



REGIONAL PLANNING INSTRUCTION
LAND USE PLANNING

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LIST OF ACRONYMS

ACHP – Advisory Council on Historic Preservation
APFO – Adequate Public Facilities Ordinance
ARPA – Archaeological Resources Protection Act
BAH – Basic Housing Allowance
BFR – Basic Facilities Requirement
BRAC – Base Realignment and Closure Act
CADD – Computer Aided Design and Drafting
CAFM – Computer Aided Facility Management
CATEX – Categorical Exclusion
CEQ – The Council on Environmental Quality
CERCLA – Comprehensive Environmental Resource and Cleanup Liability Act
CMTS – Cable Modem Terminal System
COCS – Cost of Community Services
COG – Council of Governments
CPI – Consumer Price Index
CZM – Coastal Zone Management
CZMA – Coastal Zone Management Act
DASN (ES) – Department of the Assistant Secretary of the Navy (Environmental Security)
DEM – Digital Elevation Model
DERP – Defense Environmental Restoration Program
DLA – Defense Logistics Agency
DLG – Digital Line Graphic
DoD – Department of Defense
DoN – Department of the Navy
DRG – Digital Raster Graphic
DSMOA – Defense/State Memorandum of Agreement
EA – Environmental Assessment
EE – Engineering Evaluation
EED – Electroexplosive Device
EFD – Engineering Field Division
EIS – Environmental Impact Statement
EMR – Electromagnetic Radiation
EPA – Environmental Protection Agency
ESTCP – Environmental Security Technological Certification Program
ESQD – Explosive Safety Quantity Distance
FEMA – Federal Emergency Management Agency
FPD – Facilities Planning Document
FONSI – Finding of No Significant Impact
GIS – Geographic Information System
GPS – Geographic Positioning System
HERO – Hazards of Electromagnetic Radiation
ICRMP – Integrated Cultural Resource Management Plan
INRMP – Integrated Natural Resource Management Plan
IPL – Integrated Priority List
IRP – Installation Restoration Program

ISP – Internet Service Provider
MILCON – Military Construction Project
MPO – Metropolitan Planning Organization
MSC – Mobile Switching Center
NAGPRA – Native American
NAICS – North American Industrial Classification System
NAS – Naval Air Station
NEPA – National Environmental Policy Act
NEX – Navy Exchange
NIMA – National Imagery Mapping Association
NOAA – National Oceanographic and Atmospheric Agency
NOCD – Naval Oceanographic Command District
NPDES – National Pollutant Discharge Elimination System
NRCS – Natural Resource Conservation Service
NHPA – National Historic Preservation Act
PPV – Public Private Venture
PSTN – Public Switched Telephone Network
RCRA – Resource Conservation and Recovery Act
REIS – Regional Economic Information System
ROD – Record of Decision
RSIP – Regional Shore Infrastructure Plan
SARA – Superfund Amendment and Reauthorization Act
SCPEA – Standard City Planning Enabling Act
SERDP – Strategic Environmental Research and Development Program
SFPS – Shore Facility Planning System
SHPO – State Historic Preservation Office
SIC – Standard Industrial Classification
SIP – State Implementation Plan
TIF – Tax Increment Financing
TIN – Triangulated Integrated Network
TSTC – Tri-Service CADD/GIS Technology Center
USGS – United States Geological Survey
USACE – US Army Corps of Engineers
WWW – World Wide Web

1.0 PURPOSE AND FUNCTION

1.1 Authority for Regulation

The Regional Shore Infrastructure Planning (RSIP) process is dependent upon the inclusion of a regional perspective in planning for Navy installations. This perspective will result in long-term plans which look beyond the boundaries of an installation, considering opportunities and constraints in the surrounding region. Data is collected for at both the installation and regional level in RSIPs, forming the basis of the following analysis at both scales.

Planning for Navy sites involves both regional and site specific data collection and application. The plans must reflect thorough methods of collection and thoughtful analysis and description of the relevant issues. Data requirements to comply with federal, state, and local regulations have increased, resulting in the need for more targeted collection methods. The Navy planner faces the challenge of gathering the highest quality information in the most efficient and effective manner. Exponential leaps in technology during the 1980s and 1990s have enabled the planner to access increasingly large amounts of data, whether for a fee or otherwise. The internet and Geographic Information Systems (GIS) technologies provide tools for data application, analysis, and visual display which enable community members at all levels to interact and understand the planning process at hand. The purpose of this manual is to provide both the beginning and experienced Navy planner with a useful guide for project-related data collection and application activities.

This module integrates thirty-four data topics or categories into the Navy regional planning process. Included in this list are topics representing both the natural and built environments, including those reflecting current regional and community planning methods such as mixed-use and brownfield development. According to the EPA, brownfields can be defined as, “abandoned, idled, or under-used industrial and commercial properties where redevelopment is complicated by real or perceived environmental contamination” (EPA MOU, 1997). All topic areas are discussed within a regional and naval planning context. The module provides a systematic and easy-to-use guide for data collection and usage, discussing data definitions, interpretation, analysis, and relationships. The analysis of data using GIS technologies is discussed, including best practices for creation of graphical elements.

1.2 Geographic Information Systems (GIS)

A Geographic Information System is used for development, analysis, and storage of data. Used at all levels of planning, the GIS enables a planner to create unique geographic data and associated tabular attributes. After creating or importing data, the GIS provides the means for analysis of the visual and numerical data relating to topics including both the natural and built environments. Graphics created from the GIS include raster, vector, and three-dimensional (3-D) images, displaying the analysis effectively and clearly.

At the facility and regional scale, environmental and manmade information is available for many Navy and other public sites. These data sources and graphics will be displayed and referenced throughout the following functional use areas, providing examples of analytical tools available to planners.

2.0 DATA APPLICATION AND METHOD IN THE NAVY REGIONAL PLANNING PROCESS

2.1 Data Needs

Today's emphasis on regional planning and looking "outside the fence" requires a more inclusive list of data needs. Traditional master planning focused primarily on site-specific natural systems data and limited regional socioeconomic sources. Regional planning will include that data on a site and regional scale, as well as more detailed information on socioeconomic and built environment systems.

Navy planners most often require the following:

- Continually updated, detailed, and complete station/activity mapping in at least one standard GIS format. This includes accurate information on biological, physical, and manmade data categories (i.e., vegetation and wildlife, topography, utilities, geology, etc.).
- Base maps for reference, analysis, and graphic description. These often include current aerial photography and topographic and cadastral information. The cadastral information includes real estate information describing jurisdiction and installation boundaries and metes and bounds survey information.
- Accessible and reliable socioeconomic [(e.g. US Census, Regional Economic Information System (REIS), North American Industrial Classification System (NAICS))] and cultural resource data sources. In addition to the data itself, planners may require assistance in developing targeted data collection questions to efficiently acquire cultural resources information.

2.2 Data Application

The Navy planning process requires data in a wide range and at variable levels of detail. Data categories fall into broad areas that describe both the natural and built environments at the installation and in the surrounding region. Data is collected or created for each category and is interpreted either as an opportunity or a constraint to land use planning. Opportunities and constraints for both environments must be synthesized into a composite of the information to aid the planner in defining the development suitability of a site.

Coupled with this development suitability summary is a set of Navy functional and programmatic summary information. Together, these major informational summaries provide the basis for regional shore infrastructure planning. From this combination of database opportunities and constraints, the planner can begin to explore alternative development scenarios. These scenarios can then serve as the basis for the stakeholder visioning process, which is fundamental in the Navy RSIP process. After crafting the vision and preferred scenario, the regional plan can then be developed.

The use of GIS has enhanced the application of planning information to more accurately reflect conditions in both the natural and built environments. Analyzing the interactions between layers of information enables the planner to more accurately guide development into areas that are more efficient, cost-effective, and environmentally conscious. Using the data linked to the layers, planners can use the tool for both

spatial analysis and graphic production. Taking the GIS technology one step further, the RSIP-Link product will enable the planner access to updated activity level data as well as outside sources of pertinent regional data. These outside sources will be linked to the appropriate location in a graphic user interface for more accurate and timely analysis capabilities. For a more detailed discussion of technological applications of the planning data through GIS and the RSIP-Link, see Chapter 36 on Technology.

2.3 Data Collection Method

Before beginning the data collection process, the planner must understand the tasks of the project and what is required. After the tasks are clearly delineated and the information for each task is listed, the planner should create a spreadsheet identifying the required data and its sources. Understanding the source of the data is especially important. The planner must assess the purpose of what the data will show or convey before choosing the appropriate source. Some data reflects intent for broad-scale representation while other is very detailed, telling a particular story in the numbers. The credibility and format of the source is important to consider. Using reliable and tested sources (e.g. Census) rather than particular, local data intended to fit one purpose, may result in more credible evidence and conclusions on the project.

Data collection can occur through internet research, RSIP-Link research, site visits and personal data retrieval, and telephone contact. Each method has its own strengths and weaknesses, with varying amounts of detail possible from all three. Internet research is often an advisable early step before a site visit, collecting initial background data on your activity and surrounding region. Once the site visit has occurred and source materials collected, the internet is a good place to return for more detailed data collection to supplement anything previously gathered. For example, if a data source does not have recent, digital topographic information, collection from the United States Geological Survey (USGS) site would be appropriate for base map retrieval and/or creation.

2.3.1 Method: Internet Research

- Create a spreadsheet with the types of data needed and an initial list of applicable web pages. (Note the end of each functional area section for a suggested beginning list of sites)
- Search applicable RSIP-Link sites for existing information at both the activity and regional levels. Where information is available, data collection effort can be saved in finding new data. Any information delineating official boundaries or land survey details should be investigated first through the Engineering Field Division (EFD) real estate office and local political jurisdiction.
- Search suggested sites, noting links from those pages to other applicable and appropriate sites.
- When existing sites and new links are exhausted, use a search engine to uncover new sites. Examples of search engines are <http://www.search.com>, <http://www.yahoo.com>, <http://www.northernlights.com>, and <http://www.hotbot.com>. Experiment with search phrases, noticing what results the engine returns. Target efforts to matching web pages and categories, thinking of how the information returned could be used to support or enhance the data discussion and analysis within the shore facility plan. The official Navy website is also a useful springboard to related sites <http://www.navy.mil/nol/>.
- When a website is uncovered that may be a useful reference point for future efforts on the project, bookmark it or add it to the browser “favorites” list for easy retrieval.

- Print or download applicable data sets or information when found, noting the Universal Resource Locator (URL) for future referencing in the final document bibliography.

2.3.2 Method: Site Visit

- Create a spreadsheet with the types of data needed and the sources where it will be found. Evaluate the data available in-house and perform a preliminary internet search for descriptive regional and site data before going on-site.
- Begin all data gathering efforts by gathering contact phone numbers from the project point of contact, directories, and internet resources.
- Write an email of introduction to the site contact detailing the scope and purpose of the project, as well as providing a detailed list of items to collect once on-site. Depending on the project, some of the information may be collected before you arrive.
- Follow the email with a telephone call to set up an appointment. Group appointments by location. Generate questions before arrival at site/source.
- Catalogue data the evening after the interviews. Compile notes from interviews and use the previously created spreadsheet to organize the names of sources and the information collected from them.
- Return to the office to inventory data and note data "gaps". Note which categories require further investigation.

2.3.3 Method: Telephone Contact

- Obtain phone numbers from point of contact, internet, or telephone directories.
- Verify sources by phone. Once a source is located, use a similar introduction to statement below:
- "EFD will soon begin work on the RSIP for _____ (fill in activity name and location). We are currently gathering data and think you can provide us with some useful information in the following areas....." (List specific functional use areas, using this module as a guide).
- Ask specific questions.
- Record interview and ask what data/sources are available.

NOTE: If data is not available, make sure you ask this source to recommend another source.

- Arrange for data to be sent as needed. With electronic and digital information, have the source email or File Transfer Protocol (FTP) the information to the planner's local site. If email is not available, use the fax or standard mail service. If information is needed immediately, provide the source with the planner's overnight shipping service account number.
- Note data "gaps" and categories requiring further investigation. Return to internet searches if necessary and follow-up with additional contacts.

2.4 Data and Source Update Procedures

2.4.1 Data Update

- There may be an existing in-house (EFD master source list) at the EFD. Evaluate the source list before calling for updates.
- If no source list exists in-house, follow the preceding directions for the data collection method.
- Keep records of all phone conversations and keep a personal written list of contacts. Update this list with each conversation and for each project.
- Organize list of contacts by project area and by major topic (i.e., key contacts for soils maps in Jacksonville, North Carolina area).
- There may be an existing database (library, individual data files, digital GIS data) in-house at the EFD. Any information delineating official boundaries or land survey details should be investigated first through the EFD real estate office and local political jurisdiction. Evaluate the available data before obtaining updates
- If no database exists in-house, follow the preceding directions for the data collection method.

2.4.2 Source List Update

- Keep records of all sources of data, including the date of publication, publisher, copyright information, and place of publication.
- Some data storage and updating is possible at the EFD libraries if the data is collected and updated on a regular basis. If document or source is out of date, search for the document through personal contact at a specific agency or use the internet to find the document on the web.
- Cite sources used for copyright requirements as well as future reference and further reading opportunities.

2.5 Data Pedigree and Quality

While gathering data, make sure to look for related metadata. Metadata is data about data. It may include a "data quality report" or other information that provides answers to the following questions:

- What is the age of the data?
- Where did it come from?
- In what medium was it originally produced?
- To what map scale was the data digitized?
- What projection, coordinate system, and datum were used in maps?
- What was the density of observations used for its compilation?
- How accurate are positional and attribute features?

- Does the data seem logical and consistent?
 - Do cartographic representations look "clean?"
 - Is the data relevant to the project at hand?
 - In what format is the data kept?
 - How was the data checked?
 - Why was the data compiled?
 - What is the reliability of the provider?

(Colorado www, 2001)

An undocumented dataset can be practically worthless. The metadata will give a clue to the accuracy of the data and its suitability for use in the planning study. The metadata is critical information about the data that allows the planner to know what they are buying and hence becoming a smart shopper.

While considering the best source for required data, the planner must also consider the option of having a custom-made dataset built for the study. Sometimes the costs of using and converting publicly and commercially available digital files outweigh their value. The available data may not contain exactly the sort of information that is needed for the study, or the information may be divided among a large number of files provided by different public and private suppliers in different formats. To get the required data in the required format efficiently and accurately, it may have to be created for the study.

2.6 Role of Graphics in Planning Documents

"A picture is worth a thousand words" is a phrase often heard in the design community. While pictures are not a replacement for words, a judicious use of graphics in documents can help to present information with more clarity and efficiency. Planning documents need to present vast amounts of information on a range of subjects as succinctly as possible. Using the combined strength of graphics and text, planners can assemble clear, concise, and visually appealing documents.

The computer age has resulted in a growing ease in creating and reproducing high-quality graphics, increasing the options of available data sources and formats. In fact, with so many options to choose from, it is sometimes difficult to know how to pick one over the other. This chapter provides guidance for weighing the pros and cons of available data options.

Graphical information collected and created for Navy RSIPs will be integrated into the RSIP-Link product after the plan is complete. The use of the RSIP-Link as a repository for compiled graphics, as well as a source for data collection and investigation, is critical in maintaining an up-to-date planning process. Planners should investigate RSIP-Link products within their region or an adjacent one in order to collect information for analysis. The electronic format of the RSIP-Link will enable planners to update information regularly, avoiding a static plan which is used infrequently. The links to information outside the Navy realm will provide the person using the tool a regional perspective on the installation and region-wide issues facing a specific plan.

2.6.1 Graphical Formats

Listed below are four graphical formats commonly used in planning documents. Each of these is best suited to record, present and analyze specific types of data:

- **Maps** : They are used for spatial data and locational distributions.

- **Graphs and Tables:** These show discrete values that can be aggregated or categorized based on some criteria.
- **Flow charts and diagrams:** They display processes or hierarchies.
- **Pictures:** These can be used for the richness of detail of the three-dimensional world (include photographs and sketches).

2.6.2 Establishing Parameters

Consider the following factors before choosing graphics :

- **Audience :** Who is the document going to be distributed to? What level of comfort and familiarity is the audience likely to have with planning issues and reading graphics?
- **Format of publication :** Is the document going to be distributed digitally or in printed format? What will the page sizes be? Will it be a black-and-white document or color? What will the print quality or digital resolution be?
- **Purpose :** What is the primary purpose or goal of the document? Is it a single-use document (e.g. a brochure, a presentation) or a reference document to be used frequently?
- **Resources :** How much time and budget is available for creating and reproducing the document? What kind of equipment and manpower will be available for production of the document?

The answers to the above will help the planner make appropriate choices for several elements:

- **Visual hierarchy :** Information is best conveyed in stages, where basic information is conveyed first and details at a later stage. A fundamental way to prioritize importance and control information flow is by establishing a visual hierarchy in the document through the use of font sizes, size and position of graphics, line weights, borders and colors. Larger font sizes claim attention first, as do highlighted text and the color red against an even background.
- **Complexity of graphics :** Not all elements or details are relevant to the primary function of the graphic. Too much detail can even hide or disguise the message of a graphic. The amount of detail that can be included is dependent on the scale at which the graphic will be produced.
- **Size and print media :** Small-scale graphics will need to be more generalized. For example, making a map will involve a process of abstraction in which features of the real world would be generalized or simplified to meet the demands of the theme and audience. The size of a printed map will be closely related to the level of details necessary to make the map useful. If the document is to be published digitally, the size of a graphic is less of an issue due to the ability to change the scale at will. But, image resolution will govern clarity at different scales.

