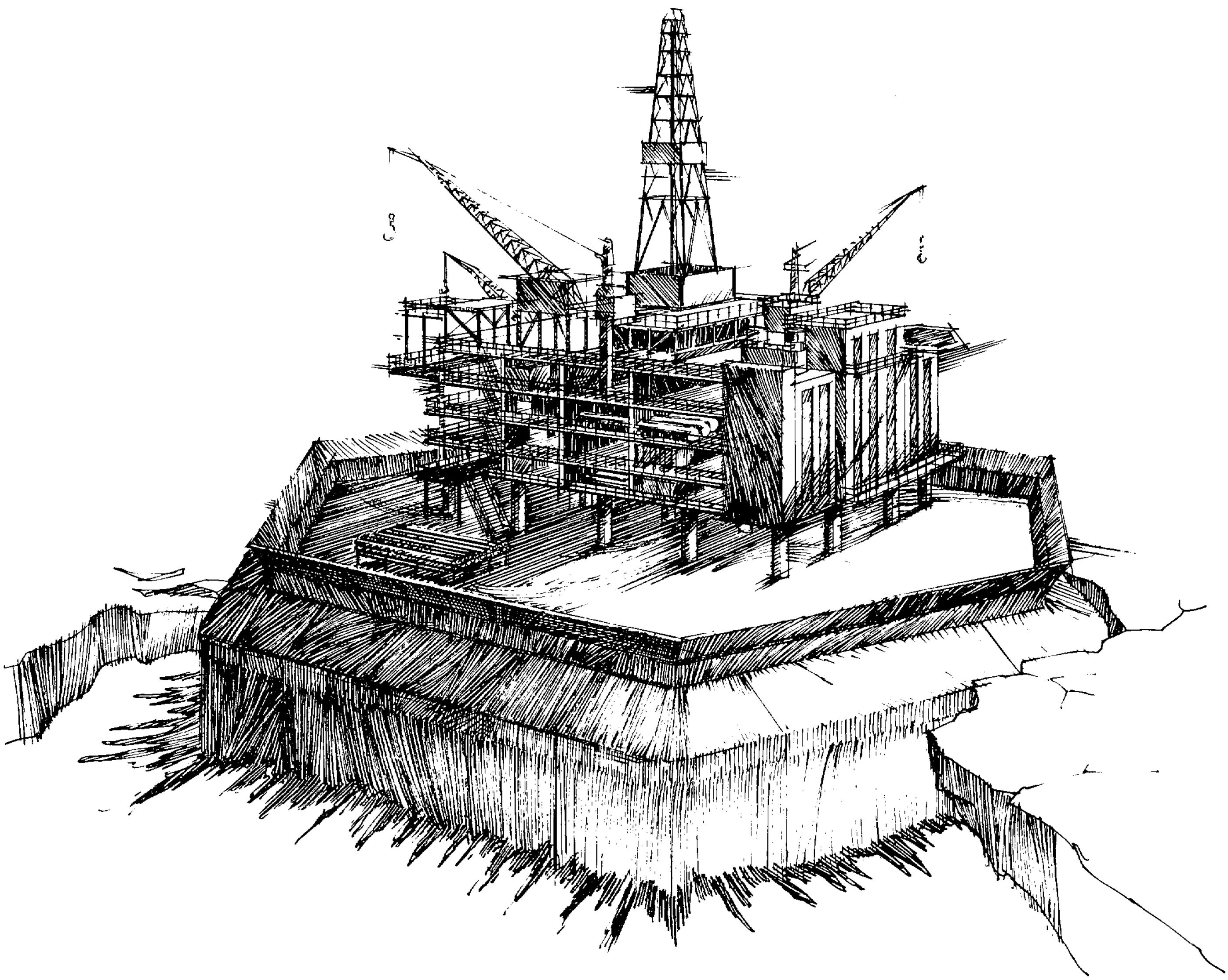
AN ENVIRONMENTAL REVIEW OF POTENTIAL OUTER CONTINENTAL SHELF PLATFORM FABRICATION/ASSEMBLY YARD SITES IN WASHINGTON'S COASTAL ZONE



WASHINGTON STATE DEPARTMENT OF ECOLOGY

FEBRUARY 1984

JOHN SPELLMAN
GOVERNOR

DONALD W. MOOS
DIRECTOR

WDOE 83-12

The Cover

The cover illustration is an artist's conception of the concrete production island being proposed by Exxon USA for use in the Norton Sound and Beaufort Sea in water as shallow as 40 feet or as deep as 180 feet. The six-sided concrete production island would provide a stable base for drilling in an ice environment.

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"Some 150,000 people are currently employed in the design, construction, and management of offshore platforms. This global effort is guiding annual expenditures of more than $15 billion and nearly all estimates of future growth exceed 20 percent per year."[1/]

"No oil-related environmental issue has received less attention in the United States than the coastal impact of construction sites for offshore oil production platforms.[2/]

1/ Ellers, Fred S. "Advanced Offshore Oil Platforms," Scientific American. April 1982, Vol. 246, No. 4, p. 39.

2/ Baldwin, P. L. and Baldwin, M. E., Onshore Planning for Offshore Oil-Lessons from Scotland. The Conservation Foundation, Washington, D.C., 1975. p. 67.

AN ENVIRONMENTAL REVIEW OF POTENTIAL OCS PLATFORM FABRICATION/ASSEMBLY YARD SITES IN WASHINGTON'S COASTAL ZONE

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CHAPTER 1

STUDY SUMMARY

Introduction

This study, conducted under the auspices of the Coastal Energy Impact Program, was initiated to assist the Washington State Department of Ecology (WDOE), local planners and industry in making informed and responsible decisions involving the siting and/or expansion in Washington State of industrial facilities engaged in the fabrication/assembly of offshore oil and gas drilling platforms necessary for California and Alaska Outer Continental Shelf (OCS) oil and gas development. The study approach involved assessing: (1) market demand for offshore production platforms and associated modular structures likely to be required in support of OCS development offshore Alaska and California; (2) rig yard siting requirements based on projected market needs; (3) existing and potential sites for fabrication and/or assembly of offshore platforms; (4) environmental impacts and issues raised by this type of development; (5) potential impact avoidance measures; and (6) summarizing federal, state, and local permit requirements.

As with the "Coal Port Study" previously sponsored by WDOE, this project was a cooperative effort involving industry, regulatory agencies, local government, and port management representatives. Because of the cooperative approach taken, a common understanding of the strengths and weaknesses of various platform fabrication/assembly yard sites identified in the study was established. It was intended, therefore, that sponsors and reviewers of proposals to expand existing facilities or to site new ones should benefit from having available the kind of preliminary planning information contained in this study.

Background

Former Secretary of the Department of the Interior, James Watt, announced in mid-1982 the approval of a five-year leasing program designed to accelerate development of oil and gas potential on the nation's OCS. Under provisions of this plan, nearly the entire OCS (1 billion acres) would be offered for lease during the five-year period ending in 1987. The Department of Interior estimates remaining hydrocarbon resources contained in the OCS to be 43.5 billion barrels of oil and 230.6 trillion cubic feet of gas.[1/] The combined Alaska and California OCS contains well over half the total OCS acreage and much of the estimated remaining oil and gas resources according to the Department of Interior.

No lands offshore Washington have thus far been scheduled for lease sale. Nevertheless, the accelerated leasing activity underway offshore Alaska and California, combined with the recent large Santa Maria Basin discovery offshore California, have stimulated considerable interest in Washington's centrally situated coastline (between California and Alaska), as industries interested in supplying exploration and production platforms seek fabrication/assembly yard sites on the West Coast. Another primary reason for the heightened interest in locating in Washington is that few sites on the entire West Coast meet the range of criteria considered important to establishing facility site feasibility.

The heightened interest in locating on Washington's coast is evidenced by the fact that companies such as Kaiser (1976 and 1977), Chicago Bridge and Iron (1982), and most recently Peter Kiewit Son's Company initiated actions to secure coastal facility sites and others are understood to be currently reviewing potential sites. Furthermore, existing in-state industries such as Snelson-Anvil (Anacortes), Concrete Technology Corporation, Tacoma Boatbuilding Company, J. A. Jones Construction Company (Tacoma), and Wright Schuchart Harbor Co. (Seattle and Tacoma) have the capability and interest in fabricating and/or assembling platform structures for use in offshore oil and gas development. These in-state industries may at some point be interested in expanding and/or modifying their facilities to accommodate construction of various platform structures required for California and Alaska OCS oil and gas development.

Snelson-Anvil (Anacortes) and Wright Schuchart Harbor Co. (Seattle and Tacoma) have been building various modular structures for use in Alaska by the oil and gas industry since 1975 and 1973, respectively (see summary of oil and gas related module construction activity in Washington

State - Appendix A). Interest in expanding these and other related facilities in Washington State could result if the pace of oil and gas development should accelerate offshore California and Alaska.

This study was initiated because of the apparent near-term potential for the establishment of a large scale facility(s) to fabricate offshore oil and gas platforms along Washington's coastline and because of the state's general policy to encourage comprehensive shoreline planning. It is intended that such planning, conducted in advance of actual development, will ensure that the need for a diversity of shoreline uses is met, while simultaneously providing maximum environmental protection.

Study Scope

Following is a summary of the methodology employed in addressing the major study elements of this project.

- Platform Market Demand: The initial approach taken in this study to determine future production platform demand offshore Alaska and California was to send a questionnaire to the various oil companies possessing leases in these offshore areas. This approach was undertaken simultaneous with a review of Department of Interior platform estimates. Because of a general lack of response to the mailing, a more direct phone survey was conducted. This approach proved to be successful, as companies were generally candid in addressing the difficult question of future platform need. Because of the proprietary nature of the information provided by the oil companies involved in the survey, the individual company platform need estimates were aggregated to a total number.

- Need for West Coast Platform Facilities: A questionnaire addressing the issue of platform facilities need was sent to domestic offshore platform constructors. The responses to the questionnaire were combined with the oil company telephone survey to assess possible need for additional platform fabrication facilities on the West Coast.

- Potential Platform Fabrication Sites: A questionnaire was sent to port and local planners requesting their assistance in identifying potential sites where platform fabrication/assembly facilities might potentially be located. Provided in the questionnaire was a list of the siting criteria compiled, based on a review of pertinent literature and input received from existing platform fabricators. The resulting list of identified potential platform fabrication sites may not be all inclusive despite the effort to make the list as comprehensive as possible. There may be potentially developable sites that have been overlooked. Information concerning sites identified subsequent to issuance of this report will be kept on file at the WDOE, Shorelands Division.

- Environmental Assessments: A preliminary environmental assessment was undertaken for each of the sites listed. The assessment, which was a collaborative effort between WDOE and local planners, involved separating potential impact issues from minor or nonissues. Additional comments concerning potential environmental impacts were solicited from the Washington Departments of Fisheries, Game, and Natural Resources.

- Impact Avoidance Measures: This section addresses specific impact avoidance measures related to facility siting, design and operation and mitigation that should be considered by developers as part of general project planning. These impact avoidance measures correspond to the kinds of environmental impacts which could potentially be associated with platform facilities development and operation.

Study Findings

The major findings of this study are as follows:

- Recent history and the results of this study strongly suggest that the platform construction industry has included Washington State as a possible location for offshore oil and gas platform fabrication/assembly. The major reason for this interest is the fact that

Washington is centrally located to potentially serve both Alaska and California future offshore platform needs.

- Platform construction sites in Grays Harbor and Everett received permits in the mid-1970s resulting in preliminary site development. Both of these sites were subsequently abandoned due to unfavorable market conditions.

- Chicago Bridge and Iron, Inc. (CBI), proposed to develop a third site at Cherry Point in Whatcom County in 1977. This proposal was abandoned after a lengthy land use battle which was lost by CBI only after direct involvement by the Washington State Legislature and the governor.

- Currently, Kiewit Son's, Inc., has presented a fourth proposal to build a platform fabrication/assembly facility at the same Cherry Point site previously proposed by CBI. The Kiewit proposal, as of this writing, is under federal, state, and local permit review.

- As many as 100 offshore <u>production platforms</u> may be required for combined Alaska and California offshore development by the year 2000. This figure could be greater or considerably less depending on such factors as government approval of offshore exploration and development, resource discovery and confirmation, development economics, and technical feasibility.

- In the near term (next 2-3 years or longer), specially designed <u>exploration platforms</u> for use in Alaskan arctic waters will likely be needed. One such platform is currently under construction in Japan for use by Exxon in late 1984. Orders for two other similarly designed platforms (for use by Sohio and Amoco oil companies) have been held up largely due to the dry hole drilled on the Mukluk formation in the Beaufort Sea in late 1983. An undetermined number of additional exploration platforms may be ordered if significant near term discoveries are made in the arctic offshore.

- The Alaska and Canadian platform market would likely be of greater interest to platform fabricators located in Washington because of close proximity and the fact that existing and proposed facilities in California and Mexico will likely be able to meet California platform demand.

- An estimated 2-4 additional platform fabrication/assembly facilities may be required on the West Coast to meet domestic platform demand. This assumes that most, if not all, the platform construction is undertaken by domestic firms.

- Far East facility operators may dominate both the California and Alaska platform markets because of 1) low labor costs; 2) low material costs; 3) many existing facilities being under utilized; and 4) government support (subsidies) for facilities engaged in platform construction.

- A total of ten platform fabrication facilities are currently being proposed on the West Coast in anticipation of accelerated California and Alaska offshore development. The proposed sponsors and their respective site locations are listed as follows:

Sponsor	Proposed Facility Location
1. B. G. Offshore	Ensanada, Mexico
2. Kaiser	Los Angeles, California
3. Brown and Root/Wright Schuchart Harbor Co.	Eureka, California
4. Exxon	Eureka, California
5. Chicago Bridge and Iron/ Raymond International	Coos Bay, Oregon
6. Guy F. Atkinson	Coos Bay, Oregon
7. Morrison Knudsen Co./ Concrete Technology	Astoria, Oregon
8. Kiewit Son's	Cherry Point, Washington
9. Foundation Company Canada/ Skanska of Sweden	Prince Rupert, British Columbia
10. American Bridge, Div. of U.S. Steel	Hunters Point, California

- This study lists and evaluates 17 potential platform fabrication sites located in coastal Washington. These sites were identified by local planners and port districts based on composite site criteria provided to them by WDOE in the form of a questionnaire. The evaluation information for each of the listed site locations should provide insight concerning a spectrum of environmental issues, which could conflict with site development proposals. This should not, however, be interpreted to mean that this preliminary site evaluation can by itself be used to actually predict whether or not permits would be issued for a particular site.

- Potential platform fabrication sites identified in this study were not ranked on the basis of suitability, but were grouped together based on the amount of infrastructure in place at the respective sites. Following is a comprehensive listing of the sites identified as potentially developable:*/

Existing industrial facilities where platform construction could be potentially accommodated:

Anacortes-Snelson-Anvil, Inc.
Tacoma-Tacoma Boat Co.
Tacoma-Concrete Technology
Tacoma-J.A. Jones Construction Co.
Seattle-General Construction Co.

Those sites that potentially could be developed which have a substantial amount of infrastructure:

Everett-Weyerhaeuser Mill A
Everett-Norton Site
Vancouver-Columbia Industrial Park
Longview-International Paper

Those sites that potentially could be developed, which have some infrastructure:

Whatcom County-Cherry Point
Tacoma-Commencement Bay, Outer Hylebos
Westport-Halfmoon Bay
Westport-Marina
Vancouver-Port Terminal
Kalama-Industrial Park
Kalama-Terminal Site
Longview-International Paper

*/While every effort was made to make this list as comprehensive as possible, there may be sites in Washington State that have been overlooked.

- This study identifies specific environmental impact avoidance measures considered applicable to the development of offshore platform fabrication facilities in Washington State. Discussion focuses on measures related to facility siting, design and operation, and impact mitigation. Close attention to each of these areas during the preliminary planning process could facilitate development at an appropriate location without undue delay.

References

1. Department of Interior News Release, Minerals Management Service. Approval of 5-Year OCS Oil and Gas Leasing Program Announced, July 21, 1982.

CHAPTER 2

CALIFORNIA AND ALASKA DEMAND FOR OFFSHORE OIL AND GAS PLATFORMS

Introduction

This chapter addresses the question of projected demand for offshore production drilling platforms and associated modular structures required for California and Alaska OCS oil and gas development (platforms designed for exploration offshore Alaska are also considered). The emphasis is on developing an understanding of what the future platform market is likely to be, since the number of platforms required for offshore oil and gas development on the West Coast can be taken as an indicator of potential platform/module construction yard activity in Washington State. Projecting the number of platforms and modules that will be needed is a tenuous exercise at best. For example, as of early 1984 most scheduled OCS lease sales for lands offshore California and Alaska have not yet taken place. Because exploratory drilling in these prospective lease areas has been limited, it is not known precisely what the production potential might be and, thus, what exact number of production platforms (and exploration platforms in the case of Alaska offshore development) might be required. Further complicating the picture are the political and economic uncertainties related to extraction and sale of the resource. These uncertainties should be kept in mind in the discussion of projected platform needs which follows.

OCS 5-Year Accelerated Oil and Gas Leasing Schedule

A major factor expected to stimulate OCS exploration and development and thus the need for platforms and associated modules is the implementation of the latest five-year OCS oil and gas leasing schedule by the Department of Interior. As previously mentioned in the Background section of this report, the five-year leasing schedule, if fully implemented, would open virtually the entire OCS for leasing consideration -nearly 1 billion acres - compared to only about 2.5 percent made available over the last 28 years, according to the Department of Interior.[1/]

The latest five-year schedule, dated July 1982, contains 41 sale offerings proposed for the period from August 1982 to June 1987. The schedule calls for 20 offerings on the West Coast including 16 offerings offshore Alaska and four offshore California (Table 2.10) (Figure 2.10).

According to Department of Interior estimates, 85 percent of America's untapped oil potential is on publicly owned lands with two-thirds of that offshore and much of the new oil is expected to be found offshore Alaska.[2/] This being the case, the need for production and exploration platforms and various modular structures, especially for development offshore Alaska could be significant in terms of resultant expansion of existing facilities and establishment of new ones in Washington State. The following sections in this chapter describe platform need estimates for California and Alaska offshore development based on information made available by the oil industry and state and federal agencies.

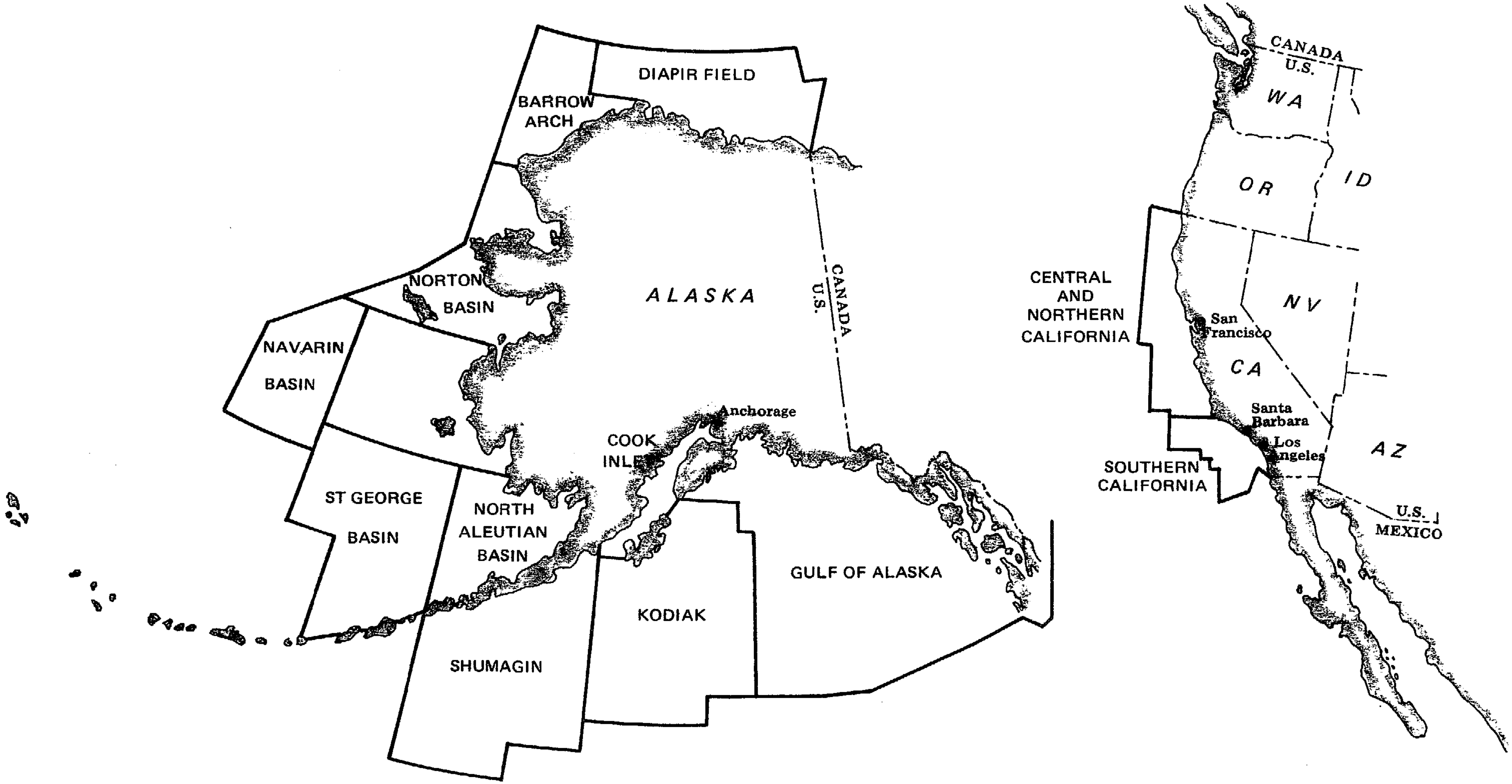
Table 2.10

U.S. DEPARTMENT OF INTERIOR FINAL FIVE-YEAR OCS LEASING SCHEDULE FOR ALASKA AND CALIFORNIA (August 1982-June 1987)

Sale #	Planning Area	Sale Date
71	Diapir Field, AK	August 1982
57	Norton Basin, AK	March 1983
70	St. George Basin, AK	April 1983
73	Central and northern California	Sept. 1983
80	Southern California	Jan. 1984
83	Navarin Basin, AK	March 1984
87	Diapir Field, AK	June 1984
88	Gulf of Alaska/Cook Inlet	Oct. 1984
89	St. George Basin, AK	Dec. 1984
85	Barrow Arch, AK	Feb. 1985
92	North Aleutian Basin, AK	Feb. 1985
91	Central & northern California	Sept. 1985
100	Norton Basin, AK	Oct. 1985
95	Southern California	Jan. 1986
107	Navarin Basin,	March 1986
97	Diapir Field, AK	June 1986
99	Kodiak, AK	Oct. 1986
101	St. George Basin, AK	Dec. 1986
109	Barrow Arch, AK	Feb. 1987
86	Shumagin, AK	June 1987

Figure 2.10

ALASKA AND CALIFORNIA OCS PLANNING AREAS



Source: U.S. Department of Interior, Minerals Management Service

Washington and Oregon OCS Development

There have been no state lease sales off the coast of Oregon, and in Washington State the only lease sale was held in 1978 for state lands offshore the Long Beach Peninsula. All leases from this sale expired in the spring of 1983. No new state or federal lease sales are scheduled for either state at the present time.

California OCS Development

Recent oil discoveries on new OCS leases in the Santa Maria Basin offshore central California will likely be developed quickly.[3/] Three significant discoveries were announced in 1982 and field delineation and production operations for these areas are now being planned. Geologists estimate that a minimum of 16 geologic structures hold the promise for significant discoveries in the offshore portion of the Santa Maria Basin that was opened for exploration during Sale #53 in 1981.[4/] Other basins offshore central and northern California are attracting considerable interest though final leasing of these basins has been delayed due to legal challenges to lease sale #73 on environmental grounds. These new oil discoveries combined with the prospects of additional discoveries make offshore California the brightest spot in the domestic market for the next three or four years.[5/]

A recent Dames and Moore report indicated that oil production offshore California increased in 1981 for the first time since 1969.[6/] According to Dames and Moore estimates, total offshore oil production by the end of 1983 (225 mbd) will be up 64 percent from 1980 (137 mbd). Further increases in production are expected to accelerate as fields in the Santa Maria Basin are developed. Based on announced discoveries and indicated plans, OCS production is likely to increase from the 1982 78 mbd production level to a peak from between 400 and 576 mbd between 1990 and 1993. Combined with projected state offshore production, the total peak would range between 520 and 700 mbd (Table 2.11). Should these production increase figures be accurate, they would represent an increase ranging between 280 and 410 percent, respectively, over the 1980 level.

Table 2.11

TOTAL CALIFORNIA OFFSHORE PETROLEUM PRODUCTION FORECAST
(1982-2000)
(thousands b/d)

	Federal OCS					
	Base Case Development [1]	Slow Development [2]	New Discoveries [3]	State Offshore [4]	Total Offshore Base	Total Offshore Slow
1982	78	78	-	109	187	187
1983	122	122	-	103	225	225
1985	122	122	-	93	215	215
1986	325	250	-	88	413	338
1988	385	300	-	115	500	415
1990	575	395	-	125	700	520
1993	500	400	20-50	115	635-665	535-565
1995	430	355	50-100	105	585-635	510-560
2000	350	280	50-100	85	485-535	415-465

Source: Dames & Moore, March 1983.

[1] These are announced developments in the Santa Barbara Channel and Long Beach area and announced/potential development in the West Santa Barbara Channel and Santa Maria Basin. Base Case development assumes no regulatory delays.

[2] Slow development assumes peak production occurs in 1993. Based on Southern California Coastal Pipeline Feasibility Study, Part C, Bechtel (December 1982).

[3] These are estimates to allow for possible additional discoveries offshore California. The industry's aggressive ongoing exploration plans and recent successes suggest a strong likelihood of additional discoveries.

[4] Assumes five percent per year general decline in production from old oil fields through 2000 with additional production from S. Elwood, Huntington fields, and new state leases in Santa Barbara Channel in 1988.

After the 1990-93 production peak, Dames and Moore projects an offshore production decrease to a level ranging between 415 and 535 mbd in the year 2000.

California Production Platform Demand

The number of production platforms likely to be installed offshore California (state and federal waters) in the next seven years (through 1990) is estimated to be in the range of 15-19 platforms. This estimate is based on an informal WDOE telephone survey of oil companies (ARCO, Exxon, Chevron, Union, Texaco, Shell, and Phillips) holding leases offshore California. The actual number of platforms installed in the 1983-90 time frame could very well deviate higher or lower depending on a variety of factors ranging from government approval of development plans to economics.

Looking beyond 1990, it is extremely difficult to determine what additional number of platforms may be required for offshore production. Discussions with representatives of the aforementioned oil companies indicated that not until additional exploration and delineation work is completed will they know precisely how many platforms will be required.

Realizing the inherent difficulty in estimating what the production platform requirements will likely be 10 to 15 years from now, the Department of Interior, Bureau of Land Management (BLM) has, nevertheless, developed such estimates. Each environmental impact statement (EIS) prepared in conjunction with an OCS lease sale has included an estimated number of platforms likely to be installed subsequent to leasing and exploration. The BLM estimate, contained in the EIS prepared for the current comprehensive five-year OCS oil and gas lease sale schedule (1982-86), projects 56 production platforms being installed offshore California as a result of implementing this schedule. Specifically, BLM estimates that 37 platforms will likely be installed in the southern California planning area between 1986 and 1998. Between 1987 and 1997 BLM estimates that 19 platforms will be installed in the central and northern California planning area (Table 2.12).[7/] These estimates do

Table 2.12

ESTIMATED CALIFORNIA OCS DEVELOPMENT TO RESULT FROM THE IMPLEMENTATION OF THE FINAL 1982-86 OIL AND GAS LEASING SCHEDULE

					Platforms		
Planning Area	Oil/billion bbls*	Gas Tcf*	Probability of Economic Success*	Number of Platforms	First	Most Intense	Last
S. California	.9	1.5	1.0	37	1986	1989-90	1998
C & N California	.5	.7	.99	19	1987	1988-89	1997

*Conditional mean estimates of resources (trillion ft^3) to be recovered from adoption of the proposed Dept. of Interior schedule (Alternative I-1).

Source: Final Supplement to the Final Environmental Statement - Proposed Five-Year OCS Oil and Gas Lease Sale Schedule, Jan. 1982-Dec. 1986, Vol. 1, March 1982. pg. 41-43.

not include platforms likely to be installed on OCS lands leased prior to 1983 or platforms to be installed in state waters. Not included either are the additional platforms likely to be installed on offshore lands leased subsequent to expiration of the current five-year lease schedule (after mid-1987).

No reliable estimates are available concerning the number of platforms that may be required for lease sales after mid-1987. Additional production platforms would likely be required. An estimated 52 additional platforms are projected to be installed on pre-1983 leases based on estimates contained in EISs prepared for individual lease sales #53, #48, and #35 (1981, 1979, and 1975, respectively).[8/] These additional platforms are projected to be installed between 1983 and 1998. Only four platforms are projected to be installed in state waters during the 1983 to 1998 time period.[9/] A combined total of 112 platforms are, therefore, projected to be installed between 1983 and 1998 in California State and federal offshore waters.

Estimates developed by BLM are just that and not everyone agrees with these OCS estimates, including the California Office of the Western Oil and Gas Association (WOGA). This coordinating organization represents the interests of the oil industry, and maintains that the BLM estimates may be 90 to more than 100 percent high.[10/] WOGA's contention seems to be valid, particularly in light of the response to the WDOE telephone survey, which indicated that by the end of this decade (1990) about 20 additional platforms would likely be installed offshore California. If the BLM survey results are even approximately close to being accurate, there would have to be a flurry of activity to install the balance of 90 plus platforms projected to be required by 1998.

There are just too many unknowns to justify the highly optimistic BLM platform estimate. Negative factors such as lease sale litigation, slumping petroleum prices, increased platform costs (primarily resulting from the need to drill in deeper water) and perhaps, most importantly, overly optimistic resource estimates could each contribute to substantially reduced estimates of demand for production platforms.

Assuming the BLM estimates to be 90 to over 100 percent high, a more reasonable estimate of the number of production platforms likely to be installed offshore California between 1983 and 1998 might be 50-60. Halving the projected 112 platforms still leaves 56 which would represent an 80 percent increase over the 31 offshore platforms and artificial islands installed during the 25-year period between 1958 and 1983. This estimated range of 50-60 platforms coincides with the estimate developed independently by the Humboldt County Planning Department as part of a platform fabrication yard need assessment conducted by the county (Summer 1983).[11/]

Timing of Platform Installation

Platform installation timing predictions are imprecise, since a variety of factors can influence when a platform will be installed. Factors such as government approval, platform cost and petroleum economics can alter or preclude installation even though a schedule may have been established. This should be kept in mind when reviewing the schedule of proposed OCS platforms (Table 2.13) prepared by the Department of Interior, Minerals Management Service. Not indicated in this schedule, for example, are possibly 10 additional platforms expected to be proposed by Occidental, Union, Chevron, and Texaco in the near future.[12/] These platforms would likely be built before 1990.

Only four platforms are known to be proposed for state waters offshore California in the foreseeable future. All four platforms would be operated by ARCO and would likely be installed simultaneously in the 1985/86 time frame.[13/]

Platform Types - California

Exploration offshore California is expected to extend into increasingly deeper waters between now and the year 2000, as shallower, more easily accessible and, therefore, less costly oil and gas resources are exploited first. With the trend toward deeper water development, it is expected that larger more costly production platforms will be required. At least

Table 2.13

PROPOSED PLATFORMS FOR THE PACIFIC OCS - CALIFORNIA

Platform	Operator	OC5-P number	Unit/ (field)	Number of well slots	Water depth (feet)	Distance to shore (miles)	Installation date
Edith	Chevron	0296	(Beta Northwest)	70	161	8.4	1983
Eureka	Shell	0301	(Beta)	60	699	10.0	1984
Gail	Chevron	0205	Santa Clara (Sockeye)	36	740	13.5	1986
Hermosa	Chevron	0316	New Discovery Tract	48	605	10.0	1985
Harvest	Texaco	0315	New Discovery Tract	n.a.	788	12.0	1985
Hondo "B"	Exxon[1]	0190	Santa Ynez (Hondo)	60	1,200	6.0	1987
Pescado "A"[2]	Exxon[1]	0182	Santa Ynez	60	1,075	8	1988
Pescado "B1"[3]		0183		28	1,023	7.8	1992 or 1998
Pescado "B2"		0182	(Pescado)	60	1,140	8	1988
Sacate	Exxon[1]	0193	Santa Ynez (Sacate)	28	620	5.0	1989
Hidalgo	Chevron	0450	Arguello	56	435	12.0	1986

n.a. = Information not yet available.

[1] All information regarding the development of Exxon's Santa Ynez Unit is preliminary; all numbers and dates are approximate.

[2] Two options are being considered for development of the Pescado field that may require either one (Pescado) A) or two (Pescado B1 and B2) platforms.

[3] The installation date for the Pescado B1 platform (if two Pescado platforms are determined to be necessary) depends on the location of oil treating facilities for future Santa Ynez Unit development. If the existing offshore storage and treatment vessel is expanded, then the Pescado B1 platform would be installed in 1998; however, if new oil treating and storage facilities (and a new marine terminal) are constructed onshore, then the Pescado B1 platform would be installed in 1992. The difference in installation dates is due to the limited oil treating capacity of the expanded offshore and treatment vessel.

Source: Collins and others, 1982; Ghylin, 1982; Lundvall, 1982.

Prepared by the Department of Interior, Minerals Management Service.

seven of the platforms scheduled or tentatively scheduled for installation by 1992 offshore California will be in waters 700 feet or deeper, and of these, four platforms will be in water over 1,000 feet deep (Table 2.13). All of these and other platforms now being considered for installation offshore California are of the conventional steel jacket design.

The consensus of a number of manufacturers of production oil and gas platforms was that conventional piled steel jacket platforms would continue to be built for offshore California oil and gas development until other alternative designs are proven to be more cost competitive and as reliable. Jacket fabricators generally agree that 1,500 feet is now the practical limit of steel platforms and that economic considerations may make alternative types of platforms preferable in water depths greater than 1,000 feet.[14/]

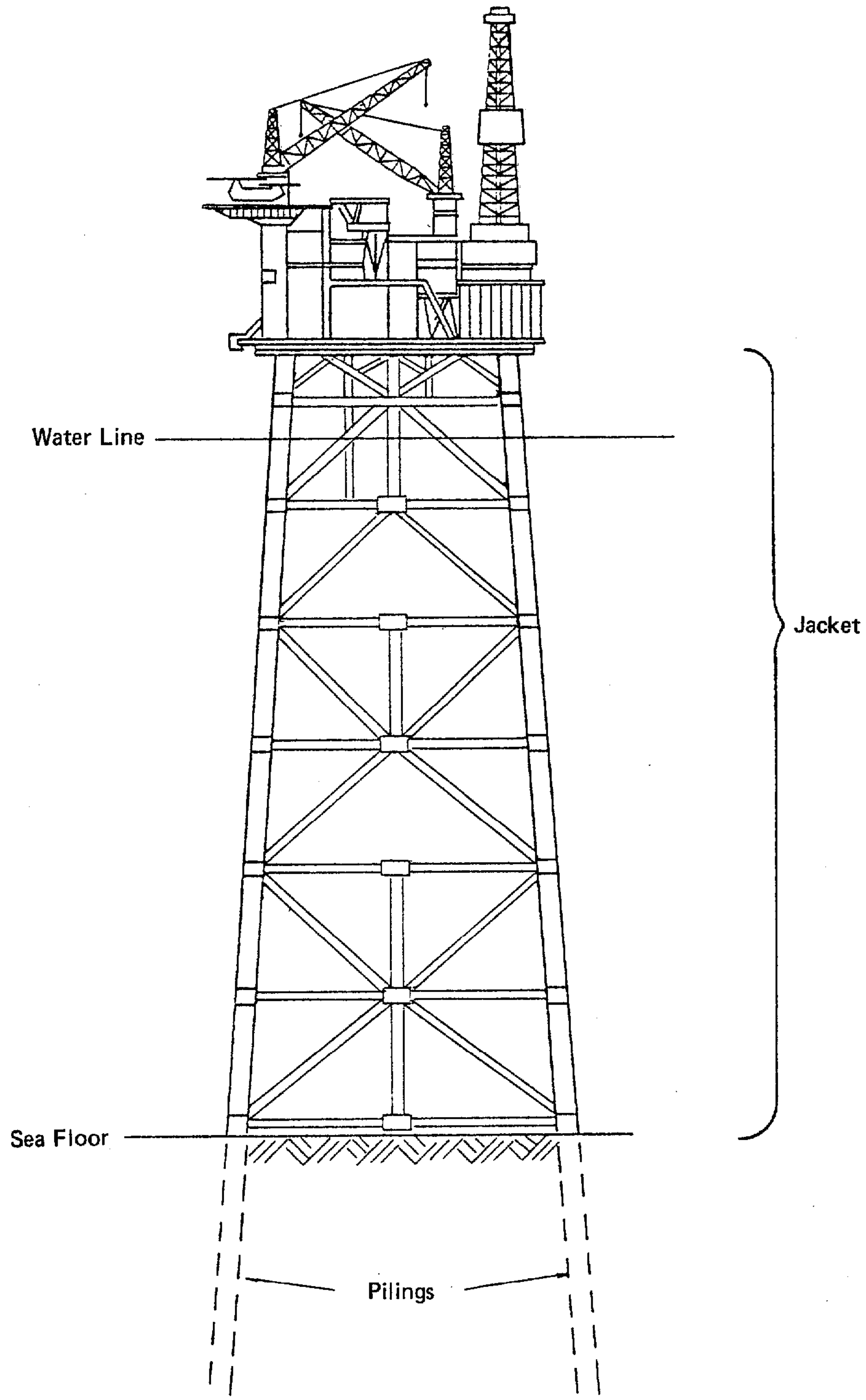
Conventional Steel Jacket

The jacket, or main body of a steel jacket platform, consists almost entirely of steel tubular members that are welded together (Figure 2.11). The steel jacket supports one or more decks on which drilling and/or production equipment is mounted. The platform is pinned to the sea floor by steel piles driven through the legs at its base. Such platforms are designed to resist the actions of wind, waves, and currents. Development drilling, production, and processing may all be centered on one large platform or they may occur on smaller, separate but interconnected platforms. In deep water it is most likely for economic reasons that only one platform would be used. The well head equipment is located on the platform deck.

The advantages and disadvantage of the piled steel jacket platform and seven other platform designs are summarized in Figure 2.12. It is entirely possible that one or more of these alternative designs could, depending on needs and cost, substitute for the conventional steel jacket platform offshore California. However, two designs in particular, namely the tension leg platform and the guyed tower platform, stand out as possible

Figure 2.11

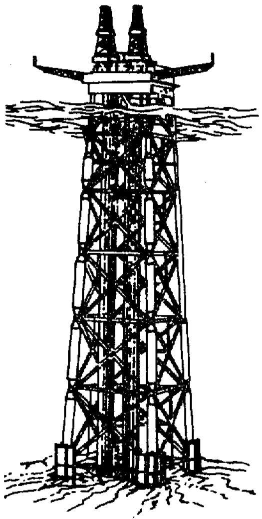
TYPICAL STEEL – TEMPLATE PLATFORM



Source: Draft EIR Kaiser Steel Corporation
Terminal Island Marine Assembly Yard, June 1983

Figure 2.12

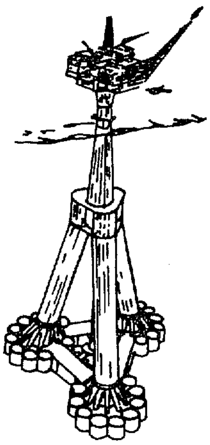
PLATFORM DESIGNS: ADVANTAGES AND DISADVANTAGES



Piled steel jacket

Advantages
- Current technology
- Has deepwater experience

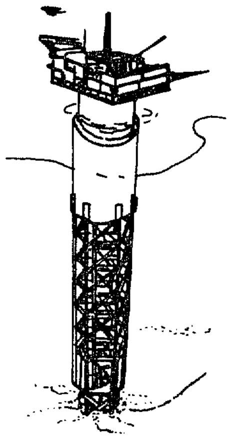
Disadvantages
- Very thick steels required
- Launching presents great stresses



Concrete gravity unit

Advantages
- Current technology
- Can take large deck loads
- Low maintenance
- Sheltered deck loading

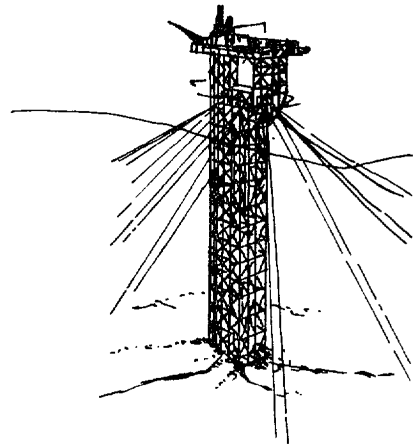
Disadvantages
- Float-out depths limited
- Sand poses foundation problem



Articulated tower

Advantages
- Piled foundation
- Deck weight not critical

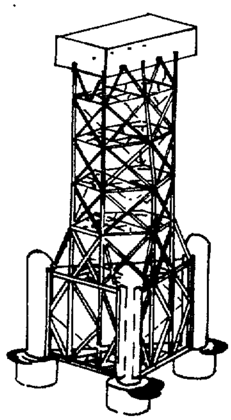
Disadvantages
- No experience with large joints
- Gas blowout poses hull danger



North Sea guyed tower

Advantages
- Piled foundation
- Deepwater application underway
- Buoyancy can reduce pile stress

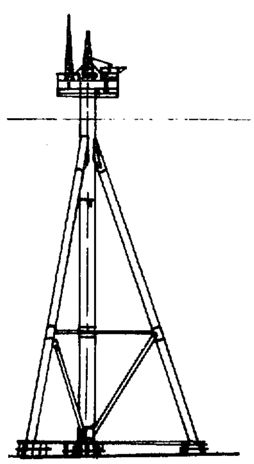
Disadvantages
- High maintenance on guywires
- Vessel anchoring difficult



Steel gravity platform

Advantages
- Can take large deck loads
- Sheltered deck loading

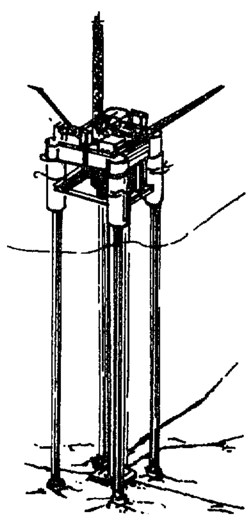
Disadvantages
- Float-out depths limited
- Bottles susceptible to damage



Steel tripod tower

Advantages
- Piled foundation
- Small water plane area

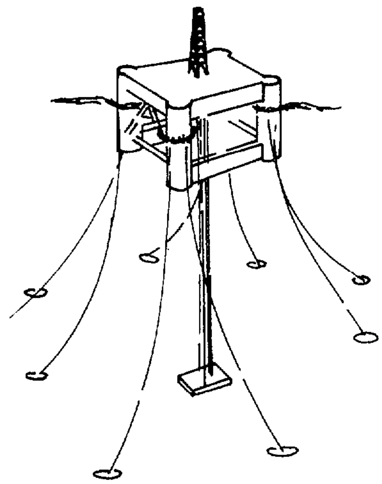
Disadvantages
- Very thick steels required
- Limited space for conductors
- Deck loading offshore



Tension leg platform

Advantages
- Unlimited depth deployment
- Restricted vertical movement

Disadvantages
- Deck load sensitivity
- Complexity of tensioning systems



Catenary anchored floater

Advantages
- Unlimited depth deployment
- Restricted horizontal movement

Disadvantages
- Deck load sensitivity
- Large vertical movement
- Vessel anchoring difficult

Source: Offshore, December 1982

alternatives to the steel jacket, especially in water depths exceeding 1,000 feet.

Tension-Leg Platform

Tension-leg platforms (TLP) differ significantly from most other platform designs in that the platform structure supporting the modules and drilling rigs floats rather than sits on the seabed (Figure 2.13). The TLP, which is applicable to a water depth range of 500 to 2,000 or 3,000 feet, is tethered to the sea floor by slender steel tubes or wire ropes attached at its four corners.

The first production TLP is currently being built by Conoco (UK) Ltd. for use in the Hutton field of the North Sea (depth 480 feet). Because of technical problems associated with the construction of this platform, installation will not occur at the end of 1983, as originally planned. At the earliest, it is now expected that the Hutton would be installed in late 1984. Problems associated with the construction of this first production TLP have driven the cost of the Hutton Field project up to nearly $1.2 billion, about 30 percent more than the original $900 million budgeted.[15/]

Guyed Tower Platform

The guyed tower platform is applicable for water depths ranging between 700 and 3,000 feet. This unique platform design consists of a steel tower of lattice configuration with a constant cross-section from top to bottom; the width of the column is generally one tenth of the water depth for which the tower is designed (Figure 2.14).[16/] The tower is held in place by a number of guylines extending radially from the top of the tower to clump weights on the sea floor.

The first commercial scale guyed tower platform was installed for Exxon during June 1983 in the Gulf of Mexico.[17/] Located in 1,000 feet of water, the 1,078 foot platform is expected to go on production in 1984.

Figure 2.13

TENSION LEG PLATFORM

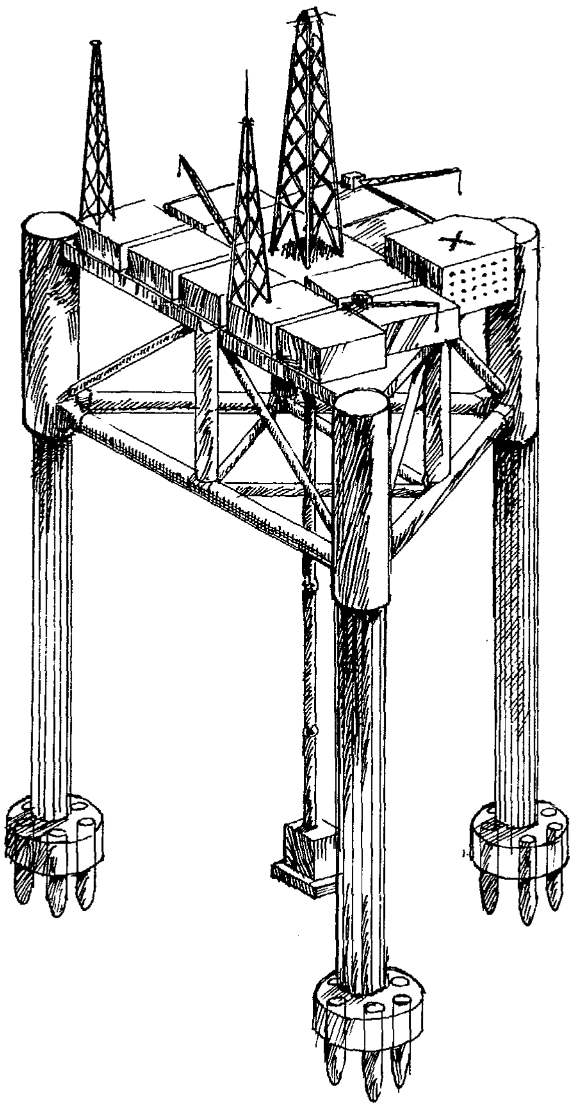
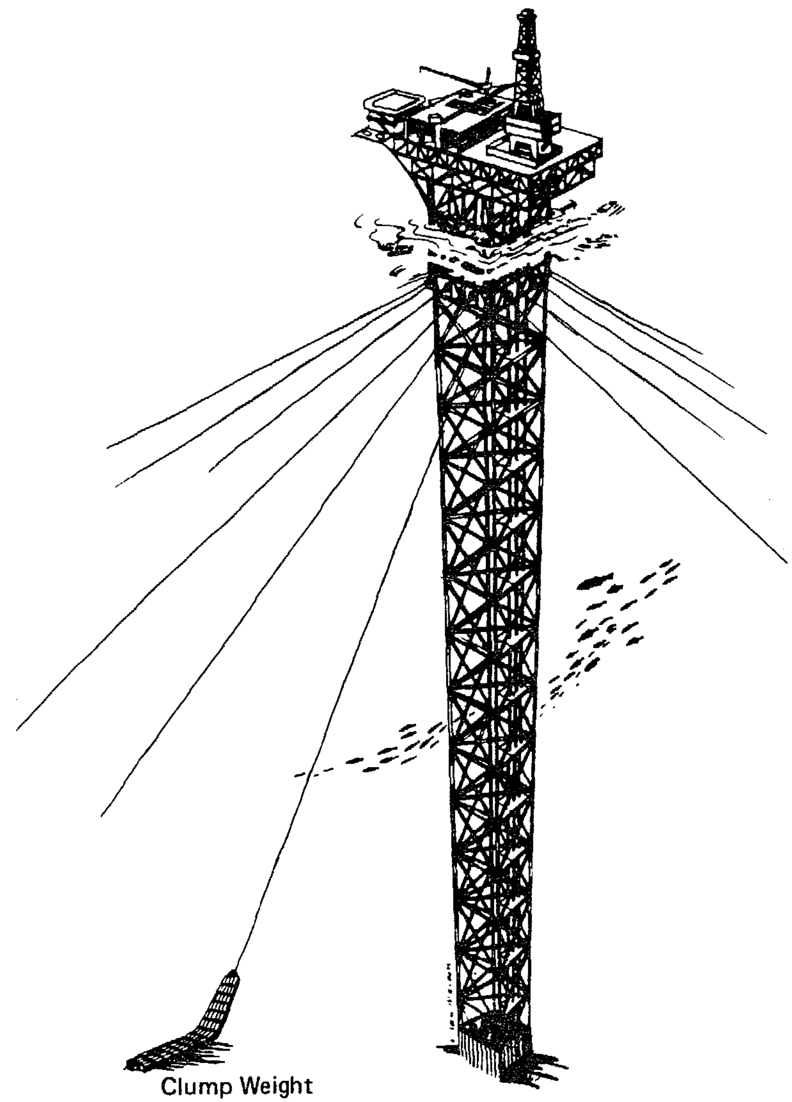


Figure 2.14

GUYED TOWER PLATFORM



Summary of California Platform Demand

In summary, California market demand for offshore production platforms could be relatively strong between 1983 and 1998 compared to the recent past, based on information currently available. An estimated 50 to 60 platforms (more or less) may be installed in combined state and federal waters during this 15-year time span as a result of leases issued since 1975 and scheduled for sale through mid-1987. Of this number, an estimated 15-19 steel jacket platforms are likely to be installed offshore California by 1990. Other platform designs may be considered for water depths greater than 1,000 feet.

Alaska Offshore Development

The Alaska OCS is larger than the entire OCS along the coasts of the lower 48 states. Planning areas there include about 815 million acres compared with 444 million acres for the Atlantic, Gulf, and Pacific OCS areas combined. Because of the hydrocarbon potential and large area of the Alaska OCS, more sales are currently scheduled there than in any other region. Much of what is known about the hydrocarbon potential of the Alaska OCS is through inference from seismic exploration, and a small amount of drilling. The limited amount of knowledge gained through these activities makes it difficult to judge accurately how many production platforms will actually be installed in the 1983-2000 time frame. Only after more extensive drilling is completed subsequent to each individual lease sale can more accurate platform needs be assessed.

The first of 16 Alaskan OCS lease sales was held in 1982, as part of the current accelerated five-year OCS oil and gas leasing schedule. The Diapir Field lease sale (OCS lease #71) drew bids in excess of $2 billion, which is indicative of the optimism concerning the belief that the Beaufort Sea acreage may yield another giant field like Prudhoe Bay. The BLM estimated in their presale EIS covering all OCS planning areas that 1.7 billion barrels of undiscovered recoverable oil may be contained in the Diapir Field (Table 2.14). Other sources believe the resource estimate for just a single geologic structure (Mukluk) within the Diapir

Table 2.14

ALASKA OCS OIL AND GAS DEVELOPMENT
ESTIMATED TO RESULT FROM THE IMPLEMENTATION OF THE FINAL 1982-86
OIL AND GAS LEASING SCHEDULE

Planning Area	Oil/billion bbls**	Gas Tcf**	Probability of Economic Success
S. Alaska (Kodiak, Schumagin, Gulf of Alaska, Cook Inlet)	.1	.8	1.00
St. George Basin	.4	2.2	.64
Navarin Basin	.6	3.7	.76
Norton Basin	.2	1.6	.57
Barrow Arch	.3	1.0	.76
Diapir Field	1.7	8.9	1.00
N. Aleutian Basin	.3	1.3	.42
Hope Basin	.1	.8	.24

**Conditional mean estimates of resources to be recovered from adoption of the proposed Department of Interior leasing schedule (Alternative I-1). This alternative most closely approximates the final 1982-87 five-year OCS oil and gas leasing schedule according to the Minerals Management Service, Los Angeles (June 1983 personal communication).

Source: Final supplement to the Final Environmental Statement - Proposed Five-Year OCS Oil and Gas Lease Sale Schedule, Jan. 1982-Dec. 1986, Vol. 1, pg. 41-43.

Field may be as high as five billion barrels.[18/] This latter estimate may no longer be valid based on the disappointing results of the first well drilled into this formation by Sohio in late 1983.

The BLM Diapir Field hydrocarbon estimate is about three times that believed recoverable from the Navarin Basin planning area, which has the second highest hydrocarbon estimate (.6 billion barrels) of the scheduled lease sale areas. The other Alaska OCS planning areas are estimated to contain between .1 billion barrels (S. Alaska Sale Area) and .4 billion barrels (St. George Basin) of oil with the overall probability of economic success ranging between 100 percent (S. Alaska Sale Area and Diapir Field) and .24 percent (Hope Basin).

