

HD1683.V8M3 FY1991 1992

MASTER DRAINAGE PLAN UPDATE,

CITY OF POQUOSON, VIRGINIA

JULY 1992

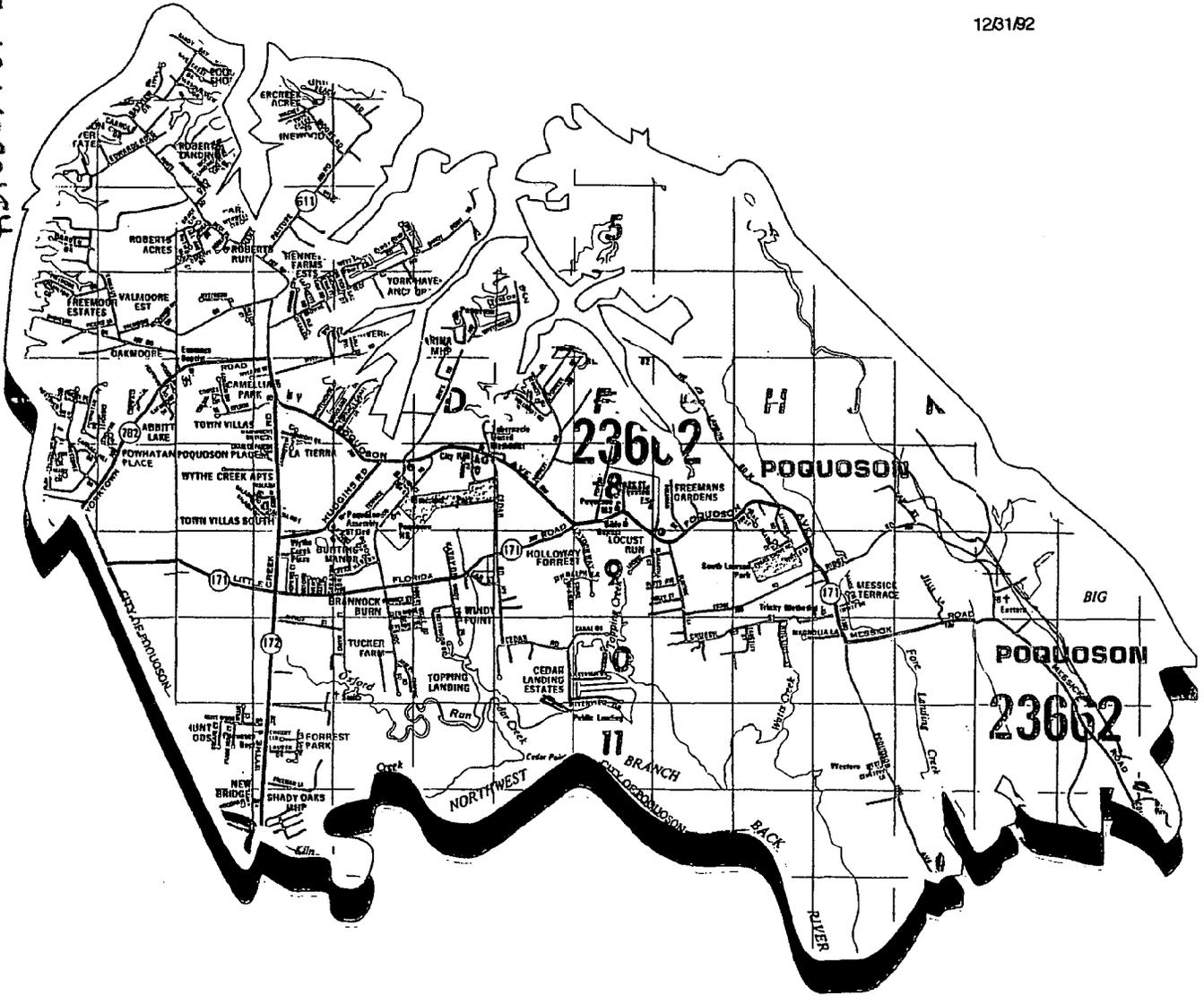
FY '91

Task 66

Final Product

VA Coastal Resources Mgt. Program

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C.K. TUDOR ENGINEERS, INC.
11524 JEFFERSON AVENUE
NEWPORT NEWS, VIRGINIA 23601

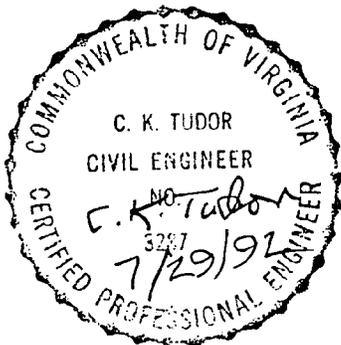
MASTER DRAINAGE PLAN UPDATE

CITY OF POQUOSON, VIRGINIA

JULY 1992

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CITY OF POQUOSON, VIRGINIA
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SUMMARY

Poquoson at this time has no major drainage problems such as are faced by most cities because of several factors; division of the City into small watersheds (excepting the Big Woods), low intensity of development and flat topography. The small watersheds limit the amount of runoff that is concentrated at any one point. The low density of development provides more surface for absorption of rainfall. The flat topography causes a slow rate of runoff providing more time for absorption, a high time of concentration, and a large area for retention for each increment of water level rise. Although there is at times rain water standing longer than residents might wish very little damage to property results from meteoric water. Tidal flooding is the biggest cause of flooding damage.

To provide adequate outfalls together with adequate access easements for all areas would require an estimated \$637,445.00 (see pages BC-6 and C-1). In the fully developed areas \$408,035.00 would necessarily be borne by the City alone. In the undeveloped areas significant shares of the cost could be borne by the developers.

Drainage requirements of the Big Woods have not changed significantly since 1986. The existing system is adequate for the present state of development. Further development will require improving the capacity of the system most likely by a storm water detention or retention system either by a public body or piecemeal as individual parcels are developed.

INTRODUCTION

This study was authorized by the City Council resolution dated October 28, 1991 and is paid for in part (50%) under a grant from the Virginia Coastal Resources Management Program (VCRMP). The purpose is to update and expand the existing Master Drainage Plan. The original Master Drainage Plan which covered approximately 30% of Poquoson was prepared in 1975 and was supplemented in 1986 by the Big Woods Drainage Study and later by studies of other watersheds (Odd Road, Little Florida Road, etc.). With this study all drainage systems have been inventoried and all major systems have been analyzed and preliminary improvement designs made where needed.

METHODOLOGY

This study has two principal parts: First, an Update Inventory of Structures and Improvements. This part consists of city-wide location and identification of all drainage structures (pipes, culverts, inlets, etc.) and ditches. Functionality or dysfunctionality and physical condition is noted where feasible. The topography sheets prepared by Air Survey & Design, Inc. in 1985 are the base sheets for this study. The Update Inventory information includes all the base sheets. The Proposed Systems include only those sheets where new proposals are located.

All elements in the existing systems were visited by field personnel; dimensions were measured and elevations taken. Insofar as practical, conditions of the structures were noted. However, in many instances the blockages and/or siltation made exposure of the structures impractical for personnel access without excavation equipment. In a few cases access to private property for purpose of this study was denied by the property owner despite appeals by the City staff.

There are some structures in the City that no longer function as originally intended because of subsequent development and improvements. Pipes have been abandoned in place and ditches have become clogged with vegetation and/or silt.

The second part of the study is the Proposed Drainage Systems which includes all significant watersheds not included in the 1975 study or otherwise fully developed.

The principal design assumption is that undeveloped areas will be developed in accordance with current zoning except the Big Woods area. Development of the Big Woods was assumed to be according to the Zuchelli-Hunter study of 1985. However, using current zoning would not materially affect the results. Design calculations for all areas were made by the Rational Method again except for the Big Woods area in which SCS methods were used.

No attempt was made to design the drainage in undeveloped areas since there is no way to anticipate the timing or configuration of such development. Rather, the structures designed are where the outfall from present or future developed areas cross City Rights-of-Way

and the ditches designed are the outfall from these structures.

These designs should serve to indicate to the City the outfall requirements when developments are proposed or when replacement of existing structures is necessary for whatever reason. In several locations two or more watersheds or parts of watersheds could conceivably be combined depending upon the sequence of development.

Costs from the proposals in this study have been tabulated and the costs from the 1975 and 1986 studies have been updated to current prices. Eliminated from these costs are the access roads proposed in the 1975 study since this idea had apparently not found any acceptance.