2.6.3 Selecting Graphics

Once the basic parameters for the document as a whole have been established, the planner can work within them to select individual graphics. For each graphic, the planner must ensure that the primary message is conveyed. Using the RSIP-Link as an information repository, the planner should investigate existing graphic resources potentially applicable to the specific region and/or process. Overlap in the RSIP planning process will help ensure the availability of source information applicable to regions that are completing initial RSIPs.

The next step would be to fine-tune this message. This is achieved by making deliberate decisions about various details. To better illustrate the kind of details that need to be considered, this section will discuss graphics selected for some of the subsequent chapters of this module.

2.6.3.1 Graphical Format: Climate

The nature of the primary message dictates the choice of graphical format. The Precipitation Map for Mississippi (Figure 11c on pg. 74) shows the spatial relationship between discrete values for a single factor - amount of precipitation. In contrast, the Climate Summary Table (Figure 11a on pg. 72) has a wealth of detail for one spatial location. It indicates the minimum, maximum, and mean values for precipitation, snowfall, temperature, relative humidity, dew point for Naval Air Station (NAS) Meridian. The bar graph (Figure 11b on pg. 73) compares relative levels of one factor over time. A pie graph compares the amounts of one factor as a fraction of the total.

2.6.3.2 Data Source and Format: Topography

Data is freely available from a variety of sources in a large number of formats. A good example is topographical data from the U.S. Geographical Survey (USGS). The USGS provides data as printed maps or digital data for topographic quadrangle maps, Digital Line Graphs (DLG), Digital Raster Graphics (DRG), Digital Elevation Models (DEM), aerial photographs, orthophoto quads, satellite images, thematic maps such as land use/land cover, and shaded relief topographical maps. The USGS also produces topographical data in specialized formats, including non-quadrangle maps and maps for special needs of various federal agencies including US base maps, state/county map series, National Park series, Antarctic map series, National Imagery and Mapping Agency (NIMA) 15-minute topo maps, and U.S. Border maps. While all of the above impart topographical data, the source and final format of the data make each data set unique.

2.6.3.3 Level of Analysis: Topography

Some maps represent a single layer while others are created by analyzing one or more layers of information. The level of analysis depicted in a map must be selected to appropriately represent the information required for the study. For example, topographical data can be displayed in both two-dimensional (2-D) and 3-D formats. In 2-D, topographical data can be represented as a USGS Quad (Figure 4a on pg. 14). This choice involves the least amount of time and effort in producing the map, and no analysis is required to display the information. If a custom made topographical map is desired, the planner may choose to obtain digital data such as contour lines. The planner may then create a map with appropriate contour intervals, including only labels that are relevant to the planning study. In certain cases, topographical data is important not as elevations, but as slope, i.e. the relationship of one elevation to another (Figure 4b on pg. 16). Slope can also be visually interpreted from a 3-D surface (Figure 4c on pg. 17). This surface was created using data obtained as contour lines which was analyzed and processed into a Triangulated Irregular Network (TIN). If the study is heavily dependant on topographical information, it may be worthwhile to create a three dimensional model to perform advanced analysis. Visual effects such as shadowing may also enhance the map.

2.6.3.4 Attributes of Map Features: Soils

Maps are a compilation of layers, and each layer is comprised of several features. For example, a soil map (Figure 6a on pg. 30) is comprised of a number of background layers overlain by the soils layer, which is the primary message of the map. Each feature may have one or more attributes associated with it. The soil

layer is in polygons differentiated by color. The color indicates the type of soil (refer to the map legend) and the polygon indicates the area of a particular soil type. The soil type is an attribute of the polygon feature and helps to make the map more meaningful. The planner must decide which attributes of map layers are relevant to the study and how best to depict them.

2.6.3.5 Industry Standards: Navy and Community Land Use

Planners use data created by various professions, including, but not limited to, engineering, geology, oceanography, sociology, environmental science, and forestry. Each profession has its own standards for representing data that are used and understood universally. Planners also follow standards within their own profession; the use of a standard color code to signify land uses is a good example (Figure 30b on pg. 218). Although land use maps from various sources may vary in shade and pattern for each zone, the following colors are primarily accepted as the industry standard

- yellow - residential
- red- commercial
- blue - institutional
- purple - industrial
- green - open space

Some government agencies and large organizations, including the Department of Defense, often create and follow their own standards. Activity land use is indicated based on category codes for real property and are designated by standard colors (category code in parentheses):

Land Use	Category Code Series	Color
Operations	(110-160)	Red
Maintenance/production	(200)	Magenta
Supply/storage	(400)	Brown
Administration	(600)	Blue
Residential	(710-720)	Yellow
Community	(730)	Orange
Recreation/open space	(740)	Green
Utilities	(800)	Gray

The planner needs to be conversant with the industry standards accepted within the professions that create the data so that the data is accurately understood. The planner may also choose to use these standards in the planning document to ensure clear communication with the reader.

2.6.3.6 Progress or Change: Adaptive Reuse / Energy

The need for planning arises due to a desire or need to control change. Documenting change is often done by a series of graphics. Figure 26a on pg. 192 shows the changes in the use and facade of a former factory building. Progress can also be monitored using graphs plotting the same factor at frequent intervals. Figure 12a on pg. 80 shows the energy consumption of NAS Corpus Christi and Pearl Harbor and the green line displays the planned energy consumption level.

2.6.4 Cartography Tips

Planners rely heavily on maps because many planning decisions are based on locational and spatial information. Good maps can be a great asset to the clarity and brevity of a planning document. But what constitutes a good map?

Cartography is the art and technique of making maps and charts. Since a map is basically a graphic element, it is difficult to establish exact rules or formulas for creating an aesthetically pleasing map. This section discusses some basic ingredients that go into producing a neat, legible, and organized map.

2.6.4.1 Golden Rule for Cartographers

The primary aim of the cartographer must be to bring the most important map information into the foreground of the reader's attention. Other details will need to be displayed in the background to make the map intelligible.

A map is generally built in layers of information. Some layers are displayed to show location, and others are analyzed in relation to each other to draw conclusions about an impact or project. Base map layers are used to create a suitable background and add context to the map. The base map layers may include roads, political boundaries, shoreline, landmarks, hydrology, and buildings. Some of these layers may be more relevant and important to the primary message of the map than others. Some decisions to be made while organizing the layers include :

- Does it play an essential function?
- Could it be simplified, or does it require elaboration?
- Is it of critical importance to reader comprehension, or only of background interest?

2.6.4.2 Editing and Organizing Data for Display

Cartographers reduce the world to points, lines, and areas, using a variety of visual resources. Jacques Bertin, in his book *The Semiology of Graphics* (1983), inventories these resources using the categories of size, shape, value, texture or pattern, hue, or orientation, and shape. Cartographers must also be concerned both with the content and the form of the text, i.e., the wording and the way the text is displayed on the map.

A useful method of simplifying a map is by grouping or organizing data appropriately. Listed below are the different categories of data and their appropriate indicators of use.

- Nominal data is information that is simply grouped into categories on the basis of qualitative considerations: a road distinguished from a river or a forest distinguished from an open field.
- Ordinal data is grouped by rank on the basis of some quantitative measure: small, medium, and large cities or single-lane, double-lane, and four-lane roads.
- Interval data is information that can be arranged using a standard scale along which operations of addition and subtraction have meaning. An example of an interval measure is temperature.
- Ratio data is information that, like interval data, can be arranged along a scale but, in addition, the scale begins at a non-arbitrary zero point. At the zero point, no features are present. The operations of

multiplication and division can be employed with ratio data to consider proportions and magnitudes. Elevation above sea level, precipitation, and population are all examples of ratio data.

2.6.4.3 Map Elements

Almost all maps must include certain basic elements that provide the reader with critical background information. Map elements include the title, scale, key map, legend, north arrow, author, date of production, projection, and map sources. These may be presented as text or graphics. The placement of this information and the style of its depiction will vary greatly from map to map. But in all cases, the elements must be distributed so as to maintain balance within the map frame or page. Conventionally, the main map frame is aligned to the top left, while the map elements are placed in a group towards the right and bottom of the page. Map elements may be organized in a hierarchy based on relevance, priority, or importance of information. As a rule, unnecessary crowding or, conversely, large blank areas, must be avoided. Neatlines or borders help to organize the final layout.

3.0 DATA CATALOG INTRODUCTION

This data reference guide presents discussions of each of the 34 planning categories. The purpose of the category discussions and reference guide is to describe the basic information and key issues a planner should consider and collect data for in Navy planning. It is designed to help planners formulate the important questions to ask when collecting, creating, analyzing, and applying data.

The discussion of data categories responds to Navy planners' needs. It provides a set of helpful procedures, questions to ask, and steps to take if data is not available. Key federal and Navy requirements/ instructions are mentioned. The opportunities and constraints of each category to planning, and the reasons why certain data categories are more applicable to certain levels of Navy planning, are discussed. The guide defines the categories and presents key issues for each (called planning factors). It supplies a list of generic products that can be obtained from each major source.

Each data category discussion includes the following elements:

- Introduction
- Relevance to Planning Studies
- Relationship to Other Functional Areas
- Primary Planning Factors for Functional Area
- Interpretation of Planning Factors
- Relevant Impact Questions to Ask
- Data Source List
- Data Samples (illustrative)

The categories are grouped into five convenient data systems: the Physical, Biological, Cultural, Existing Built Regulatory, and Socio-Economic Systems. Examples of data are provided for each category and are discussed within the corresponding functional area text. The text includes a discussion of techniques for displaying and using data for spatial analysis in the planning process. The general impact of proposed Navy activities is studied at the activity and regional levels.

4.0 Topography

The basic landform or topographic structure of a site is a resource that strongly influences the location of land uses and recreational and interpretive functions. As a basic tool for planners, topographic maps provide the foundation for the site analysis process which leads to the land use plan and eventually to the detailed site plan. Elevation changes, landform type, drainage patterns underlying geology of an area, and topographic data, in combination with other site factors, can be interpreted as either an opportunity or a constraint to development. Topographic conditions are most important to development decisions when assessed on a smaller scale. However, larger, regional assessments are also important to consider when relating topographic elements to other areas such as geology and watershed issues.

4.1 Relevance to Planning Studies

4.1.1 Regional Studies

General topographic maps may also be used to describe the vicinity and region, but they require much less detail than site topographic maps. The topography of the region can usually be visually depicted by a quality map that identifies major landforms - low points such as valleys, rivers and wetlands, highpoints such as ridges, hilltops, and plateaus. Existing development, particularly major highways and streets, will reinforce these basic landforms. As described below, the use of 3-D images are often helpful at this scale. 2-D data layers serve as the base for the 3-D images, translated easily in a spatial analyst program.

4.1.2 Activity Plans

Topographic data is primarily used at the activity planning level to determine site-specific development opportunities and constraints. A quality topographic base map of the site is essential for conducting site analysis activities. The USGS 2-D maps are adequate for a site where topography is not a primary consideration in planning. Electronic versions of these maps are easily obtained from USGS. (Figure 4a on pg. 14) More complex topographical issues may require the use of 3-D images in order to more accurately assess and understand the impacts of the proposed planning actions. On a larger scale, a 3-D image of the entire region will enable the planner to assess potential relationships between the topography and hydrogeologic issues. If quality topographic base maps or digital data layers are not available, surveys should be completed under advance "planning studies". A general topographic

DEFINITIONS

Seismic activity—Waves of energy transmitted through the earth's crust at rupture or slip points in the tectonic plates.

Geologic uplift—The upward movement of the upper surface of the earth's crust.

Rain shadow effect – Low precipitation on the far side (leeward side) of a mountain when prevailing winds flow up and over a high mountain or range of high mountains. This creates semiarid and arid conditions on the leeward side of the range.

Slope—The degree of inclination from horizontal.

Terrain—The topographical features comprising the earth's surface.

Plateau—Upland surface bounded by steeper descending slopes.

Ridge—The elevated landform below which is a descending slope on both sides, culminating in a valley floor.

understanding of the vicinity of the site is important to analyze drainage and visual relationships between site and off-site uses and areas.

Figure 4a

USGS Topographic Map - MCB Quantico



Source: US Geological Survey 1994, 1:24000 Quantico Quadrangle

4.2 Relationship to Other Resource Areas

Topography and terrain features relate primarily to soils and geology and secondarily to surface hydrology and vegetation. Soils on slopes tend to have better surface drainage than in the lowlands. Topography relates to geology in that topographically steep or rugged areas, knobs, ridges, etc., are generally underlain by harder rock. In addition, topography is often an indicator of the historic geologic character of an area. Mountain ranges and steep areas indicate previous geologic uplift, perhaps accompanied by seismic activity. The amount of vegetative cover is directly related to the topographic relief and thickness of the soil cover as well as site orientation and rainfall characteristics. Steep topographic features often contribute to the lack of rainfall on the leeward slope. This “rain shadow effect” caused by the interception of rainfall by steep slopes results in drier conditions and less vegetation on the leeward side. The effect is most noticeable at the regional scale, impacting large areas of land. Floodplains and other wetland types can be found in topographic lowlands.

4.3 Primary Topographic Planning Factors

4.3.1 Slope

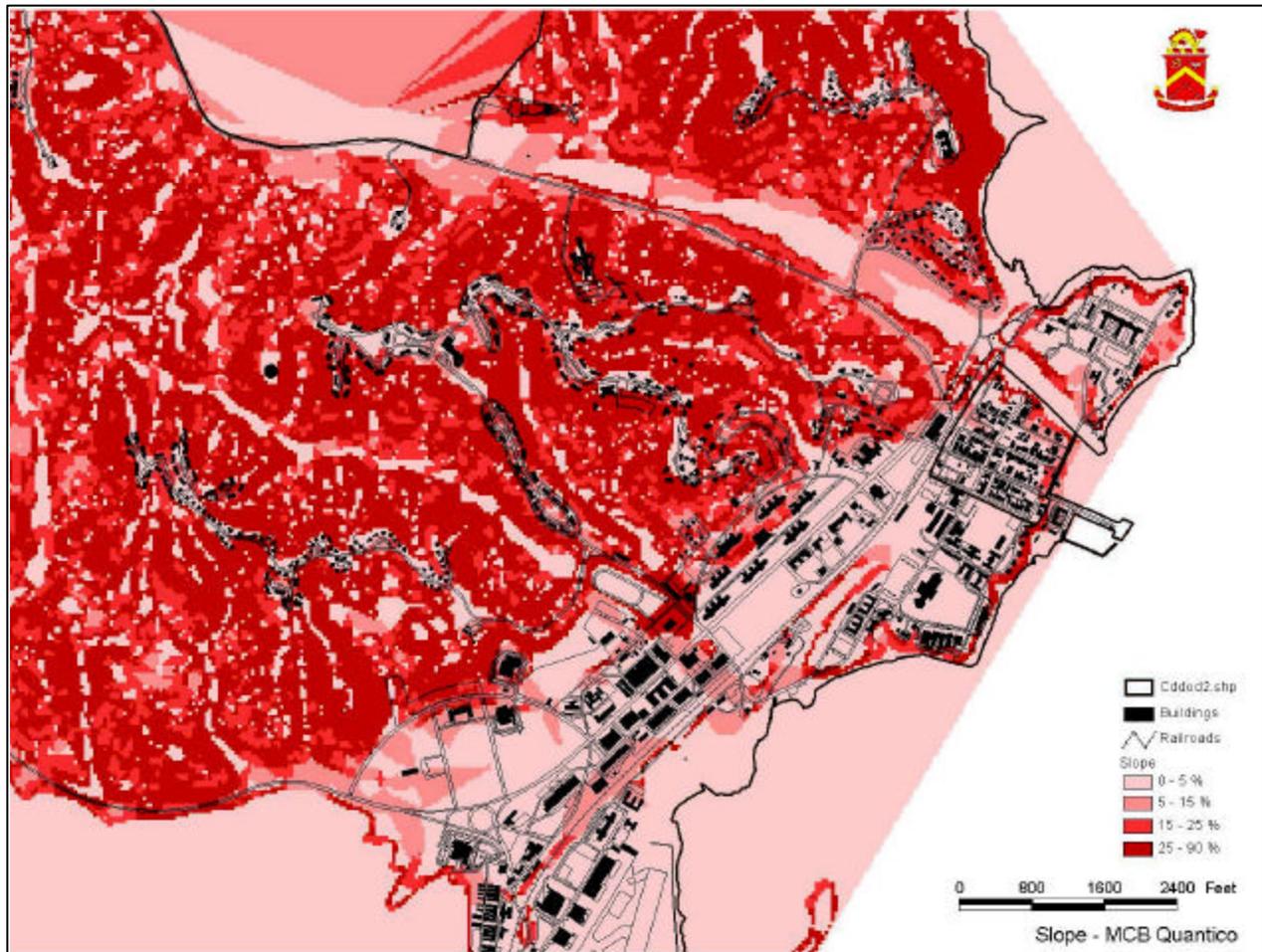
Slope is the inclination (slant) of the landform surface from absolute horizontal. Slope can be expressed as a ratio, percentage, or angle (degree); for example, a 3:1 slope is also a 33 1/3% or 23 degree slope. For development planning, slopes can generally be classified as follows:

- Gentle (0-5%)
- Rolling (5-15%)
- Steep (over 15%)

Displaying slope through the use of 2-D contour lines is a simple means of assessing the elevation of the land. A contour map will provide the reader with an overall picture of steep or shallow slopes, ridges, and valleys, if he or she is familiar with the methods of interpretation. Digital slope information can also be represented in raster format so that data is represented as pixels instead of lines (Figure 4b on pg. 16). More easily understood by the layperson, a 3-D image of slope contours is a visual analysis of the elevations (Figure 4c on pg. 17). Many readers will relate to the 3-D image, as it closely resembles the manner in which they see slope around them everyday.