Since the Final Supplement to the Final Environmental Statement for the 1982-86 five-year OCS oil and gas lease sale schedule was released in March of 1982, individual EISs for the Diapir Field, Norton Sound, and St. George lease sales have been released with updates of estimated oil and gas resources. As indicated in Table 2.15, estimates for St. George Basin and Diapir Field were revised upward for oil, while the estimates for Norton Sound varied little. The gas resource estimate for the Diapir Field was reduced substantially from 8.9 to 1.78 trillion cubic feet (Tcf). The gas resource estimate for Norton Sound also decreased somewhat (1.6 to 1.09 Tcf), while the gas resource estimate for St. George Basin increased (2.2 to 3.66 Tcf).

The preceding discussion illustrates how resource estimates can be expected to fluctuate as new exploration data and information are made available. And, with the revisions in resource estimates it should be assumed that the number of estimated platforms required for development may vary from original estimates.

Alaska Production Platform Demand

If the BLM resource estimates for the respective Alaska OCS planning areas are close to being accurate, then a substantial number of offshore production platforms would likely be installed before the year 2000. As mentioned above, however, uncertainties related to making accurate

Table 2.15

DIFFERENCES IN ALASKA OCS RESOURCE ESTIMATES CONTAINED IN THE 1982-86 LEASE SCHEDULE EIS AND SUBSEQUENT INDIVIDUAL LEASE SALE EISS

Planning Area/Sale No. (Area)	Resource Estimates Oil/billion bbls	Gas/Tcf
Diapir Field*	1.7	8.9
71 (Diapir Field)** 9/82	2.38	1.78
Norton Sound*	.2	1.6
57 (Norton Sound)** 3/83	.14	1.09
St. George Basin*	.4	2.2
70 (St. George Basin)** 2/83	1.12	3.66

*Estimates taken from Final Supplement to the Final Environmental Statement - Proposed Five-Year OCS Oil and Gas Lease Schedule, Jan. 1982-Dec. 1986, Vol. 1, pg. 41-43 (March 1982)

**Estimates taken from EISs prepared for individul lease sales.

assessments of undiscovered recoverable oil and gas resources make projecting the exact number of offshore platforms a difficult task at best. For example, the Cook Inlet (sale CI, 1977) and Northern Gulf of Alaska (sale #39, 1976) EISs projected the installation of 25 and 22 platforms, respectively, based on optimistic resource estimates. To date, no discoveries have been made in these lease areas, hence no production platforms have been required. Similar outcomes could very well take place in other Alaska offshore areas recently leased or yet to be leased.

The current five-year leasing schedule (mid-1982 to mid-1987), if fully implemented, could result in 22 production platforms, including gravel islands, being installed on the Alaska OCS by 1998, according to the final supplement to the EIS prepared for the leasing schedule.[19/] A breakdown of platform numbers and probable installation dates by planning area is shown in Table 2.16. As this table indicates, the first of the platform installations resulting from the current five-year lease schedule would not likely occur until 1986 with the highest number of installations peaking in the 1987-91 time frame.

Though the projected number of Alaska OCS production platforms for all planning areas was made as recently as March 1982, new data suggests that these estimates (22 platforms) may be conservative. For example, based on mean resource estimates, contained in individual EISs for the Diapir Field (sale #71, October 1982), Norton Sound (sale #57, March 1983) and St. George (sale #70, April 1983) planning areas, 23 platforms would likely be installed on leased lands in these planning areas.[20/] Add to this figure the platforms projected, based on anticipated development of Alaska OCS leases issued between 1979 and 1981, and an estimated total ranging between 32 and 35 platforms would be installed (Table 2.17). Not included in this total are the 47 platforms previously projected to be installed in the Northern Gulf of Alaska and Cook Inlet resulting from lease sales held in 1976 and 1977, respectively. Platform projections for these lease areas were not included, since no discoveries have yet occurred and prospects appear dim.

Table 2.16

ESTIMATED ALASKA OCS PLATFORM DEVELOPMENT TO RESULT FROM THE IMPLEMENTATION OF THE FINAL 1982-87 OIL AND GAS LEASING SCHEDULE

Planning Area	Number of Platforms	First	Platforms Most Intense	Last
S. Alaska (Kodiak, Schumagin, Gulf of Alaska, Cook Inlet)	1	1991	1991	1991
St. George Basin	3	1987	1987-91	1991
Navarin Basin	3	1988	1988	1995
Norton Basin	3	1988	1988	1993
Barrow Arch*	1	1990	1990	1990
Diapir Field*	8	1986	1989-90	1998
N. Aleutian Basin	2	1987	1987	1991
Hope Basin*	1	1990	1990	1990

*Includes only the portion of the planning area in water depths of 0-100 meters (328 ft).

**Conditional mean estimates of resources to be recovered from adoption of the proposed Department of Interior schedule (Alternative I-1). This alternative most closely approximates the final 1982-87 five-year OCS oil and gas leasing schedule according to the Minerals Management Service, Los Angeles (June 1983 personal communication).

Source: Final Supplement to the Final Environmental Statement - Proposed Five-Year OCS Oil and Gas Lease Sale Schedule, Jan. 1982-Dec., 1986, Vol. 1, pg. 41-43.

Table 2.17

PLATFORM PROJECTION NUMBERS FROM FINAL EIS'S PREPARED FOR ALASKA OCS LEASE SALES HELD BETWEEN 1976 AND 1983

Sale No./Area/Date	Projected No. of Production Platforms
39 (N. Gulf of Alaska) 1976[a]	22[b]
CI (Cook Inlet) 1977[a]	25[b]
BF (Beaufort) 1979	3-6[c]
55 (E. Gulf of Alaska) 1980	2[c]
60 (Lower Cook Inlet/ Shelikot Strait) 1981	4[c]
71 (Diapir Field) 1982	3[c]
57 (Norton Sound) 1983	9[c]
70 (St. George) 1983	11[c]

a. No discoveries to date (1983).

b. Projections based on extreme range for estimated recoverable oil and gas resources.

c. Projections based on estimated mean range of undiscovered recoverable oil and gas resources.

Source: Final EIS for the pertinent area.

The range of 32-35 platforms is projected only for those OCS leases issued since 1979. Updated platform estimates for the 13 remaining Alaska OCS lease sales scheduled through mid-1987 could increase the total. Until these estimates are available, it is probably reasonable to use what appear to be fairly conservative planning area estimates contained in the final supplement to the final EIS prepared for the current OCS leasing schedule (Table 2.16). The additional platforms projected in this EIS for planning areas not yet leased would increase the total estimated number of production platforms (including gravel islands) to between 39 and 42. Since three of the 13 remaining lease sales are scheduled for planning areas where leases have already been issued, EISs prepared for upcoming lease sales in these areas should be expected to further refine the projected total number.

Production platform installations resulting from the sale of state offshore leases and OCS leases likely to be issued after mid-1987 should be expected to increase the total number of platforms likely to be in place before the year 2000. No estimates of platform numbers are currently available for state offshore lease sales or possible OCS lease activity after mid-1987.

Alaska Exploration Platform Demand

Year-round exploration in the arctic requires the use of unconventional platform structures, primarily because of the severe ice conditions encountered there. Oil companies operating in shallow Alaskan arctic waters have thus far been utilizing man-made islands as a drilling base, but are now beginning to turn away from their use because of high costs and the fact that they are not reusable.*/ As an alternative to gravel islands, several oil companies operating in the Alaskan arctic are proposing to have reusable mobile steel and/or concrete gravity platforms built to withstand the harsh conditions and thus make it possible to conduct exploration activities on a year-round basis.

*Gravel from defunct islands can be requarried for use elsewhere, but at great expense and in water depths probably not exceeding 60 feet.

The total number of arctic exploration platforms likely to be required in the years ahead is not yet known. However, until recently there was enough optimism concerning the prospect of discoveries being made in Alaska's arctic offshore waters that three concrete and/or steel gravity platform structures were tentatively to have been built by 1985 to begin accelerating offshore exploration there. One of these platforms is now under construction in Japan for scheduled use by Exxon in Alaska's western Beaufort Sea in November 1984. Orders for the other two similarly designed platforms (for use by Exxon and Amoco oil companies) have been held up largely due to the dry hole drilled in the previously highly touted Mukluk formation in the Beaufort Sea in late 1983. This dry well, the most costly in history, may have tempered the optimism surrounding oil and gas prospects in the Alaska Beaufort Sea.

Should Sohio, Amoco, and other oil companies holding leases in the arctic offshore remain optimistic about oil and gas prospects there, the Mukluk experience could reinforce the opinion that less costly, reusable mobile exploration platforms would be advantageous over gravel islands. A better understanding of the direction these oil companies will take in determining their arctic offshore platform needs may be realized in a year or two (1984 or 1985), after the completion of near term exploratory drilling.

Timing of Platform Installation

Exploration Platforms

The first mobile gravity platform to be used for Alaska OCS exploration (Exxon) is tentatively scheduled for delivery to the Beaufort Sea in mid-1984. Other similarly designed exploration platforms may be ordered in the near future for use in the Beaufort depending on the results of early drilling and the level of optimism concerning oil and gas prospects there.

Production Platforms

The first Alaska OCS production platform installation, resulting from leases issued under the current five-year leasing schedule, should take place in the shallow waters of the Beaufort Sea in 1986, based on the EIS prepared for the schedule (Table 2.16). The period of greatest installation intensity, according to the Department of Interior EIS, would be in the 1988 to 1990 time frame. While it may be possible that the estimated eight Beaufort production platforms could be installed by 1986, with more to follow closely in other areas in succeeding years, it is not probable; especially since initial exploration and delineation drilling have yet to be completed. Not until the results of preliminary drilling are in, will it be known if production platforms will even be needed, keeping in mind that in the Beaufort Sea, for example, a 300 million barrel (or more) field would likely be required to be commercial.[21/]

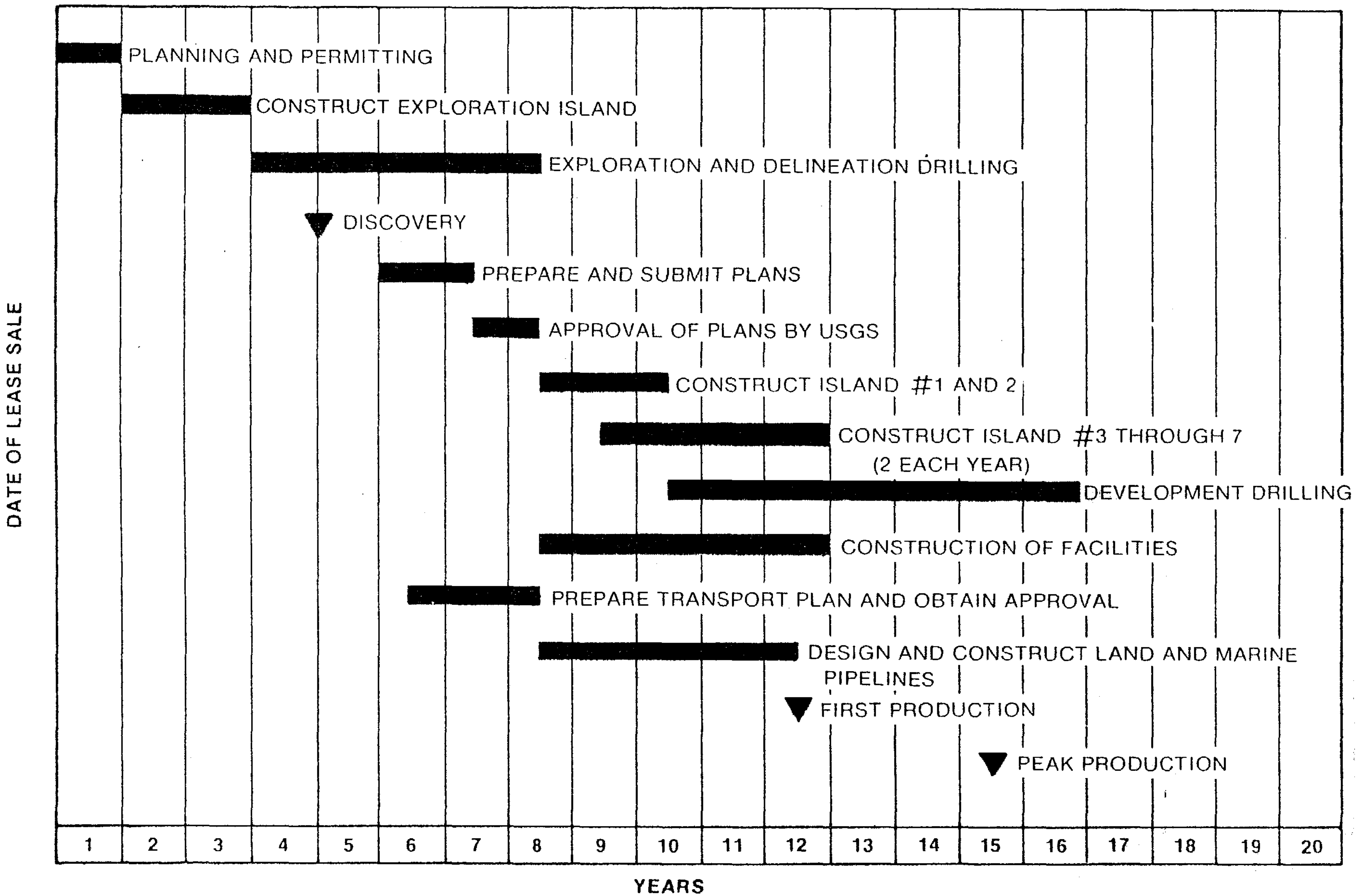
Assuming that discoveries are made beginning in the 1983/84 drilling season, it would likely take a minimum of seven to eight years before production would begin in the more easily accessible areas such as the Beaufort and perhaps double this amount of time in more remote areas (Figure 2.15).[22/] Factors that will influence Alaska offshore production timing include economics, environmental considerations, and approval and installation of marine and land pipeline systems. Problems associated with any one of these factors could slow or even prevent production operations.

Platform Types - Alaska

Alaska, unlike California, presents a variety of harsh offshore drilling conditions ranging from the violent storm prone seas of the Gulf of Alaska to the massive ice forces (most of the year) characteristic of the Beaufort and Chukchi seas. Unique environmental conditions in each of the Alaska offshore areas where exploratory and production drilling is expected to occur in the months and years ahead will require special drilling system design considerations not necessary in more temperate climates. At least fifty-one concepts for drilling and production in the arctic offshore environment have been identified.[23/] The discussion which follows addresses some of the various types of offshore drilling systems being considered for year-round operation in the Alaska offshore areas. Special

Figure 2.15

BEAUFORT SHELF (OIL CASE – 500,000 BARRELS PER DAY) DEVELOPMENT SCENARIO



Source: U.S. Arctic Oil and Gas, National Petroleum Council, December 1981 attention is given to those drilling systems that potentially could be supplied by fabrication/assembly facilities located in Washington.

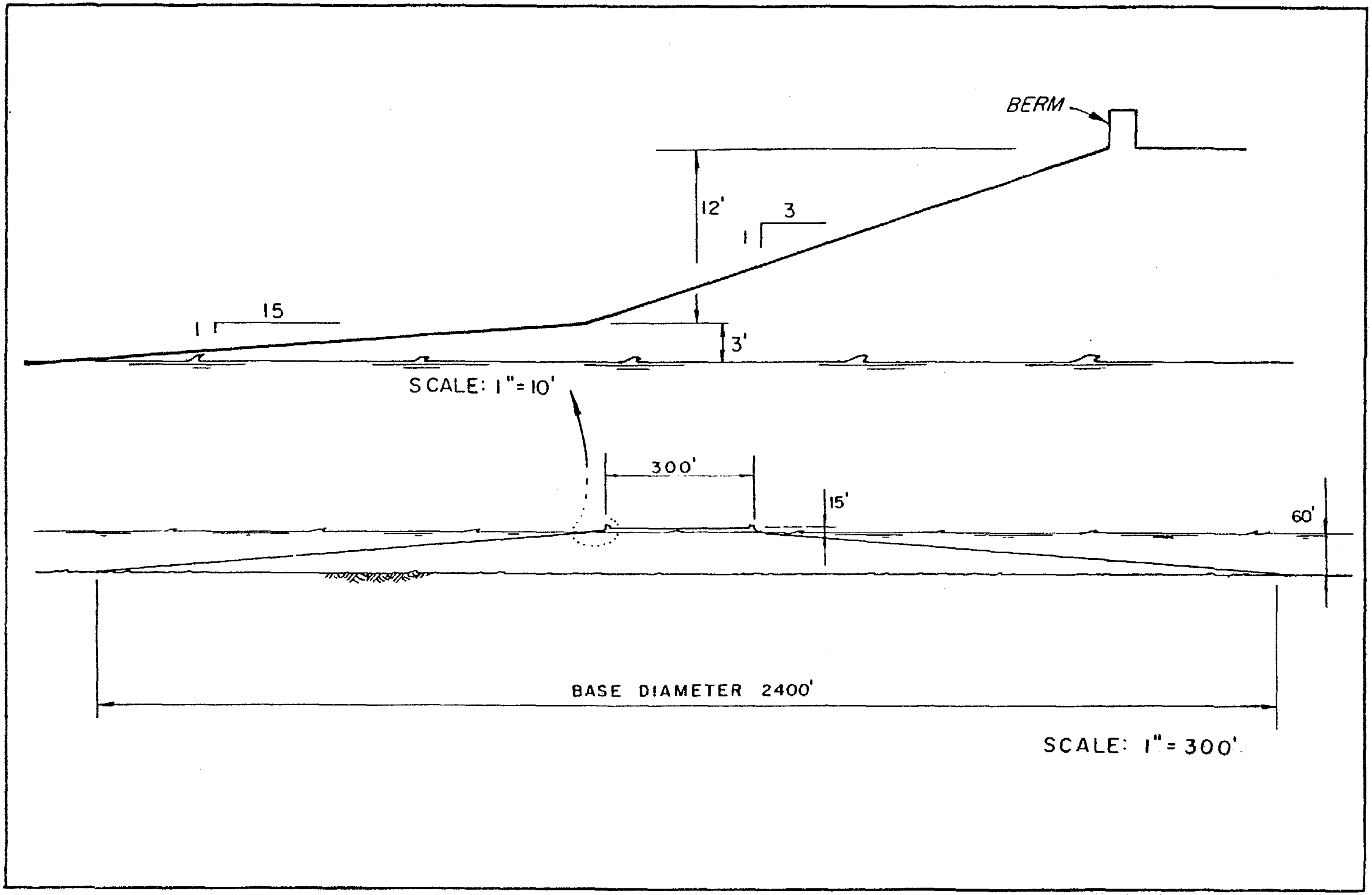
Beaufort and Chukchi Seas - Exploration

The Beaufort Sea, while possibly containing the largest petroleum reserves of any offshore Alaska planning area, has the most severe environmental conditions. Massive ice forces in winter and wave forces in summer make conventional exploration and production drilling impractical. Alternative means of both exploration and production drilling, therefore, are required. For example, the first round of exploratory drilling (1983-84) in the highly prospective OCS sale #71 area of the Beaufort will likely entail the use of gravel islands in 40-60 feet of water (Figure 2.16).[24/] But, as drilling proceeds into deeper water, in the second round (1984-85), gravel islands will likely become too expensive ($1-2 million/vertical ft.) and could not be reused. In their place, for confirmation and delineation drilling during the second season, mobile concrete or steel gravity structures will likely be used.[25/] In the long run, these gravity structures will be less expensive ($85 million or more) than gravel islands ($40-75 million) for exploration, since they can be reused. This contention may have been confirmed recently as Sohio's Mukluk gravel island costs in Alaska's Beaufort Sea will push the exploration well's cost to more than $100 million, making it the costliest wildcat in history.[26/]

Several mobile steel/concrete gravity structure designs have been proposed to endure the severe ice conditions encountered in the Beaufort Sea. Sohio's Arctic Mobile Structure (SAMS) is such a design. It basically is an octagonally shaped barge built with a reinforced, prestressed concrete base which supports steel drilling modules (Figure 2.17). The interior of the structure would be comprised of reinforced concrete bulkheads, thus creating a honeycomb effect. The walls of the SAMS are made of prestressed, high density concrete to defend against ice shear. A steel/concrete wall is located atop the ice wall to deflect storm waves.

The SAMS base would have the capability of extending seven foot diameter high stress steel spuds (anchor pins) to penetrate up to 40 feet below

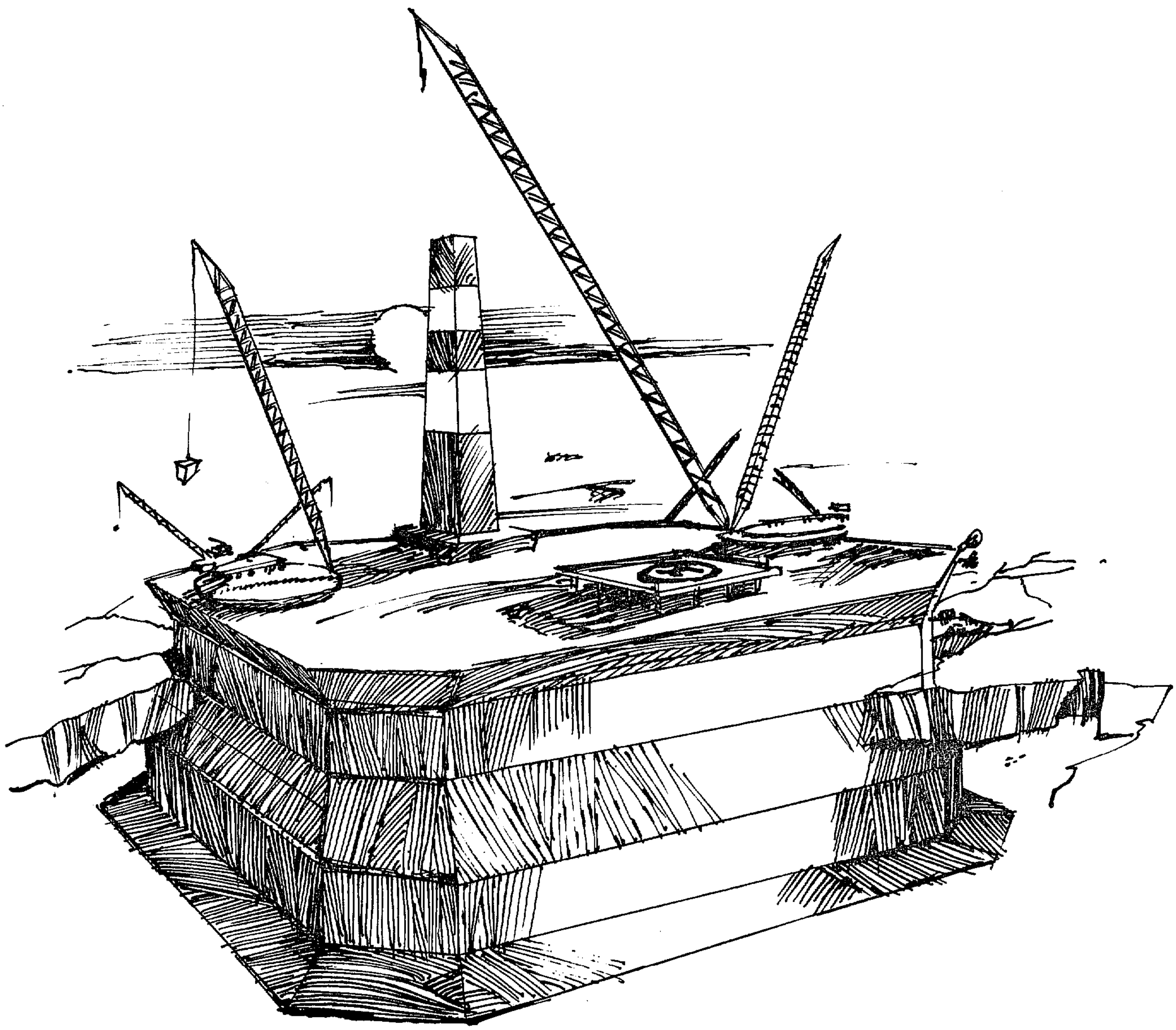
Figure 2.16
ELEVATION OF ARCTIC EXPLORATORY DRILLING ISLAND



Source: U.S. Arctic Oil and Gas Report prepared by the National Petroleum Council, December 1981

Figure 2.17

SOHIO'S ARCTIC MOBIL STRUCTURE (SAMS)



Source: Offshore, July 1983

the sea floor preventing lateral movement. The bottom soils and structure mat would provide vertical resistance.

Individual wells onboard would be protected by special caissons designed to separate from the mat should the base slide.

The concrete island drilling system (CIDS) is a similar structure designed by Global Marine Development Inc. and now under construction in Japan by NKK.[27/] The CIDS design utilizes stacked concrete modules topped with a steel drilling barge (Figure 2.18). A depth range of 18-52 feet can be achieved with this design by assembling modules of varying heights.

The CIDS, as with the SAMS, utilizes a compartmental design. The concrete base structure would be comprised of a network of hollow precast concrete cylinders (Figure 2.19) connected by walls and enclosed top and bottom by concrete slabs which provide both the weight necessary for ice pack resistance and buoyancy (after deballasting) necessary for moving the structure. Ballasting and deballasting are achieved with sea water.

The CIDS can be moved to another site by refloating the concrete module and towing the entire structure intact. Differences in water depth are expected to be accommodated by restacking the base modules to the appropriate level.

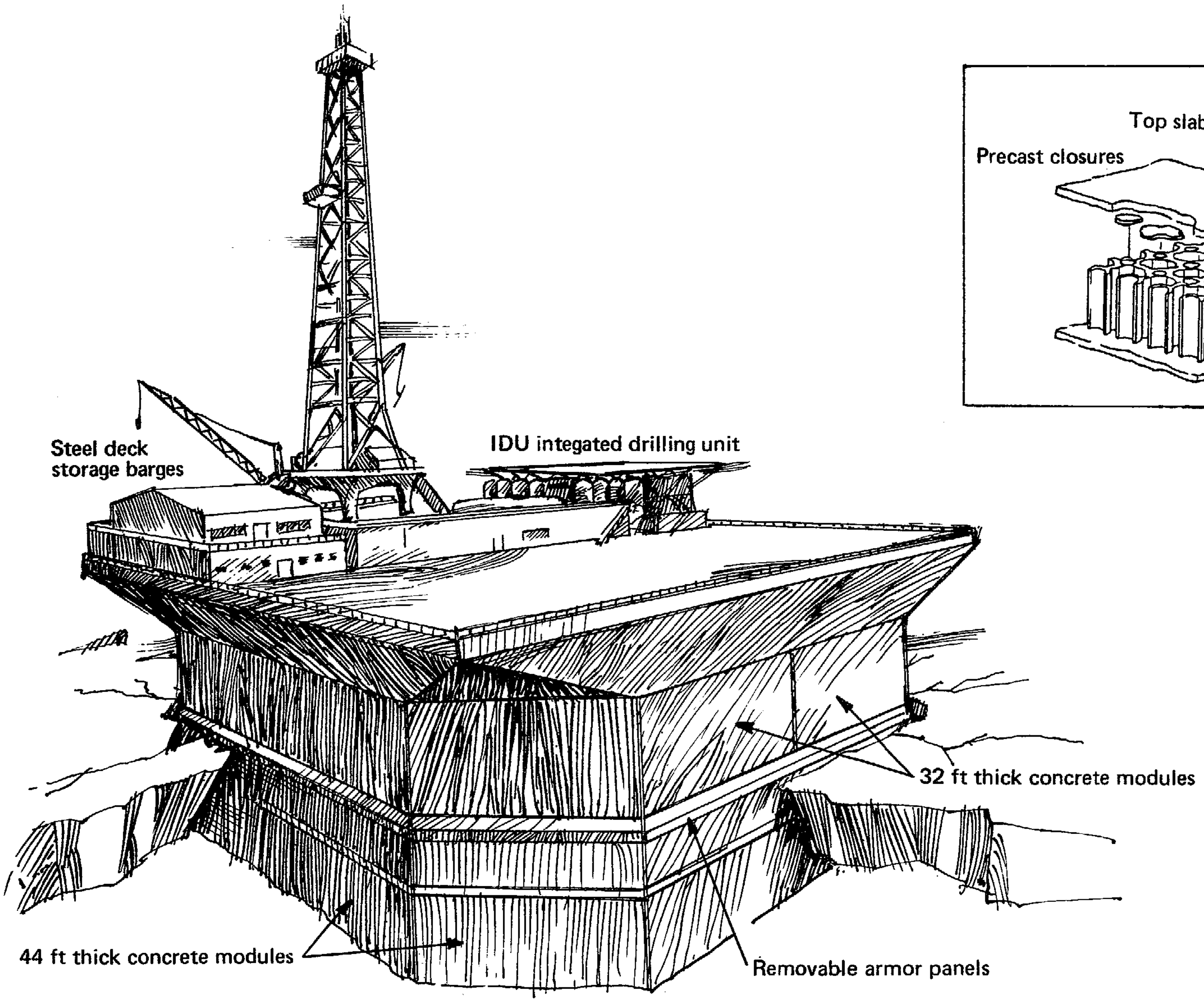
Another drilling system designed for the shallower waters (20-50 ft) of the Beaufort and Chukchi seas is the portable arctic drilling structure (PADS). This drilling system, designed by Chicago Bridge and Iron Industries, Inc., Chicago, could be built for exploratory and/or development activities.[28/] The combination steel (80 percent)/concrete (20 percent) drilling system would be 400 feet in diameter and 75-80 feet high (Figure 2.20). Conventional arctic land rigs could be adapted for use on the PADS.

Other drilling structure designs being considered by industry for exploration of the shallower areas of the Beaufort and Chukchi seas include: (1) a variety of steel caisson configurations aimed at containing a

Figure 2.18

CONCRETE ISLAND DRILLING SYSTEM (CIDS)

STACKED GRAVITY UNIT FOR 18–55 FOOT DEPTHS



Source: Offshore, December 1982

Figure 2.19

HONEYCOMB DESIGN USED IN CONCRETE GRAVITY UNIT

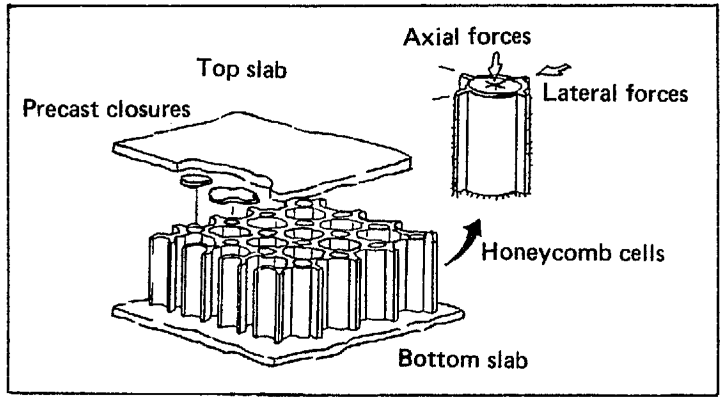
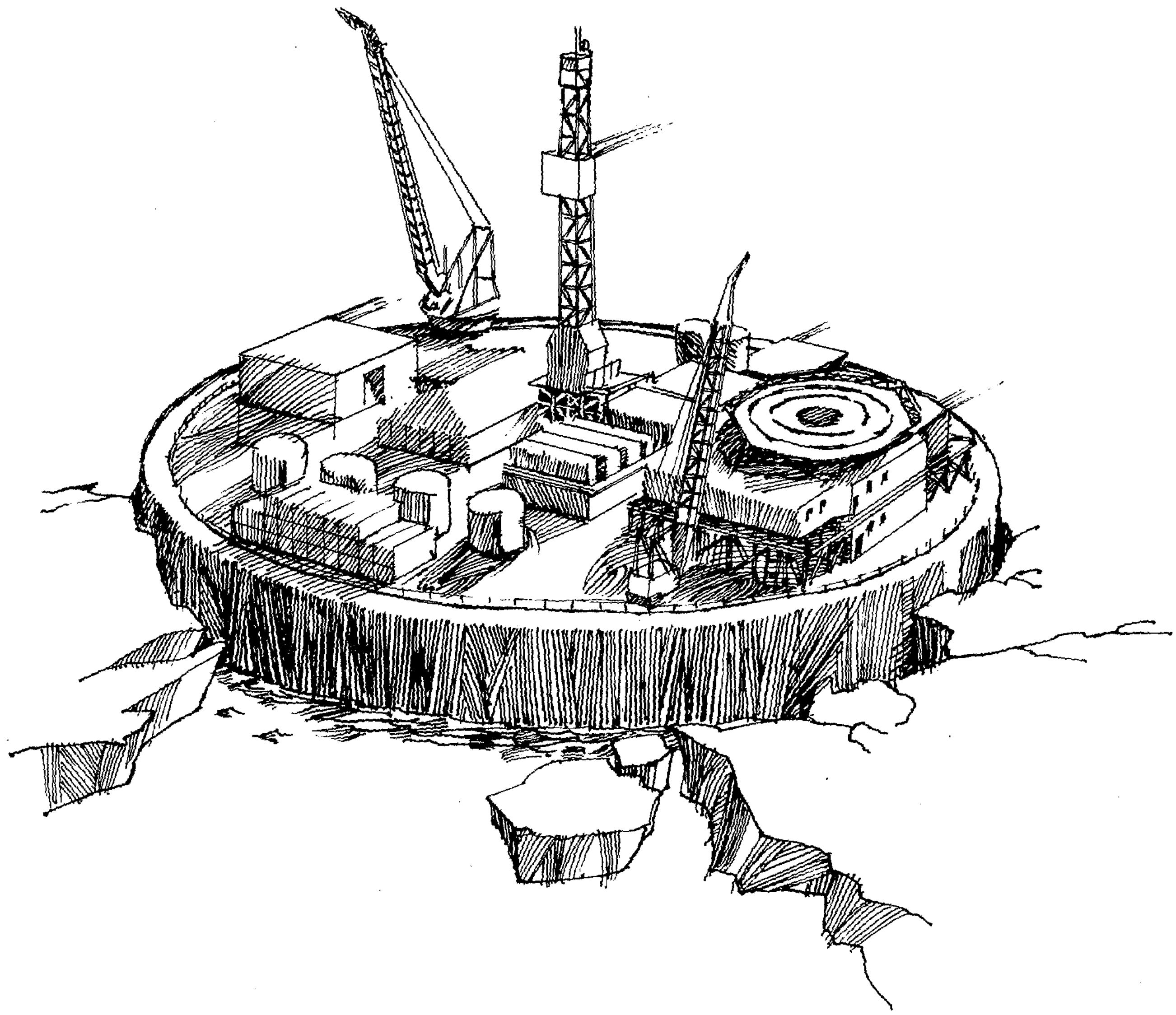


Figure 2.20

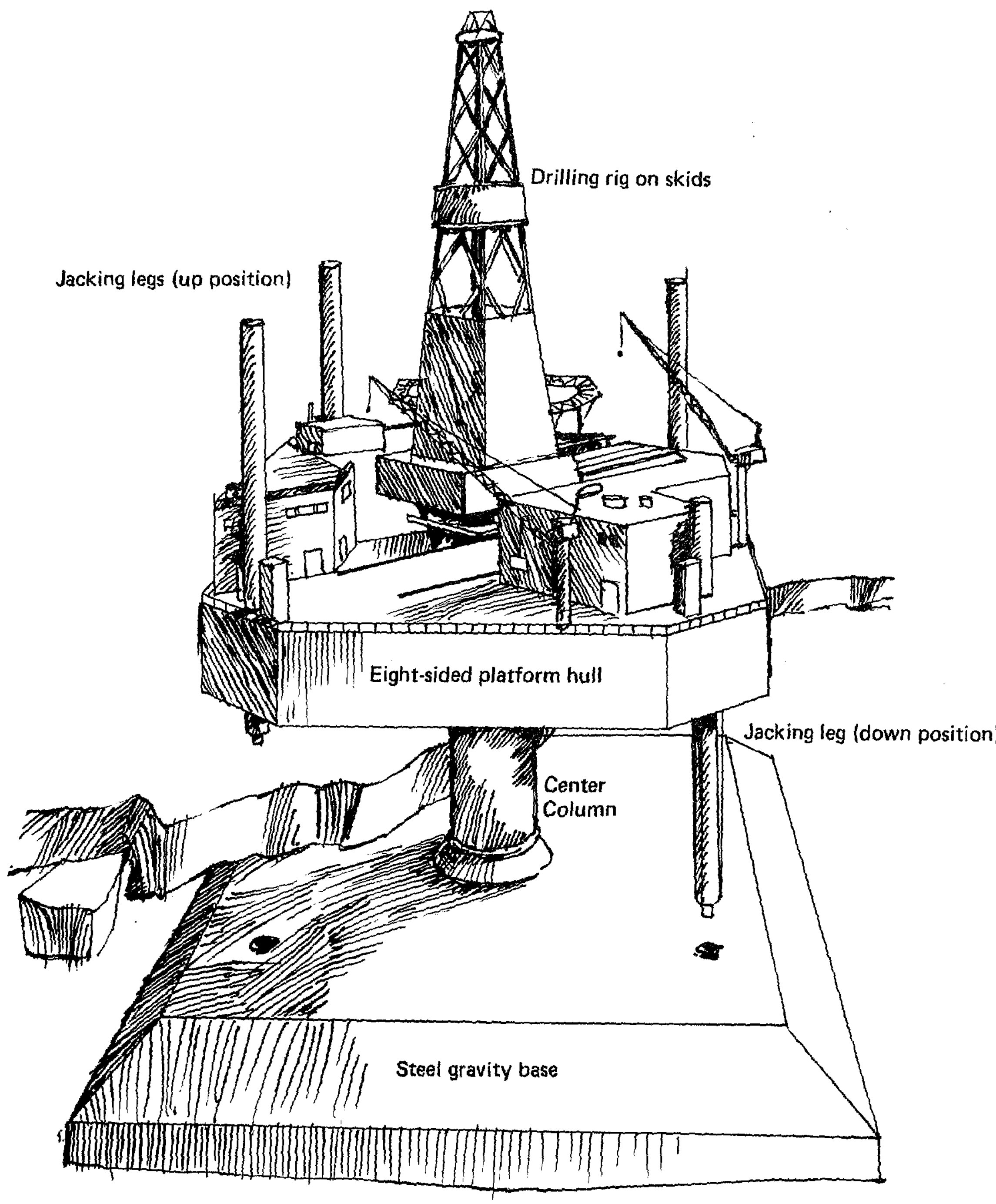
PORTABLE ARCTIC DRILLING STRUCTURE (PADS)



Source: Oil and Gas Journal, June 13, 1983

Figure 2.21

MONOPOD JACKUP FOR 15–90 FOOT WATER DEPTHS



Source: Offshore, December 1982

gravel island, (2) conversion of a very large crude carrier (tanker) to a steel drilling caisson, (3) a steel monopod jackup (Figure 2.21), and (4) several types of arctic class semisubmersibles.

A somewhat different design approach is required for drilling systems located in deeper water areas of the Chukchi and Beaufort seas. The design difference is required due to the increased severity of ice forces encountered in the deeper water. Currently, a conical gravity structure may be the leading design contender for water depths ranging from 100 to 250 feet deep and possibly deeper (Figure 2.22).[29/] Such structures capable of supporting both exploration and development are being investigated.

Beaufort and Chukchi Seas - Production

For production in the Beaufort and Chukchi seas, current opinion is that gravel islands will likely be utilized for water depths approaching 100 feet unless an alternative, less expensive permanent means can be developed.[30/] It may be possible that versions of the mobile steel/concrete gravity platforms proposed for exploratory drilling can be utilized for production in shallow Beaufort Sea waters and gravity-based cone structures in deeper waters i.e., 150 to 250 feet. In either case, it is essential that development platforms be able to support drilling operations year-round.

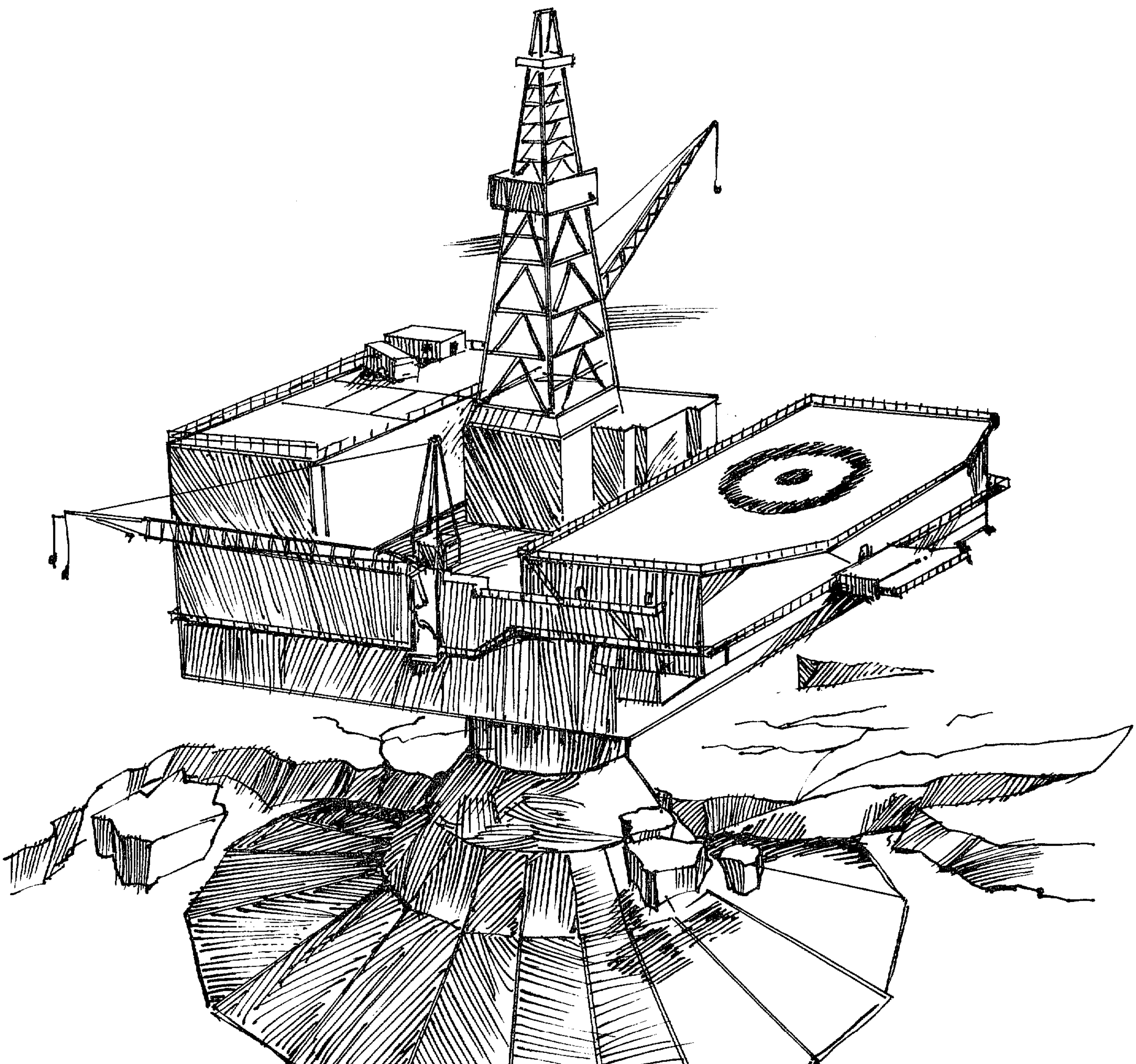
Exxon is one of many companies considering a specialized production drilling system design for the Beaufort.[31/] The concrete production island being proposed would be used in water 40 to 180 feet deep (Figure 2.23). Once positioned on the sea floor, the six-sided island would be filled with sand or gravel as a means of anchoring it in place. The concrete production island would provide a solid drilling base, resistant to ice forces like the conventional dredged gravel islands.

Bering Sea - Exploration

The Bering Sea is a subarctic environment forming a transition between the stormy Gulf of Alaska and the ice covered Arctic Ocean. While the

Figure 2.22

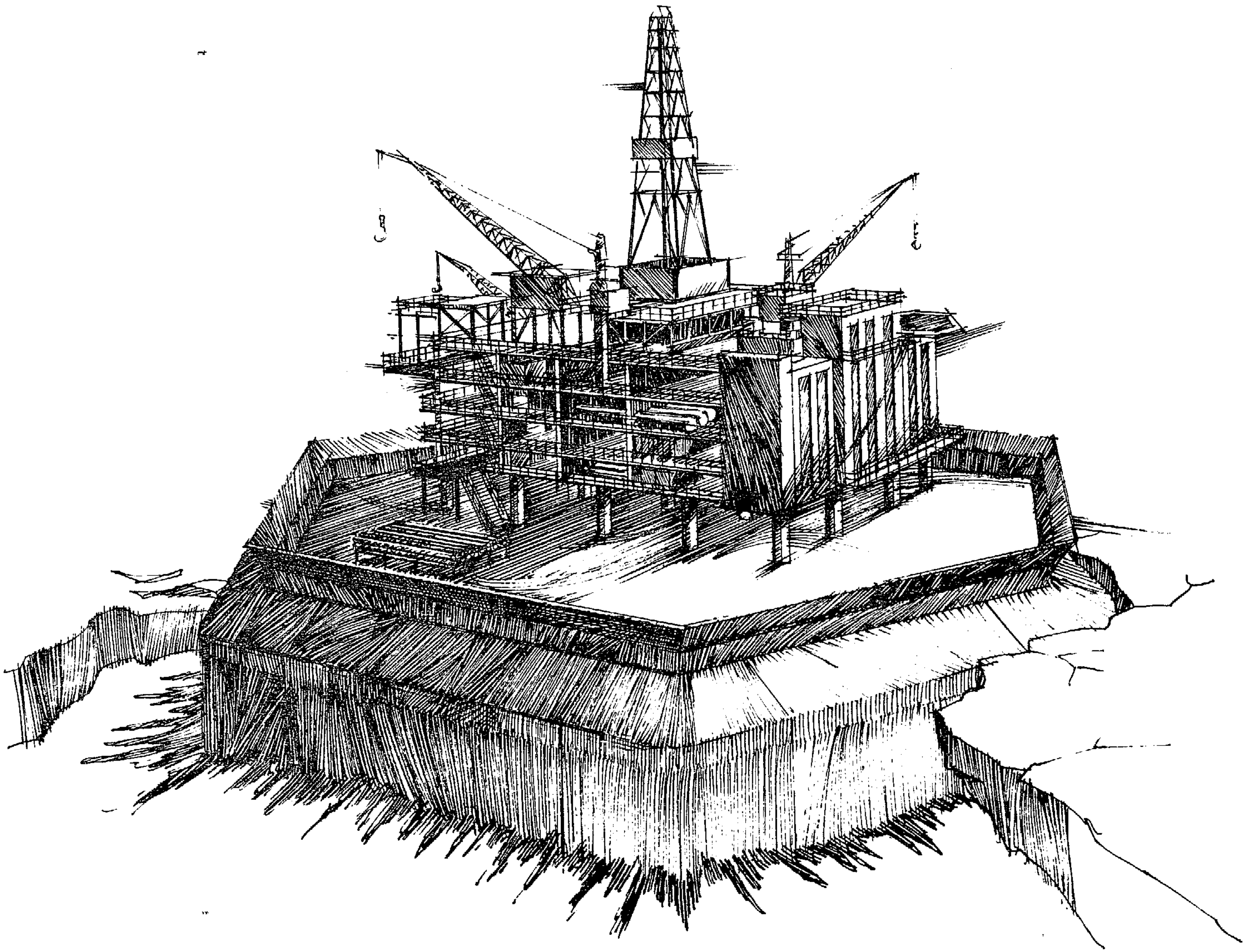
ARCTIC CONICAL GRAVITY PLATFORM



Source: U.S. Arctic Oil and Gas, Petroleum Council, December 1981

Figure 2.23

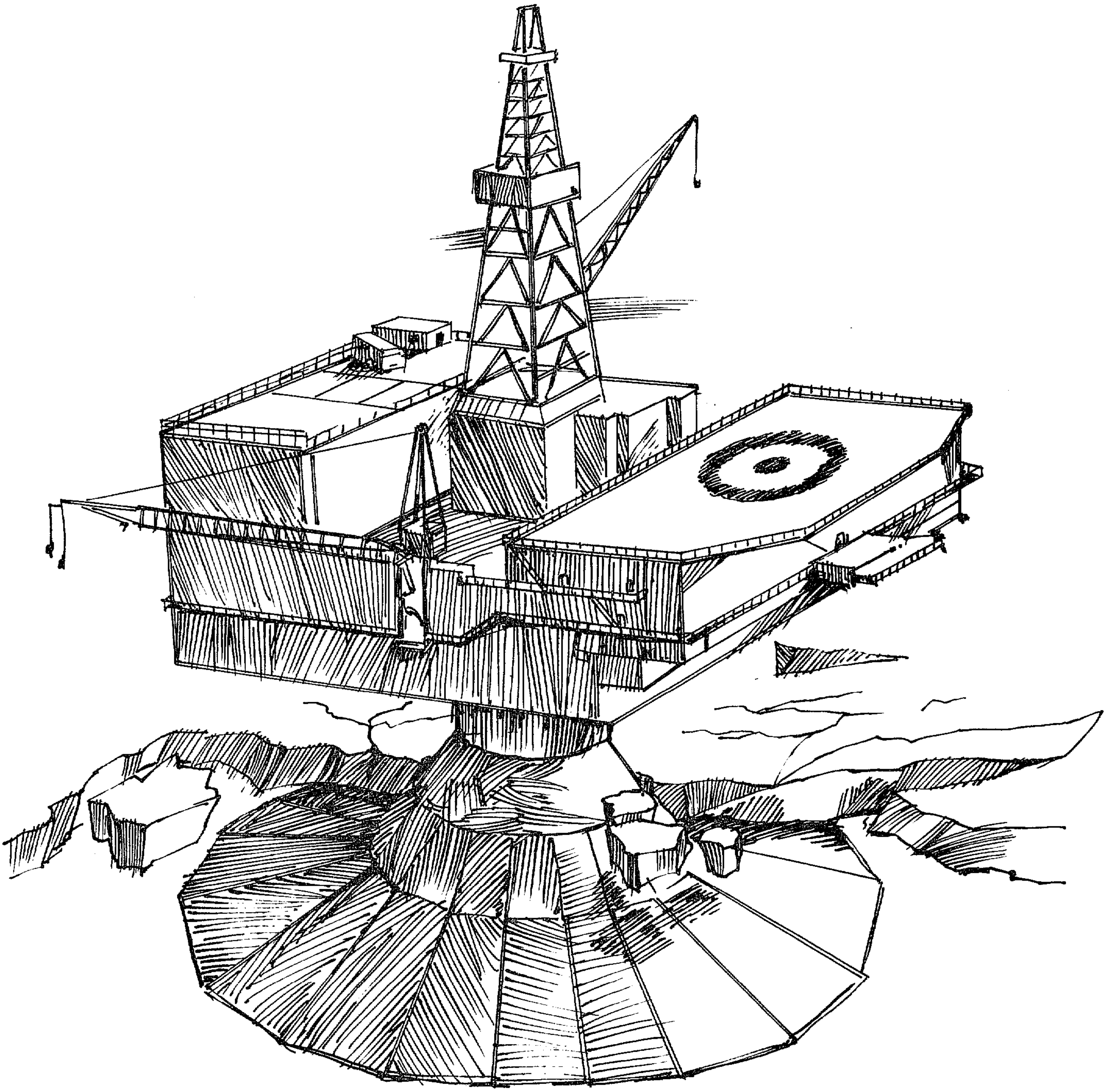
EXXON PROPOSED PRODUCTION ISLAND



Source: Exxon U.S.A., First Quarter, 1983

Figure 2.22

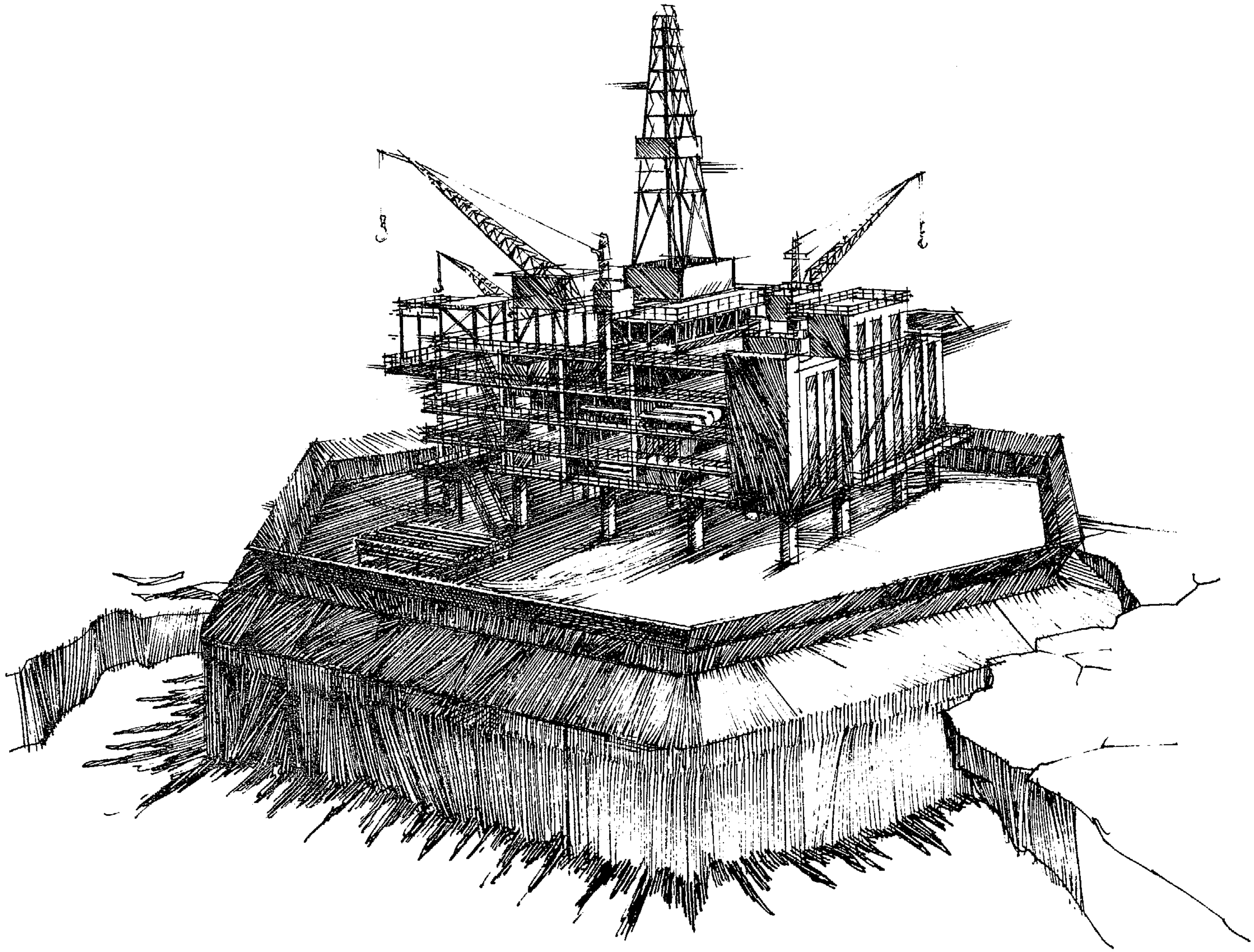
ARCTIC CONICAL GRAVITY PLATFORM



Source: U.S. Arctic Oil and Gas, Petroleum Council, December 1981

Figure 2.23

EXXON PROPOSED PRODUCTION ISLAND



Source: Exxon U.S.A., First Quarter, 1983

combination of bad weather and seasonal occurrence of sea ice distinguishes the Bering Sea from other U.S. offshore areas, each of these environmental elements is less severe than in the Chukchi and Beaufort seas to the north.