On pages BC-1 through BC-5 costs for improvements proposed in this study are tabulated. Included in these costs are some items which are not necessary to drain City Rights-of-Way but which would be necessary for development of an upstream area. In undeveloped areas creation of on-site detention or retention ponds may be an option for private citizens. This would not generally be an option for the City due to space requirements.

On pages C-1 and BC-5 are summarized the costs from the 1975-1986 and 1992 studies respectively which have been adjusted to subtract any on-site costs which might be for private development. Nevertheless, any improvements in public right-of-way or outfall are sized to accommodate up-stream development.

ENVIRONMENTAL CONCERNS

Environmental requirements effecting improvements such as proposed

in this report are addressed by the following applicable ordinances:

Site Plan Ordinance

Subdivision Ordinance

Erosion and Sedimentation Control Ordinance, Sect. 2.3(4)

Chesapeake Bay Preservation Ordinance

Each of these ordinances incorporates requirements for storm water management with the Chesapeake Bay Preservation Ordinance Overlay overriding most other requirements. No additional legislation would be required at this time.

BIG WOODS

The drainage for the Big Woods is adequate for the area as now developed (9%±) but has very little excess capacity. The 1986 study estimated a cost of close to \$3,000,000.00 to purchase the land and construct the combination of ditches and detention ponds that would be required for full development as envisioned by the Zuchelli-Hunter study. Future development without greatly enlarging the present system could require on-site detention by each individual development. At the time of the 1975 drainage study the Big Woods basin was estimated at 467 acres. Approximately 121 acres was added to the system with the extension of a ditch to Cary's Chapel Road in York County. The 1986 study assumed the inclusion of additional acreage as covered by the Zuchelli-Hunter development study giving a total of about 665 acres. Two subsequent development projects; Wythe Creek Plaza

Shopping Center and Bayside Convalescent Center have had some small effect on the basin. Wythe Creek Plaza increased the rate of runoff in the area developed (5 acres) but mitigated the effect on the system by enlargement of the north side ditch on Victory Boulevard and installation of an additional 36" pipe across Victory Boulevard.

The drainage system constructed for Bayside Convalescent Center probably has the long term effect of diverting about 16 acres from the Big Woods system.

**BASIN "A" - NORTH PASTURE ROAD
SHEET 2**

Basin "A" takes in a total of 18.4 Ac.± of largely undeveloped land, 14 Ac. from west of Pasture Road through an existing 15" culvert under Pasture Road and through a ditch to Lyons Creek.

The existing 15" pipe is inadequate for a developed basin due to its lack of capacity and elevation to extend its reach to the upper portions of the basin.

Proposed improvements would consist of replacing the 15" pipe with a 30" RCP across Pasture Road into a manhole, then 2 runs of 36" RCP to a point past the garage on the adjoining property. From the pipe, regrade and reshape 260'± of existing ditch at B=4, Z=1 to a cove of Lyons Creek.

An existing 10' easement runs down the south side of the existing ditch. An additional 10' strip should be acquired on the north side until the end of the pipe, then a 15' strip additional on the north side down to the cove.

Estimated Cost of Improvements - \$18,614.00

**BASIN "B" - NORTH DARDEN DRIVE
SHEET 4**

Basin "B" covers 15.6 Ac.± with 75% being undeveloped land. Current drainage is through a ditch on the east side of Emmaus Road into a 24" piping system, crossing Emmaus Road, which discharges into a paved ditch which flows into Lambs Creek.

Development in the upstream basin would require replacing the existing 24" system with a 27" system. The outfall ditch into Lambs Creek is adequate and will require no improvements other than to remove a section of 24" pipe at the extreme downstream end. Both the ditch and piping system are covered by easements and no additional easements are required.

Estimated Cost of Improvements - \$16,972.00

Alternative - As an alternative drainage system, all the area east of Emmaus Road in the north and south Darden Drive and Freemoor Drive basins could be combined and drained through only one outfall.

**BASIN "C" - SOUTH DARDEN DRIVE
SHEET 4**

Basin "C" is comprised of 16.2 Ac. approximately half of which is undeveloped land. Runoff is carried through a ditch into a piping system crossing Emmaus Road into a paved ditch leading into Lambs Creek.

The existing piping system is inadequate to handle increased flows from a developed basin. The existing 18" and 24" system should be replaced with a 27" and 30" system. The existing paved outfall ditch is adequate and no improvements are proposed.

The outfall ditch is covered by a 20' easement and the first run of pipe on the east side of Emmaus Road is covered by a 10' easement. The 10' easement should be increased to 15' and a 15' easement should be acquired to cover the remainder of the piping system.

Estimated Cost of Improvements - \$30,058.00

Alternative - As an alternative drainage system, all the area east of Emmaus Road in the north and south Darden Drive and Freemoor Drive basins could be combined and drained through only one outfall.

**BASIN "D" - FREEMOOR DRIVE
SHEET 4**

Basin "D" encompasses 20.4 Ac. approximately half of which is developed. Existing drainage consists of a ditch on the east side of Emmaus Road, draining to a yard drain with 18" pipe. The yard drain drains to a 18" culvert under Emmaus Road into a ditch at the rear of Freemoor Estates. Runoff then enters a 24" piping system across Freemoor Drive and into a branch of Lambs Creek.

For total development in this basin the existing system is inadequate. The 18" system should be replaced with a 24" and 27" system crossing Emmaus Road. The proposed system is lowered to provide reach into the upper basin. The existing ditch beside Freemoor Estates should be regraded to match the inverts between the piping systems. The 24" piping system across Freemoor Drive should be replaced with a 30" and 36" system.

An existing 10' easement covers the pipe and ditch at Freemoor Estates. There is no easement for drainage on the east side of Emmaus Road. An additional 10' easement would be required for the ditch for maintenance and 15' easements for the piping system east of Emmaus Road.

Estimated Cost of Improvements - \$44,039.00

Alternative - As an alternative drainage system, all the area east of Emmaus Road in the north and south Darden Drive and Freemoor Drive basins could be combined and drained through only one outfall.

**BASIN "E" - SOUTH EMMAUS ROAD
SHEET 4**

Basin "E" covers an area of 36.9 Ac.± of private, largely undeveloped land with 7.6 Ac. north of Emmaus Road draining through an 18" culvert under Emmaus Road and into an outfall ditch to Lambs Creek.

In a developed state, the 18" culvert under Emmaus Road is inadequate to carry the runoff. Proposed improvements would include replacing the 18" pipe with a 19"x30" culvert, lowered enough to provide the reach for the upper areas of the basin and to provide cover for the pipe.

The outfall ditch would require regrading and reshaping to B=2, Z=1 at .0035 ft/ft. A 25' drainage and maintenance easement would be required from the Emmaus Road culvert to the end of the outfall ditch.

Estimated Cost of Improvements - \$31,275.00

**BASIN "F" - NORTH POWHATAN DRIVE
SHEET 8**

Basin "F" encompasses 47.4 Ac.± of private land, a majority of which is undeveloped. Runoff drains through a ditch at the north side of Westover Shores/Powhatan Place subdivision and into a 24" piping system across the front of the pumping station at the end of Westover Drive and into an arm of Lambs Creek.

In order to convey runoff from a fully developed basin, the 24" pipes would have to be replaced with 42" pipes at least as far as the current piping system. Upstream improvements might include

an extended piping system or a drainage ditch (B=2, Z=1) to some point in the upper reaches of the basin.

There is an existing 15' easement along Powhatan Place and Westover Shores but any additional easement requirements will have to be determined based on the future drainage design.

Estimated Cost of Improvements - \$8067.00

**BASIN "G" - SOUTH YORKTOWN ROAD
SHEET 8**

Basin "G" consists of 15.8 Ac. of mostly undeveloped land. Runoff from 7.9 Ac. east of Yorktown Road is carried through a 24" culvert into a drainage ditch that connects to the Westover Shores ditch.

With the development of Bayside Convalescent Center, a large portion of the area that previously drained to the 24" culvert was diverted to the Westover ditch through Bayside's drainage system. The 24" culvert is adequate to handle the flow from the remainder of the basin, however 950' of ditch from the culvert to the Westover ditch should be cleaned, widened, and regraded. A 20' easement is required.

