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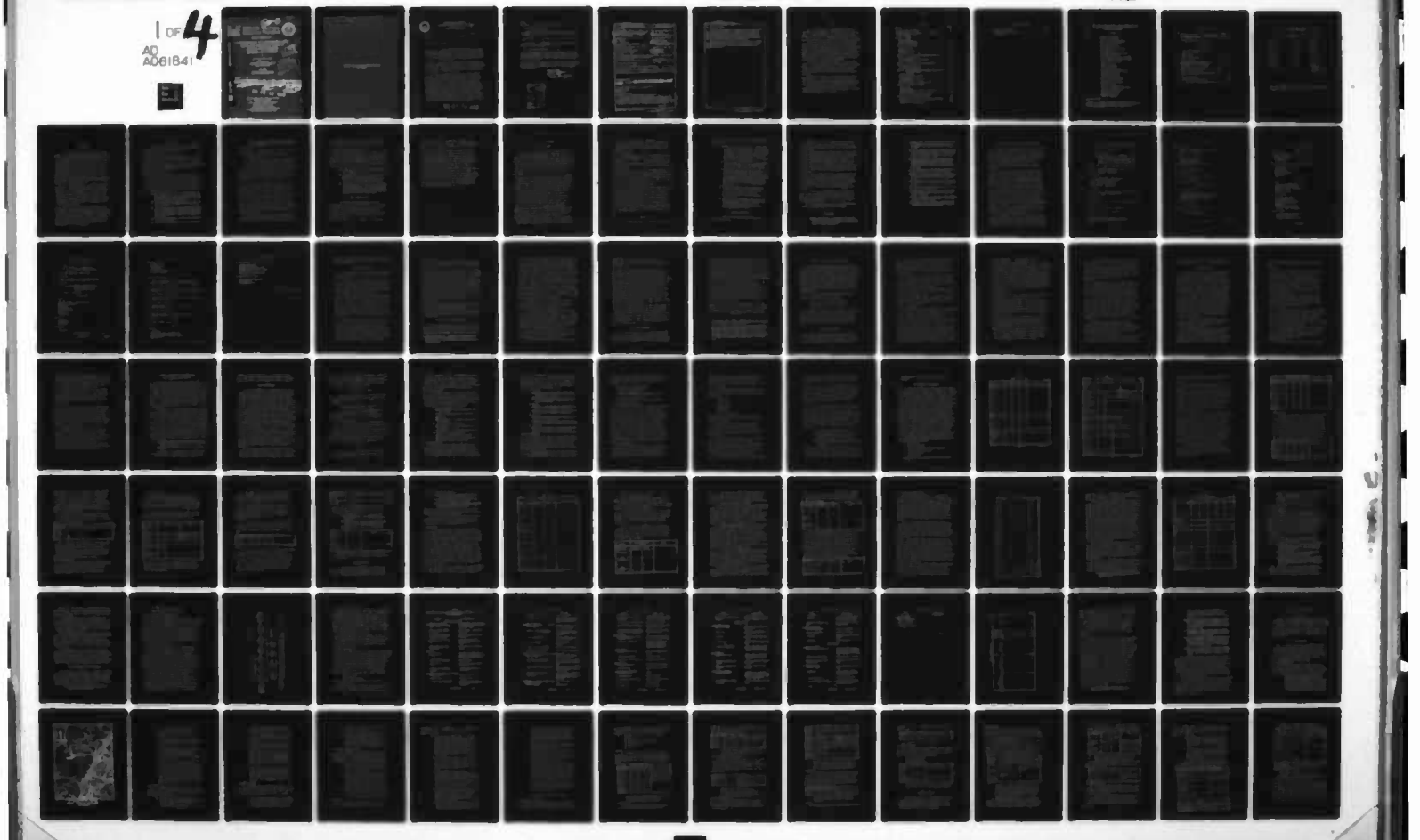


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DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT D-78-19

A METHODOLOGY FOR DETERMINING LAND VALUE AND ASSOCIATED BENEFITS CREATED FROM DREDGED MATERIAL CONTAINMENT

by

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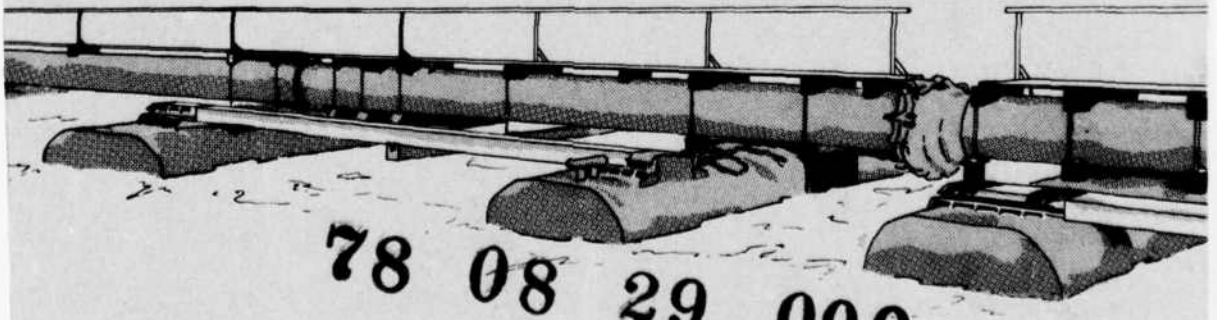
June 1978
Final Report



Prepared for Office, Chief of Engineers, U. S. Army
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Under Contract No. DACW39-77-C-0069
(DMRP Work Unit No. 5D05)

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IN REPLY REFER TO: WESYV

31 July 1978

SUBJECT: Transmittal of Technical Report D-78-19

TO: All Report Recipients

1. The technical report transmitted herewith represents the results of one of several research efforts (work units) undertaken as part of Task 5D, Disposal Area Land Use Concepts, of the Corps of Engineers' Dredged Material Research Program (DMRP). The objective of Task 5D, part of the Productive Uses Project, was to obtain information to facilitate planning and implementation of concepts for the ultimate productive use of dredged material containment areas.

2. Because of constraints on open-water disposal of dredged material, the Corps of Engineers has had to resort more and more to land disposal. Land for disposal activities is becoming scarce, and the problem becomes more acute with the selection of each new disposal area. Attention, therefore, was directed toward identifying disposal concepts that would enhance rather than degrade available land.

3. Some DMRP work units under other tasks were designed to develop guidelines to improve disposal facility operations and management procedures. Others served to develop techniques for the reclamation of potentially valuable materials in order to extend the useful life and to enhance aesthetic and environmental characteristics of dredged material containment areas. However, all sites will eventually be filled, and the total DMRP picture would have been incomplete without considering concepts for the productive uses of the resultant created land. To this end, most of the problems associated with the land use of dredged material containment areas relate to a planning rather than an engineering function. The particular research effort reported on herein was one of five aimed at assessing the economic, technical, environmental, institutional, legal, and social incentives and constraints for the development of a rational basis for site selection, ultimate land use, and the management of the created land. The specific purpose of this study was to develop a methodology for the valuation of dredged material containment areas that are productively used.

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4. The methodology was developed by:

a. Identifying those factors considered to reflect value enhancement and/or diminution resulting from development on dredged material containment sites.

b. Developing an initial methodology to set values on the above factors.

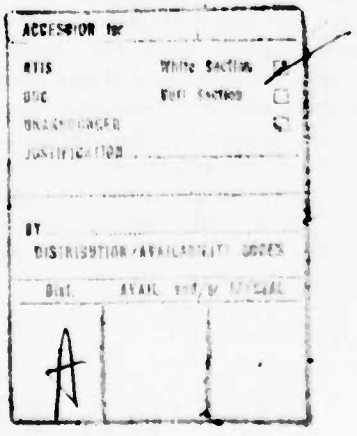
c. Conducting a case-study analysis in which the methodology was applied to 15 specific dredged material containment sites in which land use was a specific objective.

d. Refining the methodology for general use.

5. A stepwise procedure for valuation of productively used dredged material containment areas is presented along with discussions of the methodology. Both the direct market value and the indirect effects of the contemplated land use in terms of community benefits and adverse impacts can be determined.

6. The findings of the report should have general input for planning of productive uses for containment areas. Additionally, it should have explicit input to the benefit/cost analysis performed to determine project feasibility.

JOHN L. CANNON
Colonel, Corps of Engineers
Commander and Director



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Appendices A through O [redacted] attached to the inside of the back cover of this report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Containment areas
Dredged material
Land value
Waste disposal sites

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

This report presents a step-by-step methodology for determining land values and associated benefits from the productive use of dredged material containment sites. A discussion of productive uses of dredged material sites, their physical characteristics, institutional and legal constraints, and local land demand is included, as well as an overview of property valuation.

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20. ABSTRACT (Continued).

The methodology is presented and discussed in terms of such parameters as site description, establishment of use potential, value estimation, and associated benefits and impacts. Working tables are presented. The resulting land value and the associated benefits and impacts created by dredged material containment should be explicit inputs to the formulation of plans in accordance with Principles and Standards for Water and Related Land Resource Planning and Corps of Engineers regulations.

Fifteen case studies of productively used dredged material containment sites were conducted to validate and refine the methodology. One of the case studies was used in this report as a site-specific example of how the methodology can be applied. All fifteen case studies are included as Appendices A through O.

PREFACE

The study reported herein was developed as part of the Productive Uses Project, one segment of the Dredged Material Research Program (DMRP). The DMRP is sponsored by the Office, Chief of Engineers, U.S. Army, and is managed by the Environmental Laboratory (EL) of the U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi.

The study was conducted under Contract No. DACW 39-77-C-0069 between SCS Engineers, Reston, Virginia, and WES as part of DMRP Work Unit No. 5D05, "Determination of the Value of Land and Associated Benefits Created by Dredged Material Containment." The report was prepared in order to develop a methodology to determine land values and associated benefits from the productive use of containment sites. Fifteen case studies, which are presented as Appendices A through O, were conducted to test and refine the methodology.

The study was conducted by SCS Engineers. Principal authors were E. T. Conrad, PE, Project Manager, and Andre J. Pack, AIP, Project Planner. Other contributors were David E. Ross, Donald G. Sherman, and Michael M. McLaughlin, SCS Engineers; Patrick F. Kane, KRS Associates; and Richard Almy, International Association of Assessing Officers.

Technical assistance was provided by Michael Walsh and Major Mark Malkasian, EL. Preparation of this material was under the direction of Mr. Thomas Patin, Contracting Officer's Representative, and under the general supervision of Dr. John Harrison, Chief, EL.

Director of WES during the conduct of this study and the preparation and publication of this report was Colonel J. L. Cannon, CE. Technical Director was Mr. F. R. Brown.

CONTENTS

CONTENTS (Continued)

TEST CASE STUDIES FOR A METHODOLOGY FOR DETERMINATION OF LAND VALUE AND ASSOCIATED BENEFITS CREATED FROM DREDGED MATERIAL CONTAINMENT*

Appendix No.	Title
A	Anacortes Case Study Anacortes, Washington
B	Artificial Island Case Study Salem County, New Jersey
C	Bay Port Case Study Green Bay, Wisconsin
D	East Potomac Park Case Study Washington, D.C.
E	Fifth Avenue Marina Case Study San Diego, California
F	Florida State Fairgrounds Case Study Hillsborough County (Tampa), Florida
G	Hookers Point Case Study Tampa, Florida
H	Hoquiam Case Study Hoquiam, Washington
I	Patriots Point Case Study Charleston County, South Carolina
J	Vicksburg Case Study Vicksburg, Mississippi
K	Virginia Beach Case Study Virginia Beach, Virginia
L	Pelican Island Case Study Galveston, Texas
M	Port Jersey Case Study Jersey City and Bayonne, New Jersey
N	Blount Island Case Study Jacksonville, Florida
O	Rivergate Case Study Memphis, Tennessee

Appendix References

* Appendices A through O were reproduced on microfiche and are enclosed in an envelope attached to the inside of the back cover.

LIST OF FIGURES

LIST OF TABLES

CONVERSION FACTORS, METRIC (SI) TO U. S. CUSTOMARY UNITS OF MEASUREMENT

Metric (SI) units of measurement used in this report can be converted to U. S. customary units as follows:

Multiply	By	To Obtain
millimetres	0.03937	inches
centimetres	0.3937	inches
metres	3.281	feet
metres	1.094	yards
kilometres	0.6214	miles
square metres	10.76	square feet
square metres	1.196	square yards
hectares	2.471	acres
cubic metres	1.308	cubic yards
metric tons	1.120	short tons (2000 pounds)
Celsius degrees	1.8	Fahrenheit degrees*

* To obtain Fahrenheit degrees from Celsius readings, use the following formula: $F = 1.8(C) + 32$.

CHAPTER I: SUMMARY

Project Scope

1. This report presents a methodology for the valuation of dredged material containment sites that are productively used. Two kinds of value are determined: first, the direct market value is estimated for the containment site itself; and secondly, community benefits and adverse impacts are described for the indirect effects of the contemplated land use. This report identifies those variables which commonly affect site value, and provides a procedure for sequentially evaluating the significant variables. The resulting changes in land value and the associated benefits and impacts created by dredged material containment can be explicit inputs to the formulation of plans in accordance with Principles and Standards for Water and Related Land Resource Planning and U.S. Army Corps of Engineers (CE) regulations and policies.

2. The CE Waterways Experiment Station (WES) is conducting a comprehensive, nationwide research program on the disposal of dredged material. The Dredged Material Research Program (DMRP) will provide more definitive information on the environmental effects of dredging and dredged material containment operations. It will develop dredging and containment alternatives which are technically satisfactory, environmentally compatible, and economically feasible. The consideration of dredged material as a manageable resource is an important part of the DMRP.

3. Dredged material can be used as a resource in two ways: The material itself can be put to a number of productive uses, such as aggregegate, select material for embankments, or sanitary landfill cover; or the land created by confined dredged material disposal can be used for recreational, residential, commercial, or industrial sites. Pressures for confined disposal of dredged material have increased significantly in recent years, dictating a thorough examination of the land use alternatives.

Valuation Methodology

4. The methodology is a four-stage approach toward determining site value and associated benefits. Generally, it is based upon the comparable sales approach to real estate appraisal.

Site description

5. The first stage in the methodology involves a description of the candidate site in terms of its physical characteristics, environmental setting, development and land use considerations, and local economic trends. This stage also serves as a data base upon which the analyses of subsequent stages of the methodology can be based. Some of the value criteria will emerge at this point by the mere descriptive process employed to characterize the site.

Establishment of use potential

6. This stage of the methodology involves evaluation of the containment site with respect to its most likely use and its highest and best use, once the fill operation has been completed and the site has dewatered and consolidated. The use constraints on a piece of land are, in turn, dependent upon a number of legal, planning, and engineering factors which are unique to each piece of property. Key criteria which have a bearing on land use are as follows:

- Land use planning and zoning are the most important of the criteria related to site use. In effect, local communities, counties, and even some states control the use of land by means of land use plans (or general or comprehensive plans) and/or zoning ordinances.
- Other institutional and legal constraints can limit site use; e.g. Coastal Zone Management Permits and Wetlands Conservation Policies.
- Physical site characteristics such as shape, topography, and fill characteristics can significantly affect the use of the land and the value of the site. Fill characteristics can necessitate special foundation work for certain types of site improvements, thereby increasing the cost of development.
- Accessibility is important, particularly for industrial or commercial development.
- The availability of utilities to serve a site can also be

a value criterion in certain instances. If a candidate site is not within close proximity to utilities, the timing of development (and even the value of that particular site) can be affected.

Estimate of value

7. The actual site valuation process, which forms the third stage of the methodology, is dependent upon three basic criteria:

- Demand for the use identified in the use potential stage of the methodology
- Identification of land parcels similar to the subject site, for which recent sales or assessment data are available
- Utility of the comparables relative to the subject site

8. The demand for the land use identified in the use potential section of the methodology will establish whether the land can be developed for that use, and/or how long the land may be on the market before it is sold and developed, and/or how rapidly the market value of the site might increase over time. In other words, demand can affect the timing for development of the candidate site and, hence, indirectly affect its value.

9. The identification of comparable pieces of property which have sold in the marketplace or for which some other type of value information (such as assessment data) is available should be made. The basic value estimate of a containment site will be largely based upon comparable sales or assessment data. Once comparables have been identified and their value established, a utility estimate should be made for the comparables to determine if they can be utilized as a basis for establishing site value. If a comparable is indeed similar with respect to its utility (which is based upon accessibility, proximity to public services, foundation constraints, and/or proximity to similar types of activities), then the comparables can be considered to have equal utility and thus be utilized as legitimate bases for establishing site value.

10. Once a weighted average value has been established for the comparables, adjustments may have to be made for the site value in order to account for differences in factors such as demand and utility

or other special constraints. Once these adjustments are made, a final site value estimate can be established. That value will form the basis for consideration of the value enhancement created by the dredged material contained in the site.

Associated benefits and/or adverse impacts

11. In addition to identifying the value criteria and determining the direct dollar benefit attributable to the dredged material containment site, certain other factors must be considered which pertain to potential benefits and/or adverse impacts that relate to the productive use of a site. These benefits and/or adverse impacts cover a wide range of characteristics and factors. In the methodology they have been subdivided into three primary categories:

- Social effects. These are factors which relate to the social impacts of the productive use of a site on local communities.
- Economic effects. Certain economic benefits and/or adverse impacts may result from the productive uses of a site and may relate not only to the site and the adjacent area, but also to the surrounding community and, perhaps, even to the surrounding county and state.
- Environmental effects. Dredging, placement of dredged material containment on a site, and site development and improvement can have a wide range of environmental effects, not only with respect to pollution but also with respect to the alteration of ecosystems and other significant environmental considerations.

Other Planning Factors

12. The method of placing dredged material can affect site valuation. If the placement of dredged material is accomplished with an eye toward the productive use of a site, that site can be prepared in such a manner that dewatering and subsidence can occur within a minimum time frame. Also, development of the site for construction purposes can be significantly aided in terms of cost reduction and timing.

13. Of greatest significance, however, is the importance of

planning and coordinating site development. Recognition of the productive use potential of containment sites should be an integral part of the planning and feasibility study process for CE dredging projects.

14. The productive use potential is significant when one considers that dredged material, which was once thought to be a spoil, is actually a productive resource that can lead to the creation and improvement of land, thus generating economic benefits. Careful planning is required to insure that this resource potential is realized without adversely impacting the local community.

15. Use of dredged material containment sites needs to be better coordinated with local planning agencies. Discussions with local planning agencies during the course of the case studies indicated a lack of proper coordination in many cases between either CE Districts or sponsors and local agencies. Local planning agencies are concerned about the land use implications of containment sites, especially if the sites are large. They feel the need to become involved with the sponsor or the CE early in the determination of site use and attendant zoning implications.

CHAPTER II: INTRODUCTION

Purpose of Study

16. Consideration of dredged material as a manageable resource is an attractive alternative for disposing of dredged material from new and maintenance projects. Dredged material is a soil resource rather than a waste material and offers potential reuse value. When properly disposed, dredged material can be an asset to an area. A completed dredged material containment site offers an ideal opportunity for the enhancement of land for beneficial purposes. Depending on the type of material deposited, a containment site can be utilized for a variety of uses, including open space, recreational, industrial, commercial, or residential.

Background

17. Traditionally, CE studies, environmental impact statements, and even benefit/cost analyses considered the location, acquisition, and operation of dredged material containment sites as unavoidable costs to sponsoring agencies and/or the CE. Disposal site operations were generally viewed as temporary, adverse impacts for the duration of the dredging activities. Quantitative assessments of project benefits rarely focused beyond the anticipated value of improved navigation or local and regional transportation, commerce, and industry.

18. Feasibility studies and benefit/cost analyses have only recently begun to consider the potential values of dredged material and dredged material containment sites. Rarely, however, even in these recent analyses, has adequate consideration been given to intensive site development. The Principles and Standards for Water and Related Land Resources Planning and the CE's Digest of Water Resources Policies require that in feasibility studies undertaken to assess project viability, especially for dredging projects, benefit measurement must consider the market value of any productive outputs of project implementation, as well as nonmonetary or intangible benefits which are directly related. These benefits are to be considered appropriate inputs to benefit/cost and other related

analytical studies utilized in CE decision-making.

19. This study resulted in development of a methodology to estimate land value enhancement and related benefits and/or impacts caused by the containment of dredged material and productive use of dredged material sites.

Valuation methodology

20. A methodology to estimate the value enhancement to land due to dredged material containment, as well as associated benefits or impacts resulting from containment site development, should have value to the CE not only in its analytical assessments, but also in fulfilling National Economic Development Planning requirements of the Principles and Standards.

21. For benefit/cost analyses the methodology developed as a result of this study can aid in a more concise identification and quantification of benefits and costs resulting from the management of dredged material. No longer should dredged material be thought of merely as an inconvenient waste to manage and evaluate in terms of a cost. Further, benefits accruing to containment sites can be made explicit, especially as they stem from a site's development potential.

22. For CE planning activities, the methodology developed herein can have value with respect to the programming of projects and for aiding project sponsors in a more effective analysis of their own planning strategies relative to a dredging project and its benefits. The CE may be better able to program the timing of dredging projects and the management of dredged material if it has a clearer conception of the relationships between a project and its economic, physical, natural, and navigational environments. Project sponsors may be better able to gain acceptance by their constituency in proposals if clear community benefits beyond normal navigation benefits can be shown.

Approach

23. A five-step approach was used to develop uniform criteria

and procedures in the form of a methodology which could evaluate the direct and indirect values and impacts of the productive uses of dredged material sites:

- The first step involved analysis and stratification of major known containment sites around the country where development of some form had taken place or was being planned. These sites were analyzed with respect to the history of dredging operations that produced the fill, the types of material dredged, and the placement and duration of the project. The sites were then stratified or classified according to types of fill material and development.
- The second step involved selecting from the stratified sites those measures which were identified and considered to be reflective of value enhancement or benefits and/or impacts resulting from development.
- The third step was to develop the first cut of a methodology. The methodology would attempt to utilize the above measures in such a manner as to allow estimates of the value changes attributable to dredged material containment and development benefits resulting from productive site use for a given site. Interrelationships were sought among the measures that would link them into a pattern which would identify their relevance to value change or benefit/impact generation.
- The fourth step involved selecting a set of case studies against which to test the methodology. Fifteen case study sites were selected from among those analyzed in step one. These sites were selected with emphasis on geographical distribution, type of site material, and type of site development.
- Finally, as the fifth step, the results of the case studies were evaluated against the methodology and refinements made where appropriate. This refined methodology has been proposed to serve as a general purpose model for evaluating future candidate disposal sites.

Report Organization

24. This report is organized into essentially four parts, as subsequently described.

25. Chapters I and II outline the scope of the project and its relationship to the Dredged Material Research Program. They further present a broad overview of the purposes for which the methodology has been developed.

26. Chapter III provides an overview of the productive uses of dredged material containment sites and their planning. The chapter also examines the engineering, economic, and legal limitations on the planning and development of containment sites. Essentially, the chapter is meant to provide a broad persepctive on the productive use of and limitations on containment sites. Chapter IV summarizes land valuation techniques from an appraisal standpoint and introduces the three basic appraisal techniques and their relationship to containment site valuation.

27. Chapter V delineates the actual methodology suggested for estimating land value changes and associated benefits and impacts resulting from the productive use of dredged material containment sites. Chapter VI is a step-by-step application of the methodology to an actual candidate containment site located in Vicksburg, Mississippi. This chapter illustrates how the methodology can be applied.

28. Chapter VII is an evaluation of these case studies in order to derive meaningful data on those factors which are seen to most significantly affect value and create impacts. Chapter VIII provides policy recommendations to the CE, relative to containment site planning and programming.

29. The fifteen case study reports are included on microfiche attached to the inside of the back cover of this report.

Definitions

- Highest and best use. As commonly employed the term refers to a use of land that maximizes its value within legal land use or zoning constraints. Derived from the theory of economic maximization.

- Stratification. The identification and classification of properties or groups of properties that may be meaningfully compared with one another for valuation purposes.
- Utility. The capacity of a good to give satisfaction to an individual at a particular time or over a period of time. With respect to property, it refers to the measure of the property's physical characteristics relative to satisfying its owner.
- Assessment to sales ratio. A ratio which allows a rough calculation of market value of property from assessed value data. Calculated by performing a multiple regression analysis on a set of assessed values relative to a set of market values for similar properties.
- Accrued depreciation. The difference between the cost of an item and its present book or market value.
- Density. The intensity of improvement allowed on a parcel of property. Measured either in terms of units per acre, buildable area to total area, or height limitations.
- Accessibility. The setting of a property relative to its surroundings and the resultant ease of ingress and egress.
- Raw site. The dredged material containment site prior to placement of dredged material.
- Estimated site. The site upon completion of dredged material placement, dewatering, and settling, but prior to development.
- Effects. The changes resulting from a major activity, such as dredged material containment. Includes both benefits and adverse impacts.
- Comparable. A piece of property in proximity to the containment area that can be meaningfully compared with the site for valuation purposes.

CHAPTER III: PRODUCTIVE USES OF DREDGED MATERIAL SITES

30. Utilization of dredged material sites to meet the land use needs of a community is a time-honored practice. Many old coastal cities, including Washington, D. C., San Francisco, California, and Charleston, South Carolina, have been constructed in part upon land made by filling marshland with dredged material. Dredging and fill activities have traditionally been located in proximity; i.e., the single greatest consideration for disposal site selection in the past has been to minimize the distance from the dredging operations.

31. The traditional range of choices for suitable dredged material disposal sites has been narrowed considerably by recent legislation. The serious environmental questions regarding ocean dumping and unconfined disposal of dredged materials have virtually eliminated these options. A third alternative, that of dredged material containment, has gained increasing importance in dredging projects, and upland disposal has been practiced to a lesser degree.

32. Dredged material containment has an additional advantage, the relatively rapid creation of new land resources. Utilization of these land resources has taken many forms, and reflects a wide range of human activity. The private sector has used dredged material sites for industrial, commercial, residential, and agricultural land uses and for use as aggregate sources. The variety of public sector uses for containment sites is even wider, including recreational, educational, cultural, open space, and transportation land uses. At a number of sites, several such uses have been combined in an integrated fashion. Table 1 summarizes the productive uses of dredged material that were identified during this study.

33. Development of a dredged material site is influenced by a number of considerations peculiar to the sites themselves, including site physical characteristics, institutional (legal) constraints, and local land demand. The sections which follow will treat each of these considerations more fully. Considerations common to land development

Table 1

Productive Uses of Dredged Material in the United States

Industrial

- Port Facilities/Warehouses

  Coastal: New York NY; Newark, NJ; Norfolk, VA; Charleston, SC; Jacksonville, FL; Tampa, FL; Mobile, AL; New Orleans, LA; Houston, TX; Galveston, TX; Corpus Christi, TX; Los Angeles, CA; Long Beach, CA; San Francisco, CA; Oakland, CA; Seattle, WA.

  Great Lakes: Buffalo, NY; Green Bay, WI; Duluth, MN.

  Rivers: Mississippi - Memphis, TN; Osceola, AR; Vicksburg, MS; Columbia - Portland, OR; Tennessee - Counce, TN.

- Manufacturing

  Offshore Power Systems: Jacksonville, FL;
  Ingalls Shipyard: Pascagoula, MS;
  Brown & Root: Port Aransas, TX;
  Columbia Yachts: Norfolk, VA;
  Dow Chemical Co.: Freeport, TX.

- Bulk Storage

  Grain Elevators: Galveston, TX; Corpus Christi, TX; Duluth, MN;
  Oil Tanks: Houston, TX; Norfolk, VA;
  Coal: Mobile, AL.

- Energy Facilities

  Nuclear Plant, Public Service Electric and Gas Co: Salem, NJ.

- Water Intake

  Potomac Electric Power Co.: Washington, DC.

Commercial

- Offices

  Corps of Engineers Area Office: Port Arthur, TX;
  Southwest Florida Flood Management District Area Office: Tampa, FL.

(Continued)

Table 1 (Continued)

- Retail Stores

  Merritt Island Shopping Center: Merritt Island, FL;
  Port Center: Portland, OR.

- Boating and Yachting Facilities

  Mission Bay: San Diego, CA;
  Wells Harbor: Wells, ME;
  St. Mary's County, MD;
  Pokomoke River, Eastern Shore, MD.

- Other Sports Facilities

  RFK Stadium: Washington, DC.

- Cultural Facilities

  Thomas Jefferson Memorial: Washington, DC.

- Other Private Commercial Use

  Radio Tower: Morehead City, NC.

Municipal/Institutional

- Schools and Colleges

  Naval Academy: Annapolis, MD
  Florida International University: N. Miami, FL;
  Beach Channel High School: New York City, NY;
  Texas State University: Port Arthur, TX;
  Northwestern University: Chicago, IL.

- Police/Fire Protection

  Interama: N. Miami, FL.

- Water Supply/Sewage Treatment Facilities

  Hookers Point STP: Tampa, Fl;
  STP: N. Miami, FL.

(Continued)

Table 1 (Continued)

Residential

- Single Family Homes

  Numerous developments along the coasts of FL and NJ;
  Long Island, NY;
  Redwood Shores, CA;
  San Rafael, CA.

- Townhouses/Garden Apartments, High-Rise Apartments

  Cleveland, OH;
  San Rafael, CA;
  Foster City, CA;
  Co-op City, Bronx, NY;
  Battery Park City, NY;
  Miami, FL.

Recreational

- Beaches

  Oceanside: San Diego County, CA;
  Ocean Beach: San Diego, CA;
  Doheny State Beach: Los Angeles, CA;
  Lake Charles, LA;
  Columbia River, OR.

- Community Parks

  Lumps Pond State Park, DE;
  E. Potomac Park, DC.
  Pleasure Island: Port Arthur, TX;
  City parks: Detroit, MI
  Toledo, OH;
  Sandy Point State Park, MD;
  Childress Island: Anacostia, DC.

- Golf Courses

  Pleasure Island: Port Arthur, TX;
  Interama: N. Miami, FL;
  Patriots Point: Charleston, SC.

(Continued)

Table 1 (Continued)

Agricultural/Horticultural

- Food Crops

  Tomatoes: Eagles Island: Wilmington, NC;
  Old Daniel Island: Berkeley County, SC;

  Corn: Hutchinson Island: Savannah, Ga.

- Non-Food Crops

  Cherry blossom trees: East Potomac Park, Washington, D. C.

- Pasture Land

  Livestock grazing: Galveston (Jefferson County), TX;
  Pacific County, WA;
  High Island: Port Arthur, TX.

  Shrimp farming: Freeport, TX.

Transportation

- Airports

  LaGuardia, Kennedy: New York City, NY;
  National: Washington, DC.
  Boston, MA;
  Newark, NJ;
  Philadelphia, PA;
  San Francisco, CA;
  Hawaii;
  Portland, OR.

- Highways

  Florida;
  New Jersey;
  California.

- Railroads

  Chicago, IL.

Natural/Open Space

(Continued) (Sheet 4 of 6)

Table 1 (Continued)

- Wildlife Refuges

  Wilmington, NC;
  James River, VA;
  San Diego, CA;
  Tymes Beach, Buffalo, NY;
  Hopper's Island, MD.

Multiple Use

- Beaufort Island, Morehead City, NC

  State park; warehousing and port facilities; single family housing; retail stores; office space; military facilities.

- Interama, N. Miami, FL 243 ha (600 acres)

  University campus; municipal buildings; sewage treatment plant; golf courses.

- Pleasure Island, Sabine Lake, Port Arthur, TX

  2 parks; golf course; motorcycle trail; yacht club and marina; State University campus.

- Pelican Island, Galveston, TX

  Recreation area; port terminals; manufacturing; offices; shipyard; college.

- Swan Island, Portland, OR

  Ship repairs; industry "Port Center"; restaurants; office buildings; commercial facilities.

- Hoquiam, WA

  Airport; sawmill; sewage lagoon.

Material Use

- Aggregate

  Seattle, WA;
  Interstate highway, Sacramento, CA;
  Construction, Upper Mississippi, IA, MN, WI;
  Nawiliwili, HA.

(Continued)

Table 1 (Concluded)

- Beach Nourishment and Protection

  Virginia Beach, VA;
  Rockaway Beach, NY;
  Hannah Park, Jacksonville, FL;
  Doheny State Beach: Los Angeles, CA;
  Muller Key, FL;
  Green Harbor: Marshfield, MA.

- Sanitary Landfill Cover

  Sacramento River Delta, CA;
  Detroit, MI;
  Philadelphia, PA.

(Sheet 6 of 6)

generally, i.e., availability of capital, zoning, air emissions, and wastewater effluent limitations, are beyond the scope of this chapter and will not be addressed.

Physical Characteristics

34. The most basic physical characteristic affecting productive land use of dredged material sites is the nature of the dredged material in place.

35. Building foundation design depends initially on the soil characteristics of the site. Poor surface foundation support may be overcome by constructing deep foundations; however, such structures typically involve considerable expense, depending upon the proximity of the load-bearing strata to the surface. Foundation costs could render an otherwise feasible project infeasible.

36. Organic silts and clays, common components of material removed by maintenance dredging, generally display poor load-bearing capacities. Such materials dewater and consolidate slowly, especially where site drainage is poor. Such dredged materials often require special costly placement in order to develop the site. Material removed by new construction dredging is normally more suitable from the standpoint of providing a foundation and contains fewer, if any, pollutants which may be found in material from maintenance dredging. Some dredged material is used for construction aggregate (shells, sand, gravel, etc.).

37. Material dredged in coastal areas has a high salt concentration, which prevents growth of most kinds of vegetation. Therefore, uses which require plant growth (such as agriculture) are barred from areas where dredged material placement has been recent or is ongoing. Rainfall will eventually leach the salt from the soil, but requires sufficient time and adequate drainage to complete the process. Carrying costs for site development are thus increased. The problem could be more quickly resolved by covering the dredged material with borrowed topsoil, but again, to do so involves

considerable expense.

38. Soil characteristics influence the cost of utility placement as well. Unstable soil conditions may be overcome by the construction of cradles for underground utilities. Once again, development costs are increased.

39. Dredged material sites are generally flat. Low relief causes problems which may affect site use in two ways: First, site development must await dredged material dewatering and stabilization, which increases carrying costs; secondly, development of such a site, which requires earthmoving to prevent ponding and flooding, increases development cost.

40. The method employed to place dredged material can significantly affect the severity of the physical problems associated with productive uses. Placement of coarser-grained materials on the portion of the site planned for high-intensity use can reduce foundation construction expenses, for example. This selective material placement has historically been employed to prevent imminent breeches in earthen dikes. The concept could be readily applied where *ultimate* site development has been planned in advance.

41. With the possible exception of the time delay for soil desalination, dewatering, and stabilization, the development problems identified above are not unique to dredged material sites as such, but rather common considerations for land development in coastal areas. Inland dredged material containment sites, however, often present development problems unique to their region in each of the above respects.

Institutional and Legal Constraints

42. The recent environmental legislation has directly affected the potential for productive use of dredged material containment sites.* This relatively new body of law is the most visible of the institutional considerations for site development. Other examples include basic

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* Science Applications, Inc., "Evaluation of Laws and Regulations Impacting the Landuses of Dredged Material Containment Areas," in publication, U. S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Miss.

property ownership questions and federal flood insurance program coverage.

43. The National Environmental Policy Act (NEPA) expands the scope of considerations for agency decision making when contemplating a "major federal action significantly affecting the human environment." Under NEPA, the expanded scope for consideration must include an Environmental Impact Statement (EIS) for the federal action. Such a requirement can affect productive use of dredged material sites in several ways. A conveyance of land by the CE can qualify as a major federal action under NEPA. Therefore, dredged material containment sites owned by the CE must be scrutinized from the environmental impact perspective before they may be developed for productive use. This, in effect, means that two EISs may be required for the productive utilization of dredged material containment sites. The first would cover the entire dredging project, including the prospective site use. The second would deal only with the land conveyance for productive use. A requirement for a separate EIS may discourage a private developer seeking a site for a use which would otherwise be exempt from an EIS requirement.

44. NEPA-type legislation on the state level has recently become more common, as well. The considerations identified above with respect to the federal NEPA can be applied with equal force for major state actions under state environmental policy laws.

45. The productive use of dredged material sites in coastal areas is influenced by the Coastal Zone Management Act of 1972 (CZMA). Any federal permit required for the contemplated productive use cannot be issued until the state has certified that the land use is consistent with the state's coastal zone management program. The CZMA imposes this requirement only in those states in which the coastal zone management program has been approved. The only states whose programs have been approved to date are Washington, Oregon, and California.

46. Inland sites are constrained in some instances by the Wild and Scenic Rivers Act, which forbids issuance of a federal permit if the contemplated use would have a direct and adverse effect on the environmental values of a river protected under the Act.

47. Wetlands protection laws are found in a variety of forms in

coastal states throughout the Nation. A site formerly used for dredged material deposition may be considered under state law to be an environmentally sensitive area, requiring additional state permits and further delay.

48. Property law provides an additional consideration for development of dredged material sites. Unclear title for a site delays adequate financing, adding to carrying costs for financing costs or both. The question of site ownership is often raised only after land value has been increased by dredged material placement, and productive use planned. Conflicting ownership claims may arise where the boundary-determining definition of high- or low-water mark is questioned, or where the claim of title itself is contested. The latter may be the case in any of the thirteen original states which continue to claim tidal lands by Sovereign right. The state's Sovereign right to dispose (or to retain ownership) of tidal lands can be defeated by a demonstration that the English Sovereign had already exercised the right during colonial times (in favor of a predecessor) in interest to the title contestant. Litigation is often required to settle such title disputes.

49. Flood insurance requirements may also inhibit disposal site development. The Flood Disaster Protection Act of 1973 prohibits federal financing of any project where special flood hazards are present, unless a federal flood insurance program has been instituted for the surrounding area. Dredged material containment sites are often located in areas with special flood hazard potential, and the resulting unavailability of federal financing can terminate consideration of site productive uses.

Local Land Demand

50. In view of the many physical and institutional problems identified in the previous sections, one may wonder why a dredged material disposal site would ever be developed for a productive land use. Historically, the answer has been that waterfront building and

recreation sites are economically attractive and in limited supply, and dredged material sites are normally located on the water. Local demand for waterfront sites thus provides a significant economic incentive to overcome the physical constraints on development of dredged material containment sites. Dredging projects in harbors present special demand circumstances. Commercial space near port facilities is usually in premium demand, and, where fast land is created in such areas through the placement of dredged materials, the tendency is to develop the new land as port facilities. The large number of port facilities/warehouses identified in Table 1 bears out this observation.*

51. Open space in urban areas is also in high demand. This demand for open space should be distinguished from the economic demand identified for other uses, as open space is more difficult to value economically. The difficulty in quantifying the open space requirements in a community makes the demand for such areas no less real, however. Dredged material sites are often ideally suited to meet this open space demand by virtue of their traditionally close proximity to water-bodies.

52. It would be misleading to take the dredged material containment site out of the context of the dredging project as a whole. Dredging must continue if the United States is to maintain and enhance its waterways and waterborne commerce. The dredged material can be used to create usable land with minimal adverse environmental impact.

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* The following reports should be consulted for additional information about the productive uses listed in Table 1:

J. J. Gushue and K. M. Kreutziger, "Case Studies and Comparative Analyses of Issues Associated with Productive Land Use at Dredged Material Disposal Sites," Technical Report D-77-43, Dec 1977, U. S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Miss.

Environmental Laboratory, "Productive Land Use of Dredged Material Containment Areas: International Literature Review," in preparation, U. S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Miss.

CHAPTER IV: AN OVERVIEW OF PROPERTY VALUATION

53. Property valuation involves analyses of certain physical, social, economic, and institutional factors with the purpose of estimating the effect and interrelationship of these parameters on the value of the property in question. Property appraisal requires considerable expertise in the characteristics of various types of property, as well as certain specific valuation techniques. However, the nonappraiser, using a few basic techniques, can derive a rough estimate of property value. These estimates can be used to illustrate a range of values and depict certain types of benefits associated with land value. As such, these techniques could be applied to estimates of value for dredged material containment sites.

54. Central to the process of valuation are two interrelated concepts -- "market value," and "highest and best use." Market value is an economic concept and may be defined as:

> *The highest price a property will bring in an open market which is competitive; where both buyer and seller are reasonably informed and act freely, and sufficient time is allowed for the sale.*

55. Inherent in the concept of market value is the economic idea of highest and best use. The highest price of a property can be realized only if the property is put to its highest and best use permitted under existing legal constraints such as zoning, land use, environmental restrictions, etc. In essence, highest and best use derives from the theory of economic maximization or economic return to the site.

The Process of Valuation

56. There are several basic steps in making an appraisal, and these steps will apply to all appraisals for any type of property.

57. The first step is to classify the property being appraised according to its zoning, land use, and salient physical character-

istics. This set of classification factors depends upon the nature of the property being appraised and the nature of the real estate market for that particular type of property. Zoning is an important factor unless current zoning has little effect on market behavior, as is the case in many rural areas which are anticipatorily zoned, sometimes decades into the future. In those instances, current land use will be the important factor.

58. The second basic step is to determine which units of comparison should be employed in estimating value. The values of land parcels are usually described in terms of dollars per front foot, square foot, or acre, unless all parcels are of similar size and shape, in which case the parcel itself becomes the unit of comparison.

59. Third, data on market values must be assembled. These data include verified sales prices of similar properties, or income and operating expenses, or construction costs.

60. Fourth, an appropriate appraisal technique must be selected and applied to the property in question. The three basic techniques, briefly reviewed below, are: The Comparable Sales Approach; The Cost Approach; and The Income Approach.

Comparable sales approach

61. This technique involves estimating the value of a property on the basis of other similar previously sold properties. Where sufficient sales or assessment data exists, this technique tends to be the most reliable and objective of the three appraisal techniques.

62. The first step in applying the comparable sales approach is to analyze the market in order to identify groups of properties that may be meaningfully compared with one another for valuation purposes. This process is often termed classification or stratification. It is aimed at establishing the utility of properties used for comparability purposes relative to the property being valued. The incremental value of many properties will be a function of certain site characteristics such as view, accessibility, utilities, and topographic constraints. In many cases this factor may require certain value adjustments to arrive at a final cost estimate. Therefore, it is good strategy to take these fac-

tors into account when establishing comparable utility.

63. Comparable sales are regarded by the courts, the public, and the appraisal profession as the single best indication of value in those cases where sufficient sales of similar properties are available. Therefore, the final step in the comparable sales technique is to collect this sales data and analyze it relative to establishing a value estimate.

64. When valuing unimproved land, the appraiser is generally called on to make optimum use of a limited data base since vacant land sales are often in short supply. More than with any other aspect of appraisal, the accurate valuation of undeveloped land requires reasoned judgement and good sense. In many cases assessment data will serve as a good surrogate for sales data, especially where assessments to sales ratios are available or can be easily calculated.

Cost approach

65. The cost approach is useful because of the relative ease of obtaining data. It is primarily applicable to the appraisal of improved properties. The technique is based on the assumption that the value of a property is equal to the cost of the acquiring an equally desirable substitute property -- in this case the process of acquisition being the construction of the substitute. Thus, the appraisal process begins with the hypothetical substitution of the property being appraised with a new but otherwise identical property on the same site.

66. The technique begins with estimating current construction costs. However, since market value is based on improvements in their present condition, if the present cost of the improvements is greater than their contribution to total property value, the difference between cost and value must also be estimated. This difference is called "accrued depreciation" or "diminished utility."

67. There are four common methods of estimating improvement costs: the comparative unit method; the unit-in-place method; the historical cost method; and the quantity-survey method. The first two are the most commonly used in appraisal practice.

68. With the comparative unit method, most direct and indirect costs are summed and divided by a measure such as floor area to obtain a unit cost per sq m. This method insures that typical costs are used and tends to produce replacement cost estimates. The unit-in-place method expresses all indirect and some direct costs of an individual construction component on the basis of a unit of measure. The result is an in-place unit costs estimate for specific components such as foundations, floors, walls, etc.

Income approach

69. The income approach provides an estimate of market value based on the income-producing capability of a subject property. It is based on the premise that the market value of a property is directly related to the amount, duration, and certainty of income associated with the use of the property. Where income-producing properties are concerned, this is the primary valuation approach.

70. The first step in the income approach is estimating gross income, which is based on a concept termed "normal unit rent." This is the amount for which a subject property can reasonably be expected to rent or lease on a per unit basis, under current market conditions and typical management. Some types of property can have more than one normal unit rent (e.g., apartment buildings with differing number of bedrooms). Two sources of information for estimating normal unit costs include the typical per unit rents commanded by similar properties and the rental history of the subject property itself.

71. The second step to this approach is to calculate the anticipated expenses necessary under typical management to operate and maintain the property and to provide for replacements. Once these expenses have been calculated, they can be subtracted from estimated gross income to arrive at net income. This figure is then converted or "capitalized" into value.

72. The final step in the income technique is the capitalization of normal net income. This is the process by which the present value of future incomes or benefits are computed. This relationship

may be expressed either as a rate (ratio of income to value) or as a factor (ratio of value to income). The former is normally used.

Containment Site Valuation

73. Land valuation, especially for undeveloped land, generally calls for the analyst to make use of a very limited data base. The cost approach, as such, is not appropriate for vacant land appraisals. Land rents can be helpful when available, but are often dated and generally limited to commercial property and farmlands. The income approach requires the calculation of rent, income, and capitalization data to a degree which would be beyond the capabilities of most laymen. The comparable sales approach tends to be the most objective and reliable of the three approaches to valuation.

74. For these reasons, comparable sales comparison is the best technique from which to abstract an estimating methodology for valuating dredged material containment sites. This technique has been breifly described above, but specific aspects of the comparable sales approach merit closer delineation in order to gain a clear understanding of their importance in the methodology which will be developed in Chapter V. The methodology is not an appraisal technique, but rather an approach for deriving an estimate of probable value given certain conditions, constraints, and parameters over a period of time.

75. The methodology is related to the comparable sales approach to appraisal in that the methodology utilizes aspects of the appraisal technique in a somewhat less precise manner.

Utility estimation (stratification)

76. This element is an important aspect of deriving adequate comparable sales. For valuation purposes comparable property must possess certain characteristics in common with the subject property. Generally, these characteristics will be obvious in nature and include such parameters as size, shape, access, utilities, and topographical features. The characteristics should be obvious

enough so that adjustments can be made in the value of the subject property for characteristics it possesses which the comparables do not.

Standard units

77. Land values of comparables must be expressed in terms of a standard unit. This is absolutely essential to appraise land on a sales comparison basis. The most common U.S. units are sq ft, front ft, and acres. Corresponding metric units are sq m, m, and ha. That unit which best fits the market should be utilized. For example, for waterfront properties the unit of measure utilized most often is the front ft. This is especially true for beachfront land. If all land tends to sell for the same value per lot, regardless of size, then the parcel itself is the appropriate unit of comparison.

78. When parcels selected for comparison purposes in the valuation process have approximately equal frontage, linear units should be the units of comparison. When parcels tend to possess greater similarity with respect to shape rather than size, square units would be the appropriate units of measure.

Market data assembly

79. All recent vacant land sales of similar utility should be analyzed. Since vacant land sales data often tend to be scarce, and since many containment sites tend to be located in areas where sales activity is not intense with respect to commercial, industrial, public, and open space land, this task is not difficult. Many assessors use sales data up to five years old, although it is recommended that sales beyond this age not be considered.

80. All sales prices should be adjusted to a comparable time period to insure completeness of data. This task will not be difficult since, in most areas, assessors or realtors have a good handle on market conditions and can generally supply an annual rate of land appreciation over some recent time period.

Highest and best use

81. The point of departure in any valuation is consideration

of the potentialities, usefulness, and productivity of the subject property as compared with the same characteristics of sold properties or comparable investments. The best use among alternative permitted and feasible uses of an improved or unimproved property is at the core of the comparisons used in appraisal methodology. Valuation usually is controlled by a determination of best use.

82. The first essential, either in appraisal or estimating value, is the highest and best use analysis. Without an adequate forecast of realistic and available future use, appraisal becomes a meaningless guess. Market value cannot be explored without forming a judgement with respect to the reasons why a buyer would wish to buy a property.

Assessment data

83. In many cases, sufficient sales data on unimproved land may not exist from which to derive an estimate of value. Assessed valuations can serve as a substitute for sales data if carefully approached. Assessments are based, in turn, on sales data which frequently may be several years old. Most states, however, have regulations which require periodic updating of assessment information. The assessor will do this either on the basis of new sales or adjustments of existing assessments to reflect general value increases for a particular land use category.

84. Often, measures termed assessment-to-sale ratios will have been computed for a jurisdiction. This is a measure of the relationship or ratio between average sales prices and average assessments over a period of time. Usually market prices, especially in areas of strong land demand, are higher than assessed value. The ratio represents the difference in the two values.

85. Thus, where assessments are reasonably up-to-date; can be easily adjusted for time; or where a ratio is available; assessed values can serve as surrogates for comparable sales data.

CHAPTER V: METHODOLOGY FOR DETERMINATION OF LAND VALUE AND ASSOCIATED BENEFITS

86. Estimating changes in the value of land where dredged material containment has taken place should be considered an integral part of the CE planning and feasibility study process for projects related to dredging operations. A review of planning and feasibility studies performed by various CE Districts indicates that changes in land value and associated benefits created by the containment of dredged material are often not explicitly considered in feasibility studies for dredging porjects proposals. The cost/benefit analyses routinely performed for feasibility studies usually only imply land enhancement and related benefits, concentrating instead upon project benefits and costs as explicit factors to be considered.

87. The changes in land value and associated benefits and impacts created by dredged material containment should be considered as explicit benefit or cost inputs to appropriate benefit/cost analysis procedures performed in relation to project feasibility studies. The policy of the CE is not very clear in this area. For the purpose of this methodology, Section 5-5 of Chapter 5 of the Digest of Water Resources Policies (EP 1165-2-1) was used as a policy base. This section is fairly specific regarding the role of cost and value analysis in feasibility evaluations. It requires "estimating those costs of a project which can be compared with the estimated benefits to determine whether the project is justified economically." Subsection (b) deals with benefit analysis and lists general factors to be considered in the benefit/cost analysis. Two are of specific interest:

- Market values of outputs as measured by market prices expected to prevail at the time of project construction, or cost of equivalent fill.
- Nonmonetary or intangible benefits resulting from the project

88. The material from CE dredging projects is clearly an output produced by the project. It seems only reasonable to assume, therefore, that any land value changes accruing to sites where dredged

material is contained should be explicitly considered as an input for benefit/cost analyses. Likewise, any indirect benefits or adverse impacts associated with land value changes also should be considered.

General Methodology

89. The methodology which is presented below can be utilized by planners engineers, and economists to estimate land value changes and associated benefits and adverse impacts of sites being considered for containment of dredged material resulting from CE dredging projects. The change in value estimated by this methodology, which could be either a benefit or a cost, would then constitute a valid input to benefit/cost analyses or any related cost analyses relative to project feasibility studies. This methodology can also be helpful in aiding project sponsors (i.e., port authorities, municipalities, private individuals, etc.), to perform analyses of potential benefits or costs associated with dredging projects or dredged material containment which they propose to the CE. It is suggested that in order to make optimum use of this methodology a multi-disciplinary approach be used. Effective analysis as required by the methodology will require personnel with different backgrounds.

90. The methodology is a four-part approach to estimating value changes and associated benefits or impacts. The first part is descriptive and places the containment site in the context of its physical, ecological, and legal environment, thus development potential constraints and incentives are derived. The second part seeks to ascertain the use potential for the site upon completion of placement operations. The third part of the methodology deals with the determination of site value changes as the result of dredged material containment. The final part identifies the associated benefits and impacts of dredged material containment.

91. The suggested methodology utilizes appraisal techniques as a basis, but is not meant to be an appraisal process. It is a technique for deriving an estimate of value change to a site if it serves as a dredged material containment site. This change may be a benefit if land

value is enhanced and the site development potential is increased, or it may be a cost if land value is reduced or if development potential is negatively affected. Value judgement constitutes a large portion of the estimate analysis. This methodology can, therefore, be viewed as a guide to enhance the value judgements being made.

Time Frame of Value Estimate

92. In the majority of instances, a site utilized for containment of dredged material cannot be developed for a number of years following the beginning of dredged material placement. This is due to two factors:

- Placement of dredged material on the site is carried out over a period of months or years.
- Dewatering and consolidation of the material can also take months or years after final placement.

The methodology presented herein is directed at estimating value and associated benefits at the time that the site is suitable for development and improvement.

93. Projecting values over time can be risky, however, and is best left to someone trained in analytical projection and land economics. This methodology does not deal with projection. Land value changes are estimated at present value; i.e., site values and benefits are determined as if the site were developable at the time of the feasibility study. Economists can, in turn, take the values and adjust them over time in appropriate benefit/cost analyses. Economists in the CE Districts or sponsor agencies are generally in the best position to make these time adjustments and evaluations.

Site Description

94. This portion of the methodology should analyze the site relative to its physical and environmental setting, and its relationship to the proposed project(s) from which the dredged material

is anticipated. The legal, physical, environmental, and institutional constraints or incentives which might have a bearing on site development potential should be clearly identified. Appropriate economic parameters of the surrounding area, such as employment statistics, types of industry, growth rates, and types of development should also be delineated in this part of the methodology.

Physical characteristics

95. This segment of the description should cover the physical parameters of the site as they exist at the present time and as they would exist once dredged material containment operations have ceased. The characteristics of the dredged material and the proposed dredging and placement time frame also should be discussed. The following is a suggested listing of the parameters to be discussed:

- Physical Parameters - Existing
  - Size and shape of area contemplated for containment and elevation
  - Type of land contemplated for containment purposes
  - Land use
  - Underlying soil and geological formation conditions (if available)
- Physical Parameters - Anticipated
  - Size and shape of ultimate containment area and elevation
  - Characteristics of dredged material to be contained
- Time Frame and Placement Technique
  - Sequencing of dredged material placement
  - Anticipated completion of placement operations
  - Placement techniques to be utilized

Environmental setting

96. This part of the description should address specific environmental factors which are present and relate to the site, or could be anticipated from dredged material containment. There are a variety of environmental concerns which relate to the selection of a site for dredged material containment. The analyst should be aware

of these and address them if there is a potential for significant impacts. The basic impacts to be considered are those which relate to the natural characteristics of the site and its immediately surrounding area, primarily ecological, physical, hydrological, and pollutant characteristics. More specifically, certain categories may be most relevant to such a consideration:

- Ecological
  - Types of animal species, either terrestrial or aquatic which could be affected by site filling, development, and improvement.
  - Ecological habitat which might be altered by site filling and development, and the extent of the perceived alterations.
- Physical
  - Changes in site topography and related conditions which could have environmental consequences.
  - Changes in soil characteristics due to site filling which could have environmental consequences.
- Hydrologic
  - Impacts of sedimentation due to site dewatering on adjacent waterbody quality.
  - Impacts on groundwater resulting from percolation through fill material of dredged material contaminants.
- Pollution
  - Increased short-term pollution of surrounding waterbodies due to dredging-initiated turbidity.
  - Nutrient leaching from fill material into waterways.

Surrounding development

97. A discussion of the types and status of development near the proposed containment site is helpful in establishing a perspective of the site and its physical environment. Knowledge of existing and planned development around the proposed site, as well as the anticipated timing, will be important in establishing site development potential and constraints.

98. The development potential of the site can be profoundly influenced by surrounding development, which may act both as a constraint and/or an incentive to the sites. If a site is projected to be feasible

for eventual industrial development, but is located in or adjacent to a residential area, that proximity will pose a constraint to optimum development. The following factors should be addressed in this discussion:

- Types of development near the site
- Typical area of developed sites
- Number of undeveloped sites
- Proposed development, both short-term (one to five yrs) and long-term (more than five yrs).
- Typical age of developed sites
- Potential for major changes in types of development on unimproved land

Site zoning and area land use planning

99. An important legal constraint on containment site development potential will be the scope and quality of planning which occurs at the community and/or regional level. Most states have legislation that now provides for and, in some instances, mandates comprehensive planning. The objective of this legislation is to provide direction to developers and governmental agencies in the use and management of an area's physical and natural environment. Comprehensive Plans (Master Plans, General Plans, Development Plans), when developed and adopted, should form the basis for identifying land use potential. Unfortunately, many jurisdictions have yet to develop Comprehensive Plans, or have not extended the planning areas to include potential containment sites. There are also jurisdictions in which the plans, even though they exist, are often ignored. Therefore, in identifying the development potential of a dredged material containment site, it is necessary to determine both if a plan applies to the site, and if the plan has relevance.

100. Zoning is the technique used by most jurisdictions to implement Comprehensive Plans. Therefore, zoning should be consistent with those plans. In these cases, the allowed land use within a zoning district would be the basis for establishing development potential for a site. In other jurisdictions, agricultural or low-

density residential zoning is used as a holding category, with the assumption that developers will petition for rezoning when land development is desired. Zoning can, therefore, be used as an indicator for land use, but only after affirming the method of zoning in the jurisdiction.

101. A Comprehensive Plan will generally allocate all land within the planning area by generalized land use categories. Although each jurisdiction may have its own categories, traditionally they have been divided into:

- Open Space
- Recreation
- Agriculture
- Residential
- Commercial
- Industrial
- Public and Semi-Public

These designations are generally portrayed on a land use map, or criteria are presented that will allow determination of appropriate land uses for a given site.

102. Changes in land use categories (e.g. residential to industrial) can occur over time, though generally not within short time frames (one to five yrs). Usually, major changes in land use categories will occur as a result of significant economic or environmental disruptions, causing prevailing uses to be less and less in demand.

103. Zoning intensity can change more readily over short time frames and should therefore, be more carefully evaluated. In a given area the most intense use allowed for a land use category may set the upper bound for allowable zoning. In another area the most common intensity of use may set the upper bound. Zoning, both present and future potential, should be carefully analyzed, not only with respect to the site, but also adjacent properties.

104. The planning agency of a jurisdiction normally has the basic charge for planning and zoning decisions. Evaluation of planning

and zoning considerations should start, and in many cases will end, with the planning agency. Their evaluation of what is happening and will likely happen with respect to land use is the best information to rely upon.

105. In addition to local or regional planning and zoning considerations, there may also be state and federal legal constraints to consider. The two most common relate to coastal zone management legislation and wetlands preservation and management. Legislative provisions as well as pertinent plans may limit development options regardless of land use or zoning considerations. Therefore, if deemed pertinent, appropriate documents should be reviewed.

Area trends

106. Area trends should address certain economic aspects of the community or the area where the potential site is located. Development potential for a given piece of land is largely a function of demand. Demand for land is in turn a function of economic condition. A strong economy may cause strong demand for commercial and industrial land, which generates additional employment and production activities. Additional employment will create demand for new housing. Population growth will increase demand for public services and facilities; e.g., parks and police stations. The following parameters should be discussed:

- Characteristics of the economic base; e.g., agriculture, manufacturing, distribution.
- Is the economy growing, static, or declining (is employment increasing, level, or decreasing)?
- Is the population growing, static, declining?
- The types of developments, if any, that are occurring with respect to housing, or commercial, or industrial activity.

The discussion of these parameters can be either generalized in the form of a brief overview, or specific, relative to one or more significant parameters which may be particularly relevant for the community or area under study. Sources of data include the local planning agency, the chamber of commerce, banks or other financial institutions,

local newspapers which have research bureaus, and/or U.S. Census Bureau data.

