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AL R E SHANNON ET AL. 29 MAY 80 HNDTR-80-45-SP-VOL-1

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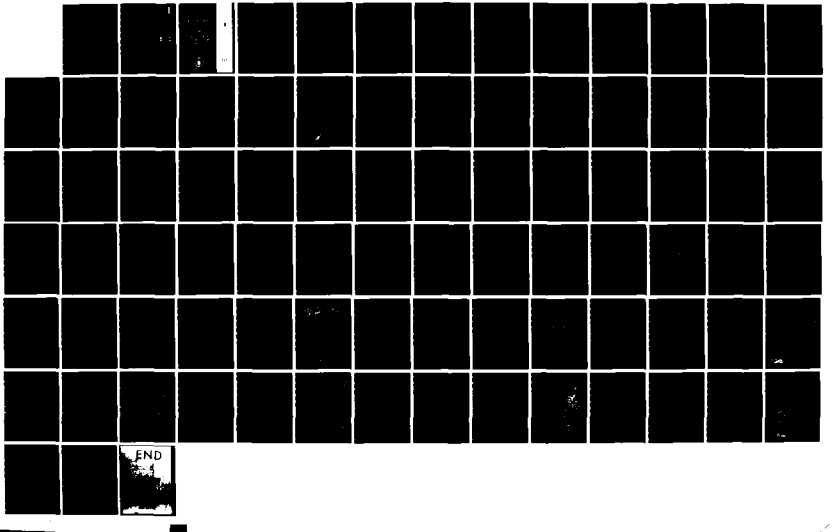

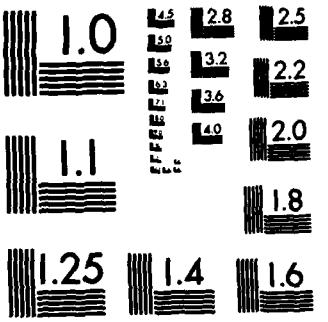

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REGIONAL PETROLEUM RESERVE EAST COAST

VOLUME I

IDENTIFICATION AND EVALUATION OF POTENTIAL STORAGE SITES

U.S. ARMY
CORPS OF ENGINEERS
HUNTSVILLE DIVISION

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STORAGE	FUEL OIL	NEW ENGLAND
NEW YORK	NEW JERSEY	

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

VOLUME I PRESENTS A DETAILED DESCRIPTION OF THE PROCEDURES AND RESULTS OF A SITE IDENTIFICATION AND EVALUATION PROCESS UNDERTAKEN IN SUPPORT OF THE REGIONAL AND NONCONTIGUOUS PETROLEUM RESERVE (RPR) PROPOSAL. THE CRITICAL FACTORS AND RATING GUIDANCE USED FOR INITIAL SCREENING ARE DESCRIBED IN APPENDIX B. POTENTIAL SITES, ACCEPTED DURING THE INITIAL SCREENING, WERE SUBJECTED TO A FINAL SCREENING WHERE THEY WERE POINT-SCORED ON THE BASIS OF AN EVALUATION OF SPECIFIC CHARACTERISTICS. THE SCORING SYSTEM, AS ESTABLISHED

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BY THE REVIEW AND SUMMATION TEAM, IS DESCRIBED IN APPENDIX C. SITE SCORES AND RANKING UNDER EACH OF THE THREE STORAGE MEDIA ARE SHOWN IN APPENDIX D.

VOLUME II PROVIDES CONCEPTUAL DESIGN DRAWINGS, CONSTRUCTION COST ESTIMATES, AND A LIFE CYCLE COST ECONOMIC ANALYSIS CONDUCTED TO IDENTIFY, AND QUANTIFY, UNIQUE ECONOMIC ADVANTAGES THAT MAY BE ATTRIBUTABLE TO THE CANDIDATE SITES.

VOLUME III PROVIDES THREE RELATED ENGINEERING STUDIES: (1) DEVELOPMENT OF CONDUCTIVE AND CONVECTIVE HEAT TRANSFER CONCEPTS FOR NO. 6 RESIDUAL OIL. (2) FEASIBILITY OF HEATING RESIDUAL OIL STORAGE FACILITIES WITH SOLAR ENERGY. (3) AN ANALYSIS ON LEASE VS PURCHASE OF STORAGE FACILITIES.

HNDTR-80-45-SP

EAST COAST

REGIONAL PETROLEUM RESERVE
(RPR)

VOLUME I

IDENTIFICATION AND

EVALUATION OF POTENTIAL

STORAGE SITES

Prepared by:

US Department of Energy
Strategic Petroleum Reserve
and
US Army Engineer Division, Huntsville

May 29, 1980

FOREWORD

The Regional and Noncontiguous Petroleum Reserve (RPR), as proposed by the Administration in 1979, includes the storage of 20 million barrels of residual fuel oil (No. 6), or an acceptable substitute, for the East Coast of the United States. At least half of this amount would be physically stored within the Northeast (New England, New York and New Jersey), with the remainder stored in locations that provide timely accessibility to the East Coast.

As a part of the planning effort initiated in response to the Administration's proposal, the Department of Energy (DOE), with assistance from the U.S. Army Corps of Engineers (CE), identified and evaluated potential oil storage sites for the East Coast RPR. This report, Volume I, presents a detailed description of the procedures and results of the site identification and evaluation process. Conceptual design for ten (10) candidate sites and results of related engineering studies will be included in Volumes II and III respectively.

Managerial and technical support was provided by the following elements of the CE:

- U.S. Army Engineer Division, Huntsville, Ala.
- New England Division, Waltham, Mass.
- North Atlantic Division, New York, N.Y.
- South Atlantic Division, Atlanta, Ga.
- Waterways Experiment Station, Vicksburg, Miss.

SUMMARY

Approximately 178 potential storage sites were initially identified based on their location, size and apparent availability. Sites were screened and evaluated against a comprehensive list of weighted evaluation factors. An initial screening of all sites was conducted to eliminate sites which exhibited critical flaws or unacceptable characteristics. Forty-one (41) sites remained acceptable as a result of the initial screening effort, and these were subjected to a final screening. These 41 sites were point-scored and ranked.

This report recommends 10 of the remaining 41 sites for retention as candidate sites. These would be subjected to detailed technical, environmental and cost analyses required to support final site selections.

TABLE OF CONTENTS

1.0 IDENTIFICATION OF POTENTIAL SITES

The U.S. Army Corps of Engineers (CE), under an agreement with the DOE, was tasked to conduct a survey of property along the East Coast of the United States to identify potential RPR storage sites. Initial site and location parameters were furnished to the CE to restrict the scope of the survey within reasonable bounds, with the intent that these bounds could be expanded should the survey produce an insufficient number of potential sites. These parameters were as follows:

- o Sites should be located within approximately five miles of deep water or an existing harbor.

  Distribution studies performed for the RPR program have concluded that the primary mode of transportation for residual fuel oil should be by waterborne means. The difficult handling characteristics of No. 6 oil make it highly desirable to minimize the pipeline distances from supporting marine terminals. Transportation analyses have further indicated that terminal facilities associated with the storage sites should be capable of accommodating tankers in the 38,000-dwt class as a minimum; these tankers would require a water depth of approximately 35 feet.

- o Sites should be relatively undeveloped.

  In developing oil storage facilities, it is considered appropriate to avoid disrupting existing private operations where possible. The requirement to compensate for and relocate existing operating facilities would likely result in high cost impact, extended development schedules, and significant local economic impact.

- o Sites should include a minimum of 160 acres of usable property.

  This amount of acreage is equivalent to slightly less than 10 million barrels of storage capacity. Preliminary cost analyses have indicated that large, centralized facilities would be more cost-effective than small, dispersed facilities. It is considered likely that, for a reserve of 20 million barrels, the cost of developing multiple sites smaller than 10 million barrels would be prohibitive.

The site survey effort included the collection of technical and environmental data on each site sufficient to support the site screening and evaluation process.

Sites which had been previously studied for possible RPR use by consulting engineering firms, as well as sites which have been offered by private interests were automatically included as potential sites and subjected to the screening process, regardless of whether or not they conformed to the previously mentioned parameters.

While the storage of residual fuel in solution-mined salt domes has been identified as an alternative method of storage, the CE's site survey effort did not include potential salt domes sites. The feasibility of such storage is presently being studied in detail. Should the decision be made to store residual fuel in a salt dome, it was assumed that salt dome property already owned by the DOE in the Gulf Coast region would be utilized.

1.1 SURVEY RESULTS

Approximately 178 potential storage sites were identified. The sites are identified in Appendix A and include locations in 14 states and two Canadian provinces.

2.0 SITE SCREENING AND EVALUATION

2.1 EVALUATION CRITERIA

The site selection criteria established by the SPR Plan of January 1977 were used as the basis for establishing evaluation factors for potential East Coast RPR sites. These criteria are:

- o Technical Feasibility and Suitability for Storage

  Potential storage sites must exhibit physical characteristics which could reasonally support the intended facilities from a technical standpoint.

- o Storage Capacity Availability

  Sufficient real estate to develop the storage facility must be available. Current use of the property was considered in terms of how it might impact on the timely availability and development of facilities.

- o Proximity to Existing Distribution Systems

  As a result of distribution and transportation studies conducted for East Coast RPR, it was determined that the primary mode of distribution of residual fuel oil should be waterborne transportation. Potential storage sites must therefore have access to harbors or waterways which are capable of accommodating the types of ships most likely to be utilized in transporting the oil. Since residual oil must be maintained at an elevated temperature in order to achieve flow, the storage location will be highly cost-sensitive to its distance from the distribution terminal.

- o Environmental Impacts

  Potential storage sites must be evaluated in terms of the environmental impacts, including economic impacts, that would and could occur as a result of construction and operation of the storage facility.

- o Security and Safety

  Potential storage sites must be evaluated in terms of the feasibility of providing adequate security and safety measures for personnel, equipment, and stored product.

- o Cost

  Potential storage sites must be comparatively evaluated in terms of their costs of acquisition, development, and operation.

In order to facilitate the development of specific evaluation factors and ensure correct weighting of the point-scoring system used in final screening, the factors were organized under the three distinguishable modules which make up a typical oil storage complex: oil storage site, terminal site, and pipeline connecting the storage and terminal sites; plus a fourth category for environmental impacts. The point-scoring system, described below under "Final Screening", was designed so that cost impact would be implicit in the scoring for each of the evaluation factors. Therefore, separate cost factors were not necessary in determining the candidate storage sites. Site-specific cost estimates will be prepared as part of the comparative analysis of candidate sites. This analysis is further described under Section 4 of this document.

2.1.1 Specific factors of each category which were used in the site screening and evaluation were as follows:

I. Oil Storage Site Module

- o Availability of utilities
- o Topographic conditions
- o Soil and geological conditions
- o Meteorology and Seismology
- o Site accessibility
- o Availability and condition of existing structures
- o Availability of real estate
- o Ability to provide security
- o Safety factors

II. Terminal Site Module

- o Availability of existing facilities and, if required, feasibility of new construction
- o Harbor conditions
- o Availability of real estate

III. Pipeline Module

- o Distance between storage site and terminal
- o Pipeline routing

IV. Environmental Impacts

- o Air
- o Life forms
- o Land and water
- o Socioeconomic

2.2 STORAGE MEDIA CONSIDERATIONS

A variety of oil storage media or containers have been considered by the SPR for the storage of petroleum; these are fully discussed in Chapter IV of the SPR Plan of January 1977. The following storage media are actively being considered at present for storing residual fuel oil for the East Coast RPR:

- o Conventional, aboveground steel tank
- o In-ground concrete tanks or reservoirs ("cut-and-cover")
- o Conventional hard-rock mines
- o Solution mines in salt domes

Each of the above storage media are considered technically feasible for the storage of residual oil based on available information. A Storage Media Assessment will be conducted to determine the relative advantages and disadvantages of the different media in terms of technical feasibility, environmental impacts, security, safety, cost, and schedule. As discussed in Section 1, the areas surveyed for potential storage sites did not include areas where salt domes exist. Hence, each of the identified potential sites was evaluated for each of the three remaining storage media types, i.e., steel tanks, cut-and-cover, and mines.

2.3 ORGANIZATION AND PROCEDURES

2.3.1 ORGANIZATION AND RESOURCES

For the most part, the individuals participating in the site screening and evaluation process were the same individuals who identified the potential sites and collected the pertinent data used during the process.

A team approach, consisting of four evaluation teams plus a Review and Summation Team, was utilized to ensure the most efficient use of available resources and expertise. The specific teams and their areas of responsibility were as follows:

- Storage Site Technical Team - Evaluated all technical aspects, including safety and security, of the storage site module.
- Terminal Site Technical Team - Evaluated technical aspects related to existing terminal facilities, feasibility of constructing new facilities, and harbor conditions.
- Real Estate Team - Evaluated availability of real estate associated with storage site and terminal site modules.
- Environmental Team - Evaluated all potential environmental impacts.
- Review and Summation Team - Reviewed the evaluation results produced by each team, summarized the results, and made decisions as to which of the potential sites would be retained for further evaluation.

Each of the evaluation teams consisted of four or five professionals from the U.S. Army Corps of Engineers having the required expertise in the disciplines under consideration by the particular team, as well as a thorough familiarity with the appropriate geographic regions. The Review and Summation Team consisted of six professionals, representing both the CE and the DOE, who provided the multi-disciplined expertise required to perform the functional responsibilities of that team.

2.3.2 SCREENING AND EVALUATION PROCEDURES

Site screening and evaluation was performed in two steps:

- Initial Screening of all potential sites to identify critical flaws and eliminate the poorest sites from further consideration, and
- Final Screening to evaluate in detail and rank those sites which survived the initial screening.

Figure 2-1 depicts the organization and flow process during both the initial and final screening processes.