Conventional exploratory drilling systems will likely be used in most areas of the Bering Sea. Jack-up units, for example, can be used in the Bering Sea in water depths generally under 300 feet. This would include Norton Sound, the North Aleutian Basin, and part of the St. George Basin.[32/] In deeper waters, such as the Navarin Basin, semisubmersibles and drillships can be used during the seven month ice free season. An extension of the drilling season may be achieved with use of ice breakers and water agitating techniques.

Bering Sea - Production

Gravity-based cone production platforms in the northern Bering Sea (the Norton and St. Matthew-Hall basins) may be feasible in water depths between 60 and 200 feet (Figure 2.24).[33/] The concrete production island mentioned previously for use in the Beaufort might also be suitable in these water depths.

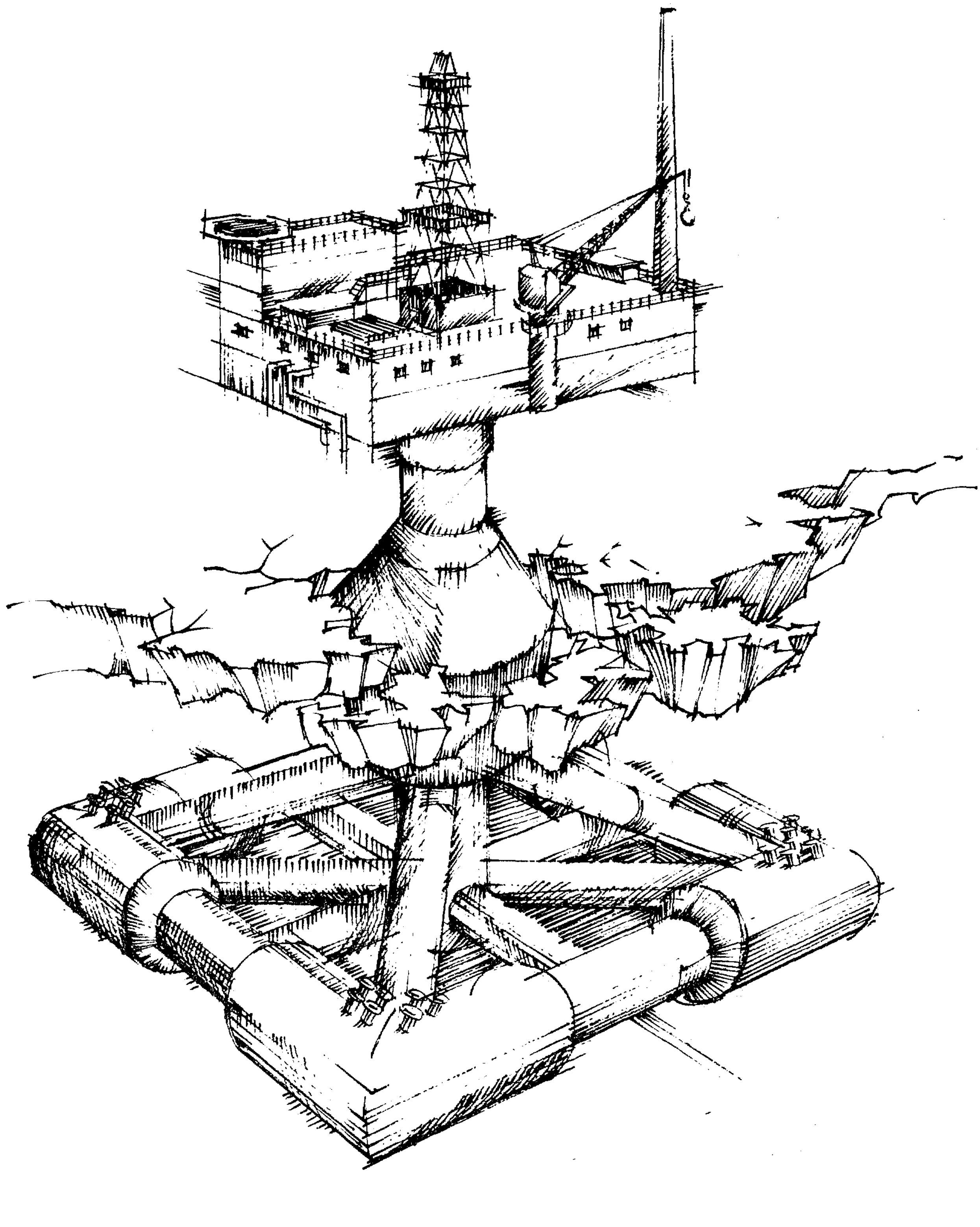
In the southern Bering Sea (the Bristol Bay, St. George, Aleutian, and Navarin basins) development may be accomplished on gravity-based structures in water as deep as 650 feet (Figure 2.25). Pile-supported structures may be used in the southern Bering Sea to water depths of approximately 200 feet (Figure 2.26). These platforms would be designed such that the wells would be protected from ice flows by their containment within the legs or a supporting caisson.

Gulf of Alaska - Cook Inlet Exploration

Exploration drilling has proceeded in the Gulf of Alaska utilizing conventional mobile drilling systems in water depths generally under 700 feet. Jack-up rigs can be used in shallow water and drillships and semisubmersibles can be used in deeper water. For example, during the summer of

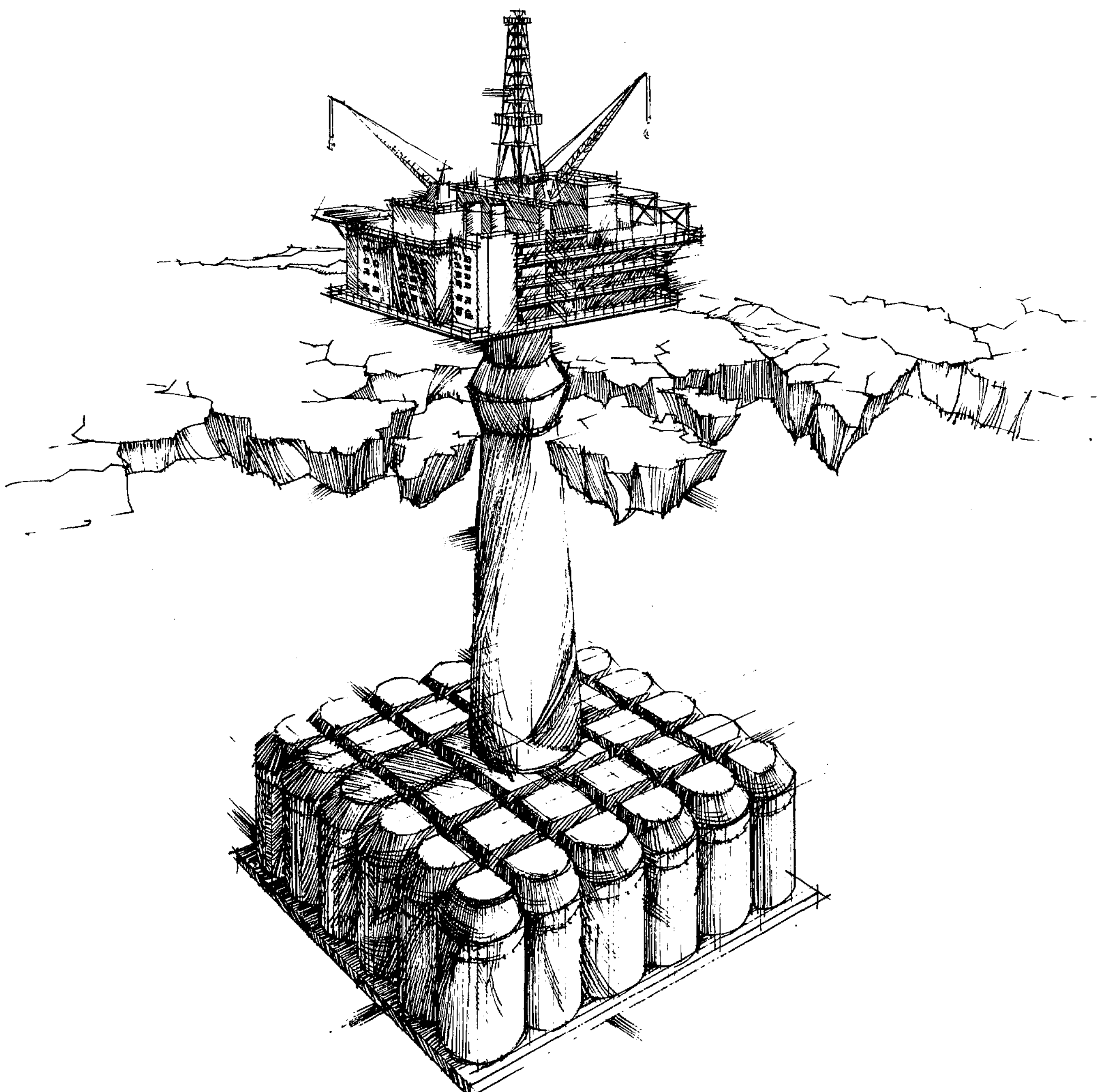
Figure 2.24

PILE FOUNDED STEEL MONOPOD WITH CONE GRAVITY PRODUCTION STRUCTURE



Source: Exxon U.S.A., First Quarter, 1983

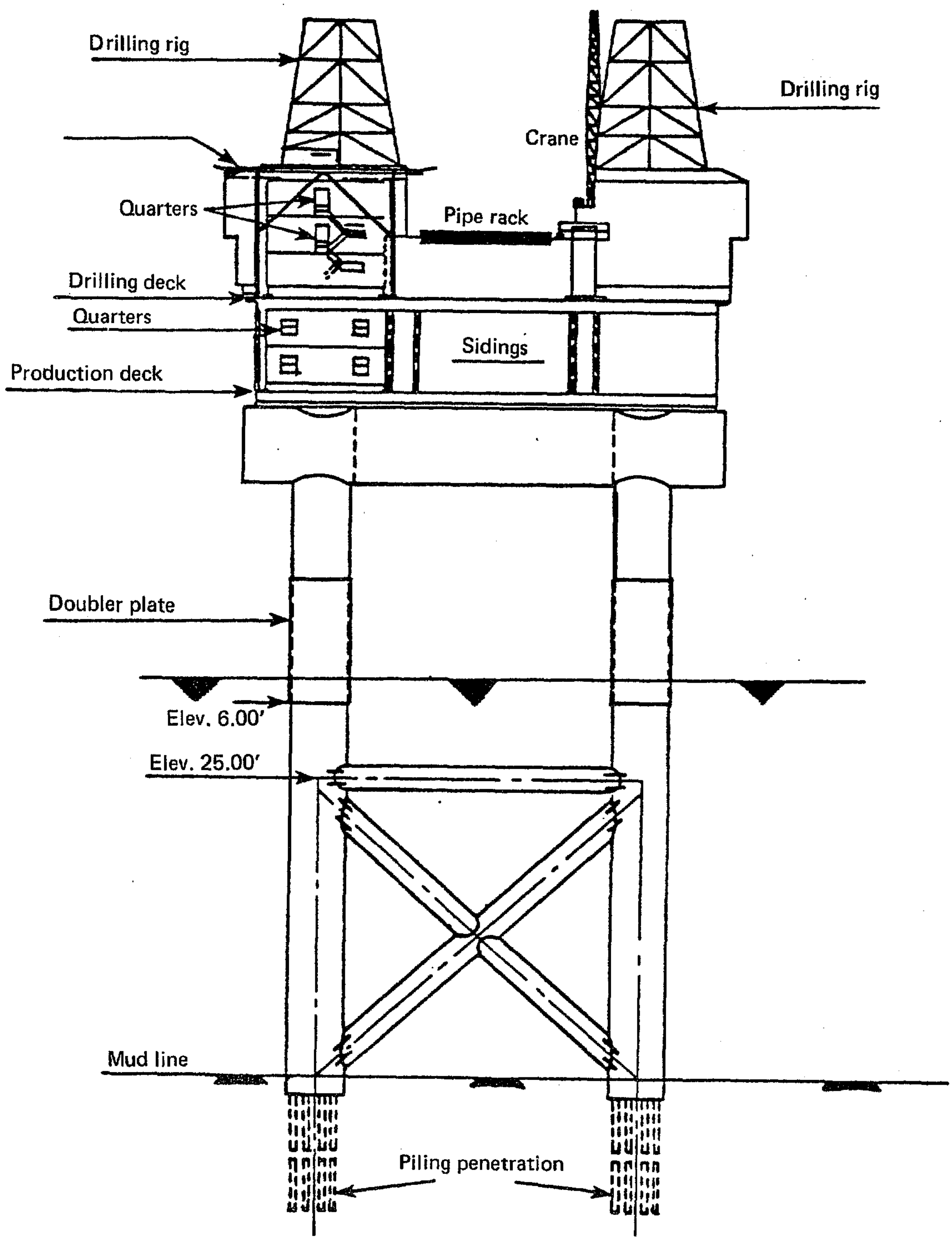
Figure 2.25
MONOTOWER GRAVITY PRODUCTION PLATFORM



Source : Exxon U.S.A., First Quarter, 1983

Figure 2.26

FOUR–LEGGED COOK INLET PRODUCTION STRUCTURE



Source: U.S. Arctic Oil and Gas, National Petroleum Council, December 1981

1983, ARCO drilled a wildcat in the Gulf of Alaska about 30 miles offshore southeast Yakutat utilizing the Ocean Odyssey, a new arctic class semi-submersible built in Japan. It appears unlikely that mobile rigs such as these would be built in Washington, since existing facilities elsewhere can fabricate them more economically.

Cook Inlet exploration can and has been undertaken utilizing the same conventional drilling systems described above.

Gulf of Alaska - Production

Steel jacket platforms are considered the most likely choice for oil production in the Gulf of Alaska. Concrete gravity platforms, tension leg platforms, or guyed tower platforms might also be considered, should economically exploitable petroleum discoveries be made there.[34/] The steel jackets used in the Gulf of Alaska would likely be similar to those previously described for offshore California.

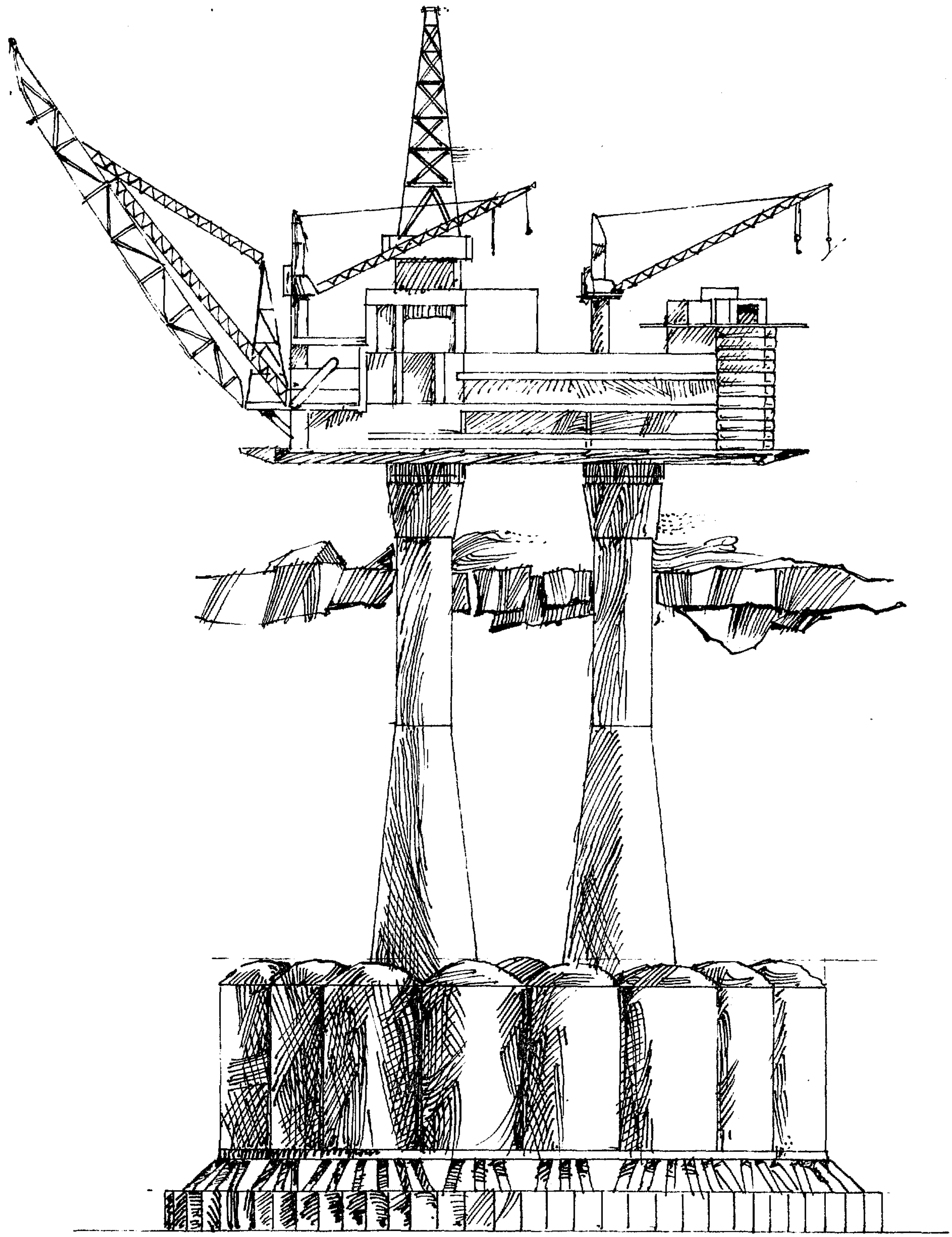
Should concrete gravity platforms be considered for the Gulf of Alaska, they might be designed similar to those used extensively in the North Sea, where weather and sea conditions approximate those of the Gulf of Alaska. During the last 13 years, 21 such "gravity base" structures have been built by Norwegian, British, and French contractors. The most recent and advanced of these was the 899,000 ton Statfjord B, built in Norway and installed in 1982 (Figure 2.27).

Because of their tremendous mass, concrete gravity structures have proven to be especially resistant to severe wave forces. Also, unlike other types of production platforms, it is possible to store large amounts of oil in the hollow platform base, thus making it feasible to transport oil by tanker rather than by pipeline when the latter is not possible. This could be an important factor in the Gulf of Alaska where pipeline installation may not be feasible.

The Statfjord B, mentioned above, is of the Condeep design, which typically consists of a large cellular base with a steel deck supported by

Figure 2.27

STATFJORD B CONCRETE GRAVITY–BASE PLATFORM
(Norway)



Source: Scientific American, Vol. 246, No. 4, April 1982 one, two, or three columns. Wells may be drilled through the columns. This type of structure may be applicable to depths of 980 feet and may, as in the case of the Statfjord B, reach a total weight of nearly 900,000 tons.

Cook Inlet - Production

Between 1964 and 1968, 14 production platforms were installed in the Upper Cook Inlet.*/ These platforms, which differ markedly from conventional steel jackets, were designed to endure severe conditions such as earthquakes, eight-knot tidal currents, 30 foot tides and ice conditions. The Cook Inlet platforms were built with one, three, or four large diameter steel legs used to support the drilling decks. The legs also serve as enclosures for drilling rigs. The Cook Inlet platforms, the largest of which is in 130 feet of water, are considered to be small compared to those that might be required for the Gulf of Alaska.

Summary of Alaska Platform Demand

Exploration Platforms

The first arctic mobile gravity platform to be used for exploration is tentatively scheduled for delivery to the U.S. Beaufort OCS in mid-1984. Orders for two other similarly designed exploration platforms have been held up and may be cancelled, depending on the outcome of the initial round of drilling during the 1983/84 drilling season. No reliable estimate of future arctic exploration platform need, therefore, can be made until these and subsequent drilling season results are known.

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*/Three of these platforms were built in Vancouver, Washington at the Columbia Industrial Park located on the shoreline of the Columbia River. Deck sections and quarters modules for Shell Platform "C" and deck sections for an ARCO platform were built between 1966-68 by General Construction Co. (Marine Division of Wright Schuchart, Inc.) in their yard No. 2 in Seattle.

Production Platforms

The first Alaska OCS production platform is optimistically estimated to be installed in 1986 in the shallow waters of the Beaufort Sea, based on the EIS prepared for the current five-year OCS oil and gas leasing schedule. Oil industry sources believe the late 1980s may be a more realistic time frame for installation of the first production platform. Gravel islands will very likely be utilized for water depths not exceeding 60 feet. Concrete and/or steel gravity platforms may be considered for deeper waters in the Beaufort. Other platform designs including steel jacket, conical, condeep monotower, and others made of concrete and/or steel are being considered for various areas depending on assessed needs. The number of production platforms of various types including gravel islands likely to be installed offshore Alaska between 1986 and the year 2000 could exceed 40 if current oil and gas estimates prove to be accurate.

A variety of factors related to economic, environmental, regulatory, and resource confirmation considerations could cause this number to be considerably less or greater. The most intense period of platform installation on leases issued between 1979 and mid-1987 is estimated to be between 1988 and 1991, should development in fact occur. This time frame could be moved back, of course, depending on those influencing factors mentioned above.

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CHAPTER 3

PLATFORM FABRICATION/ASSEMBLY FACILITIES

Introduction

This chapter examines offshore platform fabrication/assembly facilities; where they are located, what they look like, and how many might be required to serve the needs of accelerated development offshore California and Alaska. Before proceeding, however, a distinction should be made between the terms "fabrication" and "assembly" as they apply to the type of facility considered. Integrated fabrication yards are involved with both the fabrication and assembly of components such as pipe and/or prestressed concrete sections. An assembly yard, on the other hand, receives the fabricated components and it is here that those components are assembled. As one might expect, the land requirements for an integrated fabrication/assembly facility are significantly greater than for an assembly yard.

Existing Platform Fabrication/Assembly Facilities

Domestic Facilities

Kaiser Steel Corporation is the major platform constructor located on the West Coast. Kaiser has fabrication facilities located at Napa and Fontana, California, and assembly yards in Oakland and Vallejo. Fabricated components are transported to the assembly yard by truck and rail, though Napa additionally has barge access. The Oakland and Vallejo assembly yards each have one skidway for launching steel jacket platform structures.

A major constraint associated with the Kaiser Assembly yards is that of bridge clearance for the larger platforms expected to be required for near-term offshore California oil and gas development. Kaiser's Vallejo yard is constrained by the Richmond-San Rafael Bridge, which has a clearance of 185 feet (MHW), while the Oakland yard is constrained by the Oakland Bay Bridge which has a clearance of 217 feet (MHW). Platform structures transported from these yards would also have to pass under the Golden Gate Bridge, which has a clearance of 232 feet (MHW).[1/] Structures with dimensions exceeding these clearances could not be built at these yards.

Between 1966 and 1968, six offshore production platforms were built by Brown and Root at the Columbia Industrial Park in Vancouver, Washington. These platform structures were designed for water depths ranging from just over 100 feet to approximately 200 feet offshore California and Alaska.[2/] As with the Kaiser facilities, this yard is also constrained by bridges. The most limiting bridges of the four in place over the Columbia River between Vancouver and the Pacific Ocean are the Interstate and Burlington Northern (swing type) bridges at Vancouver (159 feet horizontal x 175 feet vertical and 200 feet horizontal, respectively).

All other major domestic platform construction facilities are located along the Gulf of Mexico. Although platform structures built at Gulf Coast facilities have been installed offshore California, it would likely not be feasible for these facilities to build the expected larger platforms required offshore California. The reason for this is the 160 feet horizontal limitation of the Panama Canal. Large platform structures could not be transported through the canal and the cost and associated risk of transport around the tip of South America would preclude this alternative.

Foreign Facilities

At least nine facilities located in the Far East, ranging from Singapore in the south to Korea in the north, could build platforms to supply both offshore Alaska and California (see Appendix B). These mostly large, modern facilities are located a considerable distance from where platforms will be needed offshore Alaska and California. The cost of transportation, however, would likely be more than offset by lower labor and material costs. These two factors could make the Far Eastern yards extremely competitive for certain types of platforms i.e., those which could be transported a long distance with determined minimal risk.

Ensanada, Mexico, and Prince Rupert, British Columbia, have been mentioned as possible locations where platform construction facilities might be built. B.G. Offshore Constructors, a French firm, has proposed to build an all-purpose platform construction facility at Ensanada, that could serve both California and Alaska offshore platform needs.[3/]

The platform construction facility currently proposed jointly by Foundation Co. of Canada and Skanska of Sweden for Prince Rupert also could serve both Alaskan and Canadian offshore platform needs.[4/]

Need for Additional West Coast Facilities

Based on a WDOE telephone survey of major oil companies operating offshore California and Alaska, and a letter survey of domestic platform constructors, it appears that there may be a need for additional platform fabrication/assembly facilities on the West Coast. Estimates range from 2-4 additional facilities to serve both Alaska and California, assuming that the platforms will be built in the United States.

Facilities to Serve California Platform Demand

The exact number of facilities required to serve production platform needs offshore California, besides depending on the level of expected development and other factors, will depend on the number of skidways that could be accommodated at a facility. Currently, four sites are being proposed in California: one by Kaiser at Terminal Island in Los Angeles Harbor, one by American Bridge at Hunters Point in San Francisco, and two at Eureka by Brown and Root/Wright Schuchart Harbor Co., and by Exxon. The development of these proposed sites could bring to nine the total number of skidways available in California.

Until recently it was estimated that five to eight skidways would be required for California offshore development over the next six to eight years. This assumes that all platforms are built in the United States, according to a recent West Coast demand study conducted by the Humboldt County Planning Department.[5/] Since this report was released in August 1983, West Coast yards failed in their bid to receive contracts to build two platforms (water depth 605 feet and 788 feet) for Chevron and Texaco, respectively, for development offshore California. Contracts instead were awarded to firms located in Japan and Korea. This, of course, would reduce the number of skidways necessary for California offshore development by two, at least in the near term. The awarding of these contracts confirm the strong competitive position that the Far Eastern yards have, as development accelerates offshore California and Alaska.

While it is certainly possible that proposals may yet surface to build jacket platform structures in Washington for use offshore California, it is probably not likely in the near term. This would seem especially to be the case if the proposed yard at Ensanada, Mexico, is developed along with the four other yards now being proposed for California. There may, in fact, not even be a need for these proposed facilities if the highly competitive Far Eastern yards continue to outbid domestic competition, which is a very definite possibility.

Facilities to Serve Alaska Platform Demand

The number of new facilities on the West Coast required to meet exploration and production platform demand for offshore Alaska is more of an unknown than for California. Not until more exploration and confirmation drilling is completed offshore Alaska will a comprehensive estimate of the number of exploration and production platforms required there be available. Projections of platform fabrication/assembly facilities need at this time, therefore, would have to be based solely on speculation. This is particularly the case, since yards located in the Far East will be extremely competitive with United States yards for the Alaska market.

Currently, five new yards have been proposed for development on the United States and Canadian West Coast to serve Alaska and possibly Canadian platform needs. Three of these yards would be developed in Oregon, one in Washington, and one in British Columbia. Chicago Bridge and Iron and Guy F. Atkinson are proposing to build separate yards at Coos Bay, Oregon, while Morrison-Knudsen is proposing a similar facility at Astoria. Peter Kiewit Son's Company has initiated efforts to obtain permits to build a yard at Cherry Point, Washington.[6/] And, in British Columbia, Foundation Company Canada and Skanska of Sweden are proposing a platform construction facility at Prince Rupert. Each of these proposals would involve construction of a graving dock to build large concrete/steel gravity structures expected to be required for Beaufort Sea oil and gas exploration and production (see Chapter 2 Market Demand).

Because of strong competition from Far Eastern yards, it is reasonable to assume that not all of the platform fabrication/ assembly facilities currently being proposed for Oregon and Washington will be needed. Competition, in fact, could be so great that it is entirely conceivable that without U.S. government intervention, Far Eastern yards could totally dominate the Alaska platform market. A possible indication of their dominance is the fact that the first of the large mobile gravity platforms to be used for exploration in the arctic is now being built in Japan. The Molikpaq, the world's first all steel deep-caisson platform designed for year round drilling in arctic waters will be ready for delivery to the Canadian Beaufort Sea in the summer of 1984. This platform is being built by IHI of Japan. Another Japanese firm, Nippon Kokan KK, Tokyo, recently was awarded a contract to construct a reusable mobile concrete drilling system (CIDS) by Global Marine Development Inc., Newport Beach, California (see Figure 2.18).[7/] This platform is being built for use by Exxon to explore lease holdings in the western portion of the Diapir area offshore Alaska's North Slope.

Additional evidence of possible near term dominance of the Alaska platform market by Far Eastern constructors may be forthcoming as Amoco and Sohio oil companies each may contract for the second and third arctic mobile gravity exploration platforms (for use in U.S. waters), possibly in 1984. Before the disappointing results of the Mukluk Wildcat were known in late 1983, both companies were looking for a 1984 or 1985 delivery. Such a tight time frame would likely give existing Far Eastern yards a competitive advantage, since domestic firms would most likely have to build a fabrication/assembly facility before work could begin. Because of the disappointing results of the Mukluk Wildcat, orders for these platforms may now be delayed or cancelled.

Steel Jacket Production Platform Fabrication/Assembly/Installation

Steel jacket platforms will continue to be in demand offshore California, and maybe eventually in the Gulf of Alaska and southern Bering Sea, should a discovery be made there. And, though it is probably not likely that steel jackets will be built in Washington State in the near term, it nevertheless is a future possibility. For this reason, it would be useful to establish a better understanding of the techniques used for steel jacket construction and installation.

While it is not necessary that a jacket fabrication facility and assembly yard be located at the same site, it is advantageous for economic reasons that these facilities be in reasonably close proximity. Figure 3.10 depicts the fabrication and assembly process from receipt of flatplate steel for tubular fabrication to jacket assembly and launch.

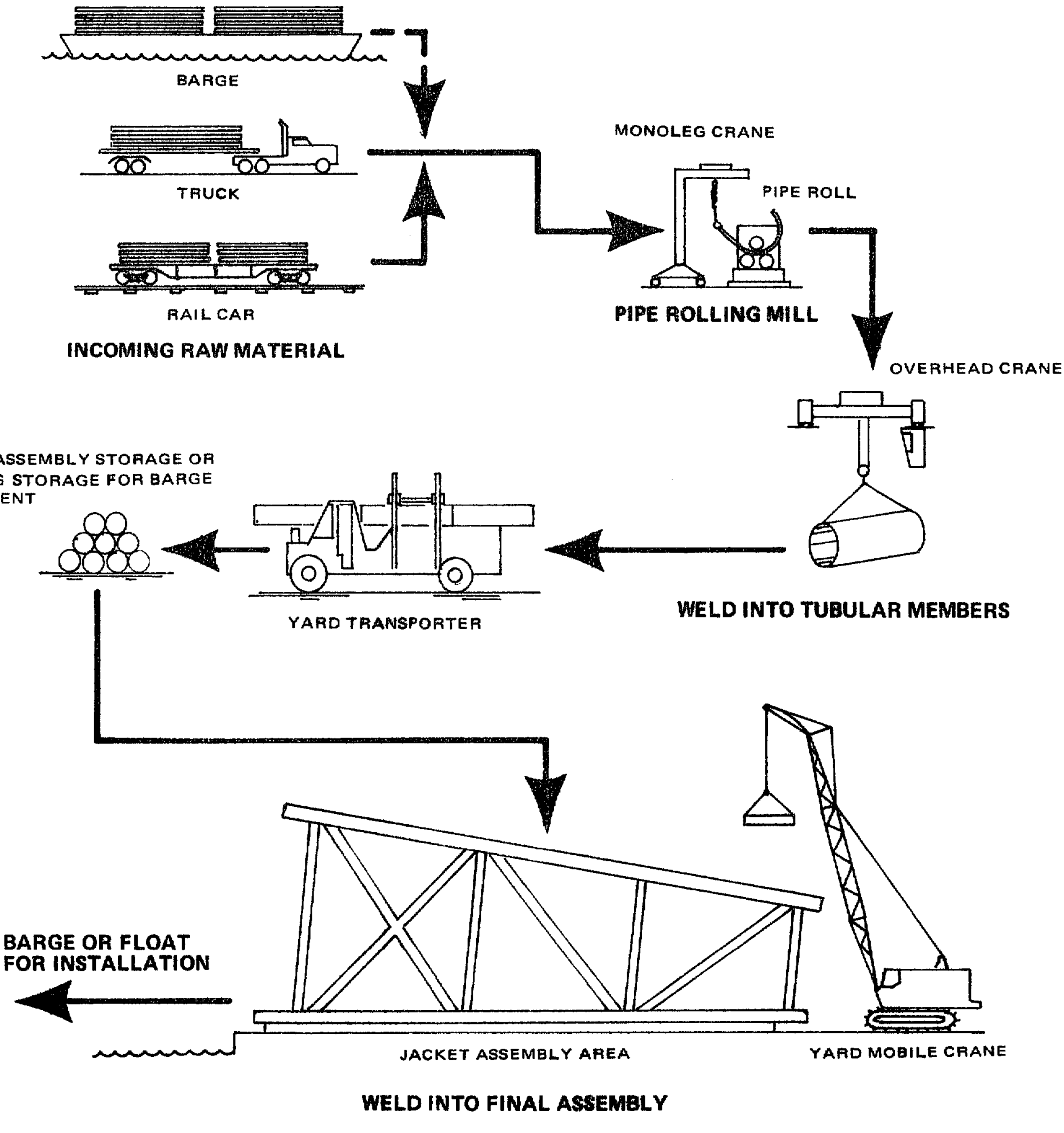
After a platform fabrication facility receives flat steel plate from a foundry, it is fed into a rolling mill where it is rolled into a tubular of the specified diameter and then welded lengthwise. Sections may then be welded together, especially those requiring precision or complex workmanship and/or stress-relieving heat treatment in a furnace. Sandblasting and painting are generally undertaken at the fabrication facility prior to transport to the assembly yard.

Once received by the assembly yard, tubular sections and subassemblies are welded together to form tubular members. Joints requiring special cuts and stress-relieving heat treatment are often welded at the fabrication facility but sometimes this may be accomplished at the assembly yard, depending on capability.

The tubular members are joined together on the ground to form the sides of the platform jacket. After each side section is completed flat on the ground, it is raised to a vertical position utilizing long-boom crawler cranes (Figure 3.11). The side panels are then welded together to form a single jacket structure.

Figure 3.10

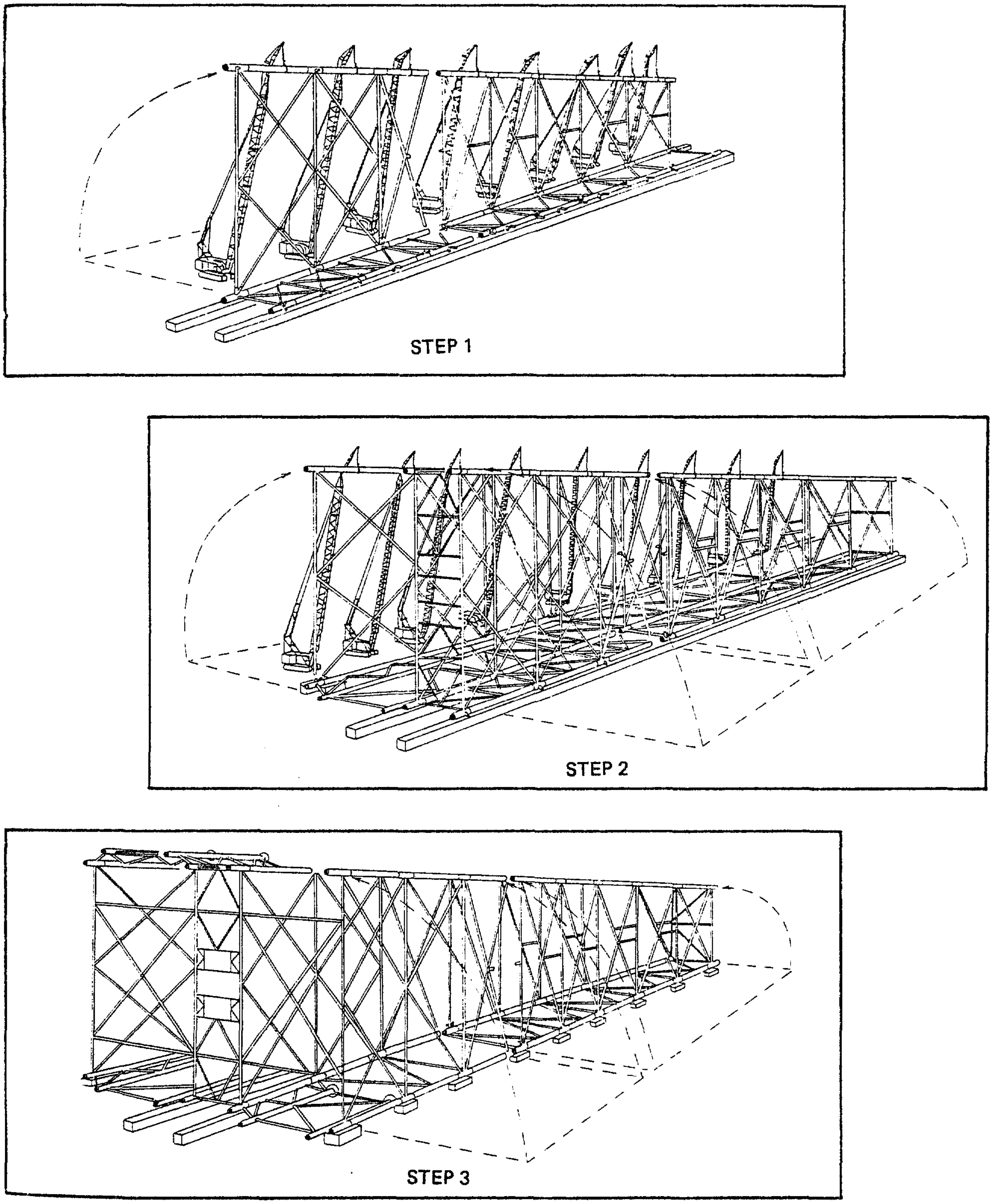
STEEL JACKET CONSTRUCTION FLOW DIAGRAM



Source: Draft EIS, Construction and Operation of Pacific Fabricators' Steel Structure Fabrication Yard at Warrenton, Oregon, Prepared by U.S. Army Engineers District Portland, December 1977.

Figure 3.11

SCHEMATIC DRAWING OF ROLL-UP PROCEDURE



Source: Draft EIR, Kaiser Steel Corporation, Terminal Island Marine Assembly Yard, Prepared by Los Angeles Harbor Department, June 1983

Depending on the design of the jacket, it could either be loaded onto a special launch barge(s) (possibly in sections) for transport to the installation site or floated and then towed to the installation site. Jackets that use their own structural members for flotation are considerably more expensive to build, since the diameter of the tubulars must be greater to achieve necessary buoyancy. Also, self-floating jackets must be assembled below sea level in graving docks partitioned from the adjacent sea by flood gates. After the jacket is completed and water allowed to flood the work area, the gates are opened and the jacket floated out.

Once on-site, the jacket sections are joined together if the jacket has been transported in more than one piece. The jacket or sections may be upended by one or two derrick barges. The jacket is allowed to slowly sink to the bottom, or to its mating section, and is pinned to the sea floor by steel piping (Figure 3.12). Deck sections are constructed and towed out separately. Once the jacket is in place, the deck sections are lifted on by derrick barges and secured to the jacket. Finally, the individual deck components, such as drilling equipment, crew's quarters, and production facilities, are mounted onto the deck.

Jacket construction can take from one to three years, depending on the design. Installation can take from 2 to 18 months, depending on such factors as weather, equipment availability, procedure utilized, and others.[8/]

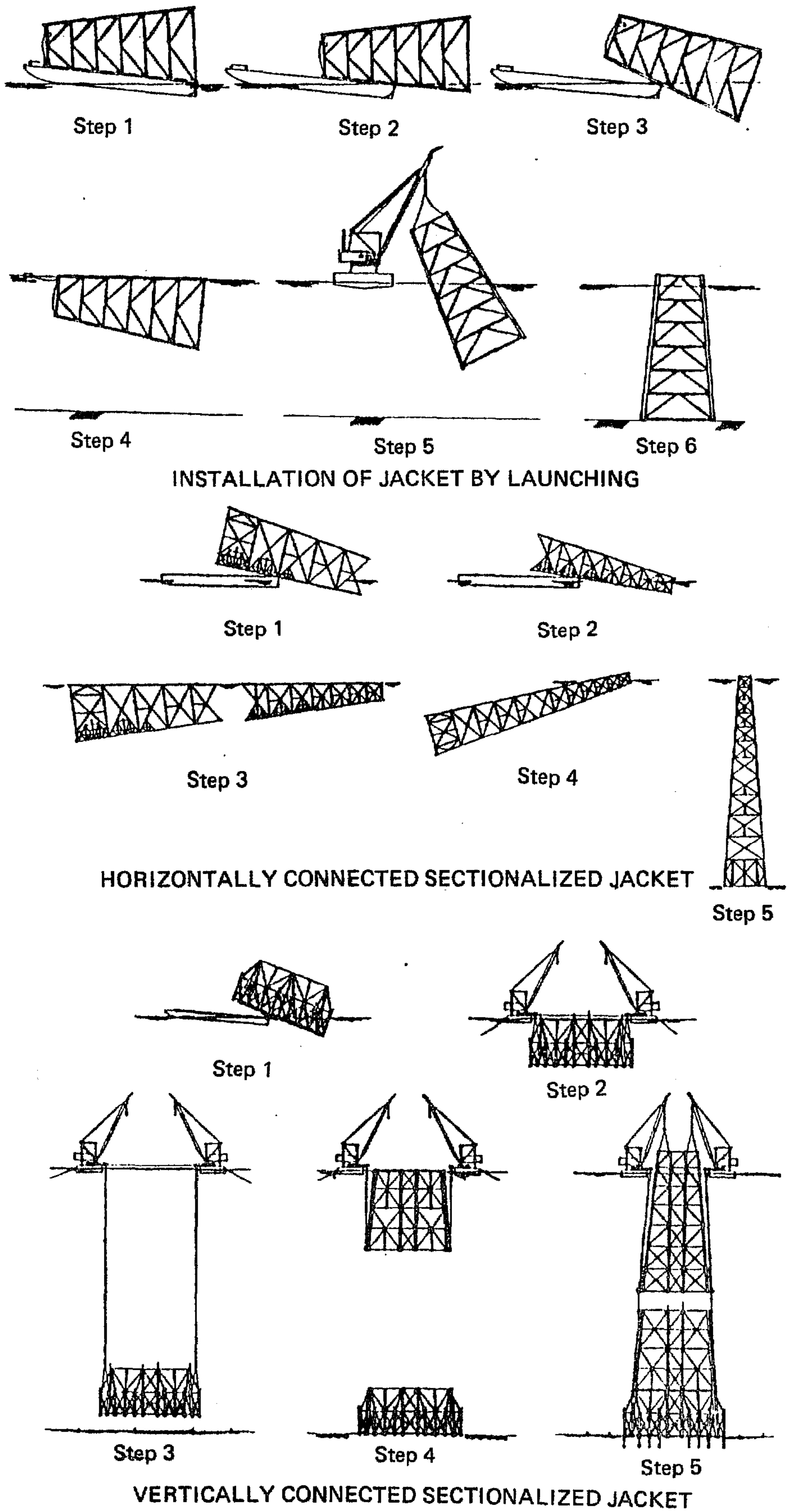
Facilities utilized for platform fabrication/assembly may also be used for manufacturing various platform deck modules. Such being the case, it is necessary that enough area be provided for fabrication/assembly and that barge launch facilities be available.

Concrete/Steel Gravity Exploration Platform Fabrication/Assembly

Washington's proximity to Alaska combined with possibly several suitable platform fabrication/assembly sites, make the state a likely location for near-term construction of concrete and/or steel gravity exploration platforms for shallow Beaufort Sea waters. Evidence that this is the

Figure 3.12

STEEL JACKET INSTALLATION PROCEDURES



Source: "Construction of Offshore Platforms", Journal of the Construction Division, Proceedings of the American Society of Civil Engineers, Vol. 108, No. C04, December 1982 case lies in the fact that platform construction firms continue to be interested in developing such facilities along Washington's coast. Chicago Bridge and Iron Company (CBI), in 1982, gave up on efforts to develop a platform fabrication/assembly facility at Cherry Point near Bellingham after failure to obtain the necessary permits. As mentioned previously, Peter Kiewit Son's Company has taken an option on the same CBI site and has begun submitting the necessary development permit applications. Kiewit hopes to have the necessary permits to begin site development by mid-1984. Other companies have been rumored to be interested in developing platform fabrication facilities in Washington to serve the Alaska offshore exploration and production platform market.

The Kiewit proposal, as did the CBI proposal, would involve building concrete/steel gravity platforms for Alaska offshore development. Kiewit has indicated that their proposed facility is in response to the developing Alaska market for gravity platforms that could be used for offshore exploration and development, initially in the shallow Beaufort Sea area. As with CBI, Kiewit would undertake platform construction in a large graving dock (dry dock) situated below sea level and protected by flood gates against water incursion. A variety of steel and/or concrete gravity platform designs could be built in such a facility.

The concrete/steel mobile drilling "island" or "caisson" platform concept, intended for use in arctic offshore exploration, appears to be representative of the first generation of platforms now planned or being built (see Chapter 2, Figures 2.17 and 2.18). These platform structures are the type that would most likely be built in the near-term on Washington's coastline, should a fabrication/assembly facility(s) be developed there and platform construction contracts be awarded to its operator.

The construction of a concrete island-type gravity platform, such as is now being built in Japan for use by Exxon, would involve sophisticated concrete construction techniques. Precasting of prestressed concrete components would necessarily be undertaken at a precast concrete facility located either on-site or elsewhere. Precast components would then be transported to the graving dock assembly area. Large cranes would lift the various precast beam and wall components into position over a cast-in-place platform base. Once these components were positioned, concrete pours would be made around specified joints forming the compartmentalized concrete platform base. Other specified concrete pours such as the lid over the compartmentalized base could be cast in place at the assembly site.

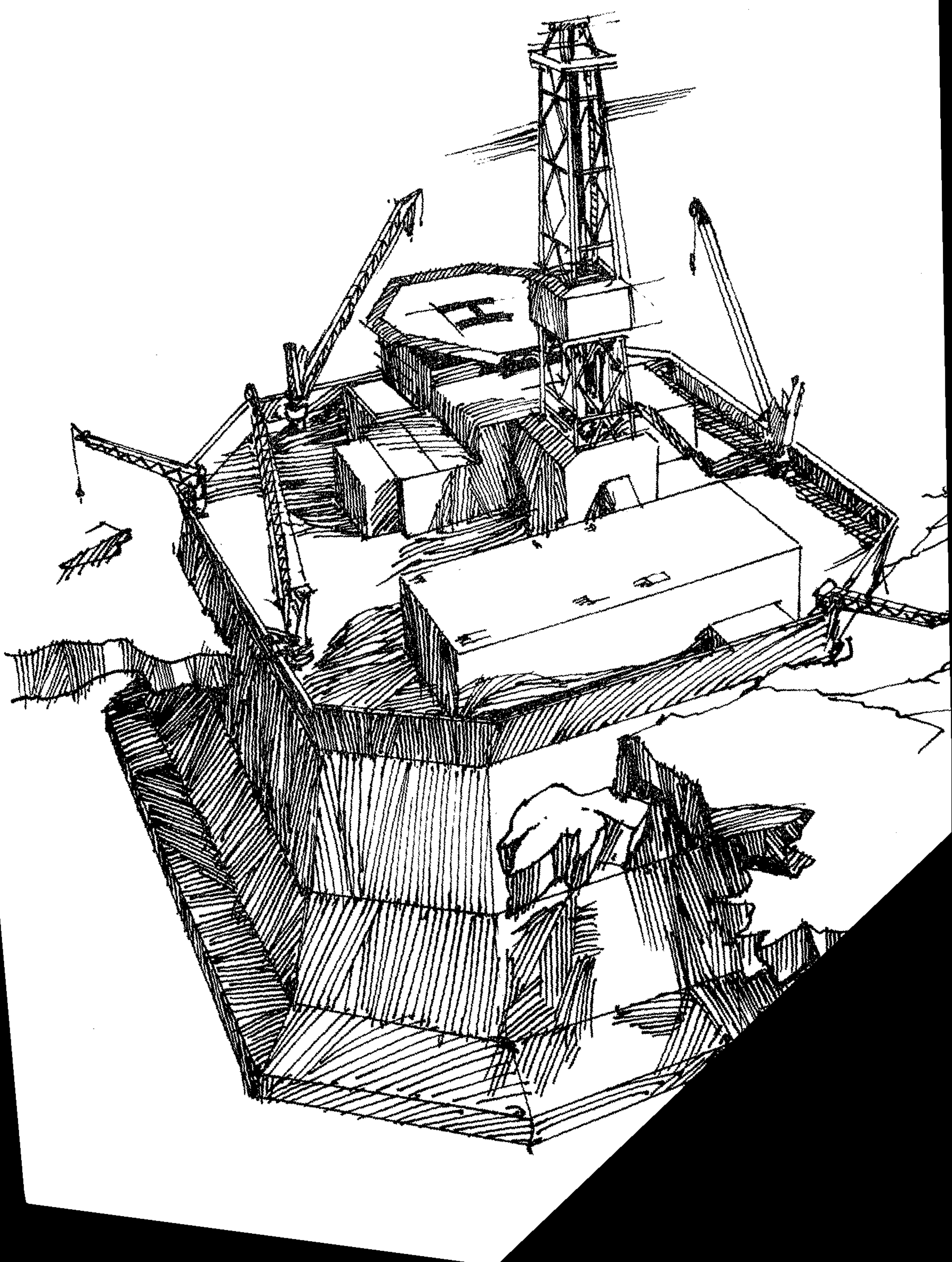
Simultaneous with the concrete base being built, all of the deck modules would be fabricated and assembled either at the site or elsewhere and transported to the site. As soon as the concrete base of the structure was completed, the steel deck modules would be placed into position; most likely with cranes. It is desirable that the platform be outfitted before it is launched though this is not a necessity. Once the platform is readied, the graving dock is flooded and the gates opened. The floating platform is then towed to the drilling site by large oceangoing tugs. Launch would most likely occur during late spring in order to coordinate arrival in the arctic during the ice free late summer season.

Steel gravity platforms used in shallow waters of the Alaskan and Canadian arctic would likely be built in a large graving dock, as is the case with concrete gravity structures. The process for building these structures would be similar to that for building concrete platforms in that subassemblies would be fabricated and joined together in a step-wise fashion. The larger steel components would be lifted into position by crane and joined together (welded, bolted, riveted, as appropriate) utilizing techniques common in shipbuilding. Figure 3.13 shows an artist's drawing of the Molikpaq steel gravity caisson now under construction by IHI (Japan) in a graving dock used to build supertankers.

Launching techniques for the steel gravity structures would be essentially the same as for similarly designed concrete platforms. Once the platform was readied for launch, the graving dock would be allowed to fill with water, the containment gates opened, and the platform floated out. As with the concrete platform structure, modules could be installed on the platform base in the graving dock or after launch of the base structure, depending on the situation.

Figure 3.13

MOLIKPAQ STEEL GRAVITY CAISSON UNDER CONSTRUCTION BY IHI IN JAPAN,



Concrete/Steel Gravity Production Platform Fabrication/Assembly

An undetermined number of arctic shallow water concrete/steel gravity-type platforms could reasonably be expected to be built in the next five years at a facility in Washington State if such a facility existed and was competitive with Far Eastern and possibly other domestic yards. These shallow water arctic structures initially would be for exploration. If discoveries warranted, it is possible that construction of a new generation of production platforms, possibly a hybrid of the shallow water structures, would follow. If this scenario should develop, it is probably reasonable to believe that the same graving dock facilities and construction techniques used for building exploration platforms would be applicable for arctic shallow water production platforms.