Establishment of Use Potential

107. This portion of the methodology is concerned with evaluating the containment site with respect to the optimum or most likely use for which the site could be developed once fill operations have ceased and the site has dewatered and consolidated. For those projects where a specific use has been pre-planned by the sponsor, this step may not be necessary. However, even in those cases, situations will exist where potential site use may be uncertain because of pending public policy decisions; in these instances, it is considered appropriate to establish the potential highest and best use as the basis for determining the change in value resulting from the dredged material placement. The Site Description portion of the methodology discusses legal and environmental constraints which can affect development potential. While these parameters will be important in determining use potential, there are associated parameters which can also impact use potential. This part of the methodology, then, addresses the associated parameters, relates them to the legal and environmental parameters, and derives an estimate of the site's use potential.

108. In order to facilities this estimate, Table 2 "Use Potential Estimation" can be used. It allows a step-by-step analysis of the pertinent parameters for estimating use potential and interrelates them to produce an estimate of the site utilization potential. Six major parameters are considered:

- Land use
- Zoning intensity
- Other institutional and legal constraints
- Physical characteristics
- Accessibility
- Utilities

The six parameters are discussed below, with the relative portion

Table 2

Use Potential Estimation

Parameter	Existing (Site)	Existing (Adjacent)	Projected (Site)	Impact
Land Use Category (Check appropriate categories)				
Open Space				
Recreational				
Agricultural				
Residential				
Commercial				
Industrial				
Public/Semi-Public				
Zoning Intensity (Check appropriate categories)				
Low-Density				
Medium-Density				
High-Density				
Other Institutional and Legal Constraints	Type (Description)		Impact	
Coastal Zone Management Permit				
Wetlands Conservation				
Other				

(Continued)

Table 2 (Concluded)

Parameter	Description			Impact
Physical Characteristics				
Site Size and Shape				
Fill Character	Check One	Foundation Constraint (Check One)		
Gravel			Spread or Mat	
Coarse Sand			Pile or Pier	
Fine Sand		Impact		
Silt				
Clay				
Soil Character	Check One			
Pollutants				
Salt				
Other				
Geology (Depth to Foundation Strata)				
Accessibility (Check Appropriate Boxes)	Readily Available	Readily Developable	Not Available	
Highway				
Rail				
Water				
Utilities (Check Appropriate Boxes)	In	Required	Impact	
Water				
Sewer				
Power				
Estimate	Actual		Impact	
Highest and Best Use (Legally Allowed)				
Actual Use Likely				
Utilization Potential				
Under-utilized				
To Potential				

(Sheet 2 of 2)

of Table 2 following each discussion. Pages 83 through 86 in Chapter VI illustrate the use of Table 2 via a site specific example.

Land use

109. The land use designation identified for the site and/or surrounding area in the Comprehensive Plan should be a major determinant of use potential. This parameter then requires estimating allowable site land use. Present site land use as designated in the Comprehensive Plan may either be actual use as undeveloped land, or a use projected by the planning agency, when and if development occurs. The decision that must be made is whether the land use presently designated for the site will be similar or different once the site is developable. Discussions with the appropriate planning officials are the best approach to this evaluation. They should be in a position to evaluate the potential land use for the site once containment operations have ceased.

110. If information cannot be obtained from planning officials, an analysis of the Comprehensive Plan is in order. Site and adjacent land uses should be examined. If the physical characteristics of the projected development site are similar to those of adjacent properties, the same land use may be allowed, even if not presently designated. If, however, the site characteristics will differ significantly from adjacent areas, allowable land use may either be unique to the site's characteristics, or may remain at the present designated use. For example, a site that is now marshland may, after containment, be suitable physically for industrial development. However, if adjacent uses are largely residential or open space/recreational, the site may either be designated for residential use or remain with an open space or recreational designation.

111. The methodology considers seven major categories of land use. It is possible that more than one category may be allowed. Normally only one category will be most appropriate, however. If the existing and anticipated land use will be different, the impact should be briefly discussed.

Parameter	Existing (Site)	Existing (Adjacent)	Projected (Site)	Impact
Land Use Category (Check appropriate categories)				
Open Space				
Recreational				
Agricultural				
Residential				
Commercial				
Industrial				
Public/Semi-Public				

Zoning intensity

112. Because dredged material placement is likely to substantially change the character of the site, it is unlikely that the prefill zoning intensity will be applicable (unless the ordinance has been changed in anticipation of the site improvement). Therefore, it will be necessary to determine how the site will be zoned, and then to review the requirements of the expected zoning category. If the zoning in the locality follows the Comprehensive Plan, this will establish the appropriate zoning category. If this is not the case, it will be necessary to review the locality's zoning history. This can be ascertained by contacting the local planning agency, the board of zoning appeals, and local governing body.

Zoning Intensity (Check appropriate category)	Existing (Site)	Existing (Adjacent)	Projected (Site)	Impact
Low-Density				
Medium-Density				
High-Density				

Other institutional and legal constraints

113. In addition to zoning considerations, other land use

regulations may, in some cases, affect the use of a site. A common example would occur in coastal areas where Coastal Zone Management Plans may prohibit a certain use or intensity of use, even though it may be allowed by local community standards. In some cases federal, state, or even county regulations may prohibit development altogether, even though dredged material containment may be allowed. These environmental planning regulations should be examined to determine the applicability of these provisions if the proposed site is in a coastal or wetlands region.

114. Another example of regulations which may affect a site is that, in most cases, an EIS or at least an environmental assessment must be prepared. Such a requirement can result in delays in project construction and increased costs.

Other Institutional and Legal Constraints	Type (Description)	Impact
Coastal Zone Management Permit		
Wetlands Conservation		
Other		

115. In addition to the institutional and legal aspects of use potential discussed above, the physical characteristics of the site, its accessibility, and the availability of utilities can have considerable impact on the use and subsequent development potential of a piece of land. The subsequent tabulations deal with these factors in a step-by-step fashion to enable a realistic assessment of their relative bearing and impact on estimating use potential.

Physical characteristics

116. These factors, or parameters, deal with the physical aspects of the site, namely its anticipated size and shape, characteristics of the fill materials, characteristics of the underlying soil, and geology. These parameters can be used in a secondary fashion to estimate use potential. In some cases these factors may have a

primary bearing on use potential.

117. Site size and shape. The general size and shape of a site can have a bearing on use potential. In an area well-suited to industrial use; a small site may be too small to accommodate industrial development. A site in an area appropriate for commercial development may have inadequate street frontage to support a commercial use; and an irregularly shaped parcel may only be suitable for a number of small users.

118. Fill characteristics. The type of fill material can impact the type of foundation necessary for certain development. A site containing mostly fine-grained materials may require pile or pier

Parameter	Description	Impact	
Physical Characteristics Site Size and Shape			
Fill Character	Check One	Foundation Constraint (Check One)	
Gravel		Spread or Mat	
Coarse Sand		Pile or Pier	
Fine Sand		Impact	
Silt			
Clay			
Soil Character	Check One		
Pollutants			
Salt			
Other			
Geology (Depth to Foundation Strata)			

foundations which can increase site development costs over normal foundations. This parameter may not affect use potential, except to delay development until a similar site without such foundation constraints is first developed.

119. Soil characteristics. A site, which may be suitable for agricultural purposes because of its location, environmental setting, and economic parameters, may be unusable if significant salt deposits are present. In such a case, soil condition may have a direct bearing on use potential.

120. Geology. This parameter could affect use potential if underlying site geology is such as to make any development on the site risky because of such factors as instability or earthquake potential. Also, the depth required to reach foundation strata will impact foundation costs in cases of pier or pile foundations, influencing use in an economic sense.

Accessibility

121. This parameter can impact use potential relative to timing. A site with poor access may be last in line for development, if other similar sites exist in the area which have better or easier access, or where significant expenditures do not have to be undertaken to provide access.

Accessibility (Check Appropriate Boxes)	Readily Available	Readily Developable	Not Available	
Highway				
Rail				
Water				

Utilities

122. The absence of utilities can be a constraint to development if they must be provided from a distance. Since utilities are generally a public service, the jurisdiction may not want to extend them to a single site, especially if there are no other users in the adjacent area. In some communities utility provision, especially for sewers, is used as a planning tool to stage development and manage growth. If utilities are not near the site, local utility companies should be contacted to ascertain conditions under which they will extend their utilities to the site.

Utilities (Check Appropriate Boxes)	In	Required	Impact
Water			
Sewer			
Power			

Estimate

123. The six individual parameters analyzed above are brought together in this part of the use potential estimate to derive a bottom-line estimate of potential site utilization. There are actually three items to be estimated:

- The highest and best allowable use for the site under land use, zoning, and other institutional constraints
- The likely use, based upon fill characteristics, foundation constraints, and accessibility, which may not allow the site to be utilized to full potential
- Whether or not the site will be used to its legal potential

Estimate	Actual	Impact
Highest and Best Use (Legally Allowed)		
Actual Use Likely		
Utilization Potential		
Under-utilized		
To Potential		

124. The estimated site use potential will constitute the input with which the next part of the methodology, the Demand Estimate, will be determined.

Estimate of Value

125. This portion of the methodology is structured around a series of analyses which are directed toward arriving at an actual estimate of value for the proposed containment site, and an enhancement value applicable to the dredged material. In effect, three

values will be estimated for the site:

- A market value based on estimated value of the site as if it were developed at this point in time
- A raw land value reflecting the value of the site prior to any dredged material containment
- A change in value reflecting an incremental value which is the difference between the market value of the developable site and its raw land value

The change in value should be the major output of this estimation analysis. It can be considered input to the cost/benefit analysis for the proposed dredging project being evaluated.

126. This portion of the methodology is comprised of three steps: 1) A demand estimate; 2) An estimate of comparable utility; 3) An estimate of value. The first two steps generate outputs which are used directly as inputs to the third and final step.

Demand estimate

127. This phase consists of a series of steps designed to arrive at an estimate of the general strength of demand for the type of use estimated for the site in the Use Potential analysis. Demand intensity can have an important bearing on a site's market value. Demand can influence how quickly market prices of land rise or influence the time a piece of land will be on the market before it is sold.

128. Two basic parameters are suggested for evaluating the intensity of demand relative to estimated site use potential. The first parameter looks at a series of three economic growth indicators: new employment, population growth, and sales tax revenue increases. These three indicators are generally utilized by economists to gauge the strength of an economy in an area. The condition of the economy will, in turn, determine the demand for different categories of land use in relation to strength of economic activities related to the particular land use type.

129. In addition to economic growth indicators, certain community development indicators can also be evaluated to gauge demand strength. Firms (either commercial or industrial) locating in a community can

Table 3

Demand Estimate

Parameter	Average Annual Percent Increase		Impact
Economic Growth Indicators	Overall Area or Community	Adjacent Site	
New Employment			
and/or Population Growth			
and/or Sales Tax Revenue Increases			
Community Development Indicators			
No. of New Firms			
or Redevelopment Activity			
or Building Permit Activity			
Estimated Demand Intensity	Short Term	Long Term	
Little Activity			
Average Activity			
Strong Activity			

indicate economic condition. Building permit activity can likewise also provide a feeling for economic condition.

130. For convenience in performing this analysis and deriving a demand estimate, Table 3 "Demand Estimate" has been developed. It facilitates a step-by-step analysis of the pertinent factors to derive an estimate of demand. Pages 87 through 88 in Chapter VI illustrate the use of Table 3 via a site specific example.

131. Economic Growth Indicators. The sponsor can be a good source of economic data. In many cases the proposed site has been suggested by a sponsor after careful evaluation of its development potential and economic factors; for example, port authorities often have good economic data upon which they have based their planning.

132. Additional jobs in a community, or rate of increase in employment over some period of time signal the extent of demand for commercial, industrial, and residential land. More jobs may increase demand for stores or housing, and hence land for their development. Population growth rates likewise may signal demand for additional residential or public use land.

Parameter	Average Annual Percent Increase		Impact
Economic Growth Indicators	Overall Area or Community	Adjacent Site	
New Employment			
and/or Population Growth			
and/or Sales Tax Revenue Increases			

133. In some jurisdictions sales tax revenue increases at the local level can be measured. If a sharp increase in tax revenues has occurred during some period prior to the project feasibility analysis, it could signal a growth in employment with a corresponding increase in commercial and residential land demand.

134. One advantage in utilizing these economic growth indicators is that in many cases, these indicators are projected by a local planning agency to estimate future trends. Communities which have Comprehensive Plans may have an economic element as part of the Plan. The economic element usually addresses existing activity and projects future growth activity. Thus, planners are a good initial source for data collection. If no planning agency exists at the local level, a regional planning agency may have this economic data.

135. Community development indicators. In some cases a community may have undertaken a significant program of economic development, either by developing vacant land within its jurisdiction or by undertaking urban renewal activity. The fact that either of these processes has been undertaken will not in itself be indicative of land demand. However, if there has been an actual location of new firms in a community over a period of time as a direct result of either land development or urban renewal activity, it could indicate the existence of land demand. If this data can be obtained, it should be utilized to determine a general demand picture.

136. Some communities have community development agencies, whose charge is to stimulate economic development either be developing new land within the community to attract business or industry, or by engaging in redevelopment activities through converting existing uses into newer or higher intensity economic uses. These agencies will generally have a planning program of some type which can be a source of data to indicate relative demand strength.

137. Building permit activity can sometimes also be utilized to gain a demand perspective. Strong building permit activity, either community-side or on a localized sub-community basis, can indicate strong demand for certain types of uses. Generally, however, building

permit data should not be projected. It should be used as a benchmark to indicate a certain level of past demand. Building permit data can be used in a projected context only in conjunction with the economic indicators discussed above.

Community Development Indicators	Overall Area or Community	Adjacent Site	Impact
No. of New Firms			
or Redevelopment Activity			
or Building Permit Activity			

138. Estimated demand intensity. Based on an evaluation of the data derived for the three groups of measures discussed above, it should be possible to arrive at a reasonable estimate of the intensity of demand for the particular type of use envisioned for the site. The estimate should indicate the level of intensity both for the short term (one to five years) and for the long term (over five years). Reasonable assumptions can be made in both cases. However, it should be remembered for the actual valuation of the site that if intense short-term demand is anticipated, but little long-term demand is expected, site value will likewise probably increase significantly over the short-term, but be stable over the long-term.

Estimated Demand Intensity	Short Term	Long Term	Impact
Little Activity			
Average Activity			
Strong Activity			

Estimate of comparable utility

139. The methodology proposed for site value estimation utilizes elements of the market comparable sales approach. The primary component of this approach is the selection of comparable properties to utilize in deriving a value for the subject property. The theory, simply stated, is that if properties can be identified which have comparable utility to the property valued, and if these properties have recently been sold, then their sales price can be inferred to the property being valued as a reasonable market value. The properties selected for comparison must have utility comparable to that of the property being valued, or the differences in utility must be easily calculable.

140. The first step in actually estimating site value is to determine and select comparable sites for which value has already been established, either directly by sales or indirectly through assessed valuations. As previously noted, sales data is generally preferred to assessment data. Once a group of comparables have been selected, their utility with respect to the subject property must be established.

141. Table 4 "Stratification Estimate" has been prepared to facilitate the estimation of utility comparison between the site and those properties selected as similar in utility for valuation purposes. Pages 89 through 91 in Chapter VI illustrate the use of Table 4 via a site specific example. It should be remembered that the comparison being made is actually between raw land with no dredged material containment and sites that are developed or are vacant but developable. However, since a use potential for the raw site has been established previously, the comparables selected need simply be of similar use or developable for a similar use.

142. Utility. The basic parameter suggested in this methodology for achieving comparison estimates is utility. This parameter involves evaluation of five basic measures to arrive at a utility comparison. The first step in applying the utility evaluation is a brief description of the comparables selected. This description

Table 4

Stratification Estimate

Measure	Site	Comparables
Site Use and Spatial Features		
Site Accessibility		
and/or Availability of Public Services		
and/or Proximity to Similar Activities		
and Foundation Constraint		

Estimate of Site Utility	Check One	Impact
Less than Comparables		
Equal to Comparables		
Greater than Comparables		

should address the area of the comparable sites, topographical features, actual development or development potential of the comparable sites, and location relative to the subject site.

143. The five measures suggested for the utility estimate are basically concerned with physical factors which link a piece of land to its surrounding environment. Site Accessibility is concerned with comparisons of proximity to major transportation facilities such as highways, railroads, and marine terminals or airports. In the case of residential, public, or recreational land uses, this concern may involve accessibility to good public transportation. Availability of Public Services is concerned with evaluating relative proximity of subject or comparable sites to public services such as police or fire protection and utilities such as water, sewer, and power. Proximity to Similar Activities is concerned with evaluating the relationship of sites to similar types of uses. Activities which are similar in nature generally tend to cluster, as in the case with housing, shopping centers, and certain classes of industry. Finally, Foundation Constraint looks at similarities or differences in the types of foundations necessary on the sites for the particular type of improvement being contemplated.

144. One copy of Table 4 should be filled in for the site and one copy for each of the comparables. A composit analysis of all the comparables can then be filled in on the site copy. If it is determined that the utility of the site is greater or less than that of the comparables, an adjustment will have to be made in the next step of the methodology when estimating site value from the comparables.

Value estimate

145. The final step in valuation portion of the methodology is to estimate each of the three values identified earlier: site value, raw land value, and incremental value change. To facilitate this process, Table 5 "Valuation Estimate" can be used. It allows a step-by-step estimation of the three values and involves four steps.

- Average the sales prices for the comparable sites selected for valuation purposes, and adjust for the time value of money.

Table 5

Valuation Estimate

Parameters	Comparables				
	No. 1	No. 2	No. 3	No. 4	No. 5
Use					
Value of Comparables					
Price Adjustment to Estimate Yr					
Average Value of Comparables					
Average Value Adjustment	Adjustment		Impact		
Demand Adjustment					
Utility Adjustment					
Special Constraints					
Site Value					
Adjusted (Average Comparable Value Plus Sum of Value Adjustments)					
Raw (Prior to Dredged Material Containment					
Value Change (Estimated Site Value Less Raw Site Value					

- Adjust average sales price to reflect demand fluctuations, utility differences, and any special constraints anticipated for the site.
- Determine value of site after dredged material containment.
- Determine raw land value for the site.

Pages 91 through 93 in Chapter VI illustrate the use of Table 5 via a site specific example.

146. Comparable values. The objective of this part of the methodology is to obtain the average value of the comparable properties. The comparables are first categorized by land use, and then sales data (or assessment data) are entered. These data are adjusted, if necessary, to reflect the effects of inflation between the time of sale (or assessment) and the present. Minor adjustments should be made to reflect the similarity of the comparable to the subject site by "weighting" the comparables. Such weighting is discretionary, and is included only to permit the user to avoid, where appropriate, simply summing values of the comparables and then dividing by the number of comparables.

147. Value adjustments. Once a weighted average value for the comparables is obtained, certain more substantial adjustments to that value may be necessary. Three basic adjustments may be required:

- A demand adjustment, if it has been determined from Table 3 that site demand will likely be much greater or much less than what might be considered average, due to economic activity.
- A utility adjustment, if it has been determined in Table 4 that the site possesses much greater or much less utility than the comparables.
- An adjustment for any special constraint or enhancement which might accrue to the site. For example, if septic tank/drainfield sewage disposal may be required because there is no sewer available, site value could be reduced.

148. Ideally, any value adjustments should be expressed in percentage terms. However, since estimation of their magnitude will be largely based on informed judgement derived from discussions with experts such as realtors, planners, engineers, and assessors, the

adjustments for the purpose of this methodology should be expressed only qualitatively. This means actual value adjustments will probably have to be expressed as ranges to compensate for the lack of precise dollar value adjustments.

149. Site value. This value will be the weighted average value of the comparables plus the sum of the value adjustments. Since these adjustments will be qualitative rather than quantitative, the site value estimate should be expressed as a range. The value should be presented for square units or linear units of measure, depending on the way in which the data was obtained.

150. Raw site value. This value is the actual value, in place, for the site in its present condition without dredged material containment. It should be calculated in much the same way as the site value estimate is calculated; i.e., comparables should be selected as for the developable site. This may mean going through the exercise of filling out parts of Table 4 and all of Table 5 again, this time for the raw site.

151. Value change. This value, the difference between the estimated and raw site value, is attributable to the dredged material containment and represents the primary value output of the methodology. However, it may also be necessary to include in the value change consideration, significant increases or decreases to adjacent property values which might accrue from development of the containment site.

Associated Benefits and Adverse Impacts

152. This portion of the methodology is concerned with identifying and analyzing the public and private sector benefits. The effects resulting from dredged material containment sites could potentially cover a wide range of economic, environmental, and social benefits and adverse impacts. The assessment of these effects is an iterative process which generally involves the following steps:

- Profiling existing conditions and characteristics of the site and surrounding area

- Identifying anticipated effects
- Describing and displaying the effects
- Evaluating the effects

Profiling character of proposed/projected use

153. The first step in identifying associated benefits and adverse impacts requires profiling the proposed or projected use. The procedures used to establish the Use Potential Estimation serve as a basis for this profile. Where a specific development activity has been proposed by the sponsor, information regarding the anticipated employment, development intensity, etc., should be available. In those cases where use proposals have yet to be developed, planning standards and experience from comparable uses can be employed. This information should be available from CE economists, standard land planning textbooks, and from the development controls governing the site and surrounding area (e.g., zoning, subdivision control).

Identification of anticipated effects

154. This part of the process requires the identification of only those effects which would be significant. The tendency in this type of an analysis is to generate a plethora of effects, many of which ultimately result in confusing the issues. A significant effect, as defined in Corps ER 1105-2-240, dated 10 November 1975, is "one which would be likely to have a material bearing on the decision-making process." Even though effects assessment is essentially an objective undertaking, determining whether or not an effect is significant must also reflect publicy held values. This activity is not intended to replace either the requirements of NEPA or those under the Principles and Standards. Rather, it is intended as a tool to aid in generating data for a more thorough site evaluation.

155. Two guides were develoepd to assist in identifying significant effects. The first guide (Figure 1) shows the relationship of the various categories of effects which could result from the productive use of a dredged material disposal site. This guide should be used as a starting point for identifying and evaluating significant effects. Once a site productive use has been determined

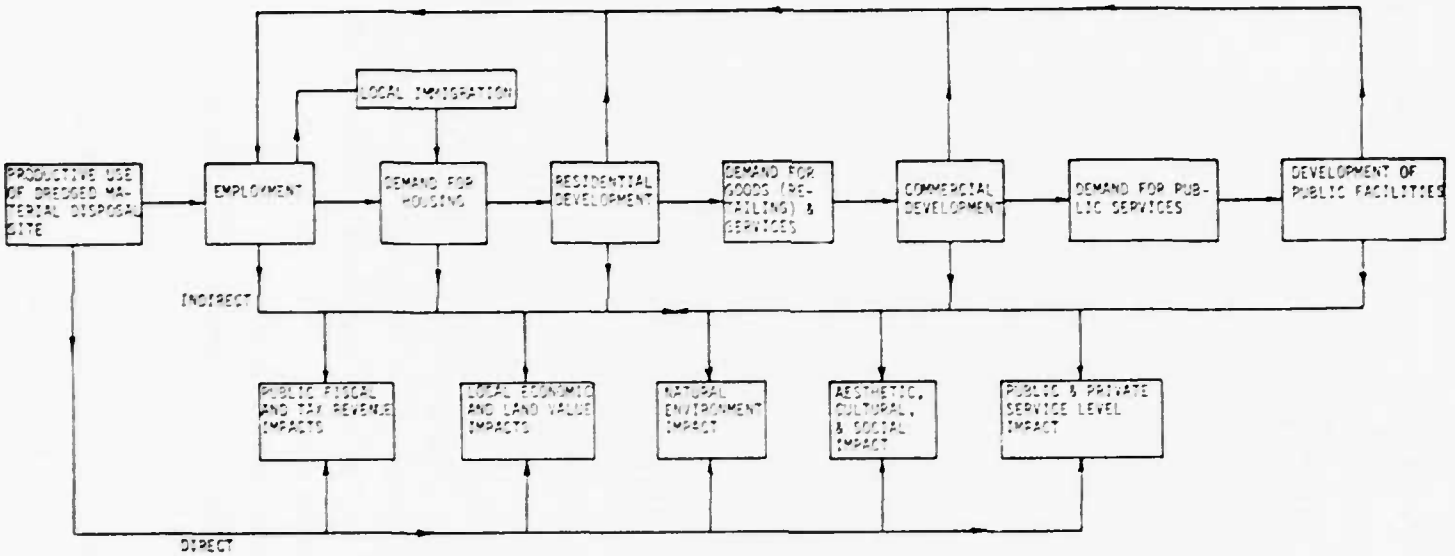


FIGURE 1. Interrelationship of the categories of potential effects on a surrounding area from the creation of a productively used dredged material site

the analyst need only to examine each category of direct impacts as detailed in the Figure to mentally check if an effect might occur in any category. The second guide (Table 6) lists specific types of social, economic, and environmental factors and subfactors. Within each general category of effect, topics are introduced that reflect the generic factors that make up the universe of the system, as well as specific types of adverse impacts. This guide is designed to allow an analyst to determine how the proposed project will impact on the three systems categories. The analyst should ask the question, "will the proposed use affect each factor?"

156. A careful evaluation of the guides with the site characteristic information developed in the "Project Description and History" of the methodology allows the analyst to identify significant effects (benefits or adverse impacts) resulting from containment activity. Again, it cannot be too strongly emphasized that judgement will play a key role in this process.

Description and display

157. Once significant effects have been identified, they should be generally described to provide basic understanding of the parameters involved, the magnitude of the effect(s), and the decision of whether or not the effect should be considered as a benefit or an adverse impact. The effects should be objectively described and displayed in an easily understood format such that the differences among the potentially significant effects are clearly shown. To aid in the display of anticipated effects, Table 7 "Benefit/Adverse Impact Evaluation" has been prepared. The format is straightforward and requires two factors to be recorded at this stage of the analysis:

- Affected Party
- Benefit/Adverse Impact

Pages 96 and 97 of Chapter VI illustrate the use of Table 7 via a site specific example.

158. Affected party. This factor is concerned with identifying the individual, agency, group, or entity potentially affected by each of the benefits or adverse impacts which have been identified;

Table 6

Environmental, Economic, and Social Benefits and Adverse Impacts Applied to the Methodology

Factor	Application
Environmental System	
● Land Use Relationship	
- Improve land utilization	Housing demand improved market for residential land, improved agricultural land.
- Provide land for needed facilities	Sites for park, sewage treatment plant.
- Prevent/mitigate adverse environmental effects	Created breakwall to prevent flooding.
- Develop adverse land use mix	Create mixed land use or zoning patterns in a neighborhood.
- Reduce open space land inventories	Land for parks or recreation areas.
● Housing	
- Provide sites	Particularly significant if Opportunity provided for low- and moderate-income families.
- Strengthen housing market	New employment.
- Enhance site	Provide open space, community facilities.
- Increase local demand for housing	Create localized housing supply dislocations.
● Commercial and Industrial Development	
- Provide sites	Industrial parks.
- Enhance sites	Improved vistas.
- Increase energy consumption	Increased use of natural gas and oil for heating and manufacturing.

(Continued)

Table 6 (Continued)

Factor	Application
- Increase land densities	Higher densities in outlying areas due to industrial or commercial development.
● Transportation (rail, air, highway)	
- Reduce congestion	Allowed relocation of facility out of congested area.
- Supports system improvements	Justify deepwater ports, justify construction of nearby access road.
- Improve utilization	Increase tonnage to support existing rail system.
- Facility creation	Provided right-of-way or terminal.
- Increase traffic congestion	Local streets and highways.
- Increased noise pollution	Areas adjacent to development.
● Utility Systems (Sewer, water, electrical, gas)	
- Provides source	Sites for sewage disposal plants, power plants.
- Justified system expansion	Line extension to site will open up new areas for development.
- Improved use of existing system	Site use will increase efficiency of distribution system/ treatment plant.
- Overload existing system capacities	Increased demand on existing utility systems requires additional public capital expenditures.
● Community Facilities (schools, parks, public buildings, health facilities)	
- Provides sites	New park land.

(Continued) (Sheet 2 of 6)

Table 6 (Continued)

Factors	Application
- Improved use factors (protect investment)	Increased population in areas with schools under capacity.
- Justified additional facilities	Power plant employment.
- Provided/improved environment	Provided buffers, open space, or attractive vistas.
- Expansion of public facilities requiring public expenditures	Schools, utilities, streets, service facilities.
● Air Quality	
- Dispersed/separated air pollution activities	New industrial development away from residential areas.
- Increased air pollution	Additional industrial or commercial development generating point source or auto exhaust emissions.
● Water Quality	
- Protection of watershed	Site use as managed open space.
- Health considerations	Pollution control
- Degradation of water quality	Discharge from industry.
● Coastal Zone	
- Navigable waterways	Protection and enhancement.
- Land absorption	Reduction of natural resource.
● Environmental Protection	
- Flood protection	Dikes.
- Erosion control	Shore protection.
- Protection of natural areas	Wildlife sanctuaries, beaches.
- Biota	Flora and fauna
- Ecosystem	Flora and fauna

(Continued)

Table 6 (Continued)

Factors	Application
- Destruction of localized ecosystems	Wildlife habitats, flora and fauna, and natural areas.
Economic System	
● Government Revenues	
- Real estate taxes	Site and off-site land value increase.
- Sales taxes	From market development by site activity.
- User fees	Dockage changes, park admissions.
- Income taxes	From increased/improved employment.
- Increased expenditures	Capital investment in additional public facilities resulting from development.
● Employment	
- Construction payroll	Major on-site development (power plant) or off-site, in support of site use.
- Permanent employment/site related	On-site and off-site "supporting" uses.
- Permanent employment/area related	Overall increase in area economy.
● Land Value Increase	
- Adjacent properties	Improved vistas (housing adjacent to new park), market potential (convenience stores serving new employees).
- Land accomodating support activities	Transport terminals supporting port.

(Continued)

Table 6 (Continued)

Factor	Application
- Area wide	Increased employment will create higher land prices.
- Increases in property assessment	Rise in property taxes paid by individuals.
● Capital Investment	
- On-site development	Buidlings, equipment.
- Off-site supporting	Buildings, equipment.
- Area wide	General increases in economic growth.
- Government	Public facilities.
Social System	
● Community Services	
- Public safety, health, etc.	Increased demand; improved utilization of existing programs; generate new demands; provide sites for facilities.
- Recreation opportunities	Parks, open space, marinas.
- Reduction of recreational opportunities	Development of potential open space.
● Community Goals	
- Community image	Return waterfront to public use.
- Aesthetics	Change of waterfront can either improve or degrade the visual impact.
- Income maintenance	Improve area economy.
- Organization/agency charters	Port authorities, economic development agencies.
- Growth	

(Continued) (Sheet 5 of 6)

Table 6 (Concluded)

Factor	Application
● National Concerns - Economic development - Energy development - Environmental protection	

(Sheet 6 of 6)

Table 7

Benefit/Adverse Impact Evaluation

Affected Party (Group, Entity, or Individual)	Benefit/Adverse Impact	Measure of Value	Direct/Indirect Benefit/ Adverse Impact	Long/Short Term Time Frame	Evaluation

value of money.

e.g., the project sponsor, the site user(s), the local government, the business community, and/or area residents. This information will prove helpful in the benefit/cost analyses which may follow, in that actual flows of benefits or costs could be identified.

159. Benefit/adverse impact. At this stage the effects should be categorized as to whether or not they are to be considered as benefits accruing from the site or adverse impacts anticipated from site development. This distinction will allow not only accurate differentation among effects, but also will allow those effects which can be quantified to be transferred into the benefit/cost analysis.

Evaluation of effects

160. The actual evaluation of the segregated effects (benefits or adverse impacts), should provide realistic judgmental assessment of the relationship of the effects to the developed site and the physical, social, environmental, and economic environment in which the site is located. In most cases a single commentary type of evaluation will suffice. Where possible, a measure of value should be identified for the pertinent benefit or adverse impact. This measure of value will help economists or others to translate the benefit or adverse impact into quantitative terms for benefit/cost or other analytical assessments. In addition, it is useful to identify whether the benefit or adverse impact is primary or secondary in nature. A quick reference to Figure 1, which separates the major categories into direct and indirect groups, will aid in this estimation. It is also valuable, especially for later analytical work, to identify the relative time frame within which the effects are anticipated.

161. A general guide which may be useful in evaluating site development effects is to relate the identified effects to five categories of what may be termed "outputs." These outputs relate to processes or flows of events which can follow the productive use of dredged material containment sites.

- Effects on distribution of real income. The beneficiaries of plans will be specified by family

incomes into upper, middle, and lower third, based on the national average. At the planner's discretion, other classes of beneficiaries may be displayed for a given study, such as "farm," "urban," and so forth.

- Effects on health, safety, and community well-being. Generalized statements are to be avoided. If an impact is significant enough to be displayed, then it is important enough to be documented, particularly where the contribution is used to formulate, select, or recommend a plan.
- Effects on educational, cultural, and recreational opportunities. These impacts generally can be shown as a function of mileage/time, distance, and numbers and kinds of population affected.
- Injurious displacement of people and community disruption. This category is recognized as a recurrent problem in many plans. The display should indicate the effect of measures taken to avoid such problems; for example, betterments, early sale and leaseback, town relocation, and the like.
- Other. The social category is a broad one and unique aspects may be involved in any given plan or element thereof. The "other" category is intended to insure that all social contributions of significance are included.

162. The methodology which has been discussed above, while perhaps short of being either ideal or self performing, is nevertheless considered to be adequate for performing the type of estimation described herein. The two important points to be remembered are that the methodology is intended as a set of guidelines, and that it involves application of sound judgement for many of its operations. Deviations from the methodology may be warranted, and even encouraged, where sound judgement dictates that the situation being investigated does not lend itself to its application.

163. The conditions associated with dredged material containment sites and their productive uses will vary widely. This methodology has been developed to cover a broad spectrum of possible characteristics and contigencies; this generality in itself may cause problems. It is hoped, however, that if reflection and good judgement are utilized, the methodology will be a valuable tool to estimate value and associated benefits and adverse impacts.

CHAPTER VI: SITE SPECIFIC EXAMPLE

Introduction

164. In order to achieve some degree of consistency in applying the methodology to a range of possible containment sites and conditions, this chapter will utilize a specific case study and proceed in a step-by-step application of the methodology. In this way it is hoped that various factors to be considered in the estimating process will be uniformly classified with respect to their interrelationships. The case study which will be utilized is a candidate containment site in Vicksburg, Mississippi.

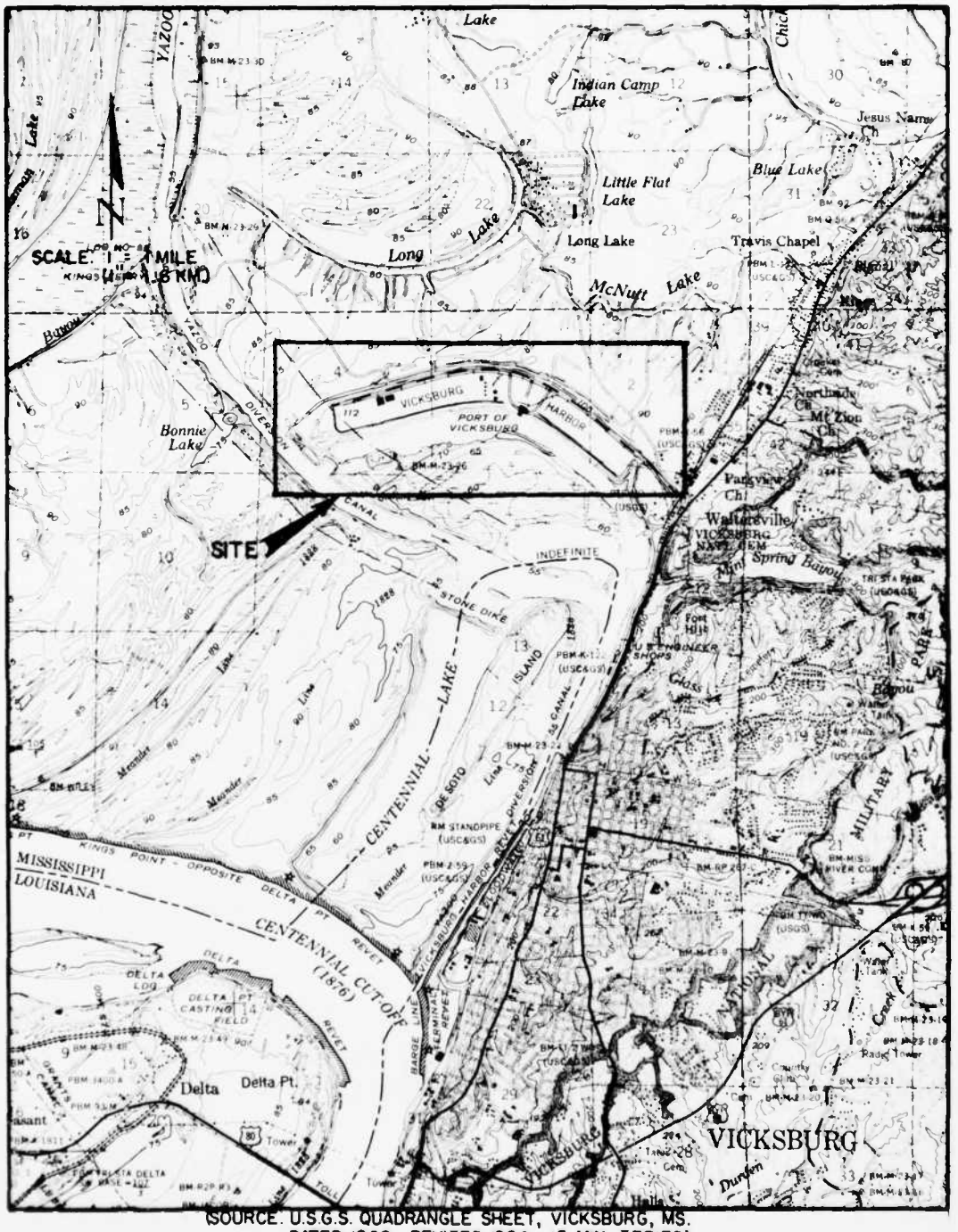
Site Description

165. This section should discuss the candidate site relative to its physical and environmental setting, and its relationship to the dredging project from which the fill material will be obtained. Physical, legal, and environmental constraints and/or incentives which could have a bearing on the development potential of the site should be noted. Economic data on employment, industrial profiles, growth rates, and development should also be discussed.

Physical characteristics

166. This segment should address the physical features of the candidate site as they presently exist and as they will exist when containment operations are complete. The makeup of the dredged material and the dredging time frame should be discussed as well.

- *The candidate site is, at present, a generally rectangular area comprised of about 729 ha (1800 acres) located approximately 2.4 km (1.5 miles) northwest of the city of Vicksburg, Mississippi, and lying along the Yazoo Diversion Canal which bounds the site on the west and south. The site is bounded on the east by uncultivated open space, and on the north by the Warren County Industrial Center (Figure 2). Of the total 729 ha (1800 acres) about 664 ha (1640 acres) are wooded, 57 ha (140 acres) cleared,*



(SOURCE: U.S.G.S. QUADRANGLE SHEET, VICKSBURG, MS.
DATED 1962, REVISED 1964, 15 MIN. SERIES)

Figure 2. Vicinity map, Vicksburg, MS. case study site

and the remainder consists of a portion of a shallow lake (long Lake) which is northwest of the site.

- *No soil information is available. However, it is assumed to be a combination of medium- to fine-grained soil underlying a top layer of loam. Geological data are not available.*
- *The CE proposes a two-step program to construct a slackwater harbor north and west of the Industrial Center, enlarge the Yazoo River Diversion Canal south of the Industrial Center, and widen the approach to the Center.*
- *Stage one will consist of construction of a 91-m (300-ft) wide and 3646-m-(12,000-ft) long slackwater channel with berths and maneuvering areas. The Diversion Canal will be widened to 91 m (300 ft) from the channel entrance, downstream for 8 km (5 miles). Stage 2 will consist of widening the slackwater channel and Diversion Canal each an additional 61 m (200 ft).*
- *Material from the Stage one phase will be placed along the east side of the channel to create 113 ha (280 acres) of landfill to an elevation of 35 m (116 ft) msl. Maintenance material from the slackwater channel and the material from the Stage two improvements will be placed on the west side of the channel and create an additional 28 ha (70 acres) of landfill.*
- *Stage one can be designed and constructed in six yrs. Construction of Stage two will require two yrs, and will be scheduled for completion concurrent with the completed development of the Stage one fill site. Approximately 39.6 million cu m (43.3 million cu yds) of medium- to fine-grained sand and silt will be dredged with a cutterhead pipeline dredge.*

Environmental setting

167. This segment should provide a description of the natural environment surrounding the candidate site in addition to any environmental concerns which may be known or have surfaced during the course of the project feasibility studies.

- *The area surrounding the candidate site contains an abundance of natural resources. Water areas include the Mississippi and Yazoo rivers, the 20-ha (50-acre) Long Lake, the 142-ha (350-acre) Centennial Lake, and numerous levee borrow areas. These water areas offer excellent opportunities for boating, skiing, and commercial and sport fishing.*

- *Land areas in the vicinity of the site are mostly level to gently sloping floodplains which, where not protected by flood control works, are subject to frequent flooding (Mississippi River). Nevertheless, these land areas are utilized for agriculture and forestry. The major crops are cotton and soybeans, and there is some pasturing of livestock. The hardwood forests which are situated throughout the area provide excellent habitats for a variety of native wildlife species.*

- *Climate is usually mild, with an average temperature of about 19°C (66°F). Precipitation averages about 129 cm (50 in.) per yr, with the heaviest rainfall between January and June.*

- *The primary long-term environmental effect of the dredging project and development of the containment site will be the loss of fish and wildlife habitat. The Mississippi Game and Fish Commission will purchase 259 ha (640 acres) of bottomland hardwood forest, and manage a 138-ha (340-acre) greentree waterfowl area, both with funds supplied by the CE. This is intended to offset the primary long-term impacts.*

- *Short-term impacts resulting from dredging operations will possibly include destruction of the endemic bethnic communities, and increases in the turbidity of siltation in adjacent water areas. Contaminants from bottom sediments could also become suspended in the water column. Additionally, the risk of industrial pollution, noise pollution, and the disruption of aesthetic values, both during construction of the project and following industrial development is probable.*

Surrounding development

168. This segment discusses the type of development adjacent to the candidate site and is intended to place the site in the proper physical perspective in relation to its surrounding area. This discussion can also aid in the estimate of the site's development potential.

- *The only significant development near the candidate site is the Warren County Industrial Center. This industrial park contains approximately 32 industries representing a variety of manufacturing operations.*

- *The industrial park, comprising 99 ha (245 acres), was completed in 1963 and is fully developed at the*

present time. The size of the parcels ranges from 0.4 to 13 ha (1 to 32 acres), with an average parcel size of 2 ha (5 acres).

- *The majority of the industries located in the park have been in existence at least eight to ten yrs, and many have expanded during that period. As the park is fully developed, any expansion will have to be by the way of adjacent land which is largely lowlying forest and grassland. Warren County anticipates the need for additional industrial land, especially waterfront parcels, over the long term (in excess of five yrs). This development could easily be accommodated on adjacent land.*

Site zoning and area land use plans

169. This section will form an important foundation for the use potential estimate below. Land use and zoning considerations should be evaluated not only for the candidate site, but also for the surrounding area. The estimate of use potential will be made for sometime in the future and may thus be impacted by uncertainties.

- *Warren County is in the unique position of having neither a land use plan nor a zoning ordinance. In fact, the County does not even possess a building ordinance. Therefore, land use and zoning considerations are, at best, superfluous.*

- *However, for the sake of evaluation, both land use and zoning considerations can be approximated. If, as one segment of the County's politicians and administrators want, a land use plan and zoning ordinance were developed, the site would most likely be designated for industrial use due to its proximity to the existing industrial development. In part, this would also probably be due to the perceived latent demand for waterfront industrial land in the area.*

- *Zoning would in all likelihood be for high-intensity manufacturing, which would essentially allow any and all industrial uses. There is a possibility that provisions of Public Law 92-500 related to wetlands might apply to those portions of the site adjacent to the Yazoo River. If so, development could be prohibited and zoning, if developed, would likely be open space.*

Area trends

170. Certain aspects of the local economic base should be detailed so that the demand function for the site can later be

estimated, relative to its development potential. An overview of the economic condition of the community in which a site is located will be helpful in this regard.

- *Historically, the economy of the Vicksburg-Warren County area has been dependent upon agriculture. However, in the last decade, tremendous gains have been made by the area and the State of Mississippi to better balance the economy by increasing industrialization. Tourism is also an important factor in the area's economy, and adds approximately $4 million annually. The 688-ha (1700-acre) National Military Park attracts approximately one million visitors annually. Because of the area's Civil War background, numerous tourists are attracted to the area's antebellum homes, museums, and other places of historic significance.*

- *The Vicksburg-Warren County area is served by five major highways: U.S. Highway 61 and State Highways 27 and 3 run north and south; Interstate Highway 20 and U.S. Highway 80 run east and west. The Illinois Central Gulf Railroad provides the area with north-south and east-west rail service. The area has a municipal airport and is served by seven trucking firms.*

- *Waterway development in the Vicksburg area includes the Mississippi River Navigation Channel, the Yazoo River Diversion Canal, and the Vicksburg Harbor Project. The Mississippi River Navigation Channel is presently maintained at a minimum depth of 2.7 m (9 ft) and a minimum width of 91 m (300 ft) from Baton Rouge, Louisiana, to Cairo, Illinois. In 1876, Centennial Cutoff (a natural cutoff) removed the Mississippi River Navigation Channel from along the Vicksburg city front, restricting Vicksburg as a river port.*

- *The completion of the Yazoo River Diversion Canal in 1903 restored Vicksburg as a river port and provided a new outlet for the Yazoo River. The Vicksburg Harbor Project was completed in 1960 and provides water access for approximately 99 ha (245 acres) of industrial landfill. Within approximately 10 yrs, essentially all the lands were being utilized or were committed to development.*

- *Riverside development within the study area has occurred along the east banks of the Mississippi River and the Yazoo River Diversion Canal and extends upstream from the vicinity of Interstate 20 highway bridge for a distance of approximately 12.8 km (8 miles). Twenty-six*

private terminal facilities and two public terminals are operating at the Port of Vicksburg. Commodities moving through these terminals include farm and food products, wood and kindred products, petroleum products, nonmetallic minerals, concrete products, chemicals and kindred products, metals products, and manufactured goods and products. While there have been fluctuations in the volume of waterborne commerce, the overall trend has been upward.

- *The harbor facilities at Vicksburg are used by local commerce and vessels navigating the Mississippi River. Towboats range from 15 to 61 m (50 to 200 ft) in length, and barges range from 59 to 91 m (195 to 300 ft) in length and 11 to 18 m (35 to 60 ft) in width. From 1970 to 1972, mini-ships made frequent calls at Vicksburg. These ships have an overall length of 65 m (215 ft), a beam of 15 m (50 ft) and a draft ranging from 1 m (4 ft) light to 5 m (16 ft) loaded. It is possible that mini-ship service to inland ports will be resumed in the future.*
- *The Warren County Industrial Center contains 32 industries which operate on the harbor. The Industrial Center represents a private investment of $40 million, and provides employment for 1150 people, an annual payroll of about $7 million. At present, essentially all of the usable riverfront industrial sites and all of the lands in the Warren County Industrial Center are utilized or committed to development. The demand for waterfront industrial sites is evidenced by the fact that only 10 yrs were required to commit the 99 ha (245 acres) in the Industrial Center to development.*
- *Total tonnage for Vicksburg Harbor increased from 1.4 million metric tons (1.6 million short tons) in 1965 to 2.6 million metric tons (2.9 million short tons) in 1974, for an average annual growth rate of 6.9 percent. Most of the increase occurred during 1969 and 1974. Prior to 1969, total movements were relatively stable or declining.*

Land Use Potential Considered for Valuation

Establishment of use potential

171. This part of the methodology deals with an evaluation of the candidate site with respect to establishing the potential for its development and use once fill operations have ceased and dewatering

has been accomplished. Here, Table 2 (developed for the methodology in Chapter V) will be utilized to perform the analysis. This table evaluates six basic parameters with respect to use potential:

- Land Use
- Zoning Intensity
- Other Legal or Institutional Constraints
- Physical Characteristics
- Accessibility
- Utilities

Land use

172. An evaluation of likely land use at the time of site development, as well as present land use, should be conducted to determine the likely effect of this parameter on the site, as well as the relationship of site land use to adjacent and proximate properties.

Parameter	Existing (Site)	Existing (Adjacent)	Projected (Site)	Impact
Land Use Category (Check appropriate categories)				
Open Space	X	Some		*Warren County has no land use plan or zoning ordinances. These estimates address the possibility of zoning at some future date prior to development of the site. They are based on the perceived latent demand by segments of the County for waterfront industrial land. In many cases this would be sufficient to warrant anticipatory zoning.*
Recreational				
Agricultural		Some		
Residential				
Commercial				
Industrial		Majority	X	
Public/Semi-Public				

If a land use plan and zoning ordinances existed in Warren County, the candidate site would in all probability be designated for industrial use and zoned to permit Heavy Manufacturing activities.

Zoning intensity

173. To estimate zoning intensity, the appropriate planning agency staff should be contacted since they deal, on a daily basis, with

zoning considerations and requests for zoning changes. The zoning consideration is important as it will set the upper bound for the intensity of activity permitted on a site.

Zoning Intensity (Check appropriate category)	Existing (Site)	Existing (Adjacent)	Projected (Site)	Impact
Low-Density		Some		With simulated industrial land use, the attendant zoning would most likely be of a high intensity to permit the widest range of industrial uses.
Medium-Density				
High-Density	X	Majority	X	

If a zoning ordinance existed for Warren County, the site, in all probability, would be zoned for high-density or Heavy Manufacturing to permit maximum flexibility of industrial use.

Other institutional and legal constraints

174. In addition to land use or zoning, there may be legal constraints imposed on use potential through state or federal legislation or regulations. Coastal Zone Management Act provisions are an example of such a provision in coastal areas. Any such constraints that might exist should be identified and the impact briefly discussed.

Coastal Zone Management Permit		Provisions of the Wetlands Conservation Act could be applicable to the portion of the site adjacent to the Yazoo River. If so, development could be restricted, or, the permitting process could pose costly time delays for development. No accurate data exist at this time, however, on which to base such an assumption. Therefore, no impact is assumed.
Wetlands Conservation	X	
Other		

Provisions of the Wetlands Conservation Act could impact the use potential of the candidate site. This possibility is not considered likely at the present time, and could be further explored once fill operations actually get under way.

Physical characteristics

175. Certain physical characteristics of the site and fill material to be contained could have a bearing on use potential. These should be identified and analyzed as to their potential impact on site utilization.

Parameter	Description		Impact	
Physical Characteristics Site Size and Shape	Rectangular site, 303 m (1000 ft) wide; 142 ha (350 acres) on both sides of the proposed Slackwater Channel. Flat topography		Ideally suited for development as industrial sites.	
Fill Character	Check One	Foundation Constraint (Check One)		
Gravel			Spread or Mat	x
Coarse Sand	x		Pile or Pier	
Fine Sand	x	Impact		
Silt	x	Nature of fill material would preclude any special foundation work in order to support improvements.		
Clay				
Soil Character	Check One	Some contaminated material from bottom sediments may be present, but will have no effect on industrial development potential.		
Pollutants				
Salt				
Other				
Geology (Depth to Foundation Strata)		Not Available.		

The size and shape of the site makes it ideal for industrial development, especially of a waterfront nature. The characteristics of the anticipated fill material are not such as to require special foundation considerations for structural improvement.

Accessibility

176. This parameter can have an impact on site market value, both in terms of bid price and length of time on market, if other more accessible sites are available. Accessibility should be described in terms of ease of getting to the site and relative proximity of the site to the forms of transport most utilized by the type of activity anticipated for it.

Accessibility (Check Appropriate Boxes)	Readily Available	Readily Developable	Not Available	Impact
Highway	x			Access will be via highway serving adjacent Industrial Park. Site will have waterfront access for shipping purposes and be proximate to rail spur.
Rail	x			
Water	x			

This site has excellent access characteristics, especially with regard to industrial goods transportation.

Utilities

177. The availability or lack of utilities should be identified

in order to ascertain if this would have any impact on development timing or cost.

Utilities (Check Appropriate Boxes)	In	Required	Impact
Water		X	*All utilities are readily available in the adjacent industrial park and will pose no problem for development.*
Sewer		X	
Power		X	

All major utilities are available nearby.

Use potential estimate

178. This last segment of the use potential estimate essentially integrates the parameters which were evaluated above to arrive at an estimate of the likely use for which the candidate site could be developed. Three factors need to be identified here:

- Highest and Best Use
- Actual Use Likely
- Utilization Potential

Estimate	Actual	Impact
Highest and Best Use (Legally Allowed)	*Industrial*	*Increased availability of needed waterfront industrial land.*
Actual Use Likely	*Industrial with range of activities*	
Utilization Potential		*Long-term - full potential utilization is likely.*
Under-utilized		
To Potential	*Full*	

The candidate site will in all likelihood be utilized to its highest and best use potential as an industrial site.

Estimate of Value

179. The analyses in this part of the methodology are comprised of three elements from which the actual estimate of site value and value enhancement from dredged material containment are derived. The change in value (enhancement) due to dredged material placement is the major output of this part of the methodology.

Demand estimate

180. This element is designed to generate an estimate of the strength of demand for the candidate site given the projected use to which it will be put. Table 3 facilitates the analysis of demand. The two parameters that are evaluated to arrive at a demand estimate are Economic Growth and Community Development.

181. Economic growth indicators. In analyzing this parameter, employment growth, population growth trends, and increases in sales tax revenues in the community will be considered. All three factors are not necessary to the analysis, but at least two should be identified. The relative strength of the economy and hence demand for specific land uses can be gauged from these factors.

Parameter	Average Annual Percent Increase		Impact
Economic Growth Indicators	Overall Area or Community	Adjacent Site	*Both the rate of population growth and rate of employment growth indicate an economy which is not exhibiting an unusual demand for land, especially industrial land. This, despite contentions by some sectors of the community that a strong latent demand for industrial land exists.*
New Employment	*1.5 percent annually (1973 to 1978)*	*Data not Available*	
and/or Population Growth	*6.6 percent (1960 to 1970)* *7.2 percent projected (1970 to 1980)*	*Not Applicable*	
and/or Sales Tax Revenue Increases			

Economic growth in Vicksburg/Warren County is not significant. Population growth between 1960 and 1970 was 6.6 percent, and is projected at 7.2 percent during this decade. This is due, in large part, to absence of a strong industrial base to draw labor from outside the area. The employment base of the area has only increased at a rate of about 1.5 percent annually over the last five yrs.

182. Community development indicators. In analyzing this parameter, the emphasis is on new firms in the area or community in the recent past or on any significant redevelopment activity which might signal anticipated growth in the economy. Building permit

activity can also be utilized but is generally less reliable due to uncertainty of whether it reflects new construction or renovation.

Community Development Indicators	Overall Area or Community	Adjacent Site	Impact
No. of New Firms	*No accurate data available*	*2 in the last 3 years in Industrial Park*	
or Redevelopment Activity	*Mostly historical in nature*	*None*	*No significant activity is apparent, either in terms of new firm location or in terms of major redevelopment aimed at attracting new industry.*
or Building Permit Activity	*N/A*	*N/A*	*Building permit activity is unavailable due to lack of a building code or ordinances requiring permits.*

Community development indicators do not show significant development activity which would reveal unusual demand for industrial land over time.

183. Estimate. The actual estimate is concerned with identifying both short-term and long-term demand and any special factors noteworthy in either case.

Estimated Demand Intensity	Short Term	Long Term	Impact
Little Activity	*X*		*No special demand is forseen for industrial land in the area. There could be some slight increase in demand for waterfront land if shipping activity increases substantially.*
Average Activity		*X*	
Strong Activity			

Stratification estimate

184. This element of the value estimation attempts to establish the degree of similarity between the candidate site and comparable sites for which sales data are available. The similarity is expressed in terms of utility comparison.

185. Table 4 "Stratification Estimate," has been developed to aid in this analysis. The table uses four measures of utility: Accessibility; Availability of Public Services; Proximity to Similar Activities; and Foundation Constraints. These are all measures of utility.

186. Utility. The first step in comparing the utility of the site with the comparables is to describe the comparables in terms of their physical and topographical features, and their development potential if unimproved.

- *Two unimproved sites were available and have been selected for value comparison. The first site consists of 73+ ha (180+ acres) of relatively level non-wooded land with all utilities. The site also includes about 304 m (1000 ft) of railroad frontage, making it ideal for industrial development.*
- *The second site consists of about 41+ ha (100+ acres) of unimproved land which is comprised of partially flat and partially sloping topography. The site is adjacent to the major highway between Vicksburg and Memphis, and all utilities are available. The major portion of the site would be suitable for industrial development.*

187. Once the comparables have been described, the utility analysis can be performed. One copy of Table 4 should be filled out for each comparable and a composite copy of the basic data for each comparable and the site should show the combined data.

Measure	Site	Comparable No. 1
Site Use and Special Features		
Site Accessibility		*Excellent access to site; 304 m (1000 ft) of railroad frontage.*
and/or Availability of Public Services		*All utilities on site.*
and/or Proximity to Similar Activities		*No proximity to industrial development.*
and Foundation Constraint		*None*

Estimate of Site Utility	Check One	Impact
Less than Comparables		*Comparable has excellent development potential for an industrial park. Topography is basically flat and shape is rectilinear.*
Equal to Comparables		
Greater than Comparables		

Comparable No. 1 has excellent development potential and possesses good development characteristics.

Measure	Site	Comparable No. 2
Site Use and Special Features		*Good access with frontage on major highway linking Vicksburg and Memphis.*
Site Accessibility		*Good access with frontage on major highway linking Vicksburg and Memphis.*
and/or Availability of Public Services		*All utilities on site.*
and/or Proximity to Similar Activities		*No proximity to industrial development.*
and Foundation Constraint		*None*

Estimate of Site Utility	Check One	Impact
Less than Comparables		*Comparable has good industrial development potential. Topography is more varied than first comparable, but topography is not a constraint.*
Equal to Comparables		
Greater than Comparables		

Comparable No. 2 has good potential and average development characteristics.

188. Estimate. This segment should combine the description of the utility measures of the comparables and derive an estimate of the utility of the site relative to the comparables.

Measure	Site	Comparable
Site Use and Special Features		
Site Accessibility	*Site access to and from site by water and railroad.*	*One comparable has rail frontage, the second has highway frontage. Access to both is excellent.*
and/or Availability of Public Services	*Utilities are available in adjacent Industrial Park.*	*All utilities are available at comparable sites.*

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and/or Proximity to Similar Activities	*Site is adjacent to existing Industrial Park.*	*Comparable sites are not adjacent to any industrial or commercial activity.*
and Foundation Constraint	*None*	*None*

Estimate of Site Utility	Check One	Impact
Less than Comparables		*Site is estimated to be comparable in utility to the properties selected for sales comparison purposes in all but the proximity measure. In this instance the lack of activity proximity for the comparables is not felt to be significant.*
Equal to Comparables	X	
Greater than Comparables		

The candidate site is of equal utility with respect to the two comparables selected for the comparable sales approach. The fact that the two comparables are not located in proximity to industrial activity should not detract from their value relative to the site.