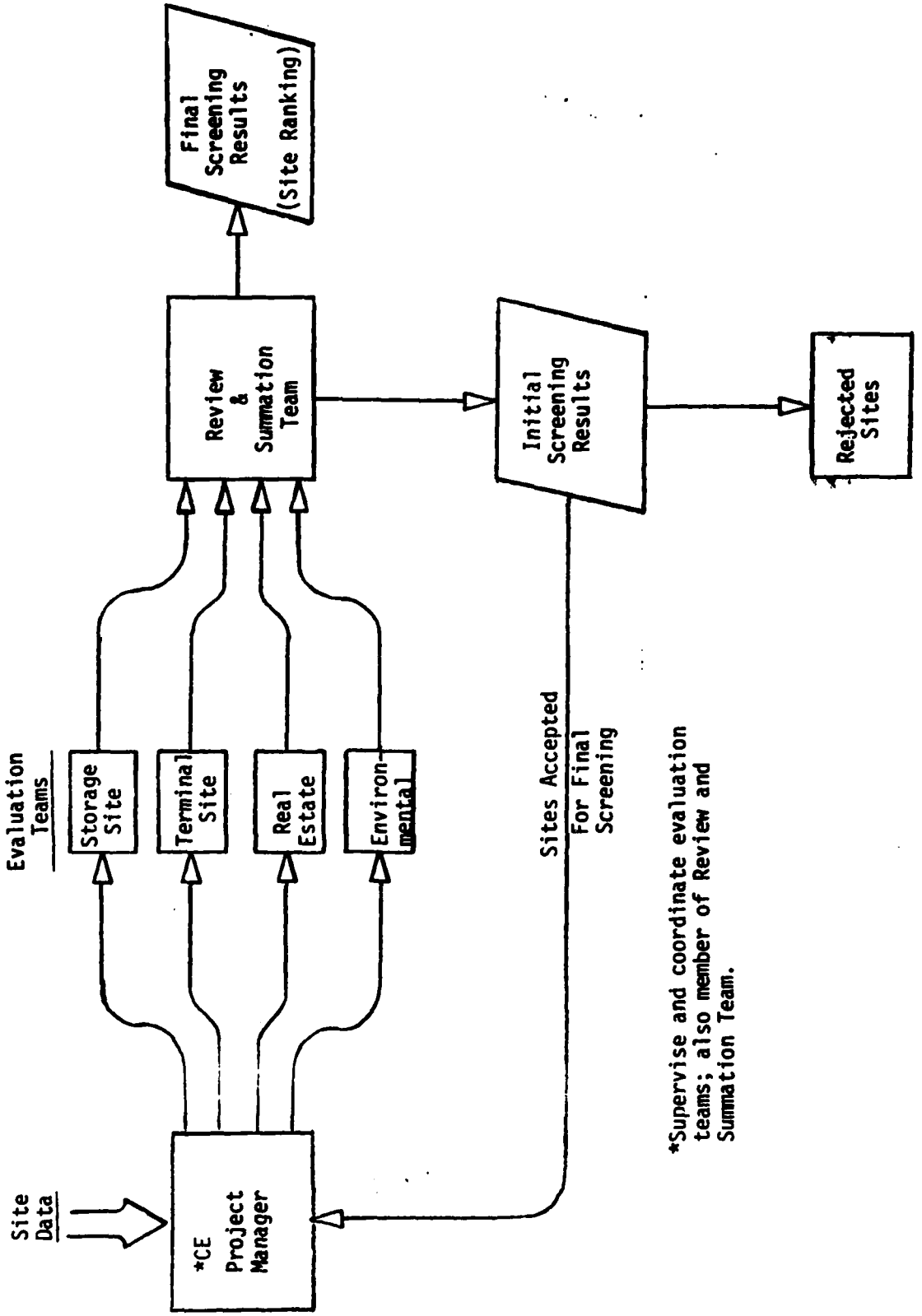


FIGURE 2-1

EAST COAST RPR - SITE SCREENING PROCESS

2.3.2.1 Initial Screening

The purpose of the initial screening effort was to evaluate all potential sites against a list of specific critical factors to determine which sites should be omitted from further consideration. The critical factors and rating guidance used for initial screening are described in Appendix B. Team evaluations, along with appropriate data to support the ratings, were furnished to the Review and Summation Team who determined the acceptance or rejection of each potential site. Rejections were based on a concurrent review of all poor and marginal characteristics exhibited by a particular site, and not solely on any one condition.

Results

Of the 178 potential sites originally identified, 41 were judged acceptable and returned to the evaluation teams for final screening. An additional 10 sites were identified as having potential for lease arrangements only, based on present land use or active property development plans; these sites are identifed in Appendix F. The lease-only sites were not subjected to the screening process but will be retained for future consideration should leasing be included in the program acquisition plan.

2.3.2.2 Final Screening

Potential sites, accepted during the initial screening, were subjected to a final screening where they were point-scored on the basis of an evaluation of specific characteristics. The scoring system, as established by the Review and Summation Team, is described in Appendix C. The distribution of points among the four major categories were based primarily, but not exclusively, on estimated cost impact as follows:

I. Storage site, 0 to 75 points
II. Terminal site, 0 to 30 points
III. Pipeline, 0 to 10 points
IV. Environmental impact, -30 to 0 points

Since the scoring in Category I was dependent on the storage media being considered, potential sites were generally given three sets of scores, one for each of the three storage media: tanks, mines, and cut-and-cover.

Results

Site scores and ranking under each of the three storage media are shown in Appendix D. It should be noted that the results produced no conclusive evidence as to the superiority of any specific geographic area.

3.0 SELECTION OF CANDIDATE SITES

Three major considerations affected final Selection of Candidate Sites:

- o A minimum of 10 million barrels of residual fuel oil is to be physically stored within the Northeast, i.e., New England, New York or New Jersey.
- o Economies of size and centralized facilities will likely dictate that the number of individual sites be minimized.
- o The most cost-effective storage media has not been determined to date.

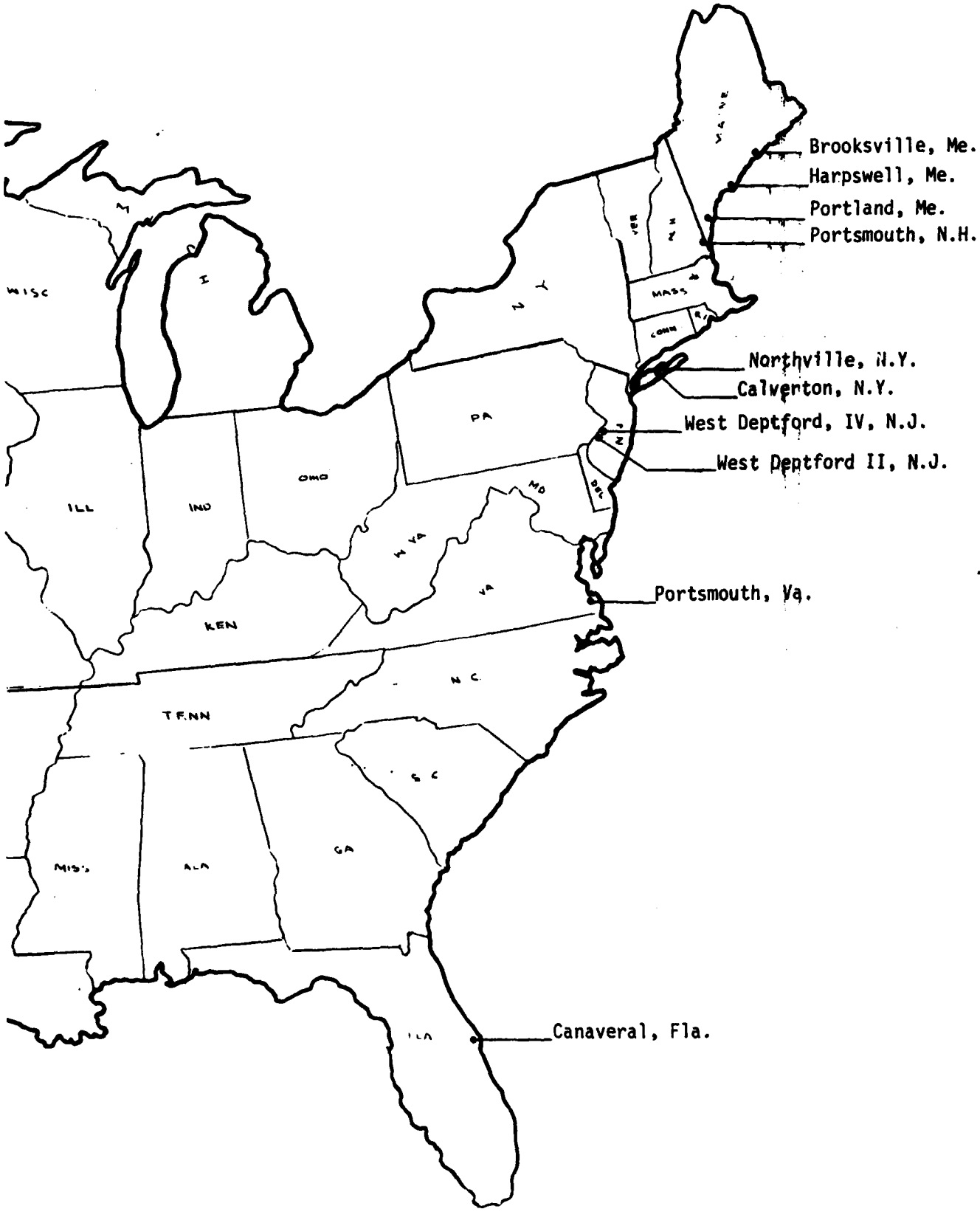
The list of candidate sites must include a sufficient number of the top-ranked sites to retain flexibility in terms of size and storage media, and must include sites located in the Northeast.

Ten candidate sites were selected for further evaluation and analysis; these are shown in Table 3-1 and on Figure 3-1. A description of the candidate sites is included as Appendix E.

TABLE 3-1
EAST COAST RPR CANDIDATE SITES

SITE	OWNERSHIP	POTENTIAL VOLUME (MMB)	POTENTIAL STORAGE MEDIA T	M	C/C
Craney Is., Portsmouth, Virginia	Federal	10+	X		X
Canaveral, Florida	Federal	10	X		
smouth, New Hampshire	Federal	10	X		X
Ca rt New York	Federal	20			X
Northville II, New York	Private	20	X		X
Portland, Maine	Private	20		X	
West Deptford II, New Jersey	Private	20	X		
West Deptford IV, New Jersey	Private	20	X		
Harpswell, Maine	Private	10	X		X
Brooksville, Maine	Private	20		X	

Fig. 3-1
East Coast RPR Candidate Sites



4.0 FINAL SITE SELECTION

From the 10 candidate sites, it is likely that no more than three will be ultimately developed for the East Coast RPR, based on the economies associated with larger, centralized facilities. Furthermore, should the decision be made to actively consider leasing of storage facilities as an alternative, the list of candidate sites would be expanded to include, as a minimum, the lease-only sites identified in Appendix F.

The following efforts have been initiated to support the final site selection phase of the program:

- Environmental Impact Reports (EIRs) on the 10 candidate sites,
- Lease vs purchase economic analyses,
- Conceptual-level site layouts and cost estimates for the 10 candidate sites,
- Feasibility and cost-effectiveness study of the use of non-traditional energy sources (e.g., solar and waste-heat) for heating residual fuel oil, and
- Assessment of alternative storage media.

APPENDIX A

LIST OF POTENTIAL SITES

FOR

EAST COAST RPR

List of Potential Sites For East Coast RPR
(By State or Province)

Site Location (File ID No.)

ARKANSAS

Vicinity of Fort Gibson (3)

DELAWARE

Claymont (152)
Delaware City - I (153)
Wilmington - Edgemoor Disposal Site (160)
Pidgeon Point, Wilmington (161)
Delaware City - II (162)

FLORIDA

Jacksonville (125)
Canaveral (126)
Port Everglades (127)
Miami (128)

LOUISIANA

Vicinity of St. James (4)

MAINE

Harpswell (6)
Otisfield (8)
Brunswick (172)
Searsport (173)
Phippsburg (174)
Brooksville (175)
Webhannet (179)
Clark Island (180)
Mt. Waldo (181)
Great Wass Island (186)
Jonesboro (187)
Portland (190)

MARYLAND

S. W. Area Park, Baltimore (138)
Marley Neck, Baltimore (139)
Piney Point (140)
North Point (141)
Lexington Park (142)
Crisfield (143)
Claiborne (144)

Tolchester (145)
Worton (146)

MASSACHUSETTS

New Bedford (7)
Fall River (11)
Hopkinton (12)
Hingham/Cohasset (167)
Sandwich (168)
South Weymouth (169)
Hingham (170)

NEW HAMPSHIRE

Farmington/Rochester (13)
Hooksett (14)
Manchester (15)
Merrimack (16)
Newington/Portsmouth (17)
New Market (18)
Pelham (19)
Raymond (20)
Rochester (21)
Seabrooke (22)
Portsmouth (171)

NEW JERSEY

Carteret (23)
Linden (24)
Perth Amboy (25)
Pureland (26)
South Amboy (27)
Morgan/Cheesequake Creek I (37)
Morgan/Cheesequake Creek II (50)
Lyndhurst/Sawmill Creek (38)
Union City/Penhorn Creek (39)
Union City (40)
North Arlington (41)
Rutherford/Berry's Creek - (42)
East Rutherford (43)
Brielle/Town of Wall (44)
Long Branch (45)
Port Monmouth (46)
Keansburg (47)
Conaskunk Point (48)
Keyport Harbor (49)
Secaucus/Hackensack River - I (51)
Secaucus/Hackensack River - II (52)
Rutherford/Berry's Creek - II (53)
North Bergen/Cromakill Creek (54)
East Rutherford/Walden Swamp (55)
East Rutherford/Doctor Creek (56)
East Rutherford/Moonachie Creek (57)
Little Ferry (58)
Spring Lake Heights (70)

Allenhurst Loch Arbour (71)
Woodbridge (77)
Elizabeth (82)
Kearny - I (82)
Union City/Little Snake Hill (84)
Sayreville (85)
Edison (86)
Kearny - II (96)
Piles & Morses Creek, Linden (97)
Pettys Is., Pennsauken (104)
Oldman Township - I (105)
Carneys Point (106)
Pennsville (107)
Paulsboro (108)
Westville (109)
Duck Is., Hamilton Township (110)
Newbold Is., Mansfield Township (111)
Burlington Is., Burlington Township (112)
Palmyra Township (113)
Raccoon Is., Logan Township (114)
Oldman Township - II (115)
West Deptford - I (116)
West Deptford - II (117)
West Deptford - IV (118)
West Deptford - III (119)
Money Is., Elsinboro Township (120)
Lowe Alloways Creek Township (121)
Penns Neck Township (122)
Killcohook, Pennsville Township (123)
Cape May (124)
Port Reading (189)

NEW YORK

Plattsburgh (2)
Akron (29)
Greigsville (30)
Himrod/Seneca Lake (31)
Kingston (32)
Roslyn (59)
West Hempstead (60)
Kings Park/East Northport (61)
Middle Island - I (62)
Middle Island - II (63)
Middle Island - III (64)
West Tiana (66)
St. James - I (67)
St. James - II (68)
Crab Meadow/Northport (69)
Setauket (72)
Mt. Sinai/Mattituck (73)
Calverton (74)
Vicinity of Sound Beach (75)
Vicinity of Brookhaven State Park (76)
Fresh Kills (79)
Bulls Head (80)

Vicinity of Arlington Yard, Staten Is. (81)
Prince's Bay, Staten Is. (87)
Arbutus Lake - I Staten Is. (88)
Arbutus Lake - II, Staten Is. (91)
Nassau/Richmond Pkwy., Staten Is. (89)
Pleasant Plains/West Shore Pkwy, Staten Is. (90)
Richmond Creek/Latourette Park, Staten Is. (92)
Springville (93)
Pralls Creek/Arthur Kill, Staten Is. (94)
Vicinity Goethal's Bridge/Arthur Kill, Staten Is. (95)
Cedar Point (99)
Smoking Point (100)
Northville - I (101)
Northville - II (102)
Island of Meadows, Staten Island (103)
Stapelton (188)

PENNSYLVANIA

Mustin Field/Philadelphia (33)
Philadelphia - I (147)
Philadelphia - II (148)
Philadelphia - III (149)
Tinicum Township (150)
Marcus Hook (151)
Falls Township - I (154)
Falls Township - II (155)
Falls Township - III (156)
Tullytown Boro (157)
Fort Mifflin, Philadelphia (158)
Hog Island, Tinicum Township (159)

RHODE ISLAND

Melville (34)
Quinset Point (163)
Davisville (164)
Newport (165)
Prudence Island (166)

