | $32 | $16 | 49% | $48 | 2.3% | $33 | $16 | $49 | 2020Q3 | 18.9% | $39 | $19 | $58 |
| *0.0%* | Project Operations | $0 | $0 | 49% | $0 | 0.0% | $0 | $0 | $0 | 0 | 0.0% | $0 | $0 | $0 |
| **31** | CONSTRUCTION MANAGEMENT | | | | | | | | | | | | | |
| *10.0%* | Construction Management | $169 | $82 | 49% | $251 | 2.3% | $173 | $84 | $257 | 2020Q3 | 18.9% | $206 | $100 | $305 |
| *2.0%* | Project Operation: | $0 | $0 | 49% | $0 | 0.0% | $0 | $0 | $0 | 0 | 0.0% | $0 | $0 | $0 |
| *2.5%* | Project Management | $48 | $23 | 49% | $71 | 2.3% | $49 | $24 | $73 | 2020Q3 | 18.9% | $58 | $28 | $87 |
| | **CONTRACT COST TOTALS:** | $2,487 | $1,086 | | **$3,574** | | $2,528 | $1,104 | $3,633 | | | $2,784 | $1,221 | **$4,005** |


Skokomish GI Feasibility
Logan Workload
07-Aug-15 13:50
Activity ID
Activity Name
Skokomish GI Feasibility
PED
A1000 Pre-Authorization Planning & Design
A1010 Authorization
A1020 Engineering
A1030 Phase 1 Solicitation Period
A1040 Phase 1 Contract Award
A1370 Phase 2 Solicitation Period
A1390 Phase 1 Completion
A1380 Phase 2 Contract Award
A1400 Phase 2 Completion
A1410 Contract Completion
Project Construction
Phase 1 Construction
Carbody Levee Removal
Temporary Access & Support
Mobilization
Staging Area
Clearing & Grubbing
Remove Cars
Demobilization
Levee Removal
Levee Removal
Plantings
RM 9 Levee Breach & Setback
Temporary Access & Support
Mobilization
Staging Area
Clearing & Grubbing
Demobilization
Levee Work
Setback Levee/Planting Berms/Planting
Breaching
Grange Levee
Temporary Access & Support
Mobilization
Staging Area
Clearing & Grubbing
Demobilization
Levee Work
Setback Levee/Planting Berm/Plantings
Breaching
RM 5 Reconnection
Temporary Access & Support
Mobilization
Staging Area
Temporary Roads & Culverts
2016 2017 2018 2019 2020 2021 2022
Q1 Q2 Q3 Q4
24-Sep-21, Skokomish GI Feasibility
24-Sep-21, PED
24-Sep-21, Project Construction
06-Nov-19, Phase 1 Construction
13-Aug-19, Carbody Levee Removal
13-Aug-19, Temporary Access & Support
07-Aug-19, Levee Removal
13-Sep-19, RM 9 Levee Breach & Setback
13-Sep-19, Temporary Access & Support
17-Sep-19, Levee Work
06-Nov-19, Grange Levee
06-Nov-19, Temporary Access & Support
30-Oct-19, Levee Work
17-Sep-19, RM 5 Reconnection
22-Aug-19, Temporary Access & Support
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary
Page 1 of 2
TASK filter: All Activities
© Oracle Corporation


Skokomish GI Feasibility
Logan Workload
07-Aug-15 13:50
Activity ID
Activity Name
2016
2017
2018
2019
2020
2021
2022
Q3 Q4 Q1 Q2 Q3 Q4
Clearing & Grubbing
Demobilization
Channel Construction
INWATER WORK WINDOW
Inlet
Outlet
Phase 2 Construction
Upstream LWD
Temporary Access & Support
Mobilization
Staging Area
50' Access Point
Culvert Crossing
Demobilization
Large Woody Debris Placement
Bar Apex
INWATER WORK WINDOW
5-Log Channel Jam
5-Log Bank Jam
INWATER WORK WINDOW
Single Logs
17-Sep-19, Channel Construction
24-Sep-21, Phase 2 Construction
24-Sep-21, Upstream LWD
24-Sep-21, Temporary Access & Supp
18-Sep-21, Large Woody Debris Place
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary
Page 2 of 2
TASK filter: All Activities
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U.S. Army Corps of Engineers
Project : Skokomish River GI
Skokomish GI - Feasibility Estimate

Skokomish River GI
Skokomish River General Investigation
Environmental Restoration Project

Estimate Classification: Level 3

PM/Planner: Rachel Mesko
Environmental Lead: Nancy Gleason
Technical Lead: Glenn Kato

Labor: Updated 11-Mar-2015 per Davis-Bacon General Decisions for Mason County

| | |
|---|---|
| Estimated by | Daniel Lowry, PE, CCC |
| Designed by | Engineering Division, Seattle District |
| Prepared by | Cost Engineering Section, Seattle District |
| Preparation Date | 3/13/2015 |
| Effective Date of Pricing | 11/14/2014 |
| Estimated Construction Time | Days |

Designed by
Engineering Division, Seattle District
Estimated by
Daniel Lowry, PE, CCC
Prepared by
Cost Engineering Section, Seattle District

| | |
|---|---|
| Design Document | Feasibility Design Documents |
| Document Date | 10/31/2014 |
| District | Seattle |
| Contact | Daniel Lowry, 206.764.3702 |
| Budget Year | 2015 |
| UOM System | Original |

**Direct Costs**
LaborCost
EQCost
MatlCost
SubBidCost

**Timeline/Currency**

| | |
|---|---|
| Preparation Date | 3/13/2015 |
| Escalation Date | 11/14/2014 |
| Eff. Pricing Date | 11/14/2014 |
| Estimated Duration | 0 Day(s) |
| Currency | US dollars |
| Exchange Rate | 1.000000 |

**Costbook CB12EB-b: MII English Cost Book 2012-b**

**Labor NLS2012: National Labor Library - Seattle 2012**
**bsite for current Davis Bacon & Service Labor Rates. Fringes paid to the laborers are taxable. In a non-union job the whole fringes are taxable. In a union job, the va**

**Labor Rates**
LaborCost1
Landscape
LaborCost3
LaborCost4

**Equipment EP14R08: MII Equipment 2014 Region 08**

**08 NORTHWEST**

| | |
|---|---|
| Sales Tax | 6.05 |
| Working Hours per Year | 1,540 |
| Labor Adjustment Factor | 1.06 |
| Cost of Money | 2.13 |

**Fuel**

| | |
|---|---|
| Electricity | 0.078 |
| Gas | 3.000 |
| Diesel Off-Road | 3.000 |
| Diesel On-Road | 3.500 |

**Shipping Rates**

| | |
|---|---|
| Over 0 CWT | 30.86 |
| Over 240 CWT | 29.05 |
| Over 300 CWT | 26.59 |
| Over 400 CWT | 24.30 |

| | |
|---|---|
| Cost of Money Discount | 25.00 |
| Tire Recap Cost Factor | 1.50 |
| Tire Recap Wear Factor | 1.80 |
| Tire Repair Factor | 0.15 |
| Equipment Cost Factor | 1.00 |
| Standby Depreciation Factor | 0.50 |

| | |
|---|---|
| Over 500 CWT | 11.26 |
| Over 700 CWT | 9.51 |
| Over 800 CWT | 6.48 |

| Date | Author | Note |
|---|---|---|
| 1/28/2015 | Lowry | PROJECT DESCRIPTIONThis estimate consists of costs to restore natural hydraulic processes and provide habitat along the Skokomish River. This work will include setting back levees, installing large woody debris, and reconnecting tributary channels, along with other more minor elements. The construction period of this project is approximately three years. |
| 1/28/2015 | Lowry | BASES OF DESIGNThis estimate is based on the drawings, figures, and quantities prepared for the combined Feasibility Report/EIS, October, 2014. |
| 1/28/2015 | Lowry | ACQUISITION PLANThe project will be acquired by a yet to be determined bidding process. However, the PDT has determined it will likely be split into at least two separate contracts.It is not know if this work will be performed by a Contractor under the Small Business Administration 8a program, HUBZone, SDVOSB, Women Owned Small Business or through a combination of these and full and open bidding. The estimator choose to use a contracting arrangement and markups consistent with small business contracting methodology.Design-build construction is not anticipated, and a full set of plans and specs will be made available at solicitation. |
| 1/28/2015 | Lowry | SUB-CONTRACTING PLANIt is assumed that a prime contractor will subcontract the majority of the construction work. The prime will manage the project and provide oversight. |
| 1/28/2015 | Lowry | PROJECT CONSTRUCTIONSITE ACCESSThe project site is located on the Skokomish River. Access and staging areas are accounted for within the provided plans.BORROW AREASThere are several nearby sources. Further evaluation will need to be done at Feasibility Estimate to determine if fill may be available from sources other than commercial sources. Local borrow is not anticipated at this time.CONSTRUCTION METHODOLOGYThe construction methodology contains standard heavy civil elements, and some in-water work is expected. There is limited access at some points, and multiple handlings of material along with off road dump trucks is assumed throughout much of the project.UNUSUAL CONDITION (Soil, Water, Weather)Work must be coordinated with seasonal weather variations. No major issues related to in situ soil issues or water work is expected.UNIQUE TECHNIQUES OF CONSTRUCTIONNone expected |
| 1/28/2015 | Lowry | CONSTRUCTION WINDOWSSCHEDULE6 days a week, ten hours per day. In-water work is limited to 15-July to 15-September.OVERTIMEThis estimate assume overtime. This may be adjusted depending on contract arrangement, but is necessary to consolidate work within the dry season and fish windows. |
| 1/28/2015 | Lowry | EQUIPMENT AND LABOR AVAILABILITY & DISTANCE TRAVELEDThis estimate uses Davis Bacon labor rates for Seattle, Washington. Equipment rates used are from EP 1110-1-8, Region 8, 2014. |
| 1/28/2015 | Lowry | ENVIRONMENTAL CONCERNS-Turbidity issues due to in-water work.-Large amount of off-road work may impact habitat. |
| 1/28/2015 | Lowry | RISKRisks were evaluated using the Abbreviated Cost and Scheduled Risk Analysis. A contingency rate of 17.2% was generated from this analysis and is applied to this estimate. |
| 2/4/2015 | DQC | DCQ was completed by Logan Wallace, PE, CCE. |

| Date | Author | Note |
|---|---|---|
| 3/13/2015 | Wallace | Project markups are based on historical data points for similar levee projects. The mark ups are on the conservative side of the typical range and will be reevaluated as the project moves foward. The contracting vehicle selected for the project will have a large influence on the markups used in the future. |
| 4/26/2015 | Lowry | Per PM direction, setback levees (RM 9 and Grange) were reincorporated as part of the project package. |
| 8/5/2015 | Wallace | REV 10New quantities for River Mile 9 and Grange Levee were provided by civil design. The new quantities were significant reductions in both the setback levee heights and the planting berms |

| Description | Quantity | UOM | ContractCost | Escalation | Contingency | SIOH | ProjectCost |
|---|---|---|---|---|---|---|---|
| Project Cost Summary | | | 8,956,981 | 0 | 0 | 0 | 8,956,981 |
| Skokomish River General Investigation | 1.00 | EA | 8,956,981 | 0 | 0 | 0 | 8,956,981 |
| Fish and Wildlife Facilities | 1.00 | EA | 8,956,981 | 0 | 0 | 0 | 8,956,981 |
| Wildlife Facilities & Sanctuary | 1.00 | EA | 8,956,981 | 0 | 0 | 0 | 8,956,981 |
| Upstream LWD | 1.00 | EA | 2,905,743 | 0 | 0 | 0 | 2,905,743 |
| Car Body Levee Removal & Breach | 15,058.00 | BCY | 2,018,610 | 0 | 0 | 0 | 2,018,610 |
| River Mile 9 Levee Breach & Setback | 1.00 | EA | 1,578,798 | 0 | 0 | 0 | 1,578,798 |
| Grange Levee Setback | 1.00 | EA | 1,602,193 | 0 | 0 | 0 | 1,602,193 |
| River Mile 5 Reconnection | 1.00 | EA | 851,636 | 0 | 0 | 0 | 851,636 |

| Description | Quantity | UOM | DirectCost | SubCMU | CostToPrime | PrimeCMU | ContractCost |
|---|---|---|---|---|---|---|---|
| Contract Cost Summary | | | 4,861,439 | 1,917,499 | 6,778,938 | 2,178,043 | 8,956,981 |
| Skokomish River General Investigation | 1.00 | EA | 4,861,439 | 1,917,499 | 6,778,938 | 2,178,043 | 8,956,981 |
| Fish and Wildlife Facilities | 1.00 | EA | 4,861,439 | 1,917,499 | 6,778,938 | 2,178,043 | 8,956,981 |
| Wildlife Facilities & Sanctuary | 1.00 | EA | 4,861,439 | 1,917,499 | 6,778,938 | 2,178,043 | 8,956,981 |
| Upstream LWD | 1.00 | EA | 1,576,789 | 622,205 | 2,198,995 | 706,749 | 2,905,743 |
| Car Body Levee Removal & Breach | 15,058.00 | BCY | 1,095,390 | 432,244 | 1,527,634 | 490,976 | 2,018,610 |
| River Mile 9 Levee Breach & Setback | 1.00 | EA | 856,792 | 338,037 | 1,194,829 | 383,969 | 1,578,798 |
| Grange Levee Setback | 1.00 | EA | 870,331 | 342,652 | 1,212,983 | 389,210 | 1,602,193 |
| River Mile 5 Reconnection | 1.00 | EA | 462,137 | 182,361 | 644,497 | 207,139 | 851,636 |

| Contingency on Base Estimate | 80% Confidence Project Cost |
|---|---|
| Baseline Estimate Cost (Most Likely) -> | $8,678,981 |
| Baseline Estimate Cost Contingency Amount -> | $4,295,598 |
| Baseline Estimate Construction Cost (80% Confidence) -> | $12,974,579 |

| Project Contingency | 80% Confidence Project Cost |
|---|---|
| Project Contingency Amount (80% Confidence) -> | $4,295,598 |
| Project Contingency Percentage (80% Confidence) -> | 49% |

| | |
|---|---|
| Project Cost (80% Confidence) -> | $12,974,579 |

# - PROJECT CONTINGENCY DEVELOPMENT -

## Contingency Analysis

| Most Likely Cost Estimate | $8,678,981 | |
|---|---|---|
| Confidence Level | Value | Contingency |
| 0% | $9,562,288 | $883,307 |
| 5% | $10,970,775 | $2,291,795 |
| 10% | $11,251,062 | $2,572,082 |
| 15% | $11,446,809 | $2,767,829 |
| 20% | $11,602,967 | $2,923,986 |
| 25% | $11,736,798 | $3,057,817 |
| 30% | $11,857,340 | $3,178,359 |
| 35% | $11,965,935 | $3,286,954 |
| 40% | $12,069,118 | $3,390,137 |
| 45% | $12,182,751 | $3,503,771 |
| 50% | $12,290,177 | $3,611,197 |
| 55% | $12,393,037 | $3,714,056 |
| 60% | $12,494,725 | $3,815,744 |
| 65% | $12,602,722 | $3,923,741 |
| 70% | $12,712,330 | $4,033,350 |
| 75% | $12,839,182 | $4,160,201 |
| 80% | $12,974,579 | $4,295,598 |
| 85% | $13,128,789 | $4,449,808 |
| 90% | $13,335,564 | $4,656,584 |
| 95% | $13,634,744 | $4,955,763 |
| 100% | $15,113,450 | $6,434,470 |

# SKOKOMISH RIVER BASIN
# MASON COUNTY, WASHINGTON
# ECOSYSTEM RESTORATION

## APPENDIX L

## COMPLIANCE DOCUMENTS

## Integrated Feasibility Report and Environmental Impact Statement

US Army Corps
of Engineers
Seattle District

# FISH AND WILDLIFE COORDINATION ACT FINAL REPORT

NOTE: Throughout the plan formulation and environmental coordination processes of the feasibility study, the project team was using local site names to refer to each site where measures could be implemented for ecosystem restoration. During the project's recent feasibility-level design phase, site names were formalized in the Final Feasibility Report and Environmental Impact Statement; therefore, some site names have changed since initial environmental compliance and coordination efforts were completed early in the study. The final list of sites in the recommended plan includes the following:

- Confluence Levee Removal
- Upstream Large Woody Debris
- Side Channel Reconnection
- Wetland Restoration at River Mile 9
- Wetland Restoration at Grange

# United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

FEB 27 2015

In Reply Refer To:
**01EWFW00-2015-CPA-0018**

Evan R. Lewis, Chief
Environmental and Cultural Resources Branch
U.S. Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, Washington 98124-3755

Dear Mr. Lewis:

Subject: Final Fish and Wildlife Coordination Act Report, Skokomish River Basin Ecosystem Restoration Project

In January 2014, the U.S. Fish and Wildlife Service (Service) issued a draft Fish and Wildlife Coordination Act (FWCA) (Ref. # 01EWFW00-2014-CPA-0015) Section 2(b) report for the Skokomish River Basin Ecosystem Restoration Project proposed by the U.S. Army Corps of Engineers, Seattle District (Corps), and local sponsors (Mason County and Skokomish Indian Tribe). We are pleased that the Corps has advanced the preferred alternative described in the draft FWCA report, and, further, that the Corps has addressed and/or incorporated many of the Service's recommendations. The basic project elements in the current proposal do not differ substantially from those described in the draft FWCA report. For these reasons, the January 2014 draft FWCA report will serve as the final FWCA report, with the modifications and additions noted in this letter.

Together, the draft report and the contents of this letter constitute the Service's final FWCA report for the Skokomish River Basin Ecosystem Restoration Project authorized by the River and Harbor Act of 1962 (Public Law 87-874), Section 209, Puget Sound and Adjacent Waters. Our comments and recommendations have been prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*) (Act) and constitute the report of the Secretary of the Interior required under Section 2(b) of that Act.

**COORDINATION**

On September 23, 2014, the Corps met with the Service, other natural resource agencies (including the National Marine Fisheries Service and the Washington Department of Fish and Wildlife), and other stakeholders to present draft designs, get feedback from the natural resource agencies, and to provide design guidance from the natural resources perspective to the Corps design team. Additional coordination has occurred via email.

**CURRENT PROPOSAL**

The Corps' preferred alternative described in the draft FWCA report consisted of a base action - the Car Body Levee Removal - and eight additional actions, or increments. Each of these nine actions (the base and the eight increments) were independent in that implementation of any one action did not depend on implementation of any of the others. At the time the draft FWCA report was issued, the Corps' proposal was largely conceptual in nature and provided few design details. This section identifies conceptual modifications from the initial proposal, and describes the current proposal's critical design details.

The following six increments described in the draft FWCA report have been excluded from the project and are not part of the current proposal: Grange Levee Setback (Increment 37[1]), River Mile 9 Levee Setback (Increment 28), Hunter Creek Mouth Restoration (Increment 39), Hunter Creek Enhancement (Increment 40), Weaver Creek Enhancement (Increment 43), and Dips Road Setback (Increment 26). The current proposal consists of the Car Body Levee Removal, and the following two increments: Upstream large woody debris (LWD) Installation (Increment 35) and Side Channel Reconnection (Increment 9). The Service recently completed consultation under section 7 of the Endangered Species Act for these restoration projects (Ref. # 01EWFW00-2015-TA-0253).

The Car Body Levee Removal action involves the removal of the existing levee and diverting flow into the existing North Fork channel by enlarging an existing channel and installing seven engineered log jams (diversion ELJ's). The proposal also includes adding 26 single-log structures. Channel enlargement will require excavating 4,715 cubic yards (cy) of material to enlarge the existing channel to 200 feet long and 70 feet wide. The channel will be designed to pass flows up to 2,000 cubic feet per second (cfs). Discharges above 2,000 cfs will be split between the main channel and the historic South Fork channel. Each ELJ will consist of 27 logs of varying length, will be anchored with 10 piles, and will be partially buried with excavated streambed material (as ballast). Single logs will be anchored with boulders and partially buried. The initial Car Body Levee Removal action described in the draft FWCA report describes potentially leaving sections of the existing levee in place provided that they did not interfere with the hydraulics of the project. The current proposal does not contain this provision. Under the current proposal, 10,345 cy of earthen or mostly earthen levee material, 61 small trees (less than 12 inch diameter breast height), and 57 larger trees (greater than 12 inch diameter breast height)

[1] Increment numbers noted throughout this letter are consistent with those in the draft FWCA report and may not reflect the current Corps numbering scheme.

will be removed. The total area where excavation or soil disturbance will occur is approximately 3.6 acres. The disturbed area will be planted with native conifers (10 foot on center) and shrubs (6 foot on center), and covered with bark mulch to a depth of six inches.

The Upstream LWD Installation action involves the installation of seven bar apex-type (after Abbe and Montgomery 1996) ELJ's, 24 five-log clusters, and 56 single logs. The bar apex-type ELJ's are a recent addition to the project proposal. Each ELJ will consist of 27 logs of varying length, will be anchored with 10 piles, and will be partially buried with excavated material replaced as ballast. The five-log channel clusters will be anchored with 4-5 ft boulder anchors buried directly under the log trunks. Single logs will be anchored with boulders and partially buried. The large wood installations currently proposed represent a 25 percent increase over that described in the draft FWCA report.

The Side Channel Reconnection will activate an existing side channel and off-channel pond network at lower river discharges than current. This network provides 45 acres of high quality, low velocity fish habitat. The reconnected side channel will be activated at discharges greater than what is typically experienced during a moderate winter storm (4,000 to 6,000 cfs). The channel inlet will be excavated to open it up to the river. Excavation dimensions will be approximately 50 feet wide, 0 to 5 feet deep, and a few hundred feet long. Approximately 3,600 cy of material will be excavated at the inlet. To ensure longevity of the project, the inlet and the outlet will be stabilized with six five-log clusters (four at the inlet, two at the outlet).

**PROJECT IMPACTS**

The project impacts are as described in the draft FWCA report, with the modifications described in this section.

All impacts associated with the following removed increments are eliminated:

- Grange Levee and River Mile 9 Levee Setbacks (Increments 37 and 28)
- Hunter Creek Mouth Restoration (Increment 39)
- Hunter and Weaver Creek Side Channel Restorations (Increments 40 and 43)
- Dips Road Setback (Increment 26)

Impacts associated with the following increments are modified as indicated:

- *Car Body Levee Removal* - The Service identified potential negative effects of leaving existing levee sections in place, which was part of the Corps' initial proposal. The current proposal is to remove the entirety of the existing levee, thereby eliminating these concerns.

- *Upstream LWD Installation* - The Service identified potential negative effects associated with improper placement of ELJ's and large wood. Improper placement could serve to "lock" the channel in place rather than providing the intended geomorphic, hydraulic, and fish habitat benefits. The current Corps engineering design drawing (dated December 5, 2014) does not indicate any improper ELJ or large wood placements. These concerns are thus eliminated.

  The initial Corps proposal did not include large, bar apex-type ELJ's. The inclusion of seven such structures in the current proposal will have positive impacts above those described in the draft FWCA report. Bar apex log jams have the greatest positive influence on river hydrogeomorphology and fish habitat relative to other types of jams or large wood placements (Abbe and Montgomery 1996). The long-term benefits of these structures greatly outweigh the short-term negative impacts associated with installation (i.e., pile driving). In sum, the seven proposed bar apex-type ELJ's will increase the overall benefits of the project.

## RECOMMENDATIONS

The draft FWCA report offered two types of recommendations: Tier 1 recommendations were offered to help minimize negative impacts and maximize benefits to natural resources, and Tier 2 recommendations were intended to generate additional benefits to natural resources. This section describes how these recommendations apply to the current proposal, and offers additional recommendations.

### Tier 1 Recommendations

1. *Improper ELJ and large wood placement.* The current design does not indicate any improper ELJ or large wood placement. The Service encourages the Corps to remain attentive to this recommendation in making any modifications to the design and placement of ELJ's and large wood.

2. *Levee breaches.* The current proposal calls for completely removing the Car Body Levee, rather than breaching it in places and leaving portions of the levee in place. The River Mile 9 and Grange Levee setbacks are not included in the current proposal. Therefore, this recommendation no longer applies.

3. *Tributary side-channel contaminants.* The tributary side-channel enhancements are not included in the current proposal. Therefore, this recommendation no longer applies.

4. *Tributary side-channel water temperature.* The tributary side-channel enhancements are not included in the current proposal. Therefore, this recommendation no longer applies.

5. *Tributary side-channel habitat complexity.* The tributary side-channel enhancements are not included in the current proposal. Therefore, this recommendation no longer applies.

6. *Dips Road existing bank armoring.* The Dips Road setback is not included in the current proposal. Therefore, this recommendation no longer applies.

7. *Hunter Creek mouth excavation.* The Hunter Creek mouth excavation is not included in the current proposal. Therefore, this recommendation no longer applies.

8. *Coordination.* We recommend that the Corps continue to coordinate with the Service, the National Marine Fisheries Service, Tribes, and permitting agencies, as needed, during design development and in making any substantial modifications the project proposal and/or design.

**Tier 2 Recommendations**

1. *Channel pattern, river mile (RM) 9 to 11.* The seven bar apex-type ELJ's the Corps has added to the project proposal will help facilitate formation of an island-braided pattern to this reach of the river. The Service further recommends intentionally locating the proposed five-log clusters to serve specific geomorphic functions, including: a) ensuring that flow is directed at the bar apex-type ELJ's; and, b) encouraging development of a meandering pattern and relatively deep, narrow channels throughout the reach. The meander jams described by Abbe and Montgomery (1996) are useful in providing these functions. A relatively deep, narrow channel will facilitate sediment transport through the reach, which will minimize future aggradation and provide better fish habitat.

2. *Channel pattern, RM 3.2 to 9.* The Corps has not acted on this recommendation. The Service continues to maintain that channel pattern is a critical consideration for long-term aquatic habitat restoration and recovery of fish populations in the action area.

3. *Channel pattern, RM 7.8 to 9.* The Service continues to maintain that channel pattern is a critical consideration for long-term aquatic habitat restoration and recovery of fish populations in the action area. Therefore, it is important to protect and maintain the existing forested area between the North and South Fork channels downstream from RM 9. The Service recommends positioning some of the diversion ELJ's to serve this purpose.

   The Service also recommends installing meander-type jams in the current South Fork reach between RM 7.8 and 9. This reach will be bypassed by the project, but will be active at elevated flows. In addition, depending on how hydrogeomorphic forces interact in this section of the river, it is quite possible that this reach will become active at discharges below the design threshold. The five-log cluster structures proposed by the Corps for other areas of the project may serve as meander-type jams in this reach. Properly sited meander-type jams will aid in creating a deeper, narrower channel, facilitate sediment transport through the reach, minimize future aggradation, and provide better fish habitat. If necessary for budgetary reasons, we recommend not installing the single-log structures proposed for RM 9 to 11, and instead using these resources to install meander-type jams in the RM 7.8 to 9 and the North Fork reaches (see recommendation 5 below). Meander-type jams in the RM 7.8 to 9 and the North Fork reaches will provide greater hydrogeomorphic and fish habitat functions than single logs in the RM 9 to 11 reach.

4. *Increasing levee setbacks.* The River Mile 9 and Grange Levee setbacks are not included in the current proposal. Therefore, this recommendation no longer applies.

5. *North Fork channel enhancements.* The current proposal includes a provision for moving some of the diversion ELJ's to the downstream side of the excavated channel to improve habitat quality. This opportunity may arise if hydraulic modelling shows that fewer ELJ's are needed to maintain the desired channel configuration at the excavated channel location. The Service supports this contingency as long as a sufficient number of diversion ELJ's are sited to protect and maintain the existing forested area between the North and South Fork channels downstream of RM 9.

   The Service continues to maintain that North Fork channel enhancements are important for long-term aquatic habitat restoration and recovery of fish populations. Therefore, we recommend that the Corps evaluate the potential for additional enhancements, including installing meander-type jams in this reach. The five-log cluster structures proposed by the Corps for other areas of the project may serve this function if properly sited. Properly sited meander-type jams in this reach will aid in creating a deeper, narrower channel, facilitate sediment transport through the reach, create pools, minimize future aggradation, and provide better fish habitat. If necessary for budgetary reasons, we recommend not installing the single-log structures proposed for RM 9 to 11, and instead using these resources to install meander-type jams in the North Fork and RM 7.8 to 9 reaches. Meander-type jams in these reaches will provide greater hydrogeomorphic and fish habitat functions than single logs in the RM 9 to 11 reach.

**Additional Recommendations**

We highly recommend that the Corps reconsider the River Mile 9 and Grange Levee Setbacks. These levees represent some of the most severe constrictions in this part of the river. Setting them back and reconnecting these parts of the floodplain with the river would provide a multitude of benefits, including:

- providing valuable floodplain refuge habitat for fish (refuge from high flood flows);
- increasing hydraulic energy and sediment transport capacity, helping to ameliorate the aggradation problem; and,
- reestablishing potential for formation of seasonal or perennial off-channel habitat such as swales which are currently lacking in the system.

**SUMMARY**

The current proposal will provide meaningful long-term ecological benefits that outweigh the short-term negative impacts of construction. Elimination of some of the increments (namely the levee setbacks, the side channel restorations, and the Dips Road setback) has reduced the overall positive impact potential of the project as a whole. However, the remaining base action and increments will provide important and substantial ecological restoration. The modifications to these elements described in this letter (i.e., incorporation of bar apex-type ELJ's, increase in wood abundance, and full removal of the Car Body levee) have eliminated some concerns and increased benefits of these elements to natural resources. The Service supports the project as described. Our support is not contingent upon implementing the recommendations outlined in this letter. However, we feel strongly that our recommendations will meaningfully increase the ecological restoration and fish recovery value of the project, and encourage their implementation.

We have appreciated and enjoyed cooperating with the Corps as this project has proceeded. Please contact Mark Celedonia at (360) 534-9327, or Martha Jensen at (360) 753-9000 for questions about our comments and/or for future coordination and collaboration on the Skokomish General Investigation.

Sincerely,

Eric V. Rickerson, State Supervisor
Washington Fish and Wildlife Office

**LITERATURE CITED**

Abbe, T.B., and D.R. Montgomery. 1996. Large woody debris jams, channel hydraulics and habitat formation in large rivers. Regulated Rivers: Research and Management 12:201-221.

# FISH AND WILDLIFE COORDINATION ACT DRAFT REPORT

NOTE: Throughout the plan formulation and environmental coordination processes of the feasibility study, the project team was using local site names to refer to each site where measures could be implemented for ecosystem restoration. During the project's recent feasibility-level design phase, site names were formalized in the Final Feasibility Report and Environmental Impact Statement; therefore, some site names have changed since initial environmental compliance and coordination efforts were completed early in the study. The final list of sites in the recommended plan includes the following:

- Confluence Levee Removal
- Upstream Large Woody Debris
- Side Channel Reconnection
- Wetland Restoration at River Mile 9
- Wetland Restoration at Grange

# United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

JAN 16 2014

Evan R. Lewis, Chief
Environmental & Cultural Resources Branch
U.S. Army Corps of Engineers, Seattle District
PO Box 3755
Seattle, Washington 98124-3755

Dear Mr. Lewis,

Enclosed is the draft Fish and Wildlife Coordination Act Report for the Skokomish River Basin Ecosystem Restoration Project authorized by the River and Harbor Act of 1962 (Public Law 87-874), Section 209, Puget Sound and Adjacent Waters. Our comments and recommendations have been prepared under the authority of and according to the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*)(Act), and constitutes the report of the Secretary of the Interior required under Section 2(b) of that Act.

We appreciate and support the U.S. Army Corps of Engineers restoration efforts in the Skokomish River watershed. We look forward to continued coordination as the project moves forward. Should you or your staff have any questions regarding the enclosed draft report, please contact Mark Celedonia (360-534-9327; mark_celedonia@fws.gov, of this office.

Sincerely,

for Ken S. Berg, Manager
Washington Fish and Wildlife Office

**Fish and Wildlife Coordination Act**
**Draft Section 2(b) Report**

# ASSESSMENT OF THE SKOKOMISH RIVER BASIN ECOSYSTEM RESTORATION FEASIBILITY STUDY, MASON COUNTY, WASHINGTON

Submitted to:
Seattle District
U.S. Army Corps of Engineers
Seattle, Washington

Prepared by: Mark T. Celedonia
Reviewed by: Martha L. Jensen
Approved by: Bridget Moran

U.S. Fish and Wildlife Service
Washington Fish and Wildlife Office
Lacey, Washington

January 2014

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**LIST OF ACRONYMS**

| | |
|---|---|
| cfs | cubic feet per second |
| DPS | Distinct Population Segment |
| EIS | Environmental Impact Statement |
| ESA | Endangered Species Act |
| ESU | Evolutionarily Significant Unit |
| FAA | Final Array of Alternatives |
| FWCA | Fish and Wildlife Coordination Act |
| GI | General Investigation |
| LWD | large woody debris |
| PA | Preferred Alternative |
| NEPA | National Environmental Policy Act |
| PAL | Planning Aid Letter |
| PMP | Project Management Plan |
| RA | Range of Alternatives |
| SRBER | Skokomish River Basin Ecosystem Restoration |
| SWAT | Skokomish Watershed Action Team |
| TSP | Tentatively Selected Plan |
| USFS | United States Forest Service |
| USFWS | United States Fish and Wildlife Service |
| USACE | United State Army Corps of Engineers |
| WFDW | Washington Department of Fish and Wildlife |
| WSDOT | Washington State Department of Transportation |

# I. INTRODUCTION

The United States Army Corps of Engineers (the Corps), Seattle District is proposing to conduct the Skokomish River Basin Ecosystem Restoration (SRBER) project in the lower Skokomish River watershed. This watershed, including the study area, is severely degraded and has been the focus of significant attention by federal, state, local, tribal, and private entities. Significant, widespread, and persistent anthropogenic disturbances throughout the watershed from the late 1800's to the early 1990's have resulted in degraded conditions for many aquatic species. The river is believed to have once supported the most abundant salmon and steelhead trout (*Oncorhynchus* spp.) populations in all of Hood Canal, one of the four major Puget Sound basins. Now, however, two endemic populations are locally extirpated and several others are severely depressed. Recovery plans for two species specifically cite a need for significant restoration in the lower watershed before recovery can begin. The SRBER project proposes a suite of actions intended to restore natural watershed and ecosystem structure, function, and processes to the lower watershed for the benefit of native salmonids and other aquatic species.

The Corps, in coordination with local cost-sharing sponsors, stakeholders, and the Service, identified a multitude of possible restoration-oriented activities across the General Investigation (GI) study area. The study area is a fairly broad area encompassing the entirety of the lower watershed, including floodplains and the river delta (see Section II.B. for more detail). The Corps analyzed the proposed restoration activities and issued a Final Array of Alternatives intended to represent the Range of Alternatives of a National Environmental Policy Act (NEPA) assessment. From this Range of Alternatives / Final Array of Alternatives (RA/FAA)[1], the Corps, in conjunction with local sponsors and with input from the Service, identified a Tentatively Selected Plan intended to represent the Preferred Alternative of a NEPA assessment. The area affected by the Preferred Alternative / Tentatively Selected Plan (PA/TSP) is located in the upstream part of the study area. The area affected by the PA/TSP will be referred to as the "action area" in this report.

The purpose of this report is to evaluate possible effects to fish and wildlife of the proposed SRBER project, and recommend actions for minimizing deleterious consequences and maximizing benefits. In doing so, this report broadly evaluates effects within the study area of each alternative in the RA/FAA in order to concur with or dispute selection of the PA/TSP. A greater level of detail is provided in the evaluation of PA/TSP effects in the action area.

This report is provided under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*), and constitutes the report of the Secretary of the Interior required under Section 2(b) of that Act. The National Marine Fisheries Service (NMFS) and the Washington Department of Fish and Wildlife were invited to provide input and participate in developing recommendations. The NMFS opted to provide input directly to the USACE. The WDFW opted to not participate.

[1] "Final Array of Alternatives" and "Tentatively Selected Plan" are Corps terms related to internal Corps process. As noted, each term represents a specific corresponding element in a NEPA assessment. The Corps and NEPA terms will be used together in this report to facilitate ease of understanding.

### A. Project authority, purpose, and scope

The proposed SRBER project is the outcome of the Skokomish River Basin Feasibility Study, which the Corps is conducting under the authority of the River and Harbor Act of 1962 (Public Law 87-874), Section 209, Puget Sound and Adjacent Waters. The Corps concluded the reconnaissance phase in March 2000 and determined that there was sufficient federal interest to advance to the next stage of conducting a feasibility study. The study was postponed from 2002 to 2006 due to unresolved issues associated with Cushman Dam operations and lack of local sponsor funding. The feasibility study was resumed on July 3, 2006, with Mason County and the Skokomish Tribal Nation as the local sponsors and non-federal funding partners.

The project was dual purpose - flood hazard reduction and ecosystem restoration - throughout much of the feasibility phase. However, preliminary economic analyses indicated low expected annual flood damages due in part to recent flood mitigation projects spearheaded by Mason County. These developments have led the Corps and project sponsors to focus solely on ecosystem restoration (USACE 2012).

The Corps (USACE 2012) identified a three-part purpose to the Skokomish River Basin feasibility study:

1. evaluate significant ecosystem degradation in the Skokomish River Basin;
2. formulate, evaluate, and screen potential solutions to these problems; and,
3. recommend a series of actions and projects that have federal interest and are supported by a local entity willing to provide the requisite local cooperation.

### B. Prior efforts and coordination with the Service

Prior to 1998. A variety of entities - including the Corps, Mason County, the Skokomish Tribal Nation, and Washington State Department of Transportation - identify flooding problems in the study area. The Corps determines that flood control and/or flood hazard reduction efforts would not be cost effective.

1998-1999. The Corps proposes a combined Flood Hazard Reduction and Ecosystem Restoration. Entities involved in formulating and discussing proposals include the Corps, the Service, Mason County, and the Skokomish Tribal Nation

January 1999. The Corps issues the document "Project Management Plan: Skokomish River Flood Hazard Reduction and Ecosystem Restoration."

July 1999. The Corps issues for comments the document "Skokomish River Flood Hazard Reduction and Ecosystem Restoration Study, Preliminary 905(b) Analysis."

October 1999. The Service provides written comments on the July 1999 Preliminary 905(b) Analysis.

February 2000. The Corps issues the document "Skokomish River General Investigation (GI) Reconnaissance Study, 905(b) Analysis." The analysis determined that there is a Federal interest in proceeding with a project in the area.

July 2006. The Corps issues the document "Final Project Management Plan (PMP) for Feasibility Phase Study of Skokomish River Basin, Mason County, Washington."

November 2006. Several meetings were held, with Service participation, to discuss and develop GI studies and evaluations.

June 2008 - September 2009. The Service conducts comprehensive ecological field surveys in the Skokomish River watershed as part of the GI. Final report is issued June 2011 (Peters et al. 2011).

September 2008. The Service provides a written Planning Aid Letter commenting on the July 2006 PMP.

January 2011 - May 2012. A series of meetings are held with the Corps, the Service, Mason County, and the Skokomish Tribal Nation to develop ecosystem restoration project ideas.

June 2012. The Corps issues the document "Integrated Feasibility Report and Environmental Impact Statement Feasibility Scoping Meeting Read-Ahead."

June 2013. The Corps meets with the Service to provide update on planning process and discuss Fish and Wildlife Coordination Act (FWCA) reporting needs.

June 2013 - September 2013. Ongoing communications between the Corps and the Service to discuss and refine the Final Array of Alternatives.

September 16, 2013. The Corps, the Service, NMFS, the local sponsors, and other stakeholders (e.g., Mason Conservation District) meet to discuss the PA/TSP. WDFW was invited but was not in attendance.

### C. Prior studies and reports

A multitude of studies and reports have been issued on Skokomish River basin hydrology and ecology, the causes and consequences of watershed and aquatic ecosystem degradation, and recommendations for improvement. The most pertinent ones are cited throughout this report.

# II. DESCRIPTION OF STUDY AREA AND ACTION AREA

## A. Watershed context

The Skokomish River is located in the southeastern portion of Washington State's Olympic Peninsula (Figure 1). It flows southeast out of the Olympic Mountains and empties into Annas Bay at the southern end of Hood Canal, a natural waterway and one of Puget Sound's four major basins. The Skokomish watershed is the largest in Hood Canal. Measuring 240 mi$^2$, it is twice as large as the next largest watershed in the basin. Similarly, the Skokomish subestuary[2] is the largest and most complex in Hood Canal, measuring 2,175 acres with a perimeter of 11. 2 miles (Todd et al. 2006). The Skokomish River system is believed to have supported some of the largest runs of Pacific salmon and steelhead trout (*Oncorhynchus* spp.) in Hood Canal (Correa 2003). However, many of these endemic Skokomish River salmon populations are either locally

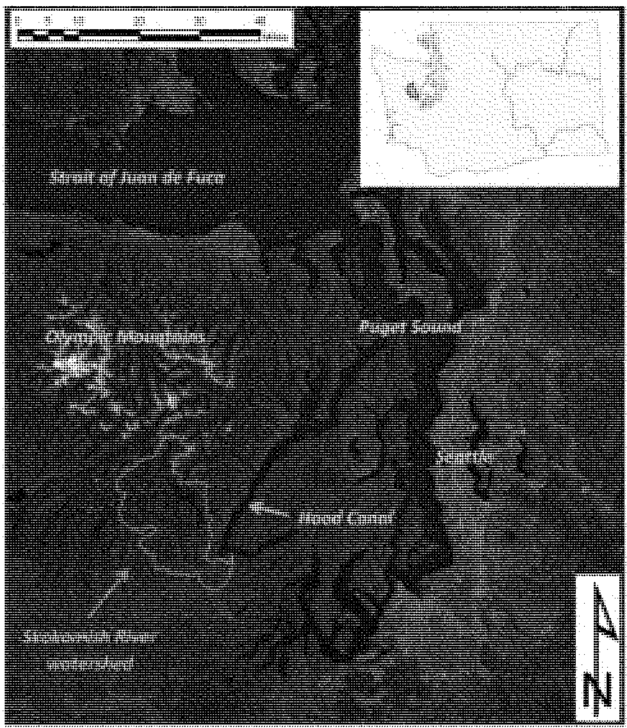


Figure 1. Map showing location of the Skokomish River watershed.

[2] Following Simenstad (2000), the term "subestuary" describes the estuarine delta at the river mouth. This area is physically and ecologically distinct from Hood Canal proper.

extirpated or severely depressed due in large part to past human activities throughout the watershed (Correa 2003; WDFW 2013b). Excellent detailed descriptions of the Skokomish watershed and it's geology, hydrology, climate, geomorphology, ecology, human impacts, and the interactions between these factors can be found in several reports (e.g., SIT and WDFW 2010; Peters et al. 2011; USACE 2011; USACE 2012). A very brief summary of the most pertinent elements is presented below.

The Skokomish basin consists of three primary sub-basins and the mainstem[3]. The three sub-basins include the North Fork Skokomish (33 mi), the South Fork Skokomish (28 mi), and Vance Creek (11 mi). The mainstem flows 8 miles from the confluence of the North and South Forks to the river's mouth in Hood Canal (Figure 2). Vance Creek enters the South Fork two miles upstream from the confluence of the North and South Forks. These three primary tributaries originate in steep mountainous and foothill terrain and transition to shallower gradients as they converge and enter the flat alluvial[4] mainstem valley (Figure 2). The Skokomish watershed has variable terrain ranging from alluvial and glacial valley bottoms with relatively gentle slopes, to rugged and steep terrain with near vertical side slopes in the headwaters. Soil depths in the watershed are shallow except in the river valleys, where sediment may be hundreds of feet deep. The climate is a temperate marine climate with wet winters and dry summers. Annual rainfall varies from 60 inches in the lower valley to 120 inches in the headwaters. Federal ownership accounts for 66 percent of the watershed, including 48 percent in Olympic National Forest and 18 percent in Olympic National Park (Figure 3).

### B. Study area and action area

The study area lies in the lowest part of the watershed where gradients are relatively shallow and the three main branches of the river system come together and flow across the broad alluvial Skokomish Valley floodplain (Figure 2). This area measures 11 square miles and includes the mainstem, the lower 4 miles of the South Fork, the lower 2 miles of the North Fork, the lower 2 miles of Vance Creek, and the subestuary. The upper portion of the study area is mostly agriculture and rural residential intermixed with areas of commercial timberland and undeveloped lands (Figure 3). The lower portion of the study area lies in the Skokomish Tribal Nation reservation, which is largely undeveloped with some rural residences and other uses.

The primary action area is located in the upstream part of the study area (Figure 2). Secondary, or ancillary, action areas include: 1) as yet unidentified source areas for large woody debris (LWD); and, 2) disposal site(s) for excavated materials and/or removed levee materials.

[3] The term "mainstem" can have two meanings: 1) From a river system perspective, the mainstem of a river is usually the largest channel. There are inconsistencies among some Skokomish River reports in how the term "mainstem" is used. Some use the term to describe only areas below the North and South Fork confluence. Others extend use of the term to apply to areas in the South Fork, while others the North Fork. For this report, the mainstem Skokomish River is defined as only that part of the river downstream from the confluence of the North and South Forks. 2) From a habitat perspective, relatively large river channels provide what is commonly termed "mainstem habitat." To avoid confusion, this report will use the term "main channel" instead of "mainstem" to describe this type of habitat. In the Skokomish watershed, main channel habitat is defined in the South Fork (approximately 25 miles), the North Fork (approximately 23 miles), and below the confluence (8 miles).
[4] The term "alluvial" means that alluvium, or loose, non-compacted sand and gravel, is the dominant inorganic material comprising the valley floor.

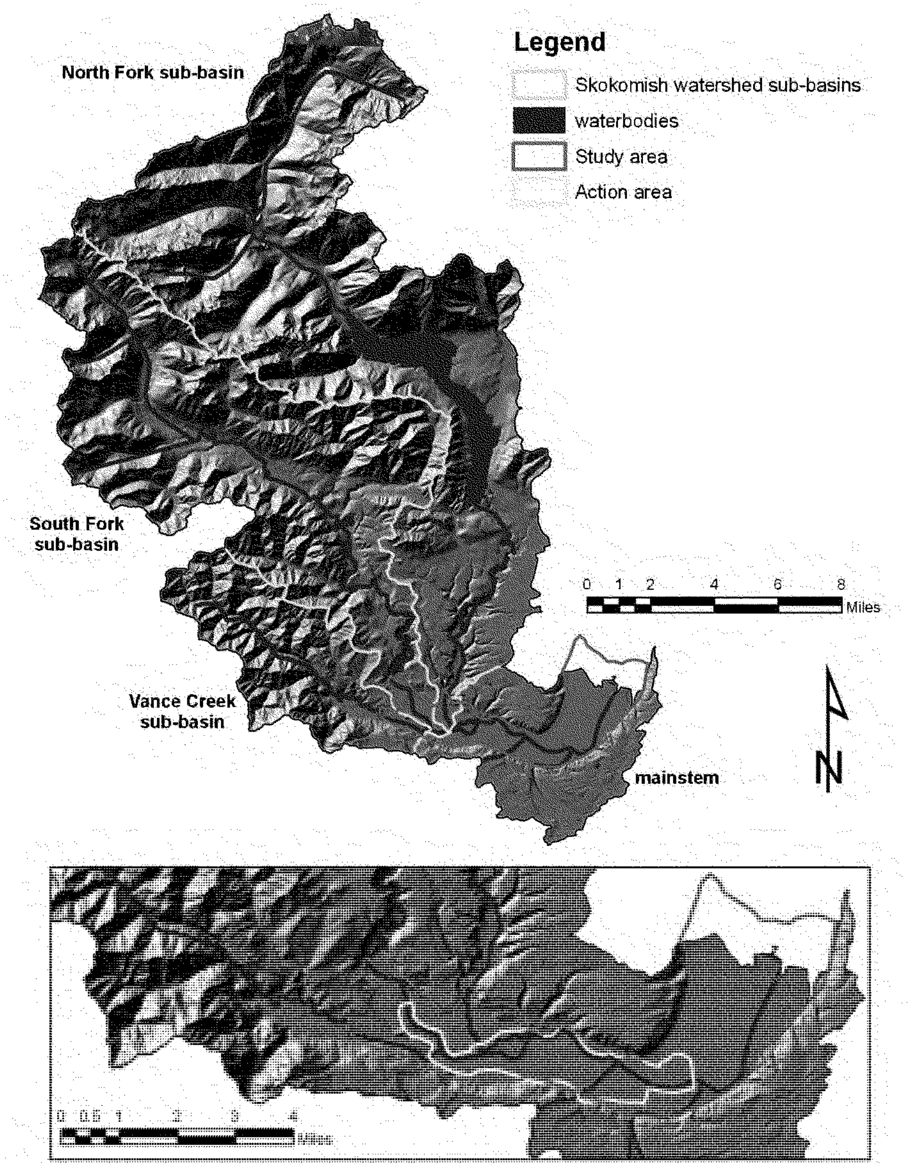


Figure 2. Map showing Skokomish River watershed shaded relief across the watershed (top) and within the study area and primary action area (bottom).

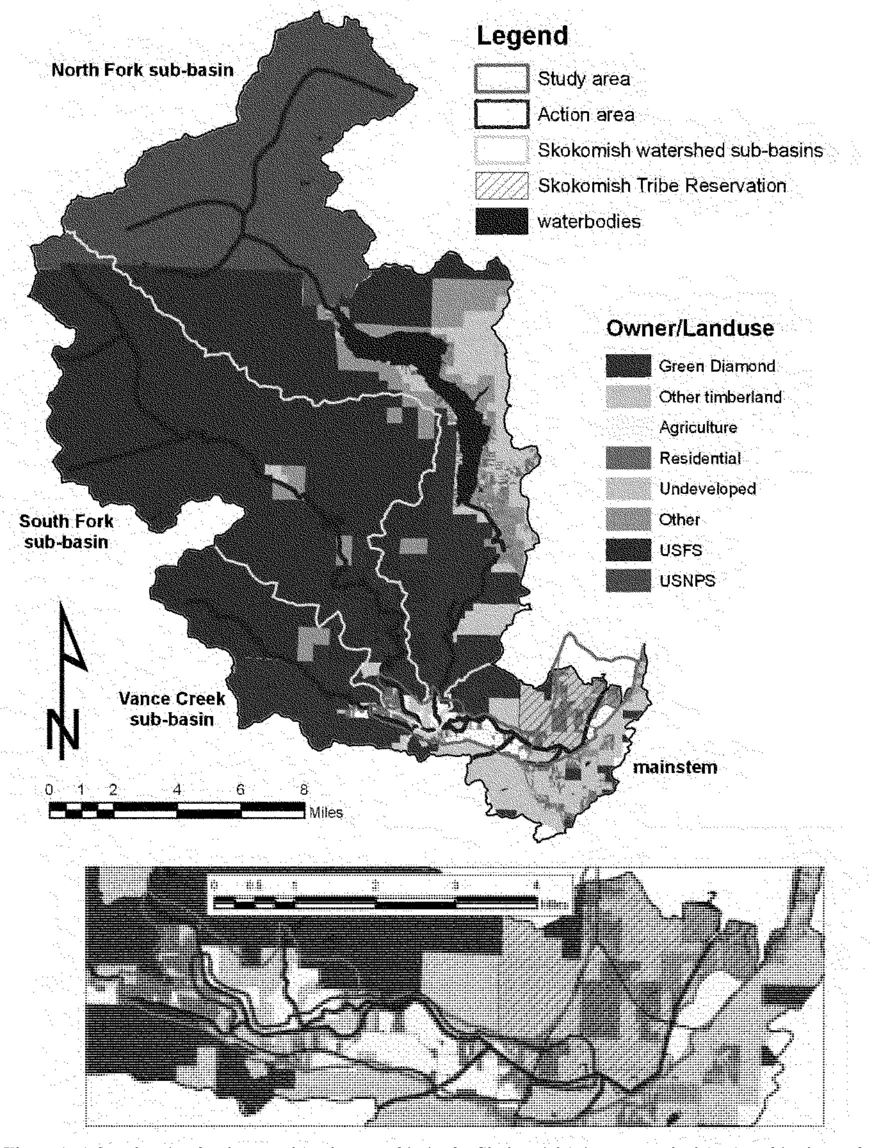


Figure 3. Map showing land use and land ownership in the Skokomish River watershed (top) and in the study area and primary action area (bottom).

The current state of the Skokomish River in the study area is the product of many decades of anthropogenic impacts throughout the watershed. These impacts have been substantial, widespread, and persistent. The migration of Euro-American settlers to the watershed in the late 1800's marked the onset of watershed transformation. During the next century, the watershed and the river experienced a variety of impacts, including: intense logging and widespread deforestation of riparian, floodplain, and upland areas throughout the basin; removal of nearly all LWD from the river and tributaries; river straightening and channelization with levees; additional hydraulic constrictions caused by roadway bridges (US101 and SR106); and, installation of two dams on the North Fork and subsequent withdrawal of nearly all its water. Many of these actions took place entirely or partially within the study area. Others occurred outside of the study area (e.g., North Fork impoundment and water withdrawal), but directly or indirectly shaped the physical and biological conditions observed today.

Cumulatively, these actions have resulted in a severely impaired system: the channel is highly aggraded and very unstable; sediment routing is highly impaired; and characteristics of quality salmon and trout habitat are lacking, including LWD, pools, side-channels, and off-channel habitat. Increased sediment supplies, reduced flows, and levees have also had a significant effect on estuarine habitat. The delta has become steeper, resulting in: 1) loss of important intertidal and eelgrass habitat; and, 2) a reduced mesohaline mixing zone, which is an important transition area for juvenile and adult salmonids as they move between freshwater and seawater. Several reports provide fairly thorough documentation and discussion of how human alterations have shaped the river and aquatic ecosystem in the study area (e.g., SIT and WDFW 2010; Peters et al. 2011).