4.3.2 Landform

Slope, configuration, and scale define terrain features. The terrain is composed of different landform types: uplands, valley walls and lowlands. (Special landforms would include plains, mesas, cliffs, dunes, etc.). Landforms are integral to the analysis of the visual and aesthetic qualities of a site; they also define surface water flow or drainage patterns and can indicate underlying geologic features.

Figure 4b**Slope - MCB Quantico**

Source: MCB Quantico Master Plan Update, May 2000

4.4 Topographic Factor Interpretation

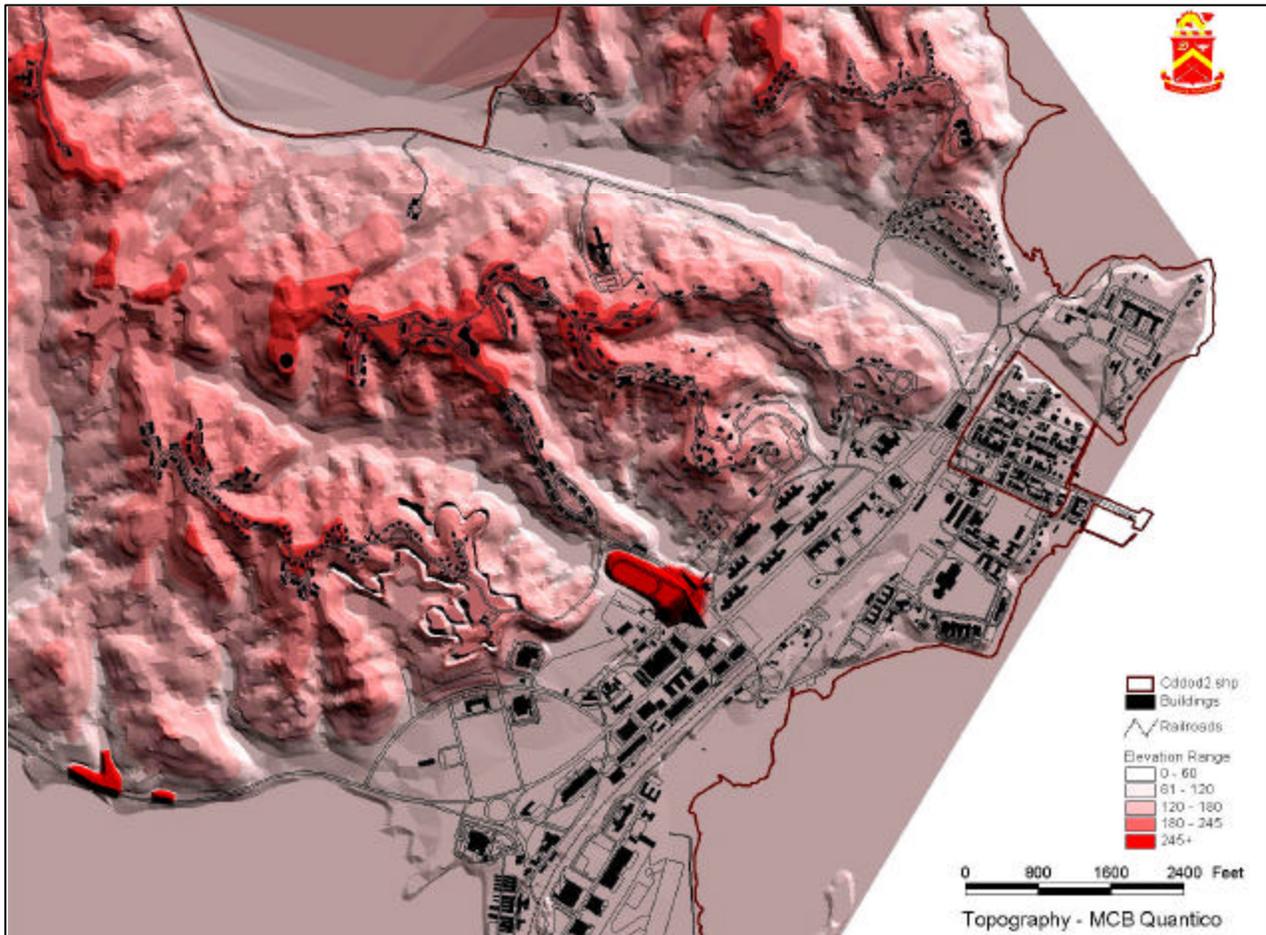
4.4.1 Opportunities

- Broad uplands and plateaus usually offer few development limitations and can accommodate a variety of road and building types and other structures.
- Ridges can provide protection from cold or damaging winds.

- Uplands and areas of steep slope can provide dramatic views and vistas, while valleys offer a sense of enclosure and are visually buffered from outside influences.
- Unique topographic features can have high scenic qualities.
- Valley walls of gentle to moderate slopes are developable for a variety of uses and can offer quality views.
- Valleys and lowlands offer high visual and recreation potential and can be ideal for certain low intensity uses.

Figure 4c

Triangulated Irregular Network (3-D Surface) - MCB Quantico



Source: MCB Quantico Master Plan Update, May 2000

4.4.2 Constraints

- Steep slopes (generally over 15%) should be avoided. Disturbance of such land can cause excessive erosion and downstream siltation (water quality) problems. Site development costs increase dramatically on steeper slopes (roads, utilities, parking lots, large buildings, etc), although structures can be designed especially for such conditions if warranted by other opportunity factors.
- Extremely flat areas can present drainage problems (such as ponding) and therefore increase site utility costs (i.e. storm sewer systems).
- Valleys and lowlands may be subject to flooding problems, inundation, and bank erosion. Wetlands may also exist in lowland areas. If wetlands exist on the site, Section 404 permits from the Army Corps of Engineers (USACE) are required for drainage and development. Permitting requirements vary on the type of project and its impact. See Section 404 regulations for further guidance on regulatory requirements for developing in wetlands.
- Extensive disturbance of valley walls can destroy scenic and natural resources, creating stream and groundwater recharge problems.

4.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of topographic information on a specific proposed project.

- Will the natural slopes on the site be altered as a result of this project?
- Are the slopes on or adjacent to the site classified as generally unstable?
- Is there potential for slope failure, avalanche, or rockfall on the site or adjacent to it?
- Will disposal, excavation, or quarrying activities associated with this project produce changes in topography or ground surface relief features at this site?
- Will the project be located on or near any areas of high scenic value such as unusual views of water or landscape?
- Will the project result in the obstruction of any scenic vista or view or in the creation of an aesthetically offensive view open to public sight?

4.6 Data Sources

1. Internet

- <http://mapping.usgs.gov>
- <http://www.websites.noaa.gov/guide/sciences/earth/topography.html>

2. Local

- City and/or county planning office or public works department
- Topographic maps of land use plans
- Aerial photographs
- Local floodplains information
- Floodplain Information Rate Maps (FIRM)
- Floodplain ordinances and plans
- Building codes relating to development elevation requirements

3. State

- Department of Natural Resources
- Digital USGS maps or data layers
- State topographic maps

4. Federal

- U.S. Geological Survey – National Center
 - 7 1/2 mm. quad maps, 1:24,000 scale
 - Topographic maps at 1:250,000 scale
 - State maps at 1:500,000 scale
 - Shaded relief maps
 - Orthophoto quad maps
 - Digital Elevation Models (DEMs)

ADDITIONAL SOURCES

- Activity Division of Natural Resources
- Regional Council of Governments (COG)

5.0 GEOLOGY

Planners are primarily concerned with the engineering and environmental aspects of geology. Engineering properties of geologic materials can directly influence the siting of large buildings, roads, runways, bridges or other major structures. Environmental geology, ideally, would consider all geologic influences, including engineering aspects. It would focus on man's impact on natural geologic processes and vice versa. This would include: the geologic stability of construction sites; water supply sources; occurrence, recharge, and quality of groundwater; and natural hazards (e.g., earthquakes, tsunamis, floods and landslides). Therefore, the planner can utilize geologic information to define both quality construction sites and sensitive environmental geology areas.

5.1 Relevance to Planning Studies

5.1.1 Regional Studies

Published geologic maps, surveys, and reports are most readily applied at the regional scales. The level of detail required in these studies is similar to that offered in statewide geology documentation. Seismic hazards are often documented at the regional scale, and they are important in shaping the development types and patterns of a community. The Navy planner must consider the propensity of seismic activity in the specific region, assessing the degree to which hazard planning on a regional scale should be incorporated into the regional plan.

5.1.2 Activity Plan

Site-specific geologic data is available primarily through on-site drilling and surveying. Geologic formations can generally be located through analysis of published statewide and regional geology maps. GIS data is often an accurate means of estimating water-table depth and geologic formations on the site. General planning guidelines can be drawn from geologic characteristics described (USGS) and State Geologic Survey or mining publications.

DEFINITIONS:

Water table – The upper surface of the zone of groundwater saturation, where all the pore spaces are filled with water.

Aquifer – A water-bearing layer of permeable rock, sand, or gravel.

Zone of aeration—Upper part of earth's crust where air is dominant in rock pores.

Zone of saturation—Upper part of earth's crust where rock pores are filled with water.

Landslide—Collapse and downward movement of earth materials.

Fault – A fracture or fracture zone along which there has been vertical or horizontal displacement of the sides relative to one another. The displacement may extend for several inches or for many miles.

Sinkhole – A topographic depression developed by solution of limestone, dolomite, or rock salt.

Karst – A type of limestone topography characterized by closed depressions (sinkholes), caves, and subsurface streams.

5.2 Relationship to Other Resource Areas

Relationships exist between bedrock types and the soils that overlay them, although soil composition and thickness varies with the geologic history and parent material. Surficial geology can be related to topography. Topographically steep or rugged areas, ridges, knobs, etc. are generally underlain by hard rock such as granite and have thin soil cover.

Surficial geology affects vegetation and land use. Rough terrains have thin soil cover, supporting only limited vegetation types. Thick surficial soil covers are usually excellent sites for crops or pasturelands. Surficial geology is related to surface water flow in that infiltration is directly governed by the permeability of the underlying materials. Infiltration is directly related to the amount of water available for streams and the development and size of drainage patterns.

Bedrock geology is related to the occurrence of groundwater. The crystalline hard rocks are extremely poor aquifers. They may, however, be the cause of underground lakes by trapping underground water flow. Sedimentary rocks generally yield considerably more water to wells, and they are important sources of groundwater in some areas.

5.3 Primary Geologic Planning Factors

5.3.1 Depth to Bedrock

Bedrock geology deals with the distribution, thickness, sequence, and types of hardened, solid rocks that compose the earth's crust. Depth to bedrock is an important planning factor in that shallow bedrock could require blasting to construct certain structures (basements, utilities, etc). If bedrock is within ten feet of the surface, it can usually be termed "shallow". Shallow bedrock could provide an excellent foundation or anchor for other structures, if the structure is properly keyed into the appropriate type of bedrock. Rock that is very close to the surface can increase site development costs by requiring extensive blasting and excavation. Unless the planned structure has a huge mass requiring a bedrock foundation support, there is little need for deep bedrock conditions.

5.3.2 Groundwater/Water Table/Aquifers

Precipitation is the major source for groundwater, which exists almost everywhere below the earth's surface. Understanding the location of these underground sources of water is crucial in long-term planning. Figures 5a and 5b (pg. 22, 23) clearly display the different types of geology and water sources in relation to each other. The use of layering in Figure 5a effectively communicates the interaction of different aquifers. Figure 5b aids the reader in applying the information from Figure 5a in a context of depth under the earth's crust. In order to assess the overall conditions in a region, maps such as these are useful representations.

The permeability of a rock depends on the size of the pores between the rock's grains. The larger the pores, the higher the porosity, and the greater the water flow through them. In the upper part of the earth's crust, the rock pores primarily contain air (zone of aeration). Water moves downward through this zone to rock pores that are filled with water (zone of saturation). The upper surface of the zone of saturation is called water table. The lower limit of the zone of saturation is the point at which (depth) pressure closes rock pores and prevents water intrusion. An aquifer is any permeable, water-bearing rock layer.

Figure 5a Mid-Atlantic Aquifer Descriptions

The surficial aquifer is the uppermost aquifer in the Northern Atlantic Coastal Plain aquifer system but is of limited extent.

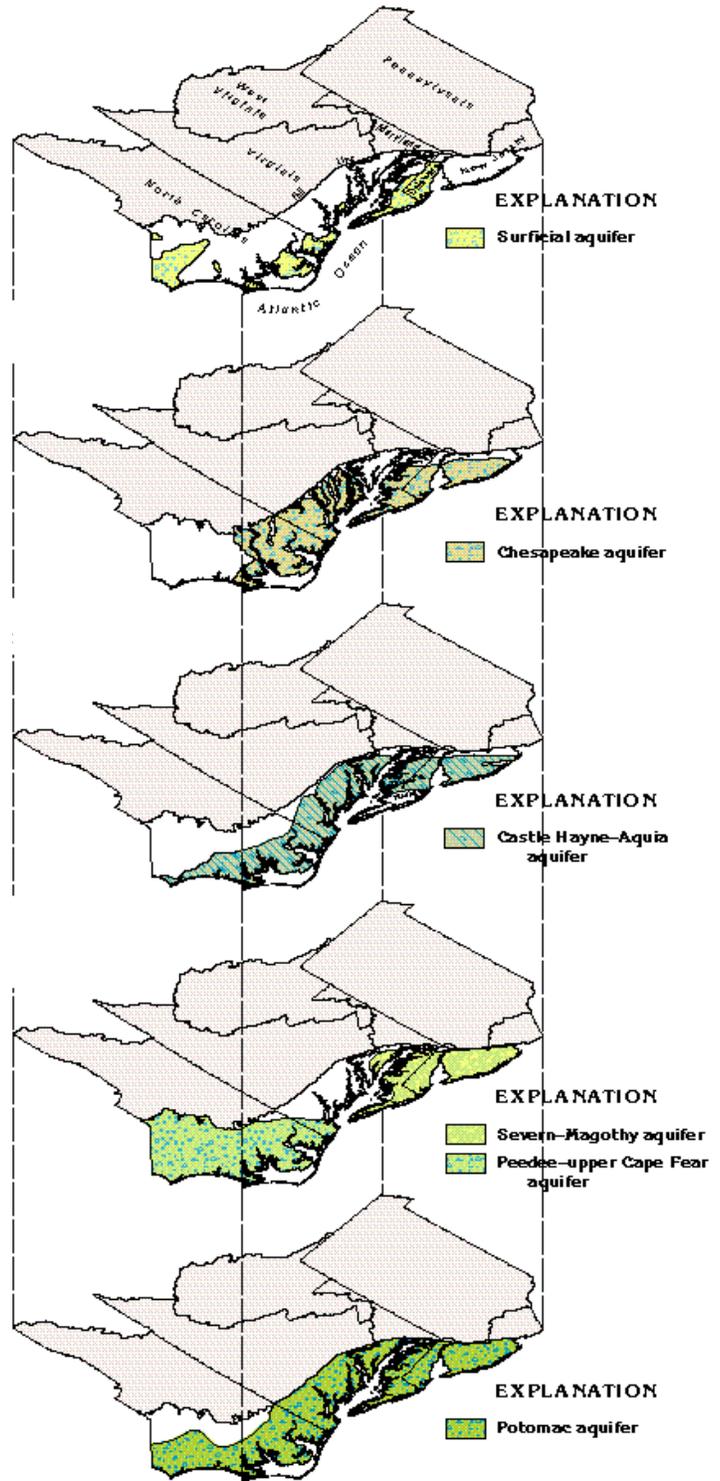
Sands of the Chesapeake aquifer form an extensive water-yielding unit that extends from the Fall Line to the coastline in places

The Castle Hayne-Aquia aquifer is not as widespread as the overlying Chesapeake aquifer, but yields large volumes of water in North Carolina where it consists of limestone. Elsewhere, the aquifer consists of sand that becomes clayey and almost impenetrable on the Delmarva Peninsula.

The Severn-Magothy and the Peedee-upper Cape Fear aquifers are in sand beds of equivalent age, but are not known to be connected. Both aquifers are underlain and overlain by confining units that consist mostly of clay.