Value estimate

189. The last element in the valuation portion of the methodology involves the actual estimate of the site value and change in value attributable to dredged material containment. This part of the process has been facilitated via the development of Table 5, "Valuation Estimate." A step-by-step estimate of value can be derived for the site by applying this table.

Comparable values

190. The first step in the value estimate is to derive a weighted average value for the comparables which have been selected and analyzed in the previous section of the methodology. The use of each comparable which is allowed or could be realized should be identified. The value of each comparable should be adjusted to a base year (year the estimate is being made), if the sale is older than one yr.

Parameters	Comparables				
	No. 1	No. 2	No. 3	No. 4	No. 5
Use	*Industrial (assumed zoning)*	*Industrial*			

Value of Comparables	$9900/ha ($4000/acre) 1977	$7400/ha ($3000/acre) 1975			
Price Adjustment to Estimate Yr	use 7 1/2% annual $12,600/ha ($4300/acre)	use 7 1/2% annual $9100/ha ($3700/acre)			
Average Value of Comparables	$9900/ha ($4000/acre)				

Both comparables are suited for industrial development although no development plans have been announced to-date by the purchasers. Comparable No. 1 sold in 1977 for $9900/ha ($4000/acre). Comparable No. 2 sold in 1975 for $7400/ha ($3000/acre). Both comparable values have been adjusted upward and, in this case, weighted equally to determine an average value of $9900/ha ($4000/acre).

191. Value Adjustments. Adjustments for any unusual demand conditions or significant differences in utility between the site and the comparables should be made at this point. Also, if there are any special constraints on site development not previously covered, a value adjustment should be made at this time.

Average Value Adjustment	Adjustment	Impact
Demand Adjustment	None	
Utility Adjustment	Add 25% for assumed latent demand for waterfront land	Since the site will have waterfrontage, not in the comparables, and some latent increase in demand is assumed by certain interests, site value is adjusted upward.
Special Constraints	None	

A 25 percent upward price adjustment to reflect the waterfront siting of the candidate site relative to the comparables is made. The analyst judged that this increase is sufficient in the absence of any significant demand or strong economic activity and should satisfy the water adjacency aspect of land value.

192. Estimate. The site value estimate is the average or weighted average of the comparables plus the sum of any value adjustments. The raw site value (the present value of the site

prior to any filling) is calculated from comparables in the same fashion as was the site value. The change in value is the difference between the two, and represents the enhancement created by dredged material containment.

Site Value	Amount	Impact
Adjusted (Average Comparable Value Plus Sum of Value Adjustments)	*$12,300/ha ($5000/acre): includes 25% upward adjustment of base of $9900/ha ($4000/acre)*	*Upward adjustment because of waterfrontage.*
Raw (Prior to Dredged Material Containment	*$1200/ha ($500/acre)*	*Based on County assessed value of partly-wooded grazing land. No actual comparable sales are available for site land in its present state, which is not suitable for industrial development.*
Value Change (Estimated Site Value Less Raw Site Value	*$11,100/ha ($4500/acre)*	*Value added because of dredged material containment and subsequent development of site suitable for industrial improvements.*

This candidate site is not mudflat nor under water. Its present value is assessed for the 1978 tax year as grazing land at a value of $1200/ha ($500/acre). This assessment in part reflects its proximity to developed properties. The value change is thus calculated at $11,100/ha ($4500/acre) and represents the enhancement value created by the containment of dredged material and subsequent development of the site for industrial purposes.

193. It should be remembered that this change in value, which is imputed as the value added by dredged material containment, is the value if the site were developable today. This value, as well as the site value, should be adjusted for time in an appropriate fashion to reflect value at the time the site will actually be ready for development. This should be done by a competent economic analyst or appraiser.

Associated Benefits and Adverse Impacts

194. Here the emphasis is on the identification and analysis of those public and private sector benefits and impacts which could be generated by the ultimate development of the candidate site, and for which some measure of value could be derived for benefit/cost analysis purposes. A complete analysis under Principles and Standards requires this consideration.

Profiling existing conditions

195. Relevant economic, social, and environmental characteristics of the community or area wherein the site is located, as well as the site itself, should be detailed. The Site Description section of this analysis should suffice for this data. The characteristics identified therein should provide a sufficient base from which to identify appropriate benefits and adverse impacts.

Identification of anticipated effects

196. An analysis of the Site Description and examination of Table 6 of the methodology should allow a reasonable outline of benefits and adverse impacts resulting from eventual site development.

I. Social Effects

A. Noise impacts during construction and site development.

B. Disruption of local aesthetics of site developed as industrial park.

C. Reduction of recreation opportunities.

II. Economic Effects

A. Increased local property tax revenues.

B. Employment/labor force increases.

III. Environmental

A. Potential air pollution increases.

B. Potential water pollution; organic materials or solids.

C. Compaction and subsidence.

D. Sedimentation effects.

Description and display

197. Once the effects have been identified they should be described in order to analyze the magnitude of the effect and whether or not an effect should be considered a benefit or adverse impact. The effects should be objectively described and displayed in a form that is easily understood. Table 7 has been developed in the methodology to facilitate the display and evaluation of effects.

198. The basic approach in Table 7 is to identify the group, entity, or individual affected; to determine if the effect is a

benefit or adverse impact; to identify the measure of value that could be utilized to quantify the effect; and to identify the time frame over which the effect can be anticipated.

199. The final step is a simple commentary on what type of condition the effect will generate with respect to the affected party.

200. Table 8, which has been developed for this example case study, is presented on the following pages. All significant effects have been ascertained and evaluated. As a final note, when analyzing productive use effects, a careful review of this portion of the methodology should assure a reasonable evaluation of these benefits and adverse impacts.

Table 8

Benefit/Adverse Impact Evaluation

Affected Party (Group, Entity, or Individual)	Benefit/Adverse Impact	Measure of Value	Direct/Indirect Benefit/ Adverse Impact	Long/Short Term Time Frame	Evaluation
General Community. Unemployed segment of working age population.	Increased employment opportunities.	Increases in per capita income; increases in sales tax revenues.	IB	LT	Development of candidate site for industrial purposes would create potential employment opportunities at the local level, leading to increased personal expenditures and consequent increases in the level of sales tax revenues.
General community and residents in vicinity of site.	Increases in levels of certain air pollutants.	Cost of reducing pollution to pre-development levels.	II	LT	Development of industrial activity could result in additional pollutant emissions depending on the type of industry and production process employed.
Water related recreational users fish and/or wildlife.	Generation of organic or solid pollutants into the Yazoo River.	Cost of cleaning up pollutants and restoring water quality to pre-development state.	II	LT	Some industries produce organic materials and solids as by-products of manufacturing processes which can find their way into water bodies via direct discharge, and impact water quality and aquatic life forms.
Site Improvements.	Timing of compaction and subsidence of fill material.	Loss in site income due to development delays from either subsidence or compaction.	DI	ST	If compaction of fill material or placement of fill material, is not accomplished with site planning in mind, delays in site development can occur.

(Continued)

Table 8 (Concluded)

Affected Party (Group, Entity, or Individual)	Benefit/Adverse Impact	Measure of Value	Direct/Indirect Benefit/ Adverse Impact	Long/Short Term Time Frame	Evaluation
Residents in vicinity of site.	Impact of noise generated during development of site for improvement purposes and construction of those improvements.	Potential environmental suit brought by residents against developer or owner of improvement.	II	ST	Noise generated during site development and construction of any improvements could adversely affect residents in the vicinity of the candidate site if levels are excessive.
General community.	Aesthetic impact on the natural setting of the area, particularly in relation to its waterfront configuration.	Cost of development of an alternative site utilized for riverfront open space purposes.	DI	LT	Development of an industrial park on the candidate site would remove 728 ha (1800 acres) of open space from the county and change the aesthetics of the area.
General community.	Impact of reduction of river associated recreational opportunities.	Cost of developing alternative acreage for recreational use.	II	LT	The candidate site presently affords excellent opportunities for small game hunting, and river oriented recreational activities which would be eliminated by development.
General community.	Benefit of increased property tax revenue.	Increase in the county assessment base.	DB	LT	Development of candidate site for water-oriented industrial uses would increase property value of acreage and hence local property tax revenues.
Water quality.	Sedimentation turbidity due to dredging and site dewatering.	Uncertain.	DI	ST	Localized turbidity impacts will likely result because of dredging operations and containment site dewatering. Some impacts to aquatic biota can result.

(Sheet 2 of 2)

CHAPTER VII: EVALUATION OF CASE STUDIES

Identification of Criteria for Study Site Evaluation

201. The 15 case study sites chosen to validate and refine the methodology were selected to reflect a wide spectrum of productive uses, physical settings, and geographic locations. Evaluation of the case study data focuses on identifying and correlating those criteria or variables which appear to have the most direct bearing on productive use value. These criteria have been aggregated into the following categories for analysis purposes:

- Productive uses considered for valuation
- Physical and dredged material characteristics
- Setting (relative to surrounding area development)
- Valuation factors
- Associated benefits/adverse impacts

The criteria, as they pertain to each case study site, have been incorporated into four matrices at the end of this chapter.

Productive uses considered for valuation

202. Site productive use (or use potential) is a significant criterion in establishing site value and value change due to containment. This parameter was already established in all the case studies and, therefore, utilized as given. The range of site productive uses includes state fairgrounds, a nuclear electric generating station, a small boat marina, parks and related recreational facilities and one mixed use site (industrial, recreational, institutional uses). Industrial use accounts for 9 of the 15 sites. This was not unexpected, given the size of these sites and their location in port areas and in proximity to similar industrial/manufacturing activities.

203. One site, Virginia Beach, is a bit of an anomaly since it has a productive use as a beach area, but does not have a value, per se. Rather, the value is a transferred benefit to adjacent beachfront commercial uses.

204. Overall, productive use potential plays a significant role

in valuation. The fact that 14 of the 15 case study sites are in waterfront locations and can be utilized for a high-intensity use contributes to their site value. In most port areas, industrial land suitable for water-related manufacturing activities, or activities which rely on water transport access, is scarce. Therefore, new land large enough to support industrial activities, either of a manufacturing or warehousing nature, is highly valued. Further, productive use potential for recreational purposes seems to be highly valued for increased community benefits.

Site physical and dredged material characteristics

205. Site physical characteristics. The physical characteristics (location, size, and topography) of the case study sites vary significantly among sites, as shown in Table 9.

206. A geographic distribution of case study sites was attempted. Six of the sites are located on or near the Atlantic Coast, from Florida north to New Jersey; two are located in Florida near the Gulf of Mexico; and one is located in Texas. Three sites are located on the Pacific Coast -- one in California and two in Washington. One site is located on the Great Lakes, and two are in the Mississippi River Delta.

207. Site size can be an important consideration in value, relative to use potential. A site which can be utilized for industrial purposes should be large enough to support development of improvements, including parking facilities, storage yards, and transport terminals. All the case study sites are large enough for industrial improvements. The larger sites are well-suited for industrial park or similar development. The total areas comprising the case study sites range from 9 ha to over 1300 ha (22 to 3200 acres). In all cases, the sites are sufficiently large to accommodate their highest and best productive uses.

208. All of the case study sites are relatively flat, which is desirable for development. Additionally, in each case study site the dredged material was graded after dewatering and settlement, and in some cases a layer of topping material such as sand or crushed gravel was applied as a surface course. The topography and waterfront location of the sites make them ideal for development purposes.

Table 9

Case Study Site Physical and Dredged Material Characteristics

Site	Location	Approximate Size		Soil Characteristics				Depth to Foundation Strata	
		ha	acres	type	grain size	bearing capacity	vegetative support	m	ft
Anacortes	Anacortes, WA	11	26	Sand/ clay	Fine	Fair	Good	8	25
Artificial Island	Salem County, NJ	81	200	Silty clay loam	Fine	Fair	Good	21	70
Bay Port	Green Bay, WI	233	575	Sand/ clay	Fine	Poor	Good	5	15
E. Potomac Park	Washington, D.C.	133	329	Silt/ clay	Fine	Poor	Good	31	100
Fifth Avenue Marina	San Diego, CA	9	22	Fine sand	Fine	Fair	Good	NA	
Florida State Fair-grounds	Hillsborough Co., FL	112	276	Silt/ clay	Fine	Poor	Good	NA	
Hookers Point	Tampa, FL	162	400	Silt/ clay	Fine/me-dium	Fair	Good	NA	
Hoquiam	Hoquiam, WA	18	45	Sand/ silt	Fine	Fair	Good	10	34
Patriots Point	Charleston, SC	182	450	Silty Loam	Fine	Poor	Good	18	60
Vicksburg	Vicksburg, MS	142	350	Sand/ silt	Fine	Good	Good	12	40
Virginia Beach	Virginia Beach, VA	17	43	Sand & clay	Fine to medium	Fair	Poor	NA	
Pelican Island	Galveston, TX	1306	3225	Silt/ clay	Fine	Fair	Good	NA	
Port Jersey	Jersey City, NJ	172	430	Sand/ clay	Fine to medium	Fair	Poor	23	75
Blount Island	Jacksonville, FL	680	1700	Silt/ clay	Fine	Good	Good	25	80
Rivergate	Memphis, TN	172	425	Sand/ clay	Medium	Good	Good	NA	

209. The geographic location of sites is not determined as a value criterion. Land value markets are localized in nature and dependent on local economic and environmental conditions. However, within a given area, location and value can be related. Waterfront sites usually command the highest value in a local area, regardless of use. Additionally, proximity considerations can have a bearing on value related to use. The economic principle of agglomeration (like activities tend to locate within proximity to each other) appears to work effectively with respect to location decisions and, to a lesser extent, value.

210. Dredged material characteristics. In many of the case study sites, the dredged material which has been placed on the containment sites is fairly uniform in character. The material is predominately fine-grained, and contains primarily sands, silts, and clays. Three of the sites contain fine-to-medium-grained sand. Only the Virginia Beach case study site contains dredged material primarily consisting of sand. This fill character, however, is necessary due to the beach nourishment nature of this site.

211. In most of the case study sites, the nature of the fine-grained, fill material provides inadequate bearing capacity for large structures such as commercial or industrial improvements without special pier or pile foundations. Most of the contained sites can support smaller structures by use of spread foundations. If special foundations must be constructed in order to utilize a site, this can prove to be a value-affecting criterion, except in those cases where site demand is such that additional development costs necessitated by poor load-bearing fill are not overriding.

Setting relative to surrounding area development

212. Of the 15 sites, 10 are located in urban areas, (as shown in Table 10). Five sites are located in surburban areas outside of central cities, but they are near the urban center. Only one site is located in an essentially rural area. That site is utilized for a nuclear electric generating station, a use requiring a location away from populated areas. In all cases, the zoning is consistent with site utilization, although actual productive use may not be the highest and best use allowable under the zoning provisions.

Table 10

Case Study Settings

Site Name	Productive Use	Water and Sewer	Urban Setting	Zoning	Access
Anacortes	Industrial/Manufacturing	To site	Urban/port	Industrial/Urban	Excellent
Artificial Island	Nuclear Power Plant	None nearby. Developed their own services	Rural	Industrial/Urban	Poor
Bay Port	Industrial/Port	Nearby	Urban	Industrial/Urban	Good
E. Potomac Park	Park	On-site	Urban	Open Space	Excellent
Fifth Avenue Marina	Marina/Park	Adjacent to site	Urban	Open Space	Excellent
Florida State Fairgrounds	State Fairgrounds	On-site	Suburban	Urban "Transition"	Good
Hookers Point	Industrial/Port Facility	On-site	Urban/port	Industrial/Urban	Excellent
Hoquiam	Industrial/Manufacturing	0.2 km (.13 mile) from site	Urban/port	Industrial/Urban	Good
Patriots Point	Museum, marina, golf course, motel	Water extended to site. Package sewage treatment plant installed.	Suburban	Commercial/ Agricultural/ Open Space	Fair
Vicksburg	Industrial/Manufacturing	Adjacent to site	Suburban	None	Good
Virginia Beach	Beachfront Commercial	Adjacent to site	Urban	Residential/ Commercial	Excellent
Pelican Island	Industrial/Residential/ Institutional/Recreational	To site	Urban	Industrial/ Residential/ Open Space	Excellent
Port Jersey	Industrial/Commercial	On-site	Urban	Industrial	Excellent
Blount Island	Industrial	To site	Suburban	Industrial	Excellent
Rivergate	Industrial	On-site	Suburban	Manufacturing	Excellent

213. Site access varies; however, only one site (Artificial Island), has poor access. The remaining sites, as shown in Table 10, possess good to excellent accessibility to highway, rail, and/or water transport.

214. While there appears to be a relationship between setting and value, no evidence was found to support setting as a significant value criterion. Normally one would expect that site value would decrease with distance from a central city. Since all but one of the sites were either urban or suburban, and most were port-oriented, a value-location relationship could not be established.

Valuation factors

215. All sites exhibit significant value changes, when comparing site value prior to dredged material containment with site value in a developed state (Table 11). In all cases, this change in value reflects a significant increase (on the average seven-fold).

216. The case study site valuation estimates are based on the methodology; specifically, on estimated demand for the site use, identification and estimation of the utility of comparable sites for which land value sales data or assessment value was available, and specific site characteristic adjustments to value of comparables.

217. Site demand can be a value criterion, either with respect to the bid price of a piece of land, or the length of time that a property remains on the market. If demand is low the sales price for a site will be lower than the listed price, or the site will not be developed for a longer period of time.

218. Properties which have sold make good comparison bases for estimating site value. However, the comparability of certain utility measures between the sites and the comparable sites has to be measured before the comparables are utilized to establish a base value.

Associated benefits/adverse impacts

219. The associated benefits and adverse impacts resulting from the productive use of the containment sites, as well as the process of filling the sites, cover a range of factors. These "effects" fall into three broad categories: economic, physical, and environmental. In some cases, the benefits are primarily indirect, and in other cases the

Table 11

Case Study Site Valuation Factors

Site Name	Use Considered for Valuation	Raw Value Prior to Dredged Material Placement		Adjusted Present Value		Enhancement Value	
		per ha	per acre	per ha	per acre	per ha	per acre
Anacortes	Industrial/Port	$5,400/ha	$2,200/acre	$43,200/ha	$17,500/acre	$37,800/ha	$15,300/acre
Artificial Island	Nuclear Power Generation	$12/ha	$5/acre	$3,200/ha	$1,300/acre	$3,200/ha	$1,300/acre
Bay Port	Heavy Industrial	Nominal	Nominal	$16,100/ha	$6,500/acre	$16,100/ha	$6,500/acre
E. Potomac Park	Recreational	None		$645,900/ha	$261,500/acre	$645,900/ha	$261,500/acre
Fifth Avenue Marina	Recreational/Open Space	$10,600 to $26,900/ha	$4,300 to $10,900/acre	$1.94 million to $2.60 million/ha	$784,000 to $1.0 million/ acre	$1.92 million to $2.60 million/ha	$779,000 to $1.0 million/ acre
Florida State Fairgrounds	Commercial/Retail	$11,100/ha	$4,500/acre	$106,300/ha	$43,000/acre	$95,100/ha	$38,500/acre
Hookers Point	Deepwater Terminal Facilities	Nominal	Nominal	$160,600/ha	$65,000/acre	$160,600/ha	$65,000/acre
Hoquiam	Industrial/Port	$2,000/ha	$800/acre	$13,100/ha	$5,300/acre	$11,100/ha	$4,500/acre
Patriots Point	Commercial/Recreational	$5/ha	$2/acre	$43,000/ha	$17,400/acre	$43,000/ha	$17,400/acre
Vicksburg	Industrial/Port						
Virginia Beach	Commercial/Retail	$5,600/ front m	$1,700/ front ft	$5,600/ front m	$1,700/ front ft	Maintenance Value	Maintenance Value
Pelican Island	Industrial/Residential	$1,725/ha	$700/acre	$19,266/ha	$7,800/acre	$17,540/ha	$7,100/acre
Port Jersey	Industrial	$35,000/ha	$14,000/acre	$198,000/ha	$79,000/acre	$163,200/ha	$65,200/acre
Blount Island	Industrial	$16,055/ha	$6,500/acre	$83,360/ha	$33,750/acre	$27,250/ha	$10,900/acre
Rivergate	Manufacturing	$11,100/ha	$4,500/acre	$134,500/ha	$54,500/acre	$123,400/ha	$50,000/acre

Table 12

Case Study Sites--Associated Benefits/Adverse Impacts

Associated Benefits/Adverse Impacts	Anacortes	Artificial Island	Bay Port	E. Potomac Park	Fifth Ave. Marina	Florida State Fairg.	Hookers Point	Hoquiam	Patriots Point	Vicksburg	Virginia Beach	Pelican Island	Port Jersey	Blount Island	Rivergate
Adjusted Value Increase						X	X				X				
Increased Business Activity			X		X	X	X				X		X		X
New Jobs	X	X	X			X	X	X	X	X	X	X	X	X	X
Increased Taxes/Revenues	X		X		X			X		X	X				
. Sales	X					X	X	X	X		X	X			X
. Real Estate	X	X	X			X	X		X			X	X	X	X
Community Attractiveness				X	X	X			X		X				
General Boost to Economy	X		X			X	X		X			X		X	X
Operations Revenue						X	X		X						
Provide Needed Community Facilities				X	X	X	X						X		
Increased Recreation Opportunities				X	X	X			X		X	X			
Construction Jobs		X					X					X	X		X
Utility Taxes		X													X
Decrease in Area Taxes		X													
Public Educ. (re: Nuclear Power Plants)		X													
Increased Congestion		X	X		X				X		X			X	
Higher Property Taxes															
Environmental Degradation		X	X		X				X	X		X		X	
Increased Municipal Expenses															
Limits Area Development Potential		X													
Community Concern		X								X				X	
Detracts from Adjacent Vistas									X			X			
Improved Medical Care Services		X													
Provide Needed Power		X													
Educational/Cultural Opportunities									X						
Expands Area Tourist Potential									X						
Introduce Alt. Transportation Mode							X		X		X		X	X	
Create Site for Admin. Offices				X											X

benefits and adverse impacts are primarily direct. Table 12 displays these analyses relative to the case study sites.

220. Benefits. Economic benefits, both to the public and the private sector, are the most common effects of productive use of a site. Specifically, the creation of employment opportunities in the case of industrial, commercial, or recreational use, and subsequent secondary effects on commercial activity, sales tax revenues, additional land demand and property assessments can be considered economic benefits.

221. Adverse Impacts. Environmental and physical factors seem to be most common impacts among the sites. Primary environmental adverse impacts were found to occur during material placement and dewatering. In many of the cases, the actual change of site from a natural mudflat or shallow harbor bottomland created localized ecological changes.

222. The benefits and adverse impacts associated with filling and development do not appear to have a significant direct bearing on site value. Rather, this value, either positive or negative, is related to the overall costs or benefits of the particular dredging project initially undertaken.

Criteria

223. Criteria which may be considered significant with respect to the determination of value or value enhancement of containment sites were identified from the case study analyses. However, in evaluating these criteria it is also useful to determine if the criteria (variables) are related in any manner and what the characteristics of those relationships are.

224. In analyzing these relationships for the case studies, the criteria are divided into three categories:

- Physical
- Economic
- Productive use

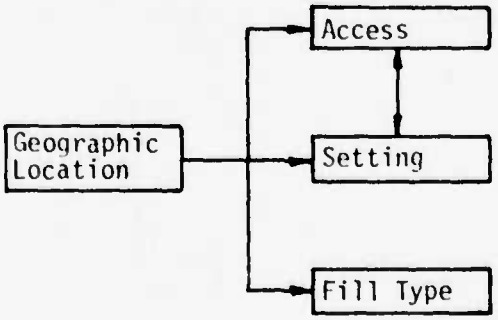
225. The evaluation considers these criteria in each of the categories which are related and those which are not, and the criteria considered in all instances are those which are significant relative to value increase or decrease.

Physical criteria

226. The significant physical criteria used to evaluate the case studies include: geographic location; fill type; setting; and access.

227. Geographic location appears to be the deterministic variable in this category; in essence setting the parameters for the other three variables. The geographic location of a site relative to large regional areas of the United States appears to have some correlation with the composition of dredged material which will be used for filling. On a localized level, location (setting) relative to an urban area or within an urban area will determine the type of site accessibility that exists, as well as the generalized setting. In an urbanized area, a site will generally have good accessibility.

228. The diagram below represents the basic relationship among the physical criteria:



Economic criteria

229. Evaluating the economic criteria relative to value consideration produces six variables:

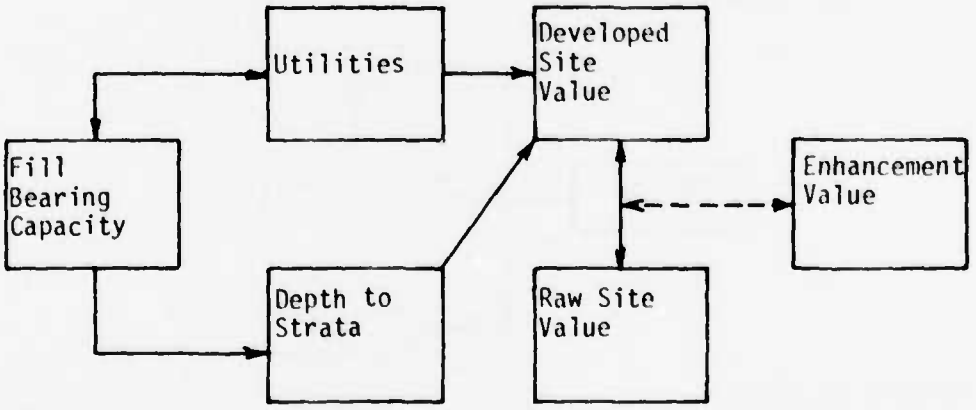
- Fill bearing capacity
- Utilities
- Depth to bearing strata
- Raw site value

. Developable site value

. Enhancement value

With the exception of the value variables, this group consists of physical measures of site development costs.

230. No key variable emerges in this group, rather each of the physical criteria has an economic bearing on site value, based on the cost of normal development. The bearing capacity of fill material is related to the "depth to bearing strata" measurement, as it impacts the cost of foundation work. Utilities can have an impact on the timing of site development, depending on how far they are located from a site and the cost of extending utilities to the site. The development value of a site, and therefore the benefit or enhancement value, depends on the raw site value in the sense that the raw site value forms the basis for any increase. Enhancement value is the difference between the raw site value and the development value. The diagram below illustrates the basic relationship among the economic criteria.



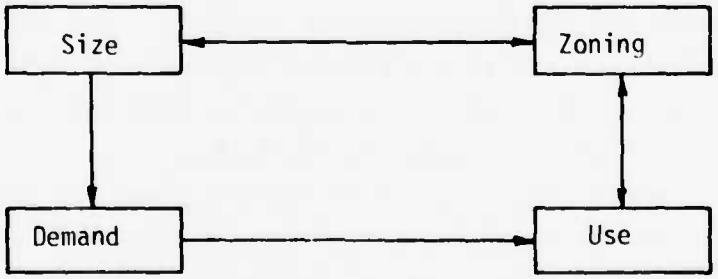
Productive use

231. Four variables are included for consideration in this category:

- Size of site
- Zoning
- Demand
- Use

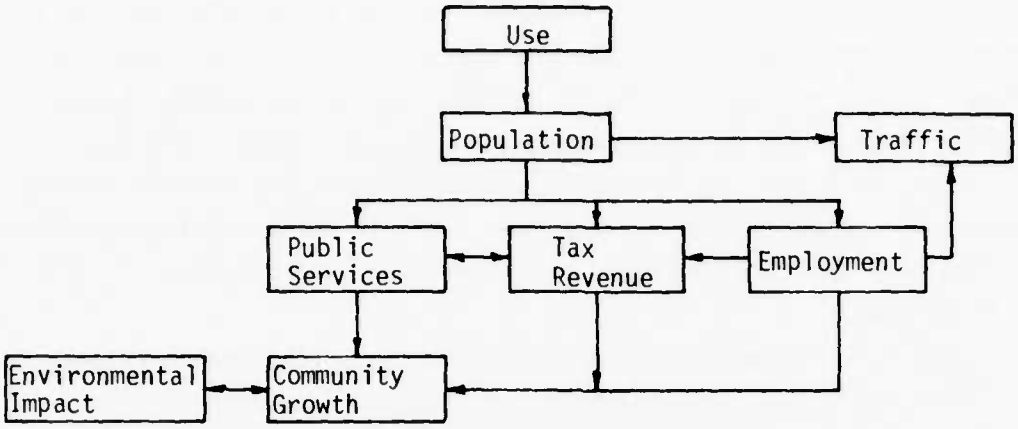
The use criterion is truly the "bottom line" of the relationship of the other three variables and is, in turn, a key criterion in determining value. Zoning and use are clearly related and can be rather closely correlated in so far as zoning constrains use of a site. The size of a site can also pose use constraints, depending on the minimum acreage required for a particular type of use. This is not a significant factor for the case studies, since the sites are more than adequate for most types of uses.

232. The demand variable is a criterion which, though related to use, operates rather independently and appears to be more directly linked to development value. However, no significant correlation was discovered between demand and development value, except for the effect of demand on market price and the length of time that a site would remain on the market. The diagram below illustrates the basic relationships among the productive use criteria:



Associated benefits/adverse impacts

233. No key variable is identified among the range of variable effects encountered in the case studies. However, it is possible to show basic relationships among the effects in a relative sense. The diagram below illustrates these relationships:



Applicability of Methodology

234. The criteria variables evaluated could not be correlated to any significant degree in the case studies. Rather, the case studies identify basic relationships that exist among some of these criteria. This is a better output than correlation would be, since identification clearly presents the relationships among variables. Too often a correlation between two or more variables is assumed to show a cause-effect relationship, when this may be far from the case. Correlation is not meant to imply cause and effect.

235. By merely identifying relationships among the criteria variables, no attempt is made to assign cause and effect. Rather, it is shown that, for a specific set of circumstances and for a specific set of conditions, a set of variables interact in a certain fashion. This interaction cannot, however, be taken as a model that will apply to every case and every set of conditions which may be encountered in the future. Instead, every case and every set of variables must be judged on its own merits, utilizing the described set of relationships as a framework of reference.

236. When viewed from this persepctive, the methodology as tested in the case studies and presented in Chapter V of this report, can be applied to the evaluation of future candidate dredged material containment sites. The methodology effectively identifies a set of criteria

which have been tested and validated with respect to the determination of value and associated benefits and/or impacts. The relationships among these criteria vary from site to site, and additional criteria may be identified for consideration in specific cases. However, the criteria identified in the methodology constitute a valid and relatively complete nucleus of variables for analysis purposes.

237. This methodology should prove useful to engineers, planners, and economists in CE Districts, as well as project sponsors, whether individuals, private enterprise, or public agencies. Ideally, it should be utilized in a multi-disciplinary team context. However, it can be utilized by an individual as long as appropriate specialized inputs or judgements are included where necessary or where outside the scope of the investigators expertise.

CHAPTER VIII: CONCLUSIONS

Opportunities and Constraints

238. The containment of dredged material on fill sites provides opportunities for enhancing values of otherwise worthless or marginally valued land. These opportunities vary, depending on whether the containment site is located in an urban or a rural area. However, as shown by the case studies undertaken for this study, even rural land removed from an urban area can be productively used after serving as a containment site. Generally, the opportunity for significant value creation seems greatest in port areas and where the containment site is readily accessible to water, rail, and highway transport.

239. In cases where containment sites are developed for parks or related recreational uses, the opportunity for value creation lies with adjacent properties which might benefit from the existence of those recreational opportunities, rather than the site itself. Two of the case studies which were concerned with water-oriented recreational use in urban areas validate this hypothesis.

240. The opportunity for value creation is not dependent on the type of use projected for the site, rather a complex set of related factors which have been analyzed in the preceding chapter. What is significant is the fact that, especially in urban areas, the containment of dredged material provides the opportunity to create additional land area for development, which in many cities is a commodity in demand during times of economic and population growth.

241. Also, certain constraints appear to relate to value creation, primarily in terms of site use potential. These constraints, which have been previously discussed, are primarily of a legal nature. Federal and state legislation, such as the Coastal Zone Management Act, may significantly limit the type of productive use to which a containment site may be utilized. This and other federal and state legislation often are concerned with the protection of valuable tidelands, marshlands, and related natural water areas. Therefore,

the containment of dredged material may be altogether prohibited where these types of areas are considered endangered.

242. In an area where strong demand does not exist, significant development costs pose a constraint to value creation. A site in a semi-urban, no-growth area where little demand exists, and which contains dredged material of poor quality from a foundation standpoint, will have less value than comparable property without that constraint. One of two things will happen; either the price paid for the site will be below market value, or the site will remain undeveloped for many years.

Recommendations

243. The opportunities and the constraints on value of containment sites imply certain considerations that the CE should make more explicit in their planning, programming, and project development processes. There is no doubt that significant opportunities exist for creating productive land from the containment of dredged material. However, this area of benefits still needs to be placed in the proper perspective within CE planning and decision-making structure, especially at a time when available candidate sites may be harder to find.

Use of methodology

244. The approach and methodology presented in this study was developed to aid in making a more effective determination of the productive use and economic benefit questions related to the utilization of dredged material containment sites. Its utility lies in its adaptability to a wide variety of settings, site characteristics, and institutional and planning considerations. Ideally, it requires an interdisciplinary team approach to be effectively utilized. However, an individual, if he has access to the range of expertise required to optionally use the methodology, can apply it by himself. The use of this methodology, both on the part of CE District personnel, and potential site sponsors, should be encouraged.

Institutional considerations

245. Dredged material containment site opportunities and limitations should be a more explicit part of the CE project feasibility study process for dredging projects. The productive use of containment sites and associated benefits and adverse impacts need to be explicity considered in cost/benefit analyses and related analytical studies. Also, the consideration of containment site productive use must be made a part of formal CE policy, especially as it relates to planning.

246. Potential sponsors of containment sites should be more aware of the opportunities and constraints, on both productive use and value. The evidence suggests that the sponsors are often aware of the use potential of a candidate site and frequently propose a site with a specific development purpose in mind. However, the evidence also suggests that adequate consideration is not given to the associated benefits and adverse impacts which result from that productive use. The methodology presented herein, if properly utilized in the context of a multi-disciplinary approach, will be effective in assessing both the productive use and value questions of containment site planning.

Financial considerations

247. Normally a sponsor provides the containment site at his expense, and the CE provides the dredged material and fills the site. Although there is no charge to the sponsor for the dredged material, the CE may elect to charge the sponsor for any additional development required for the site (e.g., diking); this is not always the case. The sponsor usually provides the additional development himself. Once the site is developed, the sponsor then leases, rents, or sells it. It is not known whether the rate of return to the sponsor includes any consideration of the productive use value of the site once it has been improved. Normally, a lease to a tenant will be based on the development cost of a site and not its market value.

248. It might be beneficial to explore capturing a portion of the increase in site value created by dredged material containment and returning that increment to the CE to defray, in part, the cost of the dredging operation. If site value is enhanced through the

dredging actions of the CE, equity considerations would suggest a return of a portion of that enhancement to the causal party. On the other hand if the sponsor is required to pay the CE for dredged material placed on his site, the land cost will increase, thereby increasing the sales or rental price, which in turn will reduce the attractiveness of the productive use.

Planning considerations

249. There appears to be a strong need in many CE Districts for better coordination between the CE and local planning agencies with respect to the containment site productive use question. Productive uses will have land use and zoning implications which now impact the local community. These implications are not only due to site considerations, but also the effects of site development on the surrounding area and its inherent land use and zoning considerations. Local planning agencies need to be involved in the process at the very outset of CE site selection and containment considerations.

250. In view of the benefit potential of site development, in particular the economic aspects, more explicit planning considerations are also warranted in the internal CE study process. The dredging process and site preparation process prior to development are related functions. Certain timing and logistical considerations should be observed to ensure a smooth project development process, from dredging operation through preliminary site development (dewatering and final grading). More explicit consideration of these latter aspects of containment process in CE project planning could create a smoother project development process and even reduce overall costs.

251. In many instances, the placement of dredged material on a site can have development cost implications. In many dredging operations the characteristics of the dredged material varies with depth of dredging and location within the dredging project. If the dredged material will be a mixture of fine-grained and other material, consideration should be given to segregated placement. If a determination has been made as to the productive use of the site, placement could

programmed to ensure that the best foundation material is concentrated on that part of the site where the improvements will most likely be located.

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

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Appendices A-O on microfiche in pocket.

1. Containment areas. 2. Dredged material. 3. Land value. 4. Waste disposal sites. I. Pack, Andre J., joint author. II. SCS Engineers, Reston, Va. III. United States. Army. Corps of Engineers. IV. Series: United States. Waterways Experiment Station, Vicksburg, Miss. Technical report ; D-78-19)
TA7.W34 no.D-78-19

DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT D-78-19

A METHODOLOGY FOR DETERMINING LAND VALUE AND ASSOCIATED BENEFITS CREATED FROM DREDGED MATERIAL CONTAINMENT

by

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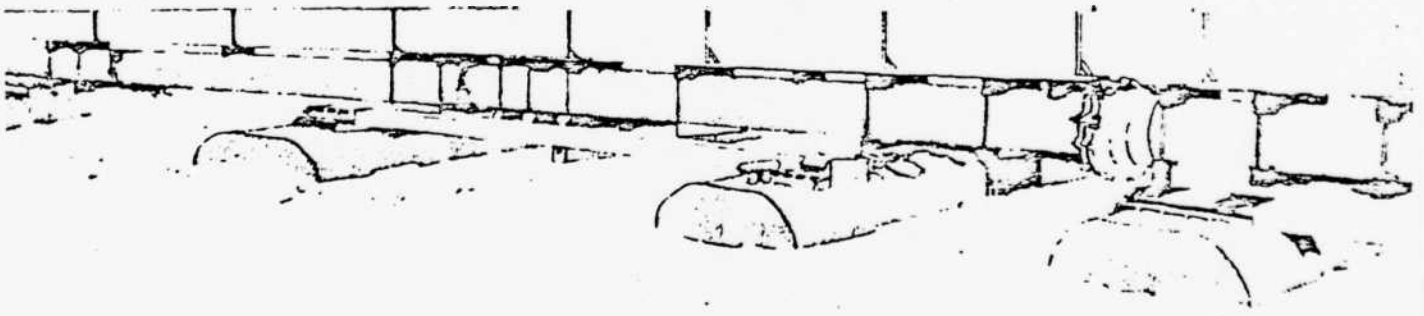
June 1978

FINAL REPORT



Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

Under Contract No. DACW39-77-C-0069
(DMRP Work Unit No. 5D05)

Monitored by Environmental Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

APPENDIX A: ANACORTES CASE STUDY
ANACORTES, WASHINGTON

APPENDIX A: ANACORTES CASE STUDY
ANACORTES, WASHINGTON

Project Description and History

Physical characteristics

1. The site under consideration, which was previously a mud flat, consists of approximately 11 ha (26 acres) of fill. It is adjacent to and east of an industrial redevelopment area administered by the City of Anacortes in Skagit County, Washington, and is a part of the redevelopment project. The redevelopment project, a primary component of the city's overall economic development plan, is located on the shores of Fidalgo Bay, which outlets into Puget Sound.

2. Approximately 482,000 cu m (630,000 cu yd) of dredged material was deposited on the site; about seven-eights was pumped hydraulically and the remaining one-eighth was placed clamshell dredging. The material was obtained by dredging operations to construct a barge channel from the industrial area through Fidalgo Bay to Puget Sound.

3. The dredged material is being retained on-site by a seawall and dikes constructed by the City of Anacortes to a height of 5.2 m (17 ft). The site has been leveled and is about 90 percent dewatered, although initial settling is not anticipated for another two years.

4. Figures A1 and A2 show the location of the project site and its relationship to the surrounding area.

Environmental setting

5. In 1973 the Washington State Department of Ecology designated the waters of Fidalgo Bay as Class A, which generally meets or exceeds federal requirements for general uses such as wildlife habitat, recreational navigation, or water supply.

6. The U.S. Bureau of Fish and Wildlife and the Washington Department of Game have designated Fidalgo Bay as an important habitat for a variety of marine plants and organisms. In addition,

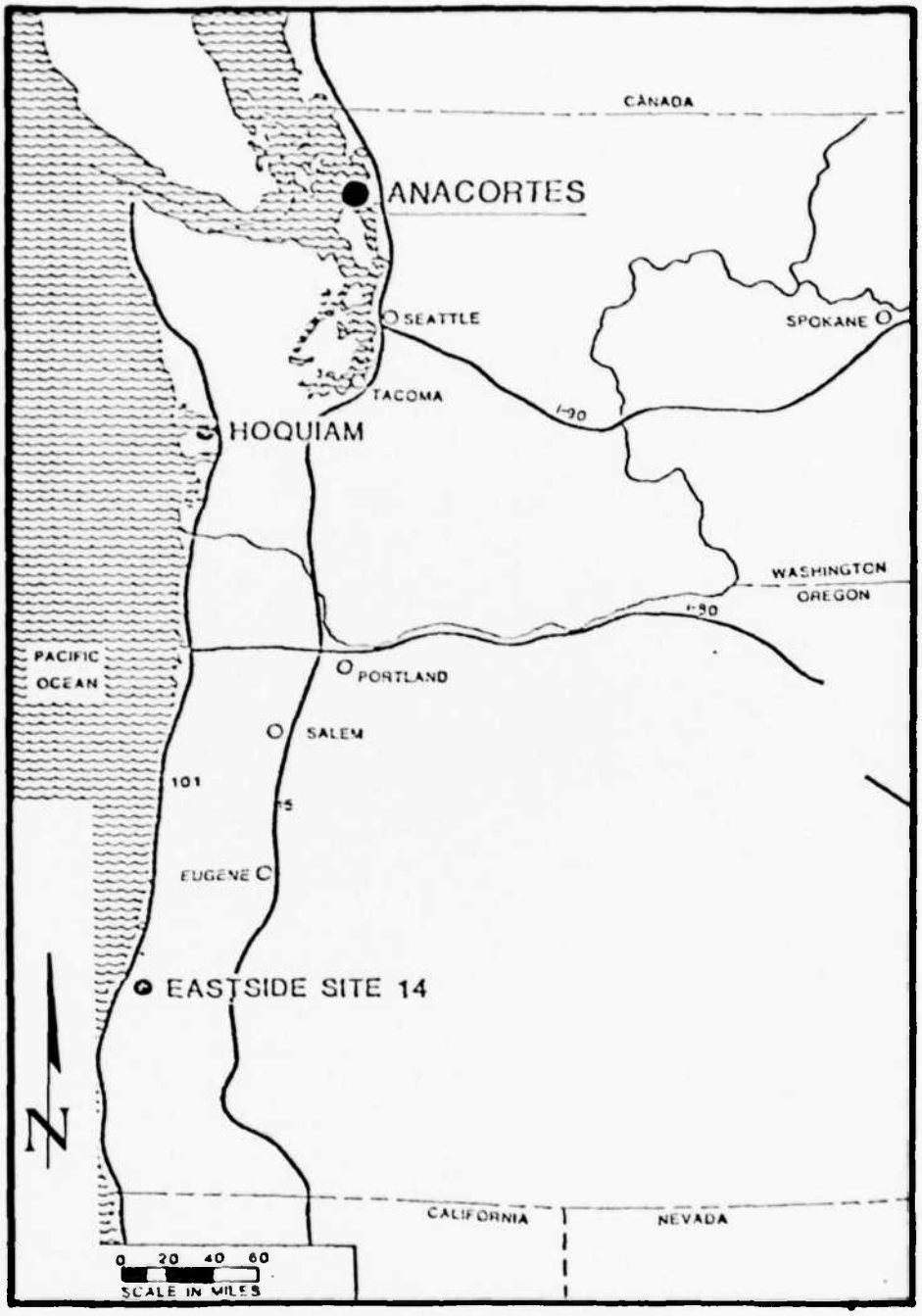


Figure A1. Vicinity map

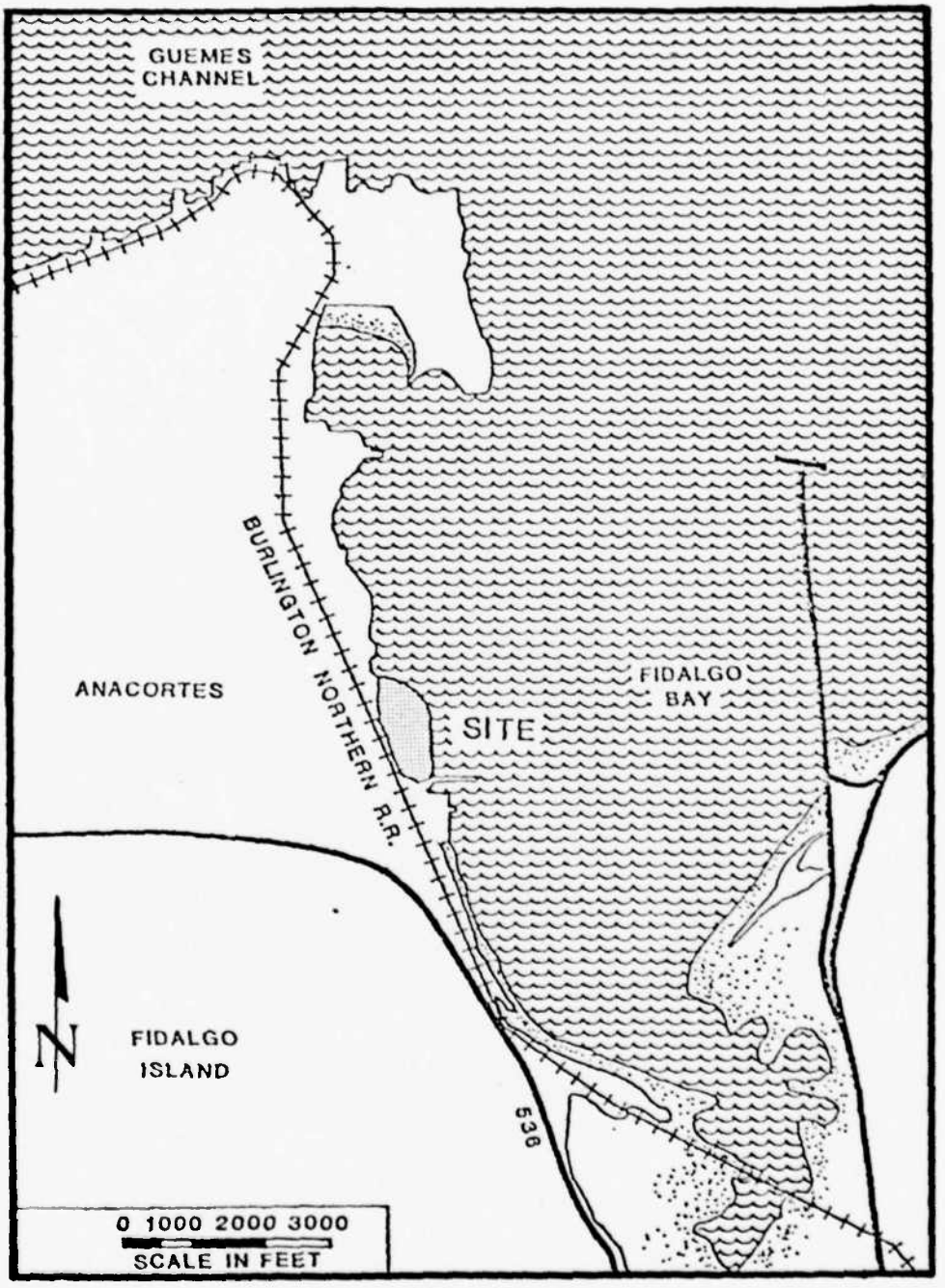


Figure A2. Site location

the Bay is a spawning ground for several fish species, including silver smelt and Pacific herring. Several species of birds, including four classified as "rare", use the waters of the Bay for feeding and resting.

7. Thus, some specific environmental constraints can be expected to be associated both with the site and surrounding area:

- A reduction of the quantity and quality of waterfowl habitats with shoreline industrial development.
- Water quality degradation adjacent to waterfront industrial development.
- Substitution of filled land for tidelands can increase predator fish and marine invertebrates resulting in increased predatory pressure on juvenile salmonids.

8. Overall, the environmental setting of the site must be considered to be urban industrial in a basically sensitive ecological environment.

Site development

9. The disposal facility is a part of an industrial park complex being developed by the City of Anacortes under an urban renewal plan funded by the U.S. Department of Housing and Urban Development (HUD). Most of the properties have been sold to private parties, even though development has not yet begun. A commitment by the Corps of Engineers to dredge a barge channel was necessary, however, to stimulate investor interest.

10. The 10.5-ha (26-acre) site, though leveled and partially graded, has not been developed because it is still in the dewatering and settling stage.

Surrounding development

11. The site is part of a 48.6-ha (120-acre) industrial park developed by the city as an urban renewal project. Properties adjacent to and surrounding the fill site are in various stages of industrial development. North of the site is a partially developed parcel which is one of a group owned by the Snelson Anvil Co. South of the site is a parcel owned by Publishers Forest Products

Co., which produces wood chips and pulp for transshipment, and is located in the vicinity of the disposal site.

12. Scott Paper Co. has a pulp mill located about two parcels north of the disposal site.

Site zoning and area land use plans

13. The subject site and all other properties located within the urban renewal area are designated for some type of industrial land use.

14. The Anacortes Comprehensive Plan, which was revised in 1977, shows a Heavy Manufacturing (HM) designation for the entire renewal area. This specification relates to industrial uses involving the processing, handling, and manufacturing of products.

15. The zoning assigned to the site, as well as all properties within the redevelopment project, is MP-2, designating high-intensity manufacturing. Under this zoning, any manner of heavy industrial activity is generally permitted.

16. Given the size of the city in which the subject site is located (population of 8015), the amount of developable industrial land made available through the redevelopment process (48.6 ha (120 acres)) is sizeable. In the planning process undertaken for the industrial park, it was envisaged that the development of the sites and common facilities for light and heavy manufacturing and distribution activities would allow the city to capitalize on the potential for waterborne commerce.

Area trends

17. The economy of Anacortes is seen to be a part of the overall economy of the upper Puget Sound region. The most important component of that economy is the water-dependent industrial operations in the area. In a 1961 long-range development plan, the city adopted a plan to develop an industrial park complex to take advantage of waterborne commerce.

18. This plan was in response to a sharp decline in the forest products and fisheries segments of the economy experienced during the 1950s, which resulted in a decline in population. The development

of the Shell and Texaco refineries offset this decline and brought the levels to their highest point ever (populations of 8400 in 1960). However, between 1960 and 1970 refinery growth did not compensate for continued decline in forest products activities, and by 1970 the population had dropped to 7700.

19. Slow-to-moderate population growth has occurred since 1970, largely as a consequence of shipping activity, which has averaged 2.1 million metric tons (2.3 million short tons) per yr. A 1970 study indicated that any new growth in the forest products industry would be dependent on the availability of low-cost water transportation facilities for barge shipment.

20. Overall economic growth in Anacortes can be characterized as "maintenance" or "minimal growth," especially in the industrial sector. Consequently, the demand for industrial land does not appear to be intensive, and absorption will tend to be slow.

Land Use Potential Considered for Valuation

21. The site is located in a 48.6-ha (120-acre) industrial park developed by the City of Anacortes as an urban renewal project. It is designated on the Comprehensive Plan as industrial land, with a zoning designation of HM. Some development has already occurred in the park, although only one enterprise properly classified as HM has been developed. Table A1 shows the step-by-step analysis used to develop site utilization potential.

22. The type and composition of the dredged material could be a factor in site devleopment. The dredged material is soft organic silt with an underlayer of grayish clay. According to a soils investigation prepared for the dredging project, this type of material has high compressibility. The stratum underlying the dredged material was also found to have a high compressibility function. The report recommended pile foundations extending through the dredged material to the substratum for any significant structural

improvements.

23. The soil conditions and foundation constraints which result could affect development timing and, perhaps, market value. If foundation costs are excessive, adjacent sites with no foundation constraints will likely be developed first. The other possibility could be a lower bid price in a sales transaction compared with market value of comparable adjacent sites.

24. Despite any foundation constraints, use potential will still be considered as industrial, though perhaps not HM as per site zoning.

Valuation Estimate

Review of available measures of value

25. Site value estimate was derived through a comparable cost approach. The comparables selected for valuation purposes consist of one sale which was six months old and reassessments of two industrial parcels which were felt to have comparable utility. The assessment data utilized in the case of the second two comparables is four months old. All three properties selected for comparability purposes are unimproved.

26. The value potential of the subject site will accrue not only because of its development potential as an industrial site, but also because of its proximity to water transport.

Demand estimate

27. Present demand for industrial land in the Anacortes area seems to be marginal. The incidence of one sale in twelve months is partial evidence for this. Table A2 illustrates the demand analysis with respect to this site. During the 1960 and 1976 period, the Anacortes area experienced a net decline in both population and employment. This has been due largely to the decline in year-round employment opportunities in the area.

28. Unless significant shortages of waterfront industrial sites occur over the short term in the Seattle-Tacoma area, a strong

demand for industrial land in Anacortes is not foreseen.

Stratification estimate

29. The physical condition measure of utility is not really applicable to this case since both the subject site and comparables are unimproved

30. In this case, the attractiveness measures appear to provide a good basis for deriving a utility comparison between the subject parcel and those parcels selected as comparables for valuation purposes.

31. The candidate site is estimated to be equal utility with comparable parcels with respect to the range of measures of attractiveness utilized (see Table A3).

Value estimate

32. The value of comparables to be utilized in this estimate has been computed to be $43,200 per ha ($17,500 per acre), with comparables being of equal utility and similar use potential (see Table A4).

33. The incremental site value or benefit enhancement attributable to dredged material containment is on the order of $37,800 per ha ($15,300 per acre). This figure is based on the estimated site value of $43,200 per ha ($17,500 per acre) based on value of comparables, less the raw site value prior to containment. The raw site, which was basically a mudflat, had an assessed value of $5,400 per ha ($2,200 per acre). The valuation was primarily due to the relative scarcity of mudflat/tidelands in the Anacortes area and corresponding use potential for development.

Associated benefits/impacts potential

34. Table A5 delineates the range of major potential benefits and impacts which are likely to occur as a result of site development.

35. The most significant area of indirect benefit creation relative to the project site would be in terms of potential employment opportunities generated for the local community. The additional employment would in turn generate spin-off benefits in terms of increased sales revenue at the local level, increased local sales taxes, and the impetus for additional growth in the

commercial service sector of the community.

36. Community economic benefits can also accrue, mainly in the form of increased property tax base and the resultant tax revenues. There could also be a spin-off area of community economic benefit in terms of increased location attractiveness for industrial or manufacturing firms. The location of one to two firms into a new industrial park can often go a long way in providing attraction to additional location choices.

37. On the impact side, increased industrial activity will often result in increased levels of demand for public services, especially utilities and access and circulation roads. These involve capital expenditures which must be met by the community via tax revenues.

38. Increasing development can also result in congestion, both of an aesthetic and a real nature, and environmental impacts in the areas of air and noise pollution.

Table A1
Use Potential Estimation

Constraint	Actual	Impact
Soil Condition		The natural water content of the dredged material is well above the standard liquid limit, and characteristically has extremely low shear strength and very high compressibility. This type of material, according to the soils investigation, places severe limitations on site development.
Gravel		
Coarse Sand		
Fine Sand		
Silt	Soft organic silt comprises top layer	
Clay	Grayish clay comprises bottom layer	
Other		
Foundation Constraint		In most cases, according to the soils investigation report, structures will need to be supported on piles extending to hard bottom. If the site is still settling, frictional downdrag loads will occur on the piles and must be added to the pile loads, in addition to the building loads.
Spread or Mat		
Pile	Would likely have to be used in most cases	
Pier		
Allowable Land Use (Per Land Use Plan)		The site is a portion of an urban renewal area which has been designated by the city as an industrial park and is slated to be developed for a variety of manufacturing uses.
Open Space		
Recreational		
Agricultural		
Residential		
Commercial		
Industrial	Maximum usage allowed	
Public		
Zoning Intensity (Per Zoning Ordinances)	Heavy Manufacturing	This zoning category would permit high intensity industrial use, such as a mill, steel plant, or other factory use.
Estimation		The site will most likely be underutilized relative to its land use and zoning potential. This may result in an intensity of use lower than surrounding parcels. A somewhat lower market bid price for the land relative to comparables may result. This will be due to foundation cost and constraints as well as present and projected short term lack of demand for industrial land.
Highest and Best Use	Heavy Manufacturing	
Actual Likely Use	Light Manufacturing	
Utilization Potential		
. Underutilized	Soil and foundation constraints	
. Overutilized		
. To Potential		

Table A2

Demand Estimate

Parameter	Indicator	Impact
Building Permit Activity by Land Use, as per Table A1	No., Year-To-Date 2 Industrial Permits Total Valuation $250,000	Industrial facility development must be classified as slow given available land and extent of area economy.
or Sales Activity by Land Use, as per Table A1	No., Year-To-Date 1 in 1977 Average Value $42,000/ha (land) ($17,000/acre)	Marginal sales activity, especially in the industrial park area, given proximity to major markets.
Economic Growth Indicators	Average Annual Percent Increase	The Anacortes area has experienced a slow rate of growth during the last decade. In fact, there was a period of net population and employment decline during the 1960's which has still to be made up.
Added Employment	No good increase figures due to net decrease during 1960 to 1970	
and/or Added Population	Net decline between 1960 and 1970 of about 4%	
and/or Sales Tax Revenue Increases		
Community Development Indicators	Year To Date	Industrial location has been almost negligible. Aside from the industrial park the city has about 910 ha (2,000 acres) outside its limits zoned for industrial use but undeveloped.
No. of New Firms	One new firm	
or Urban Renewal Activity	Completion of last two parcels in Industrial Park	

Estimated Demand Intensity	Short-Term	Long-Term	Impact
Little Activity			Little activity is foreseen both for the short and long term unless a real scarcity of waterfront industrial land occurs in South Puget Sound.
Average Activity			
Strong Activity			

Table A3
Stratification Estimate

Parameter	Site	Comparables
Pnysical Condition		
Basic Condition of Improvements (If Any)	*Not Applicable*	*Not Applicable*
Approximate Age of Improvements (If Any)	*Not Applicable*	*Not Applicable*
Attractiveness		
Accessibility to Site	*Excellent access roads, both local and arterial*	*Excellent local and arterial access roads*
and/or Accessibility to Transport	*Excellent access to both rail and water transport*	*Excellent access to rail; good access to water transport*
and/or Service Availability		
and Proximity to Similar Activities	*Good potential proximity to industrial activity*	*Good potential proximity to industrial activity upon completion of park development*

Estimate of Site Stratification	Impact
Site is of equal utility to comparables	*Comparables selected for valuation purposes appear to possess equal utility to the subject property with respect to measures of attractiveness*

Table A4
Valuation Estimate

Parameters	Comparables				
	No. 1	No. 2	No. 3	No. 4	No. 5
Use	Heavy Manufacturing	Heavy Manufacturing	Heavy Manufacturing		
Value of Comparables	$42,000/ha ($17,000/acre)	$45,700/ha ($18,500/acre)	$42,000/ha ($17,000/acre)		
Price Adjustment to Estimate Yr					
Average Value of Comparables	$41,200/ha ($17,500/acre)				

Average Value Adjustment	Percent Adjustment	Impact
Demand Adjustment		
Utility Adjustment		
Special Constraints	None	
Site Value		
Adjusted (Average Comparable Value Plus Sum of Value Adjustments)	$41,200/ha ($17,500/acre)	Site is level, with excellent access and transport proximity (rail and water). There are no topographical or accessibility constraints.
Raw (Prior to Dredged Material Containment	$0.54/sq m or $5400/ha ($0.05/sq ft or $2,200/acre)	Based on assessed valuation by Skagit County Assessor for tidal mudflat land around the Anacortes area.
Value Change (Estimated Site Value less Raw Site Value	$37,800/ha ($15,300/acre)	Value or benefits from dredged material disposal operations on site is the difference between raw land value before operations and developable value after operations and dewatering, based on comparable land sales value.