In order to understand how the proposed SRBER project may affect fish and wildlife resources, it is important to understand the natural and human history of the watershed and the study area, and how these have interacted to create the physical and biological conditions observable today. These histories and interaction can be summed up as follows: 1) the physical forms, functions, and processes within the watershed and the study area are inherently very sensitive to disturbance and alterations; 2) the biological character of the watershed and the study area - including survival and productivity of fish and aquatic species of interest - are intimately linked to these physical forms, functions, and processes; and, 3) the watershed and the study area have been heavily disturbed and altered by diverse human activities since the late-1800's, substantially altering their physical and biological character. This context is a primary driver influencing project success at restoring more natural physical and biological characteristics and ultimate effect on fish and wildlife resources. A brief summary of pertinent study area characteristics and how they've been shaped by humans is presented below.

### 1. Geology

The study area's geologic history and setting suggest that it is highly sensitive to disturbance. Recently deglaciated landscapes such as the Skokomish basin experience an unstable "paraglacial" (or immediate post-glacial) period until glacial sediments are either removed from the system or become stable (Ballantyne 2002). Low-gradient alluvial reaches such as that within the study area are particularly sensitive and highly responsive to disturbance (Skidmore et al. 2011). In the Pacific Northwest, significant stabilization is achieved by abundant in-channel

LWD and mature conifer-dominated forests that blanket riparian, floodplain, and upland areas. Disruption to such stabilization mechanisms can destabilize the entire system by re-activating paraglacial sediment transport, creating unstable channel conditions, and re-mobilizing floodplain sediment sources (Ballantyne 2002; Skidmore et al. 2011).

### 2. Channel pattern

Channel pattern is important to river restoration because it has a direct bearing on aquatic ecosystem diversity and productivity. The term "channel pattern" is used to describe two basic aspects of a river: 1) the migratory behavior of a river; that is, the degree to which the channel migrates laterally across the floodplain; and, 2) whether the river has a single thread or multiple threads. Researchers generally recognize four primary channel patterns in rivers such as the Skokomish[5]: straight, meandering, island-braided (or anabranching), and braided (Figure 4; Leopold and Wolman 1957; Beechie et al. 2006; Huang and Nanson 2007; Eaton et al. 2010; Beechie and Imaki 2013).

Meandering channels are single-thread channels that migrate laterally across the floodplain (Leopold and Wolman 1957; Beechie et al. 2006). They are often found at low gradients, and thus are usually lowest in the watershed. The meandering pattern is evident in the lower Skokomish River mainstem. Evidence suggests that the meandering pattern was present in this part of the river prior to anthropogenic disturbance (Bountry et al. 2009; SIT and WDFW 2010)

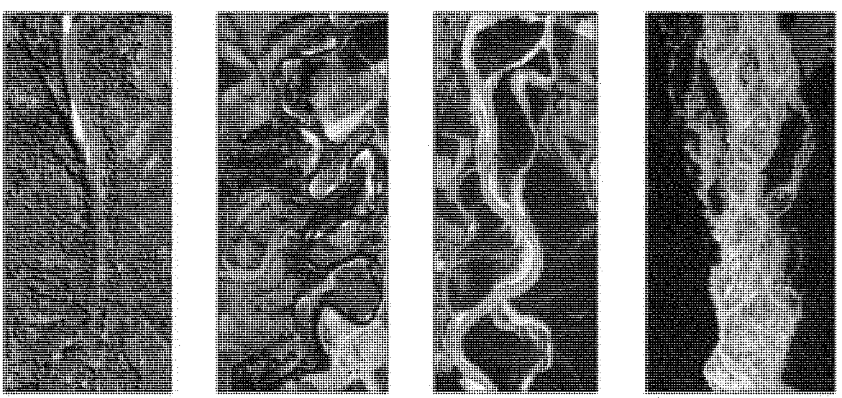


Figure 4. Examples of the four channel patterns found in western Washington rivers similar to the Skokomish. Image from Beechie and Imaki (2013).

[5] Authors have used different terms and definitions for similar patterns, and these terms have sometimes overlapped or contradicted one another. Beechie et al. (2006) provides a summary of these.

Braided channels have multiple threads that migrate laterally across the floodplain (Leopold and Wolman 1957; Beechie et al. 2006). They are usually found high in watersheds where steep headwater streams deposit abundant sediment into more moderately sloped main channels (Beechie et al. 2006; Beechie and Imaki 2013). Braided channels are symptomatic of large sediment inputs that exceed transport capacity of the channel. Braided channels are highly unstable. Of the three migrating channel patterns, meandering channels migrate the quickest and thus have the most disturbed floodplains (Beechie et al. 2006). Individual threads are separated by non- or sparsely-vegetated islands. Locations of channel threads and islands are in a constant state of change.

Within the study area, the South Fork and much of the mainstem currently exhibit a braided channel pattern (Peters et al. 2011). Braided morphologies are highly unstable, homogenous, and inhospitable to many fish species including salmonids. In the study area, the lack of LWD in the braided channel has yielded a largely featureless plane-bed channel type with a general paucity of pools (WDFW and PNPTT 2000). This provides poor habitat for fish spawning, rearing, and overwintering. The current braided channel pattern is not believed to have existed in this location prior to anthropogenic disturbance (SIT and WDFW 2010; Peters et al. 2011). Instead, anthropogenic disturbances to the system, including but not limited to removal of most LWD from the system and widespread deforestation of riparian, floodplain, and upland areas, are responsible for the current braided pattern. Conversion to the braided pattern is believed to have had substantial deleterious consequences to many fish species (Peters et al. 2011).

The third cannel pattern, island-braided, also has multiple threads that migrate laterally across the floodplain (Beechie et al. 2006; Huang and Nanson 2007; Eaton et al. 2010; Beachie and Imaki 2013). This channel pattern existed in part or most of the study area prior to anthropogenic disturbance (SIT and WDFW 2010; Peters et al. 2011). Island-braided channels are much more stable than braided channels because individual threads of the island-braided pattern are separated by stable vegetated islands. In contrast, the non-vegetated islands of the braided pattern are unstable and constantly shifting. Island-braided channels are considered intermediate between meandering and braided channels (Eaton et al. 2010). They are often found downstream of braided channels and upstream of meandering channels in the watershed (Beechie et al. 2006; Beechie and Imaki 2013). They also show a migration rate and floodplain disturbance level that are intermediate between the braided and meandering patterns (Beechie et al. 2006).

The island-braided pattern is common in undisturbed transport-limited depositional reaches of western Washington alluvial rivers (Beechie et al. 2006). This pattern provides channel stability and allows for both sediment storage and sediment transport (Beechie et al. 2006; Burge 2006; Huang and Nanson 2007; Jansen and Nanson 2010). It is a physically and hydraulically diverse pattern with abundant side channels, LWD, riffles, and complex pool habitats. Side channels are often markedly different from main channels in terms of hydrology, gradient, substrate, and habitat.

Ecological theory suggests that the island-braided channel pattern produces the most diverse and productive aquatic and floodplain habitats, which in turn supports the most productive fish populations (Ward et al. 1999; Gurnell and Petts 2002; Ward et al. 2002; Beechie et al. 2006;

Francis et al. 2009). Empirically, the island-braided pattern has been found to contain the highest quantity, quality, and diversity of aquatic habitats (Arscott et al. 2000), and thus the greatest biological diversity (Gurnell et al. 2005). Side channels and other off-channel habitat typically associated with the island-braided pattern (Ward et al. 1999; Ward et al. 2002; Beechie et al. 2006) have well-documented superior value to salmonids in the Pacific Northwest (e.g., Murphy et al. 1989; Beechie et al. 1994; Morley et al. 2005; Jeffres et al. 2008; Bellmore et al. 2013).

There are three primary lines of evidence supporting the contention that most of the river in the study area exhibited an island-braided channel pattern prior to human disturbance:

1. Maps and survey records made during the late 1800's and early 1900's indicate historic vegetated islands between RM 4.5 and 11, as well as in the lower North Fork. These data are presented in SIT and WDFW (2010) and Peters et al. (2011) and will not be duplicated here. The maps and survey records clearly show islands between RM 9 and 11, between RM 7.7 and RM 8, between RM 4.5 and 6, and on the North Fork between RM 0 and 1. A slough mapped between RM 6.8 and 7.6 suggests another likely island in this location.

2. Geomorphic theory suggests that the island-braided pattern develops in transitional areas where steeper, more mountainous gradients transition to shallower gradients in valley bottoms (Beechie et al. 2006, and references therein; Beechie and Imaki 2013). The study area matches the idealized setting where the island-braided pattern would be expected.

3. Preliminary application of a predictive model (Beechie et al. 2006) to the Skokomish River[6] predicts the island-braided pattern starting at about RM 11.5, and extending downriver to RM 3.2 to 5 (Figure 5). This matches very closely with the early maps and survey records discussed above.

Both SIT and WDFW (2010) and Peters et al. (2011) relied on historic land surveys and maps (line of evidence 1) to support the contention that the Skokomish River had an island-braided pattern prior to human disturbance. Neither report considered geomorphic theory (line of evidence 2) or channel pattern predictive models (line of evidence 3). These two additional lines of evidence have not been reported or considered elsewhere. The brief presentations above are not intended as comprehensive or sufficient applications of geomorphic theory or channel pattern predictive modeling to the Skokomish River. Such evaluations are beyond the scope of this report. Rather, they are included to highlight heretofore neglected information and approaches

[6] The Beechie et al. (2006) model uses river discharge and channel slope to predict channel pattern in western Washington watersheds. Variations of this methodology are common (e.g., Leopold and Wolman 1957; Desloges and Church 1989; Beechie and Imaki 2013). The preliminary Skokomish assessment used slope data from Bountry et al. (2009). Estimates of two-year flood discharge (approximating bankfull discharge) were obtained from two sources: a) LP-III Model estimates calculated by the Bureau of Reclamation (England 2007; USBOR 2009, cited in USACE 2011); and, b) the regression equation proposed by Sumioka et al. (1998) using watershed area and mean annual precipitation. Mean annual precipitation for the Sumioka et al. (1998) method was represented by climatological period 1961-1990 and was obtained from the United States Department of Agriculture Natural Resource Conservation Service.

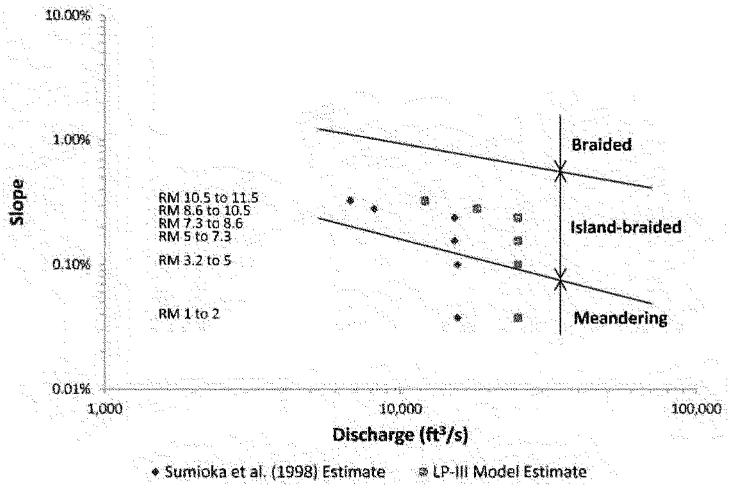


Figure 5. Results of preliminary predictive modeling (Beechie et al. 2006) for predicting natural channel pattern in the Skokomish River. The black lines represent thresholds that separate channel patterns: meandering from island-braided (lower line); island-braided from braided (upper line). Two methods for estimating two-year flood discharge in the Skokomish River are shown (Sumioka et al. 1998 and LP-III Model). See text for explanation. River miles on the left correspond with each pair of data points to the right. Results indicate that the island-braided pattern is predicted from RM 11.5 to about RM 3.2.

vital to understanding the geomorphic and ecological history of the Skokomish River, and thus informing restoration efforts for maximizing benefits.

### 3. Aggradation

Rapid and substantial riverbed aggradation[7] in the study area has been one of the most notable and agreed upon consequences of human impacts in the watershed. For example, the U.S. Geological Survey (USGS) gaging station at the US101 bridge has experienced over 4 feet of aggradation over the 32 year period from 1965 to 1997, a rate of 1.3 feet per decade (Stover and Montgomery 2001). As a result of aggradation, channel capacity in this location has steadily decreased from 13,000 cfs in 1943 to about 4,000 cfs in recent years (USACE 2011). Aggradation is so severe that the South Fork often goes completely dry between RM 8 and 9 during late-summer and early-fall[8] (SIT and WDFW 2010). It is thought that the Skokomish River in the study area has been naturally aggrading for the past 2,000 years (Bountry et al. 2009). However, the rate of aggradation experienced during the 20th and early 21st century is believed to be well above natural.

[7] Aggradation is the build-up of sediment in the river channel. It occurs when sediment inputs from upstream exceed transport capacity. The result is an increase in the elevation of the river bed.
[8] Late-summer and early-fall is the normal seasonal low-flow period for unimpounded western Washington rivers.

Reviewers commonly cite six factors believed to have contributed to the current state of aggradation (Bountry et al. 2009; SIT and WDFW 2010; Peters et al. 2011):

1. Clearcut logging and rapid deforestation throughout the watershed resulting in an increased sediment load from unstable slopes, mass wasting, and bank erosion.

2. Removal of logjams and large wood pieces and clearing of riparian zone old-growth forest throughout the study area resulting in release of stored floodplain sediments and subsequent conversion of an island-braided channel pattern to a less stable braided one.

3. Reduction in flow from the North Fork Skokomish River due to the operation of Cushman dam, resulting in reduced sediment transport capacity in the mainstem Skokomish River.

4. Channelization and straightening of the river channel using riprap, crib structures, cabled logs, and removal of large wood, resulting in reduced sediment transport efficiency.

5. Confinement of the channel by levees, resulting in backwatering of some areas, translation of depositional zones in a downstream direction, in-channel deposition of suspended sediments in low gradient areas, and loss of storage of coarse sediments in secondary channels.

6. Hydraulic flow constrictions at US101 and SR106 bridge crossings, causing back watering and loss of sediment transport capacity.

Each of these mechanisms is physically plausible and has likely contributed to the aggradation problem to varying degrees. However, there is no professional consensus among the various experts who have studied physical processes in the Skokomish River as to which are most important (Bountry et al. 2009). Without a clear understanding of which mechanisms are driving or most responsible for aggradation in the study area, agreement on the most effective restoration actions in the study area will remain elusive.

Severe aggradation in the study area may impact fish populations by: 1) blocking migration; 2) inducing channel instability which can scour and bury redds (egg nests); 3) reducing habitat quantity and quality by filling in pools and diminishing pool frequency and depth; and, 4) increased incidence of fish stranding and mortality in the floodplain due to increased frequency and severity of flooding.

### 4. Large woody debris

Large woody debris is severely lacking throughout the study area (Correa 2003; Peters et al. 2011), a result of direct channel clearing of LWD in the early 1900's as well as removal of source LWD areas via deforestation. LWD is a primary structural factor affecting general channel stability, hydraulics, sediment routing and retention, bank erosion, and channel pattern. It is vital in both: 1) creating and maintaining channel characteristics that constitute high quality fish habitat; and, 2) providing a direct source of complexity, hydraulic cover, and cover from predators, which together increase salmonid rearing densities and survival.

### 5. Channelization and floodplain connectivity

Residents of the valley and various government agencies have over the years implemented various uncoordinated diking, channelization, and bank stabilization efforts throughout the study area (Bountry et al. 2009). The result has been an extensive albeit discontinuous network of levees, dikes, and associated structures through the length of the study area. The Corps (USACE 2000) noted that these levees may mitigate low-level and site-specific flooding but are of little benefit during large magnitude flood events. These levees have likely contributed to the current state of aggradation and fish habitat loss through the complex interactions that levees can have with channel hydraulics and sediment transport and deposition. Although not entirely conclusive, the construction of levees coincides with the beginning of aggradation in the study area (Stover and Montgomery 2001). Three levee sites have severely constrained the river and are believed to have had the most influence in shaping the study area: the Nalley Island levees[9]; the Car Body and River Mile 9 Levees near the pre-2004 North Fork confluence; and the Grange Levee (Peters et al. 2011). These and other levees in the study area isolate the channel from the floodplain, and inhibit natural physical processes and formation of natural river morphologies. They also inhibit formation, maintenance, and use of off-channel habitat that is important for many salmonid species.

Channel straightening in the Skokomish River began in the 1930's. Channelization in the study area was not well documented, although at least four sections along the South Fork and the mainstem are believed to have been straightened (Bountry et al. 2009): an area below RM 12, another area just downstream of RM 9.6, and sections from RM 8 to 9, and RM 4 to 5.3. Channelization results in a temporary increase in hydraulic capacity, but reduced sediment transport efficiency over the long-term. Channels that are straightened to increase flood conveyance are usually widened as well. This tends to improve hydraulic capacity, but reduces the sediment transport capacity relative to a more sinuous channel with a deep thalweg[10], a lower width-to-depth ratio, and the presence of secondary currents along the bed and banks that keep sediment mobilized. Channelization thus shortens the length of the channel and by extension available habitat, and may also contribute to aggradation.

## C. Other restoration efforts

There is strong interest by a variety of federal, state, local, tribal, private entities, and affiliated collaborative groups (e.g., the Skokomish Watershed Action Team), to restore the Skokomish River watershed. These groups have implemented numerous restoration projects of varying scales throughout the watershed. In the absence of any overarching, comprehensive, watershed-scale organization, early restoration efforts were generally ad-hoc, small, and localized. Collaboration within groups such as the Skokomish Watershed Action Team (SWAT) and the Hood Canal Coordinating Council appears to be facilitating a more holistic, comprehensive, and systematic approach to developing and prioritizing restoration projects within the watershed.

[9] Most of the Nalley Island levees were removed between 2007 and 2010.
[10] The thalweg is the deepest part of the channel.

A brief summary of the larger, more pertinent completed or ongoing restoration efforts in the watershed is outlined below. Additional restoration projects are underway and/or planned. Many of these are either upstream from the study area or in and near the subestuary. Large-scale restoration in the study area has generally been avoided. Restoration leaders (e.g., SWAT) have recognized the complexities and magnitude of the issues and restoration needs here, and are thus relying on the Corps and the GI for direction and funding (SWAT 2007). Organizations such as the Mason County Conservation District are facilitating smaller-scale efforts throughout the study area.

*South Fork Skokomish River watershed restoration on USFS lands (1990 - 2004).* The U.S. Forest Service and various partners implemented various restoration projects in the South Fork, including road, in-stream, riparian, and vegetative work totaling $10.6 million. See USFS (2004) for more details. These efforts marked a turning point in that resource extraction was deemphasized in favor of watershed restoration.

*Skokomish Estuary Restoration, Phase 1 (2007).* This effort removed 0.69 miles of dike on the west side of Nalley Slough, restoring 108 acres of intertidal wetlands.

*Cushman Project Federal Energy Regulatory Commission (FERC) Project No. 460, Settlement Agreement for the Cushman Project (January 2009).* This settlement provided a variety of beneficial actions for fish and fish habitat in the North Fork Skokomish River. Among the most important was restoration of flows to the North Fork, which has widely been viewed as critical to restoring natural sediment transport rates through the study area. Flow restoration was implemented in March 2008, prior to signing of the settlement agreement. Other notable actions agreed to in the settlement include fish population supplementation plans, construction and operation of fish passage facilities at the Cushman project, fish and habitat monitoring, and enhanced fish habitat plans.

*US 101 Purdy Creek Bridge Replacement (September 2009).* The old 110-foot-long US101 Purdy Creek Bridge was replaced with a 350-foot-long, taller bridge primarily to reduce flood-related road closures in this location. Flooding from the Skokomish River was common here. The bridge replacement had the added benefit of reducing one of the four hydraulic constrictions in this section of the river system. These four constrictions are distributed laterally across the floodplain at essentially the same longitudinal point in the valley (i.e., along US 101). Thus, backwatering upstream of all four US 101 bridges is expected to decrease (WEST Consultants, Inc. 2006).

*South Fork Skokomish River Large Wood Project (Summer 2010).* Thirty engineered log jams (ELJs), consisting of over 2,000 logs, were installed in a one-mile stretch of the South Fork Skokomish River located approximately 10 miles upstream from the study area. In addition, approximately 12 acres of floodplain were restored and stabilized with tree and shrub plantings. These actions are expected to stabilize and retain sediments in the area immediately around the ELJs, and thus restore more natural sediment transport rates to downstream areas. Other benefits include enhancement of fish spawning and rearing habitat in the immediate ELJ installation area.

*Skokomish Estuary Restoration, Phase 2 (2010).* This effort removed 2.49 miles of dikes, removed roads and culverts, and filled ditches, restoring 200 acres of subestuary habitat. The implementation of Phases 1 and 2 were widely regarded as critical to alleviating flooding in the lower mainstem and to restoring critical subestuary structure and function for the benefit of fish, shellfish, and shorebirds.

*Green Diamond Resource Company watershed restoration (mid-1990's to present).* The Green Diamond Resource Company owns and manages 15% of the Skokomish River watershed for commercial timber production. Green Diamond has upgraded and decommissioned roads to decrease sediment inputs from their road systems, and has restored fish passage in some areas by replacing inadequate culverts.

*South Fork Skokomish River watershed restoration on USFS lands (2005 - present).* The U.S. Forest Service, in conjunction with the SWAT, the Skokomish Tribe, and other partners, have completed over $11.5 million in restoration work, including road closures and decommissioning, road stabilization, trail conversion, and commercial and pre-commercial thinning for expediting development of characteristics similar to mature forest. Among other results, efforts since 1990 have decreased road density in the upper South Fork watershed from 3.3 miles per square mile to less than 1.9 miles per square mile.

## III. FISH AND WILDLIFE RESOURCES AND PLANNING OBJECTIVES

### A. General fish and wildlife concerns

The SRBER project is intended to restore some degree of watershed and aquatic ecosystem structure, function, and processes for the benefit of numerous aquatic species, with a particular emphasis on salmonids. Ecological restoration invariably involves some degree of disturbance, risk, and uncertainty, and also often involves trade-offs that favor some species and habitats over others. Watershed-scale restoration, such as that proposed by the SRBER project, involves complex physical and biological interactions that often times are not fully understood. Because of the scale and scope of this project, and the complexity of the physical and biological processes involved, primary fish and wildlife concerns include:

1. How likely are the intended benefits of the proposed actions to be realized?

2. Will all pertinent factors that may influence success be adequately considered?

3. What short- and long-term negative impacts to target and non-target species and habitats may arise?

4. Will the intended benefits outweigh the negative impacts?

5. Will unintended consequences and level of risk associated with those consequences be adequately considered and managed?

6. What is the potential for the proposed actions to result in a net negative impact to target and non-target fish and wildlife resources?

7. What will negative impacts be to non-target species and will benefits to target species outweigh these?

### B. Planning objectives

The Corps has identified four planning objectives of the proposed SRBER project for a 50-year period of analysis:

1. Provide year-round passage for fish species around the confluence of the North and South Forks.

2. Reconnect and restore the side channel and tributary networks in the study area.

3. Improve the quantity, quality, and complexity of native in-channel and floodplain habitats in the study area.

4. Increase the channel capacity of the Skokomish River to allow for restoration of rearing habitat as well as reduce stranding of salmonid species listed under the Endangered Species Act (ESA).

### C. Current status of fish and wildlife resource

#### 1. Federally listed, proposed, and candidate Species

Federal ESA-listed species and/or the habitat suitable to support these species which occur or may occur in the study area include the following:

- Puget Sound Chinook salmon (*Ocnorhynchus tshawytscha*)
- Hood Canal summer chum salmon (*O. keta*)
- Puget Sound steelhead trout (*O. mykiss*)
- bull trout (*Salvelinus confluentus*)
- northern spotted owl (*Strix occidentalis caurina*)
- marbled murrelet (*Brachyramphus marmoratus*)
- streaked horned lark (*Eremophila alpestris strigata*)

These species are all listed as threatened. In addition, the yellow-billed cuckoo (*Coccyzus americanus*) has been proposed for listing as threatened, and the fisher (*Martes pennanti*) is a candidate species currently scheduled for proposed listing in 2014. Federal species of concern are addressed in Section III.A.3.

Of these species, the northern spotted owl, marbled murrelet, streaked horned lark, and yellow-billed cuckoo are not expected to occur in the study area. The northern spotted owl and marbled murrelet are found in mature and old growth conifer forests, and the yellow-billed cuckoo is strongly associated with large stands of mature riparian cottonwood forests. While there are small patches of large conifer stands in portions of the study area, there is not sufficient habitat to support these three bird species in the study area. The streaked horned lark requires large areas of bare ground in an open flat landscape, such as that found in native prairies and in developed areas like airfields. Such habitat is lacking in the study area. The other species listed above are either known to occur or may occur in the study area. These are discussed more fully below.

### a. Puget Sound Chinook Salmon ESU and Designated Critical Habitat

Chinook salmon in the Skokomish River belong to the Puget Sound Chinook salmon ESU which was listed as threatened under the Endangered Species Act in March of 1999. This listing was recently upheld in a 5-year review (NMFS 2011). Despite recent negative trends in abundance, the NMFS concluded that extinction risk of the ESU had not significantly increased. The NMFS noted that the ESU "is relatively well distributed over 22 populations in 5 geographic areas." Critical habitat was designated in 2005 to include the Skokomish River subestuary, the mainstem Skokomish River, the South Fork to approximately RM 12, the North Fork to just above Lake Cushman, the lower three miles of Vance Creek, and lower parts of several major tributaries (NMFS 2005). This generally overlaps with what is believed to be the historical spawning distribution in the basin (SIT and WDFW 2010).

The Skokomish River Chinook salmon population is severely depressed at best. In 2002, WDFW rated this stock as "depressed" due to "chronically low natural escapement" (WDFW 2002). Natural spawner escapement has been relatively stable since about 1990, averaging a little under 1,250 spawners per year (WDFW 2013b). Preliminary evidence suggests that hatchery strays account for considerable proportions of these naturally spawning fish (WDFW 2002; WDFW and PSIT 2007, cited in SIT and WDFW 2010; WDFW and PSTIT 2010). Juvenile production is also substantially lower than other Puget Sound river basins (Peters et al. 2011). The existence of a self-sustaining naturally-reproducing population is therefore questionable.

Chinook salmon are one of the most variable of the salmonid species in terms of life history diversity and habitat requirements. Puget Sound Chinook are no exception. Adult spawners enter natal watersheds during much of the year. "Early returning" fish typically migrate into freshwater during spring and summer; "late returning" fish typically enter during fall. Regardless of entry timing, spawning usually occurs from early August through late October. In the Skokomish River, spawning occurs in the mainstem, in the lower portions of the North and South Forks, and in Purdy, Vance, and Hunter Creeks. Fry emerge from redds between December and April. Juvenile Puget Sound Chinook salmon may spend as little as a few days to as many as 12 months or more rearing in freshwater habitats (SSPS 2007). Most, however, spend 6 months or less in freshwater, and enter estuary habitats by mid-July (Fresh 2006). Main channel, tributary, and off-channel pond areas in and near the study area all provide important freshwater rearing habitat for Skokomish River Chinook salmon (Peters et al. 2011). Natal delta and subestuary areas are vital for rearing and migration (Fresh 2006; Peters et al. 2011). Juveniles may spend up to 10 months rearing in natal delta/subestuary habitats.

Historically, the Skokomish River had both an early and a late run of Chinook salmon. However, the early run is considered extirpated (Nehlson et al. 1991; Ruckelshaus et al. 2006) and the late run is largely if not entirely non-native (Ruckelshaus et al. 2006; SIT and WDFW 2010). The late-timed run is much more dependent upon conditions in the lower watershed than the early-timed run. For this reason, the Skokomish River Chinook salmon recovery plan emphasizes reintroduction and recovery of an early-timed run at this time (SIT and WDFW 2010). The authors note that substantial improvement in lower watershed conditions is critical to recovery of the late-timed run. The existing late run population arose from widespread use of Green River (southeast Puget Sound) hatchery-origin fish at many Hood Canal hatcheries, including two in and near the Skokomish River basin. Nonetheless, the existing late run Skokomish River Chinook are considered part of the ESA-listed Puget Sound ESU.

Spawning historically peaked in October and often extended into November in the Skokomish River (SIT and WDFW 2010). However, past hatchery practices unintentionally advanced river return and spawn timing in Skokomish River naturally-reproducing stock by as much as 6 weeks or more (SIT and WDFW 2010). Thus, the existing run enters the river and spawns during the lowest river flows of the year. In contrast, the endemic run was more closely timed with the end of the summer drought season, the onset of fall rains, and rising river flows. This loss of environmentally-adapted behavior compounds already complicated recovery needs. First, access to spawning habitats in Vance Creek and the South Fork is frequently blocked at low flows by aggraded sediments above the North Fork confluence. In addition, spawning habitat is restricted to the central portion of the channel during low flows. This leaves eggs particularly susceptible to potential effects of peak fall and winter discharges, such as scouring, fill, and channel migration. These concerns would be ameliorated at historical run timing.

### b. Hood Canal Summer-run Chum Salmon ESU and Designated Critical Habitat

Hood Canal summer chum salmon were listed as threatened under the Endangered Species Act in March of 1999. This listing was recently upheld in a 5-year review, which found that "the overall trend in spawning abundance is generally stable" and determined that the ESU "remains at a moderate risk of extinction" (NMFS 2011). Critical habitat was designated in 2005 to include the Skokomish River subestuary and the mainstem Skokomish River from the vicinity of the old (pre-2004) confluence of the North and South Forks to the mouth (NMFS 2005).

Hood Canal summer chum adults typically spawn in the lower portions of rivers and streams from late August through late October (WDFW and PNPTT 2000). This timing corresponds with the lowest river and stream flows of the year. Spawning habitat is thus restricted to the central portion of the channel. This leaves the eggs particularly susceptible to potential effects of peak fall and winter discharges, such as scouring, fill, and channel migration. Fry emerge from gravel substrates between February and late May, and migrate downstream to estuary habitats shortly thereafter. There is little to no freshwater rearing. Dense bands of eelgrass in nearshore estuary areas are believed to provide important rearing habitat and safe migratory corridors for juvenile summer chum (Simenstad 2000). Eelgrass thrives in shallow, gentle-gradient areas with clear water and sandy substrate (Gayaldo 2002; Berry et al. 2003), and is present in the Skokomish subestuary albeit at a 17 percent reduction from historical levels (Jay and Simenstad 1996).

The Skokomish River stock has been considered extirpated since the late-1960's or early 1970's (WDFW and PNPTT 2000; NMFS 2007). A small handful of adult spawners are periodically observed in the river, but these are believed to be strays and not indicative of a self-sustaining population. Anthropogenic impacts described in Section II - particularly channel instability, scour, and fill - are believed to be the primary cause for this populations demise. Prior to degradation, the Skokomish River may have once supported the largest summer chum population in Hood Canal (WDFW and PNPTT 2000). Based on historical observations and habitat similarities, summer chum are believed to have spawned in the North and South Forks, Vance Creek, the mainstem, and several tributaries. The Skokomish River has been identified as a potential future target for reintroduction of summer chum, provided appropriate restoration actions are taken and are successful at improving habitat conditions (WDFW and PNPTT 2000).

### c. Puget Sound Steelhead DPS and Designated Critical Habitat

Puget Sound steelhead were listed as threatened under the Endangered Species Act in 2007. This listing was recently upheld in a 5-year review (NMFS 2011). Despite recent negative trends in abundance, the NMFS concluded that extinction risk of the DPS had not significantly increased. Critical habitat has recently been proposed and includes the mainstem Skokomish River, the North Fork to just below Lake Cushman, the entire South Fork and Vance Creek mainstems, and lower parts of several major tributaries (NMFS 2013). This generally overlaps with current and historical spawning distribution within the basin (WDFW 2002).

Similar to Chinook salmon, Puget Sound steelhead exhibit both an early- ("summer") and a late- ("winter") returning form. Summer steelhead enter freshwater from May to October, hold for several months in deep, low-velocity areas, and spawn from January to April. Winter-run fish enter freshwater from November to April, and spawn shortly thereafter from February through June. The winter-run form is the more predominant form throughout Puget Sound. Regardless of spawning strategy, steelhead juveniles rear in freshwater habitats for up to three years prior to seaward migration making them one of the most dependent anadromous[11] salmonids on freshwater habitat. Juvenile steelhead use riffles and fast-flowing pool habitats during the summer and prefer pool and side channel habitats in winter. Mainstem and tributary habitats in and near the study area provide year-round rearing habitat for juvenile *O. mykiss* (Peters et al. 2011). Smolt outmigration has been observed from February through September, with the peak occurring in May (Peters et al. 2011). Outmigrating smolts spend little time in the estuary, choosing instead to migrate rapidly toward the ocean.

The Skokomish River supports a winter-run of steelhead; the current or historical existence of a summer-run is uncertain (PSSTRT 2013). In 2002, WDFW considered the Skokomish River winter steelhead "depressed" citing "chronically low escapements and long-term negative trend escapement" (WDFW 2002). Since then, spawner numbers have been trending upward, although annual returns are still low. Spawners averaged about 390 per year between 2004 and 2012 (WDFW 2013b). Most spawning is observed in the mainstem and South Fork in and near

[11] Anadromous means that individuals of the species migrate from freshwater to saltwater to feed and grow, and return to freshwater to spawn. Some anadromous species migrate to saltwater immediately after hatching and return only to spawn (e.g., pink salmon). Others are more dependent on freshwater, rearing in freshwater for a few months (e.g., some Chinook salmon populations) to several years (e.g., steelhead trout) prior to migrating to saltwater.

the study area, although the North Fork and Vance Creek also support spawning steelhead. Juvenile trout (*O. mykiss* and cutthroat combined) have been observed rearing throughout the Skokomish basin, including the mainstem, the North Fork to the first dam (Cushman Dam No. 2), the South Fork to RM 19, and Vance Creek to RM 5 (Peters et al. 2011).

#### d. Bull Trout and Designated Critical Habitat

Bull trout were listed as threatened under the Endangered Species Act in 1999. This listing was upheld in a 2008 5-year review (USFWS 2008). A current 5-year review is pending in which the listing status is not expected to change. The Skokomish River is one of fourteen core areas belonging to the Coastal-Puget Sound DPS[12] of bull trout, and supports the only known bull trout population in Hood Canal. The Coastal-Puget Sound DPS is the only DPS to exhibit a diadromous life history form, meaning that individuals migrate between marine and freshwater habitats. Diadromous bull trout spawn in freshwater, and feed and grow in both marine and freshwater habitats. The Coastal-Puget Sound DPS also exhibits the more common adfluvial and fluvial[13] forms. Critical habitat for bull trout was designated in 2010 and includes parts of the mainstem, South Fork, and North Fork Skokomish River, Vance Creek, Purdy Creek, and Lake Cushman. Bull trout have been observed throughout the mainstem and the North and South Forks (Peters et al. 2011)

There are at least two and possibly three local populations of bull trout in the Skokomish River. One is an adfluvial population that inhabits Lake Cushman and the North Fork above the lake. This population is separated from the study area by the two Cushman dams, both of which lack fish passage facilities. The South Fork Skokomish River supports a depressed but stable fluvial population (Peters et al. 2011). Brown Creek - a tributary to the South Fork - contains suitable habitat for bull trout spawning and rearing, and may support a local population (USFWS 2004).

The bull trout population in the Skokomish River core area is one of the most depressed in the Olympic Peninsula Management Unit. The population is at risk of genetic drift due to low population levels (less than 1,000 adults). Also, because there are fewer than five local populations, bull trout in this core area are at elevated risk of extirpation and adverse effects from random naturally occurring events (USFWS 2004).

Bull trout are present in freshwater habitats all year, typically utilizing pools with suitable cover in main channels and side channels (USFWS 2004). Peters et al. (2011) observed bull trout in and near the study area year-round. Complex habitat including large woody debris, undercut banks, boulders, and pools are important for bull trout. In the Skokomish River, bull trout generally spawn from mid-September through the end of November in areas upstream from the study area. Bull trout fry typically emerge from April through May in other systems (USFWS 2004). Exact emergence timing in the Skokomish River is unknown. Diadromy has not been

[12] Bull trout within the coterminous United States are considered one DPS in the ESA listing despite sufficient scientific basis for segregating into multiple DPS's. The Service has continued to refer to multiple specific DPS's for purposes of consultation and recovery planning. Recent scientific evidence supports the multiple DPS approach (USFWS 2008; Ardren et al. 2011)

[13] Adfluvial means that the fish feed and rear in a lake and migrate to flowing water (a river or stream) to spawn. Fluvial means that spawning, feeding, and rearing all occur within flowing water, although the fish may migrate long distances through the river system.

documented in the Skokomish River population, although some juveniles have been captured in a screw trap in the lower river near the estuary (Matthew Kowalski, Skokomish Tribal Nation, personal communication), possibly indicating the existence of diadromy. Because bull trout are highly dependent on clean, cold water, and because they have one of the longest incubation periods (four to six months) of any native fish in the Pacific Northwest, bull trout are extremely dependent on good water quality and intact habitats (Fraley and Shepard 1989; Rieman and McIntyre 1993).

### e. West Coast Fisher DPS

The West Coast DPS of the fisher is a candidate species for ESA listing (USFWS 2013). The fisher historically occurred on the Olympic Peninsula and in the Cascade Mountains, but were extirpated from Washington State in the mid-1900s due to over-trapping, predator control measures, and habitat fragmentation. Extensive surveys to detect wide-ranging carnivores in the 1990s and early 2000s failed to detect fishers in Washington. Because of the lack of fisher detections and concern about fisher population declines, a status review was performed in 1997 and the species was listed as state endangered in 1998. Following the listing, conservation efforts for the species increased, including development of a recovery plan and a feasibility study for reintroduction.

The Olympic Peninsula was identified as the highest priority for reintroduction. Animals were captured in British Columbia and released over a three year period between 2008 and 2010. In 2009, several fishers were released in the Skokomish River watershed immediately upstream of Lake Cushman in Olympic National Park. All of the released animals were fitted with radio-transmitters and tracking data revealed that animals both dispersed widely across the Olympic Peninsula and were reproducing. Although batteries in the radio-collars of the founder populations have since expired, fishers have been detected at bait and camera stations across the Olympic Peninsula, with recent (2012-2013) confirmed reports in the lower Hoh River watershed, near Lake Ozette, the upper Bogachiel River watershed, Lake Crescent, the foothills between Port Angeles and Sequim, the Buckhorn Wilderness, and the Duckabush River watershed. Given their large home ranges, huge dispersal distances, and data indicating that translocated fishers are using a variety of habitat types, it is likely that they could move through or be present in the study area.

## 2. State-listed Species

Washington State species of interest that may be affected by the project include:

- State Candidate Species: bull trout, Puget Sound Chinook salmon, Hood Canal summer chum, and river lamprey (*Lampetra ayresi*).
- State Monitored Species[14]: Pacific lamprey (*L. tridentata*), reticulate sculpin (*Cottus perplexus*), and riffle sculpin (*C. gulosus*).

[14] From WDFW (http://wdfw.wa.gov/conservation/endangered/status/SM/): "Washington State Monitored Species are not considered Species of Concern, but are monitored for status and distribution. They are managed by [WDFW], as needed, to prevent them from becoming endangered, threatened, or sensitive."

Information on the abundance, distribution, and status of lamprey and sculpin species in western Washington is extremely limited and largely anecdotal. River lamprey have been found in several Puget Sound rivers (Wydoski and Whitney 2003). Three occurrences have been documented within the Skokomish River watershed between 1931 and 1993 (USFWS undated; WDFW 2013a), one of which was in the study area (WDFW 2013a). Larvae (ammocoetes) rear in freshwater for several years in backwaters and quiet eddies with fine silt and mud substrate (Wydoski and Whitney 2003). Seaward migration generally occurs from April to June. Adults begin returning to freshwater by September, spawning several months later from April through June.

Pacific lamprey are found in most Puget Sound rivers (Wydoski and Whitney 2003). Peters et al. (2011) captured several Pacific lampreys emigrating from the Skokomish River. Similar to river lamprey, Pacific lamprey ammocoetes rear in freshwater for 4 to 7 years in depositional areas, backwaters, and quiet eddies with fine silt and mud substrate. Seaward migration generally occurs from March to July, although some fall migration has been observed. Adult Pacific lamprey return to freshwater between March and October, overwinter in deep pools, then spawn from April through July. Spawning occurs in similar habitats to salmon: in gravel-bottomed streams, at the upstream end of riffles, and at pool tailouts, typically upstream from suitable juvenile rearing habitat. Riffles and side channels are important Pacific lamprey spawning habitats.

Riffle sculpin and reticulate sculpin often occur in the same Puget Sound streams (Wydoski and Whitney 2003), and have been observed in the Skokomish River (Mongillo and Hallock 1998; Peters et al. 2011). Backwater pools (riffle sculpin), in-channel pools (reticulate sculpin), and similar quiet areas are favored habitats, although both species have also been observed in riffles. Both species spawn in the spring and spend their entire lives in freshwater.

### 3. Federal species of concern

Federal species of concern known to use or that may use areas in and near the study area include coho salmon (*O. kisutch*) Puget Sound/Strait of Georgia ESU, Pacific lamprey, river lamprey, bald eagle (*Haliaeetus leucoephalus*), the olive-sided flycatcher (*Contopus borealis*), the northern goshawk (*Accipiter gentilis*), and the peregrine falcon (*Falco peregrinus*).

Skokomish River coho were identified as an individual stock based on their distinct spawning distribution. They were labeled as healthy in the 2002 SASSI (WDFW 2002). It is a mixed stock with natural spawning occurring in most accessible tributaries to the Skokomish River with the most significant area being the lower North Fork and Vance Creek. Coho salmon are widely distributed throughout the Skokomish Basin. They have been observed in tributary, main channel, and pond habitats (Peters et al. 2011). Juvenile coho salmon were observed up to the lower dam in the North Fork, up to RM 27 in the South Fork, and up to RM 3.7 in Vance Creek.

Coho salmon generally do not migrate to sea until the spring of their second year of life and therefore rely heavily on freshwater habitat as juveniles. Although they are typically spawned in higher gradient streams, they generally rear in the middle reaches of watersheds and prefer slower velocities than most other juvenile salmonids (Quinn 2005). Coho juveniles generally prefer pools over riffles. Their densities are positively correlated with LWD presence (Roni and Quinn 2001), and the importance of wood cover may increase with stream size (Peters 1996). Coho fry may also use the stream-estuary transitional area (ecotone) to rear during the summer, migrating upstream to overwinter in side channel and off-channel habitats located in lower watersheds (Miller and Sadro 2003). During high flow periods throughout the winter months, coho make extensive use of off channel habitat and migrate several kilometers down tributaries and main stem reaches to reach these habitats (Peterson 1982). Coho smolts generally migrate through the estuary rapidly, and thus do not rely as heavily on estuary habitat as some other salmonids.

#### 4. Other fish and wildlife resources

Other fish species known or likely to occur in the study area include (Mongillo and Hallock 1997; Peters et al. 2011):

- Fall chum salmon (*O. keta*)
- Coastal cutthroat trout (*O. clarki*)
- Prickly sculpin (*C. asper*)
- Coast range sculpin (*C. alecticus*)
- Shorthead sculpin (*C. confuses*)
- Western brook lamprey (*L. richardsoni*)
- Threespine stickleback (*Gasterosteus aculeatus*)
- Largemouth bass (*Micropterus salmoides*)
- Brook trout (*S. fontinalis*)

Peters et al. (2011) evaluated aquatic ecosystem condition in the Skokomish River watershed using primary and secondary producers. Primary producers rely directly on sunlight for energy, and consist mostly of algae. Secondary producers acquire energy from sources other than direct sunlight, for example by consuming plants or animals. Secondary producers evaluated by Peters et al. (2011) consisted of benthic macroinvertebrates, stream-dwelling insects that live in the top several inches of the stream bed. Peters et al. (2011) concluded that most main channel and tributary sites sampled in the Skokomish River, including those in the study area, had relatively healthy primary and secondary producer communities. However, the authors noted that some community aspects were possibly indicative of degraded or altered conditions associated with bed instability, lack of woody debris, lack of riparian vegetation, and/or lack of habitat complexity.

Common wildlife species that are adapted to degraded or partially degraded riparian and/or floodplain habitats, to fragmented second-growth forest, and/or to agricultural and light residential environs occur throughout the study area.

### D. Conditions affecting fish and wildlife resources

Peters et al. (2011) identified four main factors within the study area inhibiting production and recovery of salmonids: 1) channel instability, 2) habitat availability, 3) habitat connectivity, and 4) habitat quality. Channel instability increases redd scour and burial, and is a direct source of mortality to incubating eggs and embryos (e.g., DeVries 2000; Schuett-Hames et al. 2000; Gottesfeld 2004). Influence of channel instability has not been empirically evaluated in the Skokomish River, but may affect several species that have low population levels in the system, including summer chum salmon, Chinook salmon, steelhead trout, and bull trout, as well as long-lived macroinvertebrate taxa. Habitat availability is significantly reduced relative to historic levels due to loss of stable side channels and off-channel floodplain habitats, as well as channel straightening and isolation of the floodplain from the main channel. The current braided channel pattern, in addition to lacking stable side channels, also lacks pools and thus provides poor rearing habitat for most salmonids. The pools that are present are shallow and lacking in complexity due to absence of LWD. Finally, habitat connectivity above RM 9 on the South Fork, including Vance Creek, is often blocked during late summer and early fall due to subsurface flow and dry riverbed between RM 8 and 9. This blocks fish migrations and movement. Particularly affected are: 1) potential spawner migrations of Chinook and summer chum salmon at a time of peak migration; 2) possible bull trout spawner migrations; and, 3) downstream migrations of any fall smolt outmigrations, although these have not been evaluated in the Skokomish River.

Aggradation in the study area has increased the frequency and duration of flooding. This, in combination with the network of levees, lack of floodplain connectivity, and lack of floodplain side-channels and off-channel networks, may increase stranding and stranding-related mortality of fish. There are no empirical data on the extent of stranding-related mortality in the study area and how this is influenced by conditions in the lower watershed. However, anecdotal observations and photographs frequently show adult fish stranded in agricultural fields in the study area following flood events. Many of these fish appear to be fall chum salmon, one of the healthy populations in the watershed. Because of the seasonal timing of flood events and peak spawning migrations, adult fall chum salmon and coho salmon are most at risk for becoming stranded. Other species generally peak prior to the onset of large flooding (summer chum salmon, Chinook salmon), or afterward (steelhead trout). Resident species (cutthroat trout, rainbow trout), overwintering juveniles (coho salmon, steelhead trout), and overwintering adults and subadults (bull trout) in the study area may also be susceptible to stranding.

## IV. EVALUATION METHODOLOGY

There are no known established models or alternative methodologies that can adequately represent and consider the complexities and dynamics of the physical and biological processes interacting in the study area that affect fish, wildlife, and their habitat. Thus, best professional judgment and available science were used to evaluate benefits and impacts to fish and wildlife resources associated with implementation of the proposed SRBER project. Service staff made observations of aquatic resources, habitats, and existing conditions throughout the watershed and the study area as part of the General Investigation (Peters et al. 2011). The Service also reviewed numerous studies conducted in the watershed and the study area by the Corps and others investigating and documenting fauna, watershed processes, and sources of ecosystem degradation in the Skokomish River.

## V. FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

The Skokomish River has been degraded for many decades. Fish species that have persisted during this time generally appear stable, including those populations that are currently depressed. Restoration efforts - some fairly substantial - which have been and continue to be implemented by various entities throughout the watershed will likely benefit most if not all aquatic species in the watershed. These efforts have largely been limited to areas upstream and downstream of the action area. None of these other efforts are expected to directly or indirectly affect the riverbed drying between RM 8 and 9 that blocks fish migration. This blockage is a primary impediment to reestablishment and recovery of Chinook and summer chum salmon (SIT and WDFW 2010; Peters et al. 2011). Thus, despite other restoration efforts throughout the watershed, these species would not be expected to show much improvement without the proposed project.

Other degraded conditions in the study area are expected to continue to affect abundance, productivity, and recovery of most species of interest. That is, even if the blockage problem did not exist, conditions such as channel instability and lack of quality habitat would persist and thus continue to limit productivity of fish species. Riparian, floodplain, and upstream areas are not expected to provide meaningful quantities of LWD to the channel anytime soon. In addition, existing levees will continue to act as hydraulic constrictions, exacerbate aggradation, and disconnect floodplain areas from the main channel. Thus, the unstable braided channel pattern, the lack of side-channel and off-channel habitats, and the lack of complex main channel pools are expected to persist into the foreseeable future. Other watershed restoration efforts not associated with the proposed SRBER project are not expected to sufficiently affect any of these conditions in the study area within the next 50 years. This takes on added significance because of the relative importance of main channel habitats in the Skokomish basin. Relative to other western Washington river systems, the Skokomish watershed has a high main channel-to-tributary ratio (Peters et al. 2011). This means that main channel conditions have a greater effect on overall productivity in the Skokomish River system than in other western Washington rivers.

The river in the study area between RM 6 and 12 is at high risk for avulsion[15] (SCI and SA 1999; GeoEngineers 2006), and this risk will increase as aggradation continues. Avulsions are a natural phenomenon that are part of healthy functioning watersheds. Evidence suggests that avulsions have been common throughout the upper part of study area for at least the last 2,000 years (GeoEngineers 2006; Bountry et al. 2009). Some identified potential avulsion sites are located upstream of the reach that often runs dry each year. Avulsions in this area may result in one or more new channels bypassing the dry area, which may prove beneficial to upriver salmon migration. Avulsions are likely to occur during fall or early winter potentially stranding incubating eggs and fish rearing or overwintering in newly abandoned channels. Any avulsions throughout the high-risk area would likely result in new channels running through existing agricultural fields. Due to the lack of trees and LWD in the existing agricultural fields, the new channels would be unstable and generally inhospitable to rearing salmonids. Because of the existing degraded conditions in the current channel, it is uncertain whether any avulsions would result in substantially detrimental long-term consequences to any of the affected species. However, the exact nature of any long-term impacts would depend largely on human responses.

[15] Avulsion means that the river shifts from one channel to another.

# VI. ALTERNATIVES CONSIDERED

## A. Formulation of alternatives

The USACE Draft Feasibility Report / Environmental Impact Statement (USACE 2013) provides a detailed description of the processes used to formulate alternatives. In short, the USACE developed a list of potential restoration measures in coordination with local sponsors, interested stakeholders, and the general public. A total of 25 possible management measures and 60 potential restoration sites were identified. Through various Corps screening and selection processes described in the Draft Feasibility Report / Environmental Impact Statement (USACE 2013), the Corps identified a RA/FAA in August 2013. Six alternatives were selected for the final RA/FAA (Table 1). Alternative 1 is the "No Action" alternative required by the NEPA to be considered. The other five alternatives (Alternatives 7, 23, 28, 45, and 60) consist of a base action and an array of additional actions (termed "Increments"). Alternatives 45 and 60 propose to dredge 5.5 to 9 miles, respectively, of the lower river to a depth of 8-10 feet in addition to several Increments. Alternatives 7, 23, and 28 propose to remove a levee near RM 9 (the Car Body Levee), in addition to one or more Increments. Alternative 28 was chosen as the PA/TSP and is described more fully in Section VI.B.

Table 1. Range of Alternatives / Final Array of Alternatives proposed by the USACE for Skokomish River basin ecosystem restoration. Descriptions of the proposed actions are provided in the text.

| Alternative ID and name | Base action | Additional actions (Increments) |
|---|---|---|
| No Action (Alternative 1) | no action | - |
| Car Body Levee Removal | | |
| Alternative 7 | Car Body Levee removal | Increment 35 |
| Alternative 23 | Car Body Levee removal | Increments 35, 9, 37, 28, 39, and 40 |
| Alternative 28 | Car Body Levee removal | Increments 35, 9, 37, 28, 39, 40, 43, and 26 |
| Riverbed Excavation (Dredging) | | |
| Alternative 45 | Excavation (dredging) from RM 3.5 to 9 | Increments 35, 9, 37, 28, 40, 43, and 26 |
| Alternative 60 | Excavating (dredging) from the mouth to RM 9 | Increments 35, 9, 37, 28, 40, 43, and 26 |

**Increments**

| | | | |
|---|---|---|---|
| 35 | Upstream LWD installation | 39 | Hunter Creek mouth restoration |
| 9 | Side channel reconnection | 40 | Hunter Creek side channel restoration |
| 37 | Grange Levee setback | 43 | Weaver Creek side channel restoration |
| 28 | River Mile 9 Levee setback | 26 | Dip Road setback |

During the plan formulation process, the FWS maintained that dredging in the manner proposed in Alternatives 45 and 60 had no restoration benefits, was extremely environmentally damaging, and should therefore not be considered. During pre-screening, the Corps screened dredging out in part due to "severe adverse environmental impacts" (USCAE 2012), yet continued to include dredging in the list of alternatives to be considered. The FWS continues to maintain that dredging as proposed in Alternatives 45 and 60 has no restoration value.

### B. Preferred Alternative / Tentatively Selected Plan

The PA/TSP (Alternative 28) consists of the base action (Car Body Levee removal) and eight additional actions, or increments (Figure 6). Each of these nine actions (the base and the eight increments) are independent in that implementation of any one action does not depend on implementation of any of the others. Each of the nine proposed actions are described below. Current Corps policy is to advance project proposals through the draft EIS/FWCA phase at only a conceptual level of detail. Thus, few project details were available for inclusion in this evaluation and report. The project proposal's level of detail will be increased as it advances into the final EIS/FWCA phase.