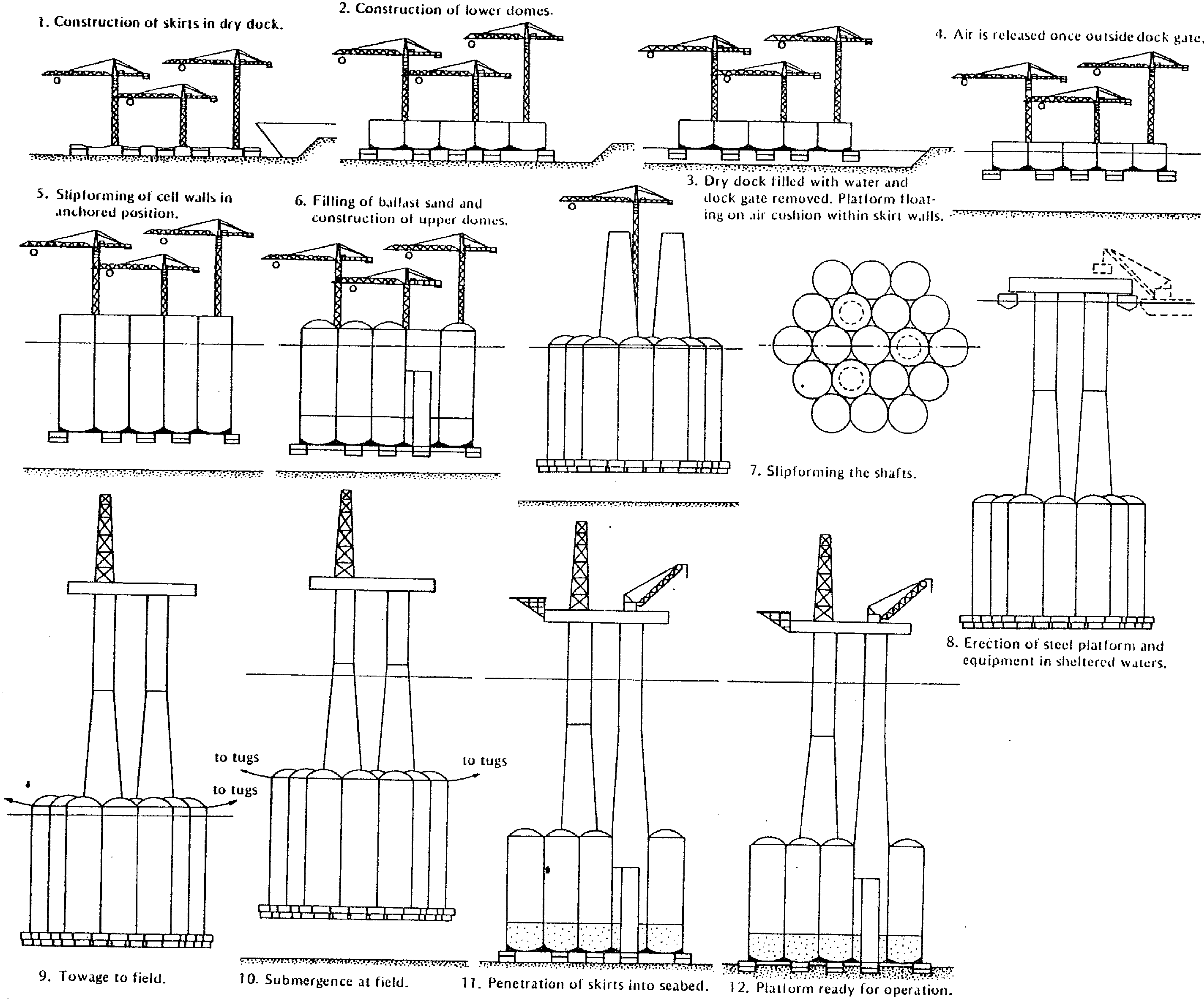
Concrete gravity structures of a much different design and requiring different construction techniques may be used in the remote, deeper water areas of the Alaskan Bering Sea and Gulf of Alaska. One of these designs, the Condeep concrete gravity platform, consists of a hollow concrete base on which one to four towers would be built. The base on this type of structure would be built in a graving dock to the stage where it could be floated out to deeper water (Figure 3.14). Once in deeper water (depth in excess of the final height of the structure) the structure would be lowered (ballasted) into the water as the tower(s) is built upward using a concrete slip-form technique. Once the tower(s) is completed and the deck modules installed, the platform is raised and towed to the oil field. At the installation site, the platform is allowed to slowly submerge to the bottom, where the shear weight of the structure keeps it anchored in position. Other conical tower concrete or steel gravity structures could be built using similar techniques.

Other Designs: Fabrication/Assembly/Installation

Tension-leg Platform

The deck and hull of the tension-leg platform can be constructed separately. The hull must be built in a shipyard or a yard with a graving

Figure 3.14
CONCRETE GRAVITY PLATFORM FABRICATION PROCEDURE



Source: A.S. Hoyer Ellefsen

dock. The deck can be built in a modular fashion anywhere close to a waterway. After launch, the hull can be floated nearshore, where the deck sections are joined utilizing a large crane. Four concrete anchors would be the first components of the TLP to be installed. Each would be secured to the sea floor by a set of steel piles. A drilling template would be installed next and a specified number of wells drilled through it by a floating rig. The TLP would then be towed out, positioned over the anchors, and moored by a temporary mooring system. Four tethers, one at each corner would be run simultaneously and connected to their anchors. Once the platform is completely secured, well drilling could commence.

Guyed Tower Platform

The first commercial guyed tower built in the United States was constructed utilizing construction techniques similar to those used in building conventional steel jackets.[9/] The 1,054 jacket was built for Exxon by Brown and Root Inc., at their Harbor Island facility at Aransas Pass, Texas. The guyed tower jacket, which took two years to construct, was built in one piece on a skidway nearshore at the facility. Once completed, the 21,000 ton tower was loaded onto a specially adapted barge for delivery to the installation site in the Gulf of Mexico. After arrival at the installation site, the guyed tower was side launched, guided into position and was allowed to sink slowly to the bottom in an upright position. Four 1,800 foot guylines were in place (attached to 200 ton clump weights) when the tower arrived at the installation site. They were attached to the tower immediately after the July 1983 launch. A total of 20, 5-inch diameter guylines will have been attached and 14 steel piles installed from 100 to 560 feet below the mudline to hold the tower in place once installation is complete. Decks and drilling derricks are to be installed by early fall 1983, with development drilling expected to follow soon thereafter.

Facility Siting Criteria

A few years ago the task of describing a typical platform fabrication/ assembly facility would have been relatively easy, as all offshore production platforms were of the conventional steel jacket type typically seen in the Gulf of Mexico and offshore California. Today, however, as the oil industry has moved into deeper water and begun exploration and development in severe offshore arctic and subarctic environments, exploration and production platform designs have changed; in some cases radically. These new platform designs are altering rig yard criteria from those previously associated with the fabrication of steel jacket structures.

An example of the change in rig yard siting criteria in recent years may be noted at a facility located on the Columbia River in Vancouver, Washington. As mentioned previously, between 1966 and 1968, six offshore production platforms were built by Brown and Root, Inc., at the Columbia Industrial Park in Vancouver. These platforms, which were designed for water depths ranging between 100 feet and approximately 200 feet, were able to be built on the Columbia River and barged under the Interstate Bridge at Vancouver with only minimal clearance. By today's standards these were relatively small production platforms. Several structures built for offshore California during the next few years will be for water depths ranging over 1,000 feet deep. The base dimensions of these structures may preclude transport under any of the bridges on the Columbia River and, therefore, their construction at the Vancouver site or any other location upriver from Astoria.

Platform structures built for Alaskan arctic waters present siting criteria demands of a different nature, with a graving dock and moderately deep water adjacent to the dock, and unobstructed access to open water being important needs. Concrete versus steel as a platform building material and platform construction methodology are additional factors affecting facility siting criteria.

Realizing the varied platform types anticipated on the West Coast, it seems reasonable to assume that those interested in developing rig yards in Washington State or anywhere else on the West Coast would want to accommodate those varied platform types to the maximum extent practicable. Therefore, the discussion which follows concerning siting requirements for a "typical rig yard" is based on a composite of the siting criteria for the range of steel and concrete platform structures thought likely to be built in Washington if a facility(s) were to be developed here.

Description of a "Typical" Platform Fabrication/Assembly Yard

Before reviewing specific siting criteria, it would be useful to describe a "typical" Washington fabrication/assembly yard. Generally speaking, the yard would be a large waterfront facility consisting mostly of cleared land, warehouses, possibly a precast concrete facility, shops, large graving dock, jacket launchway (possibly), steel rolling mill (unlikely), and administrative buildings set back from the waterfront. Depending on the platform design, a structure would either be built in the graving dock, or on a shipway along the waterfront. Supporting infrastructure such as roads, railroads, power lines, etc. would be evident at the facility.

The layout of the fabrication yard would be determined largely by the type, number, and complexity of the platforms being constructed.

Siting Criteria for a "Typical" Platform Fabrication/Assembly Facility

What follows is a summary description of criteria that would likely be considered by a developer interested in establishing a platform fabrication/assembly facility in Washington State. Certain of these criteria would be considered more crucial than others depending on the specific needs of the developer.

Climate: Since most fabrication work is done either outside or in large open sheds, overly adverse weather conditions can hamper productivity. Although rain poses a minor threat, a location where a frequent combination of rain, wind, and high seas prevail would place that site at a competitive disadvantage in the site selection process. It should be noted, however, that fabricators in Scotland operate year-round at a latitude which approximates that of Juneau, Alaska.

Acreage: The size of a fabrication yard would be determined by the type of platform and size and number of platforms constructed annually, as well as the number of platform components fabricated at the site. Deck modules, pipe and various other components are often manufactured elsewhere and assembled on-site. The minimum facility size would be approximately in the 25-acre range to a probable maximum of several hundred acres (the proposed Kiewit facility at Cherry Point is 270 acres in size).

Land use in the platform fabrication yard is generally divided between fabrication and storage-support. For steel jacket platforms, approximately 50 to 60 percent of the land is allocated to fabrication and 45 percent to storage-support.[10/] For platform structures built in a graving dock this breakdown might vary somewhat.

Land Availability: The availability of the land can have an important effect on the siting and size of a yard initially and later if expansion is considered. Many fabricators prefer short-term lease options, with renewal clauses stipulating no maximum lease period and stating the availability of additional options, should site expansion be required.

Planning and Zoning Land parcels should be planned for industrial uses and zoned accordingly. In addition, controls for the shoreline interface and adjacent waterbody, under the Shoreline Management Act and local Shoreline Master Program, should provide for industry and associated activities (fill, dredge, piers, etc.). While procedures exist to amend local comprehensive plans, zoning ordinances, and shoreline master programs, such amendments often generate a significant amount of controversy and lengthy administrative processing. Predesignation of parcels for appropriate uses can do much in achieving permit predictability and timely decisions.

Slope/Soil: For steel jacket structures it is required that the yard be flat with a slope gradient no greater than three percent. The soil should be well drained with a low water table and good load bearing capacity, in the range of 14,000 pounds per square foot.[11/]

Open Ocean Access

Sea Conditions: This is an important consideration. Minimal wave and swell conditions should prevail especially in the vicinity of where a platform would be launched and in the access channel to the open ocean.

Channel Depth: The minimum depth at dockside and in the channel varies depending on the type of platform being constructed. For steel jacket platforms, the depth requirement can range between 15 and 30 feet.[12/] Large concrete gravity structures (condeep-type), such as might be built for the Gulf of Alaska, would require a harbor depth of 480 feet to 800 feet for construction and 128 feet for navigation along the towing route.[13/] This depth requirement could be substantially reduced if the base were built locally and then transported to a deep water harbor site in Alaska for second phase completion.

The depth requirement for the SAMS (Sohio Arctic Mobil Structure) gravity structure to be used for exploration is approximately 38 feet.

Channel Width: For steel jacket platforms, a channel width of 200 feet to 300 feet is preferred.[14/]

The SAMS-type gravity structure would likely require approximately a 600 foot channel width. The extra width would facilitate tug maneuvering of the structure to the open sea. Since there are shallow water gravity structures considerably larger than the SAMS now being designed, it is possible that the channel width requirement could be even greater, though it is probably more likely that these structures would be built in sections and towed to open water where they would be joined together. Should this, in fact, be the case, channel width requirements could be substantially reduced.

The harbor width requirement for construction of the condeep-type concrete platform is on the order of 3,000 feet. Fabricators of this type of platform prefer not to navigate a channel to reach their deep water construction site.

Graving Dock: The SAMS-type structures will likely require a graving dock for their construction. Should the structure be built in one piece, it would require a graving dock of the approximate minimum size of 400 ft. x 400 ft x -26ft MLLW. The width of the graving dock could be substantially reduced if the structure were built in sections.

The graving dock facility should be constructed on a site having soil capable of supporting great weights, probably in the vicinity of 5,000 pounds per square foot.[15/]

Cargo Piers: Various platform raw materials and components fabricated elsewhere would be transported by water to the assembly site. It would be highly advantageous, if not essential, that a pier facility be available for ships and, at minimum, ocean barge delivery. The water depth requirements would vary between 15 and 30 feet.

Energy Needs

Electricity: Requirements would likely range between approximately 2,000 KVA (2 megawatt) and 4,500 KVA per platform, with the exact needs depending on the type and number of structures to be built.[16/]

Other Fuels: In addition to the electricity requirement, natural gas (if available), gasoline, and diesel fuel would be utilized in amounts related to the size and scope of facility operations.

Water Needs: The site would likely require a minimum of a six-inch water line.[17/] A typical concrete gravity platform designed for water depths approaching 500 feet requires 4,800 gallons of water per hour for their construction.[18/] The amount of daily water use would depend on the type and number of structures built.

Rail Transportation: It is highly desirable that rail transportation to the site be available, since a variety of materials and components used in platform construction could be provided by this means. The exception to this requirement might be a situation where materials could be alternatively delivered by truck or barge.

Highway Transportation: Ready access to adequate roads is essential since a variety of supplies and materials would be delivered by truck to the site.

Labor Requirements: Fabrication/assembly yards employ large numbers of skilled laborers, as well as supervisory, administrative, and engineering personnel. As much as 85-90 percent of the work force can be hired locally, if available and properly trained.[19/]

Total Employment: Estimates vary. This depends on a variety of factors including the type and number of platforms required. Employment could range from as few as 250 to as many as 1,600 or more. The Kiewit proposal for Cherry Point envisions employing a total of 415 staff and workers to build the SAMS structure.[20/]

Employment Categories: The exact employment composition would vary depending on the kinds of structures, but generally the major job classifications represented include welders, metal fitters, equipment operators, electrical workers, plumbers, machinists, painters, and helpers.[21/]

Absence of Overhead Structures: It is essential that there be no overhead obstructions either at the construction facility or along the transit route to the platform installation site. This means that bridge and power line locations, especially, must be considered in the planning process.

Wastewater

Domestic: Domestic sewage at a platform fabrication yard would have to be piped to a municipal sewage treatment plant or treated on-site. No estimates were immediately available concerning amounts generated.

Industrial: Because of the metal fabrication procedures sometimes employed at a yard, (e.g. rolling, shotblasting, welding, and corrosion prevention), process and cooling waters contain quantities of particulate matter, dissolved heavy metals, and anti-fouling chemicals. Treatment facilities on-site or nearby would be required to remove pollutants in accordance with water quality regulations before discharge.

Fire Protection: It is highly desirable that local fire protection be available to complement on-site equipment.

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17. Op cit. #15. p. 13.

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20. Bellingham Herald news article, August 19, 1983.

21. Op cit. #15. p. 35.

CHAPTER 4

FACILITY PERMIT AND APPROVAL REQUIREMENTS

Introduction

A number of federal, state, and local permits would be required for a typical offshore platform fabrication/assembly yard along Washington's coastline. This, of course, would be the case with any project of similar magnitude. Table 4.10 shows a list of permit requirements, agency responsibilities, and estimated processing times expected for a typical rig yard. Not shown in the table is the amount of preparation time required prior to or during permit submittal and processing. It is during this preparatory period that coordination between developer and agencies takes place. This preparation process can significantly affect the amount of time required to procure any particular permit or approval.

What follows is an overview of the requirements which must be met before various federal, state, and local permits can be issued. It is highly recommended that a potential developer contact the appropriate local planning agency concerning permit requirements as a first step in the development process.

Federal Permits

The U.S. Army Corps of Engineers and the Coast Guard have jurisdiction over projects affecting navigable waterways, waters of the United States to the line of ordinary high water and adjacent wetlands. The Corps issues permits for works and structures under authority of Section 10 of the Rivers and Harbors Act of 1899. Permits are also issued by the Corps for fill material in wetlands (Section 404 of the Clean Water Act). The Coast Guard administers permits for bridges and causeways affecting navigable waterways under Section 9 of the Rivers and Harbors Act. The Corps requests input from the Coast Guard on Section 10 permits to ensure the proposal does not adversely affect vessel safety through impacts to navigation channels or aids to navigation.

Table 4.10

Typical Rig Yard Permit and Approval Requirements

PERMIT	AGENCY	Time Comparison (Weeks) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
°<u>SEPA: EIS Requirement</u> State Environmental Policy Act Compliance expected to be required	Washington Dept. of Ecology (WDOE) state or local lead agency	3 to 6 months approximately *
°Master Application (ECPA) Applicant has the option to file a master permit application	County Planning Dept./WDOE	120 days?
°Corps of Engineers (COE) Required for any activity in navigable waters (Sect. 10 of Rivers and Harbors Act & Sect. 404 of the Clean Water Act.) NEPA EIS	Corps of Engineers	60 - 90 days?
°Shoreline (Substantial Development) Required if project is located within shoreline jurisdiction.	County or City Planning Dept.	3 - 4 months approximately
°Shoreline Variance Required if project design (bulk, setbacks, etc.) varies from SMP requirements. Must also meet WDOE variance criteria of Shoreline Master Program (SMP).	County or City Planning/WDOE	4 - 5 months approximately
°Shoreline Conditional Use Required for activities and uses specified in SMP as needing conditional use approval. Must also meet WDOE conditional use criteria of SMA.	County or City Planning/WDOE	4 - 5 months approximately
°National Pollutant Discharge and Elimination System (NPDES) Needed if pollutants will be discharged into state's surface waters.	WDOE	6 months approximately
°New Source Construction (Air) Approval required for new source construction and/or existing sources releasing contaminants to ambient air.	WDOE Regional or Local Air Pollution Control Authority	------------------------00000000000000000++++++++

*Completion of SEPA must precede permit issuance.

<u>LEGEND</u>

// EIS plus Permit Preparation
0 Public Notice and Comment Period
- Review and Processing
X Inspection and Investigation
+ Decision and Issuance

Table 4.10

Typical Rig Yard Permit and Approval Requirements

PERMIT	AGENCY	Time Comparison (Weeks) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
°Permit to Appropriate Public Water (Water Right Permit) For use or diversion of surface or ground water or change of use	WDOE	----0000000000000000000000++++++++++++++++++++++++++
°Flood Control Zone Permit May be required if project is located within designated Flood Control Zone.	County Planning Dept./WDOE	---XXX+++
°State Waste Discharge Permit needed if pollutants will be discharged into state's ground waters or into municipal sewer systems	WDOE	------------0000000000000000000+++
°Sewage and Industrial Waste Treatment Facilities Approval Approval of plans to modify existing or construct new industrial waste treatment or disposal systems	WDOE	------------------+++
°Public Sewage Disposal Approval If in excess of 14,500 gal./day or if treatment is required.	WDOE	------------------+++
°Water Quality Certification Required by federal law for discharges to state waters AND/OR	WDOE	0000000----------------+++++++
Short-term exception to water quality standards Required when project does not meet minimum water quality standards	WDOE	-----XXX---+++++
°Burning Permit Required for the open burning of material for commercial purposes.	WDOE	----+++
°Marine Land Lease Required lease on state owned tidelands designated for various marine related uses.	Dept. of Natural Resource (DNR)	----XXXX------------------------+++++++++*

*Actual processing could be as short as one month if the Corps permit and Shoreline permit have been issued.

LEGEND

EIS plus Permit Preparation
0 Public Notice and Comment Period
- Review and Processing
X Inspection and Investigation
+ Decision and Issuance

Table 4.10

Typical Rig Yard Permit and Approval Requirements

PERMIT	AGENCY	Time Comparison (Weeks) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
°Open Water Dredge Disposal Permit Required for disposal of dredge materials at approved marine sites.	DNR	----XXX-----+++++++
°Burning Permit Required if burn pile is higher than ten feet and/or in excess of 100 tons.	DNR	-X+
°Hydraulic Project Approval	Washington Department of Fisheries	----XXX###---++
°Hydraulic Project Approval Required if structures are placed in the waters of the state	Washington Department ofGame	----XXX###---++
°Approval of Public Water System Required if project includes development of a new drinking water supply system or alteration of an existing system.	Department of Social & Health Services	----------------++
°Various Local Permits (Building, Grading, Zoning)	City and County Agencies	

The Section 10 and 404 permits are dependent upon input from a variety of federal, state, and local agencies. Such input usually comes in response to a "Public Notice of Application" issued by the Corps. By circulating public notices of application, the Corps coordinates efforts and actions of all agencies with jurisdiction over a proposal to ensure compliance with all regulations and to address interjurisdictional concerns. Input from private individuals and groups is also solicited through the same mechanism.

There are two other external sources of input to the Corps that generally must be satisfied prior to the issuance of the Section 10 or 404 permits. One is the issuance of other permits by other agencies with jurisdiction. Hydraulic Project Approval, issued either by the Washington Department of Fisheries or the Department of Game, depending on jurisdiction, is such a permit that parallels Section 10 requirements. Water Quality Certification and Coastal Zone Management Act consistency determination by the Washington Department of Ecology parallels the Section 404 criteria. These state permits will be discussed in more detail later. The other criterion is agreement by the appropriate agencies that the project's impacts to the natural environment are mitigated.

The requirements of Section 404 of the Clean Water Act state that filling activities causing unacceptable impacts to wetlands associated with waters of the U.S. must be denied or the impacts mitigated. Those agencies with responsibility for providing comments to the Corps under provisions of the Fish and Wildlife Coordination Act are the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), and the Washington Departments of Fisheries and Game (WDF and WDG). Applicants should contact these agencies to discuss impact issues and project design criteria, since permit review criteria will vary between each agency. During the impact evaluation process, agencies may provide input concerning practical alternatives or the possibility of mitigation as a means of offsetting adverse impacts associated with a project proposal. A single mitigation/compensation plan agreed to by the responsible resource agencies would result as determined appropriate.

State Environmental Policy Act (SEPA)

The State Environmental Policy Act, which was enacted by the Washington State Legislature in 1971, established many broad environmental policies. Of key significance is the requirement that all branches of state government must consider the environmental impacts in decision making.

Under the provisions of SEPA, an EIS would be required if the responsible official of the SEPA lead agency determined that development of a platform fabrication yard would have a probable significant adverse effect on the environment. An EIS must be prepared before any permits or other governmental approvals can be issued. The responsible official from the lead agency must consult with the public and other agencies about impacts, alternatives, and mitigation measures which must be discussed in an EIS.*/ Under SEPA, the lead agency may use an EIS at the federal level to comply with SEPA.

State Permits

There are a variety of permits issued by state agencies that would probably be required for the development of a rig yard facility regardless of the location. Most are performance oriented. That is, there are certain criteria established by law that must be satisfied before the permit will be issued. This section discusses each permit, the responsible agency, and the general requirements of the permit.

Hydraulic Project Approval (HPA)

This "permit" is required for any project that involves dredging or the placement of a structure in state waters. RCW 75.20.100 states that applicants must submit "full plans and specifications of the proposed construction work, complete plans and specifications for the protection of fish life in connection therewith. . ." and must receive written approval for the proposed project.

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*/A listing of WDOE and county SEPA coordinators is contained in Appendix C.

The restrictions placed on the proposal usually limit the types of materials used in construction of the structures, the period of construction, and possibly the method of construction. Dredging periods are confined to those times when juvenile fish of either food or game species are not present. Dredging operations and procedures are also specified.

The HPA permit is issued by the Department of Fisheries or the Department of Game depending on jurisdiction. If wildlife habitat impact mitigation under the Corps' Section 404 permit and the Fish and Wildlife Coordination Act is involved in the proposal, an HPA will not likely be issued until the mitigation activity issue is resolved.

National Pollutant Discharge Elimination System Permit (NPDES)

This permit is required under P.L. 92-500, the Clean Water Act, for any pollutant or effluent discharge into the state's surface waters. The NPDES permit is issued by the Washington Department of Ecology. The permit applies to discharges from sanitary wastewater treatment plants as well as to effluent from industrial wastewater treatment plants (federal facilities are permitted by EPA).

Sewage and Industrial Waste Treatment Facilities Approval

This approval is issued by the Department of Ecology after it has reviewed the design and specifications of all wastewater treatment plants. The purpose of this approval is to ensure that the proposed treatment facility provides for a reliable and effective method of waste treatment, as well as to avoid the duplication of service where other facilities are available. In this manner, the number of effluent sources is limited. Obviously, this approval must work in harmony with the NPDES permit. Both the NPDES and sewage and waste treatment facility approval require detailed engineering and design efforts and are not required during the initial site permitting phase. However, preliminary engineering evaluations are generally required during this phase by the Department of Ecology to ensure that the entire project is designed to minimize wastewater generation and maximize treatment capabilities.

State Waste Discharge Permit

Any commercial or industrial facilities disposing of waste material into the ground waters of the state, or commercial or industrial operators discharging solid or liquid waste material into sewerage systems operated by municipalities are required to obtain this permit from the Department of Ecology (does not apply to domestic sewage).

Water Quality Certification and/or Short-Term Exception to Water Quality

Certification is required by federal law as a prerequisite to obtaining a federal permit. It is issued by the Department of Ecology to ensure that there is no degradation of water quality during dredging, filling or construction in state waters. For the various types of dredging activities, methods of operation are specified for the dredge itself and for the water return. For structures, the types of materials allowed are specified. Short-term exceptions are granted when some impacts cannot be avoided, but WDOE requires every effort be made to minimize those impacts to water quality. This permit is required during the initial permitting phase and generally must be issued prior to issuance of the Corps' Section 10 and/or 404 permits.

Public Sewage Disposal Approval

Prior to the construction or modification of a domestic wastewater facility for an industrial establishment, an engineering report and plan, with specifications for the project are to be submitted to the Department of Ecology. However, if the local government entity has received Department of Ecology approval of a general sewer plan and standard design criteria, engineering reports and plans and specifications for sewer line extensions, including pump stations, need not be submitted for approval. In this case, the entity need only provide a description of the project and written assurance that the extension is in conformance with the general sewer plan.

Marine Land Lease

Before development of facilities can take place in state owned aquatic lands, a lease or other use authorization must be issued. The power to lease all state owned tidelands, bedlands, shorelands, and harbor areas is vested in the Commissioner of Public Lands who administers the Department of Natural Resources. Applications for use of state owned aquatic lands must be accompanied by drawings and plans for the proposed improvements. This use application must be submitted to the Department of Natural Resources in acceptable detail prior to issuance of the Corps' Section 10 permit. Sites not on state owned lands are not required to obtain department use authorization.

New Source Construction Approval (Air)

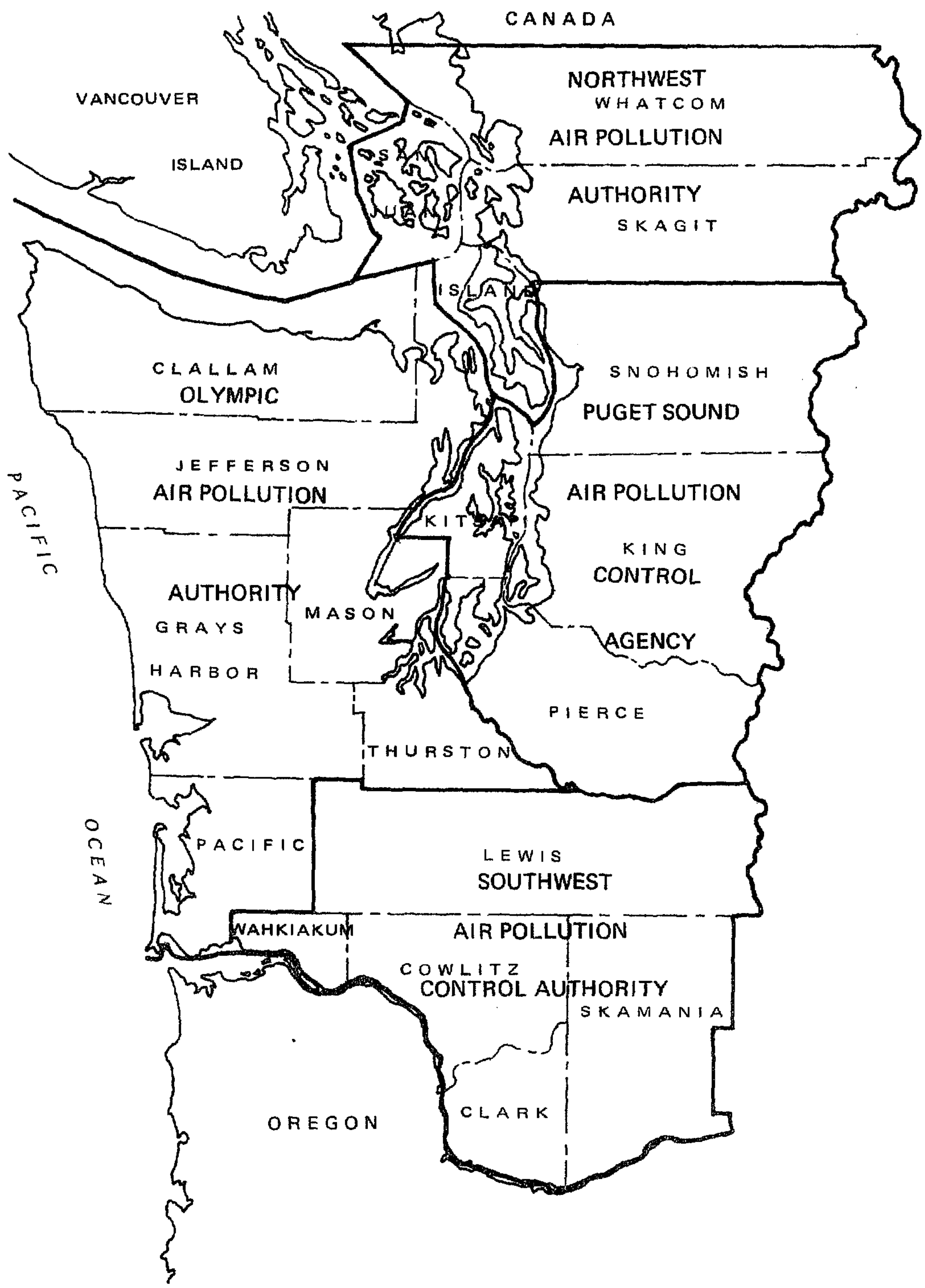
Any activated air pollution control authority may classify air contaminant sources which may cause or contribute to air pollution. The appropriate air pollution control authority (Figure 4.10) or the Department of Ecology will require notice of construction, installation, or establishment of any new air contaminant sources. As a condition precedent to construction, either agency may require the submission of plans, specifications, and other information in order to determine whether the proposal will meet the requirements of all applicable air pollution rules and regulations and provide all known available and reasonable emission control. The applicant must show that the best available control technology will be used and that the facility will not result in a violation of state and federal air quality standards. In nonattainment areas, an emission offset would be required. If estimated emissions levels exceed 250 tons per year, preconstruction and operations monitoring may be required. If the agency determines that the proposal complies, it will approve the proposal with possible conditions to assure maintenance of compliance. This approval must be obtained during the initial permitting phase (see address listing of Air Pollution Control Authorities - Appendix D).

Figure 4.10

AIR QUALITY

AREAS OF JURISDICTION IN WESTERN WASHINGTON

REGIONAL AIR POLLUTION CONTROL AGENCIES AND DEPARTMENT OF ECOLOGY



Water Rights and Approval of Public Water Supplies

Nearly any entity desiring to appropriate ground or surface water for a beneficial use must first apply to the Department of Ecology for an appropriation permit. Each application specifies the source, the nature and amount of proposed use, the time the water is required, the location, and description of the works to deliver the water and the period of construction. All applications must include maps or drawings if the department requires. Water appropriations permits are necessary for withdrawal of water from any surface water body. Withdrawal from ground water sources in volumes greater than 5,000 gallons per day requires an appropriation permit.

Either the local health district or the Department of Social and Health Services (DSHS) must approve the plans and the design of a public water supply works to ensure that the facility will consistently and reliabily provide water which meets potable standards. The agency with jurisdiction varies depending upon local health district capabilities and agreements with DSHS.

Open Water Dredge Disposal Approval

Application for approved use of open water disposal sites must be made to the Department of Natural Resources. Applications for use of an established site must be for dredged material that meets the approval of federal and state agencies and for which there is no practical upland disposal site or beneficial use such as beach enhancement. Disposal will normally be limited to previously approved disposal sites. When required, new sites will be designated according to the procedure contained in WAC 332-30-166.

State Flood Control Zone Permits

The State Flood Control Zone Permit Program is administered by the four WDOE regional offices. This state permit is required for building and development in the 18 state-designated flood control zones.

The counties of King, Cowlitz, Skagit, Clallam, Thurston, and Clark administer the flood control zone permit systems within their county boundaries. Applications for permits in these counties should be made through the local building or planning department.

Open Burning Permits

The Department of Natural Resources and the local air pollution authority should be contacted if open burning is planned. Permit requirements and stipulations can be defined at that time.

Crossings of Public Roads and Railroads

The state Utilities and Transportation Commission must approve all crossings of public roads and railroads.

Noise Standards

Although no particular permit is required, the state Department of Ecology promulgates specific noise standards (WAC 173-60) for development and commercial activity. Noise impacts must be addressed in the project EIS, where it must be shown that noise levels are either within state standards or are adequately mitigated.

Local Permits

Most permits issued by local governments deal with the appropriateness of a proposal as a land use. If the site proposed for a rig yard facility is not designated for such use, amendments to the zoning ordinance, comprehensive plan, and/or local shoreline master program may be possible. Procedures for amendments to these types of regulations vary from jurisdiction to jurisdiction, but the proponent of an amendment can be assured that a series of public hearings will be involved and that the proposed amendment(s) should be thoroughly addressed in the project's environmental document. Following is a brief discussion of the permit requirements at the local level.

Shoreline Substantial Development Permit

The Shoreline Management Act was enacted in 1971 to establish coordinated state and local management of the development of fragile and valuable state shoreline resources. State guidelines for shorelines of statewide significance, as administered through local shorelines master programs, give preference to uses in the following order, which:

- recognize and protect the statewide interest over local interest
- preserve the natural character of the shoreline
- result in long-term over short-term benefit
- protect the resources and ecology of the shoreline
- increase public access to publicly owned areas of shorelines
- increase recreational opportunities for the public in the shoreline

No development may be undertaken on state shorelines covered under the state Shoreline Management Act except that which is consistent with the state policy and local master program. A shoreline substantial development permit must be obtained from the local agency with jurisdiction to ensure that the development meets the criteria of the Shorelines Act.

Shoreline substantial development permit application and issuance procedures vary among jurisdictions depending on the language of the local master program. Permit related regulations that will be consistent though, are public notice procedures and state review periods, compliance with SEPA, and compliance with all other local land use regulations. Action by the local government to approve or deny a shoreline substantial development permit must be reported to the Department of Ecology for its review of the local action's conformance with state guidelines.

In the event a shoreline substantial development permit is denied, an appeal of the local action by the aggrieved party is heard by the Shoreline Hearings Board (SHB). The appeal must be filed within 30 days of the Department of Ecology's receipt of the local action. The department or the attorney general must certify that the reasons for the review are valid before the matter goes to the SHB. Judicial review of the local action or the SHB's action is an alternative course of action that may be considered.

Shoreline Variance/Conditional Use Permits and Master Program Amendments

Certain aspects of the development of a platform fabrication/assembly facility along a shoreline may require a conditional use permit or require variances depending on the language of the local shoreline master program. The purpose of a conditional use permit is to allow greater flexibility in the administration of the use regulations of the local master program in a manner consistent with the local master program and state shoreline guidelines. Uses classified as conditional uses can be permitted only after consideration by the local government and by meeting such performance standards that make the use compatible with other permitted uses within the area.

The purpose of variances is to grant relief to specific performance standards where there are unique or extraordinary circumstances relating to the property such that strict implementation of the regulation imposes practical difficulties of an unnecessary hardship on the applicant. Developers should consult local shoreline master programs to determine the need for conditional use or variance permit applications for potential sites. All variances and conditional uses are subject to review and approval of the Department of Ecology.

Amendments to local shoreline master programs (additions, deletions, or modifications) may be made by local jurisdictions to reflect changing local circumstances, new information, or improved data. Changes are made consistent with the public review process and other provisions defined in the Shoreline Management Act. Any amendments or adjustments that are made, however, do not become effective until approved by the Department of Ecology, as defined in the act.

Floodplain Regulation Permits

Most local governments are now administering flood regulation permit programs which are based on ordinances that comply with requirements of the National Flood Insurance Program.

Other Local Permits

At the local level, all construction requires a building permit. Also, approval is usually required for the creation of new intersections between project roads and existing thoroughfares. Depending on local procedures, other permits or approvals may be necessary.

Summary

Numerous permits and approvals are necessary for almost all aspects of the development of a platform fabrication/assembly facility. Working in concert with the likely mandatory EIS, these permits require the proponent to fully investigate and evaluate alternative designs and methods of development that will limit the adverse impacts to all segments of the environment. Through this process, the public interest is protected and maintained.

The permitting system is designed to be comprehensive in scope and coordinated among the various levels of jurisdiction. Those agencies with the closest and most specific jurisdiction must approve the proposal and issue the appropriate permit before the next level will act. In this manner, local permits must be issued prior to the state agencies issuing their permits. The federal permits are generally issued after all of the state and local permits are approved. This procedure is designed to avoid the possibility of conflict or contradiction among the various authorities.

CHAPTER 5

ENVIRONMENTAL IMPACT POTENTIAL

Introduction

Previous chapters provided a description of platform fabrication facilities including their general layout and operation. With that as a background, this chapter provides a generic listing of potential environmental impacts, which can be used in identifying impact issues in the site review process. It is anticipated that a potential developer of a platform fabrication/assembly facility would be able to utilize this listing of potential environmental impacts in screening particular sites, as a means of determining permit feasibility. The listing, besides possibly assisting in determining preliminary permit feasibility, may be helpful to local planners and the public in evaluating whether or not a platform construction facility would be an asset or liability to the community.

Environmental Review Elements

The elements listed in Table 5.10 address potential impacts on the physical, biological, and socioeconomic environment that could result from the development and operation of a platform construction facility. This listing of potential environmental impacts generally parallels the list of elements of the environment contained in the State Environmental Policy Act (SEPA). Each of these elements would be expected to be addressed in detail, as part of the Environmental Impact Statement (EIS) preparation process. The discussion which follows addresses each of these elements as they relate to potential impacts resulting from facility development and operation.

Earth

Platform fabrication/assembly yards typically are graded flat and covered with gravel which is then compacted to withstand heavy loads. If a graving dock is required, a substantial amount of dredging or onshore

TABLE 5.10

LIST OF POTENTIAL ENVIRONMENTAL IMPACTS

Earth

- Changes to local topography
- Surface compaction
- Alteration of longshore transport

Air

- Elevated dust emissions
- Emissions from ships, trains and other vehicles

Water

- Modification of hydrologic regimes
- Elevated levels of runoff
- Degradation of adjacent surface waters by windblown dust
- Increased turbidity due to dredging and dredge disposal

Flora and Fauna

- Degradation of adjacent wetland habitat
- Degradation of adjacent aquatic habitat
- Degradation of adjacent terrestrial habitat
- Disruption of corridors and fish migratory pathways
- Rare or endangered species impacts

Other

- Noise pollution
- Light and glare generation
- Alteration of land use designations
- Potential for on-site accidents
- Potential for ship accidents
- Traffic congestion at grade crossings
- Increased demand for public services
- Increased demand for utilities
- Aesthetic impact
- Disruption of recreational/commercial fishing
- Disruption of general recreational activities
- Archaeological/historical resource impacts
- Competing uses for land and shoreline

excavation would be required. This work can substantially alter local topography, affect soil permeability, and alter local hydrologic regimes and runoff patterns. Longshore current patterns could also be affected by shoreline dredging and/or excavation. Similar impacts on longshore current patterns can result from the installation of pier structures.

Air

Emissions can result from various operations associated with the fabrication of both steel and concrete platforms. Air pollution sources include the following:

- o pipe and metal cleaning by sandblasting;
- o paint emissions;
- o welding;
- o windblown aggregate and cement dust; and
- o transportation emissions from

  a) cranes and other machinery used to move steel and/or concrete components in the fabrication and assembly process

  b) trains, trucks, tugs and barges used to deliver and remove materials; and

  c) automobile traffic

Sandblasting Emissions and Controls. Sandblasting of metal surfaces for painting generates particulate matter, principally sand and metal dust. These emissions can be controlled through use of filters, wet-scrubbers, or electrostatic precipitators depending on the size, density, shape, and surface characteristics of the particles and whether the work is done inside or outside.

Painting Emissions and Controls. The process of painting can generate high levels of emissions during both application and drying. The volume of these losses is determined by the amount of volatile matter in the paint--averaging about 50 percent of the total. Major ingredients include aliphatic and aromatic hydrocarbons, alcohols, ketones, esters, alkyl and aryl hydrocarbon solvents and mineral spirits.[1/]

Welding. Welding involving certain metals can generate toxic emissions which could cause serious health problems if the welding was conducted in a poorly ventilated area. Gases such as CO, CO_2, O_3 and NO_2 are typically given off in the welding process. Processes associated with welding such as acid baths used in metal cleaning could also be potentially hazardous.

Windblown Aggregate and Cement Dust. In those yards where cement platforms will be constructed, additional air emissions potentially can occur from windblown aggregate and cement dust.

The overall impact of these air emissions would depend on the size and output of the facility, the existing air quality at the site and in adjacent areas, endemic biota, prevailing winds and local meteorological conditions, and the degree to which available control technology is applied.

Transportation Emissions. A variety of raw materials and supplies for the platform fabrication yard would be delivered by railcars, trucks, supply boats, and barges. On-site, heavy duty trucks, cranes, and other machinery would be used for a range of activities. This machinery uses either diesel fuel or gasoline and releases emissions of carbon monoxide, sulfur oxides, hydrocarbons, and nitrogen oxides. Automobile emissions associated with the work force at the facility represents an additional source of air pollutants (emissions from various types of heavy machinery are presented in Appendix E).

Water

Runoff from a site may be contaminated by particulate matter, heavy metals, petroleum products, and process chemicals. The kinds and amounts of contaminants would be determined by the complexity and control practices of the facility. The effect of these contaminants would be influenced by both the original quality of the receiving waters and the sensitivity of the existing aquatic population. Both hydrocarbons and heavy metals are toxic to some aquatic organisms; other organisms may exhibit sublethal physiological responses, such as reduced growth rates. Small amounts of some heavy metals can accumulate in the tissue of certain fish, especially filter-feeding shellfish, thus rendering them unfit for consumption. (A summary of pollutants contained in effluent of OCS related facilities is contained in Appendix F).

Increased runoff and siltation may also alter circulation patterns, flushing rates and the salinity gradient locally. Most estuarine and marine biota are able to withstand slight alterations in temperature and salinity. Larval forms are often less tolerant and the local area may, as a result, be less suitable for migration, feeding, or spawning purposes.

Dredging required to maintain an adjacent channel at a depth sufficient for service boats, tugs, and barges used to transport and install completed platforms may cause significant environmental impacts. In previously undisturbed portions of an estuary or harbor these impacts could include:

- alteration of water circulation patterns and salinity gradients as a result of alteration of shoreline and bottom topography;

- alteration or destruction of intertidal and benthic habitats; and

- addition of nutrients and particulates to the water column.

These changes in the aquatic and seabed environment may result in a partial or total change in the species composition of the local waters.

Dredging in an existing industrial area would likely cause minimal environmental impact compared to an undeveloped area, since productivity and diversity of indigenous species may be low in a developed harbor. This is due to the continual turbidity resulting from maintenance dredging, and the constant influx of toxic substances, such as oil discharges from boats and heavy metals from industrial discharges. Since only species adapted to these conditions are generally present in the area, further dredging would likely not elicit significant environmental degradation.

The most significant impact of dredging in an industrial area would result from disposal of the dredge spoils, which may contain high concentrations of petroleum products and heavy metals. Some of these compounds, such as aromatic hydrocarbons, are extremely toxic to marine life. Others such as lead, may be concentrated in the tissues of lower organisms, such as filter feeders, and passed up the food chain with lethal effects at higher levels.

Plants and Animals

The destruction and/or alteration of plant and animal communities, both aquatic and terrestrial due to facility site development and operation, is a very real concern. Site clearing and preparation, dredging, and filling could each involve the destruction or radical alteration of plant and animal habitat. The degree of impact can be measured in terms of the amount and type of plant and animal diversity in existence at the site prior to development. If, for example, there is limited diversity of both plant and animal life, then development impact would likely be minimal, assuming the absence of rare or endangered species. The opposite would be true if there is a high degree of plant and animal diversity.

If site preparation alters only a small part of a species' habitat and the surrounding area is not at its peak carrying capacity, the displaced species may relocate nearby. However, if the disturbed area is large in relation to the total available habitat, or if a species' habitat requirements are specific for the area destroyed, the species may be eliminated from the area.

Impacts on undeveloped wetlands are of particular concern, since this habitat type has been vanishing at an alarming rate in recent years due to development activities. The siting of a platform fabrication facility at a wetland location would have a pronounced impact, especially if a substantial amount of filling is involved. Filling can cause severe impacts such as 1) changing aquatic habitats to terrestrial; 2) lowering biological productivity in the area; and 3) changing water retention and detritus production properties of the filled area.

When a wetland is filled, previously aquatic habitats that may serve as potential waterfowl breeding grounds and spawning grounds of fish populations will also be destroyed. If alternate wetland habitats suitable for reproduction are not available, entire species may have to relocate from the area.

Wetlands are highly productive areas which act as organic sinks, providing large volumes of nutrients to coastal organisms and filtering contaminants from surface runoff. When wetlands are filled, fewer organic compounds enter coastal waters, and primary productivity in the area decreases. This may ultimately reduce productivity in adjacent coastal waters.

Wetlands also act as natural dams to prevent fresh water from moving into marine waters, and salt water from moving inland. Because wetlands are saturated, fresh water is retained underground in natural reservoirs. When a wetland is filled, it can no longer act as a barrier. As a result, fresh water may move into the ocean, effectively lowering the water table, and salt water may intrude into the coastal water table.

Other potential detrimental effects to flora and fauna associated with platform fabrication facility development and operation relate to impacts on 1) agricultural lands; 2) rare or endangered plant and animal species; 3) unique or critical habitat areas; and 4) creation of barriers to natural migration corridors for fish and other animals.

Noise

Heavy machinery used during site construction and operation would raise noise levels around the site. Table 5.11 lists, as an example, the sound levels expected from grading, pile-driving, and dredging during construction of the proposed Kaiser platform assembly yard at Terminal Island in Los Angeles.

The impact of construction and operation noise on the surrounding community would largely be determined by existing noise levels. The effects would be much greater in a rural area, with an average level of 40 decibels, than in a metropolitan area, which has an average level of 70 decibels. Furthermore, any source generating less than 70 decibels will have little impact on an urban area, whereas in a rural area, any source generating more than 40 decibels will increase ambient levels (Table 5.12 indicates expected noise levels during operation of the proposed Kaiser yard at Terminal Island in Los Angeles).[1/]

Light and Glare

A platform fabrication facility would likely be equipped with lights for nighttime operation. Over-water installations, such as a pier, would require Coast Guard approved navigational hazard lights.

A site located near residential or other nonindustrial areas will need to address the potential problem of disruption of adjacent communities by light and glare emanating from the site during nighttime operation. Isolated sites run the potential risk of adversely affecting wildlife usage of adjacent areas due to nighttime light and glare. Of concern also, is the potential for light and glare distracting passing motorists on adjacent roads and highways at night.

Land Use

Site selection for a prospective platform fabrication/assembly facility should generally seek to comply with local comprehensive land use plans, zoning and shoreline management master programs. If this is not entirely

TABLE 5.11

CONSTRUCTION EQUIPMENT, USAGE FACTORS, AND SOUND LEVELS

Construction Activity	Equipment	Sound level 15 m (50 ft) - dB[a]	Number of Units[b]	Usage Factor[c]
Grading	Scraper	88	3	.14
	Compactor	82	1	.10
	Backhoe	85	2	.16
	Water truck	86	1	.05
	Grader	85	1	.05
	Roller	80	1	.10
	Dump truck	86	2	.02
Equivalent Sound Level, L_{eq}, total at 15 m (50 ft) = 86 dB				
Pile-Driving	Pile-driver	101	1	.04
Equivalent Sound Level, L_{eq}, total at 15 m (50 ft) = 87 dB				
Dredging	Clamshell dredge	82	1	.07
	Work boat	83	1	1.00
Equivalent Sound Level, L_{eq}, total at 15 m (50 ft) = 83 dB				

[a] Source: U.S. Army, 1977; EPA, 1975; and Dames & Moore's files.

[b] The same numbers and types of equipment would be employed during construction of Phase I and Phase II. Dredging would occur after other construction was complete.

[c] Usage factors represent the fraction of total operating time that the equipment is operating in its noisiest mode; Source: U.S. Army, 1977; EPA, 1975; and Dames & Moore's files.

Source: Draft EIR - Kaiser Steel Corporation Terminal Island Marine Assembly Yard, Los Angeles Harbor Department, June, 1983.

TABLE 5.12

OPERATIONAL EQUIPMENT, USAGE FACTORS, AND SOUND LEVELS
(Proposed Kaiser Yard at Terminal Island, Los Angeles)

Equipment Item	Sound Level 15 m (50 ft) per Item - dB[a]	Phase I Operation Number of Units	Phase I Operation Load Factor[b]	Phase I Operation Usage Factor[c]	Phase II Operation Number of Units	Phase II Operation Load Factor[b]	Phase II Operation Usage Factor[c]
Crane, 1380-hp[d]	88	2	1.0	0.22	2	0.64	0.57
Crane, 700-hp	85	2	1.0	0.22	2	0.64	0.57
Crane, 520-hp	85	2	1.0	0.22	4	0.64	0.57
Crane, 430-hp	85	1	1.0	0.22	1	0.64	0.57
Crane, 330-hp	84	2	1.0	0.22	5	1.0	0.45
Crane, 250-hp	84	2	1.0	0.11	2	0.64	0.57
					2	1.0	0.36
Crane, 150-hp	83	2	1.0	0.11	2	0.64	0.57
Tugboat, 2500-hp	93	1	0.01	1.0	1	0.034	1.0
Railroad Switch Engine	91	1	0.005	1.0	2	0.004	1.0
Trucks	86	2	0.5	0.02	4	0.054	0.02

Phase I: L_{eq}(9) total at 15 m (50 feet) = 90 dB

Phase II: L_{eq}(11) total at 15 m (50 feet) = 95 dB

[a] Source: EPA, 1975; EPA, 1977; Swing and Pies, 1973; and Dames & Moore's files.

[b] Load factors represent the fraction of total working hours when the equipment would be operating. Load factors for Phase I are based on a 9-hour per day equipment operations schedule. Load factors for Phase II are based on a 16-hour per day schedule, with the equipment operating during only 11 of the 16 hours.

[c] The usage factor represents the fraction of operating time for a particular equipment item when that item is operating in its noisiest mode. Source: EPA, 1975; Swing and Pies, 1973; Port of Los Angeles, 12-10-82, Table A2; and Dames & Moore's files.

[d] Total horsepower for three engines.

Source: Draft EIR - Kaiser Steel Corporation Terminal Island Marine Assembly Yard, Los Angeles Harbor Department, June 1983.

possible, variances to existing land use designations may be required. These variances could have a variety of impacts depending upon adjacent land uses, agency concern, and public receptiveness.

Natural Resources

Fuel requirements for vehicles and equipment will result in consumption of nonrenewable fossil fuels (gasoline, diesel and natural gas). An approximate 3 megawatt electricity supply would be required which, during a time of surplus, would likely not be a problem as long as inexpensive hydropower is available. If a surplus was not available, new facility electricity requirements could increase dependence on coal and uranium fuels.

Platform fabrication facilities engaged in the construction of concrete gravity platforms would additionally require large amounts of aggregate, sand, cement and water. Table 5.13 lists the materials required for a single concrete gravity platform designed for a water depth of 480 feet. Material amounts would, of course, be expected to vary depending on the design and size of the platform. Extraction of these resources would be expected to have measurable environmental impacts.

TABLE 5.13

MATERIAL REQUIREMENTS: CONCRETE PLATFORM FABRICATION FACILITY

Material	Amount	Explanation
Sand	100,000 tons	Ballast to lower platform
Aggregates	200,000 tons	Raw material for concrete
Cement	50,000 tons	Raw material for concrete
Water	20 tons (4,800 gal./hr.)	Industrial use only

Source: Planning for Offshore Oil Development - Gulf of Alaska OCS Handbook, Alaska Department of Community and Regional Affairs, 1978, p. 161.

Also of significance would be the loss of upland and shoreline resources due to facility development.

Risk of Explosion or Hazardous Emissions

Some risk of accidental fuel spills and explosion would be present both during the receiving of incoming fuel supplies and during vehicle and equipment refueling.

Various permitting and regulatory authorities would require environmental protection plans to minimize spills or other potential harmful discharges into a river or shoreline. The Spill Prevention Control and Countermeasure (SPCC) plan, required by EPA for this kind of facility would place several requirements on facility design and operational procedures, as well as placement of certain emergency equipment.

Population

Population impacts resulting from the construction and operation of a platform fabrication/assembly facility would be expected to vary depending on the work force levels involved and the population of the community where the facility is located. For example, in areas where there is a substantial labor pool, as much as 85 to 90 percent of the work force could be hired locally.[2/] This being the case, the local population level would not increase appreciably. However, if a facility was to locate in an area where the labor pool was quite small, and it was necessary to bring a substantial number of workers in from outside the area, the resulting population related impacts could be significant.

The current Kiewit proposal to build a platform construction facility at Cherry Point in Whatcom County, would employ an estimated 410 people. This compares with 1,000 employees estimated to be required for the Chicago Bridge and Iron facility previously proposed for the same Cherry Point site. The Kiewit estimated work force level probably reflects the lower end of the range in terms of the number of people initially to be employed at a platform construction facility. Depending on the magnitude of platform construction at a particular facility, as many as 1,600 individuals or more could be employed.

Because platform construction is generally a "boom or bust" business, the number of people employed at any given time can vary dramatically. This "boom-bust" phenomenon could have a substantial impact on the population size of a small community both during the hiring and layoff phases of the work cycle.