Estimated Cost of Improvements - \$15,086.00

**BASIN "H" - NORTH ROBERTS ACRES
SHEET 5**

Basin "H" is comprised of 30.8 Ac.± of which 2/3 is already developed (Roberts Acres). The basin is drained through a ditch on the north side of Roberts Acres into a 30" culvert across Hunts Neck Road and out into Roberts Creek. To accommodate increased flows from the remainder of this basin being developed would require the replacement of the 30" culvert with a 36" culvert at the same grade and elevation or reinforcing the existing culvert with a 21" pipe.

The existing outfall ditch to Roberts Creek is adequate for increased flows but rip-rap is required at the outfall pipe.

A variable width drainage easement is in existence on the Roberts Landing side of the outfall ditch. An additional 15' easement is required on the east side of Roberts Landing down to Roberts Creek.

Estimated Cost of Improvements - \$7,022.00

**BASIN "I" - SOUTH ROBERTS ACRES
SHEET 5**

Basin "I" encompasses an area of 56.5 Ac.±, of which approximately half is undeveloped land. The runoff from this basin currently flows through a ditch running along the south side of Roberts Acres, through a 24"x53" pipe across Hunts Neck Road and through a ditch into Roberts Creek.

The 24"x53" pipe at Hunts Neck Road is inadequate to handle the runoff from a totally developed basin. Improvements would necessitate replacement of the existing pipe with a 38"x60" HERCP, lowered enough to give cover and not conflict with the existing sanitary sewer. The outfall ditch northeast of Hunts Neck Road requires regrading and widening from the 38"x60" to Roberts Creek.

A 25' easement is required for drainage and maintenance on the outfall ditch.

Estimated Cost of Improvements - \$24,386.00

**BASIN "J" - WAINWRIGHT DRIVE EXTENSION
SHEET 9**

Basin "J" encompasses 24.6 Ac. of largely undeveloped land to the southwest of Poquoson Avenue and northwest of Hudgins Road. Current drainage is by way of a small ditch running from Islander Way to a 24" piping system crossing Poquoson Avenue and out to a canal into White House Cove.

Development in this basin would require replacing the existing piping with a 29"x45" pipe across Poquoson Avenue lowered to provide cover, then a 36" outfall pipe to the canal.

The outfall pipe to the canal is currently without an easement and will require a 15' easement.

Estimated Cost of Improvements - \$17,057.00

**BASIN "K" - ALPHUS STREET
SHEET 14**

Basin "K" totals 36.5 Ac.± currently draining from Little Florida Road south to Alphus Road, through a 24" culvert then through a ditch south to Oxford Run.

The Alphus Road system was previously studied in 1975, but since then drainage installed in the Poquoson Shopping Center and by VDOT have eliminated the need for any drainage to cross Little Florida Road.

In order to drain sections of Little Florida Road between Smith Street and Wythe Creek Road, an existing ditch running to Alphus Street would require lowering and reshaping at B=1, Z=1, then a piping system as shown on the previous study, with the exception of 36" pipe in place of 48" pipe would be required to cross Alphus Road. The outfall ditch from Alphus Street to Oxford Run would require regrading and widening to B=4, Z=1. A 25' easement would be required the length of the proposed ditches for drainage and maintenance.

Estimated Cost of Improvements - \$55,833.00

**BASIN "L" - CEDAR ROAD/LITTLE FLORIDA ROAD
SHEET 15**

Basin "L" encompasses an area of 74 Ac.± which presently drains across Little Florida Road from the north through an 18" RCP and a 12" RCP, southward to dual 24" RCPs under Cedar Road.

Development in this area would require the replacement of the dual 24" RCPs at the outfall with a single 54" RCP and lowering the invert in order to reach the upper limits of this basin. The existing drainage ditch along the first 650'± upstream of Cedar Road is adequate but would need to be deepened. There are 2-36" RCPs along this route that need to be lowered to increase reach. Enlarging the existing ditch section would be required from these pipes northward to Little Florida Road where the 18" RCP would be replaced by a 36" RCP and the 12" RCP would be replaced by an 18" RCP. The sanitary sewer at Cedar Road is deep and does not present a problem. There is an 18" sanitary sewer force main along Little Florida Road which may need relocation below the proposed 36" RCP.

Waterlines along both routes may need adjustment to allow for increased pipe sizes.

A 25' easement along the ditch north of the dual 36" pipes and a 40' easement along the ditch south of the pipes is recommended.

Estimated Cost of Improvements - \$88,880.00

Alternative - Development in Basins "M" and "L" lend themselves to a number of alternative drainage configurations. The area of Basin "L" north of Little Florida Road could be drained along Little Florida Road westward to the ditch at Far Street. The upper portion of Basin "M" could be combined with the lower portion of Basin "L" and drained southward to the existing large canal at Cedar Road.

**BASIN "M" - CEDAR ROAD
SHEET 15**

Basin "M" drains a 30 acre watershed of undeveloped land which presently drains across Cedar Road in a single 18" pipe. This pipe is inadequate even for the present drainage situation. Replacement of the 18" RCP with 2-36" RCPs and lowering the invert is proposed. Regrading of approximately 200' of outfall ditch to the west of Cedar Road is required.

Existing sanitary sewer at this location limits the use of a single larger pipe. Installation of the 36" pipe will require an increase in the height of the road to provide sufficient cover over the pipes. Use of HERCP pipe could reduce this requirement.

A 4" sanitary sewer force main relocation under the 36" pipe would be necessary as would any existing waterlines.

A 25' easement along the outfall ditch is recommended for proper maintenance.

Estimated Cost of Improvements - \$18,570.00

Alternative - Rerouting of runoff from Basin "M" into Basin "L" and southwest to Cedar Road would reduce the requirements at this location.

BASIN "A" - NORTH PASTURE ROAD

Clearing	\$ 700.00
Ditch	1,820.00
Pipe (All Sizes)	6,792.00
Endwall, Manhole, Yard Drains, etc.	4,200.00
Remove Pipe, Boxes, etc.	108.00
Paving	495.00
Rip Rap	600.00
Easements	615.00
Hydroseed	456.00
Erosion Control	400.00
	<u>16,186.00</u>
15% Misc. and Engineering	<u>2,428.00</u>
TOTAL	\$ 18,614.00

BASIN "B" - NORTH DARDEN DRIVE

Clearing	\$ n/a
Ditch	n/a
Pipe (All Sizes)	4,401.00
Endwalls, Manholes, Yard Drains, etc.	5,000.00
Remove Pipes, Boxes, etc.	2,912.00
Paving	930.00
Rip Rap	750.00
Curb and Gutter	360.00
Easements	n/a
Hydroseed	105.00
Erosion Control	300.00
	<u>14,758.00</u>
15" Misc.	<u>2,214.00</u>
TOTAL	\$ 16,972.00

BASIN "C" - SOUTH DARDEN DRIVE

Clearing	\$ n/a
Ditch	n/a
Pipe (All Sizes)	12,660.00
Endwalls, Manholes, Yard Drains, etc.	6,000.00
Remove Pipe, Boxes, etc.	4,585.00
Paving	930.00
Rip Rap	n/a
Curb and Gutter	360.00
Easements	270.00
Hydroseed	332.00
Erosion Control	1,000.00
	<u>26,137.00</u>
15% Misc. and Engineering	<u>3,921.00</u>
TOTAL	\$ 30,058.00

BASIN "D" - FREEMOOR DRIVE

Clearing	\$	n/a
Ditch		1,250.00
Pipe (All Sizes)		16,578.00
Endwalls, Manholes, Yard Drains, etc.		9,750.00
Remove Pipe, Boxes, etc.		6068.00
Paving		1,515.00
Rip Rap		n/a
Curb and Gutter		540.00
Easements		1,125.00
Hydroseed		884.00
Erosion Control		600.00
		<u>38,310.00</u>
15% Misc. and Engineering		<u>5,747.00</u>
TOTAL	\$	44,057.00

BASIN "E" - SOUTH EMMAUS ROAD

Clearing	\$	3,150.00
Ditch		10,815.00
Pipe (All Sizes)		1,080.00
Endwalls, Manholes, Yard Drains, etc.		2,000.00
Remove Pipe, Boxes, etc.		130.00
Paving		510.00
Rip Rap		n/a
Curb and Gutter		n/a
Easements		5,794.00
Hydroseed		1,171.00
Erosion Control		2,000.00
		<u>27,196.00</u>
15% Misc. and Engineering		<u>4,079.00</u>
TOTAL	\$	31,275.00