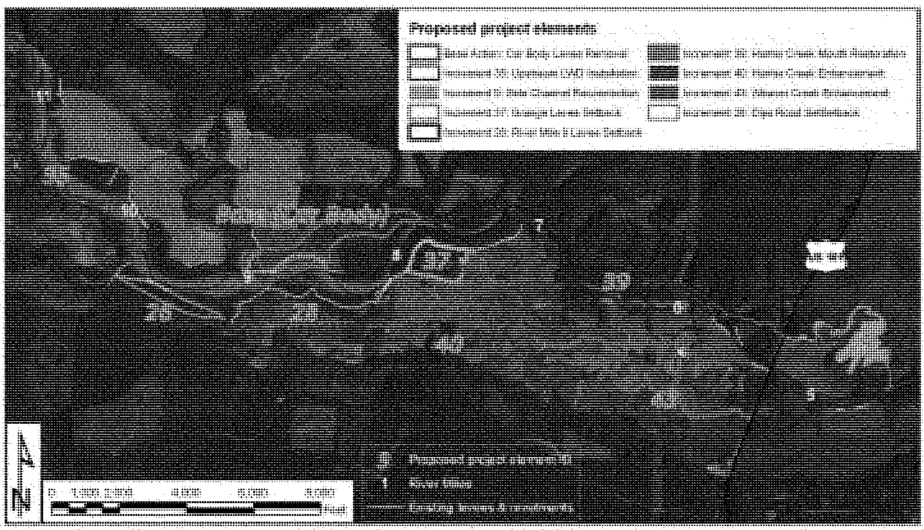


Figure 6. Map showing locations of proposed actions that make up the Preferred Alternative / Tentatively Selected Plan.

### 1. Car Body Levee removal

This action will remove all or part of a 4,670-foot-long levee (termed the "Car Body Levee") located near the pre-2004 North and South Fork confluence (RM 9) on the north side of the channel (Figure 7). The primary purpose of this action is to restore a continuous low flow channel. This will be accomplished by reestablishing the confluence near its pre-2004 location at RM 9 and diverting flows from the South Fork into the North Fork. Thus, the current North Fork channel downstream from RM 9 will become the mainstem and the severely aggraded reach that has run dry in late summer most years since 2004 will be bypassed. Small-scale excavation and strategic LWD placement will help divert flow from the aggraded reach into the North Fork channel. Once bypassed, the aggraded reach will function as an overflow channel during high flow events. Many project details have yet to be proposed, including sections of the levee to be removed, means of material removal, disposal site(s) for removed levee materials, exact locations of excavation and LWD installation for channel diversion, source of LWD, means of LWD transport from source to destination areas, and means of installation.

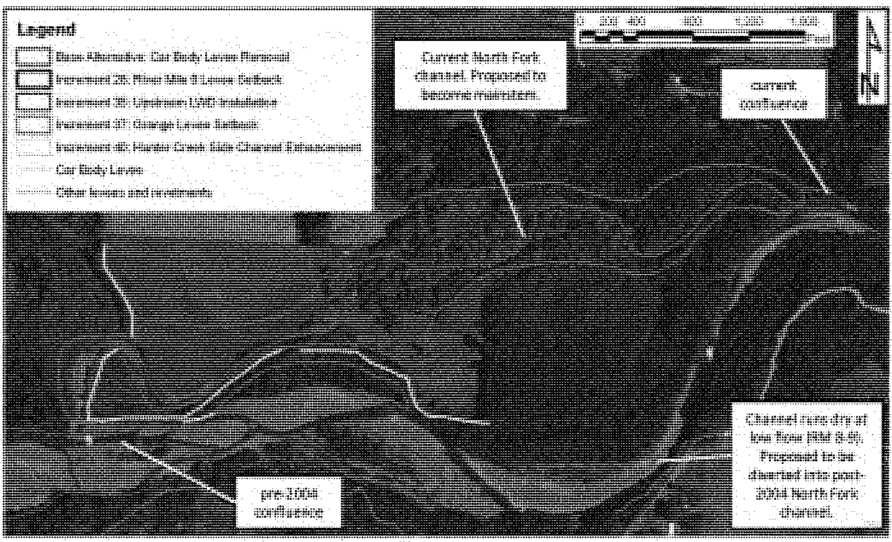


Figure 7. Map showing proposed Car Body Levee removal area, area where South Fork will be diverted into the North Fork, and current and former (pre-2004) confluence of the North and South Forks of the Skokomish River.

### 2. Increment 35 - upstream LWD installation

This action will install LWD through a combination of small LWD jams and single logs between RM 9 and 11 (Figure 8). This increment proposes to add approximately 30 to 40 new key-size logs per mile to existing LWD in the channel to meet regional reference quantities based on Fox and Bolton (2007). Key-size criteria include 2 to 3 feet diameter, 15 to 30 feet long, and intact rootwad. Small LWD jams may be used to increase meandering and bar formation and provide cover for fish. Up to 6 to 12 small jams per mile could be installed without adversely affecting flooding or increasing risk of erosion. Single logs may be used to induce localized pool formation. Some jams and single logs may remain within the wetted channel at low flows. Others may be activated only at elevated discharges. Currently, details have not been proposed for such items as number of logs to be added, number of jams and logs per jam, locations of jams and single logs, means of attachment if any (e.g., steel cables), source of LWD, means of LWD transport from source to destination areas, and means of installation.

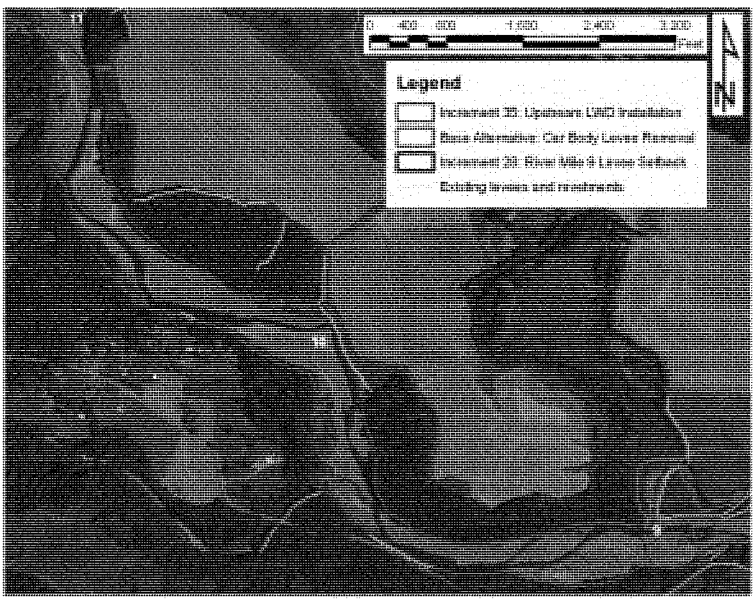


Figure 8. Map showing proposed upstream LWD installation area (Increment 35). LWD jams and single logs will be placed in the channel and along the banks, although exact locations have yet to be proposed.

### 3. Increment 9 - side channel reconnection

An abandoned side channel that runs between RM 4 and 5.6 would be reconnected to the main channel to provide high flow refuge and rearing habitat for fish (Figure 9). Currently, this channel is a structurally diverse complex of ponds and wetlands with well-vegetated riparian areas that receives river flow only during very high discharge events. The fish population is diverse and abundant, and includes coho salmon, Chinook salmon, trout, and non-native largemouth bass, among other species (Peters et al. 2011). Proposed work includes excavating the channel inlet and outlet; no other work within the channel will occur. The intent is to facilitate fish movement to and from the pond and wetland complex by increasing the amount of time the side channel is connected to the main channel. Excavating the inlet of the side channel would provide flows through the pond and wetland complex at discharges of near bankfull and above, which occurs approximately three to four times per year. The downstream end would be connected more frequently, although an exact connection discharge has yet to be proposed. Reconnecting the channel to the river could provide 45 acres of high quality, low velocity fish habitat that would be accessible much more frequently than is currently the case.

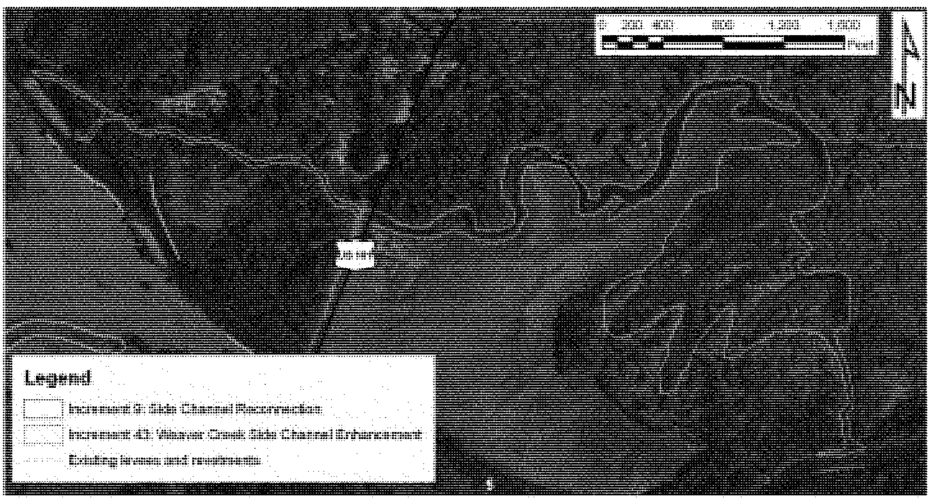


Figure 9. Map showing proposed side channel reconnection (Increment 9).

## 4. Increments 37 and 28 - Grange Levee and River Mile 9 Levee setbacks

Increment 37 will remove part of a 2,700-foot-long levee (termed the "Grange Levee") located between RM 7.5 and 8 (Figure 10). The intent of this action is to reconnect floodplain habitat. A new setback levee will be constructed approximately 1,200 feet landward (south) of the existing levee. This will provide access to about 34 acres of riparian habitat, forest, and floodplain on the riverward side of the new setback levee. The new setback levee will be about 2,900 feet long and will provide a similar level of flood risk reduction as the existing levee.

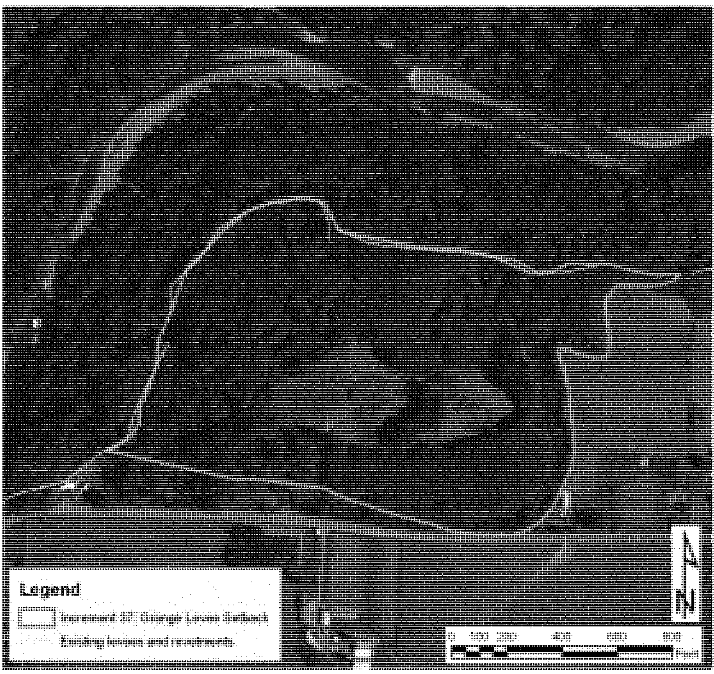


Figure 10. Map showing proposed Grange Levee setback area (Increment 37). Overlapping yellow and pink lines denote existing levee to be removed or breached. Southern-most pink line denotes alignment of proposed setback levee. The white number 8 is the river mile.

Increment 28 will remove part of a 4,450-foot-long levee (termed the "River Mile 9 Levee") located between RM 8.3 and 9.2 (Figure 11). The intent of this action is to reconnect floodplain habitat. A new setback levee will be constructed approximately 200 to 300 feet landward (south) of the existing levee. This will provide access to about 23 acres of riparian habitat, forest, and floodplain on the riverward side of the new setback levee. The new setback levee will be about 4,460 feet long and will provide a similar level of flood risk reduction as the existing levee.

Two strategically located sections of the existing Grange Levee totaling approximately 800 feet will be breached, as will four strategically located sections of the River Mile 9 Levee totaling approximately 950 ft. These breaches will allow flood waters to flow freely within the levee setback area, providing fish access to the riparian habitat. The River Mile 9 setback levee will be designed for shallow overtopping at 2-yr and larger floods. Details have not yet been proposed for exact locations of the sections to be breached and disposal site(s) for the removed materials. Design and installation details for the new setback levee have also yet to be proposed.

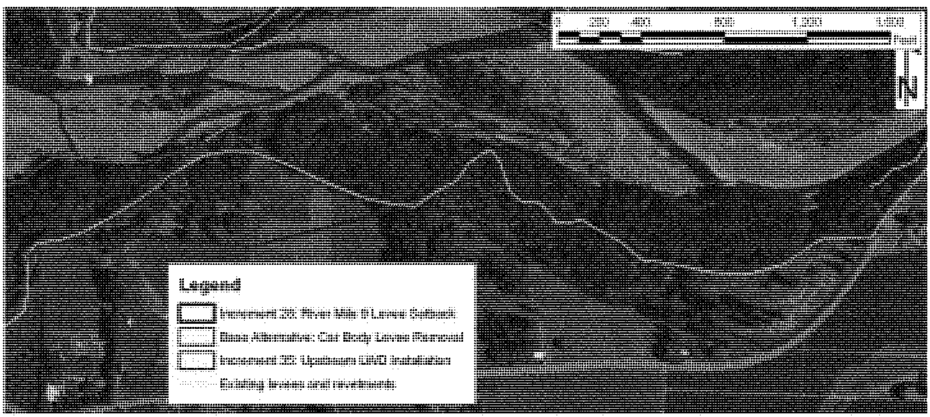


Figure 11. Map showing proposed River Mile 9 setback area (Increment 28). Overlapping yellow and purple lines denote existing levee to be removed or breached. Southern-most purple line denotes alignment of proposed setback levee. The white number 9 is the river mile.

### 5. Increment 39 - Hunter Creek mouth restoration

This action involves excavating the mouth of Hunter Creek (RM 6.5). The proposal asserts that the outlet of Hunter Creek is relatively high, which may inhibit fish movement between the mainstem and Hunter Creek at low flows. The proposal also asserts that discharge from Hunter Creek into the Skokomish River mainstem may become restricted, particularly after Increment 40 is installed. Design details, including volume of material to be excavated, have yet to be proposed.

## 6. Increments 40 and 43 - Hunter and Weaver Creek side channel restorations

These increments involve the construction of tributary channels to Hunter Creek (Increment 40; Figure 12) and Weaver Creek (Increment 43; Figure 13) to provide additional fish rearing and refuge habitat. Both creeks are perennial groundwater fed streams. Proposed work consists of excavating small channels along existing swales down to slightly below the water table. Many of these swales are relict channels, formerly active main channel and/or tributary channels that

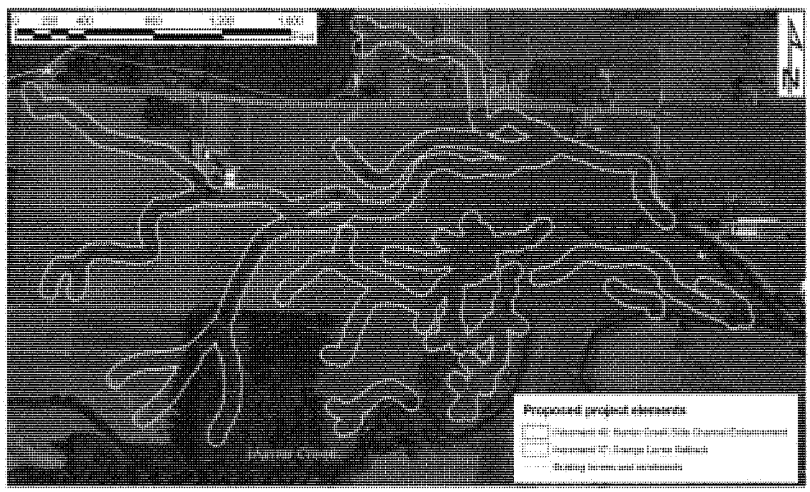

Figure 12. Map showing proposed Hunter Creek side channel enhancement area (Increment 40).

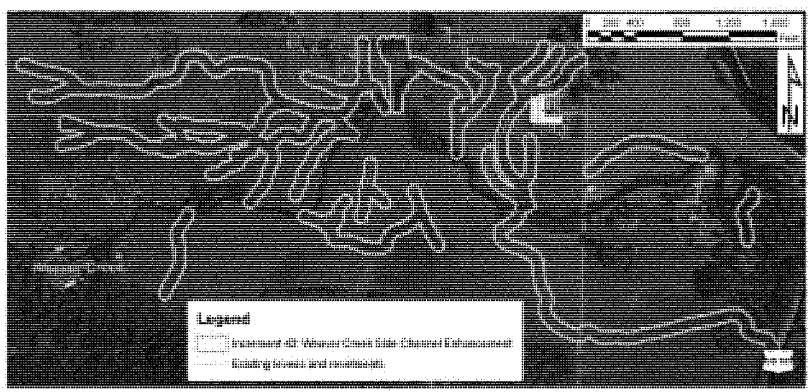

Figure 13. Map showing proposed Weaver Creek side channel enhancement area (Increment 43).

have naturally filled in with sediment over time (Bountry et al. 2009), presumably prior to Euro-American settlement in the region. Thus, although these increments comport with the broader watershed goals of ecosystem and salmon recovery, in and of themselves they are not channel restorations *per se* as much as they are channel enhancements or creations. Swales to be excavated lie predominantly within agricultural fields. Short lengths of each increment - 1,000 feet of the Hunter Creek increment and 1,000 feet of the Weaver Creek increment - lie within second-growth forest adjacent to agricultural lands. Constructed channels will have a 4-foot bottom width and approximately 5-foot depth. The total length of channels proposed for excavation are approximately 21,250 feet for Hunter Creek and 27,110 feet for Weaver Creek.

### 7. Increment 26: Dips Road setback

The Dips Road relocation, located between RM 9.5 and 9.7, is intended to provide additional floodplain habitat and reduce the stranding potential for fish (Figure 14). A 3,700-foot-long section of the road between the Vance Creek and Swift Creek bridges will be relocated about 400 feet landward (south). Approximately17 acres of riparian forest currently on the landward side of the existing road will be on the riverward side of the new road. The existing roadbed will be partially removed. Where the existing road embankment is higher than the adjacent ground both the asphalt and roadbed fill material will be removed. Where the existing road is lower than the adjacent ground level only the asphalt will be removed. River sediments are expected to deposit in the low areas and provide soil for future vegetation to grow.

The new road will follow the alignment #2 provided by Mason County on November 13, 2012. This alignment generally runs halfway between the river and the bluff to the south. Refinement of the alignment will occur during the feasibility-level design phase. This action is considered to be a road relocation and as such will be entirely funded by non-federal sponsors.

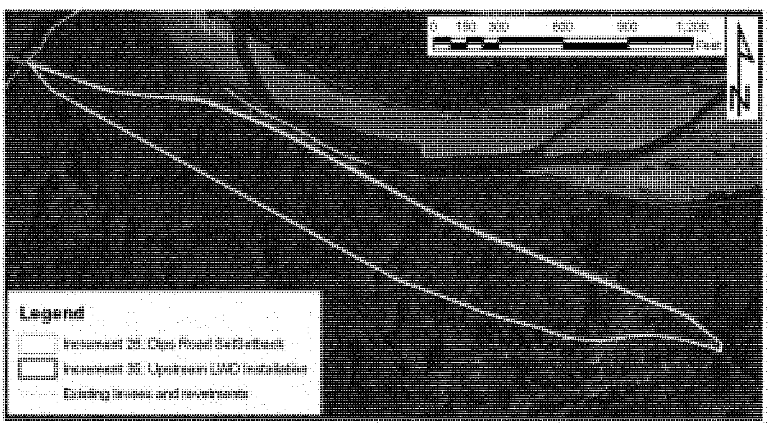

Figure 14. Map showing proposed Dips Road setback area (Increment 26). Gray line closest to river denotes section of road proposed to be removed. Gray line farthest from river denotes proposed new road alignment.

# VII. PROJECT IMPACTS

## A. Preferred Alternative / Tentatively Selected Plan

A full description and evaluation of project impacts is not possible since the PA/TSP is only at the conceptual stage of development and many project details have yet to be proposed. In general, there will be short-term negative impacts from construction of each action, including diminished water quality (turbidity and suspended sediment), noise disturbance from construction machinery, airborne particulates from soil disturbance, and vegetation removal and disturbance associated with construction of temporary equipment access routes and conducting activities at each work site. These construction-related effects are common to many restoration and conservation projects, and standard conservation measures and best management practices are generally followed to minimize the frequency, intensity, and duration of these impacts.

The intent of the SRBER project is to restore habitat and provide long-term benefits to aquatic habitats and species from implementing the actions identified in the PA/TSP. For some proposed actions, the degree to which beneficial impacts will be realized, and whether benefits will outweigh negative impacts, depends on design aspects that have yet to be proposed. Potential beneficial and negative impacts of each proposed action are discussed below. A more thorough evaluation of effects of implementing the PA/TSP will be possible as the project advances into the design stage.

### 1. Car Body Levee removal

The Car Body Levee removal's intended benefit is to restore perennial flow between RM 8 and 9 and thus restore year-round fish movement through this area. This action is expected to provide the following benefits:

- Upstream and downstream movement of adult and juvenile fish will no longer be blocked during late-summer low flow, potentially benefitting many species of concern, including Chinook salmon, summer chum salmon, bull trout, and coho salmon. Restoring passage is an important component for Chinook salmon recovery (SIT and WDFW 2010) and summer chum salmon reintroduction and recovery (WDFW and PNPTT 2000; Peters et al. 2011), primarily in terms of providing access to substantial spawning habitat above RM 9.
- The Car Body Levee, in combination with the River Mile 9 Levee, represents the most severe channel constriction in the study area (Peters et al. 2011). Removing these constrictions is expected to increase hydraulic energy and sediment transport capacity, thereby ameliorating the aggradation problem in this area.
- Potential use of this section of the river for main channel spawning and rearing will be restored, representing a net gain in habitat quantity over existing conditions.
- This action may help restore the historic island-braided channel pattern to this section of the river, which would benefit most if not all species of trout and salmon by increasing side channel habitat.

- LWD installed to help redirect the channel is expected to provide additional complex instream habitat features that will create pools and benefit most if not all species of salmon and trout, albeit on a very small scale.

The Corps has indicated that some portions of the existing levee could be left in place provided they do not inhibit the desired hydraulic functions of the project. Leaving remnant sections in place may result in negative unintended consequences. Remnant sections may pose a risk for fish stranding as water levels drop following high water events. Field and laboratory evidence suggests that anthropogenic structures can impede movement of fish back into the main channel and thus increase stranding-related mortality (Bradford 1997; Sommer et al. 2005). In addition, remnant sections may limit restoration of floodplain function. Poorly located remnant sections may diminish potential gains in floodplain flow area, which is critical to alleviating impacts of levee-associated channel constrictions. Other interactions between the river and reconnected floodplain may also be affected by remnant sections, including slowing channel migration, impeding avulsions, limiting LWD recruitment, inhibiting sediment deposition in the floodplain, and restricting organic matter transfers.

The additional flow into the North Fork channel from the redirected South Fork may increase channel size and common river-related impacts in the North Fork channel. The affected North Fork channel runs through agricultural lands and scrub-shrub vegetation with few mature trees, although no formal vegetation surveys have been performed. Historically, the affected North Fork reach was part of the broader active floodplain and channel migration zone, as evidenced by historic 500 to 2,000-year-old relict channels (Bountry et al. 2009) and more recent extensive gravel bars and side channels (Godaire et al. 2007 cited in SIT and WDFW 2010) throughout the affected area. Thus, levee removal will reconnect these historic floodplain lands with the active channel.

The Car Body Levee is suspected to have derelict automobiles incorporated into its construction. Removal of these old automobiles may release automotive-related toxic contaminants from leaking tanks (engine oil, gasoline, etc.) or from already contaminated soils and sediments. The Corps has indicated that they will investigate the extent of derelict automobiles in the levee, existing contamination in the adjoining soils and sediments, and potential for release of contamination associated with removing the automobiles and additional levee materials. The results of the investigation will dictate what measures are appropriate for minimizing potential for release of toxic contaminants into the environment and for removing existing contaminated soils and sediments. Proper implementation of the investigation, cleanup, and removal will minimize adverse impacts associated with toxic contaminants.

### 2. Increment 35 - upstream LWD installation

The primary stated beneficial impacts of LWD installation are to increase channel meandering and bar formation, and provide cover for fish. If designed and constructed appropriately, these intended benefits as well as other ancillary benefits will be realized. These include:

- Bank stabilization resulting in reduced bank erosion and reduced sediment inputs.
- Channel stabilization resulting in reduced redd stranding and reduced stranding of fish hiding or overwintering in the substrate.
- Sediment and bed stabilization resulting in reduced redd scour and fill, and reduced crushing of fish hiding or overwintering in the substrate.
- Reduced sediment transport resulting in reduced rate of aggradation downstream.
- Increased hydraulic and channel complexity resulting in pool formation and increased quantity and quality of main channel fish rearing habitat. This benefit may be maximized by ensuring that sufficient volumes of wood and root wads are submerged at lower river flows.
- Generally increasing LWD levels in this reach to those more closely approximating historic natural levels. Such high natural levels are widely known to provide numerous functions and benefits including but not limited to those identified above.

Due to the large size of the Skokomish River, these benefits will be maximized by incorporating LWD into engineered log jams as opposed to placement of single logs. Benefits may also be maximized by ensuring that root wads are incorporated as appropriate.

LWD installations have at times been misused, either intentionally or unintentionally, to inhibit meandering, channel migration, and the formation of natural geometries and morphologies. Such misuse can "lock" a channel in place and can force the channel into a morphology that is not natural and/or not what the channel would otherwise tend toward for the given geologic and hydrologic setting. These can have negative impacts to fish habitat, habitat-forming processes, and fish populations. These can also negate or inhibit benefits described above from being realized. Lacking design details for LWD placement, this report cannot assess whether or to what degree these negative impacts may be realized.

Source location(s) for LWD have yet to be identified. The Corps has indicated a preference to use conifer species for LWD installations, but has also suggested that cottonwoods are easily acquired and may be incorporated. Use of LWD may require cutting mature trees if stockpiled wood resources are not available. If mature trees are cut for use in aquatic restoration, this will likely have negative impacts to habitat for terrestrial species. A fuller discussion of impacts will not be possible until source area(s) are identified.

### 3. Increment 9 - side channel reconnection

The primary beneficial impacts of the side channel reconnection are to increase the amount of time the side channel is connected to the main channel and facilitate fish movement in and out of the pond and wetland complex. This will increase access to, egress from, and usability of the existing high quality rearing and refuge habitat located within the side channel. During high river discharges the reconnected channel would provide a low velocity refuge. During most of the year the channel would provide pond habitat for fish rearing. A potential negative impact may be increased predation on juvenile salmon and trout by the largemouth bass population that currently exists in the side channel.

### 4. Increments 37 and 28 - Grange Levee and River Mile 9 Levee setbacks

The primary beneficial impact of these levee setbacks is to reconnect floodplain habitat. Floodplain reconnection is expected to increase connectivity with and/or promote development of lateral habitats such as side channels and off-channel ponds. These types of habitats provide highly productive rearing areas and important slow-water refuge areas during elevated discharges for many fish species. Increased floodplain connectivity also allows for more natural channel migration and channel access to LWD source areas. Finally, the existing River Mile 9 and Grange Levees, in combination with the Car Body Levee, represent the most severe channel constrictions in the study area (Peters et al. 2011). Reducing these constrictions by setting back the levees is expected to increase the river's hydraulic energy and sediment transport capacity, thereby ameliorating the aggradation problem in this area.

Similar to the Car Body Levee removal action, the Corps has indicated that some portions of the existing Grange and River Mile 9 levees could be left in place. Thus, the same concerns over fish stranding risk, hydraulic function, and river-floodplain interactions that were discussed in the Car Body Levee removal section (VII.A.1.) apply here as well.

Vegetation disturbed by notching or removal of the existing levee and installation of the proposed setback levee consists of early- to mid-stage second growth forest, although no formal vegetation surveys have been completed. Some agricultural fields may also be disturbed during installation of the River Mile 9 setback levee and the eastern portion of the Grange setback levee. Land cover in the reconnected floodplain consists largely of early- to mid-stage forest with some smaller areas of cleared land and agricultural fields.

### 5. Increment 39 - Hunter Creek mouth restoration

The primary stated benefits of this project are to provide year-round access between Hunter Creek and the mainstem Skokomish River, and to minimize backwatering in Hunter Creek. However, there are no data to confirm the necessity of this intervention. Benefits are thus uncertain and cannot be asserted with confidence. Negative impacts would include temporary disturbance and increased suspended sediment and turbidity from material removal, potential injury or harm to species in the immediate vicinity of the excavation work, and potential loss of legacy sediments which may or may not include spawning gravels.

### 6. Increments 40 and 43 - Hunter and Weaver Creek side channel restorations

The primary stated benefits of these actions are to provide additional fish rearing and refuge habitat. If designed and constructed appropriately, these actions have the potential to provide substantial quantity and quality off-channel rearing and refuge habitat that would benefit numerous species of salmon and trout in the system. The extent to which these benefits may be realized depends in part on diversity and complexity in the constructed channels as well as the nature and extent of riparian buffers. In-stream structure (LWD) and heterogeneity in flow regime (flowing water channels and blind or "dead end" channels), morphology (varied depths; pools & riffles), and substrate (gravels, cobbles, silt, etc.) would all contribute to net positive impacts. However, the current proposal lacks the necessary information to determine whether or to what extent these may be included. In its current form, the proposal describes seemingly homogenous channels of uniform width and depth lacking in diversity and complexity. The Corps has indicated that this type of featureless channel is not what is intended and that design details have yet to be identified for creating ecologically beneficial channels. The Corps has indicated that riparian buffers will be incorporated, but has not yet provided any additional details. In the absence of such design details, potential negative impacts of various possible scenarios include the following:

- Because the new channels will be constructed almost entirely within existing agricultural fields, negative impacts associated with agricultural runoff may arise. Improperly managed drainage from agricultural fields can create a host of problems for adjacent and downstream waterbodies, including increased sediment loads, increased turbidity, increased nutrient load, eutrophication, and inputs of agricultural chemicals that can be toxic to aquatic organisms (Needelman et al. 2007; Pierce et al. 2012). These may negatively impact the entire aquatic ecosystem, including primary producer, macroinvertebrate, and fish communities, from the point of entry in Hunter Creek downstream to the subestuary and Hood Canal. Negative impacts may be minimized by incorporating riparian buffers, in-channel vegetation, and other measures (e.g., Evans et al. 2007; Needelman et al. 2007; Strock et al. 2010; Messer et al. 2012; Pierce et al. 2012).
- Installation of the proposed channels without adequate riparian shading would likely lead to elevated water temperatures which may propagate into Hunter and Weaver Creeks.
- Open, homogenous channels lacking in complexity and diversity would likely not be used for rearing by juvenile salmon and trout, or would be used at low densities. Such channels would likely also increase predation risk on rearing or refuging juveniles.

### 7. Increment 26: Dips Road setback

The primary stated benefit is to reconnect 17 acres of floodplain riparian forest and reduce the stranding potential for fish. Benefits of setting back the road and reconnecting the floodplain may include:

- Increase the channel migration zone.
- Increase potential for formation of side channels and off-channel habitats.
- Provide long-term access to LWD supply.
- Improve connectivity between main channel and any existing off-channel riparian habitats. The existence, extent, and quality of existing off-channel habitats is currently unknown.

Approximately 800 feet of riprap separate the channel from the existing road on the western end of the proposed project site. Currently there are no definitive plans to either remove or leave this material in place. Leaving the material in place would lessen the degree to which the above stated benefits are realized.

### B. Other plans

The No Action Alternative (Alternative 1) would allow causes and consequences of degradation to persist and perhaps worsen. See Section V for a fuller discussion of how no action is likely to affect the fish and wildlife resources in the study area.

The Riverbed Excavation Alternative (Alternatives 45 and 60) would result in significant negative impacts, including loss of salmonid and other fish habitat, loss of spawning gravels, sublethal effects on salmon, trout and other aquatic species due to suspended sediments, loss of invertebrate forage base, increased bank and channel instability, isolation of side channels from water sources and fish use due to lowering of the main channel, and dewatering of adjacent wetlands. There is also a high degree of risk and uncertainty associated with dredging in alluvial channels because they can respond in significant and unexpected ways (Skidmore et al. 2011). The need to dispose of large volumes of excavated material would result in additional negative impacts. The significant risk and negative ecological impacts of these alternatives have led the Corps to exclude these alternatives from further consideration.

## VIII. EVALUATION OF ALTERNATIVES

The study area is clearly in need of restoration to improve habitat conditions for listed and non-listed fish and other aquatic species, and for general aquatic ecosystem health. The no action alternative (Alternative 1) would allow causes and consequences of degradation to persist and perhaps worsen. The riverbed excavation alternatives (Alternatives 45 and 60) are highly ecologically damaging, highly risky, and carry potentially severe unintended consequences. The Service has consistently opposed these alternatives in their various forms over the course of the GI and plan formulation. Furthermore, the Corps recognized that this alternative would result in unacceptably high economic and social costs, and severe adverse environmental impacts (USACE 2012). For these reasons, this alternative has been excluded from further consideration. The PA/TSP (Alternative 28) has the potential to provide meaningful restoration benefits within the study area, provided that certain design criteria and additional conservation measures are incorporated.

If implemented appropriately, the PA/TSP will address many high priority restoration actions identified by the Service (Peters et al. 2011), the Corps, local sponsors, and other stakeholders (USCAE 2012). However, the PA/TSP does not include actions that address one far-reaching high-priority recommendation identified by the Service during the GI (Peters et al. 2011): re-formation of island-braided channel pattern through use of engineered logjams. This action would help stabilize active channel sediments, facilitate sediment transport, and increase habitat quantity and complexity, all critical needs in the study area (see Section II.B.2). As discussed in Section II.B.2, the island-braided channel pattern existed in part and perhaps most of the study area prior to anthropogenic degradation. The Service believes that, where appropriate, re-forming an island-braided pattern through use of engineered logjams would yield greater restoration benefits than some of the actions currently presented in the PA/TSP.

Despite the aforementioned shortcomings, the PA/TSP is likely to ameliorate and/or reverse some of the causes and consequences of ecosystem degradation. The PA/TSP is anticipated to improve habitat conditions in the lower watershed and benefit many target and non-target species and the aquatic ecosystem as a whole. With proper designs and conservation measures, risks associated with the PA/TSP are low and benefits are expected to outweigh the negative impacts.

## IX. RECOMMENDATIONS FOR FISH AND WILDLIFE CONSERVATION

The Service supports the PA/TSP, but is providing the following list of concerns and recommendations to minimize potentially adverse effects and maximize benefits to fish and wildlife resources associated with the various proposed actions. Recommendations are divided into two tiers. Tier 1 recommendations are considered essential for minimizing potential negative impacts of the actions and ensuring that intended benefits are realized. Tier 2 recommendations are those that will enhance overall restoration effectiveness in the study area, and provide additional benefits beyond those currently represented in the PA/TSP.

### A. Tier 1 recommendations: Ensuring PA/TSP effectiveness

1. The Service does not support LWD designs that are likely to inhibit channel meandering and migration, and the formation of natural geometries and morphologies. We recommend that the Corps ensure that a proper reach analysis is conducted and that designs for layout and placement of LWD are appropriate, achieve the desired objectives, and do not function in an unintended manner. Such unintended consequences could "lock" the channel in place and force the river into a channel pattern or morphology that is not natural and/or not what the channel would otherwise tend toward for the given geologic and hydrologic setting. These can have negative impacts to fish habitat, habitat-forming processes, and fish populations that may outweigh any benefits.

2. For all three levee breaches and setbacks (Car Body, Grange, and River Mile 9), the Service recommends evaluating impacts on fish stranding risk, hydraulic function, and river-floodplain interactions of leaving remnant levee sections in place. Results of such evaluations should inform and guide decisions on where to strategically locate breaches and remnant sections to minimize negative impacts and maximize hydrologic and ecological benefits. Evaluations may indicate excessive negative consequences of leaving one or more remnant sections in place, in which case the Corps should consider removing these section.

3. The Service does not support tributary side-channel enhancement designs (Increments 40 and 43) that do not include provisions for protecting water quality associated with runoff from the surrounding agricultural fields. This may be accomplished in various ways, including planting riparian buffers and in-channel vegetation, installing water control structures, and other measures (e.g., Evans et al. 2007; Needelman et al. 2007; Strock et al. 2010; Messer et al. 2012; Pierce et al. 2012).

4. The Service does not support designs for restoration and enhancement of tributary side-channels (Increments 40 and 43) that do not include provisions for maintaining or improving water temperatures. Riparian buffers that include native trees and woody shrubs provide shade that help maintain cool summertime temperatures, as well as provide added habitat and water quality protection benefits.

5. The Service does not support designs for restoration and enhancement of tributary side-channels (Increments 40 and 43) that result in homogenous and featureless channel forms that lack complex habitat elements. To the greatest extent practical, tributary side-channels should include abundant in-stream structures (LWD) and be designed in a manner that provide heterogeneity in flow regimes (areas with flowing water channels and blind channels with no flow), morphology (varied depths; pools and riffles), and substrate (gravels, cobbles, silt, etc.). Channels exhibiting such diversity and complexity would maximize fish utilization and rearing densities. Complex and diverse channels and instream habitat features would also minimize predation risk on rearing or refuging juveniles. Failing to incorporate sufficient structure, diversity, and complexity may result in negative impacts and consequences that outweigh any realized benefits.

6. The Service does not support leaving existing riprap associated with the current Dips Road in place after the new road alignment is constructed. Leaving riprap in place would inhibit natural channel meandering and riverine processes. Physical structures necessary for protection of the proposed roadway should be installed as far away from the river as practical.

7. There are no data to support or demonstrate any ecological benefits of the Hunter Creek mouth excavation (Increment 39). The Service recommends either removing this action altogether, or gathering data sufficient to demonstrate an ecological need that will outweigh negative impacts.

8. We recommend the Corps coordinate with the Services, tribes, and permitting agencies throughout the designing of the SRBER project to expedite ESA Section 7 consultation and other permitting needs. Early coordination can: 1) provide opportunities for the Service and pertinent agencies to suggest conservation measures for avoiding, reducing, or minimizing potential adverse effects to listed species; 2) identify design alternatives that can benefit recovery of listed species; and, 3) provide technical assistance on specific species habitat requirements that could be incorporated into the project.

### B. Tier 2 recommendations: Generating additional benefits

1. The river reach (RM 9 to 11) proposed to receive LWD additions from Increment 35 historically exhibited an island-braided pattern. This channel pattern generally provides stable sediment routing and superior habitat for a variety of fish species, including some listed species. Loss of this channel pattern throughout the study area has been cited as a primary contributor to habitat loss, stock declines, and general ecosystem degradation (SIT and WDFW 2010; Peters et al. 2011). The Service recommends investigating and

designing engineered LWD jams that will facilitate re-formation of this type of channel pattern. Peters et al. (2011) provides a brief description of how this might be accomplished.

2. It appears highly likely that the river from RM 3.2 to 9 exhibited an island-braided channel pattern. Because of the high value of this channel pattern to fish and fish habitat, the Service recommends considering additional evidence for its possible presence. If the weight of evidence suggests that the island-braided pattern likely existed in this area, the Service further suggests considering measures for restoring this pattern to this part of the river.

3. Proposed actions for the Car Body Levee removal may help facilitate re-formation of an island-braided pattern between RM 7.8 and 9. However, the proposed actions alone may be insufficient to rapidly restore this type of channel pattern. Thus, in coordination with recommendation IX.B.2. above, the Service recommends investigating additional measures that may be incorporated into the proposed action to expedite formation of an island-braided pattern in this location.

4. The Service recommends evaluating whether levee setbacks can be increased by: a) setting back levees between the proposed Grange and River Mile 9 setbacks (RM 8 to 8.3), and to the east of the proposed Grange setback (RM 7 to 7.5); and, b) increasing the setback distance of the proposed River Mile 9 setback and the east and west ends of the proposed Grange setback. Increasing the setback distances in this area will further reduce hydraulic constrictions, provide more floodplain connection to the river, and facilitate natural channel migrations and riverine processes.

5. Benefits of the Car Body Levee removal may be maximized by incorporating enhancements to the North Fork channel between the old and new channel confluences (RM 7.8 to 9). The Service recommends evaluating this area for potential LWD additions, riparian planting, and other such enhancements.

## X. SUMMARY AND THE SERVICE POSITION

The Service believes that the PA/TSP is the best alternative of those proposed by the Corps. The PA/TSP will provide meaningful restoration benefits within the study area, provided that certain design criteria and additional conservation measures described in this report are incorporated. Risks associated with the PA/TSP are low and benefits will outweigh negative impacts. The PA/TSP will ameliorate and/or reverse some of the causes and consequences of ecosystem degradation and therefore benefit many target and non-target species, the aquatic ecosystem as a whole, and the broader watershed.

The Corps should consider opportunities for incorporating additional ecological benefits. Evaluating and incorporating actions for restoring an island-braided channel pattern, as appropriate, would be particularly valuable. The high ecological value of the island-braided pattern suggests that this measure would yield significant benefits. Specifically, significant additional improvements in sediment stabilization, sediment transport, habitat complexity, habitat sustainability, and abundance of fish populations and other aquatic organisms may be realized.

Because the alternatives reviewed in this report were conceptual in nature and included very limited design details, the Service was unable to thoroughly evaluate potential project impacts. Design aspects that would negatively impact fish and wildlife resources and that would not be supported by the Service have been included, as have additional recommendations that would enhance benefits to fish and wildlife resources in the study area. We look forward to working with the Corps in developing more detailed evaluations of project impacts and optimum designs and measures for maximizing benefits and minimizing negative impacts.

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# FISH AND WILDLIFE COORDINATION ACT

# PLANNING AID LETTER

# United States Department of the Interior

FISH AND WILDLIFE SERVICE

Western Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503


SEP 2 6 2008

Colonel Anthony Wright
U. S. Army Corps of Engineers
Seattle District
P. O. Box 3755
CENWS-PM-CP
Seattle, Washington 98124-3755

Attn: Mamie Bouwer

Subject: Project Management Plan for Feasibility Phase Study of Skokomish River Basin

Dear Colonel Wright:

We have reviewed the Project Management Plan (PMP), finalized on July 6, 2006, for the ecosystem restoration and flood damage reduction project on the Skokomish River in Mason County, Washington. The PMP provides the basis for conducting the feasibility phase of project development. The purpose of the feasibility phase is to investigate and formulate potential alternatives to address flooding reduction measures and environmental restoration actions.

This planning aid letter is provided as technical assistance and does not constitute the final report authorized by Subsection 2(b) of the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*). The following paragraphs contain our comments on the PMP.

**General Comments**

The PMP identifies the baseline conditions and the studies to be conducted in order to supply the information needed to form and evaluate alternatives for ecosystem restoration and flood damage reduction of the Skokomish River. The Skokomish River GI Recon Study, 905(b) Analysis (Corps 2000) states the "unnatural sediment deposition has been attributed to decreased peak and average flows from the North Fork because of the Cushman Hydropower project and to increased sediment from the South Fork because of timber harvest activities." The 905(b) Recon Study recognizes "that the influence of the upper watersheds must be addressed in order to fully rectify problems indentified in the lower watershed." Many of the alternatives listed in the PMP provide options for short term flood reduction and habitat restoration measures in the lower watershed. Only a few options are discussed for directly addressing the sources of the problem, increased sediment and decreased flows, or for providing for long term sustainability of a restored watershed. We believe more emphasis should be placed on the following: 1) assisting the current efforts of cooperators to implement road management plans designed to reduce sediment inputs from the upper watershed, 2) increasing riparian forest restoration to supply future large woody debris, and 3) increasing flows from the North Fork.

We think the feasibility phase study should also identify and consider the effects that global warming may have on the alternatives for this project. Several changes have been identified that are occurring now or will occur over the next 50 to 100 years (Mote *et al.* 2005, Glick *et al.* 2007): increases in average air and water temperatures, reductions in summer freshwater inflow to Puget Sound, changing precipitation patterns with more frequent severe weather events, rises in sea level, and reductions in many coastal and wetland habitats. Some of these changes could be of particular concern to this project. Accelerated sea level rise combined with high river flows greatly increases the severity of floods and shoreline erosion events (Mote *et al.* 2005). Changes in the types and locations of tidal wetlands could reduce the ability for these habitats to support salmonids, especially juvenile Chinook and chum salmon. Spawning habitat for forage fish, which make up a critical part of the marine food web, could also be affected by reduction in the area of estuarine beaches (Glick 2007).

A synthesis of the literature and current studies could identify the predicted and potential effects of global warming and the possible vulnerabilities of the alternatives to these effects. This information would be important to consider when evaluating the project alternatives. The effects of global warming are not factors that can be controlled by this project, but the long-term success and benefits of the project can be affected by the predicted and potential effects of global warming, especially rises in sea level.

**Specific comments on listed possible actions**

Five ecosystem restoration measures were brought forward from the reconnaissance phase study for evaluation during the feasibility phase study: dredging to expedite channel conveyance restoration, dikes and bank protection, natural drainage patterns restoration, selected acquisition of floodplain easements and flood-proofing, and an alternative to include a combination of the listed measures. These restoration measures were used as a base from which to develop more detailed project and implementation studies. The PMP contains a draft list of recovery/flood damage reduction actions for the Skokomish GI feasibility study. The draft list is divided into five main categories of possible actions: 1) mainstem realignment, 2) sediment control, 3) road removal/alteration, 4) Cushman Dam operations, and 5) other actions.

Mainstem realignment

Mainstem realignment includes the possible actions of dike removal and new dikes or setback levees, reconnection of freshwater wetlands and side channels, riparian corridor restoration or enhancement, engineered log jam construction, and floodplain stabilization and enhancement. Dike removal and set back levees may have minimal direct impacts to the aquatic environment depending on location. Set back levees are often recommended as a less damaging alternative to other flood reduction measures. Dike removal and setback levees will allow for a wider river channel migration zone, reconnection with historic floodplain areas, and the opportunity to restore native riparian vegetation along the river.

Other possible actions discussed in the PMP are to construct two new channels (800 ft each) in the estuary to reconnect freshwater wetlands with the floodplain and to reroute Vance Creek (500 ft of new channel) to connect with Swift Creek instead of the South Fork Skokomish River. These actions may provide habitat benefits for fish and wildlife, such as rearing habitat for salmonids, but it is unclear how rerouting Vance Creek will reduce flood impacts. Routing more water to Swift Creek with its smaller bankfull width could cause bank erosion and impacts to fish habitat in Swift Creek. Also, the bridge over Swift Creek will need to be evaluated for suitability with increased water flows. Constructing new channels can cause significant impacts to wetlands and stream habitat through loss of riparian habitat and increased sediment erosion and turbidity. These adverse biological effects need to be addressed and measures taken to minimize or mitigate for those effects.

We support the PMP option of restoring riparian forests in the Skokomish Valley floodplain. Riparian forests can become a source for future recruitment of large wood that is important to maintaining channel complexity, stabilizing banks, and decreasing sediments entering the river. Riparian forests can provide shade to reduce water temperatures and provide habitat for other wildlife including reptiles and amphibians. Constructing engineered log jams and placement of other large woody debris will increase channel complexity and aid in creating important fish habitat features such as pools, side channels, and stable spawning habitat that are lacking in the river. Adding large wood is important to restoring habitat for salmonids in the short term, but even more important is providing riparian forests to make the ecosystem more self sustaining in the long term.

Possible floodplain stabilization and enhancement actions listed in the PMP include construction of 2 or 3 level spreader dikes, surface roughening, precision land forming, subsurface drainage, and a diversion channel. These actions can have potential adverse impacts to fish and their habitat. These actions, especially constructing a diversion channel, can cause increased bank erosion, sublethal effects to fish from increased turbidity, loss of invertebrate prey base, and dewatering of adjacent wetlands. Mitigation measures can be implemented to decrease the impacts to wildlife and habitat, but more information from the current Skokomish River studies will be necessary to evaluate the short term impacts of construction and the potential for long term effects and benefits.

Sediment control

The PMP lists three possible sediment control actions: sediment stabilization, South Fork mainstem stabilization, and dredging. The U.S. Forest Service (USFS) and Green Diamond Timber Company, owners of the majority of upper watershed lands, have completed and still plan to rebuild or decommission forest roads on their properties in the upper watersheds of the South and North Fork Skokomish and Vance Creek. The goal is to eliminate unstable side slopes, disperse storm water runoff from direct flow into streams, and decommission unnecessary roads. The feasibility study should evaluate more options to assist with implementation of those plans. Reducing sediment input from forest roads will address the source of sediments entering the river and provide long term benefits for ecosystem restoration and flood reduction in the floodplain.

The South Fork mainstem stabilization option proposes to stabilize sediments in the first 2 miles of the South Fork by installing fish-passable weirs. The PMP describes the weir design as similar to weirs installed in Goldsborough Creek but on a much larger scale. Construction of concrete weirs on a large scale in the South Fork could result in loss of salmonid spawning habitat and significant riparian habitat. Given the width of the floodplain, the high sediment loads, and high flood flows, construction of weirs in the first 2 miles of the South Fork would be susceptible to weir failures and sedimentation. Also, if continued maintenance of the weirs is necessary due to sediment accumulations or weir failures, then the need for maintaining access roads should be addressed. Reducing the amount of sediment that reaches the lower Skokomish Valley is very important, but possible options must also consider the longevity of the actions taken and feasibility of long term maintenance requirements. This action needs to be more fully evaluated to address the short term and long term requirements and/or effects.

Dredging of 5 miles of mainstem channel upstream of the Highway (Hwy) 101 Bridge, selectively removing gravel at specific locations, and physically creating stream channels, sinuosity, and gradient may expedite channel conveyance and habitat formation but can have adverse impacts to the environment. As discussed above for constructing new channels and installing weirs, the potential impacts of these actions can affect bank stability, spawning habitat, migration corridors, prey base, and water quality and turbidity. Some of the impacts can be reduced through mitigation measures, but some habitat functions could require a year to recover or reestablish. The short term impacts must be evaluated against the potential long term benefits.

Road Removal/Alteration

Possible actions include improving, rerouting, or removing roads in the Skokomish River floodplain. As of September 2008, the Washington Department of Transportation has begun construction to replace the Hwy 101 Purdy Creek Bridge with a longer, three-span pre-cast concrete girder bridge. The bridge project is designed to increase floodplain connectivity and includes wetland mitigation. These improvements can be included in the evaluation of possible actions considered in the PMP. The PMP assumes that the Washington Department of Transportation will design and provide estimates for replacing the Hwy 101 Bridge over the mainstem Skokomish to remove fill or install culverts to improve floodplain connectivity problems associated with the existing bridge. If not already considered, designs for replacing the bridge should also evaluate raising the structure to avoid flooding during 2-year and 5-year flood events. Another possible action is to reroute Public Utility District power lines to follow existing road alignments so that the power lines and service roadways in the floodplain can be removed. Other road removal actions discussed are removing parts of Bourgalt and Old Skokomish Roads and installing prefabricated 50-foot-long bridges on Reservation Road. The road removal actions would decrease sediment inputs from the roads and would provide for better floodplain connectivity with minimal effects to wildlife and habitat. We suggest evaluating actions to raise and improve the remaining roads to provide access during small flood events and to reduce the potential for erosion of roads during flood events.

Cushman Dam FERC Actions

Low peak and average river flows due to water withdrawal at the Cushman Hydroelectric Dam on the North Fork has been identified as one of the primary reasons for "unnatural sediment deposition" in the Skokomish River and increased flooding (Corps 2000). Restoring flows to the lower Skokomish River is important for sediment conveyance and to achieve long term flood reduction and restoration of the Skokomish Valley floodplain. Many of the potential options within the scope of the GI feasibility study provide for measures that would begin the process of sediment conveyance and provide for immediate needs in the floodplain. The benefit of these actions may be short lived if natural processes can not be gradually restored. Removal of dams or construction of a third dam is not likely to occur in the foreseeable future. Through the licensing process with Tacoma Power, North Fork minimum flows have been increased to 240 cfs as of March 2008. Also, a settlement agreement is underway to discuss gradual recovery of flows from the North Fork, flushing flows of approximately 2,500 acre feet twice a year, and fish passage structures to allow access to habitat in the upper North Fork. The feasibility study should include an assessment of current increased flows from the North Fork Skokomish River in combination with the other actions under consideration.

Other Actions

Other flood reduction and restoration actions, which may be, but are not necessarily, part of the GI, include levee removal around the Hunter Property east of the Skokomish River near Hwy 106, acquisition of floodplain easements along the North Fork and mainstem Skokomish River, and the USFS replacing culverts that block fish passage to streams in the upper watershed. As discussed previously, we agree that dike removal to allow for a wider river channel migration zone and improved connectivity in the floodplain will be beneficial in the long term, and depending on the time of year, have relatively minimal effects (e.g., sediments and turbidity) to federally listed and designated critical habitat from removal activities. We support the options of acquiring riparian and floodplain easements and the USFS upgrading of culverts in the upper watershed streams. We further suggest that more options be developed for assisting other entities, including buying ecologically important areas from willing land owners and assisting the USFS in their culvert upgrades.

