DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
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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.

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

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

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Appendices A through O were reproduced on microfiche and are enclosed in an envelope 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
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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.

(Continued)

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.

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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.

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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.

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)

- 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)

- 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 Special 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

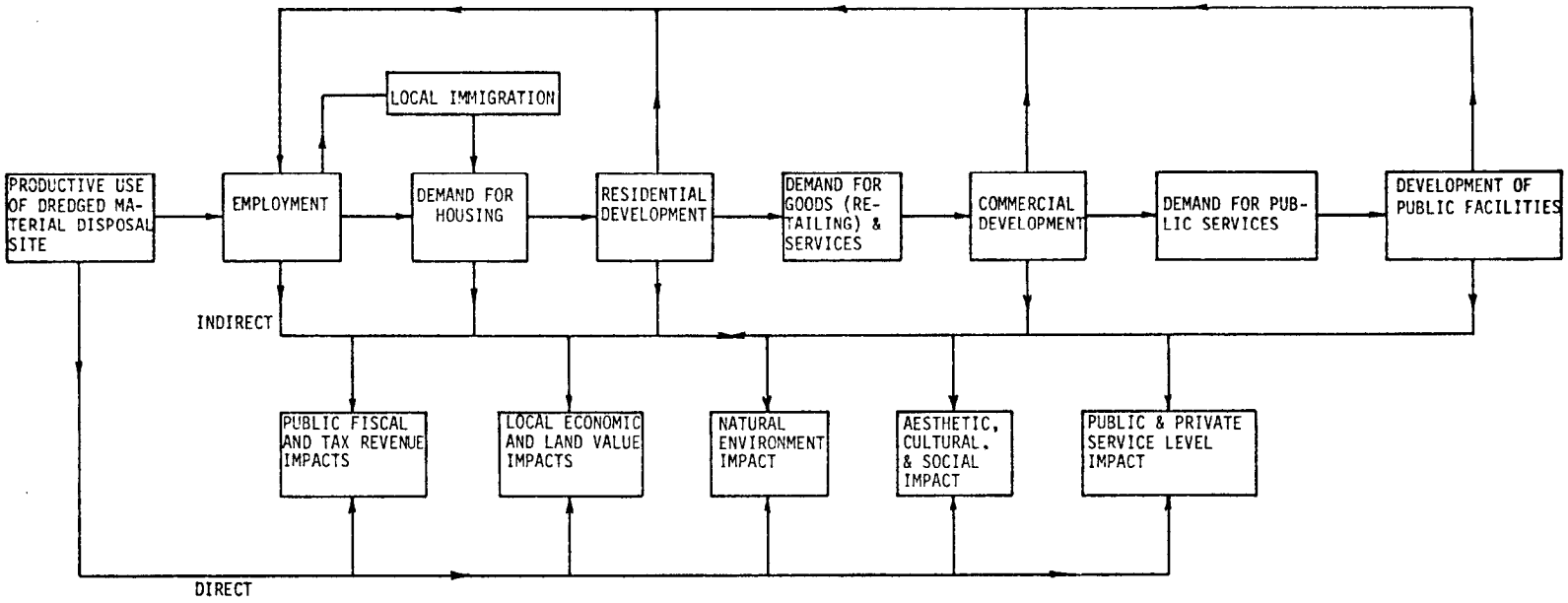


FIGURE 1. Interrelationship of the categories of potential effects on a surrounding area from the creation of a productively used dredged material site

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)

Table 6 (Concluded)

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

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

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.