Table A5

Benefit/Impact Potential Matrix

Benefit	Public	Private	Site	Adjacent Site	Community	Comment
If site is developed, existence of industrial activity could serve as a magnet to draw other similar activities into the park.		X		X		
Creation of employment opportunities in nonforest products related activities.		X			X	Site development, especially as Heavy Manufacturing, could lead to new community employment opportunities and a possible reduction in community-wide unemployment.
Growth in community economic output.		X			X	Site development will lead to increased community economic output measured in real dollar terms, resulting in tightening of regional economic linkages.
Increases in community assessment base.	X				X	Increased assessment will result in added community property tax revenues.
Increased sales tax revenues.	X				X	Increased employment activity will result in additional household expenditures and consequent sales tax revenue generation.
Opportunities for additional service activity.		X		X	X	Development of Heavy Manufacturing activity would constitute primary economic activity which would in turn generate increased service activity.
Physical growth and restoration via Industrial Redevelopment of a segment of the land stock.	X			X	X	
Alleviation of localized regional pressure for water proximate industrial land.	X					Development of the site and the Industrial Park could alleviate some of the pressure on the south Puget Sound region for prime water adjacent industrial land.

(Continued)

Table A5 (Concluded)
Benefit/Impact Potential Matrix

Impact	Public	Private	Site	Adjacent Site	Community	Comment
Increased physical and traffic congestion.	X			X	X	Site and park development will generate significant amounts of lary vehicle traffic perhaps requiring significant upgrading of access and arterial streets. Also, the full development of the 55 ha (120 acres) would add significantly to the physical congestion of the area.
Increased noise and air pollution.	X				X	Traffic and machine activity both on and generated by the site and park would undoubtedly increase both noise levels and pollution levels in the immediate area.
Increased public service demand.	X				X	Intense development will generate the need for new or increased levels of public service at least for the industrial park area. This could necessitate capital expenditures which might not be offset by additional tax revenues.
Community growth pressures.	X	X			X	If significant economic activity develops, strong growth pressures would be exerted on the community which might run counter to its purpose.

APPENDIX B: ARTIFICIAL ISLAND CASE STUDY
SALEM COUNTY, NEW JERSEY

APPENDIX B: ARTIFICIAL ISLAND CASE STUDY
SALEM COUNTY, NEW JERSEY

Project Description and History

1. The Artificial Island case study involves the use of a dredged material site for a nuclear electric generating station. This intensive industrial use of previously undeveloped land could be expected to have a dramatic effect on this predominantly rural area.

Physical characteristics

2. Artificial Island is a peninsula situated in the northern portion of the Delaware River Estuary, approximately 64 km (40 miles) south-southwest of Philadelphia, Pennsylvania (Figure B1). The peninsula is slightly more than 4.8 km (3 miles) in length and varies to about 1.6 km (1 mile) in width (Figure B2).

3. The site is bordered on the west by the Delaware River and is connected to the New Jersey mainland to the east by low-lying marsh areas. Originally a natural sandbar, Artificial Island was used for the first 50 yrs of this century by the Corps of Engineers as a dredged material site.

4. The peninsula and adjacent marshes are virtually flat, with an elevation of between 2.4 and 3 m (8 and 10 ft) msl. The southern shoreline is protected by wooden pilings and a retaining wall. Immediately inland from the retaining wall, a sand berm rises some 2.4 to 3 m (8 to 10 ft).

5. The soil on the peninsula is predominantly clay and silt loam that extends to a depth of 7.5 to 9 m (25 to 30 ft) and covers a coarser sand layer. The soil structure is inadequate as a foundation for large loads, as blow count data reveal virtually no penetration resistance to a depth of 7.5 to 9 m (25 to 30 ft). A suitable stratum for deep foundation support lies some 19.5 to 21 m (65 to 70 ft) beneath the ground surface. Thus, the site exhibits severe foundation limitations, requiring large loads to be supported by this deep

Figure B1. Vicinity map

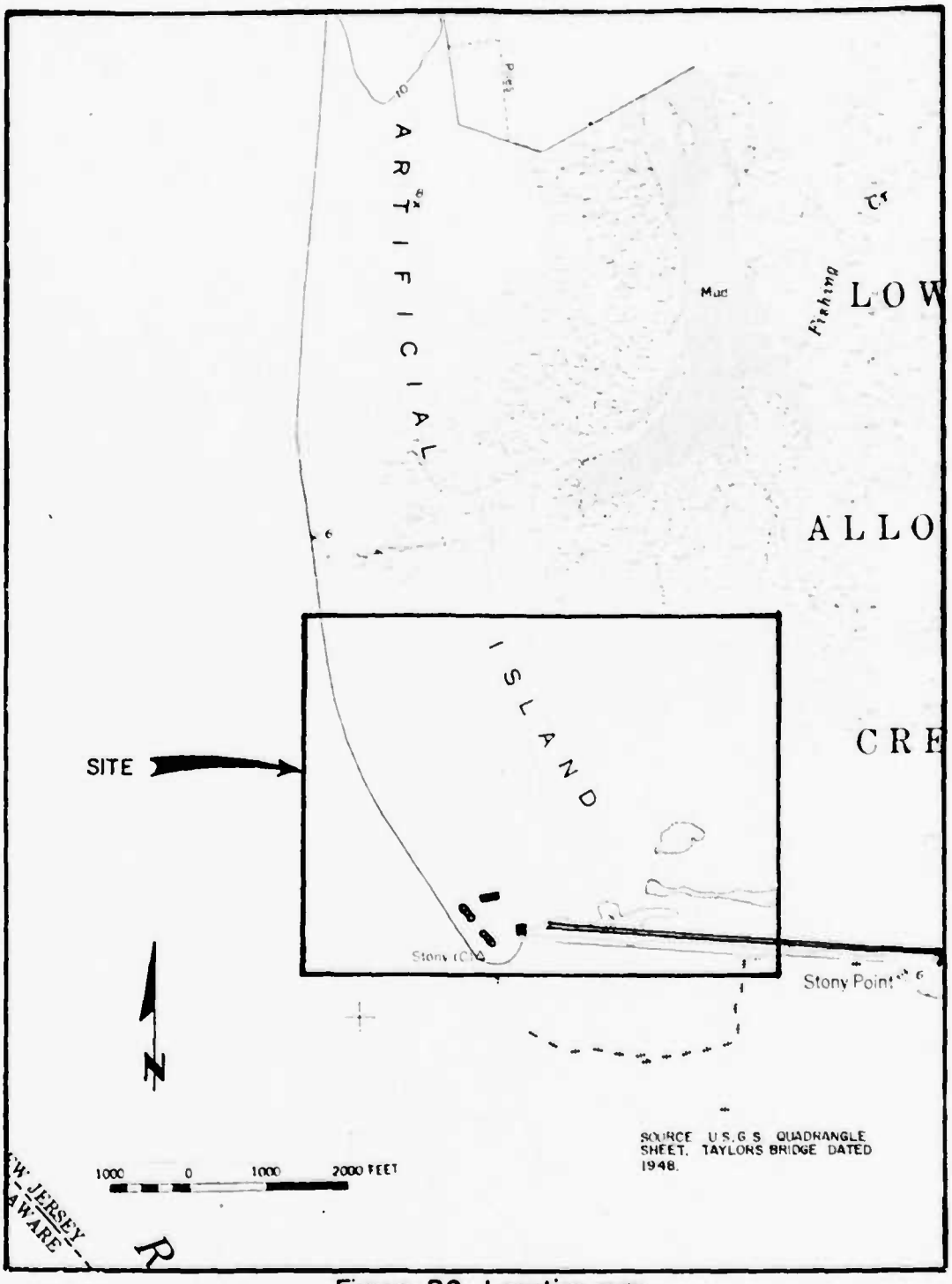


Figure B2. Location map

stratum (the Vincentown Formation). The Vincentown Formation is stiff coarse sand; laboratory tests have shown shear strength to be between 12,205 and 22,457 kg/sq m (2,500 and 4,600 lb/sq ft).

6. Access to the site is provided by a two-lane roadway constructed upon a filled portion of the adjacent marshes. The roadway is the only means of surface access between the site and the balance of Salem County.

Environmental setting

7. As previously noted, the Artificial Island site is bounded to the west by the Delaware River Estuary and to the east by marshes and meadows. Thus, the environmental setting for the peninsula is classified as open space and forms a transition zone between aquatic and terrestrial environments.

8. The Artificial Island Wildlife Preserve lies adjacent to the northern portion of the peninsula, and the New Jersey State Division of Fish and Game owns approximately 1416 ha (3500 acres) adjacent to the southern portion of the peninsula (the Mad Horse Creek Hunting Reserve). These wildlife reservations form a large buffer that insulates Artificial Island from the rest of Salem County. The peninsula is considered to be highly sensitive in terms of environmental setting.

Site development

9. The Salem Nuclear Electric Generating Station (SNEGS) was constructed on a 81-ha (200-acre) parcel comprising the southernmost end of Artificial Island. The site was acquired by the Public Service Electric and Gas Company (PS&G) via a land trade with the Corps of Engineers in 1968, and construction was begun shortly thereafter.

10. Foundations for the nuclear reactors measured about 30.5 by 61 m (100 ft by 200 ft). They were constructed by removing the overburden covering the Vincentown Formation, which is 20 to 21 m (65 to 70 ft) beneath the ground surface, and replacing the soil materials with lean concrete.

11. When complete, SNEGS will have a production capability of approximately 2200 megawatts. One half of the station is now

completed and operational; the balance is scheduled for completion in 1979. In addition, a second nuclear electric generating station of approximately the same size is under construction on the site. The second station (Hope Creek) is scheduled to start operating in 1981 and will be completed by 1983.

Surrounding area development

12. The meadows and marshes that surround the peninsula are presently undeveloped. Much of the adjacent land is federally or state-owned and serves as wildlife preserve. Similar land, privately owned, is used almost exclusively for agricultural or fur-trapping purposes. The closest town to Artificial Island is Hancock's Bridge, approximately 8 km (5 miles) to the northeast.

13. Salem County remains primarily rural, although recently it has begun to feel the urban influences of Philadelphia and Wilmington, Delaware. Industrial development to date has been slight, and most of the county remains as either open space or farmland.

Site zoning and area land use plans

14. The possibility of substantial industrial development in the wetlands area adjoining Artificial Island is remote. Even if environmental questions raised by draining and filling the marshes are resolved, technical problems presented by poor foundation soils would remain. Institutional restrictions compound the environmental constraints; both the States of New Jersey and Delaware would be involved in developing the coastal region, New Jersey for that portion above the low-water mark and Delaware for that portion below the low-water mark.

15. Although the Artificial Island site is zoned industrial with no restrictions, most of the land separating the peninsula from the mainland is classified as open space on the 1970 Salem County Master Plan. Table B1 summarizes land use categories for Salem County. The zoning ordinance implements the open space plan and categorizes the marsh area as a floodplain.

16. In addition to the restrictive zoning, the State of New Jersey, pursuant to its Coastal Area Facility Review Act, has placed

a development moratorium on the region within 10.4 km (6.5 miles) of SNEGS. The moratorium area was determined, in part, by considering population evacuation time and prevailing wind patterns if a nuclear accident occurred at Artificial Island.

17. The federal government owns much of the prime industrial land in Salem County. This federal control is a serious constraint to local planning, and could become more so if industrial developers attempt to take advantage of the availability of large quantities of electric energy and favorable tax treatment in the county.

Area trends

18. The urban influence of Philadelphia has begun to extend into northern Salem County, stimulating suburban residential development and related support services. Industrial development in the county has remained relatively stable, or decreased slightly, over the last 10-yr period. Today chemical and glass manufacturing activities constitute the bulk of industrial development in the county.

19. Lower Alloways Creek Township, in which Artificial Island lies, has not yet been influenced by the Philadelphia urban sprawl. Township population has remained between 1100 and 1500 for two centuries. Agriculture has provided the primary economic activity during this time. The recent trends in the township reflect economic stagnation with no additional commercial activity stimulated by the township's constant population.

20. In the absence of the nuclear electric generating station on Artificial Island, there is little to suggest a growth trend of any kind in Lower Alloways Creek Township. With regard to the entire county, SNEGS provides the first real industrial growth in the last several years. Taken in this context, the use of the Artificial Island site for nuclear power generation is the exception to an area trend, rather than an example of one.

Land Use Potential Considered for Valuation

21. Table B2 presents the primary constraints on development for site and for comparable properties. Constraints included the

environmental setting, access, geology, and soil characteristics, as well as zoning and other institutional constraints. In a normal fair market, these constraints collectively would prohibit construction of a nuclear electric generating station on Artificial Island.

22. It is difficult to imagine a more productive land use for the Artificial Island site than that of nuclear electric generating station. The SNEGS has been constructed in an area of severe foundation and access limitations, which could be avoided only by a substantial capital investment. Such an investment would likely not be made by other industries, considering adjacent construction sites.

23. In terms of land use potential, nuclear electric generating stations should be considered a category apart from other industrial development. The public resistance to nuclear power station construction has resulted in agressive land acquisition postures by electric utility companies.

24. Because the term "fair market value" assumes a willing buyer acting freely, the aggressive posture of utility companies seeking a noncontroversial site for a nuclear power station can bring much higher purchase prices than the "fair market value" of the site, as described below.

25. The land use potential considered for valuation purposes should be the existing land use, i.e. nuclear power generation. However, the unusual characteristics of this kind of industrial development make comparisons with nearby sites difficult. The following sections will demonstrate this problem more clearly.

Valuation Estimate

Review of available measures of value

26. For purposes of this study, the direct value of the site will be considered as the market value of the site for its present use. Comparable sales are not available to assist in determining site

value. The present market value must be derived from the 1968 sale price of the 81-ha (200-acre) parcel to PSE&G.

27. The Salem County property tax assessment for the site is currently being appealed by PSE&G. The range within which the market value lies is between the figure assessed by the county and that claimed by PSE&G on appeal.

Demand estimate

28. Electric utility companies seeking to locate nuclear electric generating stations are discouraged by the factors that would encourage other kinds of industrial development: proximity to population centers, large local populations from which to draw workers, potential for community growth, etc. Noncontroversial sites for nuclear electric generating stations have become difficult to find; the demand for such sites, which is quite high, is a localized phenomenon.

29. Artificial Island provided a relatively noncontroversial site for nuclear power generation because of its isolation from population centers. The disparity between purchase price and appraised value is the measure of demand for such sites. Objective measures of demand, such as building permit, sales, population, tax, and other growth data, do not adequately reflect the demand which the Artificial Island site satisfies.

30. Specific demand for nuclear electric generating station sites is strong and will continue to be strong.

31. Site stratification analysis may not be properly applied to the Artificial Island site and comparable properties. The SNEGS is new, and no improvements have been made to comparable parcels.

32. As noted earlier, the stratification of surrounding properties is of little consequence to the value of Artificial Island for nuclear electric generating station purposes. Although questions of accessibility, service availability, and strength of the local economy are highly relevant for most industrial development, they are irrelevant for construction of a nuclear electric generating station.

Value estimate

33. The Artificial Island site was appraised by the Corps of Engineers at $185 per ha ($75 per acre) in 1967. The appraisal was conducted using market values for four properties comparable to the peninsula. The highest and best use for the unimproved Artificial Island site was considered to be agricultural, and no discount was made for the inaccessibility of the site.

34. PSE&G purchased a 81-ha (200-acre) parcel on the peninsula in April of 1968. Consideration for the sale was $129,000, or approximately $1,600 per ha ($650 per acre), and took the form of another property owned but not used by PSE&G. The high purchase price, relative to the appraised value, can be explained by the fact that PSE&G was not a willing buyer, but was actually compelled to obtain some site for construction of a nuclear electric generating station.

35. For tax assessment purposes, Salem County currently values the 81-ha (200-acre) parcel at $1 million, or $12,360 per ha ($500 per acre). PSE&G has appealed this assessment, claiming the value of the parcel is only $300,000, or $3,708 per ha ($1,500 per acre). These figures apparently represent the range of the true market value of the land alone.

36. Applying the market value approach to the on-site improvements would be difficult, and the results would be suspect. There have been no sales of comparable nuclear electric generating stations with which to compare the Artificial Island station. A valid figure for the value of such a specialized facility would be given by the cost approach to valuation.

37. The total capital cost for Units No. 1 and No. 2 of the Salem Nuclear Electric Generating Station is reported by PSE&G as $1.2 billion. The second two units under construction are estimated to cost $1.9 billion upon completion in 1983. Thus, an electric utility contemplating construction of a similar power generating facility could readily expect to spend more than $3 billion.

38. A value figure for the Artificial Island site should reflect the high demand for nuclear electric generating station sites.

Comparable properties do not fairly reflect this demand; therefore, the best source for valuation is the 1968 sale, with an allowance due to inflation and improved access. The access road is the only improvement that should be considered for land valuation purposes.

1968 sale price	$129,500
plus a 9-yr inflation rate @ 8 percent	129,500
81 ha (200 acres) without access	$259,000
$3,200 per ha ($1,300 per acre) without access	
Estimated cost to gain access:	
stabilization and fill	$250,000
bituminous paving and base	350,000
	$600,000 or $7,400 per ha ($3,000 per acre)

39. The estimated value of the land alone with access is $860,000, or $10,650 per ha ($4,300 per acre) (January 1977 dollars). Most of this value is given by the cost of improved site access. To determine the enhancement value of dredged material placement for Artificial Island, the site value without access should be compared with the raw site value that the peninsula would have in the absence of dredged material containment. Raw site value is given as the value of similarly located industrial land without access at about $50 per ha ($25 per acre). The enhancement value of dredged material placement on the site is the difference between $3,200 and $50 per ha ($1,300 and $25 per acre), or $1,350 per ha ($1,275 per acre).

Associated benefits/impacts potential

40. Employment and tax revenue data provide the best quantitative measure of the benefits associated with the use of the Artificial Island site.

41. Employment on Artificial Island reached 3500 employees in 1974 and is currently 3300. Of the 3300, only 22 percent live in Salem County. Most of the employment generated by the SNEGS consists of temporary construction workers. Upon completion of the second station in 1983, total employment on the site will be 600.

42. Table B3 presents the benefits and impacts resulting from development of the Artificial Island site. Foremost among these is the dramatic increase in utility gross receipts tax revenues received by Lower Alloways Creek Township. Evidence of the financial benefits to the township is given by the new, ultramodern township hall, fire station, and school buildings in the township.

43. The increased revenue from the gross receipts tax has lessened township reliance on real property taxes as a source of funds, as shown by Table B4. But these gross receipts tax revenues are not available to the County government, which must maintain the roads damaged by increased congestion and construction activities.

44. Of the impacts, the public concern over having two neighboring nuclear electric generating stations may be the single greatest obstacle to the development of the site and the most difficult to quantify.

Table B1

Salem County Land Use - 1970

Land Use	Percentage	ha	(Acres)
Undeveloped			
Farmland and Vacant	55.5	49,310	(121,844)
Woodland	21.5	19,110	(47,221)
Marsh and Meadow	15.6	13,918	(34,391)
Subtotal, Undeveloped Land	92.6	82,338	(203,456)
Developed			
Commercial	0.5	455	(1,125)
Industrial	0.7	588	(1,452)
Public	0.9	828	(2,045)
Roads and Streets	1.0	937	(2,314)
Residential	4.3	3,739	(9,240)
Subtotal, Developed Land	7.4	6,547	(16,176)
Total, Developed and Undeveloped Land	100.0	88,885	(219,632)

Source: Salem County Planning Board

Table B2

Use Potential Estimation

Constraint	Actual	Impact
Soil Characteristics	Hydraulic fill and alluvium to depth of 7.5 to 9 m (25 to 30 ft), clays, silts, and sands	Suitable for some agricultual uses, but severely restricts load-bearing capacity of the property
Geology	Adequate load bearing stratum at 19.5- to 21-m (65- to 70 ft) depth	Development requires substantial investment for massive foundation structures, restricts use to light loads in the absence of strong demand override
Access	Single two-lane asphalt roadway constructed on site, leading to nuclear electric generating station	Lack of rail transportation may discourage industrial development; expense involved in constructing additional roadways will impede development of comparables
Environmental Setting	Predominantly open space, recreational, and agricultural; sensitive wetlands	Environmental impact of site development would be substantial compared to surrounding environment; additional development therefore severely constrained
Zoning	Industrial	Not a constraint; could be considered to be in conflict with environmental setting
Other Institutional	1) Boundary between DE and NJ involves dual jurisdiction	1) Stricter Coastal Zone Management Law in Delaware limits development and could bar pier construction, discourage industrial development

(Continued)

Table B2 (Concluded)

Constraint	Actual	Impact
	2) Federal government owns balance of site	2) Requirements for EIS, etc. could effectively prohibit further development even if federal government decided to sell additional parcels.
	3) CAFRA permit moratorium	3) Further development temporarily prohibited by New Jersey CAFRA.

Table B3

Benefit/Impact Potential Evaluation

Benefits	Public	Private	Site	Site Adjacent	Community	Comments
Increased Utility Gross Receipts Tax Revenues	X				X	Use of site for power generation increases local allocation under state formula, permits reduction in local real property tax rate.
Increased Employment Opportunities	X	X			X	Will provide 600 permanent jobs and as many as 3500 temporary construction jobs in private sector; removes unemployed from public assistance programs.
Satisfied Demand for Electric Energy Generating Capacity	X	X			X	Satisfies private demand for suitable sites, public demand for reliable energy sources.
Increased Property Tax Base	X				X	Private ownership of site removes property from exempt status for tax assessment.
Education	X				X	PSE&G provides public relations information to the public regarding nuclear power production and safeguards.
Improved Medical Care	X	X	X	X	X	PSE&G funded a nuclear medicine unit at the local public hospital.

(Continued)

Table B3 (Concluded)

Impacts	Public	Private	Site	Site Adjacent	Community	Comments
Increased Congestion	X				X	Public outlays for police department have increased dramatically to ensure safe vehicular and pedestrian movement throughout county. Public expenditures for highway maintenance throughout the county have increased, with no corresponding increase in revenues available (tax revenues are enjoyed by township alone). Access road is inadequate for peak traffic flows.
Environmental Degradation	X			X		Vehicular traffic movement through formerly undisturbed wetlands areas. Site is overutilized considering its environmental setting.
Public Sense of Insecurity	X				X	Possibility of nuclear accident or nuclear poisoning creates public anxiety.

Table B4

Tax Revneues - Lower Alloways Creek Township

Gross Receipts Tax			Real Property Tax		
Year	Annual Revenues	Percent Change	Actual Rate	Percent Change	Notes
1968	0	--	$2.80/$100 Value		
1969	0	--	$3.07	+10	
1970	0	--	$4.47	+46	
1971	$ 235,000	--	$1.15	-74	*
1972	1,775,000	+655	$1.11	- 4	**
1973	2,706,000	+ 52	$1.07	- 4	
1974	3,344,000	+ 24	$0.98	- 8	
1975	4,189,000	+ 25	$1.06	+ 8	
1976	5,912,000	+ 41	$1.03	- 3	†
1977	5,997,000	+ 18	$0.90	-13	
...					
1983 (est)	15,000,000				††

* School bond debt retired

** Reactor vessel for Unit No. 1 set in place

† Unit No. 1 begins operations

†† Two stations (four units) completed

APPENDIX C: BAY PORT CASE STUDY
GREEN BAY, WISCONSIN

APPENDIX C: BAY PORT CASE STUDY
GREEN BAY, WISCONSIN

Project Description and History

1. The Bay Port Industrial Park is a dredged material disposal site that the City of Green Bay plans to develop as an industrial area.

Physical characteristics

2. The Bay Port site is located within the corporate limits of the city of Green Bay, Wisconsin. The geographic location of Green Bay and Bay Port and a property map of the site are shown in Figures C1 and C2.* The site is situated on the southern shore of Green Bay approximately 3.2 km (2 miles) northwest of the mouth of the Fox River, and the site comprises 233 ha (575 acres).

3. The site is bounded on the northeast by Green Bay; on the southeast by Hurlbut Street and the Pulliam power plant of the Wisconsin Public Service Corporation (WPSC); on the southwest by West Tower Drive, which will be the service drive for Interstate Highway 43 (I-43), now under construction; and on the northwest by Military Avenue.

4. The Bay Port site was originally known as Atkinson's Marsh, and the topography was that of a low, flat, marshy shore. Natural elevations ranged from 0.3 to 1.2 m (1.5 to 4.0 ft) mlw, International Great Lakes Datum (IGLD), which is 175.3 m (576.8 ft) msl. Parts of the area were periodically inundated as lake levels in Green Bay fluctuated and, in February of 1972, the elevation of Green Bay was 176.1 m (579.6 ft) msl. In 1966, a dike was constructed by the City of Green Bay on the perimeter of the site. The parcel has been filled to an average elevation of 178 m (585 ft) msl, and in some places up to an elevation of 179.2 m (590 ft) msl. Additionally fly ash from the Pulliam plant has been deposited in some areas.

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* Brown County Planning Commission, "Project Bay Port: A Development Plan for an Industrial Trans-shipment Area (Including Alternatives)," BCPC-SR No. 13, March 1973, Green Bay, Wisconsin.

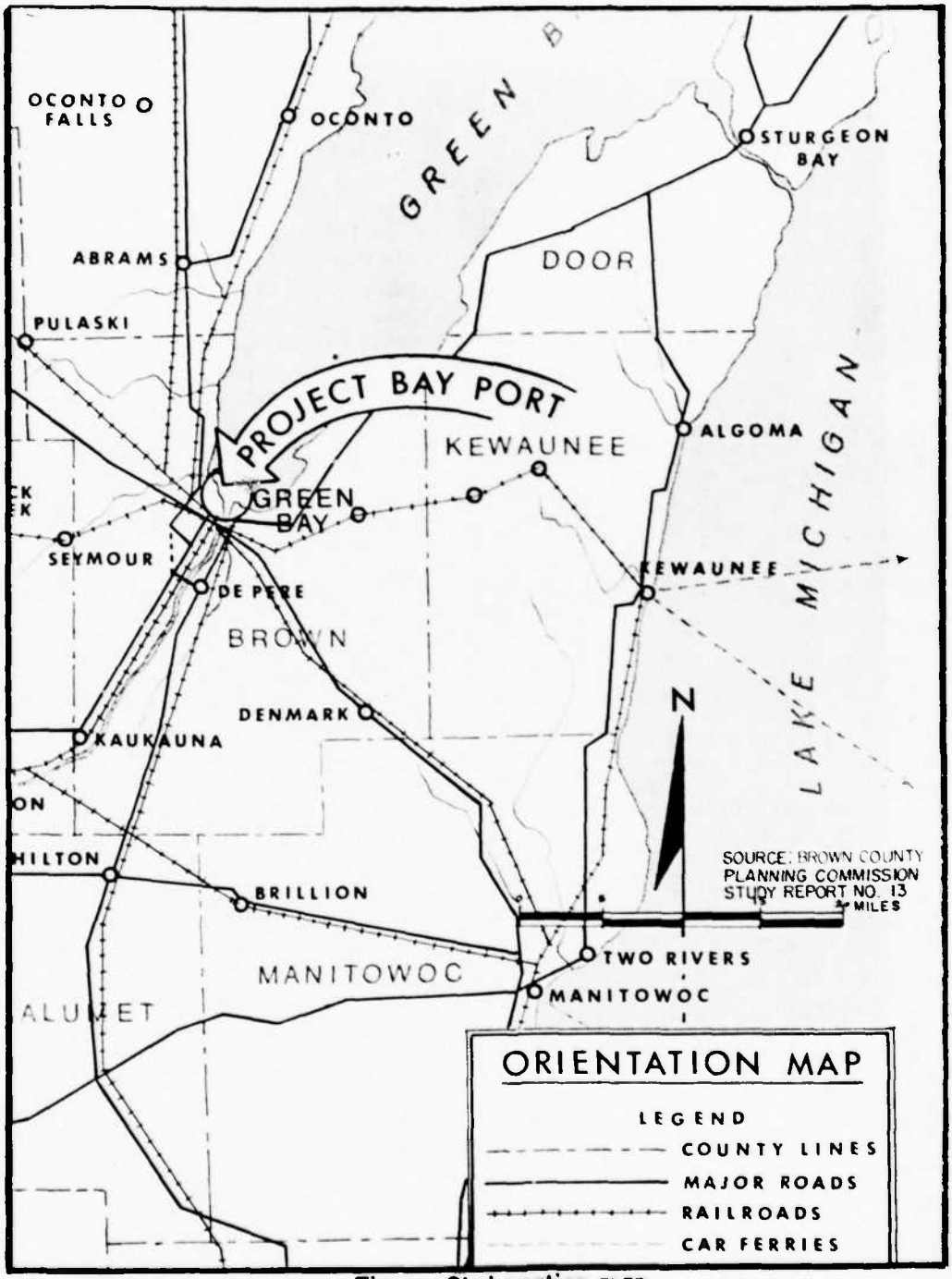

Figure C1. Location map

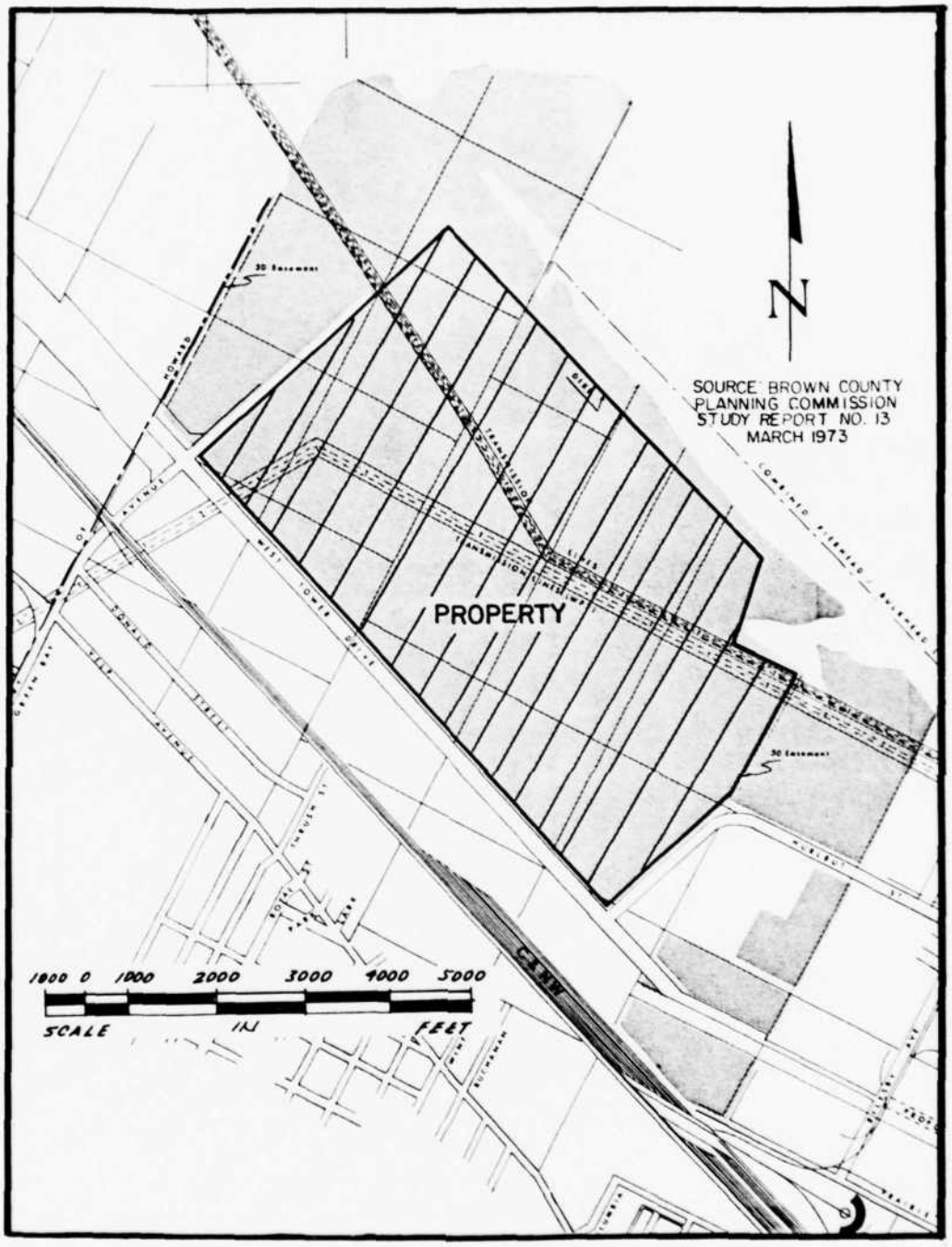

Figure C2. Property map

5. According to a summary of a soil survey,* the depth of fill at the site varies from 1.8 to 3.3 m (6 to 11 ft). Underlying the fill is 0.3 to 0.6 m (1 to 2 ft) of a black peat or topsoil. Underlying the organic soils are glacial lake sediments composed of various layers of silt, clayey silt, and silty clays.

6. The predominant forms of vegetation on the site is marsh grass. However, some willow trees exist along the shore of Green Bay.

Environmental setting

7. The Bay Port site is part of a large wetland area that ran from the mouth of the Fox River westerly to Duck Creek. The natural environment has, of course, been altered by the placement of dredged materials. Much of the surrounding area has been similarly altered by filling and industrial development. However, the preservation of the remaining wetlands is becoming increasingly important, and most of the site is part of the Duck Creek Parkway, a major conservation area.

Site development

8. Apart from the placement of dredged materials, the site is undeveloped. However, the site is traversed by WPSC electric transmission lines having minimum clearance of 8.5 m (28 ft).

Surrounding area development

9. To the south and east of the Bay Port site are a number of transportation and industrial developments, and the site has access to three modes of transportation.

10. Highway access to the site is from the east and west. West Tower. Drive connects with U.S. Highway 41 and provides access from the west; access from the east is via Hurlbut Street, Bylesby Avenue, Prairie Avenue, and Broadway. The eastern access is through an old residential area and involves one major grade crossing (Figure C2).

11. Interstate 43 (I-43), when completed in 1980, will provide access to the site via the Hurlbut Street Interchange. Although

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* Brown County Planning Commission, ibid.

Military Avenue is now closed pending completion of I-43, it will be reopened, presenting access to the site from the south.

12. Railway access to the site will be provided by the Chicago and Northwestern Transportation Company Railroad. The City of Green Bay hopes to obtain direct access to the site via a lead track from the Chicago and Northwestern switching yard, south of and running parallel to West Tower Drive (I-43). The proposed lead track would require a stable earthen fill in part of the remaining wetland. The fill would occupy a strip of land, approximately 18 m (60 ft) wide by 547 m (1800 ft) Long. A draft environmental impact statement has been prepared for the railroad lead track;* whether or when the proposal will be approved is not certain. An alternate railroad access would involve a rebuilding and extending of railroad tracks from Bylesby Avenue.

13. The site is also potentially accessible from the waters of Green Bay. Water depths ranging form 0.8 to 2.9 m (2.9 to 9.5 ft) are reported** in the Bay. Although there is no demand for additional harbor facilities, the City of Green Bay plans to reserve some of the waterfront land for water-oriented uses, such as a marina or other recreational use.

14. Most of the land to the south and east of the site and north of the Chicago and Northwestern Railroad is used for oil storage and other industrial uses. Conoco, Green Bay Terminal, Clark Oil, and Cities Service have constructed tank farms in the immediate area. In addition to the aforementioned WPSC power plant, the F. Hurlbut Company is a major industrial land owner. The Hurlbut slip on the Fox River is used in the shipment of construction and building materials. Southwest of the Chicago and

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* Owen Ayres and Associates, "Draft Environmental Impact Statement; Railroad Lead Track: Project Bay Port at Green Bay, Wisconsin," November 1977, Eau Claire, Wisconsin; prepared for City of Green Bay Redevelopment Authority, Green Bay, Wisconsin.

** Brown County Planning Commission, ibid., p. 9.

Northwestern Railroad is a mixture of industrial, commercial, and residential land uses.

Site zoning and area land use plans

15. The planned land use of the Bay Port site and the surrounding area is for industrial purposes. The entire area is zoned for general industrial use and residential uses are not permitted under existing zoning. The City of Green Bay, as previously mentioned, acquired the site to allow for industrial development. It is likely, however, that a portion of the waterfront will be reserved for recreational use expansion. The land to the northwest of the site is part of the Duck Creek Parkway conservation area.

Area trends

16. Green Bay is a growing area. The 1970 population of the Green Bay Standard Metropolitan Statistical Area (Brown County SMSA) was 158,244; an increase of 26.5 percent over the 1960 figures. The 1975 population is estimated to be 170,682. Employment figures rose from 42,300 in 1960 to 57,300 in 1970 (an increase of 35 percent), and to 86,300 in October of 1977.

17. Industrial development has also been steady. Within the City of Green Bay, a 132-ha (327-acre) industrial park which began development in 1969 (Packerland), is now approximately 85 percent complete. The Wisconsin Department of Revenue estimated that the market value of manufacturing property in Green Bay rose 15 percent between 2-yr 1975 and 1977 to a total of $120,716,400. Major industries are paper products and food; several machinery manufacturers are located in the area as well.

Land Use Potential Considered for Valuation

18. Based on transportation networks, surrounding developments, and land use planning considerations, the most likely use of the Bay Port site is for industrial purposes. Additional support for this conclusion can be found in Table C1. At present there is no

need for additional harbor facilities. Therefore, the most likely uses will be highway- or rail-oriented. As previously stated, however, a portion of the waterfront may be reserved for recreational use. Any privately owned recreational use would have to compete with potential industrial users for land; therefore, the market value of nonindustrial uses can be assumed to be the same as the market value for industrial land.

Valuation Estimate

Review of available measures of value

19. The Bay Port site will not be ready for development until 1980 at the earliest and estimates of the value of the total site or of individual parcels is necessarily somewhat speculative. Nonetheless, a rough indication of current market values can be obtained by considering acquisition costs, development costs, recent sales prices of other industrial sites, and current asking prices for industrial land.

20. The City of Green Bay acquired the Bay Port site from the Atkinson family in 1969 for approximately $1.4 million, or about $6000 per ha ($2300 per acre), although an agreement to purchase the site may have been reached as early as 1966. The purchase involved three separate parcels. The City also acquired a parcel from the Chicago and Northwestern Railroad. A total of 246 ha (607 acres) are owned by the City.

21. In addition to the costs of acquiring the land, the City of Green Bay accrued additional costs associated with the site. In 1966, the City spent $25,000 to construct the dike; in 1969, the City agreed to pay $620,000 to the federal government for its share of depositing dredged materials on the site; and in 1973, $5,000 was spent repairing damage to the dike caused by high water levels. Additionally the preliminary estimated cost of the proposed lead track will be $450,000.*

* Owen Ayres and Associates, ibid., p2.

22. The City estimated that it had spent or committed a total of $2,346,000, or $10,000 per ha ($3,900 per acre), by March of 1973 on the Bay Port project,* including interest on the unpaid balance of the site acquisition costs and on bonds for funds to reimburse the federal government for dredged material disposal costs. By early 1976 this total had risen to $2.5 million, or $11,000 per ha ($4,100 per acre),** and in January of 1978, to a total of $3.0 million, or $13,000 per ha ($4,900 per acre), according to an interview with the City's Industrial Development Coordinator.

23. In order to fully develop the site, the City will have to provide rail access, internal roadways, and utilities. These could easily cost $4,900 per ha ($2,000 per acre), bringing total project costs to at lease $17,000 per ha ($7,000 per acre).

24. In comparison, recent sales of industrial land in the Green Bay area range from $14,000 to $35,000 per ha ($5,500 to $14,000 per acre). Packerland industrial park sites are being sold for $19,000 to $30,000 per ha ($7,500 to $12,000 per acre), depending on size; smaller sites sell for a higher per-acre price. Sites in the Ashwaubenon industrial park range from $19,000 to $35,000 per ha ($7,400 to $14,000 per acre). A site near Bay Port sold for $16,000 per ha ($6,500 per acre) in 1975.

Demand estimate

25. The factors affecting the demand for industrial land are summarized in Table C2. The inventory of vacant land zoned for industrial use in the Green Bay area is approximately 810 ha (2000 acres), which appears adequate for the foreseeable future. Bay Port is the only major vacant industrial land remaining within the City of Green Bay and is therefore, necessary if the City of Green Bay is to compete for industrial development.

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* Brown County Planning Commission, ibid., p 45.

**Energy Resources Inc. and Sasaki Associates, Inc., "Case Studies and Comparative Analyses of Issues Associated with Productive Land Use at Dredged Material Sites; Case Study Report No. 3, Bay Port, Green Bay, Wisconsin," Internal Working Document, Jan. 1977, prepared under contract for Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss. (DMRP Work Unit No. 5D02)

26. The City's competitive posture is strong. Green Bay has an aggressive economic and industrial development program. Bay Port is an attractive site for industrial development. The City's development strategy is to break even in terms of development costs. It currently plans to market parcels in the Bay Port project for about $25,000 per ha ($10,000 per acre), a realistic amount in view of future development costs and current market values. In summary, demand for parcels in Bay Port in proportion to the rate of growth in the Green Bay area appears likely.

Site stratification

27. In a number of important respects (e.g., size, waterfront location, development status) the Bay Port site is unique, thereby lessening the usefulness of other industrial sites as indicators of the value. However, general comparisons are outlined in Table C3. In general, other industrial sites are available for immediate development, whereas Bay Port will not be ready for development until about 1980. When the Bay Port project is complete, the site will be extremely attractive. However, estimates of current market value should reflect the current status of the project and the timing issues.

Value estimate

28. The current market value of the Bay Port site is estimated to be $16,000 per ha ($6,500 per acre). This estimate is based on an analysis of the available market data, which is outlined in Table C4. Since Bay Port has not been subdivided, a figure in the low end of the range of value indicators was chosen on the assumption that the entire parcel was being sold in one piece. When Bay Port is ready for development, the City of Green Bay will subdivide it, and the per ha (or per acre) of individual parcels can be expected to increase as reflected by the available market data. It can be noted that the estimated market value of $16,000 per ha ($6,500 per acre) is approximately halfway between current development expenditures of $12,000 per ha ($4,900 per acre) and the present value of approximately $21,000 per ha ($8,500 per acre). By the

time that the land is subdivided and sold, it is anticipated that the sale price will be $25,000 per ha ($10,000 per acre).

Associated benefits/impacts potential

29. The benefits and impacts associated with the development of the Bay Port site are listed Table C5. In general, benefits are related to the continuing industrial and economic development of Green Bay. The primary impacts are environmental; natural wetlands and associated wildlife habitats will be diminished.

Table C1

Use Potential Estimation

Constraint	Actual	Impact
Soil Characteristics	Irregular layers of silt, clay, sand, and gravel with deposits of fly ash in some areas.	Conditions vary in different parts of the site; however, heavy industrial buildings with large column loads would require foundations supported on a hard layer of clayey silt or silty clay that starts at elevation of 171 to 174 m (563 to 573 ft) msl. Foundations could be supported on this layer by using either drilled caissons or piles. Footings may be feasible in areas where the hard layer is shallow, or for lightly loaded buildings. The design of floor slabs on grade, roadways, and railroads should take into consideration settlement of the soil.
Groundwater Table	The Elevation of the groundwater table is near the elevation of the surface of Green Bay.	Surface soils will support vegetation. In general basements would not be practical.
Access	Highway access to U.S. 41 and, in 1980, to I-43.	Highway accessibility is good and will be better; accessibility is not a constraint.
	Railroad access to the Chicago and Northwestern Railroad	The site could have direct access via a lead track, for which approval has not been granted; less direct access is possible via existing spur tracks. Railroad access will make the site most attractive for industrial development.
	The site fronts on Green Bay	The site is attractive for water-oriented land uses including port facilities and recreation. Dredging would be necessary to make the site suitable for port facilities.
Environmental Setting	The natural environment is that of a wetland.	Approval to develop wetlands will be increasingly difficult to obtain.
	The man-made environment is that of an industrial area.	Proposed uses should be compatible with the surrounding industrial uses.
Zoning	Industrial (residential uses not permitted)	A wide variety of uses are permitted.
Other Institutional	Area is designated for industrial expansion.	Proposed uses must be compatible with land use objectives.

Estimation	Comments
Highest and Best Use -- Industrial/Waterfront Recreational	Consistent with Master Plan, industrial development objectives, and zoning; compatible with surroundings.
Actual Use Likely -- Industrial/Waterfront Recreational	A wide range of industrial, warehousing, office, and allied facilities permissible under zoning.
Utilization Potential -- Satisfied when development is complete	The development time frame is indefinite.

Table C2

Demand Estimate

Parameter	Indicator	Impact
Permit activity by land use	New "Business" Buildings in Green Bay: yr / No. / Value 1975 / 15 / $ 3,864,000 1976 / 46 / 18,597,000 1977 / 43 / 4,735,000	Steady but unspectacular growth is portrayed.
Sales activity by land use	Quantitative data on industrial land absorption rates could not be obtained. Prices per ha range from $14,000 to $35,000 (per acre from $55,000 to $14,000).	Current industrial land inventory adequate.
Employment	Increases in Brown County employment between 1970 and October 1977; seasonally adjusted No. / Percentage 27,000 / 47	Substantial growth in employment. Apparently much of this growth is from non county residents.
Population	Increase in Brown County population between 1970 and 1975 No. / Percentage 12,500 / 8	Steady growth.
New establishments	Increase in Brown County New Establishments between 1967 and 1972: Type / No. / Percentage stores / 96 / 7 wholesale / 52 / 17 manufacturing / 2 / 1	Steady growth and increased diversification of business.

Estimated Demand Intensity	Short Term	Long Term	Impact
Little activity	no	no	When the Bay Port project comes on stream, the City of Green Bay will be in a competitive position to share in the region's steady economic growth.
Average activity	yes	yes	
Strong activity	no	no	

Table C3

Stratification

Attribute	Site	Comparables
Physical condition	Undeveloped	Undeveloped
Accessibility to site	Will have excellent access to local and arterial roads	Excellent access to local and arterial roads
Accessibility to transportation	Access to rail and water transportation	Access to rail transportation
Service availability	Sewer, water, electricity, and gas not yet in place	Utilities in place
Proximity to similar activities	Contiguous sites	Proximity varies

Table C4

Site Value Estimate

Parameter	Bay Port	Packerland	Ashwaubenon	Hurlbut
Use	General industrial	Limited and general industrial	Limited and general industrial	General industrial
Utility	Undeveloped; services not installed	Services installed	Services installed	Undeveloped; services not installed
Sale price per ha (per acre)	--	$18,500 to $30,000 ($7,500 to $12,000)	$18,500 to $35,000 ($7,500 to $14,000)	$16,000 ($6,500)
Time adjusted sale price, 5 percent per yr per ha (per acre)	--	$20,500 to $33,000 ($8,300 to $13,200)	$20,500 to $37,000 ($8,300 to $15,400)	$18,500 ($7,500)
Service adjusted sale price per ha (per acre)	--	$15,500 to $28,000 ($6,300 to $11,200)	$15,500 to $35,500 ($6,300 to $14,400)	$18,500 ($7,500)
Estimated site value per ha (per acre): $16,000 ($6,500)				

Table C5

Benefit/Impact Potential Matrix

Benefit	Public	Private	Site	Adjacent Site	Community	Comment
Development will permit continued growth in basic industries within the city of Green Bay		X			X	The objective of the project is to allow for industrial expansion; without the site, industrial developments would locate elsewhere.
Increased basic industry employment		X			X	The City of Green Bay estimates employment potential at 4,400.
Increased service industry employment		X			X	The City of Green Bay estimates that between 2.7 and 3.0 service jobs are created by each basic job.
Increased property tax base and revenues	X				X	Bay Port is now tax exempt, development will put land back on the tax rolls as well as add buildings to the rolls. At current rates, Bay Port when fully developed could increase annual property tax revenues between $2-3 million.
Increased economic activity generally		X	X		X	New industry and jobs will expand personal income, retail sales, bank deposits, and the like.
Impact						**Comment**
Increased traffic congestion			X	X		Development will increase highway and rail traffic, and depending on how rail/access is provided, railroad grade crossings will cause further traffic congestion. However, apart from railroad induced traffic congestion, the highway system should make traffic congestion negligible.
Increased noise and air pollution			X	X	X	Vehicular traffic and industrial processes will doubtless increase noise and pollution levels.
Increased demands on governmental infrastructure	X				X	Additional manufacturing facilities will increase demands on utilities and police and fire protection, and the like. Increased employment and population will increase demands on school system and other governmental services as well.
Diminished wetlands			X	X	X	Diminishing the wetlands will have an adverse effect on wildlife habitats, most notably the habitats of nesting, foraging, and migratory birds.

APPENDIX D: EAST POTOMAC PARK CASE STUDY WASHINGTON, D.C.

APPENDIX D: EAST POTOMAC PARK CASE STUDY
WASHINGTON, D.C.

Project Description and History

1. The East Potomac Park case study involves the use of a contained dredged material site for recreational use. More intensive site use as a waterfront commercial development also is investigated.

Physical characteristics

2. East Potomac Park is located in Southwest Washington, D.C. A map of East Potomac Park and surrounding areas is presented in Figure D1. The park comprises 133 ha (329 acres) and is 4.8 km (3 miles) long and approximately 671 m (2200 ft) at its widest point.

3. The East Potomac Park site was created entirely by placement of dredged material as a result of new construction and channel maintenance dredging that began in 1882 and was completed in 1912. Sediments dredged from both the Virginia and Washington Channels of the Potomac River were placed in a confined dredged material site located on the tidal mudflats. The dredged material consisted of organic and inorganic clays and sandy-silt mixtures that were typical of bottom sediments in the estuarine portions of the Potomac River. The materials were dredged by clamshell, dipper, bucket, and hydraulic type dredges.

4. Site development is generally limited to light frame structures, except where special foundations (piles, etc.) are provided. Typical soil bearing capacities are 9,765 kg/sq m (1.0 ton/sq ft) with a range of 4,883 to 14,648 kg/sq m (0.5 to 1.5 ton/sq ft). Depth to bedrock generally ranges from 18.3 m (60 ft) to greater than 30.5 m (100 ft).

5. Virtually all of the site has been cleared and covered with short grasses, shrubs, and trees. The site is almost entirely flat with a maximum elevation of approximately 3 m (10 ft) msl. In addition, most of the site is rather poorly drained, causing rainwater to pond. The site

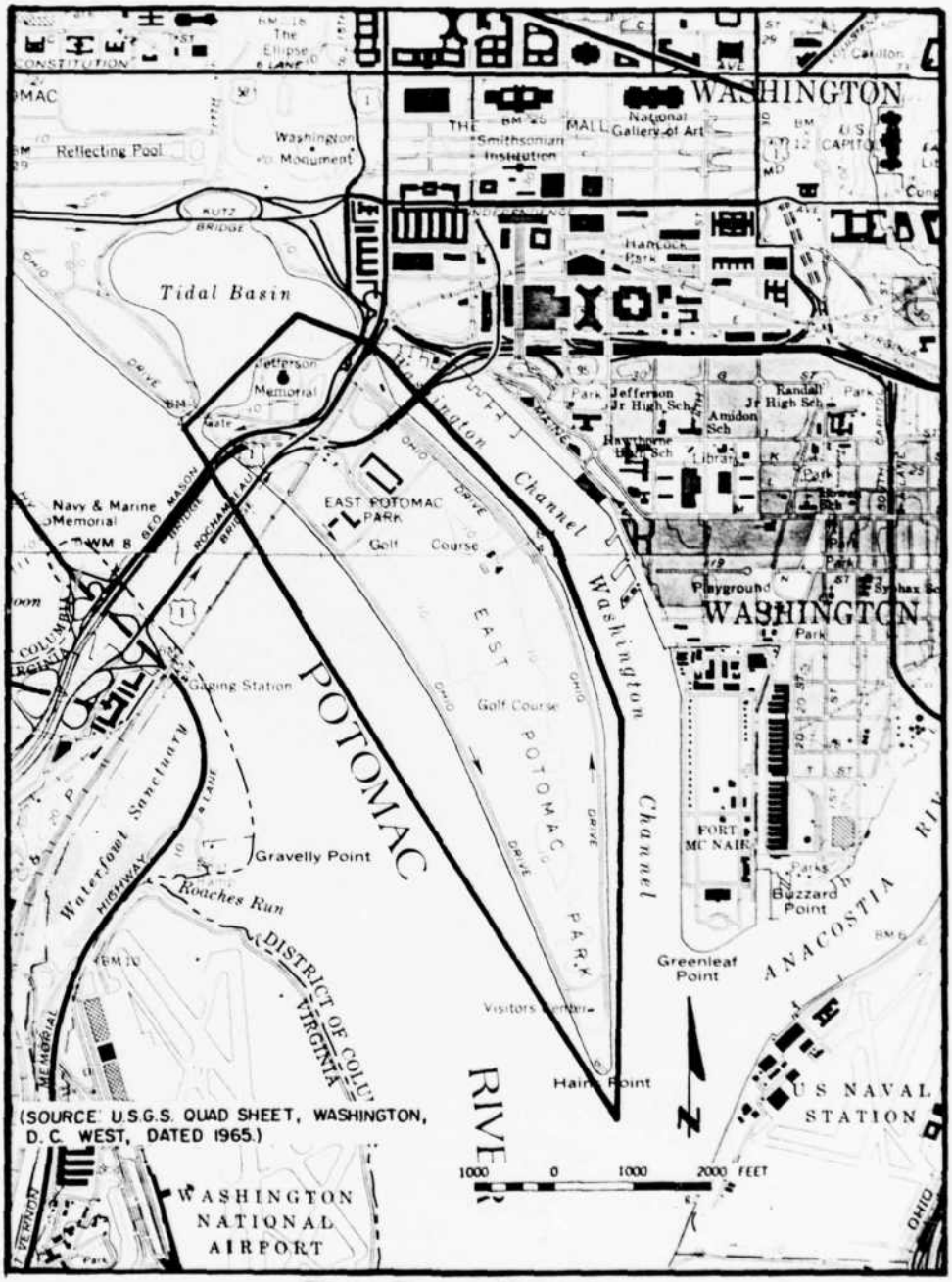

Figure DI. Location map

also is subject to periodic flooding from the Potomac River.

6. The northwest extremity of the site is traversed by a limited access highway, Interstate 395 and U.S. 1, providing direct access to the site. Access to the site from the adjacent neighborhood is provided by surfaced streets. The site itself is surrounded by a paved two-lane perimeter road (Ohio Drive). Thus, access to the park by most people is by private automobile.

Environmental setting

7. The park grounds provide sanctuary to numerous varieties of birds and small animals, although these lands have not been identified as the residence or breeding grounds of any endangered species. The water quality of the Potomac Estuary in the vicinity of East Potomac Park is suitable for recreational boating, maintenance of aquatic life, and industrial water supply; but water contact recreation and wading are prohibited. District of Columbia noise restrictions would apply to this site.

8. Federal and District of Columbia air quality restrictions on both sulfur dioxide and particulate emissions also would apply to this site. The District of Columbia's restrictions are the more stringent of the two and limit sulfur dioxide emissions to 0.109 ppm as an annual mean and 0.029 ppm as a 24-hr mean. Particulate emissions are limited to 75 μg/cu m (4.7×10^{-3} lb/cu ft) as an annual mean, and 160 μg/cu m (1×10^{-2} lb/cu ft) as a 24-hr mean.

9. Overall, significant environmental restrictions would prohibit any heavy industrial use of this site. However, carefully planned commercial or recreational use should be able to be developed to meet District of Columbia and Federal environmental requirements.

Site development

10. Approximately 85 percent of the 133-ha (329-acre) site is covered by four, 9-hole golf courses, a snack bar, driving range, miniature golf course, and a recently refurbished clubhouse. Other recreational facilities include a swimming pool, 22 tennis courts (five of which are covered by an inflatable shell during the winter), and several multipurpose playing fields. Other small structures located

on-site include a comfort station, an ecological research station (formerly a "teahouse" operated by the Girl Scouts), and a structure remaining from the original Corps of Engineers site development (currently used as a "tourmobile" headquarters).

11. Two major buildings exist on park grounds. They are a one- to three-story National Park Service, National Capital Region (NPS-NCR) and Park Police headquarters building (built on 20-m (65-ft)-deep pile foundations) and a one-story park equipment maintenance and repair garage. Recently a 0.23 ha-(0.58-acre) surface easement and 0.12-ha (0.20-acre) are easement were granted to the Washington Metropolitan Area Transit Authority (WMATA). Construction of a segment of a new WMATA subway route is currently underway on this easement.

Surrounding area development

12. The Jefferson Memorial, the Tidal Basin, ballfields, and passive park lands are located north of East Potomac Park, while to the west lie National Park Service park lands and the Washington National Airport. The area across the Washington Channel north and east of the site is part of the Southwest Washington urban renewal area. It consists of a number of waterfront commercial establishments (restaurants, hotels, and marinas), office buildings (HUD, EPA, L'Enfant Plaza, etc.), and low-, mid-, and high-rise apartment buildings. Fort Leslie J. McNair, an historic Army post, is east of the site. The waterfront commercial developments were placed on fill material using pile clusters (up to 9 piles per cluster) driven to a depth of 12 to 18 m (40 to 60 ft).

Site zoning and area land use plans

13. The Park serves a regional need for recreation by residents of the District of Columbia, Arlington County, and the City of Alexandria, as well as by area commuters. Tennis courts within the park are used more than 20,000 playing hours per year. Golf course attendance increased significantly in recent years, from less than 80,000 users in 1972 to more than 100,000 users per yr since 1974. Similarly, use of park open space for recreation has increased to

the extent that the conversion of one of the golf courses to open space is being considered. On 1 April 1975, a planning directive was issued to initiate the formulation of an East Potomac Park development concept plan. Work on this plan is scheduled for completion in late 1978.

14. The Southwest Washington urban renewal area, located across the Washington Channel from the site, will be zoned UR (Urban Renewal) until 1996. At that time, it is expected to be rezoned W-2 (waterfront-mixed-use, medium-density), which will allow commercial and some residential development. This property serves as a comparable area to the East Potomac Park site.