**Summary**

We reiterate that evaluation of the whole watershed is important to addressing the problems in the Skokomish Valley floodplain. We recommend pursuing more actions that address the primary sources of river aggradation: sediment inputs from the South Fork and low flows from the North Fork Skokomish River. If actions addressing these items are outside the direct jurisdiction of the GI, then the Corps should assist agencies, sponsors, and land owners in implementing the actions where possible. One-time dredging may be necessary to remove sediments in the mainstem channel to expedite channel conveyance and allow the river to begin a more natural process. However, dredging the channel may have significant adverse impacts to federally proposed and listed fish and wildlife. Mitigation measures, such as replenishing spawning gravel, can minimize impacts to instream habitat, but quantification and assurance of long term benefits to fish and other aquatic organisms are needed to compensate for the short term adverse effects. In light of the potential for effects to ESA listed fish and wildlife, we suggest beginning the ESA consultation process soon after the alternative actions have been evaluated and more specific actions have been agreed upon.

We support the Corps' current and continued efforts for open communication and cooperation among the many agencies, entities, and groups involved in various flood reduction and restoration actions in the Skokomish River watershed.

Thank you for the opportunity to review and provide comments on this document. Should you have any questions, please contact Shirley Burgdorf of my staff at (360) 534-9340 or at the above letterhead address.

Sincerely,

Carolyn Scafidi

for Ken Berg, Manager
Western Washington Fish and Wildlife Office

**LITERATURE CITED**

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+ any NSH studies that might be pertinent

Karl Ericksons - H&H analysis

# NATIONAL MARINE FISHERIES SERVICE

# APPROVAL FOR SECTION 4(d) LIMIT 8 BIOLOGICAL OPINION

**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
Oregon and Washington Coastal Area Office
510 Desmond Drive SE, Suite 103
Lacey WA, 98503

February 3, 2015

Evan R. Lewis
Chief, Environmental and Cultural Resources Branch
Department of the Army
Seattle District, Corps of Engineers
P.O. Box 3755
Seattle, WA 98124-3755

Re: Confirming use of the Washington State Habitat Restoration Program, ESA 4(d) Limit 8, as ESA review for the Skokomish River Ecosystem Restoration Project

Attention: Nancy Gleason

Dear Mr. Lewis:

In 2007 the NMFS approved the Habitat Restoration Program (HRP) as a conservation program for habitat restoration projects under the Endangered Species Act Section 4(d) Rule, Limit 8. The state of Washington's Recreation and Conservation Office (RCO) is responsible for administration of this program.

We provided comments to your office on the larger Skokomish River Draft Feasibility Report last April and have been following the development of the related Skokomish River Ecosystem Restoration Project. We understand that the RCO has approved use of the HRP for this project. We agree that this project fits within the HRP, Limit 8 for NMFS species. If you have questions regarding this project or Limit 8, please contact Randy McIntosh of my staff at randy.mcintosh@noaa.gov, 360-534-9309.

Sincerely,

Matt Longebaugh
Central Puget Sound Branch Chief

Cc: Nancy Gleason, COE

# WASHINGTON STATE RECREATION AND CONSERVATION OFFICE

# APPROVAL FOR SECTION 4(d) LIMIT 8 BIOLOGICAL OPINION

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STATE OF WASHINGTON

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February 17, 2015

Nancy Gleason, MES. Fish Biologist
U.S. Army Corps of Engineers – Seattle District Aquatic Resources Division
PO Box 3755
Seattle, WA 98124

Subject: Skokomish River Ecosystem Restoration General Investigation - Confirmation for use of SRFB Limit 8 Self-certification Form

Dear Nancy:

The purpose of this letter is to confirm the US Army Corps of Engineers may use the Salmon Recovery Funding Board's (SRFB) "Self-certification of Proposed Habitat Restoration Activity Consistency with the Habitat Restoration Program, 4(d) Rule, Limit 8" for restoration actions proposed through the Skokomish River Ecosystem Restoration General Investigation.

Recovery actions identified in the Puget Sound Chinook Salmon Recovery Plan and the Hood Canal Summer Chum Salmon Recovery Plan were reviewed under the Endangered Species Act (ESA). As such, the Limit 8 Self-certification form acknowledges ESA review and compliance for those recovery actions identified in the recovery plans. Furthermore, the restoration actions proposed by the USACE in the Skokomish River Basin are identified in and consistent with the recovery plans.

Please feel free to contact me if you have any questions or concerns.

Sincerely,

Mike Ramsey, Salmon Grants Manager

Cc:
Loretta Swanson, Mason County
Joseph Pavel, Skokomish Tribe
John Bolender, Mason Conservation District

# Self-certification of Proposed Habitat Restoration Activity

## Consistency with the

## Habitat Restoration Program, 4(d) Rule, Limit 8

In order for a proposed habitat restoration activity to be consistent with the Habitat Restoration Program (HRP), the project proponent needs to review the elements of the HRP and certify, using the checklist below.

The HRP includes habitat protection and restoration projects funded by the SRFB that meet the following characteristics:

- ☒ Are part of a habitat portion of a salmon recovery plan approved by a Regional Salmon Recovery Organization and the State of Washington and published in the Federal Register by NMFS; <u>and</u>
- ☒ Are part of an adopted Implementation Schedule developed by a Regional Organization to implement the habitat portion of a Salmon Recovery Plan; <u>and</u>
- ☒ Are funded in part or wholly with Washington State and/or Pacific Coastal Salmon Recovery Fund (PCSRF) monies managed by the SRFB and are consistent with the technical and procedural criteria outlined by SRFB; <u>and</u>
- ☒ Are being done for the purpose of habitat restoration; <u>and</u>
- ☒ Are projects that fit within a specific list of eligible actions:

*In-Stream Passage*

*In-Stream Diversion Screening*

*In-Stream Habitat*

*Riparian Habitat Restoration*

*Upland Habitat Restoration or Protection*

*Estuarine and Marine Nearshore Habitat Restoration*

U.S. Army Corps of Engineers,
Seattle District — January 23, 2015

/s/ Project Proponent — Date

# SRFB TECHNICAL GUIDANCE FOR HABITAT RESTORATION, INCLUDING STREAMBANK PROTECTION, FISH PASSAGE, SCREENING, AND INVENTORY INFORMATION

Stream Habitat Restoration and Integrated Streambank Protection: WDFW, in concert with other State agencies, has developed guidelines that facilitate the consistent application of good science and practices for project designs, construction, and operations affecting aquatic systems.
http://wdfw.wa.gov/hab/ahg/

The WDFW provides technical assistance to SRFB applicants for the design and development of barrier correction and screening projects. WDFW provides design standards and performs technical review of fish passage and other habitat restoration and development projects. This technical review is required for approval through the Hydraulic Project Approval (HPA) process and is especially critical for fish passage and screening projects. Additional information is available on the WDFW Web page at:
http://www.wdfw.wa.gov/hab/engineer/habeng.htm#upstrm

Project Applicants are encouraged to utilize the WDFW Priority Index (PI) system. It provides a standardized methodology for the assessment and prioritization of fish passage barriers and water diversion screens. To assist applicants in developing the PI, WDFW has developed the Fish Passage Barrier and Screening Assessment and Prioritization Manual. Additional information is available on the WDFW Web page at:
http://www.wdfw.wa.gov/hab/engineer/fishbarr.htm.

Fish Passage Projects: All fish passage projects must meet state fish passage criteria. The WDFW has developed Fish Passage Design at Road Culverts Manual to guide in the implementation of fish passage projects. WDFW has also developed a Fish Passage Data Design Form that is included in the application materials and is available electronically on the IAC/SRFB web site at http://www.iac.wa.gov/srfb/docs.htm.

Screening Projects: All screening projects must meet state fish screening criteria. The WDFW has developed the draft guidelines for fish screens. This is available at:
http://www.wdfw.wa.gov/hab/engineer/fishscrn.htm

Inventory Projects: WDFW has an established protocol for fish passage barrier and screening inventories, which should be followed. The protocol can be found in the Fish Passage Barrier and Screening Assessment and Prioritization Manual available on the WDFW Web page at: http://www.wdfw.wa.gov/hab/engineer/fishbarr.htm.

# U.S. FISH AND WILDLIFE SERVICE

# CONCURRENCE WITH USE OF PROGRAMMATIC BIOLOGICAL OPINION ON FISH PASSAGE AND RESTORATION PROJECTS

NOTE: Throughout the plan formulation and environmental coordination processes of the feasibility study, the project team was using local site names to refer to each site where measures could be implemented for ecosystem restoration. During the project's recent feasibility-level design phase, site names were formalized in the Final Feasibility Report and Environmental Impact Statement; therefore, some site names have changed since initial environmental compliance and coordination efforts were completed early in the study. The final list of sites in the recommended plan includes the following:

- Confluence Levee Removal
- Upstream Large Woody Debris
- Side Channel Reconnection
- Wetland Restoration at River Mile 9
- Wetland Restoration at Grange

**Electronic Approval for use of the**
**2008 Fish Passage and Restoration Programmatic**

U.S. Army Corps of Engineers Civil Works levee setback projects
in the Skokomish River
(FWS# 01EWFW00-2015-TA-0253, 13410-2008-F-0209)

On January 15, 2015, the U.S. Fish and Wildlife Service (Service) received your letter, the Memorandum for the Services, and Specific Project Information Form requesting consultation for the U.S. Army Corps of Engineers Civil Works Skokomish River levee setback project. The U.S. Army Corps of Engineers (Corps) made a "likely to adversely affect" determination for the bull trout (*Salvelinus confluentus*) and a "may affect, not likely to adversely affect" determination for designated bull trout critical habitat. The project is located near the town of Skokomish, in Mason County, Washington (T21N, R4W, Section 8).

The proposed project includes: 1) removing the Car Body levee (5,400 ft), 2) removing portions of the existing Grange and River Mile 9 levees, 3) setting back the Grange and River Mile 9 levees (2,750 and 4,370 feet of setbacks, respectively), 4) reconnecting 45 acres of off-channel habitat, 5) constructing 14 engineered log jams (ELJ), and 6) installing numerous single logs and clusters of large wood. Access to the sites may require up to 13 temporary stream crossings (depending on the flows), and there will be as many as 60 sites where in-water work could occur (14 ELJs, 13 stream crossings, two sites for reconnecting the off-channel habitat, one levee breach, and 30 log clusters). The actual number of instream work locations will likely be less, depending on flow conditions at the time of construction and minimization measures that will be implemented (e.g. constructing ELJs along edges of gravel bars). Any trees that are removed to provide access to the sites and which meet the size criteria will be used in construction of the ELJs. Access and construction of the project will occur during summer low flow conditions, and diversion and/or isolation of work areas will comply with the protocols established in the 2008 Fish Passage and Restoration Programmatic. Fish will be removed using dip nets, seines, and electrofishing (if necessary). Turbidity monitoring will occur during all in-water work and will comply with the conditions issued in the water quality certification issued by the Washington Department of Ecology. Construction activities will take two in-water work seasons to complete. The purpose of the project is to restore instream habitat complexity and floodplain connectivity for bull trout and other listed salmonids.

The project is located in the Skokomish River core area for bull trout. Based on telemetry studies, bull trout in the Skokomish River Core Area are fluvial and do not show signs of anadromy. Based on the 5-year review, the bull trout population in this core area is rapidly declining. The number of adults in the South Fork Skokomish River is estimated to be approximately 50 individuals. The nearest potential bull trout spawning habitat is approximately 15 miles upstream of the project site in Brown Creek and documented spawning occurs upstream of river mile 20 in the mainstem. Water temperatures in the South Fork Skokomish River at the project site are cool (at or below 15°C, based on water quality monitoring data at Potlatch) and suitable for bull trout year-round. Based on the cool water temperature and good habitat quality, we anticipate adult, subadult, and larger juvenile bull trout to be present in the project area during project implementation. Given the proposal for isolation, dewatering, and removal of fish from the work sites, there is the potential that bull trout could be stranded and/or exposed to high levels of turbidity during construction.

Because of the level of temporary physical disturbance and increased turbidity, the Service anticipates incidental take of subadult and juvenile bull trout that remain within the proposed project sites after diversion of the water. We also expect dewatering and fish handling (seining, capture, electrofishing) of individual fish to result in significant disturbance and stress.

The project reach is designated as critical habitat. The final revised rule designating bull trout critical habitat (75 FR 63898 [October 18, 2010]) identifies nine Primary Constituent Elements (PCEs) essential for the conservation of the species. The following PCEs are present in the action area and may be affected by the proposed action:

*Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.* The proposed action is designed to improve flows and connectivity to the floodplain along the South Fork Skokomish River. Reconnection to the floodplain and installation of the ELJs will intercept groundwater sources, improve hyphoreic connections, and create scour pools. Because the project is designed to improve fish access to off-channel and cold-water habitats and thermal refugia, the long-term effects of the action on this PCE are considered beneficial.

*Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.* The proposed action may result in temporary impacts to water quality and disturbance associated with elevated levels of suspended sediments and disturbance at the time of installation of the ELJs and river crossings. Construction of the inlet and outlet to the side channel and widening of the levee breach will produce pulses of increased turbidity during the first high flows. Increased turbidity will be short-term and will not preclude bull trout movement through the area during and after construction. Because the Grange and River Mile 9 levees will not be removed in their entirety, there is the possibility of fish stranding behind the remaining sections after high flows. The potential for stranding will not be known until after the first flooding of the area. Long-term effects of the proposed action are expected to be beneficial because the ELJs are designed to provide interspersed thermal refugia in the river reach and the reconnected side-channel habitat will provide foraging habitat. Therefore, construction-related effects to this PCE are considered insignificant and long-term effects are anticipated to be beneficial.

*An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.* The proposed action may affect the food base of bull trout through short-term degradation of water quality and removal of some shrubs and overhanging vegetation. Upon completion of the proposed action, we anticipate that riparian vegetation will recover. The river reach provides habitat for juvenile salmonids and a diversity of aquatic macro-invertebrates. The ELJs will improve both instream habitat complexity and the food base in the action area because the LWD structures will attract aquatic macroinvertebrates and juvenile fish which are prey species for bull trout. Therefore, long-term effects to this PCE are considered beneficial.

*Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.* The primary objective of the project is to restore floodplain functions and increase habitat and channel complexity in the action area through the addition of large wood, levee setbacks and reconnection of historic side channels. No measurable short- or long-term construction-related impacts to this PCE are anticipated. Therefore, effects to this PCE are considered entirely beneficial.

*A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.* The proposed action would alter the hydrograph of the South Fork Skokomish River through the installation of ELJs that are designed to create scour pools and create cold water refugia and the removal and setback of the levees designed to reconnect the river with the floodplain and create off-channel habitat for juvenile salmonids. Logging practices in the lower watershed has resulted in a reduction in the amount of natural wood in the channel that historically kept substrate materials sorted and moving through transport reaches. Because the primary purpose of the project is to reconnect the river with the floodplain and to restore natural channel complexity and hydrologic function, long-term effects to this PCE are considered beneficial.

**Incidental Take Statement**

Given the duration of in-water work (two in-water work seasons), the Service anticipates individual bull trout that are in the project area to be exposed to elevated levels of turbidity and disturbance associated with access crossings, installation of the ELJs, and excavation to reconnect the historic off-channel habitat. We also expect dewatering and fish handling (seining, capture, electrofishing) of individual fish to result in significant disturbance and stress, and the stranding of fish would result in death.

Most, if not all, of the adult bull trout will be upstream of the project reach in their natal streams preparing to spawn at the time that work will be conducted. Some non-reproductive adults, smaller subadults and juvenile bull trout may be present in the action area; however, we expect the number of fish that may be present and exposed to construction to be small, given the time of year that work will be done (summer low flow) and the small bull trout population size in the Skokomish Core Area.

Adverse effects to juvenile and subadult bull trout are anticipated from activities that generate high levels of turbidity and disturbance associated with use of heavy equipment, reconnecting the side channel, widening the levee breach, and placement of wood in the channel. In-water work is scheduled to occur between July 15 and September 15 over two consecutive years. Elevated levels of turbidity are expected to extend up to 300 ft downstream and 100 ft upstream of each in-water work site (4.5. miles total[1]). All non-breeding adult, subadult, and juvenile bull trout that are present in the project reach and area of elevated turbidity will experience significant impairment of feeding, sheltering, and normal behavior (Harassment) during installation of the ELJs.

If fish are stranded after high flows, this would result in injury or death (Harm) of individual fish. Because adult and subadult bull trout are highly mobile and can easily detect and avoid equipment and in-water activities, we do not anticipate these larger life history stages of bull trout to be physically injured or killed during dewatering and fish handling.

Given the extremely low population and distance from the nearest spawning areas, we do not anticipate young-of-the-year to be present in the project area. However, habitat conditions and water temperatures in the project reach are suitable and older juveniles (1 to 2 years old) may be present in the project reach during construction. Juvenile bull trout are strongly associated with substrates and their instinct is to hide (especially during the day) rather than flee when disturbed. Juvenile bull trout are also largely nocturnal to avoid predation. Given their affinity to hide in undercut banks and intersticial spaces of cobbles and boulders, we anticipate that any juveniles that are present during in-water work and fish handling could be crushed or injured.

The extent of take is along the lower river between river miles 5 and 10: Car Body levee - 5,400 feet, Grange and River Mile 9 levees are 2,750 and 4,370 feet long, 45 acres of off-channel habitat will be reconnected, and in-water work sites associated with ELJs and stream crossings. All individuals that are present in areas where construction will be conducted in the wetted channel or in areas where fish removal is conducted will be stressed or could be injured or killed. The duration of take is anticipated to be between July 15 and September 15 over two in-water work seasons.

Turbidity monitoring and fish capture reports should be sent to the U.S. Fish and Wildlife Service, 510 Desmond Dr SE, Suite 102, Lacey WA 98503, attention Shirley Burgdorf.

Restoration of habitat complexity for bull trout will enhance the quality of suitable habitat with associated positive effects on long-term survival and recovery of the species. Therefore, the long-term effects of the action are considered beneficial.

The proposed action meets all of the applicable criteria in the Fish Passage and Habitat Enhancement Restoration Programmatic (Programmatic) for Activity Category 2: Insteam Structures – ELJs and placement of live stakes, Category 3: Levee Removal and Modification, and Category 4: Side Channel/Off Channel Habitat Restoration and Reconnection. As per the criteria set forth in the Programmatic, the Service is responding via this electronic format to give approval to cover the proposed action under the Programmatic. The U.S. Fish and Wildlife Service tracking number for this project is 01EWFW00-2015-TA-0253. If you have any questions, please contact Shirley Burgdorf at (360) 534-9340 or Martha Jensen at (360) 753-9000, of this office.

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[1] Distanced calculated from summing the area of anticipated turbidity (400 ft) for each potential in-water work site (60 total sites).

# NATIONAL HISTORIC PRESERVATION ACT SECTION 106 COMPLIANCE

NOTE: Throughout the plan formulation and environmental coordination processes of the feasibility study, the project team was using local site names to refer to each site where measures could be implemented for ecosystem restoration. During the project's recent feasibility-level design phase, site names were formalized in the Final Feasibility Report and Environmental Impact Statement; therefore, some site names have changed since initial environmental compliance and coordination efforts were completed early in the study. The final list of sites in the recommended plan includes the following:

- Confluence Levee Removal
- Upstream Large Woody Debris
- Side Channel Reconnection
- Wetland Restoration at River Mile 9
- Wetland Restoration at Grange

From: Miller, Kris [mailto:kmiller@skokomish.org]
Sent: Wednesday, February 18, 2015 10:14 AM
To: Kanaby, Kara NWS
Subject: [EXTERNAL] Section 106 review of the Skokomish River Basin Ecosystem Restoration Feasibility Study.

Ms. Kanaby,

The Skokomish THPO has reviewed and concurs with the determination that no historic properties will be affected by the proposed Skokomish River Basin Ecosystem Restoration Feasibility study. We also concur that construction monitoring should take place.

If you need further information from the THPO, please contact me at 360-426-4232 or e-mail shlanay1@skokomish.org

Thank you,

--

Kris Miller

Tribal Historic Preservation Officer

80 N Tribal Center Road

Skokomish, WA 98584

shlanay1@skokomish.org

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past, Shape the Future

Allyson Brooks Ph.D., Director
State Historic Preservation Officer

February 10, 2015

Mr. Evan Lewis
Environmental & Cultural Resources
Seattle District
Corps of Engineers
PO Box 3755
Seattle, Washington 98124

Re : Skokomish River Basin Ecosystem Restoration Project
Log No.: 120513-01-COE-S

Dear Mr. Lewis:

Thank you for contacting our department. We have reviewed the professional archaeological survey report you provided for the proposed Skokomish River Basin Ecosystem Restoration Project, Mason County, Washington.

We concur with your determination of No Historic Properties Affected with the stipulation for professional archaeological monitoring. We look forward to further consultations and the draft Monitoring Plan. Please provide the draft in an unlocked Word file.

We would appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and a copy of these comments should be included in subsequent environmental documents.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360) 890-2615 mobile
email: *rob.whitlam@dahp.wa.gov*

**DEPARTMENT OF THE ARMY**
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

Environmental and Cultural Resources Branch

FEB 09 2015

The Honorable Guy Miller, Chairman
Skokomish Indian Tribe
North 80 Tribal Center Road
Shelton, Washington 98584

Subject: Section 106 Review of the National Historic Preservation Act for the Skokomish River Basin Ecosystem Restoration Feasibility Study.

Dear Chairman Miller,

The United States Army Corps of Engineers (Corps), in conjunction with the Skokomish Indian Tribe (Tribe) and Mason County, is proposing to construct an ecosystem restoration project in the Skokomish River Valley. As you know, the Skokomish River Basin is located on the Olympic Peninsula in northwestern Washington at the southern end of Hood Canal. The study area is approximately 11 square miles and includes the lower Skokomish watershed, the Skokomish Valley, and Skokomish River estuary (see Figure 1 of enclosed report). The river is the largest source of fresh water to Hood Canal and is of critical importance to the overall health of Hood Canal. Alteration of the river environment and encroachment on the floodplain by man-made structures has degraded the natural ecosystem processes necessary to support critical fish and wildlife habitat throughout the basin. Furthermore, extensive river aggradation has led to a loss of hydraulic connectivity preventing salmon access to upstream habitat and spawning areas.

The Corps contacted your office via letter in 2005 when the feasibility study was initiated to invite your participation in the study process and to solicit any concerns the Tribe may have in the early planning stages. The Corps and Tribe have met many times but in 2010 the Corps and the Tribe had a face-to-face meeting to discuss the project and specifically asked for any knowledge and concerns on properties which may be of religious and cultural significance to the Tribe. In November 2013 the Corps again contacted your office as we had just identified our tentatively selected plan (TSP) and were beginning the process of producing feasibility level designs. Our letter again asked for any knowledge or concerns about cultural resources within the project area and, invited you to participate in the preparation of a programmatic agreement (PA) for this undertaking. In the past year, we have further refined their conceptual level designs and feel that delaying identification efforts through the preparation of a PA is no longer necessary. We would like to take this opportunity to reengage you in the cultural resource aspects of the project.

The purpose of this letter is to update you on the status of the project and to summarize efforts that the Corps has taken to date to identify historic properties that may be affected by the undertaking and provides the agency determinations and findings as provided at 36 C.F.R.§ 800.4 and 5. The Corps has determined that *no historic properties affected* by the proposed undertaking. It should also be noted that the Corps is requiring monitoring as part of the project undertaking in order to ensure appropriate protection and treatment of any unanticipated discoveries of cultural resources should any be found during the project implementation phase.

In our 2013 letter the Corps defined the entire study area as the area of potential effects (APE) for the purpose of the PA. However, the Corps has further refined the APE to include the proposed project footprints for each project component including access roads and staging areas. The acreage for the revised APE is 282 acres.

In order to compare the preliminary alternatives and identify potential impacts to cultural resources, the Corps conducted a literature review and windshield survey in 2009. Sources reviewed included previous inventory reports and site forms, historic maps, and ethnographic literature. The windshield survey was designed to characterize the nature of the resources present in the basin and to determine if there were any historic structures or other clearly visible resources that should be avoided during alternative development. In addition, the Corps gathered information from local residents through oral histories.

Based on the development of the TSP the Corps conducted a cultural resource survey of the components that make up the TSP on January 8th, 15th, and 23rd, 2015. The cultural resource survey included recording the Car Body levee, River Mile (RM) 9 levee and the Grange levee. In addition, shovel testing occurred at the proposed setback location for the RM 9 levee and at one of the side channel reconnection areas. Only one of the side channel reconnection areas could be surveyed. The second side channel reconnection area was inaccessible and was covered by standing water during the summer. For the RM 9 levee, shovel testing only occurred on property where the private property owners had signed rights of entry. The proposed setback location for the Grange levee was not surveyed due to lack of permission from private property owners to access their land. The LWD locations were not surveyed as the locations for the LWD are within the current main stem channel of the Skokomish River. In addition, the proposed access routes would cross private property where landowner permission has not been granted.

Subsurface shovel probes at both the proposed RM 9 setback alignment and the side channel reconnection at RM 5.6 were negative for cultural material. Three areas were unable to be surveyed: 1) The proposed setback levee for Grange levee was not surveyed due to lack of land owner permission for access; 2) The channel reconnection site at RM 4 was inaccessible and unable to be surveyed; and 3) Areas where logjams are proposed to be placed within the Skokomish River channel were not surveyed.

The Corps is requiring construction monitoring during construction for the following locations to ensure no cultural resources are inadvertently discovered: 1) Construction of the RM 9 setback levee, and 2) The channel reconnection locations at RM 4 and 5.6. While the channel reconnection location at RM 4 was not surveyed both are relict channels of the Skokomish River and reconnection would involve re-excavating the former inlet and outlet of these channels. In addition, excavation would only be deep enough to allow water to pass into the channel during higher flows.

For the proposed setback for the Grange Levee, the Corps will only conduct a cultural resource report after landowner permission to construct the setback levee across private property has been received. As indicated earlier, the placement of the LWD is within the current Skokomish River channel. Should the proposed locations of the LWD change the Corps will review the locations to determine if a cultural resource survey may also be warranted.

Based on the Corps internal guidelines for flood control systems and structures the Corps has determined that the Car Body levee, and the RM 9/Grange levee are not eligible for listing in the National Register of Historic Places (NRHP). Though both the Car Body levee and the RM 9/Grange levee are fifty years of age these levees are a ubiquitous type of levee and are not distinguished for their engineering value. In addition, both the Car Body levee and the RM 9/Grange levee show clear loss of essential integrity due to loss of linear continuity due to breaches, and both levees are experiencing erosion. While both the Car Body levee and the RM 9/Grange levee were built to protect agricultural fields from flooding these levees did not play a central role in the agricultural development of the Skokomish River Valley. Finally, neither the Car Body levee nor the RM 9/Grange levee can provide additional information beyond what is already known about the settlement and development of the watershed.

The Corps believes we have made a reasonable and good faith effort to identify historic properties that might be affected by the undertaking. Based on the results of the records search, field investigations and information gathered through consultation, the Corps has determined that *no historic properties will be affected* by the proposed Skokomish River Basin Ecosystem Restoration Feasibility Study. However, Corps is requiring construction monitoring.

If you have specific questions or if we can provide any clarification about this request or should you have any other concerns regarding cultural or historic resources, please contact Ms. Kara Kanaby (Lead Archaeologist) by telephone at (206) 764-6857 or by email at Kara.M.Kanaby@usace.army.mil.

Sincerely,

Evan Lewis, Chief
Environmental and Cultural
Resources Branch

Enclosure

Cc: (with enclosures)
Kristine Miller
Tribal Historic Preservation Officer
Skokomish Indian Tribe
North 80 Tribal Center Road
Shelton, Washington 98584

**DEPARTMENT OF THE ARMY**
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

Environmental and Cultural Resources Branch

FEB 09 2015

Allyson Brooks, Ph.D.
Washington State Historic Preservation Officer
Department of Archaeology and Historic Preservation
P.O. Box 48343
Olympia, WA 98504

Subject: Section 106 Review of the National Historic Preservation Act for the Skokomish River Basin Ecosystem Restoration Feasibility Study. Log No. # 120513-01-COE-S

Dear Dr. Brooks:

The United States Army Corps of Engineers (Corps), in conjunction with the Skokomish Indian Tribe and Mason County, is proposing to construct an ecosystem restoration project in the Skokomish River Valley. The Skokomish River Basin is located on the Olympic Peninsula in northwestern Washington at the southern end of Hood Canal. The study area is approximately 11 square miles and includes the lower Skokomish watershed, the Skokomish Valley, and Skokomish River estuary (see Figure 1 of enclosed report). The river is the largest source of fresh water to Hood Canal and is of critical importance to the overall health of Hood Canal. Alteration of the river environment and encroachment on the floodplain by man-made structures has degraded the natural ecosystem processes necessary to support critical fish and wildlife habitat throughout the basin. Furthermore, extensive aggradation has led to a loss of hydraulic connectivity preventing salmon access to upstream habitat and spawning areas.

The Corps first contacted your office about this project in November of 2013. At that time, we had just identified our tentatively selected plan (TSP) and were beginning the process of producing feasibility level designs. Our letter asked for any knowledge or concerns about resources within the project area and it invited you to participate in the preparation of a programmatic agreement (PA) for this undertaking. In the past year, the Corps and its partners have further refined their conceptual level designs and delaying identification efforts through the preparation of a programmatic agreement is no longer necessary. We would like to take this opportunity to reengage you in the project.

The purpose of this letter is to update you on the status of the project and to summarize efforts that the Corps has taken to date to identify historic properties that may be affected by the undertaking and provides the agency determinations and findings as provided at 36 C.F.R.§ 800.4 and 5. We request your agreement with our finding that there will be *no historic properties affected* by the proposed undertaking. It should also be noted that the Corps is requiring monitoring as part of the project undertaking in order to ensure appropriate protection and treatment of any unanticipated discoveries of cultural resources should any be found during the project implementation phase.

In our letter dated November 15th, 2013, alternative descriptions were provided and the letter noted that the project partners would likely recommend Alternative 2c which included the removal of Car Body levee and installation of large woody debris (LWD) upstream. The Corps has further refined the conceptual designs and has chosen a TSP. preferred alternative also referred to as the Tentatively Selected Plan (TSP). The TSP is compromised of several components that include the removal of Car Body levee, upstream LWD, side channel reconnection of two relict side channels at river mile (RM) 5.6 and 4; the construction of two setback levees for the Grange levee and the RM 9 levee (see figures 2,3,4,5 and 6 in enclosed report). In our 2013 letter the Corps defined the entire study area as the area of potential effects (APE) for the purpose of the PA. However, the Corps has further refined the APE has defined the area of potential effect (APE) to include the proposed project footprints for each project component including access roads and staging areas. The acreage for the revised APE is 282 acres.

The Corps has sought information from the Skokomish Indian Tribe regarding places which they attach religious and cultural significance and to identify any concerns they have with the project. The Corps has notified and requested information from the Skokomish Tribe in a face-to-face meeting in 2010. As one of our sponsor for this project the Corps has remained in communication with the Skokomish Tribe throughout the course of the project.

In order to compare the preliminary alternatives and identify potential impacts to cultural resources, the Corps conducted a literature review and windshield survey in 2009. Sources reviewed included previous inventory reports and site forms, historic maps, and ethnographic literature. The windshield survey was designed to characterize the nature of the resources present in the basin and to determine if there were any historic structures or other clearly visible resources that should be avoided during alternative development. In addition, the Corps gathered information from local residents through oral histories.

Based on the development of the TSP the Corps conducted a cultural resource survey of the components that make up the TSP on January 8th, 15th, and 23rd, 2015. The cultural resource survey included recording the Car Body levee, RM 9 levee and the Grange levee. In addition, shovel testing occurred at the proposed setback location for the RM 9 levee and at one of the side channel reconnection areas. Only one of the side channel reconnection areas could be surveyed. The second side channel reconnection area was inaccessible and was covered by standing water during the summer. For the RM 9 levee, shovel testing only occurred on property where the private property owners had signed rights of entry. The proposed setback location for the Grange levee was not surveyed due to lack of permission from private property owners to access their land. The LWD locations were not surveyed as the locations for the LWD are within the current main stem channel of the Skokomish River. In addition, the proposed access routes would cross private property where landowner permission has not been granted.

Subsurface shovel probes at both the proposed RM 9 setback alignment and the side channel reconnection at RM 5.6 were negative for cultural material. Three areas were unable to be surveyed: 1) The proposed setback levee for Grange levee was not surveyed due to lack of land owner permission for access; 2) The channel reconnection site at RM 4 was inaccessible and unable to be surveyed; and 3) Areas where logjams are proposed to be placed within the Skokomish River channel were not surveyed.

The Corps is requiring construction monitoring during construction for the following locations to ensure no cultural resources are inadvertently discovered: 1) Construction of the RM 9 setback levee, and 2) The channel reconnection locations at RM 4 and 5.6. While the channel reconnection location at RM 4 was not surveyed both are relict channels of the Skokomish River and reconnection would involve re-excavating the former inlet and outlet of these channels. In addition, excavation would only be deep enough to allow water to pass into the channel during higher flows.

For the proposed setback for the Grange Levee, the Corps will only conduct a cultural resource report after landowner permission to construct the setback levee across private property has been received. As indicated earlier, the placement of the LWD is within the current Skokomish River channel. Should the proposed locations of the LWD change the Corps will review the locations to determine if a cultural resource survey may also be warranted.

Based on the Corps internal guidelines for flood control systems and structures the Corps has determined that the Car Body levee, and the RM 9/Grange levee are not eligible for listing in the National Register of Historic Places (NRHP). Though both the Car Body levee and the RM 9/Grange levee are fifty years of age these levees are a ubiquitous type of levee and are not distinguished for their engineering value. In addition, both the Car Body levee and the RM 9/Grange levee show clear loss of essential integrity due to loss of linear continuity due to breaches, and both levees are experiencing erosion. While both the Car Body levee and the RM 9/Grange levee were built to protect agricultural fields from flooding these levees did not play a central role in the agricultural development of the Skokomish River Valley. Finally, neither the Car Body levee nor the RM 9/Grange levee can provide additional information beyond what is already known about the settlement and development of the watershed.

The Corps has made a reasonable and good faith effort to identify historic properties that might be affected by the undertaking. Based on the results of the records search, field investigations and information gathered through consultation, the Corps has determined that *no historic properties will be affected* by the proposed Skokomish River Basin Ecosystem Restoration Feasibility Study. However, Corps is requiring construction monitoring as noted previously.

At this time, the Corps is requesting the Washington SHPO's review and agreement with our finding that there will be *no historic properties affected* by the project. We appreciate your consideration of our request. If you have specific questions or we can provide any clarification, please contact Ms. Kara Kanaby (Lead Archaeologist) by telephone at (206) 764-6857 or by email at Kara.M.Kanaby@usace.army.mil.

Sincerely,

Evan Lewis, Chief
Environmental and Cultural
Resources Branch

Enclosure

DEPARTMENT OF
ARCHAEOLOGY &
HISTORIC PRESERVATION
Protect the Past, Shape the Future

Allyson Brooks Ph.D., Director
State Historic Preservation Officer

December 5, 2013

Mr. Rolla L. Queen
Environmental Resources Section
Corps of Engineers – Seattle District
PO Box 3755
Seattle, Washington 98124-3755

Re: Skokomish River Basin Ecosystem Restoration Feasibility Study
Log No.: 120513-01-COE-S

Dear Mr. Queen:

Thank you for contacting our department. We have reviewed the materials you provided for the proposed Skokomish River Basin Ecosystem Restoration Feasibility Study, Mason County, Washington.

We look forward to further consultations and the development of a Programmatic Agreement to address the totality of the Project and its elements.

Please keep us apprised of your next steps and we look forward to participating in future meetings and consultations..

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4. Should additional information become available, our assessment may be revised.

Thank you for the opportunity to comment and we look forward to receiving information on the results of your efforts.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360) 586-3080
email: *rob.whitlam@dahp.wa.gov*

**From:** Miller, Kris
**To:** Storey, Danielle L NWS
**Subject:** Re: [EXTERNAL] Skokomish North Fork Car Body Levee Removal (UNCLASSIFIED)
**Date:** Wednesday, February 26, 2014 3:25:46 PM

---

Hello Daniell,

I tried calling you at the number you left on my machine, but it says no longer in service.

On Tue, Dec 10, 2013 at 1:40 PM, Storey, Danielle L NWS <Danielle.L.Storey@usace.army.mil> wrote:

> Classification: UNCLASSIFIED
> Caveats: NONE
>
> Hi Kris,
>
> No. The purpose of this consultation is to develop a plan about how we are going to do a survey. We would like the Tribe to weigh in. This project won't move forward for at least 4 years. Has there been a survey at the car body levee? Wisaard didn't have one listed.
>
> -----Original Message-----
> From: Miller, Kris [mailto:kmiller@skokomish.org]
> Sent: Monday, December 09, 2013 3:19 PM
> To: Storey, Danielle L NWS
> Subject: [EXTERNAL] Skokomish North Fork Car Body Levee Removal
>
> Hello Daniell,
>
> Just a quick question about this letter I received for consultation regarding the project.
> Did you review the archaeological survey that was completed?
>
> --
> Kris Miller
>
> Tribal Historic Preservation Officer
> 80 N Tribal Center Road
> Skokomish, WA 98584
> shlanay1@skokomish.org
>
> Classification: UNCLASSIFIED
> Caveats: NONE

--
Kris Miller

Tribal Historic Preservation Officer
80 N Tribal Center Road
Skokomish, WA 98584
shlanay1@skokomish.org

**DEPARTMENT OF THE ARMY**
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

Environmental and Cultural Resources Branch

NOV 1 5 2013

Allyson Brooks, Ph.D.
State Historic Preservation Officer
Department of Archaeology and Historic Preservation
Post Office Box 48343
Olympia, Washington 98504-8343

SUBJECT: Development of a Programmatic Agreement for the Skokomish River Basin Ecosystem Restoration Feasibility Study

Dear Dr. Brooks:

U.S. Army Corps of Engineers (Corps) has partnered with the Skokomish Indian Tribe and Mason County to study and evaluate potential ecosystem restoration projects within the Skokomish River Basin under the authority of the Corps' General Investigation (GI) Program. The purpose of the study is to evaluate ecosystem degradation in the Skokomish River Basin; to formulate and evaluate potential solutions to these problems; and to recommend a series of feasibility level projects that have a federal interest and are supported by the non-federal sponsors. The study will culminate in the completion of a programmatic level environmental impact statement (EIS) and feasibility level design of the preferred alternative that will be sent to the Chief of Engineers for approval and then submitted to Congress for authorization and eventually appropriations. Project specific environmental documents will be developed as the projects are further defined. Because this is a feasibility study and effects on historic properties cannot be fully determined prior to approval of an undertaking (in this case Congressional Authorization) the Corps is seeking to execute a programmatic agreement (PA) with your office pursuant to 36 CFR 800.14(b) in order to fulfill its responsibilities under Section 106 of the National Historic Preservation Act (NHPA).

The Skokomish River Basin is located on the Olympic Peninsula in northwestern Washington at the southern end of Hood Canal. The study area is approximately 11 square miles and includes the lower Skokomish watershed, the Skokomish Valley, and Skokomish River estuary (Figure 1). The river is the largest source of fresh water to Hood Canal and is of critical importance to the overall health of Hood Canal. Alteration of the river environment and encroachment on the floodplain by man-made structures has degraded the natural ecosystem processes necessary to support critical fish and wildlife habitat throughout the basin. Furthermore, extensive aggradation has led to a loss of hydraulic connectivity preventing salmon access to upstream habitat and spawning areas.

The Corps is currently analyzing two action alternatives that are composed of groupings of restoration projects. Each alternative was developed with a "base" measure that addresses the need for increased quantity and quality of pool habitats in the river as well as year-round fish passage near the confluence. Up to eight incremental measures or projects (e.g., side channel reconnections, levee setbacks, placement of large woody debris, etc.) were added to these "bases" to capture supplementary benefits. A description of the alternatives is provided below.

**Alternative Descriptions**

**Alternative 1: No Action Alternative**

No project would be recommended under the No Action Alternative.

**Alternative 2: Car Body Levee Removal (3 Scales)**

Alternative 2 consists of a "base" measure that removes the levee on the north side of the mainstem near the original North Fork confluence, referred to locally as the car body levee. Mainstem flows would then be diverted into the North Fork channel and reenter the mainstem at the confluence location (Figure 2). This would bypass the area where the river goes dry during the summer and would provide improved fish migration. A portion of flood flows would continue to flow in the channel.

Eight possible restoration projects or increments could be added to this "base" to form complete alternatives. Different scales of each alternative were developed based on the number of increments added to the "base." Please see Figure 2 for a better explanation of what these increments would entail.

| **Car Body Levee Removal (Alternative 2A)** | **Car Body Levee Removal (Alternative 2B)** | **Car Body Levee Removal Scale (Alternative 2C)** |
|---|---|---|
| Base Alternative #3: Car Body Levee Removal | Base Alternative #3: Car Body Levee Removal | Base Alternative #3: Car Body Levee Removal |
| Increment #35: Upstream LWD Installation | Increment #35: Upstream LWD Installation | Increment #35: Upstream LWD Installation |
| Increment #9: Side Channel Reconnection | Increment #9: Side Channel Reconnection | |
| Increment #37: Grange Levee Setback | Increment #37: Grange Levee Setback | |
| Increment #28: River Mile 9 Levee Setback | Increment #28: River Mile 9 Levee Setback | |
| Increment #39: Hunter Creek Mouth Restoration | Increment #39: Hunter Creek Mouth Restoration | |
| Increment #40: Hunter Creek Side Channel Restoration | Increment #40: Hunter Creek Side Channel Restoration | |
| Increment #43: Weaver Creek Side Channel Restoration | | |
| Increment #26: Dips Road Setback | | |

**Alternative 3: Riverbed Excavation (2 Scales)**

Under this alternative, the summer low flow problem would be addressed through two different scales of dredging (Figure 3). Under Alternative 2A, 2.5 million cubic yards would be removed from the mainstem channel between river miles 0 and 9. Under Alternative 2B, 1.2 million cubic yards would be removed between river miles 3.5 and 9. Under both scales of Alternative 2, there would be a need for periodic maintenance to remove sediment accumulations. Dredged material would be placed in the estuary and nearshore of Annas Bay. This beneficial reuse of material would provide suitable hard substrate for shellfish attachment. The eight possible increments discussed above would be added to both scales of this alternative.

In order to compare the preliminary alternatives and identify potential impacts to cultural resources, the Corps conducted a literature review and windshield survey. Sources reviewed included previous inventory reports and site forms, historic maps, and ethnographic literature. Completed in 2009, the windshield survey was designed to characterize the nature of the resources present in the basin and to determine if there were any historic structures or other clearly visible resources that should be avoided during alternative development. The Corps also requested information about cultural resource concerns from the Skokomish Indian Tribe's Tribal Historic Preservation Officer in a face to face meeting in 2010 and gathered information from local residents through oral histories.

Conceptual designs have been developed for the two action alternatives and a draft integrated Feasibility Report/Environmental Impact Statement (EIS) has been prepared. At this time Alternative 2C has been identified as the preferred alternative in the draft integrated feasibility report/EIS. Alternative 3 is not recommended due to the deleterious effects dredging could have on other aspects of fish habitat as well as the anticipated costs of continued maintenance dredging. Selection of the preferred alternative will be confirmed after the Draft Feasibility Report/EIS has gone through public review.

After public review, the Corps and project sponsors will begin to develop "feasibility-level" designs (typically a 35% design) of the preferred alternative. These designs will be included with the Final Feasibility Report/EIS and submitted to the Chief of Engineers and eventually Congress. After Congressional approval of the project and appropriations are received, the Corps would prepare environmental assessments (EA)s or a supplemental EIS for each of the restoration projects. It is anticipated that traditional Section 106 identification efforts such as cultural resource surveys would occur at this stage.

The Corps would like to take this opportunity to invite you to participate in this next phase of the study both through your comments on the preferred alternative and through the preparation of the PA. We anticipate that the PA would layout a clear process for defining the area of potential effect; define the level of inventory and evaluation efforts as the preferred alternative is further refined; and propose best management practices or standard treatments for specific property types or effects.

In addition to the Skokomish Indian Tribe and Mason County, the Corps has identified the City of Shelton and the Mason County Historic Preservation Commission as potential participants in the development of the PA. The Corps is also notifying the Advisory Council on

Historic Preservation (ACHP) as required at 36 CFR 800.6(a)(1)(i)(c) and inviting them to participate. We would appreciate your assistance identifying additional consulting parties.

We look forward to collaborating with your office on the development of this PA. For more information about this project or clarification about this request, please contact Danielle Storey, Cultural Resources Lead, via telephone at (206) 764 4466 or via email at Danielle.L.Storey@usace.army.mil. I may be reached by telephone at (206) 316-3096 or by email at Rolla.l.Queen@usace.army.mil.

Sincerely,

for Rolla Queen, Chief
Cultural Resources Section

Enclosures

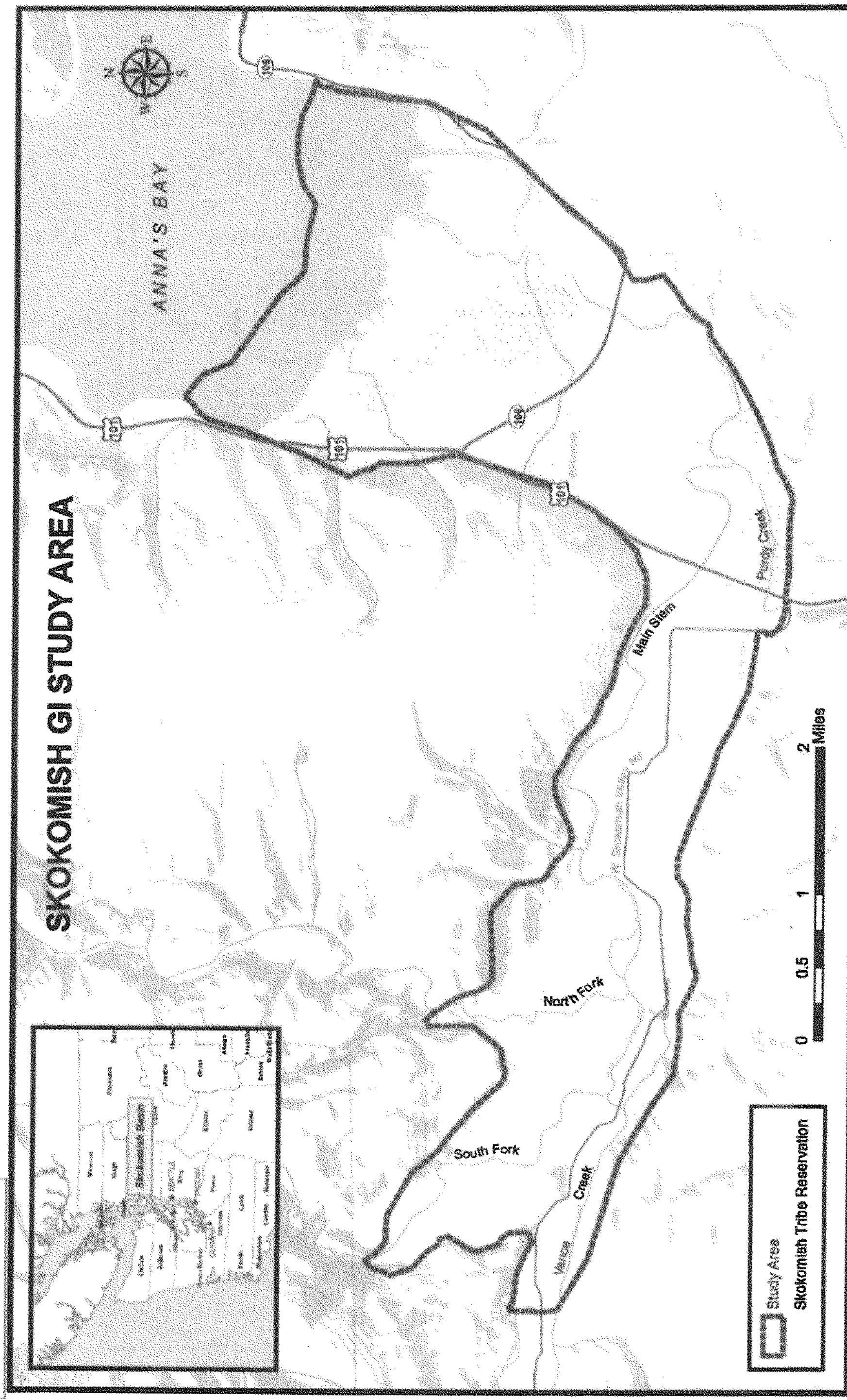
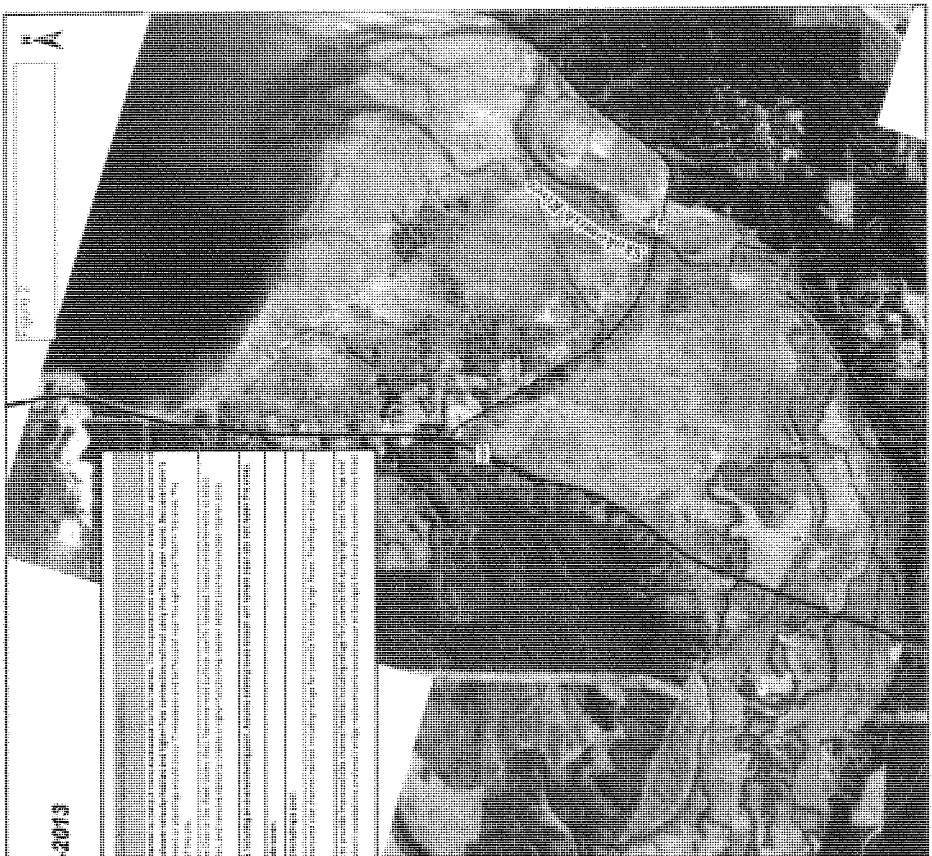
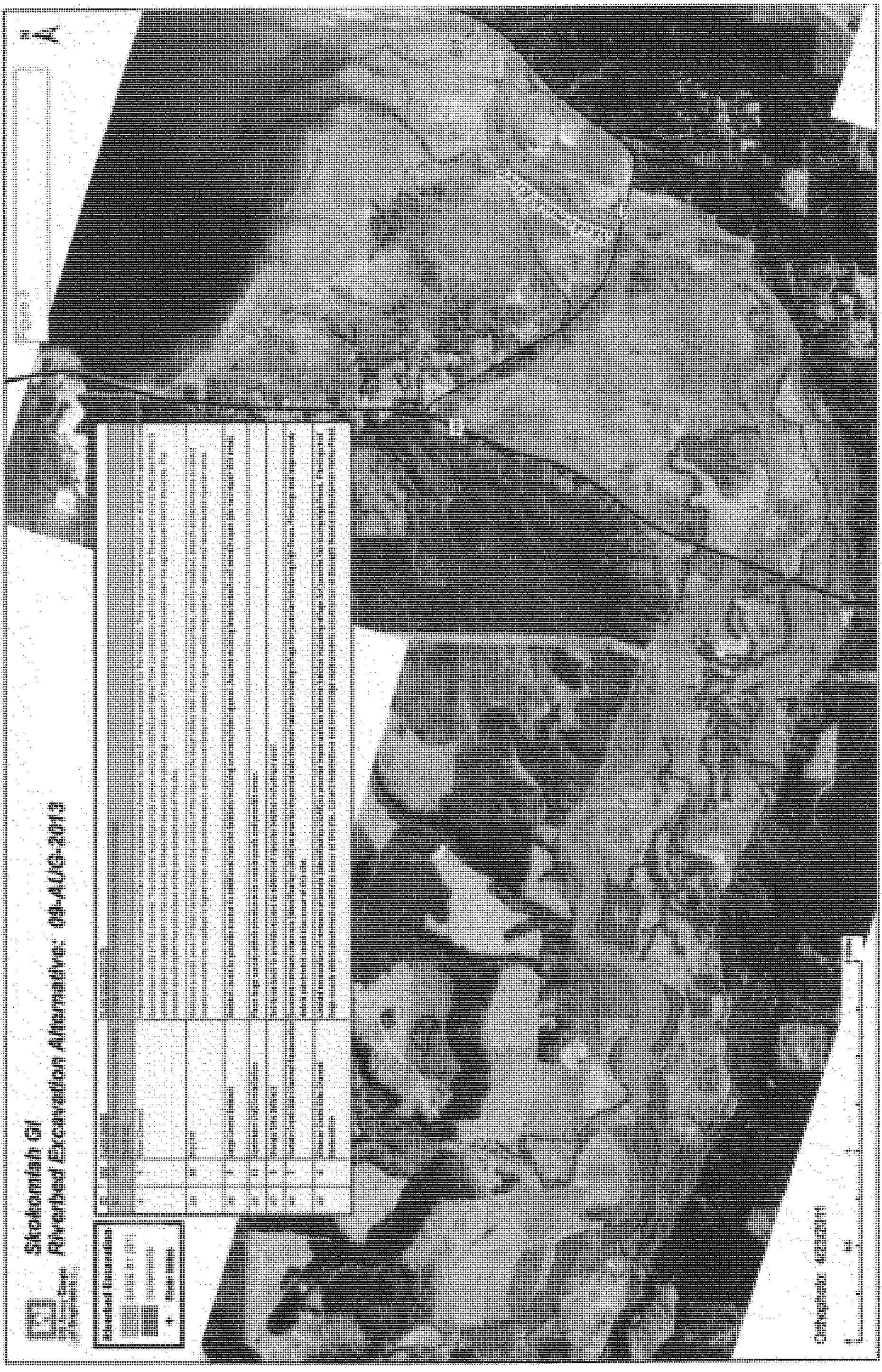

SKOKOMISH GI STUDY AREA
ANNA'S BAY
101
106
Main Stem
Purdy Creek
North Fork
South Fork
Vance
Creek
0 0.5 1 2 Miles
Study Area
Skokomish Tribe Reservation

Figure 1


Skokomish GI
Car Body Levee Removal Alternative: 09-AUG-2013


Skokomish GI
Riverbed Excavation Alternative: 09-AUG-2013

**DEPARTMENT OF THE ARMY**
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

Environmental and Cultural Resources Branch

The Honorable Guy Miller, Chairman
Skokomish Indian Tribe
North 80 Tribal Center Road
Shelton, Washington 98584

NOV 15 2013

Dear Chairman Miller:

As you are aware, the U.S. Army Corps of Engineers (Corps) has partnered with the Skokomish Indian Tribe and Mason County to study and evaluate potential ecosystem restoration projects within the Skokomish River Basin under the authority of the Corps' General Investigation Program. The purpose of the study is to evaluate ecosystem degradation in the Skokomish River Basin; to formulate and evaluate potential solutions to these problems; and to recommend a series of feasibility level projects that have a federal interest and are supported by both the Skokomish Indian Tribe and Mason County. The Corps contacted your office via letter in 2005 when the feasibility study was initiated to invite your participation in the study process and to solicit any concerns you may have at the early planning stages. Since that point in time, two action alternatives have been developed (Appendix A). The Corps would like to take this opportunity to re-engage your participation as a consulting party under Section 106 of the National Historic Preservation Act (NHPA). We are specifically seeking to execute a programmatic agreement (PA) with your office pursuant to 36 CFR 800.14(b) in order to fulfill our responsibilities under Section 106 of the NHPA.