Housing

Impacts associated with housing supply and demand would depend on the size of the work force and whether it was indigenous, and on the availability of housing in the local area. A work force assembled from the local labor pool would likely have minimal impact on housing demand. On the other hand, if the work force is imported into the area, the impact on housing could be substantial, especially if the local community is small in size.

Transportation

Vehicular transportation impacts associated with facility development and operation could range from slight to substantial depending on the size of the work force and the capability of the local highway system to accommodate large traffic loads.

Waterborne transportation, involving tug and barge deliveries to and from the facility, could pose problems if the area was already a congested port facility. Conflicting uses of the adjacent waterway could, for example, cause scheduling conflicts to arise. Tug and barge activities could also impact local fish harvesting, depending on operations scheduling.

Rail transportation to and from a platform construction facility would likely cause minimal impact, assuming the rail line was already in place. If, however, a lengthy spur line was required to be built to the facility, there could potentially be significant impacts associated with its construction and possibly its operation.

Public Services

Potential impacts on local services such as fire and police protection, schools, recreational facilities, sewage, water, and hospitals could range from no impact or slight impact to substantial impact. This depends on the size of the work force, and whether it was, for the most part, indigenous, or not, and the existing capability of the local community to accommodate additional demand for services. The greatest impacts would be expected to occur in smaller communities where public service facilities may be marginally adequate or nonexistent.

Energy

Electricity, natural gas, gasoline, and diesel fuel are typically used at platform construction facilities in varying amounts. Table 5.14 shows the annual energy consumption estimates for the proposed Kaiser platform construction facility in Los Angeles.

Under normal circumstances, energy impacts associated with meeting facility requirements would be considered minimal. However, because of recently recognized uncertainties associated with the supply of electricity and petroleum in particular, there is always a possibility that regional supplies could be diminished with little or no advanced warning. This is particularly the case with petroleum. Any new demand for these energy forms, therefore, represents a potential competing use requirement, that should be considered as part of local energy contingency planning.

Also of potential significance in considering additional demand for electricity, is the fact that future demand will likely have to be met with increasingly expensive thermally-produced power, vis-a-vis nuclear and coal fired power plants. Increased dependence on expensively produced power will undoubtedly result in increased consumer rates - a factor that should be considered in the planning process.

Table 5.14

ANNUAL ENERGY REQUIREMENTS[a]

Project Activity	Electricity (kW-hr)	Natural Gas (10^6 ft^3)	Gasoline (gal)	Diesel Fuel (gal)
CONSTRUCTION				
Commuter Vehicles				
Phase I	--	--	4,800	--
Phase II	--	--	4,800	--
Construction Equipment				
Phase I	--	--	--	40,500
Phase II	--	--	--	42,100
TOTAL[b] - Phase I	--	--	4,800	40,500
TOTAL[b] - Phase II	--	--	4,800	42,100
OPERATION				
Commuter Vehicles				
Phase I	--	--	99,500	--
Phase II	--	--	193,600	--
Tugboats				
Phase I	--	--	--	4,800
Phase II	--	--	--	9,600
Supply Trucks				
Phase I	--	--	--	5,700
Phase II	--	--	--	7,600
In-plant Vehicles				
Phase I	--	--	--	7,800
Phase II	--	--	--	15,600
Cranes				
Phase I	--	--	--	209,500
Phase II	--	--	--	617,700
Railroad Switch Engine				
Phase I	--	--	--	300
Phase II	--	--	--	600
Space Heat				
Phase I	--	0.3	--	--
Phase II	--	0.3	--	--
Electric Power Generation				
Phase I	9,360,000	--	--	--
Phase II	27,040,000	--	--	--
TOTAL - Phase I	9,360,000	0.3	99,500	228,100
TOTAL - Phase II	27,040,000	0.3	193,600	651,100

[a] Values are rounded to the nearest 100 gal, 100 kW-yr, or 100,000 ft^3.

[b] Based on the construction schedule shown on Figure 1.6-1. Phase II amounts reflect incremental construction activities on the 52-acre expansion area. Overall total would be the sum of the Phase I and Phase II totals.

[c] Phase II totals reflect all activities on the entire 100-acre site and, therefore, represents the overall total. The Phase I and Phase II totals are not additive.

Source: Draft EIR - Kaiser Steel Corporation Terminal Island Marine Assembly Yard, Los Angeles Harbor Department, June 1983.

Utilities

Water, sewage, and solid waste disposal requirements could be substantial, particularly if facilities to provide these services are inadequate or nonexistent. Construction of new water and/or sewage systems and expansion of existing systems could be an added burden to local taxpayers. Environmental impacts associated with the need for increased capacity for sewage and solid waste disposal are additional considerations.

Impacts associated with increased electricity demand are discussed above in the Energy section.

Human Health

No major or unusual human health impacts would be anticipated for people living near a platform construction facility. Neither would there likely be any significant health impacts on those employed during construction and operation of the facility. The only apparent exception might be potential impacts on welders of toxic welding emissions. This potential health problem would be expected to occur only under conditions of inadequate ventilation.

Aesthetics

A platform fabrication/assembly facility would be expected to have an aesthetic impact on the area. The degree of impact would depend on factors such as whether or not the facility was located in an existing industrial area, and on the general level of facility exposure to the public. Perhaps even greater than the aesthetic impact of the facility would be the temporary aesthetic impact of the platform structures built at the facility. Depending on the design, a platform could be several hundred feet in length and 100 to 300 feet in height. The larger structures unless hidden by local topographic features, would likely be visible for a distance of several miles.

Recreation

Water associated components of a platform construction facility could potentially impact recreational and commercial fishing and other water uses in some areas, particularly where extensive pier or piling structures are required. Insurance carriers for a facility may require that the public be kept away from these structures, thus excluding these areas from recreational use.

Archaeological/Historical

As with any major project, any suspected archeological or historical resources in the development area must be surveyed and inventoried. An assessment of this kind of impact must be made on a case-by-case basis and coordinated through the state Office of Archaeology and Historic Preservation. A state approved, professional archaeologist may have to be called to a site to conduct survey work prior to development.

Competing Uses

Competing potential uses for a specific site area may require a separation of facility components. For example, unloading and storage operations which are not water dependent, may have to be located inland from specifically water dependent facility operations to allow for other competing facilities to utilize limited shoreline land resources.

Economic

The economic impact to a community of a platform construction facility would be to generally broaden the local tax base and increase local revenues. However, because of the "boom-bust" nature of the platform construction business, the generally rapid expansions and contractions of construction operations could have profound impacts on the economy of a local community. For example, a community might make a substantial investment in support services and infrastructure with the expectation that platform construction would proceed at a high pace only to find subsequently that due to market conditions, construction was substantially reduced or curtailed. Such a situation could obviously adversely affect the economy of a local community, especially a small community lacking a diversified economic base.

The many market uncertainties that exist relating to future offshore Alaska and California platform demand, combined with expected intense domestic and foreign competition for whatever market does develop, should be cause for local decision makers to conduct a very careful cost benefit analysis of economic impact on the local community. As mentioned in the introductory chapter of this report, permits were issued and preliminary site development undertaken at platform construction sites in Grays Harbor and Everett during the mid-1970s, with the result that the projects were subsequently abandoned due to unfavorable market conditions. This could occur again as most, if not all, the proposals to build platform fabrication facilities on the West Coast are currently being made based on speculation, without assurance of actual contracts being awarded.

References

1. "Transportation Noise and Noise from Equipment Powered by Internal Combustion Engines," Wyle Laboratories for the EPA, 1971, p. 63.

2. Onshore Facilities Related to Offshore Oil and Gas Development Fastbook, prepared by the New England River Basins Commission, November 1976, p. 8.21.

CHAPTER 6

SITE SPECIFIC EVALUATIONS

Introduction

This chapter provides a first order environmental assessment of potential offshore platform construction sites in Washington. A summary profile matching site characteristics with factors generally considered important in the platform fabrication yard siting process is also included. The site specific evaluations were made of those sites nominated by local planners and port districts based on composite site criteria provided to them by WDOE in the form of a questionnaire.

The siting criteria used in the evaluation were established based on a review of pertinent literature and discussions with individuals in the platform fabrication business. As indicated in the chapter dealing with typical fabrication/assembly yard site requirements, a variety of criteria are involved in the site evaluation process and the importance of a particular criterion could be expected to vary from site to site depending on a developer's needs.

Perhaps as important as specific siting criteria are factors pertaining to availability of the site and prospects for receiving permits to develop the site. It is concerning this latter point, especially, that this chapter would hope to provide some limited degree of predictability. Specifically, the information contained herein is intended to provide some insight concerning environmentally related issues which could interfere with an applicant receiving all of the necessary development permits for the sites listed. This should not, however, be interpreted to mean that this site evaluation can by itself be used to actually predict whether or not permits would be issued for a particular site. This is not possible because of the very preliminary nature of the site review and because a project and associated impacts can only be hypothesized until an actual project is proposed.

It is not the intention or purpose of this report to rank the sites listed below on the basis of suitability, though it is readily apparent that some sites are superior to others. Rather, it is intended that those sites be identified where platform construction could potentially occur and that potential environmental issues be recognized early in the project planning process. It is hoped that by identifying these potential environmental issues at an early date and subsequently investigating them in detail concerning their possible resolution, actual development could proceed at an appropriate location without undue delay.

As a means of facilitating the review process, the sites listed below have been divided into three categories as follows:

- Existing industrial facilities where platform construction could potentially be accommodated.

  Anacortes - Snelson-Anvil, Inc.
  Tacoma - Tacoma Boat Co.
  Tacoma - Concrete Technology
  Tacoma - J. A. Jones Const. Co.
  Seattle - General Const. Co.

- Those sites that could potentially be developed which have a substantial amount of infrastructure:

  Everett - Weyerhaeuser Mill A
  Everett - Norton Site
  Vancouver-Columbia Industrial Park
  Longview - International Paper

- Those sites that could potentially be developed, which have some infrastructure:

  Whatcom County - Cherry Point
  Tacoma - Commencement Bay
  Outer Hylebos
  Westport - Halfmoon Bay
  Westport - Marina
  Vancouver - Port terminal site
  Kalama - Industrial Park
  Kalama - Terminal site
  Longview - International Paper

Other sites were reviewed but determined not to be particularly well suited for OCS platform construction. They have not been evaluated in this study. These sites include the following:

- Clallam County - Sekiu site
- Port Gamble - Pope and Talbot site
- Neah Bay - Makah site
- Woodland - Port of Woodland site
- Ilwaco - Port of Ilwaco site
- Port Townsend - Glen Cove síte

Existing Industrial Facilities Where Platform Construction Could Potentially be Accommodated

Anacortes Snelson-Anvil Site

Location:	Anacortes, west side of Fidalgo Bay.
Ownership:	Snelson-Anvil, wholly owned subsidiary of Kiewit Industrial Corporation.
Acreage:	60 acres developed (additional acreage is available)
Water Frontage:	2,400 feet frontage.
Water Depth:	Varies from -5 MLLW to -25 MLLW in front of the site.
Channel Width:	-18 feet MLLW x 150 feet x 5180 feet dredged in 1976.
Deep Water Proximity:	Tow out draft of approximately 100 foot depth is available an estimated six miles from the site. Water depth from this point to the Pacific Ocean is in excess of 200 feet. Water depths in excess of 40 feet lie approximately 1 mile from the site.
Rail Transportation:	Burlington Northern (site currently has four rail spurs).
Highway Transportation:	Interstate 5 connected to site by State Highway 20, most of which is a divided four lane roadway (approximately 18 miles).
Deep Water Cargo Piers:	Port of Anacortes can berth a ship up to 700 feet long. The dock is approximately one mile from the site.

Anacortes Snelson-Anvil Site (cont'd)

Graving Dock Site:	Site is on consolidated glacial till. Very high load bearing is possible. Soils studies indicate favorable graving dock capabilities.
Overhead Obstructions:	None. There are no overhead or horizontal features which could restrict water access.
Water Availability:	City-supplied high pressure mains (6 inches+) serve the site.
Electricity Supply (2,000 KVA Min):	This much power is currently serving the site; more is available (Puget Sound Power and Light Co.).
Skilled Labor:	Site has drawn up to 1,500 craftsmen in the past. Area has drawn up to 6,000 for plant construction.
Shoreline Management Designation:	Urban environment.
Compatible With Local Zoning:	Heavy industrial.
On-Site Warehousing:	Approximately 50,000 square feet is located on-site excluding shop areas. Additional space is available within one mile.
Fire Protection:	Site served by fire mains plus full time municipal fire department.
Sewer Service:	Large capacity sewerage system serves the site.

100 Tons/Axle Wheel Loads: Have been handling loads this large for eight years with no difficulties.

Constraints:

- Additional dredging would be required to accommodate certain types of structures. Although dredging has been allowed as necessary to support facility operation at this site, extensive additional dredging could impact herring spawning and crab habitat.

- Additional land would likely be required to make this a viable site.

Opportunities:

- Snelson-Anvil has successfully operated its industrial modularization business at this site for eight years. Offshore structures require similar shoreline and upland site characteristics and, therefore, could likely be accommodated with some site alteration.

- Close proximity to the Strait of Juan de Fuca and the open ocean as well as the inland passage to Alaska.

- Highly skilled and available labor pool.

- Of approximately 70 additional acres that may be available, 15 acres owned by the city of Anacortes is definitely available (urban renewal site adjacent to Snelson Anvil).

- Urban shoreline designation and Industrial zoning classification are favorable for site development.

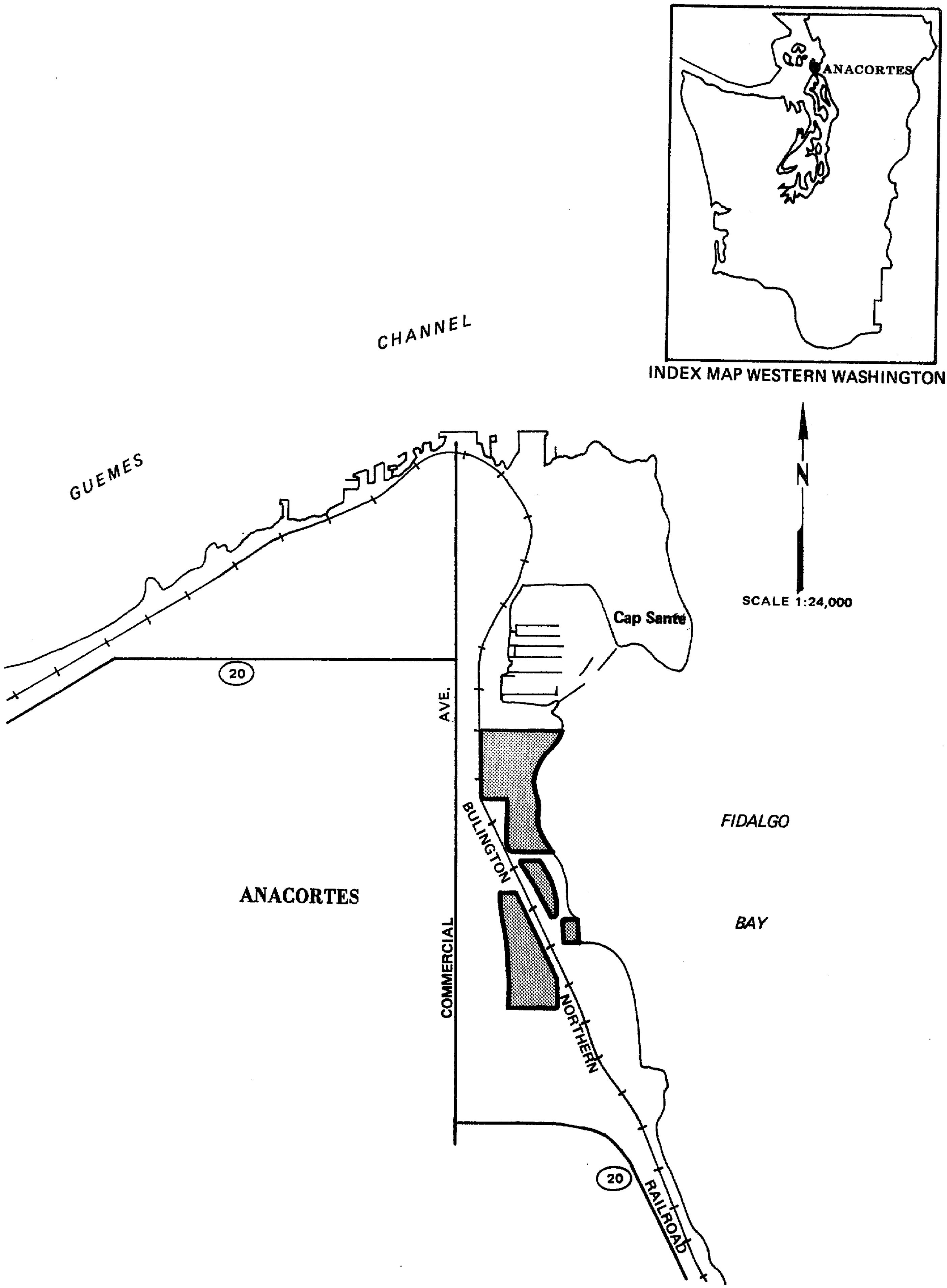


Figure 6.10

ANACORTES SNELSON–ANVIL SITE.

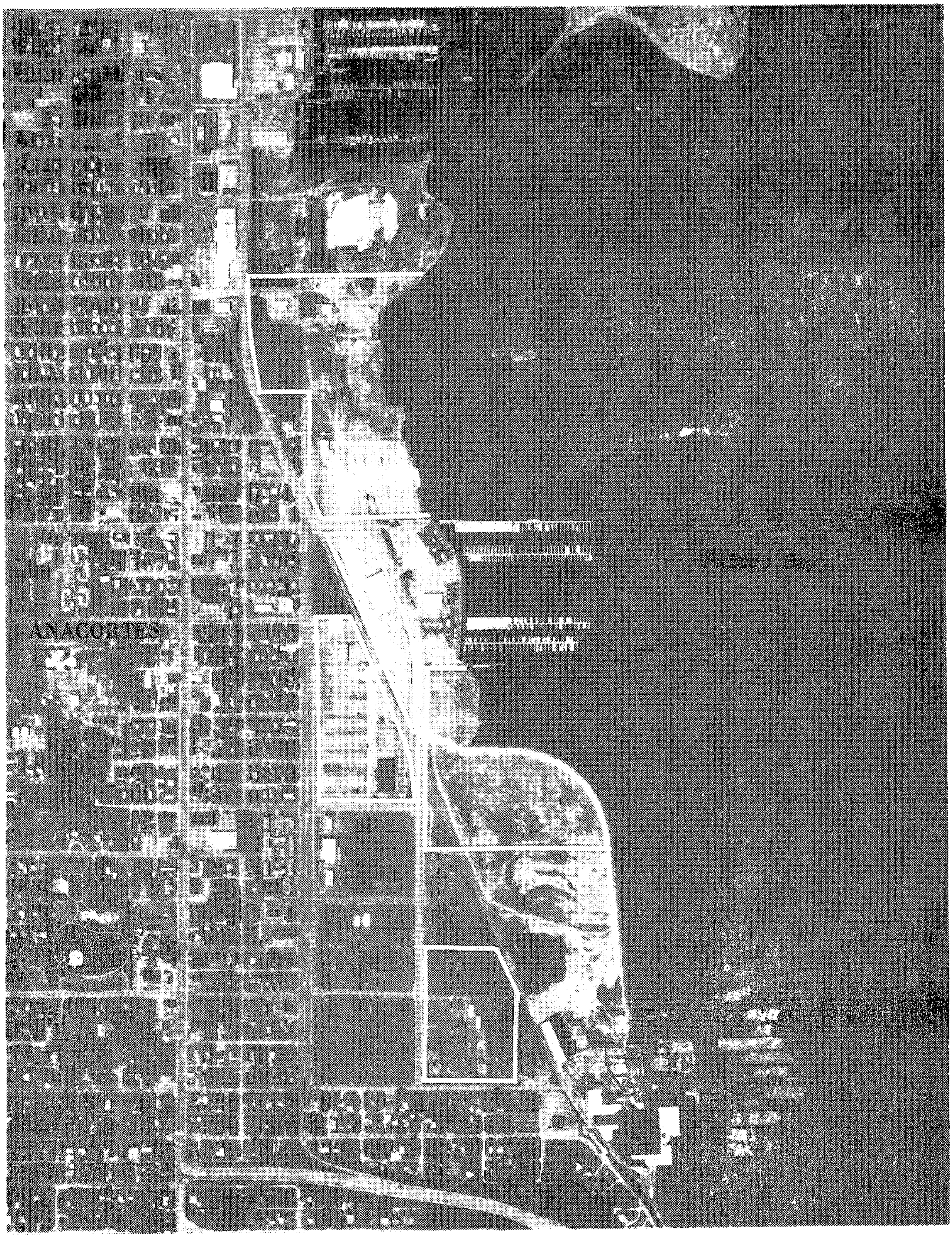


Figure 6.11

ANACORTES SNELSON—ANVIL

SNELSON-ANVIL - ANACORTES
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes		X
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal		X
Flora and Fauna		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
Other		
Noise pollution		X
Light and glare generation		X

SNELSON-ANVIL - ANACORTES (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings		X
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact		X
Disruption of recreational/commercial fishing		X
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

Tacoma Boat Plant #3 Site

Location:	Outer Hylebos and Blair waterways, Alexander Ave., Tacoma.
Ownership:	Tacoma Boatbuilding Company.
Acreage:	50 acres (platform for construction); Plant #1 site consists of 20 acres which could be utilized for module and support ship construction.
Water Frontage:	600 ft. side-launch extends to depths of -35 ft. MLLW. Side-launch expandable to 1,000 ft.
Water Depth:	Natural deep harbor - average depth 180 ft.
Channel Width:	Passage to open ocean unrestricted with depths well in excess of 100 ft.
Deep Water Proximity:	Anchorage within bay with depths to 400 ft.
Rail Transportation:	Rail service connection to all lines serving the Pacific Northwest.
Highway Transportation:	Three miles from Interstate 5.
Deep Water Cargo Piers:	2,000 ft. of pier frontage (avg. depth 35 ft.). Also adjacent to Port of Tacoma terminal piers with depths in excess of 40 ft.
Graving Dock Site:	Side-launch area could be dredged to construct a graving dock if necessary. Present side-launch installation will support 10,000 lbs/ft^2.
Overhead Obstructions:	No overhead restrictions from construction area to launch area and beyond.

Tacoma Boat Plant #3 Site (cont'd)

Water Availability: Site served with an 8-inch water main.

Electricity Supply (2,000 KVA Min.): Site presently served by 2-4,000 KVA service centers and 1-1,000 KVA center. Additional power is available.

Skilled Labor: Present labor force at 2,240 production personnel. Additional labor available in immediate area.

Shoreline Management Designation: Urban environment

Local Zoning: Heavy industry

On-Site Warehousing: Presently operating five major warehouses with 300,000 $ft.^2$ capacity (floor loading to 4,000 $lbs/ft.^2$ acceptable).

Fire Protection: City fire department and fire boats; fire main to site with service valves located throughout the site.

Sewer Service: City sewage services the site.

100 Tons/Axle Wheel Loads: Ship modules up to 500 tons have been wheeled to and from the construction site.

Constraints:

- None apparent

Opportunities:

- Immediate proximity to deep water.

- Substantial in-place infrastructure.

- Shoreline permits have previously been issued without delay at this site for construction of the shipyard and side-launch.

- Site is located in port area designated for heavy industry, shipbuilding, and terminal use.

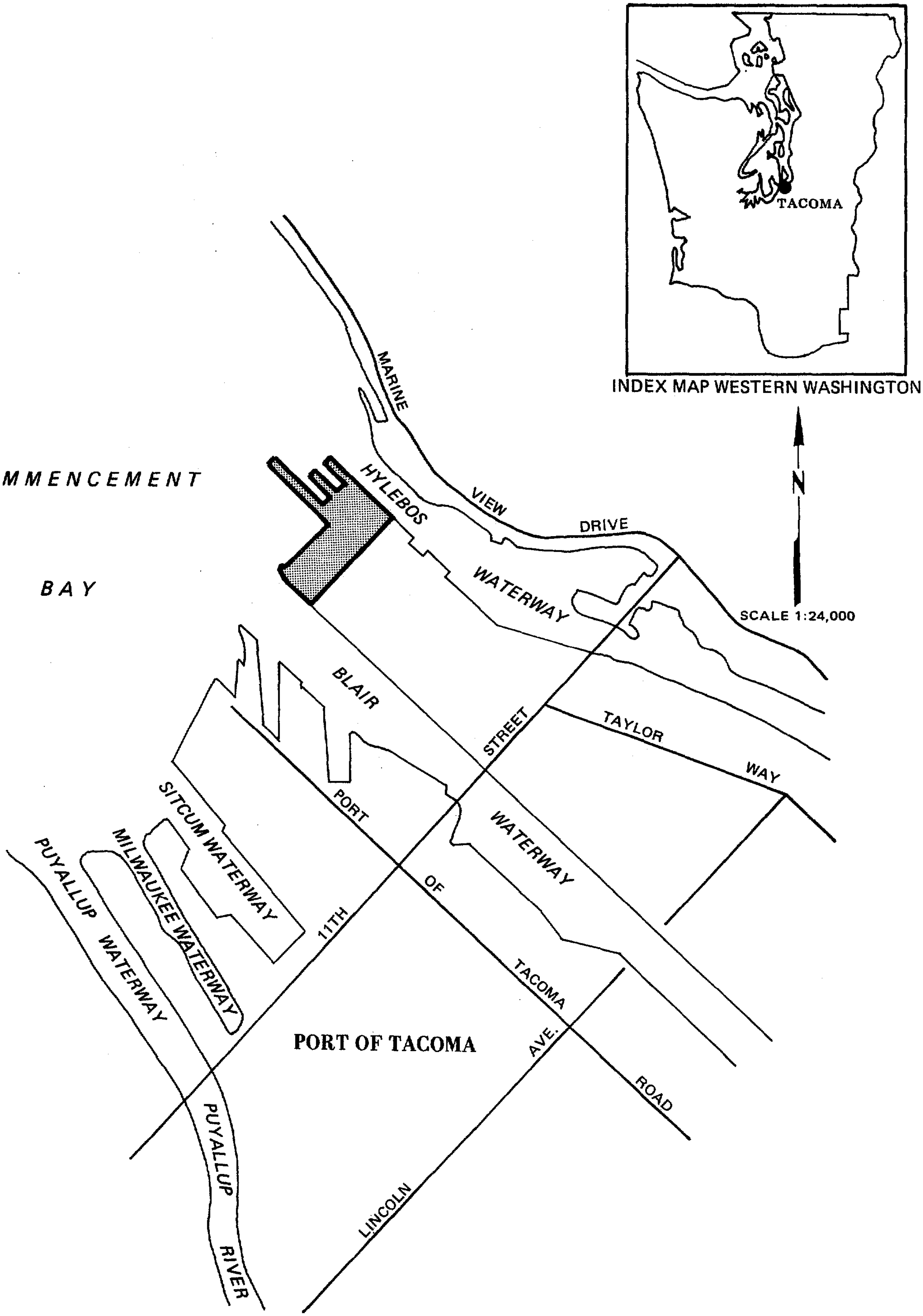


Figure 6.12

TACOMA BOAT PLANT NO. 3 SITE.

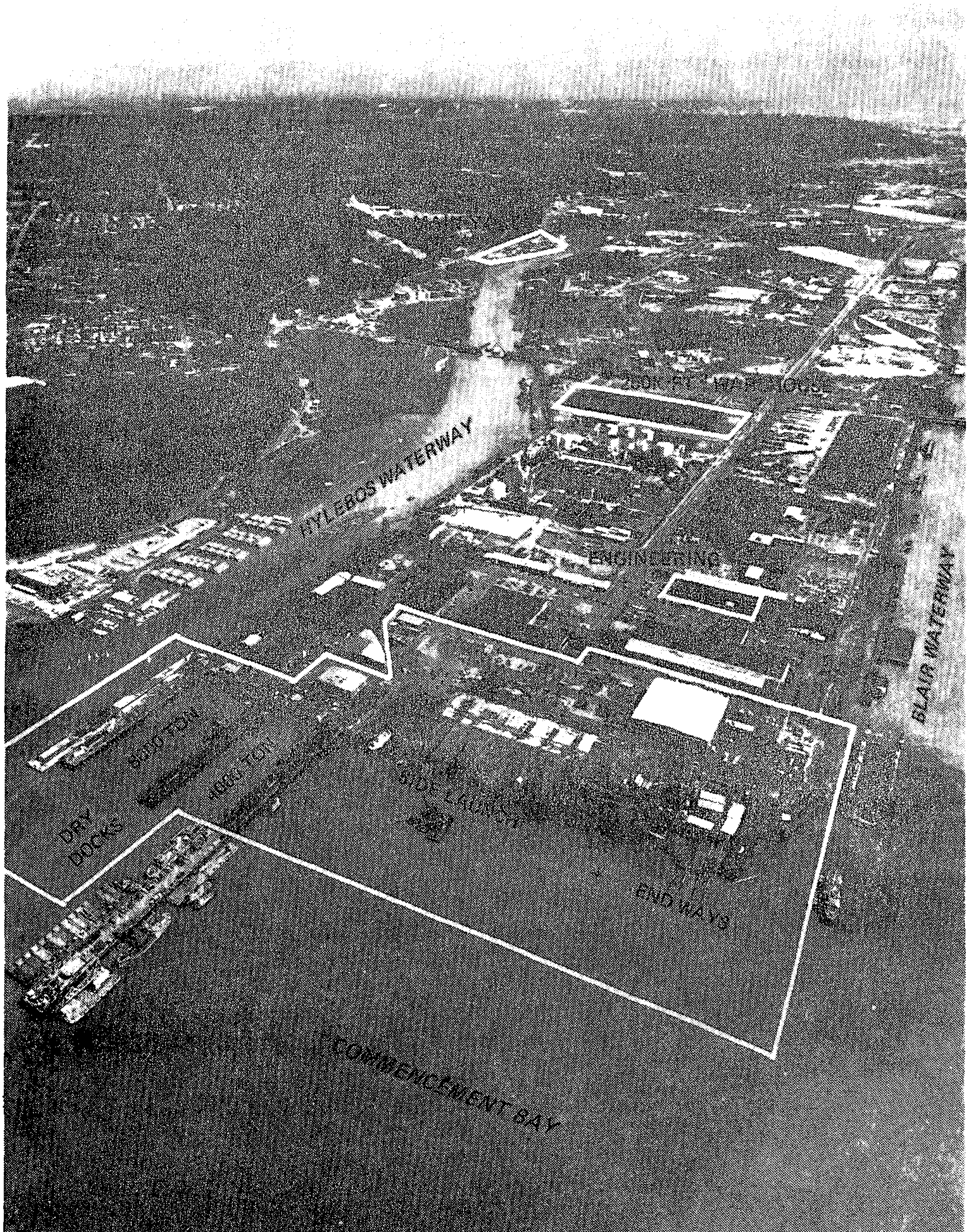


Figure 6.13

TACOMA BOAT

PLANT #3 TACOMA BOAT SITE
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions	X	
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes		X
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal		X
Flora and Fauna		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
Other		
Noise pollution		X
Light and glare generation		X

PLANT #3 TACOMA BOAT SITE (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings		X
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact	X	
Disruption of recreational/commercial fishing		X
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

Concrete Technology Corporation

Location:	Blair Waterway, Tacoma
Ownership:	Concrete Technology
Acreage:	36 level well drained acres, including 100,000 square feet of precast concrete production buildings.
Water Frontage:	750 feet of water frontage.
Water Depth:	40 ft. deep channel to Commencement Bay.
Channel Width:	Limited to the 150 ft. Blair Bridge width.
Deep Water Proximity:	Water depths of 300-500 ft. in adjacent Commencement Bay. Minimum depth to the Pacific Ocean is 220 feet.
Rail Transportation:	Burlington Northern and Union Pacific connect from the plant site via the City of Tacoma belt line.
Highway Transportation:	Interstate-5 is two miles away via a five-lane (including a center turn lane) arterial.
Deep Water Cargo Pier:	Port of Tacoma major cargo terminals within ½ mile of site. An unloading pier available at CTC plant for 400 foot ocean-going barges.
Graving Dock Site:	Existing 150' x 500' x -1' (MLLW) graving dock with adequate load capacity.
Overhead Structures:	Transmission power lines cross Blair Waterway with 173 feet of vertical clearance.

Water Availability:	Adequate city water to the site.
Electricity Supply (2,000 KVA Min.):	Main power line (Tacoma City Light) extends to the site. Adequate supply available.
Skilled Labor Availability:	Excellent pool of skilled construction labor available.
Shoreline Management Designation:	Urban environment
Local Zoning:	Heavy industry
On-Site Warehousing:	10,000 square feet of warehousing . . . open storage areas available.
Fire Protection:	Two fire stations are within ½ mile of facility. City fire boat can provide a 5-minute response.
Sewer Service:	Currently adequate - the main sewer line lies adjacent to the facility if additional capacity is required.
100 Tons/Axle Wheel Loads:	No problem according to Concrete Technology officials.

Site Constraints:

- Currently horizontal clearance at the Blair Bridge is limited to 150 feet. Structures wider than this require segmented construction. Concrete Tech notes that they have considerable experience with joining procedures that have proven to be satisfactory for structures built there in the past.

Site Opportunities:

- Existing facility is well developed and operational for constructing floating concrete structures.
- Graving dock available (150 ft. x 500 ft. x -1 ft. (MLLW)).
- Plans are underway by the U.S. Corps of Engineers to widen and deepen Blair Waterway to 42 feet deep with a 300 foot bridge opening. This could be completed within three years.
- Urban shoreline designation and industrial zoning classification are favorable for site development.

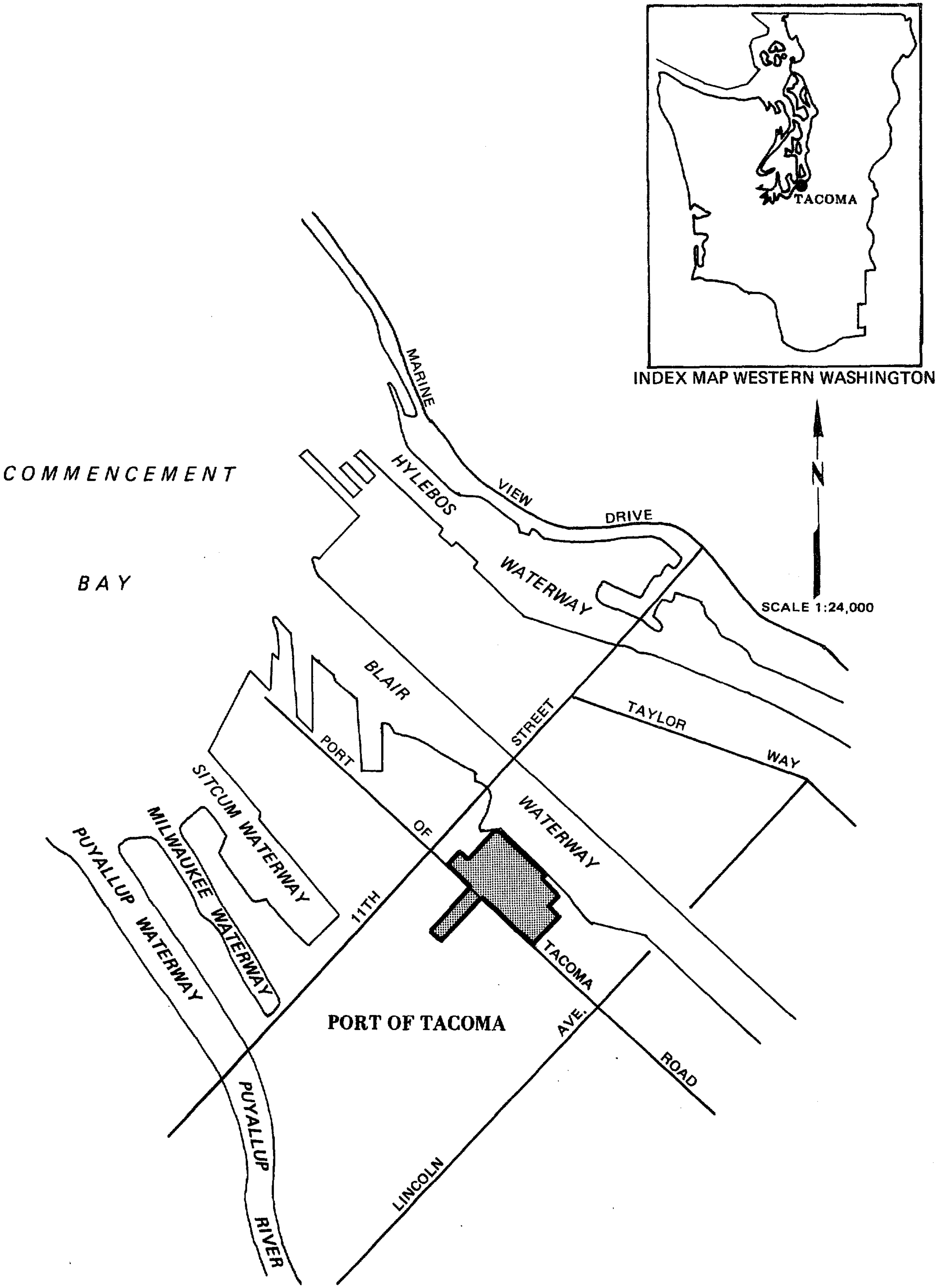


Figure 6.14

TACOMA CONCRETE TECHNOLOGY CORPORATION SITE.

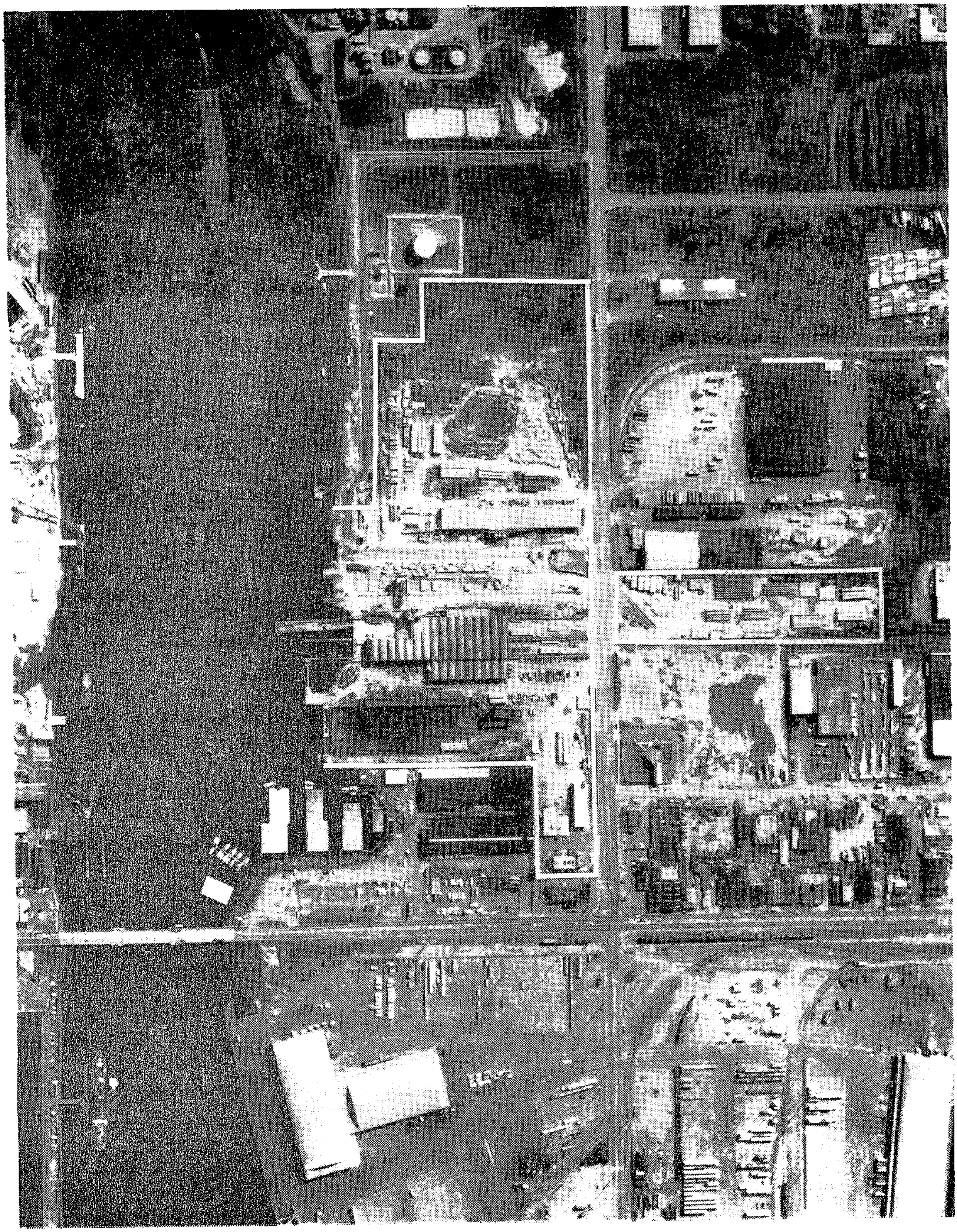


Figure 6.15

CONCRETE TECHNOLOGY

CONCRETE TECH SITE
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions	X	
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes		X
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal		X
Flora and Fauna		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat		X
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways		X
Rare or endangered species impacts		X
Other		
Noise pollution		X
Light and glare generation		X

CONCRETE TECH SITE (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings	X	
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact	X	
Disruption of recreational/commercial fishing		X
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

J. A. Jones Tacoma Site

Location: Blair Waterway, Port of Tacoma.

Ownership: Port of Tacoma; leased by J. A. Jones through 1986.

Acreage: 27 acres with additional acreage available across the street (about 30 acres level and cleared).

Water Frontage: 2,400 ft. frontage.

Water Depth: 40 ft. deep channel to Commencement Bay.

Channel Width: Limited to the 150 ft. Blair Bridge width.

Deep Water Proximity: Water depths of 300-500 ft. in adjacent (1 mile) Commencement Bay. Minimum depth to the Pacific Ocean is 220 ft.

Rail Transportation: Burlington Northern to the site.

Highway Transportation: Approximately one mile from Interstate 5 via county/city streets.

Deep Water Cargo Piers: Pierce County terminal owned by the Port of Tacoma (water depth -40 feet MLLW).

Graving Dock Site: A graving dock 575 ft. x 575 ft. x -4 MLLW is available on-site. The existing sheet pile opening to the dock is approximately 40 ft. wide. Permits have been received to deepen the graving dock (-12 ft. MLLW) and to widen the gate (70 ft. wide).

J. A. Jones Tacoma Site (cont'd)

Overhead Obstructions: Two overhead power lines cross the Blair Waterway between the site and Commencement Bay (173 ft. and 170 ft. of vertical clearance).

Water Availability: Site served with six-inch plus water line.

Electricity Supply (2,000 KVA Min.): Tacoma City Light (adequate supply to the site).

Skilled Labor: Excellent pool of skilled construction labor available.

Shoreline Management Designation: Urban environment

Local Zoning: Heavy industry

On-Site Warehousing: None on-site - Port of Tacoma warehousing available within 1½ miles (25,000 $ft.^2$). Private warehousing available across the street.

Fire Protection: ¼ mile from port fire department.

Sewer Service: Sewer line extends along site boundary.

100 Tons/Axle Wheel Loads: Should be adequate.

Site Constraints:

- This site would likely not be large enough for large platform structures without access to additional land.

J. A. Jones Tacoma Site (cont'd)

- Currently horizontal clearance at the Blair Bridge is limited to 150 ft. Structures wider than this require segmented construction. J. A. Jones notes that they have experience with joining procedures (note: Hood Canal Floating Bridge) that proved satisfactory for structures built there in the past.

Site Opportunities:

- Existing facility was developed for construction of floating concrete structures.

- Graving dock available (575 ft. x 575 ft.).

- Plans are underway by the U.S. Corps of Engineers to widen and deepen Blair Waterway to 42 ft. deep with a 300 ft. bridge opening. This could be completed within three years.

- Urban shoreline designation and industrial zoning classification are favorable for site development.

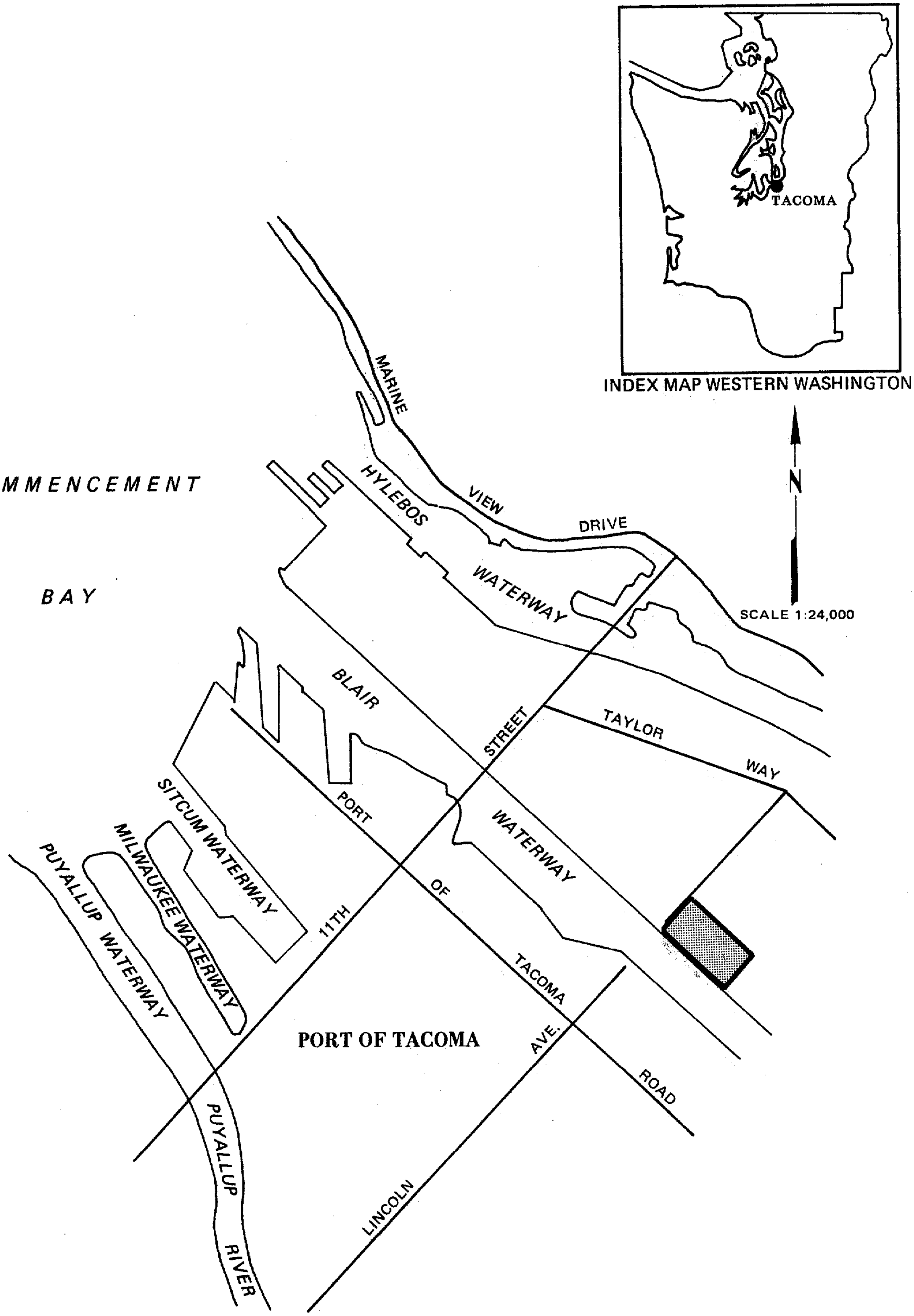


Figure 6.16

TACOMA J.A. JONES SITE.

Figure 6.17

J.A. JONES

J. A. JONES SITE
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions	X	
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes		X
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal		X
Flora and Fauna		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat		X
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways		X
Rare or endangered species impacts		X
Other		
Noise pollution		X
Light and glare generation		X

J. A. JONES SITE (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings	X	
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact	X	
Disruption of recreational/commercial fishing		X
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

General Construction Co. Yards 1 & 2

Location:	Duwamish Waterway, City of Seattle
Ownership:	Wright Schuchart, Inc. (parent corporation)
Acreage:	15 acres with additional adjacent acreage available (about 25 acres have been utilized for previous module fabrication projects).
Water Frontage:	825 ft. frontage.
Water Depth:	30 ft. deep channel to Elliott Bay maintained by Corps of Engineers.
Channel Width:	Limited to 150 ft. Spokane Street and railroad bridge widths.
Deep Water Proximity:	Water depths of 250-400 ft. in adjacent (1 mile) Elliott Bay.
Rail Transportation:	Burlington Northern to the site.
Highway Transportation:	Approximately two miles from Interstate 5, via four-lane city streets.
Deep Water Cargo Piers:	Port of Seattle (water depth -40 feet MLLW).
Graving Dock:	A graving dock 414 ft. x. 140 ft. and 14 ft. maximum draft x -4 MLLW is available on-site. The opening to the waterway is 103 ft. wide.
Overhead Obstructions:	New West Seattle bridge 140'.
Water Availability:	Site served with six-inch plus water line.

General Construction Co. (cont'd)

Electricity Supply (2,000 KVA Min.):	Seattle City Light (adequate supply to the site).
Skilled Labor:	Excellent pool of skilled construction labor available.
Shoreline Management Designation:	Urban development.
Local Zoning:	Heavy industry.
On-Site Warehousing:	10,000 S.F. on-site - ample nearby.
Fire Protection:	Hydrants on-site and Seattle Fire Department, both shore and water.
Sewer Service:	Sewer line extends along site boundary.
100 Tons/Axle Wheel Loads:	Proven on module project loadouts.

Site Constraints:

- This site would likely not be large enough for large platform structures without access to additional land.
- Currently, horizontal clearance at the Spokane Street Bridge is limited to 150 ft. Structures wider than this require segmented construction. General Construction Co. notes that they have experience with joining procedures in the past and most recently, the 900 ft. long Hood Canal Floating Bridge drawspan section. Segments were cast in the graving dock and assembled in Elliott Bay.

- The Duwamish River has a serious sediment contamination problem which could preclude dredging.

- Degradation of adjacent aquatic habitat (Duwamish River) by source contaminants associated with operation of a rig yard at this site could aggravate an existing sediment contamination problem.

Site Opportunities:

- Existing facility was developed for construction of floating concrete structures. More than half the state's floating bridge pontoons were built in this facility. Additional work of this type is expected in the future.

- Plans are underway by the U.S. Corps of Engineers to widen and deepen the Duwamish Waterway to 39 ft. deep with a 250 ft. channel width.

- Plans are underway to widen the opening of the graving dock from 103 ft. to 140 ft.

- Two gantry cranes service the site and graving dock, one at 50 T. and one at 20 T.