VERMONT

West Rutland (35)

VIRGINIA

Chesapeake (129)
Craney Island, Portsmouth (130)
Yorktown (131)
Newport News (132)
Gloucester (133)
Kimarnock (134)
Onancock (135)
Cape Charles (136)
Virginia Beach (137)

Cheatham (176)
Hampton Roads, Portsmouth (177)

NOVA SCOTIA

Strait of Canso/Port Hawkesbury (1)

NEWFOUNDLAND

Belle Island (36)

APPENDIX B

INITIAL SCREENING CRITICAL FACTORS

Appendix B

Initial Screening Critical Factors

RANKING SHEETS

I. Technical

1. Topography

(a) Excessive soil cutting to modify contours:

- o Over 5 million cy = Poor
- o 3-5 million cy = Marginal
- o Less than 3 million cy = Acceptable

(b) Excessive soil fill (controlled borrow) required to have equipment/bldg. pads and roads above 25-year flood level:

- o Over 1 million cy = Poor
- o 500,000 - 1 million cy = Marginal
- o Under 500,000 cy = Acceptable

(c) Rivers, inlets, streams or lakes within site boundaries which are not part of oil distribution system:

- o Comprising over 10 percent of site acreage = Poor
- o Comprising 5-10 percent of site acreage = Marginal
- o Comprising less than 5 percent of site acreage = Acceptable

(d) Limited access to site:

- o Existing conditions require extensive road work to provide access by heavy construction equipment = Poor
- o Otherwise, acceptable

2. Soil Characteristics

(a) Requirement for pile foundations for storage containers:

- o Significant pile work likely = Poor
- o Otherwise, acceptable

3. Seismic

- o Location is seismic zones 3 or 4 = Poor
- o Location is near known fault = Poor
- o Otherwise, acceptable

4. Utilities

(a) Availability of commercial electric power:

- o Permanent site power available no earlier than 24 months after construction start = Poor

- o Amount of power available:

  Less than 2000 kVA = Poor

  Between 2000 and 5000 kVA = Marginal

  Over 5000 kVA = Acceptable

II. Real Estate

1. Estimated property value

- o Over $75K per AC = Poor
- o $25-75K per AC = Marginal
- o Less than $25K per AC = Acceptable

2. Existing Land Use

- o Relocation of existing operation may be required = Poor

- o Owner has initiated plans for property development = Poor

- o Existing easements that significantly impact construction or operation = Poor

- o Extensive demolition required = Poor

- o Otherwise, acceptable

3. Waterfront Real Estate

- o Acreage required for new docks and/or terminal facilities not available (approx. 30 AC required for complete new terminal) = Poor
- o Otherwise, acceptable

III. Terminal

1. Harbor Condition

- o Harbor inlet cannot be negotiated by a 50-Mdwt light-loaded tanker = Marginal
- o Navigation restrictions would not permit use of a tanker having 38-Mdwt, 35-ft. draft, 712 ft. LOA, and 90-ft. beam; and harbor improvement is not permitted.= Poor
- o Annual maintenance dredging of over 1 million cubic yards would be likely = Poor
- o Existing harbor congestion would not permit additional 3 tankers per day = Poor
- o Otherwise, acceptable

IV. Environmental

- o Construction and/or operations could impact endangered or commercially valuable species, as designated by USFWS = Poor
- o Construction sites located on historical or archaeological sites = Poor
- o Site improvements located on floodplains or wetlands = Poor
- o Storage or new terminal site located within one mile of residential area = Poor

- Construction would occur on prime or unique farmland, as designated by Federal, State, or Local Agricultural Organization = Poor
- Use of facility would be inconsistent with existing or proposed Coastal Zone Management Plan = Poor
- EPA-designated "non-attainment" area for air quality = Marginal
- Otherwise, acceptable

APPENDIX C

FINAL SCREENING

POINT BASIS

SITE SCREENING FOR EAST COAST RPR

Point Distribution
(Maximum Possible Points = 115)

I.	Storage Site (max. 75 pts)	
	a. Utilities	0 to 10
	b. Topography	0 to 10
	c. Soils/Geology	0 to 25
	d. Meteorology/Seismology	-10 to 0
	e. Site Access	0 to 5
	f. Existing Structures	- 5 to 2
	g. Real Estate	0 to 15
	h. Security	0 to 4
	i. Safety	0 to 4
II.	Terminal Site (max. 30 pts)	
	a. Availability of existing facilities or feasibility of new construction	0 to 15
	b. Harbor Conditions	0 to 10
	c. Real Estate	0 to 5
III.	Pipeline (max. 10 pts)	
	a. Length	0 to 10
	b. Routing	-10 to 0
IV.	Environmental Impacts (max. 0 pts)	
	a. Air	-3 to 0
	b. Life Forms	-9 to 0
	c. Land & Water	-9 to 0
	d. Socioeconomic	-9 to 0

SITE SCREENING

Point Basis

I. Storage Site — Points

a. Utilities (0 to 10)
(within approx. 1 mile)

(1)	Elect.	=	5
(2)	Steam	=	4
(3)	Sewage	=	1

b. Topography (0 to 10)
(contours & Elevations)

(1) Work Req'd to Level		Tank	Cut & Cover	Mine
Below 1 MM Cu. Yd.	=	10	10	10
1-2.9 MM Cu Yd	=	5	10	10
3-5 MM Cu Yd	=	2	10	10
(2) Poor Property Shape	=	-1	-1	-1

c. Soils & Geology (0 to 25)

		Tank	Cut & Cover	Mine
(1) Bed Rock @ Surface	=	15	0	25
Bed Rock @ -5' to -10'	=	25	0	20
Bed Rock @ -11' to -20'	=	25	5	15
Bed Rock @ -21' to -49'	=	25	15	10
Bed Rock @ Below -50'	=	25	25	5
Bed Rock not suitable for mine	-	-	-	0
(2) Disposal Area	=	-5	0	0
(3) Piling Required:				
Up to 10% of area	=	-5	0	0
Over 10% of area	=	-10	0	0

d. Meteorological & Seismic (-10 to 0)

(1) Seismic: Zone 3 or 4 = -1
Zone 1 or 2 = 0

(2) Storm History (Hurricane & Wind)

None	=	0
5 yr. freq.	=	-2
2 yr. freq.	=	-5
yearly	=	-9

e. Site Access (0 to 5)

		Border Site	Within 1 Mile	Beyond -
Major Fed. H'way	=	4	3	0
State H'way	=	3	1	0
County H'way	=	2	1	0
Secondary road	=	1	0	0
None	=	0	0	0
Only by Waterborne (Heavy Equipment)	=	-2	-2	-2
Rail Availability	=	1	1	0

f. Existing Structures (-5 to 2)

Usable Structures: 3 or more	=	2
Usable Structures: 2 or less	=	1
None	=	0
Wood Bldg. Demo. (& small structures)	=	-1
Concrete Structure Demo.	=	-3
Concrete Structure Demo. (contaminated)	=	-5

g. Real Estate (0 to 15)

(1) Federal Owned, Excess = 15
Federal Owned = 10
State Owned = 5
County Owned = 3
City Owned = 2
Private Owned = 0

(2) Zoning:

No Restrictions = 0

Restrictions = -1 to -2

h. Security (0 to 4)

Difficult to secure (bad contours, numerous drainage culverts, trees, etc.) = 0

Reasonable (slight contours, undergrowth, etc.) = 2

Easy to secure = 4

i. Safety (0 to 4)

Close to Other Oil Co. (Assistance) = 1

Good Water Supply Available = 2

Within 10 mi. of city of 25,000 (good Fire & Police capability) = 1

II. Terminal Site

a. Availability of Existing Terminal or New Construction (Score either (1) or (2).

(1) Exist. Terminal (0 to 15)

Surge Capability = 1

No. 6 oil handled = 2

Oil heating capability = 1

Deballasting capability (at or near) = 1

Booster Pumps = 1

Throughput better than 220,000 BPD = 4

Throughput 100,000-210,000 BPD = 3

Throughput 50,000-90,000 BPD = 2

Throughput less than 50,000 BPD = 1

Docking capacity for 50,000 dwt & 2-Barges = 4

Docking capacity for 50,000 dwt Tanker = 3

Docking capacity for 30,000 dwt tanker = 2

Docking capacity for 16,000 dwt tanker = 1

Docking capacity for less than 16000, dwt (Tanker or Barge) = 0

(2) New Terminal (0 to 9)

Good Depth in Area, 40' = 3

Average Depth in Area, 38' = 2

Minimal Depth in Area, 35' = 1

*Good site contour = 3

Average site contour = 2

Poor site contour = 1

*Excellent Access for Constr. = 3

Average Access for Constr. = 2

Poor Access for Constr. = 1

*NOTE: Automatic maximum points for offshore terminal.

b. Harbor Conditions (0 to 10)

(1) 40' depth & over in channel = 10

38'-39' depth = 9

35'-37' depth = 8

32'-34' depth (minor dredging)= 4

Up to 32' depth (major ") = 0

(2) Dredging: Greater than 1 mile = -4

1/2 mile to 1 mile = -2

Under 1/2 mile = -1

c. Real Estate (0 to 5)*

(1) Ownership:

Federal Owned, Excess = 5

Federal Owned = 4

State Owned = 3

County Owned = 2

City Owned = 1

Private Owned = 0

(2) Zoning:

Restricted = -1

Not Restricted = 0

*NOTE: Automatic maximum points (5) for offshore terminal.

III. Pipeline (0 to 10)

a. Distance Site to Terminal, 5 mi. = 2
Distance Site to Terminal, 4 mi. = 4
Distance Site to Terminal, 3 mi. = 6
Distance Site to Terminal, 2 mi. = 8
Distance Site to Terminal, 1 mi. = 10

b. Routing:

Pass Thru Industrial Area = -1

Pass Thru Residential Area = -2

Pass under railroads or H'ways = -1

River Crossing-Navigable = -4

River Crossing - Other = -2

IV. Environmental Impacts

a. Air (-3 to 0)

Based on EPA designations

b. Life Forms (-9 to 0)

(1) Commercial Fishing (-3)

(2) Endangered Species (-3)

(3) Spawning Beds or Area Fish Migration Routes (-3)

c. Land and Water (-9 to 0)

(1) Flood Plains/Wetlands (-3)

(2) Historical or Archaelogical (-2)

(3) Coastal Zone Management (-2)

(4) Aquifer Recharge/Water Supply Impacts (-2)

d. Socioeconomic (-9 to 0)

(1) Potential for Controversy (-3)

(2) Adjacent to Residential or Shopping Centers (-4)

(3) Near Public Use Areas (Recreational) (-2)

NOTE: Maximum negative scores are shown. Actual rating depends on estimated level or severity of potential impact.

APPENDIX D

FINAL SCREENING

SITE EVALUATION SCORES

PART A. Steel Tanks

PART B. Mines

PART C. Concrete Reservoirs (Cut-and-Cover)

EAST COAST RPR - FINAL SCREENING

A. Steel Tanks

NO.	SITE (FILE ID NO.)	POTENTIAL VOLUME (MMB)	POINT SCORE
1	Canaveral, Fla (126)	10	85
2	Craney Is., Portsmouth, Va (130)	10+	74
3	Portsmouth, N. H. (171)	10-20	86
4	Northville II, N. Y. (102)	20	76
5	Jacksonville, Fla (125)	20	72
6	West Deptford II, N. J. (117)	20	67
7	Harpswell, Me (6)	20	65
8	Vicinity of Sound Beach, N. Y. (75)	20	63
9	Carneys Point, N. J. (106)	10	63
10	Philadelphia III, Pa (149)	10	62
11	Mt. Sinai/Mattituck, N. Y. (73)	20	61
12	West Deptford IV, N. J. (118)	20	62
13	Davisville, R. I. (164)	20	59
14	Smoking Point, N. Y. (100)	10	59
15	Port Everglades, Fla (127)	10	59
16	West Depthford I, N. J. (116)	10	58
17	Marley Neck, Baltimore, Md (139)	20	58
18	Sandwich, Mass (168)	20	57
19	Vic. of Brookhaven State Park, N. Y. (76)	20	57
20	Setauket, N. Y. (72)	10	56
21	North Point, Md (141)	20	56
22	Chesapeake, Va (129)	10	55
23	Yorktown, Va (131)	20	55
24	Hampton Roads, Portsmouth, Va (177)	10	52
25	Searsport, Me (173)	20	49
26	Vicinity of St. James, La (4)	20	48
27	Oldman Township I, N. J. (105)	20	47
28	Brooksville, Me (175)	10	47
29	Linden, N. J. (24)	10	41
30	Cape Charles, Va (136)	20	41
31	Gloucester, Va (133)	20	34
32	Middle Is. III, N. Y. (64)	10	30
33	Seabrooke, N. H. (22)	10	29
34	Middle Is. I, N. Y. (62)	20	25
35	Middle Is. II, N. Y. (63)	10	25
36	Phippsburg, Me (174)	20	22

EAST COAST RPR - FINAL SCREENING

B. Mines

NO.	SITE (FILE ID NO.)	POTENTIAL VOLUME (MMB)	POINT SCORE
1	Portland, Me (190)	20	58
2	Jacksonville, Fla (125)	20	52
3	Brooksville, Me (175)	10	47
4	Carneys Point, N.J. (106)	10	43
5	West Deptford I, N.J. (116)	10	43
6	Marley Neck, Baltimore, Md (139)	20	43
7	Hampton Roads, Portsmouth, Va (177)	10	42
8	Great Wass Is., Me (186)	20	41
9	Oldman Township I, N.J. (105)	20	41
10	Chesapeake, Va (129)	10	40
11	Davisville, R. I. (164)	20	39
12	North Point, Md (141)	20	36
13	Yorktown, Va (131)	20	35
14	Sandwich, Mass (168)	20	32
15	Searsport, Me (173)	20	32
16	Jonesboro, Me (187)	20	26
17	Seabrooke, N.H. (22)	10	22
18	Cape Charles, Va (136)	20	21
19	Clark Is., Me (180)	20	17
20	Gloucester, Va (133)	20	14
21	Phippsburg, Me (174)	20	12

EAST COAST RPR - FINAL SCREENING

C. Concrete Reservoirs (Cut-and-Cover)

NO.	SITE (FILE ID NO.)	POTENTIAL VOLUME (MMB)	POINT SCORE
1	Craney Is., Portsmouth, Va (130)	10+	89
2	Portsmouth, N. H. (171)	10+	86
3	Northville II, N. Y. (102)	20	76
4	Calverton, N. Y. (74)	20	74
5	Jacksonville, Fla (125)	20	72
6	Smoking Point, N. Y. (100)	10	69
7	Mt. Sinai/Mattituck, N. Y. (73)	20	66
8	Vicinity of Brookhaven State Park, N. Y. (76)	20	65
9	Setauket, N. Y. (72)	10	64
10	Carneys Point, N. J. (106)	10	63
11	West Deptford I, N. J. (116)	10	63
12	Vicinity of Sound Beach, N. Y. (75)	20	63
13	Marley Neck, Baltimore, Md (139)	20	63
14	Philadelphia III, Pa (149)	10	62
15	Hampton Roads, Portsmouth, Va (177)	10	62
16	Oldman Township I, N. J. (105)	20	62
17	Chesapeake, Va (129)	10	60
18	Davisville, R. I. (164)	20	59
19	Sandwich, Mass (168)	20	57
20	North Point, Md (141)	20	56
21	Yorktown, Va (131)	20	55
22	Cape Charles, Va (136)	20	41
23	Harpswell, Me (6)	10	40
24	Middle Is. III, N. Y. (64)	10	38
25	Searsport, Me (173)	20	37
26	Gloucester, Va (133)	20	34
27	Middle Is. II, N. Y. (63)	10	33
28	Middle Is. I, N. Y. (62)	20	33
29	Brooksville, Me (175)	10	27
30	Seabrooke, N. H. (27)	10	27
31	Phippsburg, ME (174)	20	12

APPENDIX E

CANDIDATE SITES: DATA SHEETS

PORTSMOUTH, VIRGINIA SITE

a. General.