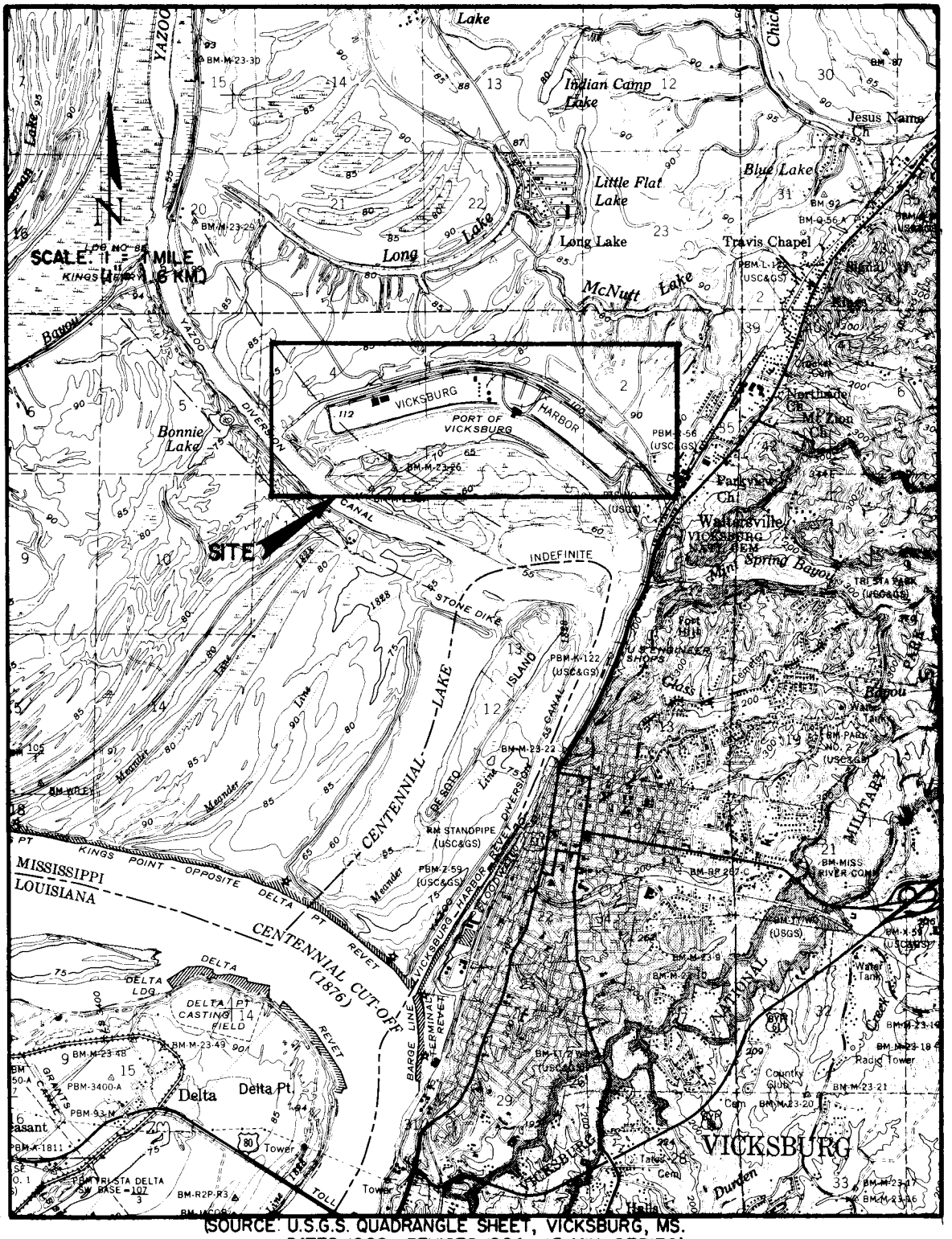
Site Description

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	*Fully*	

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*	*No significant activity is apparent, either in terms of new firm location or in terms of major redevelopment aimed at attracting new industry.*
or Redevelopment Activity	*Mostly historical in nature*	*None*	
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.*

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 (assumes*	*Industrial zoning)*			

Value of Comparables	*$9900/ha ($4000/acre) 1977*	*$7400/ha ($3000/acre) 1975*			
Price Adjustment to Estimate Yr	*use 7 1/2% annual $10,600/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, hotel	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	$10,800 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

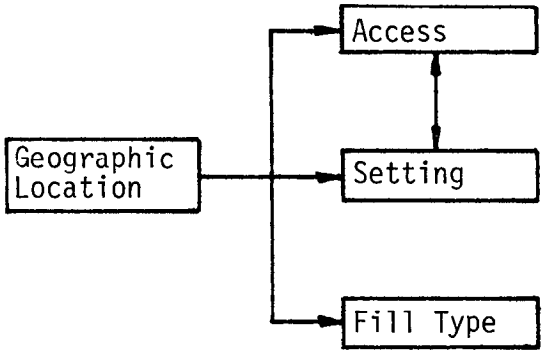
225. The evaluation considers these criteria in each of the categories which are related and those which are not, and the criteria considered in all instances are those which are significant relative to value increase or decrease.