Conceptual designs have been developed for the two action alternatives and a draft integrated feasibility report/environmental impact statement (FR/EIS) has been prepared. A summary of the alternatives is included in Appendix A. At this time Alternative 2C has been identified as the preferred alternative. Alternative 3 is not recommended due to the deleterious effects dredging could have on other aspects of fish habitat as well as the anticipated costs of continued maintenance dredging. Selection of the preferred alternative will be confirmed after the draft FR/EIS has gone through public review.

After public review, the Corps and project sponsors will begin to develop "feasibility-level" designs (typically a 35% design) of the preferred alternative. These designs will be included with the Final Feasibility Report/EIS and submitted to the Chief of Engineers and eventually Congress. After Congressional approval of the project and appropriations are received, the Corps would prepare environmental assessments (EAs) or a supplemental EIS for each of the restoration projects. It is anticipated that traditional Section 106 identification efforts such as cultural resource surveys would occur at this stage.

Because this is a feasibility study and effects on historic properties cannot be fully determined prior to approval of an undertaking (in this case Congressional Authorization is needed to undertake design and construction) the Corps is proposing to use a phased process to identify and evaluate historic properties until the specific aspects or locations of the alternatives are more fully refined. This process would be codified in the PA. We anticipate that the PA would lay out a clear process for defining the area of potential effect; define the level of inventory and evaluation efforts as the preferred alternative is further refined; and propose best management practices or standard treatments for specific property types or effects.

We are contacting you both as a Tribe with traditional and cultural resource interests and concern within the study area and as a Tribe with a designated Tribal Historic Preservation Officer (THPO) whose lands fall within the study area. The Corps has also identified the State Historic Preservation Officer, Mason County, the City of Shelton and the Mason County Historic Preservation Commission as potential participants in the development of the PA. The Corps is notifying the Advisory Council on Historic Preservation (ACHP) as required at 36 CFR 800.6(a)(1)(i)(c) and inviting them to participate. We would appreciate your assistance identifying any additional consulting parties.

We look forward to collaborating with your office on the development of this PA. For more information about this project or clarification about this request, please contact Danielle Storey, Cultural Resources Lead, via telephone at (206) 764 4466 or via email at Danielle.L.Storey@usace.army.mil. I may be reached by telephone at (206) 316-3096 or by email at Rolla.L.Queen@usace.army.mil.

Sincerely,

Rolla Queen, Chief
Cultural Resources Section

Enclosure

Cc: (with enclosures)
Kristine Miller
Tribal Historic Preservation Officer
Skokomish Indian Tribe
North 80 Tribal Center Road
Shelton, Washington 98584

Appendix A

**Skokomish River Basin General Investigation**
**Summary of Alternatives**

The Corps is currently analyzing two action alternatives that are composed of groupings of restoration projects. Each alternative was developed with a "base" measure that addresses the need for increased quantity and quality of pool habitats in the river as well as year-round fish passage near the confluence. Up to eight incremental measures or projects (e.g., side channel reconnections, levee setbacks, placement of large woody debris, etc.) were added to these "bases" to capture supplementary benefits. A description of the alternatives is provided below.

**Alternative 1: No Action Alternative**

No project would be recommended under the No Action Alternative.

**Alternative 2: Car Body Levee Removal (3 Scales)**

Alternative 2 consists of a "base" measure that removes the levee on the north side of the mainstem near the original North Fork confluence, referred to locally as the car body levee. Mainstem flows would then be diverted into the North Fork channel and reenter the mainstem at the confluence location (Figure 2). This would bypass the area where the river goes dry during the summer and would provide improved fish migration. A portion of flood flows would continue to flow in the channel.

Eight possible restoration projects or increments could be added to this "base" to form complete alternatives. Different scales of each alternative were developed based on the number of increments added to the "base." Please see Figure 2 for a better explanation of what these increments would entail.

| Car Body Levee Removal (Alternative 2A) | Car Body Levee Removal (Alternative 2B) | Car Body Levee Removal Scale (Alternative 2C) |
|---|---|---|
| Base Alternative #3: Car Body Levee Removal | Base Alternative #3: Car Body Levee Removal | Base Alternative #3: Car Body Levee Removal |
| Increment #35: Upstream LWD Installation | Increment #35: Upstream LWD Installation | Increment #35: Upstream LWD Installation |
| Increment #9: Side Channel Reconnection | Increment #9: Side Channel Reconnection | |
| Increment #37: Grange Levee Setback | Increment #37: Grange Levee Setback | |
| Increment #28: River Mile 9 Levee Setback | Increment #28: River Mile 9 Levee Setback | |
| Increment #39: Hunter Creek Mouth Restoration | Increment #39: Hunter Creek Mouth Restoration | |
| Increment #40: Hunter Creek Side Channel Restoration | Increment #40: Hunter Creek Side Channel Restoration | |
| Increment #43: Weaver Creek Side Channel Restoration | | |
| Increment #26: Dips Road Setback | | |

**Alternative 3: Riverbed Excavation (2 Scales)**

Under this alternative, the summer low flow problem would be addressed through two different scales of dredging (Figure 3). Under Alternative 2A, 2.5 million cubic yards would be removed from the mainstem channel between river miles 0 and 9. Under Alternative 2B, 1.2 million cubic yards would be removed between river miles 3.5 and 9. Under both scales of Alternative 2, there would be a need for periodic maintenance to remove sediment accumulations. Dredged material would be placed in the estuary and nearshore of Annas Bay. This beneficial reuse of material would provide suitable hard substrate for shellfish attachment. The eight possible increments discussed above would be added to both scales of this alternative.

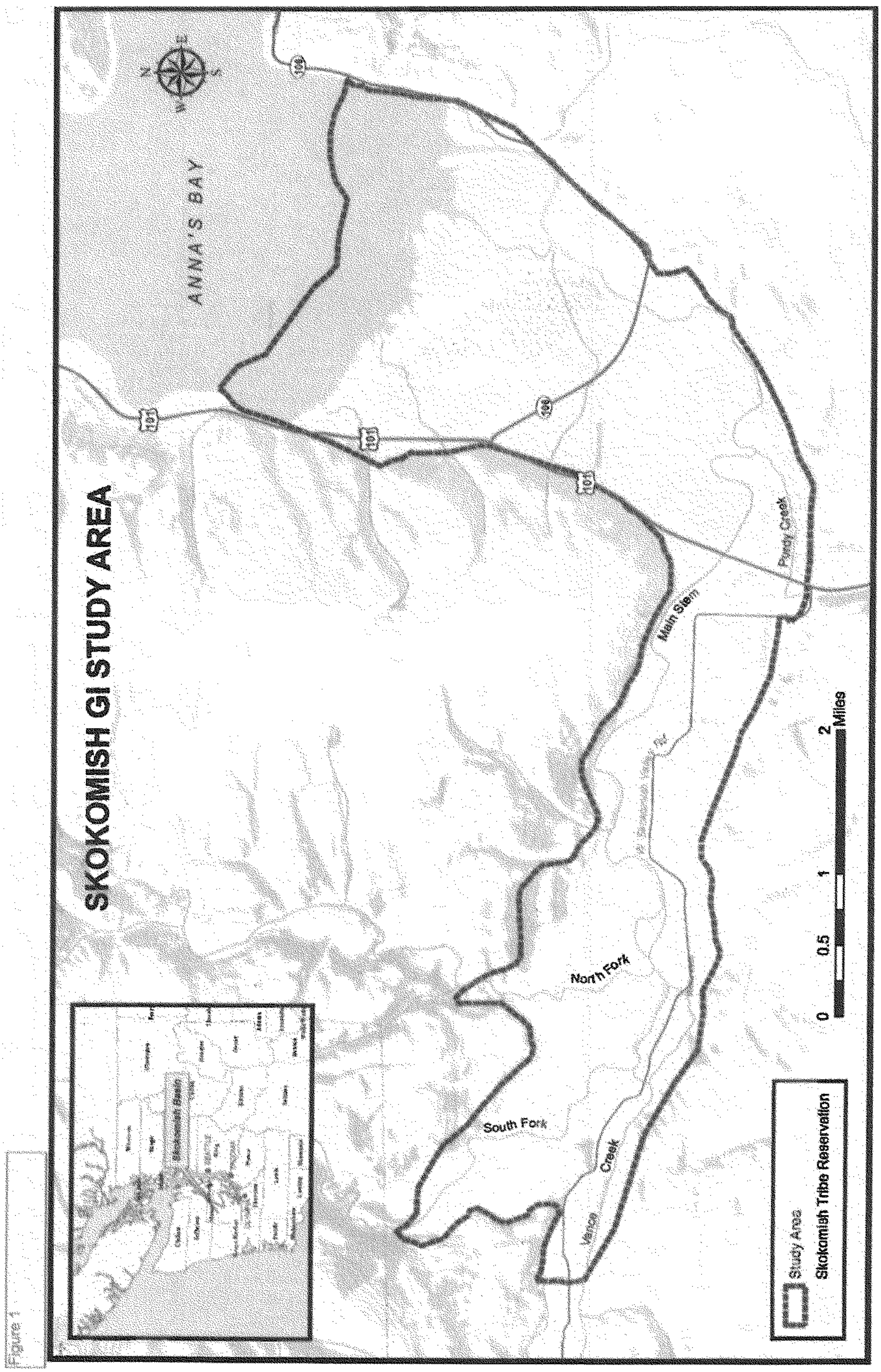
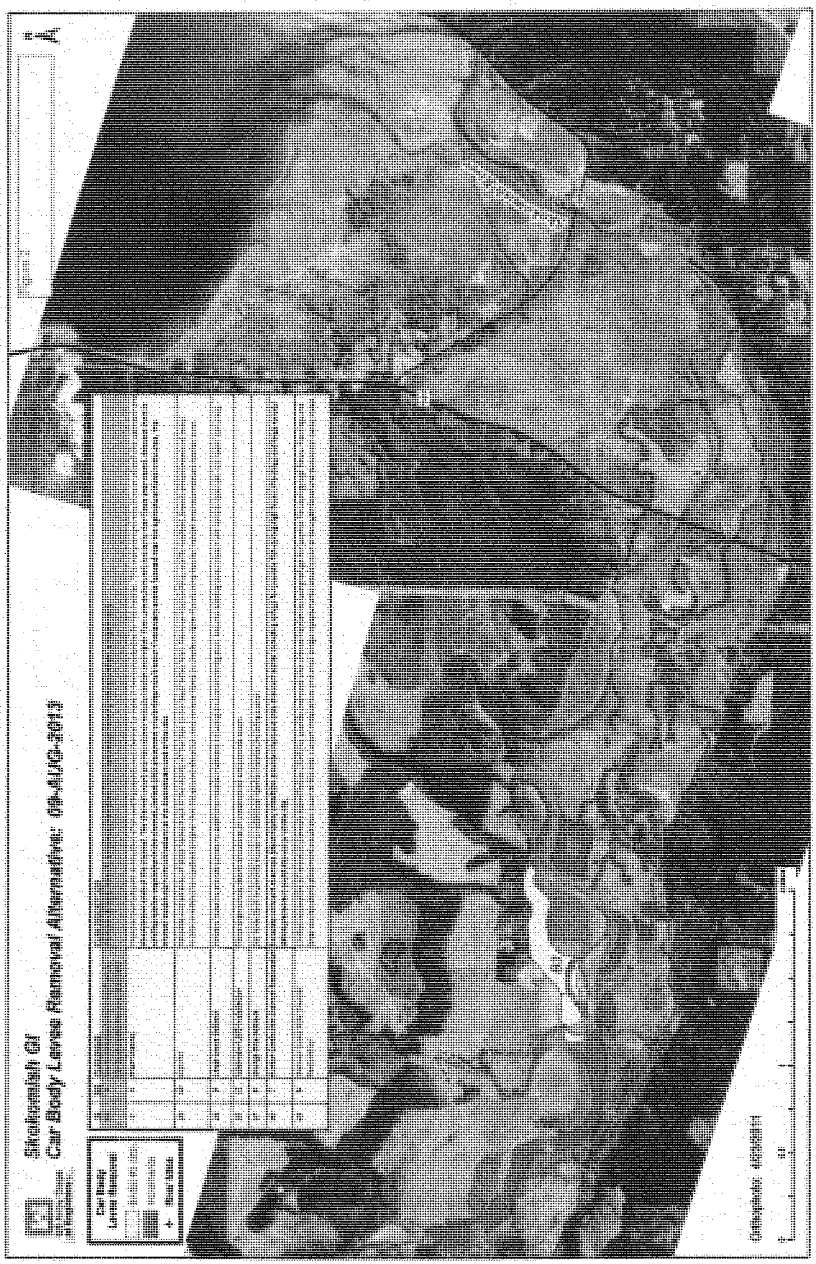
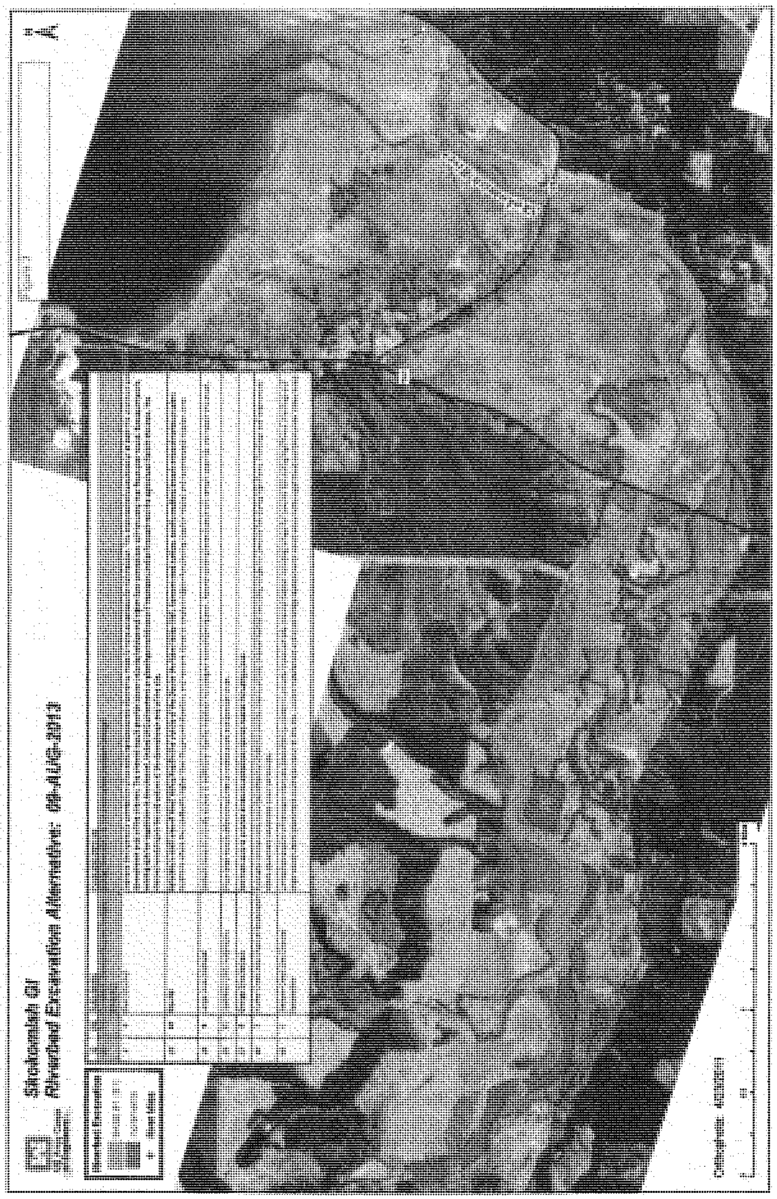


Figure 1
SKOKOMISH GI STUDY AREA
ANNA'S BAY
N
E
S
W
101
106
Main Stem
Purdy Creek
North Fork
South Fork
Vance Creek
Study Area
Skokomish Tribe Reservation
0
0.5
1
2
Miles


Snohomish GI
Car Body Levee Removal Alternative: 09-AUG-2013



# CLEAN WATER ACT SECTION 404(b)(1)

# CLEAN WATER ACT SECTION 404 ANALYSIS

## Skokomish River Basin Ecosystem Restoration General Investigation

## Mason County, Washington

Prepared by:

U.S. Army Corps of Engineers

Seattle District

Environmental and Cultural Resources Branch

April 2015

US Army Corps of Engineers ®
Seattle District

# 1 INTRODUCTION

The purpose of this document is to record the U.S. Army Corps of Engineers (Corps) compliance evaluation of the proposed actions within the Skokomish River Ecosystem Restoration General Investigation in Mason County, Washington, pursuant to the Clean Water Act (CWA), and the General Regulatory Policies of the Corps. Specifically, Section 404 of the CWA requires an evaluation of impacts for work involving discharge of fill material into the waters of the U.S., and evaluation guidance can be found in the CWA 404(b)(1) Guidelines [40 CFR §230.12(a)]. The General Regulatory Policies of the Corps of Engineers [33 CFR §320.4(a)] provide measures for evaluating permit applications for activities undertaken in navigable waters.

Attachment A provides the Corps' analysis of compliance with the CWA Section 404(b)(1) and the General Regulatory Policy requirements.

## 1.1 Project Background

The purpose for the proposed action is to work within the defined study area to enact solutions within the Corps' authority to restore ecosystem process, structure, and function in the aquatic environment by addressing the primary problems identified during the feasibility study. Effort toward improving the aquatic ecosystem should include addressing lack of wetland and side-channel connections, increasing channel complexity, increasing large woody debris (LWD), increasing pool depth and frequency, restoring degraded riparian conditions, improving conditions in the reach of the river that dries up each summer, and improving channel capacity to the maximum extent practicable. Restoration of ecosystem structures, functions, and processes will benefit nationally significant resources in the study area.

The Skokomish River Basin is located on the Olympic Peninsula in northwestern Washington (Figure 1, inset). The study area is approximately 11 square miles comprised of the lower Skokomish watershed, the Skokomish Valley, and Skokomish River estuary (Figure 1). The area is characteristic of the enormous beauty and versatile environment of Hood Canal and Puget Sound.

The Skokomish watershed drains approximately 230 square miles from three major tributary basins, the North Fork (118 square miles), the South Fork (76 square miles) and Vance Creek (29 square miles). The river collects flow from these steep, mountainous basins and drains into a flat, alluvial plain approximately ¾ to 1½ miles wide known as the Skokomish Valley. Richert Springs, Hunter, Weaver, and Purdy Creeks are predominantly spring fed tributaries that flow through agricultural lands in the southern portion of the Skokomish Valley floodplain before entering the mainstem Skokomish River. The Skokomish River mainstem flows through the Skokomish Valley to the Skokomish estuary, consisting of the mouth of the Skokomish River and the delta that is tidally influenced. It is the largest and most complex river estuary in Hood Canal. The Skokomish River empties into Annas Bay at the southern end of Hood Canal, an arm of Puget Sound.

The Skokomish River Basin is a large and complex watershed. Numerous Federal, State, and local agencies are working within their respective authorities to implement restoration projects throughout the watershed. While previous and continuing restoration efforts are having localized benefits, there remains a need for larger-scale action by the Corps. The Corps has several significant and unique opportunities to address problems in the Lower South Fork, Skokomish River mainstem, and tributaries (Weaver Creek, Vance Creek, and Purdy Creek) where many impacts from the upper watershed are manifested. As a result, the study area for the General Investigation (GI) has focused on the lower 11 miles of the river. Figures 1 and 2 show the location of the Skokomish River Basin and GI study area.

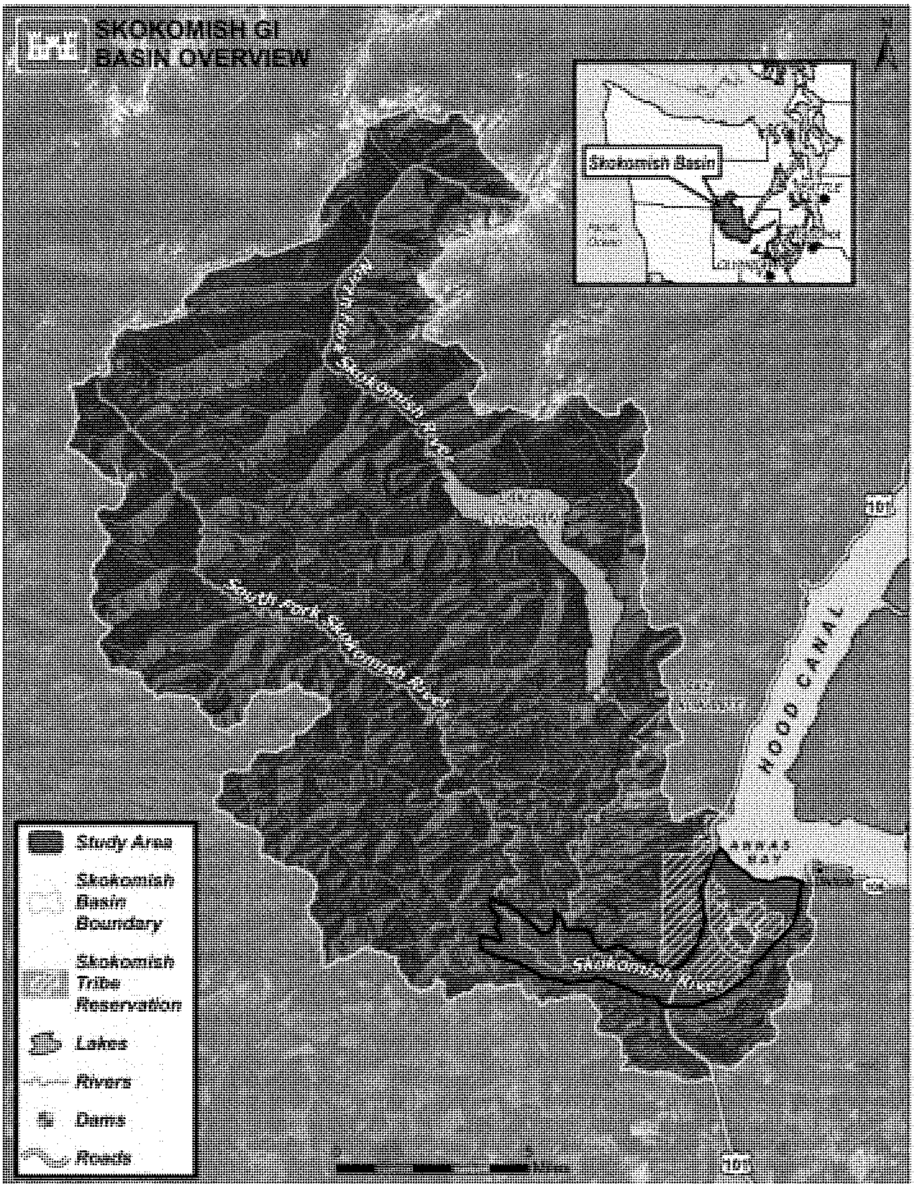



**Figure 1: Skokomish River Basin Overview**

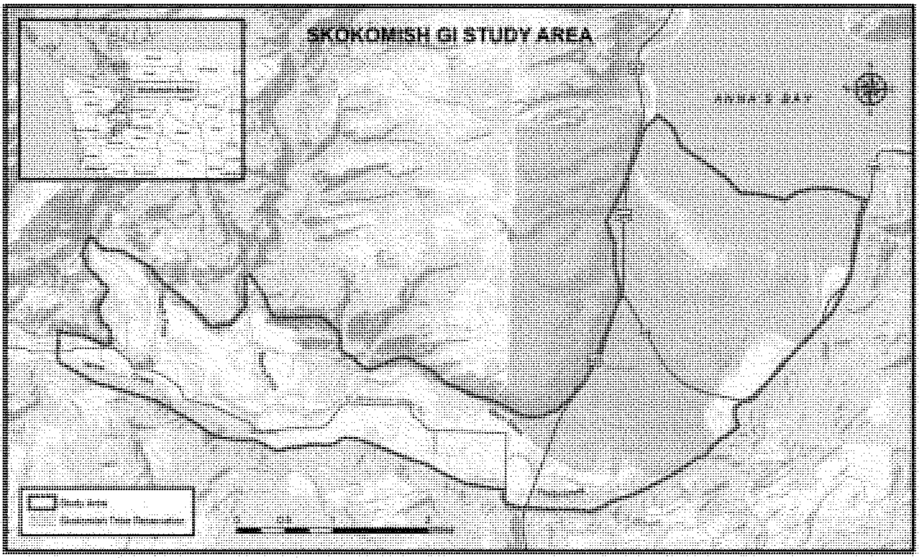



**Figure 2: Skokomish River Basin GI: Study Area**

## 1.2 Project Purpose and Need

The need for the proposed Federal action arises from the significant degradation of natural processes that influence the ecological functions of the lower watershed.

The purpose for the proposed action is to work within the defined study area to enact solutions within the Corps' authority to restore ecosystem process, structure, and function in the aquatic environment by addressing the primary problems identified during the feasibility study.

## 1.3 Proposed Action and Alternatives

**No Action Alternative***

Under the No Action plan, which is synonymous with the "Future Without-Project Condition," the assumption is that no project would be implemented by the Corps to achieve the planning objectives. The present ecosystem degradation would continue to have negative effects for fish and wildlife, especially species listed under the Endangered Species Act (ESA) that have critically low populations.

**Confluence Levee Removal Alternatives**

Three Confluence Levee Removal Alternatives were evaluated during this step of the planning process. Each plan represents a best buy plan identified during the cost benefit analysis. Alternative #11 is the least cost best buy plan that includes a side channel project; this alternative represents the minimum Federal investment for the study. Alternative #18 was carried forward because it is the first alternative that includes wetland restoration, identified as a critical habitat need in the study area. Alternative #27 represents the largest scale of the Confluence Levee removal that includes all proposed restoration increments except for setting back a road, which appears in the riverbed excavation alternatives. The increments included in each scale of the Confluence Levee Removal Alternative are outlined in Table 1.

**Table 1: Confluence Levee Removal Alternatives**

| Confluence Levee Removal (Alternative #11) | Confluence Levee Removal (Alternative #18) | Confluence Levee Removal (Alternative #27) |
|---|---|---|
| Base #3: Confluence Levee Removal | Base #3: Confluence Levee Removal | Base #3: Confluence Levee Removal |
| Increment #35: Upstream LWD Installation | Increment #35: Upstream LWD Installation | Increment #35: Upstream LWD Installation |
| Increment #9: Side Channel Reconnection | Increment #9: Side Channel Reconnection | Increment #9: Side Channel Reconnection |
| | Increment #37: Wetland Restoration at Grange | Increment #37: Wetland Restoration at Grange |
| | Increment #28: Wetland Restoration at River Mile 9 | Increment #28: Wetland Restoration at River Mile 9 |
| | | Increment #39: Hunter Creek Mouth Restoration |
| | | Increment #40: Hunter Creek Tributary Restoration |
| | | Increment #43: Weaver Creek Tributary Restoration |

The map shown below (Figure 3) indicates the location of all the project features considered for inclusion in the Confluence Levee Removal Alternatives.

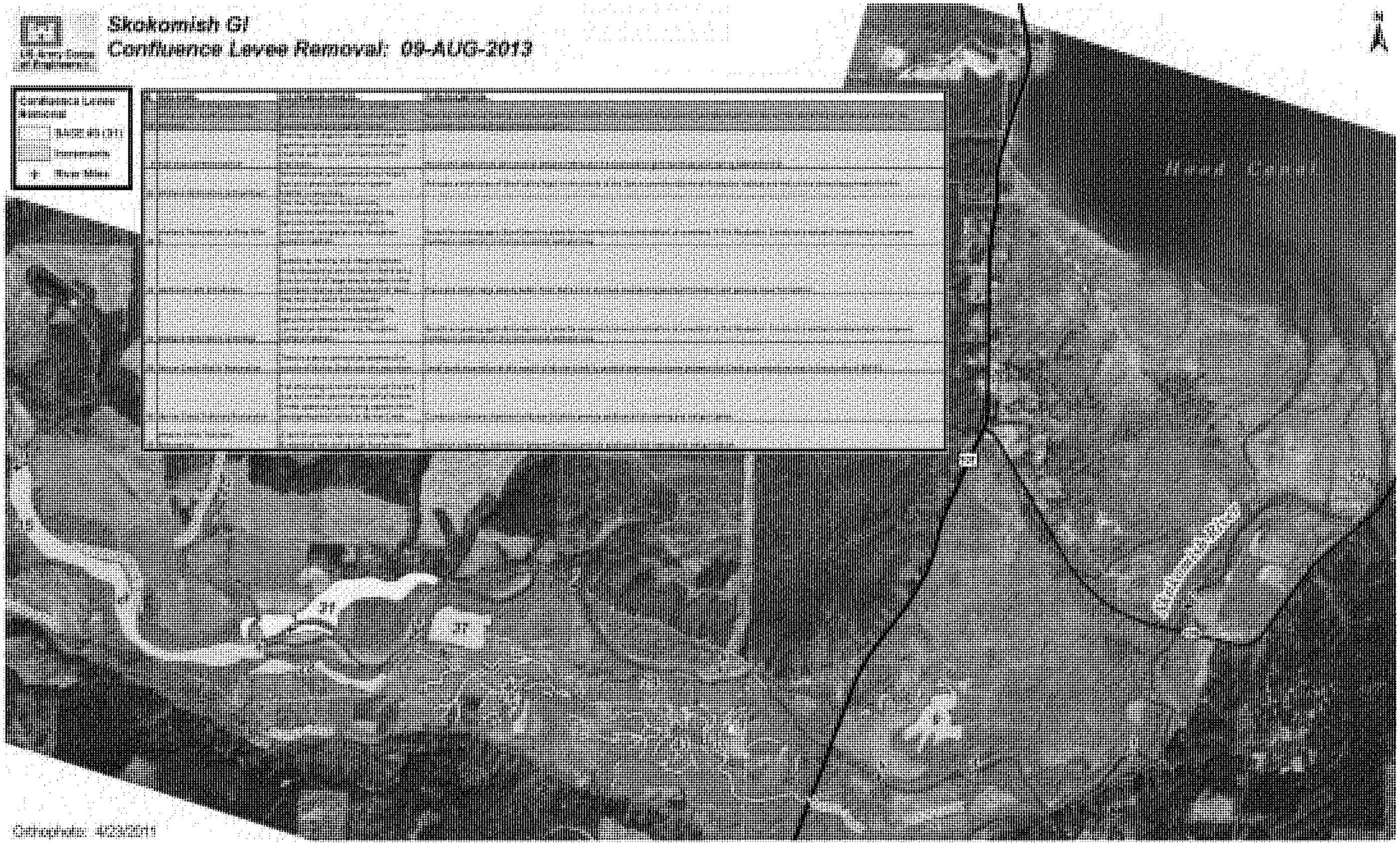



Figure 3: Confluence Levee Removal Alternatives

**Riverbed Excavation Alternatives**

Two Riverbed Excavation alternatives were evaluated during this step of the planning process. Alternative #45 represents a smaller scale of riverbed excavation alternative. It should be noted that this plan is a cost effective plan only, and not one of the best buy plans. The cost effectiveness analysis did not indicate this plan is a best buy; however, it was analyzed with other alternatives because it meets the critical needs of the study area while requiring a smaller extent of dredging compared to Alternative #60. Alternative #60 represents the largest-scale best buy plan and represents the most significant Federal investment for this study. The increments included in each scale of the riverbed excavation alternative are outlined in Table 2.

**Table 2: Riverbed Excavation Alternatives**

| Riverbed Excavation (Alternative #45) | Riverbed Excavation (Alternative #60) |
|---|---|
| Base #5: Riverbed Excavation (RM 3.5-9) | Base #1: Riverbed Excavation (RM 0-9) |
| Increment #35: Upstream LWD Installation | Increment #35: Upstream LWD Installation |
| Increment #9: Side Channel Reconnection | Increment #9: Side Channel Reconnection |
| Increment #37: Wetland Restoration at Grange | Increment #37: Wetland Restoration at Grange |
| Increment #28: Wetland Restoration at River Mile 9 | Increment #28: Wetland Restoration at River Mile 9 |
| Increment #40: Hunter Creek Tributary Restoration | Increment #40: Hunter Creek Tributary Restoration |
| Increment #43: Weaver Creek Tributary Restoration | Increment #43: Weaver Creek Tributary Restoration |
| Increment #26: Wetland Restoration at Dips Road | Increment #26: Wetland Restoration at Dips Road |

The map shown below (Figure 4) indicates the location of the project features included in the largest scale of the Riverbed Excavation Alternative (Plan #60). Alternative #45 is the same, but with a shorter length of riverbed excavation.

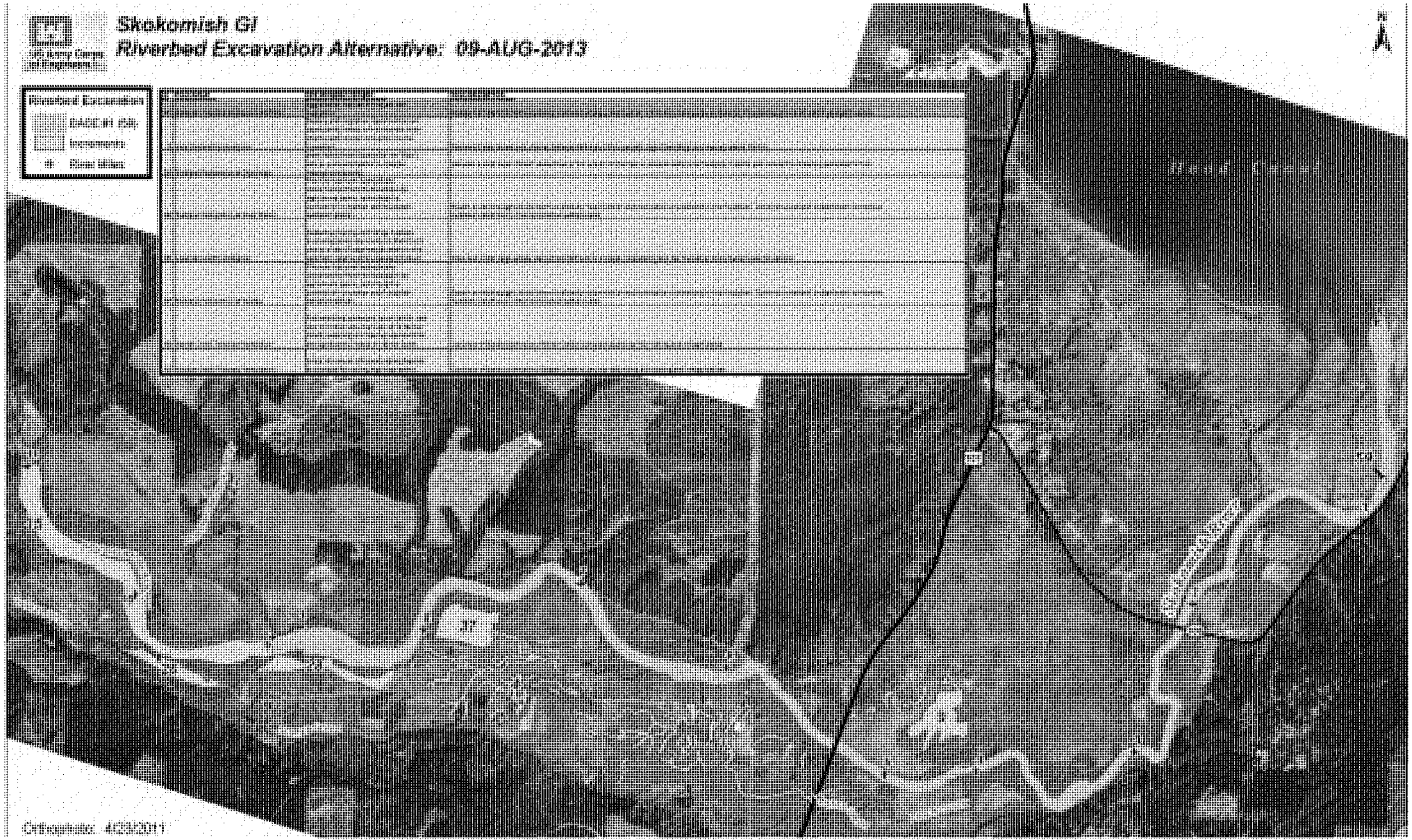



**Figure4. Riverbed Excavation Alternative**

# 2 POTENTIALLY ADVERSE EFFECTS (INDIVIDUALLY OR CUMULATIVELY) ON THE AQUATIC ENVIRONMENT

## 2.1 Effects on Physical, Chemical, or Biological Characteristics of the Aquatic Ecosystem

### 2.1.1 Physical

Confluence Levee Removal Alternatives #11, 18, and 27

Removing the Confluence Levee and diverting the South Fork into the North Fork near the pre-2003 confluence would provide a year-round connection to the South Fork. The combined discharges would provide a continuous low flow channel in what is now the North Fork channel. The reach of the South Fork that runs subsurface in late-summer/early-fall would be abandoned during those low flow periods. These alternatives would have little effect on flooding since the South Fork channel would still convey flood discharges, and both sides of the river frequently flood in this location already.

Removing the Confluence Levee would divert much of the South Fork water and bedload into the existing North Fork channel. The abandoned reach of the South Fork would remain active during high flows. Bedload deposit would begin to aggrade the combined South Fork/North Fork channel. Based on the recent deposition rates, the initial deposition rate in the combined channel could be in the 0.1 +/- 0.05 feet/year range. As the channel aggrades, it will meander across the floodplain, forming and abandoning gravel bars. During the 50-year project life, there could be two to three feet of deposition across the entire 1,000- to 2,000-foot wide floodplain between the old and new confluences and north of the existing channel. Levee removal would greatly reduce the risk of the avulsion to the south near river mile (RM) 9.

Riverbed Excavation Alternatives #45 and #60

Alternative #60, excavation of the mainstem and South Fork Skokomish Rivers from RM 0-9, would increase the channel capacity and is expected to greatly reduce the chances of the South Fork channel running subsurface in late summer/early fall. The riverbed excavation would average 8 to 11 feet deep. The river would be returned to a cross-section size similar to what may have existed in the early 1900s. The proposed excavation would produce a river channel with an approximate 50% annual chance of exceedance (ACE), or two-year flood capacity, considerably reducing the flood risk in the valley. Floods larger than the 50% ACE would still cause overbank flooding, but to a lesser degree than present. The increased channel capacity allows the placement of LWD habitat structures in the river without increasing the flood risks in the valley.

The smaller scale of this alternative, #45, is excavation of RM 3.5-9. This would have the same channel dimensions as the longer excavation alternative, but starts just upstream of where the southern floodwaters re-enter the mainstem. It would provide 50% ACE flow capacity in the excavated reach and reduce flood risks in much of the valley. Downstream of RM 3.5, channel capacity and flooding would be unchanged. LWD habitat structures could be placed in the excavated reach of the river and flood risks would still be less than they are now.

For both alternatives #45 and #60, the excavated riverbed would have less capacity for subsurface flow (less gravel to transmit water through) and is expected to place the thalweg below the existing water table. Both of these factors should help to maintain surface flows in the mainstem and South Fork during summer low flow conditions. The excavation would allow the placement of LWD to form pool habitat. LWD jams would be small, typically four to six logs, and placed to encourage meandering and bar formation. A few LWD structures would be placed along the riverbank to reduce the risk of accelerated bank erosion due to the channel excavation.

The higher in-channel discharges would increase the bedload transport and reduce deposition from RM 9 downstream to Highway 101 (RM 5). The bankfull bedload transport at Highway 101 could increase from approximately 2,500 tons/day to around 10,000 tons/day. Between Highway 101 and RM 3.5 there would be a proportional increase in deposition, as the minimum bedload transport capacity (less than 200 tons/day) occurs just upstream of RM 3.5. Downstream of RM 3.5, bedload transport potential would increase, but transport would be limited by the amount of material available to be scoured from the riverbed. The average bedload deposition rate is expected to remain at about 0.08 to 0.14 feet per year range observed in recent years. At that deposition rate, sediment accumulation in the excavated channel would aggrade the riverbed by about two feet in 20 years, lowering the channel capacity from 50% ACE (17,500 cfs) to 75% ACE (13,500 cfs). It is recommended that maintenance be done at 20-year intervals to retain the design channel capacity. If the channel is not excavated to maintain the channel capacity, it could return to its pre-excavation capacity in roughly 65 to 75 years.

### 2.1.2 Chemical

The proposed action alternatives would not create a significant hazard to the public or the environment through transport, use, or disposal of hazardous materials. There are no CERCLA-regulated substances involved with any of the proposed restoration sites. There are a few old cars at Confluence Levee that are parked above ground and do not appear to be contaminating the surrounding area.

### 2.1.3 Biological

For both groups of alternatives, riparian wildlife such as mink, beaver, and river otter may be disrupted by construction; however, none of the alternatives would have a significant negative effect on the animals or their habitat. Resulting conditions for these species would likely improve with any of the action alternatives.

<u>Confluence Levee Removal Alternatives #11, 18, and 27</u>

*Fish*

Construction for removal of the Confluence Levee would have no in-water work and minimal disturbance for fish as machinery works on the riverbank. Construction work for the increments associated with all three alternatives would involve some in-water work and would therefore have short-term disturbance to fish species still present during the fish work window that is timed for when juvenile salmon are absent, 15 July to 15 September. Turbidity is the primary concern for stress to fish species. Background turbidity during the summer is typically very low. Construction methods would employ best management practices (BMPs) to minimize turbidity. Alternative, #27 would have 141 in-water workdays; Alternatives #18 and #11 would have 94 and 26 in-water workdays, respectively.

Confluence Levee removal would resolve the problem of the river going subsurface in the summer months by providing a bypass to this reach as the South Fork combines with the North Fork. The benefit of this year-round connection for fish is that adult salmon migrating upstream would have access to their spawning areas and would not have to endure delays to migration and the complete blockage of access to critical spawning habitat.

*Vegetation (Wetland, Riparian, Estuarine)*

Construction impacts to vegetation from implementation of Alternative #27 would be a temporary clearing of approximately 1.15 acres of upland vegetation bordering on riparian zones for staging areas for the Confluence Levee removal, and for the restoration of Hunter and Weaver Creeks. This alternative would have approximately 5 acres of wetland fill to construct the wetland embankments that would result in a net gain of 51 acres of riparian wetlands; an additional 1 acre of wetland vegetation would be disturbed for the Side Channel Reconnection increment. Alternative #18 would have 0.92 acre of uplands cleared for staging areas and the same amount of wetland impacts and restoration as #27. Alternative #11 would have 0.1 acre of upland vegetation cleared for staging and access and 1 acre of wetland vegetation disturbance. The Corps would select staging areas based partly on avoidance of large trees and would replant all staging areas at the end of construction. Vegetation would be expected to reach pre-construction conditions within approximately three years.

The proposed actions would have great benefits to riparian and wetland vegetation. Implementation of Alternative #27 would involve 242 acres of mixed riparian and wetlands habitats. The proposed restoration would result in improvement of existing wetland and riparian zones and connection of uplands to riverbank, creating new riparian zones through breaching agricultural berms and constructing wetland embankments. Alternative #18 would provide the same types of improvements, but to less acreage at 200 total acres of wetlands and riparian zone improved or created. Alternative #11 would provide reconnection of 68 acres of riparian uplands at the location of the Confluence Levee removal and reconnection of a 44-acre wetland to the mainstem river. Alternatives #27 and #18 would each have approximately 6 acres of wetland fill or disturbance to gain their large area of wetland benefits. Alternative #11 would have a temporary impact to 0.7 acre of wetlands. None of these three alternatives would have a significant effect on eelgrass in the estuary.

Riverbed Excavation Alternatives #45 and #60

*Fish*

Alternatives #45 and #60 would have significant short-term detrimental effects to all fish species in the Skokomish River due to the wide-scale sediment excavation. These alternatives are designed to remove the top 8 to 10 feet of riverbed sediments for 9 miles in #60 and for 4.5 miles in #45. This work would remove the benthic macroinvertebrates that serve as the primary food source for most fish, and would likely kill most of the sculpin and lamprey species present in the length of channel that would be dredged. Construction would adhere to fish work windows, but these are timed to protect salmon that are in the channel only during juvenile and adult life stages. Sculpin and lamprey inhabit the river throughout their lives, and are less capable of avoiding dredge machinery. Loss of these fish populations could take many years to recover.

Such broad-scale alteration of the river bottom would cause significant risk to salmon habitat. Salmon spawn throughout the lower 12 miles of the river. Gravel size at the depths achieved by dredging is assumed similar to the top layers; however, sediment removal directly alters the channel geometry and risks creating morphology that is unfavorable to salmonids. Some risks include the following: salmon have a narrow range of parameters for spawning depth, velocity, and substrate size (Bjornn and Reiser 1991), and therefore may not find appropriate spawning habitat for one or more years as sediments stabilize and channel morphology adjusts (Kondolf et al. 2002); disturbed substrate has a lower velocity threshold for scour of eggs incubating in the gravel (NOAA Fisheries 2004); and such significant quantity of gravel removal can reduce the amount of water that flows through the hyporheic zone, which can lead to elevated water temperatures without the cooling effect of intragravel flow. A variety of other biological consequences are associated with sediment extraction from streams (Collins 1995, Kondolf et al. 2002).

Benefits of river sediment excavation for both Riverbed Excavation alternatives are that providing the capacity for the 50% ACE would greatly reduce the problem of fish stranding on high ground after being flooded out of the river and then trapped with no channel access back into the river. Additionally, the increased flow capacity would allow for placement of LWD habitat structures throughout the excavated reach of river without exacerbating flooding in the valley. Dredging would also resolve the problem of flow going subsurface in the late summer. If this alternative were selected as the preferred alternative, the Corps would further investigate the quantification and magnitude of the fish-stranding problem, as well as pursue an analysis of whether the assumed benefits outweigh the impacts and speculated risks.

*Vegetation (Wetland, Riparian, Estuarine)*

Both of these alternatives would have the same acreage of staging areas at approximately 1.15 acres. Construction impacts to vegetation would be the same as described for the Confluence Levee Removal Alternative #27. Alternatives #45 and 60 include all of the increments; therefore, both would improve the same acreage of wetland and riparian vegetation as Alternative #27 at approximately 242 acres, and would impact approximately 6 acres of wetlands to achieve the overall benefits and net gain in wetlands.

### 2.2 Effects on Recreational, Aesthetic, Historical, and Economic Values

Significant recreation activities (boating, camping, bicycling, hunting, etc.) occur outside the study area in the upper watershed or beyond Annas Bay. The alternatives would not have more than a negligible effect on fishing activity within the study area. The cultural resources survey did not identify any significant cultural resources. The Corps has determined a finding of *no historic properties affected* and will require monitoring during construction. See Section 4.3 for additional information.

### 2.3 Findings

Based on the analysis of the alternative actions, the Confluence Levee Removal Alternative #18 is the least environmentally damaging practicable alternative because while it has more wetland fill than Alternative #11, it has net gain of 51 acres of wetlands restored. Under this plan, the proposed action is not exempt from Section 404 of the CWA due to placement of LWD within the river channel and/or wetland fill activities. A thorough and detailed analysis of alternatives appears in the Feasibility Report/Environmental Impact Statement prepared for this project.

## 3 ALL APPROPRIATE AND PRACTICABLE MEASURES TO MINIMIZE POTENTIAL HARM TO THE AQUATIC ECOSYSTEM

### 3.1 Impact Avoidance Measures

The Corps objective in ecosystem restoration planning is to contribute to national ecosystem restoration (NER). Contributions to NER (outputs) are increases in the net quantity and/or quality of desired ecosystem resources. The NER Plan must reasonably maximize ecosystem restoration benefits compared to costs, consistent with the Federal objective. The selected plan must be shown to be cost effective and justified to achieve the desired level of output. Five project alternatives were considered (See Section 2 above). After analysis of all relevant environmental benefits and impacts, the Corps has identified Alternative #18 as the recommended plan (NER Plan) and as the environmentally preferred alternative per NEPA regulations at 40 CFR 1505.2 (b).

Impact avoidance measures in the design include the following:

- The Corps would schedule work to occur during designated periods often referred to as fish windows as established by WDFW per Washington Administrative Code (WAC) 220-110-271.
- The Corps would schedule work outside of bird nesting season.

- Each construction contractor would be required to prepare an Environmental Protection Plan for approval by a Corps staff biologist.
- Traffic alterations would be designed to minimize impediments, with the shortest and least disruptive detours possible, and in coordination with the relevant transportation agency.

### 3.2 Impact Minimization Measures

In accordance with Corps policy, minimization of ecosystem, cultural, and socio-economic impacts will be a significant project consideration [ER 1105-2-100]. The Corps will take all practicable steps during construction of the project to minimize impacts to these resources. Contingencies will be in place in case any of the water quality protection measures fail to achieve their intended function. The Corps will observe all construction windows to ensure that impacts to sensitive species will be avoided or minimized, to include ESA-listed salmonids and bald eagles.

Restoration sites would involve in-water work and areas of ground clearing. Protecting water quality from stormwater runoff requires best management practices (BMPs) to avoid excessive runoff and elevated turbidity in the receiving water body. It is important to avoid excessive pulses of sediment that are more than what the surrounding aquatic life can easily tolerate. The project would have a Stormwater Pollution Prevention Plan including a Temporary Erosion and Sedimentation Control Plan approved by a Corps staff biologist. Construction contractors would be required to obtain a Construction Stormwater Permit under Section 402 of the Clean Water Act. Standard construction stormwater BMPs can be incorporated into site designs, operational procedures, and physical measures on site. These are examples of frequently used BMPs:

- Minimize area of ground disturbance and vegetation clearing.
- Use the site's natural contours to minimize run-off and erosion.
- Do not expose the entire site at one time; avoid bare soils during rainy months.
- Stabilize erodible surfaces with mulch, compost, seeding, or sod.
- Use features such as silt fences, gravel filter berms, silt dikes, check dams, and gravel bags for interception and dissipation of turbid runoff water.

### 3.3 Compensatory Mitigation Measures

No mitigation is proposed. The project is restoration and has the overall effect of enhancing wetlands and increasing their total area in the Skokomish Valley, which offsets any wetland impact. Access roads and staging areas have been located as far from wetlands as is practicable and will be re-planted and replaced to function in-kind after the project is completed.