BASIN "F" - NORTH POWHATAN DRIVE

Clearing	\$	n/a
Ditch		n/a
Pipe (All Sizes)		3,360.00
Endwalls, Manholes, Yard Drains, etc.		2,000.00
Remove Pipe, Boxes, etc.		1,075.00
Remove and Replace Concrete Drive		340.00
Paving		n/a
Rip Rap		n/a
Curb and Gutter		n/a
Easements		n/a
Hydroseed		90.00
Erosion Control		150.00
		<u>7,015.00</u>
15% Misc. and Engineering		<u>1,052.00</u>
TOTAL	\$	8,067.00

BASIN "G" - SOUTH YORKTOWN ROAD

Clearing	\$ 1,750.00
Ditch	4,750.00
Pipe (All Sizes)	n/a
Endwall, Manholes, Yard Drains, etc.	n/a
Remove Pipe, Boxes, etc.	n/a
Paving	n/a
Rip Rap	n/a
Curb and Gutter	n/a
Easements	3,563.00
Hydroseed	1,055.00
Erosion Control	<u>2,000.00</u>
	13,118.00
15% Misc. and Engineering	<u>1,968.00</u>
TOTAL	\$ 15,086.00

BASIN "H" - NORTH ROBERTS ACRES

Clearing	\$ n/a
Ditch	n/a
Pipe (All Sizes)	1,296.00
Endwalls, Manholes, Yard Drains, etc.	2,000.00
Remove Pipe, Boxes, etc.	300.00
Paving	630.00
Rip Rap	1,000.00
Curb and Gutter	n/a
Easements	630.00
Hydroseed	50.00
Erosion Control	<u>200.00</u>
	6,106.00
15% Misc. and Engineering	<u>916.00</u>
TOTAL	\$ 7,022.00

BASIN "I" - SOUTH ROBERTS ACRES

Clearing	\$ 1,400.00
Ditch	3,350.00
Pipe (All Sizes)	3,168.00
Endwalls, Manholes, Yard Drains, etc.	6,000.00
Remove Pipe, Boxes, etc.	1,832.00
Paving	630.00
Rip Rap	750.00
Curb and Gutter	n/a
Easements	3,075.00
Hydroseed	700.00
Erosion Control	<u>300.00</u>
	21,205.00
15% Misc. and Engineering	<u>3,181.00</u>
TOTAL	\$24,386.00

BASIN "J" - WAINWRIGHT DRIVE EXTENSION

Clearing	\$	n/a
Ditch		n/a
Pipe (All Sizes)		6,576.00
Endwalls, Manholes, Yard Drains, etc.		3,900.00
Remove Pipe, Boxes, etc.		2,500.00
Paving		750.00
Rip Rap		400.00
Curb and Gutter		n/a
Easements		300.00
Hydroseed		106.00
Erosion Control		300.00
		<u>14,832.00</u>
15% Misc. and Engineering		<u>2,225.00</u>
TOTAL	\$	17,057.00

BASIN "K" - ALPHUS STREET

Clearing	\$	3,850.00
Ditch		10,155.00
Pipe (All Sizes)		15,072.00
Endwalls, Manholes, Yard Drains, etc.		5,400.00
Remove Pipe, Boxes, etc.		1,260.00
Paving		630.00
Rip Rap		1,250.00
Curb and Gutter		n/a
Easements		6,694.00
Hydroseed		2,239.00
Erosion Control		2,000.00
		<u>48,550.00</u>
15% Misc. and Engineering		<u>7,283.00</u>
TOTAL	\$	55,833.00

BASIN "L" - CEDAR ROAD/LITTLE FLORIDA ROAD

Clearing	\$	7,000.00
Ditch		20,973.00
Pipe (All Sizes)		4,536.00
Endwalls, Manholes, Yard Drains, etc.		9,720.00
Remove Pipe, Boxes, etc.		748.00
Paving		2,100.00
Rip Rap		n/a
Curb and Gutter		n/a
Easements		13,068.00
Relocate Force Main		7,500.00
Relocate Water Main		7,400.00
Hydroseed		3,100.00
Erosion Control		1,142.00
		<u>77,287.00</u>
15% Misc. and Engineering		<u>11,593.00</u>
TOTAL	\$	88,880.00

BASIN "M" - CEDAR ROAD

Clearing	\$ 402.00
Ditch	1,360.00
Pipe (All Sizes)	2,304.00
Endwalls, Manholes, Yard Drains, etc.	4,320.00
Remove Pipe, Boxes, etc.	173.00
Paving	1,200.00
Rip Rap	n/a
Curb and Gutter	n/a
Easements	750.00
Relocate Force Main	1,500.00
Relocate Water Main	3,700.00
Hydroseed	200.00
Erosion Control	<u>239.00</u>
	16,148.00
15% Misc. and Engineering	<u>2,422.00</u>
TOTAL	\$ 18,570.00

POQUOSON DRAINAGE STUDY - 1992

IMPROVEMENT COSTS TO THE CITY OF POQUOSON
FOR ADEQUATE DRAINAGE OF AND IN RIGHTS-OF-WAY

Basin A - All Improvements Necessary	\$ 18,614.00
B - No Improvements Necessary	0.00
C - No Improvements Necessary	0.00
D - Easements Required, 7,500 sq.ft.	1,125.00
E - Easements Required, 38,625 sq. ft.	5,794.00
F - No Improvements Necessary	0.00
G - Easements Required, 23,750 sq. ft.	3,563.00
H - Easements Required, 4,200 sq. ft.	630.00
I - Easements Required, 20,500 sq. ft.	3,075.00
J - Easements Required, 2,000 sq. ft.	300.00
K - All Improvements Necessary	55,833.00
L - All Improvements Necessary	88,880.00
M - All Improvements Necessary	<u>18,570.00</u>
TOTAL	\$196,384.00

1975 POQUOSON DRAINAGE STUDY COST UPDATE
 IMPROVEMENT COST TO THE CITY OF POQUOSON
 FOR ADEQUATE DRAINAGE OF AND IN RIGHTS-OF-WAY
 LESS IMPROVEMENTS MADE SINCE 1975

<u>SYSTEM</u>	<u>TOTAL COST</u>	<u>COST TO CITY</u>
A. Poquoson Shores	\$ 2,100.00	\$ 2,100.00
B. Pasture Road	33,640.00	33,640.00
C. Forrest Road	n/a	n/a
D. Laydon Way	8,639.00	8,639.00
E. Church Road	57,710.00	48,362.00
F. High School	10,258.00	10,258.00
G. Whites Terrace	32,134.00	32,134.00
H. North Wythe Creek Road	2,625.00	2,625.00
J. Wythe Creek Apartments	n/a	n/a
K. Georgian Manor	33,638.00	33,638.00
L. Old Pond Road	167,593.00	167,593.00
M. Bannockburn	8,053.00	8,053.00
N. Smith Road	17,017.00	17,017.00
O. Odd Road	40,160.00	40,160.00
P. Alphas Street	n/a	n/a
R. Wythe Creek Road	n/a	n/a
S. Brick House Road	19,925.00	19,925.00
T. Forrest Park	8,625.00	8,625.00
U. Chapel Road	<u>8,292.00</u>	<u>8,292.00</u>
	\$450,409.00	\$441,061.00
J. Big Woods	-	-