The site in the Portsmouth, Virginia area is located on the Craney Island Naval Facility, which is north of Portsmouth and near the southern branch of the Elizabeth River.

b. Technical Feasibility and Suitability for Storage.

(1) The site is located in an area where utilities such as water and power are readily available. Potable water is available at some distance, as are sanitation facilities. Steam is not available at the site.

(2) The property borders on the south side of the 2500-acre disposal area. Adjacent areas are currently used for Navy fuel storage and all existing tanks are on piling.

(3) The property elevation ranges from 8 feet to 15 feet above sea level. The 100-year floodplain in this area is 8.5 feet elevation. Mean tidal range is 2.7 feet and extreme is 3.4 feet. Extremes of irregular fluctuations due to combined effect of tides and wind are minus 3.5 feet and plus 9.62 feet.

(4) The proposed site is located in seismic zone #1. The temperature will vary from a high of 85°F in August to a low of 30°F in January. The normal and annual precipitation is 44 inches, and the normal annual snowfall is between 6 inches and 18 inches.

c. Storage Capacity Availability.

(1) Tract Size - The entire Craney Island Fuel Depot is estimated to be about 896 acres. With regard to the potential storage of No. 6 Residual Fuel Oil, there are about 400 acres of contiguous open land

available as a storage site; however, about 133 acres of this open land have been leased to the city of Portsmouth for a solid refuge land fill (no garbage).

(2) Expansion Potential - There are other smaller open tracts on the Craney Island Fuel Depot. Also, the 2,500-acre Craney Island Disposal Area, which is active, is located adjacent to and north of the Fuel Depot; thus, the basic site size is only adequate for storage of 10 MMB #6 residual oil, with the possibility of expansion to 20 MMB on tracts described.

(3) Soils are clay and silt, with fat marine clay at a depth of 4 to 10 feet. The material has little bearing capacity and all existing tanks are constructed on piles. Bed rock is indicated to be at 2200 feet depth. Ground water is at a depth of 4 to 5 feet.

(4) Dewatering would be very difficult due to the cohesive nature of the soil. This also is very inefficient for well points.

d. Proximity to Existing Petroleum Distribution System.

(1) The dock/terminal consists of one 1200-foot pier and one 900-foot finger pier. Draft alongside the main pier ranges from 40 to 42 feet m.s.l., and alongside the smaller pier the depth ranges from 32 to 36 feet m.s.l. Previous records indicate that three vessels call at the facilities weekly and two barges call at the facilities daily.

(2) The terminal has a storage capacity of 2.7 MMB and is served by a number of pipelines from 6 inches to 12 inches in diameter. These facilities handle Naval Special Fuel Oil which is equivalent to #4 Fuel Oil.

The present facilities are currently utilized so a new pipeline will be required from the dock to the proposed tank farm approximately two (2) miles distant. The dock will require modification to connect the pipeline to the unloading facilities.

e. Environmental Impact.

No serious environmental problems are anticipated as the proposed facility is in compliance with the area land use management plan.

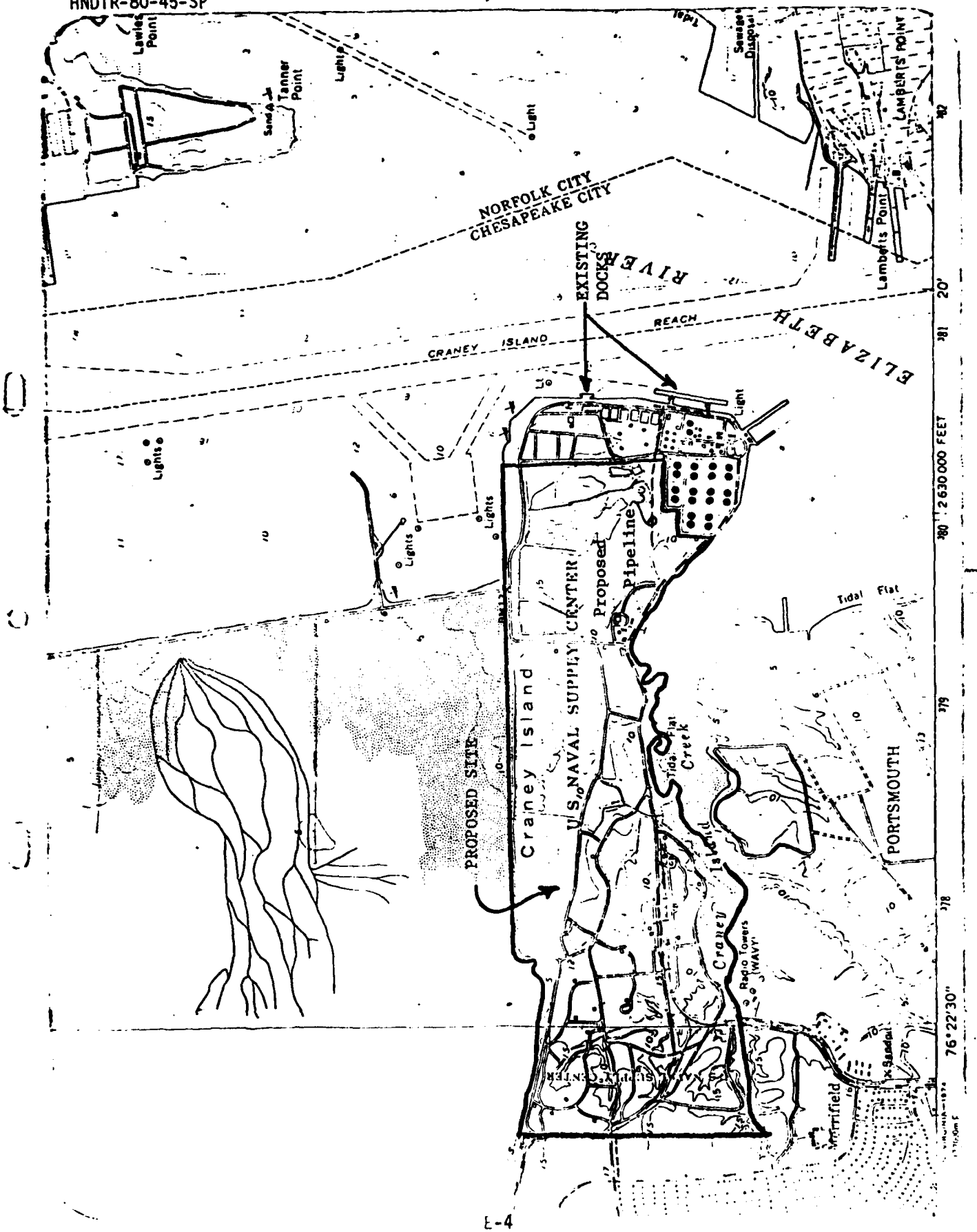
f. Security and Safety.

(1) The facility is presently secured by Navy Guards. It is anticipated this would continue. Backup support is available from local law offices.

(2) The Navy Fire Department would respond to fires in the storage site areas. They have modern equipment, including foam, and are thoroughly trained in extinguishing petroleum fires. Backup support is available from adjacent area fire department, such as Portsmouth and Suffolk.

HNDTR-80-45-SP

PORTSMOUTH, VIRGINIA



CANAVERAL, FLORIDA SITE

a. General.

The Canaveral site is located on the Canaveral Peninsula, at the north edge of the City of Cape Canaveral, Florida.

b. Technical Feasibility and Suitability for Storage.

(1) The site is located in the Canaveral Harbor area where major utilities such as power, water, potable water, and sanitation facilities exist. There is a steam line adjacent to the site, but availability and capacity are unknown at this time.

(2) The sites are in the general area of other oil storage facilities and petroleum facilities.

(3) Property in the area ranges in elevation from tidal flats and low disposal areas to as high as 10 feet above m.s.l.

(4) The property is located in seismic zone #1. The climate is semi-tropical with lowest temperatures, in the middle 50s, occuring in January and the highest temperatures in the low to middle 90s encountered during July and August. Annual precipitation can be expected to be approximately 52 inches. Flooding from a severe hurricane is possible.

c. Storage Capacity Availability.

(1) There are approximately 200 acres available on Government property adjacent to the Canaveral Harbor which is operated by the Port Authority of the State of Florida.

(2) The potential site is relatively flat and underlain with sand. Special foundation treatment is anticipated, however, due to a subsurface clay layer. *This may require site preloading or piling to some degree.*

(3) The site under consideration can accommodate storage of 10 MMB of residual oil with the possibility of expanding to 20 MMB.

(4) There are excellent major highways adjacent to the property and railroads within one mile.

(5) The site is located within four miles from existing docks, or a new dock location. An under-river crossing will be required.

d. Proximity to Existing Petroleum Distribution System.

(1) Canaveral Harbor presently has three tanker berths which are capable of handling residual fuel oil.

(2) Tanker berth No. 3, which is new, will accommodate ships up to 950 feet long with 40-foot draft. This terminal will serve tankers up to 80,000 dwt and will be connected by pipeline to the bulk storage facilities of Canaveral Corporation, Belcher Oil Company, Florida Power and Light, and Orlando Public Utilities.

(3) A new pipeline would extend from tanker berth No. 3 under the Bannana River to the storage location which is within four miles.

e. Environmental Impact.

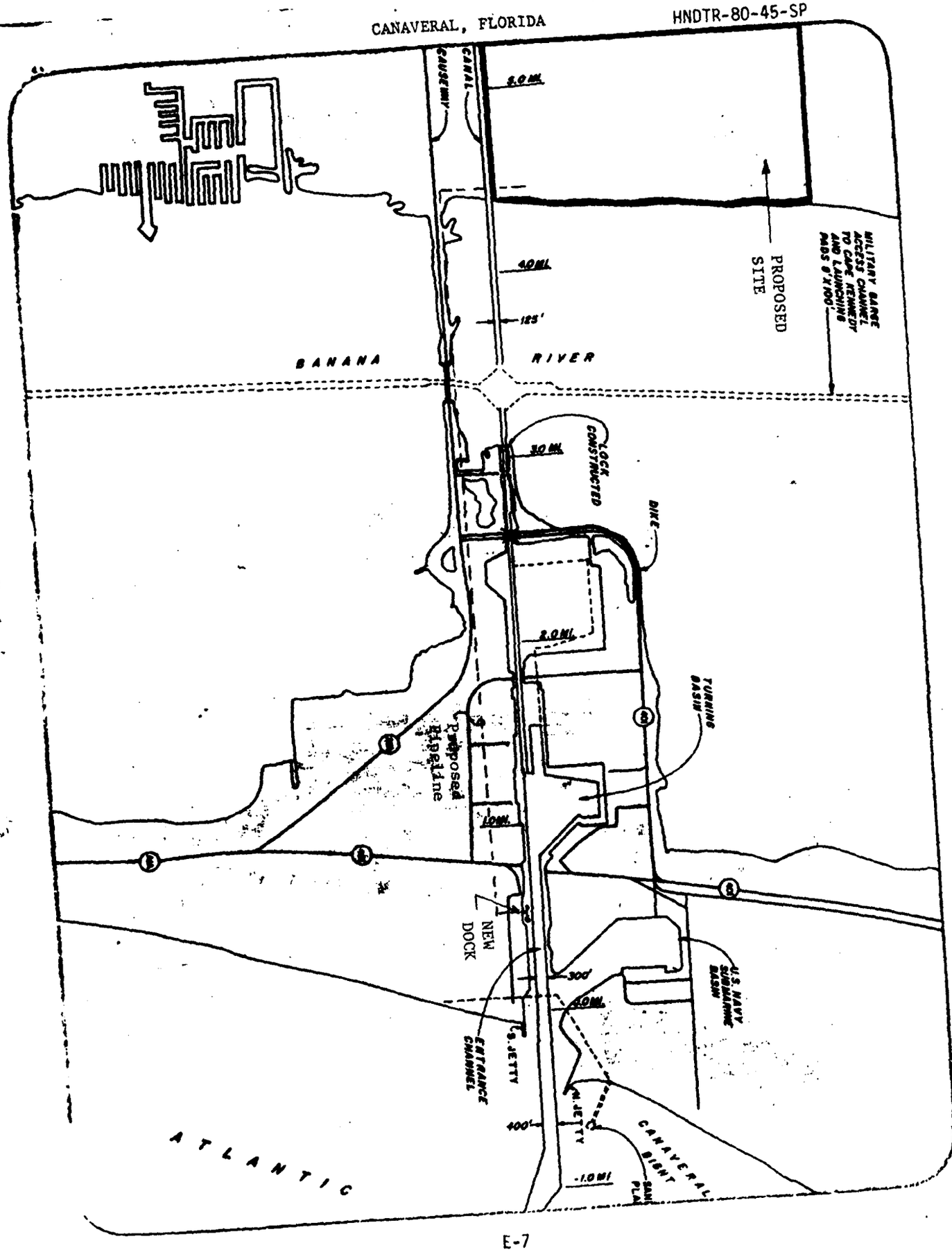
(1) Special precautions will have to be taken at the site to prevent pollution from accidental oil spills, or destruction of wetland.

(2) Minor impact is anticipated during construction and could consist of earth moving and site clearing with some loss of wildlife habitat, and water quality degradation through harbor construction activities.

f. Security and Safety.

(1) The harbor is secured by personnel arranged for by the Port Authority. Local law enforcement from Cape Canaveral is available for backup if required.

(2) The Port Authority is responsible for fire protection in the harbor area, which apparently is adequate. Adjacent communities are capable of responding if required.


CANAL
CAUSEWAY
5.0 MI.
4.0 MI.
125'
PROPOSED SITE
MILITARY BARGE ACCESS CHANNEL TO CAPE KENNEDY AND LAUNCHING PADS 6'X100'
BANANA
RIVER
LOCK CONSTRUCTED
3.0 MI.
BIKE
2.0 MI.
TURNING BASIN
Proposed Pipeline
1.0 MI.
NEW DOCK
300'
5.0 MI.
U.S. NAVY SUBMARINE BASIN
ENTRANCE CHANNEL
S. JETTY
N. JETTY
400'
-1.0 MI
CANAVERAL BIGHT
SAND PLA
ATLANTIC

PORTSMOUTH, NEW HAMPSHIRE SITE

a. General.

The Portsmouth, New Hampshire site is located on the Pease Air Force Base property in the Newington area of Rockingham County, New Hampshire near the Piscataqua River.

b. Technical Feasibility and Suitability for Storage.

(1) The utilities that are available at the site include power and water, and are adequate to meet the needs of the storage complex. Steam is not available as heating utilizes hot water. Potable water and sanitation systems are available at some distance, however.