Area trends

15. The economy of the Washington metropolitan area is dependent on government and government-related activities. White collar workers represent roughly 55 percent of the civilian labor force. More than 40 percent of the civilian labor force is directly employed by federal and local governments. Projected area trends are presented in Table D1.

Land Use Potential Considered for Valuation

Establishment of use potential

16. Table D2 presents the site use potential estimation. Land use plans for East Potomac Park are currently being formulated. Thus, for the purposes of this case study, they present no constraints, although no deviation from present site usage is anticipated.

17. Constraints include the soil composition and foundation conditions. Specifically, special foundations (piles) would be required for all but light-intensity site development. Since adjacent site development was constrained by similar foundation conditions, these conditions are not assumed to reduce the value of the site relative to the values of adjacent, comparable properties.

18. Site recreational usage enhances the value of the adjacent properties located across Washington Channel. This value can be considered transferable to the East Potomac Park site, and results

in a significant indirect, on-site value. This is in addition to the direct on-site value as a recreational area.

19. Alternate utilization of East Potomac Park as waterfront commercial development would result in higher direct on-site value (although not as high as the adjacent properties, as shown in the stratification estimates). However, this would reduce the indirect, on-site value discussed in the preceding paragraph. Consequently, either site usage (recreational or commercial) is likely to satisfy the site use potential.

20. In summary, site utilization as a recreational or waterfront commercial development will satisfy the East Potomac Park site use potential.

Valuation Estimate

Review of available measures of value

21. A 1975 water resources bulletin issued by the U.S. Army Engineers Division, North Atlantic, placed the value of the 254 ha (628 acres) comprising East and West Potomac Parks at $94 million. In May of 1974, 2,504 sq m (26,956 sq ft) of permanent surface easement and 4,455 sq m (47,960 sq ft) of permanent air easement (of which 2,338 sq m (25,165 sq ft) and 1,236 sq m (13,038 sq ft), respectively, are located within East Potomac Park) were granted to the WMATA for a total of $171,000. Neither NPS-NCR nor the WMATA personnel were willing to explain the basis of these appraisals. However, personnel of the District of Columbia, Department of Housing and Community Development (DHCD), indicated that they received several requests for information regarding their valuations and the bases for their valuations of the waterfront disposition sites (shown in Figure D1) of the Southwest Redevelopment Project, Washington, D.C., during the winter of 1974. Presumably, these valuations provide the bases for the WMATA easement value.

22. The waterfront disposition sites across Washington Channel from the Park site were originally appraised for the Washington, D.C.

Redevelopment Land Agency (RLA) by a private firm in December of 1967. These appraisals were based on a capitalization of probable land returns from each site should it be improved and put to use, since no comparable sales data existed. The land returns were estimated by deducting from the real estate rents the probable expenses of operating and maintaining the real estate, including tax expenses; recapture of the required investment (exclusive of land); and a "reasonable" rate of return on the unrecaptured portion of the investment in each year during the economic life of the development.

23. These waterfront sites were subsequently leased and developed. Table D3 summarizes the various measures of value of the East Potomac Park site and the comparable waterfront disposition sites, including 1977 assessments of a portion of the comparable sites.

Demand estimate

24. Table D4 considers site usage, surrounding development, and area trends as indicators of the demand for the uses for East Potomac Park. Strong demand for recreational use of the site is based on its golf course, tennis court, and open space attendance statistics. Area trend statistics indicate continued strong demand for recreational usage of the site.

25. With the completion of the commercial redevelopment of the waterfront properties across the Washington Channel from the site, there is a strong demand for additional commercially developable waterfront property in the Southwest D.C. area. Area population, employment, and income trends indicate continued strong demand for both recreational and commercial development of the site.

26. In summary, overall demand for either recreational or waterfront commercial developments is strong and will continue to be strong.

Site stratification

27. Evaluation of the site in terms of existing recreational development will utilize the on-site data previously presented in the review of available measures of value. Thus, the site stratification estimate is made only for the purpose of estimating site utility for

development of waterfront commercial property similar to that of comparable sites located across Washington Channel.

28. Site physical condition for the stratification estimate presented in Table D5, is relatively unimportant since East Potomac Park is largely open space. Although the seawall surrounding the park site needs repair, these repairs could easily be incorporated in the design of the waterfront commercial development. On the other hand, the East Potomac Park site appears to be slightly less attractive to development due to poorer site accessibility of the south portion of the site, when compared to that for comparable sites.

29. Thus, the site is estimated to be of slightly less utility than comparable waterfront commercial properties adjacent to the site.

Value estimate

30. The value of the East Potomac Park site was determined both for existing site utilization as a recreational area and for site development as a waterfront commercial area (Table D6).

31. The on-site value estimates were then adjusted to the present year and averaged, and site adjustment factors (*in this case, none*) were applied to give the estimated site value as a recreational area. A similar procedure was performed on the comparable site values to yield the estimated site value for waterfront commercial development.

32. The two estimated site values presented indicated that site value as a recreational area is about $65.00 per sq m ($6.00 per sq ft), and is marginally greater than site value for waterfront commercial development. Since raw site value was negligible, the incremental site value due to site creation using dredged material is to be equal to the estimated site value as a recreational area. Thus, both the estimated site value and incremental site value as a recreational area are estimated to be $65.00 per sq m ($6.00 per sq ft).

Associated benefits/impacts potential (indirect value)

33. Several indirect values would be created by commercial development of the site. Specifically, there would be substantial increases in employment, income, and tax revenues. These benefits could be measured in terms of gross receipts and sales tax revenues

produced by commercial establishments. Employee earnings could be measured by establishment payrolls with the exception of restaurants. Restaurant employees earnings are estimated by assuming a fixed percentage of establishment gross receipts.

34. Other community economic benefits such as increased property tax revenues would also be created. Property tax revenues can be estimated from local tax assessment rates and the valuation estimates presented in the prior section. Recreational value of the site could be determined from an estimate of the number of site users and the total of the user fees paid.

35. Table D7 describes various benefits and impacts associated with site utilization as a recreational area. With the exception of site requirements for public services and funding, the development of the site as a recreational area is beneficial to both public and private sectors of the community.

Table D1

Area Trends*

Area Analysis	Type	Projected Area Trends, thousands				
		1970	1980	1985	1990	1995
Neighborhood						
Area located across Washington Channel from E. Potomac Park (COG Planning Analysis Districts No. 107 and No. 200)	Population	14.1	13.8	17.1	18.7	22.6
	Households	5.2	6.5	8.2	9.9	11.6
	Employment	72.0	90.8	92.8	99.6	106.9
Local						
District of Columbia	Population	756.5	729.7	750.3	771.5	793.3
	Households	262.5	268.5	284.3	301.0	318.7
	Employment	618.1	702.1	738.9	760.1	797.9
Regional						
Metropolitan Washington SMSA (excluding Charles County, MD)	Population	2861.2	3254.9	3603.7	3947.0	4238.7
	Households	898.6	1142.2	1209.2	1435.3	1557.7
	Employment	1433.0	1731.6	1911.9	2107.3	2342.0

* From Metropolitan Washington Council of Governments (COG), "Cooperative Forecasts Reports", Dec. 1976.

Table D2

Use Potential Estimation

Constraints	Actual	Impact
Soil Condition		
Gravel Coarse Sand		Locally variable, fair to poor bearing strata requiring thorough soil investigations prior to any intensive site development.
Fine Sand	Sandy-silt layers of variable depths	
Silt	Sandy-silt layers of variable depths	
Clay	Organic and inorganic clay layers of variable depth	
Foundation		
Spread or Mat Pile Pier	Required for all but light development	Added cost factor which would substantially reduce site value in absence of strong demand. Comparable surrounding properties have similiar foundation constraints.
Allowable Land Use (Per Land Use Plan)		
Open Space Recreational Agricultural Residential	Existing site use	East Potomac Park land use plans are being formulated. Although no deviation from current land use is anticipated, waterfront commercial development of this land will also be considered

(Continued)

Table D2 (Continued)

Constraints	Actual	Impact
Allowable Land Use (Per Land Use Plan)		
		for the purpose of this study (since it is also compatible with surrounding land uses).
Commercial Industrial Public	Existing surrounding area use	Mixed commercial-retail and (some) residential land use are allowed on surrounding properties.
Zoning Intensity		
(Per Zoning Ordinance)	Not applicable to federally owned property	Surrounding area is currently zoned UR for Urban Renewal. Eventually this area will be rezoned W-2 with mixed-use, waterfront commercial (and some residential) development allowed.
Highest and Best Use	Recreational or Waterfront Commercial	Existing site utilization strongly enhances value of adjacent properties located across Washington Channel, and is therefore of significantly indirect on-site value (in addition to recreational value).
Actual Use Likely	Recreational	

(Continued)

Table D2 (Concluded)

Constraints	Actual	Impact
Utilization Potential		Site utilization as waterfront commercial development would result in higher direct on-site value. However, this would be the indirect on-site value resulting from the enhancement of land values across the Washington Channel attributable to site usage as a recreational area. Thus, either usage is likely to fulfill the site utilization potential.
Underutilized		
Overutilized		
To Potential	Satisfied by existing use or alternate use for waterfront commercial development	

Table 03

Available Measures of Value

Property	Land Use	Value	Area ha	Area (acre)	Value ha	Value (acre)	Value sq m	Value (sq ft)
On-site (East Potomac Park)								
1. 1975 - U.S. Army CE (also includes West Potomac Park)	Recreational	$94,000,000	254.00	(628.00)	$370,100	($149,700)	$37.00	($3.44)
2. 1974 WMATA-NPS, right-of-way	Recreational	$ 171,000	0.25*	(0.62)*	$684,000	($276,300)	$68.40*	($6.34)*
Adjacent (Comparable) Sites								
1. 1967 D.C. - RLA	Commercial	$1,321,000	4.06	(10.04)	$325,370	($131,600)	$32.54	($3.02)
2. 1973 parcel sale	Commercial	$ 155,300	0.22	(0.55)	$705,900	($281,800)	$70.59	($6.47)
3. 1977 assessments	Commercial	$ 736,900**	1.36	(3.35)	$541,800**	($145,900)**	$54.18*	($5.05)*

* Additionally, 0.45 ha (1.10 acre) of air easement was granted.
** Ratio of assessed value to market value is reportedly 1.00.

Table D4

Demand Estimate

Parameter	Indicator	Impact
Site usage		
Golf Course	Increase from less than 80,000 users per yr in 1972 to more than 100,000 users per yr since 1974.	Strong demand for continued site use as recreational area. Demand for open-space recreational use is so strong that conversion of a portion of one of the golf courses to open-space is being considered.
Tennis Courts	Total usage exceeded 20,000 playing hours in 1977	
Open Space	Intense weekend usage during spring, summer and fall months	
Economic Growth Indicators	Average Annual Percent Increase	
Population	Area population increased 38% during the 1960 to 1970 decade.	Strong demand for either recreational or waterfront commercial development based on population increases, amounts of leisure time available to government employees, and high per capita discretionary incomes.
Employment	In 1975, white collar workers represented 54% of the area civilian labor force. More than 40% of the area civilian labor force were local or federal government employees.	
Income	Area median family income ranked third highest nationally during the 1960 to 1970 decade. This level is not expected to change significantly.	
Community Development Indicators	Year-to-Date	
Urban Renewal Activity	Fourteen new leases to commercial enterprises have been signed since 1970, which virtually completes redevelopment of the 6.23-ha (15.4-acre) "Waterfront Disposition Sites" of the Southwest D.C. redevelopment project.	There is a strong demand for additional commercially developable waterfront property in the Southwest D.C. area.

Estimated Demand Intensity	Short Term	Long Term	Impact
Little Activity			Moderately strong demand next decade and very strong during the following decade for either recreational or waterfront commercial development.
Average Activity			
Strong Activity	Moderately strong activity	Very strong activity	

Table D5

Stratification Estimate

Parameters	Site	Comparables
Physical Condition		
Condition of Improvements	Largely open space, completely landscaped terrain, good condition. Seawall surrounding site needs repairs. Structures in good condition.	Relatively new structures - good to excellent condition.
Age of Improvements	10 to 50 yr	Less than 10 yr
Attractiveness		
Accessibility to Site	Good access roads. No public transit. Not close enough for easy pedestrian access.	Excellent access roads, served by public transit.
Accessibility to Transport	Good access to rail, water, and air transport.	Good access to rail, water, and air transport
Service Availability	Close proximity.	Close proximity.
Proximity to Similar Activities	Only golf and tennis recreational area in local vicinity.	Only developed waterfront commercial area in local vicinity.

(Continued)

Table D5 (Concluded)

Estimate of Site Stratification	Site	Impact
Less Utility than Comparables	Slightly less attractive for waterfront commercial development.	Comparables selected for valuation purposes appear to possess slightly greater utility than the site for waterfront commercial development. Site adjustment factor 10% due to less site accessibility.
Equal Utility to Comparables		
Great Utility than Comparables		

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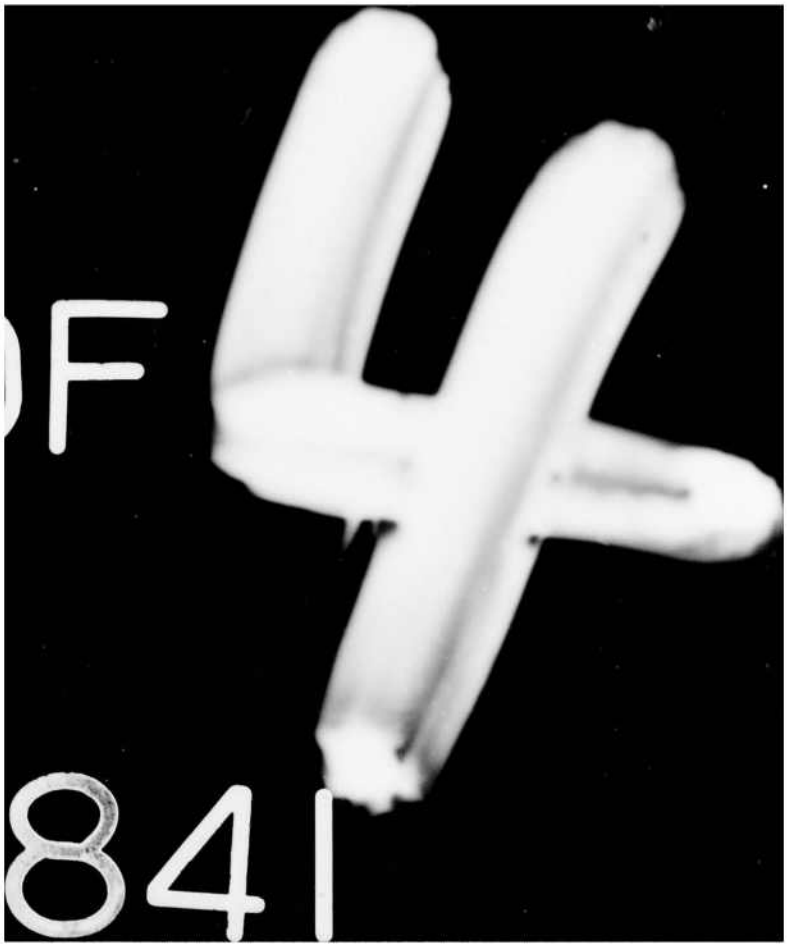
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Table D6

Value Estimates

Parameters	On-Site		Comparables		
	No. 1	No. 2	No. 1	No. 2	No. 3
Use	Recreational	Recreational	Commercial	Commercial	Commercial
Utility (Table D5)	Not applicable	Not applicable	Equal	Equal	Equal
Value	$144.67/sq m ($13.44/sq ft) (1975)	$68.25/sq m ($6.34/sq ft) (1974)	$32.51/sq m ($3.02/sq ft) (1967)	$69.64/ sq m ($6.47/sq ft) (1973)	$54.35/sq m ($5.05/sq ft) (1977)
Price Adjustment (to present yr if sale is older) (1977)	$43.16/sq m ($4.01/sq ft)	$86.00/sq m ($7.99/sq ft)	$59.74/sq m ($5.55/sq ft)	$94.73/sq m ($8.80/sq ft)	$54.35/sq m ($5.05/sq ft)
Average Value of Site	$65.00/sq m ($6.00/sq ft)		Average Value of Comparables	$69.64/sq m ($6.47/sq ft)	
Site Factor Adjustments (If Necessary)	Percent Adjustment Factor (Up or Down)		Impacts		
Special Accessibility Features (if any)	Value of site equals value of comparables less 10%.		Site value for waterfront commercial development is 10% less than the value of the comparables due to less accessibility.		
Topographical Constraints (if any)	None				
Estimated Site Value (Average comparable value plus sum of site factor adjustments)	$65.00/sq m ($6.00/sq ft) site value as recreational area. ($62.64/sq m = $69.64 - 10% ($5.82/sq ft = $6.47 - 10%) (site value for waterfront commercial development).		Comments: Estimated site value as recreational area is greater than estimated site value as waterfront commercial development.		
Raw Site Value (Prior to dredged material disposal operations)	None		Comment: Site created from Potomac River mudflats.		
Incremental Site Value (Benefit Value of Site; Estimated value less Raw Site Value)	$65.00/sq m ($6.00/sq ft)		Incremental site value of East Potomac Park utilized as a recreational area is equal to estimated site value, since raw site value was zero.		

Table D7

Benefit/Impact Potential Evaluation

Benefits	Public	Private	Site	Adjacent Site	Community	Comments
Satisfies demand for recreational facilities (golf, tennis and open-space).	X				X	Entire community benefits from availability of recreational facilities and improved quality of living.
Provides facilities for National Parks management operations.	X		X		X	Provides central base of operations and management for site and other area National Parks, benefitting users of all area National Parks.
Provides wildlife habitat.	X		X	X	X	Enhances adjacent property values, and in turn tax revenues. Positively affects general quality of living.
Impacts						**Comments**
Creates public service demand.	X		X		X	Requires continual public funding to provide, operate and maintain park facilities which are not directly paid for by site users.

APPENDIX E: FIFTH AVENUE MARINA CASE STUDY SAN DIEGO, CALIFORNIA

APPENDIX E: FIFTH AVENUE MARINA CASE STUDY
SAN DIEGO, CALIFORNIA

Project Description and History

Physical characteristics

1. The Fifth Avenue Marina dredged material containment area is a 8.9-ha (22-acre) site consisting of two, boot-shaped moles surrounding a water area of marina-type configuration. The site, which is owned by the San Diego Unified Port District, is located in the northeast portion of San Diego Bay, directly south of the downtown area of San Diego, California (Figure E1.)

2. The site, which has been filled to an average elevation of about 4 m (12 ft), consists primarily of medium-grained sandy material totaling about 1 million cu m (1.3 million cu yd), which was dredged from a harbor channel deepening project in 1976. The dredged material is protected from erosion by a dike comprised of stone revetments, constructed by the Port in early 1976.

3. Soils engineering studies conducted both by the Port and the U.S. Army Engineer District, Los Angeles, have indicated that the nature of the dredged material placed on the site is adequate for foundation support for moderate-intensity construction without special foundation work. The north mole has dewatered and settled sufficiently for development to begin, while the south mole is anticipated to take another six to eight months to stabilize.

4. Originally the project sponsor anticipated creating a rectangular site by filling about 54 ha (133 acres) of bottomland. However, prior to dredging operations, the design plans were altered in order to provide for increased recreational uses along the site perimeter and to avoid filling such a large area of water. The revised plan called for filling only 15 ha (37 acres) of bottomland to create 8.9 ha (22 acres) of surface area.

Figure E1. Location map

Environmental setting

5. San Diego Bay originally consisted of rich saltmarsh tidelands which served as excellent habitat for waterfowl and various species of aquatic organisms. Since 1900 however, about 21 percent of the initial half-tide bay water area has been filled in and the Bay now comprises only about 42.9 sq km (16.6 sq miles) of water at half-tide. Approximately 142 ha (350 acres) of saltmarsh and 243 ha (600 acres) of mud flats outline the finger of the Bay.

6. When dredging operations commenced in the Bay (about 1940) water quality declined severely. Industrial and human waste from factories adjacent to the Bay and vessels which used the waterways were the major sources of pollution. In 1963 these discharges were halted and since that time, the waters of the Bay have remained relatively free from pollution.

7. Presently, the waters of the Bay serve as an important spawning ground for various species of ocean fish. Samplings have indicated at least 14 species of fish and three species of invertebrates in this portion of the Bay. The intertidal mud flats, which are at the base of the site, have obviously been destroyed and temporary turbidity has been caused from the dredging operations. However, these effects are not felt to be long term in nature.

8. The environment of the Bay around the site can best be classified as delicate and subject to frequent disruption, especially by heavy utilization of waters by power vessels.

Site development

9. As stated above, the site consists of two boot-like peninsulas known as the north mole and the south mole. There is presently no development of any type on the north mole, although small pleasure boats occasionally moor off it.

10. A portion of the south mole, however, encompasses an improvement, i.e., the San Diego Rowing Club. The clubhouse was constructed on pilings about 76 m (250 ft) offshore. South of the clubhouse, about 31 m (100 ft) away, is an island constructed in the 1920s with dredged materials from the main harbor channel. This island

(Brennans Island) as well as the clubhouse, are now part of the south mole peninsula. Dredged material has been placed within 0.6 m (2 ft) of the clubhouse.

11. The Port District intends to demolish the clubhouse in the near future and fill the presently unfilled area under the clubhouse with material dredged from the water inside the moles, portions of which are too shallow for larger pleasure boats.

Surrounding area development

12. The north mole of the site extends from what was an old ferry terminal (but is now vacant land) into the harbor. Across Harbor Drive from the site is Navy Field, a recreational area owned by the U.S. Navy, and consists of ballfields and other active sports facilities. Harbor Drive is the major transportation corridor along the Bay in this area and is immediately adjacent to the site. Campbell Industries, a small shipbuilding company, is south of Navy Field and adjoins the south mole area.

13. Another mole is located somewhat north of the north mole. It is called the "G" Street mole and is being developed as a wholesale and retail fish market and restaurant area. East of the "G" Street mole is the U.S. Naval Supply Center and the police headquarters for the City of San Diego.

14. All this development, including the containment site, is within the boundaries of a city redevelopment project known as the San Diego Embarcadero Development Area. The site, along with an adjacent 5.1 ha (12.7 acres) of dredged material which was filled some years ago, are integral parts of the proposed redevelopment plan.

15. The redevelopment proposal calls for Navy Field to be returned to the Port District in a land exchange agreement and redeveloped for hotel and restaurant activities with associated parking facilities. The area around and toward the city side of Navy Field is planned for redevelopment as multiple family units, including town-house and condominium uses. Existing Harbor Drive would be re-located to the east side of what is now Navy Field, and the 5.1-ha (12.7-acre) containment site adjacent to the subject site will be

developed as a specialty tourist activity center called Sea Port Village and consist largely of boutiques and restaurants.

Site zoning and area land use plans

16. The Master Plan for the San Diego Unified Port District is a legal document enforced by zoning provisions vested in the Port, under whose jurisdiction the site and much of the surrounding area is located. It shows the site as designated for recreational use. The zoning allows for minimal recreation related development, such as snack stands, boathouses, and berthing facilities.

17. The area surrounding the site is under the jurisdiction of the Port. It is designated for a mixture of commercial and industrial land uses. The Navy Field area is designated for commercial use, with zoning permitting medium-density development sufficient for hotel and restaurant activity. The area immediately south of Navy Field has been designated for industrial use with zoning to permit light manufacturing activity such as boatyards and related activities. The area around Navy Field not under the jurisdiction of the Port has been designated by the City of San Diego for primarily residential redevelopment with zoning to permit high-density, multifamily residential development.

Area trends

18. Two factors have played a major role in the economic growth of San Diego's economy:

- The development of industrial complexes along the waterfront.
- The large concentration of Naval facilities along the Bay.

19. The Port of San Diego provides a home base for one of the largest concentrations of Naval facilities in the Continental United States. Nearly 20 percent of the Navy's active fleet utilizes San Diego as its main port facility. The revenue to the city and county generated by Navy activities has been estimated at $1.2 billion annually. Tourism, especially water-related, is another strong factor in the area's economic makeup. The estimate of tourist

expenditures on water and waterfront related activities is $50 million annually.

20. The area wherein the containment site is located is within a 15-minute drive of approximately 75 percent of the employment opportunities in San Diego County, and within a 20-minute drive of 60 percent of the population of San Diego County. The City of San Diego and the Port view the site and the surrounding area as a key project in the revitalization of this area south and west of the downtown area of San Diego. It is presently an agglomeration of parking lots, deteriorating houses and apartments, and light industrial facilities. It is felt that the development of Sea Port Village, the subject site as marina and park, and the redevelopment of the Navy Field area could spark the revitalization of the larger surrounding area based on the attractiveness of these three sites once developed.

Land Use Potential Considered for Valuation

21. In its Master Plan the San Diego Unified Port District has designated the containment site for Recreational/Park use with zoning to allow minimal development of a service nature. The Port intends to develop the site as a small boat marina and the moles for park use. Some improvements will be allowed on the moles, but these will be minor service facilities to complement the site--i.e., snack stands, restroom facilities, and limited parking, mainly for service vehicles.

22. The legal land use and zoning constraints placed on the site have delineated its highest and best use potential to basic recreational use. In addition, provisions of the California Coastal Zone Management Act require careful consideration of coastal development, and would place additional restrictions on free development of the site due to processing and procedural regulations for development permits. In addition, the permitting process is simplified

for recreational use sites (Table E1).

23. With respect to its public use potential, the site must be considered as utilized to its potential as a recreational use. As an alternative private use, which would be the real basis for valuation in the case of publicly owned land, the site would still have its highest and best use as a recreational site. In this instance it would be an especially appropriate private use, perhaps more valuable than even commercial or industrial land due to its function as a catalyst to stimulate the redevelopment of the surrounding area.

Valuation Estimate

Review of available measures of value

24. For valuation purposes, the site has been considered at its highest and best alternative private use, which in this case is considered to be a marina site with attendant park land and services. The comparables selected for valuation purposes should be marina facilities of equal or somewhat greater size, which in this case is about 250 slips. Utilization of the income approach would be the preferred appraisal technique for arriving at value for such a use. Revenues in the form of rents would be analyzed and capitalized to arrive at a land value. This approach, however, requires a qualified appraiser and was therefore not utilized.

25. Instead, sales data for comparable sites were sought. These were not available, since marina sites in San Diego Harbor are exclusively developed and leased by the Port Authority and do not appear on the tax rolls as taxable property. Therefore, alternative commercial or industrial sites of similar size were sought for which sales data were available. The strategy was to derive a value from the comparables and then adjust it for waterfront use--thus deriving a value estimate.

26. The San Diego Multiple Listing service allowed access to their data files. Three commercially zoned parcels which were un-

developed and had sold during the year were found. These parcels, one of which is utilized as a parking lot, are within 1.6 km (1 mile) of the waterfront. One of the parcels is about 0.4 km (0.25 mile) from the subject site near Navy Field. The value of these parcels served as the basis for the site value estimate, which was then adjusted for its waterfront siting.

Demand estimate

27. The demand analysis performed in Table E2 indicates a strong demand for waterfront land, especially land usable for recreational purposes such as a marina. The growing tourist and shipping related economy of San Diego has generated a need for recreational activities such as marinas located in proximity to the downtown area and planned residential waterfronts developments.

28. An additional factor contributing to strong demand for the site and similar uses is the imminent implementation of a city-sponsored redevelopment project in the area of the subject site. This project, which is intended to revitalize an area heretofore undesirable from a residential and commercial standpoint, looks to waterfront recreational development as a catalyst for the redevelopment process.

29. On the basis of the above, strong continued demand for marina and park-type land can be anticipated. This demand merits consideration of an upward adjustment of estimated site value.

Site stratification

30. As previously delineated, three comparable sites were selected for valuation purposes. These sites, although zoned commercially and not of a waterfront nature, were nevertheless selected for comparability purposes. They possess similarity in overall size and topography to the moles and with rezoning could be utilized as park sites. In assessing the comparables it was determined to compare only the land aspect of the subject site since that was the only basis of comparison available. An upward adjustment in site value would be made to reflect the site's waterfront quality as opposed to the comparables (Table E3).

Value estimate

31. A site value estimate (as per Table E4) in the range of $194 to $258 per sq m ($18 to $24 per sq ft), or 1.9 million per ha ($784,000 to $1 million per acre), has been calculated for the land and water portions of the site. This can be taken as the value of an alternative public use on the site. It is based on the weighted average of the three comparables and an adjustment factor to reflect waterfront siting. The adjustment factors were determined to be within a range of between 50 percent and 100 percent over the weighted comparable average, hence the value range.

32. The San Diego County Assessor and Port Authority have assigned values of between $1.00 and $2.70 per sq m ($0.10 and $0.25 per sq ft) to Bayfront bottomland in areas not under the jurisdiction of the Port. This value range has been interpreted as raw site value prior to dredged material containment. The incremental site value, or implied benefit value of the dredged material, is therefore on the order of between $194 to $258 less $1.00 to $2.70 per sq m ($18 to $24 less $.10 to $0.25 per sq ft).

Associated benefits/impacts potential

33. Table E5, delineates the anticipated benefits and/or impacts potentially resulting from site development. The greatest potential benefit is seen in the area of promoting the commercial and residential redevelopment of the area, which would in turn create economic benefits in the local economy and public tax base. The economic benefits are seen in terms of increased job opportunities and resultant expenditures in the commercial sector created by redevelopment. The public benefits are seen mainly in terms of increased assessments and tax revenues resulting from new development.

34. The most significant area of impact is environmental. Development of the marina could cause environmental problems with respect to the fragile ecosystem existing in this portion of the harbor. Also, new development will result in greater traffic volumes and attendant noise and air pollution.

35. Overall, the development of the site and its attendant

economic benefits can be viewed more from a benefit than an impact perspective.

Table E1

Use Potential Estimation

Constraint	Actual	Impact
Soil Condition		Soil study performed in conjunction with Port feasibility study has determined condition of fill as being good foundation material for structural support of small to medium sized improvements.
Gravel		
Coarse Sand		
Fine Sand	Some medium grained	
Silt		
Clay		
Other		
Foundation Constraint		No special foundation preparation work is anticipated because of the nature of the fill material.
Spread or Mat	Acceptable	Dewatering and settling of the material occured rapidly, producing a useable site with a delay of only about 20 months.
Pile		
Pier		
Allowable Land Use (Per Land Use Plan)		Port Master Plan calls for utilization as a park facility with associated service improvements, and a marina.
Open Space		
Recreational	Present and projected	
Agricultural		
Residential		
Commercial		
Industrial		
Public		
Zoning Intensity (Per Zoning Ordinances)	Recreation, limited development	Improvements are allowed only as service related to the basic park and marina use.
Estimation		Planned public use as a park and marina meets highest and best use criteria from a legal constraint point of view. The alternative private use is also recreational, in this case as an economic incentive and catalyst to surrounding development.
Highest and Best Use	Recreational	
Actual Likely Use	Recreational	
Utilization Potential		
. Underutilized		
. Overutilized		
. To Potential	Definitely	

Table 12

Demand Estimate

Parameter	Indicator	Impact
Building Permit Activity by Land Use, as per Table 11	No., Year to Date N.A. Total Valuation N.A.	
or Sales Activity by Land Use, as per Table 11	No., Year to Date 3 commercial lots, no water front Average Value $118,/sq m ($11/sq ft)	Market for developable waterfront land for any type of use is very strong. Lack of sales because of lack of availability appears to corroborate this.
Economic Growth Indicators	Average Annual Percent Increase	Overall economy of San Diego is fairly strong and growing. Population in migration is constant and generating strong housing demand. Sales tax revenue increases reflect buying power. Demand for recreational activity, especially water-oriented, is also strong.
Added Employment		
and or Added Population	3% annual increase, last 10 yr	
and/or Sales Tax Revenue Increases	about 8% annually	
Community Development Indicators	Year to Date	City and Port are committed to re-development of a large area of waterfront and adjacent land. Project anticipates a variety of uses to be developed over the next 10 yr.
No. of New Units		
or Urban Renewal Activity	Embarcadero redevelopment project is under way	

Estimated Demand Intensity	Short Term	Long Term	Impact
Little Activity			Strong demand for waterfront land for any type of use will drive prices steadily upward
Average Activity			
Strong Activity	in stages	overall	

Table E3

Stratification Estimate

Parameter	Site	Comparables
Physical Condition		
Basic Condition of Improvements (If Any)	None	Three vacant commercial; one is utilized as parking lot.
Approximate Age of Improvements (If Any)		
Attractiveness		
Accessibility to Site	Excellent	Excellent
and/or Accessibility to Transport	Excellent water	Good freeway access
and/or Service Availability		
and Proximity to Similar Activities	Good	Good

Estimate of Site Stratification	Impact
Basically Equal Utility to Comparables	The sites selected as comparables, though not waterfront property, are similar enough in terms of size, topography, and attractiveness measures to be considered as having equal utility in everything except waterfront siting. This will require significant upward value adjustment for site.

Table t4

Valuation Estimate

Parameters	Comparables				
	No. 1	No. 2	No. 3	No. 4	No. 5
Use	Vacant Commercial	Vacant Commercial	Commercial Parking Lot		
Value of Comparables	$118/sq m ($11/sq ft) 1977 sale	$129/sq m ($12/sq ft) 1977 sale	$129/sq m ($12/sq ft) 1977 sale		
Price Adjustment to Estimate Yr	none	none	none		
Average Value of Comparables	$129/sq m ($12/sq ft)				
Average Value Adjustment	Adjustment		Comment		
Demand Adjustment					
Utility Adjustment	Percent Adjustment Waterfront siting and access; add between 50% and 100% to value		Access and strong demand for waterfront property reflects significant value increase over other commercial properties.		
Special Constraints					
Site Value					
Adjusted (Average Comparable Value Plus Sum of Value Adjustments)	$194 to $258/sq m ($18 to $24/sq ft)		Comparables do not have waterfront location.		
Raw (Prior to Dredged Material Containment	Bottomland assessed at between $1.00 and $2.70/sq m ($0.10 and $0.25/sq ft)		Bottomland assessment is conservative due to limited supply.		
Value Change (Estimated Site Value less Raw Site Value	$194 to 258/sq m less $1.00 to $2.70/sq m ($18 to $24/sq ft less $0.10 to $0.25/sq ft)		Raw site value reflects constrained supply of bottomland in San Diego Harbor.		

Table E5

Benefit/Impact Potential Matrix

Benefit	Public	Private	Site	Adjacent Site	Community	Comment
Increased opportunity for recreational activity.	X				X	Development of a park and marina facility will increase the inventory of recreational use land available to the city and provide added locational attractiveness.
Increased attractiveness of location of activities on adjacent properties.		X		X		Development of the proposed site facilities would make adjacent parcels of land more attractive for development or redevelopment
Catalyst for local redevelopment proposals.	X			X		The site proposal is seen as a catalyst to stimulate a redevelopment proposal which includes a significant portion of the surrounding lands.
Increases in commercial activity.		X			X	Site development, primarily of the marina, and its stimulus to adjacent development, could provide increased economic benefits both in terms of sales activity and employment opportunities.
Reduced pressure on similar recreational/park activities in the area.	X				X	Site development would take pressure off some already overcrowded nearby marina facilities.
Increased Port economic benefits.	X				X	Marina development will result in additional operational revenues for further Port facility development and operations.
Increased tax revenues.	X				X	Personal property taxes collectable on boats will accrue to the city.
Potential Pedestrian orientation and activity center.		X		X	X	Park and marina site can provide a pleasant place for workers in nearby establishments to lunch. Also the site would be a magnet for general waterfront pedestrian activity.
Impact						**Comment**
Increased traffic congestion.	X			X		Increased traffic flow, both on adjacent streets and in the waters of the harbor, can be anticipated from marina development
Deterioration of proximate water environment.	X			X		Small boating activity around the marina, especially by power boats, could have the effect of upsetting any local marine ecosystems, especially via gasoline leakage and tank overflow.
Rowing Club condemnation.		X	X			Development of the project would necessitate destruction of the San Diego Rowing Club facilities, presently located on a portion of the site.

APPENDIX F: FLORIDA STATE FAIRGROUNDS CASE STUDY
HILLSBOROUGH COUNTY (TAMPA), FLORIDA

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HILLSBOROUGH COUNTY (TAMPA), FLORIDA

Project Description and History

1. The Florida State Fairgrounds case study site was purchased by the Florida State Fairground Authority in the early 1970s. At the time of purchase, the majority of the site was below the 100 yr floodplain. The site was raised to a buildable elevation as a result of the placement of dredged material from a nearby flood control project. This project, part of the "Four Rivers Water Management Program," was sponsored by the Southwest Florida Water Management District (SWFWMD) with support from the Corps of Engineers. The quality of the dredged material originally placed on the site was extremely poor. Development costs increased significantly because of the need to excavate undistrubed land for foundations and to add a 0.3-m (1-ft) cover of select material (also taken from the SWFWMD Bypass Canal Project under the auspices of the State Fairground Authority).

Physical characteristics

2. The Florida State Fairgrounds is a 111.7-ha (276-acre) parcel in Hillsborough County, Florida; approximately 11.2 km (7 miles) east of Tampa (Figure F1 locates the site within the Tampa Area). The site is generally rectangular and is bounded on the north by Interstate 4 and on the east by U.S. Highway 301. This is also the area where these two major highways intersect with U.S. Highway 92, and it is less than 0.8 km (0.5 mile) from the intersection of Interstate 275 (now under construction) with Interstate 4, (Figure F1).

3. The site now contains five man-made lakes used for irrigation and drainage control, operation of air conditioning units, and for aesthetic enhancement. The site also has several drainage channels which connect the lakes to a nearby flood control channel.

Environmental setting

4. Prior to filling, the site was used for cattle grazing, and had limited tree growth and vegetation. An attempt was made to develop

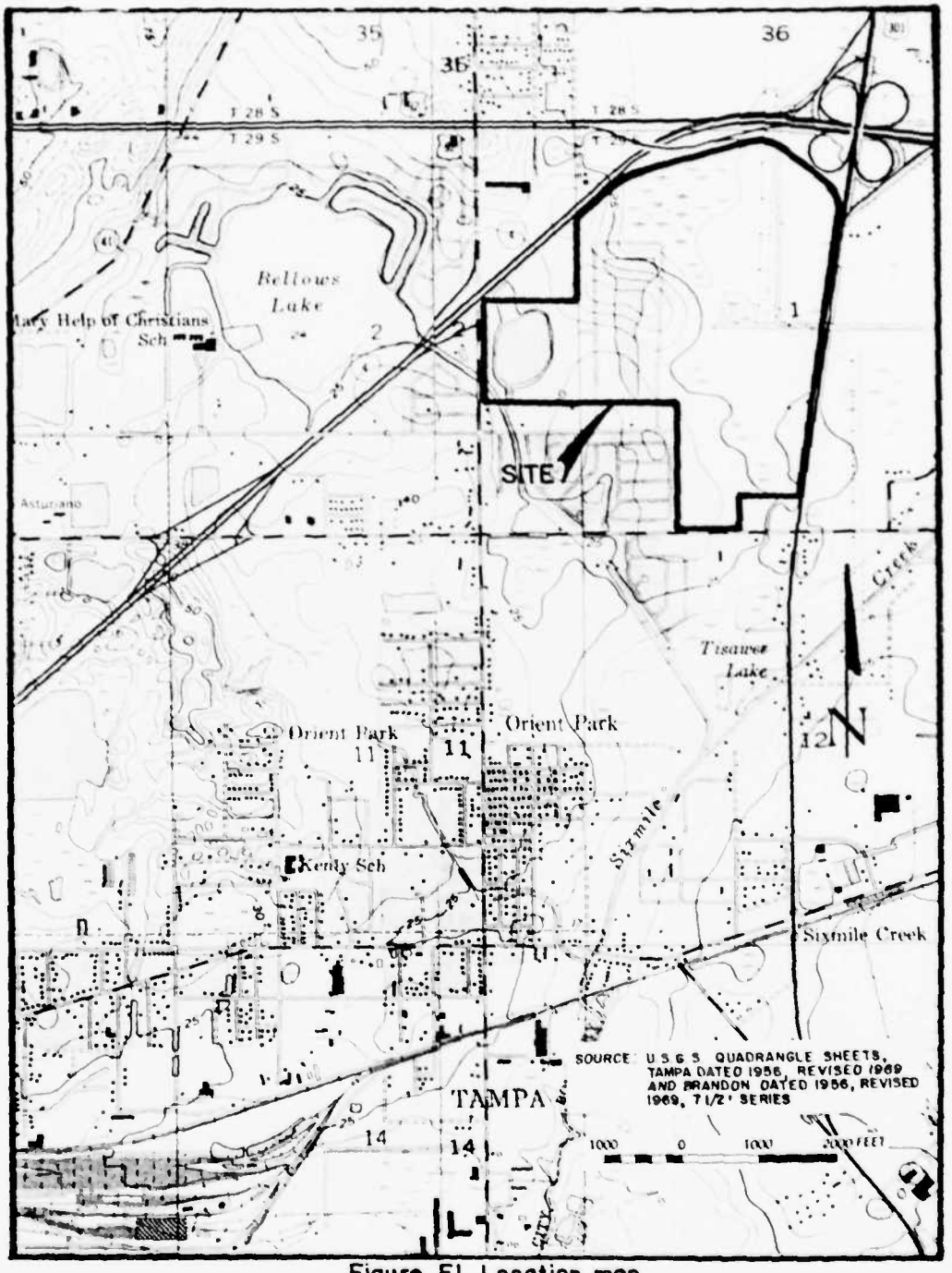

Figure F1. Location map

a residential subdivision on a portion of the site. To accomplish this, a lake was dredged to contain groundwater and to raise the elevation of the building lots.

Site development

5. The initial development phase included construction of 14 buildings; parking areas; a midway area; a horses show complex. A racetrack and a picnic area will be constructed in the future. The buildings include a 7,740-sq m (86,000-sq ft) exhibition hall, a cultural center with 3,690 sq m (41,000 sq ft) of exhibition space, six exhibition pavilions, five livestock barns, and an amphitheatre.

6. The Florida State Fairground Authority, an agency of the State, started to use the site in 1976. Previously, the State Fair was held at a small site in downtown Tampa. The new facility has been one of the few fairgrounds built in the Nation since the 1930s. In addition to greatly expanding the activities that can be conducted during the State Fair, the facilities are now being used year-round for other activities, including conferences and conventions, trade shows, and a variety of recreation programs.

7. To date, expenditures on the site have amounted to $9.2 million, including the $1.2 million land purchase price and $1.4 million for extraordinary site development costs due to the poor quality of the dredged material.

Surrounding area development

8. Land in this portion of Hillsborough County was used primarily for agricultural purposes until the mid 1960s. Construction of the interstate highway stimulated development of new subdivisions and a major shopping center approximately 3.2 km (2 miles) from the site. Development in the area was also restricted by high groundwater. However, as a result of the construction of the Tampa Bypass Canal, the level of the groundwater has been substantially lowered, and the problem of flooding has been reduced.

Site zoning and area land use plans

9. The zoning immediately surrounding the site was agricultural or low-density residential until recently. In anticipation

of the development pressure that the fairgrounds will generate, the surrounding land has been rezoned to a Fair/Campus (F/C) designation. This zoning classification allows a wide variety of commercial activities, but controls development so that the activities of the fairgrounds are not compromised.

10. One new use, a recreational vehicle sales and service operation, has just been completed across from the site within the F/C zone.

Area trends

11. As stated above, growth was previously restricted by the high groundwater. The reduction of this problem and the construction of two interstate highways have permitted the area to now become a major growth area of the Tampa metropolitan area.

12. In order to establish the land use potential for the case study site, the site character was reviewed in relation to generalized criteria for various land uses that would be allowed under the area's Comprehensive Plan (The Horizon 2000 Plan).

13. The Plan designated the land as "Urban Transition," which allows residential, commercial, or institutional use. The following portrays the evaluation for each of these uses in relation to the characteristics of the site:

- Residential. Land surrounding the case study site has been subdivided for residential use. However, no residential development has occurred adjacent to the interstate, because of the obvious environmental deterrents. Generally, land this close to a major transportation node would be most appropriately used for multifamily residential or Planned Unit Development (PUD) residential. This would allow a developer to design away from the highway and minimize potential negative impacts. The large size of the parcel would lend itself to a PUD. Assuming 14.8 dwelling units (du) per ha (6 du per acre) residential density net, and a land value of $3000 per du, the value for the site would be roughly $5 million.
- Commercial. Three types of commercial development would appear appropriate for the site: strip commercial, a regional shopping center, and an office/service commercial center.

- Strip commercial development would command the highest land value. However, only one side of the site fronts on a highway that would allow driveways or curb cuts, thus limiting the strip commercial use to one quarter of the perimeter. If the frontage were developed for strip commercial use it would significantly reduce the potential on the remainder of the site.
- A regional shopping center development would benefit by the large assembly of land and its adjacency to the major highway intersections. Because this is the most significant transportation node in this part of the county and since there have been no other regional centers built in the area as yet, this use would be appropriate. The one constraint to regional center appropriateness is the lack of nearby residential development. However, as noted above, the area is now considered a growth area and therefore would have the projected population to support a regional center.
- Use of the site for an office service commercial center would be appropriate because of its location and size. However, this type of use is not as dependent upon proximity to a major transportation node, and therefore the site would not be as valuable for this purpose.

• Institutional. The present use (the state fairgrounds) is itself institutional. Other institutional uses would include schools (community colleges), commercial or public recreation, health complexes, etc. These uses would be expected to pay less for land than the other uses.

Land Use Potential Considered for Valuation

14. The site is particularly well suited for the fairgrounds, because of highway access and the availability of vacant land surrounding the site to support ancillary uses. Reportedly, the former owner of the majority of the fairgrounds site was convinced to sell by appealing to his civic pride--a fairgrounds site is very important to the area's economy. Also, he owned other land in the area which would presumably increase in value as a result of the fairgrounds.

Therefore, even though the sale was reportedly at arm's length, some "arm-twisting" is implied.

15. The most appropriate alternate private use for the land would have been as a regional shopping center. Such a use would be justified by its location adjacent to the major highways, the size of the parcel under single ownership, and the projected growth of the area. This possibility was reportedly recognized by the previous owner, as evidenced by his unwillingness to sell the highway frontage.

Valuation Estimate

Review of available measures of value

16. Direct value. The measurement of direct land value would be the increase in value following dredged material placement. This value will be computed by comparing the pre-fill value with the present value. The present value will be based on the alternate private use (regional shopping center, justified in paragraph 15). This approach is necessary because traditional financial proforma cannot be applied to a public use (e.g., state fairgrounds).

17. Indirect value. The approach used to identify indirect value will be to examine each of the beneficiaries of the developed site, including the owner (the Florida State Fairground Authority) and the community (the local government, surrounding land owners, employees, and residents). Table F1, "Measures of Indirect Value," identifies the beneficiary, describes a measure of value and identifies its type, and gives a rationale for inclusion.

Demand estimate

18. Demand for land in this sector of the county was formerly limited by the high groundwater and limited access prior to the development of the interstate highways. A portion of the site was considered for a single family subdivision several years ago, but the concept was not developed because of a limited market. However, the overall economy in the Tampa Bay Area has improved, and as a result of the flood control channel and the development of the

new highways, real estate activity has increased.

Site stratification

19. Although the actual purchase price of the site has been recent enough to indicate real value, the possible arm twisting noted previously requires consideration of comparable sites as well.

20. Three types of comparables were reviewed. The first is a large site at the other quadrant of the interstate highway interchange. The second is a parcel in the area that has been filled with dredged material from the bypass canal. The third is land used for the selected highest and best alternate private use (a regional shopping center) elsewhere in the county. The comparables that were selected for consideration and their relationship to the selected site are described in Table F2, "Stratification of Comparables."

Value estimate

21. The case study site, although strategically located, was of little value prior to fill material placement because it was within the 100-yr floodplain. By placement of dredged material from the nearby SWFWMD Flood Control Project, the land increased in value. The following describes how the direct value of the dredged material containment can be computed:

- The direct value of the site, as it relates to this study would be the effect of the placement of the dredged material, i.e., the change in land value.
- To determine this change, a base value for the site prior to dredged material placement must be established and related to the after-fill value.
- Since the after-fill user is a public entity, it is inappropriate to use traditional proforma measures to determine value. Rather, the alternative highest and best private use should be used as the basis for determining value.
- The most obvious indicator of the base value (pre-fill material placement) would be the price paid by the Fairground Authority, an average of $11,100 per ha ($4,500 per acre). Because there was some indication that the sale was not totally an arm's length transaction, it was necessary to examine values of similar land. Table F2, Comparable 1, indicates that the $11,100 per ha ($4,500 per acre) price was a true market value. This is further supported by the value of

nearby land as determined by the County Assessment Office.

- The highest and best use of the site has been identified as a regional shopping center. The value of land for this use, based on Table F2, Comparable 3, would be $10.76 per sq m ($1.00 per sq ft), or $12 million (111.7 ha x $10.76 per sq m (276 acres x 43,560 sq ft per acre x $1.00 per sq ft)). However, this value would be for a site that is ready for development (above floodplain and suitable soil).
- Relating the dredged material placement to "after" value could be done in two ways, either the cost of filling the site with suitable material or the extra development cost that would occur as a result of the poor quality of the dredged material. These alternatives are described below:
  - According to local builders/developers, suitable fill material costs between $1.96 and 3.27 per cu m (average $2.62) ($1.50 and $2.50 per cu yd (average $2.00)) in place. Assuming development would require 80 percent of the site, to be raised 2.4 m (8 ft) the cost of the fill would be:

    80 percent of 111.7 ha (276 acres) = 89 ha (220 acres)
    2.68 cu m per sq m (0.33 cu yd per sq ft) of fill (allowing for compaction)
    89 ha (220 acres) $\times \left(\frac{10{,}000 \text{ sq m}}{\text{ha}} \quad \frac{43{,}560 \text{ sq ft}}{\text{acre}}\right) \times$
    2.68 cu m/sq m (0.33 cu yd/sq ft) x $2.62/cu m ($2.00/cu yd) = $6.3 million

  - Adding the cost to fill the site to the land purchase price and subtracting this from the value of land for a regional shopping center establishes the value of the dredged material containment activity:

    Value of highest and best use - $12 million
    Purchase price - $1.2 million
    Cost of fill - $6.3 million
    Developed cost - $7.5 million
    Value created by dredged material placement - $4.5 million

  - An alternate method of determining value of the dredged material placement would be to subtract the cost of the land plus the extraordinary site development costs from the value of the highest and best use.

    The estimated cost for extraordinary site development

was provided by the architect for the State Fairground Authority. This included placement of all building foundations through the fill to undisturbed base and the addition of 0.3 m (1 ft) of select material over the original fill material to allow surface water percolation.

Value of highest and best use -		$12 million
Purchase price	$1.2 million	
Extra dev costs	$1.4 million	
Total Developed cost	$2.6 million	
Value created by dredged material placement (12 million less $2.6 million) -		$9.4 million

Since the site benefited from placement of the dredged material, the second alternative is considered to be the appropriate measure of value increase.

Associated benefits/impacts potential

22. The values that were indirectly created by the productive use of the dredged material site are described in Table F3.

Table F1

Measures of Indirect Value

Beneficiary	Measures of Value	Type	Comments
Owner - Florida State Fairground Authority	• Value of land created	Direct	This is developed under the primary land value.
	• Revenue of operations	Indirect	The State Fairground Authority by charter is commissioned on a zero based budget; therefore, retainment of their bonds is dependent upon the revenue received from the use of the fairground facilities. The State Fairground Authority was created to administer the fairgrounds, both for the conduct of the State Fair and use for other purposes.
Surrounding Land - owners	• Increase in land value	Indirect	The fairgrounds and its various activities increase traffic to the site which creates significantly increased value potential for adjacent land owners. This has been recognized by the county in the rezoning of the land to a special Fair/Campus (F/C) designation.
Support Businesses	• Revenues from operations	Tertiary	Businesses that will benefit due to their proximity to the fairgrounds include restaurants, hotels and motels, and retailers.
Local/State Government	• Tax revenue	Tertiary	Real estate taxes yield will increase. Fair-related activity will generate sales, business, and personal income taxes.
Employers	• Jobs created	Tertiary	The fair itself and increased area businesses will improve employment.

Table F2

Stratification of Comparables

Comparable 1: Opposite Quadrant of Interstate Interchange		
Parameter	Comment	Comparability
• Location	North of subject parcels, across Interstate 4	
• Size/Shape	78.9 ha (195 acres), generally rectangular	Supports use similar to subject land
• Physical Constraints	50% of site below 100-yr floodplain	Similar to subject land
• Access	Adjacent to Interstate 4 and US 301	Identical to subject land
• Regulatory Constraints	Zoned agricultural use. Planned "urban transition"	Identical to subject land
• Market Demand	Considered growth area of county	Identical to subject land
Value Estimate		
Source		Comment
Asking Price -	on the market for $850,000, or $10,800/ha ($4358/acre)	Reported to be unincumbered offering
Assessment -	currently assessed as agricultural land - $433/ha ($175/acre) maximum by law	Not relevant
Comparable 2: Nearby Dredged Material Fill Site		
Parameter	Comment	Comparability
• Location	Approximately 1.6 km (1 mile) north of subject site. West side US 301 frontage	

(Continued)

Table F2 (Continued)

Parameter	Comment	Comparability
• Size/Shape	38.4 ha (95 acres), rectangular, 240 m (800 ft) frontage on US 301	Will not support similar use. Highest value will be for frontage.
• Physical Constraints	Dredged material raised land above floodplain, will support construction without additional cost.	Subject land required extensive improvement to support use
• Access	Direct access from US 301, but one mile from interchange area	One third less visibility from major thoroughfares
• Regulatory Constraints	Zoned for highway oriented commercial (C-1), which is consisted with Comprehensive Plan	Similar with frontage potential of subject land
• Market Demand	Part of county growth area	Similar to subject land

Value Estimates

Source		Comment
Asking Price	- offered for $24,700/ha ($10,000/acre)	Owner reportedly distressed; will accept lower price
Assessment	- Assessed at $12,400/ha ($5,000/acre). No significant sales since fair opened.	Not reflection of true value assessed. Will be reconsidered after several sales.

Comparable 3: Regional Shopping Center

Parameter	Comment
• Location	No specific location has been chosen as a comparable. Rather, the market price generally accepted for regional shopping center land will be used. Therefore, stratification would not be applicable.

(Continued)

Table F2 (Concluded)

Value Estimates	
Source	Comment
Local Real Estate Appraisor - stated that this type of land will sell for $10.76/sq m ($1.00/sq ft) if it can be developed.	Subject land could not be developed and required fill. Because of the poor quality of the fill material, development costs were increased by approximately $1.29/sq m ($0.12/sq ft).

Table F3

Benefit/Impact Potential Evaluation

Benefit	Beneficiary	Measure
Revenue from operations	Owners	The size and location will allow the Fairground Authority to generate sufficient income to amortize bonds and pay operating costs without public assistance.
	Community	Facilities exist without tax dollar support.
Value increase to surrounding property	Owners of surrounding land	The fair will generate activity that will accelerate demand for adjacent land. Approximately 121.4 ha (300 acres) have been rezoned to F/C to accommodate growth.
	County	Higher land value will increase real estate tax yield.
Business supporting fair activities	Business Owners	In addition to the State Fair, year-round use of the site for conventions, trade shows, and recreation will increase business for nearby motels and restaurants and will create opportunity for new businesses (e.g., a recreational vehicle dealership recently opened across from the site).
	Employees	New businesses will create new jobs.
	Community	Increased business will increase business and personal income and taxes.
Recreational opportunities	Community	The facility will offer a wide range of events that expand recreational opportunities in the area.

APPENDIX G: HOOKERS POINT CASE STUDY
TAMPA, FLORIDA

APPENDIX G: HOOKERS POINT CASE STUDY
TAMPA, FLORIDA

Project Description and History

Physical characteristics

1. The Hookers Point case study involves the use of a dredged material site for port and related facilities. The 162-ha (400-acre) site, which is the primary focus of this report, is owned and leased by the Tampa Port Authority (TPA). The site and its surrounding and adjacent port facilities have extensively influenced the region's land uses and economy.

2. Hookers Point is one of three land masses created from dredged material within the Hillsboro portion of Greater Tampa Bay. Figure G1 depicts the relationship of the site to the downtown Tampa area, Hillsboro Bay, YBOR City, and the surrounding area.

3. The case study site consists of a 162-ha (400-acre) portion of the approximately 405-ha (1000-acre) Hookers Point area which is controlled by the TPA. More specifically, it is the land created from containment of dredged material from a TPA channel-deepening project that was initiated in 1967 and a subsequent Corps of Engineers maintenance dredging project that was initiated in 1972. The TPA channel deepening resulted in placement of approximately 9.2 million cu m (12 million cu yd) of material, and was completed in 1969. The Corps maintenance dredging project resulted in placement of approximately 0.4 million cu m (0.5 million cu yd) of material.

4. The type of dredged material and placement methods used in the Hookers Point area were reportedly inferior prior to 1968. At that time the TPA decided that dredging activities could serve the dual purpose of improving the channel and creating developable land. That decision resulted in the adoption of material placement techniques involving the selection of more stable dredged material for placement at the perimeter of the fill and placement of the less

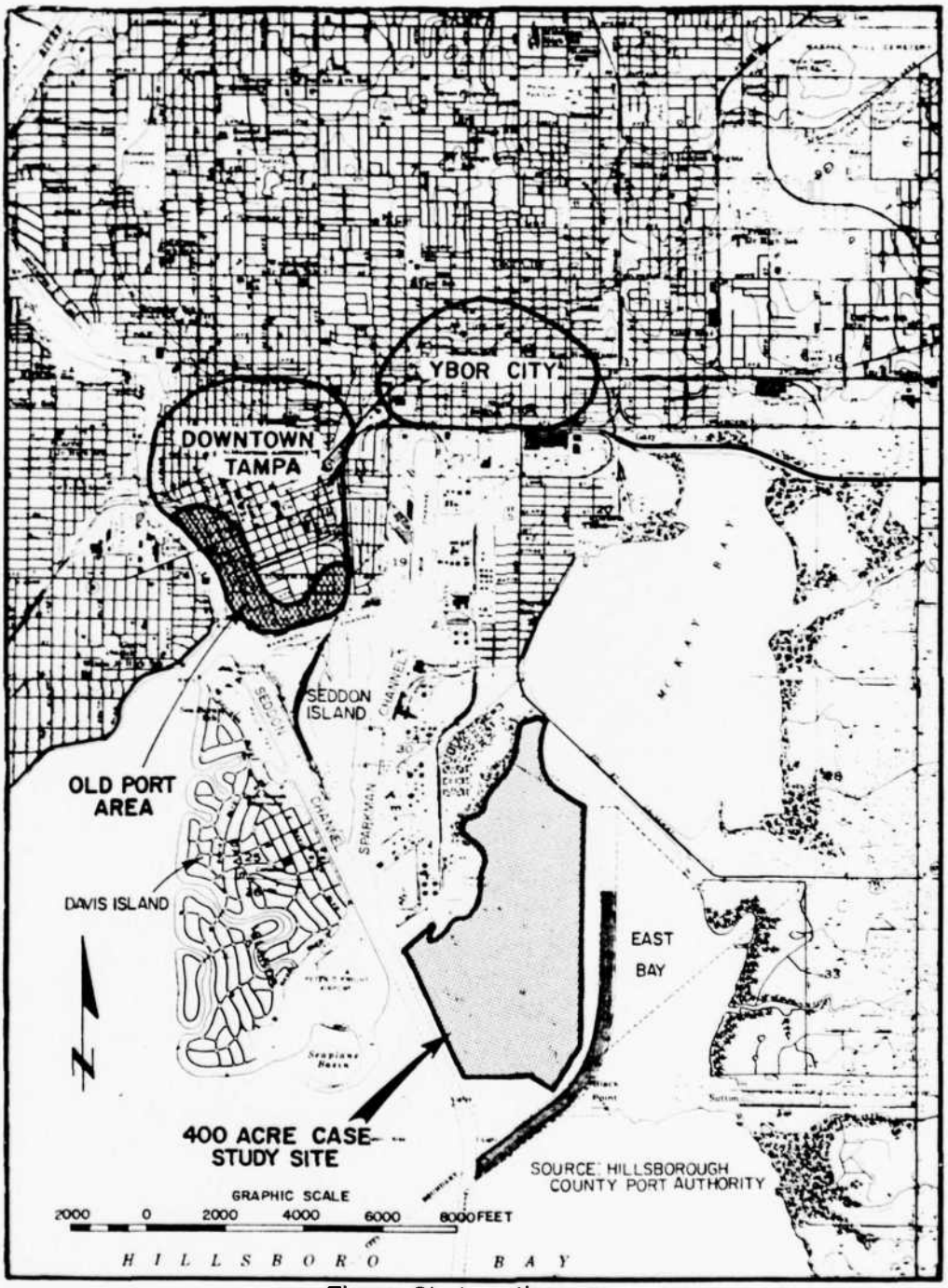

Figure GI. Location map

stable material at the interior. Although the Harris report* provides extensive engineering data, TPA indicated that no specifications were followed in the placement, but were left to the responsibility of the field personnel.