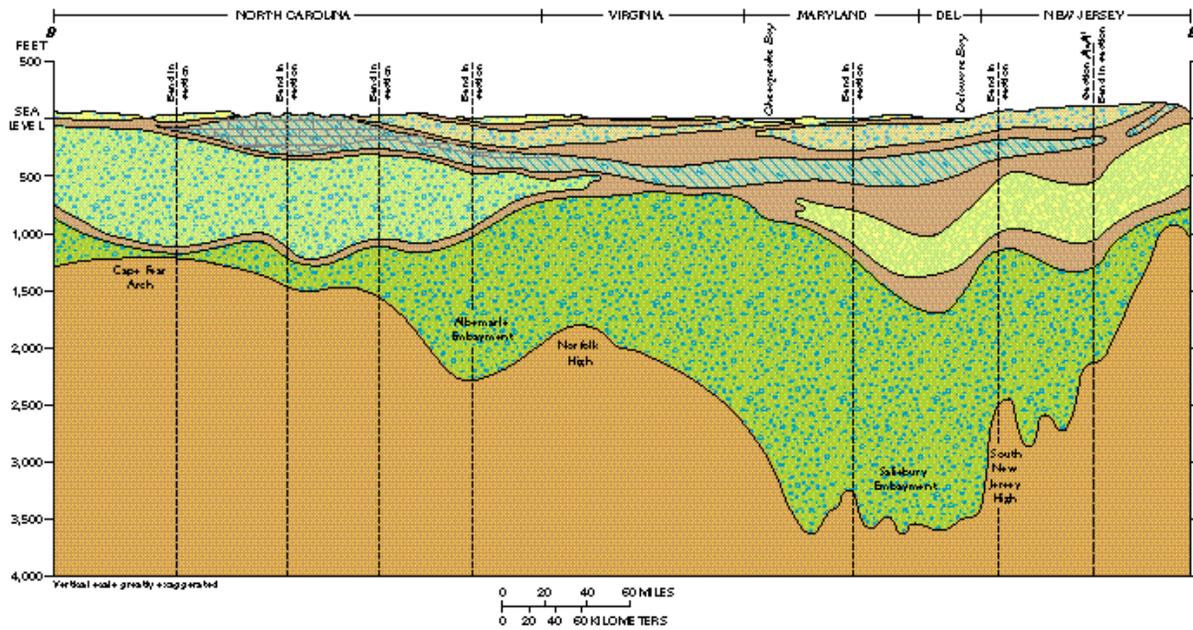
The Potomac aquifer is the lowermost and most widespread aquifer in the Northern Atlantic Coastal Plain aquifer system. The aquifer consists of a thick sequence of sand beds and lies directly on crystalline bedrock in most places but locally is underlain by a clayey confining unit.

Modified from Trapp, Henry, Jr., 1992, Hydrologic framework of the Northern Atlantic Coastal Plain in parts of North Carolina, Virginia, Maryland, Delaware, New Jersey and New York: U.S. Geological Survey Professional Paper 1404-G, 59p.



Source : U.S. Geological Survey, Ground Water Atlas of the United States website
http://capp.water.usgs.gov/gwa/ch_1/gif/L022.GIF

Figure 5b
Cross-Section of Mid-Atlantic Aquifers



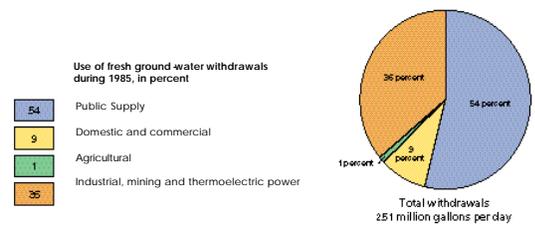
- EXPLANATION**
- Surficial aquifer
 - Confining Unit
 - Chesapeake aquifer
 - Castle Hayne-Aquia aquifer — Gray block pattern indicates limestone; otherwise glauconitic sand pattern indicates limestone
 - Severn-Magothy aquifer
 - Peedee-upper Cape Fear aquifer
 - Potomac aquifer — includes local basal confining unit from Delaware southward
 - Crystalline rock

Note : The aquifer system is thinner where parts of the underlying crystalline-rock surface have been upwarped and thicker where the crystalline rocks have been down-warped.

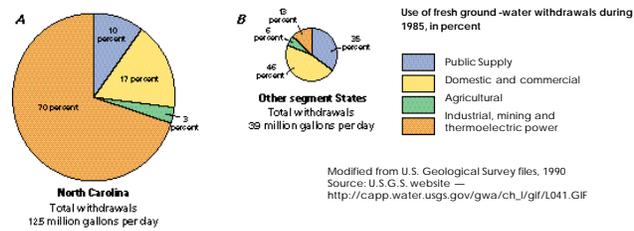
Modified from Trapp, Henry, Jr., 1992, Hydrologic framework of the Northern Atlantic Coastal Plain in parts of North Carolina, Virginia, Maryland, Delaware, New Jersey and New York: U.S. Geological Survey Professional Paper 1404-G, 59p.

Source : U.S. Geological Survey, Ground Water Atlas of the United States website — http://capp.water.usgs.gov/gwa/ch_l/gif/L020.GIF

Note : More than one-half of the freshwater withdrawn from the regional Potomac aquifer during 1985 was used for public supply. Large amounts of water also were withdrawn for industrial, mining, and thermoelectric power uses.



Modified from U.S. Geological Survey files, 1990
Source: U.S.G.S. website — http://capp.water.usgs.gov/gwa/ch_l/gif/L059.GIF



Modified from U.S. Geological Survey files, 1990
Source: U.S.G.S. website — http://capp.water.usgs.gov/gwa/ch_l/gif/L041.GIF

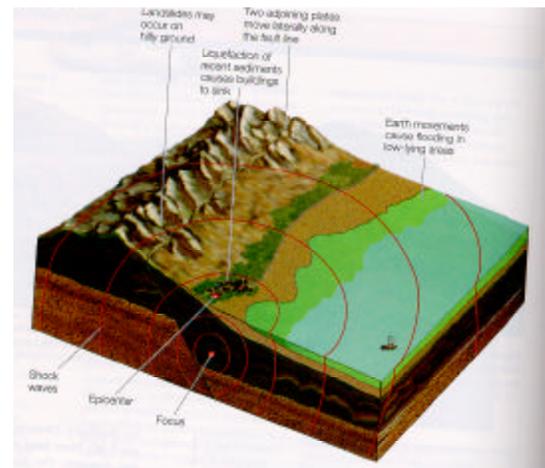
Note: Most of the freshwater withdrawn from the Castle Haynes-Aquia aquifer in the North Carolina Coastal Plain during 1985 was used for industrial, mining, and thermoelectric power purposes (A). Most of this water was pumped for mining use. In contrast, most of the freshwater withdrawn from the aquifer in Virginia and northward during the same period was used for public supply and domestic and commercial uses (B).

High water table conditions can be constraints in the siting of structures with deep foundations or basements. Groundwater is a natural resource, so the type and yield of aquifers can influence land use planning decisions, particularly the locating of "dirty" industrial/commercial uses where groundwater contamination might occur or affect well location for water supply. Regional considerations about the water availability and table depth should also be noted when developing large-scale plans for the naval activity. A severe shortage of water in the region may impact the landscaping or engineering plans of specific projects.

5.3.3 Geologic Hazards

Geologic hazards primarily include earthquakes, tsunamis, and landslides. Areas of geologic instability, such as major faults or sinkholes should be avoided for major construction sites. Buildings located on thick soil or rock debris are most affected by earthquake shocks. In order to avoid areas of seismic instability, graphics such as Figure 5c on pg. 25 can be used in assessing suitable areas for development. Providing analysis of these areas through GIS enables the developers to quickly and accurately assess areas to avoid for seismic hazards. If development already is present, areas for retrofitting can be identified as well.

Scientists have developed several different methods for enhancing the structural integrity of buildings in seismically active areas. Despite the advances in engineering, however, mitigation measures that impact the location of development still must be implemented on a regional scale. Through the use of GIS mapping and analysis, planners can work with scientists to locate seismically active areas. The planners can then create policy at the activity and regional level to guide development out of susceptible areas through land use control.



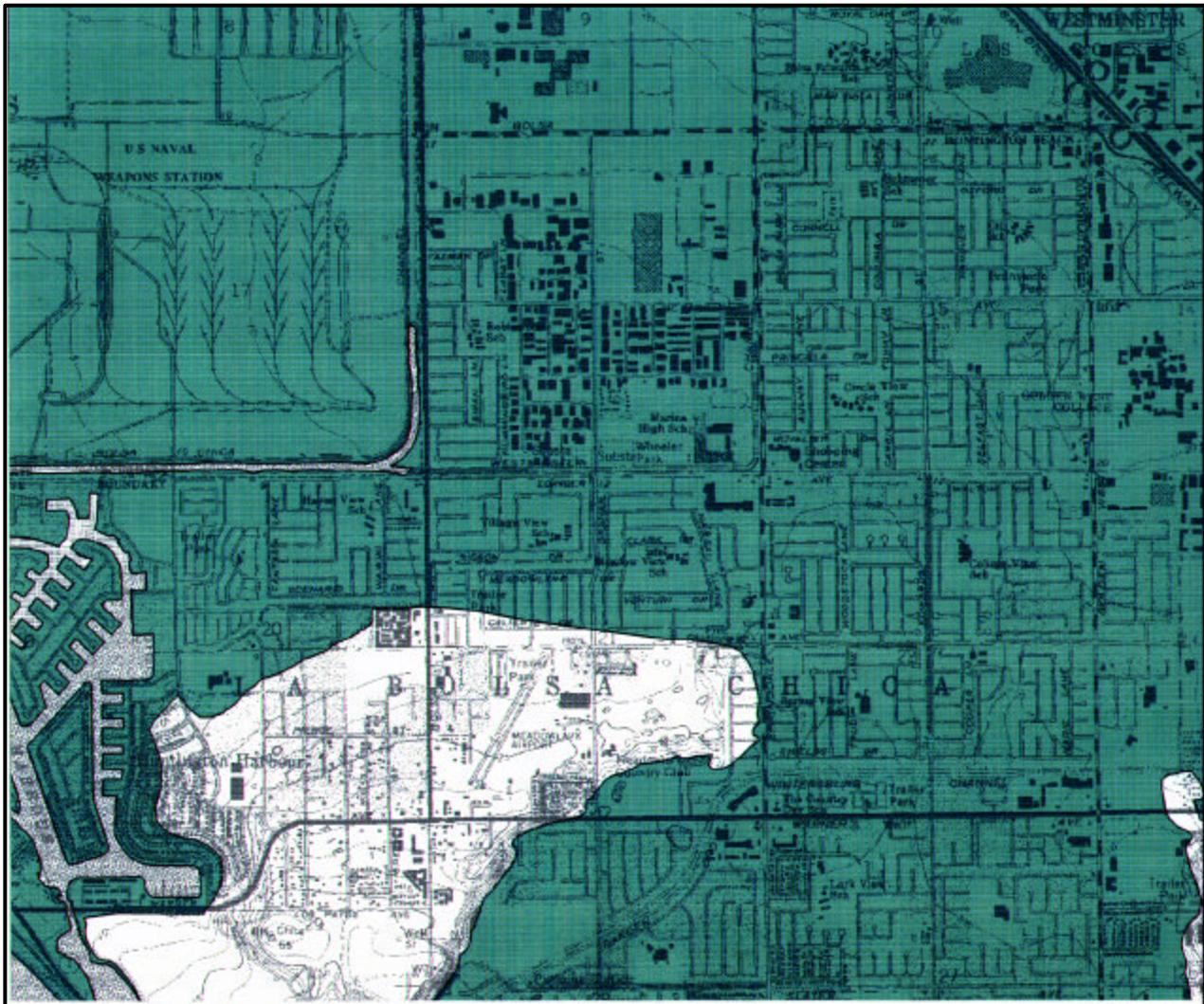
Tsunamis are giant water waves set up by seismic movements. Proposed projects along water bodies which are near or underlain by major faults or volcanic activity should include considerations for both earthquake and flood impacts. Some geologic formations are unstable when excavated along a slope and are subject to landslide activity; such areas should be avoided, or at least stabilized after excavation. The potential for new sinkholes to appear in areas having karst topography (limestone areas where sinkholes are numerous) is increased when major groundwater removal activities occur.

5.4 Geologic Factor Interpretation

5.4.1 Opportunities

- Geologic data, when integrated with other planning data, can assist the planner in locating specific uses on a site; certain geologic characteristics should be avoided, while others may be desirable for development sites.
- Areas with quality groundwater resources, or aquifers, are desirable locations for wells. Aquifer depth, yields, and water quality determine the relative suitability of an area for well location.

Figure 5c
Seismic Hazard Zones, Seal Beach, CA



**Official Map of Seismic Hazard Zones
 Seal Beach Quadrangle**

Released: March 25, 1999

For additional information on seismic hazards in the map area, the rationale used for zoning, and additional references consulted, refer to DMG's World Wide Web site <http://www.consrv.ca.gov/dmg/>

MAP EXPLANATION
Zones of Required Investigation



Liquefaction
 Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.



Earthquake-Induced Landslides
 Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Source: California Department of Conservation, Division of Mines and Geology website - http://www.consrv.ca.gov/dmg/shezp/maps/m_sealb.htm

- Artesian wells and springs can be water supply sources as well as aesthetically pleasing environmental features.
- Some construction sites may require stable bedrock conditions for foundations.
- Mineral resource areas (coal/oil-bearing strata, ore deposits and constructional/industrial minerals) can provide valuable raw materials for direct Navy use or income production through quality resource management programs.

5.4.2 Constraints

- Bedrock within ten feet of the surface is considered shallow and poses constraints to underground structure and utility placement. Shallow bedrock conditions may call for extensive blasting and excavation, thus increasing site development costs.
- High water table conditions can impact basements and certain foundations through seepage and foundation movement.
- Malfunctioning septic systems, landfills, industrial/chemical spills, urban run-off and other wastes that penetrate the aquifers, can contaminate groundwater resources.
- Geologic hazard areas (i.e., earthquake, landslide zones) should be avoided as major construction sites if possible. Should it be necessary to build in a hazard area, appropriate engineering and design measures must be undertaken in the planning process to ensure public safety and structural integrity.

5.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in evaluating the relative importance of geologic information on a specific proposed project.

- Will the project involve construction such as buildings, sewage disposal systems (including septic tanks), pipelines or roads/runways?
- Is there any evidence that this project will be located on or near an area of geologic instability such as areas prone to rockfall, landslides, or sinkholes (limestone outcrops) or those containing unstable landfill?
- In some construction activities, excavation may be required which could result in severe erosion and stream siltation, if highly erodible soils are involved. Is any blasting or excavation likely in connection with this project?
- Are there any unique geologic features of scientific, educational, or aesthetic value on this site?
- Is there a potential for, or history of, either earthquake or volcanic activity in this area?
- Are mineral deposits of potentially commercial value located on or close to the site?

- Has there been extensive subsurface mining, other resource extraction, or groundwater withdrawal in this area that might influence site stability?
- Are the rocks found in this area extensively jointed, porous, or otherwise highly susceptible to physical or chemical erosion, such as shale, particulate stone (e.g. sandstone), limestone, dolomite, gypsum and rock salt?

5.6 Data Sources

1. Internet

- <http://www.usgs.gov>
- <http://marine.usgs.gov>

2. Local

City and/or County Planning Department

- Comprehensive plan
- Zoning ordinance
- Hazard development ordinance

3. Regional

- Bureau of Land Management State and Regional Offices
- Council of Governments (COG)
- Geologic map, text from land use plan
- Mineral resource information

4. State

- Department of Natural Resources
- State geological maps
- State and county-wide mineral resource maps

5. Federal

- U.S. Geological Survey
 - maps
- Mineral resource surveys
- Bureau of Land Management (BLM)
- U.S. Department of the Interior

ADDITIONAL SOURCES

- Natural Resources Branch, Real Estate Operations NAVFACENGCOM
- Natural Resources Management Plan Schedule
- Energy resource surveys

6.0 SOILS

The planner must be aware of the types, locations, and characteristics of soils on the site(s) to be planned. Although soils are important to agricultural, forest, and other vegetation growing activities, the planner is primarily concerned with the engineering properties of soils as they affect on-site construction activities. A proper analysis of the construction-related characteristics of on-site soils will aid the planner in defining the relative suitability of an area for a particular program element (e.g. buildings, other structures, utilities, parking, roads, recreation areas.) Regionally, development actions taken at a particular site may impact other functional areas through soils erosion or compaction.

6.1 Relevance to Planning Studies

6.1.1 Regional Studies

The soils do not impact the regional planning initiatives without first being disturbed at a site. If disturbed and altered, downstream impacts may occur, threatening water quality, habitat, and vegetation.

6.1.2 Activity Plan

Soils data is most readily used at the activity plan level. This data can provide the planner with a basic set of land use locational criteria related to the various engineering properties of soil types on a site. Lower construction and maintenance costs can result from planning which recognizes soils constraints. General soil surveys can be used in most planning activities. Adequate site-specific soil borings and tests to ensure the proper location and structural design of the structure should precede major structure construction.