MASTER

DRAINAGE STUDY

CITY OF POQUOSON

VIRGINIA

JULY 1992

PROPOSED DRAINAGE SYSTEMS
IMPROVEMENTS

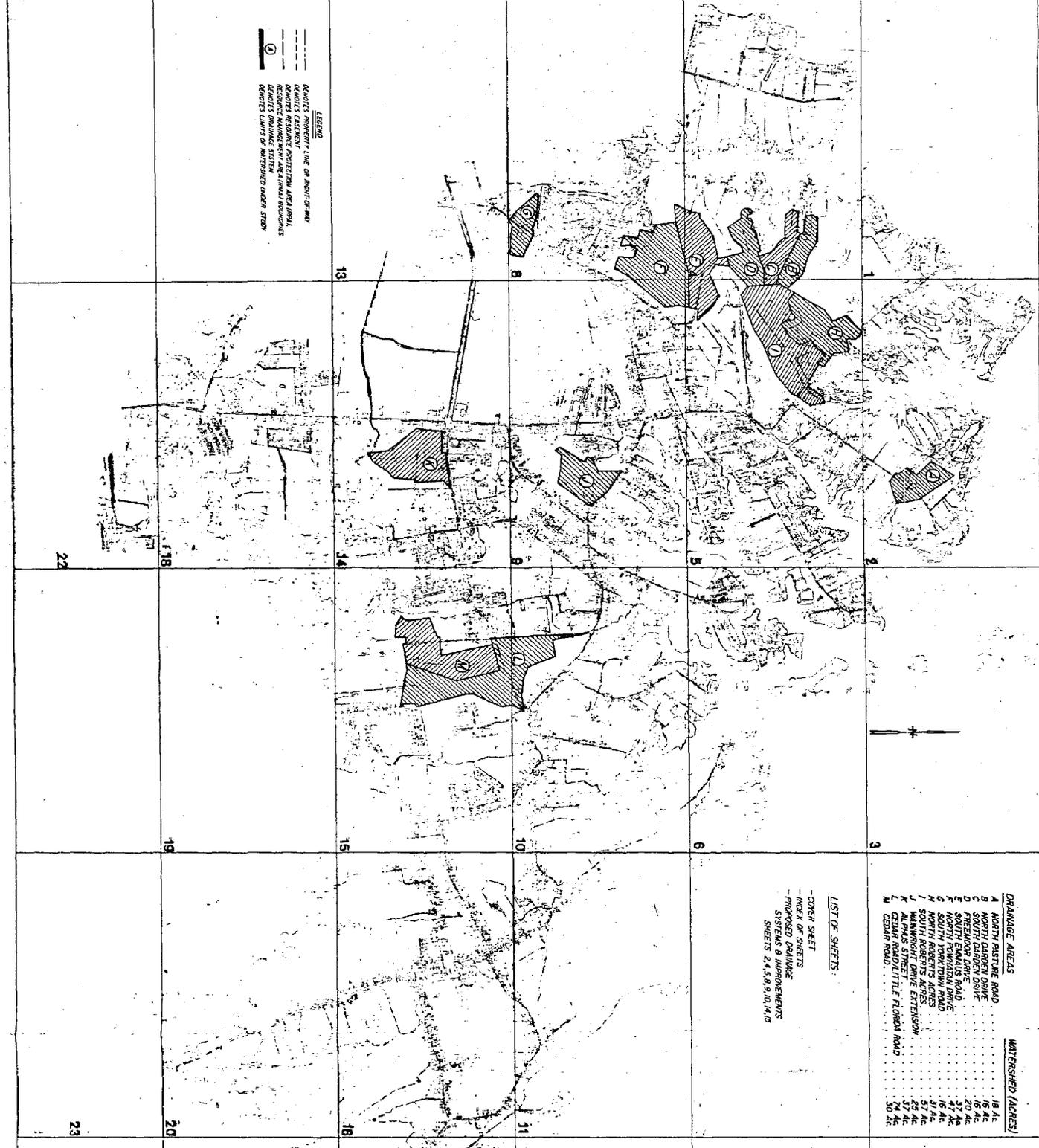
CITY COUNCIL

- L. CORNELL BURCHER.....MAYOR
- GORDON G. HELSEL, JR.....COUNCILMAN
- L. HAROLD QUINN, JR.....COUNCILMAN
- JAMES T. HOLLOMAN, JR.....COUNCILMAN
- W. CROSSBY FORREST, III.....COUNCILMAN
- ROGER N. MESSIER.....COUNCILMAN
- BELVIN F. WARD, JR.....COUNCILMAN
- ROBERT M. MURPHY.....CITY MANAGER



C. K. TUDDER ENGINEERS, INC.
 11524 JEFFERSON AVENUE
 NEWPORT NEWS, VIRGINIA

800,000 820,000 840,000 860,000 880,000 900,000



LEGEND
 --- BOUNDARY LINE OF BASIN OR WATERSHED
 --- DRAINAGE SYSTEM
 --- PROPOSED DRAINAGE SYSTEMS & IMPROVEMENTS
 --- DRAINAGE LIMITS OF ADJACENT WATERSHED STUDY

WATERSHED AREAS	WATERSHED (ACRES)
1 NORTH EASTERN ROAD	18 AC.
2 NORTH GARDEN DRIVE	16 AC.
3 SOUTH GARDEN DRIVE	20 AC.
4 PINEWATER DRIVE	17 AC.
5 NORTH ROBERTS ROAD	16 AC.
6 SOUTH ROBERTS ROAD	17 AC.
7 NORTH ROBERTS AVENUE	17 AC.
8 ALPINE STREET	23 AC.
9 ALPINE STREET EXTENSION	17 AC.
10 CEDAR ROAD/LITTLE FLORIDA ROAD	16 AC.
11 CEDAR ROAD	16 AC.

LIST OF SHEETS:
 --- COVER SHEET
 --- INDEX OF SHEETS
 --- PROPOSED DRAINAGE SYSTEMS & IMPROVEMENTS
 SHEETS 2, 4, 5, 6, 9, 10, 11, 12

DRAINAGE STUDY
CITY OF PODUOSON
INDEX OF SHEETS

NO.	DATE	BY	REVISION
1	11-11-11
2	11-11-11

NO.	DATE	DESCRIPTION

PLAN
 SHEET
 SCALE
 DATE

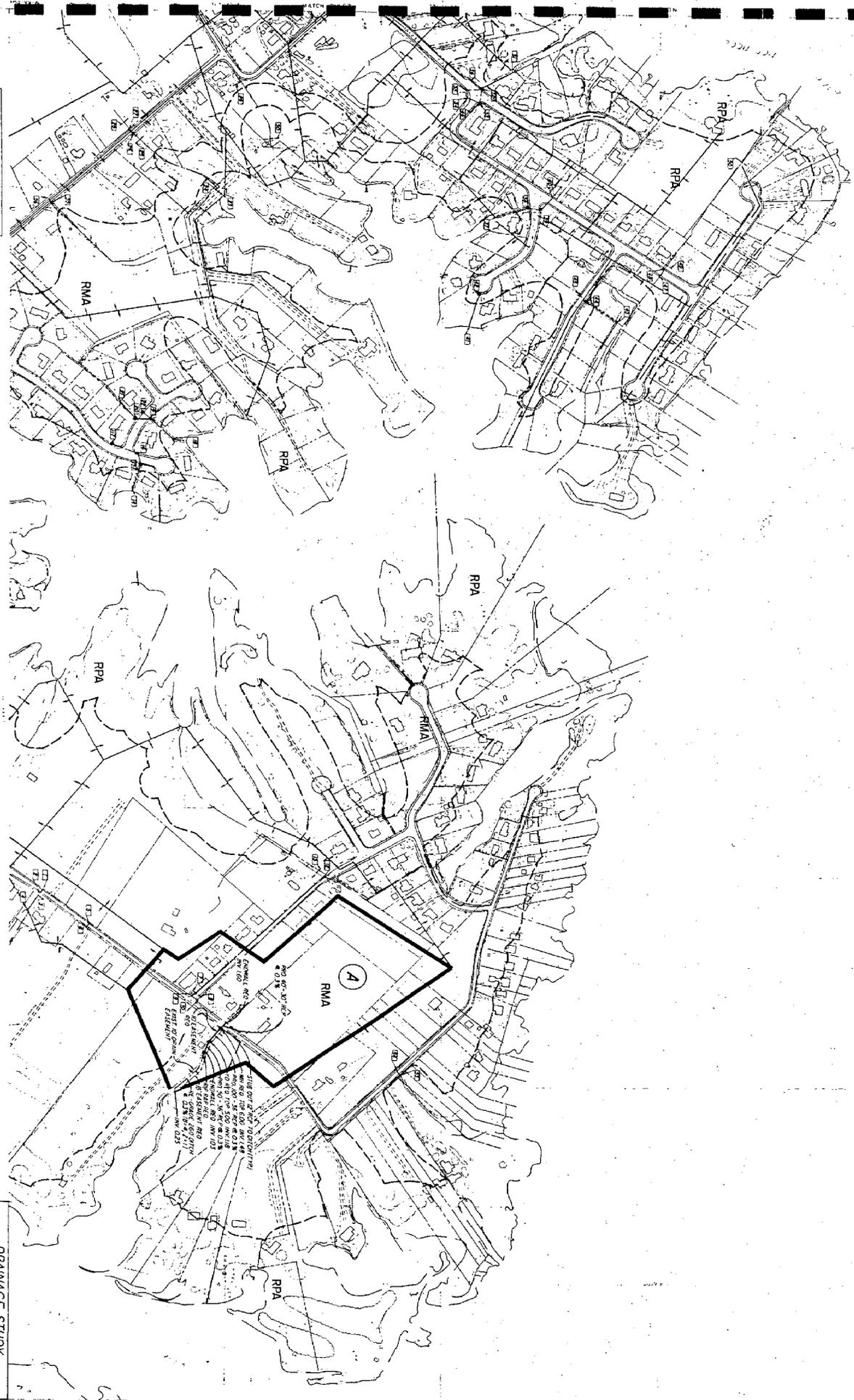


NOTE: ALL PROPERTY LINES
 SHOWN BASED ON THE 1985 SAT
 MAPS.