Environmental setting

5. Hookers Point extends south from the urbanized area of the City of Tampa and is surrounded on the remaining three sides by water. On the east, Hookers Point is bordered by the East Bay; on the south and west it is bordered by the Sparkman Channel and the Seddon Channel. All three water areas have been deepened to accommodate major shipping. Two major landfill areas have been created west of the site: Seddon Island, a port-related industrial area; and Davis Island, a combination of residential, commercial, and industrial uses.

6. The dredged material activities are under the control of the Environmental Management Program initiated by TPA, and are subject to the controls of the Coastal Zone Management Act.

7. The undeveloped portions of the site support considerable wildlife as an ephemeral activity which is a characteristic of recent dredged material sites elsewhere in the Bay.

Site development

8. The 162-ha (400-acre) case study portion of Hookers Point has been planned as a major deepwater port facility. Land on the perimeter, which accommodates deepwater vessels, has been subdivided to lease to a variety of terminal activities (e.g., general cargo terminals and storage). Bulk storage facilities, general purpose industrial sites, and a site for the city's sewage treatment plant are located within the interior areas of the site. Presently, a number of terminal facilities have been completed, and construction of the sewage treatment plant is nearing completion.

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* Frederick R. Harris, Inc., "Tampa Harbor - Florida 43 ft Dredging Project, East Bay/Port Seddon Channel Cut "C"," Oct 1972, Tampa, Florida, prepared for Tampa Bay Authority, Tampa Bay, Florida.

9. The site is adequately served by municipal water and sewer systems and has sufficient public utilities to support the proposed development. It possesses an extensive network of rail lines and has direct vehicular access to metropolitan Tampa (to the north) and to areas on the eastern portion of Hillsborough County via a causeway (to the east). The internal road system provides access to all parcels.

10. The land is owned and held in public trust by TPA, which in turn leases land to private interests. Buildings and improvements constructed by the leasees will become the property of TPA upon termination of the leases.

Surrounding area development

11. The land contiguous to Hookers Point is used for a combination of older, port-related industrial development (along YBOR Channel), and older, low-density, low-value housing which is part of the Hispanic community.

12. Seddon Island, the landfill immediately west of the site, is heavily industrialized. Davis Island, further to the west, was once considered a prestigious residential area. Although some decline has occurred within recent years, a revitalization is currently underway. A private air field is located on Davis Island adjacent to Hookers Point. It provides a buffer between the residences and the industrialized port activity. The older portion of the TPA's land on Hookers Point contains shipyards, boat storage facilities, and the TPA's administrative complex.

Site zoning and area land use plans

13. Hookers Point and the City of Tampa are subject to the planning requirements of the Hillsborough County Local Government Planning Act of 1975, which requires a comprehensive plan for all jurisdictions within the County and further requires that development comply with the plan provisions. In compliance with this legislation, the TPA prepared a Master Plan of Development for the entire port which has been made part of the Horizon 2000 Plan -

the adopted comprehensive plan for the County. The TPA Master Plan specifies that the Port of Tampa "should efficiently serve the foreign and domestic commerce of the United States, the State of Florida, and the geographic areas contiguous to the Port and fulfill the responsibilities of the Port Authority in management of the submerged land." The Master Plan further requires compliance with the provisions of the Coastal Zone Management Plan that was developed by the State of Florida, and requires that development must be responsive to environmental conditions. These constraints limit the amount of land available for commercial and industrial purposes and limit the availability of deepwater shipping activities.

14. The long range policy of the TPA as stated in the Master Plan is to increase the flow of traffic through the Port by promoting harbor deepening projects, modernization of facilities, and creation of special facilities to accommodate the shipping opportunities. These goals will be accomplished through a combination of public and private actions. For example, the private sector is assisted by use of special purposes tax-free municipal bonds. A specific TPA objective is to support the phosphate mining activities in Tampa, which constitute a major component of the area's economy.

15. The Master Plan for the Port proposes the relocation to the Hookers Point area of several older port facilities that are not on deepwater channels. Proposals for land transportation systems call for more direct access to the area's interstate highway system and elimination of grade crossings.

Area trends

16. A comprehensive site development plan that is supportive of the Master Plan for Development and current zoning has been prepared, based on the economic projections and trends for maritime-related activities. The TPA has been successful in marketing much of the available land in the Hookers Point area and is currently involved in a more intense marketing program to complete the project. For example, a study to determine the feasibility of creating cargo

terminals along the East Bay has been conducted which indicates a total construction cost of $13 million.

Valuation Estimate

Review of available measures of value

17. Table G1 identifies those values that were considered to be relevant to the case study because (1) they appeared in the available documentation; (2) they were identified in interviews with local officials; or (3) they were considered appropriate by the case study investigators. The values are listed according to owner and user groups and a community grouping that includes all others who may benefit. The table also indicates whether the benefit is considered to be direct, indirect, tertiary, or intangible, and contains a rationale for consideration as a potential value.

18. It should be noted that this table was compiled after work was completed regarding development of specific values for each. Therefore, the list has been pretested in part.

Associated benefits/impacts potential

19. The previous section identified those values that could be considered in evaluating the productive use of a dredged material site. This section discusses how these values can be quantified, states the results of other studies directed at specific value quantifications, and in some instances actually computes value based on certain assumptions made by the investigators. In each case, the value is related to the owner, the site users, or the community, as described in Table G1.

Value to owner: Tampa Port Authority

20. Value of created land. A recent appraisal was made for the TPA by the Knight Appraisal Company. Using acceptable techniques, average land value was estimated at $160,600 per ha ($65,000 per acre). This assessed value also was established by the County Tax Office. This value, applied to the estimated 162 ha (400 acres) formed by post-1967 dredged material activities, results in a land value of

$26 million ($160,600 per ha x 162 ha ($65,000 per acre x 400 acres)).

21. A review of assessment and sales experience (comparative property analysis) of private port facilities in Tampa could be performed to verify this appraisal. Such an effort is not warranted for this case study.

22. Value increase to original land. The lands initially purchased by the TPA were developed and leased to a number of port-related facilities, including a shipyard. Because these are now part of a larger deepwater port, their value has increased.

23. Two techniques for establishing value were explored and found appropriate, although not pursued:

- Assessment comparison. Present assessed values from the County Tax Office records can be compared with previous assessed values to establish value increases. These comparisons must discount the effect of inflation and changes in assessment practices. This information is available in the assessment office.
- Value comparison. The older port facilities are also leased. As existing leases expire, they have been renegotiated at higher values. The capitalized value of these leases can be computed to determine land value increases. (Note: TPA indicated that increases have not kept pace with land value increases. Therefore, this method may not yield true value. TPA could probably identify which renegotiations have been "arm's length".)

24. Value of percentage lease increase. The TPA has several leases related to revenue and/or profit. For example, the shipyard lease stipulates payment as a percentage of the volume/profit. Because larger and more ships are occupying the Port (dredged material site), shipyard activities are increasing; thus, lease proceeds are increasing. A comparison of revenue prior to deepwater dredging to current revenue will establish the increased revenue to TPA.

25. Fulfillment of the Tampa Port Authority Charter. This was identified as an intangible benefit and therefore was not quantifiable, with the exception of the TPA Charter commitment for environmental management of the Bay. A portion of the TPA revenues

is used for these purposes. Presently, a fund of $5 million is earmarked for creation of a bulkhead within the Bay to contain dredged material from future maintenance activities.

26. The measure of other TPA Charter commitments would be recognition that the dredged material site did achieve certain goals (e.g., creation of a deepwater port/terminal).

27. Revenue from operations. The TPA collects a composite fee from leasees based on the value of the land, dockage charges, and wharfage charges. The average annual yield from these three sources has been computed to be $12,800 per ha ($5,200 per acre). Using the 162 ha (400 acres) created by the subject fill site and multiplying it by the computed annual yield, TPA receives an annual income of approximately $2 million. This amount, which is shown in the TPA 1976 Annual Report, is the basis for TPA operating at a zero base budget.

28. Value of improvement reverting to TPA. All facilities constructed on the site become the property of the TPA at the termination of the lease. Although these improvements will have been fully depreciated if the lease extends to its full term, early termination can result in TPA ownership of valuable buildings.

29. Operational efficiency. The TPA administrative and maintenance facilities are located at Hookers Point. Expansion of the Port allows consolidation of maritime activities under TPA jurisdiction, and thus operational efficiency and improved control are possible. Quantification is not practical for this intangible benefit.

Value to users: on-site maritime businesses

30. Profit from operations. Port tenants (on-site maritime business) will benefit from the ability to conduct business at a deepwater port. Although the figures quantifying this value were not developed for the case study, the methodology that could be used is described below:

- The site development plan can be used to compute the extent of development that the site can accommodate - terminals, dock storage areas, office buildings, etc. Because some of these facilities are in use, the

operators can provide data regarding volume of business and/or profit. The figures can be used to establish ratios of business volume to square footage. This ratio can be applied to project development that the site will accommodate.

- If the facility operators are unwilling to provide these data, standard dollar volume per sq ft figures are available through various businesses and census documents, by type of activity.

Value to users: off-site maritime related businesses

31. Profit from operations. The industries supporting the Port --mining, manufacturing, transport, communications, and wholesale trade--are subject to annual analysis by various organizations which compile business statistics. These figures, used in a TPA-sponsored study, showed that the off-site industries had a 44 percent increase in business activity following completion of the Port. Not all of this increase can be attributed to the Port development, but it would be possible (but time consuming) to compute the amount of increase attributed to the Port project.

32. It should be noted that this 44 percent increase and other subsequent monetary impacts described herein relate to the entire 405-ha (1000-acre) Hookers Point area and other port facilities in Tampa Bay. Data were not available to allow the investigators to identify impacts due to the 162-ha (400-acre) case study site specifically.

Value to user: Tampa sewage treatment plant

33. Availability of noncontroversial site. Elimination of controversy over selection of a sewage treatment plant site and the resultant time delays is considered to be a benefit to the city, although clearly intangible.

34. The reduction in cost of sewer interceptors, if the treatment plant were to be located in outlying portions of Tampa, would be a quantifiable value. The City Engineering Department can identify alternative sites considered, estimate the location and size of new interceptors that would be required, and make a rough estimate of the cost of the additional sewers and pump stations.

Value to the community: local government

35. Tax receipts. The County assesses real estate taxes on land and improvements. The County Assessment Office uses the $160,600 per ha ($65,000 per acre), or $26 million (same as the PTA appraisal) value for the land.

36. Although the assessment records can be researched to determine actual improvement value, a more generalized approach has been used. If the site area (162 ha (400 acres)) is reduced by 20 percent for necessary rights-of-way, circulation, etc., the net land to be built upon is 130 ha (320 acres). Assuming that 20 percent of this land will be used for buildings, 297,280 sq m (3.2 million sq ft) of buildings will be constructed. Using an average construction cost of $215 per sq m ($20 per sq ft), this yields $64 million in improvements.

37. Based on an approximate tax rate of $1 per $100 of market value, the annual tax revenues from land and improvements would be $900,000 ($64 million + $26 million x 1 percent).

38. Tax on revenues (license fees, etc.). The fees paid to local government are limited to business taxes, building permits, etc. Although a benefit, the fees are considered insignificant and have not been computed. The principal fees are those from dockage and wharfage collected by TPA.

39. Tax on business and employee income. A study completed by the University of Florida for TPA* reported that in 1967 port-related wages in the eight-county Tampa area totaled $210 million. The study further translated this into $16 million in tax revenues. The methodology for allocating port-related wages considered all employees totally involved in waterborne commerce and percentages of employees of those firms only partially involved (e.g., 25 percent of the employees of a trucking firm with 25 percent of its business

* University of Florida International Marketing Resource Center, College of Business Administration, "Economic Impact of the Tampa Port," Sept 1968, Gainesville, Fl.

originating or terminating at the port would be included in the computation).

40. Tax on redeveloped waterfront area. Creation of the Hookers Point Port allowed for relocation and/or elimination of the port-related activities formerly at the edge of downtown Tampa. This waterfront land is potentially valuable for high-density residential development, hotels, convention centers, etc. The following describes an approach to computing a value increase:

- The land use maps and field investigation indicated that between 20 and 40 ha (50 and 100 acres) would be available for redevelopment; 30 (75) is used as an average. Using a residential density of 99 units per ha (40 units per acre) and a land value of $5,000 per unit, the redevelopable land would have a value of $15 million (average x units x cost per unit). Assuming a $25,000 per ha ($10,000 per acre) value for industrial land (the previous use), the net increase in land value would be over $14 million.
- If 300 dwelling units were constructed at an average cost of $20,000/unit, the project would create over $60 million in new taxable property. The annual tax from the redeveloped land would be $750,000 ($60 million + $15 million at a tax rate of $1 per $100 of valuation).

41. Fulfillment of local goals and objectives. The City's Comprehensive Plan contains goals and objectives relating to new industrial development and downtown revitalization. The accomplishment of such goals generally occurs in small increments over extended periods of time. Creation of large sites to accommodate the Port activities and opportunities for massive waterfront redevelopment would accelerate accomplishment of the area's goals--a definite, but intangible benefit.

Value to the community: area labor force

42. On-site jobs. Although no statistics were available regarding the number of jobs expected on-site, the projected square footage of new development (compared with national averages for employment per sq m (sq ft) for each type of use) would be the measure of jobs created. Similarly, average wages by type of activity could

could be identified to indicate the quality of new jobs.

43. Off-site jobs. The University of Florida study* estimated that wages of $210 million were earned in 1967 as a result of all Port facilities. This amount represents one seventh of the wages earned in the eight-county area. This computation was based on a survey of the Port and port-related businesses.

44. Off-site jobs/economy related. The establishment of a deepwater port provides the Tampa area with significant economic activity that would otherwise not exist. This will have a new benefit to the area economy. However, due to the number of factors that must be considered in estimating this impact, such a computation is beyond the scope of this case study.

Value to the community: port related business

45. Profit from operations. Profit from operations is a value indirectly related to the dredged material site. The University of Florida study** used an approach initially developed in conjunction with a 1953 Delaware Port Authority Study (also referred to as the "Philadelphia Approach") to estimate value per ton of shipping. It was estimated that the movement of cargo through Hookers Point Port generated revenues of $69 million in 1967. This is only one component of the economic benefits attributed to the Port. Since tonnage has doubled since that time, the current annual contribution could be considered to be $140 million.

Value to the community: downtown interests

46. Elimination of blight. Downtown Tampa is surrounded on three sides by water. Prior to development of the Hookers Point area, the waterfront was used almost entirely for maritime-related activity. This created an interesting, but unsightly vista from downtown property, and denied the downtown area a waterfront location. Redevelopment of the waterfront area offers waterfront vistas and more attractive views from the interior portion of the downtown area.

*University of Florida International Marketing Resource Center, ibid.
**Ibid.

47. Waterfront redevelopment contribution to downtown economy. The spendable income of potential waterfront residents and/or tourists can be computed and related to improved downtown businesses. However, these computations are complex and are not appropriate for this case study. Rather, the awareness that the redevelopment will occur should be considered an intangible benefit.

48. Increased land value - downtown interior. Because of the increased economic activities that exist in downtown Tampa, the value of downtown land should increase. Again, quantification would require complex computation that is considered inappropriate for this case study.

Table 61

Measures of Value

Beneficiary	Measures of Value	Type	Comment
Owner - Tampa Port Authority	• Value of Created Land	Direct	Although Bay area was owned by TPA, dredged material has created marketable land - a valuable asset.
	• Value Increase to Original Land	Indirect	Original holdings had no deep water access. Expanded facility increased value of original land.
	• Value of Percentage Lease Increase	Indirect	Expanded port provides greater business potential to shipyard and others that pay TPA a percentage of volume/profit
	• Fulfillment of TPA Charter	Intangible	TPA could justify the cost of deep water dredging by the revenue produced by the port. A portion of these revenues are set aside to fund TPA environmental management activities.
	• Revenues from Operations	Direct	This is TPA's primary source of income.
	• Value of Improvements that will Revert to TPA	Tertiary	All improvements become the property of TPA upon termination of the lease (most are 50 years+). Although improvements may be fully depreciated at the end of the lease, ownership in the event of early cancellations may be significant.
	• Operational Efficiency	Tertiary	Expanded port at single location would increase operational efficiency.

(Continued)

Table G1 (Concluded)

Beneficiary	Measures of Value	Type	Comment
Users - On Site Maritime Business	• Profit from Operations	Direct	The deep water terminals offered opportunity for business not previously possible in Tampa.
Users - Off-Site Maritime Business	• Profit from Operations	Direct	The added maritime activity supports increases in off-site support business.
Users - Tampa Sewage Treatment Plant	• Availability of Non-Controversal Sites	Intangible	Locating sewerage works in urban areas is difficult. Purchasing a site in undeveloped areas requires costly interceptor sewers.
Community - Local Government	• Tax Receipts - real estate	Direct	Assessed at fair market value, even though the owner is a public agency.
	• Tax on Revenues (license fees, etc.)	Indirect	Although primary recipient is TPA, other fees are generated.
	• Tax on Business and Employee Income	Tertiary	Deep water port reportedly has allowed several industries to expand.
	• Tax on waterfront Area	Tertiary	New port allows redevelopment of waterfront for higher value use, creating higher tax base.
	• Fulfillment of Goals/ Objectives (e.g., meets land use objectives, eliminates traffic congestion, and expands industrial development potential.	Intangible	Land use plan proposes residential/resort activity in area of downtown - formerly occupied by outmoded port facilities. Land use plan proposes expansion of industrial use at Hookers Point. Relocation of port from downtown eliminates congestion from downtown, e.g., railroad grade crossing, truck use of downtown streets. Plan objective is to expand Tampa area economy by becoming major shipping center.
Community - Area Labor Force	• On-Site Jobs	Direct	Although shipping is not "labor intensive", jobs are created.
	• Off-Site Jobs	Indirect	Support business will include more labor intensive jobs.
	• Off-Site Jobs/Economy Related	Tertiary	Port-related businesses have effect on total area economy, resulting in job increase.
Community - Port Related Business	• Profit From Operations	Indirect	Business would not otherwise exist.
Community - Downtown Interests	• Elimination of Blight	Intangible	Water views replace unsightly, outmoded, downtown port activities.
	• Waterfront Redevelopment Contribution to Downtown Economy	Tertiary	Reuse of former port areas in downtown with housing/tourist oriented development improves market for downtown commercial uses.
	• Increase Land Value - Downtown Interior	Indirect	Land with water views will have high value. Land adjoining former port uses will increase with new waterfront development.

APPENDIX H: HOQUIAM CASE STUDY
HOQUIAM, WASHINGTON

APPENDIX H: HOQUIAM CASE STUDY
HOQUIAM, WASHINGTON

Project Description and History

Physical characteristics

1. The subject site is owned by the Port of Grays Harbor, the project sponsor. It is located on the west bank of the Hoquiam River at its point of confluence with the Grays Harbor Estuary, and covers approximately 18 ha (45 acres). Figure H1 illustrates the location of the project site in Hoquiam, Washington, and shows its relationship to the rest of Grays Harbor.

2. The project site has received dredged material, or borrow fill, four times prior to the current project; including hydraulic maintenance dredgings in 1964, and a borrow operation undertaken by the Port of Grays Harbor in 1967 that raised the site's elevation; changing the site from mud flat and tideflat to salt marsh.

3. Co-applicant for the federal dredge and fill permit with Port of Grays Harbor was Kaiser Steel Corporation. They proposed to establish a facility for the manufacture and assembly of offshore drilling platforms for exploration and extraction of oil and natural gas from the continental shelf in Alaska's Northern Gulf.

4. In October of 1976, Port of Grays Harbor constructed a 1003-m (3300-ft) dike along the state's inner harbor line with a crest elevation of +5.5 m (+18 ft) mean lower low water (mllw). It was built with approximately 61,200 cu m (80,000 cu yd) of quarry rock utilizing a semipermeable design to allow some initial water seepage from the dredged fill back to the harbor. This reduced initial outlet weir flow rates, and as the dredged material fills these voids the dike will become impermeable. About 199,000 cu m (260,000 cu yd) of dredged material was deposited on the site beginning in January of 1977. It was obtained through maintenance dredging and placed hydraulically. The site is essentailly dewatered now and the next step will be to add an overlay of about 69,000 cu m (90,000 cu yd) of topsoil and

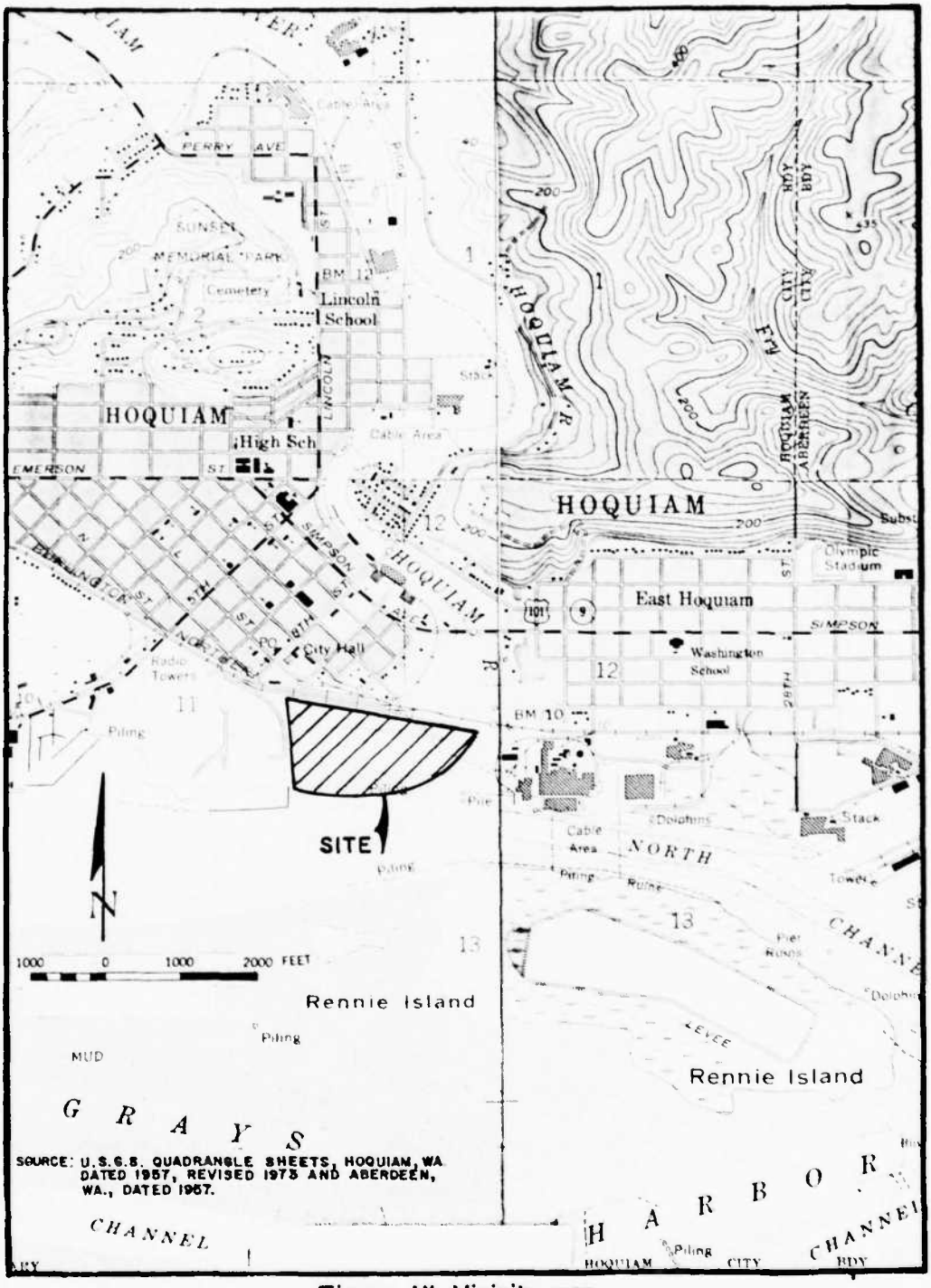

Figure H1. Vicinity map

crushed rock as the finished surface.

Environmental setting

5. The site covers 18 ha (45 acres), of which 15 ha (36 acres) were classified as wetlands prior to filling.

6. Water quality in the Grays Harbor Estuary has been a major concern since the 1930s. Natural processes and human activity have contributed to the continuing water quality problem, with industrial discharges having a major impact in the inner harbor. Water and sediment samples analyzed by Washington State Department of Ecology in 1974 and 1975 showed significant concentrations of both heavy metals and pesticides, and the concentration of some pesticides was higher than levels reported to be harmful to various marine organisms.

7. Marine life in the Estuary is significant and diversified. Much of the Estuary's primary productivity occurs in the shallow intertidal flats and associated saltmarsh and eelgrass communities. Energy transfer through food webs links these areas to all the flora and fauna of the harbor.

8. The Grays Harbor Estuary is utilized by at least 52 species of fish during various stages of their life cycles. This includes the commercially important English sole and starry flounder, as well as an abundance of many other species. Anadromous fish in the estuary include chum, coho and chinook salmon, and steelhead and cutthroat trout. Grays Harbor is one of only four major habitats for sturgeon remaining in the state of Washington. Because they prefer lower salinity water, it can be assumed that they utilized the project site prior to filling. Over 300 species of birds occur in the harbor area, including two classified as endangered by the U.S. Fish and Wildlife Service.

9. There are some environmental constraints associated with this site, or more generally, with this type of project. In general, the removal of an area of primary productivity from the estuarine food web will introduce effects throughout the entire harbor community. There will also be a reduction in water quality in terms of increasing

the turbidity, nutrient levels, and toxic substance levels as a direct result of dredge and fill placement procedures.

Site development

10. The development of this site is a two-stage effort. Port of Grays Harbor has assumed responsibility for diking, filling, and road building. The second stage includes site improvements and construction by Kaiser Steel, which has just renewed its option on the property through June of 1978. Kaiser's facilities on the site would include a railroad siding, a parking area, an office building, service buildings, utility lines, a marine launchway, and a pile-supported barge terminal.

11. Kaiser Steel also holds a lease option on a larger site in Everett, Washington. Since Kaiser would like to utilize a site of about 41 ha (100 acres) in size, it is possible Kaiser will decide not to exercise the lease option in Hoquiam. Should this happen, the Port will seek another water-dependent user for the site.

Surrounding Development

12. At the time of the Port of Grays Harbor/Kaiser Steel Corporation application in 1975, all of the land adjacent to the proposed fill site had been developed or annexed for industrial use.

13. Immediately to the north of the site are the Burlington Northern Railroad yards, depot, and roundhouse. North of Burlington Northern is the Central Business District of the City of Hoquiam. The project site is bordered on the east by the Hoquiam River, with the ITT Rayonier pulp mill located across the river. The main navigation channel of Grays Harbor lies to the south. West of the site, Anderson-Middleton Company, a forest products firm, has a dry-land log storage and sorting area. Numerous industrial land uses exist to the west along the main navigational channel.

Site zoning and area land use plans

14. The subject site is zoned Heavy Industrial (IH), as indicated in the 1966 Hoquiam Zoning Ordinance. The zoning ordinance states the purpose of this zone to be "... exclusively for manufacturing, processing, fabrication and assembly of products or materials,

warehousing and storage, and transportation facilities and rolling stock marshalling and storage." The land to the west is also zoned IH, with the parcels directly north being zoned Light Industrial (IL). All of the past uses and proposed future uses of the site have been consistent with the existing zoning.

15. Three local land use plans have a bearing on the site development. They are the Shorelines Management Master Program of the City of Hoquiam; the Port of Grays Harbor Comprehensive Development Plan; and the City of Hoquiam Comprehensive Plan - 1976. Industrial development of the site is consistent with each of these plans as well as with regional plans.

Area trends

16. The economy of Hoquiam and of Grays Harbor County is largely dependent upon the forest products industry. The Overall Economic Development Program for Grays Harbor County (OEDP) states that one of the leading indicators of economic activity in the area is the volume of cargo shipped in and out of the Port of Grays Harbor. Forest products account for 90 percent of the Port's entire trade by volume.

17. The labor force in Grays Harbor County varies from 22,000 to 24,000 persons within any given year. The area has a chronic and persistent high level of unemployment that consistently exceeds state and national averages. Fluctuations in unemployment occur due to the seasonal nature of many of the area's occupations. Figures for 1976 varied from a low of 6.7 percent unemployment in September, to a high of 11.0 percent in March.

18. In an effort to reverse this trend, and effectuate some long-term growth in the economic line of the area, the Port Authority is putting greater emphasis on attracting industries which are water dependent. Of primary desire in this scheme is an increase in shipping activities. Grays Harbor is seen as having a potential long-term growth in shipping activities for two reasons:

- It is one day closer to the Orient, relative to Puget Sound, because of its ocean proximity.

- Declining availability of waterfront industrial land in the south Puget Sound area suitable for development is placing greater demand on Gray's Harbor and similar areas on the Washington coast.

Land Use Potential Considered for Valuation

19. The soils investigation of the site indicated an upper layer of 15 to 19 m (49 to 63 ft) of compressible sandy silt and a second layer comprised of about 31 m (100 ft) of dense to very dense, fine to medium sand and gravel deposits. It was felt that compression of the subsoil would occur after filling, but that this would not mean that piles would be required for structural support.

20. Land use considered for valuation purposes was industrial. This was based on factors indicating that the site is situated in an area of strong industrial development activity; is sized to allow optimum industrial development; and is proximate to similar uses, both developed and undeveloped. (See Table III).

21. Since the subject property lies in an area uniformly zoned for heavy industrial use, there will be no problems with land use consistency. Zoning is optimum for use intensity of an industrial site.

22. It appears that since Kaiser Steel Corporation holds the lease option on the site and no apparent constraints are imposed by the site itself, the site will most likely be utilized at or very near its potential.

Valuation Estimate

Review of available measures of value

23. The value potential of the subject property is site inherent; i.e., it will accrue to the site because of its use and development potential. The fact that the site and surrounding sites are zoned for heavy industrial usage serves to confirm its value as an industrial site.

24. Sales of industrial sites in Hoquiam during the last two years have been nonexistent. However, assessment data for comparable properties adjacent to the site and in the surrounding area were readily obtainable. The data were adjusted for 1976 by the assessor's office and, in turn, adjusted by the case study analyst for 1977 to reflect the trends indicated by the assessor and realtors in the area.

25. Land value data were available on certain adjacent and proximate sites selected for comparability purposes. These sites were developed, but in all cases only a minor portion of the total site was improved. Assessment data was utilized, since sales activity for industrial land was not available during the last two years. Assessments on industrial land were from 6 to 9 months old.

Demand estimate

26. The Grays Harbor/Hoquiam area has experienced a slight increase in population and employment over the period 1970 to 1976.

27. Land demand for industrial sites is not strong, but is increasing with respect to historical trends. Three new sawmills have begun operations in the area over the last four years, a sizeable increase over previous activities. It is anticipated that as industrial sites in Puget Sound become more scarce, there will be an increase in demand in the Grays Harbor area. It is also expected that as trade with the Orient increases, Grays Harbor's advantage of proximity (one day's travel time closer) will become a significant consideration in industrial development, due to increasing costs of shipping both bulk and finished commodities. (Table H2).

Site stratification

28. Comparables selected for valuation purposes were four developed industrial sites, one adjacent to and three within 0.4 km (0.3 mile) of the subject site. The first site is improved as a papermill which processes scrap logs. The improvements cover approximately 30 percent of the total site. The second comparable

is a manufacturing facility for sheet metal goods. The third site is developed as a manufacturing facility for large fishing boats. In both the latter two sites, improvements comprise less than 30 percent of the total sites. (Table H3).

29. The fourth site is a plywood manufacturing plant which covers about 50 percent of the site.

30. Attractiveness measures appear to provide a good basis for deriving a utility comparison between the subject parcel and those parcels selected as comparable for valuation purposes. The site is also estimated to have equal utility to comparable parcels with respect to the range of measures of attractiveness utilized.

Value estimate

31. The value of comparables to be utilized in this estimate has been derived at $13,200 per ha ($5,340 per acre), based on comparables of equal utility and similar use potential. Land values of comparables available were 1976 assessments. These were adjusted upwards 22 percent to account for inflationary trends in the local land values. No apparent site factor adjustments have been determined for the subject site. (Table H4).

32. In this case, the incremental site value or benefit attributable to the dredged material containment site is on the order of $11,100 per ha ($4,500 per acre), based on a 1974 assessment of $2,000 per ha ($800 per acre) for tidal flatlands.

Associated benefits/impacts potential

33. Indirect values will accrue as a result of the site's development. Potential employment opportunities for the local community are important in Hoquiam, as unemployment is relatively high in the area and much of the area's employment is seasonal. If Kaiser Steel proceeds with construction of the proposed manufacturing and assembly facilities on the site, it will be a step towards diversifying Grays Harbor's economic base, which is now dependent on the forest products industry.

34. Additional employment will also generate benefits to the community in terms of increased local sales revenue and sales taxes

and possible impetus for additional growth in the commercial service sector of the community.

35. Hoquiam has significant limitations on its ability to handle large volumes of heavy transport traffic. This problem will be increased by the development of additional industrial firms.

36. Present congestion is already encouraging forest products firms to examine processing or shipping facilities in other areas. Additionally, heavy industrial traffic through the central business district interferes with commercial uses. Capital expenditures by the community may be required to alleviate this type of problem. Table H5 summarizes the effects of site productive use.

Table 61
Use Potential Estimation

Constraint	Actual	Impact
Soil Condition		
Gravel	Borings indicate a layer of sand and gravel.	Final total settlement as a result of compression of the subsoil will be in the range of 0.5 to 2.5 in (1.0 to 1.0 ft).
Coarse Sand		
Fine Sand	Gray sandy silt comprises top layer.	Stabilization of the lower portion of the site might be required at building locations. Techniques recommended include sand drains, impact densification or filter fabric with several feet of surcharge material.
Silt	Second layer is compressible sandy silt.	
Clay		
Other		
Foundation Constraint		According to the soils investigation report, light-to moderately-heavy structures can be supported on the fill without piles after an initial settlement and dewatering period of about three months.
Spread or Mat	Adequate for most cases.	
Pile		
Pier		
Allowable Land Use (Per Land Use Plan)		The site is located in an area zoned "IH" or Heavy Industrial, as indicated in the Ideo Angular Zoning Ordinance.
Open Space		
Recreational		
Agricultural		
Residential		
Commercial		
Industrial	Maximum usage allowed.	
Public		
Zoning Intensity (Per Zoning Ordinances)	Heavy Industrial	This category would permit high intensity industrial use such as manufacturing or mill activity.
Estimation		
Highest and Best Use	Heavy Industrial	The site will most probably be utilized to its full potential due to Kaiser Steel Corp.'s plans for the site. If Kaiser does not exercise its lease option, it is likely that Port of Otaya Harbor will find another water-dependent industrial use for the site.
Actual Likely Use	Heavy Industrial	
Utilization Potential		
. Underutilized		
. Overutilized		
. To Potential	Most likely occurrence	

Table H2
Demand Estimate

Parameter	Indicator	Impact
Building Permit Activity by Land Use, as per Table H1	No., Year-to-Date (1976) 11 Industrial Permits	Activity has been mostly minor development type. No strong large scale development is evident at this time.
	Total Valuation $385,000	
or Sales Activity by Land Use, as per Table H1	No., Year-to-Date	
	Average Value	
Economic Growth Indicators	1970 to 1976 Average Annual Percent Increase	Both the city of Nooksack and the Port of Grays Harbor have experienced fluctuations in population over the last six years. Net increases in population have been minimal. A small increase in number of employed has occurred although this too has fluctuated.
Added Employment	About 0.9% per yr average	
and/or Added Population	County: +1.6% over 6 yr City: -0.2% over 6 yr	
and/or Sales Tax Revenue Increases		
Community Development Indicators	Year-To-Date	Moderate activity given overall size of area.
No. of New Firms	Two in the last year	
or Urban Renewal Activity		

Estimated Demand Intensity	Short Term	Long Term	Impact
Little Activity	Little at present		Increased demand for industrial land is anticipated due to shortage in Puget Sound and ocean location of Port of Grays Harbor. Any strong demand, at least 5 yr off.
Average Activity		Probable	
Strong Activity			

Table H3

Stratification Estimate

Parameter	Site	Comparables
Physical Condition		
Basic Condition of Improvements (If Any)	N.A.	Good
Approximate Age of Improvements (If Any)	N.A.	3 to 6 yrs
Attractiveness		
Accessibility to Site	Good access roads	Same
and/or Accessibility to Transport	Excellent access to both rail and water transport.	Same
and/or Service Availability		
and Proximity to Similar Activities	Good proximity to other industrial activity, especially forest products.	Same

Estimate of Site Stratification	Impact
Equal Utility to all Comparables	Comparables selected for valuation purposes appear to have utility equal to the subject property with respect to measures of attractiveness.

Table H4
Valuation Estimate

Parameters	Comparables				
	No. 1	No.2	No. 3	No. 4	No. 5
Use	Heavy Manufacturing	Heavy Manufacturing	Heavy Manufacturing	Heavy Manufacturing	
Value of Comparables (1976)	$12,600/ha ($5,000/acre)	$8,600/ha ($3,500/acre)	$9,900/ha ($4,000/acre)	$12,400/ha ($5,000/acre)	
Price Adjustment to Estimate Yr +22%	22% - to $15,100/ha ($6,100/acre)	22% - to $10,600/ha ($4,300/acre)	22% - to $12,100/ha ($4,880/acre)	22% - to $15,100/ha ($6,100/acre)	
Average Value of Comparables	$13,200/ha ($5,340/acre)				
Average Value Adjustment	Percent Adjustment		Impact		
Demand Adjustment	None				
Utility Adjustment					
Special Constraints	None				
Site Value					
Adjusted (Average Comparable Value Plus Sum of Value Adjustments)	$13,200/ha ($5,340/acre)				
Raw (Prior to Dredged Material Containment	$2,000/ha ($800/acre)		Tidalflats valued high because of relative scarcity of availability suitable for filling.		
Value Change (Estimated Site Value less Raw Site Value	$11,200/ha ($4,540/acre)				

Table #5

Benefit/Impact Potential Matrix

Benefit	Public	Private	Site	Adjacent Site	Community	Comment
Potential increase in employment opportunities in the industrial sector of the local economy		X			X	Unemployment rates in the industrial sector are relatively high, and much of the work is seasonal in nature. Development of industrial sites that are not lumber oriented could significantly alleviate this situation.
Increases in local sales tax revenues	X				X	The development of non-seasonal employment in the industrial sector would contribute to an expansion of sales tax revenues, both in a relative and absolute sense, as spending would not only increase, but become more stable throughout the year.
Additional demand in the commercial sector of the local economy.		X			X	If spendable income increases because of a more stable employment base, the level of commercial activity could also expand to meet the increased demand. This could result in more jobs in the commercial sector as well as physical expansion.
Increase in community assessment base	X				X	Development of industrial activity would result in increased land values for this type of land use, which would in turn result in an increase in the community's assessment base and hence property tax revenue base.
Impact						**Comment**
Only one significant impact has been identified - that of increased traffic congestion from heavy transport vehicles	X	X			X	Maguire is presently suffering from significant circulation constraints on heavy transport traffic. Development of the subject site and other sites in the proximate area would add significantly to the volume of local truck traffic. This would result in greater congestion problems and possibly require significant local investment in circulation system improvements.

APPENDIX I: PATRIOTS POINT CASE STUDY
CHARLESTON COUNTY, SOUTH CAROLINA

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CHARLESTON COUNTY, SOUTH CAROLINA

Project Description and History

1. The Patriots Point case study involves the use of a former dredged material disposal site for educational, cultural, and recreational purposes. The site is planned as the Patriots Point Naval and Maritime Museum.

Physical characteristics

2. Patriots Point is a 184-ha (454-acre) parcel of land located about one mile east of downtown Charleston, South Carolina, across the Cooper River. The site is bounded to the north by U.S. Highway 17, to the east by the Bay View Acres residential subdivision, and to the south and west by the Cooper River and Charleston Harbor. Figures I1 and I2 show the vicinity map and location map, respectively, for the Patriots Point site.

3. The site is surrounded by an earthen dike which rises 4.6 to 6.1 m (15 to 20 ft) msl. The dredged material that fills the site is a silty loam, and it supports a lush vegetative growth. The topography is basically flat; drained by ditches around the perimeter of the property.

4. Soil borings indicate that the marl stratum that underlies the Charleston area is between 12.2 to 24.3 m (40 to 80 ft) beneath the surface at the site. Marl makes an excellent foundation material, displaying cementlike characteristics when exposed to air. The silt and sand overburden provides adequate support for roads, parking, and small buildings.

5. At its northern end, Patriots Point borders U.S. Highway 17, a four-lane roadway. The intersection of the Patriots Point access road and U.S. Highway 17 is controlled by a traffic signal, making access to site both quick and safe. Just north of this intersection, the Grace Memorial Bridge and the new Cooper River Bridge stretch westward to the City of Charleston.

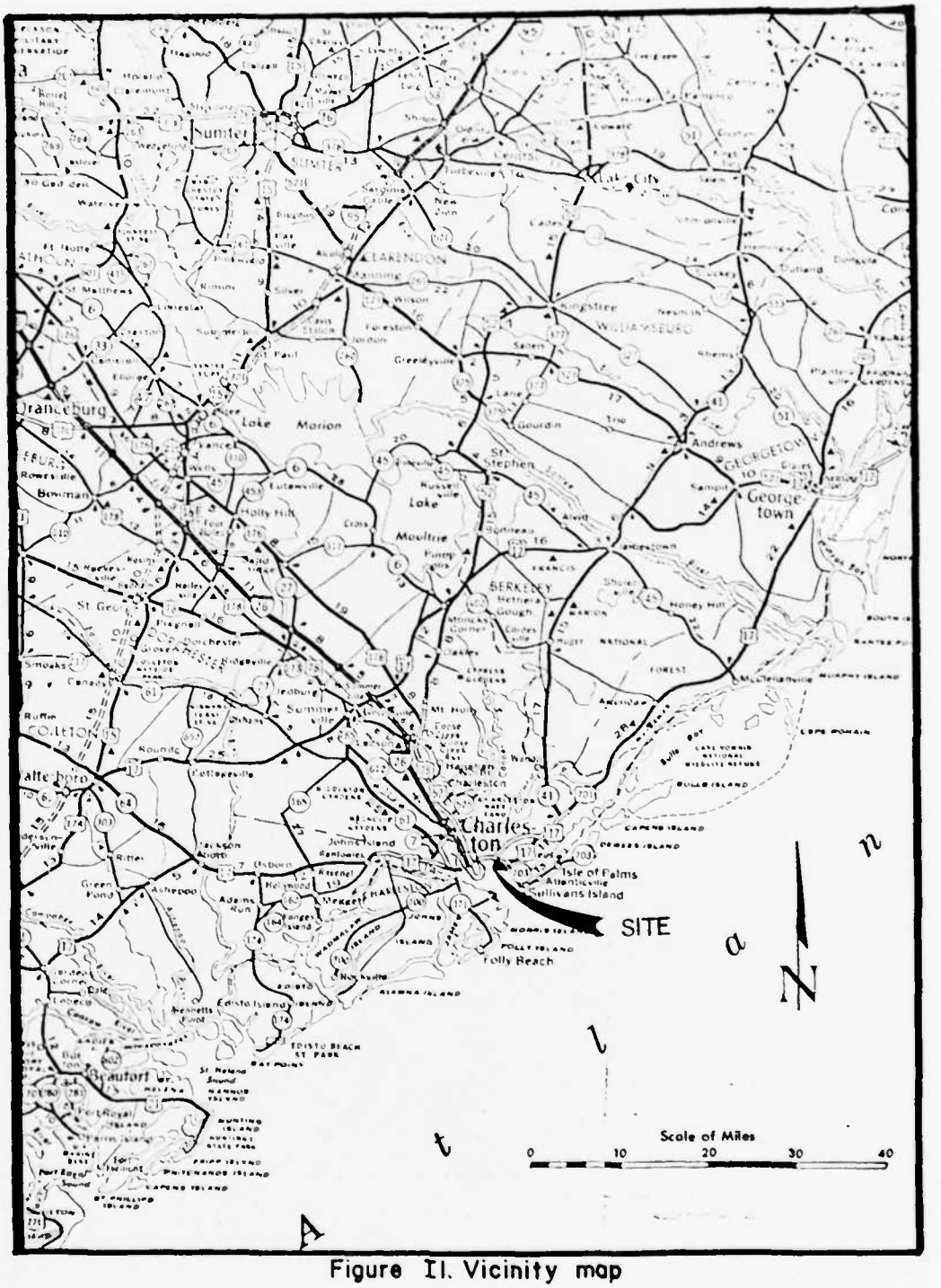

Figure II. Vicinity map

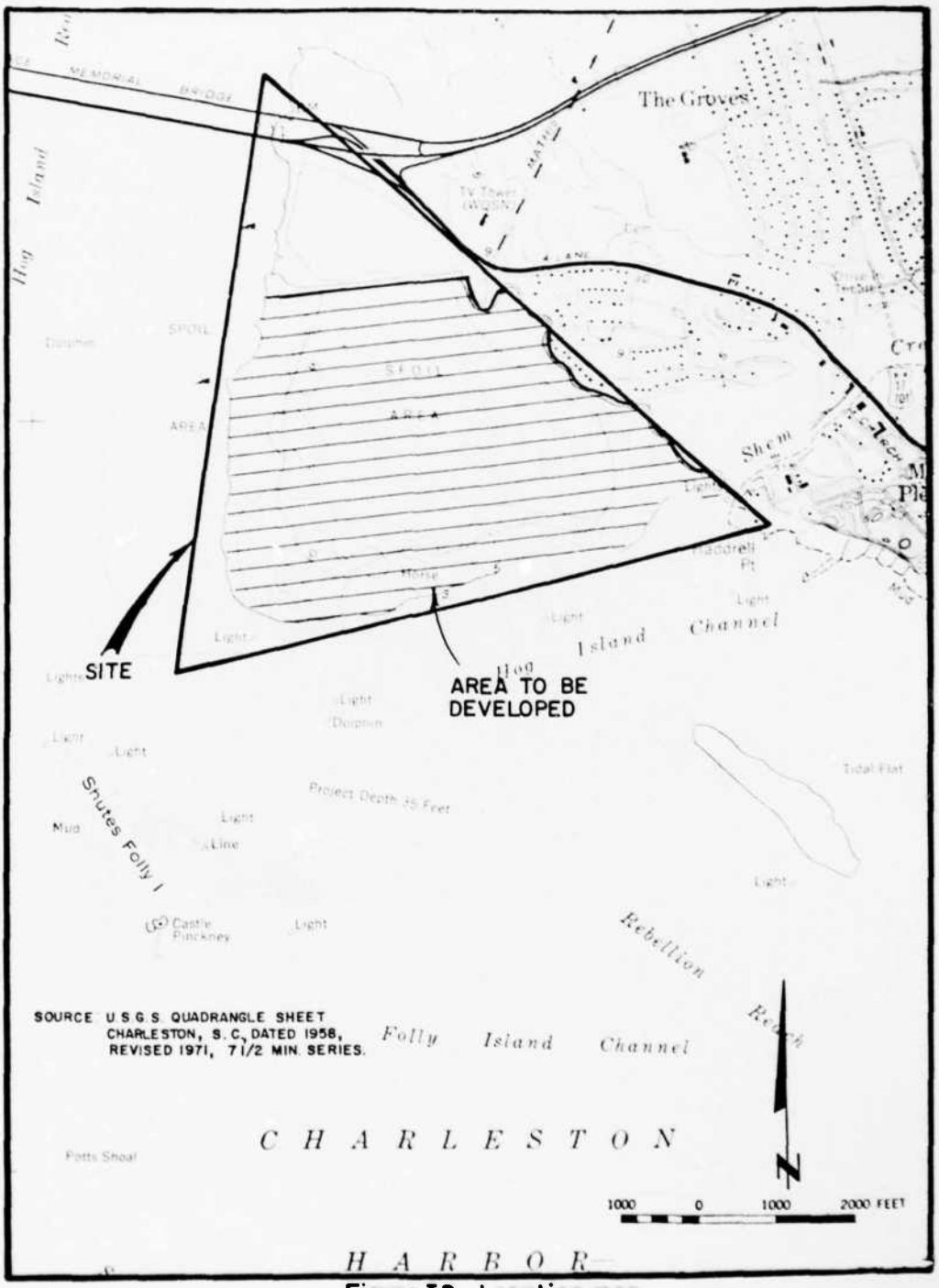

Figure I2. Location map

Environmental setting

6. Patriots Point presently serves as a transition zone between the Charleston Harbor Estuary and the suburban town of Mount Pleasant. In its undeveloped state, the site supports a thriving population of small game and fowl. The wildlife is not protected by any special statute.

7. Charleston Harbor is a major commercial transportation thoroughfare. U.S. Highway 17, a major commuter link to downtown Charleston, is lined on either side with strip commercial development. Thus, in spite of its undeveloped character, Patriots Point must be considered in this transportation/commercial context. Considered in such a context, the site is not highly sensitive from an environmental perspective. Thus, it appears that development at Patriots Point will not be constrained significantly by environmental factors.

Site development

8. Until about 1950, the Patriots Point site (then called Hog Island) was a low-lying marsh area separating Bay View Acres from Charleston Harbor. Between 1950 and 1970, the site was filled using dredged material from the Charleston Harbor enlargement. The material used was primarily maintenance dredging, although some new construction dredging also was utilized. The elevated site cut off the commanding view of the harbor from Bay View Acres.

9. In 1973 the South Carolina legislature created the Patriots Point Development Authority to control the state-owned portions of Hog Island, and authorized further land aquisitions where appropriate. In July of 1974, the Authority obtained the aircraft carrier USS Yorktown to be displayed at Patriots Point as a part of a maritime museum.

10. In November of 1977, the Authority released a revised Master Plan for the site and announced a first stage site development plan. Figure I3 shows the current Patriots Point Master Plan. Included in the near term plans are an 18-hole public golf course, a 150-room motor inn with convention facilities, a 375-slip marina, and a 300-space recreational vehicle park. Land for the inn will

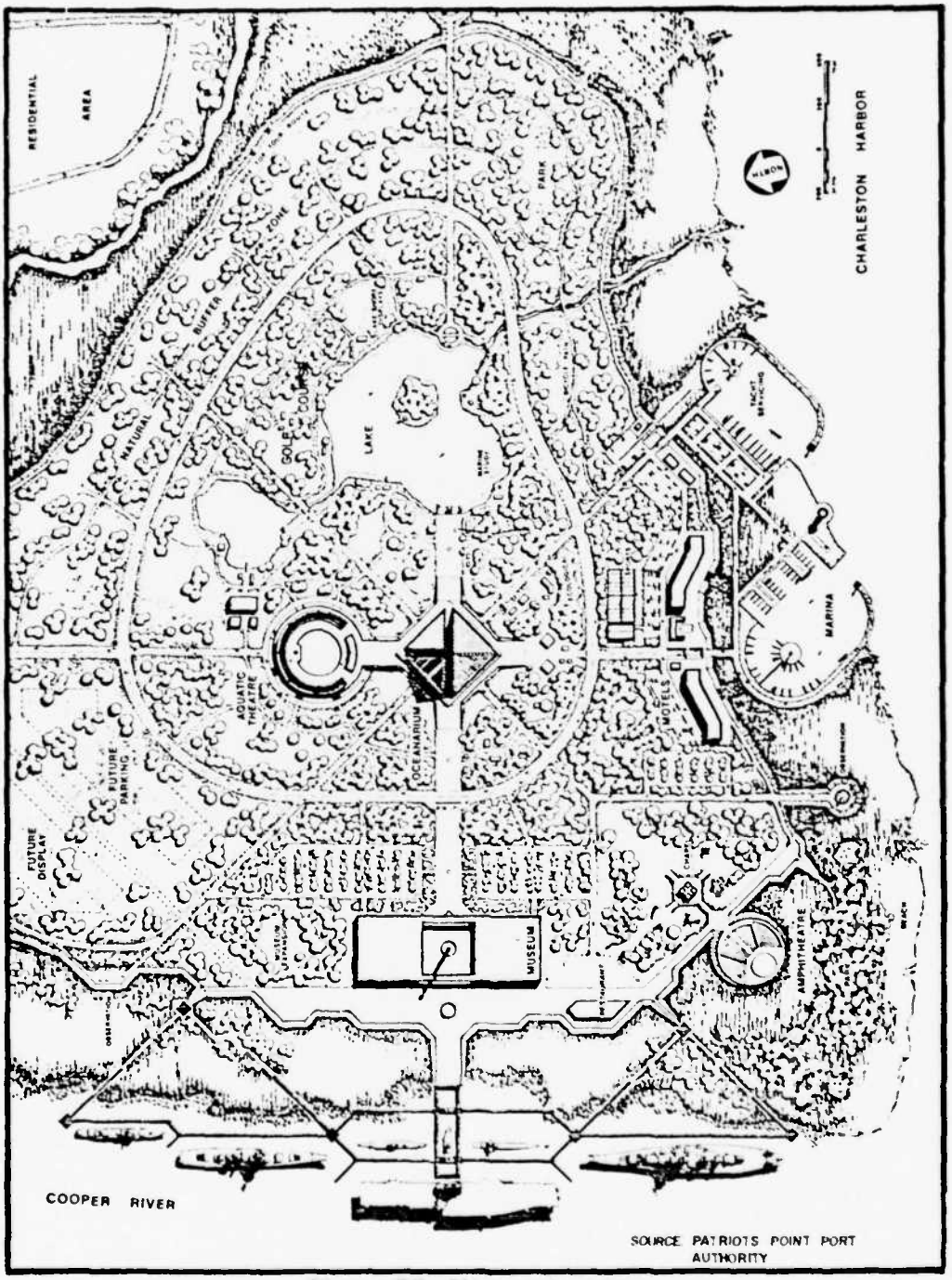

Figure I3. Site master plan

be leased to a private developer on a long term basis. The initial development phase will cover most of the 184-ha (454-acre) site, cost in excess of $8 million, and should be completed by 1980.

11. Long range plans for the Patriots Point site include the construction of an oceanarium and sea life exhibit. Plans call for adding a submarine, destroyer, cruiser, and possibly a battleship to the Naval and Maritime Museum, as these vessels become available.

Surrounding area development

12. The town of Mount Pleasant is a bedroom suburb of Charleston. Several small shopping centers and one motel are within the town limits. Most of the commercial development in Mount Pleasant is located on the U.S. Highway 17 corridor, including a number of fast food restaurants, service stations, and other retail support services.

13. The Bay View Acres subdivision is an established neighborhood of single family homes. Tax assessment data reveal that the homes are valued on the average at about $40,000. Several new homes have been built or are under construction on vacant lots in the subdivision.

Site zoning and area land use plans

14. As a state agency, the Patriots Point Development Authority is bound by law to adhere to local zoning ordinances only insofar as is practical. The Authority is not constrained in any real sense by the Charleston County or Mount Pleasant zoning ordinances.

15. A 53-ha (131-acre) parcel of the Patriots Point site has been annexed to the Town of Mount Pleasant at the request of the Authority. This portion is zoned for commercial uses, and corresponds to the area in Figure 13 designated for hotel, marina, and maritime museum uses. The balance of the site remains in Charleston County, and is zoned for agriculture and/or open space.

16. Water and sewer utilities will eventually be provided at the site by the Town of Mount Pleasant. Water is currently provided by the town, and sewer will be available upon completion of a federally funded sewage treatment plant. A 190,000-l/day (50,000-gal/day) package sewage treatment plant, located adjacent to the proposed recreational vehicle park serves Patriots Point at the present time. The package plant is

adequate to serve the carrier Yorktown and the recreational vehicle park, but will require expansion to accommodate the hotel and commercial development planned for the site before completion of the Mount Pleasant sewage treatment plant.

17. Development in Patriots Point has been complicated by an unclear title to marsh areas in the state. South Carolina claims ownership to the tidelands as a result of its sovereign proprietorship over such lands. The sovereign proprietorship was challenged by a family trust claiming title by virtue of a grant from the English sovereign. The title question was resolved by an out-of-court settlement between the Authority and the family trust; this action removed the title question as a serious threat to development.

18. The tourism industry is strong in the Charleston area, with downtown Charleston being the primary attraction. In 1976, more than 2.25 million tourists visited Charleston. Any undeveloped site in close proximity to the city, such as Patriots Point, should be improved with the tourism industry in mind.

Area trends

19. Charleston is one of twelve small- to medium-sized urban areas in the country that are projected to be the best markets for single family houses in 1978. Most of this residential development will take place in the suburbs of the city, including Mount Pleasant. Population statistics for Mount Pleasant show an increase of almost 35 percent between 1960 and 1970.

20. Much of the population surge recorded for Mount Pleasant may be attributed to the completion of the Cooper River Bridge in the mid-1960's. There are now a total of five traffic lanes spanning the river; one of these is reversible to serve peak traffic flows.

21. Construction in the Charleston area in 1977 was up 59 percent over 1976. Nonresidential construction showed an increase of more than 100 percent for the same period. Unemployment in the region has steadily decreased over the last several years, primarily because government employment remains strong.

22. Small commercial shopping centers have been planned or are under construction on several sites near Patriots Point. The new, more varied construction is a function of the steadily improving economic conditions in Mount Pleasant and adjacent Charleston county.