6.2 Relationship to Other Resource Areas

Soils can be indicators of the geological parent material (bedrock) which they overlie.

DEFINITIONS

Erosion – The breakdown and transportation of earth materials at the surface. Agents of erosion include water, wind, ice, and gravity.

Boring—A vertical sample drilled into the top and middle layers of the soil. Different soil layers are evident from the boring.

Siltation –The process by which silt and similar sized particles are transported and deposited by streams.

Permeability – The ability of a rock, air, or earth material to transmit fluids.

Infiltration – Downward movement of water into soil and rock.

Slump – Downward movement of earth materials, either in mass or as several subsidiary units, characterized by rotational motion.

Load bearing – The capability of soil to bear a certain weight without collapsing.

Swale—A vegetated drainage way allowing water to infiltrate as it passes through the channel.

Elasticity –The ability and nature of the soil to expand and contract with different climatic and moisture conditions.

Liquefaction – Earthquake-induced deformation whereby saturated, loose, granular materials are transformed from a stable state into a fluid like state in which the solid particles are in suspension, similar to quicksand. Loss of strength and ground failure often results.

Topographically steep areas generally have thin soil layers and can have high erodibility potential. Improper control at a development site may also negatively impact other areas downstream or downwind from the project. Erosion through water or wind may result in increased siltation of watercourses, depletion of hydrologic oxygen, and smothering of vegetation communities. These effects, in-turn, impact the integrity of animal habitat. Vegetation cover and type are directly influenced by soil conditions. Soil conditions relate to site development when major structures are proposed, especially in regard to building, transportation and utility systems. Valley bottoms along rivers and streams may have thick soils with high agricultural use potential. Hydrologic actions, both surface and subsurface, have direct impacts on soil conditions; permeability, elasticity, shrink-swell, etc are all fluid related.

Assessing the soil types in relation to their characteristics will enable the planner to best suit the proposed project or development to specific criteria. Through analysis of the landform types, soil conditions, locations, drainage, and texture, the most suitable location can result. Mapping these conditions on a 3-D surface can display the interaction between the criteria, allowing the planner to visualize how these elements interact when assessed together (Figure 6a on pg. 30).

6.3 Primary Soils Planning Factors

6.3.1 Erodibility

Erodible soils are those capable of wearing away or diminishing easily as a result of exposure to wind or water. Soils surveys or publications usually rate a particular soil type's erodibility potential as being 'slight, moderate, or severe.' Soils with 'severe' ratings will erode extensively during major earth-moving activities, requiring extensive erosion and sedimentation control measures during construction as well as soil stabilization measures after construction.

6.3.2 Permeability /Infiltration/High Water Table

Permeability is the characteristic of a soil that permits the flow of water through it. A soil's infiltration rate indicates its capacity to absorb precipitation or run-off, and is typically measured in terms of inches per hour or minutes required to absorb an inch of water (on a pre-wetted typical soil area). Soils that do not allow water to drain to lower soil layers or aquifers will usually be excessively wet and unsuitable for utility placement or certain building foundation types. Soils with high water tables are usually found adjacent to watercourses and in swales, and they are generally unsuitable for major excavations such as basements and underground utility vaults.

6.3.3 Elasticity

Elastic soils tend to resume their original form after compaction. This quality makes elastic soils unsuitable base materials for major asphalt roadways since they compact and expand as a vehicle travels over them, causing pavement cracking. Elastic soils are also problematic for other paved and impervious areas. Slabs on grade are built directly on the footing and soil, thus, no buffer exists between the soil and structure. Structures with a crawl space underneath do not lie directly on the changing soils, thus, they are not as susceptible to the contraction and expansion.

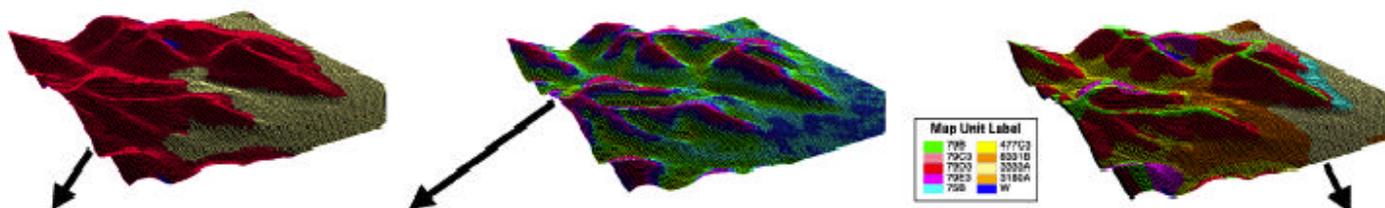
6.3.4 Shrink-Swell Potential

Shrink-swell relates to the potential for a soil's volume to change due to a decrease or increase in moisture content. The resultant shrinking or swelling action can crack walls, foundations, and roadways unless proper mitigating engineering practices are used. These soils may also have a tendency to slip or slump when they are excavated from sloping areas.

6.3.5 Bearing Strength

A soil's ability to support a vertical load from foundations, roads, and other construction masses is its bearing capacity. If soils with low bearing capacity can't be avoided for construction sites, soil compaction may increase its density and load-bearing strength.

Figure 6a
Soil Characteristics



General Landform	Parent Material	Landform Component	Slope-Profile	Drainage Class	Soil Dev. Degree	Soil Profile Contrasting Texture	Soil Series	Slope Range %	Erosion Class	Map Unit Label
Upland	Loess	Interfluvial, Side & Nose Slope	Summit, Shoulder, Backslope, Foothlope	Well	Moderate	No	Menfro	2 to 5 5 to 10 10 to 18 18 to 25	Severe Severe Severe	79B 79C3 79O3 79E3 477C3
		Head Slope, Alluvial Fill	Foothlope, Toeslope	Mod. Well	Moderate	No	Winfield	5 to 10	Severe	
Terrace	Loess/Colluvium	Interfluvial, Side & Nose Slope	Summit, Shoulder, Backslope, Foothlope	Well/Mod. Well	Weak	No	Drury	2 to 5		75B
Floodplain	Alluvium	Alluvial Fill	Foothlope, Toeslope	Well/Mod. Well	Weak	No	Haymond	2 to 5		8331B
				Somewhat Poor	None	No	Wakeland	0 to 2		3333A
				Somewhat Poor	None	Yes	Dupo	0 to 2		3180A

Source: "The Soils That We Map" brochure by USDA-NRCS National Soil Survey Center website - <http://www.statlab.iastate.edu/soils/nssc/posters/index.htm>

6.4 Soil Factor Interpretation

6.4.1 Opportunities

Soil survey information can provide the planner with a valuable organizing framework for arranging major land uses on a site; certain soils may be well suited for specific structures or uses while being poorly suited

for other uses. This soils suitability factor can be integrated with other planning factors to delineate various development zones on a site.

Certain soils have excellent capabilities for accommodating septic drain fields; lake, pond or lagoon construction; agricultural, nursery or forest areas; sanitary land fills; athletic fields; underground installations; runways or roadways; or utility corridors. Locating uses where soils are compatible results in lower construction and maintenance costs, and reduces the potential for major negative environmental impacts (e.g. erosion, sedimentation, slumping of sloped areas, etc.) In addition to assessing the suitability of soils for development purposes, it is as important to determine agricultural applicability. Soil surveys designate some land as Prime Farmland, that which is most suited in composition and fertility for agricultural uses. Legislation protects addresses land under this designation, aiming to protect the most fertile land for commodity production. See the *Prime and Unique Farmlands Regulations*, (7 CFR 657, http://www.access.gpo.gov/nara/cfr/waisidx_01/7cfr657_01.html).

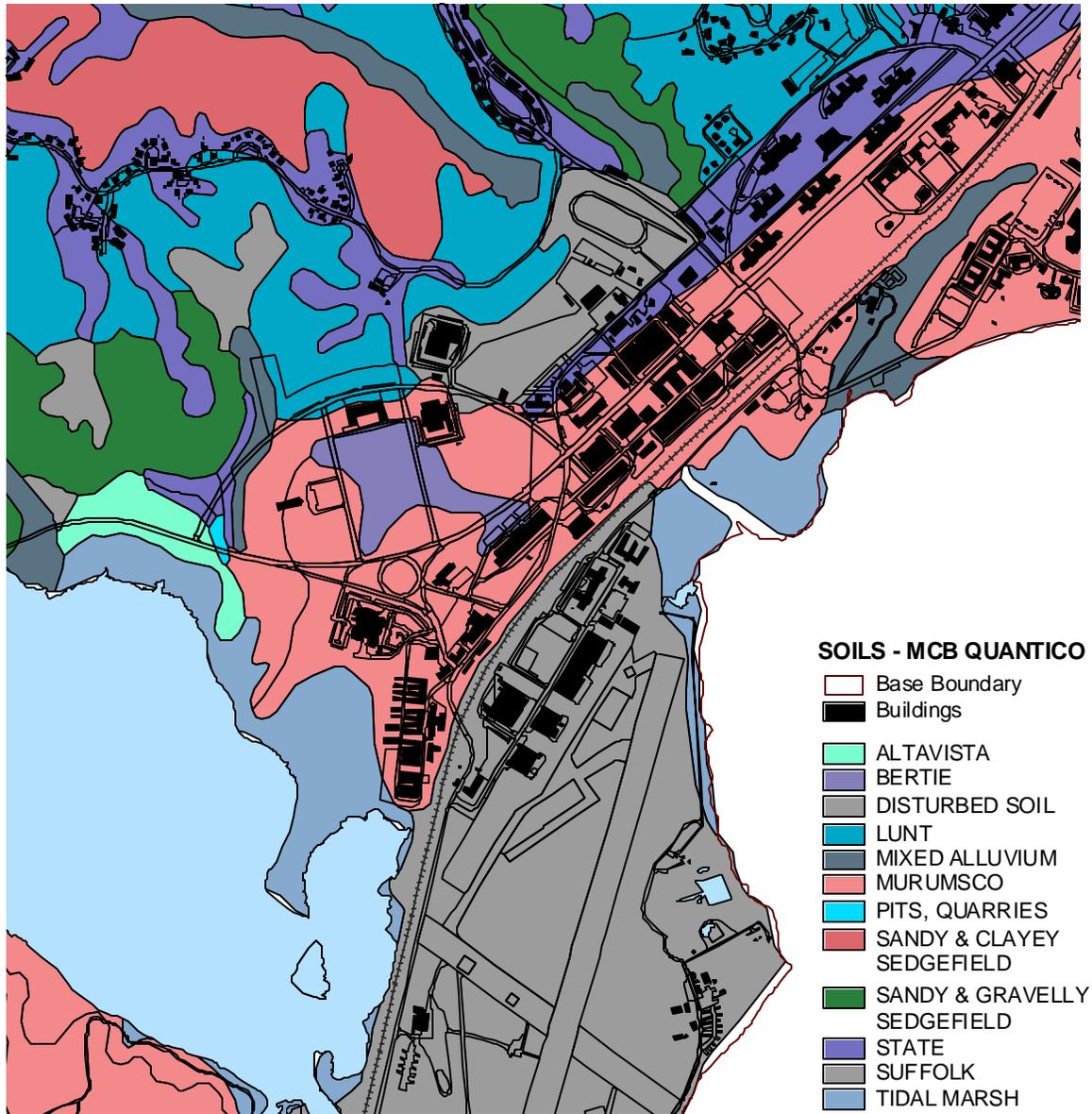
In order to most accurately identify where the appropriate soils for development lie, a soil map based on the NRCS Soil Survey is a useful tool. (Figure 6b on pg. 32) The map shows the location of soil types, and the soil survey report gives their characteristics that can be used for site suitability analysis.

6.4.2 Constraints

- Soils with high shrink-swell potential can crack walls and foundations and buckle roadways and other paved surfaces. Certain 'marine clays' with this quality can also slump or slip when excavated along a slope.
- 'Highly erodible' soils erode most severely when slopes are steep. Large-scale earth-moving activities will cause extensive erosion on these soils; therefore, proper erosion and sedimentation control measures will be required. Any cuts or steep slopes remaining after construction should be properly stabilized by vegetative planting or surfacing with impervious materials. Local and state regulations for erosion control must be followed to mitigate any potential downstream impacts.
- High water table soils are usually found near streams and in drainage swales. Underground structure walls may be subject to seepage when located in these soils unless the walls/floors are properly designed. Some structures, such as swimming pools (when empty) can be pushed out of the ground by water pressure in the soil; installing hydrostatic relief valves around the structure can prevent this potential problem.
- Soils with low bearing strength are poor for building, and they often coincide with high water table soils. If construction on these soils cannot be avoided, soil compaction measures may be used to increase its density, and thereby increase its load-bearing strength.
- Poor infiltration soils, where water is not allowed to drain to lower soil layers or aquifers, are usually wet and poorly suited for septic systems, other underground utilities, and certain foundation types.
- Highly elastic soils should be avoided when locating asphalt roads, runways or parking areas due to potential cracking from expansion and contraction from the movement of heavy loads.
- "Wet" soils, most often associated with wetlands, present constraints in development. Section 404 permits may be required from the Army Corps of Engineers before development. See Section 404 regulations as well as the *Executive Order 11990, Protection of Wetlands*.

Figure 6b

Soils - MCB Quantico



Source: MCB Quantico Master Plan Update, May 2000

CLASSIFICATION OF SOIL SERIES		
SERIES	STATE	SOIL FAMILY
ALTAVISTA	NC	FINE-LOAMY, MIXED, SEMIACTIVE, THERMIC AQUIC HAPLUDULTS
BERTIE	NC	FINE-LOAMY, MIXED, SEMIACTIVE, THERMIC AERIC ENDOAQUULTS
LUNT	VA	FINE, SMECTITIC, MESIC TYPIC HAPLUDALFS
STATE	VA	FINE-LOAMY, MIXED, SEMIACTIVE, THERMIC TYPIC HAPLUDULTS
SUFFOLK	VA	FINE-LOAMY, SILICEOUS, SEMIACTIVE, THERMIC TYPIC HAPLUDULTS

6.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of soil information on a specific proposed project.

- Are any of the soils on this site classified as having a high shrink-swell potential?
- Is there evidence that there may be problems with soil permeability on the site in terms of either excessive run-off or contamination of groundwater from septic tank infiltration fields?
- Does this site have potential for liquefaction of soils on slopes or under foundations?
- Is there evidence that the soils on this site cannot adequately support proposed project activities (e.g. soils which would not be adequate foundation material for construction projects)?
- Is there risk of damage to structures on this site from frost action within the soils?
- Is there evidence of springs or seepage on the site that would require special drainage measures in order to avoid erosion problems?
- Will the project activities result in a loss of either soils or soil fertility through erosion?
- Does the project proposed require siting/construction of buildings with large floor areas or mass; major paved areas such as runways or parking areas; or major underground structures?
- Are there any prime and/or unique farmlands on or near the project site?
- Are there local regulations in the project area establishing permitted soil erosion rates and methods of mitigation to nearby and downstream properties?

6.6 Data Sources

1. Local

- City or County Planning Department
 - Comprehensive plan
- County soil surveys (NRCS branch office)
 - Local ordinance regarding permitted impacts from erosion as related to new development

2. Regional

- Council of Governments (COG)
 - Soil surveys for multiple counties
 - Soils component of regional master plan

3. Federal

- Natural Resource Conservation Service (formerly SCS)
- U.S. Department of Agriculture
 - Soils interpretations
 - Soils capability texts

ADDITIONAL SOURCES

- State Conservationist, NRCS State Office
- USDA Cooperative Extension Office
- Natural Resources Branch, Real Estate Operations, NAVFACENGCOM

7.0 Hydrology

Navy planning requires an accurate knowledge and evaluation of the hydrologic aspects of a potential development site. Water can be a major natural resource, but in its various forms and locations, it can also act as a distinct development constraint. Hydrology concerns the properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere. For localized projects, the hydrology around the immediate site is most important to consider for potential impacts. However, conditions and constraints of the regional watershed should also be considered due to downstream impacts and potential local regulations governing the integrity of the area.

7.1 Relevance to Planning Studies

7.1.1 Regional Studies

Regional and area-wide hydrology maps display major water-based interdependencies of Navy and other sites for planning purposes. Water quantity (flow) and quality are major large scale planning issues to be considered. Major regional and area open space systems are frequently related to surficial hydrologic patterns (rivers, streams, etc.). Watershed development activities, which can impact downstream Navy sites, can be monitored at the

DEFINITIONS

Watertable - The upper surface of the zone of groundwater saturation, where all the pore spaces are filled with water.

Groundwater – Water that sinks into the soil and is stored in slowly flowing and slowly renewed underground reservoirs called aquifers; underground water in the zone of saturation, below the water table.

Surface water – The water that flows over the earth's surface, in channelized streams or in unconstrained sheet flow.

Watershed - Entire land area that delivers water, sediment, and dissolved substances via small streams to major streams and ultimately to the sea.

Runoff – That portion of rainfall that flows over the land surface as slope wash and in stream channels.