(2) Numerous roadways exist throughout the complex and connect with major highways less than one mile from the site. A major railroad line runs north and south along the Piscataqua River less than one mile from the site.

(3) The property elevation ranges from 40 feet to 100 feet above sea level. The site is not subject to flooding or erosion through wave action.

(4) The site is located in seismic zone #1. The temperature will vary from a high of 85°F in July to a low of 16°F in February. The normal annual precipitation is 44 inches and annual snowfall is between 60 inches and 100 inches.

c. Storage Capacity Availability.

(1) The area under consideration is approximately 250 acres. The property is Government-owned and presently under jurisdiction of the U. S. Air Force.

(2) The topography of the Government site is such that 10 MMB storage of #6 residual oil could be accommodated. Soils consist of silts, clays, sand and gravels, impervious to pervious and with a bearing range of 3000+ psf.

(3) Expansion of the facility to 20 MMB would require acquisition of private property. Tracts of 96 and 87 acres, respectively, east of the base; and 81 and 57 acres, respectively, north of the base would be sufficient for the expansion.

(4) Development of this site for oil storage appears practical and economically feasible because of the terrain, accessibility to navigation, and the existence of oil terminals along the Piscataqua River.

d. Proximity to Existing Petroleum Distribution System.

(1) The New England Tank Industries dock and terminal currently receives and distributes petroleum products directly to Pease AFB through one 18-inch and five 16-inch pipelines.

(2) The dock is an offshore dock consisting of a row of three steel piles, cellular breasting dolphins connected by catwalk. A 160 by 4 foot ap proach leads to the lower dolphin. The total face length is 250 feet. Depth alongside at m.s.l. is 38 feet.

e. Environmental Impact.

(1) Air Quality: According to EPA, this site presently is in violation of new source standard for petroleum storage. The present level of oxidants exceeds prescribed standards and any new facility siting would require emission compromises between existing and new sources.

(2) Land Use Restrictions: Most environmental impacts would be limited to the duration of construction with few impacts to be experienced

during the storage period. Major land impact would consist of surface disruption, clearing of vegetation, erosion, loss of wildlife habitat and degradation of visual quality in the area.

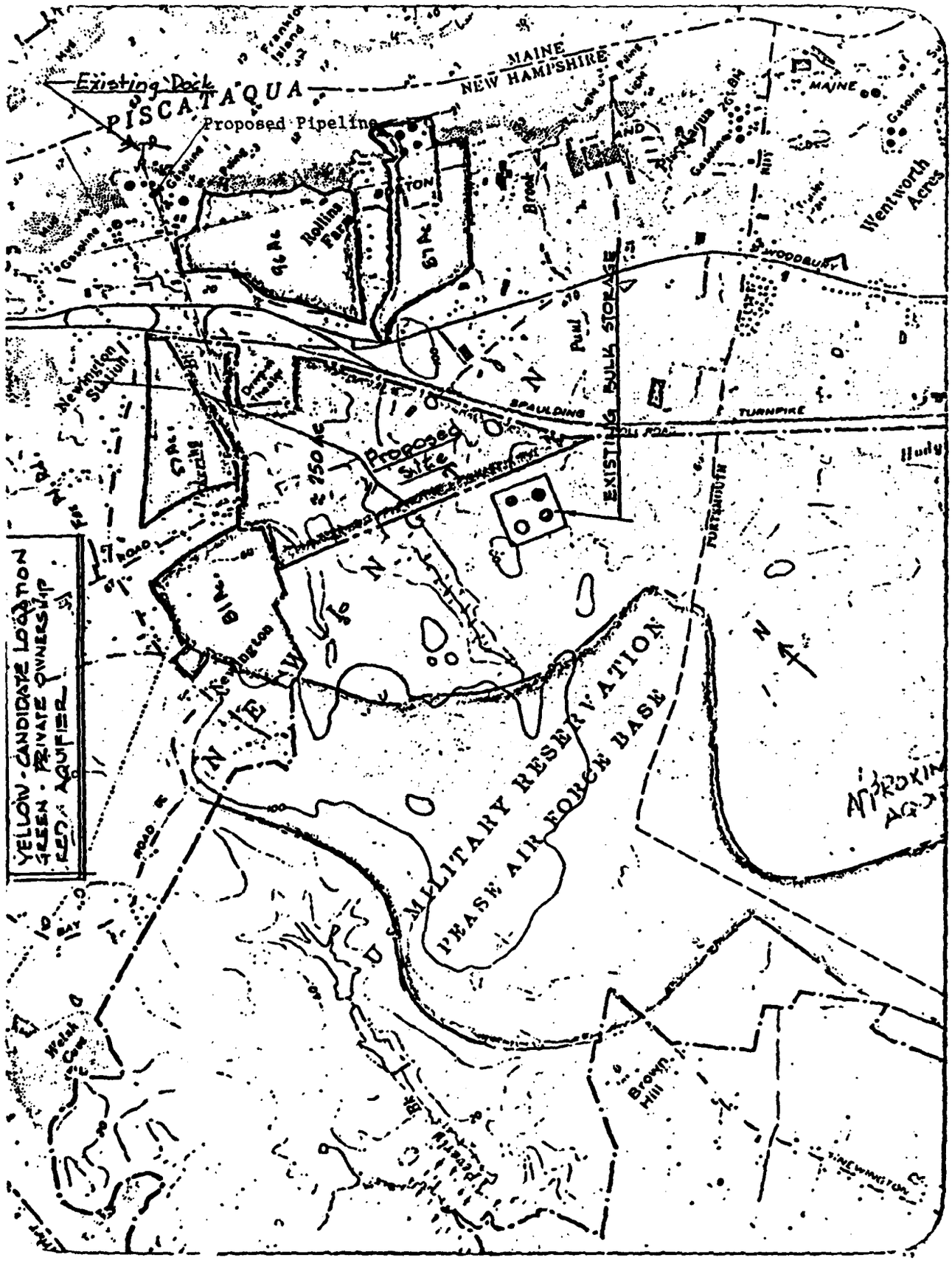
(3) Wetland Constraints: Possible impacts depending on the actual construction site location.

(4) Impact on Coastal Waters. Marine life and productivity could be affected as a result of facility construction, along with the increased possibility of accidental oil spills. Water quality may be affected by temporary increases in turbidity and possible changes in pH, DO, BOD, nutrient content, heavy metals and suspended solids.

f. Security and Safety.

(1) The Government property is presently secured by military personnel. The New England Tank Industry dock is under constant observation by watchmen. Backup support is available from law agencies from surrounding areas.

(2) Presently Government personnel provide fire protection capability for the fuel oil storage facilities. The New England Tank Industry dock is equipped with fire hydrants, hose, pumps and hand extinguishers. Local fire departments in adjacent cities are available as backup.


Existing Dock
PISCATAQUA
Proposed Pipeline
MAINE
NEW HAMPSHIRE
Rollins Farm
Wentworth Acres
Newington Station
EXISTING BULK STORAGE
SPAULDING TURNPIKE
Proposed Site
PEASE AIR FORCE BASE
MILITARY RESERVATION
YELLOW - CANDIDATE LOCATION
GREEN - PRIVATE OWNERSHIP
RED - AQUIFER
Welch Cove
Brown Hill

CALVERTON, NEW YORK SITE

a. General.

The Calverton site is located on Long Island between the communities of Calverton and Riverhead. The site is approximately four miles from Long Island Sound and is situated on U. S. Navy property that is presently used as an airfield by the Grumman Corporation, contractor for the Navy.

b. Technical Feasibility and Suitability for Storage.

(1) Sufficient power and water are available on the airfield site. Potable water and sanitation facilities are available within one mile. Steam is not available to the site.

(2) Site elevations range from 50 feet to 80 feet above m.s.l., and the site is reasonably flat. The soil is sandy and glacial.

(3) The site is located in seismic zone #1. The Long Island area has a climate that more closely resembles the continental type of climate despite the nearness to the ocean and bays. This is due to weather conditions that approach normally from the west rather than from the ocean. High temperature in the range of 85°F will occur during July, while the coldest temperature as low as 25°F occurs during January. Precipitations will normally be approximately 40 inches per year; snowfall will seldom exceed 24 inches per year.

c. Storage Capacity Availability.

(1) The total size of the Naval Facility is 1600 acres of which the majority is used by the air strips and support facilities. Two tracts do exist to the north of the main runway that could easily accommodate 10 MMB storage each.

(2) The property is Government-owned and operated by Grumman Company, a contractor for the U. S. Navy. It is anticipated that arrangements for suitably sized storage areas could be accomplished expeditiously.

d. Proximity to Existing Petroleum Distribution System.

(1) No dock/terminal facilities exist to serve this site. A new offshore berth would be required.

(2) The offshore berth would have to be approximately one mile offshore where water of sufficient depth (40') exists. This would be more attractive than having to do considerable dredging.

(3) A pipeline at least 24-inches in size would extend from the storage site approximately 4.8 miles to the offshore berth.

e. Environmental Impact.

(1) Environmental impact at the storage site could be minimized by utilizing the belowground concrete-tank-storage concept. Minor impact could be anticipated in clearing, excavating, filling and erosion normally encountered during construction.

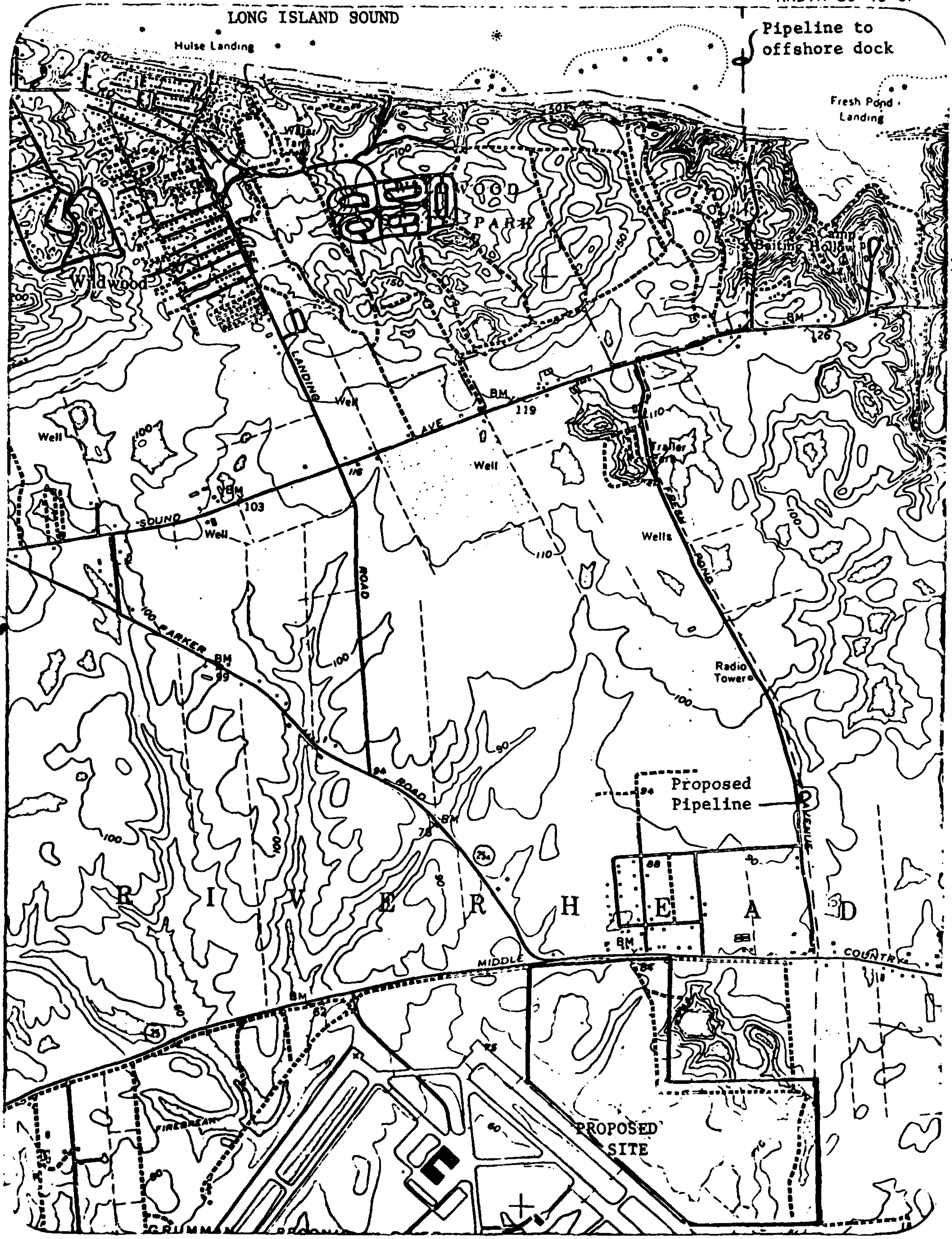
(2) Major environmental problems are anticipated during the pipeline construction. It must be buried a distance of approximately 3.5 miles, and be routed through farming, rural, residential, waterfront, and beach areas.

(3) Minor environmental impact could be expected during construction of the offshore berth and pipeline and would temporarily affect water quality and fishing grounds.

f. Security and Safety.

(1) The storage site is presently secured by the Navy contractor.

(2) Adequate fire protection equipment is available at Grumman, and local support could be arranged from communities such as Calverton and Wading River.


LONG ISLAND SOUND
Hulse Landing
Pipeline to
offshore dock
Fresh Pond
Landing
Wildwood
PARK
Camp
Baiting Hollow
Well
Well
Well
Wells
Radio
Tower
Proposed
Pipeline
R I V E R H E A D
MIDDLE
COUNTRY
PROPOSED
SITE
LANDING
ROAD
PARKER
SOUND
AVE
Trailer
FIREBREAK

NORTHVILLE II, NEW YORK SITE

a. General.

The proposed site is located on the Long Island Sound side of Long Island near Riverhead Long Island, New York. The site lies north of Sound Avenue and east of Pennys Road and borders the Northville Industries tank farm ~~on the north side~~.

b. Technical Feasibility and Suitability for Storage.

(1) The site is located in a largely rural farming area, yet sufficient utilities, such as water and power, are readily available. Steam and potable water are available in an adjacent facility but are considered to be inadequate.

(2) The property borders an existing tank farm having a capacity of 4.6 MMB currently being operated by a private oil company.

(3) The New York-Long Island area has a climate which more closely resembles the continental-type of climate despite the nearness to the ocean and numerous bays and rivers. This is due to the normal approach of weather conditions from the west rather than from the ocean. High temperatures appear usually in July and reach in excess of 85°F, and cold temperatures occur during January and reach as low as 25°F. Precipitation will normally reach 40 inches per. year. Snowfall will seldom exceed 24 inches per year.

c. Storage Capacity Availability.

(1) The site under consideration is in excess of 400 acres and lies immediately south of the Northville Industries Riverhead Tank Farm facility.

(2) Major highways border the property and a freeway is located within 5 miles.

(3) Elevation of the site ranges from 50 to 100 feet above sea level and the site is large enough to accommodate 20 MMB storage.

(4) The property is owned by a number of private parties.

d. Proximity to Existing Petroleum Distribution System.

(1) The advantage of this storage facility would be optimized through utilization of the Northville Industries loading/unloading facilities.