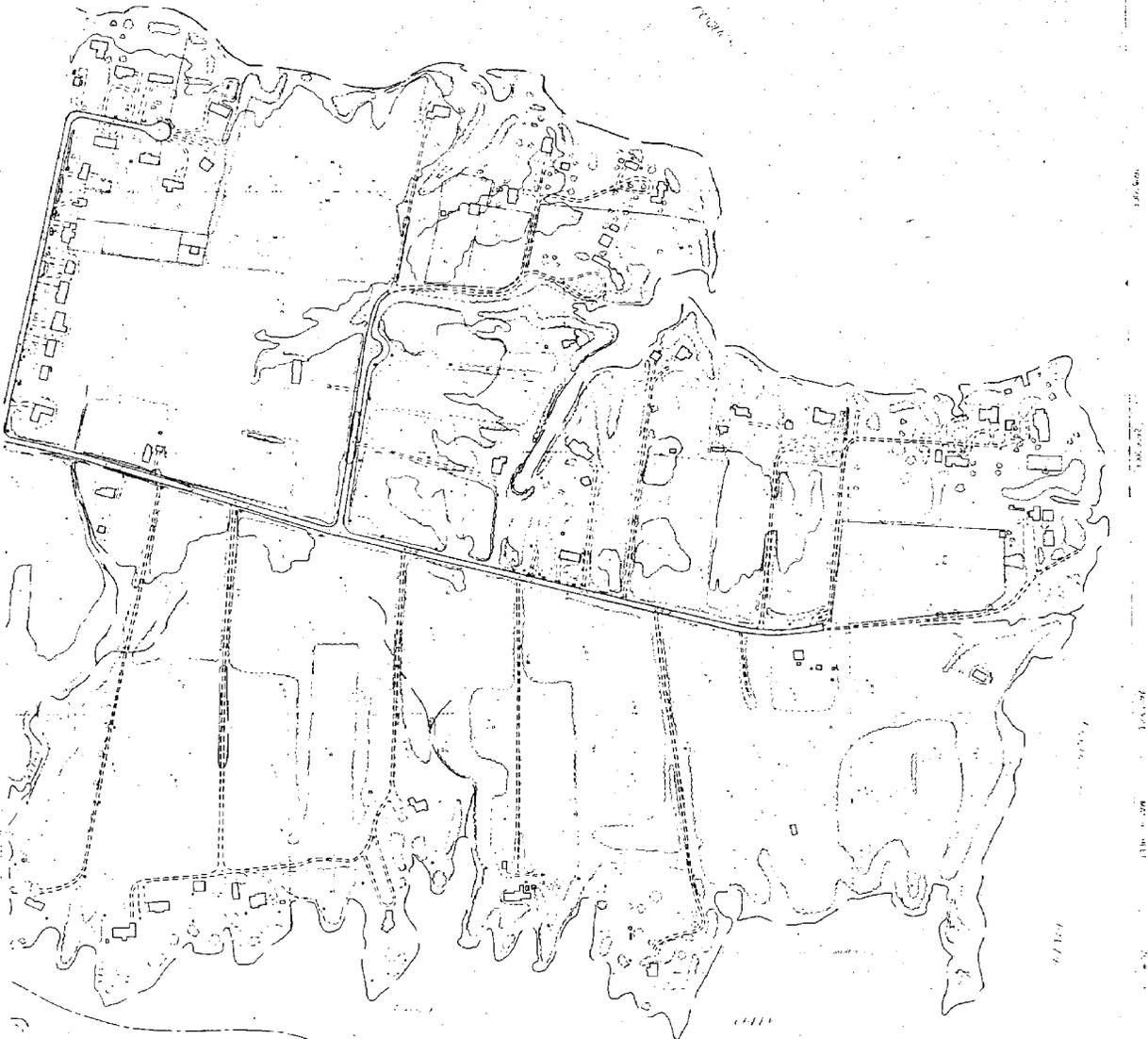
DRAINAGE STUDY
CITY OF POQUOSON
PROPOSED DRAINAGE SYSTEMS
IMPROVEMENTS

NO.	DATE	DESCRIPTION

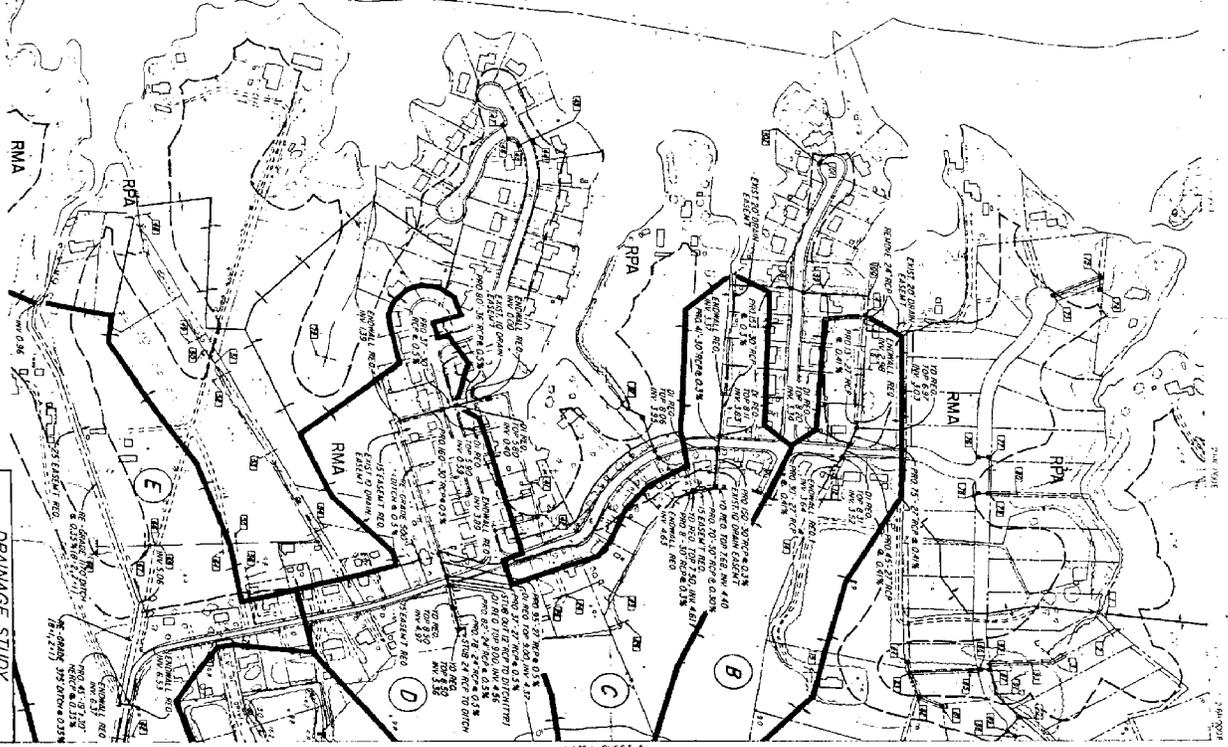


DATE	1/11/78
BY	...
CHECKED BY	...
SCALE	1" = 100'
PROJECT NO.	...
SHEET NO.	...

PROJECT NO.	...
DATE	1/11/78
BY	...
CHECKED BY	...
SCALE	1" = 100'
PROJECT NO.	...
SHEET NO.	...