Stream discharge—The volume of water and/or mass carried by the stream and released at its outlay, usually the point into which the stream empties.

Wetland - Land that is covered all or part of the year with salt water or fresh water, excluding streams, lakes, and the open ocean.

Saturation zone – The subsurface area where all available soil and rock spaces are filled by water.

Aquifer – A water-bearing layer of permeable rock, sand, or gravel.

Recharge – Precipitation that percolates downward through soil and rock into aquifers.

Floodplain – Geologically, the flat valley floor next to a stream area.

Swale— Long, narrow depression lying between parallel ridges; it is used as drainage mechanism for moving water down a descending slope.

regional planning levels. Watershed planning attempts to incorporate the sustainable use of water resources at both the headwaters and downstream. Recognizing the impacts of pollution-causing activities within the watershed enables local and regional bodies to create policy to improve the water quality and quantity in the region.

7.1.2 Activity Plan

Hydrologic information is critical to the quality of Navy planning efforts. Surface and subsurface hydrologic features must be mapped as accurately as possible in order to determine site-specific development opportunities and constraints. Surface water features are most readily described, but floodplain and subsurface hydrologic feature limits are also important in planning. Natural drainage patterns can be used to compartmentalize the environmentally sensitive areas on the site for development. The creative and sensitive use of water features and resources is most readily controlled at the activity level.

7.2 Relationship to Other Resource Areas

Hydrology, geology, and climate are interrelated. Stream flow characteristics are controlled by both climatic and geologic factors. Precipitation, evaporation, and transpiration are climate-based, while permeability and topography are geologic factors. Vegetation types and densities can also affect hydrology, particularly runoff. The discharge of a stream and permeability of the geologic materials will determine the amount of water exchange between ground and surface waters.

Water quality is directly related to hydrologic factors in the planning context. Both point source and non-point source pollution within the watershed will contribute to degraded water quality throughout the entire region. Sources of pollution include primarily agricultural operations, industry, and human sewerage. Both surface and groundwater sources can be contaminated from these sources, impacting the supply of a large region.

Surface hydrology has also been a driver in land use location decisions over the centuries. The distribution of surface water has an influence on archaeological, historic, and land use factors due to early development traditionally occurring along streams and rivers. Surface and ground water supplies are often criteria for agricultural and industrial, as well as recreation, land use locations. Residential location decisions have not been driven by the supply of water in the past, as evidenced by the continuing population booms in ecologically arid areas.

Several pieces of key legislation exist which address different elements of hydrologic features. Encompassing wetlands, rivers, floodplains, and hazardous materials that pollute them, these pieces of federal legislation protect the hydrologic features from development and pollution. In addition to these specific regulations governing hydrology, all-encompassing environmental regulations such as National Environmental Policy Act (NEPA) protect water resources through the requirement of environmental impact assessments before completing federal projects.

7.3 Primary Hydrologic Planning Factors

7.3.1 Water Features

Surficial water features such as rivers, streams, ponds, lakes, marshes or wetlands must be described in the regional shore planning process. Locational criteria in planning should consider the relative sensitivity of each water feature to the development program elements. Through the use of GIS, locating these features will aid in determining their relative sensitivity to other areas. Some water features are amenities for site development, providing recreational, visual, transportation, water supply and other attributes. Other features offer constraints to be considered in planning, such as flooding, water quality aspects, water depth, construction constraints (poor foundations), erodibility, and the need for waterproofing (Figure 7a on pg. 38).

A major part of efforts to maintain pollution-free surface waters has been the implementation of the National Pollutant Discharge Elimination System (NPDES) permits, as authorized under the Clean Water Act. The program is comprised of a system of requirements necessary to obtain permits for the initiation or continuation of and pollutant discharge to surface waters. The permit establishes specific performance standards the discharging entity must meet while also requiring the reporting of system failures to the appropriate regulatory agency. Governed by the Environmental Protection Agency (EPA) if states do not have NPDES programs in place, the permit system is a costly and time-consuming effort required for any entity of exclusions do not apply (Arbuckle et al, 1993).

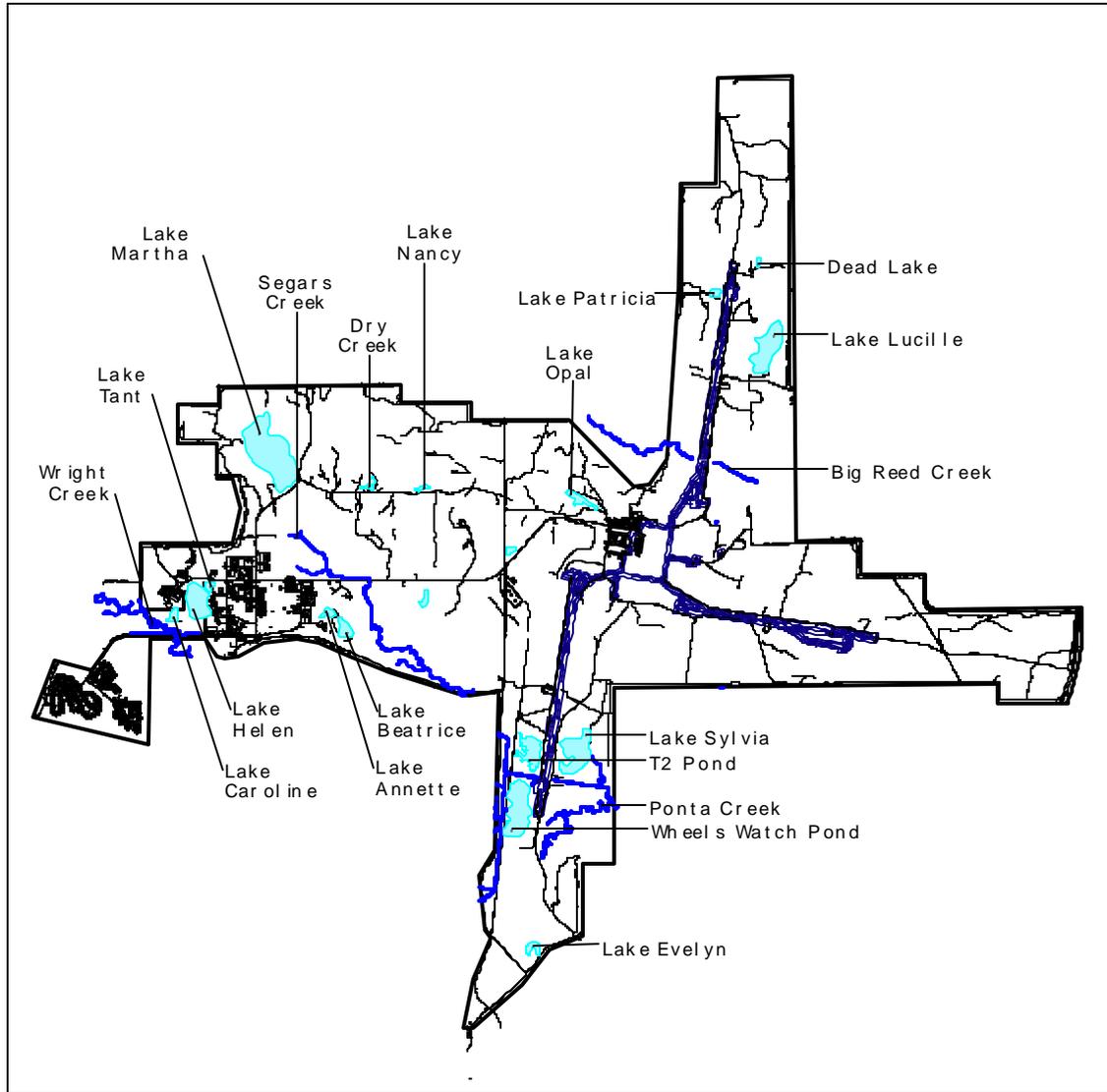
7.3.2 Groundwater

Groundwater is water in the saturated zone of the earth (i.e., that part of the geologic formation in which all voids are filled with water). Aquifers, the geologic formations bearing this water are usually dynamic (flowing) and can be recharged from surface water infiltration. The area under the ground where all the porous space between the rocks is filled with water is called the saturation zone. This water present within the pores is referred to as groundwater. The water table is the upper portion of the saturation zone, and its depth varies with the amount of precipitation. Wet periods will “recharge” the groundwater through the process of infiltration of surface water down through the soil to the zone of saturation. Dry periods result in the dropping of the water table from a lack of available precipitation to recharge the groundwater.

When groundwater flows under the soil surface, as part of the saturated zone, an aquifer is created. These massive regional storage areas of water are drained by wells and recharged by precipitation. Human-induced activities are leading to the unsustainable withdrawals from the aquifers, resulting in the need for regional water policy to control the negative impacts associated with the overuse.

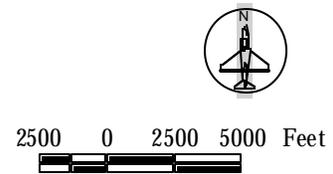
Figure 7a

Lakes and Rivers - NAS Meridian



LEGEND

-  Creeks
-  Lakes
-  Buildings
-  Airfield
-  Roads
-  Base Boundary



Source : NAS Meridian Strategic Facilities Plan, May 2001.

7.3.3 Floodplain

The floodplain is the land area (usually adjacent to a body of surface water) which may be inundated by floodwaters. A floodplain is usually a comparatively flat plain within which a stream or river flows. Floodplains are described as being for a certain frequency of flood (i.e., the 500-year floodplain, the 100-year floodplain or the 50-year floodplain); the 100-year floodplain is that land area which can be reasonably expected to be inundated at least once in 100 years. The U.S. Army Corps of Engineers, the Federal Emergency Management Agency (FEMA) and other agencies have conducted hydrological research to determine the 100-year floodplain in many urban, suburban, and strategic waterway locations. The 100-year floodplain is a generally accepted planning criterion denoting land that is flood-prone and should not be developed intensively. Figure 7b on pg. 40 is an example of a simple GIS map which, when other layers are added, would help the planner prevent development of these areas. The floodplains provide natural buffers against flooding, allowing extra volumes of water to absorb into the ground through natural ground cover rather than runoff over impervious surfaces. Navy planners must consider these areas in placement of development, taking into account the potential long-term danger of placing structures in areas with a history to flood.

The 500-year floodplain should be carefully considered when present; facilities that cannot be readily moved such as medical, ordnance, computer and some R & D facilities should be carefully considered before location there (see E.O. 11988).

Many communities have floodplain ordinances and restrictions governing the location of structures within the area. Locations of development, as well as features of the particular building, are often addressed in these ordinances. These documents may serve as guides for Navy planners in creating development policy.

7.3.4 Wetlands

Wetlands, or those land areas containing high moisture content, exist in both inland and coastal areas. They are frequently identified by vegetation type. Wetlands serve as storage areas for storm and floodwaters, reduce erosion, provide for groundwater retention, serve as food producers and wildlife habitats and have commercial value. Dredging and filling of coastal and inland wetlands is regulated by the U.S. Army Corps of Engineers under Section 404 of the Federal Clean Water Act. Executive Order 11990 limits federal government support of projects that could alter wetlands (see OPNAV Instruction 11000.16A).

7.3.5 Swales

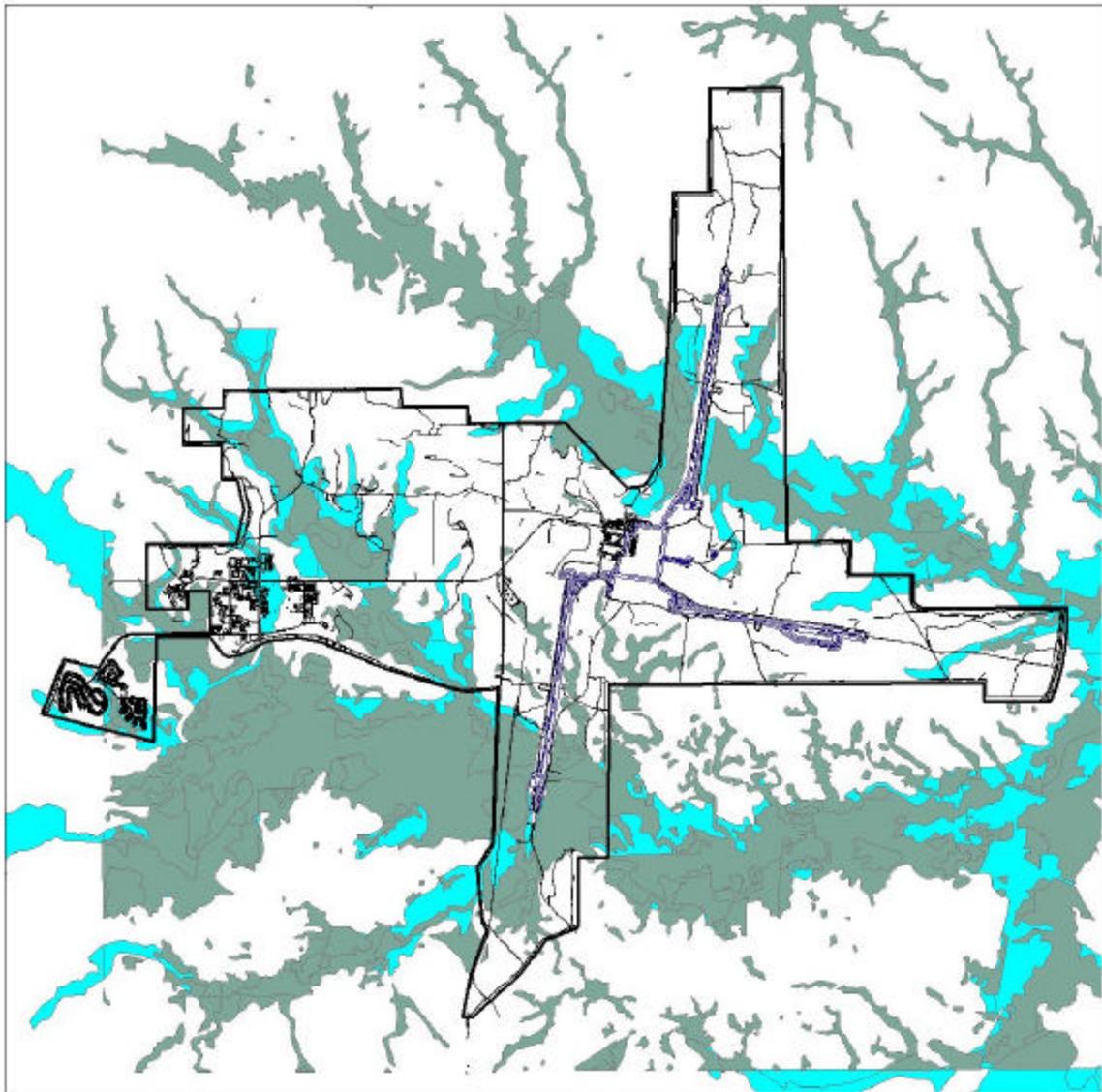
Low, depressed areas that drain run-off from adjoining land are called swales. Swales may exhibit wet soils characteristics and are important elements in surface hydrology, providing the linkage between dry land and surface water bodies. Obstructions located in swales can create a damming effect leading to ponding or flooding.

7.3.6 Watershed Context

The area upon which rain falls and drains into a water body is called the watershed for that water body. Activities occurring in a watershed can impact the hydrology of that area both quantitatively and qualitatively. Refer to the discussion of hydrology planning on a regional level for further information regarding the role of watersheds in naval planning.

Figure 7b

Wetlands and Floodplains - NAS Meridian



LEGEND

- Wetlands
- 100-year Floodplain
- Buildings
- Airfield
- Roads
- Base Boundary



2500 0 2500 5000 7500 Feet

Source : NAS Meridian Strategic Facilities Plan, May 2001.

7.3.7 Stormwater Management

This is the science which attempts to treat stormwater runoff closer to the source in a variety of ways, both natural and man-made, in order to more sensitively manage it as a major environmental resource. Stormwater management programs seek to improve water quality and quantity impacts associated with land development through the use of specific on-site water detention or retention systems. Detention devices slow down the rate of runoff (check weirs, small ponds, special drains and trenches, etc.), while retention structures hold back runoff (permanent water retention ponds and cisterns). Detention devices primarily address controlling the quantity of water, while retention ponds address quality issues through the ability of the pond to infiltrate and filter pollutants and particles during that process.

7.3.8 Best Management Practices (BMPs)

These are management approaches and design standards employed toward achieving the goal of improved water quality by reducing water pollution associated with urbanization. As primary source controls, BMPs attempt to prevent the pollutant from entering the hydrologic system or to reduce the quantity of stormwater run-off. BMPs can be regional, area or site specific in scale, and can range in scope from pollutant disposal regulations to on-site structure design standards.