(2) These facilities include an offshore mooring platform capable of handling 250,000-dwt tankers, and a barge jetty for receiving and loading 25,000 barrel barges. The depth alongside the tanker berth is 60 feet. Current pump rates for tanker loading is 55,000 BPH.

(3) Two 24-inch submarine pipelines connect the mooring platforms to the terminal. Similar lines connect the barge jetty to the terminal. The mooring platforms are equipped with articulating arms and hydraulic coupling units to facilitate rapid, efficient and safe operation.

e. Environmental Impact.

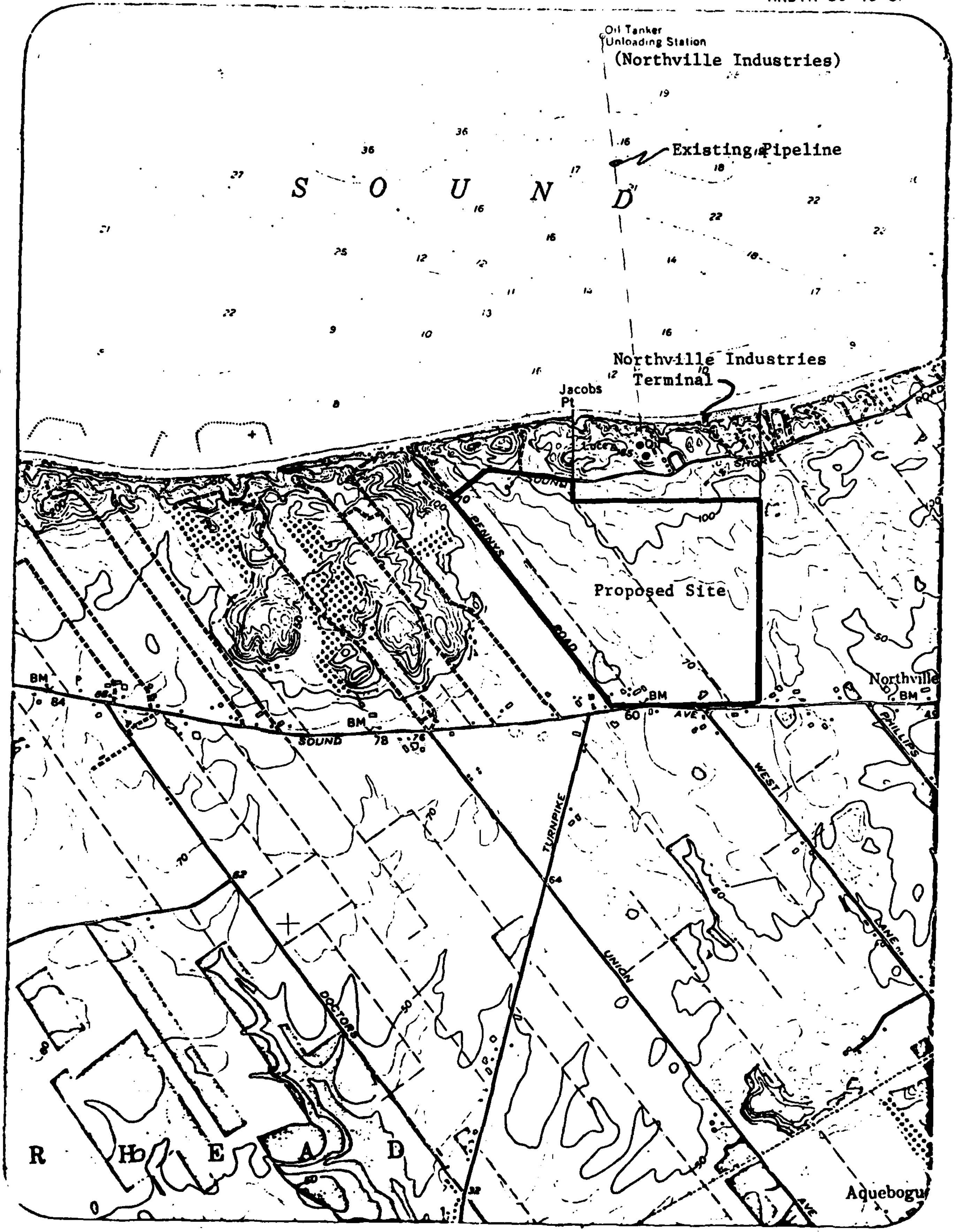
(1) It is anticipated that considerable resistance and environmental impact will be encountered as the construction would be in rural farming areas where considerable effort has been expended to preserve these areas as being only for farming use.

(2) No impact would be anticipated for modifications in the Northville Industries facility to connect to the new storage facility.

f. Security and Safety.

(1) Northville Industries currently secures their facility in a manner suitable to industry. Local enforcement agencies are available for backup if necessary.

(2) Northville Industries has suitable fire protection equipment at both offshore berths and the terminal. Support may be obtained from adjacent area fire departments, such as Northville or Riverhead, if required.


Oil Tanker
Unloading Station
(Northville Industries)
Existing Pipeline
S O U N D
Northville Industries
Terminal
Jacobs
Pt
Proposed Site
BM
SOUND
AVE
WEST
PHILLIPS
TURNPIKE
UNION
DOCTORS
LANE
Northville
R H E A D
Aquebogu

PORTLAND, MAINE SITE

a. General.

The site proposed in the Portland, Maine area is located approximately seven miles to the northwest of the city near exit 8 of the Maine Turnpike.

b. Technical Feasibility and Suitability for Storage.

(1) The site is proposed to be under an existing quarry. Suitable water, power, potable water and sanitation facilities are presently available.

(2) The property maximum elevation is 100 feet above m.s.l., and the existing quarry depth is generally 23 feet below m.s.l.

(3) The site is located in seismic zone #3 and, in general, is considered an aseismic area when compared with other parts of the country such as sections of California where the frequency of earthquakes is some 30 to 40 times that of New England.

(4) Portland, Maine is situated on a rolling coastal plain bordering the Atlantic Ocean. The White Mountains lie to the northwest and reduce the precipitation and shelter the area from strong northwesterly winds. The ocean modifies continental air masses to produce a damp, yet moderate climate in comparison to adjacent inland regions. Monthly normal temperature extremes range from an average of 74°F in July to 22°F in January. Normal yearly precipitation is 40.8 inches and seasonable snowfall is approximately 78 inches.

c. Storage Capacity Availability.

(1) The tract under consideration is suitable only for mine-type-storage of up to 20 MMB of residual.

(2) The tract size is approximately 140 acres. Subsurface rights will be required for a total of 15.7 acres from the Maine Turnpike Authority.

(3) Residual should be stored on a fixed-waterbed under atmospheric pressure. The nominal depth of the waterbed is approximately 20 inches in order to provide space for settlings. The roof of the cavern would be around 115 feet below m.s.l. and the cavern floor would be approximately 200 below m.s.l.

(4) Evaluation of the geological and geotechnical conditions that exist at this site indicate that it would be feasible to construct a facility for the underground storage of petroleum products.

(5) The storage facility property is presently owned by Blue Rock Industries and should be considered as a possible lease facility, or to be purchased.

d. Proximity to Existing Petroleum Distribution System.

(1) Three exisiting pipelines, that are owned by the Portland Pipeline Company are located above the proposed storage vessel and extend from a terminal in Portland Harbor to refineries in Montreal, Canada.

(2) The existing pipelines are one-way pipelines that specifically carry crude oil. It is anticipated that converting to handle residual, as well as reverse flow capability, will not be acceptable to the Portland Pipeline Company; therefore, a new pipeline would be required to the harbor area.

(3) The Portland Terminal Company owns Wharf No. 3, which is located on the north side of the Fore River Channel approximately 2,000 feet above the Portland Bridge. The wharf is a masonry stone retaining wall, solid fill, with a timber pile, timber-decked extension, total length of 1,400 feet and is presently unused. Adjacent water depths range between 30 feet and 35 feet.

(4) The wharf would require modification to handle #6 residual and tanker needs, including deballasting.

(5) A new 24-inch underground pipeline approximately 4.5 miles in length would be required from the wharf, along the waterfront property of the Portland Terminal Company to the southwest abutment of the railroad bridge. From there it will follow the Portland Terminal Company rail track to the storage site. The pipe will be located in the Portland Terminal Company property or in the railroad right-of-way.

e. Environmental Impact.

(1) Construction of a mine facility and the resulting rock storage would significantly alter existing topographic conditions over an approximate 59-acre area which could cause settlements up to 10 feet.

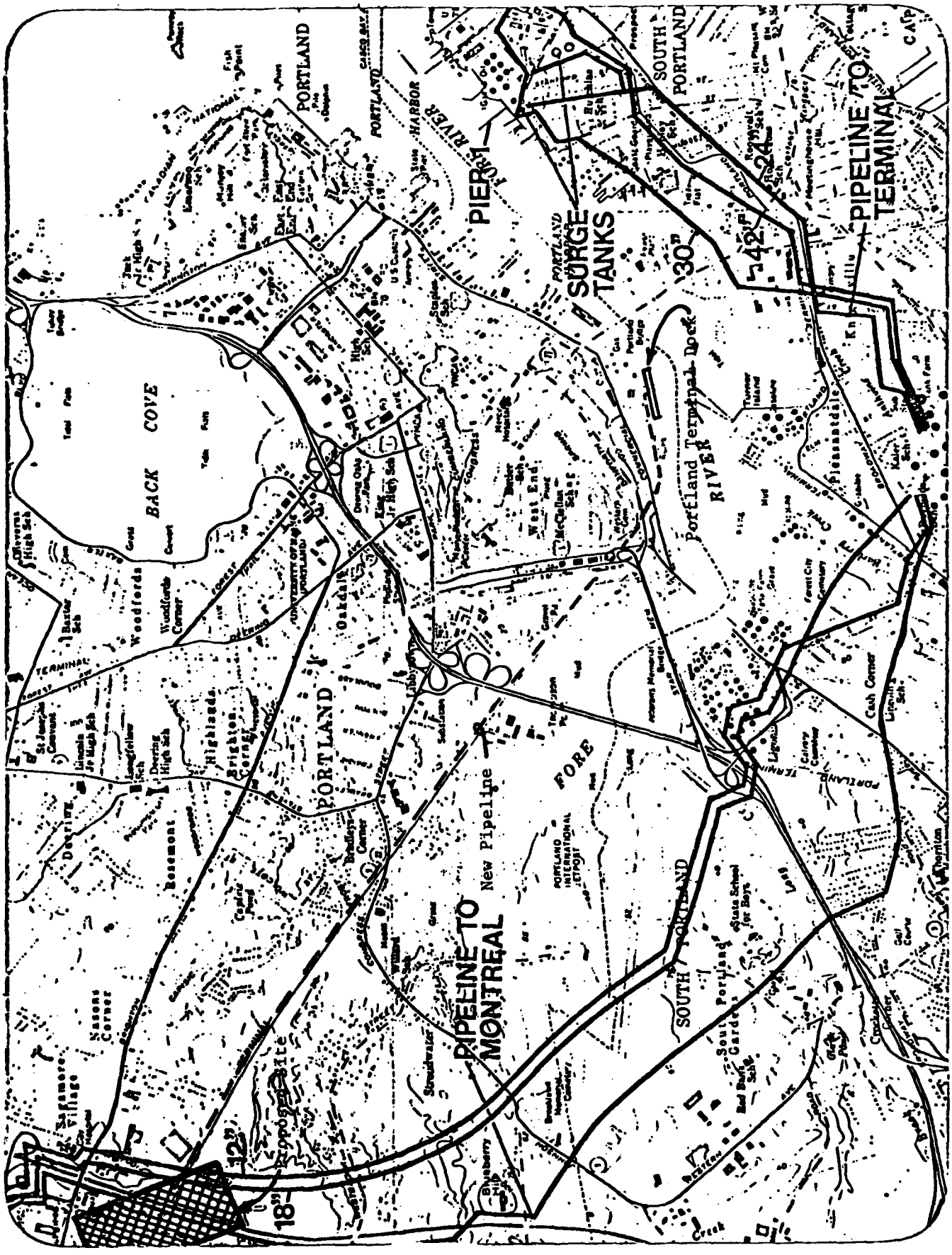
(2) Adverse effects on the terrestrial and aquatic communities at the storage and terminal sites are not anticipated to be significant. The major impacts of clearing and stockpiling at the storage site are losses of vegetation and wild life habitat.

(3) The primary adverse effect on ecological systems may result from accidental oil spills and the associated impact on marine and fresh water flora and faura.

(4) Minor construction related impact may be expected along the pipeline route.

f. Security and Safety.

(1) Terminal and storage facilities are either not-in-use or non-existent, thus security and safety are not applicable at this time.


PORTLAND
SOUTH PORTLAND
PIER
SURGE TANKS
PIPELINE TO TERMINAL
BACK COVE
Portland Terminal Dock
RIVER
FORE
New Pipeline
PIPELINE TO MONTREAL
Woodfords
Oakdale
Highlands
Basement
Nasons Corner
Cash Corner
Pleasantdale
West End
Deering High Sch
Lincoln Jr High Sch
Portland High Sch
Casco Bay
Fore River
Portland Harbor
Portland International Jetport
Spring Point
Bug Light
Cape Elizabeth
Scarborough
Pine Point
Old Orchard Beach
Saco
Biddeford
Kennebunk
Kennebunkport
Wells
Ogunquit
York
Sanford
Springvale
Alfred
Waterboro
Limerick
Cornish
Hiram
Fryeburg
Conway
North Conway
Bartlett
Jackson
Glen
Intervale
Bethlehem
Franconia
Littleton
Whitefield
Jefferson
Waldoboro
Damariscotta
Boothbay Harbor
Wiscasset
Bath
Brunswick
Freeport
Yarmouth
Cumberland
Gray
New Gloucester
Poland
Minot
Auburn
Lewiston
Lisbon
Topsham
Bowdoin
Richmond
Gardiner
Hallowell
Augusta
Waterville
Fairfield
Skowhegan
Madison
Anson
Norridgewock
Farmington
Wilton
Jay
Livermore Falls
Rumford
Mexico
Dixfield
Canton
Peru
Oxford
Norway
South Paris
Bridgton
Harrison
Naples
Sebago
Casco
Raymond
Windham
Gorham
Westbrook
Scarborough
Old Orchard Beach
Saco
Biddeford
Kennebunk
Kennebunkport
Wells
Ogunquit
York
Sanford
Springvale
Alfred
Waterboro
Limerick
Cornish
Hiram
Fryeburg
Conway
North Conway
Bartlett
Jackson
Glen
Intervale
Bethlehem
Franconia
Littleton
Whitefield
Jefferson
Waldoboro
Damariscotta
Boothbay Harbor
Wiscasset
Bath
Brunswick
Freeport
Yarmouth
Cumberland
Gray
New Gloucester
Poland
Minot
Auburn
Lewiston
Lisbon
Topsham
Bowdoin
Richmond
Gardiner
Hallowell
Augusta
Waterville
Fairfield
Skowhegan
Madison
Anson
Norridgewock
Farmington
Wilton
Jay
Livermore Falls
Rumford
Mexico
Dixfield
Canton
Peru
Oxford
Norway
South Paris
Bridgton
Harrison
Naples
Sebago
Casco
Raymond
Windham
Gorham
Westbrook
42"
30"
24"
18"
12"

WEST DEPTFORD, NEW JERSEY SITE II

a. General.