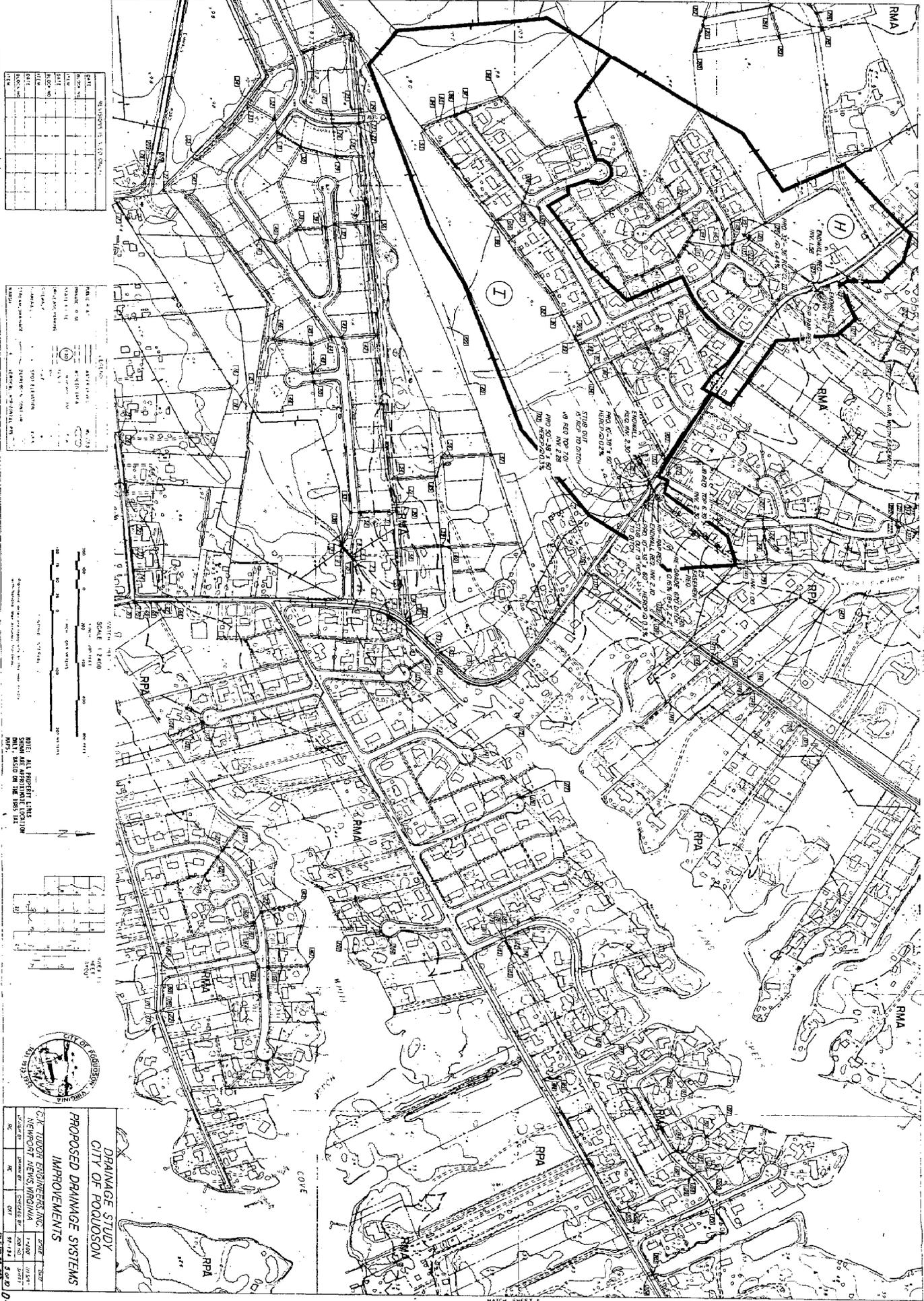


NOTE: ALL PROPERTY LINES
 SHOWN ARE BASED ON THE 1985 LIA
 MAPS.



**PROPOSED DRAINAGE SYSTEMS
 IMPROVEMENTS**

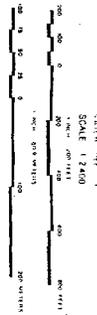
PROJECT NO.	...
DATE	1/11/78
BY	...
CHECKED BY	...
SCALE	1" = 100'
PROJECT NO.	...
SHEET NO.	...



REVISIONS TO THIS PLAN

NO.	DATE	DESCRIPTION
1	11/15/14	ISSUED FOR PERMIT
2	11/15/14	ISSUED FOR PERMIT
3	11/15/14	ISSUED FOR PERMIT
4	11/15/14	ISSUED FOR PERMIT
5	11/15/14	ISSUED FOR PERMIT
6	11/15/14	ISSUED FOR PERMIT
7	11/15/14	ISSUED FOR PERMIT
8	11/15/14	ISSUED FOR PERMIT
9	11/15/14	ISSUED FOR PERMIT
10	11/15/14	ISSUED FOR PERMIT

PROJECT NO. 14-0000
 SHEET NO. 10 OF 10
 DATE: 11/15/14
 SCALE: AS SHOWN
 DRAWN BY: [Name]
 CHECKED BY: [Name]
 APPROVED BY: [Name]



NOTE: ALL PRESENT LINES SHOWN ARE PERMIT LOCATIONS BASED ON THE 1989 PLAN.



DRAINAGE STUDY
CITY OF PORTOLOSO
PROPOSED DRAINAGE SYSTEMS
IMPROVEMENTS

C.K. TUDOR ENGINEERS, INC.
 NEWPORT NEWS VIRGINIA

NO.	DATE	DESCRIPTION
1	11/15/14	ISSUED FOR PERMIT
2	11/15/14	ISSUED FOR PERMIT
3	11/15/14	ISSUED FOR PERMIT
4	11/15/14	ISSUED FOR PERMIT
5	11/15/14	ISSUED FOR PERMIT
6	11/15/14	ISSUED FOR PERMIT
7	11/15/14	ISSUED FOR PERMIT
8	11/15/14	ISSUED FOR PERMIT
9	11/15/14	ISSUED FOR PERMIT
10	11/15/14	ISSUED FOR PERMIT

PLN NO. 14-0000



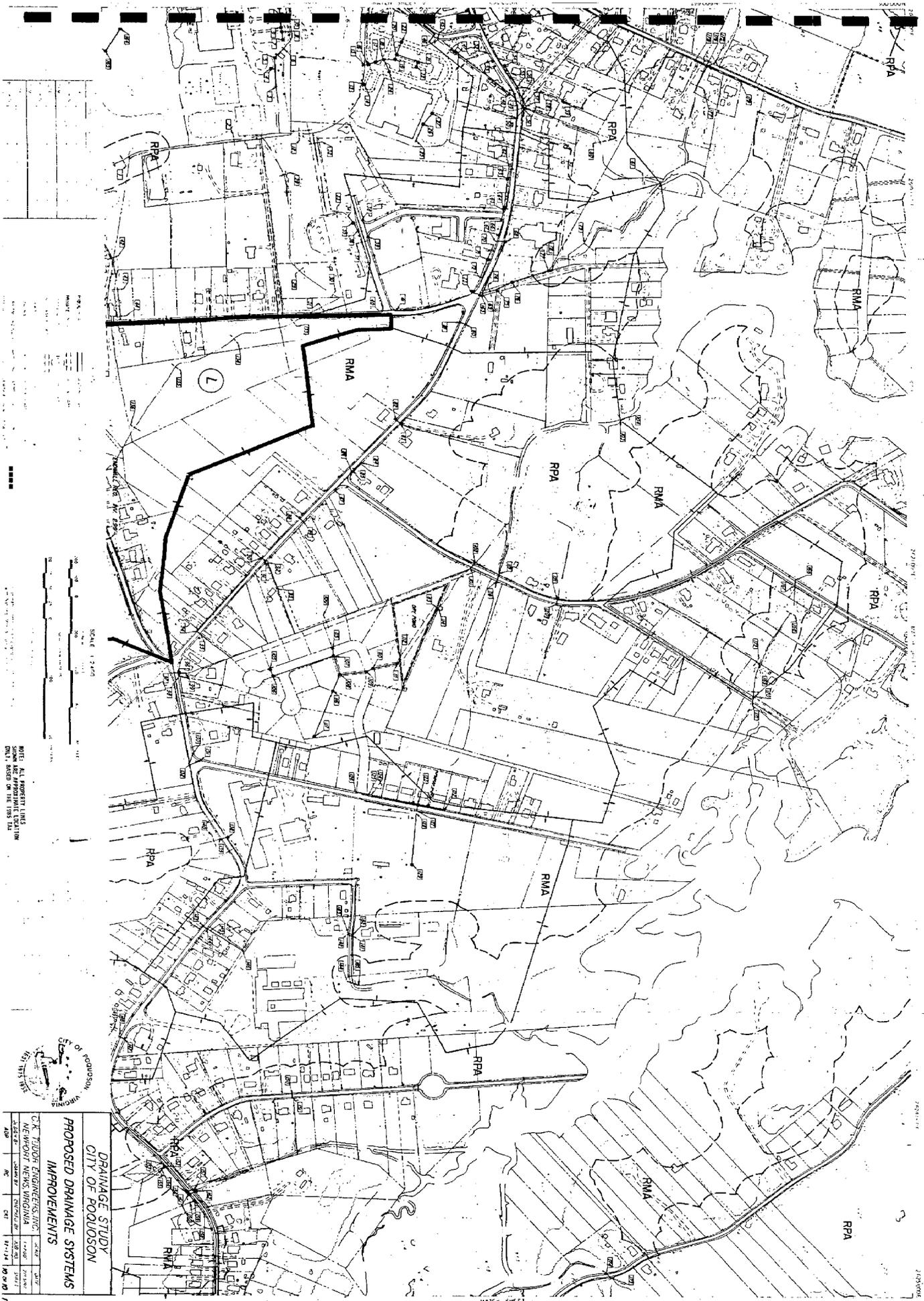
SCALE: 1"=200'