7.4 Hydrologic Factor Interpretation

7.4.1 Opportunities

- Hydrology data provides the Navy planner with another major site development organizing element. Many surficial hydrologic features such as lakes, rivers, and ponds are major visual, open space and recreational amenities as well as definers of site development unit edges.
- Water resource areas (surface water, wells, springs and aquifers) can provide valuable water supplies for a variety of Navy uses. Such water supplies could be tapped for non-drinking uses that require less treatment and cost less. An on-site water supply can offer the Navy activity greater independence from other (public or private) sources, which might enforce controls on quantities used during dry periods or increase user fees dramatically.
- Surface water features can attract a variety of wildlife and vegetation forms, offering excellent recreational and visual opportunities for Navy personnel.
- Streams and springs can act as water sources for future pond or lake development in the framework of a comprehensive open space plan for a site.
- Protected floodplains can act as open space, for visual or recreational uses, rather than developed land. This can enhance the aesthetics and function of the naval community.

7.4.2 Constraints

- Groundwater conditions should be analyzed in the planning process in order to identify constraints on foundation and underground utility location and construction. Old streambeds or underground watercourses may cause severe foundation settling under structures such as buildings, roads, and runways. Critical aquifer recharge areas should not be substantially covered with impervious surfaces (paved areas, buildings, etc.)
- Planners should identify the 500-year and 100-year floodplains and strive toward avoidance of their use for major construction activities. Flood hazard potential, increased erosion and siltation, and the high cost of construction are factors to consider in site planning. Filling in the floodplain can also cause downstream flooding due to constriction of the natural channel. Finished floor elevation of structures that must be located in the floodplain should be above the 100-year flood elevation. Medical, ordnance, and computer facilities should be limited in the 500-year floodplain; construction within the 500-year floodplain requires careful consideration.
- Wetlands and marshes are to be avoided whenever possible for the location of intensive uses (see E.O. 11990). Careless development in or near freshwater wetlands can disrupt drainage patterns and deplete the water table in their vicinity. Development setbacks may be applied to protect wetlands; however, site-specific and applicable environmental conditions and legislation should determine the dimensions of such setbacks. If wetlands are present near or on a site for a proposed development, they must be delineated and identified. Section 404 of the Federal Clean Water Act must be followed.
- Surface and groundwater resources can be contaminated by improperly designed or constructed sewer/septic systems, landfills, industrial/chemical spills, urban runoff and other wastes. Locations for such uses and activities should be away from water resource areas if possible. Potential polluting activities should be designed carefully to prevent accidental spills into the natural hydrologic system.
- Best Management Practices (BMP's) should be adhered to in all site planning, design, and construction activities. Stormwater retention/ detention devices can be planned to provide amenity functions as well as water quantity and quality functions.
- Consider the drainage patterns on site as well as the watershed context of the site. Upstream activities can affect Navy sites, and Navy activities may impact downstream uses.

7.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in evaluating the relative importance of hydrologic information on a specific proposed project.

- Is the project located over a local or regional aquifer or aquifer recharge area?
- Will activities affecting water table height such as paving, dewatering, cofferdams, cut and fill operations, vegetation clearing, earth compaction or drainage be a part of this project?
- Will the project result in changes in absorption rates, drainage patterns, or the rate and amount of surface water run-off due to the provision of additional impermeable surfaces such as parking lots and other paved areas?

- Will the project result in a reduction or increase in the amount of water otherwise available for water supply?
- Will the water supply for the project come from groundwater sources on or near the site?
- Is the site located in a designated floodplain or in an area prone to ponding?
- Will the project involve diversion, impounding, culverting or channelizing of streams, or will it significantly change the drainage patterns on or near the site?
- Will there be any change in aquatic recreational opportunities as a result of this project?
- Will the project directly or indirectly impact wetlands (marshes, swamps, bogs, tidal estuaries) through filling, dredging, diking, draining, waste discharge or other land use practice?

7.6 Data Sources

1. Internet

- <http://www.epa.gov>
- <http://www.nws.noaa.gov>
- <http://water.usgs.gov>
- <http://web.dandp.com/enviroweb/index.html>

2. Regional

- Council of Governments (COG)
 - Hydrology section of previous master plan
 - Flooding and water resources plans

3. State

- Geological Survey
- Department of Natural Resources
- Department of Environmental Regulation
- Department of Environmental Conservation
- Water Survey Division/Water Control Board
 - Hydrologic maps and texts
 - Maps/tests of ground water sources
 - Maps of aquifers
 - Floodplain maps

4. Federal

- Water Resources Division, U.S. Geological Survey – National Center
 - Hydrologic maps and texts
 - Maps/texts of groundwater sources
 - Maps of aquifers
 - Floodplains maps
 - Streamflow data
- Federal Emergency Management Administration (FEMA)

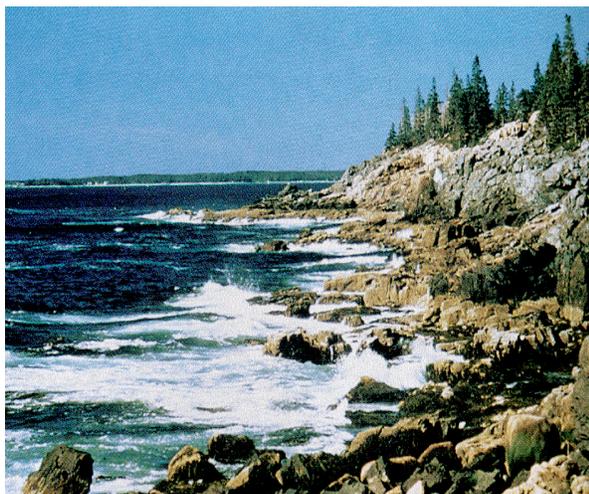
ADDITIONAL SOURCES

Natural Resource Conservation Service (formerly SCS)

8.0 OCEANOGRAPHY & COASTAL ZONE

Most Navy activities are located near oceans or other major water bodies that flow into oceans, therefore, they are usually in coastal zones. Ocean-related naval operations are directly influenced by oceanographic planning parameters, while shore facilities are influenced by some oceanographic aspects as well as by the dynamics of their coastal zone context. The coastal zone environment encompasses not only natural climate and hydrologic forces, but also the man-made/cultural aspects of this edge between ocean and land. The Navy planner must be aware of the obvious impacts (hurricanes, storms, tides, etc.) and of the more subtle concerns (marsh ecology, water supply, tourism, recreation, etc.) of planning in the coastal environment.

Oceanography is the science addressing ocean characteristics and includes the delimitation of their extent and depth, the physics and chemistry of their waters, marine biology, and the use of their resources. The coastal zone is that land near a shore, especially the shore of an ocean or sea, which is influenced by that water body geologically, geographically, climatologically, from a vegetation and wildlife standpoint, and from the tidal and wave actions. The Coastal Zone Management Act (16 U.S.C. 1451 et seq.) includes coastal waters, shoreland, islands, transitional zones, salt marshes, wetlands, and beaches in the definition of coastal zone.



DEFINITIONS

Coastal zone – Relatively warm, nutrient rich, shallow water that extends from the high-tide mark on land to the gently sloping, relatively shallow edge of the continental shelf.

Consistency Determination – Federal projects in the coastal zone are required to have a consistency determination filed with the applicable state to ensure consistency with local and state regulations.

Wave action – Wind-generated releases of energy through water, resulting in waves.

Saltwater intrusion – When fresh water is withdrawn from an aquifer near a coastline faster than it is recharged, salt water intrudes into the fresh water aquifer, contaminating the potable water source.

Tropical/extra tropical storms— Storms beginning in the tropics, eventually reaching wind speeds up to 135 mph.

Storm surge— Rapid rise of coastal water level accompanying a storm.

Beach erosion— Removal of mineral particles from the beach surface from wave and wind action.

Tidal wetlands – An area of land covered all or part of the year with salt water.

Estuaries – Partially enclosed coastal area at the mouth of a river where its fresh water, carrying fertile silt and runoff from the land, mixes with salty seawater.

8.1 Relevance to Planning Studies

8.1.1 Regional Studies

Regional studies can apply oceanographic and coastal zone data more readily because of their wider scope. Oceanography is tied to climate and weather conditions that are regional in nature. Coastal zone management plans and studies are regional in scale and can be applied directly to Navy regional studies, particularly as they relate to the land use, public infrastructure, and demographic context. Coastal management plans regarding restoration are also becoming more common in areas damaged by environmental accidents. Like other regional coastal management plans, the restoration work focuses on policy solutions for mitigating environmental damage. These plans work in concert with other federal environmental laws and agencies, targeting coastal areas around the country.

8.1.2 Activity Plan

Although oceanographic and coastal zone data are essential in coastal activity level planning efforts, much oceanographic data (winds, tides, etc.) must be refined to apply to specific sites. Coastal environmental concerns are usually defined by shoreline or wetland types; therefore, on-site habitat type identification is necessary in planning naval facilities on coastal sites. Natural constraints (flooding, storm winds/waves, wetland sensitivity, etc.) can be incorporated directly into the development suitability for a particular site.

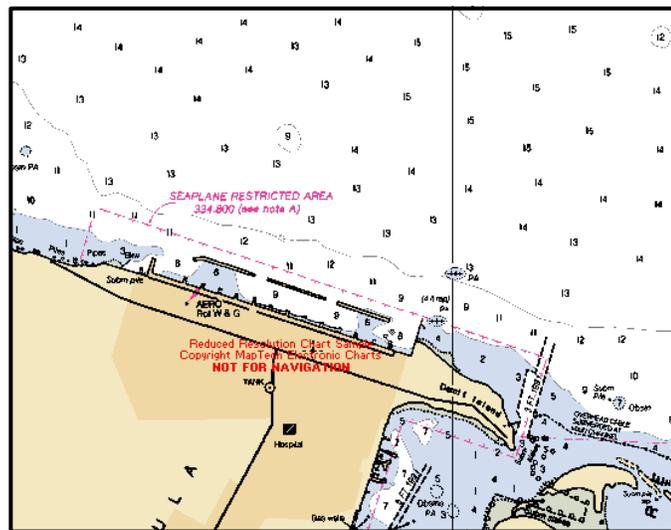
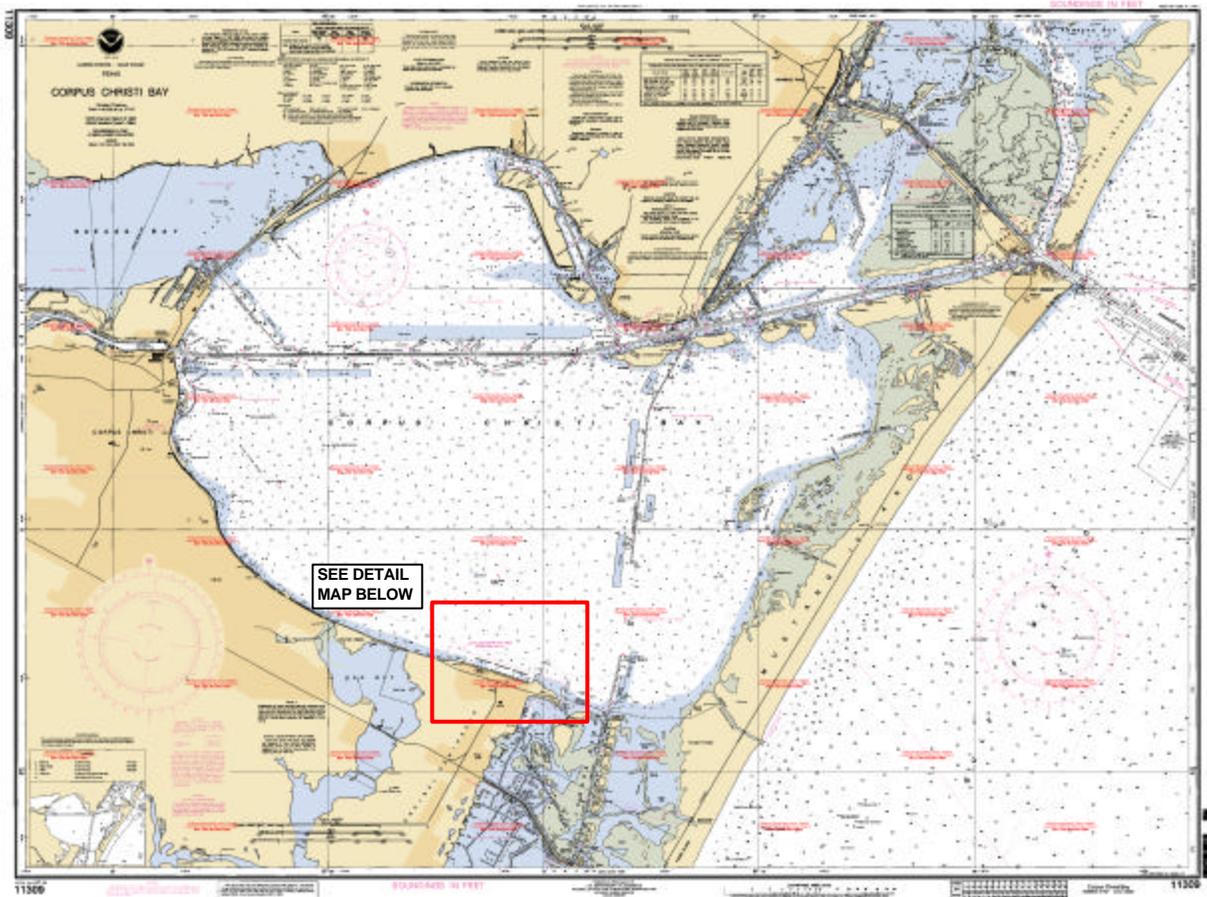
8.2 Relationship to Other Resource Areas

Oceanographic planning aspects relate to landforms (topography and geology) since tidal, current, and storm actions affect various landforms differently. Softer geologic formations will erode more readily. Barrier beaches and dunes are dynamic, moving systems. Climate and weather affect oceans and coastal areas in regard to storm wind and wave actions. Surface and groundwater hydrologic systems feed into and underlie the coastal zone; toxic waste, pollutants, and saltwater intrusion into freshwater aquifer are potential water quality hazards.

The coastal zone has archeologically and historically been a place for human settlement due to ocean transportation and food supply. Major transportation and infrastructure development has resulted in an urban and suburban in character in many coastal areas. Resort/recreation and residential developments bring greater intensity of use to undeveloped coastal beach/wetland areas. Fragile vegetative and wildlife ecosystems occur in the ocean and coastal zones, and any major activity can impact these complex systems. The federal Coastal Zone Management Act governs development within these areas, and many states have legislation more specifically targeting development activities along their shores. The increasing development along shorelines increases negative impacts to wildlife while increasing the risks of damage from flooding and storms to man-made settlements. Navy planners must be aware of state and federal regulations regarding development in coastal zones at the project site. Development should be discouraged, if not prohibited, from natural coastlines and dune structures; however, ship berths and industrial areas along the water are an acceptable use for this area due to mission requirements. The ocean and coastal zones are invaluable to the military operations of the Navy. Ship berthings must be considered in the coastal area management and planning for an activity on the water. Graphics such as Figure 8a on pg. 46 provide the basic information necessary for logistical planning of ports, displaying depths of the

Figure 8a

Depth Soundings - Corpus Christi Bay, TX



Source : Map Tech Electronic Charts

surrounding bay. Used as an informational tool for port planning, a descriptive 2-D map of soundings would be useful for the planner in charge of the area's operations. Natural and man-made constraints can produce encroachment problems if not dealt with in the planning process. Local, state and federal government coastal zone management regulations and plans can affect Navy activities. While Navy planners must be aware of their on-base impact on the coastal areas, the results of off-base development must also be considered. The growth of these areas throughout the U.S. results in communities sprawling along the coastlines.

8.3 Primary Oceanographic/Coastal Zone Planning Factors

8.3.1 Storm Winds and Waves

Most coastal areas are subject to the extreme forces of severe storms. Storms are classified by the severity of their winds and their point of origin. Global weather patterns affect storm generation through the creation of seasonal characteristics, enhancing the potential for severe storms.

Two major storm types are tropical and extra tropical. Tropical storms begin as low pressure zones in the tropics and are classified by central pressure index and wind speed; wind speeds for tropical storms range from 40 mph. (tropical depression) to 135+ mph. (extreme hurricane). Tropical storms with wind speeds greater than 74 mph are classified as hurricanes. Extra tropical storms begin as low-pressure zones outside the tropics and are generally most severe when they travel over open seas. The wind speeds of extra tropical storms are less than 74 mph.

Wind and wave action accompanying severe storms are the most destructive forces of the ocean and coastal zone environments. Storm winds are closely correlated to atmospheric pressure. In a hurricane, the highest winds occur close to the eye of the storm, while the wind speed inside the eye is relatively low. Storms are dissipated when they pass over land. Hurricanes can develop waves of up to 40 feet in the open ocean, particularly if the wind velocity is high and wind direction is sustained for long periods. Hydrostatic pressure, shallow water depth, and wind generated swells combine to form a storm surge, or rapid rise in water level. Storm surge is highest in advance of an approaching hurricane where winds are most powerful, and this surge in combination with the high tides creates storm flooding along coastlines.