Land Use Potential Considered for Valuation

23. Table II presents the basic constraints on potential development of the site and comparable properties. Constraints include soil and geology characteristics, access, environmental setting, zoning, and other institutional constraints.

24. The foundation requirements on the site merit special consideration. Much of the city of Charleston is constructed on sites with soil-bearing characteristics similar to those at Patriots Point. Large commercial structures throughout the city are constructed on pile or pier foundations.

25. Land use patterns bordering the site require some form of buffer zone between commercial development and adjacent properties. The planned 18-hole golf course provides an excellent buffer.

26. The waterfront areas at Patriots Point are best suited for moderate commercial development, such as restaurants, hotels, a marina, and related support uses. The proposed development for the site approaches, and thus satisfies, this use potential.

Valuation Estimate

Review of available measures of value

27. Recent sales data for the Patriots Point site are not valid for comparison purposes because the sales were made in contemplation of litigation. Sales data for comparable properties have been obtained, but valuation of the site using these data requires substantial adjustment of the information.

28. A professional appraisal conducted by Mr. D. C. Brown

at the request of the Authority, was completed on 17 October 1977. The appraisal was conservative in nature and was prepared in contemplation of condemnation proceedings. Nevertheless, the 1977 appraisal is the best measure of direct value available for purposes of this study.

Demand estimate

29. Sales activity in the area surrounding Patriots Point indicates a strong demand for commercial and residential properties in Mount Pleasant. The demand is very strong for scarce waterfront locations such as the Patriots Point site itself.

30. Tourism is a major factor in the Charleston economy. The demand for tourist facilities continues to increase, despite the rather limited number of obvious tourist attractions in the metropolitan area. The proposed Patriots Point development will provide another attraction. The planned recreational vehicle park will be unique to the Charleston area, and demand for these facilities and for the golf course is expected to be strong. The proposed marina will be filled shortly after construction by those currently awaiting slips.

31. The very strong demand for commercial/recreational property in the Charleston area is estimated to require a 20 percent upward adjustment in market value for the site.

Site stratification

32. The stratification analysis for the Patriots Point site and surrounding neighborhood is summarized in Table 12. The analysis considers three basic parameters: physical condition, economic condition, and attractiveness.

33. The neighborhood that borders Patriots Point is of residential character, and is well maintained. Support services are located throughout the residential community.

34. Economic indicators for the town of Mount Pleasant indicates strong growth trends for residential and related development. Patriots Point will cause additional growth due to commercial development and the employees of these new businesses.

35. Patriots Point, when completed, will be the largest

commercial installation in Mount Pleasant. As such, it can be expected to generate its own, more-than-adequate support services. For this reason, the predominantly residential character of its neighborhood is not expected to affect the value of the Patriots Point site.

36. In summary, stratification neither increases nor decreases site value for use potential.

Value estimate

37. The Patriots Point site was appraised by Mr. D. C. Brown, MAI, in October of 1977. As previously mentioned, the appraisal was conducted at the request of the Authority in contemplation of condemnation proceedings to obtain a portion of the site.

38. The highest and best use of the site considered for the 1977 appraisal was as a recreational vehicle park. The appraiser noted that locating comparables in the Charleston area was difficult, because the Patriots Point site is among the last developable parcels bordering Charleston Harbor, and certainly the largest. The appraisal concluded that the best comparable was a property recently sold in Myrtle Beach (144 km (90 miles) from Charleston) for $123,500 per ha ($50,00 per acre) for use as a recreational vehicle park. From this sale price the appraiser deducted site preparation--primarily soil stabilization--and carrying costs, to derive an appraised value for the 184-ha (454-acre) Patriots Point site of $4.8 million, or $25,900 per ha ($10,500 per acre).

39. The appraisal recognizes that the $25,900 per ha ($10,500 per acre) valuation is conservative, and probably represents the minimum market value for the site. The maximum market value is given by sales of commercial development property along the U.S. Highway 17 corridor in Mount Pleasant. Such property has sold for an average of about $123,500 per ha ($50,000 per acre) over the last two years.

40. Because much of Patriots Point will be developed as open space, a conservative value figure should be used. Choice sites along the water could command $123,500 per ha ($50,000 per acre) on the open market, while sites inland have a market value of $25,900 per ha ($10,500 per acre). Assuming that 10 percent of the property may be

categorized as "choice," average valuation of approximately $35,300 per ha ($14,500 per acre) results.

41. The average valuation must be adjusted to include the demand estimate previously identified. Thus, after adding a 20 percent upward adjustment for demand, the value estimate for the Patriots Point site is $7.9 million, or $43,000 per ha ($17,400 per acre). No adjustment is appropriate for stratification.

Associated benefits/impacts potential

42. The Patriots Point Naval and Maritime Museum will benefit the community financially through increased employment, increased tax revenues, and increased spending by tourists. The cultural and educational value, as well as recreational value, are not as easily quantified. Table I3 presents the associated benefits/impacts potential matrix.

43. It is estimated that after completion, Patriots Point will have between 600 and 800 employees during the peak summer months. Many of these jobs will be filled with those most difficult to employ, the young looking for summer jobs.

44. The carrier Yorktown currently attracts 250,000 visitors annually. By 1985, the Authority projects that 1.2 million will visit the site. If one half of these visitors are tourists staying an additional night to visit the museum, the cumulative economic impact of the Patriots Point site is staggering. Assuming each tourist spent $35 per day and applying the multiplying factor supplied by the local Chamber of Commerce, the cumulative economic impact is computed to be $55 million annually. These figures do not include direct sales and admission tax revenues. In the first 18 months of museum operation, the State received more than $30,000 in sales and admission taxes from the carrier Yorktown alone at Patriots Point.

45. The recreational and cultural benefits to the community as a result of the completed Patriots Point development are several. The proposed marina could be filled three times by boat owners now awaiting slips. The golf course will be the only publicly owned course east of the Cooper River. The Charleston Council on Higher Education will be

involved with the use of the completed museum. Each of these factors indicates that the benefits associated with site development will be enjoyed throughout the local community as well as by visitors to the area.

46. The most obvious impact the Patriots Point development will have is the increased traffic congestion which will result. The impact will be minimized by the addition of special mass transit systems, such as bus and boat tours, to serve the site.

Table 11

Use Potential Estimation

Constraint	Actual	Impact
Soil Characteristics	Hydraulic fill to 4.6-to 6.1-m (15-to 20-ft) depth, upland silts	Suitable for agriculture after salt is leached out. Insufficient load-bearing capacity for large loads.
Geology	Marl formation provides excellent foundation strata 12.2 - 24.3 m (40-80 ft) below surface	Provides site with same foundation geology as balance of Charlestown.
Access	U.S. Highway 17 with traffic light provides excellent access	Not a constraint.
Environmental Setting	Suburban development to east; Charleston Harbor to west	Residential area requires buffer zone for commercial development.
Zoning	Partially Open Space/ Agriculture, partially Commercial	Rezoning of site in town of Mount Pleasant granted on request. Industrial use constrained by present zoning.
Other Institutional	Title question for sovereign tidelands	State claim of title disputed by grantee under King's Grant. Insecurity of title increases development costs since litigation is required.

Constraint	Estimation	Comments
Highest and Best Use	Commercial/recreational	Accommodates buffer zone and prime commercial development sites on the waterfront

(Continued)

Table I1 (Concluded)

Constraint	Estimation	Comments
Actual Use Likely	Commercial/recreational	Patriots Point master plan integrates commercial and recreational uses.
Utilization Potential	Satisfied when development completed	

Table I2
Stratification Estimate

Parameter	Site	Neighborhood
Physical Condition		
Age of Improvements	Unimproved	new to in excess of 25 yr
Condition of Improvements	Unimproved	well maintained
Economic Condition		
Activity	Growing tourist activity	Strong residential activity with continued growth forecasted
Type of Industry	Tourism and recreational	Residential support services only
Attractiveness		
Accessibility	Good	Good
Transportation Available	Auto and Boat	Auto only
Service Availability	Adequate	Good
Proximity to Similar Activities	1.6 km (1 mile) to downtown Charleston	Adjacent to town of Mount Pleasant

Parameter	Estimate	Comment
Desirability of Neighborhood for Highest Potential Use	Medium	
Adjustment	0	Residential neighborhood neither improves nor reduces site value for recreational/commercial use potential

Table I3

Associated Benefits/Impacts Potential Matrix

Benefits	Public	Private	Site	Site Adjacent	Community	Comments
Increased Cultural Opportunities		X	X			Naval and Maritime Museum provides visitors a taste of Naval culture and heritage.
Increased Recreational Opportunities		X	X			Marina, golf course, and recreational vehicle park provides opportunities to tourists and residents.
Increased Educational Opportunities		X	X		X	Coordination with Charleston Council on Higher Education will enable new programs to be offered by local colleges and secondary schools.
Increased Tax Revenues	X		X			Admission and sales tax revenues derive from museum and commercial establishments.
Increased Property Tax Base	X		X			Privately owned improvements constructed on this public land (e.g., hotel) will be assessed for property tax purposes.
Increased Employment Opportunities	X	X			X	Will provide 600 to 800 jobs to the segment of the of the population most difficult to employ (young people during the summer months).

Table I3 (Concluded)

Impacts	Public	Private	Site	Site Adjacent	Community	Comments
Increased No. of visitors to Charleston area	X	X	X	X	X	Spinoff economic effect will increase employment, revenues, taxes in public and private sector.
Aesthetic Value of Surrounding Properties Improved		X		X		Developed open space removes unsightly wild growth bordering residential development.
Adverse Effect on Wildlife	X		X			Small game population will be displaced by development.
Aesthetic Value of Surrounding Properties Decreased		X		X		Bay View Acres subdivision no longer has a view of the Bay as a result of dredged material placement.
Increased Traffic Congestion	X	X		X	X	Private dissatisfaction with congestion delays and public outlays for improved transportation facilities and police.

APPENDIX J: VICKSBURG CASE STUDY
VICKSBURG, MISSISSIPPI

APPENDIX J: VICKSBURG CASE STUDY
VICKSBURG, MISSISSIPPI

Introduction

1. The case study site originally identified for evaluation in Vicksburg has been incorporated into the proposed methodology instead as a site specific example to illustrate the application of the methodology to a specific containment candidate site. The Vicksburg site was selected primarily because it represents a candidate site where dredging operations, as well as dredged material disposal, will occur in the near future. The containment of the dredged material will offer a productive use opportunity, which in this case has been determined to be an industrial park.

Site Description

2. As can be seen by reviewing the Site Specific Example chapter, the candidate site encompasses some 729 ha (1800 acres) of generally flat bottomland which is partially forested and partially utilized for grazing purposes, and which contains river frontage on the Yazoo River. The site is approximately 2.4 km (1.5 miles) from downtown Vicksburg, in Warren County, Mississippi, and is located adjacent to the fully developed Warren County Industrial Park.

3. The Corps of Engineers proposes to dredge a 91- by 365-m (300- by 1200-ft) slackwater channel into the site off the Yazoo River and to place the dredged material adjacent to the channel on both sites, thereby creating 142 ha (350 acres) of landfill which will contain generally medium- to fine-grained sand and silt. The dredging and fill operations are expected to take a total of eight years.

Use Potential

4. The candidate site has been evaluated as per the methodology in Chapter V of the report. The land use and zoning constraints which form the major basis for use potential estimation in the methodology do not apply in this case, since Warren County has neither a land use plan nor a zoning ordinance of any kind. Therefore, site use potential was evaluated primarily on the basis of site physical characteristics and surrounding land uses. The anticipated physical characteristics of the site once it has been filled are such as to allow virtually any type of development and improvements.

5. Based on the proximity of the site to the river and the existing Warren County Industrial Park, and the fact that segments of the local community have expressed feelings of a latent demand for additional waterfront industrial land, the use potential of the the site has been estimated for high intensity industrial, i.e. an industrial park.

Value Estimate

6. Demand for the industrial park site was estimated by the methodology as being average; i.e., no particularly strong demand. Two comparable sales of large parcels of land suitable for development for industrial purposes but without waterfrontage, were found for use as comparables. A stratification estimate was performed which indicated comparable utility to the candidate site.

7. The comparable value was established at $9,900 per ha ($4,000 per acre) as a base value for the site. A 25 percent upward adjustment was added for waterfront siting, giving an adjusted site value estimate of $12,400 per ha ($5,000 per acre). An assessment valuation of $1,200 per ha ($5,000 per acre) for the existing site was obtained from the Warren County Assessor. It was felt to be relaistic, given the present characteristics and use of the site. Value added was thus calculated at $11,100 per ha ($4,500 per acre) attributable to dredged material containment.

Associated Benefits

8. The last section of the Site Specific Example chapter of the report identifies and displays the significant associated effects of site productive use.

APPENDIX K: VIRGINIA BEACH CASE STUDY
VIRGINIA BEACH, VIRGINIA

APPENDIX K: VIRGINIA BEACH CASE STUDY
VIRGINIA BEACH, VIRGINIA

Project Description and History

Physical characteristics

1. The site consists of a 5.6 km (3.5 mile) stretch of sloping beach located between Rudee Inlet and approximately 49th Street in the community of Virginia Beach, Virginia. The Corps of Engineers has, since 1952, created a berm type of beach on the site which is about 31 m (100 ft) wide and slopes from an elevation of about 2 m (7 ft) msl.

2. Virginia Beach is the state's foremost summer recreation area. During the last 30 yrs the beach area has been steadily eroding, thus endangering the economic base of the community. In an effort to halt this erosion process, the Corps of Engineers undertook an erosion control (or beach nourishment) project, beginning in 1953. By July of 1953, approximately 1.0 million cu m (1.3 million cu yd) of fill material, consisting mainly of sand with some silt utilized as base material, was hydraulically placed on the beach within the project limits.

3. Since that time dredged material periodically has been placed along the berm/beach to maintain its integrity. A large portion of the dredged material presently utilized comes from Corps of Engineers dredging operations in Thimble Shoal Channel, located in the mouth of Chesapeake Bay. About 344,000 cu m (450,000 cu yd) of this medium-grained sand material has been stockpiled at Fort Story and is being redistributed along the beach at the rate of about 76,500 cu m (100,000 cu yd) annually.

4. Figure K1 shows the location of the project relative to the community of Virginia Beach.

Environmental setting

5. The site is located within an urbanized area which is heavily utilized seasonally as a recreational destination by large numbers

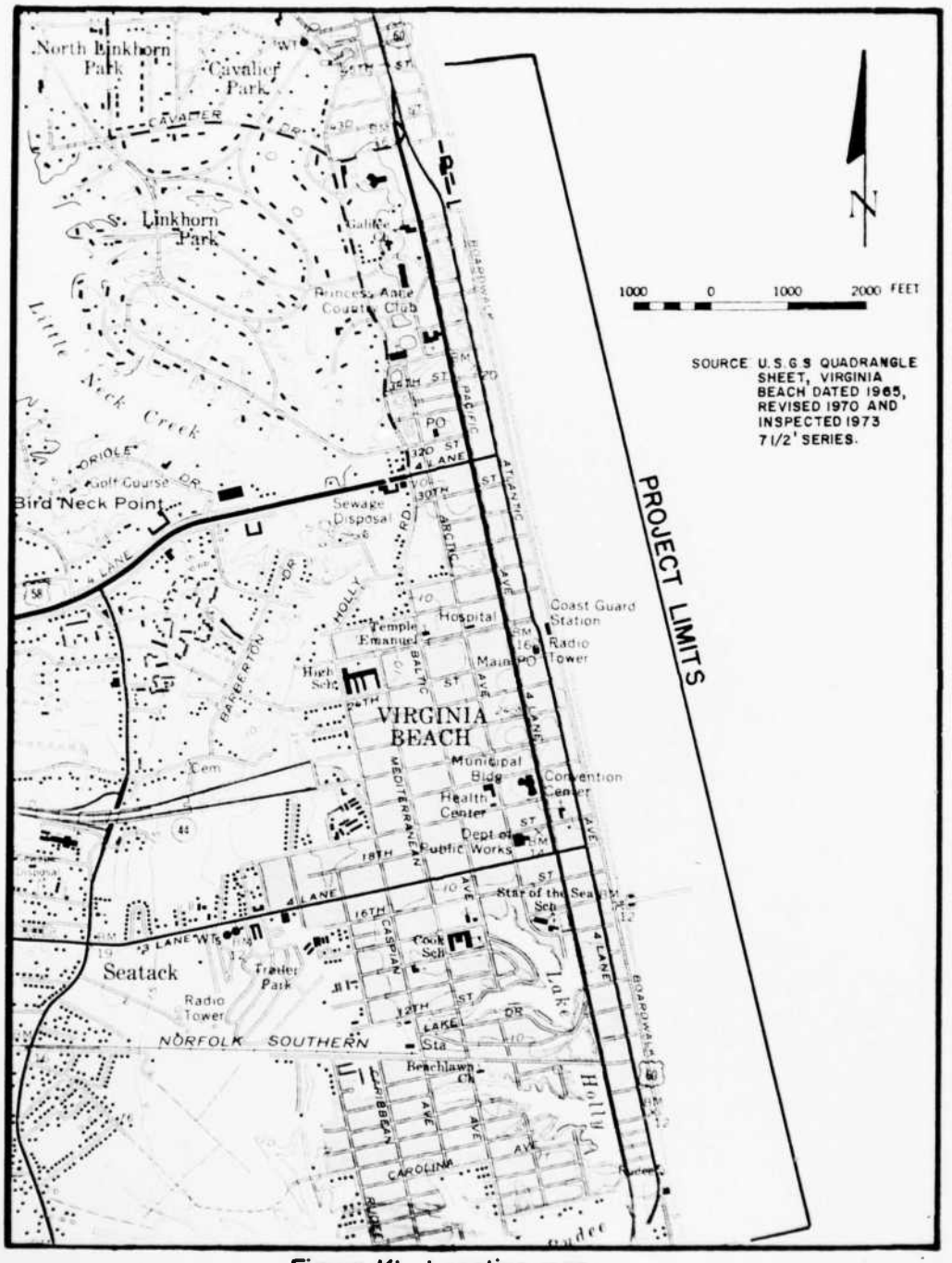

Figure KI. Location map

of tourists. The traffic generated by this activity, both vehicular and pedestrian, results in significant air and noise pollution during the summer months of the year.

6. Since it is heavily utilized, the beach area itself does not appear to contain any significant ecosystem which could be disrupted. Many varieties of fish and shellfish, some of which are locally marketed, can be found offshore.

7. No significant disruptions or problems relative to the natural environment of the area have been detected.

Site development

8. The beach area is essentially undeveloped in keeping with its recreational use. However, the entire area adjacent to the beachfront is developed with a combination of commercial and residential uses. About one sixth of the beachfront area within the project limits is developed as residential uses with single-family homes having direct beach access via easements. The remaining area is developed with a mixture of commercial uses, primarily hotels/motels and restaurants. Access to the beach area from these properties is via a community-owned boardwalk.

Surrounding area development

9. The surrounding area, which is in a combination of public and private ownership, has been developed for both recreational and residential uses. Across Pacific Avenue from the beach, and south of Cavalier Drive, development is primarily residential. North of Cavalier Drive the use is residential on both sides of Pacific Avenue.

11. Essentially, the beach is located in an urbanized area with tourism providing a significant portion of its economic base. The overall development, especially within 1.6 to 3.2 km (1 to 2 miles), reflects this economic orientation.

Site zoning and area land use plans

12. The Comprehensive Plan for Virginia Beach is presently undergoing revision, including changes in the zoning of several areas. However, it is anticipated that the beachfront and related

areas will not be changed and will retain their present land use and zoning designations.

13. The area south of 49th Street is considered to have primarily commercial land use and is zoned for medium- to high-density development. East of Pacific Avenue the zoning is high-density commercial, while west of Pacific Avenue and south of 49th Street, land use is primarily residential with both single-family and multiple zoning.

14. During the 1960s, a major annexation of agricultural land was undertaken by the community. As a result, about 23 percent of the community's land inventory is vacant and zoned for low-density residential purposes. However, this land is several kilometres from the beachfront areas and does not figure into beachfront planning considerations.

Area trends

15. Virginia Beach has experienced significant increases in urban development since 1970. Large scale retail and commercial development has occurred in support of this population growth, as well as in concert with the decentralization taking place in many growing urban areas during the last decade. The increased development in Virginia Beach has been a function of population increases and tourism industry growth.

16. Population growth in Virginia Beach, which increased some 21.5 percent during the period between 1970 and 1974, far outstripped the growth of the rest of the region, including Norfolk. The population growth projected over the next 20 yrs shows Virginia Beach with the largest population in the region, far surpassing Norfolk. This projected increase is seen as a function of three factors:

- Attractiveness of the community in terms of climate relative to other parts of Virginia and the northeastern Atlantic seaboard.
- Availability of land for residential, commercial, and industrial development coupled with low property tax rates. While the entire region is

experiencing economic growth, only Virginia Beach has significant vacant land inventories.

- The renewed trend toward migration out of central city areas, with their attendant fiscal and social problems, into surburban areas.

17. In addition to its tourist trade, Virginia Beach has a growing industrial sector, and a large portion of the community's land is being developed into industrial parks.

18. Basically, the community anticipates a continued pattern of economic growth and land development. This growth is expected to occur in both the commercial and industrial sectors and to stimulate attendant residential development responses.

Land Use Potential Considered for Valuation

19. The use potential of the subject site is limited by the nature of its location, adjacent uses, and existing uses. Strictly speaking, values or benefits will not accrue to the site, but rather to adjacent beachfront properties, which derive a primary economic benefit from the availability and utilization of the beach in a recreational manner. The inherent value of the beach is in providing a service function whose nature creates economic externalities which pass to adjacent properties.

20. In all likelihood, the current use of the site is its most economically productive use, and can thus be considered as its highest and best use. As can be seen from the evaluation in Table K1, if the site is not used as a beach, the composition of the underlying base material (fine-grained clay) would entail foundation difficulties, in turn creating additional expense for any but low density development. Use as an unimproved recreational facility therefore should be regarded as the best use potential for the site.

Valuation Estimate

Review of Available measures of value

21. Review of available data indicates the existence of both up-to-date assessment and sales information for land in Virginia Beach, specifically beach front properties. As such, the site value can be estimated by either comparable sales or assessment figures for adjacent commercial properties on a front m (front ft) basis. For the residential area north of 49th Street, comparable sales data are also readily available.

Demand estimate

22. As shown in Table K2, the demand estimate analysis considered building permit and sales transaction activity, and selected economic growth indicators to arrive at an estimate of land demand.

23. Economic growth in Virginia Beach can be considered strong because of the factors analyzed in the previous part of this study. The tourist market, though basically summer-oriented, is growing each year and the tourist season is the process of being extended by two months.

24. There is currently a shortage of prime beachfront property for both residential and commercial uses. This situation has created a strong localized demand situation with attendant price escalation. The demand is estimated to continue strong both over the short-term and long-term frame.

Site stratification

25. The stratification analysis considered three parameters, as evidenced in Table K3. These include physical condition, economic condition, and attractiveness. The idea is to compare the utility of the subject parcel and the comparable parcels.

26. Examination of comparables revealed well-maintained improvements. This is due to the sound economic condition of the area and its tourist base. Despite the limitation of summertime activity,

sufficient income flow is generated to maintain economic activity in the off-season.

27. The stratification analysis deems the site to be fully compatible and of equal utility to the comparables chosen for valuation.

Value estimate

28. Site direct value, as shown in Table K4, was derived from comparable assessment data and part of the evaluations from Tables K2 and K3. Site factor adjustments were necessary in this case becasue of the extremely strong market demand for vacant beachfront land and concurrent shortage of inventory. A proximity adjustment factor was also added to reflect the strong beachfront commercial clustering.

29. It is suggested that in this case study the site value as estimated and the raw site value are the same. The Corps of Engineers operation is one of maintaining the integrity of the beach area rather than creating anything new. In effect, there is no value added through the beach nourishment project and hence no incremental site value. The value maintained is the actual value per front m (front ft) of beach, which could be reduced in direct proportion with the erosion of the beach.

Associated benefits/impacts potential

30. Table K5 illustrates the range of perceived benefits and impacts possible as a result of continued site maintenance. In the public sector the most intense benefits were perceived to be in the area of economic growth, including the expansion of employment opportunities and increasing property values. The most intense impacts were perceived to be increasing congestion, increasing property taxes, and some potential environmental degradation due to traffic and population growth.

Table K1

Use Potential Estimation

Constraint	Actual	Impact
Soil Condition		Not optimum for multi-story building foundations without special foundation work. Could reduce market price in the absence of strong demand override.
Gravel		
Coarse Sand		
Fine Sand	Majority of fill	
Silt		
Clay	Base material under sand	
Other		
Foundation Constraint		Added cost factor for development purposes which could reduce market value in the absence of strong demand or given comparables without foundation constraint. Assume 10% value reduction in absence of strong demand.
Spread or Mat		
Pile	Most likely methods required	
Pier		
Allowable Land Use (Per Land Use Plan)		Recreation value of site has, in this case, largely determined land use and acts as effective constraint for other use.
Open Space		
Recreational	Unimproved and used as beach	
Agricultural		
Residential		
Commercial		
Industrial		
Public		
Zoning Intensity (Per Zoning Ordinances)	Not applicable in strict sense in this case	None
Estimation	Recreational/ Unimproved	Site utilization as recreational/ unimproved results in strong value benefit transfer process to adjacent properties and uses. Site land value is in effect the value of adjacent sites expressed in a front ft basis.
Highest and Best Use	Recreational/ Unimproved	
Actual Likely Use		
Utilization Potential		
. Underutilized		
. Overutilized		
. To Potential	Full potential utilized in present use	

Table K2
Demand Estimate

Parameter	Indicator	Impact
Building Permit Activity by Land Use, as per Table K1	No., Year-To-Date 1 Total Valuation $1,280,000	Activity restricted primarily to lack of developable beachfront properties despite strong demand. Significant development in other areas of community, but of an industrial and residential nature.
or Sales Activity by Land Use , as per Table K1	No., Year-To-Date 2 Residential Average Value $130,000	Sales activity reflects strong residential and industrial development, and residential oriented commercial development. Lack of beachfront sales due to strong tourist economic growth.
Economic Growth Indicators	Average Annual Percent Increase	Community-wide economic growth is strong, especially in the industrial and service sectors of the economy. Tourist economy growth is also strong, reflected in sales revenue and user day increases. Both growth areas have resulted in strong land demand.
Added Employment		
and/or Added Population	240% increase in employment in last two decades	
and/or Sales Tax Revenue Increases	21.5% increase in last five yr	
Community Development Indicators	Year-To-Date	Community development process is strong and reflects sound marketing efforts on the part of the city. Good level of demand has resulted.
No. of New Firms	20 during last 2 yr	
or Urban Renewal Activity	None on-going or contemplated	

Estimated Demand Intensity	Short-Term	Long-Term	Impact
Little Activity			Estimate strong demand over next decade for industrial, commercial, and residential sites, which will be reflected in market value increases.
Average Activity			
Strong Activity	Commercial and industrial	Strong in all sectors	

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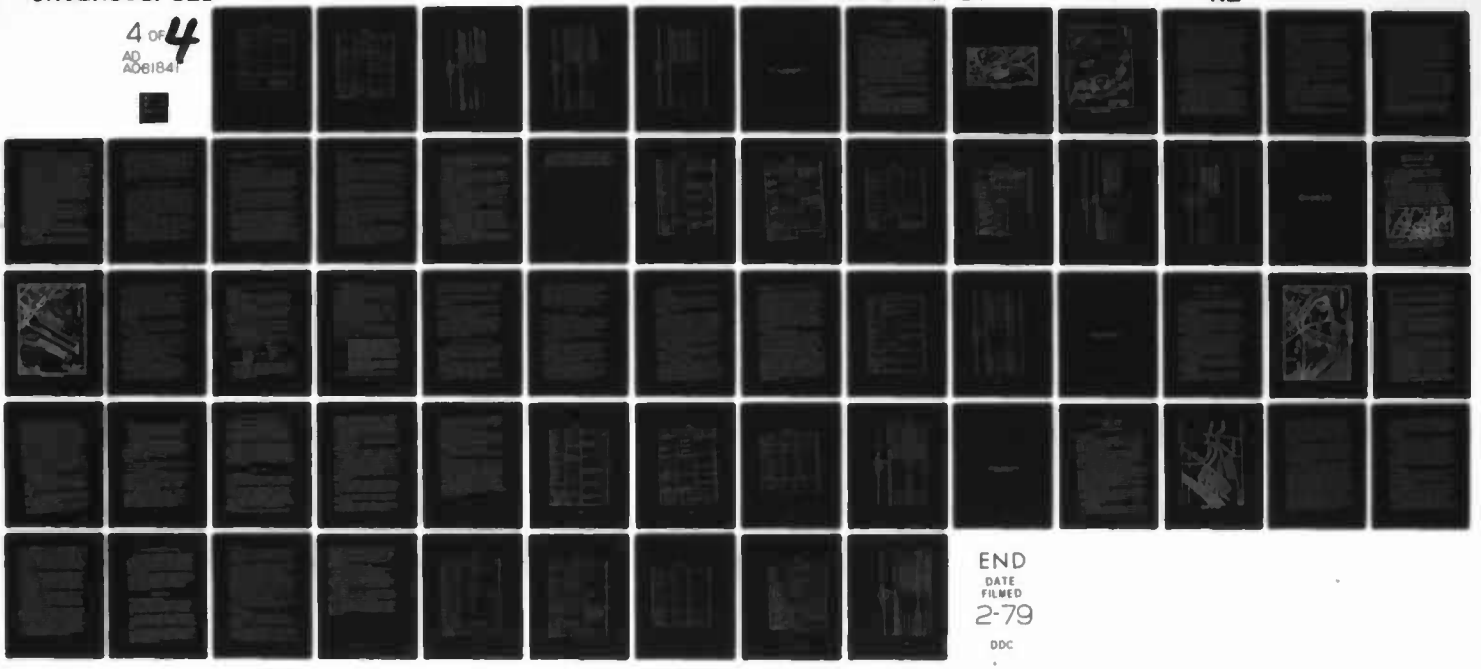

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Table K3
Stratification Estimate

Parameter	Site	Comparables
Physical Condition		
Basic Condition of Improvements (If Any)	*No improvements*	*Varied ages, generally well-maintained due to nature and condition of economic activity.*
Approximate Age of Improvements (If Any)	*Not Applicable*	*2 to 60 yrs*
Attractiveness		
Accessibility to Site	*Excellent*	*Excellent*
and/or Accessibility to Transport	*Public transport and auto*	*Public transport and auto.*
and/or Service Availability	*Close proximity*	*Close proximity*
and Proximity to Similar Activities	*Only beachfront in area*	*Clustering of service activities adjacent to beach.*

Estimate of Site Stratification	Impact
Of Equal Utility to Comparables *(In terms of beach activity support)*	*Subject site, while not utilized for same purpose as comparables, can nevertheless be considered of equal utility due to benefit interaction process between site and comparables.*

Table K4

Valuation Estimate

Parameters	Comparables				
	No. 1	No. 2	No. 3	No. 4	No. 5
Use	Residential Single family	Residential Single family	Commercial		
Value of Comparables	Comparable	Comparable	Comparable		
Value (Sales or Assessment data)	$4860/front m ($1250/front ft) sale	$4620/front m ($1200/front ft) sale	$4900/front m ($1500/front ft) sale		
Average Value of Comparables	$4800/front m ($1300/front ft)				
Average Value Adjustment	Adjustment		Comment		
Demand Adjustment	20% upward		Warranted because of exceptionally strong demand		
Utility Adjustment	10% upward		Clustering of adjacent activities tends to increase market values for commercial uses, reflecting the operation of agglomeration economies		
Special Constraints	None				
Site Value	Value		Comment		
Adjusted (Average value plus sum of Site factor adjustments)	$5600 front m ($1700/front ft)				
Raw (Prior to Dredged Material Containment)	$5600 front m ($1700/front ft) as transferred value from adjacent uses.		Raw site value is identical to adjusted site value because productive use maintains existing beach, rather than creating new land.		
Value Change (Estimated Site Value Less Raw Site Value)	None		Special character of use adds no value, but maintains existing value.		

Table 15

Benefit/Impact Potential Matrix

Benefit	Public	Private	Adjacent State	Community	Comment
Beachfront commercial and residential property value increases.		X	X		Increasing visitor days during the summertime expands tourist-serving economic activity and sales receipts, resulting in increased attractiveness of commercial properties as investments, as shown in increasing property values.
Increased economic rates-of-return to commercial establishments.		X	X		Increasing number of visitors will mean greater tourist expenditures, resulting in increased sales revenues to commercial establishments.
Increased employment opportunities, both in tourist serving and basic community-based industries.		X		X	Increasing tourist rates will result in demand for increased manpower in tourist-oriented commercial activities. In turn, new employees will generate demand in other sectors of the community's economic base, resulting in increased employment demand in those sectors.
Increased sales tax revenues.	X			X	Sales revenues, both tourist service activity generated and community generated, will result in increased community revenues for public services and capital expenditures.

(Continued)

Table 45 (Continued)
Benefit/Impact Potential Matrix

Benefit:	Public	Private	Site	Adjacent Site	Community	Comment
Increased property tax revenues.	X				X	Land demand, both for commercial and residential purposes adjacent to the beach and in other parts of the community, will increase property values, and hence, assessments and tax revenues.
Community attractiveness.	X		X	X	X	The beach, considered as a recreational resource, will have the effect of increasing the community's attractiveness, not only as a tourist center, but also as a residential and industrial location choice.
Impact						**Comment**
Environmental degradation.	X			X		Increased traffic can lead to degradation in the form of increased noise and air pollution.
Increased municipal expenditures.	X				X	Growth, both economic and population, will inevitably place a strain on any existing level of services. Providing increased levels of service, and/or additional capital facilities, can strain community revenues if tax increases do not keep pace with expenditure increases.

(Continued)

Table K5 (Concluded)

Benefit/Impact Potential Matrix

Impact	Public	Private	Site	Adjacent Site	Community	Comment
Increased congestion.		✓		✓		Increased numbers of tourists can have the effect of creating increasing levels of congestion, especially when oriented to a relatively small spatial area as in the case of the beachfront activities in Virginia Beach. Sometimes, over time, this situation can lead to an actual decline of visitors.
Increased congestion.		✓			✓	Increased numbers of tourists in the summer can create impacts in other parts of the community, away from the beachfront, especially in terms of traffic or utilization of nonbeach oriented community recreational facilities.
Increasing property taxes.		✓		✓	✓	Any time increases in property values occur, increases in property taxes are not far behind. The value increases, and hence taxes, will be sharpest among beachfront properties, but will also occur community-wide, due to the increasing attractiveness of the community as a place of residence and employment.
Environmental degradation.	✓		✓			Too many users can ruin a recreational facility, either through carelessness or simple over-utilization. The beach must be a managed resource if it is not to suffer.

APPENDIX L: PELICAN ISLAND CASE STUDY
GALVESTON, TEXAS

APPENDIX L: PELICAN ISLAND CASE STUDY
GALVESTON, TEXAS

Project Description and History

Physical characteristics

1. The containment site being examined consists of approximately 1306 ha (3225 acres) of island located on the upper Texas coast in Galveston Bay, directly north of the city of Galveston and westerly of Bolivar Peninsula. Pelican Island has been created almost entirely out of dredged material on what was originally two small spits of land in Galveston Bay.

2. The majority of dredged material containment on Pelican Island has taken place since 1947. Between 1947 and 1975, according to records of the U.S. Army Engineer District, Galveston, approximately 44,264,000 cu m (58,000,000 cu yd) of dredged material was deposited on the site by a combination of hydraulic and clamshell placement. The dredged material, consisting primarily of fine-grained silt and clays, was obtained by the original and maintenance dredging of deep-draft channels in Galveston Bay and portions of the Gulf Intracoastal Waterway.

3. The northern and western portions of Pelican Island have been leveed in order to retard the drift of dredged material back into Galveston Bay during dewatering and periods of strong westerly winds which occur in the area.

4. Figure L1 is a vicinity map illustrating the location of Pelican Island relative to its surrounding area. Figure L2 is a site map detailing the island and its present development.

Environmental setting

5. Water samples and sediment samples representing shoaled materials and bottom materials normally removed by maintenance dredging operations were taken periodically in Galveston Harbor and Channel at various locations between 1971 and 1975. Analyses of these samples showed that EPA criteria for maximum pollution levels were exceeded by volatile solids and lead and mercury at all sampling locations. The EPA recommended that no bottom

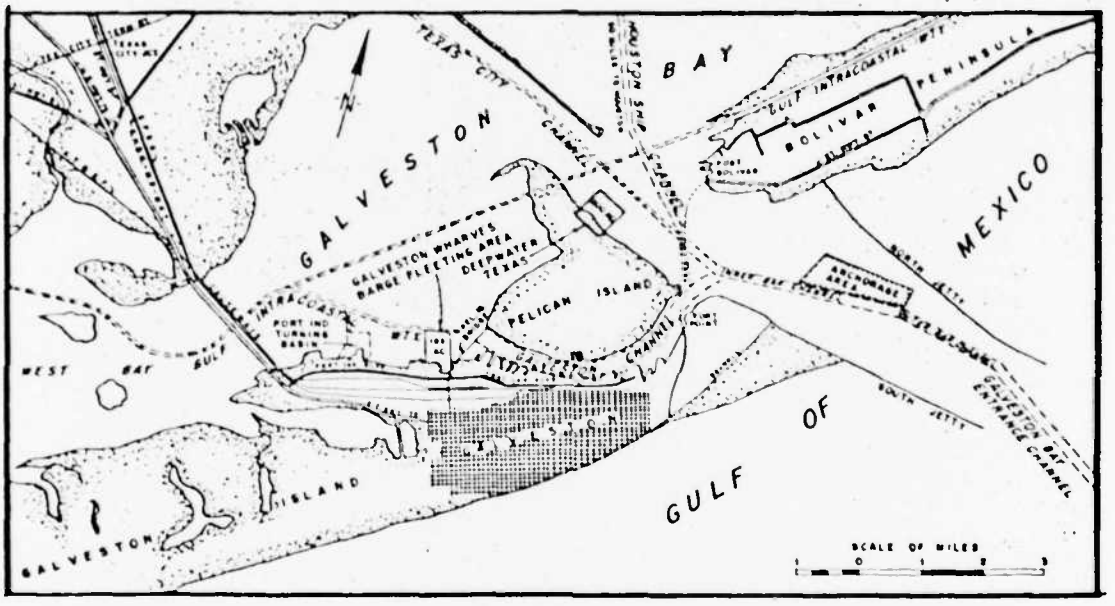

Figure L1. Vicinity map

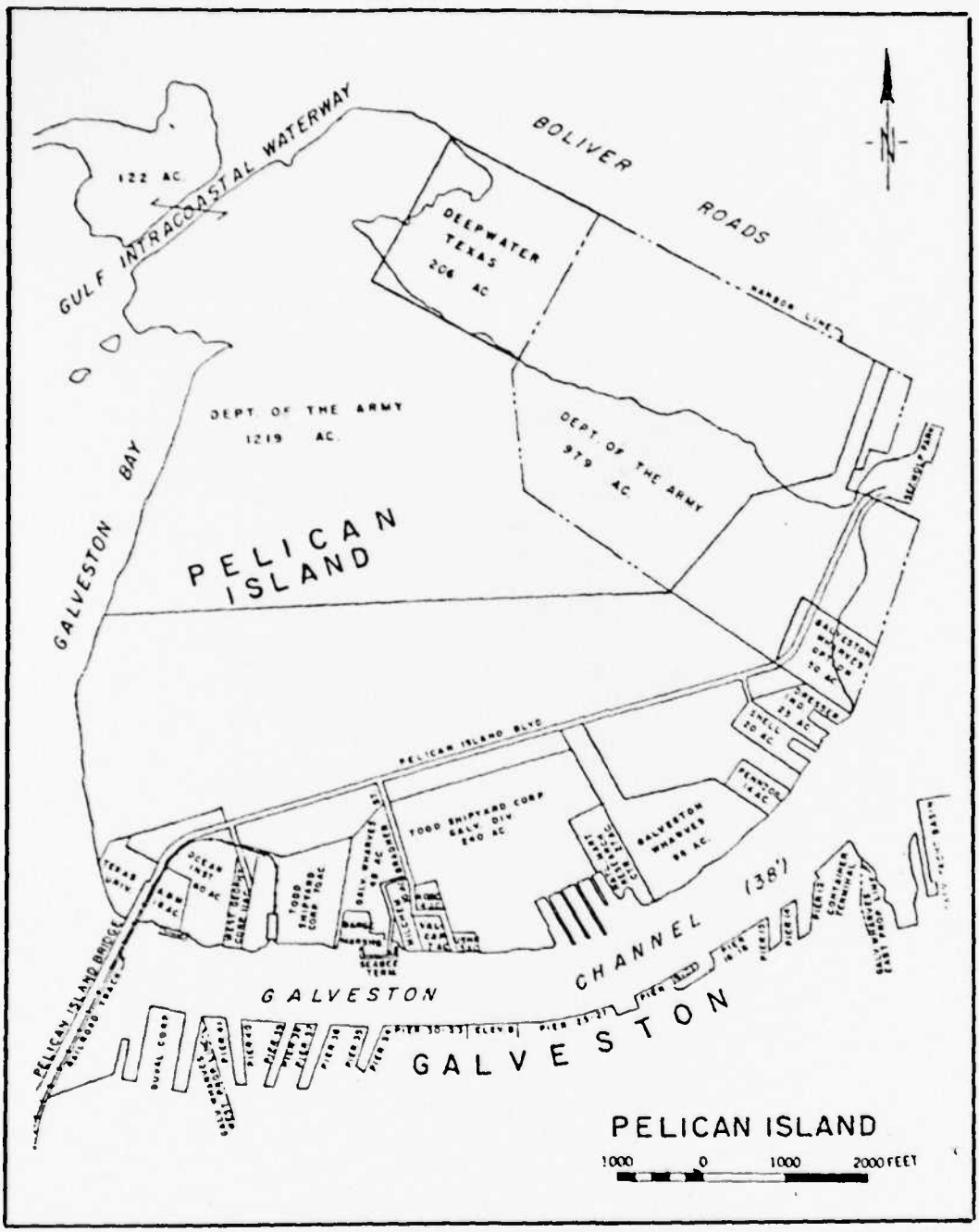

Figure L2. Site map

material dredged from the Galveston Channel be disposed of into open water, as serious water quality deterioration would occur.

6. The Houston and Texas City Ship Channels join the Bolivar Roads Channel near the eastern end of Pelican Island. The Houston, Texas City, and Galveston Channels are major tidal exchange routes and serve as migratory pathways for post-larval, juvenile, and adult fish and crustaceans migrating between the Gulf and the Galveston Bay system. Shallow areas adjacent to the channel are fished extensively by commercial fishermen for shrimp and crabs and by sport fishermen for numerous game fish, including spotted seatrout, red and black drum, croaker, sheepshead, flounder, and gafftopsail catfish. During cold weather, the warmer bottom waters in these channels provide escape routes or refuges for marine animals. Marsh areas along the western and northeastern sides of Pelican Island provide productive nursery habitat for marine organisms and feeding and nesting areas for shore and wading birds. Levees have been built around the disposal area at least 30.5 m (100 ft) shoreward of the mean high tide line on the island to avoid spillage of dredged material into the marsh areas.

7. Common sport and commercial fish in the Gulf of Mexico include red snapper, mackerel, bonito, tarpon, amberjack, jackfish, blue fish, blue-runner dolphin, and various billfishes. The Galveston Bay estuary is an important habitat for red and black drum, spotted and sand seatrout, croaker, flounder, menhaden, striped mullet, sheepshead, hardhead and gafftopsail catfish, brown and white shrimp, blue crab, and oysters.

8. Shrimp, blue crab, and oysters are the most valuable commercial species caught in Texas waters. In 1973, commercial landings from Galveston Bay estuary included 2.27 million kg (5.0 million lb) of shrimp valued at $3,320,000; 0.95 million kg (2.1 million lb) of oysters valued at $1,600,000; and 0.91 million kg (2.0 million lb) of blue crabs valued at $254,000. The Galveston Bay system produced approximately 89 percent of the state's oyster harvest in 1973. Major commercial oyster reefs are located in upper Galveston Bay, East Bay, West Bay, and Trinity Bay, but the nearest known commercial oyster reef to the Galveston Harbor Channel is

located approximately 13 km (8 miles) northwest of the project. Oyster production in Galveston Bay experienced a sharp decline in 1973. This decline was caused by unusually heavy rains and consequent flooding which resulted in loss of much of the harvestable crop and closure of much of the bay area to oystering because of high bacterial levels.

Site development

9. At present only the southern and a portion of the western extent of Pelican Island are developed. Development in this area is mixed, with industrial land use being the major type present in the developed area. Sites between 1.6 ha (4 acres) and 97 ha (240 acres) in size contain a combination of industrial/manufacturing and warehousing activities, all situated along the Galveston Channel side of the island. The Texas A&M University owns 31.5 ha (78 acres) on the western end of the island, which is utilized for an oceanography institute, and Seawolf Park, a county park/museum facility, is located on the eastern end of the island (see Figure L2).

10. The northern portion of Pelican Island, consisting of some 1023 ha (2500 acres) has been retained by the Corps of Engineers for continued dredged material containment operations, with portions to be sold off for development at an unspecified future date.

Surrounding development

11. Pelican Island is surrounded on three sides by Galveston Bay and on the fourth side by the Galveston Channel, which separates the island from the city of Galveston and the only proximate development. Development in Galveston across the Channel consists almost exclusively of the piers, warehouse facilities, and related activities which together comprise the Galveston Wharves area of the city. This area serves as the focal point for the shipping activity which is a keystone of the economy of the area.

Site zoning and area land use plans

12. The developed and undeveloped portions of Pelican Island are separated by a two-lane highway, Pelican Island Blvd., which runs in an

east-west direction across the island (see Figure L2). The area south of this street is developed, as has been stated above, for a mixture of industrial uses. The city of Galveston in its Comprehensive Plan shows an industrial use designation for the entire area, with appropriate zoning which permits all categories of industrial use.

13. To the north of Pelican Island Blvd., a tract of some 162 ha (400 acres) has been designated as a medium-density residential area. This tract, which is presently in private ownership, is viewed as having potential development possibilities for a mixture of single and multifamily residential activity. No plans or commitments exist at this time, however. The remainder of the island, still owned by the Corps of Engineers, is designated on the land use map as a marsh and recreation area.

14. Thus, from a land use standpoint, the potential exists for development of the southern half of Pelican Island as a mixture of land uses facilitating a wide range of residential and employment activities.

Area trends

15. The three major Galveston Bay ports, Galveston, Houston, and Texas City, serve a large part of Texas and parts of states to the north and west. The immediate tributary area is highly developed in both agriculture products and industry. The principal agricultural products of the region are grains, cotton, vegetables, fruit, timber, livestock, and dairy products. Minerals in the area include petroleum, natural gas, sulphur, iron ore, gypsum, building stone, brick and tile clays, shell, sand, and gravel. While commerce at the ports of Houston and Texas City consists mostly of crude petroleum and chemical products, the principal items of commerce at the Port of Galveston are agricultural products, sulphur, and imported sugar.

16. The Port of Galveston is the fifth largest dry-cargo port in the State of Texas. Almost 70 percent of the products handled by the Port of Galveston are foreign trade, 52 percent of which represents exports. Principal imports are raw sugar, bananas, frozen meat, dairy products, tea, plywood, and manufactured iron and steel products. In 1973, the

Port of Galveston handled about 6.3 million metric tons (6.9 million short tons) of cargo, about 80 percent dry cargo, about 15 percent liquid sulphur, and 5 percent petroleum and petroleum products. Industries at Galveston include machine shops, cotton compresses, shipbuilding and repair yards, a brewery, commercial fisheries, and wholesale, retail, and service establishments.

17. In the port area, industries and local government have dredged and maintained berthing areas adjacent to the wharves and slips and access channels to the port facilities. In addition, local interests have spent over $20,000,000 since 1950 in constructing port and terminal facilities for the handling of deep-draft commerce. Todd Shipyards Corporation maintains access from the channel to its deep-draft drydocking facilities on Pelican Island. The U.S. Coast Guard and the Corps of Engineers maintain docking facilities at Fort Point on the extreme eastern end of Galveston Island. The privately owned Galveston Yacht Basin and Marina has capacity for berthing 600 pleasure craft. Recent developments include a large sulphur shipping terminal constructed by the Duval Sulphur Company. This company is responsible for shipping a majority of the quantity of sulphur carried over the waterway.

18. An economic impact study based on 1968 employment data found that (1) the combined primary and secondary wage and salary income from waterborne commerce represented 61 percent of the total wage and salary income of inhabitants of the city; (2) 59 percent of the total work force was engaged in meeting the demands of waterborne commerce; and (3) more than 30 percent of the workers in the city of Galveston are employed directly in port-related activities.

19. Although the population of the city, about 62,000 in 1970, has remained relatively constant for 30 yr, the population of Galveston County has increased from 140,364 in 1960 to 169,812 in 1970. Approximately 35 percent (12,000) of the workers employed on Galveston Island live on the mainland.

20. The Galveston County mainland area is the center of one of the most important industrial concentrations on the Gulf Coast of Texas. The abundant supplies of gas and oil from nearby fields, fresh water, low taxes

and moderate climate assure continued expansion of this area. Major industries located at Texas City and LaMarque include Union Carbide Chemical Co., American Oil Co., (Standard Oil of Indiana), Marathon Oil Co., Texas City Refining Co., Monsanto Chemical Co., Gulf Chemical and Metallurgical Corporation, Smith-Douglas Co., Inc., Amoco Chemical Corp., General Aniline, and others. The four oil refineries have a combined capacity exceeding one-half million barrels per day. Texas City is served by the Texas City Terminal Railway Co., which makes daily connections with six major trunk reservoirs holding 9.5 billion litres (2-1/2 billion gallons) of water from the Brazos River.

Land Use Potential Considered for Valuation

21. The island presently contains a mixture of land uses, including recreational, industrial, and residential categories as designated by the Galveston Comprehenisve Plan. Zoning allowable under the provisions of the land use element of the plan includes low- and high-density residential and medium- to high-density industrial. Industrial development has and is occuring, while residential development could occur in the future. The use potential for the island appears fully established by virtue of present land use and zoning, which in turn appears fully consistent with highest and best use considerations. Table 1.1 shows the step by step analysis used to develop site utilization potential.

22. The type and composition of dredged material that has been placed on the island is not considered ideal for development of large buildings without resorting to pile foundations to provide sufficient bearing capabilities. The soft organic silts and clays which make up the bulk of the dredged material, according to the Corps of Engineers, have high compressibility functions, thus negating spread foundations.

23. Despite soil conditions and foundation constraints, the use potential for the island, except where expressly designated otherwise by the Galveston Comprehensive Plan, is considered as industrial. Soil

characteristics are not felt to affect price potential due to strong demand for waterfront sites in the area.

Valuation Estimate

Review of available measures of value

24. Estimating the containment site value in the case of Pelican Island is not possible in terms of the entire island. A large portion of the island is still being utilized as a containment site and characteristics of the land vary from one end of the island to another. It was decided to value those areas of the island where development had taken place, or where land use and zoning designations had been affected, as in the case of the land zoned residential immediately north of Pelican Island Blvd.

25. Land values in Galveston were available through the office of the City Assessor (Texas uses a dual city/county assessment system with incorporated cities assessing within their jurisdictions). Several industrial parcels on the island had been reassessed 3 months prior to the site visit for this case study. These assessments were based on several sales which had also occurred on the island within the last 6 months.

26. Four of the sites which were reassessed involved the sale of unimproved portions of the properties only. Of these four properties, three fronted Galveston Channel and one had no waterfront access. In addition, the assessor had also valued other unimproved parcels on the island with no water access. A good range of comparable site values was therefore available from which to derive a base value estimate.

27. Those parcels selected for comparability purposes were all judged to have utility equal to that of the unimproved land on the southern half of Pelican Island. In the case of the tracts zoned for residential development, no comparable values could be found, either on the island or in Galveston proper. Therefore, it was decided to utilize industrial land

values as a value base for residential property as well, with the understanding that when and if eventual development takes place, an adjustment might be implied.

Demand estimate

28. The present level of demand for industrial land in Galveston, especially waterfront land, is high. The port is rapidly expanding its facilities and many companies, according to port authorities, have expressed a desire for waterfront as well as nonwaterfront parcels to improve for manufacturing activities of a water related nature. In 1977 alone approximately 32 permits were issued by the city for construction of industrial improvements.

29. Employment opportunities are expanding in Galveston, according to the Galveston Planning Department. Although the city has not experienced much of a population increase since 1960, Galveston County has had a 22 percent population increase since 1965. It is estimated that approximately 35 percent of all workers in Galveston County work in the city of Galveston.

30. The overall demand for industrial land in Galveston and Pelican Island over both the short term and long term is seen as very strong. The demand for residential land, on the other hand, is difficult to predict at this time. The absence of firm development plans and ready availability of residential land on the mainland (Galveston County) make residential demand estimation difficult for the island. An estimate on a short-term basis would set demand at a low level. Table 12 illustrates the demand analysis with respect to Pelican Island.

Stratification estimate

31. In the case of both industrial and residential parcels on Pelican Island, attractiveness measures were felt to provide the best basis for establishing the utility of comparables relative to unimproved parcels. The use of physical condition measures of utility was not deemed applicable in this case, as two of the comparables, as well as other improved parcels on the island, were warehouse facilities scheduled to be torn down to make way for new manufacturing improvements.

32. As illustrated by the analysis in Table L3, the comparables and unimproved industrial parcels on the island are all deemed of comparable utility. With respect to attractiveness measures, the residentially zoned area of the island was also deemed to be of comparable utility to the parcels selected for value comparison.

Value estimate

33. The value of comparables to be utilized in this estimate has been computed to be $19,300 per ha ($7,800 per acre), with comparables being of equal utility and similar use potential (see Table L4). All sales data on which the comparable values are based, are for 1977, and no site factor adjustments were warranted.

34. The incremental site value, or benefit enhancement attributable to the dredged material containment, is on the order of $17,500 per ha ($7,100 per acre). This figure is based on the estimated site value of $19,300 per ha ($7,800 per acre), less the raw site value prior to containment. The majority of the raw site, which was basically tidal flat land in Galveston Bay, is valued at $1,725 per ha ($700 per acre). This is the present assessed value assigned to such land along Galveston Channel and the Bay by the Galveston City Assessor.

Associated benefits/impacts potential

35. Table L5 delineates the range of major potential benefits and impacts likely to occur because of development on the island.

36. The most significant area of indirect benefits relative to development on Pelican Island would be in terms of potential employment opportunities generated for the local community. This employment base would generate secondary benefits in terms of increased sales tax revenues, local property tax revenue increases, and the impetus for additional commercial and residential growth in Galveston proper.

37. Community economic benefits can also accrue, mainly in the form of increased tax base, both for property and sales taxes. Secondary community benefits in terms of increasing locational attractiveness for industrial or manufacturing firms could also result.

38. On the impact side, the most significant impact likely to be generated on Pelican Island would be the gradual reduction in open space and marshlands if the northern half of the island is also eventually developed. Increased ship traffic or industrial activity fronting Galveston Channel could lead to environmental damage to water quality and aquatic life.

Table L1

Use Potential Estimation

Constraint	Actual	Impact
Soil Condition		High compressibility of soils dictates against utilization of spread foundations for industrial development improvements. Pier foundations to bearing strata are recommended.
Gravel		
Coarse Sand		
Fine Sand		
Silt	Predominant	
Clay	Intermixed	
Other		
Foundation Constraint		Foundation requirement is not felt to affect either valuation or marketability of land on island due to strong area-wide demand for waterfront and proximate land for all uses, but especially industrial uses.
Spread or Mat		
Pile	Will be required	
Pier		
Allowable Land Use (Per Land Use Plan)		Island will support a variety of land-uses in complete compatibility with one another. Industrial uses could form an employment base for residents resulting from any residential development on the island.
Open Space		
Recreational	Northern portion	
Agricultural		
Residential	North part of southern portion	
Commercial		
Industrial	Remainder of southern portion	
Public		
Zoning Intensity (Per Zoning Ordinances)		Low- and medium-density residential and medium- to high-density industrial zoning will provide optimum development potential.
Estimation		Present development and allowable uses have set pattern for future development. If the northern part of the island is ever made available for development, recreational/open space uses should be contemplated to achieve a balance of activities.
Highest and Best Use	Residential and Industry	
Actual likely Use	Residential and Industry	
Utilization Potential		
. Underutilized		
. Overutilized		
. To Potential		

Table L2

Demand Estimate

Parameter	Indicator	Impact
Building Permit Activity by Land Use, as per Table	No., Year-To-Date 92 (1977)	Strong demand for industrial land, both with and without water access, seems evidenced by the record of building permit activity for industrial uses in 1977. The Galveston Building Department expects demand to continue.
	Total Valuation $1.6 million (1977)	
or Sales Activity by Land Use, as per Table	No., Year-To-Date	
	Average Value	
Economic Growth Indicators	Average Annual Percent Increase	Economic growth and population growth in the city of Galveston and Galveston County seem strong and are expected to continue well into the next decade. The shipping related industrial base of the area is in a strong growth phase. Both trends point to continued land demand, especially industrial.
Added Employment	8% in last 2 yr	
and/or Added Population	22% since 1965	
and/or Sales Tax Revenue Increases		
Community Development Indicators	Year-To-Date	
No. of New Firms	11 in 1977	
or Urban Renewal Activity		

Estimated Demand Intensity	Short-term	Long-term	Impact
Little Activity			Continued demand for industrial and related land, with top market dollar being offered.
Average Activity			
Strong Activity	Very Strong	Strong	

Table L3

Stratification Estimate

Parameter	Site	Comparables
Physical Condition		
Basic Condition of Improvements (If Any)	N.A.	N.A.
Approximate Age of Improvements (If Any)	N.A.	N.A.
Attractiveness		
Accessibility to Site	Excellent	Excellent
and/or Accessibility to Transport	Excellent for water and rail	Excellent for water and rail
and/or Service Availability	All services within 3.6 km (2 mile)	All services within 3.6 km (2 mile)
and Proximity to Similar Activities	Excellent for industrial; poor for residential	Excellent for industrial; poor for residential

Estimate of Site Stratification		Impact
Less Utility than Comparables		Comparables and remaining unimproved industrial parcels are judged to have equal utility for valuation purposes. There is no comparable utility for residential parcels on Pelican Island, and hence difficult to establish separate value base.
Equal Utility to Comparables	X	
Greater Utility than Comparables		

Table L4

Valuation Estimate

Parameters	Comparables				
	No. 1	No. 2	No. 3	No. 4	No. 5
Use	*Unimproved Industrial Waterfront*	*Improved Industrial Waterfront*	*Unimproved Industrial Waterfront*	*Unimproved Industrial Non Water-front*	
Utility as per Table 3	*Equal*	*Equal*	*Equal*	*Equal*	
Value (Sales or Assessment data)	*$18,500/ha ($7,500/acre)*	*$20,750/ha ($8,400/acre)*	*$19,800/ha ($8,000/acre)*	*$17,800/ha ($7,200/acre)*	
Price Adjustment to present year if sale is older					
AVERAGE VALUE OF COMPARABLES	*$19,266/ha ($7,800/acre)*				
SITE FACTOR ADJUST-MENTS (if necessary)	Percent Adjustment Factor (up or down)		Impacts		
Special Accessibility features (if any)	*None*				
Topographical Constraints (if any)	*None*				
Estimated Site Value			Comment		
(Average comparable value plus sum of Site Factor adjustments)	*$19,266/ha ($7,800/acre)*				
Raw Site Value					
(Prior to dredged material disposal operations)	*$1,725/ha ($700/acre)*				
Incremental Site Value					
(Benefit Value Site; Estimated Value less Raw Site Value)	*$17,540/ha ($7,100/acre)*				

Table L5

Benefit/Impact Potential Matrix

Benefit	Public	Private	Site	Adjacent Site	Community	Comment
Continued development either for industrial or residential activities, could serve as a magnet to stimulate the location of complementary activities such as commercial development onto the island		x		x		
Creation of additional employment opportunities.		x			x	Site development would lead to increased community and area-wide employment opportunities and corresponding reductions in area unemployment levels.
Growth in community economic output.		x			x	Increased economic output measured in real dollar terms will result in tightening of regional economic linkages.
Increased in community assessment base.	x				x	Increased assessments will result in added community property tax revenues.
Increased sales tax revenues.	x				x	Resulting from increases in household expenditures due to increased employment activity.
Opportunities for additional service activity.		x		x	x	Additional manufacturing development would constitute an addition to primary economic activity which would in turn generate increased service activities.