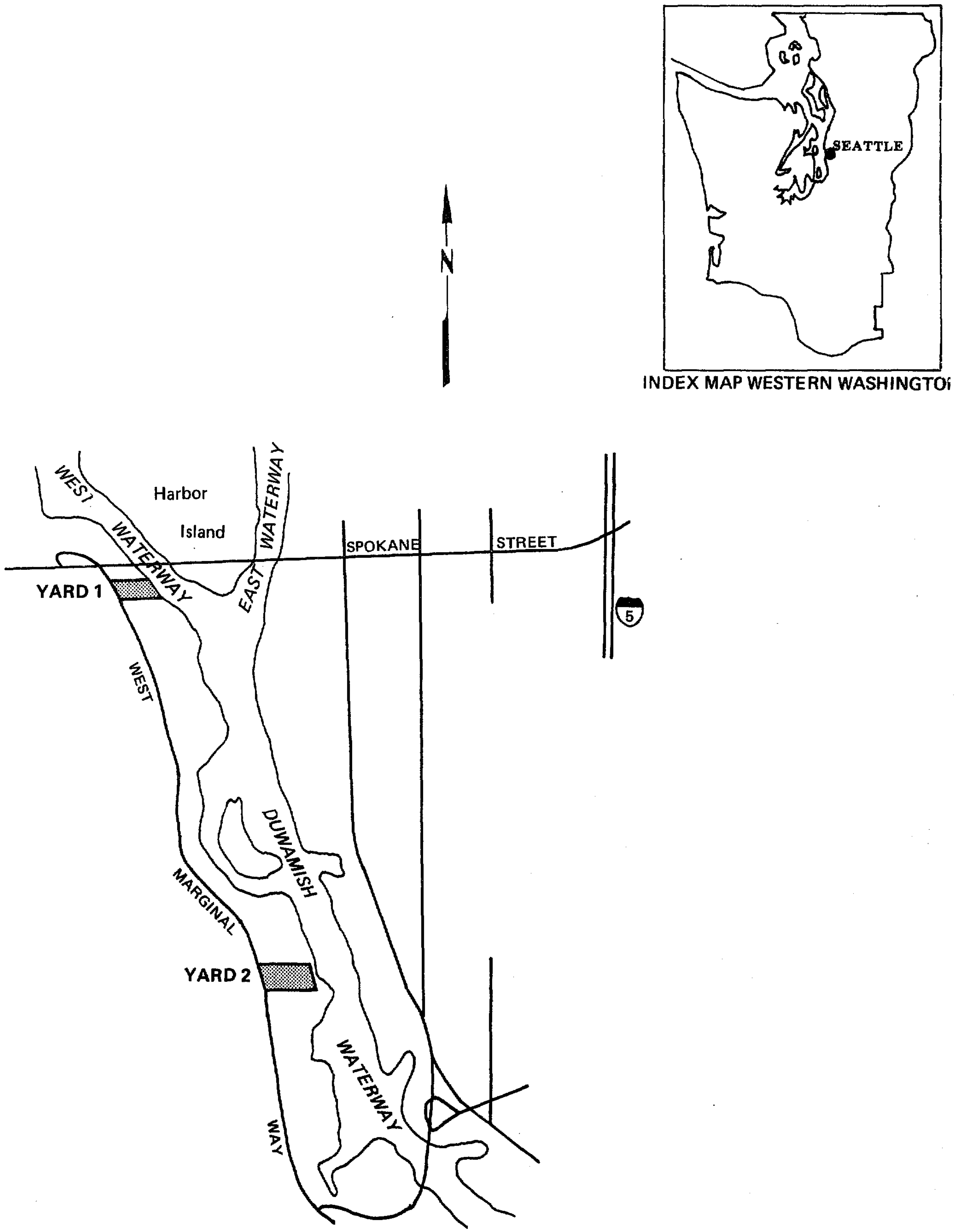
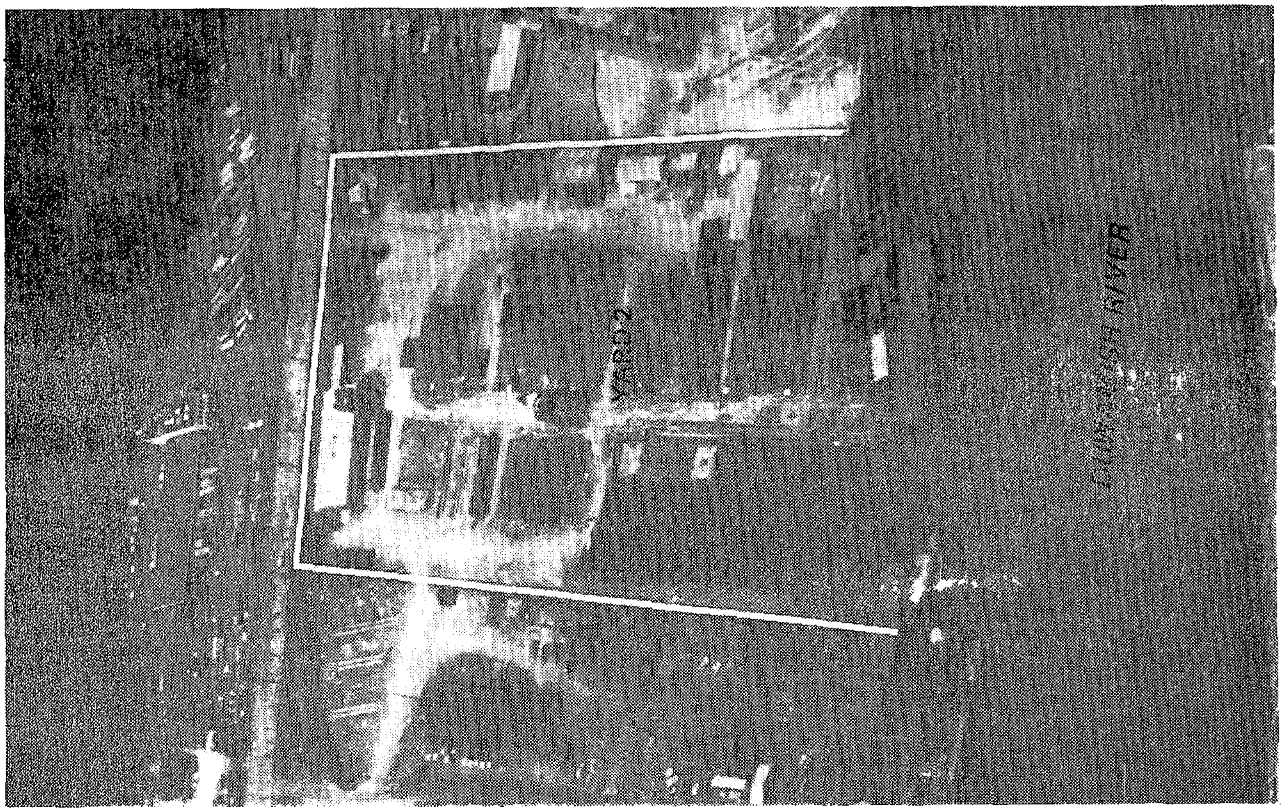


Figure 6.18

GENERAL CONSTRUCTION CO. YARDS 1 & 2.



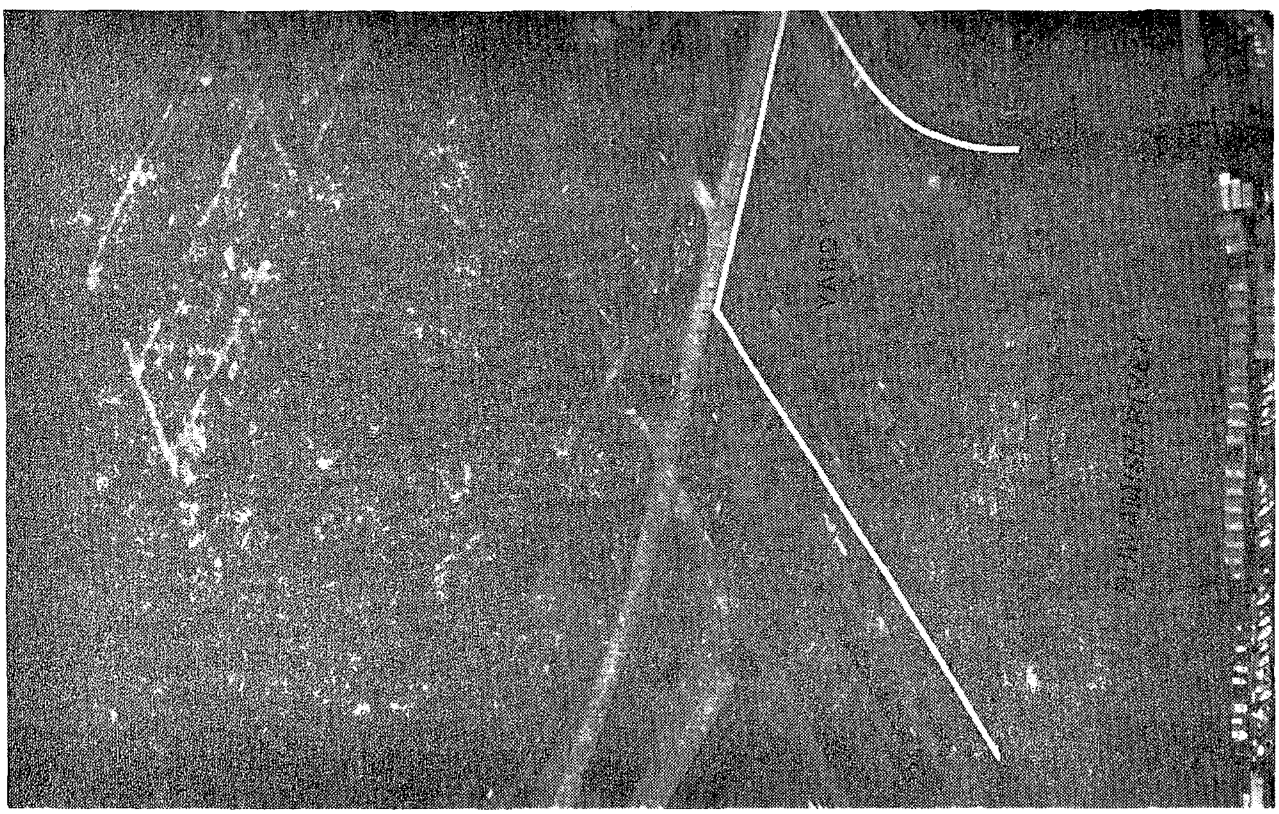


Figure 6.19

GENERAL CONSTRUCTION

GENERAL CONSTRUCTION CO. YARDS 1 & 2
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions	X	
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes		X
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal		X
Flora and Fauna		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
Other		
Noise pollution	X	
Light and glare generation		X

GENERAL CONSTRUCTION CO. (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings		X
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact		X
Disruption of recreational/commercial fishing		X
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

Sites That Could Potentially Be Developed Which Have a Substantial Amount of Infrastructure

Everett Weyerhaeuser Mill A Site

Location:	Everett waterfront
Ownership:	Port of Everett
Acreage:	54 acres - site of a Weyerhaeuser pulp mill now in the latter stages of demolition.
Water Frontage:	Approximately 4,000 ft.
Water Depth:	Immediately adjacent to water 40 feet deep that becomes progressively deeper.
Deep Water Proximity:	Water depths of approximately 300 feet less than 1 mile distance from the site.
Rail Transportation:	Burlington Northern rail extends to the site.
Highway Transportation:	Truck route to Interstate 5 (approximately 5 min.).
Deep Water Cargo Piers:	1,600 foot cargo pier available on-site.
Graving Dock Site:	Potential graving dock site at north end of property. Soils and other siting characteristics are unknown.
Overhead Obstructions:	High voltage power lines enter site from the north end and parallel the access road to the halfway point of the site. Could be moved if a problem.
Water Availability:	Six-inch water line to the site.

Electricity Supply (2,000 KVA Min.):	Adequate supply available (Snohomish PUD).
Skilled Labor Availability:	Excellent. Snohomish County had a 1982 estimated population of 365,400. The population of Everett was estimated to be 56,700.
Shoreline Management Designation:	Urban environment
Local Zoning:	Heavy industry
On-Site Warehousing:	70,000 ft^2 on-site.
Availability of Local Fire Protection:	City fire department with on-site hydrants.
Availability of Sewer Service:	City sewer system
100 Tons/Axle Wheel Loads:	Because this is the former site of a pulp mill it is assumed that certain areas would likely bear heavy loads. The capability of other areas at the site to bear heavy loads is unknown.

Site Constraints:

- Demolition of the pulp mill is not expected to be complete until December, 1983.
- Site preparation would be required after demolition including some filling.

Site Opportunities:

- Deep water access, an existing cargo pier, large labor pool, potential graving dock site and transportation access make this an attractive site.

- Urban shoreline designation and industrial zoning classifications are favorable for site development.

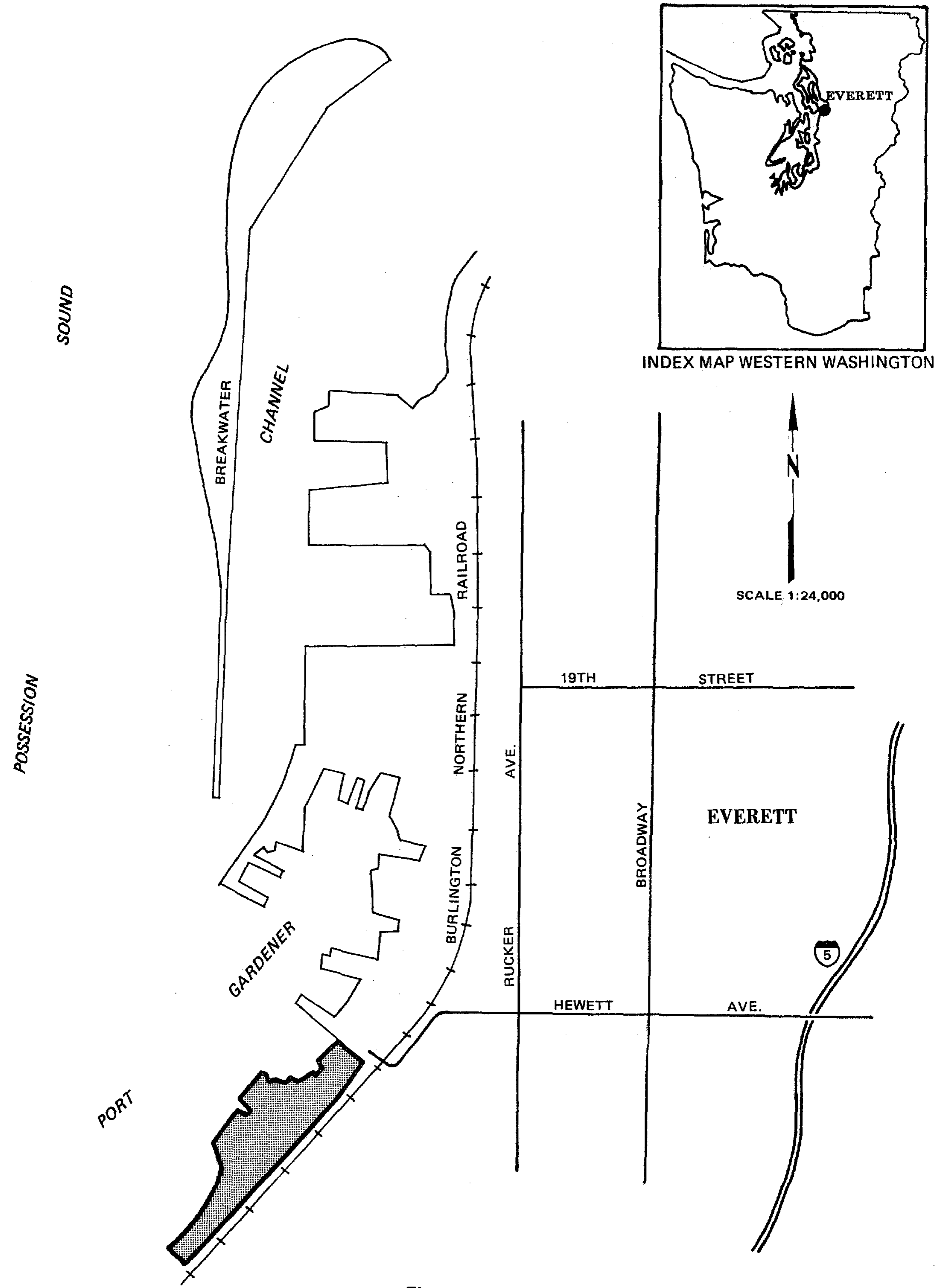


Figure 6.20

EVERETT WEYERHAEUSER MILL A SITE.

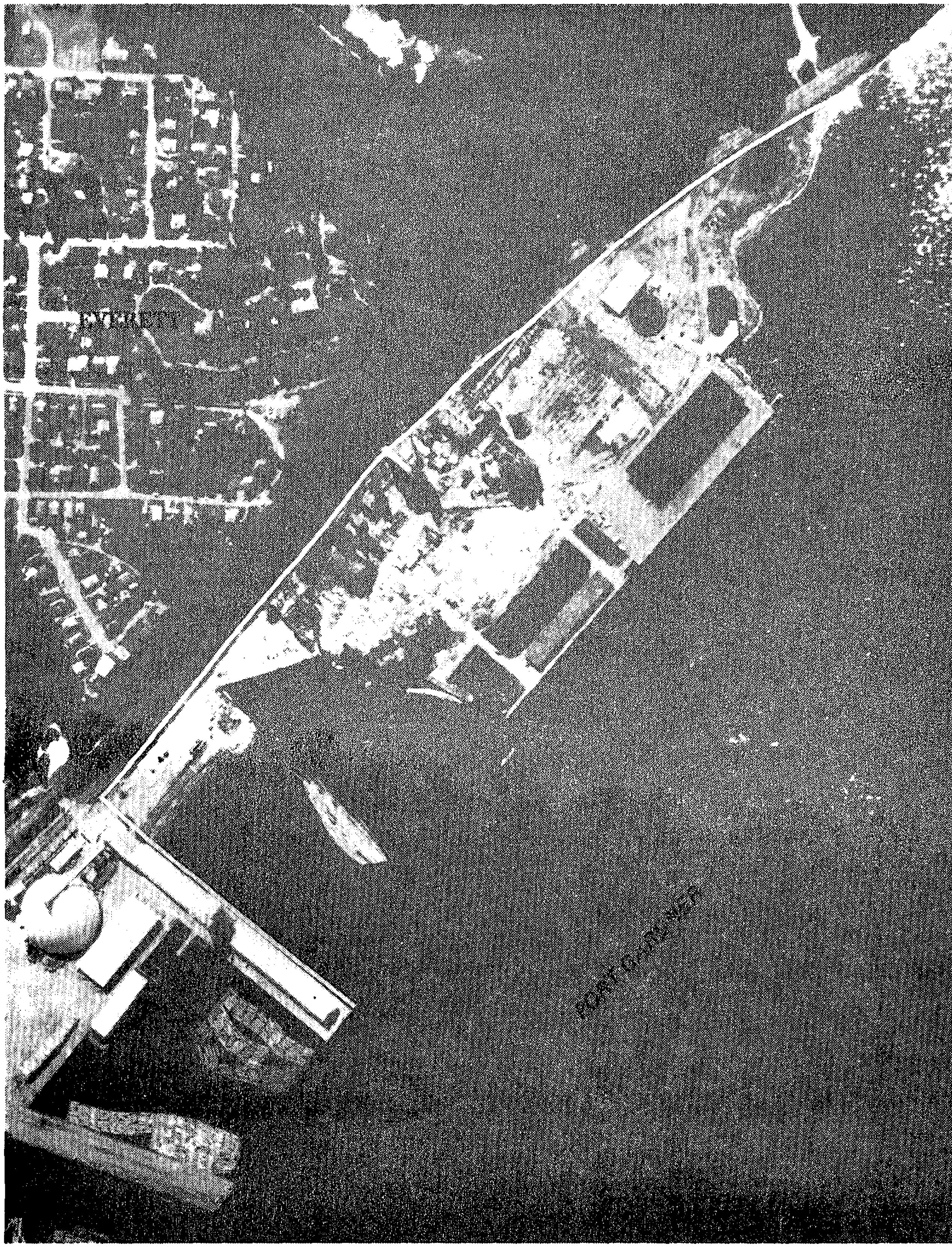


Figure 6.21

WEYERHAEUSER MILL A

EVERETT WEYERHAEUSER MILL A SITE
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes		X
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal		X
Flora and Fauna		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways		X
Rare or endangered species impacts		X
Other		
Noise pollution	X	
Light and glare generation	X	

EVERETT WEYERHAEUSER MILL A SITE (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings	X	
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact	X	
Disruption of recreational/commercial fishing		X
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

Everett Norton Site

Location:	Port of Everett Norton Site
Ownership:	Port of Everett
Acreage:	70+ acres
Water Frontage:	1,100 ft. frontage
Water Depth:	-35 ft. (MLLW)
Channel Width:	250 ft. wide for a distance of ½ mile to open water (500 ft. maneuvering basin in front of site).
Deep Water Proximity:	100 ft.+ depth from channel mouth outbound.
Rail Transportation:	Burlington Northern (sidings on-site).
Highway Transportation:	Truck route direct to Interstate 5 (approximately 5-minute travel time).
Deep Water Cargo Piers:	Norton site has a 700 ft. wharf with a 400 ft. extension under construction.
Graving Dock Site:	2 (110' x 393') graving docks on-site - currently under 30-month lease to 6/85 (area not included in acreage total). An additional large graving dock could be built at the site.
Overhead Obstruction:	None
Water Availability:	12-inch water line serves the area.

Electricity Supply (2,000 KVA Min.):	Adequate supply available (Snohomish PUD).
Skilled Labor:	Availability proven through 18 months of module construction (1/82-6/83).
Shoreline Management Designation:	Urban environment
Local Zoning:	Heavy industry
On-Site Warehousing:	36,000 square ft. on-site - another 100,000+ within five-mile radius of the site.
Fire Protection:	City fire department serves the site.
Sewer Service:	City sewer to the site.
100 Tons/Axle Wheel Loads:	Not certain, but should be able to withstand these loads based on past usage.

Site Constraints:

- Channel width at the site is 600' but channel exit width is 250' which could be a limiting factor in building large platform structures.

Opportunities:

- An existing industrial site.
- Substantial infrastructure currently in place.

Everett Norton Site (cont'd)

- Water depths of approximately 300 feet less than 1 mile distance from the site.
- Large labor pool available.
- Urban shoreline designation and industrial zoning classification are favorable for site development.

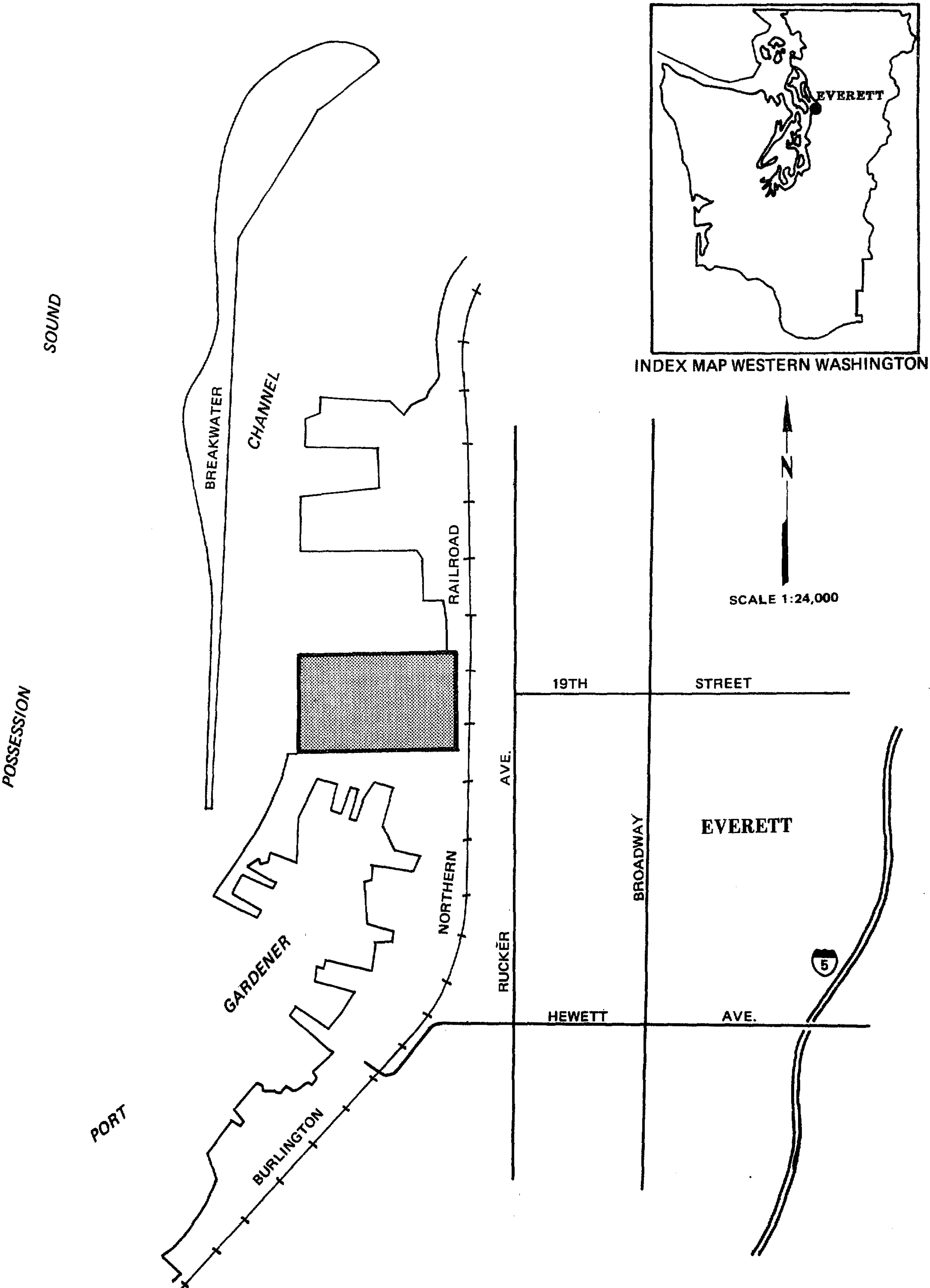


Figure 6.22

EVERETT NORTON SITE.

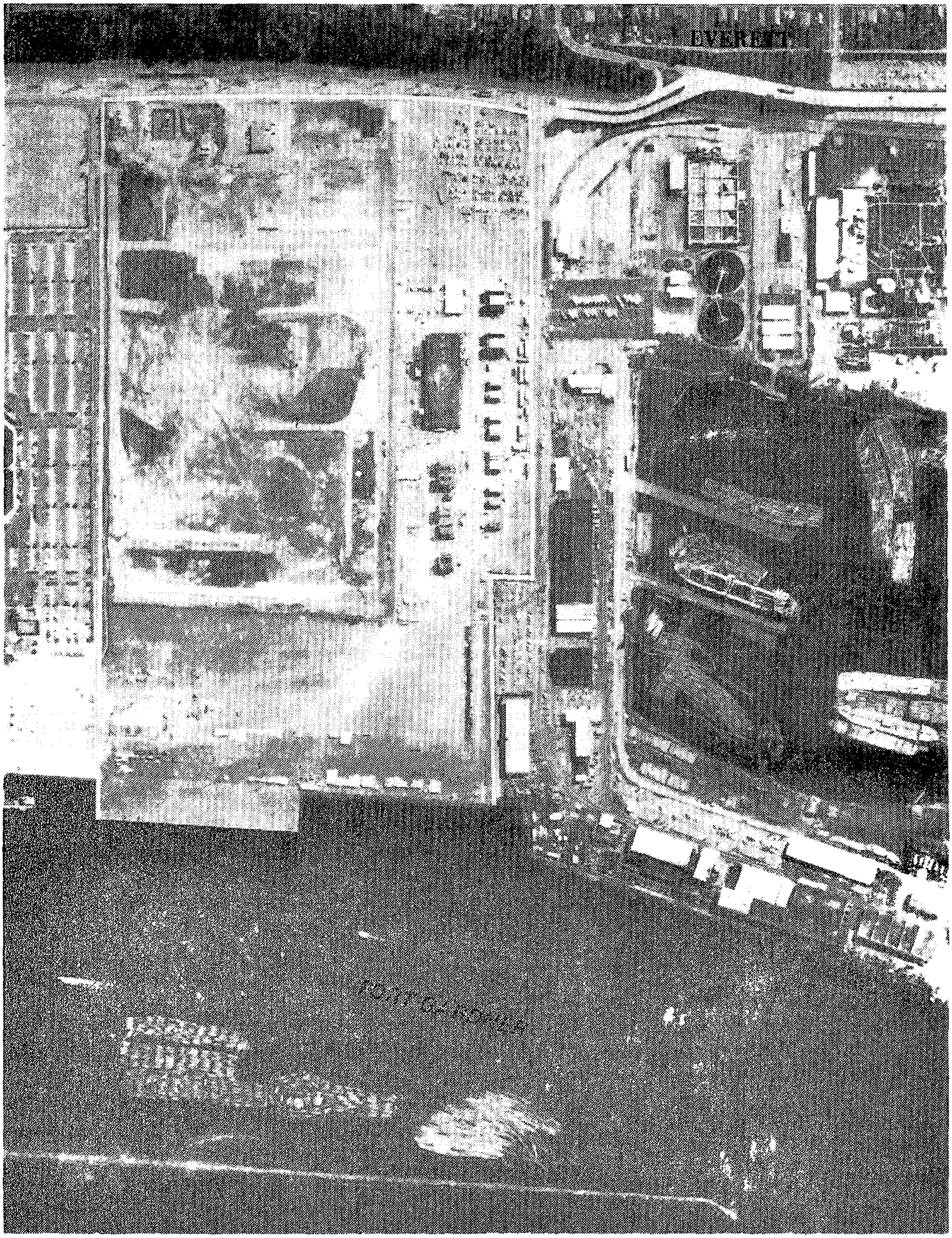


Figure 6.23

NORTON SITE

EVERETT NORTON SITE
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes		X
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal		X
Flora and Fauna		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat		X
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways		X
Rare or endangered species impacts		X
Other		
Noise pollution		X
Light and glare generation	X	

EVERETT NORTON SITE (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings		X
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact	X	
Disruption of recreational/commercial fishing		X
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

Columbia Industrial Park

Location:	Vancouver - approximately 1 mile above the Oregon/Washington Interstate Bridge.
Ownership:	Privately owned by Hayden Corporation - Portland, Oregon.
Acreage:	Site consists of 248 total acres; approximately 100 acres are available.
Water Frontage:	3/4 mile frontage on the Columbia River.
Water Depth:	Immediately offshore the water depth is approximately 30 ft. The main navigation channel lies approximately 1 mile west of site (down river) and is maintained at a 40 foot depth.
Channel Width:	The main navigation channel is a minimum of 600 ft wide.
Deep Water Proximity:	The Pacific Ocean is approximately 108 river miles downstream.
Rail Transportation:	Burlington Northern access to all areas of the industrial park.
Highway Transportation:	Highway 14 passes in front of the park. Interstate 5 is 1 mile away and Interstate 205 is 5 miles away.
Deep Water Cargo Piers:	Port of Vancouver - 1½ miles down river.
Graving Dock Site:	Undeveloped site capable of 2,000 pounds per square foot. Could be upgraded. Depending on the type of structure built, dredging may be required.

Overhead Obstructions:	None at the site. Four bridges downstream: 1) Vancouver Interstate Bridge (River Mile 106.5) vertical lift bridge with a 263 ft. horizontal clearance and between a 159 ft. and 175 ft. vertical clearance depending on water height; 2) Vancouver Burlington Northern Bridge (River Mile 105.6) swing bridge with a horizontal clearance of 200 ft. and vertical unlimited; 3) Lewis and Clark Bridge at Longview (River Mile 66) horizontal clearance 1,085 ft., vertical center (440 ft.) clearance ranges between 185 ft. and 196 ft. depending on water height; 4) Columbia River Bridge at Astoria (River Mile 13.5) horizontal clearance 1,070 ft. with vertical clearance ranging between 186 ft. and 193 ft. depending on water height. Power line river crossings maintain a minimum 210 ft. vertical clearance above the river.
Water Availability:	A new water system recently installed with 6-inch, 8-inch, and 10-inch mains.
Electricity Supply (2,000 KVA Min.):	Available on-site . . . adequate supply available (Clark County PUD).
Skilled Labor:	Vancouver/Portland area provide a large skilled labor pool.
Shoreline Management Designation:	Urban environment
Local Zoning:	Heavy industry

On-Site Warehousing: 1,350,000 $ft.^2$ of leasable building area in the park. Currently have over 150,000 $ft.^2$ of warehouse space that could be made available.

Fire Protection: City of Vancouver Fire Department

Sewer Service: City sewer to the park.

100 Tons/Axle Wheel Loads: Roadways on-site would need to be upgraded to handle these loads.

Constraints:

- o Bridges would preclude transport of large steel jackets and other platform structures exceeding a total height of approximately 175 ft. The horizontal clearance limit is 200 ft.

- o Navigation channel width of 600 ft. could limit construction of very large structures.

- o Some river dredging may be required depending on type of structure built.

- o Completed platform structures would have to be transported across the Columbia River bar, approximately 108 miles from the site.

Opportunities:

- o An existing waterfront industrial site (existing infrastructure).

- o Large skilled labor pool.

- Six offshore platform structures were built at this site between 1966 and 1968 by Brown and Root.
- World War II shipways are in place and could be used for jacket loading.
- Urban shoreline designation and industrial zoning classification are favorable for site development.

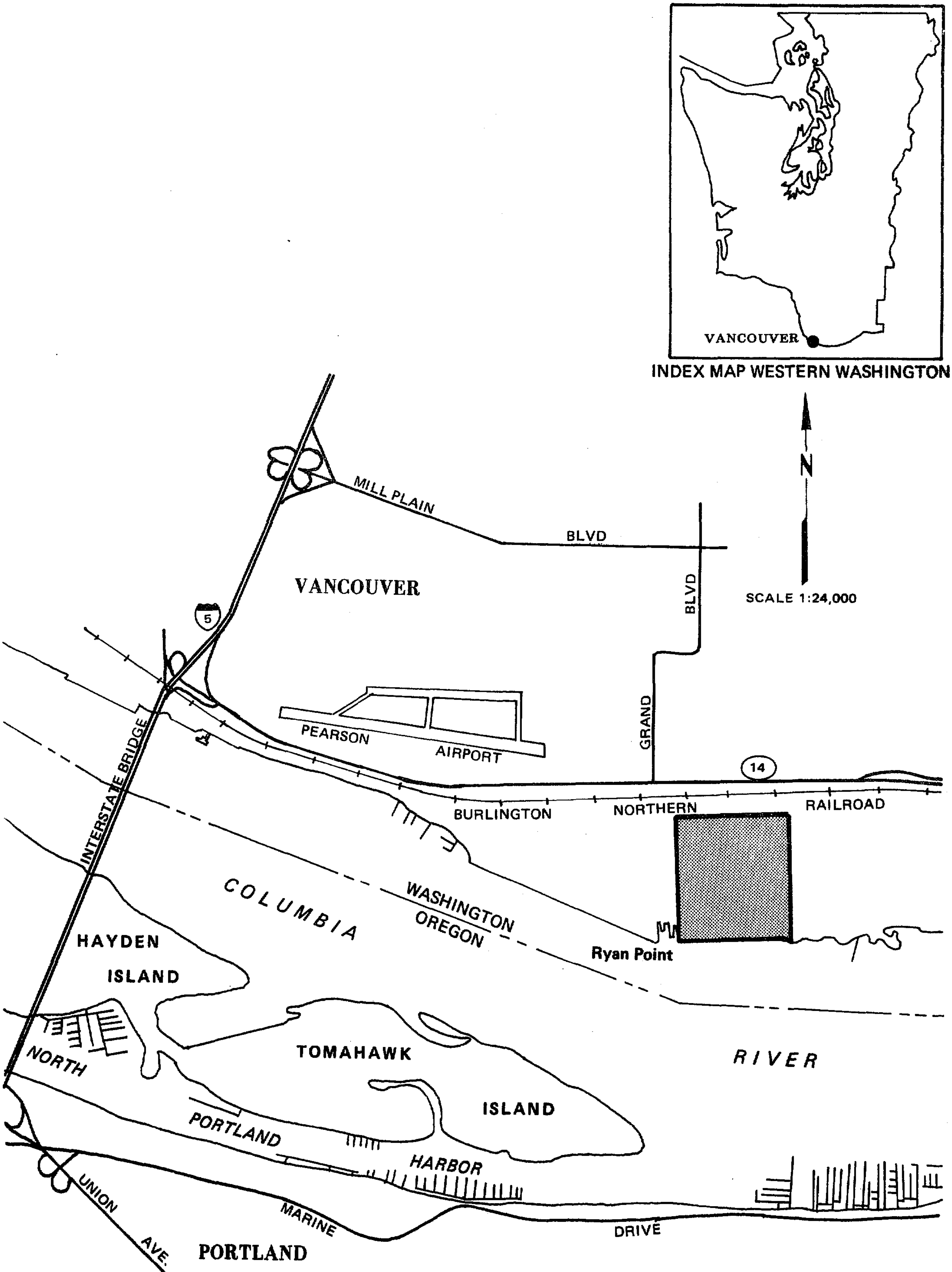


Figure 6.24

COLUMBIA INDUSTRIAL PARK

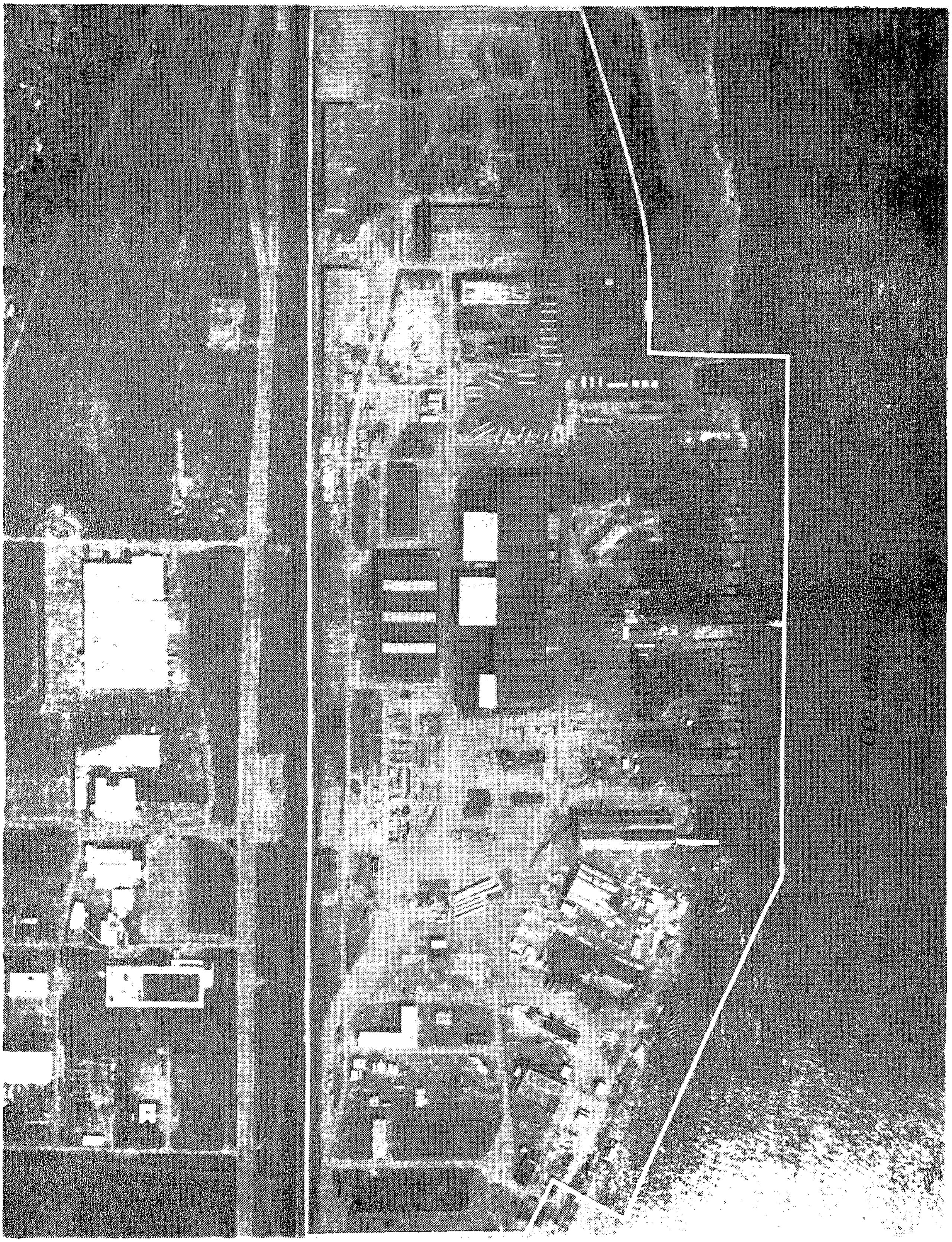


Figure 6.25

COLUMBIA INDUSTRIAL PARK

COLUMBIA INDUSTRIAL PARK
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
<u>Earth</u>		
Changes to local topography		X
Surface compaction	X	
Alteration of longshore transport	X	
<u>Air</u>		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
<u>Water</u>		
Modification of hydrologic regimes		X
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal	X	
<u>Flora and Fauna</u>		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
<u>Other</u>		
Noise pollution		X
Light and glare generation		X

COLUMBIA INDUSTRIAL PARK (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings	X	
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact		X
Disruption of recreational/commercial fishing	X	
Disruption of general recreational activities	X	
Archaeological/historical resource impacts		X
Competing uses for land and shoreline	X	

Longview International Paper Site

Location:	Longview, Washington (Columbia River Mile 67).
Ownership:	International Paper Company.
Acreage:	100 acres of flat, well drained land adjacent to the Columbia River.
Water Frontage:	2,000 feet of frontage.
Water Depth:	40 foot navigation channel adjacent to the site. Ship turning basin also in front of site.
Channel Width:	600 ft. navigation channel to the Pacific Ocean.
Deep Water Proximity:	Pacific Ocean approximately 67 miles down river.
Rail Transportation:	Burlington Northern spur to the site.
Highway Transportation:	City street to the site; Interstate 5 is approximately 3.5 miles away.
Deep Water Cargo Piers:	Port of Longview pier adjacent to the site (7 berths); International Paper pier (1 berth) located on-site is 1,300 ft. in length.
Graving Dock Site:	It is questionable as to whether a graving dock could be constructed on-site. Soil capacity according to International Paper is 1,000 pounds per square foot. An alteration in the existing river front dike would be required, the feasibility of which is unknown (dike ground elevation +12.0 ft. - top of dike +30.0 ft.).

Overhead Obstructions:	None at the site. Two bridges downstream: 1) Lewis and Clark Bridge at Longview (River Mile 66) horizontal clearance 1,085 ft., vertical center (440 ft.) clearance ranges between 185 ft. and 196 ft. depending on water height; 2) Columbia River Bridge at Astoria (River Mile 13.5) horizontal clearance 1,070 ft. with vertical clearance ranging between 186 ft. and 193 ft. depending on water height. Power lines crossing the river maintain a 210 ft. clearance above the river.
Water Availability:	A 12-inch nonpotable water line serves the site along with a 2.5-inch potable line.
Electricity Supply (2,000 KVA Min.):	Adequate power supply available to the site.
Skilled Labor:	Skilled labor pool available. Combined Longview/Kelso population 42,000 (1982). Cowlitz County population 79,500 (1982).
Shoreline Management Designation:	Urban environment.
Local Zoning:	Heavy industry.
On-Site Warehousing:	Six sheds 78 ft. x 1,200 ft. x 30 ft. high with bays, clear span and blacktop floor.
Fire Protection:	City fire department. One company owned fire truck now available on-site.
Sewer Services:	12-inch sewer line serves the site.

100 Tons/Axle:

Wheel Loads: According to a spokesman for International Paper, the site could withstand these loads.

Constraints:

- o Any modification of the existing dike structure at the site would necessarily have to be approved by the Corps of Engineers.
- o Bridges and power lines down river would preclude construction of structures exceeding approximately 185 ft. high.
- o A navigation channel width of 600 ft. could limit construction of very large structures.
- o A long distance to the open ocean (67 miles) would involve crossing the Columbia River bar at its mouth.
- o Continued deposition of Mount St. Helens ash and mud could require frequent maintenance dredging and associated disposal of dredge spoils.

Opportunities:

- o An existing industrial site with substantial infrastructure in place.
- o Site located in an area currently zoned for industrial development and compatible with the local shoreline plan.
- o Adequate labor pool.

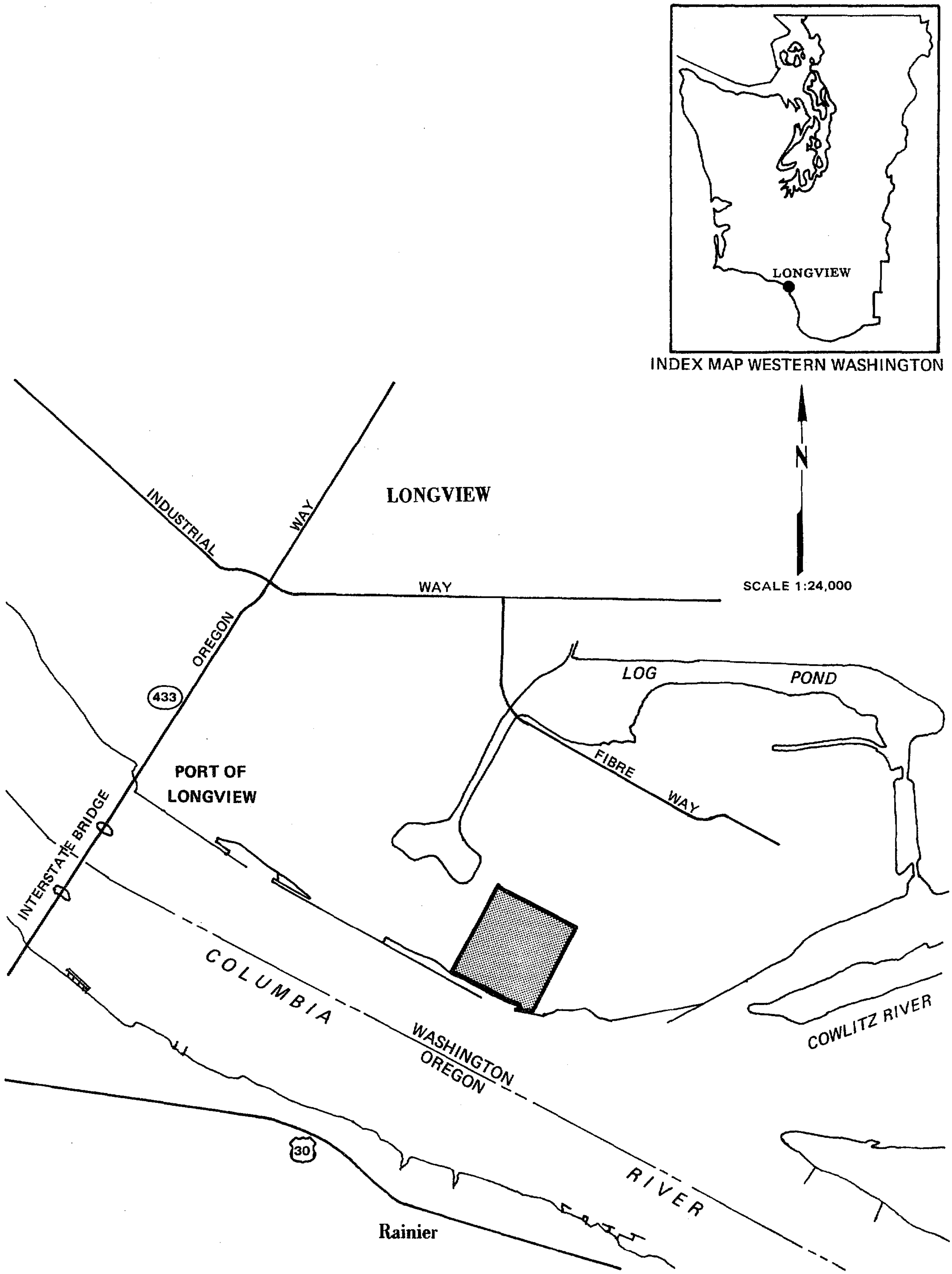


Figure 6.26

LONGVIEW INTERNATIONAL PAPER SITE.

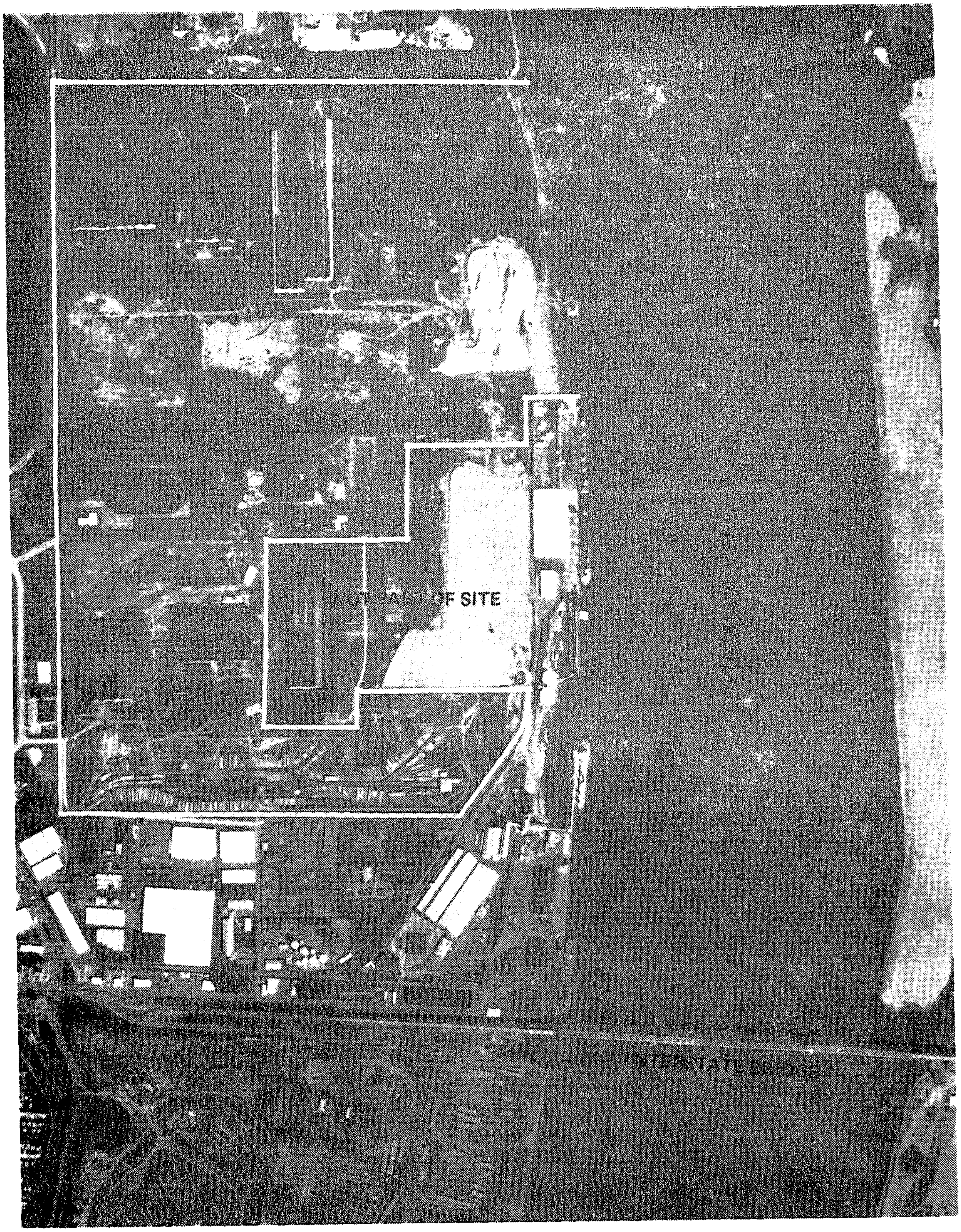


Figure 6.27

LONGVIEW INTERNATIONAL PAPER

LONGVIEW INTERNATIONAL PAPER SITE
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes		X
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/disposal	X	
Flora and Fauna		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat		X
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
Other		
Noise pollution	X	
Light and glare generation		X

LONGVIEW INTERNATIONAL PAPER SITE (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings	X	
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact		X
Disruption of recreational/commercial fishing		X
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

Sites That Could Potentially Be Developed Which Have Some Infrastructure

Cherry Point Site

Location:	Approximately 1.2 miles southeast of Cherry Point and seven miles west of the City of Ferndale.
Ownership:	Currently under option from Point Industrial Corporation by Peter Kiewit Son's Company.
Acreage:	270 acres. With the exception of 100 foot bluffs adjacent to the shoreline extending from the middle of the site southeasterly, the slope ranges from 3 percent to 12.5 percent. Several natural drainage courses are located on the site.
Water Frontage:	2,100-2,200 feet at MLLW; the 20 foot MLLW contour extends for 1,170 feet within the site boundaries.
Water Depth:	The site is situated on open water. The -20 foot MLLW contour is approximately 400 to 600 feet from the 0 foot MLLW.
Channel Width:	Site is situated on open water; no severely restricted navigation channels.
Deep Water Proximity:	The 100 foot water depth is located about 1.9 miles from the site.
Rail Transportation:	Burlington Northern lies adjacent to the site.
Highway Transportation:	Approximately 8 miles to Interstate 5 via local access road.

Cherry Point Site (cont'd)

Deep Water Cargo Piers:	Three piers are located within 1.8 miles of the site but are proprietary.
Graving Dock Site:	A graving dock could be developed at the low back end of the property assuming soil conditions are suitable. Specific engineering designs could likely resolve any soils problems according to the EIS previously prepared by Chicago Bridge and Iron.
Overhead Obstructions:	None
Water Availability:	Two, 24-inch, PUD water lines are located approximately 1 mile from the site (nonpotable water).
Electricity Supply:	(Puget Sound Power and Light Company) adequate supply of power available.
Skilled Labor:	Adequate labor supply in surrounding area (Whatcom County population 111,000 as of 1982).
Shoreline Management Designation:	"Conservancy" landward of the ordinary high water mark and "Aquatic" offshore of the ordinary high water mark. The site is within the "Heavy Impact Industrial District" zone.
Local Zoning:	Local industrial zoning allows for the construction of offshore oil drilling structures.
On-Site Warehousing:	None currently, although site (soils) could accommodate on-site warehousing.
Fire Protection:	The site is located within the boundaries of Fire Protection District No. 7, which staffs a full

time chief and about 70 volunteers. Major industries in the area provide their own basic fire protection and use local fire districts for back-up.

Sewer Service: None

100 Tons/Axle Wheel Loads: Could possibly be engineered for such heavy wheel loads.

Constraints:

- Dredging and filling of the shoreline are generally inconsistent with the current Whatcom County Shoreline Master Plan. Proposed revisions to the state Shoreline Management Act that would have allowed shoreline development (dredge and fill) at this site by Chicago Bridge and Iron were rejected by the governor in 1982.
- Fisheries related impact issues could preclude site development.
- A large bluff rises above the shoreline from approximately 25 feet on the north side of the beach front to approximately 100 feet on the south side.
- Local jurisdictions may require that the beach and adjacent shoreline shall remain open to the public for recreation purposes.

Opportunities:

- Access to adjacent deep water makes this site particularly attractive.
- Zoning and shoreline master plan allow industrial development of the uplands and a piling based pier (conditional use) on the beach.
- Relatively large amount of land available with some infrastructure.