### 3.4 Findings

Avoidance, minimization, and mitigation measures are conceptual at this stage. Further development will occur during the later design phase outlining specific measures. The Corps has determined that all appropriate and practicable measures will be taken to minimize potential harm to the environment.

# 4 OTHER FACTORS IN THE PUBLIC INTEREST

## 4.1 Fish and Wildlife

The Corps has coordinated the General Investigation with local Native American Tribes and state and Federal resource agencies to minimize impacts to fish and wildlife resources. The Corps has completed ESA Section 7 consultation for the proposed Federal action.

## 4.2 Water Quality

This project will not violate the state water quality standards found at WAC 173-201A. Confluence Levee removal would have minimal or no in-water work; however, several project components will involve in-water disturbance of substrates and thereby cause turbidity in the channel. These include installation of LWD at the upstream end of the study area, channel excavation for reconnection of the side channel at RM 4, and approximately 15 temporary culverts for equipment access across the river. Implementing these actions will cause localized turbidity during construction. The Corps will implement all BMPs and adhere to fish work windows established by Washington Department of Fish and Wildlife to minimize effects.

## 4.3 Historical and Cultural Resources

The cultural resources survey did not identify any significant cultural resources. The Corps has determined a finding of *no historic properties affected* and will require monitoring during construction. The SHPO concurred with the Corps determination of no historic properties affected in a letter dated February 10, 2015 and requested a draft of the monitoring plan for review prior to the start of construction. In addition, the Corps sent a letter on February 9, 2015 to the Skokomish Indian Tribe that provided project updates and described the results of the cultural resources survey. The Skokomish Indian Tribal Historic Preservation Officer responded by email on February 18, 2015 and concurred that no historic properties would be affected and agreed that construction monitoring should take place.

## 4.4 Environmental Benefits

The Corps is proposing to conduct restoration efforts along the Skokomish River in the lower Skokomish Valley. The purpose of this project is ecosystem restoration and this project has significant net benefits to the environment. The proposed action includes a levee removal, placement of LWD, wetland restoration, and a side channel reconnection to restore structures, functions, and processes in the Skokomish River Basin.

## 4.5 Conclusion

Based on the analyses presented in project NEPA and ESA documents, as well as the following 404(b)(1) Evaluation and General Policies for the Evaluation of Permit Applications analysis, the Corps finds that this project complies with the substantive elements of Section 404 of the Clean Water Act.

## Attachment A

### Clean Water Act 404(b)(1) Evaluation [40 CFR §230]

### 404(b)(1) Evaluation [40 CFR §230]

**Potential Impacts on Physical and Chemical Characteristics [Subpart C]:**

1. **Substrate [230.20]**

   No substrate will be added to the Skokomish River except for large boulders that will anchor the LWD installed throughout RM 9 to 11, and at the breach location at the Confluence Levee removal site. The substrate characteristics such as grain size distribution and percent fines are not anticipated to change. A small amount of excavation will be required to remove substrate from the Side Channel Reconnection project component. This material will be hauled off site. New substrate will be exposed in the inlet and outlet channels; this will be native material and no new material will be added.

2. **Suspended particulates/turbidity [230.21]**

   Construction of 3 of the 5 project components will have short-term increases to turbidity (wetland restoration will have no in-water work). Elevated turbidity will come from approximately 15 temporary stream-crossing culverts for access to the Confluence Levee removal site and LWD installation sites. Other potential sources of turbidity will come from excavation and installation of the bar-apex log jams, 5-log clusters, and single logs anchored with boulders. The third source of turbidity will occur during excavation of the inlet and outlet channels for Side Channel Reconnection. Environmental effects of these project components are described in the Final Feasibility Report/Environmental Impact statement (FR/EIS) and Appendix H of the FR/EIS. All potential sources of turbidity will be avoided and minimized. Heavy equipment needed to perform in-water work will be staged in upland areas and will not enter the Skokomish River except in isolated work areas. All in-water work will be conducted during the prescribed work windows and during low water levels to minimize water quality impacts. The project will use BMPs to ensure state water quality standards are maintained during construction. The Corps will conduct water quality monitoring during in-water work to ensure compliance with these standards. Should monitoring indicate that state water quality maximum standards for turbidity are exceeded, work would be halted and modified such that standards are met.

3. **Water [230.22]**

   The project is not expected to add any nutrients to the water that could affect the clarity, color, odor, or aesthetic value of the water, or that could reduce the suitability of the Skokomish River for aquatic organisms or recreation. Coniferous LWD, which is resistant to breakdown (and therefore has low biochemical oxygen demand), will be placed to enhance fish habitat. The Upstream LWD project component is anticipated to increase pool area, which would provide cooler water temperatures in the deeper levels of the pools for the benefit of aquatic organisms. Side Channel Reconnection will provide higher flows from the Skokomish River to the large pond/wetland area, which may have the effect of increasing dissolved oxygen to the pond area to benefit aquatic organisms.

4. **Current patterns and water circulation [230.23]**

   The purpose of the ecosystem restoration project is to restore natural processes of current patterns and circulation in the Skokomish River that have been degraded due to historical LWD removal and levee construction as well as aggradation that cut off access by aquatic organisms to the large pond/wetland area around RM 5. The 5 components of this project will add LWD to restore more natural current patterns to RM 9 to 11, remove the levee that causes significant constriction of flows for more than 1 mile of the river, reconnect flow to an abandoned channel that is now a disconnected pond, and restore a net gain of 51 acres of wetlands that will be reconnected to the river.

5. **Normal water fluctuations [230.24].**

   None of the components of this project will affect the hydrologic regime of the Skokomish River. The Side Channel Reconnection component will affect water fluctuations in the disconnected pond/wetland area around RM 5. This is anticipated to provide significantly beneficial increases to habitat quantity and quality for juvenile salmonids, particularly coho salmon that are anticipated to use the large pond area as over-wintering habitat once access is provided through excavation of inlet and outlet channels. No negative effects are anticipated from this change in water level fluctuations in the 44-acre pond/wetland area.

6. **Salinity gradients [230.25]**

   No change is expected as all project components are upstream from tidal influence.

**Potential Impacts on Biological Characteristics of the Aquatic Ecosystem [Subpart D]:**

1. **Threatened and endangered species [230.30]**

   For the proposed project, the Corps has submitted the Specific Project Information Form to NMFS and USFWS on January 14, 2015 for review of Section 7 of the Endangered Species Act compliance under the Washington State Fish Passage and Habitat Enhancement Restoration Programmatic Biological Opinion (NMFS Reference No. 2008/03598; USFWS Reference No. 13410-2008-F-0209).

   The proposed Federal action is compliant with ESA based on two separate Programmatic Biological Opinions. Project designs incorporate all necessary components to comply with the requirements of the Programmatic Biological Opinion for Fish Passage and Restoration Projects (FPRP) issued in 2008. For species under the jurisdiction of USFWS, the Corps submitted a Specific Project Information Report and received a verification letter on February 20, 2015 that the project is compliant with the FPRP Biological Opinion.

   For species under the jurisdiction of NMFS, approval authority is granted to the State of Washington in the ESA Section 4(d) Rule, Limit 8 Programmatic Biological Opinion. The Corps received a letter from NMFS dated February 3, 2015 confirming their approval of the Habitat Restoration Program (HRP) under the ESA Section 4(d) Rule, Limit 8, as administered by the Washington Recreation and Conservation Office (RCO). NMFS also stated their agreement that the project fits within the Habitat Restoration Program. The Corps certifies that the project is consistent with all of the elements of the Habitat Restoration Program 4(d) Rule, Limit 8 Programmatic Biological Opinion and communicated this to the Washington Recreation and Conservation Office. The project occurs within the Puget Sound Salmon Recovery Region covered in this Biological Opinion, and the proposed Federal action is listed in the Mid Hood Canal Chinook Recovery Planning Chapter of the Puget Sound Salmon

Recovery Plan. The Corps received a letter from the Washington Recreation and Conservation Office on February 17, 2015 providing their approval of the project's ESA coverage under the 4(d) Limit 8 Programmatic Biological Opinion.

**2. Fish, crustaceans, mollusks, and other aquatic organisms in the food web [230.31]**

There may be temporary impacts to aquatic organisms during construction for the temporary stream crossings, diversion of water for LWD installation, and excavation for reconnection of the channel. The primary causes of impacts to aquatic organisms will be turbidity and disturbance of the riverbed during excavation. However, aquatic habitat quality conditions are expected to improve greatly following construction. Upstream LWD installation will provide rearing and refuge habitat for fish and greatly increased area of substrate for the production of aquatic insects and other benthic organisms. Planting the stream banks at the Side Channel Reconnection inlet and outlet channels with native vegetation will provide shading that functions as a thermal refuge during warm summer days as well as providing a source of organic input for the food chain and insect drop as a direct source of food for fish and amphibians.

**3. Other wildlife [230.32]**

Birds and other wildlife may be temporarily displaced during construction due to noise and presence of construction vehicles. Because these impacts would only occur during the period of construction, and the great majority of standing trees would be retained, impacts are expected to be negligible and temporary. Replacing non-native plant species by planting native trees and shrubs in all areas disturbed by construction would increase the extent and species diversity on the site and create additional opportunities for foraging, nesting, cover, and refuge for a wide variety of species.

**Potential Impacts on Special Aquatic Sites [Subpart E]:**

**1. Sanctuaries and refuges [230.40]**

Not applicable. This portion of the Skokomish River is not designated by local, state, or Federal regulations to be managed principally for the preservation and use of fish and wildlife resources. The areas of construction are not within sanctuaries or refuges.

**2. Wetlands [230.41]**

The Side Channel Reconnection includes 0.73 acres of temporary impact to a Category 1 riverine wetland. Compensatory mitigation is not proposed because the project purpose is ecosystem restoration and has the overall effect of enhancing wetlands and increasing their total area in the Skokomish Valley. Access roads and staging areas have been located as far from wetlands as is practicable and will be re-planted and replaced to function in-kind after the project is completed. The two wetland restoration sites involve breaching agricultural berms and constructing new wetland embankments, which will involve 5 acres of fill of existing wetlands. However, this will have a net gain of 51 acres of wetland restoration and improvement.

**3. Mud flats [230.42]**

Not applicable. The project area has no mud flats.

**4. Vegetated shallows [230.43]**

Not applicable. The project area has no vegetated shallows.

**5. Coral reefs [230.44]**

Not applicable. The project area has no coral reefs.

6. **Riffle and pool complexes [230.45]**

   The Upstream LWD project component is anticipated to have significant benefits for increasing quality and quantity of riffle and pool complexes for 2 miles of the South Fork Skokomish River. The bar-apex log jams, 5-log clusters, and anchored single logs are anticipated to re-create the pools and riffles that occurred historically before significant LWD removal operations occurred in the early to mid-1900s.

**Potential Effects on Human Use Characteristics [Subpart F]:**

1. **Municipal and private water supplies [230.50]**

   The project will have no effects to any municipal or private water supplies.

2. **Recreational and commercial fisheries [230.51]**

   All in-water work will occur during the designated fish window. The proposed project will not prevent access to recreational or commercial fishing.

3. **Water-related recreation [230.53]**

   Significant recreation activities (boating, camping, bicycling, hunting, etc.) occur outside the study area in the upper watershed or beyond Annas Bay. The proposed project would have no effect on fishing activity within the study area. Public access for recreation directly in the Skokomish River will only be precluded at the specific construction locations to protect public safety. Public access will still be available along the rest of the many miles of river outside of the construction zones. No permanent effects to water-related recreation will occur.

4. **Aesthetics [230.53]**

   During construction, heavy equipment noise and exhaust will cause some minor disturbance. The proposed action will have no long-term effects to scenic resources or visual characteristics.

5. **Parks, national and historic monuments, national seashores, wilderness areas, research sites and similar preserves [230.54]**

   No such structures or areas are designated in the project area.

**Evaluation and Testing [Subpart G]:**

1. **General evaluation of dredged or fill material [230.60]**

   Fill material will be large boulders for anchoring logs and large logs with rootwads attached sourced from local forests for three project components. For the two wetland restoration sites, the new wetland embankments will be constructed of clean material and may use some of the native material excavated for breaching the agricultural berms. All imported material would be free from contamination.

2. **Chemical, biological, and physical evaluation and testing [230.61]**

   The Corps will conduct water quality sampling according to the protocol approved by the Washington Department of Ecology for the following parameters: turbidity, dissolved oxygen, and pH. Construction may be halted if deemed necessary under the water quality monitoring. No contaminated material will be used in the proposed action.

**Actions to Minimize Adverse Effects [Subpart H]:**

1. **Actions concerning the location of the discharge [230.70]**

   Selecting locations for the LWD and boulders involved hydraulic modeling to determine appropriate locations for the engineered log jams designed for ecosystem restoration. All excavated material will be hauled off site, or used beneficially as planting substrate where appropriate. Construction methods and BMPs will minimize the extent of any turbidity plumes. The Corps will minimize the total number and size of temporary culverts installed for access to the construction areas.

2. **Actions concerning the material to be discharged [230.71]**

   The size and quantity of boulders will be minimized to only what is required for anchoring the LWD. No materials other than boulders and LWD are proposed for fill directly in the riverbed. The wetland embankments constructed for wetland restoration will consist of clean material and may use native material from the excavated breaches in the existing agricultural berms.

3. **Actions controlling the material after discharge [230.72]**

   Construction methods and BMPs will minimize the extent of any turbidity plumes. Material to be added to the site includes boulders and LWD. There may be a pulse of sedimentation following any diversion of the river to isolate work areas resulting in short term turbidity increases. Localized shifting of sediments may continue sporadically as the river adjusts to the removal of Confluence Levee, log jam installations, and Side Channel Reconnection. The new wetland embankments will be planted with native species, which will have time to become established prior to the first inundation.

4. **Actions affecting the method of dispersion [230.73]**

   As described above, the installed LWD structures are expected to be stable after construction and not disperse although shifting may occur. The wetland embankments are designed for overtopping and are anticipated to remain in place.

5. **Actions related to technology [230.74]**

   No specific advanced technologies are anticipated for use at this time.

6. **Actions affecting plant and animal populations [230.75]**

   The Corps will coordinate construction activities and features with state and Federal resource agencies to minimize impacts to fishery and wildlife resources. There will be temporary disturbance to wildlife in the project vicinity due to noise from operation of machinery. All areas cleared for staging, access, and construction will be replanted with native species.

7. **Actions affecting human use [230.76]**

   The 5 project components are not expected to diminish water quality, but may temporarily impact the aesthetics of the aquatic site and its recreational use through exclusion from access for a short period during construction.

8. **Other actions [230.77]**

   Best management practices will be used in the proposed construction to ensure that no unnecessary damage to the environment occurs during construction.

**General Policies for Evaluating Permit Applications [33 CFR §320.4]**

## 1. Public Interest Review [320.4(a)]

The benefits expected to accrue have been compared to the reasonably foreseeable detriments, and all factors relevant to the proposal have been considered as documented in the FR/EIS. The Corps finds the proposed action of ecosystem restoration to be in compliance with the 404(b)(1) guidelines and not contrary to public interest.

## 2. Effects on wetlands [320.4(b)]

The Side Channel Reconnection project component will have a temporary impact to 0.73 acres of wetland as the inlet and outlet channels are excavated. This impact will be temporary and all cleared vegetation will be replaced with native plantings. No net loss of wetland functions is anticipated because this represents a very small portion of the 44-acre wetland area. The purpose of this project component is to provide fish access to the pond area and to increase the frequency of inundation to the former river channel that is now a 44-acre wetland. The two wetland restoration project components will involve approximately 5 acres of wetland fill due to new wetland embankments construction for a net gain of 51 acres of wetlands restored and improved.

## 3. Fish and wildlife [320.4(c)]

The Corps coordinated project planning and design with the National Marine Fisheries Service, U.S. Fish and Wildlife Service (USFWS), the Washington Department of Fish and Wildlife, and the Washington Department of Ecology regarding minimizing impacts of construction and maximizing ecosystem benefits through project design. In accordance with the Fish and Wildlife Coordination Act, the Corps received a Coordination Act Report from USFWS.

## 4. Water quality [320.4(d)]

The Corps certifies that this project will not violate Water Quality Standards as set forth by the Clean Water Act. The Corps has consulted with the Washington Department of Ecology regarding compliance with Section 401 of the Clean Water Act.

## 5. Historic, cultural, scenic, and recreational values [320.4(e)]

The project area does not occur in areas specifically designated for protection of historic, cultural, scenic, or recreational values. In accordance with Section 106 of the National Historic Preservation Act, the Corps has determined a finding of *no historic properties affected* and will require monitoring during construction at the Side Channel Reconnection locations at RM 4 and RM 5.6 and at the two wetland restoration sites where agricultural berms will be breached and new wetland embankments will be constructed.

### 6. Effects on limits of the Territorial Sea [320.4(f)]

Not applicable, since the project will not occur in coastal waters.

## 7. Consideration of property ownership [320.4(g)]

The project areas occur across a mix of public, private, and tribal ownership. Access for construction equipment and materials will be via public rights-of-way and real estate rights of entry and will be obtained prior to construction. Effects of the project will not change the ability of private property owners to use their property or access navigable waters.

8. **Activities affecting coastal zones [320.4(h)]**

   The Corps has determined that the proposed project complies with the policies, general conditions, and activities as specified in the Mason County Shoreline Master Program. The proposed action will be consistent to the maximum extent practicable with the State of Washington Shoreline Management Program and policies and standards of the Mason County Shoreline Management Program. A Coastal Zone Management Act consistency determination has been prepared and will be submitted to WDOE for review during final design phase

9. **Activities in marine sanctuaries [320.4(i)]**

   Not applicable; the area is not a marine sanctuary.

10. **Other federal, state, or local requirements [320.4(j)]**

    The Corps has completed ESA consultation and the project is in compliance with two separate Programmatic Biological Opinions. Project designs incorporate all necessary components to comply with the requirements of the Programmatic Biological Opinion for Fish Passage and Restoration Projects (FPRP) as well as the Programmatic Biological Opinion for Section 4(d) Limit 8 issued by NMFS. Washington Department of Natural resources will provide authorization for working in aquatic lands of Washington State.

11. **Safety of impoundment structures [320.(k)]**

    Not applicable; no impoundment structure will be built in this project.

12. **Water supply and conservation [320.4(m)]**

    No permit is needed concerning water supply.

13. **Energy conservation and development [320.4(n)]**

    Not applicable.

14. **Navigation [320.4(o)]**

    Not applicable.

15. **Environmental benefits [320.4(p)]**

    The project will have significant environmental benefits through removal of 5,400 feet of levee that constricts river flows, installation of 2 miles of LWD structures for improving quality and quantity of fish habitat, reconnection of the river to a 44-acre wetland area for fish access, and restoration and improvement of two riparian wetlands that will be reconnected to the river.

16. **Economics [320.4(q)]**

    The project has been analyzed for maximizing its cost effectiveness for contribution to the National Ecosystem Restoration plan. Construction of the 5 project components will contribute to employment and profits as the work will be contracted to a private company.

17. **Mitigation [320.4(r)]**

    Compensatory mitigation is not required on this project as there will be a net gain of 51 acres of wetlands at the site of the 5 acres of fill due to wetland embankment construction.

# COASTAL ZONE MANAGEMENT ACT CONSISTENCY DETERMINATION

# COASTAL ZONE MANAGEMENT ACT CONSISTENCY DETERMINATION

## Skokomish River Ecosystem Restoration Project
**January 2015**

The ecosystem restoration actions are activities undertaken by a Federal agency; the following constitutes a Federal consistency determination with the enforceable provisions of the Washington Coastal Zone Management Program.

**1. INTRODUCTION**

The proposed Federal action applicable to this consistency determination is the Skokomish River Ecosystem Restoration Project (Project) activities along the Skokomish River, as described below. This determination of consistency with the Washington Coastal Zone Management Act is based on review of applicable sections of the State of Washington Shoreline Management Program and policies and standards of the Mason County Shoreline Master Program.

U. S. Army Corps of Engineers (Corps) is proposing to conduct restoration along the Skokomish River in the lower Skokomish Valley. The proposed action includes breaching agricultural berms and constructing wetland embankments, a levee removal, placement of large woody debris, and a side channel reconnection to restore structures, functions, and processes in the Skokomish River Basin.

The Confluence levee is located across the river from the agricultural berm at River Mile 9. Around the North Fork/South Fork confluence, seasonal dry channel conditions in the South Fork have prevented upstream migration of salmon in the late summer/early fall period. Removal of the Confluence levee and diversion of the South Fork into the North Fork would provide a continuous low flow channel near the confluence, bypassing a subsurface flow reach and providing improved fish migration. A portion of flood flows would stay in the old channel. Installed LWD would direct flow in the new channel and improve fish habitat.

The wetland restoration at River Mile 9, located from RM 8.3 to 9.2, is intended to restore and improve riparian wetlands and to reduce the stranding potential for fish. The new wetland embankment will be constructed landward (south) varying distances, generally around 200-300 feet. Four strategically located sections of the existing agricultural berm will be breached. These breaches will allow flood waters to flow freely within the opened area, providing salmon access to the riparian wetland habitat with a return path to the river.

The wetland restoration at Grange, located from RM 7.5 to 8, is intended to restore and improve riparian wetlands and to reduce the stranding potential for fish. The new wetland embankment would be constructed landward (south) up to 1,200 feet. Two sections of the existing agricultural berm will be breached; these breaches will allow flood waters to flow freely within the wetland restoration area, providing salmon access to the riparian wetland habitat with a return path to the river.

Upstream large woody debris, located from RM 9 to 11, would include placement and installation of anchored wood and Engineered Log Jams (ELJs). Small wood clusters, single logs, as well as larger ELJs will be installed in this reach to encourage low flow channel meandering and mid-channel bar formation and provide multiple types of habitat benefits for salmon.

An abandoned channel that lies between RM 4 and 5.6 would be reconnected to the mainstem to provide high flow refuge and rearing habitat for fish. Restoration would involve constructing improvements to the channel inlet and outlet, while most of the channel will not be disturbed. The reconnected channel will only be connected to the mainstem Skokomish River during high discharges and would not convey river flows year round. During high river discharges, the reconnected channel would provide low velocity refuge. During most of the year, the channel would provide pond habitat for fish rearing.

**2. STATE OF WASHINGTON SHORELINE MANAGEMENT PROGRAM**

The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved state Coastal Zone Management (CZM) Programs. The Shoreline Management Act of 1972 (RCW 90.58) is the core of authority of Washington's CZM Program. Primary responsibility for the implementation of the SMA is assigned to local governments. Mason County, in which the proposed ecosystem restoration project is located, fulfilled this requirement with the Shoreline Master Program.

**3. MASON COUNTY SHORELINE MASTER PROGRAM**

The Mason County Shoreline Master Program Shoreline Designation Map was used to determine project consistency with the designated shoreline type. The proposed project area is approximately 280 acres located in the lower Skokomish watershed in the Skokomish Valley. The designation for the Skokomish River Ecosystem Restoration Project footprint in Mason County's Shoreline Management Program is Conservancy.

Mason County is in the process of updating their Shoreline Master Program. The current established Shoreline Management Program contains policies governing a wide range of shoreline activities and uses such as agriculture, commercial and residential development, shoreline stabilization, and recreational development. There are no policies governing ecosystem restoration activities that are directly applicable to the proposed project; however, some of the proposed project features are similar in nature to features discussed in the current policy. For this consistency determination, the Corps has addressed items contained in the current policy as well as the draft updated Program.

Applicable portions of the Mason County SMP are presented below with the Corps consistency indicated in ***bold italics.***

**Current Chapter 17.50 Mason County Shoreline Master Program Use Regulations**

**17.50.060 Use Regulations**

**Flood Protection and Shoreline Stabilization**

1. The County shall require and utilize the following information during its review of shoreline stabilization and flood protection procedures:

- River channel hydraulics and floodway characteristics up and downstream from the project area;
- Existing shoreline stabilization and flood protection works within the area;
- Physical, geological and soil characteristics of the area; and
- Predicted impact upon area shore and hydraulic processes, adjacent properties and shoreline and water uses.

***The Corps hos analyzed the all of the above listed information/data regarding the river's hydrology and hydraulics, existing shoreline stabilization, geomorphology, and soil characteristics for the existing conditions used in the formulation of restoration plans. The predicted impacts of the proposed Project have been designed to restore ecosystem processes. This analysis was presented in the draft Feasibility Report/Environmental Impact Statement (FR/EIS), which has gone through a public review.***

2. Conditions of Hydraulic Project Approval, issued by Washington State Department of Fisheries, may be incorporated into permits issued for flood protection and shoreline stabilization.

***This Project is a Federal action and therefore is not subject to obtaining state permits such as Hydraulic Project Approval. The wetland embankments are designed to restore wetlands and will provide the same level of flood protection that presently exists. No shoreline stabilization is included in the Project.***

3. The County shall require professional design of shoreline stabilization and flood protection works where such projects may cause interference with normal river geohydraulic processes, leading to erosion of other upstream and downstream shoreline properties, or adverse effects to shoreline resources and uses.

***The Project's interdisciplinary team includes Certified Professional Engineers specializing in civil design and hydraulic engineering.***

4. Groins on rivers, streams and lakes may be considered as a Conditional Use PROVIDED the applicant can demonstrate the appropriateness of the designed structure and that alternative shore protection measures would prove more detrimental to the geohydraulics and natural resource within the water body.

***No groins are proposed for this Project.***

5. Diking may be permitted as a Conditional Use PROVIDED:
- a. Diking is set back to the edge of the floodway;
- b. Timing and construction shall be coordinated with WDF and WDW;
- c. Diking shall be designed and constructed to meet Soil Conservation Service technical manual standards and shall, at a minimum include (1) layered compaction, (2) removal of debris (i.e., tree stumps, tires, etc.), and (3) revegetation and maintenance until ground cover is established.

***This Project is an ecosystem restoration project with the purpose of restoring floodplain connectivity and aquatic habitat. The Project will breach the existing agricultural berms and construct wetland embankments to restore and improve riparian wetlands. The wetland embankments will provide the same level of protection to the existing structures. All in-water work will occur with the designated fish window for the Skokomish River as established by WDFW per Washington Administrative Code 220-110-271.***

6. Flood protection measures shall be planned and constructed based on a state approved flood control management plan, when available, and in accordance with the National Flood Insurance Program.

***This Project is an ecosystem restoration project with the purpose of restoring floodplain connectivity and aquatic habitat. The proposed wetland embankments are designed to maintain the current level***

***of protection for the existing structures and therefore would not result in a modification to the existing flood control management plan.***

**Chapter 17.50 Draft Mason County Shoreline Master Program Regulations (1/17/13)**
**17.50.060 Use Regulations**
**7. IN-STREAM STRUCTURES**

3. When permitted, in-stream structures and their support facilities shall be:

a. Constructed and maintained in a manner that does not degrade the quality of affected waters or the habitat value associated with the in stream and riparian area; and

b. Located and designed based on reach analysis to avoid the need for structural shoreline armoring.

***The ELJs that will be installed for the purpose of ecosystem restoration will be constructed and maintained to improve the habitat value of the stream and riparian area and have been designed based on hydraulic modeling of the Skokomish River and situated to prevent the need for shoreline armoring.***

4. All in-water diversion structures shall be designed to permit the natural transport of bedload materials. All debris, overburden and other waste materials from construction shall be disposed of in such a manner that prevents their entry into a water body.

***The ELJs that will be installed to divert flow from the South Fork through the excavation at the Confluence Levee will continue to permit natural bedload transport. All debris or waste from construction will be prevented from entering the water.***

5. When installing instream structures, natural in-stream and in-water features such as snags, uprooted trees, or stumps should be left in place unless it can be demonstrated that they are a threat to public safety.

***During installation of the ELJs, all naturally occurring woody debris will be left in place or utilized to the advantage of ecosystem restoration in the aquatic environment.***

6. In-stream structures shall not prevent upstream or downstream migration of anadromous fish.

***The purpose of the Project is ecosystem restoration, therefore, all components are designed to maintain or restore upstream and downstream migration of anadromous fish.***

8. The County shall require any proposed in-stream structure to be professionally engineered and designed prior to final approval.

***The Project's interdisciplinary team includes Certified Professional Engineers specializing in civil design and hydraulic engineering.***

9. No in-stream structure shall be installed without the developer having obtained all applicable federal, state, and local permits and approvals, including but not limited to a Hydraulic Project Approval (HPA) from the State Department of Fish and Wildlife.

***This Project is a Federal action and therefore is not subject to obtaining state or local permits such as Hydraulic Project Approval. The Project is in compliance with all applicable Federal laws.***

10. The County shall require the proponent of an in-stream structure proposal to provide the following information prior to final approval unless the County determines that the issues are adequately addressed via another regulatory review process:

a. A site suitability analysis that provides the rationale and justification for the proposed structure. The analysis shall include a description and analysis of alternative sites, and a thorough discussion of the environmental impacts of each.

b. A hydraulic analysis prepared by a licensed professional engineer that describes anticipated effects of the project on stream hydraulics, including potential increases in base flood elevation, changes in stream velocity, and the potential for redirection of the normal flow of the affected stream.

c. A Habitat Management Plan prepared by a qualified professional biologist that describes the anticipated effects of the project on fish and wildlife resources; provisions for protecting in-stream resources during construction and operation, and measures to compensate for impacts that resources that cannot be avoided.

d. A description of sites proposed for the depositing of debris, overburden, and other waste materials generated during construction.

e. For hydropower facilities, the proposed location and design of powerhouses, penstocks, accessory structures and access and service roads.

f. Proposed provisions for accommodating public access to and along the affected shoreline, as well as any proposed on-site recreational features.

***The Project has undergone the complete process to comply with the National Environmental Policy Act as well as multiple reviews within and external to the Corps. Each applicable item named above has been incorporated into the FR/EIS and will be included in the final designs.***

**12. RESTORATION PROJECTS**

1. Restoration shall be carried out in accordance with an approved restoration plan prepared by a qualified professional containing, where applicable, an analysis of existing conditions, identification of the area to be restored, proposed corrective actions, including installation of native species, performance standards, monitoring schedule, planting plans, erosion and sedimentation control plans, and grading plans as necessary and in accordance with the policies and regulations of this Program.

***The Project is proposed as a result of the Skokomish River General Investigation Feasibility Study and has been documented in the FR/EIS, which contains an analysis of existing conditions, identification of the area to be restored, proposed corrective actions, including installation of native species, performance standards, and monitoring schedule. The final designs will contain erosion and sedimentatian control plans, and grading plans.***

**17.50.065 Shoreline Modification Activities**

**4. FLOOD PROTECTION**

1. The County shall require and utilize the following information, prepared by qualified engineers, hydrologists, and ecologists during its review of flood protection projects:
   a) River channel hydraulics and floodway characteristics up and downstream from the project area;
   b) Existing shoreline stabilization and flood protection works within the area;
   c) Physical, geological and soil characteristics of the area; and

d) Predicted impact upon area shore and hydraulic processes, adjacent properties and shoreline and water uses, including:
   i. analysis of the flood frequency, duration and severity and expected health and safety risks as a rationale and justification for the proposed structure.
   ii. potential increases in base flood elevation, changes in stream velocity, and the potential for redirection of the normal flow of the affected stream.
   iii. a description of proposed plans to remove vegetation. Impacts on valuable recreation resources and aesthetic values such as point and channel bars, islands and other shore features and scenery.

e) A Habitat Management Plan that identifies how impacts will be avoided, minimized and/or mitigated. The plan shall include requirements for monitoring of any mitigation actions.

f) Proposed provisions for accommodating public access to and/or along the affected shoreline in funded public projects, as well as any proposed on-site recreational features.

***The Corps has analyzed the all of the above listed information/data regarding the river's hydrology and hydraulics, existing shoreline stabilization, geomorphology, and soil characteristics for the existing conditions used in the formulation of restoration plans. The predicted impacts of the proposed Project have been designed to restore ecosystem processes. This analysis was presented in the draft Feasibility Report/Environmental Impact Statement (FR/EIS), which has gone through a public review. The Project's interdisciplinary team includes Certified Professional Engineers specializing in civil design and hydraulic engineering.***

2. Conditions of Hydraulic Project Approval, issued by Washington State Department of Fish and Wildlife, may be incorporated into permits issued for flood protection and shoreline stabilization.

***This Project is a Federal action and therefore is not subject to obtaining state permits such as Hydraulic Project Approval. The wetland embankments are designed to restore wetlands and will provide the same level of flood protection that presently exists. No shoreline stabilization is included in the Project.***

3. The County shall require professional design of flood protection projects, where permitted, to ensure such projects do not cause interference with normal river geohydraulic processes, leading to erosion of other upstream and downstream shoreline properties, or adverse effects to shoreline resources and uses.

***The Project's interdisciplinary team includes Certified Professional Engineers specializing in civil design and hydraulic engineering.***

4. Flood control structures shall be permitted only when credible engineering and scientific evidence demonstrates that:
   a) They are necessary to protect existing, lawfully established developments; or new, lawfully established bridges, utility lines, and other public utility and transportation structures where no other feasible alternative exists or the alternative would result in unreasonable and disproportionate cost; and
   b) Non-structural flood protection measures are infeasible; and

c) Impacts to habitat are avoided and minimized to the greatest extent feasible and can be successfully mitigated consistent with FEMA Region X guidance from the 2008 Biological Opinion on the Federal Flood Insurance Program; and
d) They are consistent with an adopted comprehensive flood hazard management plan if available; and
e) They are consistent with Mason County Code Chapter 14.22 and the County Comprehensive Plan.

***This Project is an ecosystem restoration project with the purpose of restoring floodplain connectivity and aquatic habitat. The Project would breach the existing agricultural berms and construct wetland embankments to restore the hydrology of the floodplain wetlands. The proposed wetland embankments would not result in a modification to the existing flood control management plan.***

6. All flood control structures shall be prohibited in Natural and Aquatic environments; except that limited elements of flood control structures may be permitted in Aquatic environments where such location is necessitated by the design of the flood control project.

***This Project is an ecosystem restoration project with the purpose of restoring floodplain connectivity and aquatic habitat. The Project would breach the existing agricultural berms and construct wetland embankments to provide the same level of protection to the existing structures.***

7. Flood control structures may be considered as a Conditional Use in Urban Commercial, Urban Residential, Rural and Conservancy designations. Where allowed, flood control structures shall meet all requirements of this program, and PROVIDED:

a. Shall be set back from the ordinary high water mark or channel migration zone consistent with incorporated Resource Ordinance buffers
b. Shall be located outside of the mapped floodway;
c. Shall be located landward of associated wetlands and wetland buffers, as determined consistent with the incorporated Resource Ordinance.
d. In instances when multiple buffers apply, shall be setback to the landward-most edge of all such buffers and setbacks.

***The project area is designated as Conservancy. This Project is an ecosystem restoration project with the purpose of restoring floodplain connectivity and aquatic habitat. The Project would breach the existing agricultural berms and construct wetland embankments to provide the same level of protection to the existing structures.***

8. Timing and construction shall be coordinated with WDFW and other applicable state, and federal agencies, including acquiring necessary permits and approvals;

***Construction of the project would be in the drier summer months to facilitate access and construction. All in-water work will occur with the designated fish window for the Skokomish River as established by WDFW per Washington Administrative Code 220-110-271.***

9. Flood control structures should be designed and constructed to applicable Washington Department of Fish and Wildlife Aquatic Habitat Guidelines technical manual standards.

***During the next phase of the project (pre-construction engineering, and design), the above mentioned WDFW manual standards will be consulted as more detailed designs are developed.***

10. Flood protection measures shall be planned and constructed based on a state approved flood control management plan, when available, and in accordance with the National Flood Insurance Program and the County Flood Damage Prevention Ordinance.

***This Project is an ecosystem restoration project with the purpose of restoring floodplain connectivity and aquatic habitat. The proposed wetland embankments would not change the current level of protection for the existing structures and therefore would not result in a modification to the existing flood control management plan.***

11. Removal of beaver dams to control or limit flooding shall be allowed provided that the project proponent coordinates with the Department of Fish and Wildlife and obtains all necessary permits and approvals from the state.

***No beaver dams are in the project footprint.***

12. New flood control structures, such as publicly funded dikes and levees, shall dedicate and improve public access pathways unless such improvements would cause unavoidable health or safety hazards to the public, inherent and unavoidable security problems, unacceptable and unmitigable significant ecological impacts, unavoidable conflict with the proposed use, or a cost that is disproportionate and unreasonable to the total long-term cost of the development.

***The proposed wetland restoration areas do not have public access; the land is under private ownership. This project would have a negligible effect (primarily related to temporary access disruption during construction) on fishing activities.***

13. Removal of gravel for flood protection purposes shall be consistent with an adopted flood hazard reduction plan and only after a biological and geomorphological study demonstrates that extraction has a long term benefit to flood hazard reduction, does not result in a net loss of shoreline ecological functions, and is part of a comprehensive flood management solution.

***Gravel removal is not proposed for the Project.***

**4. Federal Water Pollution Control Act**
The Corps concludes that the project is subject to regulation under Sections 401 and 404 of the Clean Water Act because of permanent fill of wetlands and the placement of large woody debris within the river channel. Therefore, the project does require a 401 water quality certification (WQC) and 404(b)(1) evaluation. The Corps has documented substantive compliance with Section 404 of the Clean Water Act via the 404(b)(1) guidelines that incorporated in the Final F/EIS. The Corps will obtain a WQC prior to construction involving placement of dredged or fill material in waters of the U.S., and then comply with the WQC conditions.

**5. Clean Air Act**
The proposed project has been analyzed for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act. Effects on air quality would be minimal and only

during construction, the project is exempted from the conformity requirements because it would not exceed *de minimis* levels of emissions. For this reason, a conformity determination is not required for this project.

**6. State Environmental Policy Act**
The proposed action is a Federal action subject to NEPA and is exempt from SEPA. NEPA compliance is documented in the Final FR/EIS and subsequent Record of Decision.

**7. Energy Facility Site Evaluation Council (EFSEC) Law**
EFSEC does not apply to the proposed action since the proposed project does not involve energy facilities in the State of Washington.

**8. Ocean Resources Management Act**
The proposed action is located in a river that drains into Puget Sound, a water body connected to the Pacific Ocean through the Strait of Juan de Fuca. The enforceable policies of Ocean Resources Management Act (Chapter 43.143 RCW) apply only to coastal waters of the Pacific Ocean, and do not apply to the proposed action.

**9. Conclusion.**
Based on the above evaluation, the Corps has determined that the proposed ecosystem restoration activities substantively comply with the policies, general conditions, and activities as specified in the Mason County Shoreline Master Program as well as the other five enforceable policies applicable to the Coastal Zone Management Program. The proposed action is thus considered to be consistent to the maximum extent practicable with the State of Washington Coastal Zone Management Program.

# WASHINGTON DEPARTMENT OF ECOLOGY

# HTRW INFORMATION

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
*PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000*
*711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341*

Mamie Brouwer
Project Manager, Civil Works Branch
U.S. Army Corps of Engineers
Seattle District, CENWS-PM-CP-CJ
P.O. Box 3755
Seattle, WA 98124

Dear Ms. Brouwer,

This letter is intended to provide the Corps of Engineers with additional information regarding the car body levee site proposed as part of the Skokomish River Basin Ecosystem Restoration General Investigation (GI) Study. The GI study team recently identified the Tentatively Selected Plan (TSP) which includes removal of a car body levee near the confluence of the North and South Forks of the Skokomish River. The Seattle District has requested confirmation from the Washington Department of Ecology that the proposed car body levee project site contains no known hazardous or toxic waste.

A review of Department of Ecology's toxic cleanup site database has confirmed that the car body levee area of the Skokomish River Basin contains no known hazardous or toxic waste. There are no cleanup projects active or proposed at this site at this time, and there are no active cleanup sites within the Skokomish River Basin.

Should hazardous or toxic waste be discovered during the removal of the levee, that discovery should be reported to Ecology following the procedures for reporting a spill outlined on Ecology's website: http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm.

Respectfully,

Kristopher M. Grinnell
Toxics Cleanup Program
Washington Department of Ecology

# SKOKOMISH RIVER BASIN
# MASON COUNTY, WASHINGTON
# ECOSYSTEM RESTORATION

## APPENDIX M

## PUBLIC COMMENTS AND RESPONSES

## Integrated Feasibility Report and Environmental Impact Statement

US Army Corps
of Engineers®
Seattle District

# Table of Contents

**Skokomish River Basin Ecosystem Restoration**
**Mason County, Washington**
Public Comments and Responses on the Draft Feasibility Report/Environmental Impact Statement

## 1.1 Introduction

This document responds to comments received on the Skokomish River Basin Ecosystem Restoration Project (Project) Draft Feasibility Report and Environmental Impact Statement (DFR/EIS) by the U.S. Army Corps of Engineers (Corps). Comments were submitted verbally at the public meeting held in Shelton, Washington, on March 20, 2014. Comments were also received in writing through public comment forms provided at the March 2014 public meeting, letters, and electronic mail. A total of 26 comment submittals were received. All comments were received during the 45-day open public comment period of February 21, 2014 through April 7, 2014.

At the time the DFR/EIS was released for public review, the project team was using local site names to refer to specific features or alternatives proposed for implementation. During the project's feasibility-level design phase, site names were formalized in the Final Feasibility Report and Environmental Impact Statement. The responses to public comments outlined in this document reference the original, local site names presented in the DFR/EIS; however, the Final FR/EIS presents updated naming conventions for some sites.

## 1.2 Environmental Review Process

On February 21, 2014, the Corps released the Draft Feasibility Report and Environmental Impact Statement for public review. A Notice of Availability for public review of the documents was filed in the Federal Register (EIS No. 20140044). Printed copies of the DFR/EIS were available for public review at local public libraries. Additionally, the documents were available for public review on the Corps' website at http://www.nws.usace.army.mil/Missions/CivilWorks/ProgramsandProjects/Projects/SkokomishRiverBasin.aspx.

The public review and comment period on the DFR/EIS began on February 21, 2014, and closed on April 7, 2014. One public meeting was held to receive public comment on the DFR/EIS and Appendices in Shelton, Washington, on March 20, 2014.

## 1.3 Document Organization and List of Commenters

This document contains copies of comments received during the comment period followed by the Corps' responses to those comments. Each comment is numerically coded in the margin of the comment letter, based on the order of the comments presented in the letter. The comments and responses are presented as follows:

- Master Responses (Section 1.4)
- Verbal comments received and recorded at the public meeting, with responses (Section 1.5)
- E-mail comments from agencies, organizations, and individuals, with responses (Section 1.5)
- Mail comments from agencies, organizations, and individuals, with responses (Section 1.5)

### 1.3.1 Individual Comment Submittals

A total of 26 comment submittals were received on the Draft Feasibility Study and Environmental Impact Statement. Each comment submittal was given a comment identification code. 13 comments were provided verbally at the March 2014 meeting. These comment submittals are identified as PM1 to PM13. 8 comments were provided by email; these submittals are identified as E1 to E8. The remaining 4 comments were received by mail; these submittals are identified as M1 to M4. Each comment submittal is listed below in Table 1.

| Comment Identification | Date comment received | Speaker/Comment Letter Author | Organization/Affiliation |
|---|---|---|---|
| PM1 | 3/20/2014 | Bill Hunter, Jr. | Private Citizen |
| PM2 | 3/20/2014 | Greg Stairs | Private Citizen |
| PM3 | 3/20/2014 | Alann Krivor | Private Citizen |
| PM4 | 3/20/2014 | Barb Kealy | Private Citizen |
| PM5 | 3/20/2014 | Bill Hunter, Sr. | Private Citizen |
| PM6 | 3/20/2014 | Frank Ragan | Private Citizen |
| PM7 | 3/20/2014 | Mali Krivor | Private Citizen |
| PM8 | 3/20/2014 | Blase Gorny | Private Citizen |
| PM9 | 3/20/2014 | Rich Geiger | Mason Conservation District |
| PM10 | 3/20/2014 | Bob Albaugh | Private Citizen |
| PM11 | 3/20/2014 | Art Tozier | Private Citizen |
| PM12 | 3/20/2014 | Jens Stratton | Private Citizen |
| PM13 | 3/20/2014 | Janie Kamin | Private Citizen |
| E1 | 3/26/2014 | Jeffrey Gaeckle | Washington State Department of Natural Resources |
| E2 | 3/28/2014 | Jason Ragan | Private Citizen |
| E3 | 3/29/2014 | Mali Krivor | Private Citizen, Skokomish Farms, Inc. |
| E4 | 3/30/2014 | Alann Krivor | Private Citizen, Skokomish Farms, Inc. |
| E5 | 4/6/2014 | David Kregenow | Private Citizen |
| E6 | 4/7/2014 | L.B. Kregenow | Private Citizen |
| E7 | 4/7/2014 | Derek Booth | Private Citizen |
| E8 | 4/8/2014 | Robert Dach | Bureau of Indian Affairs |
| M1 | 4/7/2014 | Kim Kratz | National Marine Fisheries Service |
| M2 | 4/7/2014 | Karen Willie | On behalf of six ranching families |
| M3 | 4/5/2014 | Blase Gorny | Private Citizen |
| M4 | 4/3/2014 | Allison O'Brien | U.S. Department of the Interior |

Each comment submittal is reproduced in its entirety in this appendix. Where a comment submittal included multiple comments, each comment was assigned a sequential number. Following each comment submittal are the Corps' responses to the comments raised in the submittal.

Verbal and written comments received during the public comment period are presented in Section 1.5.

## 1.4 Master Responses

A review of the comment letters received on the DFR/EIS revealed that some comments were made frequently, demonstrating a common concern among those submitting written comments. In some cases, the array of similar comments about a particular topic provided more clarity about a specific issue than any single comment. To allow presentation of a response that addresses all aspects of these related comments, master responses have been prepared for those topics that were raised in a number of comments. These master responses are intended to allow a well-integrated response that addresses all facets of a particular issue, in lieu of piecemeal responses to individual comments that may not have portrayed the full complexity of the issue.

When applicable, the individual responses to comments cross-reference an applicable master response to provide additional explanation and information. In some cases, a master response may fully respond to the individual comment.

Master responses have been provided for the following issues raised in comments received on the DFR/EIS:

- Master Response 1, Hunter and Weaver Creeks – Removed from Tentatively Selected Plan
- Master Response 2, Landowner Willingness
- Master Response 3, Project Scope – Flood Risk Management
- Master Response 4, Placement of Dredged Material
- Master Response 5, Agriculture in Skokomish Valley
- Master Response 6, Study Authority

## 1.4.1 Master Response 1, Hunter and Weaver Creeks – Removed from Tentatively Selected Plan

Landowner willingness is a key component of this restoration project. Based on feedback from landowners during public review of the Draft Feasibility Report/Environmental Impact Statement, the Hunter and Weaver Creek tributary projects (site # 39, 40, and 43) have been removed from the recommended plan.

- This master response applies to the following individual comments: PM9, PM10, E3, E6, M3

## 1.4.2 Master Response 2, Landowner Willingness

Landowner willingness is a key component of this restoration project. The Corps and local sponsors have worked to engage landowners throughout the study, including multiple public meetings, listening sessions, and public review of the Draft Feasibility Report/Environmental Impact Statement. If Congress authorizes the recommended plan, landowner outreach will continue during the Preconstruction, Engineering and Design Phase. During this phase, the Corps and local sponsors would continue to work to refine the project designs in coordination with landowners and stakeholders. If there are landowners who are unwilling to negotiate with study sponsors to provide necessary property, individual project sites will be modified and/or removed from the proposed restoration plan.

- This master response applies to the following individual comments: PM1, PM9, PM10, PM12, PM13, E3, E4, E5

## 1.4.3 Master Response 3, Project Scope – Flood Risk Management

To justify a flood risk management project, the Corps must indicate the benefits of building a flood risk management project outweigh the costs of the project. This "benefit-cost" analysis is completed by the study's economic team and must follow prescribed regulations developed by the Corps. A preliminary economic analysis was completed in 2012; results of this analysis were presented to the public in March 2012. The economic analysis indicates that the economic benefits (or damages avoided) of a potential flood risk management project do not adequately offset the expected costs of a flood risk management project. The economic analysis results do not justify the significant project cost for a Federal (Corps) flood risk management project in the Skokomish River Basin.

The Corps acknowledges that flooding is a problem and major concern in the Skokomish River Valley; however, flood risk management is not a project purpose of the feasibility study and the recommended plan will not include features that directly address flood risk management in the study area. Although the Corps is not recommending specific flood risk management projects, local and state government agencies intend to continue locally-funded flood damage reduction efforts to achieve local goals, such as preserving local business, communities, and historic land uses. Mason County may still take action to reduce flood risks in the Skokomish Valley, including possible implementation of agricultural best management practices.

- This master response applies to the following individual comments: PM2, PM5, E7, M2

## 1.4.4 Master Response 4, Placement of Dredged Material

The Corps analyzed many possible alternatives for placement of dredged material including placement of material in Annas Bay, open water disposal, and placement of material in a quarry or other stockpile area. Due to the significant amount of dredged material associated with the riverbed excavation alternatives (up to 2.5 million cubic yards), placement of material in Annas Bay was determined to be the most feasible alternative and would provide ancillary environmental benefits associated with creation of high quality shellfish habitat.

The Corps did not complete a detailed cost estimate for all possible transport and placement options for dredged material because the study was not scoped for this kind of specific and quantitative evaluation. However, the Corps did complete a qualitative analysis of dredged material disposal options which are summarized below.

The Corps understands that many of the area farms could use limited amounts of gravel for roads or minor infrastructure improvements. The Corps also acknowledges that small amounts of land could be rented to stockpile dredged materials. However, the volume of material proposed for removal (2.5 million cubic yards) likely exceeds the amount of land available for stockpiling or material required for small-scale infrastructure improvements. For example, stockpiling 2.5 million cubic yards of dredged materials would create a small mountain with a quarter-mile wide diameter base and height of approximately 160 feet; this stockpiling of materials in the Skokomish Valley is substantial.

Additionally, levees could not be built with dredged materials from the riverbed. The use of dredged materials for levee construction is not a preferable practice because river alluvium in the study area is typically coarse grained with little to no fines content. These materials will exhibit a high permeability and will not be effective in the levee's primary purpose of excluding flood waters. In addition, alluvial deposits are typically poorly graded and composed of rounded particles; these attributes make the soil less desirable for compaction and strength. Extensive processing of the dredged materials would be required to produce an ideal soil gradation, which would add to the project cost. Nearby glacial soils have been identified as a superior borrow source for levee fill. Even if riverbed materials were suitable for levee construction, the volume of material proposed for removal associated with the large-scale dredging alternatives far exceeds the amount of material required to construct levees (e.g., 2.5 million cubic yards of dredged materials would create a 6-foot tall levee with a top width of 20-feet; it would be 60 miles long).

- This master response applies to the following individual comments: PM2, E3, E5, E6

## 1.4.5 Master Response 5, Agriculture in Skokomish Valley

The Corps acknowledges and understands that the Skokomish Valley is the largest agricultural area in Mason County with a long history of agricultural production. The Corps also understands the value of agriculture in the Skokomish Valley and recognizes that declining agricultural productivity is a significant concern. Proposed ecosystem restoration projects included in the recommended plan are intended to be compatible with ongoing farming and agricultural practices and were not formulated to deliberately harm agricultural production in the Skokomish Valley. Much of the lower Skokomish River basin is zoned as Agricultural Resource Lands. Mason County Comprehensive Plan (updated 2005) includes goals and policies aimed at preserving and protecting agriculture.

While this Integrated Feasibility Report/Environmental Impact Statement focuses on ecosystem restoration, Mason County and project partners have been very mindful of landowner concerns and projects serving dual purposes are included. For example, channel restoration improves habitat as well as potentially reducing the high water table negatively impacting farming. Ecosystem restoration projects implemented in conjunction with local flood risk management projects, agricultural best management practices, and other actions throughout the watershed are intended to more holistically restore the Skokomish River Basin for the benefit of both humans and ecosystem resources.

- This master response applies to the following individual comments: PM5, PM10, PM11, PM12, E2, E7

## 1.4.6 Master Response 6, Study Authority

The applicability the Section 209 authority to studies on ecosystem restoration was examined early in the planning process. The Senate Report associated with the Flood Control Act of 1962 (S. Rpt. 87-2258) indicates a Congressional intent to support a broad range of "allied purposes" including environmental preservation and restoration under the umbrella of flood control and navigation. Additional areas of the report provide further background on Congressional intent with regard to the authorization. USACE Headquarters has confirmed the appropriateness of this study authority for study of ecosystem restoration in the Skokomish River Basin.

- This master response applies to the following individual comments: E5, M2

## 1.5 Public Comments and Agency Responses

**PM1**
**Verbal at public meeting 3/20/2014**
**Commenter:**
**Bill Hunter, Jr.**

Comment:

I can't really make any formal comments on advice of counsel right now. But I had a few comments on the process maybe. And I have worked on previous plans. I've worked on flood advisory board for quite a number of years when that was active. And you want local buy-in but you don't have a local process. So for me, you know, there's no way I can come on board at the tail end of something and have - I want to say confidence or any respect for the process. And for me, it's been probably a total waste of flood board money to this point in time. I'm sorry the county didn't ask to give our input. Thank you. 1

**USACE response:**

1: See Master Response 2.