The site identified as West Deptford II is located on the south side of the Delaware River, west of the mouth of Woodbury Creek.

b. Technical Feasibility and Suitability for Storage.

(1) The site is located in an industrial area where adequate water and power are available. Potable water and sanitation facilities are available within one mile; steam is not available.

(2) The property elevation ranges between 10 feet and 15 feet above sea level. This area is rarely flooded.

(3) The site is located in seismic zone #1. The locality temperature is moderated to some degree by the Delaware Bay. Temperatures in the summer rarely exceed 85 degrees F. and in winter seldom get colder than 25 degrees F. Precipitation normally is in the range of 40 inches per year and snowfall varies between 12 inches and 24 inches per year.

c. Storage Capacity Availability.

(1) The property consists of approximately 1,100 acres and is totally undeveloped. The property is owned by the Tenneco Oil Company.

(2) It is anticipated that some of the area will require pre-loading or possible minor piling.

(3) Property required for a 20 MMB storage facility and appropriate terminal would be approximately 400 acres.

d. Proximity to Existing Petroleum Distribution System.

(1) The closest marine terminals are three miles distant. Due to the proximity of this site to the Delaware River, it is most feasible to construct an adequate offshore wharf in the Delaware River.

(2) Pipeline construction extending from an offshore wharf to the storage site would not be difficult and no major problems are anticipated.

e. Environmental Impact.

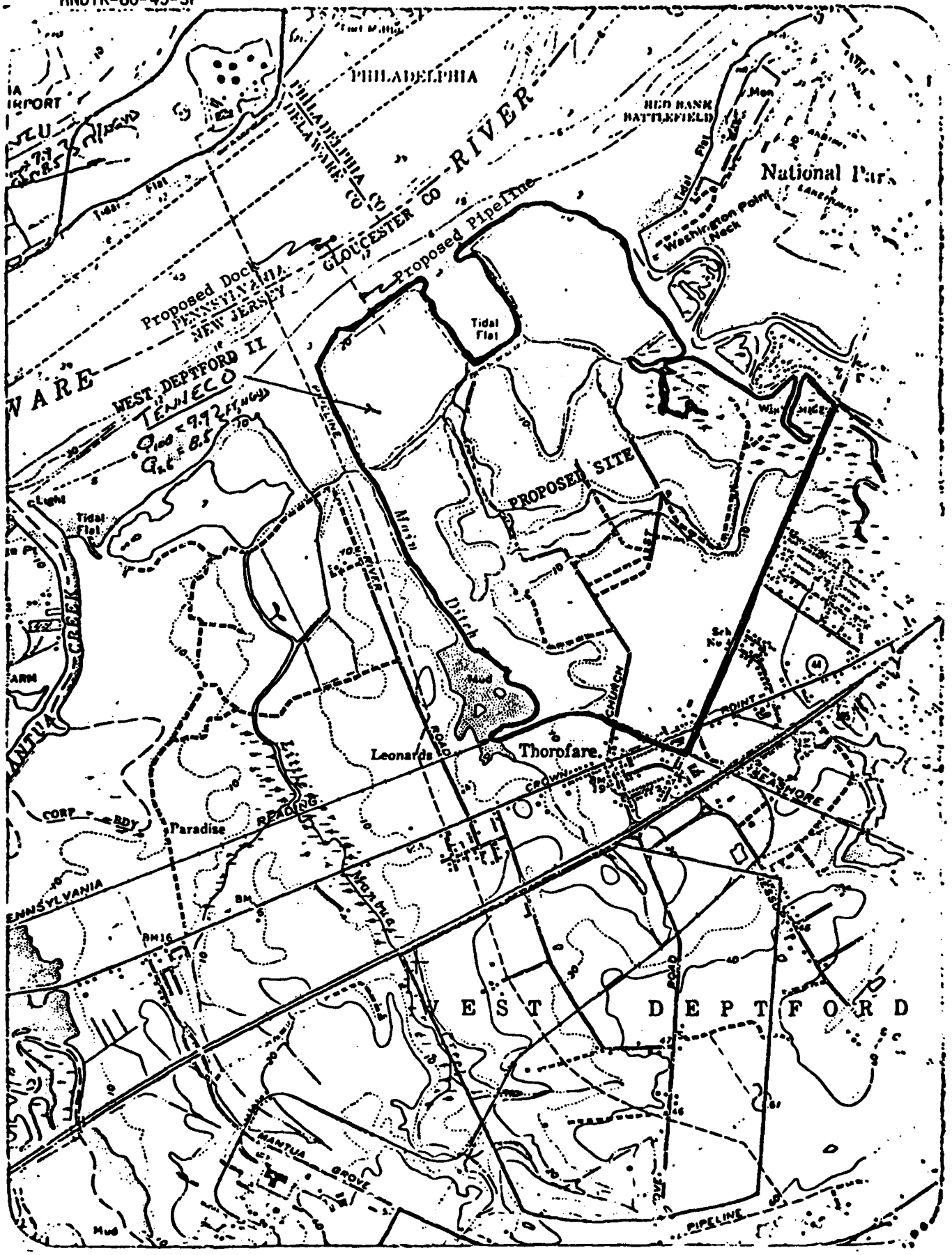
(1) In general a facility such as is proposed is in compliance with area land-use management plans.

(2) Numerous environmental impacts are anticipated because of the site and dock construction. This would involve mainly soil disruption, clearing of vegetation and disturbing habitat. Water quality could be affected during the construction activities, and during operation from accidental oil spills.

f. Security and Safety.

This is an undeveloped site, thus security and safety are not applicable.

WEST DEPTFORD II, NEW JERSEY



WEST DEPTFORD, NEW JERSEY SITE IV

a. General.

The site identified as West Deptford IV is located on the south side of the Delaware River between Mantua Creek and Woodbury Creek approximately two miles inland. The closest community being Thorofare, New Jersey.

b. Technical Feasibility and Suitability for Storage.

(1) The site is located in an industrial area where adequate water and power are available. Potable water and sanitation facilities are available within one mile. Steam is not available.

(2) The property elevations range between 10 feet and 25 feet above sea level. The site rarely floods.

(3) The site is located in seismic zone #1. The locality temperature is moderated to some degree by the Delaware Bay. Temperature in the summer rarely exceeds 85°F and in the winter seldom gets colder than 25°F. Precipitation normally is in the range of 40 inches per year and snowfall varies between 12 inches and 24 inches per year.

c. Storage Capacity Availability.

(1) The property is in two (2) tracts, consisting of approximately 800 acres and is totally undeveloped. Property ownership is private. The area has been defined as the Mid-Atlantic Industrial Park and is appropriately zoned.

(2) The site elevations generally do not exceed 25 feet above sea level. Soil is expected to be relatively stable and no pre-loading or piling anticipated.

(3) Property required for a 20 MMB storage facility would be approximately 400 acres.

d. Proximity to Existing Petroleum Distribution System.

(1) The closest marine terminals are approximately five miles distant. It would appear most feasible to construct an offshore loading/unloading wharf in the Delaware River approximately two miles northwest of the storage site.

(2) The pipeline extending from the offshore wharf to the storage site would be approximately two miles and should be at least 24 inches in diameter.

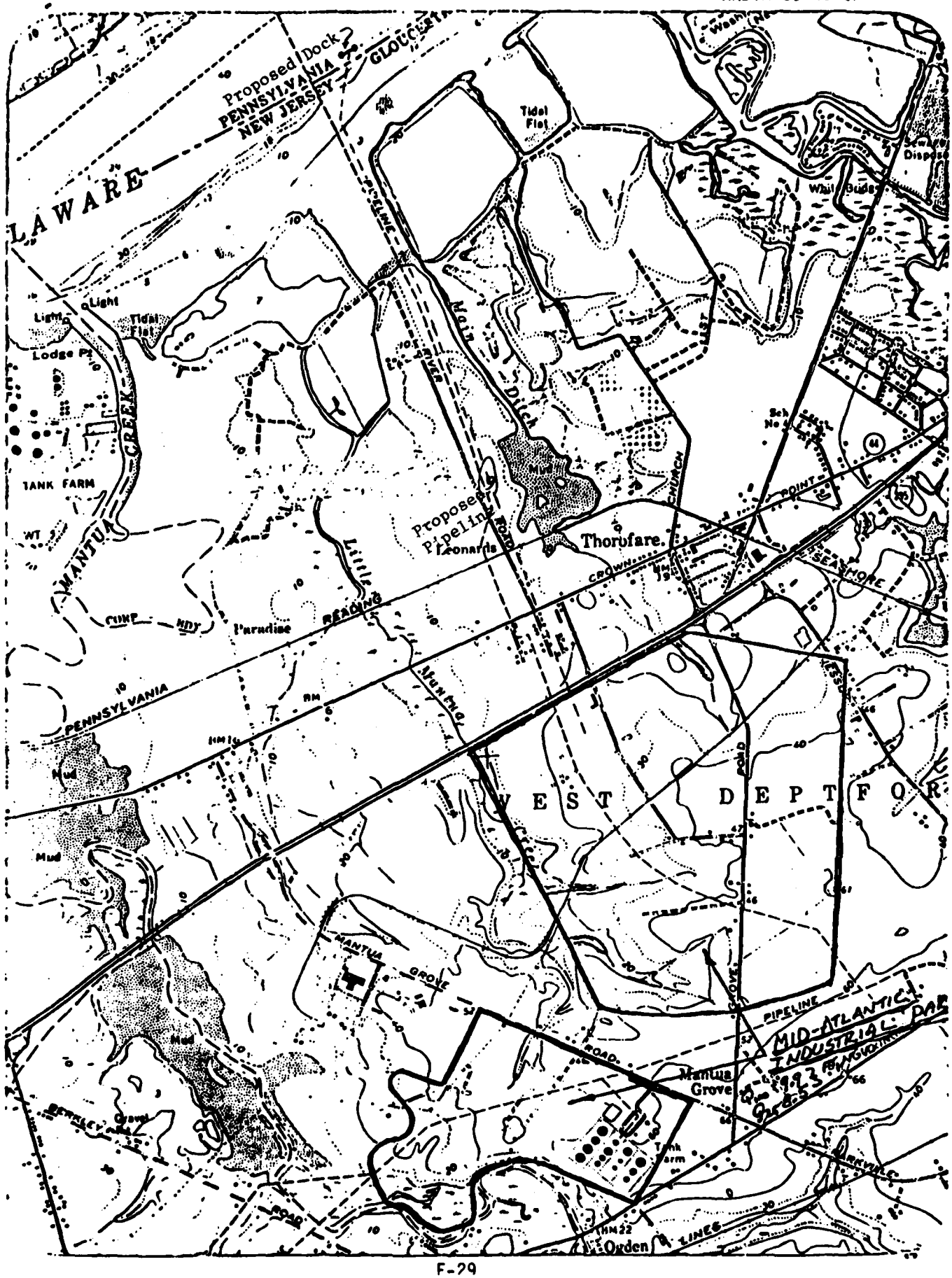
e. Environmental Impact.

(1) Environmental impact could greatly affect construction at this location. The area is presently zoned as an Industrial Park, but there are no petroleum-related facilities within several miles and residential areas are within one mile of the site.

(2) Construction activities at the storage site along the routing of the pipeline and erection of the offshore wharf will have considerable environmental impact. Water quality could also be affected during operation from accidental oil spills.

f. Security and Safety.

This is an undeveloped site, thus security and safety are not applicable.


Proposed Dock
PENNSYLVANIA
NEW JERSEY
GLOUCESTER
LAWARE
Tidal Flat
Light
Lodge Pt
Tidal Flat
CREEK
TANK FARM
MANTUA
Proposed Pipeline
Leonards
Thorofare
Little
Parradise
READING
PENNSYLVANIA
Mud
Mud
Mud
WEST DEPTFORD
MANTUA GROVE
PIPELINE
ROAD
Mantua Grove
MID-ATLANTIC INDUSTRIAL PARK
Tank Farm
Orden
LINES
Point
Crown
SEASHORE
Church
Mill Pond
Grove
Pond

HARPSWELL, MAINE SITE

a. General.

The sites identified as Harpswell, Maine are located near the south-end of Harpswell Neck Peninsula, which is between Harpswell Sound and Middle Bay approximately 14 miles northeast of Portland, Maine.

b. Technical Feasibility and Suitability for Storage.

(1) The sites are located in relatively undeveloped area, however, power and water are available on an adjacent U.S. Navy facility. Potable water and sanitation facilities are also available within one mile. No steam is available.

(2) The sites border on either side of an existing Navy facility that is currently used for fuel storage.

(3) Elevations at the sites range from 20 feet to 100 feet above m.s.l. Tidal range is 8.8 feet. Prevailing winds are from the north and are quite severe from November through March. During these months wave action could disrupt operations if the storm were intense.

(4) The proposed sites are located in seismic zone #2. The normal temperature in January may reach as low as $5^{o}F$, and in July will reach $75^{o}F$. Normal annual precipitation is approximately 48 inches, and snowfall will range between 60 and 100 inches. The navigable areas around the Harpswell Neck is generally free of ice and remains navigable throughout the year.

c. Storage Capacity Availability.

(1) There are four (4) potential sites on the Harpswell Neck. The two most likely sites are situated on either side of the Naval facility, shown as 1 and 2 on page E-33. The site to the northeast and adjoining the Navy

storage site is approximately 100 acres. The site adjoining the Navy storage site on the southwest is approximately 120 acres.

(2) Utilizing the sites adjacent to the Navy storage facility, the complex could store up to 10 MMB of residual.

(3) Should it be desirable to expand the facility to accommodate up to 20 MMB of residual, there are two (2) additional sites, shown as 3 and 4 on page E-33 that could be utilized. Approximately 275 acres is directly east-southeast and across the highway from the 100 acre tract, approximately 75 acres adjoin the 275-acre tract on the north-northeast end. Maximum distance from the terminal is 1.8 miles.

(4) All of the tracts described are in undeveloped areas, occasional residential units are indicated along the tract perimeters, especially on the water side. All are privately owned. Numerous minor roads run through the tracts and they all front on a major highway.

(5) The soils are clay, sand and gravels with bearing in excess of 3,000 psf, impervious to semipervious.

d. Proximity to Existing Petroleum Distribution System.

(1) An existing U. S. Navy storage terminal and docking facility is located on the southwest side of the peninsula.

(2) The existing docks are presently operational and being utilized to handle petroleum products. Approach channels and berthing are adequate for large tankers. The water depth along the dock is 35 feet.

(3) Pipelines would have to be extended from the dock area to the new storage areas. It appears this could be accomplished with minimal difficulty.

e. Environmental Impact.

(1) According to EPA, the existing facility presently is in violation of new source standards for petroleum storage. It is not anticipated that the additional storage will contribute appreciably.