NOTE: ALL PROPERTY LINES SHOWN ARE APPROXIMATE EXCEPT WHERE SHOWN BY SURVEY MAPS.



**DRAINAGE STUDY
CITY OF POQUOSSON
PROPOSED DRAINAGE SYSTEMS
IMPROVEMENTS**

C.K. TUDOR ENGINEERS, INC.		SCALE	DATE
DESIGNED BY	NEWPORT NEWS VIRGINIA	1"=200'	1/4/09
DRAWN BY	CHRYSTIE BY	1"=200'	1/27/09
DATE	1/27/09	PROJECT NO.	09-010
NO.	09-010	REV.	0

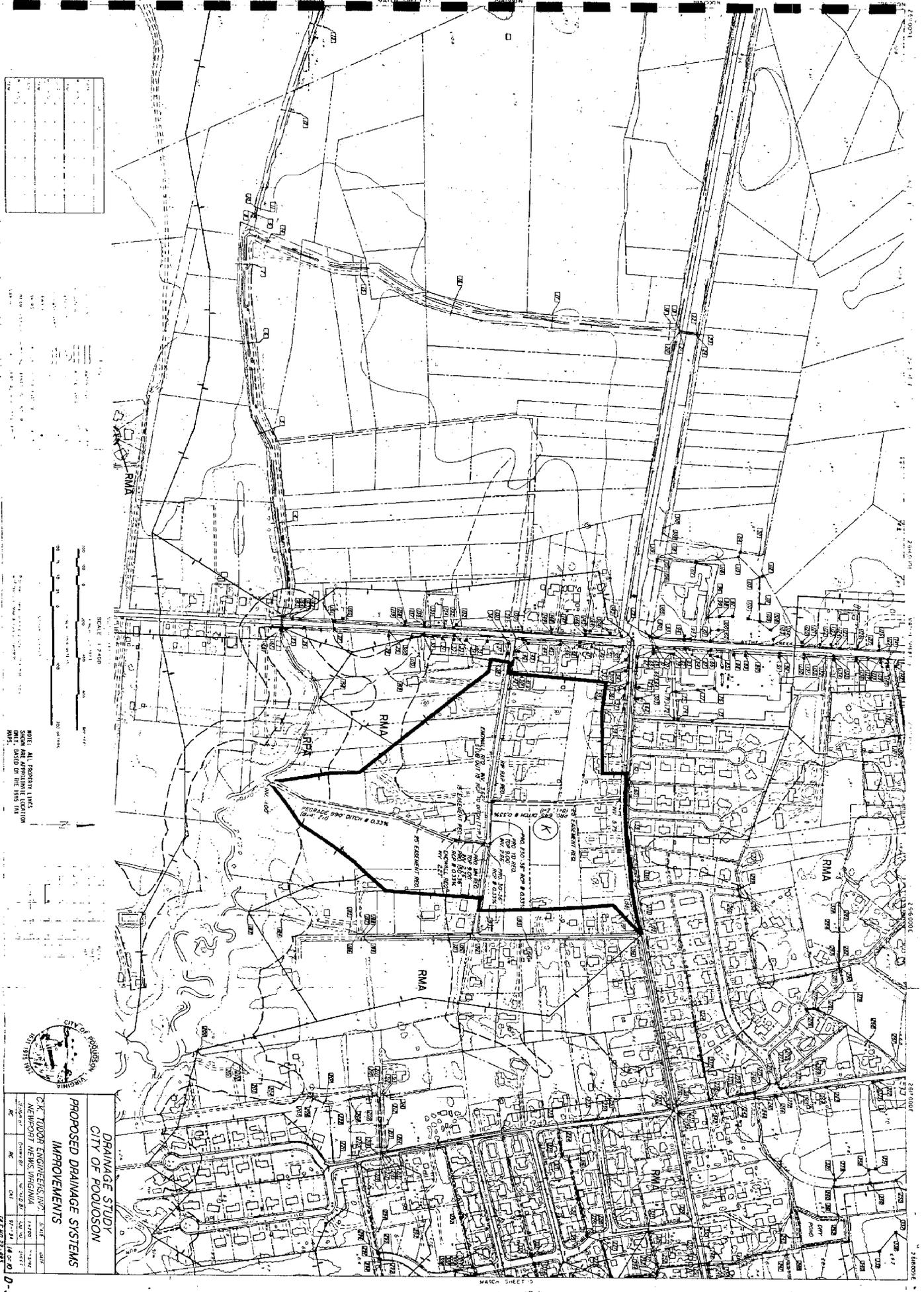


NOTE: ALL PROPERTY LINES
 AND ELEVATIONS ARE FROM
 DATA BASED ON THE 1985 T&E



DRAINAGE STUDY
CITY OF FOQUSSON
PROPOSED DRAINAGE SYSTEMS
IMPROVEMENTS

DATE	NO.	DESCRIPTION
10/1/85	1	PRELIMINARY DRAINAGE STUDY
11/1/85	2	FINAL DRAINAGE STUDY
12/1/85	3	FINAL DRAINAGE STUDY
1/1/86	4	FINAL DRAINAGE STUDY
2/1/86	5	FINAL DRAINAGE STUDY
3/1/86	6	FINAL DRAINAGE STUDY
4/1/86	7	FINAL DRAINAGE STUDY
5/1/86	8	FINAL DRAINAGE STUDY
6/1/86	9	FINAL DRAINAGE STUDY
7/1/86	10	FINAL DRAINAGE STUDY
8/1/86	11	FINAL DRAINAGE STUDY
9/1/86	12	FINAL DRAINAGE STUDY
10/1/86	13	FINAL DRAINAGE STUDY
11/1/86	14	FINAL DRAINAGE STUDY
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1/1/87	16	FINAL DRAINAGE STUDY
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3/1/87	18	FINAL DRAINAGE STUDY
4/1/87	19	FINAL DRAINAGE STUDY
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6/1/87	21	FINAL DRAINAGE STUDY
7/1/87	22	FINAL DRAINAGE STUDY
8/1/87	23	FINAL DRAINAGE STUDY
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10/1/93	97	FINAL DRAINAGE STUDY
11/1/93	98	FINAL DRAINAGE STUDY
12/1/93	99	FINAL DRAINAGE STUDY
1/1/94	100	FINAL DRAINAGE STUDY



NO.	DESCRIPTION	DATE
1	PREPARED BY	
2	CHECKED BY	
3	DATE	

SCALE: 1" = 100'
 DATE: 1/14/09
 SHEET NO. 0-9

NOTE: ALL PROPERTY LINES
 SHOWN ARE APPLICABLE LOCATIONS
 FROM THE 1990 LIA
 MAPS.



DRAINAGE STUDY
CITY OF POOLESVILLE
PROPOSED DRAINAGE SYSTEMS
IMPROVEMENTS

NO.	DESCRIPTION	DATE
1	PREPARED BY	
2	CHECKED BY	
3	DATE	

C.K. TUDOR ENGINEERS, INC.
 NEWPORT NEWS, VIRGINIA
 DATE: 1/14/09
 SHEET NO. 0-9

NOAA COASTAL SERVICES CENTER LIBRARY



3 6668 14103 5263