**PM2**
**Verbal at public meeting 3/20/2014**
**Commenter:**
**Greg Stairs**

Comment:

I've been a resident of Union my whole lifetime. I've seen issues with the Skok River. We pretty much know what caused the flooding issues way back when, logging. We don't need to point fingers. At this meeting, I don't think we need to point fingers either. However, I do believe the study is extremely, extremely limited in scope. It does not address flooding in any way, shape or form. Has it been looked at how much money the gravel is worth that would be dredged out of that river and where that money would come to? Preferably I believe it's Mason County. Those issues have not been addressed. 1

I know in the lower river, there is mud down there that would be costly to dredge. However, I've noticed in the last five years, as the water comes into the Hood Canal, the channels are not there that have been there forever, since I was yay high. They're just kind of filling in. Oysters are coming in. I see a lot more salt content. 2

I just think this whole thing, instead of focusing on fish, needs to focus on the whole big picture. There's not just one thing in the ecosystem that needs to be looked at. It needs to be looked at a whole project. I look every year and see the poor homeowners and people driving the roads and the Skokomish Tribe being flooded out. That is not good. And that needs to be addressed. It's not just about one issue, fish, putting in a couple little things here, couple little things here, for some $41 million. I just believe the whole thing needs to be addressed as a whole and look at the broad picture. I just don't think that the thing was properly looked at as a whole. It's just kind of very narrow-minded as far as the benefits. 3

And really what are those benefits? Do we really know? Not until it's done. And there may not be any benefits. All those little channels there being put in, they may all just fill in with

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sediment. Because the roads are there. Other stuff is there. The sediment backs up. Boom. They're not there anymore. So is this going to be a means to an end or just a small throw some money at it like all the millions of [...] dollars of studies on the Skok River and they've ended up with nothing. And it's just another one of them. 4

**USACE response:**

1: See Master Response 3 and Master Response 4.

2: Comment noted.

3: The Corps' recommended plan is one element of an integrated restoration effort in the entire Skokomish River watershed. There is a strong, united effort by Federal, State, and local agencies as well as the Skokomish Indian Tribe for holistic restoration of the Skokomish River Basin. Various Federal and State agencies as well as local entities are working within their individual authorities and within specific areas of the Basin to implement restoration activities throughout the upper and lower watersheds. While the Corps' study is recommending an ecosystem restoration plan for the Skokomish Valley, the synergistic efforts of those involved in restoration of the entire Skokomish River watershed will produce positive, cumulative effects across the Basin.

Mason County, the Skokomish Tribe, and Mason Conservation District intend to pursue many projects not included in the final Federal Plan over the next several years. Preliminary design and environmental impacts have been completed and assessed for most under this Integrated Feasibility Report and Environmental Impact Statement. Grant funds will be pursued to complete final design and construction of these important projects. Completing these projects at the local level will likely enable local sponsors to move more quickly and cost-effectively.

4: Regarding the proposal for extended channels along the tributaries, the preliminary design was to excavate deep enough to intercept the same groundwater that feeds the tributaries. It was assumed that new channels would have reliability of flow equal to that of the tributaries. Benefits of tributaries to riverine ecosystems include greater habitat area for aquatic-oriented mammals such as river otters and mink, greater fish productivity that can support more recreational fishing, and more drainage channels for flood flows.

| PM3 | Commenter: |
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| Verbal at public meeting 3/20/2014 | Alann Krivor |

Comment:

My name is Alann Krivor and we bought the old [Richert] farm, approximately 890 acres on the north - most of it on the north side of the river. We put 161 acres - I believe a hundred and - no - about 60 acres into an emergency watershed protection program. Because what happened, the north fork flowing down into the south fork and then forming the main stem, there was an old dike in there that blew out before we bought the property. The north fork then changed its channel and it went into an old channel and flowed down along the north side of the car dike and into then the main stem. 1

Okay. What I see happening is that you're going to remove the car dike. Now, we have

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subdivided the farm into 18 40-acre parcels. Of those, 14 of those have been sold in the area of about $300,000 each. Okay. If the south fork suddenly moves . . . Where it is right now, where the main stem is below the car dike, that area dries up at times and the river then floods out and goes into the south side of the valley. Our elevation is only slightly higher. So now the south fork - what you're proposing the south fork now is going to swing up against our land, against the EWP easement that we gave the feds. And is that going to spread into our fields? I promise you that our buyers who have paid an average of $300,000 each are not going to be happy. And would the feds then be willing to pay damages to our fields? Because those lower fields above the EWP area are going to be strictly in all crops. And that's why these people are buying there.

So anyway, that is my question. And I hope you can answer it. Can you guarantee that the gravel will not move into the new south fork channel, which then is against our land? Thank you. 1

**USACE response:**

1: Removing the Car Body Levee would divert much of the South Fork water and bedload into the existing North Fork channel. Based on recent deposition rates, the initial deposition rate in the combined channel could be in the 0.1 +/- 0.05 feet/year range. As the combined channel aggrades, it would meander across the floodplain, forming and abandoning gravel bars. This natural meandering process will develop a complex series of stream habitats that will be beneficial to salmon and other fish. During the 50-year project life, there could be two to three feet of deposition across the entire 1,000- to 2,000-foot wide floodplain between the old and new confluences and north of the existing channel; however, specific locations of future gravel bars, new stream habitats, and/or areas of deposition cannot be identified or confirmed.

| PM4<br>Verbal at public meeting 3/20/2014 | Commenter:<br>Barb Kealy |
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Comment:

I moved out here in 1979. And I've been through a couple of these meetings already. And the thing that I find to be hilarious is the fact that you can spend so much money and never get nothing done. We still have the same problems as what we've had twenty some, thirty some years ago. And could you get the Grange on there, that one with the Grange? Because you're going to be putting in all these so-called levees and you're only going to make them so high so that the water can flow over. Well you know what? It's going to give [Richerts] a hellacious field full of dead fish and fertilizer. Because we used to live right there on the corner. And the water doesn't come from this way in, it comes from this way across (indicating). So the levees, what you're going to be doing is you're going to be catching the water. And the thing I often wondered is who personally goes out and checks these things. Or are you looking at maps and things like that? Because you have to be there year after year after year to see what's really happening. And it reminds me of the sink is plugged but you keep adding water. Until you get rid of the plug, you're not going to have any drain. And what's happened is the fish, who - believe it, I love salmon - I don't want them in my yard or hanging on my fence. You know. You want them where they're supposed to be. But if you don't fix the path, they're not going to have anyplace to go. So having all these levees aren't going to help anything. 1

Now in 2009, we were camping out there on the river. And that's the first time I saw elk. And that was right there. And it was - scared the daylights out of all of us. We spent the night in the car because we couldn't figure out what that whistle was. But anyway, you know, there's a lot of fond memories in this place. 2

And it just seems like we go through blowing money when there's so many other things that you could do. Yes, it needs to be fixed. But are you doing it the right way? And that's what - you know, basically that's what it is. Because for the last three years, we have gone camping down there. And there's no water in the rivers. I can't even take the kids fishing because you can't fish unless you get to the other side of the Skok Bridge. And it's like oh, my God. You know. I mean here's all these years that we've been there. And my kids, that was their big dream was catching these fish. 3

So you know - but still I had to get my two cents worth in there because I'm all for fixing it. But are you doing it right? And that was my big thing.

**USACE response:**

1: Hydraulic modeling informed the design for the levee breaches, new levee locations, and alignments of the proposed levees. There is no entity charged with monitoring fish stranding due to the safety risks during flooding events; therefore, local knowledge and reports of fish stranding also guided the levee designs.

2: The Corps recognizes the great recreational values of the Skokomish River and important wildlife viewing opportunities afforded by the rural character of the valley. We appreciate having personal accounts of recreational experiences.

3: Corps guidance requires the systematic formulation of alternative plans to ensure that sound decisions are made with respect to development of alternatives and ultimately selection of a recommended plan. For this feasibility study, alternatives were formulated to address the critical needs of the study area (provide year-round passage for fish in the reach of the river that runs dry during summer months). The study team, non-Federal sponsors, local and regional stakeholders, and the public identified a number of potential restoration sites in the study area. Multiple rounds of screening and evaluation led the study team to carry forward and ultimately recommend only those alternatives that address the critical needs of the study area, ensuring that the recommended plan is a part of a comprehensive effort to restore the Skokomish River Basin.

| PM5 | Commenter: |
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| Verbal at public meeting 3/20/2014 | Bill Hunter, Sr. |

Comment:

We're from a family that lived, farmed, prospered in the Skokomish Valley well over a hundred years. And to see the river degrade the way it did and destroy the valley is just pitiful. Almost hard to stand up here and not go to tears when you talk about it after watching it 80 plus years that I've been in the valley, watching it. And there's nothing done. I have two generations in the room that want to farm and prosper. But unless the river is addressed, there's no prospering in agriculture in Skokomish Valley. 1

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| And our farm's never been fish habitat. We've been growing crops on it. And the only thing I really came up - want to ask, you know, you say the valley isn't worth saving. You told us last time benefit/cost ratio. I'd like to know how you - I'd like a copy of your benefit/cost ratio mailed to me so I can see. I think the valley is worth saving. It's prospered well over a hundred years by our family and several others in the valley. And I think it's worth saving. I said that. But unless there's something addressed besides just the habitat, it's a lost cause. And the two generations behind me won't prosper in agriculture in Skokomish Valley. 2 |

| USACE response: |
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| 1: See Master Response 5.<br><br>2: See Master Response 3. |

| PM6<br>Verbal at public meeting 3/20/2014 | Commenter:<br>Frank Ragan |
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| Comment:<br>I live farther up the valley. And Vance Creek is the problem up our way. It flows into the Skok. And where I live, it don't flood so bad. But the water runs into the bank and washes the gravel, which years ago the county put some riprap in when I was about this tall (indicating). And I tell you, for a few loads of riprap, it held for like 40, 50 years. But it washed down. It's washing on the neighbor's property and washes around to the bridge, washing into the bank. It's going to take out road. And it would be a lot cheaper to fix it than to let it wash out the bridge, you know, the bank and all that. Also, I live just down from there and it's washing in in my neighbor's house, my property. It's washing into my neighbor's house close. It's hitting in there. 1<br><br>They've logged - logged a lot the last couple of years up there on Vance Creek. And it's a torrent flash flood and it just eats the bank very fast and it washes all down and fills in the river. And there's a few places that could be just reduce sediment so very much if it was just a little bit of work. My neighbors had some done a couple years ago and it worked really, really good. | |

| USACE response: |
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| 1: The Corps is not proposing restoration projects on Vance Creek. However, Mason County may pursue projects in this area to addressing flooding or ecosystem restoration in the future. |

| PM7<br>Verbal at public meeting 3/20/2014 | Commenter:<br>Mali Krivor |
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| Comment:<br>My questions are about the coming on board, being committed, buying into the plan, and it's going to take the best efforts of those that are impacted to do this. Since I think our farm is going to have a sizable impact, what's the difference between selling land, asking us to sell land, or easements? And would easements come with a rental fee? This is productive ag. land. This isn't just swampland. And so what you're asking our villagers to do is to give up productive ag. land for what kind of compensation? When will the compensation be defined? And why do we have to sell? Why won't easements work? So those are my questions. 1 | |

| USACE response: |
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| 1: The Corps is currently working to identify the lands needed for/affected by the project footprint. Once the project footprint has been determined, the Corps Real Estate Division identifies the minimal real estate interest (fee purchase, easement, etc.) required for each affected parcel and develops a real estate map to reflect the real estate needs. Utilizing the real estate map that has been developed, an appraisal is performed on the property to determine its fair market value based on the type of real estate interest (fee purchase, easement, etc.) is identified for each respective parcel.<br><br>The determination for fee purchase versus easement is dependent on the amount of impact associated with the highest and best use of the property. For instance, if a pasture used for livestock was to be flooded on a frequent basis as a result of the project, and render the pasture unsuitable to raise livestock, that type of situation may constitute a fee purchase. Likewise, if only portions of a pasture were subject to flooding but the overall pasture remained suitable to raise livestock, that type of situation may constitute a flowage easement.<br><br>After the appraisal is complete, the sponsors will contact the respective landowners to make an offer on the property based on the appraised value. Once the selling price is set, the landowner conveys fee ownership or easement rights to the sponsor, which is recorded by the Mason County assessor. Then, the landowner is paid.<br><br>When easements are used instead of fee purchase, a deed restriction is placed on the property title, but the land remains privately owned after the project construction is complete. The easement protects the ecosystem restoration habitat improvement in perpetuity. Access to these privately owned lands is controlled by the landowner. |

| PM8<br>Verbal at public meeting 3/20/2014 | Commenter:<br>Blase Gorny | |
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| Comment:<br>I'm going to piss off a lot of my friends in the room right now. I've been in the valley for 44 years now and I've seen everything happen. I know all of the stories. I was on the flood board for years and years and years, too. So I've been through it all.<br><br>I think there's a lot of merit to this plan. I think that we really have no choice. These are not the people that are - that refused to dredge the river saying we can't do anything. It's primarily the Corps of Engineers. You're responding to that. I don't know what else we can do. So I think we should seriously take a look at this. There's things that look pretty good on there. There's some things that I don't particularly agree with. But I think there's general merit in the whole thing. | | 1 |

| USACE response: |
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| 1: Comment noted. |

| PM9<br>Verbal at public meeting 3/20/2014 | Commenter:<br>Rich Geiger |
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Comment:

My name is Rich Geiger. I'm with the Mason Conservation District and I've been involved with the study since it started up, well actually before 2006. And there's a few things I heard tonight I think it's time for folks to hear the rest of the story because there is a bigger story here. This is not just - or this is not the end of what is being proposed, but rather this is what we call Corps-sized projects, the big ones where we need federal assistance to get funded and carry them out. What we also have - and I brought it here this evening - is a longer list of projects that will - that are being proposed for the valley and being funded by other means. And one of the ones I wanted to announce especially was Ten-Acre Creek for Paul Hunter's place. We haven't lost visibility of need for that. We just decided that it was something that was better carried out on a local level than trying to get the Corps involved on what's essentially a simple project. But we have a lot of these simple projects identified. 1

So far as funding is concerned, I do not think that the valley has ever been in a better position so far as seeing funding for actual work getting done as we are now. We are - or the Corps is requesting 41 million. That's their estimate. And at 35 percent, the county share is about 14 million and that is about the level that other watersheds in the state are being funded for major watershed restoration plans. So that money is identified. You've got a real chance to go forward and do work. And we will be talking to folks about these additional projects and try to get them - try to get them off the ground. We've got a planning horizon now through 2019, and it's probably going to take longer than that. 2

But there is more going on than simply these projects. And we are looking at your properties. We're listening. We want to tell you especially some of these questions like with the side channels for Swift and Hunter Creek - or Hunter Creek and Weaver Creek, we're listening very closely to what you have to say about what the impact might be on your property. But what we do ask is if you would just let the surveyors on your property and let us have a look, that will move - that will keep things moving forward rather than grinding to a halt after what's been a very long effort and holding up work that's been accomplished by other folks who really want to see the Skokomish Valley thrive. And I guess that's it. Thank you. 3

**USACE response:**

1: Various Federal and State agencies as well as local entities are working within their individual authorities and within specific areas of the Basin to implement restoration activities throughout the upper and lower watersheds. There are a number of proposed present and future restoration projects for the Skokomish River Basin, including many that are not part of the Corps' recommended plan. As discussed in the comment, there are numerous restoration projects that have already been identified and are generally smaller in scale, which could be easily implemented by a local entity. These smaller-scale projects paired with the Corps' recommended plan will produce positive, cumulative effects across the Basin.

Mason County, the Skokomish Tribe, and Mason Conservation District intend to pursue many projects not included in the final Federal Plan over the next several years. Preliminary design and environmental impacts have been completed and assessed for most under this Integrated Feasibility Report and Environmental Impact Statement. Grant funds will be pursued to complete final design and construction of these important projects. Completing these projects at the local level will likely enable local sponsors to move more quickly and cost-effectively.

2: The cost estimate of the recommended plan has been updated based on refined designs included in the Final Feasibility Report/Environmental Impact Statement.

3: See Master Response 1 and Master Response 2.

| PM10<br>Verbal at public meeting 3/20/2014 | Commenter:<br>Bob Albaugh |
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Comment:

Can you pull that screen back up that showed the different channels in yellow? And Rich, we had talked about this in the last meeting. And thank you for bringing up that this has been going on since 2006. Now it's 2014. We're looking at 2019 to get something done. And I don't know how many millions of dollars have been spent on the research part of this. I'll leave that at that. 1

J.R. Hunter had brought up a point at the last meeting that each of these little things . . . And by the way, these are represented - not yellow part but the white part, those are fields. Those are agriculture. This is for Hunter Creek and Weaver Creek. Why is it called Hunter Creek? Agriculture from that family built this. That's why they named it after him. They're talking about digging the ditch through the middle of these agricultural fields and fencing it.

I understand what you're saying about trying to get on board. But that great big white elephant up above the number 39 is causing these other problems. You can't run a cross fence - and Janie brought this up at the last meeting as well - over very good agricultural land and expect people to still be able to sustain and farm it. How can that make sense to anybody in this room, anybody in this room, to fence those areas? There's crops. There's cattle. There's all kinds of things that has happened on this ground, like Bill Senior said, for over a hundred years. You can't expect that when the big problem is in that river. That's my comment. Thank you. 2

**USACE response:**

1: The Corps acknowledges that this study has required considerable time and resources. In October 2012 the study was rescoped and accelerated, which was intended to reduce study costs and timelines. Since this rescoping, the study has made considerable progress and maintains momentum. The study is anticipated to be complete in Fall 2015. However, Congressional authorization and appropriation is required before this project is constructed. Following completion of the Final Feasibility Report and Environmental Impact Statement, the Corps will forward the project recommendation to Congress for their review. If Congress endorses the recommendation, it is anticipated that they would provide authorization for construction in a Water Resources Development Act, which is typically passed every 2-7 years. The authority to construct, however, does not equate to the funding for the design and construction phase, which would be addressed annually in the Federal budget and biannually in the state budget.

2: See Master Response 1, Master Response 2, and Master Response 5.

| PM11<br>Verbal at public meeting 3/20/2014 | Commenter:<br>Art Tozier |
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Comment:

I've been a resident of the Skokomish Valley since I was brought home in 1949. One of the things that I never hear anything about is the headlands of the Skokomish where the water comes from, the mountain ranges, the Olympic National Park, south mountain, north mountain, all of the drainage of the Skokomish. You've got Vance Creek. You've got Swift Creek. You've got north fork. You've got the south fork. You've got all of these tributaries in the valley. I'd like to ask anybody in this room tonight how many tons, how many pounds, of spongelike matter are on an acre of timbered forestland? Can any of you folks here answer that? Does spongelike matter retain any water? Can any of you folks answer to that? You're all well-educated I take it, have got college degrees. Well, spongelike matter in the forest is all of the decomposed material. Do you know how many tons, how many thousands of pounds? Is it a significant amount do you think? Would 150 tons, 300 thousand pounds per acre be any figure that you would want to work with? That's what's in spongelike matter in a forest. When you take that material off at a rate that's been stripped in the Olympic National Forest and in the headlands of the Skokomish Valley, you're not going to be able to hold the water; it's going to run off; instead of slowing the water down in the mountains and putting small pondlike series in, like in Europe or back in the Tennessee Valley area that they did, and then let the mountains and the water work together and then release that water when we had low flows instead of letting it come down on us all at once. 1

And standing in the middle of the Skokomish watershed on my berm the other day when I couldn't get out and get to work and we were locked in there for a while until I had finally one of my employees come out with an old one-ton truck and drive through two foot of water to get through to me so I could go back to town and pick up somebody, that water has gotta be slowed down before it ever gets to us. It isn't anything about what the valley can do with it. It's about slowing it down before it ever gets to us. 2

And I don't know where the Army Corps of Engineers ever got in the fish business. I thought the Army was in the business of protecting us. I thought you did projects. You know. I thought that's what it was all about. I thought you were like my brother's great ancestor, Andrew Tozier, that fought at the Battle of Gettysburg that was a flag soldier that was credited with helping turn that war. I feel like we're the same guy today trying to turn this tide. You guys never ever say anything about the habitat that we've created with those agricultural, verdant pieces of ground. One of the things that grows naturally out there that I would ask anybody if they know what grass or what cover crop grows really well in the Skokomish Valley. Anybody want to ask - anybody got a - throw it out there? We grow clover naturally. The federal government is now paying - I think it's in Missouri - $3 million to have Farmers go plant clover. Clover naturally comes into the Skokomish Valley and that beautiful drainage that we live in. What's the most primary thing that we're worried about today besides the fish? The honeybee. The honeybee. So if the Skokomish Valley was the last place on the face of the planet, there's only three percent of that's arable and farmable, that place in the Skokomish Valley could grow that clover and sustain those honeybees. Used to be that if you had honeybees in Mason County, you had to do what? Does anybody know what you had to do when you had 3

14

honeybees in Mason County? You had to register those honeybees with the County Extension Agent. So if we don't have any honeybees, your kids, your grandkids, your parents, your grandparents, whoever, you guys here, won't have a Safeway store. You won't have a whole bunch of agriculturists fending off the battle of starvation.

Sixty percent of all of the fresh potable water is held in British Columbia. Three percent of the ground is arable. Pretty soon you guys aren't going to have any groceries. And like I said the last time I stood up, don't complain about a farmer when your mouth is full and your bellies are full. That's all I have to say.

I've got a lot more to say. But it's very distasteful and disdainful for me to be brought up in an agricultural community that has made a living - and I will quote Haldean Johnson (phonetic), better known as Doc, "Nobody knows what it's like until you make a living from underneath the dirt of your fingernails." And none of you folks have probably ever had to do that. Nobody here in . . . These jobs that you've got are in offices. You're not out on the ground. 3

You're not feeding cattle. You're not pulling weeds. You're not making crops grow. So you're right. With me the buck stops here. I'm like my relative, Andrew Tozier, at the Battle of Gettysburg. And he was a flag soldier that stood his ground. And it recounts in history that if he hadn't stood his ground and stayed the course that we would be living in a different world today. And that's what I'm afraid of is that for the rest of your kids and the rest of humanity, that you're going to live in a different world. Thank you for your time.

**USACE response:**

1: Headwater streams are integral components of a healthy watershed with irreplaceable value for water quality and biodiversity of the whole system. Timber harvest methods have had measurable contributions of sediment to the Skokomish River. Over the past 20 years, the US Forest Service has updated timber harvest regulations and practices to be more environmentally sensitive to the ecological value of the headwater reaches. The upper reaches of the Skokomish watershed are under the control of the US Forest Service as well as Green Diamond Timber Company. While the Corps' study is recommending an ecosystem restoration plan for the Skokomish Valley, the synergistic efforts of those involved in restoration of the entire Skokomish River watershed will produce positive, cumulative effects across the Basin.

2: Upper watershed restoration began in Olympic National Forest in the mid-1990s with over 200 miles of roads decommissioned or stabilized, over 200 miles of upland soil stabilization, and nearly 4 miles of stream restoration. The proposed project component toward the upstream end of Skokomish Valley at River Miles 9 to 11 includes installation of log jams that should help with slowing flow and creating pools. Additionally, the US Forest Service installed over 30 large engineered log jams in the South Fork Skokomish River in 2010 in River Mile 12 to 13 with several purposes, one of which is to slow river flows.

3: See Master Response 5. In addition, the Corps is in the "fish business" because ecosystem restoration is one of the primary missions of the U.S. Army Corps of Engineers Civil Works program, under which the Skokomish River feasibility study is being conducted.

| PM12<br>Verbal at public meeting 3/20/2014 | Commenter:<br>Jens Stratton |
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Comment:
My name is Jens Stratton, and after hearing Mr. Tozier talk, I was a little inspired. I heard - I'm a
real estate agent so I'm familiar with eminent domain. And I also [am] a small-scale hobby
organic farmer so I have an appreciation for farming and high quality farmland, which 1
Skokomish Valley is. And I know that the Army Corps of Engineers has a history of using
eminent domain to take people's land. And this farmland - as the population approaches nine
billion by 2030, this kind of land is going to be a high value commodity. So if they're going to
declare eminent domain - which I guess apparently that's not the case in this situation but it
has happened elsewhere - I would encourage the landowners to look into the value of
farmland in the future here. Because by 2030, the population approaching nine billion, there is
going to be a food shortage coming up. If there's any way we can retain high quality farmland
for producing local crops in this area, I'm in favor of that.

**USACE response:**

1: See Master Response 2 and Master Response 5. In addition, the Corps will not declare eminent domain for this ecosystem restoration project.

| PM13<br>Verbal at public meeting 3/20/2014 | Commenter:<br>Janie Kamin |
|---|---|

Comment:
I kind of had my say at the last meeting. But again, when we started this project again in 2005,
we were looking comprehensively at restoring the whole watershed. I worked very hard with
the SWAT group and with the tribe and doing the upper watershed and lower watershed and 1
doing complete restoration of the Skokomish River. And in the years that I haven't been
involved in that, that complete restoration of the Skokomish River has turned into an
ecosystem restoration. And when I look at what is being proposed, I have to say how much fish
habitat do you need? And how much is enough? Because you're not - the projects that are
being proposed are not really about restoring the river any longer. They're about creating
additional fish habitat. And I don't see where this is restoring certainly in my family's fields, and
I have not seen any project on Paul Hunter's. That's my homestead. I'm curious to see what
you're proposing for that. But [...] but you are creating habitat. You're not restoring habitat. 2
Those were fields. Those were farm - agricultural fields for at least - over a hundred years. My
family - I'm fifth generation from the valley. We'd hoped that we could continue. And my kids
would love to live out in the valley. But at this point, again, there's been a building moratorium
on there since 1997. There's very little we can do to be able to preserve our family farm and
our heritage and our homesteads out there. This does nothing.

And if you want buy-in from the people who live out there and whose lands that you're going
to want to use, you've gotta have something in it for them. At this point, there's nothing in it
for any of us, not really. I mean like I said, how much fish habitat do you actually need? And
you're talking ecosystem. There are - as Art said, there's more than fish out there. And like 3
Barb said, there's elk. You know. There's other animals besides the domesticated ones that we
- that have lived out there, that we've raised out there. So again, if you want buy-in from the
people in the valley, you've got to give them something in return. It would be nice if you were

able.

Years ago, in 2006 I think, we spent at least $25,000. I don't know how much that was. We hired a hydrogeomorphologist to give us best available science so that we would be able to partially lift the building moratorium and allow some relief there. People live in floodplains all over the world. We should be able to live there and continue to farm there. And that's what I would have hoped from this plan and all these studies that have been put - that have been conducted in the last few years. It would be nice if there were more benefits rather than just creating fish habitat. Thank you. 4

**USACE response:**

1: The Corps' recommended plan is one element of an integrated restoration effort in the entire Skokomish River watershed. There is a strong, united effort by Federal, State, and local agencies as well as the Skokomish Indian Tribe for holistic restoration of the Skokomish River Basin. Various Federal and State agencies as well as local entities are working within their individual authorities and within specific areas of the Basin to implement restoration activities throughout the upper and lower watersheds. While the Corps' study is recommending an ecosystem restoration plan for the Skokomish Valley, the synergistic efforts of those involved in restoration of the entire Skokomish River watershed will produce positive, cumulative effects across the Basin.

Mason County, the Skokomish Tribe, and Mason Conservation District intend to pursue many projects not included in the final Federal Plan over the next several years. Preliminary design and environmental impacts have been completed and assessed for most under this Integrated Feasibility Report and Environmental Impact Statement. Grant funds will be pursued to complete final design and construction of these important projects. Completing these projects at the local level will likely enable local sponsors to move more quickly and cost-effectively.

2: The Corps focuses restoration efforts toward examining which natural processes are impaired and how to most efficiently restore those ecosystem processes. Some of the problems identified include removal of large woody debris from the river channel, logging that removed trees for shading and wood recruitment to the channel, and small levees that reduced the total riparian area available for river flows. Restoring these aspects of natural processes has multiple benefits, including fish habitat as well as more natural hydraulics in the river channel.

Since salmon first began inhabiting the Puget Sound basin rivers as glaciers receded 10,000 years ago, habitat is viewed in a larger time scale than the period of human settlement and the onset of timber harvest and agriculture. Salmon and agriculture can certainly co-exist. Many areas not in agricultural use can be restored for greater fish productivity. The Corps does not set population recovery goals as this is the purview of other Federal, State, and local agencies and tribes. The Corps provides Federal project funds and expertise to non-Federal project partners with holistic ecosystem restoration goals.

3: See Master Response 2. In addition, the Corps is currently working to identify the lands needed for/affected by the project footprint. Once the project footprint has been determined, the Corps Real Estate Division identifies the minimal real estate interest (fee purchase, easement, etc.) required for each affected parcel and completes an appraisal to determine the value of affected properties. After the appraisal is complete, the sponsors will contact the respective landowners to make an offer on the property based on the appraised value. Once the selling price is set, the landowner conveys fee ownership or easement rights to the sponsor, which is recorded by the Mason County assessor. Then, the landowner is paid.

4: Mason County code currently prohibits construction of new structures or the expansion of existing structures within the floodway. Zones A and A2 of the Skokomish River, Vance Creek, and tributaries are designated as floodway due to special flood risk associated with avulsion based on 1998 flood maps and best available modeling at the time of ordinance adoption.

A new hydraulic model was completed as part of the development of the Feasibility Report/EIS. This model was provided to FEMA to incorporate in map updates and Draft maps have been presented for agency review. Once the maps have been adopted by the County, a change to County code may result in a change of floodway designation allowing for some expanded development.

| E1<br>via email 3/26/2014 | Commenter:<br>Jeffrey Gaeckle |
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Comment:

To whom it may concern,

The area of eelgrass (Zostera marina L.) currently listed on page 81 in the January 2014 version of the DRAFT Integrated Feasibility Report and Environmental Impact Statement report is incorrect. Based on the Washington State's Submerged Vegetation Monitoring Program's (SVMP) methodology, there are seven sample sites that make up the entire extent of Annas Bay. To date, the SVMP has only sampled three of these sites and the Draft FR/EIS (Jan 2014) only presents 2008 data (4.3 ha = 10 acres) from one of these sites (hdc2383-Annas Bay). Sampling conducted in 2010 at hdc2380-Skokomish Flats and hdc2381-Skokomish Flats West found 88.2 (217.9 ac) and 34.6 ha (85.5 ac) of eelgrass, respectively. Although, there are no eelgrass area data available for the other four sites, sources indicate eelgrass was present at all of the sites. The Marine Vegetation Atlas (http://mva.apphb.com/index.html# <http://mva.apphb.com/index.html> , must be opened in anything but MS Explorer) identifies three other sources of data including the SVMP reports. These include: 1

1) Berry, H., J. R. Harper, T. F. Mumford Jr., B. E. Bookheim, A. T. Sewell, L. J. Tamayo. 2000. The Washington State ShoreZone Inventory User's Manual. Nearshore Habitat Program, Washington State Department of Natural Resources, Olympia, WA. 23pp.
2) Thom, R. M., and L. Hallum. 1990. Long-term changes in the areal extent of tidal marshes, eelgrass meadows and kelp forests of Puget Sound. Wetland Ecosystem Team, Fisheries Research Institute, School of Fisheries, University of Washington, Seattle, WA.
3) Washington State Department of Ecology. 1979. Coastal Zone Atlas of Washington State: Volumes 1 - 12. State of Washington Department of Ecology, Olympia, Washington.

Other eelgrass data can be acquired from The Skokomish Indian Tribe and USGS who conducted a thorough mapping project of the Skokomish Delta in 2013.

Finally, another concern with the report is the lack of any review of excess turbidity from the proposed project and the effects the excess turbidity may have on submerged aquatic plants (e.g., eelgrass) along the Skokomish Delta. Will the project require monitoring of submerged 2 aquatic plants or photosynthetically available radiation (light) along the Skokomish Delta to demonstrate that project activities cause no net loss of habitat function in the eelgrass?

Thank you for taking my comments into consideration.
Jeffrey L. Gaeckle, Ph.D.
Seagrass Ecologist
Nearshore Habitat Program, Aquatic Resources Division
Washington State Department of Natural Resources (DNR)

**USACE response:**

1: The Corps appreciates the notification of an inaccurate element in the report. The 2013 figure from the WDFW database has been removed from the Final Feasibility Report/EIS. The primary source of information on extent of eelgrass is via email with staff at the Washington Department of Natural Resources assigned to the Submerged Vegetation Monitoring Program. The Corps requested the most recent data available from this team and was provided the information that appears in the report. Only one of the eelgrass monitoring sites was included as a figure in the report to serve as a representation of the sampling and to show the increase from 2005 to 2010 rather than providing a comprehensive report.

During preparation of the report, the Corps was not aware that the Marine Vegetation Atlas could not be viewed in MS Explorer. This internet browser is the only browser software approved for use on Department of Defense computers, so it only appeared as a non-functional website. Now that the information has been shared that another browser is required, Corps staff has sought out another method to view the Atlas and consulted the other sources referenced. The Final Feasibility Report/EIS has been revised accordingly.

2: The Final Feasibility Report/EIS has been revised to include a statement of effects of turbidity from the riverbed excavation alternatives. Thank you for pointing out the lack of information.

| E2<br>via email 3/28/2014 | Commenter:<br>Jason Ragan |
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Comment:

To whom It may concern, to the best of my knowledge, the Mason County Commissioners first wrote a letter to the Army Corp of Engineers in 1939. They were requesting assistance with the flooding problems caused by the Skokomish river at that time. Over the 7.5 decades since that time, the watershed has continued to decline in quality. Many millions of dollars have been spent studying the situation, and many families have had to leave the fertile lands of the valley. The quality of life is still declining to this day. The reason I started with this is so that you might begin to understand why some people are so angry and frustrated with the slow pace, and inaction of the latest study. As we attend public meetings, we see the changing faces of government employees come and go. Some genuinely care about finding a solution, most are just doing a job and looking for their next promotion. As a 5th generation valley resident, I am raising my kids here, and am hope full that they might get the chance to raise the 7th generation in this beautiful place. 1

I understand that the current scope of the project is an Environmental Restoration project, but

when speaking with people that live there, keep in mind that the valley is also habitat for
people. It is a residential area, and productive agricultural land, Not just salmon habitat.

The Skokomish Valley is the largest agricultural area in Mason County and the Skokomish river 2
is the largest freshwater tributary to Hood Canal. Hood Canal has dissolved oxygen and water
quality issues. I also want to point out that agricultural production in the Skokomish Valley is
way down from historical levels. The Mason Conservation District has historical records in
reference to this fact. Both of these declines are due in large part to the frequency and
severity of flooding. Sadly, the Army Corp has only looked at the conditions in the Valley as
they currently exist. Furthermore, this study does not seem to consider the impacts to Hood
Canal. When the river floods so frequently, nutrients from septic systems, animal manure, and
other sources are flushed into Hood Canal. As I understand it, flooding conditions will continue 3
after the proposed work is complete. This exacerbates the low dissolved oxygen problems in
Southern Hood Canal, and causes frequent closures to the shellfish growing beds on the
Skokomish tide flats.

Was the rivers impact to Hood Canal considered?

If the rivers impact to Hood Canal was not considered, why?

Are there places in the valley that flooding will get worse if some of these projects are 4
implemented?

What will happen specifically to the valley if nothing more is done? 5

Regarding "project 9", is the Washington State DOT going to be ok with additional water flow 6
under that particular bridge?

What I need to see, is a solution that takes into account the fact that the Skokomish valley is an
important part of Mason County. It is worth investing in because it has many benefits to the
surrounding community, not just fish habitat. Work on this issue needs to be done as quickly 7
as possible. Conditions are getting worse in the middle parts of the valley at an alarming rate.
The river water needs a healthy channel to flow in and it does not belong in farmers' fields, for
many reasons.

I hope to see more detailed design of some of the proposed projects in the near future. I do 8
believe that some of them will help reduce flooding, but only if something is done very soon.

Due to the fact that the Army Corp has decided it is too expensive to remove gravel, will any of
the proposed projects allow the local sponsors to work on gravel removal over a longer period
of time? It is my strong opinion that if a small scale effort had been going on over the past 30-
40 years, conditions would be much better. There is a demand for gravel and it can be 9
removed in a responsible way. If we can start a local effort to remove some sediment from the
river channel now, we will begin to make a difference. If we continue to study it and talk about
it, we will not improve conditions.

Thank you for taking the time to read this.

**USACE response:**

1: The Corps acknowledges that this study has required considerable time and resources. In October 2012 the study was rescoped and accelerated, which was intended to reduce study costs and timelines. Since this rescoping, the study has made considerable progress and maintains momentum. The study is anticipated to be complete in Fall 2015.

2: See Master Response 5.

3: Corps feasibility studies consider existing conditions to identify problems and opportunities rather than looking at how conditions may have existed at some point in the past for intensity of human development or for abundance of fish and wildlife populations. The objective for ecosystem restoration projects is not to restore conditions as they may have existed in the past but to restore natural processes that support ecological resources.

The Corps does not typically have authority to study or attempt to resolve problems relating to water quality; therefore, the problem of low dissolved oxygen in Hood Canal is outside the Skokomish Basin study area for this feasibility study. Water quality issues are under the purview of the US Environmental Protection Agency and the Washington Department of Ecology.

4: The recommended plan is designed for flooding to occur similar to existing conditions. It is also designed to avoid increasing downstream flood risks in the Skokomish Valley.

5: The "Future Without-Project Condition" is the most likely condition in the study area if no Federal (Corps) action is taken. In the future without-project condition, sediment accumulation is expected to continue to reduce the channel capacities of the mainstem and South Fork Skokomish Rivers as well as Vance Creek. Flooding in the Skokomish Valley is expected to become even more frequent, but only small increases in flood depths are likely due to the broad floodplain in the valley. Continuing sediment accumulation is expected to cause the subsurface flows in the South Fork and Vance Creek during the late summer/early fall to become more frequent and last longer. A channel avulsion that would create an entirely new channel is possible within 20 years.

6: The existing Highway 101 Bridge in the vicinity of "Project 9" is estimated to be adequate in width and height to convey flows associated with this restoration project. The Corps and sponsors will coordinate with the Washington State Department of Transportation as designs are finalized to ensure bridge capacity is adequate to convey additional flows.

7: See Master Response 5.

8: Feasibility-level designs (approximately 35% designs) are presented in Appendix H of the Final Feasibility Report/Environmental Impact Statement. More refined designs (65%, 95%, etc.) will be completed during the Pre-Construction, Engineering, and Design phase.

9: There is an opportunity for local sponsors to work on gravel removal over a longer period of time; these actions could be implemented independently of the recommendations included in the Corps' feasibility study. However, permits from the appropriate Federal, state, and local authorities would be required for activities in, over, under, or near waters of the United States. The Corps will continue to be available to Mason County and the Skokomish Indian Tribe to ensure any proposed actions are complimentary to the recommended restoration plan.

| E3 via email 3/29/2014 | Commenter: Mali Krivor |
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Comment:

I wish to state my objection to nearly every tentatively selected plan but most especially I object to plans #28, #31, #35, #40 and #43. These proposals may or may not help fish but the potential for harming people is too high. It has been stated that dredging the river would make the cost of disposing of the gravel too high yet it would seem that dredging could provide the best result for people and fish. The result of this 30+ year study is astoundingly illogical. The result seems as though nothing costs too much concerning fish, and everything costs to much concerning people. 1

If the amount of time and treasure had been spent on a dredging and gravel disposal plan, the poorly function river system might be flushing properly by now and the county may have had a continuing source of revenue. 2

Bah, this plan is madness! Worse, it is now put forth that "these plans are it, take it or leave it". So be it.

Mali J. Krivor, Co-Owner
Skokomish Farms Inc.

**USACE response:**

1: See Master Response 1 and Master Response 2.

2: See Master Response 4.

| E4 via email 3/30/2014 | Commenter: Alann Krivor |
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Comment:

As a group of 12 owners and spouses on the north side of the Skokomish River we have listened to the Corps of Engineers plans to correct the problems of flooding issues of the Skokomish River. Your latest plan is to remove the car dike on our lands, and to allow the South Fork to flow through and adjacent to our lands. As president of both the Skokomish Farms Owners Association and Skokomish Farms, Inc., we oppose and cannot permit removal of the dike designated as Plan 31 in the Skokomish GI as it provides specific protection for our land and farming operations.

The car dike was constructed by the Richert family, the former owners of our farm, to prevent flooding of the farm's south fields. We purchased the farm in 2008, and subdivided the farm into 19 - 40 acre parcels of which 12 have been sold. With the guidance of Washington State University and the Mason Conservation District it is our intent to use these south fields for vegetable crops, orchards and vineyards. 1

Nine of the 12 parcels will be severely impacted by the removal of the car dike. These fields will become a flood plain and completely unusable for our agricultural purposes. Therefore, on behalf of all the Skokomish Farms owners we will oppose any removal of the car dike.

We will investigate the dredging the South Fork and Main Stem of the Skokomish River. We firmly believe the dredging can be of benefit to the river, the fish, and financially to the Skokomish Tribe and the Skokomish Valley landowners. We know that there are many studies opposing dredging. But we also know that dredging can be very beneficial to fish populations if done correctly. Dredging can provide pools thereby greatly improving fish and marine life habitat as certain studies indicate. 2

As a principal in the development of Skokomish Farms, I have been active in the land development of over 14,000 acres in Idaho, Montana and Washington for more than 40 years and speak from experience.

Thank you,
Alann Krivor
President/CEO
Skokomish Farms, Inc.

**USACE response:**

1: See Master Response 2.

2: Comment noted.

| **E5 via email 4/6/2014** | **Commenter: David Kregenow** |
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Comment:

"the non-Federal sponsors and study teams have agreed to continue to pursue a single purpose (ecosystem restoration) feasibility study. Although the study is a single-purpose study focusing on ecosystem restoration, there is a potential for ecosystem projects that secondarily meet flood risk management goals. Additionally, local and State government agencies will continue locally funded flood damage reduction efforts to achieve local flood risk management goals, such as preserving local business, communities, and historic land uses." Page 1

**We can agree with this objective, provided there is due consideration of public input for the use of public funds, and the objective of flood control is not abandoned in favor solely of ecosystem restoration. The problems of the ecosystem and flooding are inter-related, due to sediment deposition in the river and altered flow rates. A plan that fails to address the built-up sediment in the river addresses, marginally, ecosystem problems and neglects the shared public concerns for, and public funding of, flooding problems in the region.** 1

"The Feasibility Study for the Skokomish River Basin is being conducted under the Authority of Section 209 of the River and Harbor Act of 1962, Public Law 87-874 (Puget Sound and Adjacent Waters):

"... in the interest of flood control, navigation, and other uses and related resources."
"Seattle District Office Council has confirmed the appropriateness of this authority with USACE Headquarters Office of Council. The Act's reference to "other water uses and related land resources" provides sufficient authority to study ecosystem restoration opportunities in the Skokomish River Basin." Page 2 2

**However, I would like to believe that the District Office Council did not give blanket authority to do as the Sponsors chose with Federal Resources. I would hope that the District Council, and hence the people of the United States, agree that this particular use of public funds is in agreement with the Act. Specifically, a set of actions that do nothing to control flooding or navigation for $41 million needs to be publicly debated, or at least authorized by the agency responsible for the Act.**

"The purpose of the feasibility report is to identify the plan that reasonably maximizes ecosystem restoration benefits, is technically feasible, and preserves environmental and cultural values." Page 6

Section 2.1 Problems and Opportunities
**We agree that there are several factors contributing to habitat degradation. The largest and most obvious, is the sediment deposition from upstream logging and reduced flows that create simultaneously flooding problems and** "One reach of the South Fork Skokomish River near the North Fork confluence started running subsurface in the late summer months (figure 2-1, top row) about 10 years ago." Pages 7-8 3

2.5 Planning Objectives
"Provide year-round passage for fish species around the confluence of the North Fork and South Fork Skokomish River for the 50-year period of analysis." Page 13
**This is a long way from where this started and from whence the Act authorizes the use of public funds. If the project has abandoned the objective of flood control in favor of ecosystem restoration, then the Sponsors need to find an act more pertinent to ecosystem restoration.** 4

2.6 Planning Constraints
"Due to the history and controversy surrounding this settlement agreement, USACE will not propose structural modifications to Cushman Dam, including dam removal, flow modifications, or operation adjustments ..."
**However, these issues are inter-related so rather than address the root causes of the problems, you are introducing Federal funding that impacts private property. Federal projects, and lack of commercial environmental regulation created this problem. Keep your solutions limited to the root causes.** 5

"The special flood risk zone is designated as a floodway and an avulsion risk area, which imposes restrictions on new structures, existing structures, water flow modification structures, bridges, and roadways."
**However, as a Sponsor, Mason County has the ability to modify its Flood Ordinance in the interest of this project in support of the region's objectives, which appear to include both ecosystem restoration and flood control.** 6

"Proposed projects will avoid negative effects to tribal interests." **What exactly are the tribal interests?** 7

Page 14
2.7 Public Scoping Comments and Resources of Concern
"While many public scoping comments were related to the flooding problems in the study area, the non-Federal sponsors and study team have agreed to continue to pursue a single-purpose study focusing on ecosystem restoration only." **That is not exactly what you said in Chapter 1. Page 14**
"Comments encouraged channel restoration to improve habitat, as well as to alleviate flooding." Page 14
**Somehow, then, the study sponsors have co-opted the public's right to use public funds and** 8
**determined that a use of $41 million of public funds, designated for flood control, can be used to invade private property to restore fish habitat while doing nothing to reduce flooding, fish stranding, or the fundamental underlying problems of excess material in the river bed and insufficient flows.**

3.4 Initial Array of Alternatives
The following sentence is associated with several discussions of potential dredging operations:
"Dredged material would be placed in the estuary and nearshore zone of Annas Bay which would constitute beneficial reuse of material and would provide suitable hard substrate for shellfish attachement." Page 20 9
**This length of transport also is costly. There should be consideration of alternative solutions such as more local use of the dredged material. Many of the areas farms could use gravel for roads, for instance. Material could be deposited in low-lying areas to simultaneously address flooding issues, preserve agricultural land, and still improve fish habitat.**

Base #3: NorthFork/South Fork Confluence: Car Body Levee Removal
"This base proposes removal of the levee on the north side of the mainstream near the original North Fork confluence. This base primarily addresses the project objective of restoring a continuous low flow channel near the confluence and to a lesser extent the objective of improving the quantity, quality, and complexity of pool habitat in the river. Mainstem flows would be diverted into the North Fork channel and reenter the mainstem at the confluence location. This would bypass the subsurface flow reach and provide improved fish migration. A portion of flood flows would stay in the old channel. Installed LWD would direct flow in the new channel and improve fish habitat. Periodic maintenance may be necessary to remove sediment accumulations from the new channel." Page 21

**Since this Base was deemed cost ineffective by the Corps, and then forced back into** 
**contention by the Sponsors, and ultimately selected as the best option, it deserves careful** 10
**scrutiny. The car body levee was put in place to address the flooding of the agricultural lands. Were it not for the deposition of sediment in the mainstem, flooding would not likely be an issue and the levee would not have been built. Is there any evidence that the river would have followed this path originally, before the influence of man such as sediment deposition. We are really talking about what we are trying to restore here. I don't think anyone objects to removing car bodies. However, one could replace them with engineered levees built with dredged materials from the river bed such that the channel flows continuously and the agricultural land is preserved.**

**In addition, the use of LWD to redirect the river is ironic since previous private owners attempts to do exactly this have been deemed unlawful and forced to be removed.**
**Finally, the belief that this base is sustainable is highly suspect. Given apparent rate of deposition in the river from upstream sources, and the low flow state, it seems unlikely that creating a new channel in this way will be sustainable without continued management of deposited material.**

3.6 Focused Array Alternatives
"Based on an evaluation of the initial array of alternatives using the decision criteria outlined in Table 3-4, the Corps PDT recommended carrying Bases #1, #2, and #5 forward into the focused array of alternatives because they meet the study objectives and have the largest anticipated benefits to species of concern in the Basin. In addition, the study sponsors requested that Base #3 be carried forward into the focused array because the Car Body Levee removal would allow natural river processes to be restored in a sustainable way." Page 25

**Where in Base #3 is there any analysis of natural river processes being restored in a sustainable way? Base #3 seems least natural in that it fails to address the primary problem of excess sediment in the river causing underground flow. Where is the analysis that says** 11
**this redirection of flows is natural, beneficial to the ecosystem or the local population, or is sustainable? There may be other species adversely affected by this plan. The plan might easily create alternative flooding and side channel problems leading to increased fish stranding.**

Increments
**Project #28 clearly includes the construction of new levees. Hence, one must consider levees an acceptable management practice in other areas as well. The Car Body levee appears objectionable because it used car bodies rather than other artificial means of controlling flooding. You already stated on Page 21 that there are "no HTRW concerns at the car body levee." Hence, the environmental impact is based upon the presence of car bodies and not on the presence of a man-made structure or levee.**

3.7.1 Cost Estimates
**Based upon the alternative considerations raised above, such as alternative uses for dredged material from the river channel and increased maintenance estimates for Base #3 due to the high likelihood of additional debris deposition, these cost estimates are biased in favor of Base #3, an option only still under consideration due to the local Sponsors insistence.** Page 29 12
**If the process had only considered Bases #1, #2, and #S as deemed appropriate by the Corps, and the Increments, we would have a very different final recommendation. Based upon Table 3-6, Bases #1 and #5 would have to be eliminated since their estimated costs exceed $41 million, leaving only Base #2 plus a selection of Increments.** Page 30

3.7.2 Environmental Outputs
**This is a classic "black box" analysis where the public has no opportunity to scrutinize what is deemed environmentally beneficial. The cofactors created by such modeling are arbitrary unless rigourously developed, and it is no information is presented as to how this model was** 13
**developed or how it could possibly accommodate all the pertinent environmental factors in a study areas of this size with this many projects under consideration.**

"Placement of dredged material in the Skokomish estuary and nearshore zone appeared as the most feasible disposal option (other options included disposal in a nearby quarry or open water disposal)." Page 31

**Again, there does not appear to have been due consideration of options such as road and infrastructure improvements on adjacent agricultural lands, or habitat and agricultural improvements through the use of engineered levees with re-purposed riverbed material.** 14

Table 3-8. Cost Effective Plans Pages 33-34
**No mention of Base #2, and Base #2 plus Increments is included. Base #2 was the only financially viable alternative offered by the Corps, yet is has been excluded from consideration in the final analysis.**

**<u>From this point forward, the presented analysis focuses on reasonable considerations that need to be repeated with the inclusion of Base #2, and Base #3 as an Increment.</u>** 15

USACE response:

1: The Corps' recommended plan is one element of an integrated restoration effort in the entire Skokomish River watershed. While the Corps' feasibility study focuses solely on ecosystem restoration, local and State governments may continue to pursue the objective of flood risk management. There is a strong, united effort by Federal, State, and local agencies as well as the Skokomish Indian Tribe for holistic restoration of the Skokomish River Basin. Various Federal and State agencies as well as local entities are working within their individual authorities and within specific areas of the Basin to implement restoration or flood risk management activities throughout the upper and lower watersheds. The public will continue to be involved as these activities come to fruition.

Mason County, the Skokomish Tribe, and Mason Conservation District intend to pursue many projects not included in the final Federal Plan over the next several years. Preliminary design and environmental impacts have been completed and assessed for most under this Integrated Feasibility Report and Environmental Impact Statement. Grant funds will be pursued to complete final design and construction of these important projects. Completing these projects at the local level will likely enable local sponsors to move more quickly and cost-effectively.

2: Congressional authorization and appropriation is required before this project is constructed. Following completion of the Final Feasibility Report and Environmental Impact Statement, the Corps will forward the project recommendation to Congress for their review. If Congress endorses the recommendation, it is anticipated that they would provide authorization for construction in a Water Resources Development Act, which is typically passed every 2 to 7 years. The authority to construct, however, does not equate to the funding for the design and construction phase, which would be addressed annually in the federal budget and biannually in the state budget.

3: Comment noted.

4: See Master Response 6. Also refer to comment response 2 for additional detail regarding Congressional authorization and appropriation required before the design and construction phases can occur.

5: The Corps' ecosystem restoration policies indicate that ecosystem restoration and protection initiatives should be conceived in the context of broader watershed or regional water resources management programs and objectives, which may involve contributive actions by other Federal and non-Federal agencies and other stakeholders. There may be instances where components of ecosystem restoration problems or opportunities are better addressed by other agencies through their missions and programs, which is the case for activities related to Cushman Dam. The Corps is not a signatory of the Cushman Settlement Agreement; future activities at Cushman Dam will be coordinated and implemented by the appropriate agencies as identified in the agreement.

6: Mason County code currently prohibits construction of new structures or the expansion of existing structures within the floodway. Zones A and A2 of the Skokomish River, Vance Creek, and tributaries are designated as floodway due to special flood risk associated with avulsion based on 1998 flood maps and best available modeling at the time of ordinance adoption.

A new hydraulic model was completed as part of the development of the Feasibility Report/EIS. This model was provided to FEMA to incorporate in map updates and Draft maps have been presented for agency review. Once the maps have been adopted by the County, a change to County code may result in a change of floodway designation allowing for some expanded development.

7: Tribal interests include the multiple species of fish and shellfish resources in the Skokomish River, which play an integral part of tribal culture, religion, and physical sustenance. The Skokomish Tribe has treaty-protected harvest rights within their Tribe's usual and accustomed (U&A) harvest area, which reflects the historical region in which finfish, shellfish, and other natural resources were collected. As a Federal agency, the Corps has a Federal trust responsibility to act in the Tribes' best interests, including duties to protect Tribal lands and cultural and natural resources.

8: See Master Response 6. Also refer to comment response 2 for additional detail regarding Congressional authorization and appropriation required before the design and construction phases can occur.

9: See Master Response 4.

10: Base #3 was not deemed cost ineffective by the Corps. It was evaluated early in the study process and carried forward at the request of the study sponsors before costs or environmental benefits were calculated.