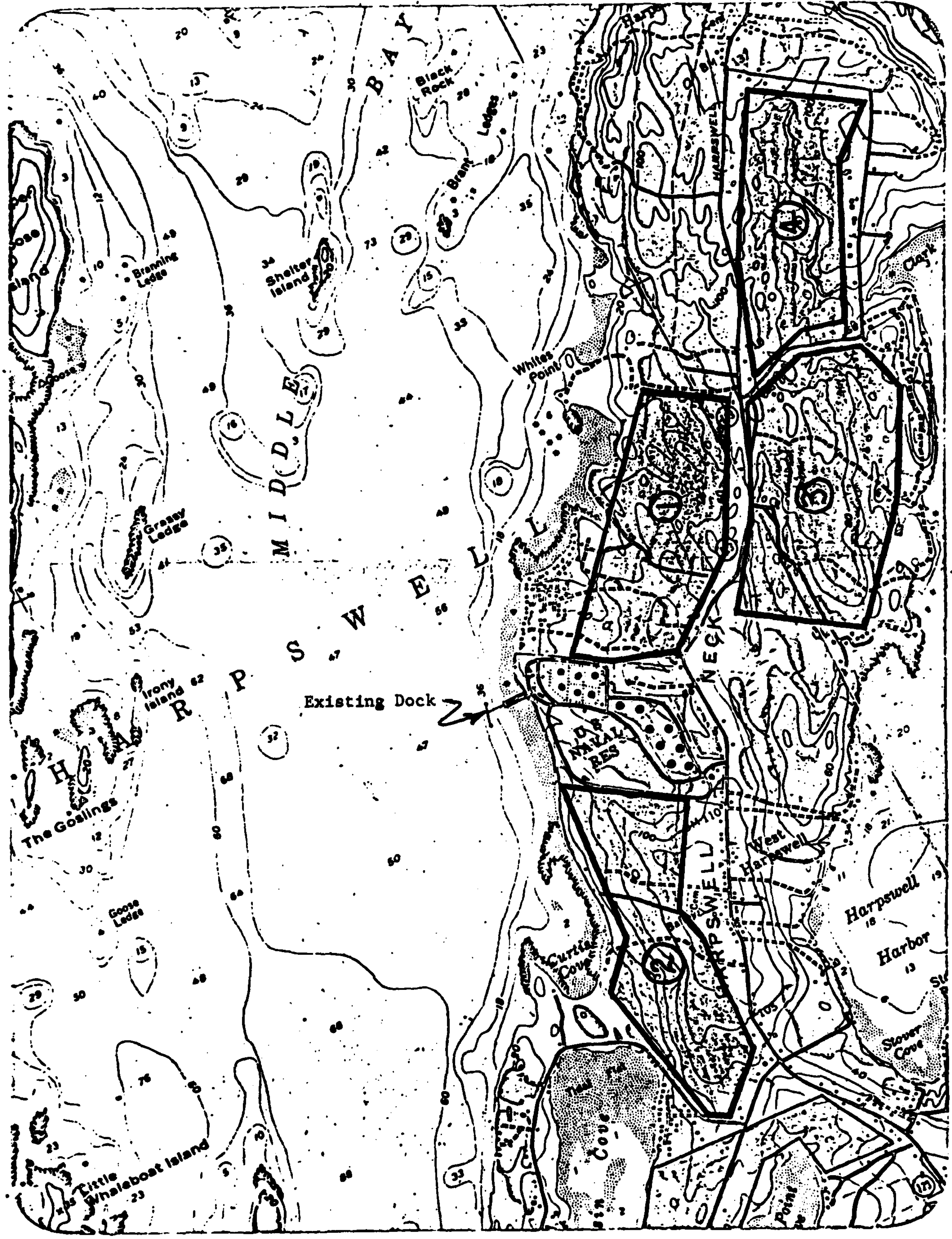
(2) Most environmental impacts would be limited to the duration of construction with few impacts expected to be experienced during the time the oil is in storage. Major land impacts would consist of surface disruptions, clearing of vegetation, erosion, loss of wildlife habitat and degradation of visual quality of the area.

(3) Marine life and productivity could possibly be affected by accidental oil spills or increased turbidity during construction.

f. Security and Safety.

(1) The Naval facility is currently secured by military personnel. Adjacent areas such as Harpswell and the Naval Air Station can serve as backup if required.

(2) The Naval storage facility and docks are adequately protected against fire damage. Other fire departments, such as at Harpswell and the Naval Air Station could respond if required.


MIDDLE HARPSWELL BAY
Black Rock
Brant Ledges
Shelter Island
Branning Ledge
Whites Point
Grassy Ledge
Existing Dock
U.S. NAVAL RES
Irony Island
The Goslings
Goose Ledge
Little Whaleboat Island
Curtis Cove
West Harpswell
HARPSWELL NECK
Harpswell Harbor
Stover Cove
Clark
Cove

BROOKSVILLE, MAINE SITE

a. General.

The Brooksville, Maine site is located south of Bangor, Maine near the village of West Brooksville and across the Bagaduce River from Castine, Maine.

b. Technical Feasibility and Suitability for Storage.

(1) The site is located in a relatively undeveloped area; however, power and water are available and presently serve the adjacent community.

(2) The elevations range from 20 to 70 feet above m.s.l.

(3) The site is located in seismic zone #2. The normal temperature in January may reach as low as $0^{o}F$, and in July will reach $75^{o}F$. Normal annual precipitation is approximately 48 inches, and snowfall will range between 60 and 100 inches. The navigable areas of the Bagaduce River are generally free of ice and remain navigable throughout the year.

c. Storage Capacity Availability.

(1) The proposed site is approximately 340 acres in size, relatively flat and wooded terrain. The size is suitable to accommodate up to 20 MMB storage of No. 6 residual fuel oil.

(2) The top soil consists mainly of marine clay, sands, and gravels; impervious to semipervious; and with bearing range of 3,000 psf. Bed rock runs from the surface to approximately 50 feet in depth and is made up of good granite. Mining of granite from quarries is done commercially in this area.

(3) The proposed site is privately owned.

d. Proximity to Existing Petroleum Distribution System.

(1) The nearest existing dock and oil storage terminal is located at Searsport, Maine approximately 13 miles distant.

(2) There are no existing docks available to this site; however, an excellent site is possible on the northwest corner of the proposed site.

(3) The natural channel of the Bagaduce River ranges from 35 to 60 feet in depth within 1200 feet of the site.

(4) It is proposed that an offshore facility be considered in lieu of dredging an approach channel of approximately 1200 feet in length and 35 feet deep.

e. Environmental Impact.

(1) Most environmental impacts would be limited to the duration of construction with few impacts expected to be experienced during the time oil is in storage. Major land impacts would consist of surface disruption, clearing of vegetation, erosion, loss of wildlife habitat, and degradation of visual quality in the area.

(2) Wetland constraints are possible along the river frontage and the area of the proposed dock.

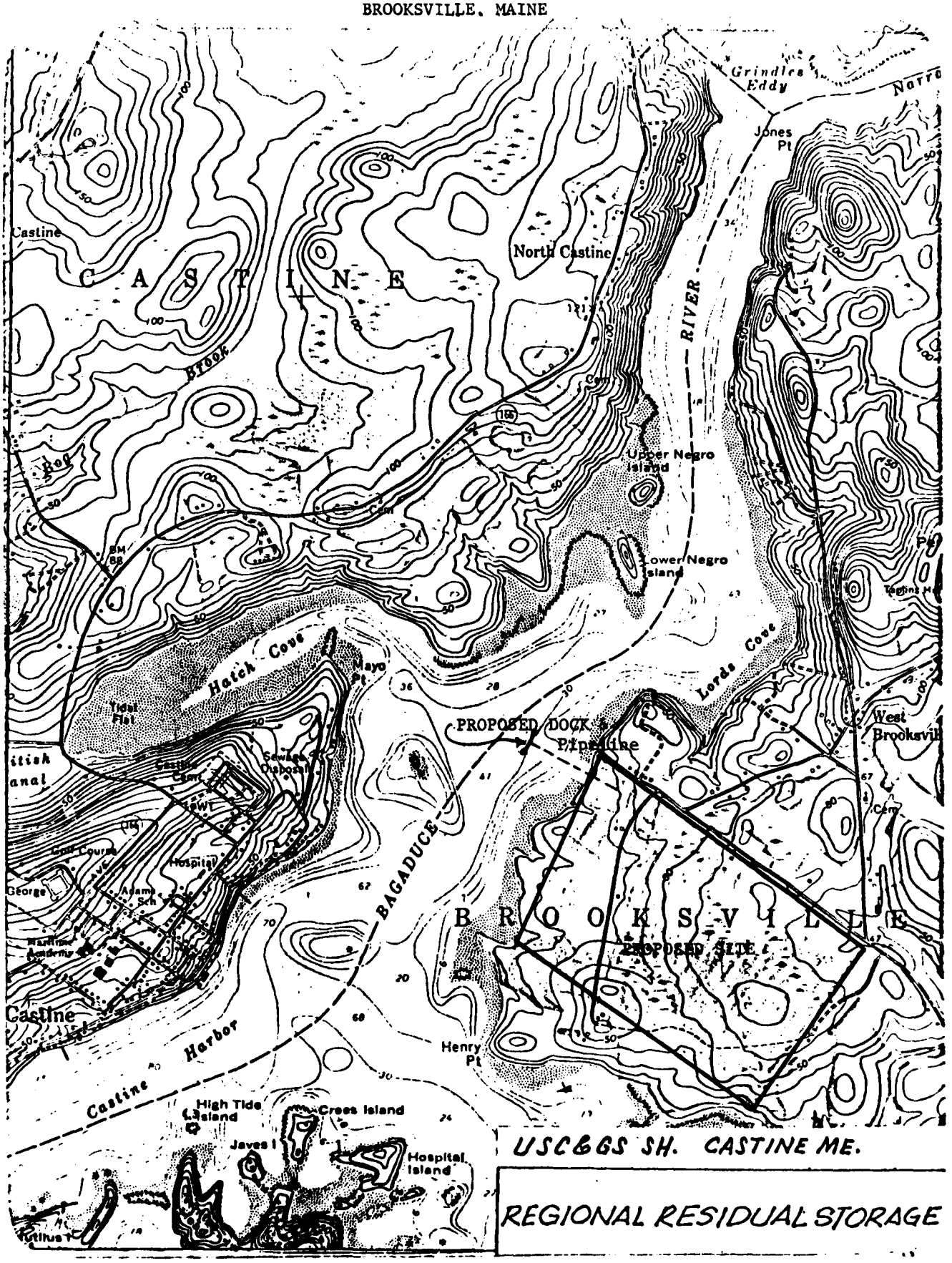
(3) Marine life and productivity could be affected as a result of pipeline and dock construction and if dredging is necessary, along with the increased possibility of accidents and oil spills.

(4) Water quality may be affected by temporary increases in turbidity and possible changes in pH, DO, BOD, nutrient content, heavy metals, and suspended solids.

f. Security and Safety.

This is an undeveloped site, thus security and safety are not applicable.

BROOKSVILLE, MAINE

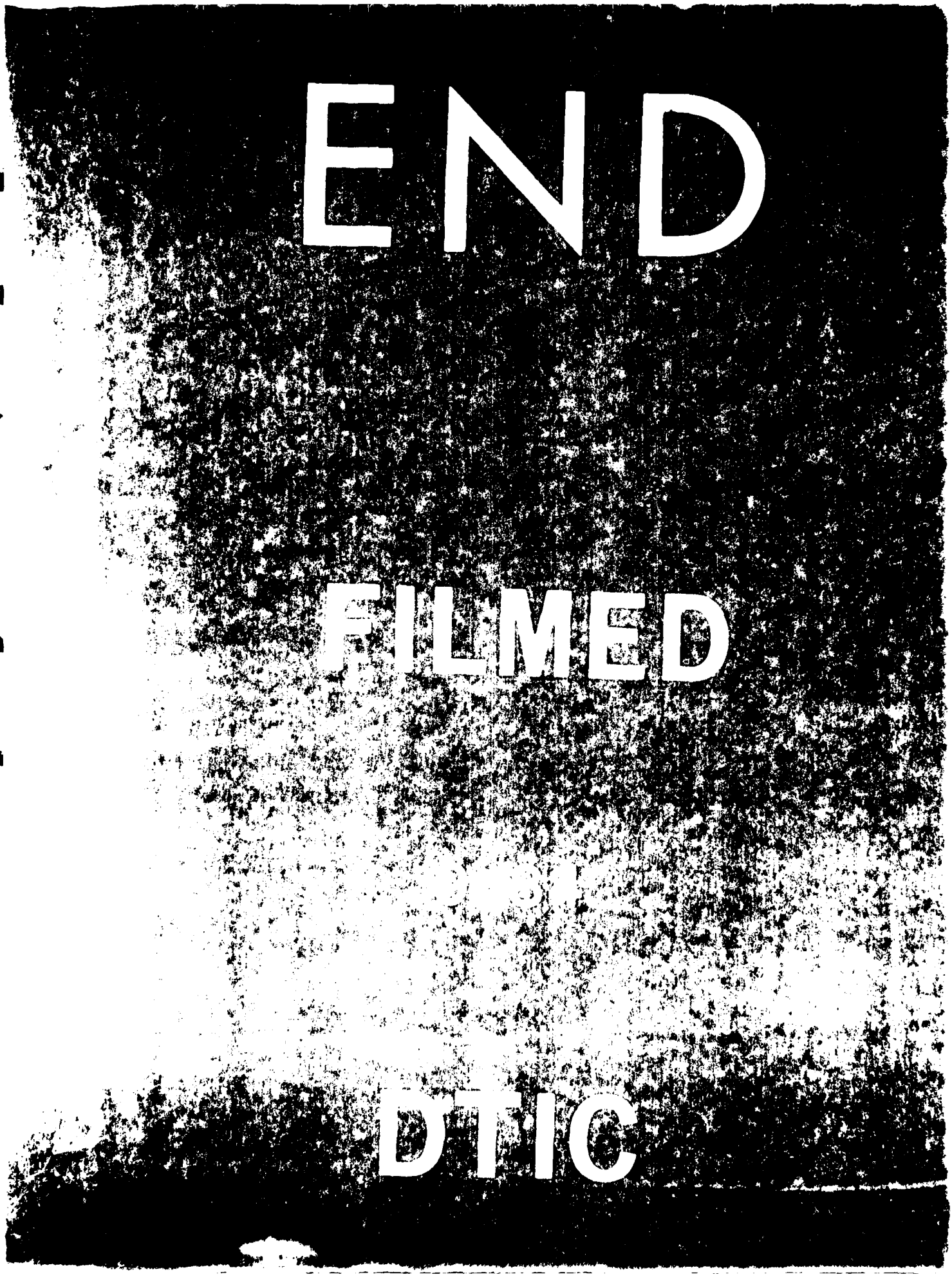


APPENDIX F

POTENTIAL LEASE SITES

EAST COAST
POTENTIAL LEASE SITES

SITES (FILE ID NO.)	APPARENT OWNER	POTENTIAL VOLUME (MMB)
Westville, N. J. (109)	Texaco	20
Northville I, N. Y. (101)	Northville Industries	10+
Piney Point, Md (140)	Steuart Petroleum	20
Philadelphia II, Pa (148)	Gulf Oil	20
West Deptford III, N. J. (119)	GATX Corp.	20
Philadelphia I, Pa (147)	Atlantic Richfield	10
Oldman Township II, N. J. (115)	Shell Oil	20
Marcus Hook, Pa (151)	Sun Oil	20
Delaware City I, Del (153)	Getty Oil	20
Claymount, Del (152)	Texaco	10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FILMED
DTIC