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

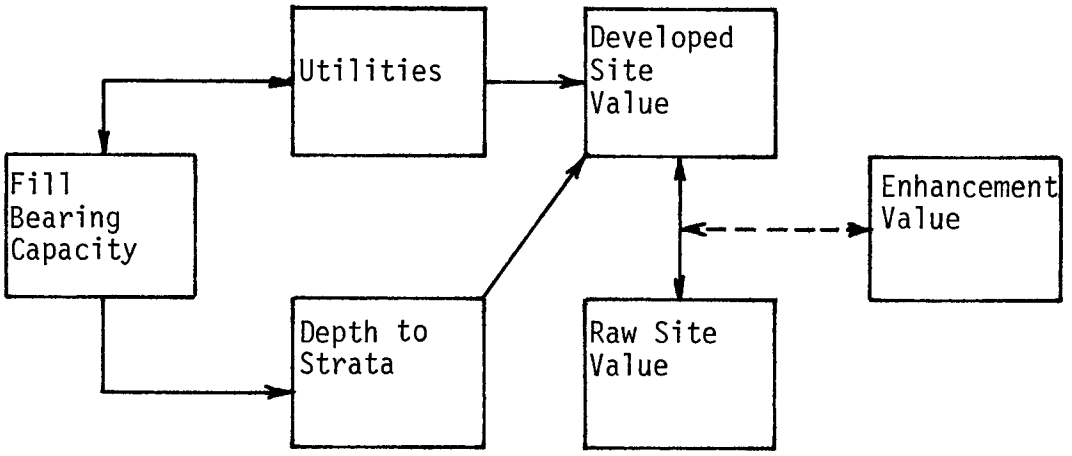
229. Evaluating the economic criteria relative to value consideration produces six variables:

- 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.



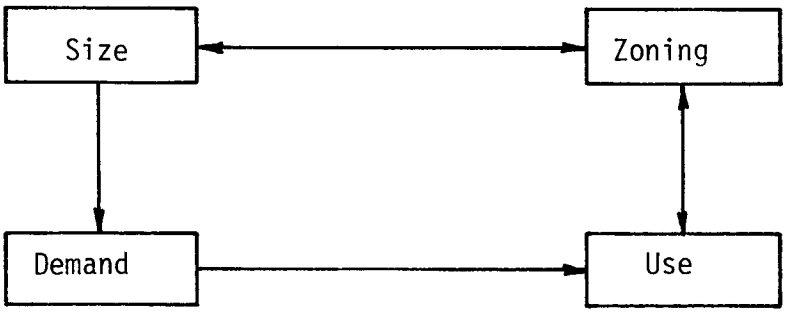
Productive use

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

- Size of site
- Zoning
- Demand
- Use

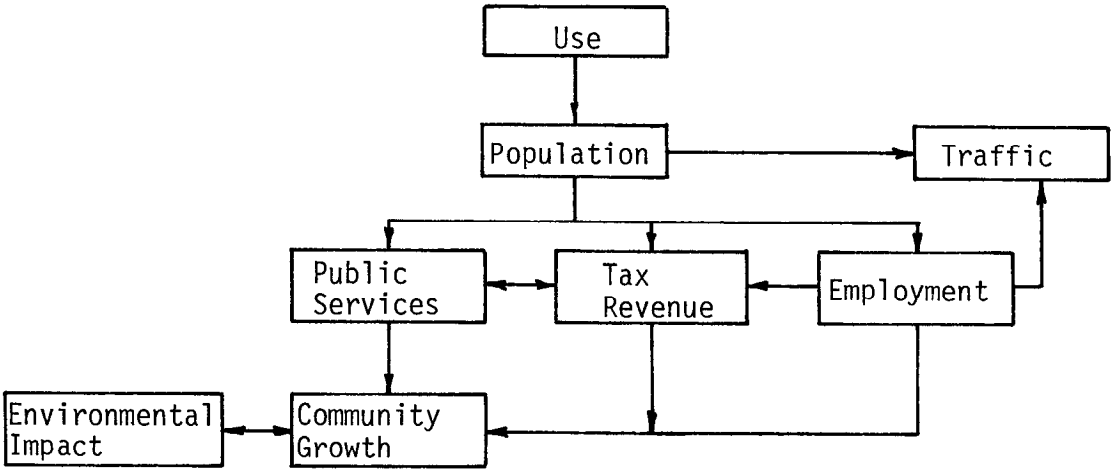
The use criterion is truly the "bottom line" of the relationship of the other three variables and is, in turn, a key criterion in determining value. Zoning and use are clearly related and can be rather closely correlated in so far as zoning constrains use of a site. The size of a site can also pose use 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.

Conrad, E T
A methodology for determining land value and associated benefits created from dredged material containment / by E. T. Conrad, Andre J. Pack. SCS Engineers, Reston, Virginia. Vicksburg, Miss. : U. S. Waterways Experiment Station ; Springfield, Va. : available from National Technical Information Service, 1978.
116 p. : ill. ; 27 cm. (Technical report - U. S. Army Engineer Waterways Experiment Station ; D-78-19)
Prepared for Office, Chief of Engineers, U. S. Army, Washington, D. C., under Contract No. DACW39-77-C-0069 (DMRP Work Unit No. 5D05)
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)
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