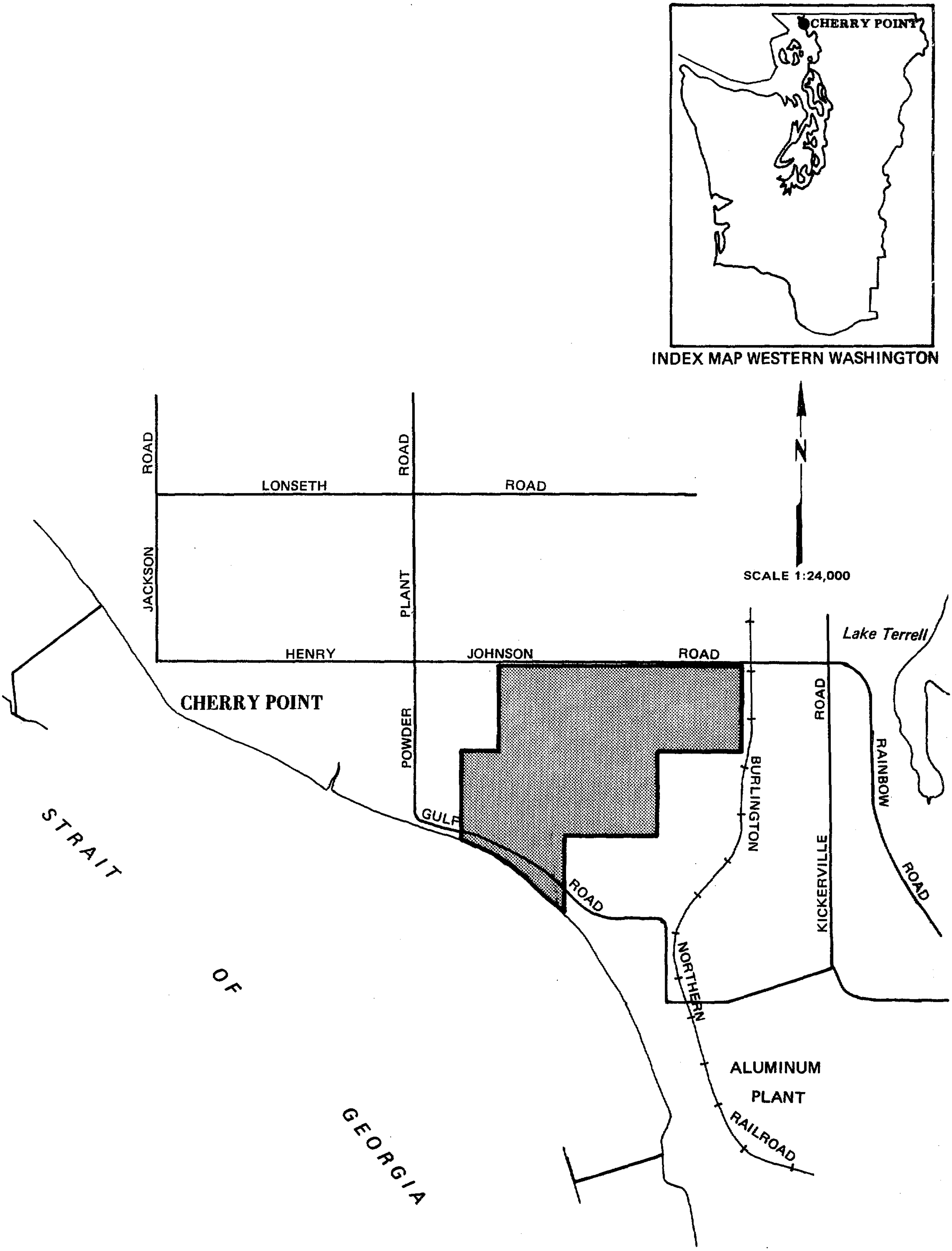


Figure 6.28

CHERRY POINT SITE.

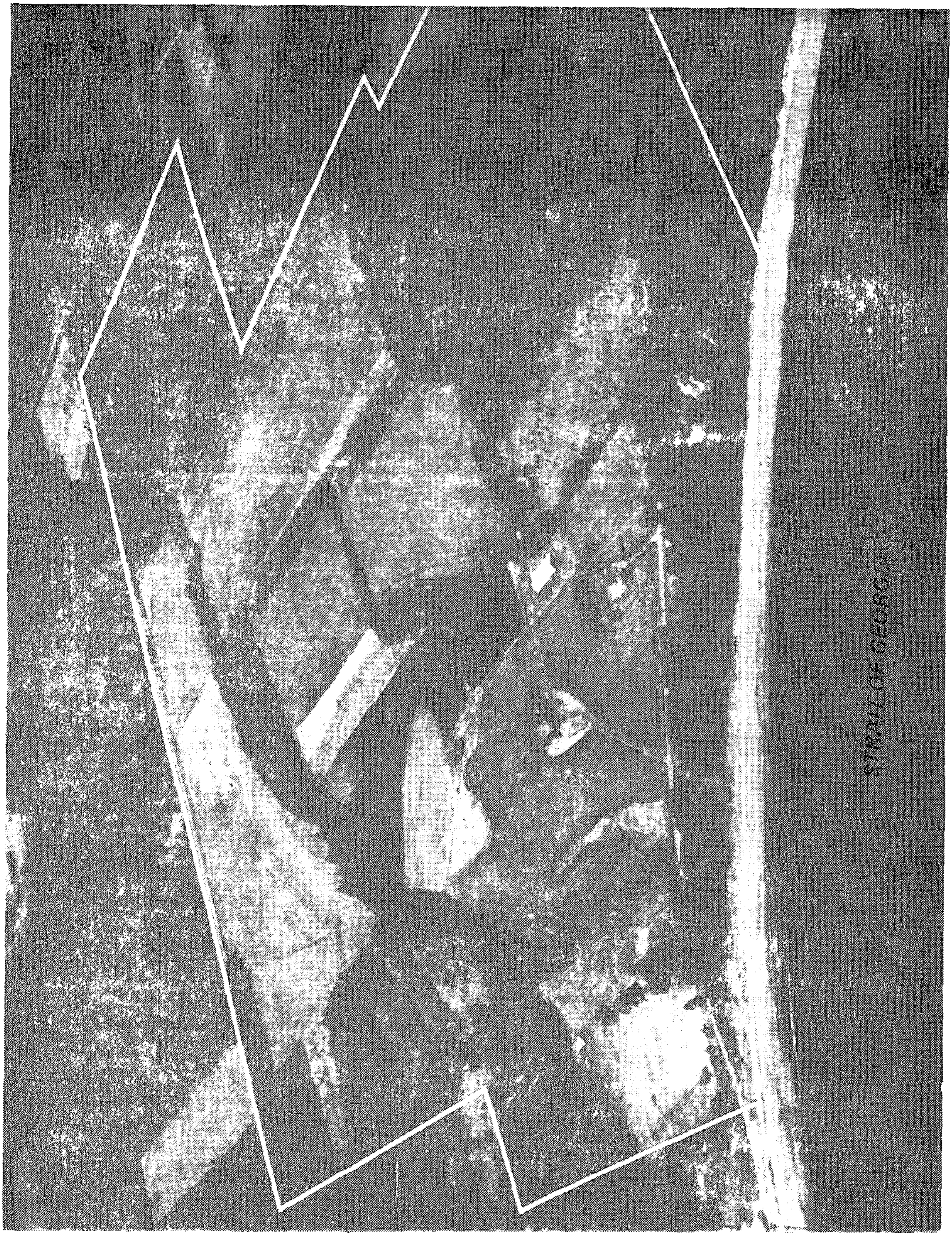


Figure 6.29

CHERRY POINT

CHERRY POINT SITE
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography	X	
Surface compaction	X	
Alteration of longshore transport	X	
Air		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes	X	
Elevated levels of runoff	X	
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal	X	
Flora and Fauna		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
Other		
Noise pollution		X
Light and glare generation		X

CHERRY POINT SITE (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings	X	
Increased demand for public services	X	
Increased demand for utilities	X	
Aesthetic impact	X	
Disruption of recreational/commercial fishing	X	
Disruption of general recreational activities	X	
Archaeological/historical resource impacts	X	
Competing uses for land and shoreline		X

Commencement Bay, Outer Hylebos Site

Location:	Tacoma, Commencement Bay, southeast of Browns Point at the opening of the Hylebos Waterway.
Acreage:	Estimated 30 acres of tidelands.
Ownership:	Port of Tacoma
Water Frontage:	Approximately 1,125 ft. of water frontage abutting Highway 509 (Marine View Drive).
Water Depth:	Outside the boundary of the site water depth increases rapidly from 40+ feet to over 400 ft. in the middle of Commencement Bay.
Channel Width:	Site is situated on Commencement Bay; open water all the way to the Pacific Ocean.
Deep Water Proximity:	300 ft. of water lies about 1 mile from the site. Water depths in deep areas of the bay range from 400 to over 500 ft.
Rail Transportation:	Access within 2 miles of the site. It is highly doubtful that rail could be extended to the site.
Highway Transportation:	Highway 509 is adjacent to the site. Interstate 5 is approximately 3 miles away.
Deep Water Cargo Piers:	None at the site. Port owned pier is located across the waterway from the site.
Graving Dock Site:	Adequate space exists for a graving dock and preliminary soil surveys indicate adequacy of soils.

Overhead Obstructions:	None
Water Availability:	12-inch water main passes in front of the property along Marine View Drive.
Electricity Supply (2,000 KVA Min.):	(Tacoma P.U.D.) adequate supply available.
Skilled Labor:	More than adequate with the combined labor pool of the Seattle/Tacoma area.
Shoreline Management Designation:	Urban environment
Local Zoning:	"S-12" Marine View Drive North Shoreline District . . . permits development of water-related and water-dependent commercial uses. A platform construction facility would need to be processed as an unlisted Shoreline Management Substantial Development/Conditional Use Permit.
On-Site Warehousing:	None
Fire Protection:	Tacoma Fire Department (includes fireboat support).
Sewer Service:	City sewer line passes in front of the site (18-inch line).
100 Tons/Axle Wheel Loads:	Site would require substantial fill over a sand base . . . likely could be designed to withstand heavy wheel loads.

Commencement Bay, Outer Hylebos Site (cont'd)

Constraints:

- Potential sensitive abutting land use issues i.e., noise, light and glare, and view blockage.
- Site would require substantial fill (approx. 30 acres).
- Potential impact on fisheries and recreational/commercial boating.
- Highway access would likely be constrained.

Opportunities:

- Close proximity to deep water (no overhead obstructions).
- Urban shoreline designation and industrial zoning classification are favorable for site development.

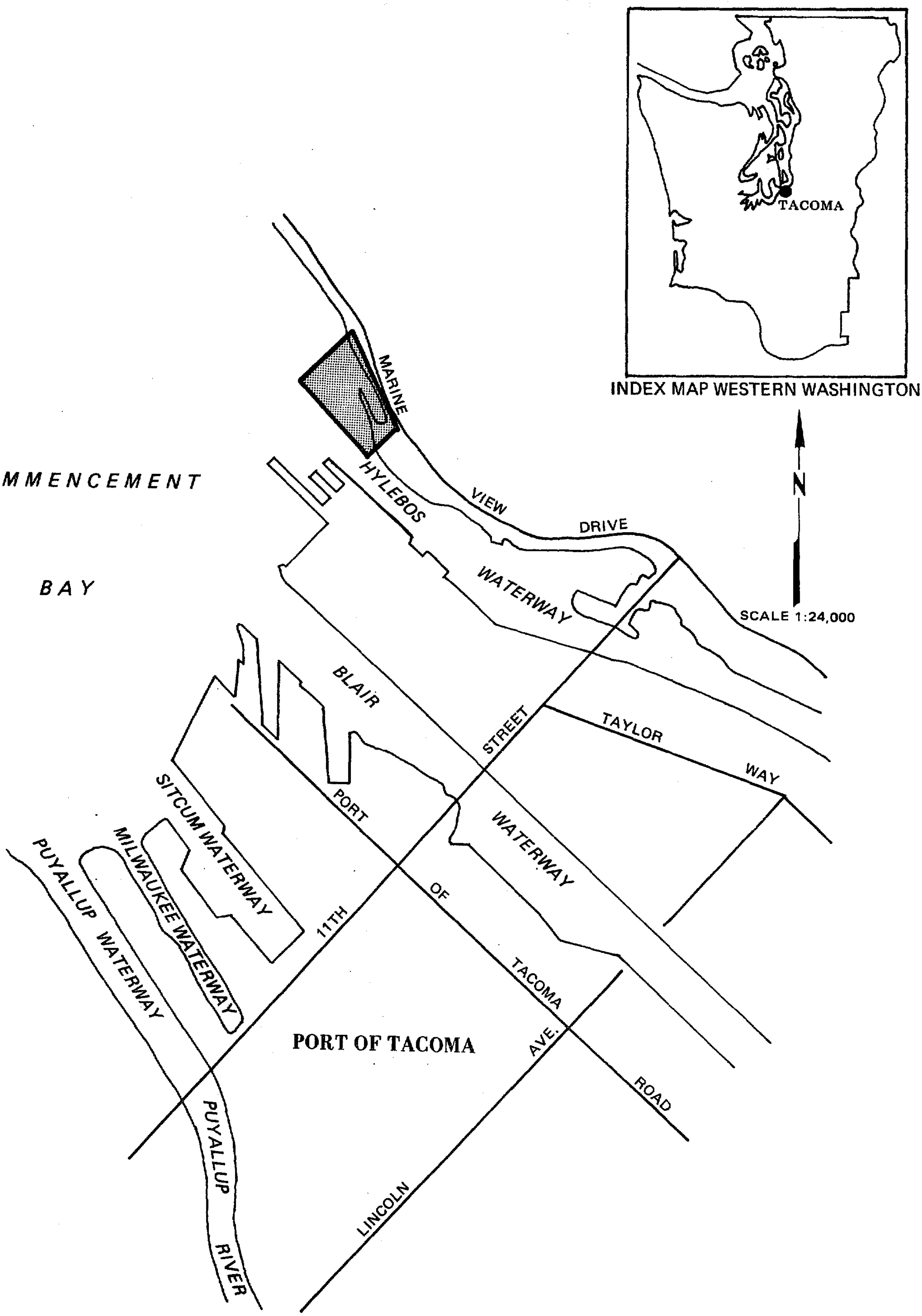


Figure 6.30

TACOMA COMMENCEMENT BAY—OUTER HYLEBOS SITE.

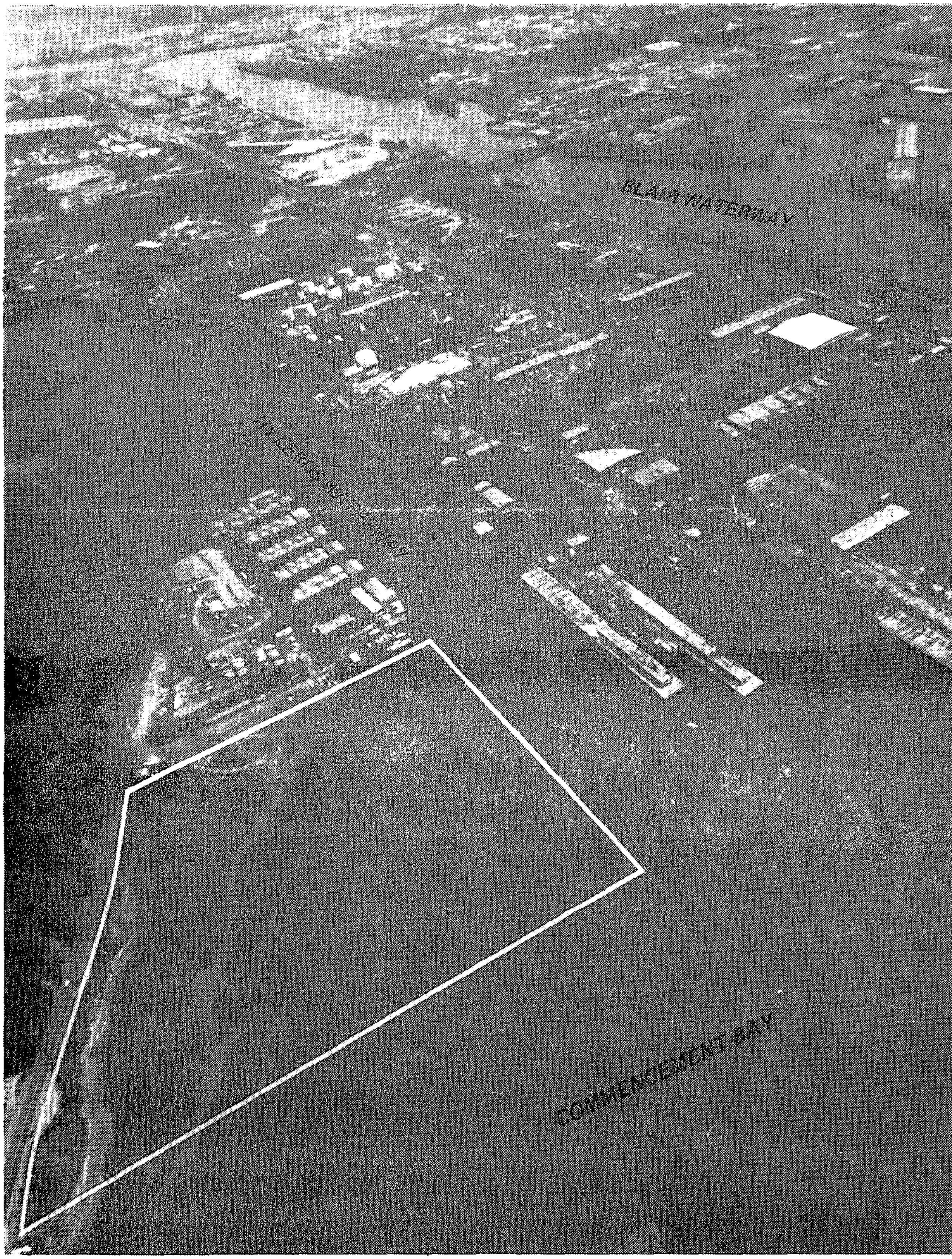


Figure 6.31
OUTER HYLEBOS

OUTER HYLEBOS SITE
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions	X	
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes		X
Elevated levels of runoff	X	
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal		X
Flora and Fauna		
Degradation of adjacent wetland habitat	X	
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat	X	
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
Other		
Noise pollution	X	
Light and glare generation	X	

OUTER HYLEBOS SITE (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings	X	
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact	X	
Disruption of recreational/commercial fishing	X	
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline	X	

Westport Half Moon Bay Site

Location:	Washington's outer coast at Half Moon Bay in the city of Westport.
Ownership:	Port of Grays Harbor.
Acreage:	83+ acres (level, well drained, low bank).
Water Frontage:	1,200 feet on Half Moon Bay.
Water Depth:	-34 feet MLLW in the navigation channel (approximately 1,500 feet from the beach). Water depth increases gradually to the navigation channel from 6 to 18 feet MLLW.
Channel Width:	The Grays Harbor deep draft navigation channel lies approximately 1,500 feet offshore. This channel is 1,000+ feet wide and can accommodate drafts of 34 feet. It extends westward approximately two miles where it connects with the outer bar channel which is 600 feet wide and can accommodate drafts of 34 feet deep.
Deep Water Proximity:	No deep water exists (other than the navigation channel) as Grays Harbor is a shallow water estuary.
Rail Transportation:	The closest rail is Burlington Northern which extends to Markham, 12 miles away.
Highway Transportation:	Less than ½ mile from state highway 105 and served by a heavy duty access road.
Deep Water Cargo Piers:	None (a shallow water barge terminal exists at Westport and would be available).

Graving Dock Site:	None
Overhead Obstructions:	None
Water Availability:	Six-inch water line within 500 feet.
Electricity Supply (2,000 KVA min.):	Adequate supply available to the site. (Grays Harbor PUD)
Skilled Labor Availability:	Yes. The population of Grays Harbor County was estimated to be 66,100 in 1982. Of this number, 28,040 lived in Aberdeen and Hoquiam, 25 miles away. The Satsop Nuclear Power Plant project 30 miles east of the site drew 4,000+ skilled workers from S.W. Washington.
Shoreline Management Designation:	Urban environment.
Local Zoning:	Residential tourist service designation would require rezoning for industrial use. The proposed Grays Harbor Estuary Management Plan designates this Westport location for uses and activities associated with commercial and sport fishing.
On-Site Warehousing:	None
Availability of Local Fire Protection:	Yes
Availability of Sewer Service:	Yes

100 Tons/Axle
Wheel Loads: Yes

Site Constraints:

- There would be a need to dredge an access channel (about 1,500 feet) to the main Grays Harbor navigation channel. Dredging by clamshell dredge rather than suction type dredge to limit impact on crab would probably be required if this site was developed.
- No direct rail service.
- No potential for a graving dock.
- Location next to a state park could become an issue.
- Winter storms and heavy seas could limit marine commerce activities.
- Skilled labor pool is limited in the immediate area.
- The proposed Grays Harbor Estuary Management Plan designates this Westport location for uses and activities associated with commercial and sport fishing.

Site Opportunities:

- Proximity to open ocean (2-3 miles).
- Because of heavy, dense, marine sands, the site could withstand very heavy loads.
- Site has access to a 600-foot barge terminal for receiving materials. A heavy duty haul road connects the terminal with the site (¼ mile distance).

- Additional port acreage available.

- Abundance of motels, restaurants, and trailer parks available in the immediate area for servicing a temporary labor pool.

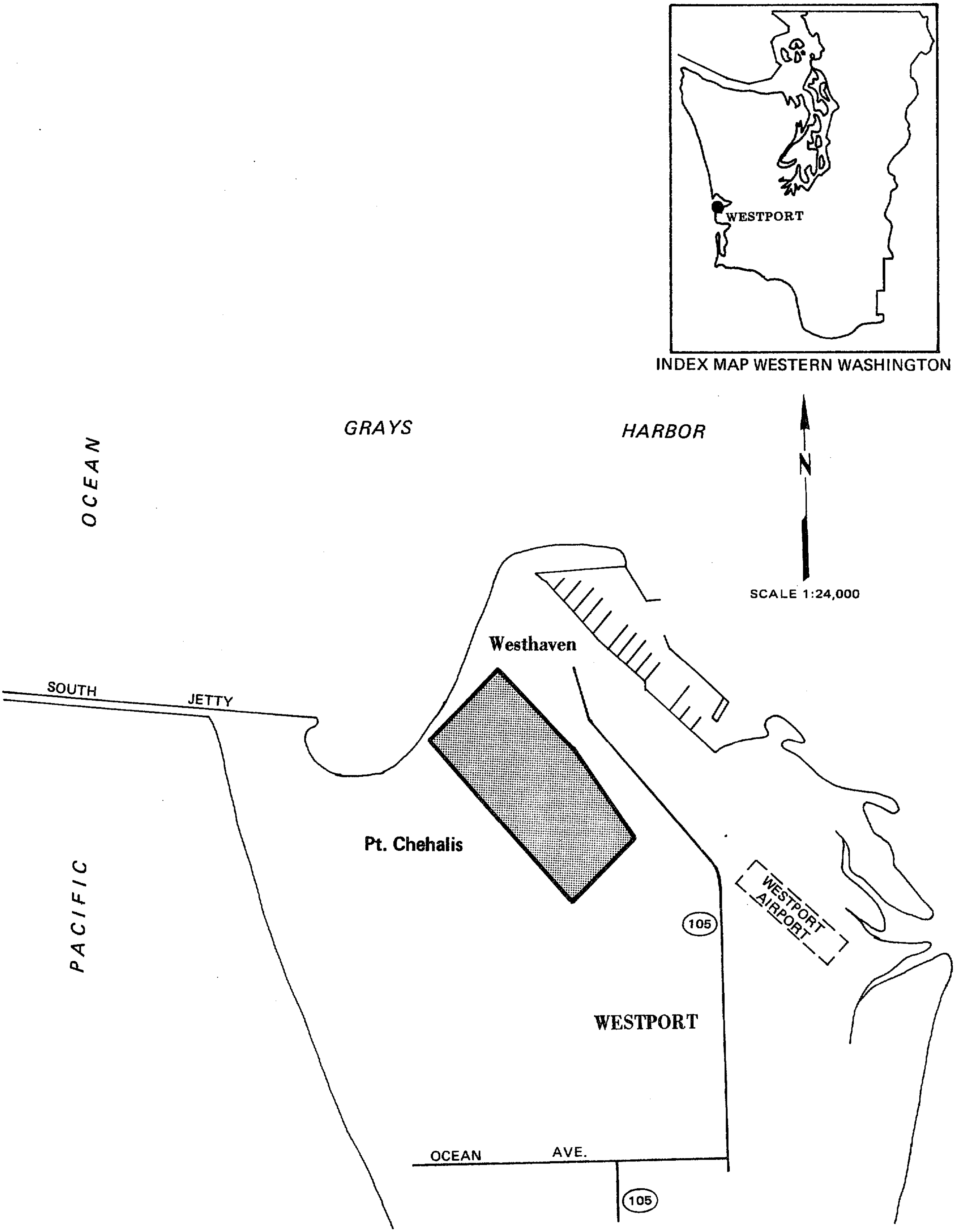


Figure 6.32
WESTPORT HALF MOON BAY SITE.

Figure 6.33
HALFMOON BAY

HALF MOON BAY, WESTPORT
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes	X	
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal		X
Flora and Fauna		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways		X
Rare or endangered species impacts		X
Other		
Noise pollution		X
Light and glare generation	X	

HALF MOON BAY, WESTPORT (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations	X	
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings		X
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact	X	
Disruption of recreational/commercial fishing	X	
Disruption of general recreational activities	X	
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

Westport Marina Site

Location:	Washington's outer coast at Westport - adjacent to the Westport marina.
Ownership:	Port of Grays Harbor
Acreage:	50+ (level, well drained, low bank).
Water Frontage:	1,200 ft.
Water Depth:	Estimated -20 ft. (MLLW) nearshore, -25' (MLLW) within 400 ft. of shore . . . at high tide have another 10 ft. of water.
Channel Width:	Estimated 2,000 ft. distance to the Grays Harbor deep draft navigation channel (1,000+ ft. wide, can accommodate drafts of 34 feet). Approximately 3 miles to open ocean.
Deep Water Proximity:	No deep water exists as Grays Harbor is a shallow water estuary.
Rail Transportation:	The closest rail is Burlington Northern which extends to Markham, 12 miles away.
Highway Transportation:	Less than ½ mile from state highway 105 and served by a heavy duty access road.
Deep Water Cargo Piers:	None (a shallow water barge terminal exists adjacent to the site and would be available)
Graving Dock Site:	Site situated on heavy, dense marine sand capable of supporting extremely heavy loads without support piling.

<u>Overhead Obstructions</u>: None

<u>Water Availability</u>: Six-inch water line within 1,500 ft.

<u>Electricity Supply (2,000 KVA Min.)</u>: Adequate supply available to the site (Grays Harbor PUD).

<u>Skilled Labor Availability</u>: Yes, the population of Grays Harbor County was estimated to be 66,100 in 1982. Of this number, 28,040 lived in Aberdeen and Hoquiam, 25 miles away. The Satsop Nuclear Power Plant project 30 miles east of the site drew 4,000+ workers from S.W. Washington.

<u>Shoreline Management Designation</u>: Urban environment

<u>Local Zoning</u>: Commercial designation would require special use permit. The proposed Grays Harbor Estuary Management Plan designates this Westport location for uses and activities associated with commercial and sport fishing.

<u>On-Site Warehousing</u>: None

<u>Fire Protection</u>: Yes, City of Westport.

<u>Availability of Sewer Service</u>: Yes

<u>100 Tons/Axle Wheel Loads</u>: Yes

Westport Marina Site (cont'd)

Site Constraints:

- o Dredging to widen and deepen an existing access channel would likely be required for the 1 mile distance to the Grays Harbor navigation channel. Dredging by clamshell dredge rather than suction type dredge to limit impact on crab would probably be required if this site was developed.

- o No direct rail service.

- o Winter storms and heavy seas could limit marine commerce activities.

- o Skilled labor pool is limited in the immediate area.

- o The proposed Grays Harbor Estuary Management Plan designates this Westport location for uses and activities associated with commercial and sport fishing.

Site Opportunities:

- o Proximity to open ocean (2-3 miles).

- o May be a good site for a graving dock since heavy, dense marine sands at the site could withstand very heavy loads.

- o A 600 ft. rock fill barge terminal exists at the site that could be used for unloading materials.

- o Abundance of motels, restaurants and trailer parks available in the immediate area to service a temporary labor pool.

- o Additional port acreage available.

WESTPORT MARINA SITE
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
<u>Earth</u>		
Changes to local topography	X	
Surface compaction		X
Alteration of longshore transport		X
<u>Air</u>		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
<u>Water</u>		
Modification of hydrologic regimes	X	
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal		X
<u>Flora and Fauna</u>		
Degradation of adjacent wetland habitat	X	
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
<u>Other</u>		
Noise pollution		X
Light and glare generation	X	

WESTPORT MARINA SITE (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations	X	
Potential for on-site accidents		X
Potential for ship accidents		X
Traffic congestion at grade crossings		X
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact	X	
Disruption of recreational/commercial fishing	X	
Disruption of general recreational activities	X	
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

Vancouver Port Site

Location: Vancouver . . . Columbia River Mile 104.

Ownership: Port of Vancouver has an option on 80-200 acres of river front land currently owned by Alcoa Aluminum.

Acreage: 80-200 acres about 25 acres of which are covered by Columbia River dredge materials.

Water Frontage: 1,000 ft. to 2,500 ft. depending on the amount of acreage purchased by the port.

Water Depth: 40 ft. Columbia River navigation channel lies immediately offshore.

Channel Width: The Columbia River navigation channel is a minimum of 600 ft. wide.

Deep Water Proximity: The Pacific Ocean is 104 river miles downstream.

Rail Transportation: Burlington Northern currently lies adjacent to the site.

Highway Transportation: Two miles to Interstate 5; Fourth Plane Road passes in front of the site providing direct access to I-5.

Deep Water Cargo Piers: An existing 600 ft. port owned pier is located approximately 2,000 ft. from the site.

Graving Dock Site: Enough room exists to build a graving dock. The acceptability of soils and other factors determining site suitability are unknown.

Overhead Obstructions:	None at the site though transmission lines cross the river adjacent to the site. Two bridges downstream: 1) Lewis and Clark Bridge at Longview (River Mile 66) horizontal clearance 1,085 ft., vertical center (440 ft.) clearance ranges between 185 ft. and 196 ft. depending on water height; 2) Columbia River Bridge at Astoria (River Mile 13.5) horizontal clearance 1,070 ft. with vertical clearance ranging between 186 ft. and 193 ft. depending on water height. Power lines crossing the Columbia River maintain a minimum 210 ft. clearance above the river.
Water Availability:	8-inch water main located 1,200-1,500 feet from the site.
Electricity Supply (2,000 KVA Min.):	Adequate supplies available (Clark County PUD).
Skilled Labor:	The Vancouver/Portland area provides a large skilled labor pool.
Shoreline Management Designation:	Urban environment
Local Zoning:	Heavy manufacturing
On-Site Warehousing:	None, although 500,000 ft.^{2} of warehouse space exists on the nearby port premises.
Fire Protection:	Vancouver fire department, Portland fireboat.
Sewer Services:	City sewer 1,200 ft. away.

100 Tons/Axle
Wheel Loads: Unknown

Constraints:

- General lack of existing infrastructure.

- Navigation channel width of 600 ft. could limit construction of very large structures.

- Bridge and power line obstructions preclude large platform structures from being built here.

- Completed platform structures would have to be transported across the Columbia River bar . . . approximately 104 miles from the site.

Opportunities:

- Large labor pool.

- Site located in an area currently zoned for industrial development and compatible with local shoreline plan.

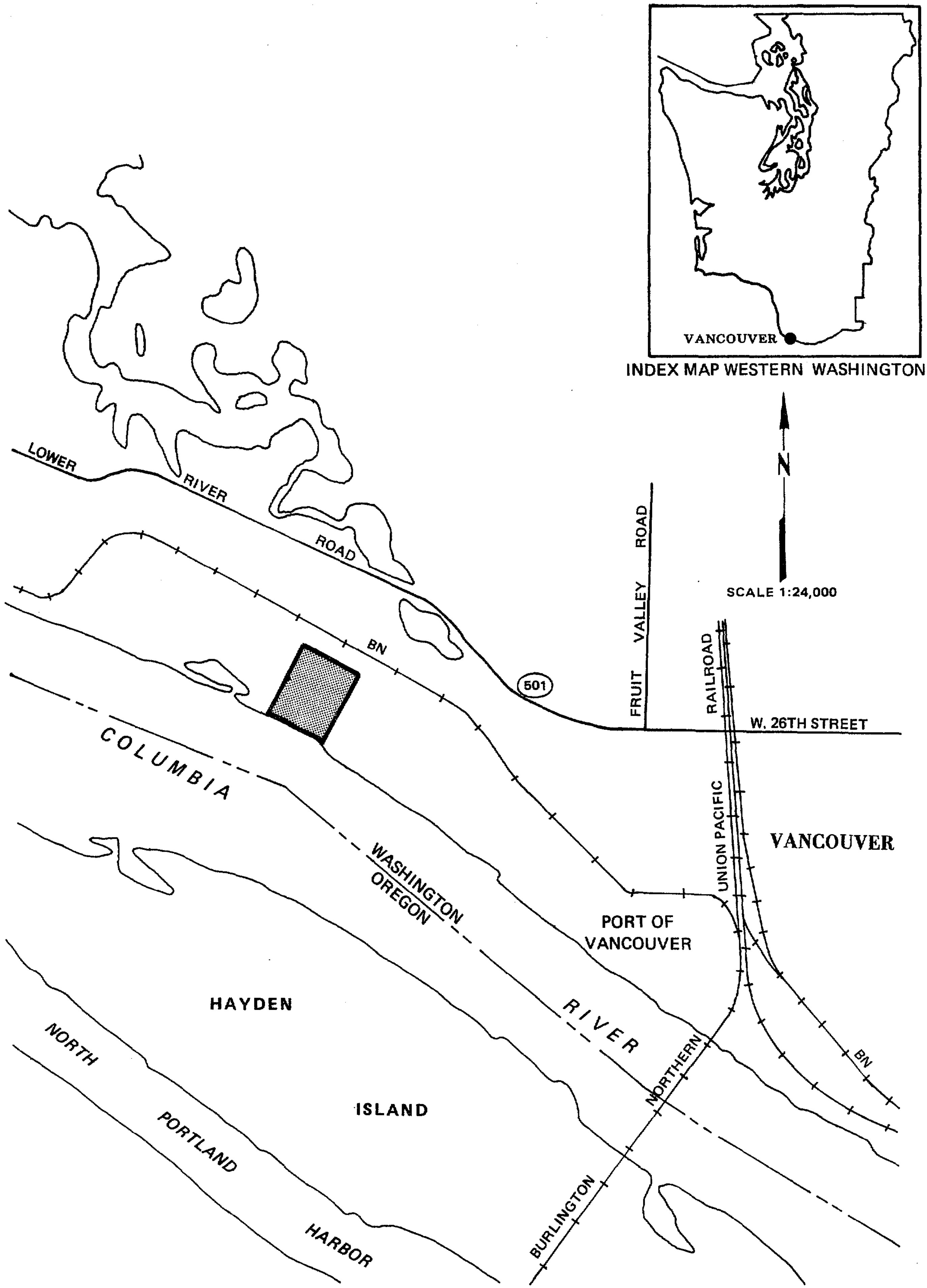


Figure 6.36

VANCOUVER TERMINAL SITE.

Figure 6.37

VANCOUVER PORT SITE

PORT OF VANCOUVER
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction	X	
Alteration of longshore transport		X
Air		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles	X	
Water		
Modification of hydrologic regimes		X
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal		X
Flora and Fauna		
Degradation of adjacent wetland habitat	X	
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
Other		
Noise pollution		X
Light and glare generation		X

PORT OF VANCOUVER (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents	X	
Traffic congestion at grade crossings	X	
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact	X	
Disruption of recreational/commercial fishing		X
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

Port of Kalama Industrial Park

Location:	Immediately south of the confluence of the Kalama and Columbia rivers.
Ownership:	Port of Kalama.
Acreage:	Approximately 100 acres diked and riprapped.
Water Frontage:	Approximately 1,000 ft. of frontage.
Water Depth:	40 ft. navigation channel 500 ft. to 1,000 ft. offshore.
Channel Width:	600 ft. minimum navigation channel to the ocean (maintained by the Corps of Engineers).
Deep Water Proximity:	Pacific Ocean 73.5 miles downstream.
Rail Transportation:	Adjacent to Burlington Northern/Union Pacific mainlines.
Highway Transportation:	Interstate 5 one mile from on/off access.
Deep Water Cargo Piers:	Adjacent to Peavey Company grain export facility (pier unavailable).
Graving Dock Site:	Soils are adequate to support loads up to 5,000 pounds per square foot. The existing river dike would have to be modified to accommodate a graving dock. Feasibility unknown.
Overhead Obstructions:	None at the site. Two bridges downstream: 1) Lewis and Clark Bridge at Longview (River Mile 66) horizontal clearance 1,085 ft., vertical center (440 ft.). Clearance ranges between

185 ft. and 196 ft. depending on water height; and 2) Columbia River Bridge at Astoria (River Mile 13.5) horizontal clearance 1,070 ft. with vertical clearance ranging between 186 ft. and 193 ft. depending on water height. Power lines crossing the Columbia River maintain a minimum 210 ft. vertical clearance above the river.

Water Availability:	12-inch main on-site. Purveyor is city of Kalama.
Electricity Supply (2,000 KVA Min.):	Adequate supply available on-site (Cowlitz County P.U.D.).
Skilled Labor:	Available from the Longview/Kelso area to the north and Portland/Vancouver to the south (considered more than adequate).
Shoreline Management Designation:	Urban environment
Local Zoning:	Not zoned
On-Site Warehousing:	None
Fire Protection:	Cowlitz County Fire District #5 and City of Kalama Volunteer Fire Department.
Sewer Service:	City sewer 1½ miles to the south; possible septic system.
100 Tons/Axle Wheel Loads:	Unknown

Constraints:

- Site would require substantial fill for use as a rig fabrication facility.

- Dredging along river front could impact anadromous fisheries on the Columbia and Kalama rivers.

- Navigation channel width of 600 ft. could limit construction of very large structures.

- Downstream bridge and power line clearances would limit the size of platform structures built.

- Completed platform structures would have to be towed across the Columbia River bar, approximately 74 miles down river from the site.

- The close proximity of the Trojan Nuclear Power Plant across the river from this site may be a factor that could affect site development.

Opportunities:

- Some infrastructure exists at the site.

- Site is a designated industrial park.

- Urban shoreline designation and industrial comprehensive plan classification are favorable for site development.

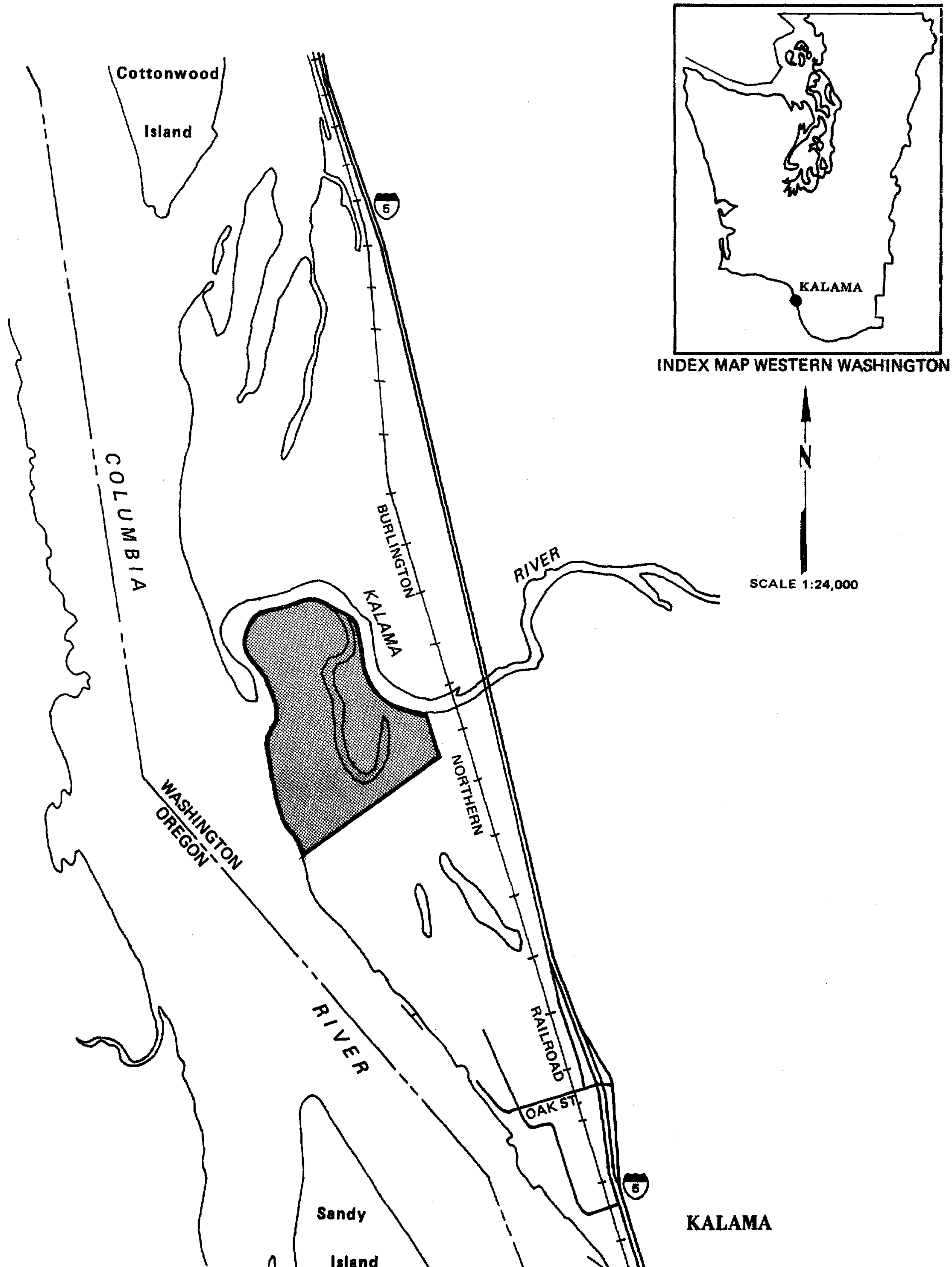


Figure 6.38

PORT OF KALAMA INDUSTRIAL SITE.

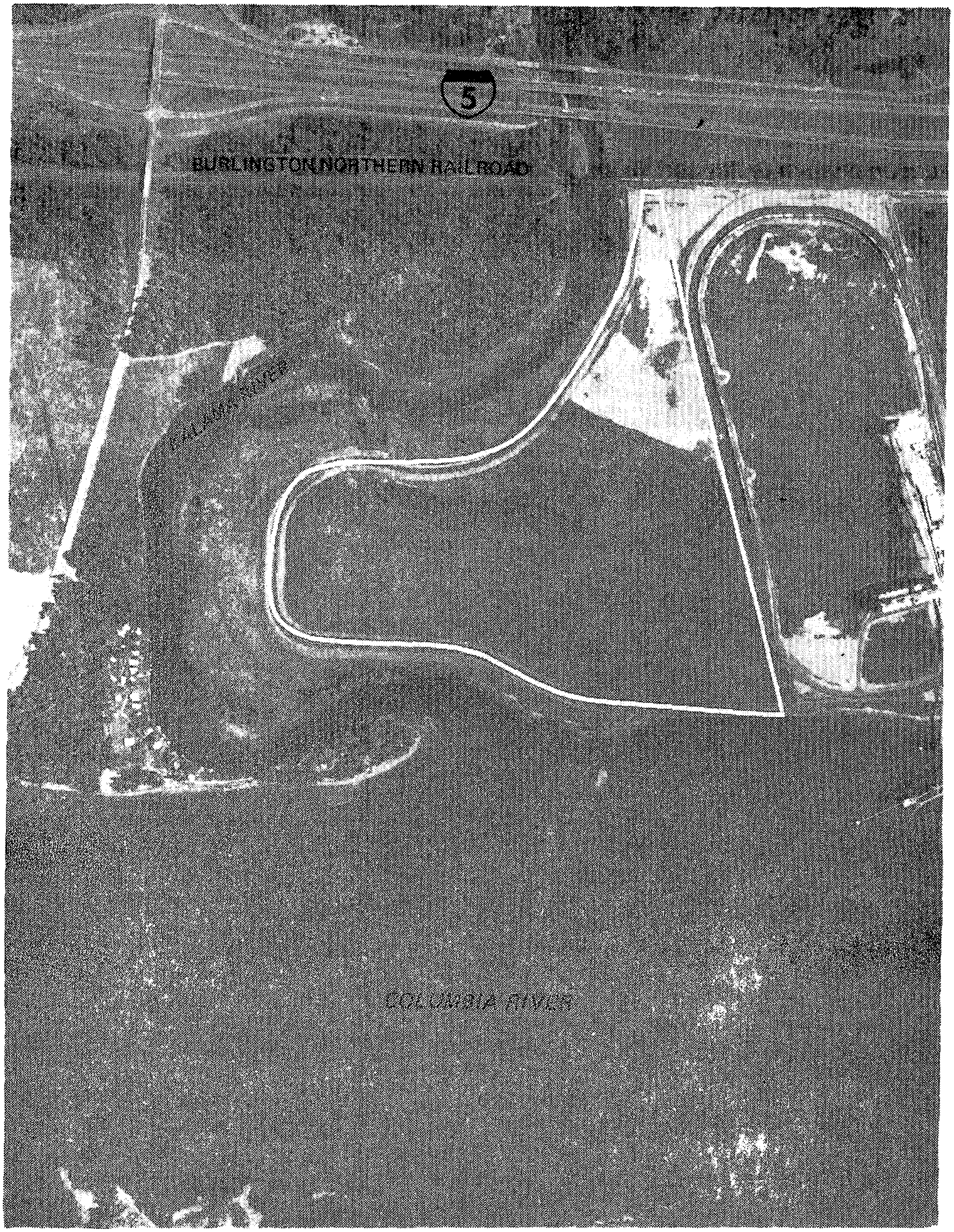


Figure 6.39

KALAMA INDUSTRIAL SITE

PORT OF KALAMA INDUSTRIAL PARK
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes	X	
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal	X	
Flora and Fauna		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
Other		
Noise pollution	X	
Light and glare generation	X	

PORT OF KALAMA INDUSTRIAL PARK (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents	X	
Traffic congestion at grade crossings		X
Increased demand for public services		X
Increased demand for utilities		X
Aesthetic impact		X
Disruption of recreational/commercial fishing	X	
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

Port of Kalama Terminal Site

Location:	Cowlitz County . . . Columbia River Mile 72.1.
Ownership:	Port of Kalama
Acreage:	246 acres of diked river bottom with approximately 80 acres filled with dredged river sand to the 32 foot elevation (base elevation is 8 ft).
Water Frontage:	Approximately 3,500 ft.
Water Depth:	Columbia River navigation channel maintained at a 40 ft. depth (the edge of the main channel varies between 500 ft. and 700 ft. offshore).
Channel Width:	600 ft. minimum navigation channel to the ocean (maintained by the Corps of Engineers).
Deep Water Proximity:	72.1 river miles to the Pacific Ocean.
Rail Transportation:	Adjacent to Burlington Northern and Union Pacific mainlines.
Highway Transportation:	Industrial access road to Interstate 5 on-site.
Deep Water Cargo Piers:	None at the site (Port of Longview pier approximately 5 Columbia River miles downstream).
Graving Dock Site:	A graving dock would have to be diked. There is enough frontage for a large graving dock but soil suitability is unknown as are other determining factors.

Overhead Obstructions:	None on-site. Two bridges downstream: 1) Lewis and Clark Bridge at Longview (River Mile 66) horizontal clearance 1,085 ft., vertical center (440 ft.) clearance ranges between 185 ft. and 196 ft. depending on water height; and 2) Columbia River Bridge at Astoria (River Mile 13.5) horizontal clearance 1,070 ft. with vertical clearance ranging between 186 ft. and 193 ft. depending on water height. Power line river crossings maintain a minimum 210 ft. vertical clearance above the river.
Water Availability:	12-inch water main approximately 1,800 ft. from S.E. corner of property.
Electricity Supply (2,000 KVA Min.):	Adequate supply available (Cowlitz County PUD).
Skilled Labor:	Available from the Longview/Kelso area to the north and Portland/Vancouver to the south (considered more than adequate).
Shoreline Management Designation:	Urban environment
Local Zoning:	Areas unzoned though the county's Comprehensive Land Use Plan designates the site area as "Industrial."
On-Site Warehousing:	None currently
Fire Protection:	Cowlitz County Fire District #5 and City of Kalama Volunteer Fire Department.

Sewer Service: City of Kalama sewer approximately 2 miles away.

100 Tons/Axle Wheel Load Capability: Unknown.

Constraints:

- Downstream bridge and power line clearances would limit the size of the platform structures built.
- The close proximity of the Trojan Nuclear Power Plant across the river from this site may be a factor that could affect site development.
- Navigation channel width of 600 ft. could limit construction of very large structures.
- Dredging impact on fisheries could be an issue.
- Completed platform structures would have to be towed across the Columbia River bar, approximately 72 miles down river from the site.

Opportunities:

- No infrastructure exists on-site.
- An identified industrial site.
- 2 million cubic yards of dredge spoils are stockpiled on the river front portion of the site.
- Urban shoreline designation and industrial zoning classification are favorable for site development.

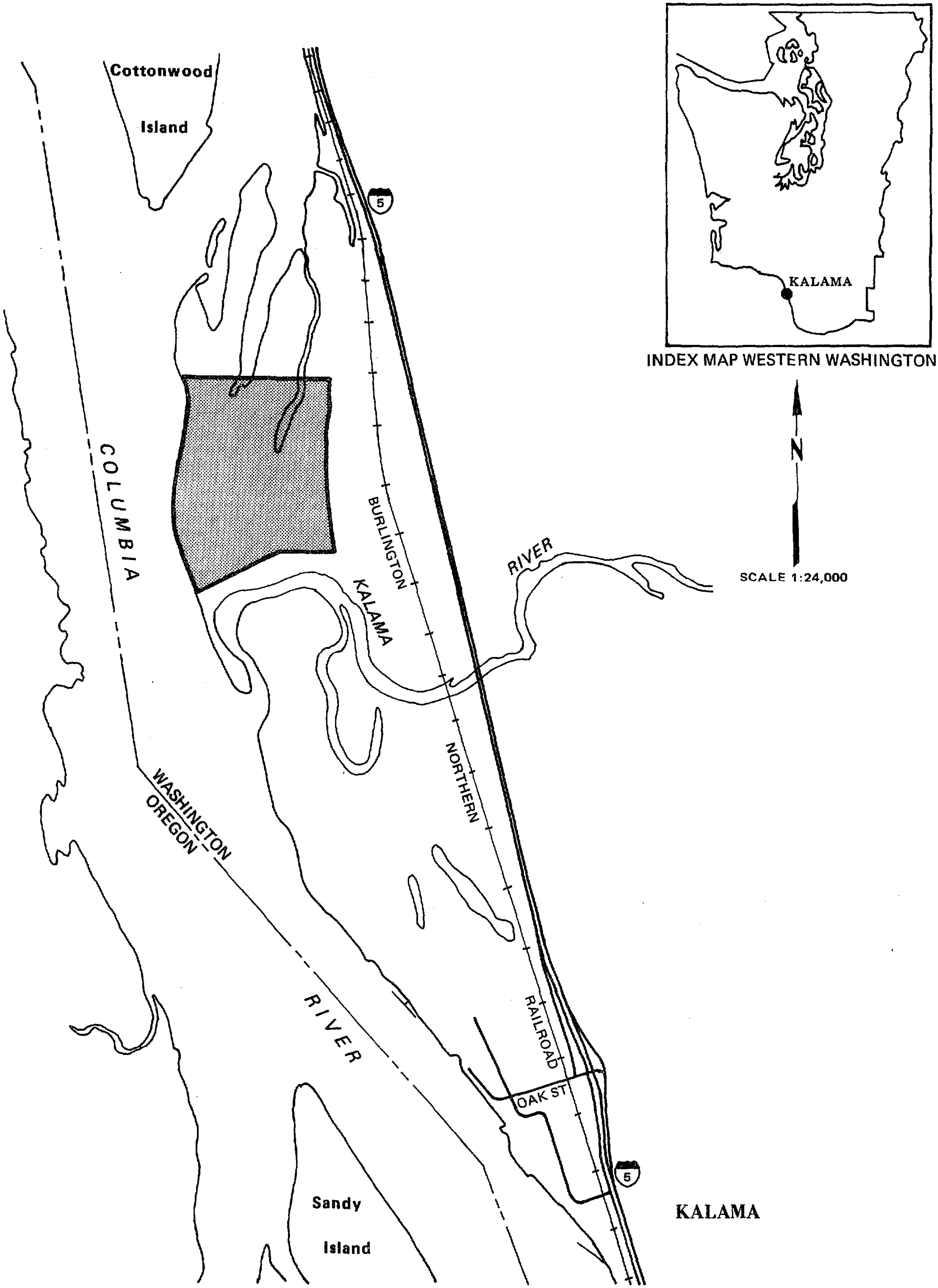


Figure 6.40

PORT OF KALAMA TERMINAL SITE.