Table L5 (Concluded)

Benefit/Impact Potential Matrix

Impact	Public	Private	Site	Adjacent Site	Community	Comment
Increased noise and air pollution	x			x	x	Additional development, especially if extensive in nature, will undoubtedly increase both noise and air pollution levels on the island.
Reduction in marshlands and open space.	x	x	x	x		A significant portion of the island is presently in an open space. Significant additional development could reduce this community resource.
Water quality and aquatic biology deterioration.	x			x	x	Significant additional waterfront industrial or other shipping related development could provide opportunities for serious adverse impacts to water quality and aquatic life in Galveston Channel through shipboard leakage, industrial runoff, or related accidents.

APPENDIX M: PORT JERSEY CASE STUDY
JERSEY CITY AND BAYONNE, NEW JERSEY

APPENDIX M: PORT JERSEY CASE STUDY
JERSEY CITY AND BAYONNE, NEW JERSEY

Project Description and History

1. Port Jersey is a large, highly developed industrial park constructed primarily upon dredged material. For purposes of the industrial development project, dredged material was a valuable resource for site preparation.

Physical characteristics

2. The site is located about 6-1/2 km (4 miles) southwest of the southern tip of Manhattan (Figure M1). Port Jersey is a long, narrow site covering some 172 ha (430 acres). The site stradles the boundary between Bayonne and Jersey City, within Hudson County, New Jersey (Figure M2). To the east of the site is the Upper New York Bay, to the west is State Highway 169 and the New Jersey Turnpike Extension, to the north is the Greenville Yards for Conrail (formerly Penn Central Railroad) and to the south is the Bayonne Supply Center of the U.S. Navy.

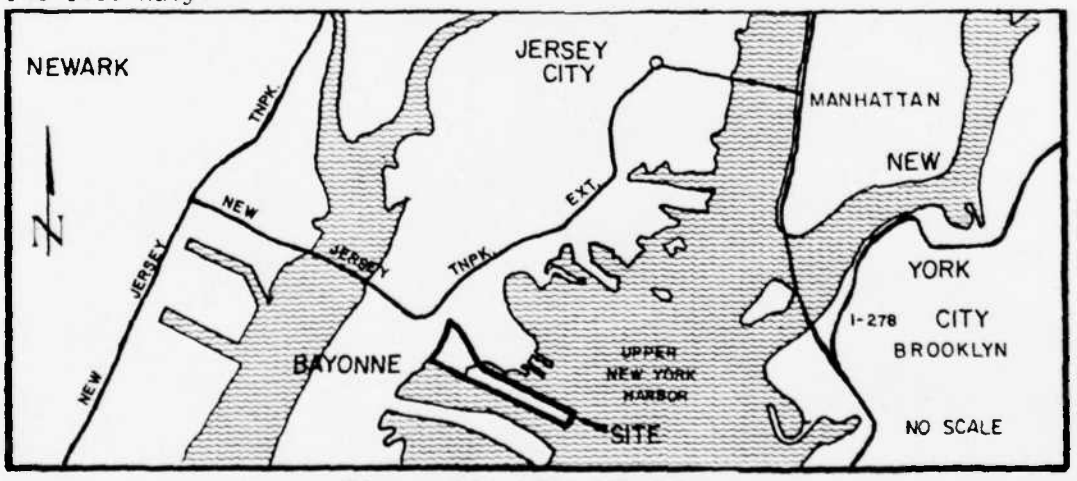

Figure M1. Vicinity Map

3. The site is flat to gently sloping, with elevations up to 6 m (20 ft) msl. Vegetation is sparse, due to a combination of intensive industrial development and poor soil characteristics.

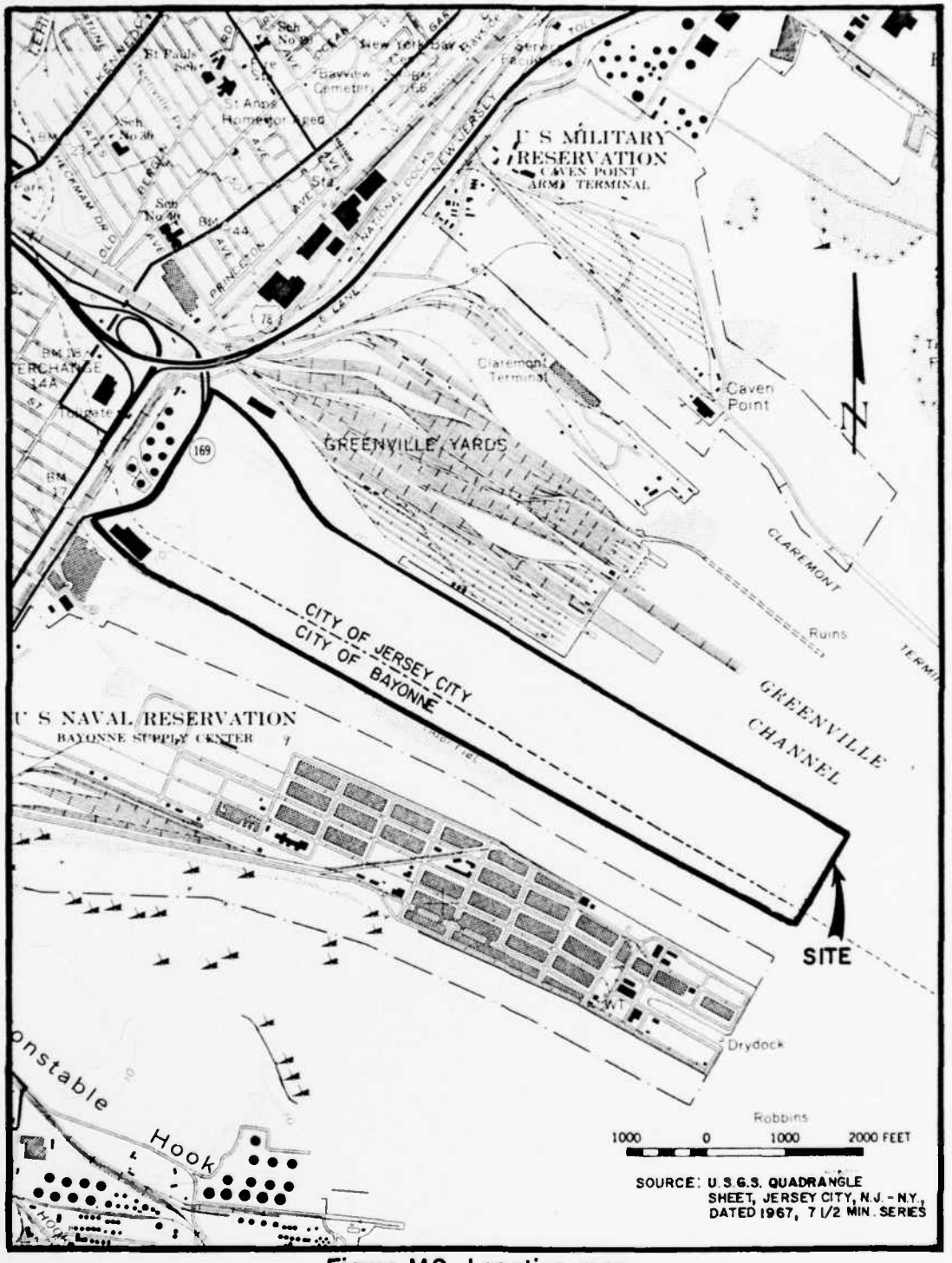

Figure M2. Location map

4. Soil borings reveal that the surface layer of hydraulic fill (composed of organic silts and clays as well as coarser sands) is underlain by alternating layers of sandy gravel and dense clay; limestone is at depths of 18 to 23 m (60 to 75 ft).

5. Site access is excellent by rail, water, and highway. The Port Jersey Railroad Company operates a railroad system on the site, which is connected to the adjacent Conrail railroad yard. Water access to the Upper Bay is by an 11-m (35-ft) deep dredged channel, and the Global Terminals Corporation has constructed a 550-m (1800-ft) wharf along the channel. Highway access is provided by the State Highway 169 and New Jersey Turnpike interchange, which is immediately west of the site.

Site development

6. Before 1968, only 38 ha (93 acres) of the Port Jersey site was the normal water level, and even this portion was not high enough to be used. In 1968 the Port Jersey Corporation acquired several land and bottom land parcels, and in 1969 a dredge-and-fill permit was issued to the corporation.

7. Selective dredged material placement was a focus of the project. The dredged material, including gravel, sand, silt and clay, was well suited to compaction through the use of a continual rotating surcharge. The dredged material itself was used as the surcharge, and it was applied for 60 to 90 days throughout the site.

8. A two-stage separation technique was employed, with initial deposition of coarser materials near the water. Silt and clay was sluiced to inland areas, away from building sites.

9. Port Jersey Corporation leases construction sites to interested parties on a long-term basis with options for renewal. Several parcels have been sold outright, the largest one being the Global Terminals facility. This container terminal, which was completed in October 1972, has 232,000 sq m (2,500,000 sq ft) of building space.

10. A number of other industrial and commercial buildings have been constructed at the Port Jersey site, and development of the entire site is nearing completion. Present employment is estimated

at about 2,500 persons, and gross annual payroll is estimated at $40,000,000.

Environmental setting

11. The waterfront areas of Bayonne and Jersey City are, for the most part, highly developed industrial areas. The urban setting for the site is not sensitive, nor is it protected by any special legal provisions. The New Jersey Coastal Area Facilities Review Act has not yet been applied to the region.

12. Crab populations have begun to increase again in the waters along Jersey City. This resurgence has affected industrial development to the north, as concerned individuals have sought to modify development plans to provide for continued growth in the crab population.

13. Twelve species of fish have been identified in the Hudson River estuary, primarily at the larval stage in life. Bottom-dwelling animals, including crabs, are also abundant. Terrestrial wildlife is not generally found in the area. Migrating birds frequent the region in the spring and autumn.

14. The waters adjoining the Port Jersey site have been classified as B-2 by the Interstate Sanitation Commission. Wastewater effluent requirements for such waters include:

. pH	6.5 to 8.5
. fecal coliform	200 per 100 ml
. BOD removal	80 percent or 35 ppm
. Settleable solids removal	30 percent
. TSS removal	60 percent
. Minimum DO	3 ppm

Surrounding development

15. The cities of Bayonne and Jersey City are fully developed industrial port centers. To the north and south of the Port Jersey site lie major transfer terminals linking surface and water transportation. Beyond the highway interchange to the west of the site is an older residential area.

Site zoning and area land use plans

16. Subsequent to the first stages of the Port Jersey development, the Liberty Harbor Redevelopment Plan was adopted by Jersey City for the surrounding area. Port Jersey itself was exempted under the land acquisition phase of this urban renewal plan, but zoning for the site was supplemented explicitly by the other requirements of the redevelopment program.

17. Under the redevelopment plan, the Port Jersey site is designated for industrial use. Permitted uses in this category include manufacturing, assembly, laboratory testing, research, marine commercial, storage, neighborhood commercial and service, containerport, shipping, trucking, automotive business, professional and governmental offices, public and quasi-public uses, off-street parking and loading, railroad, and related accessory uses. No other land uses are permitted at the site.

18. Zoning for the site is important only where it is more restrictive than the redevelopment plan land uses. The zoning ordinance for Jersey City, as amended in April 1977, designates Port Jersey as an I-3 Industrial Park. Uses under this category are listed below.

- Permitted principal uses. Office buildings; warehousing, manufacturing, processing, research, and assembly operations, but not including the production of explosives nor the processing of petroleum into fuel oil, or other products; terminal facilities for rail, truck, and waterborne transportation including storage and containerization facilities, but not including tank farms; marinas and the construction and repair of marine vessels; utilities; restaurants; motels and hotels; parking garages and lots; narcotic and drug abuse treatment centers.
- Permitted accessory uses. Off-street parking and loading; fences and walls; guardhouses; (at marinas) boat sales and rentals, repair facilities, and wholesale and retail sales of marine supplies; private helicopter landing pad; meeting rooms.

19. The portion of the Port Jersey site lying in the City of Bayonne is not subject to the redevelopment plan or zoning restrictions

noted above. The Bayonne zoning ordinance is a prohibitive one; i.e., only certain uses are prescribed within each category. The Bayonne ordinance poses no significant constraint on industrial site development.

20. All land parcels adjacent to Port Jersey are zoned for industrial land uses of various types, primarily warehousing and transportation related.

Area trends

21. The cities of Bayonne and Jersey City are industrial and transportation centers in northern New Jersey. Recent history has shown a decline in the economic strength of the two cities, and several manufacturers have ceased operations.

22. Population is generally decreasing, a trend which began at the turn of the century. Extrapolation of census data indicates that Bayonne and Jersey City will have slight or no population growth for the balance of the century, with a projected combined population of 375,000 persons. Employment has generally declined as well. From 1960 to 1970 the number of workers in Jersey City decreased from 247,000 to 102,000.

Land Use Potential Considered for Valuation

23. Table M1 presents the constraints on the productive use of the Port Jersey site. The site, with its excellent access to various modes of transportation, is ideally suited for intensive industrial activity. Land use plans and zoning for Bayonne and Jersey City recognize this suitability, and thus do not materially constrain this "natural" use.

24. Soil borings taken at the site show that soil-bearing capacity is not sufficient for large loads, but an adequate load-bearing stratum is found at a depth of 12 m (40 ft). Thus, piles or pier supports are required to support structures.

25. As stated above, the present soil characteristics resulted from a continuous, rotating soil surcharge applied for an average of

60 to 90 days. In addition, dredged material was selectively placed. The result of these procedures was to obtain acceptable soil bearing characteristics with a minimum of delay. The Global Terminals facility, for example, was fully operational only 3 yr after dredging began. Without selective material placement and surcharging, site dewatering and consolidation alone could have easily exceeded three years. Careful site planning therefore enabled the site to reach its use potential rapidly, thus minimizing carrying costs.

Valuation Estimate

Review of available measures of value

26. Valuation of the Port Jersey site is complicated by several factors. Comparable industrial sites of similar size are not found in the area. Few recent industrial land sales of any kind have been made in the area. Appraisal information is treated as proprietary by the Port Jersey Corporation, a private business concern.

27. Available measures of value are thus limited to tax assessment information and the asking price for the remaining 12-ha (30-acre) parcel at Port Jersey.

Demand estimate

28. Neither Bayonne nor Jersey City exhibits the characteristics of a growing city. Population and development have remained stagnant for the last decade, and the recent recession struck the region dramatically. Quantifying these observations is made impossible by the lack of current information at the local planning agency. A planning division without current information may be itself indicative of a stagnating economy.

29. The Port Jersey site is somewhat more attractive from a development perspective than other sites in Bayonne or Jersey City, it is included in the Liberty Harbor Redevelopment Plan. As a consequence, under State law the local real estate tax may be abated for a 15-yr period after development. While the land itself is not taxed as real estate, the value of improvements is taxed.

30. The favorable tax treatment accorded the Port Jersey site increases the demand for this land, in comparison to other industrial land in the region.

Stratification estimate

31. Stratification analysis is not appropriate for this case study because comparable industrial land sales do not exist. As previously noted, a portion of the value associated with the Port Jersey site is attributable to the special tax preference granted to redevelopment area properties.

Value estimate

32. The City of Jersey City appraises the Port Jersey property at $100,000 per ha ($40,000 per acre) for "service charge" computation. The service charge is in lieu of (and much less than) real property tax on the land. The appraised property value is currently about 65 percent of true market value in Jersey City. Using these figures, the market value of the Port Jersey site is $154,000 per ha ($61,000 per acre). This assessed value was appealed by the Port Jersey Corporation, and after the Corporation received a private appraisal, the appeal was dropped. Jersey City obtained an independent appraisal estimate of $187,500 per ha ($75,000 per acre) in contemplation of litigation on the question, but this tentative figure was never substantiated by a formal appraisal.

33. A 12-ha (30-acre) parcel at the easternmost end of the site is presently listed for sale as undeveloped industrial land. The asking price for this parcel is $4,500,000, or $375,000 per ha ($150,000 per acre). This asking price is not likely to be the selling price for the parcel, however.

34. Similarly, the fact that Port Jersey Corporation dropped its real estate assessment appeal indicates that the true market value is more than the $154,000 per ha ($61,000 per acre) figure. A weighted average market value should reflect the better-than-average location of the 12-ha (30-acre) parcel with regard to the Port Jersey site as a whole. By weighting the real estate tax appraisal 80 percent, the weighted average market value for the Port Jersey site can

be computed: (0.8) (154,000) + (0.2) (375,000) = $198,000 per ha ($79,000 per acre).

35. The raw site value before dredged material placement may be computed from the 1968 sales price for the 100-ha (250-acre) parcel auctioned by the City of Jersey City. By adjusting the $2,040,000 sale price for 10 yr of inflation at 8 percent, the raw site value for this parcel is $4,400,000, or $44,000 per ha ($18,000 per acre). This parcel included both bottomland and fastland areas. The remaining portions of the Port Jersey site were under water prior to dredged material placement. Tax assessment data show such land has a market value of about $22,500 per ha ($9,000 per acre). The average raw site value, computed in current dollars, is thus $4,400,000 + (72 ha) ($22,500 per ha) = $6,020,000, or $35,000 per ha ($14,000 per acre). The value enhancement attributable to dredged material placement for the Port Jersey site is $198,200 - $35,000 = $163,200 per ha ($65,200 per acre).

Associated benefits and impacts potential

36. Those indirect benefits and adverse impacts which resulted from the productive use of the Port Jersey site are identified in Table M2. Traffic congestion proved to be both an indirect benefit and adverse impact. On the impact side, it is true that more heavy trucks use local streets than before the site was developed. However, this increased traffic expedited planning and construction of a highway interchange which was needed prior to site improvement.

37. Use of the Port Jersey dredged material site for additional industry has boosted the local economy. For example, in 1977 Global Terminals employed more than 200 local citizens with a payroll of some $3,000,000 per year. Subcontracted labor added $1,500,000 to that figure; local purchases of supplies and maintenance amounted to another $1,000,000; and real and personal property taxes for the year totaled $600,000. These figures reflect only the value of the Global Terminals facility to Bayonne and Jersey City. For the entire Port Jersey site, the figures are even more impressive, with a total payroll of some $40,000,000 annually.

Table M1

Use Potential Estimation

Constraint	Actual	Impact
Soil Condition		
Gravel	Gravel and sands placed in building areas. Material has been surcharged	Moderate foundation limitations imposed by soil characteristics.
Coarse Sand		
Fine Sand		
Silt	Silts and clays placed away from building areas and surcharged	Adequate base for open space and some parking uses.
Clay		
Other		
Foundation Constraint		
Spread or Mat		
Pile	Timber piles used	Piles average 12 m (40 ft) in length, and are required to support concentrated loads.
Pier		
Allowable Land Use (Per Land Use Plan)		
Open Space		
Recreational		
Agricultural		
Residential		
Commercial		
Industrial	As per zoning ordinance & local redevelopment plan	Development is constrained to permitted industrial uses, including manufacturing and cargo transfer. Non-commercial support services (i.e. restaurants) are also permitted.
Public		
Zoning Intensity (Per Zoning Ordinances)	High Intensity Industrial Park	Industrial Park designation requires overall site.
Estimation		
Highest and Best Use	High Intensity Industrial	At present, the Port Jersey industrial park is nearing completion.
Actual Likely Use	High Intensity Industrial	
Utilization Potential		
. Underutilized		
. Overutilized		
. To Potential	At present use	

Table M2

Benefit/Impact Potential Matrix

Benefit	Public	Private	Site	Adjacent Site	Community	Comment
Stimulus to underdeveloped section of region, providing an element of redevelopment plan.	x				x	Redevelopment plan led to community-wide increase in related activities, thus reversing downward trends.
Increased employment opportunities		x	x	x	x	Transport-related employment is primarily blue collar. On-site employment generates further opportunities in adjacent areas and throughout the community.
Increased real estate tax revenues	x				x	While land itself is not fully taxed, improvements are.
Increased cash inflow to region		x			x	Subcontracts, payroll, and sales of supplies all accrue to local economy.
Aesthetic value of surrounding properties improved		x		x		Underdeveloped open space was unattractive before site development.
Highway expansion expedited by development	x			x		Needed highway interchange was rapidly constructed simultaneously with site development.
Impacts						**Comment**
Increased traffic congestion	x	x		x	x	Industries at site utilize heavy trucks.
Open space land uses foreclosed	x			x	x	Waterfront sites for recreation spaces are limited.

M12

APPENDIX N: BLOUNT ISLAND CASE STUDY
JACKSONVILLE, FLORIDA

APPENDIX N: BLOUNT ISLAND CASE STUDY
JACKSONVILLE, FLORIDA

Project Description and History

1. Blount Island is a 680-ha (1700-acre) dredged material site which is currently being used for industrial purposes. More than two thirds of the site is currently developed for port-related facilities and an industrial plant.

Physical characteristics

2. Blount Island is approximately 15 km (9 miles) east of Jacksonville in the St. John's River and 12 km (7 miles) west of the Atlantic Ocean. As shown in Figure N1, the island is 4 km (2.5 miles) across its base and 2.5 km (1.5 miles) wide at its widest point. The base of the island borders the Dame Point Cutoff, a 12-m (38-ft) deep navigation channel. The rest of Blount Island is surrounded by a meander in the St. John's River.

3. Topography across the island is flat to gently sloping, with elevations ranging up to 6 m (20 ft) msl. The entire island is covered with dredged material, as the area has served as a disposal site for new and maintenance dredging since the turn of the century. Soil borings reveal that the surface layer of organic silts and clays is 1 to 3 m (3 to 10 ft) thick, with limestone bedrock at -15 to -25 m (-50 to -80 ft) msl. The intermediate soil profile consists of layers of loose to firm sand, with a compressible layer of organic material at variable depth.

4. Highway access to the site is provided by State Route 105, Heckscher Drive, and a low bridge crossing the St. John's River. Heckscher Drive intersects Interstate Highway 95 about 12 km (7 miles) west of Blount Island.

Environmental setting

5. In 1972 a series of biologic surveys of Blount Island were taken. The Back River (a fingerlike bay that stretched into the island) was determined to be a valuable nursery area for shrimp and

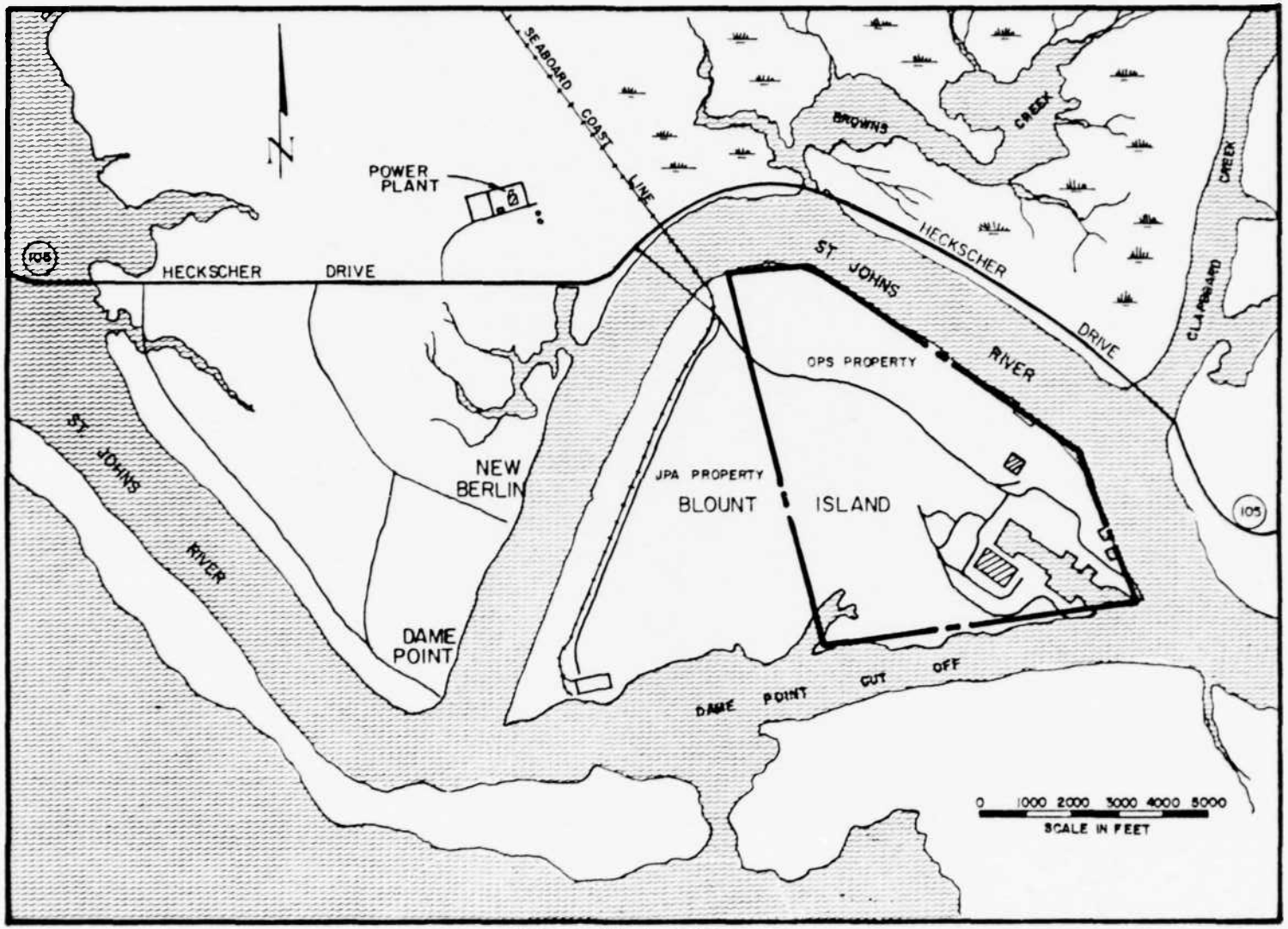

Figure N1. Location map

other animals, although not as productive as the 36,000 to 40,000 ha (90 to 100,000 acres) of adjacent marshland north and east of Blount Island.

6. The St. John's River has been classified a Class III stream, which is suitable for recreation and the propagation and management of fish and wildlife. Air quality requirements pose no constraint on site development.

7. The environmental setting of the Blount Island site is thus somewhat sensitive; however, ecological resources are available nearby to replace any areas damaged by site development.

Site development

8. Much of the land area of Blount Island was created in 1950 when a 10.5-m (34-ft) deep navigation channel was dredged some 3,700 m (12,000 ft) eastward from the small community of Dame Point. The dredged material was placed along the southern edge of the St. John's River meander to raise land elevations, and to connect Alligator Island, Vicks Island, and LeBaron Island to Goat Island (now called Blount Island).

9. In 1957 the Florida Legislature transferred title to Goat Island to the Duval County Board of Commissioners. The state stipulated that the site be used for port facilities and industrial sites. Following creation of the Jacksonville Port Authority (JPA) by the Florida Legislature in 1963, title to the 680-ha (1700-acre) island was transferred to the JPA.

10. Initial site development was authorized and funded in 1965 by part of a $25,000,000 bond issue. This work included development of access bridges and routes for road and rail, utilities, 800 m (2,600 ft) of deep-draft berthing structures, a warehouse, and storage areas. All of these facilities were constructed on the western portion of the Island. Construction of these facilities commenced in 1968 and was completed in 1972.

11. A plan for development of a major shipyard on the eastern side of the Island was abandoned when the Florida Supreme Court ruled unconstitutional a JPA $111,000,000-bond issue to finance development

of port facilities.

12. Between 1970 and 1972, dredged material from a federally assisted project to deepen Jacksonville Harbor to 12 m (38 ft) was selectively placed in confined areas of Blount Island to enhance suitability for industrial development. In late 1971, plans for development of the easternmost 344 ha (860 acres) of Blount Island were announced by the JPA. Subject to obtaining necessary permits and environmental approvals, Offshore Power Systems, Inc. (OPS) agreed to construct an industrial plant which produces platform-mounted, floating nuclear plants. In 1973, a dredge-and-fill permit was issued, and following a 1-yr delay due to court challenges, construction commenced in 1974. This construction deepened part of Back River for wharves and filled in the balance of Back River.

13. At the Blount Island terminal, a 77-m (250-ft) wharf extension was completed in 1976 and another 92-m (300-ft) extension is now nearing completion. This will result in a total frontage of 1100 m (3600 ft) and a total of five working berths along the wharf. Much of the cargo handled at the JPA facility today is automobiles and trucks. As a result, a substantial area in the interior of the island has been developed as parking areas for incoming vehicles.

Surrounding development

14. Development along Heckscher Drive has, until recently, been exclusively residential. The western end of the Heckscher Drive corridor has now been developed as an industrial park, the Imeson International Industrial Park. Imeson represents a capital investment of $500,000,000, with an annual payroll of $450,000,000 and 45,000 employees.

15. Between the Imeson development and Blount Island lie a number of recently constructed industrial facilities, the most notable being a power plant located about 1 km (0.5 mile) west of Blount Island.

Site zoning and area land use plans

16. Blount Island is zoned Industrial Waterfront (IW) under the Jacksonville Municipal Code. Section 708.320 of the Code identifies permitted uses and structures, accessory uses, and

permissible uses under this category. Section 708.320 provides that,

> *"These districts are intended to set apart and protect areas considered vital to the performance of port functions, and to provide for their efficient operation, continuation and expansion....In order to reserve such areas for port-related facilities only, it is intended to exclude uses which can be located equally well elsewhere and inappropriate to districts of this character."*

17. Virtually any heavy industrial use is permitted under the IW designation, provided the use is directly related to port activity.

18. The comprehensive land use plan for Jacksonville identifies the Heckscher Drive corridor between Interstate 95 and Blount Island as a primary area for industrial development in the region. In connection with this development the plan calls for widening Heckscher Drive from two to six lanes.

Area trends

19. Jacksonville is the self-proclaimed "port city with all of the right connections." Industrial growth in the city is strong and displays no signs of tapering off.

20. The City of Jacksonville and Duval County formed a consolidated government in 1967. This consolidation caused Jacksonville to become the largest areal city in the United States. The City/County recorded a population of 528,865 in 1970, a 16.1 percent increase over the 1960 population. The Jacksonville area Chamber of Commerce estimated the City/County population to be 585,300 in 1976 and forecasted a 1980 population of 630,000.

21. The 1970 U.S. Census recorded a labor force of 223,492 and an unemployment rate of 3.3 percent of Duval County. In 1976, the Chamber of Commerce reported a labor force of 300,000 and an average unemployment rate of 6 percent. The leading employers in the area are: Southern Bell Telephone, 4,325 employees; Blue Cross-Blue Shield, 3,600 employees; and Seaboard Coastline Railroad, 3,384 employees.

Land Use Potential Considered for Valuation

22. Considered in the context of its IW zoning classification and its close proximity to a deep navigation channel, the Blount Island site is most valuable for use as a industrial/trasnport land use.

23. Choice industrial land with deep-water access is limited by several features of the Jacksonville port system. The river channels which meander through the city are cut off by highway and railroad bridges, leaving a limited portion of the downtown area with deep-water access.

24. While proximity to deep water indicates industrial land use, the soil characteristics of the site are less favorable. The layer of organic silts which lies between the surface and bedrock poses foundation constraints, the severity of which depends on its depth, which varies. Some areas of the island require pile or pier foundations even for relately small buildings. Heavy, concentrated loads require deep foundation structures anywhere on the island. Table N1 presents the use potential estimation for Blount Island.

Valuation Estimate

Review of avialable measures

25. Real estate tax assessment data and the state-mandated ratio of assessed valuation to market value are available. For comparison, the price of the portion of Blount Island that was sold to OPS in 1972 is available.

26. The best comparable available data come from the Imeson Industrial Park experience. Comparison with Blount Island is possible because JPA has historical site development costs on the Imeson site.

27. As a part of the Environmental Impact Statement prepared by the Corps of Engineers prior to issuing the 1973 dredge-and-fill permit, the Corps estimated the enhancement value of dredged material placement at OPS site. A check of this estimate is therefore possible.

Demand estimate

28. The aggressive posture taken by the Jacksonville Chamber

of Commerce toward new industrial development has been evidenced by a strong demand for port-related industrial land. As noted above, choice industrial locations with access to deep water are limited by the layout of the Jacksonville port. A more severe limitation is possible over the long term; current plans provide for a highway bridge at Dame Point, immediately inland from Blount Island. Navigation interests have opposed the design of the bridge, since claiming that it will impede ship traffic.

29. Table N2 presents several objective measures of industrial land demand. Industrial growth is estimated to remain strong over both the long and short terms.

Stratification analysis

30. Measures of site stratification with respect to comparables are not particularly helpful. Most of the Blount Island site is currently unimproved, as is a substantial portion of the Imeson tract.

31. Availability of services is one important distinction between Imeson and Blount Island. Water and sewer are available through much of the Imeson Park, but neither are available within 12 km (7.5 miles) of the Blount Island site. This difference is offset by the marginally better accessibility to Blount Island.

32. The stratification estimate for the Blount Island site is presented in Table N3.

Value estimate

33. The 352-ha (880-acre) parcel on Blount Island owned by OPS is currently assessed at $10,060,000, or $28,600 per ha ($11,400 per acre). By applying the 0.87 ratio of assessed value to market value, the market value is computed as $32,900 per ha ($13,100 per acre).

34. Land in the Imeson Industrial Park (with utilities) has sold for almost $11 per sq m ($1 per sq ft), or $108,900 per ha ($43,560 per acre).

35. Additional site preparation expenses required to develop the Blount Island site, as opposed to Imeson, explain the vast difference between these two values. Using the $75,000 per ha

($30,000 per acre) figure supplied by JPA as the cost to prepare its parking lot sites (before actual asphalt placement), the Imeson land sales figure and the adjusted tax assessment data closely compare. The estimated market value for the Blount Island site is thus $33,750 per ha ($13,500 per acre).

36. Enhancement value cannot be computed for the site as a whole, due to its extended use as a dredged material site. But the portion sold to OPS in 1972 was initially used for dredged material placement, and the present value of that sale can be deducted from the enhanced present value to determine the enhancement value of dredged material placement: $1,538,900 + $722,200 (5 yr @ 8%)= $2,261,100, or $6,500 per ha ($2,600 per acre).

37. The enhancement value of dredged material placement is computed as follows: $33,750 - $6,500 = $27,250 per ha ($10,900 per acre).

Associated benefits/impacts potential

38. Table N4 presents the benefits and impacts for the Blount Island site. The port-related industrial use of the site will eventually benefit the community by permitting continued industrial growth and new employment opportunities. Added employment will in turn provide spin-off effects throughout the local economy, giving consumers as a group more disposable income. Real estate tax revenues should increase as well, obviating the need for tax increases.

39. Increased congestion by trucks and automobiles, with attendant increases in noise and pollution, looms as the largest adverse impact on the community. Marsh area reduction is a less severe problem because large marsh areas remain undeveloped immediately north and east of the site.

Table N1

Use Potential Estimation

Constraint	Actual	Impact
Soil Condition		Variable soil profiles indicate that optimum building placement is subject to soil characteristics. Soil-bearing capacity is fair to poor.
Gravel		
Coarse Sand	Intermediate Layers	
Fine Sand	Intermediate Layers	
Silt	Surface and Intermediate Layers	
Clay	Surface	
Other		
Foundation Constraint		Development costs are raised as foundation requirements increase.
Spread or Mat	Adequate for light loads in some areas	
Pile	Deep foundation required for heavy loads and for light loads in some areas	
Pier		
Allowable Land Use (Per land Use Plan)		The site is at the eastern end of a major industrial development corridor. Development is oriented toward shipping and distribution facilities.
Open Space		
Recreational		
Agricultural		
Residential		
Commercial		
Industrial	Waterfront related	
Public		
Zoning Intensity (Per Zoning Ordinances)	Waterfront related	High-density uses permitted if use is directly related to port activity.
Estimation		The site is presently underutilized. However, its potential is high for full development.
Highest and Best Use	Industrial/transport	
Actual Likely Use	Industrial/transport	
Utilization Potential		
. Underutilized		
. Overutilized		
. To Potential	Eventually	

Table N2

Demand Estimate

Parameter	Indicator	Impact
Building Permit Activity for Industrial Land Use	1977 43 Total Valuation $24,418,907	*Growing industrial community places a premium on well located sites.*
or Sales Activity by Land Use , as per Table	No., Year-To-Date Average Value	
Economic Growth Indicators	1977 percent increase over 1976	*Indicative of growing community and strong local economy*
Added Employment	*4 percent*	
and/or Added Population		
and/or Sales Tax Revenue Increases	*7.3 percent*	
Community Development Indicators	1977	*Attractiveness to industry is proven. City shows signs of vitality.*
No. of New Industrial Firms	*23*	
or Urban Renewal Activity	*Rather extensive in old residential neighborhoods*	

Estimated Demand Intensity	Short Term	Long Term	Impact
Little Activity			*Growth trend has been strong with no indication of reduction in industrial growth.*
Average Activity			
Strong Activity	*X*	*X*	

Table N3

Stratification Estimate

Parameter	Site	Comparables
Physical Condition		
Basic Condition of Improvements (If Any)	Excellent, where improved	Excellent, where improved
Approximate Age of Improvements (If Any)	Less than 5 yr, where improved	Less than 5 yr, where improved
Attractiveness		
Accessibility to Site	Good	Good
and/or Accessibility to Transport	Excellent	Excellent
and/or Service Availability	Fair	Good
and Proximity to Similar Activities	Excellent	Excellent

Estimate of Site Stratification	Impact
Site is of equal utility to comparables, except for lack of utilities	No adjustment

Table 44

Benefit/Impact Potential Matrix

Benefit	Public	Private	Site	Adjacent Site	Community	Comment
Satisfies demand for industrial sites with deep water access		x			x	Adequate industrial sites are required in order to attract industry.
Increased employment		x			x	Blue collar workers are employed by port-related industries. These workers constitute the majority of unemployment (currently about 6 percent).
Increased real estate tax base	x				x	Sale of JPA land will increase land stock on which property taxes are collected.
Increased economic strength	x				x	"Ripple" effect of large scale industrial development will give consumers more disposable income.
Will expedite local highway improvements	x			x		Demand caused by site development will accelerate development of needed highway and bridge.
Impacts						**Comment**
Increased traffic congestion	x			x		Heckscher Drive is designed to handle 5000 vehicles/day. Development could exceed the design limit.
Loss of natural marsh area	x		x	x		Nursery area for shrimp, etc. destroyed by fill activity, but there is an adjacent more suitable area that can be used instead.
Residential displacement		x		x		Industrial development will displace several single family homes along St. John's River.

APPENDIX O: RIVERGATE CASE STUDY
MEMPHIS, TENNESSEE

APPENDIX O: RIVERGATE CASE STUDY
MEMPHIS, TENNESSEE

Project Description and History

Physical characteristics

1. The containment site being examined consists of approximately 172 ha (425 acres) of developable land located about 8 km (5 miles) south-southwest of the Memphis Civic Center off Interstate 55. The site fronts McKellar Lake, which is an intermediary body of water between the shoreline and the Mississippi River.

2. Beginning in 1958, material from the maintenance dredging of McKellar Lake and the Memphis Harbor Channel by the CE was placed at the Rivergate site. CE records are incomplete as to the total amount of material placed on the site, which began in 1958 and continued to about 1973. It is estimated that about 1,145,000 cu m (1,500,000 cu yd) of dredged material, mostly sand, was placed during this period.

3. In 1973 Belz Enterprises, the owner of the containment site, obtained a CE permit for dredging a 1.62-km (1-mile) long by 182-m (600-ft) wide canal through the center of the containment site. Between 1974 and 1975 a total of 4,580,150 cu m (6,000,000 cu yd) of silt and sand were dredged for the canal and placed on the remainder of the site, all at the owners expense. In 1975 Belz Enterprises also contracted for supplemental dredging of McKellar Lake to bring the Rivergate site to an elevation above the 100-yr flood level.

4. Rivergate is, therefore, a unique example of a containment site with productive use potential where the majority of dredging and containment operations have been performed under private rather than CE auspices.

5. Figure O1 is a map illustrating the location of Rivergate relative to its surrounding area.

Environmental setting

6. The topography of the study region varies from gently rolling hills and ridges in upland areas east of the Mississippi River to moderately wide valleys at the mouths of tributary streams and flat delta lands

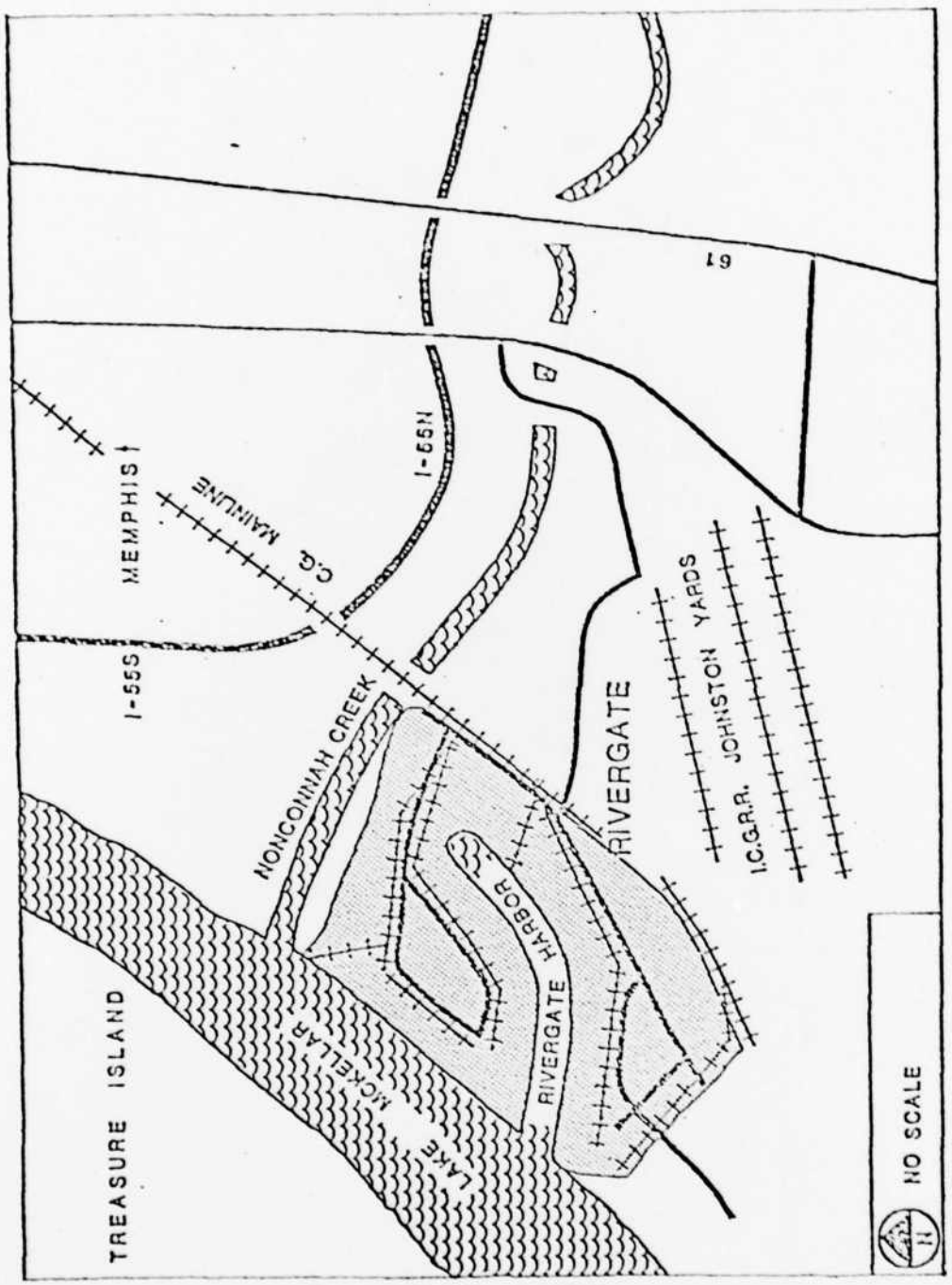

Figure 01. Site location

west of the river. Elevations range from 60.2 m (197.5 ft) above mean sea level in lower floodplain to 118.9 m (390 ft) above mean sea level in hill areas. The general study area lies within the Gulf Coastal Plain physiographic area. This plain has been dissected to a variable degree. The valleys on the Tennessee side of the river are well incised. Tributary streams have moderately wide valley floors. Hilltops and ridgetops are rounded with moderately sloping valley walls. Uplands are considered rolling to undulating. The watersheds have a dendritic drainage pattern.

7. Soils in the floodplain of the Mississippi River and tributary streams are composed of point bar deposits. Material of this type, consisting of alternating thin layers of silt, clay, and fine sand with an occasional strata of gravel, is deposited by meandering of the streams and is fine grained. This material has been recently deposited and is relatively unconsolidated. The terrain is relatively flat with minor dissection by small streams.

8. All five major vegetative communities or types that are found is the Memphis Harbor study area offer potential wildlife habitat to some species of animals. The riverfront hardwoods are used as temporary roosting sites or for nesting by some species of passerine and wading birds and are utilized by species of mammals, reptiles, or amphibians that prefer semiaquatic environments. The bottomland and bottom hardwoods are the most extensive vegetative types and offer ideal habitats for many species of terrestrial dwelling mammals, birds, reptiles, and amphibians. The loessial bluff hardwoods are in much the same category as bottomland and creek bottom hardwoods. Habitats range from dry ridges and moist slopes to semiaquatic and aquatic types in the bottoms or hollows. A wide variety of fauna may occur under such conditions. The wetlands offer semiaquatic and aquatic environments to a number of mammalian, avian, reptilian and amphibian species. These are important areas for waterfowl when the recreational opportunities are considered. Many species of reptiles, primarily snakes, will be located around this type of habitate, as well as toads, frogs, and salamanders.

9. The analyses of water chemistry and water quality by the CE indicated high levels of phosphates and orthophosphates in the area of President's Island and high levels of pesticides in the surrounding area, the latter being due to agricultural runoff. Very high concentrations of ammonia, nitrate, phosphate, and suspended solids were detected in the area of McKellar Lake.

Site development

10. At present, the Rivergate site is undeveloped except for the main access road to the site from Interstate 55 and utilities to the parcels. Rivergate has been subdivided for development purposes into 61 parcels, ranging in size from 0.8 ha (2 acres) to 5.6 ha (13 acres); 28 parcels have frontage along either the canal or McKellar Lake.

11. The whole of Rivergate is planned as an industrial port facility which will cater to a mix of industrial uses, ranging from light to heavy manufacturing and warehousing/docking facilities. The site is ideally situated from a development standpoint and is able to offer transportation access to all four major forms of freight hauling--barge, rail, truck, and air.

Surrounding development

12. Rivergate is fronted by McKellar Lake on the west, which separates it from Treasure Island, an undeveloped area fronting on the Mississippi River. The area surrounding the site on the remaining three sides is comprised of a mixture of agricultural use interspersed with industrial development.

13. The Johnston Switching Yards of the Illinois Central Gulf Railroad are located 0.8 km (0.5 mile) to the east of the site. This major rail freight switching terminal serves seven Class 1 railroads, providing access to all parts of the eastern U.S. The Memphis International Airport, which also offers complete air cargo service, is located 4 km (2.5 miles) east of the site and accessed via I-55.

14. Industrial development surrounding the site is mixed in terms of activity. A large petroleum refinery owned by Delta Industries, which produces fuel oil and gasoline, is located immediately north of the site.

19. The Memphis area historically has been associated with usage of the Mississippi River to foster area development. Waterborne commerce has long occupied a key role in the area's development and economy. Because of its advantageous location on the river and the proximity to a large center of population, industrial influx has intensified in the past decade. As a result, most of the available land along the navigable water courses has been developed. Room for future industrial expansion or development is severely limited along all channels of the existing harbor.

20. In the interest of navigation, extensive modifications in the Mississippi River near Memphis, Tennessee, have been accomplished by the Corps of Engineers. These works include the provision of off-river harbor facilities including access channels, a 390-ha (960-acre) industrial landfill above floodstage, and an industrial development area of about 2750 ha (6800 acres) that is protected from floods by a levee and pumping station.

21. Industrial activities are the primary waterfront land users in the harbor area. Industrial growth undoubtedly will contine, but furture development will be severely limited because of the lack of floodfree waterfront sites. Therefore, the continued growth of harbor-based development will cease unless a new harbor channel is developed to serve floodfree waterfront sites.

22. Without new waterfront industrial land, waterborne commerce will become more costly. Storage will have to be provided outside the Memphis waterfront area. If new industries cannot locate waterfront sites, their transportation costs will increase due to the necessity for transshipment from inland industrial areas to existing waterways.

23. Economic studies made during 1974 and 1975 indicated an existing and future need for navigation channels serving waterfront land. Projections indicated that there will be a need for development of over 162 ha (400 acres) of waterfront industrial land within 10 yr, increasing to more than 810 ha (2000 acres) in the next 50 yr.

Land Use Potential Considered for Valuation

24. The Rivergate site, though undeveloped, is already committed to use, both by virture of predetermined ownership investment and by virtue of utility location and zoning. Assuming no private investment were present at Rivergate, the ideal use potential would still be an industrial port. The surrounding land is slowly industrializing; the site has excellent waterfront access; parcels are level and large; and zoning is functional.

25. The majority of the dredged material placed on the site is a mixture of silt and medium-grained sand. Discussions with engineering personnel at the U.S. Army Engineer District, Memphis, indicated that the soil should pose no problems for large building foundations. Table 01 shows the step-by-step analysis used to develop site utilization potential.

Valuation Estimate

Review of available measures of value

26. The estimate of site value for Rivergate is based on the unit value per ha, rather than on the whole site. This is because a portion of the site is water and, therefore, not directly valued. Value is computed on a per ha basis for the land area of the site only.

27. Land values for the Memphis area are available through the office of the Shelby County Assessor. The assessor is currently revaluing industrial and commercial land in waterfrong areas and had sales data, which were less than one year old, from which to form a comparison basis.

28. From the data available, four comparables were selected all of which were waterfront parcels and all located on President's Island, which is across Lake McKellar from Rivergate. The comparables were judged to have equal utility to the unimproved sites in Rivergate in terms of all measures utilized.

Demand estimate

29. The present level of demand for industrial waterfront land in Memphis is high. The city is rapidly expanding its role, both as a waterborne commerce port and a transshipment port. In 1977 a total of 25 permits were issued by the city for construction of industrial improvements.

30. According to the Memphis-Shelby County Planning Commission, employment opportunities in Memphis are good, but there is a shortage of skilled labor in the region, which has in turn delayed development. The most important of the area's basic industries is manufacturing, made up almost equally of durable and nondurable items. The second largest sector of employment is the government labor force. Retail trade and wholesale trade and services compose the majority of the balance of occupations. Other sizeable occupation groups include construction, agriculture, transportation, communications and utilities, finance, real estate, and insurance. The unemployment rate, prior to the current recession, averaged less than 3 percent. Local industrial development organizations are attempting to attract more industry to provide an even more diversified economic base.

31. The overall demand for industrial land in Memphis, especially along waterfront areas, both over the short term and long term, is very strong. Table 02 illustrates the demand analysis for the Rivergate site.

Stratification estimate

32. Attractiveness measures provide the best basis for establishing the utility of comparable sites relative to unimproved parcels for Rivergate. As is illustrated by the analysis in Table 03, the comparables and site parcels are all deemed of comparable utility.

Value estimate

33. The value of comparables to be utilized in this estimate has been computed at $53,800 per ha ($21,800 per acre), with all comparables having equal utility and similar use potential (see Table 04). No site factor adjustments were warranted, and all data are for 1977.

34. The incremental site value, or benefit enhancement attributable

to the dredged material containment, is on the order of $43,050 per ha ($17,450 per acre). This figure is based on the estimated site value of $53,800 per ha ($21,800 per acre), less the raw site value prior to containment. The Rivergate site was originally low-lying land and partial mud flat. Similar land is valued at about $10,750 per ha ($4,300 per acre).

Associated benefits/adverse impacts potential

35. Table 05 delineates the range of major potential benefits and adverse impacts likely to occur because of site development.

36. The most significant area of indirect benefits relative to development in Rivergate is employment opportunities generated for the local community. This employment base would generate secondary benefits in terms of increased sales tax revenues, local property tax revenue increases, and the impetus for additional commercial and residential growth.

37. Community economic benefits can also accrue, mainly in the form of increased tax base, both for property and sales taxes. Secondary community benefits in terms of increasing locational attractiveness for industrial or manufacturing firms could also result.

38. The most significant adverse impact of the Rivergate project would be a gradual reduction in open space and marshlands. Increased ship traffic or industrial activity along the Mississippi River and McKellar Lake could lead to environmental degradation to water quality and aquatic life.

Table 01

Use Potential Estimation

Constraint	Actual	Impact
Soil Condition		
Gravel		Good base material for erection of commercial and industrial type buildings without special foundation work.
Coarse Sand		
Fine Sand	Majority of fill	
Silt	Some	
Clay		
Other		
Foundation Constraint		
Spread or Mat	Acceptable	Reduced development costs.
Pile		
Pier		
Allowable Land Use (Per Land Use Plan)		
Open Space		Optimum utilization of land allowable; highest return potential on investment.
Recreational		
Agricultural		
Residential		
Commercial		
Industrial	Heavy	
Public		
Zoning Intensity (Per Zoning Ordinances)	M-3	
Estimation		
Highest and Best Use	Industrial	Site allowed to be utilized to highest and best use; maximum return on investment possible.
Actual Likely Use	Industrial/Port	
Utilization Potential		
. Underutilized		
. Overutilized		
. To Potential		

Table 02

Demand Estimate

Parameter	Indicator	Impact
Building Permit Activity by Land Use, as per Table 01	No., Year-To-Date 25 in 1977	Strong activity in the industrial development area
	Total Valuation	
or Sales Activity by Land Use , as per Table 01	No., Year-To-Date	
	Average Value	
Economic Growth Indicators	Average Annual Percent Increase	Strong population growth, signaling good economic growth, either actual or potential.
Added Employment	No figures available	
and/or Added Population	6% per year over last 5 years	
and/or Sales Tax Revenue Increases		
Community Development Indicators	Year-To-Date	Memphis has strong need for additional industrial development to serve its status as a major Mississippi River port and regional center. A shortage of skilled labor is the single strongest detriment to rapid expansion at this time.
No. of New Firms	5% increase in 1977	
or Urban Renewal Activity		

Estimated Demand Intensity	Short term	Long term	Impact
Little Activity			Once labor problem is resolved, rapid economic expansion is foreseen.
Average Activity	x		
Strong Activity		x	

Table 03

Stratification Estimate

Parameter	Site	Comparables
Physical Condition		
Basic Condition of Improvements (If Any)		
Approximate Age of Improvements (If Any)		
Attractiveness		
Accessibility to Site	Excellent	Excellent to good
and/or Accessibility to Transport	Excellent to all modes	Excellent to good to most modes
and/or Service Availability	Excellent	Excellent
and Proximity to Similar Activities	Excellent	Good
Estimate of Site Stratification	**Actual**	**Impact**
Lesser Utility than Comparables		Properties selected for comparison purposes are deemed to be of basically equal utility to subject site.
Equal Utility to Comparables	generally equal	
Greater Utility than Comparables		

Table 04

Valuation Estimate

Parameters	Comparables No. 1	No. 2	No. 3	No. 4	No. 5
Use	Vacant	Vacant	Vacant	Vacant	
Utility as per Table 03	Equal	Equal	Equal	Equal	
Value (Sales or Assessment data)	$53,800/ha ($21,800/acre)	$53,800/ha ($21,800/acre)	$53,800/ha ($21,800/acre)	$51,650/ha ($20,900/acre)	
Price Adjustment to present year if sale is older					
AVERAGE VALUE OF COMPARABLES	$53,800/ha ($21,800/acre)				
SITE FACTOR ADJUSTMENTS (if necessary)	Percent Adjustment Factor (up or down)		Impacts		
Special Accessibility features (if any)					
Topographical Constraints (if any)					
Estimated Site Value			Comment		
(Average comparable value plus sum of Site factor adjustments)	$53,800/ha (21,800/acre)		No adjustments necessary.		
Raw Site Value					
(Prior to dredged material disposal operations)	$10,750/ha (4,360/acre)		Raw site was above water level with interspersed mud flats. Value is assessment estimated based on comparable sales within last 18 months.		
Incremental Site Value					
(Benefit Value Site; Estimated Value less Raw Site Value)	$43,050/ha ($17,450/acre)				

Table 05

Benefit/Impact Potential Matrix

Benefits	Public	Private	Site	Adjacent Site	Community	Comment
Development of site as an Industrial/Port facility will serve as a magnet to stimulate the location of complementary activities in the surrounding area.		x		x		
Creation of additional employment opportunities.		x			x	Development would lead to increased employment opportunities with corresponding reductions in unemployment.
Growth in community economic output.		x			x	The value of goods and services produced and/or transshipped in a port facility of this size would have a measurable impact in real dollar terms.
Increase in community assessment base.	x				x	Increased industrial assessments will result in substantial community property tax revenue increases.
Increased sales tax revenues.	x				x	Increased employment activity will result in total household expenduture increases in the Memphis area.
Opportunities for additional service activity.		x		x	x	Manufacturing development could generate demand for new service activities to complement industrial activity.
Impact						**Comment**
Increased noise and air pollution.	x			x	x	Additional development of an industrial nature will increase both noise and air pollution levels in the surrounding area.
Reduction in open space.	x	x		x		Reduction of community recreational resource base.
Water quality and aquatic biology deterioration.	x			x	x	Significant waterfront industrial and shipping related development could provide opportunities for serious adverse impacts to water quality and aquatic life in McKellar Lake.