There is evidence that the river would have followed the North Fork path originally; this reach was an active channel in the 1930s and prior to 2003, the North Fork and South Fork confluence was located near River Mile 9. During a flood in 2003, the car body levee was breached near this confluence, diverting the North fork and moving the confluence downstream nearly 1 ½ miles to River Mile 7.7. Replacing the car body levee with an engineered levee does not meet the ecosystem restoration goals of the study, as construction of a new levee in this area would continue to impede natural river processes. Additionally, levees could not be built with dredged materials from the riverbed. The use of dredged spoils for levee construction is not a preferable practice because river alluvium in the study area is typically coarse grained with little to no fines content. These materials will exhibit a high permeability and will not be effective in the levee's primary purpose of excluding flood waters. Please refer to Master Response 4 for additional information regarding reuse of dredged materials for levees.

Large woody debris will be placed adjacent to the diversion of the South Fork into the North Fork to assist in keeping low flows in the diverted channel and to prevent the main channel from migrating around the diversion. This wood will encourage recruitment and aid in formation of the newly diverted channel.

Aiming for process-based restoration, in which human-made stressors (e.g., levees) are removed from the landscape, has an inherent goal of little to no operations and maintenance costs. The new mainstem channel included in the recommended plan is intended to be environmentally self-sustaining. It is anticipated that the new channel will aggrade, eventually meandering across the floodplain. This natural meandering process will develop a complex series of stream habitats that will be beneficial to salmon and other fish. This base is designed to work with natural river processes (including aggradation) to provide sustainable habitat benefits over time.

11: The Bureau of Reclamation, the US Fish and Wildlife Service, and the Corps have identified the Car Body Levee as causing the most significant flow constriction in the lower river, and at nearly one mile long, represents one of the largest human-constructed stressors in the mainstem Skokomish River. The Corps' interpretation of the hydraulic modeling provided by the Bureau of Reclamation indicates removal of this levee would allow year-round flow through a connected river channel, by-passing the reach of the mainstem river that goes dry in late summer. This action restores year-round fish passage for upstream and downstream migrations.

The Car Body Levee's impact to the river is the nearly one mile of constriction of river flows that are not able to follow a natural river course due to the levee presence. The Corps indentified fewer than 5 cars at this site and determined the car bodies themselves are causing minimal effects relative to the overall length of the levee. The other levees proposed for construction at River Mile 9 and near the Grange are in close proximity to private residences and serve the purpose of directing flows back toward the mainstem river channel.

12: The parametric cost estimates presented in Section 3.7.1 and Appendix K of the Draft Feasibility Report/Environmental Impact Statement have undergone numerous internal and external reviews and are not biased toward a particular Base or alternative. Cost estimates account for future operations and maintenance, which is estimated to be minimal for Base #3. As discussed in #10 above, Base #3 is intended to be environmentally self-sustaining. It is anticipated that the new channel will aggrade, eventually meandering across the floodplain. This natural meandering process will develop a complex series of stream habitats that will be beneficial to salmon and other fish. This base is designed to work with natural river processes (including aggradation) to provide sustainable habitat benefits over time. The cost effective and incremental cost analysis will not be repeated with the inclusion of Base #2.

13: The environmental outputs model was developed by the U.S. Army Engineering Research and Development Center (ERDC) and underwent rigorous review and approval for use by the Corps' Ecosystem Restoration Planning Center of Expertise and the USACE Headquarters Model Approval Panel. Please refer to Appendix F of the Feasibility Report for additional information about model development, assessment approach, and limitations of the model.

14. See Master Response 4.

15: Base #2 was screened out from further evaluation before costs and benefits were analyzed. Thus, Base #2 was not included in the cost effective and incremental cost analysis presented in Table 3-8. The cost effective and incremental cost analysis will not be repeated with the inclusion of Base #2.

| E6<br>via email 4/7/2014 | Commenter:<br>L.B. Kregenow |
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Comment:
I am a landowner on the north side of the Skokomish. I have reviewed the Corps' proposal and have the following comments:

Please reopen your evaluation to fully consider increasing the water flow in the North Fork when the Skokomish is in danger of going underground and/or dredging. 1

Please evaluate the possibility of renting land in the valley on which to stockpile dredged materials to make available to valley residents for local projects. 2

Please calculate the costs shifted to affected landowners as a result of foreseeable flooding and the loss of agricultural land due to flooding and trenching.

In the absence of increased water flow or dredging, the Skokomish will remain a wide, rocky, beach head at the confluence with all of the attendant flooding, silting, and habitat issues. The Corps has not evaluated the effects of the influx of soils from our newly-exposed fields and the potential erosion along the old course of the North Fork if the cars are removed and the waters are redirected into a new course with the confluence further to the east. These considerations should be addressed. 3

The trench system proposed for the lands lying to the south of the Skokomish will decimate some of the best farm land in the county. The phenomenal rate at which we are losing agricultural land in this part of the State is troubling, and the effects of this trenching in propelling that trend should at least be acknowledged. 4

**USACE response:**

1: All alternatives were formulated to allow for year-round fish passage near the confluence, and all achieve this objective by different means (diversion of flows around subsurface reach, removal of gravel in subsurface reach, etc.). The purpose of Base #3 (removal of the car body levee and diverting mainstem flows into the North Fork) is intended to restore a continuous low flow channel near the confluence, allowing for year-round fish passage via the North Fork channel when mainstem flows run subsurface in the summer months. Diverting mainstem flows into the North Fork channel would bypass the subsurface flow reach and provide improved fish migration. Dredging was not carried forward as part of the Corps' recommended plan and further evaluation of dredging alternatives as part of the feasibility study will not occur.

2: See Master Response 4.

3: The scope of the feasibility study does not include quantitative analysis or evaluation of costs shifted to affected landowners as a result of foreseeable flooding in the future without-project condition or the loss of agricultural land due to trenching (note: "trenching" projects have been removed from the recommended plan; see Master Response 1). The Corps evaluation does, however, include an analysis of the effects of the car body levee removal on lands in the North Fork area; refer to Section 4.3.1.2 and Section 4.3.2.2 of the Final Feasibility Report/Environmental Impact statement for a summary of these effects.

4: See Master Response 1.

| E7<br>via email 4/7/2014 | Commenter:<br>Derek Booth |
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Comment:

To Whom It May Concern:

I have been retained as an expert for six Ranching families who live along the Mainstem of the Skokomish River. I also have been retained for a class action lawsuit that includes landowners who have smaller parcels in the Skokomish Valley. In all, I believe these two groups represent almost all of the private property owners in the Skokomish Valley.

By way of introduction, I am a stream geomorphologist by both training and professional background. I obtained a Masters of Science in Geology at Stanford University in 1980 and a doctorate in Geology from the University of Washington in 1984. I am currently an Affiliate Professor at the University of Washington and was previously employed there on a full-time basis with faculty appointments in the Department of Civil & Environmental Engineering and the Department of Earth & Space Sciences from 1995–2005. I am a member of the American Geophysical Union and the Geological Society of America, where I became an elected Fellow in 1999, and I am the Senior Editor of the international scientific journal *Quaternary Research*, published by the Elsevier Science Press. I have taught fluvial geomorphology at a graduate level at the University of Washington and the University of California Santa Barbara since 1985, and at multiple professional workshops for private consultants and public agencies, most recently for the Washington Department of Fish and Wildlife in 2013. I was also the author of the "Stillwater Sciences" comment letter to Mr. Patrick Cagney on the USACE's General Investigation Feasibility Study for the Skokomish River basin dated October 25, 2010.

I have reviewed the above-noted DFR/EIS (dated January 2014) and have the following comments about the introductory sections and the various alternatives. I did not analyze the economic sections of the DFR/EIS, as they lie outside of my area of expertise and are not relevant to my comments.

I note that earlier publications by the Corps of Engineers ("COE") with regard to the Skokomish River recognized the flooding concerns of the human population and the consequences that have resulted from the rising of the groundwater table in the valley. In particular, Appendix M of this DFR/EIS, in summarizing the public comments on the 2010 GI Feasibility Study, notes "The Skokomish General Investigation Study should focus on implementing solutions designed to alleviate flooding and lower the elevated water table to address the concerns of many comments received" (p. 13). I fully support this focus (as did, apparently, the 2010 effort). The current analysis is limited to "ecosystem restoration," however, in response to a perceived low benefit-cost ratio with respect to flood damage response and an apparent belief that "implementation of previous flood risk management projects by Mason County including 1

residential acquisitions (buy-outs), strict development/zoning regulations, implementation of a flood warning system and evacuation plan, and raising of structures in the floodplain" (DFR/EIS, 2014, p. 1) will provide adequate relief to landowners and residents of the valley. I see no clear evidence that this will be the case with respect to flooding, and none whatsoever with respect to high (and rising) groundwater levels, which (as I noted in my 2010 letter) are imposing substantial costs on valley residents, as well as on the once-healthy anadromous fishery of this 1
key river system. The actions proposed in the DFR/EIS not only ignore these issues (as affirmed by the explicitly single-purpose character of this plan) but also threaten to make them worse—surely not an intended outcome, but one that is likely to result from the approach you have chosen. I am hopeful there is still ample time and opportunity to reconsider this strategy before progressing further with implementation.

I have some additional, more specific comments that are keyed to specific sections:

**Section 2.1**
The section begins with a discussion of the "Problems" created in the Skokomish River since the arrival of Euro-Americans with early settlement changing the wilderness to agricultural lands. I consider it largely complete but somewhat uneven in its emphasis and analysis. The Skokomish River is considered a classic example of watershed-scale degradation (e.g., Stover and Montgomery, 2001, *Channel change and flooding, Skokomish River, Washington*: J. Hydrol. 243: 272-286), and pp. 7-8 of the DFR/EIS does acknowledge the profound role of intensive logging and altered flow regimes in ecosystem decline. However, much detail in this section is devoted to problematic man-made structures (levees and revetments, riparian alteration, removal of large woody debris, bridge crossings), and in total they imply removal of all man-made structures would lead to the restoration of the land to its pre-Euro-American status. This is not only impractical but also false--and will lead to the destruction of some of the most valuable agricultural land in the State.

I encourage you to refer to, and consider closely, the guidance provided in the recent book *Stream and Watershed Restoration* (Roni and Beechie, 2013, Wiley-Blackwell), which notes some of the most common reasons for failure of restoration efforts that are particularly relevant here (p. 7). The current list of proposed projects in the DFR/EIS does not align with this guidance, which leads me to conclude that the outcome is also likely to be as predicted:

- Not addressing the root cause(s); 2
- Not recognizing upstream processes; and
- Failure to get adequate support from public and private organizations.

In general, Section 2.1 does include all of the widely-recognized causes of salmon decline in the Skokomish River watershed (along with a few of likely marginal importance). In particular, it discusses the role of the gradual aggradation of the River, noting that it now dries up for nearly two months in the summer and that 10 years ago the endangered fish populations dropped dramatically. These changes are undisputedly from the catastrophic aggradation in the River (see points 2, 3, and 4 on pp. 9–10), with primary causation from the combination of tremendously increased sediment loads from the South Fork and dramatically reduced flows down the North Fork. Given the temporal and causal connections between the dramatic decline in fish populations and channel aggradation, dropping any plans to address this aggradation appears myopic and contrary to all current scientific guidance on "process-based restoration." I understand the challenges involved in tackling this issue directly—but ignoring it in favor of more "feasible" but ultimately doomed channel manipulations to (temporarily) reconnect side channels and tributaries seems ill-advised.

I can find no attempt to quantify the magnitude of direct anthropogenic causes (e.g., clearing of riparian forest or levee construction) in comparison to channel aggradation from increased sediment loads and the loss of natural River flows from the construction of the Cushman Dam. Thus, the long-term effectiveness of the Tentatively Selected Plan (TSP) actions is simply assumed for this ecosystem without any specific analysis of current aggradation and flooding conditions. Although the treatments listed for the TSP have proven effective in some other river and stream system, the Skokomish River has some significant overriding factors that have 2
yet to be addressed or quantified, and that are left untouched by *any* of the proposed actions. Thus, the value of these restoration actions here presently lacks factual support in this particular River, and in several cases they also carry significant economic or other social impacts that have yet to be adequately addressed.

**Section 2.2**

Although I appreciate the Corps limitations to work "within the defined study areas to enact solutions within the Corp's authority" (DFR/EIS, p. 10), the watershed itself knows no such restraints. 3
Actions that conform to this administrative guidance but that do not address underlying causes of degradation will have questionable value, at best.

**Section 2.3**

There is no dispute that the Skokomish River supports vital aquatic resources but those resources include agricultural and ranching uses, which once co-existed with a healthy and productive fishery for many decades, but are now being ignored. The descriptions in Section 2.3.2 do not at all balance the cultural and physical sustenance of the agricultural and ranching families that have lived along the River for generations. The section correctly notes that "The decline of these particularly sensitive species indicates degradation of environmental health of the Skokomish River and Hood Canal aquatic systems" (p. 11), but there is little in the proposed 4
plan that will actually address the key causes of that degradation, and much that will cause significant harm to valley residents while providing minimal long-term benefits to the fisheries, the Tribe, or anyone else. The groups identified in Section 2.3.3 have long discussed the aggradation and flooding problems it causes, but which are now being ignored. The "multiple partnerships" identified are significant for the absence of any real participation or invitation to participate that included the private property owners in the Valley. "Wetlands," without any analysis, are set out as having "technical significance," and yet other analyses or methods to assess such significance are not identified or discussed.

**Section 2.5**

The section continues the previous assumptions that year-round passage for fish, reconnection of side channels, restoration of habitat, and creation of pools can occur while ignoring the impact of the current and ongoing aggradation in the River. 5
It is doubtful that any of these features can be established or maintained with the current condition of the River.

**Section 2.7**

This section recognizes that aggradation and flooding were identified in the scoping process 6
and then states the "non-federal sponsors and study team" agreed to pursue "a single purpose

study focusing on ecosystem restoration only." This is admittedly a decision made without any public input (indeed, contrary to the input documented in Appendix M) and not obviously based upon identified scientific concerns.

**Section 5**
Without conducting an extensive analysis of the Tentatively Selected Plan, I would like to offer a few comments on the eight identified actions:

Numbers 1, 4, and 5 (levee removal and setback projects #s 3, 37, 28): In general, levee setbacks (and/or removal) have proven beneficial in many riverine settings by allowing greater floodplain access by floodwaters, development of a more diverse riparian ecosystem, and reduced direct anthropogenic impacts. However, these projects have greatest success where high sediment loads do not simply lead to greater deposition and aggradation (negating much of the anticipated benefits) and where the land placed on the inside of the new levee is not presently occupied by high-value uses. Neither of these conditions applies over much of the area proposed under these projects, suggesting that their effectiveness may be limited and the need for landowner agreement is paramount.

Number 2 (Skokomish GI project #35): Upstream LWD installation is generally advantageous on both local and (if at a large enough extent) systemic scales. The present project, however, appears to focus on using large woody debris simply to keep the river in the center of the channel, thus reducing the risk of river bank erosion on private property. Since this is a reach of the South Fork where the river is dropping its bed load, it may not be the best location for achieving any systemic benefits—for these, extensive diversity-encouraging structures farther upstream in the South Fork would be most effective, which in turn might capture some of the sediment load now being delivered to the mainstem. I understand that not all of these upstream areas fall under the purview of the Corps' present analysis, but this plan should provide strong support for any such upstream efforts that would serve to rehabilitate the watershed itself, as well as to reduce the excessive sediment load presently moving down the channel of the South Fork. 7

Number 3, 6, 7, and 8 (projects project #s 9, 39, 40, and 43): In general, these side-channel restoration and tributary reconnection projects are likely to be temporary palliatives at best, while leaving the underlying causes of ecosystem degradation largely (or entirely) untouched. I encourage reconsideration of these projects, not because they are entirely without merit but because they are likely to impose permanent impacts to the variety of land uses in the valley while providing only modest and surely temporary ecosystem benefits.

I hope these comments are useful to you in moving forward with a plan for restoration in the lower Skokomish River valley that is both effective in achieving its primary goal of ecosystem restoration while maintaining the landowner activities that once successfully coexisted with a healthy salmonid population for decades. I wish you success in this effort.

**USACE response:**
1: See Master Response 3. In addition, the actions included in the recommended plan are designed to maintain the existing levels of flood risk management in the study area; the recommended plan is not designed to exacerbate flooding.

2: Per Corps ecosystem restoration policy, the intent of ecosystem restoration is to partially or fully reestablish the attributes of a naturalistic, functioning, and self-regulating system. The concept behind the study and recommended plan is process-based restoration, where the river and tributaries will be modified once and then natural processes will be allowed to determine future conditions. The DFR/EIS did not explicitly state or intend to imply that removal of all man-made structures would lead to the restoration of the land to its pre-Euro-American status.

The Corps agrees that independently developed ecosystem restoration projects, especially those formulated without a system context, may only partially and temporarily address symptoms of a chronic systemic problem. The recommended plan is one element of an integrated restoration effort in the entire Skokomish River watershed and was conceived as part of a comprehensive restoration effort to help address more chronic, systemic problems such as aggradation.

It is correct that an extensive inventory of sediment sources and supply rates in the upper South Fork and Vance Creek watersheds was not completed and is not part of the study scope. To manage this risk, 2-dimensional (2-D) hydraulic modeling and 1-D sediment transport modeling of the recommended plan has been completed and is presented in Appendix H of the Final Feasibility Report/Environmental Impact Statement. This modeling used a range of sediment inflows to account for varying rates of future sediment supply from upstream sources.

3: The Corps' ecosystem restoration policies indicate that ecosystem restoration and protection initiatives should be conceived in the context of broader watershed or regional water resources management programs and objectives, which may involve contributive actions by other Federal and non-Federal agencies and other stakeholders. There may be instances where components of ecosystem restoration problems or opportunities are better addressed by other agencies through their missions and programs. Thus, the Corps will continue to work within the defined study area to enact solutions within the Corps' mission areas and authority.

4: See Master Response 5. In addition, the "multiple partnerships" described in Section 2.3.3 do include the private property owners in the Valley; the Corps and local sponsors have worked to engage landowners throughout the study, including multiple public meetings, listening sessions, and public review of the Draft Feasibility Report/Environmental Impact Statement. This coordination and outreach will continue. Section 2.3.3, Public Significance, has been revised to better describe the importance of agricultural and ranching uses in the Skokomish Valley. As stated in the response to #2 above, the recommended plan is one element of an integrated restoration effort in the entire Skokomish River watershed and was conceived as part of a comprehensive restoration effort to help address more chronic, systemic problems such as aggradation.

Wetlands are recognized as especially valuable landscape features warranting protection under the Clean Water Act Section 404. The Corps elected to very briefly summarize the ecological value of wetlands in the Skokomish watershed rather than write at length on the values widely recognized among the technical disciplines included in natural resources management.

5: See Master Response 3.

6: See response to item 2 above.

7: The Corps anticipates that the locations where levees are breached or removed will resemble the surrounding forested riparian areas after several years rather than becoming buried in riverborne sediments that have tended to deposit at other locations. Since the release of the Draft Feasibility Report/EIS, the Corps and non-Federal sponsors have been working with property owners on the potential alignments for the proposed setback levees at River Mile 9 and near the Grange. No project component will move forward without landowner willingness.

The objectives for installation of the Upstream Large Woody Debris (LWD) project component are to add complexity of habitat for rearing salmonids, create scour pools for juvenile and adult salmonids, and to trap sediment in this reach of the river. The Corps aims to restore natural processes rather than to keep a river in any particular channel, and structures for the sole purpose of protecting private property from erosion are not justified under an ecosystem restoration authority. The US Forest Service has installed over 30 structures in River Mile 12 to 13 and preliminary results show sediment is being trapped and pools are deepening. The Upstream LWD project component should add to these benefits.

The two tributary project components, Hunter and Weaver Creeks, have been eliminated from the proposal through coordination with stakeholders and private property owners during feasibility-level design phase. The side-channel reconnection component has undergone feasibility-level design. This large wetland area is a former segment of the mainstem river, but was disconnected when the river changed its main course. The inlet and outlet of this former channel will be re-opened and will have large logs buried within the banks of the openings. This will provide a flow connection during the winter months. This type of off-channel habitat has proven highly productive for rearing juvenile coho salmon. Further, restoration literature recommends prioritizing reconnecting isolated high-quality habitat. Velocity through these narrow openings is anticipated to avoid settling of sediments. The cost of opening these two connections and adding wood to the banks is minimal compared to the large area of wetland and low-velocity channel that will become available to salmon making this a very cost-effective project component. Additionally, no agricultural land is lost or converted to complete this project component.

| E8<br>via email 4/8/2014 | Commenter:<br>Bureau of Indian Affairs |
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Comment:

Thank you for the opportunity to review the draft Integrated Feasibility Report and Environmental Impact Statement (Report) and for your efforts to develop a meaningful set of measures to address longstanding human caused impacts in the Skokomish River basin.

As acknowledged in your report, the Skokomish River has been an integral part of Skokomish Indian tribal culture and society since long before the Treaty of Point-No-Point was signed in 1855 and degradation from European and American settlers has been ongoing from the 1850s until today. We found your report and appendices to be thorough and we generally concur with your characterization of the proposed measures. We also appreciate your recognition that a failure to act would significantly impact the cultural and spiritual identity of the Skokomish Tribe (Tribe) (see section 4.6.1.1), although we note that management of the Skokomish River basin over the last 150 years has already significantly impacted the Tribe. 1

It is clear from your Report and from similar work that we had commissioned during the

Cushman Project relicensing process, that mainstem channel aggradation is the most significant ongoing impact in the Skokomish River basin to both fish and shellfish assemblages and to the use of certain reservation lands that are continually exposed to a higher water table and frequent floods. On the North Fork, the substantive reductions in flow caused by Cushman Dam No. 2 also led to a near collapse of fisheries in that reach. None of these impacts, we should note, were either caused by or substantially benefited the Skokomish Tribe.

Both a loss of North Fork flows and mainstem channel aggradation were identified and addressed to some degree in our 2009 Settlement Agreement for the Cushman Project (Settlement). Pursuant to that Settlement, Tacoma Power agreed to provide base level flows and additional, higher level channel formation and sediment transport flows - the latter of which are triggered when upstream runoff exceeds a predetermined level. Channel formation
and sediment transport flows are intended to simulate freshets in terms of timing, frequency 2
and duration of flow events as determined by in-season conditions. However, these flows are limited to mainstem channel capacity which is currently substantially less than that necessary to mobilize sediment. As such, the North Fork will not benefit from these improvements to the degree anticipated and aggradation will continue to occur in the mainstem – even after implementation of your tentatively selected plan (TSP).

Sediment transport flows released from Cushman Dam No. 2 were not intended to create channel capacity in the mainstem. They were intended to maintain channel capacity once created through other means. Our research concluded that the only means of reducing aggradation was to physically remove mainstem sediment, similar to the measures that you evaluated in your Riverbed Excavation Alternatives. We were not able to determine, however,
whether you considered the implementation of Cushman sediment transport flows in your 3
discussion of these alternatives and whether or not those flows would reduce the frequency of needed maintenance dredging. Please add this discussion to the final version of your Report. It is possible that sediment transport flows released from Cushman Dam pursuant to our Settlement would reduce the annual cost of implementing the Riverbed Excavation Alternatives making them more economically feasible.

Unfortunately, without increased mainstem channel capacity, improvements anticipated from the channel formation flows in the North Fork will not likely be realized. This result should also be included in your discussion of environmental impacts.

We understand the cost sharing requirements of any actions that the Corps of Engineers (Corps) may implement in the basin and understand that substantive dredging is likely beyond the means of your sponsors. For this reason, you modified the priority objectives from addressing ecosystem restoration and flood risk management to focusing on the single purpose of ecosystem restoration. Aggradation, as you know, is difficult to assign to one of
these categories as both flood risk management and ecosystem restoration are dependent, in 4
large part, on mainstem channel capacity. Until channel capacity is improved, any restoration measures implemented should only be considered a partial fix. Please make it clear in your report that recovery of listed species and substantive improvements to the natural production of unlisted species is unlikely to occur without improvements in channel capacity.
These concerns should not prevent implementation of the TSP as those measures should improve conditions at the North Fork South Fork confluence (which is needed regardless of channel capacity issues in the mainstem), but no party should be under the impression that

implementation of the TSP alone is sufficient to address the impacts caused by the last 150 years of basin management.

Please also consider the following specific comments:

1. Executive Summary: In the 3rd paragraph you identify increased channel capacity and providing a year-round channel for fish passage as your two priority objectives (page vii). However in the 5th paragraph (page viii), you state that your recommended restoration plan "reasonably maximizes environmental benefits" without discussing its ability to meet either of your two objectives. Please clarify in the Executive Summary that the TSP reflects a modified scope limited to ecosystem restoration only and that improvements to channel capacity was largely beyond the means of the project sponsors. As noted above, please also make it clear in the Summary, that the TSP will only provide limited benefits so long as channel capacity remains an issue. 5

2. Section 1.1, page 1 (3rd paragraph): In this paragraph you state that ecosystem restoration and flood risk management was the initial focus of the feasibility study but that flood risk management was eliminated due to a number of measures implemented by Mason County and others. Please note that none of the measures identified in the Report that have been implemented by Mason County and others will increase channel capacity and that although economic impacts may be reduced due to these measures, channel aggradation will continue, reservation flooding will continue and likely increase in frequency, and the overall effectiveness of any environmental restoration measures will be limited. 6

3. Section 3.4, Base #1 (page 20): You estimate that maintenance dredging will be required at 20-year intervals to remove accumulated sediment. As noted above, please discuss how Cushman sediment transport flows may or may not decrease needed maintenance dredging. 7

4. Section 3.4, Base #2 (page 21): You state that sediment removal from River Mile (RM) 7.3 to 8.8 would increase discharge capacity by about 4,000 cubic feet per second and lower flood elevations by up to one foot. Please clarify how additional capacity from RM 7.3 to 8.8 would be translated in the lower mainstem – that is, how would increasing capacity at RM 7.3 affect channel carrying capacity at RM 0 through RM 7.3 and what, if any differences would there be in lower river flooding? The statement "this base addresses the project objectives on a much smaller scale than Base #1" is misleading as it would likely not provide the same benefits (regardless of scale). 8

5. Section 3.4 Base #5 (page 22): Please identify which impacts would continue to occur from RM 0 through RM 3.5 under this scenario. It is difficult to tell whether the impacts would be significant or whether they are minimal and could reasonably be left unaddressed for the long-term. 9

6. Section 3.9.2 (top of page 44): You state that fully meeting all objectives by recommending alternative #45 or #60 is not achievable, in part, given environmental considerations. We assume this statement is in reference to short-term (1-4 years) restoration impacts associated with dredging. Please further explain. The lower river is only marginally functioning at this time and likely not sufficient to allow recovery of listed fish species, to improve populations of unlisted fish species and shellfish, or to allow full recovery of the North Fork given limitations 10

to channel forming flows. How are short-term impacts balanced with long-term improvements?

7. Section 3.9.3, Alternative 45 (page 46): The risks of longer-term impacts to salmon spawning habitat seem exaggerated. Channel restoration projects have been successfully implemented for decades as have other measures that result in the eradication of most all life forms in a
treated stream (e.g., application of piscicides). Please clearly explain the specific long-term 11
impacts of concern, identify whether similar efforts have been conducted at other locations, and list the results of those efforts for comparison.

8. Section 3.9.3, Alternative 45 (page 46): Please further discuss your statement that "Resource agencies are not supportive of large-scale dredging for ecosystem restoration." Specifically, which resource agencies are making these statements and are they in specific regard to the mainstem Skokomish River? Although we concur that significant near-term impacts are likely
from dredging, we believe those impacts are acceptable in certain cases based on existing 12
conditions and the prognosis for long-term river recovery. In this particular case, a broader, specific discussion of the costs and benefits associated with dredging the mainstem Skokomish River is necessary as it would seem to be a required component of any process intending to return the Skokomish River basin to a properly functioning system. A discussion of measures that could be implemented during dredge operations to minimize adverse effects should also be included.

9. Section 3.9.3, Alternative 60 (page 47): Comments 7 and 8, above, are also applicable to 13
alternative 60.

10. Section 3.9.4, page 48 (second paragraph), page 49 (1st full paragraph): Please provide definitions for "cost prohibitive" and "extremely cost prohibitive." The text states that these
funding limitations specifically apply to Masson County and the Skokomish Tribe but we 14
assume any such decision could be reconsidered if additional funding were available from other sources.

11. Section 4.2 (page 57): All of Tacoma Power's requirements are included in the Settlement and under its amended license. As discussed previously, several measures cannot be implemented until mainstem channel capacity is improved. Tacoma has agreed to provide some limited funding to implement habitat improvement measures but those funds are
prioritized on the North Fork. Any additional funds provided to address flooding are in the 15
amount of $150,000 annually, which, as you have identified, is not sufficient to substantively address mainstem channel conveyance capacity. Please acknowledge in your Report that any additional funds provided by Tacoma Power are unlikely to substantially increase mainstem channel capacity.

12. Section 4.3.1, page58 (2nd full paragraph): Flushing flows have not been "abandoned" as described in your Report. In fact, flushing flows could be available for system-wide benefits if channel capacity was improved. It is more accurate to state that flushing flows have not yet
been implemented because of limited channel capacity. Incidentally, the $150,000 discussed in 16
comment 11 is not available until the Settlement parties agree that flushing flows are ineffective and no longer a requirement of the license.

13. Section 4.4.1.2, page 75 (Riverbed Excavation): Please clarify short-term versus long-term impacts in this discussion and identify best practices that could offset the potential short-term impacts. Clarify the risks to salmonids from modified channel morphology over the long-term, explain why channel geometry could not be designed to address salmon spawning, and indicate why conditions conducive to spawning would not equilibrate over time. As mentioned earlier, channel modifications to promote spawning and rearing habitats are readily implemented throughout the Northwest. It is unclear why they would be considered detrimental in this situation. Although the amount of gravel removed from the mainstem Skokomish River would be significant, there is no indication – given the amount of gravel currently residing in the mainstem and the significant supply available over the long-term - that water flow through the hyporheic zone would be an issue. Please further explain why you think hyporheic would be a concern in this particular location. Also, you seem to suggest that the main reason for riverbed excavation is to address the fish stranding problem – although a concern, there are many, many benefits associated with riverbed excavation that should inform any decision on this topic. 17

14. Section 4.4.2.2, Benthic Macroinvertebrates (page 79): Although we agree that macroinvertebrate populations would be affected over the short-term, these affects are not likely to be as significant as would occur through other commonly implemented restoration measures (e.g., the use of piscicides – which is used in many locations throughout the Northwest to remove non-native species). Macroinvertebrates will likely recolonize fairly quickly. In any case, as you have noted in various places in the Report, young salmon are unlikely to spend much time in this area given existing conditions. As conditions improve, macroinvertebrate populations will increase and salmon rearing will benefit. 18

15. Section 4.4.4.2, Riverbed Excavation (page 88): Please see comment 13 above. Similar modifications should be made to this section. 19

16. Section 4.6.1.2, Riverbed Excavation Alternatives (page 93): Please see comment 13 above. Similar modifications should be made to this section. Also, the statement "This alternative has a high risk of negative effects on tribal resources" is confusing. In the previous sentence you state that these alternatives would benefit shellfish (the only alternatives that would benefit shellfish), and most all of the potential negative effects are short-term. Riverbed excavation is likely the only alternative that will help the Tribe recover lost natural resources, particularly on reservation lands. 20

Again, thank you for your efforts. The Skokomish River has significant issues and we found your analysis to be extremely helpful in understanding many of the potential restoration measures that could show improvement in the relatively short-term. We support implementation of the TSP as we believe it will help to address subsurface flow concerns at the confluence of the North Fork and South Fork Skokomish River. Additional measures to be implemented as part of the TSP should also provide needed habitat and may reduce the amount of aggradation in the mainstem to some small degree. However, until the mainstem is repaired, we are concerned that these measures will only provide limited improvements. 21

| USACE response: |
| --- |
| 1: Comment noted. |

2: The Corps agrees that the recommended plan will not directly benefit the North Fork and aggradation will continue to occur in the mainstem, even after implementation of the recommended plan. The recommended plan is one element of an integrated restoration effort in the entire Skokomish River watershed and was conceived as part of a comprehensive restoration effort to help address more chronic, systemic problems such as aggradation.

3: The alternatives analysis assumed that sediment transport flows would not be implemented in the future. Sediment transport flows could possibly decrease maintenance dredging requirements associated with the large-scale dredging alternatives by a marginal amount, but the Corps' analysis does not indicate that O&M for the large-scale dredging alternatives would decrease substantially if sediment transport flows were implemented in the future. As such, a minor reduction in O&M requirements would not reduce the annual cost of implementing the Riverbed Excavation alternatives to the extent required for them to be economically feasible.

4: As stated in the response to #2 above, the recommended plan is one element of an integrated restoration effort in the entire Skokomish River watershed and was conceived as part of a comprehensive restoration effort to help address more chronic, systemic problems such as aggradation. Implemented independently, the recommended plan will not fully recover listed species.

5: The Executive Summary has been revised to better reflect priority objectives, a scope limited to ecosystem restoration, and caveats about channel capacity.

6: Comment noted. Section 1.1 has been updated to direct the reader to Section 4.3.1 and Section 4.3.2, which further discuss the existing and forecasted flood conditions in the study area absent a Corps flood risk management project.

7: If Base #1 were implemented, there is a possibility that sediment transport flows could be implemented in the future. Sediment transport flows could possibly decrease maintenance dredging requirements by a marginal amount, but sediment transport analysis does not indicate that O&M for this Base would decrease substantially if sediment transport flows were implemented in the future.

8: Additional capacity from RM 7.3 to 8.8 would not significantly affect lower mainstem channel capacity. If implemented, Base #2 would produce only minor changes in downstream flood conditions.

9: If Base #5 were implemented, channel capacity and flood patterns would remain unchanged downstream of RM 3.5. In addition, bedload transport potential would not change downstream of RM 3.5. Sediment deposition can be expected to continue to occur in the channel for the foreseeable future. The overall deposition rate is predicted to be the same as the without-project rate, approximately 30,000 cubic yards per year. However, bedload transport would be altered with higher transport rates in the upstream reach and more sediment being transported farther downstream than occurs presently. This would change the sediment deposition distribution, shifting more deposition downstream.

10: The commenter is correct that it is the environmental impacts and risks of unintended consequences associated with dredging that make alternatives #45 and #60 not achievable. Table 3-14 in the Draft Feasibility Report/EIS indicates that these two alternatives only partially meet the acceptability criteria. Through the environmental coordination process during feasibility phase with other Federal, State, and local entities and stakeholders including natural resources managers, the Corps determined that acquiring all of the necessary environmental compliance documentation from regulating agencies would not be possible. Some of these compliance requirements include the Endangered Species Act consultation process and Clean Water Act Section 401 certification.

Some of the environmental impacts include the following:

- Dredging removes the aquatic insects that live on and within the gravel, which means salmon, trout, and sculpin would have no food or significantly reduced food resources for at least one year and potentially up to five years as the longer-lived invertebrate species become reestablished.
- Dredging can de-stabilize the newly exposed surface of river substrate causing unpredictable quantities and locations of scour including upstream and downstream from the action area. This is considered a high risk for endangered salmon spawning areas that occur throughout the study area.
- Dredging can cause high levels of turbidity that risks suffocating fish and burying or excessive shading of aquatic vegetation in the estuary.
- Dredging in the river channel may inadvertently drain valuable wetland habitats that are in close proximity to the river and hydrologically connected causing loss of wetlands.
- The repeated maintenance dredging that would be required for these alternatives would be needed roughly every 20 years, which means the biological resources may never reach a stable equilibrium state, which hampers productivity at all trophic levels.

These two alternatives were ultimately not selected as the Tentatively Selected Plan due to the cost, not due to the risk of environmental impacts.

11: Literature consulted regarding risks to salmon spawning habitat include the following:

Collins, B. 1995. Riverine Gravel Mining in Washington State, Physical Effects with Implications for Salmonid Habitat, and Summary of Government Regulations. Prepared for the US Environmental Protection Agency

Harvey and Lisle. 1998. Effects of Suction Dredging on Streams: A Review and an Evaluation Strategy. Fisheries Volume 23, Issue 8, pages 8-17

Kondolf, Smeltzer, and Kimball. 2002. Freshwater Gravel Mining and Dredging Issues. Prepared for Washington Department of Fish and Wildlife, Washington Department of Ecology, and Washington Department of Transportation.

NOAA Fisheries. 2004. Sediment Removal from Freshwater Salmonid Habitat: Guidelines to NOAA Fisheries Staff for the Evaluation of Sediment Removal Actions from California Streams.

Pauley, Thomas, Marino, and Weigand. 1989. Evaluation of the Effects of Gravel Bar Scalping on Juvenile Salmonids in the Puyallup River Drainage. Cooperative Fishery Research Unit, University of Washington. Final Report to the Washington Department of Fisheries

The scale of dredging proposed in alternatives #45 and #60, at 5.5 miles and 9 miles respectively, is far greater than the typical type of operations analyzed in the literature cited above. Scale of effects is assumed to correlate to scale of disturbance. Effects are summarized in the response above. The Corps' evaluation is that dredging poses high risk to spawning salmon, especially to species listed under the Endangered Species Act.

12: The natural resource agencies consulted during preparation of the Draft Feasibility Report/EIS are listed in Section 7.3. Specific recommendation against large-scale dredging of the Skokomish River came from National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, and Washington Department of Ecology, as well as Corps staff biologists. Four different local and regional salmonid recovery plans were consulted for restoration strategies and none included recommendations for large-scale dredging.

13: Please see the preceding responses.

14: The largest-scale dredging alternative is estimated to have an initial construction cost of approximately $200 million. Per Corps cost-sharing policies for construction of ecosystem restoration projects, the non-Federal sponsor(s) would be required to contribute 35% of the construction costs with Corps, and would also be responsible for all operations and maintenance activities associated with the alternative (estimated to be up to $80 million for the largest-scale dredging alternative). These non-Federal funding requirements are beyond the budget capacity of Mason County and the Skokomish Tribe, and are also likely beyond the means of local or State grant opportunities.

15: The Final Feasibility Report/Environmental Impact Statement acknowledges that any additional funds provided by Tacoma Power are unlikely to substantially increase mainstem channel capacity.

16: The Final Feasibility Report/Environmental Impact Statement includes a more accurate discussion of flushing flows, stating that they have not yet been implemented because of limited channel capacity.

17: As stated in earlier responses, the scale of disturbance proposed in Alternatives #45 and #60 is far greater than what has been already determined to have detrimental effects to salmonid habitat. These dredging alternatives might have been able to be designed to promote spawning and rearing habitats; however, even when these alternatives were designed in a least-cost method, they were still cost prohibitive and therefore not selected. Additionally, even with careful design of in-stream features that would cost much more than the least-cost design, there would still be a risk of scour and instability of remaining substrates. Because salmon have only one chance at spawning and populations are decreased in the Skokomish River, risk of unsuitable spawning habitat and/or loss of incubating eggs due to scour may have a significant effect on multiple year classes, which can then affect an entire population for many years.

18: When analyzing potential impacts to benthic macroinvertebrates in a lotic system, use of piscicides is not directly comparable to dredging due to the different susceptibilities of some invertebrate taxa to the use of chemicals, while all benthic taxa are removed in dredging operations. Furthermore, policies on use of piscicides recommend intervals of 3 to 10 years to allow recovery of invertebrate populations. Because salmon have only one to three years of rearing time in their riverine habitat and populations are decreased in the Skokomish River, risk of decreased food availability for more than one year due to loss of the food base through substrate removal may have a significant effect on multiple year classes, which can then affect an entire population for many years.

19: Please refer to previous responses.

20: The statement regarding risk to tribal resources is referring to the potential negative effects to salmon fisheries as listed in previous comment responses regarding effects to salmon from large-scale dredging operations.

21: Thank you for the statement of support for the TSP. The Corps recognizes it is not a complete solution for all ecosystem degradation in the river; it is intended to be one component of an overall integrated plan for the watershed.

| M1<br>via letter 4/7/2014 | Commenter:<br>National Marine Fisheries Service |
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Comment:

Attached are our comments on the Corps' Draft report for Skokomish ecosystem restoration. We support ecosystem restoration for this river, which provides spawning and rearing habitat for several ESA-listed anadromous fishes. We appreciate the breadth of information in the Corps' Draft Feasibility Report. Proposals for ecosystem restoration in the Skokomish River are particularly important for us because the Skokomish is the sole missing watershed chapter of the Puget Sound Chinook Salmon Recovery Plan, which we approved in January 2007. We did not review the NEPA portion of your report, and have no comments on the DEIS. 1

The NMFS supports ecosystem restoration for this river, which provides spawning and rearing habitat for several ESA-listed anadromous fishes. We appreciate the breadth of information in the Corps' Draft Feasibility Report (Draft Report). Proposals for ecosystem restoration in the Skokomish River are particularly important for us because the Skokomish is the sole missing watershed chapter of the Puget Sound Chinook Salmon Recovery Plan, which we approved in January 2007. We also support the recommendations made by the U.S. Fish and Wildlife Service (USFWS) in their Fish and Wildlife Coordination Act report to the Corps (January 2014).

While we agree that human alteration of the channels and floodplain since the mid to late 1800s have resulted in severely impaired salmon habitats today, we believe a few additional parts of the story are important for understanding current and desired future conditions. Geologic factors make the lower 10 miles susceptible to flooding. First, the lower 10 miles of the valley have extraordinarily wide, level, and deep deposits of alluvium which are easily eroded following inattentive land use (see geomorphic and geologic reports cited below). Second, significant sources of sediments are delivered from riverbank landslides and headwaters. Third, tectonic land-level uplift at about rivermile 2.4 forced the channel to the southern valley wall, and likely exacerbates the extent of flooding across the low-relief floodplains upriver. In addition to these landform constraints, settlers over the past 160 years or so have cut trees, cleared channels, and placed non-engineered levees and some roads in locations that promoted erosion, flooding, and destabilized channels.

The BOR (2009) geomorphic report summarizes, "...within the last 2,000 years, the Skokomish River Valley is an aggradational environment. Holocene deposits along the Skokomish River form one broad surface throughout the valley and vary in age based on the lateral migration history of the Skokomish River." 2

A geologic study by Polenz et al. (2010b) reports depths of the extensive deposits of alluvium in the lower valley. They state that "at least 44 ft, and perhaps as much as 70 ft of alluvium has accumulated in the Skokomish Valley over the past 8,500 years." That report also describes a cross-valley geologic control (the Lucky Dog structure) that forces the river channel to the southern valley wall at about rivermile 2.4. That control is manifest as an uplifted berm, some

17+ ft above the floodplain. "If the Lucky Dog structure repeatedly raised the valley floor east of the Lucky Dog bog, additional alluvium would have gotten trapped west of the structure, thus potentially thickening the alluvium west of the structure. A maximum sediment volume estimate is therefore not implied by the available data. But a minimum volume estimate could be generated from the 44 ft minimum alluvial thickness, the width of the valley, and the volume of delta sediment above the paleo-alluvial plain implied by the sample. Such a sediment volume estimate may provide an interesting long-term comparison to historic attempts at assessing the impact of land use practices on sediment load in the modern Skokomish River."

That report also states, "Consideration of historic flood records in the context of other evidence for tectonic activity in the Skokomish Valley suggests that tectonic land-level changes may contribute to frequent flooding on the Skokomish River...The persistent frequency of flooding favors gradual land level changes (creep) over sudden land level changing events as a possible tectonic contribution to flooding on the Skokomish River." (Polenz et al. 2010b).

Before European settlement started in about 1850, we expect much of the low-relief lower valley had anastomosing channels with forested islands; channels packed with all sizes and ages of wood piles and jams; and, forested floodplains with many beaver ponds and relic channels. (See attached 1 page map excerpted from the BOR (2009) report that shows channel locations since 1861, earlier paleo-channel, and the Lucky Dog structure). We believe that pervasive actions by settlers lead to local and persistent erosion of the former islands, 2
riverbanks and floodplains. Local erosion across the lower valley was triggered by (a) removing most standing riparian trees (which promoted extensive erosion of the floodplain as roots decayed), and (b) removing inchannel wood for many miles of channel (which de-stabilized river banks, bars, and beds). Throughout the lower valley, widespread erosion and persistent clearing of floodplains in turn resulted in the wide, shallow channels, deforested conditions and typical flooding observed since at least 1912.

Certainly the transport of sediments from headwaters and over-steepened riverbanks has contributed to lower valley aggradation, but we believe a significant trigger for historic aggradation is local erosion of riverbanks and floodplains within the lower valley. Our hypothesis is that late nineteenth and early twentieth century tree-clearing and agricultural activities transformed the lower 9+ miles from multi-thread channels with forested, stable banks and forested islands, into a wide shallow channel with eroding banks and few mature riparian trees.

Diverting substantial flows from the North Fork, starting in about 1926, likely encouraged lower valley aggradation by greatly reducing transport power. Further, levees and roads that were added without thought to maintaining riverine processes likely contributed to unstable channel conditions. Also, the landslides and similar unstable landforms along upper riverbanks of the South Fork below the canyon, i.e., about rivermile 11 mentioned in BOR (2009), are likely ongoing sources of sediments delivered to the lower river.

This perspective leads us to support the Draft Report's ideas for restoring channel conditions
and riparian planting, and we further recommend reestablishing forested islands and 3
floodplains with fully stocked forests. This is also in agreement with the USFWS recommendation in Appendix A to reestablish a braided-channel pattern with islands. Because
4

dredging is likely to be very disruptive for productive salmon habitats, with dredged channels soon refilled by high flows, we cannot support that approach.

5

We note the stock of Chinook salmon in the Skokomish River, while originating from Green River hatchery stock, and largely sustained by the local hatchery, is considered an independent population believed necessary for recovery of the ESU. As summarized in the most recent 5-year review of the ESU, that population continues to show low productivity and abundance, which is not surprising given the mix of severe challenges to that population (Ford ed., 2011). The 2013 fisheries Co-managers' report summarized the fraction of natural-origin Chinook salmon returning to the Skokomish River in 2012. "A preliminary estimate is that spawning escapement in the Skokomish River was comprised of about 87% hatchery-origin Chinook and 13% natural origin Chinook" (WDFW & Puget Sound Treaty Tribes, 2013). Because it is difficult to distinguish the local habitat effects on the Chinook salmon population from other effects, the potential that Skokomish ecosystem restoration will significantly help recovery of that population is uncertain. Nevertheless, all species of salmonids are expected to generally benefit from ecosystem restoration.

6

Channel conditions will become favorable for fish when roughness elements are restored (e.g., Engineered Log Jams (ELJs) and natural wood collections), side channels are stable, lateral bank erosion is greatly diminished by wood and riparian vegetation (not riprap), and functional floodplains are restored that include wetlands and dense cover of riparian trees and shrubs. Eventually, deeper channels and pools will become evident as channel banks and floodplains become stabilized by older forests. In-channel restoration actions should be planned as pilot studies to learn and adaptively manage for effective restoration.

While the expected time for restoration to become effective is not certain, ELJs on similar sized rivers (Elwha, SF Stillaguamish, Dungeness, and White rivers) have shown substantial influences on channel conditions within a few years of construction. Results of the early pilot studies on the Skokomish will enable adjustment of later extensive wood placement throughout the low gradient reaches of the main channel. Establishing older forests on the banks and floodplain can be accelerated by dense planting, limiting herbivory, and frequent surveys of stocking to allow early silvicultural intervention in the first decade or so. Ultimately, as much of the channel migration zone as possible should be dedicated to natural riparian function.

7

We support the priorities for reconnections, levee actions, and ELJs described in Appendix E, Table 4. We also support the four restoration monitoring objectives detailed in Appendix E. Implementing monitoring tied to these objectives will enable restoration effectiveness to be assessed. As described in the GeoEngineers, Inc. (2006) report, we also recommend reach assessments be completed, and results incorporated into project planning and design.

8

We note the Draft Report's summary of flooding history in Appendix B, Flooding and Sedimentation Baseline. "It is likely that aggradation was underway prior to 1912 as the frequent flooding experienced at that time suggests an undersized channel already existed." That perspective is consistent with our understanding of the geologic and early settlement factors summarized above. In addition, the modeling results of bedload distribution described in Figure 9 of Appendix B, i.e., that bedload does not move below about rivermile 3, are consistent with the idea that the uplifted berm at about rivermile 2.4 acts to collect sediment and gradually raise the floodplain and riverbed upstream.

The Draft Report lacks a long-term socioeconomic vision for the lower river, recognizing that flooding will continue and the water table will likely keep rising, which will continue to challenge current agricultural practices and road management. Would a stronger emphasis to buy property within the channel migration zone (plus a riparian buffer zone) from interested landowners be money better spent for long term ecosystem restoration? Are landowners willing to work as a group to come up with a realistic land-use plan for the lower watershed to balance ecological, sociological and economic needs, given that flooding will continue indefinitely? As part of the ecosystem restoration, how many properties could be acquired and levees removed, which could then allow the river to start finding its own equilibrium? We also see an opportunity for floodplain education. In other venues, the Corps has pointed residents of floodplains to educational material and we encourage the Corps to mention that material (ASCE 2010) in the Final Report. 9

References

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[Figure excerpted; available upon request]

**USACE response:**

1: Thank you for the statement of support for the TSP. The Corps appreciates the acknowledgment of context within the plan for recovery of Puget Sound Chinook. Additionally, the US Fish and Wildlife Service has provided a Final Fish and Wildlife Coordination Act report based on their review of the feasibility-level designs completed for the Final Feasibility Report/EIS. Please see Appendix L.

2: Thank you for providing additional background information on the geologic and human sources affecting the existing conditions.

3: Coordination with multiple natural resource agencies during feasibility-level design phase has resulted in design of larger engineered log jam structures and planting of conifers to reestablish forested islands and a braided-channel pattern with islands.

4: The Corps acknowledges that multiple natural resource agencies have provided input opposed to dredging due to its risk to salmon habitats.

5: The Corps appreciates validation of the assumption that all salmonid species should generally benefit from the proposed ecosystem restoration. The suggested methods have been incorporated into the feasibility level designs. Please see Appendix H of the Final Feasibility Report/EIS.

6: The River Mile 9 levee setback and Grange levee setback project components were designed for the maximum area allowed by landowners for the purpose of capturing as much channel migration zone as possible for natural riparian function.

7: Comment noted.

8: The Corps appreciates validation of a consistency in understanding and interpretation of reports available.

9: Local socio-economic planning is outside of Corps authorities and mission areas. Mason County representatives, as one of the two non-Federal sponsors for the project, have been working with local landowners.

| M2<br>via letter 4/7/2014 | Commenter:<br>Karen Willie on behalf of property owners |
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Comment:

My law firm represents six ranching families who live along the Mainstem of the Skokomish River. We also represent a class of landowners who have small parcels in the Skokomish Valley. In all, we represent almost all of the private property owners in the Skokomish Valley.

We take issue with the assertion that the Corps of Engineers has the "study authority" to proceed with its project. On page 2 of the DEIS it states: "Seattle District Office of Council has confirmed the appropriateness of this [study] authority with USACE Headquarters Office of Council. The Act's reference to 'other water uses and related land resources' provides sufficient authority to study ecosystem restoration opportunities in the Skokomish River 1

Basin."

Originally, the Corps of Engineers ("COE") had a flooding prevention alternative which addressed that the aggradation in the river as part of the study. That alternative has been dropped in the DEIS. What remains are all projects aimed at enhancing the river for fish habitat. Some of the projects will lead to further flooding of ranching properties that are designated as some of the most valuable in Washington state.

The grant of authority under Section 209 of the River and Harbor Act of 1962, Public Law 87-874 (Puget Sound Adjacent Waters) is in the opening language of the Act quoted at the top of page two. The authority granted to the COE is for "flood control and allied purposes." With the new, non-flooding scope of this DEIS, the COE is now outside of the authority of the River and Harbor Act of 1962. 1

**USACE response:**

1: See Master Response 3 and Master Response 6.

| M3<br>via mail 4/5/2014 | Commenter:<br>Blase Gorny |
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Comment:

I moved to the Skokomish Valley in 1970 and have lived there continuously since then. My property is directly across the river from the Richert/Krivor Skokomish Farms property. The north fork of the river flowed in directly behind my property. It has since changed to an old channel and joins the south fork closer to the church. The cars at the then confluence of north and south forks were put along the bank on the Richert side by the Richerts in 1971 (summer). The dyke behind my property prevented flooding of my neighborhood until 1994. Over the years the channel filled significantly in that area. Since 1994 the river has topped the dyke and flooded the neighborhood 6 or 8 times. There is also deep flow over Eells Hill Road in major flood events that also was never witnessed by me until 1994. For about 5 or 6 years now the river dries up (or flows underground) behind my property from about the Dips to the church. I have been able to walk on dry land across the river for up to a month in the summer. 1
Many of the proposed solutions to minimize major flooding of the Skokomish River make sense. Removal of cars, dykes on the old Richert property, setback dykes and minor dredging in critical places will help.

The proposed creation of minor channels on the large agricultural fields is likely to work, however, as proposed or understood by the large landowners it presents a farming nightmare. The ground water is so high now in a good 30% of those fields not that they are not farmable and full of swamp grass. To be able to initiate the fix the large landowners will need to be presented with a plan that is at least "called" in the name of agriculture. Good luck!

**USACE response:**

1: See Master Response 1. In addition, as described in the comment, some features of the recommended restoration plan are anticipated to provide ancillary flood risk management benefits.

| M4<br>via mail 4/3/2014 | Commenter:<br>U.S. Department of the Interior |
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| Comment:<br>The Department of the Interior has reviewed the Draft Environmental Impact Statement for the Skokomish River Ecosystem Restoration, Mason County, Washington. The Department has no comments on the document at this time. We appreciate the opportunity to comment. | 1 |

| USACE response: |
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| 1: Comment noted. |