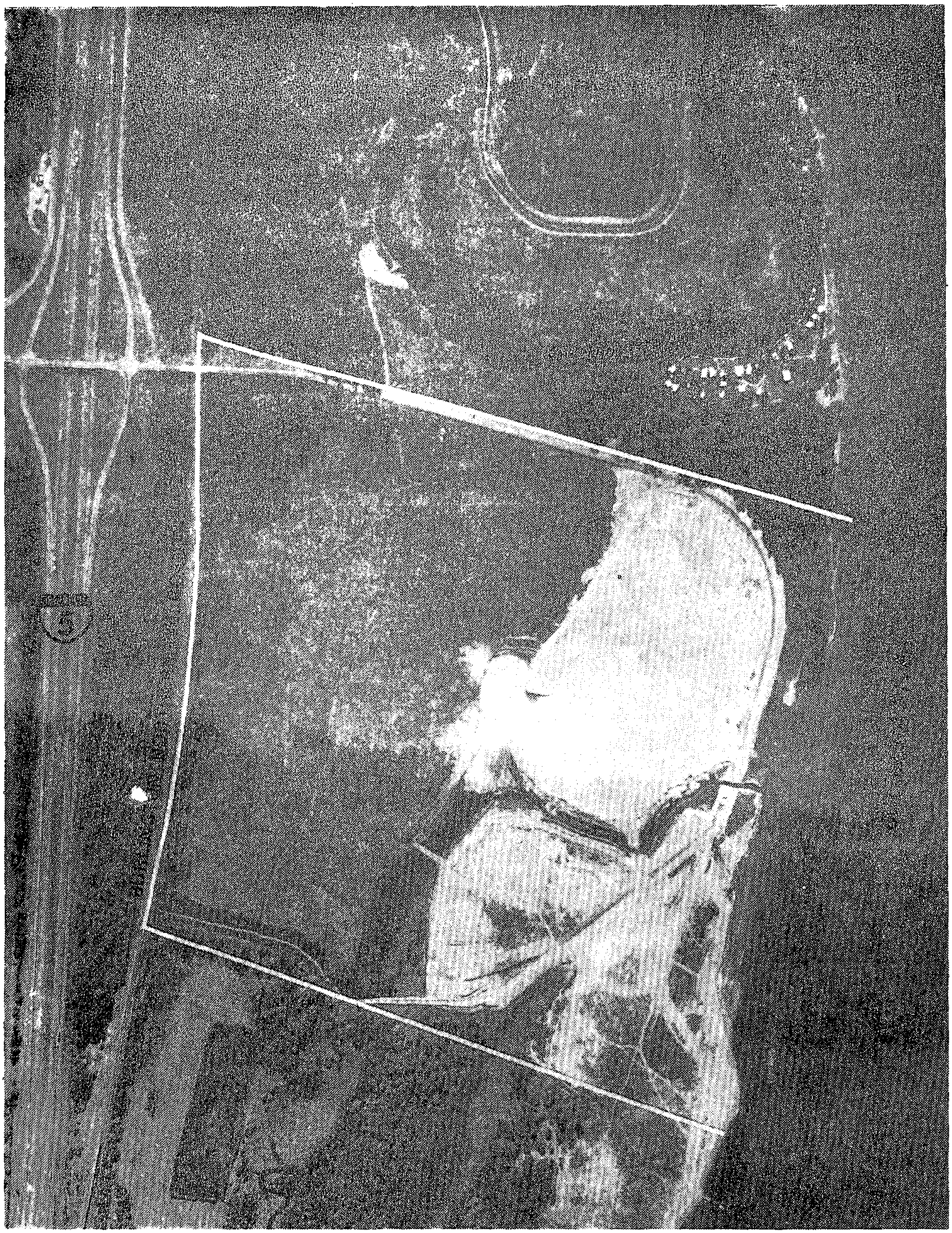


Figure 6.41

KALAMA TERMINAL SITE

PORT OF KALAMA TERMINAL SITE
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
<u>Earth</u>		
Changes to local topography		X
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
<u>Water</u>		
Modification of hydrologic regimes		X
Elevated levels of runoff		X
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal	X	
<u>Flora and Fauna</u>		
Degradation of adjacent wetland habitat		X
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat		X
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
<u>Other</u>		
Noise pollution	X	
Light and glare generation	X	

PORT OF KALAMA TERMINAL SITE (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents	X	
Traffic congestion at grade crossings		X
Increased demand for public services	X	
Increased demand for utilities	X	
Aesthetic impact		X
Disruption of recreational/commercial fishing	X	
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline		X

Note:

There is an existing mitigation agreement in place for use of this site as a coal transshipment site. Wetland mitigation and shoreland alteration to prevent ship wash stranding of juvenile salmonids are included in the existing agreement.

Barlow Point International Paper Site

Location:	Columbia River Mile 61.8, Cowlitz County, Barlow Point (SW¼ Section 26, T 8 N, R 3 W, W.M)
Ownership:	International Paper Company.
Acreage:	Approximately 100 acres of undeveloped pasture land.
Water Frontage:	Approximately 3,000 ft.
Water Depth:	40 foot navigation channel located approximately 1,000 ft. offshore.
Channel Width:	The Columbia River navigation channel is a minimum of 600 ft. wide.
Deep Water Proximity:	The site is approximately 62 river miles from the Pacific Ocean.
Rail Transportation:	Burlington Northern spur approximately 2 miles from the site.
Highway Transportation:	Paved county and city road to site. Interstate 5 approximately 6.5 miles from site.
Deep Water Cargo Piers:	None. Nearest is Port of Longview, approximately 6 miles upriver.
Graving Dock Site:	Feasibility unknown.
Overhead Obstructions:	None at the site. The Columbia River Bridge at Astoria (River Mile 13.5) horizontal clearance 1,070 ft. with vertical clearance ranging between 186 ft. and 193 ft. depending on water height.

Water Availability: Six-inch water line extends past the site.

Electricity Supply (2,000 KVA Min.): Adequate supplies available (Cowlitz County PUD).

Skilled Labor: Skilled labor pool available. Combined Longview/Kelso population 42,000 (1982). Cowlitz County population 79,500 (1982).

Shoreline Management Designation: Urban environment.

Local Zoning: Heavy industry.

On-Site Warehousing: None. Soil suitability unknown.

Fire Protection: Rural Fire District No. 2.

Sewer Services: None.

100 Tons/Axle Wheel Loads: Site would require substantial fill in order to achieve necessary load capacity.

Constraints:

- General lack of existing infrastructure.
- Bridge and power line obstructions down river would preclude construction of structures exceeding approximately 185 ft. high.
- A navigation channel width of 600 ft. could limit construction of very large structures.

- Long distance to the open ocean (62 miles) would involve crossing the Columbia River bar at its mouth.

- Site would require a substantial amount of fill.

- Continued deposition of Mount St. Helens ash and mud could require frequent maintenance dredging and associated disposal of dredge spoils.

Opportunities:

- Site located in an area currently zoned for industrial development and compatible with the local shoreline plan.

- Adequate labor pool.

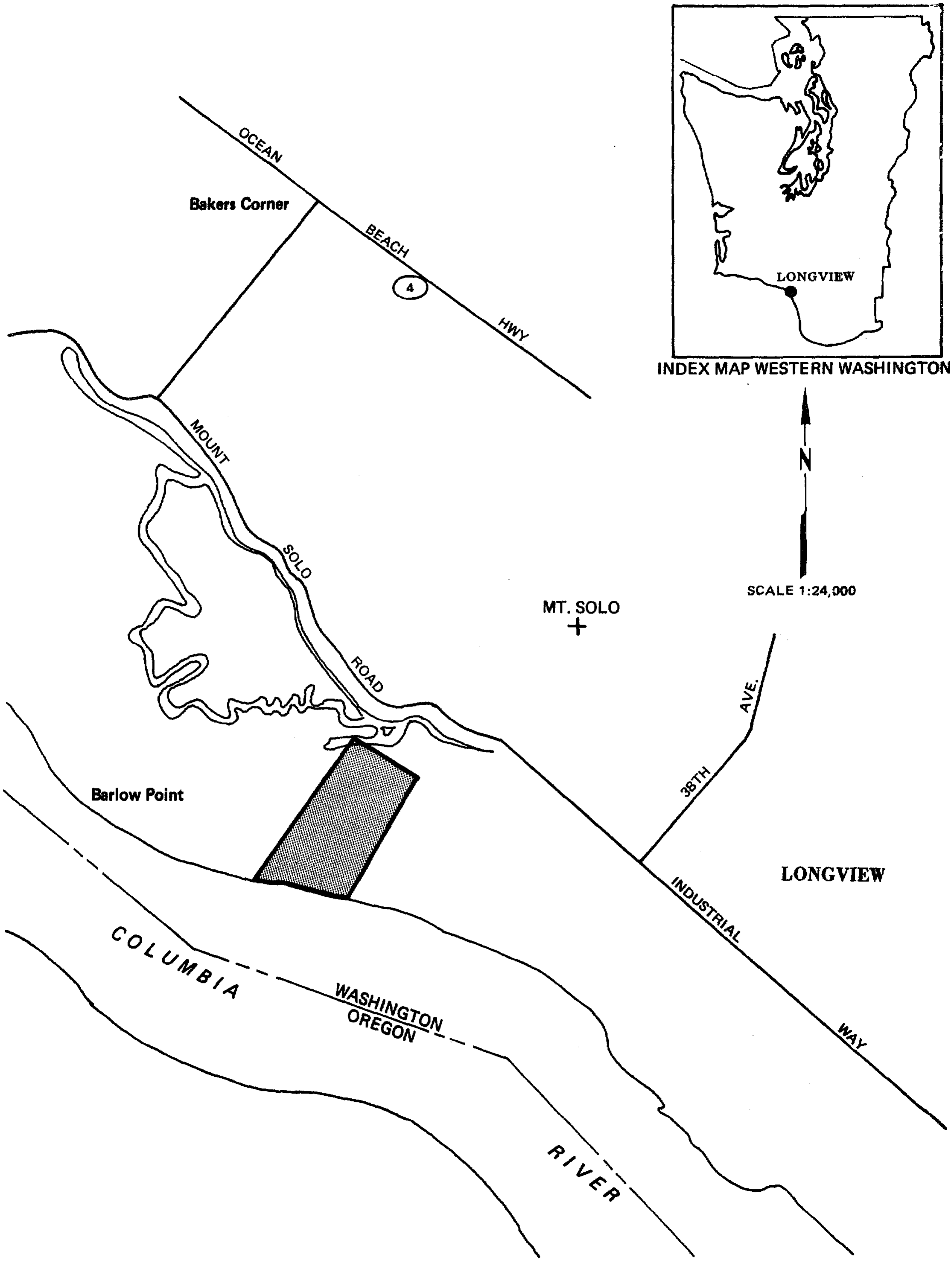


Figure 6.42
BARLOW POINT INTERNATIONAL PAPER SITE.

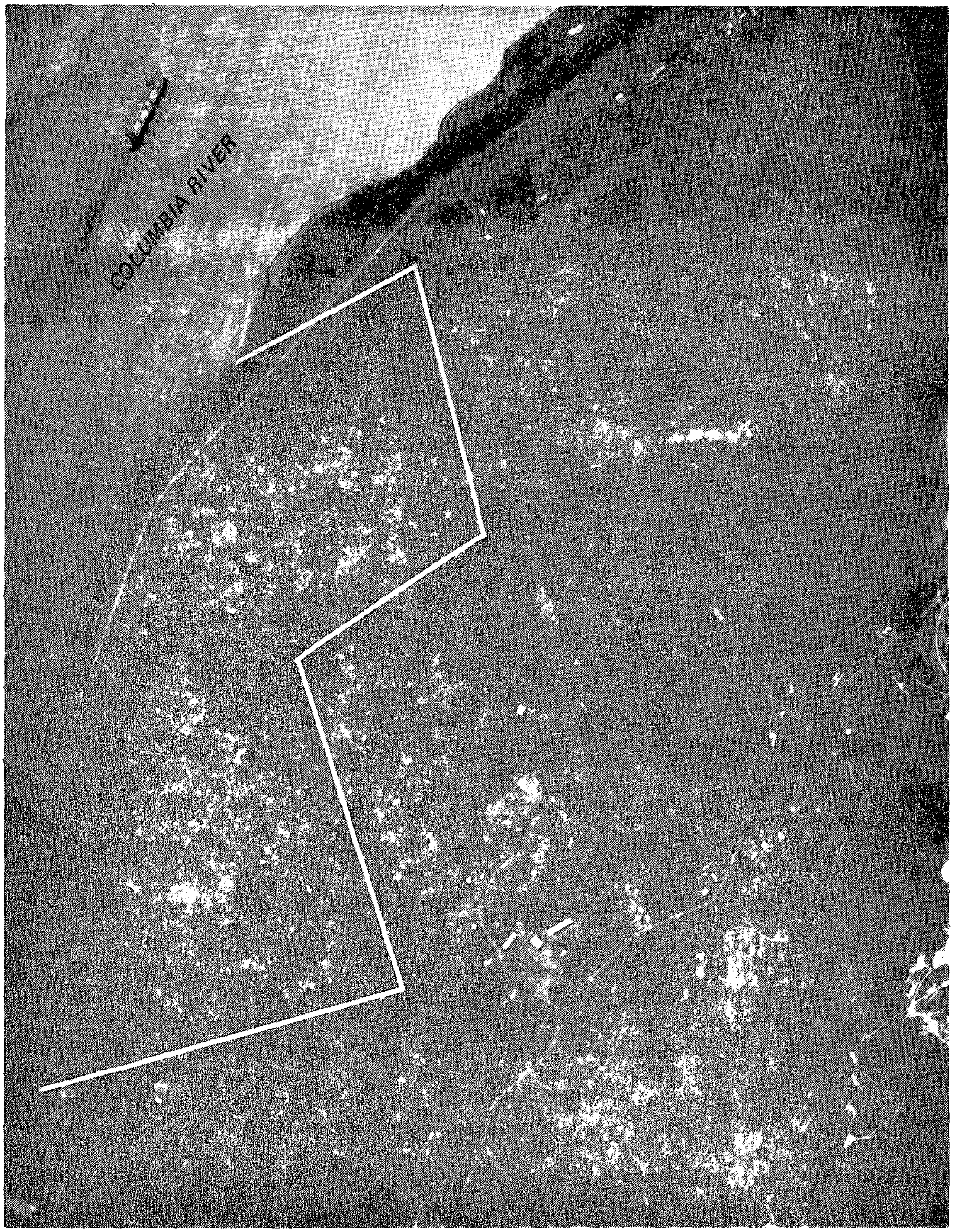


Figure 6.43

BARLOW POINT SITE

BARLOW POINT INTERNATIONAL PAPER SITE
EVALUATION OF IMPACT ISSUES

Impact Categories	Potential Impact Issues	Minor or Nonissues
Earth		
Changes to local topography	X	
Surface compaction		X
Alteration of longshore transport		X
Air		
Elevated dust emissions		X
Emissions from welding activities		X
Emissions from ships, trains and other vehicles		X
Water		
Modification of hydrologic regimes	X	
Elevated levels of runoff	X	
Degradation of adjacent surface waters by windblown dust		X
Increased turbidity due to dredging/ disposal	X	
Flora and Fauna		
Degradation of adjacent wetland habitat	X	
Degradation of adjacent aquatic habitat	X	
Degradation of adjacent terrestrial habitat	X	
Disruption of corridors and fish migratory pathways	X	
Rare or endangered species impacts		X
Other		
Noise pollution	X	
Light and glare generation	X	

I. P. BARLOW POINT (cont'd)

Impact Categories	Potential Impact Issues	Minor or Nonissues
Alteration of land use designations		X
Potential for on-site accidents		X
Potential for ship accidents	X	
Traffic congestion at grade crossings	X	
Increased demand for public services	X	
Increased demand for utilities	X	
Aesthetic impact	X	
Disruption of recreational/commercial fishing	X	
Disruption of general recreational activities		X
Archaeological/historical resource impacts		X
Competing uses for land and shoreline	X	

CHAPTER 7

IMPACT AVOIDANCE MEASURES

Introduction

Impact avoidance includes all activities and measures which, when incorporated into project design, have the effect of eliminating or reducing environmental impacts or if this is not possible, providing compensation to offset unavoidable impacts. Impact avoidance measures can be subdivided into three basic areas of consideration:

- Siting measures
- Design and operation measures
- Mitigation measures

Impact avoidance measures considered applicable to the development of offshore platform fabrication facilities are listed in Table 7.10. How these avoidance measures apply to specific potential impacts is depicted in the matrix shown in Figure 7.10. This matrix identifies specific impact avoidance measures potentially applicable to the impacts identified for each of the sites profiled in the previous chapter. A discussion of these measures follows.

Siting Measures

Properly siting a platform fabrication facility is perhaps the most important action that can be taken in alleviating many environmental and regulatory concerns which can negate or stall a project.

Two of the more frequent problems are siting on or near wetlands and along shorelines identified as prime fisheries and shellfish habitat. There has been much concern, both governmental and public, in recent

Table 7.10

IMPACT AVOIDANCE MEASURES

Siting Measures

- Site in industrialized areas
- Avoid areas which would impact wetlands or other critical habitats
- Restrict shoreline siting to water-dependent facility components
- Site in areas previously disturbed or with low habitat quality
- Avoid noise-sensitive populations
- Avoid floodways

Design and Operation Measures

- Pier on piling design
- Graving dock equipped with fish screens and/or nets
- Scheduled use of graving dock
- Avoid extensive shoreline filling
- Pave roads and vegetate open areas
- Appropriately sized retention basins
- Avoid extensive dredging
- Minimize component placement along shorelines and in shallow water
- Configuration avoidance of important habitat areas
- Perimeter berm/vegetative buffers
- Daytime scheduling of noisy operations
- Directed lighting to minimize glare
- Use of glass refractorless luminaires
- Allowance of public access to site property shoreline
- On-site safety measures
- Installation of aids to navigation
- Road or track rerouting
- On-site firefighting equipment
- On-site potable water supply
- On-site sewage treatment
- Allow fishing near piers where possible
- Allow recreational rights of way where possible
- Site survey by state approved professional archaeologist/historian

Mitigation Measures

- On-site habitat enhancement
- Off-site land purchase (habitat, recreation, etc.)
- Funding of wildlife management

Environmental damage can be greatly minimized by locating platform fabrication facilities in areas previously disturbed and of low habitat quality such as in areas that are already industrialized.

Figure 7.10

POTENTIAL IMPACT ISSUES / IMPACT AVOIDANCE MEASURES MATRIX

IMPACT AVOIDANCE MEASURES — SITING MEASURES

POTENTIAL IMPACT ISSUES	SITE IN INDUSTRIAL AREA	AVOID AREAS WHICH WOULD IMPACT WETLANDS OR OTHER CRITICAL HABITATS	RESTRICT SHORELINE SITING TO WATER DEPENDENT FACILITY COMPONENTS	SITE IN AREAS PREVIOUSLY DISTURBED OR WITH HABITAT QUALITY	AVOID NOISE SENSITIVE POPULATIONS	AVOID FLOODWAYS
EARTH						
CHANGES TO LOCAL TOPOGRAPHY	●			●		
SURFACE COMPACTION	●					
ALTERATION OF LONGSHORE TRANSPORT						
AIR						
ELEVATED DUST EMISSIONS						
EMISSIONS FROM SHIPS, TRAINS AND OTHER VEHICLES						
WATER						
MODIFICATION OF HYDROLOGIC REGIMES	●					●
ELEVATED LEVELS OF RUNOFF						
DEGRADATION OF ADJACENT SURFACE WATERS BY WINDBLOWN DUST		●	●			
INCREASED TURBIDITY DUE TO DREDGING/DISPOSAL						
FLORA AND FAUNA						
DEGRADATION OF ADJACENT WETLAND HABITAT	●	●		●		
DEGRADATION OF ADJACENT AQUATIC HABITAT	●	●	●	●		
DEGRADATION OF ADJACENT TERRESTRIAL HABITAT	●	●		●		
DISRUPTION OF CORRIDORS AND FISH MIGRATORY PATHWAYS						
RARE OR ENDANGERED SPECIES IMPACTS	●	●		●		
OTHER						
NOISE POLLUTION	●				●	
LIGHT AND GLARE GENERATION	●					
ALTERATION OF LAND USE DESIGNATIONS	●		●			
POTENTIAL FOR ONSITE ACCIDENTS						
POTENTIAL FOR SHIP ACCIDENTS						
TRAFFIC CONGESTION AT GRADE CROSSINGS						
INCREASED DEMAND FOR PUBLIC SERVICES	●					
INCREASED DEMAND FOR UTILITIES	●					
AESTHETIC IMPACT	●					
DISRUPTION OF RECREATIONAL/COMMERIAL FISHING						
DISRUPTION OF GENERAL RECREATIONAL ACTIVITIES	●					
ARCHAEOLOGICAL/HISTORICAL RESOURCE IMPACTS	●					
COMPETING USES FOR LAND AND SHORELINE	●		●			

DESIGN AND OPERATION MEASURES (part 1)

POTENTIAL IMPACT ISSUES	PIER ON PILING DESIGN	GRAVING DOCK EQUIPED WITH FISH SCREENS AND/OR NETS	SCHEDULED USE OF GRAVING DOCK	AVOID EXTENSIVE SHORELINE FILLING	PAVE ROADS AND VEGETATE OPEN AREAS	APPROPRIATELY SIZED RETENTION BASINS	AVOID EXTENSIVE DREDGING	MINIMIZE COMPONENT PLACEMENT ALONG SHORELINES AND IN SHALLOW WATER	CONFIGURATION AVOIDANCE OF IMPORTANT HABITAT AREAS	PERIMETER BERM/VEGETATIVE BUFFERS	DAYTIME SCHEDULING OF NOISY OPERATIONS	DIRECTED LIGHTING TO MINIMIZE GLARE	USE OF GLASS REFACTORLESS LUMINAIRES
EARTH													
CHANGES TO LOCAL TOPOGRAPHY													
SURFACE COMPACTION													
ALTERATION OF LONGSHORE TRANSPORT	●						●						
AIR													
ELEVATED DUST EMISSIONS					●								
EMISSIONS FROM SHIPS, TRAINS AND OTHER VEHICLES													
WATER													
MODIFICATION OF HYDROLOGIC REGIMES				●									
ELEVATED LEVELS OF RUNOFF						●							
DEGRADATION OF ADJACENT SURFACE WATERS BY WINDBLOWN DUST					●								
INCREASED TURBIDITY DUE TO DREDGING/DISPOSAL	●			●			●						
FLORA AND FAUNA													
DEGRADATION OF ADJACENT WETLAND HABITAT				●	●	●			●				
DEGRADATION OF ADJACENT AQUATIC HABITAT	●			●	●	●	●		●				
DEGRADATION OF ADJACENT TERRESTRIAL HABITAT					●	●			●				
DISRUPTION OF CORRIDORS AND FISH MIGRATORY PATHWAYS	●	●	●	●			●		●				
RARE OR ENDANGERED SPECIES IMPACTS				●	●	●			●				
OTHER													
NOISE POLLUTION										●	●		
LIGHT AND GLARE GENERATION										●		●	●
ALTERATION OF LAND USE DESIGNATIONS				●				●					
POTENTIAL FOR ONSITE ACCIDENTS													
POTENTIAL FOR SHIP ACCIDENTS													
TRAFFIC CONGESTION AT GRADE CROSSINGS													
INCREASED DEMAND FOR PUBLIC SERVICES													
INCREASED DEMAND FOR UTILITIES													
AESTHETIC IMPACT				●						●			
DISRUPTION OF RECREATIONAL/COMMERIAL FISHING	●	●	●	●		●	●						
DISRUPTION OF GENERAL RECREATIONAL ACTIVITIES			●	●	●								
ARCHAEOLOGICAL/HISTORICAL RESOURCE IMPACTS													
COMPETING USES FOR LAND AND SHORELINE			●	●				●					

DESIGN AND OPERATION MEASURES (part 2) and MITIGATION MEASURES

POTENTIAL IMPACT ISSUES	ALLOWANCE OF PUBLIC ACCESS TO SITE PROPERTY SHORELINE	ONSITE SAFETY MEASURES	INSTALLATION OF AIDS TO NAVIGATION	ROAD REROUTING	ONSITE FIREFIGHTING EQUIPMENT	ONSITE POTABLE WATER SUPPLY	ONSITE SEWAGE TREATMENT	ALLOW FISHING NEAR PIERS WHERE POSSIBLE	ALLOW RECREATIONAL RIGHTS-OF-WAY WHERE POSSIBLE	SITE SURVEY BY STATE APPROVED PROFESSIONAL ARCHAEOLOGIST HISTORIAN	MITIGATION MEASURES: ONSITE HABITAT ENHANCEMENT	OFFSITE LAND PURCHASE HABITAT, RECREATION, ETC.	FUNDING OF WILDLIFE MGM'T.
EARTH													
CHANGES TO LOCAL TOPOGRAPHY													
SURFACE COMPACTION													
ALTERATION OF LONGSHORE TRANSPORT													
AIR													
ELEVATED DUST EMISSIONS													
EMISSIONS FROM SHIPS, TRAINS AND OTHER VEHICLES													
WATER													
MODIFICATION OF HYDROLOGIC REGIMES													
ELEVATED LEVELS OF RUNOFF													
DEGRADATION OF ADJACENT SURFACE WATERS BY WINDBLOWN DUST												●	●
INCREASED TURBIDITY DUE TO DREDGING/DISPOSAL													
FLORA AND FAUNA													
DEGRADATION OF ADJACENT WETLAND HABITAT											●	●	●
DEGRADATION OF ADJACENT AQUATIC HABITAT											●	●	●
DEGRADATION OF ADJACENT TERRESTRIAL HABITAT											●	●	●
DISRUPTION OF CORRIDORS AND FISH MIGRATORY PATHWAYS											●	●	
RARE OR ENDANGERED SPECIES IMPACTS											●	●	●
OTHER													
NOISE POLLUTION													
LIGHT AND GLARE GENERATION													
ALTERATION OF LAND USE DESIGNATIONS													
POTENTIAL FOR ONSITE ACCIDENTS		●			●								
POTENTIAL FOR SHIP ACCIDENTS			●										
TRAFFIC CONGESTION AT GRADE CROSSINGS				●									
INCREASED DEMAND FOR PUBLIC SERVICES						●	●						
INCREASED DEMAND FOR UTILITIES						●	●						
AESTHETIC IMPACT													
DISRUPTION OF RECREATIONAL/COMMERIAL FISHING	●							●					
DISRUPTION OF GENERAL RECREATIONAL ACTIVITIES	●								●			●	
ARCHAEOLOGICAL/HISTORICAL RESOURCE IMPACTS										●			
COMPETING USES FOR LAND AND SHORELINE													

years about the rate at which wetlands are disappearing within the continental U.S. and about the impact of shoreline development on fisheries and shellfish habitat.

The importance of wetlands to the ecology of a region is well documented. Wetlands provide buffers from storms and flooding by absorbing excess water into the organic matrix which serves as substrate. Wetlands serve as hydrological reserves, where they slowly release stored water to ground and surface water reservoirs, which is important during times of drought. Wetlands can also filter out pollutants, such as suspended solid material, as water flows through the vegetation and organic matrix. Wetlands supply nutrients to marine and other aquatic habitats, enhancing productivity and serving as habitat, nursery grounds, and food sources for a large variety of plants and animals.

The Corps of Engineers has been given the mandate to protect wetlands and regulate certain construction activities within wetlands by virtue of Section 404 of the Clean Water Act. This would require a Section 404 (b)(1) analysis of alternatives before permitting work in a wetland.

Shoreline areas identified as prime fisheries and shellfish habitat should also be avoided, especially if considerable dredging and/or filling are possibilities. Areas of special concern are those habitats determined to be important for reproduction and juvenile rearing and feeding. Established salmon migratory routes should also be considered sensitive areas. Project sponsors, by working with the appropriate state and federal resource agencies to identify these sensitive environmental areas during the early stages of the siting process, would likely be able to minimize permit delay and rejection. In this regard, a project proponent would likely find it advantageous to maximize siting flexibility by considering more than one site, if possible. Of course, the alternative to this is to conduct a thorough site review before settling on a specific site.

Generally speaking, siting a facility in an established industrial area or in an area previously disturbed or of low habitat quality will greatly minimize problems related to permit issuance. A quick review of zoning and local shoreline management designation status would provide a preliminary indication of the appropriateness of a particular site.

Because of increased residential, recreational, and commercial development pressure on shorelines, it is preferable that only water dependent components of a facility be placed on a shoreline. Other nonwater dependent components of the facility could then be placed, preferably, at an upland location.

Improper siting on a floodplain can also present problems. Concerns here focus on the potential impact of a facility in raising flood waters above predevelopment levels. It is preferable, therefore, as with shorelines, that facilities locate on uplands or in areas where the potential for flooding is minimal.

Other potential environmental impacts that should be considered in the siting process include noise, light glare, and dust. Again, each of these potential impacts could be minimized or eliminated altogether by developing a comprehensive siting review process. For example, it would obviously not be desirable to locate a facility near a residential area where noise, lights, and dust would become issues of concern, yet this frequently does occur.

Design and Operation Measures

Combined with proper siting, various design and operation measures can further reduce potential environmental impacts associated with platform fabrication yard design and operation.

Graving Dock Design and Operation

Graving dock facilities, which would likely to required for various platform structures being considered for Alaska, should be designed and operated such that fish and other marine organisms are not injured, entrapped, or killed. This could possibly be achieved through the use of a screen or net system that could be activated when filling or emptying the graving dock. Any flooding and evacuation of the graving dock should be scheduled such that possible impacts on critical reproductive and associated migratory cycles are minimized. Appropriate state and federal resource agencies can be helpful in providing information concerning critical time periods for the various species involved.

Dredging and Filling

Facility designs requiring minimal filling and dredging (none preferably) are environmentally preferable. This is an obvious preference considering the fact that state and federal agencies place a great deal of importance on minimizing disturbances to natural habitats, especially those considered important to species propagation and enhancement.

Piers

Pier on piling designs are preferable and along some state shorelines are a required alternative to piers built by filling. Again, the reason for this is to minimize disturbance to the natural shoreline and to minimize interference with longshore sediment transport and other natural beach processes.

The design and operation measures discussed above are considered important. These measures, combined with those listed in Table 7.10 are meant to mitigate the following identified impacts.

- Disruption of fisheries, shellfish, and other critical habitat areas.
- Light and glare generation.
- Alteration of land use designations.
- Potential for on-site accidents.
- Potential for ship accidents.

- Traffic congestion at grade crossings.
- Increased demand for public services.
- Increased demand for utilities.
- Aesthetic impact.
- Disruption of recreational/commercial fishing.
- Disruption of general recreational activities.
- Archaeological/historical resource impacts.
- Competing uses for land and shoreline.

The relationship between these impacts and specific avoidance measures is illustrated in the matrix shown in Figure 7.10.

Mitigation Measures

Mitigation is a principle for reducing or compensating for unavoidable disruption to natural habitat. However, it may not be possible in certain instances to mitigate a particular impact if it is determined that that impact could not be effectively reduced or offset in any manner. When mitigation is considered, it involves a process of negotiation between federal, state, and local government entities and the developer. It can take a variety of forms, but generally includes one or more of the following considerations:

- On-site habitat enhancement or creation such as revegetation, restoration of filled and diked areas, and wetland formation. Another effective measure is redeposition of suitable sediments on riprap to allow rapid recolonization of food organisms utilized by juvenile salmonids.

- Off-site land purchase and dedication as wildlife habitat for a certain period of time or in perpetuity.

- Recreational land purchases.

- Establishing a fund for wildlife habitat management either in combination with off-site land purchase or on lands already utilized for wildlife habitat. This frequently takes the form of raising game birds, stocking fish, revegetating and restoring an area, or constructing fences.

Mitigation/Compensation: An Abbreviated Case Study

The following case study is presented as an example of the kind of mitigation considered for a platform fabrication facility currently being proposed. It should be emphasized that this is only an example and that mitigation must be considered on a case-by-case basis.

Brown and Root and Wright-Schuchart-Harbor in the fall of 1983 received the necessary permits to develop a platform construction facility at Eureka, California. Impact mitigation was a condition for permit issuance at this 45-acre site on Humboldt Bay, where steel platform jackets will likely be built to help supply anticipated oil and gas production platform needs for offshore California.

Mitigation at this site will involve the following:

1. Providing habitat protection for two low-lying areas on the property that are subject to flooding. These areas encompass slightly less than two acres. They will be fenced off and not utilized in any manner by the developers. Further, the developers have agreed to provide protective plantings and to screen these areas with plants.

   and. . .

2. Minimizing potential impacts on intertidal and subtidal habitat areas at the site. The developers have agreed to scale down their initial dredging plan from 9.25 acres to 2.85 acres. This measure will reduce the amount of critical intertidal area being affected from 3.25 to .85 acres. This reduction in the amount of acreage being dredged will be accomplished by construction of piled piers (over the intertidal zone) for use in unloading barges and loading completed platforms. In the original plan, the barges would have been brought directly to shore via the dredged channel.

   Additionally, the developers have agreed to compensate for loss of intertidal eelgrass and decreased subtidal productivity by planting two acres of eelgrass on nearby public tidelands that were previously denuded as a result of mechanical oyster harvesting.

APPENDIX A

SUMMARY OF OIL AND GAS RELATED MODULE CONSTRUCTION ACTIVITIES IN WASHINGTON STATE

An estimated 40-50 percent of all of the modular structures shipped to Alaska for use in oil and gas development have been built in Washington State.*/ Between 1975 and 1983 the state's largest oil and gas related module contractors, Snelson-Anvil (Anacortes) and Wright Schuchart Harbor Co. (Tacoma) shipped to Alaska 596 modular structures of various types weighing approximately 230,000 tons. Other smaller facilities, including Haskell Corporation (Port of Bellingham), Hoffman Construction (Columbia Industrial Park in Vancouver), and General Construction Co. and Wright Schuchart Harbor Co. (Seattle) together built 200 modules during this time period weighing in excess of 60,000 tons. Numerous other small companies in Western Washington such as Weldit Corporation in Bellingham have provided various components necessary for module construction. Following is a brief description of identified facilities building modules for use in oil and gas development and a summary of their construction activities, as well as a listing of other Washington firms contributing to module construction.

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*Larry Levorsen, President, Anvil Corporation, Bellingham, WA, June, 1983. Personal Communication.

ANACORTES, WASHINGTON

Location: West side of Fidalgo Bay
Site Owner: Snelson-Anvil, Inc.

Acreage: 60 acres developed, additional available
General Contractor: Snelson-Anvil Corp.
Employment: 1,500 peak 1976, average 400-450

Modular Construction Record

Year	Number of Modules	Module Types	Destination	Total Tonnage
1975/76	20	Oil and gas processing/ operations center	Prudhoe Bay, AK	13,000
1976/77	103	Ammonia Urea Plant	Kenai, AK	50,000
1978/79	9	Chevron Platform Grace top-side deck modules, i.e., living quarters, drilling, power generation, fresh-water processing, etc.	California, OCS	2,600
1980	27	Oil and gas processing/ operations center	Kuparuk Field, AK	4,800
1981	26	Oil and gas processing/ central production facility	Kuparuk Field, AK	11,000
1982	24	Oil and gas processing/ generators/compressors	Kuparuk field, AK	4,200
1983	24	Oil and gas processing	Kuparuk Field, AK	5,200
TOTAL	234		TOTAL	90,800

TACOMA, WASHINGTON

Location: Blair Waterway
Site Owner: Port of Tacoma

Acreage: 111 acres
General Contractor: Wright Schuchart Harbor Co.
Employment: 3,600 peak (1975-76), 400 average*

Modular Construction Record

Year	Number of Modules	Module Types	Destination	Total Tonnage
1975	78	Oil and Gas Processing	Prudhoe Bay, AK	26,165
1976	94	" " " "	" " "	22,000
1977	6	" " " "	" " "	2,950
1978	58	" " " "	" " "	24,000
1979	4	" " " "	" " "	3,800
1980	11	" " " "	" " "	2,400
1981	24	" " " "	" " "	13,400
1982	56	" " " "	" " "	17,650
1983	31	" " " "	" " "	22,600
TOTAL	362		TOTAL	134,965

(*) Port of Tacoma (Personal Communication)

BELLINGHAM, WASHINGTON

Location: Port of Bellingham
Site Owner: Haskell Corporation

Acreage: 10.3 acres
General Contractor: Haskell Corporation
Employment: 600 peak (1975), 100 average

Modular Construction Record

Year	Number of Modules	Module Types	Destination	Total Tonnage
1974	4	Central power station	Prudhoe Bay, AK	1,400
1975	44	Pipeline gathering center No. 1 & 2, flow stations No. 1 & 2, base camp and recreation center	Prudhoe Bay, AK	11,250
	2	Steam plant condensers	Valdez, AK	420
1976	6	Pipeline gathering center No. 3	Prudhoe Bay, AK	1,850
	4	Pump stations 1, 3, 4 & 8 metering skid	TAPS, AK	1
1982	12	Refinery crude unit skids	Fairbanks, AK	12
	1	Gas lift station	Prudhoe Bay, AK	1
1983	2	Pump stations 2 & 7 booster pump modules	TAPS, AK	2
TOTAL	76		TOTAL	15,795

VANCOUVER, WASHINGTON

Location: Columbia Industrial Park
Site Owner: Hayden Corporation, Portland, Oregon

Acreage: 20 acres - more available
General Contractor: Hoffman Construction
Employment: 250 peak, 150 average

Modular Construction Record

Year	Number of Modules	Module Types	Destination	Total Tonnage
1976/77	21	Processing modules	Prudhoe Bay, AK	7,350*

*Estimated

SEATTLE, WASHINGTON
SHIP CANAL

Location: Ewing Street
Site Owner: Wright Schuchart, Inc.

Acreage: 14 acres
General Contractor: Wright Schuchart Harbor Co.
Employment: 450 peak, 150 average

Modular Construction Record

Year	Number of Modules	Module Types	Destination	Total Tonnage
1974	5	Oil processing	Prudhoe Bay, AK	2,500
1975	11	Oil processing	Prudhoe Bay, AK	2,600
1976	6	Oil processing	Prudhoe Bay, AK	2,600
1977*				
TOTAL	22		TOTAL	7,700

* Moved operation after 1976

SEATTLE, WASHINGTON
DUWAMISH WATERWAY

Location: West Marginal Way
Site Owner: Wright Schuchart, Inc.

Acreage: 15 acres, max expansion 25 acres
General Contractor: General Construction Co. or
Wright Schuchart Harbor Co.
Employment: 650 peak, 150 average

Modular Construction Record

Year	Number of Modules	Module Types	Destination	Total Tonnage
1967-69	20	Offshore decks and modules	Cook Inlet, AK	8,000
1973	12	Housing and drill support	Prudhoe Bay, AK	3,900
1974-75	28	Oil processing	Prudhoe Bay, AK	12,100
1979	4	OCS California generation and control	Santa Barbara Channel, CA	1,800
1983	2	Transformer modules	Prudhoe Bay, AK	400
TOTAL	66		TOTAL	26,200

EVERETT, WASHINGTON
PORT OF EVERETT

Location: Norton Terminal
Site Owner: Port of Everett

Acreage: 29 used for modules, 70+ available
General Contractor: Wright Schuchart Harbor Co.
Employment: 250 peak, 100 average

Modular Construction Record

Year	Number of Modules	Module Types	Destination	Total Tonnage
1983	18	Drill site expansion	Prudhoe Bay, AK	2,780

WASHINGTON FIRMS CONTRIBUTING TO MODULE CONSTRUCTION

Acme Iron Works
2520 S. College
Seattle

Ace Tank & Equipment Co.
1124 Elliot W.
Seattle

Leckenby Co.
2745 11th S.W.

Union Tank Works
12065 - 44th Pl. S.

Maltby Tank and Barge
5500 S. First
Everett

Washington Iron Works
1500 Sixth S.
Seattle

P.S.F. Industries
65 S. Horton
Seattle

J. & E. Steel Fabricators
4612 - 148th N.E.
Redmond

Transco Northwest
1149 Andover Park W.
Seattle

Flohr Metal Fabricators
3920 - 6th N.W.
Seattle

Reliable Steel Fabricators
1218 W. Bay Drive
Olympia

American Boiler Works
1332 Norton
Everett

Olympic Machine & Welding Works
2420 Port of Tacoma Rd.
Tacoma

Streich Brothers
1650 Marine View Drive
Tacoma

Welk Bros. Metal Products
Airways Industrial Park
Spokane

National Blower Sheet Metal
1129 St. Paul
Tacoma

Thompson Metal Fab
2000 Columbia Way
Vancouver

Holaday-Parks
401 S. Webster
Seattle

Western Sheet Metal
325 N. Washington
Olympia

Alaskan Copper Works
3600 E. Marginal Way S.
Seattle

Weldit Corporation
201 Harris
Bellingham

APPENDIX B

FAR EASTERN PLATFORM FABRICATION/ASSEMBLY OPERATORS

Mitsui Engineering and Ship Building Company
711 West 6th St. Suite 2190
Los Angeles, CA 90017
Contact: Mr. Maeshima, Senior Vice President
(213) 628-5330

Hyundai Corp USA
1660 Geary Blvd.
San Francisco, CA 94115
Contact: Mr. Kang I. Lee, Mgr.
(415) 921-8969

IHI Incorp.
111 Pine St., Suite 700
San Francisco, CA 94111
Attn: Mr. Kominami, Gen. Mgr.
(415) 986-2262

Kawasaki Steel Corp.
c/o C. Itoh & Company
One Maritime Plaza
San Francisco, CA 94111
Attn: T. Kohiyama
(415) 391-2510

NKK America Inc.
444 S. Flower St. Suite 2430
Los Angeles, CA 90017
Attn: T. Yamamoto, Exec. VP & Gen. Mgr
No phone number
Contact: Div. Mitsuibishi Intl.
50 California St. Suite 3000
San Francisco, CA 94111
Mr. Ted Sakai

Mitsuibishi Heavy Industries, Inc.
Two Houston Center, Suite 3800
Houston, TX 77010
Attn: Mr. Sasago
(713) 654-4474

Hitachi Ship Building Corp.
c/o Nissho-Iwai American Corporation
Broadway Plaza, 700 Flower Street, Suite 1900
Los Angeles, CA 90017
Attn: Mr. Max Maeda, Steel Dept.
No phone number

Nippon Steel Corp.
Civin Engineering and Marine Construction Div.
6-3 Otemachi 2-Chome-Chiyoda KU
Tokyo, 100 Japan
Attn: Mr. Hisashi Nakazawa, Mgr. Intl. Projects Office
Contact: (American) Mitsui & Company USA Inc.
One California St. Suite 3000
San Francisco, CA 94111
Steve Johnson
(415) 765-1179

Daewoo Shipbuilding & Heavy Machinery Ltd.
201 California Street Suite 590
San Francisco, CA 94111
Attn: Mr. C. H. Kim
(415) 788-5555

APPENDIX C

DEPARTMENT OF ECOLOGY AND COUNTY SEPA COORDINATORS

(Names, Addresses, and Telephone Numbers)

INFORMATION SOURCES

Any one of the nearest Department of Ecology or county offices listed below can provide you with information on permit applications.

Department of Ecology

Northwest Regional Office
4350 150th Avenue N.E.
Redmond, WA 98052
(206) 885-1900

Southwest Regional Office
7272 Cleanwater Lane
Mail Stop LU-11
Tumwater, WA 98504
(206) 753-2970

DOE Headquarters
Environmental Review Section
Mail Stop PV-11
Olympia, WA 98504
(206) 459-6237

County

Clallam County
Clallam Co. Planning Dept.
223 East Fourth Street
Port Angeles, WA 98362
(206) 452-7831

Clark County
Regional Planning Council
of Clark County
1408 Franklin
P.O. Box 5000
Vancouver, WA 98663
(206) 699-2361

Cowlitz County
Cowlitz Co. Dept. of
Community Development
207 Fourth Ave. N.
Kelso, WA 98626
(206) 577-3052

Mason County
Mason Regional Planning Council
P.O. Box 186
Shelton, WA 98584
(206) 426-5593

Pacific County
P.O. Box 66
South Bend, WA 98586
(206) 875-6541

Pierce County
Pierce County Planning Dept.
County-City Building
Room 732
Tacoma, WA 98402
(206) 593-4426

Grays Harbor County
Planning Department
P.O. Box 390
Courthouse Annex Bldg.
Montesano, WA 98563
(206) 249-5579

Island County
Island Co. Planning Dept.
P.O. Box 698
Coupeville, WA 98239
(206) 678-5111

Jefferson County
Planning Department
Courthouse
Port Townsend, WA 98368
(206) 385-1427

King County
Building & Land Dev. Div.
450 King County Admin. Bldg.
Seattle, WA 98104
(206) 344-7900

Kitsap County
Community Development
614 Division Street
Port Orchard, WA 98366
(206) 876-7152

San Juan County
San Juan Co. Planning Department
P.O. Box 947
Friday Harbor, WA 98250
(206) 378-2354

Skagit County
Skagit Co. Planning Dept.
New County Admin. Bldg.
120 W. Kincaid St.
Mt. Vernon, WA 98273
(206) 336-9333

Snohomish County
Snohomish County Planning Dept.
County Admin. Bldg.
Everett, WA 98201
(206) 259-9311

Thurston County
Thurston County Regional
Planning Council
Olympia, WA 98502

Wahkiakum County
Wahkiakum County Permit Coordinator
Courthouse
Cathlamet, WA 98612
(206) 795-3543

Whatcom County
Bureau of Building &
Code Administration
410 Grand Avenue
Bellingham, WA 98225
(206) 676-6907

APPENDIX D

WESTERN WASHINGTON AIR POLLUTION CONTROL AUTHORITIES

AIR POLLUTION CONTROL AUTHORITIES

The map on page 4-10 shows the jurisdictional areas of the below listed air pollution control authorities.

Northwest Air Pollution Authority
207 Pioneer Bldg. Second & Pine
Mount Vernon, WA 98273
(206) 336-5705

Puget Sound Air Pollution Control Agency
410 West Harrison Street
Seattle, WA 98119
(206) 344-7330

Olympic Air Pollution Control Authority
120 East State Street
Olympia, WA 98501
(206) 352-4881

Southwest Air Pollution Control Authority
Northeast Hazeldell Avenue
Suite 7601 H
Vancouver, WA 98665
(206) 696-2508

APPENDIX E

EMISSION FACTORS FOR HEAVY-DUTY DIESEL-POWERED CONSTRUCTION EQUIPMENT

Equipment	Carbon monoxide		Exhaust hydrocarbons		Nitrogen oxides		Aldehydes		Sulfur oxides		Particulates	
	lb/hr	lb/1000 gallons	lb/hr	lb/1000 gallons	lb/hr	lb/1000 gallons	lb/hr	lb/1000 gallons	lb/hr	lb/1000 gallons	lb/hr	lb/1000 gallons
Tracklaying tractor	0.386	87.5	0.110	25.1	1.47	332.0	0.027	6.22	0.137	31.1	0.112	25.3
Wheeled tractor	2.15	161.0	0.148	50.9	0.994	342.0	0.030	10.3	0.090	31.1	0.136	46.5
Wheeled dozer	0.739	65.9	0.234	20.7	5.05	450.0	0.065	5.76	0.348	31.2	0.165	14.8
Scraper	1.46	98.3	0.626	42.2	6.22	419.0	0.143	9.69	0.463	31.2	0.406	27.3
Motor grader	0.215	78.0	0.054	17.4	1.05	374.0	0.012	4.31	0.086	31.1	0.061	22.2
Wheeled loader	0.553	95.4	0.187	32.3	2.40	408.0	0.041	7.17	0.182	31.2	0.172	29.3
Tracklaying loader	0.160	65.9	0.032	13.2	0.584	240.0	0.009	3.66	0.076	31.2	0.058	24.0
Off-highway truck	1.34	92.2	0.437	30.0	7.63	524.0	0.112	7.74	0.454	31.2	0.256	17.7
Roller	0.184	114.0	0.054	24.3	1.04	488.0	0.016	6.10	0.067	31.1	0.050	24.2
Miscellaneous	0.414	94.2	0.157	34.7	2.27	494.0	0.031	6.78	0.143	31.1	0.139	30.1

Source: "Heavy-Duty Construction Equipment" in Compilation of Air Pollutant Emission Factors, 2nd ed., U.S. EPA, 1976, pp. 3.2.7-2 and 3.2.7-3.

EMISSION FACTORS FOR HEAVY-DUTY
GASOLINE-POWERED CONSTRUCTION EQUIPMENT

Equipment	Carbon monoxide		Exhaust hydrocarbons		Evaporative hydrocarbons	Crankcase hydrocarbons	Nitrogen oxides		Aldehydes		Sulfur oxides		Particulates	
	lb/hr	lb/1000 gallons	lb/hr	lb/1000 gallons	lb/hr	lb/hr	lb/hr	lb/1000 gallons	lb/hr	lb/1000 gallons	lb/hr	lb/1000 gallons	lb/hr	lb/1000 gallons
Wheeled tractor	9.52	3250.0	0.362	122.0	0.0681	0.0719	0.430	146.0	0.0176	5.82	0.0155	5.20	0.024	8.27
Motor grader	12.1	3910.0	0.410	132.0	0.0661	0.0818	0.320	102.0	0.0194	6.02	0.0167	5.31	0.0207	6.86
Wheeled loader	15.6	3630.0	0.531	124.0	0.0655	0.106	0.518	121.0	0.0213	4.95	0.0234	5.31	0.0298	7.0
Roller	13.4	3840.0	0.611	176.0	0.0622	0.122	0.362	100.0	0.0167	4.86	0.0185	5.28	0.026	7.47
Misc.	17.0	3960.0	0.560	130.0	0.0560	0.112	0.412	95.8	0.0198	4.44	0.0234	5.28	0.0258	6.06

Source: "Heavy-Duty Construction Equipment" in Compilation of Air Pollutant Emission Factors, 2nd edition, U.S. EPA, 1976, pp. 3.2.7-4 and 3.2.7-5.

APPENDIX F

SUMMARY OF IMPACTS OF POLLUTANTS CONTAINED IN EFFLUENTS OF OCS RELATED FACILITIES

HYDROCARBONS (in crude oils and petroleum products)

- Human illness after ingestion of contaminated seafood
- Toxicity to many forms of marine fauna (particularly free-floating juvenile forms)
- Illness after ingestion, and interference with feather function in birds
- Adverse effects on photosynthesis and growth in marine plants
- Reduced flowering and seed germination in marine plants
- Selective inhibition of species in marine plants

HEAVY METALS

- May be essential or nonharmful in minute concentrations, but are lethal to humans, animals, and plants in excessive doses.
- May build up to toxic levels in animal and human tissues

AMMONIA

- Alters pH of receiving water
- Toxic to pH-sensitive organisms
- Increases plant growth

SUSPENDED SOLIDS

- Reduction in photosynthesis due to increase in turbidity
- Blanketing of stream bottom, lethal to eggs and young of fish
- Increase in substrates on bottom for bacterial decay

ANTI-FOULING ADDITIVES

- Affect organisms in receiving water in manner of prescribed usage (e.g., algicide, bactericide, fungicide)

THERMAL DISCHARGES

- Increases metabolic rate
- Increases bacterial growth rates
- Alters animal behavior, including feeding, spawning, migration, and predator-prey relationships
- Decreases solubility of gases in water
- Increases solubility of metallic compounds
- Increases rates of chemical reactions
- Increases chemical toxicity

GLOSSARY

Assembly Facility - A facility where prefabricated components are assembled to form a final platform structure. Typically, an assembly yard is much smaller in size than a fabrication yard, ranging between 20 and 100 acres.

Caisson Platform - A variety of caisson designs are being considered by industry for exploration and production in the Arctic environment. Several designs would arrange a series of on-bottom steel or concrete caissons ringing infilled gravel.

Concrete Production Island - A type of concrete caisson gravity structure being considered for production in water depths ranging between 40 and 180 feet in Alaska's Norton Sound and Beaufort Sea.

Drilling Rig - Equipment used for drilling an oil or gas well.

Drill Ship - A self-propelled, self contained vessel equipped with a derrick amidships for drilling wells in deep water.

Exploration Rigs - Semisubmersibles, jack-ups, and drill ships are used for exploratory drilling in offshore waters.

Fabrication Facility - A facility where platform components are constructed for subsequent final assembly either at the same location or elsewhere.

Gravel Island - A man-made gravel island built for shallow water exploration and production in the Alaskan Arctic. Cost would likely limit water depth to between 40 feet and 60 feet.

Graving Dock - A work facility, the floor of which lies below sea level. A graving dock is generally required to build gravity platform structures self-floating steel jackets, and semisubmersibles.

Gravity Platform - A steel or concrete drilling platform used for production or exploration that is held in place by its own weight.

Guyed Tower - A production platform consisting of a relatively slender column with a constant cross-section from top to bottom. The tower is held in place by a number of guylines extending radially from the top of the tower to clump weights run along the sea floor to anchors.

Jack-up - A bargelike, floating platform with legs at each corner that can be lowered to the sea bottom to raise the platform above the water (used for oil and gas exploration).

Marine Launchways - Also called a skidway or marine ways . . . refers to the supporting structure upon which a completed steel jacket is skidded onto a waiting barge.

Mineral Management Service - A branch of the U.S. Department of Interior responsible for all functions carried out previously by the former Conservation Division of the U.S. Geological Survey (USGS). Also responsible for Outer Continental Shelf program support activities, including functions of the Office of OCS Program Coordination; all functions related to the management of offshore energy and minerals administered by the Bureau of Land Management (BLM); all functions that support the OCS program in the Geologic Division and resource programs of the USGS; oil spill trajectory analysis functions of the Office of Earth Science Applications, USGS; all functions of the Office of Policy Analysis relating to scheduling the sale of leases of OCS lands; and all functions relating to the OCS program transferred from the Department of Energy.

Module - An assembly that is functional as a unit and can be joined with other units for increasing or enlarging the function; for example, drilling and compressor modules on the deck of an offshore production platform.

Monopod - Exxon has proposed a pile-founded steel monopod with cone producton platform. This structure would consist of a cylindrical steel tower with a cone attached at the water line to deflect ice. The square base, also consisting of large steel cylinders would be nailed to the sea floor.

Monotower - A concrete gravity production platform proven in North Sea operations. This platform type consists of a concrete base (capable of oil storage) and a large concrete tower that extends upward from the sea floor. The platform operations modules are attached to the top of the tower.

OCS Planning Area - A planning area is a broad, geographic designation used by the Mineral Management Service in the early stages of the OCS leasing process. There are currently seven planning areas off the contiguous United States and 15 off Alaska. These planning areas are drawn roughly according to geologic boundaries.

Outer Continental Shelf (OCS) - All submerged lands that compromise the continental margin adjacent to the United States and seaward of state offshore lands. The OCS has been subject to federal jurisdiction and control since enactment of the Submerged Lands Act of 1953 (43 U.S.C. 1301 and 1302).

Production Platform - A steel or concrete structure from which offshore wells are drilled and oil and gas extracted.

Rig Yard - A term sometimes used to describe a facility engaged in the fabrication and/or assembly of offshore platforms.

Rolling Mill - A facility where plate steel is rolled into tubular components for use in constructing steel jacket platform structures.

Semisubmersible - A twin hulled, self-propelled, floating drilling structure used for oil and gas exploration. This structure provides a relatively stable drilling platform that can function under severe sea and weather conditions. The semisubmersible is capable of drilling in water depths of 2,000 feet.

Slip Form - A technique used in building concrete gravity platforms wherein concrete walls are built by moving the forms upward incrementally after a pour has hardened.

Steel Jacket - A supporting structure for an offshore platform consisting of large-diameter pipe welded together with pipe braces to form a multi-legged stool-like structure. The jacket is secured to the ocean floor by pilings driven through the legs. The multilegged platform is then fitted onto the jacket and secured.

TAPS - Trans Alaska Pipeline System - Oil pipeline which extends from Prudhoe Bay to Valdez, Alaska.

Tension Leg Platform - A large semisubmersible-like production platform with a mooring system consisting of wire rope or steel tube tethers extending from the corners of the platform to pile or gravity anchors on the sea floor.