8.3.2 Coastal Zone Management

The complexities of the ocean and the land are compounded at the point where those two environments interact, in the coastal areas. Industrial, transportation, and utility corridors have developed along the coast, as have human settlements in general. Recreation draws people to the coast; biological functions of coastal areas provide valuable resources for human use. The complexity and fragility of the coastal zone, combined with human dependence on it, create the potential for permanent environmental damage. The need for strong comprehensive management of coastal zone lands and resources in the United States spawned the Coastal Zone Management Act (CZMA) of 1972 (Coastal Zone Management Act, 16 U.S.C. 1451 *et seq.*). The Act authorizes states and localities to develop management programs and administration grants, and declares that it is federal policy "to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological values, as well as to needs for economic development". In addition to the CZMA, the Coastal Nonpoint Source Pollution Control Program of 1990 establishes guidance for the creation of state level pollution control programs.

“The Coastal Nonpoint Source Pollution Control Program, or Section 6217, requires the 29 states and territories with approved Coastal Zone Management Programs to develop Coastal Nonpoint Pollution Control Programs. In its program, a state or territory describes how it will implement nonpoint source pollution controls, known as management measures, that conform with those described in Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters” (EPAcoast, 2001)

At the state, regional, and local levels, the CZMA has created numerous agencies and legislation to deal with key coastal problems and issues ranging from environmental to economic in scope. Although federal properties are excluded from the coastal zone, a consistency determination is required for those projects affecting the coastal zone. This determination is based upon consistency with state plans; Navy planners must submit consistency determinations directly to the states for their agreement. Navy planners must be aware of the coastal zone management policies and requirements affecting planning activities, as well as the lead-time required for consistency determinations. In order to fully understand many of the natural and manmade challenges facing a specific coastal zone and activity, graphics such as Figure 8b on pg. 49 could be used to enable planners to assess residential pressures, location, and natural issues such as increased bay siltation and erosion concerns. Analyzing a photo alone, or as part of a time series, enables the planner to assess changes to both environments while planning for future impacts.

Also relevant to coastal zone protection is the Marine Protection, Research, and Sanctuaries Act of 1972. Regulating dumping in ocean waters, the regulation aims to, “prevent or strictly limit the dumping into ocean waters of any material which would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities” (33 U.S.C. 1401 *et seq*). Regulating dumping for both US and foreign vessels, the law focuses on protecting human health and safety.

8.3.3 Ocean Resources

Ocean resources can be described in three major categories: mineral resources (such as oil, gas, sand, and gravel); physical features (excluding minerals, such as inlets, beaches, submerged rock formations, shipwrecks and artificial reefs/jetties, sand bars and underwater channels/canyons); and, living marine resources (such as fin fish and shellfish). Physical features, such as bathymetric contours, impact the creation of development and use policies within a shipping channel and on the land around it (Figure 8c on pg. 50). Through a graduated color map, depths of the features are easily and quickly distinguished. Coastal and marine management programs may have policies and regulations for use of and development in and near ocean resource areas; therefore, Navy planners should be aware of such controls.

8.3.4 Shoreline Resources

Beaches and barrier dunes provide wildlife habitat, are of aesthetic and recreational value, and protect against storm-generated waves. Beach and dune erosion and movement are important factors that should be evaluated in planning analyses. Historical analyses of inlet movements, openings, and closures are also valuable in planning waterfront areas. Development will reduce dune-stabilizing vegetation, resulting in weakened barriers against erosion and wave-induced damage. Understanding how the shoreline has moved throughout the recent history, as well as how increasing development has impacted that, is important for the naval planner to understand in prioritizing development decisions on the site.

Figure 8b

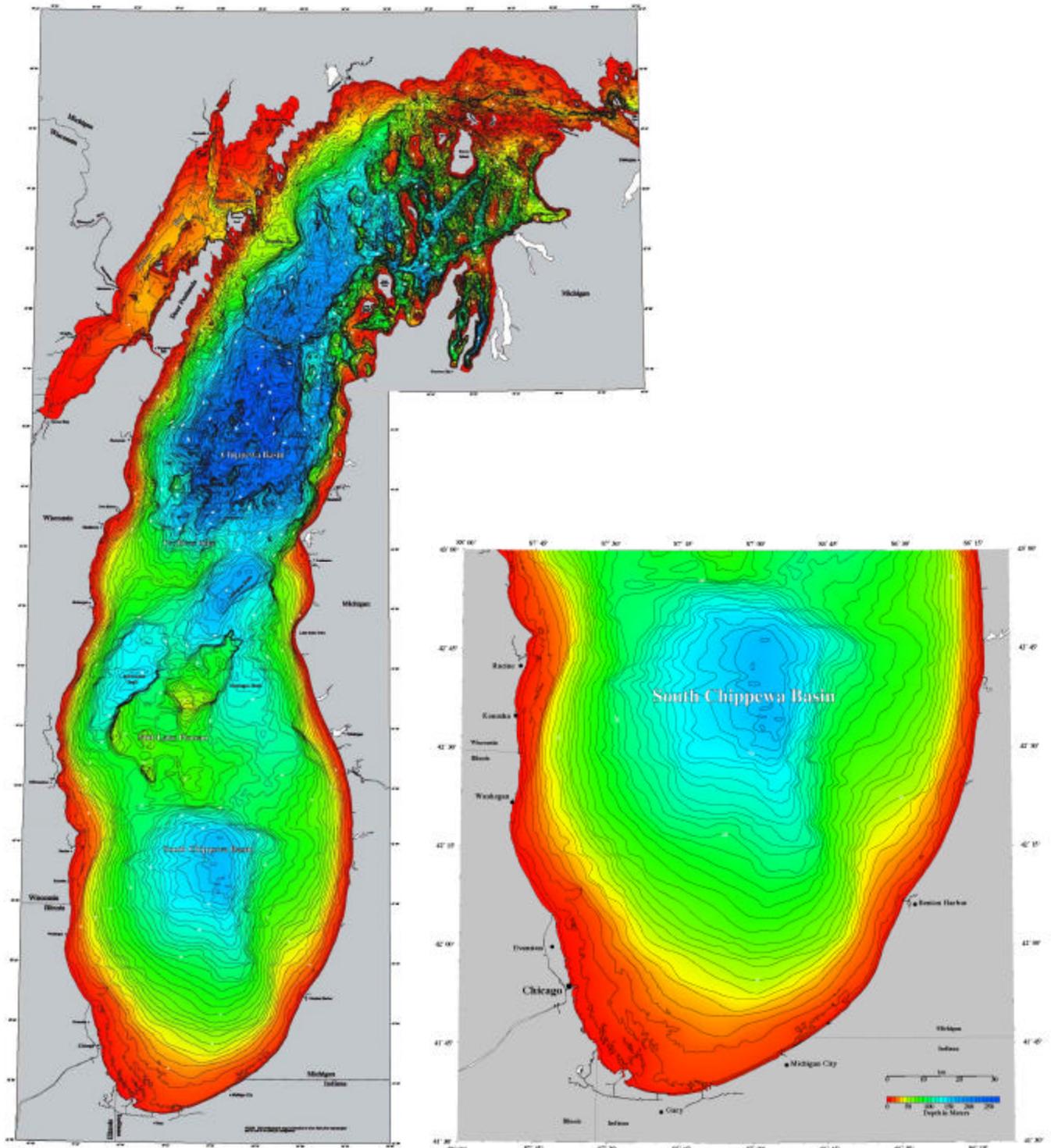
Aerial View of Pearl Harbor, HI, 1993



Source: PACNAVFACENGCOM RSIP-Link

Figure 8c

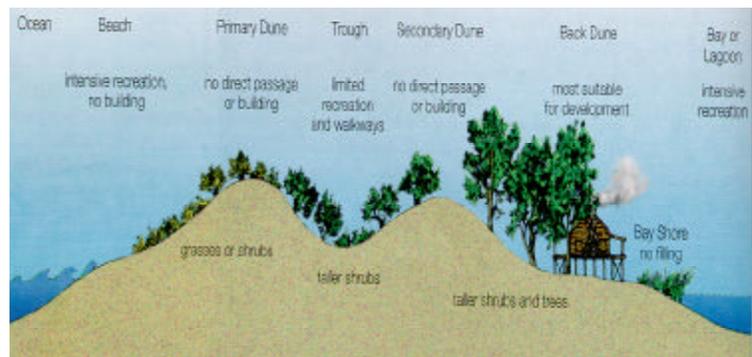
Bathymetry of Lake Michigan



Source : Great Lakes Data Rescue Project, National Oceanic & Atmospheric Administration website
http://www.ngdc.noaa.gov/mgg/greatlakes/lakemich_cdrom/start.htm

8.3.5 Estuarine and Wetland Resources

Tidal wetlands, shallow estuarine areas, and barrier beaches are the primary elements of the estuarine zone. This environment is the world's most productive food producing zone, supporting a diversity of aquatic vegetation, fin fish, shellfish, and wildlife forms. The ebb and flow, characteristic of estuarine areas, is critical to the survival of these species. Human development in tidal marsh areas can destroy these resources. Water quality degradation can result in losses of commercial shellfish resources, recreational value, aesthetic beauty, endangered species, and threats to estuarine-dependent fish and wildlife, as well as potential contamination of seafood. Sensitive site and regional development policies/criteria can aid in mitigating these potential problems. Regional plans will provide policy guidance for keeping these sensitive areas free of development.

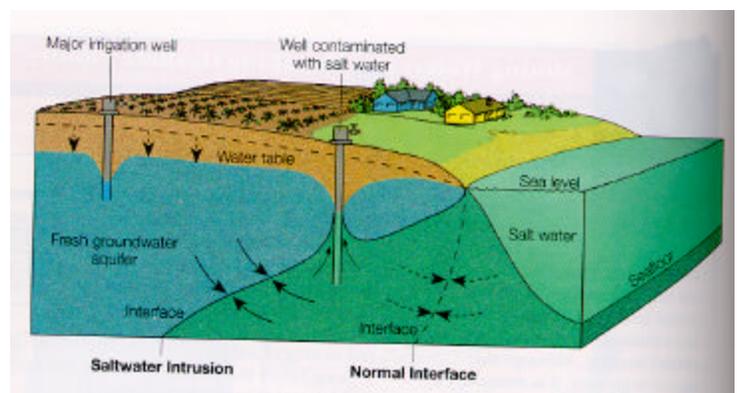


8.3.6 Water Resources

Surface water and groundwater are valuable coastal zone resources. Surface waters are prone to pollution by nutrients, pathogenic organisms, toxic/hazardous wastes, thermal discharges, suspended sediments, and saltwater intrusion into freshwater resources. Unsustainable withdrawal of groundwater and the prevention of aquifer recharge by stormwater drainage systems, which discharge directly into surface waters, can reduce valuable groundwater supplies and lower water table levels (creating surface water base flow problems). Information on surface and groundwater conditions can be especially valuable in planning for site utility systems.

8.3.7 Flooding

Urbanization in the upper regions of major watersheds and improper development of coastal floodplain areas can increase the rate of stormwater runoff and reduce the floodplain's (flood) water storage capacity. Increased areas of impervious surface resulting from increased development and urbanization increases runoff as compared to land with natural cover. Water infiltrates undeveloped lands, recharging the groundwater supplies and water table. These two actions, increased runoff and reduced storage capacity, can dramatically increase downstream peak discharges on smaller streams. Floodplain levels and upstream development/urbanization trends are invaluable factors in coastal planning efforts.



8.3.8 Upland Resources

Upland resources include wildlife habitats; endangered, threatened and rare animals; and, endangered and rare vegetation. Upland plants and animals can be destroyed by urbanization and overexploitation (hunting, fishing, etc.). Endangered, threatened, and rare plants and animals are legally protected from direct exploitation; however, pollutants, land development impacts, and other urban/human activities continue to be threats to such species. Awareness of vegetative and wildlife resources and their environmental sensitivities, along with quality planning practices, can preserve these valuable resources.

8.3.9 Coastal Area Amenities/Encroachment

The visual appeal of the landscape draws many people to the coast. Its water/land edge character creates an ideal recreational environment during certain times of the year. Recreational uses of the coastal zone include: swimming, surfing, and diving; boating and water skiing; fishing; hunting; hiking; bicycling; horseback riding; picnicking; and camping. Summer beach usage demands in urban and resort areas can be great, resulting in demands for public usage of Navy-owned beaches. Heavy tourism can also generate boat traffic, presenting potential public encroachment into Navy operational waters. The attractiveness of the coastal zone to the public, and the fact that most Navy facilities are located in that zone, call for a thorough understanding of these issues by Navy planners.

8.4 Oceanographic/Coastal Zone Factor Interpretation

8.4.1 Opportunities

- Oceanographic and coastal zone data are invaluable locational criteria for naval facilities requiring ocean access or usage. Current information, along with beach/shoreline/inlet movement histories, can determine the best sites for water and shore facilities.
- Coastal zone management programs provide a great deal of information for planning studies of coastal sites; CZM policies and regulations should also be adhered to in site development planning.
- Ocean, shoreline, estuarine/wetland, and upland resources of the coastal zone offer great mineral, plant and animal, recreational/open space land and water use potential. These resources can be utilized and conserved through sensitive planning efforts.
- Coastal landscapes offer a rich variety of scenic features that can become visual focal points at Navy facilities. Base housing, institutional, service (commercial, dining, etc.), administrative and recreational land uses can be sited sensitively to take advantage of ponds, ocean, marsh, forest and/or open space vistas.

8.4.2 Constraints

- Oceanographic storm (frequency and direction), tide and current information can provide important water-oriented activity site location criteria for Navy planners. Sites having high severe storm

frequency should be avoided for major facility location if possible. Water depth, tides, and current information aid in determining port facility siting.

- Coastal zone environmental constraints, such as estuarine wetland ecosystems and endangered species protection, restrict site-planning alternatives to those that are sensitive to environmental conditions.
- Off-site upstream floodplain development and urbanization can adversely affect Navy coastal sites by increasing the rate of runoff, thereby causing coastal area flooding.
- Gradual shoreline recession can threaten Navy coastal facilities unless beach and dune stabilization preservation measures are taken.
- Tropical storms, such as hurricanes, can cause substantial damage to coastal facilities; building siting, elevation and structural systems should be designed and constructed to withstand hurricane winds if they are frequent occurrences.
- Tourism and recreation demand can create encroachment problems for Navy facilities in coastal zones because more pressure exists to use Navy-owned ocean, beach, and wetland areas recreationally. This is only applicable where activities are open to the public.
- Excessive pumping from freshwater aquifers can cause saltwater intrusion into the groundwater supply, particularly in coastal barrier island locations.
- Bathymetric features of bays and inlets impact the availability of use for shipping and transport. Continual clearing, or dredging, of the channel and bay may be required to keep the area from the effects of increased siltation.

8.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of oceanographic and coastal zone information on a specific proposed project.

- Will the project result in changes to currents or to the course/direction of marine water movements?
- Is the project located in a State with an approved Coastal Zone Management (CZM) program?
- If so, does the project lie within or adjacent to the defined coastal zone?
- If so, will the project have significant physical impacts on the coastal zone (including impacts resulting from actions such as filling, dredging, waste discharge, loss of visual quality or encouragement of future coastal development)?
- Note: If "YES", consultation with the State Coastal Zone Management Office is recommended, and a Coastal Consistency Determination must be prepared. Contact the CZM representative at EFD for technical assistance.
- Is the site area prone to tropical storm activity? What is the history of major storm activity and what geographic paths have major storms taken historically?

- Is there major urbanization in the watershed area for the activity site?
- Are there endangered or rare species in the area? If so, development or pollution generated by such development is illegal without the proper clearances and mitigation.

8.6 Data Sources

1. Internet

- <http://www.noaa.gov>
- <http://www.darp.noaa.gov>
- <http://www.darp.nmfs.gov>
- <http://www.hydra.gsa.gov/pbs/pt/call-in/factsheet/0200/czmafina.pdf>

2. Regional

- Council of Governments (COG)
 - Maps of sensitive environmental areas
 - Previous master plan coastal zone maps

3. State

- Department of Natural Resources
- Sea Grant Program/State University
- Coastal Commission
 - Coastal zone maps and environmental studies
 - Aerial photos

4. Federal

- NOAA, Department of Commerce , Water Resources Division,
- Army Engineer Coastal Research Center
 - Shoreline and hydrological studies
 - Climate studies
 - Coastal zone management guidelines
 - Nautical charts
 - Winds, tides data, climate charts
 - Bathymetric measurements
 - Oceanographic station data

ADDITIONAL SOURCES

- Regional Authority/Commission (208 Plan)
- Natural Resource Conservation Service (formerly SCS)

9.0 WATER QUALITY

Naval activities can impact the surface and ground waters in the watershed or aquifer where the naval facility is located. Water quality data is presented in terms of the relative purity of surface and ground waters as compared to natural conditions. The Federal Water Pollution Control Act, also called the Clean Water Act, sets forth water quality goals, a permit system, and a regional planning process for assuring the clean up of the nation's waters. The Safe Drinking Water Act assures the provision of safe sources of water supply. Federal facilities must meet applicable Federal, state, interstate, and local regulations designed to assure compliance with the Clean Water Act and Safe Drinking Water Act, although exemptions for military-unique situations may be requested from the EPA. A detailed description of the requirements and duties of Navy planners in the area of water pollution control is presented in the "Environmental Protection and Natural Resources Manual (OPNAVINST 5090.1B).

9.1 Relevance to Planning Studies

9.1.1 Regional Studies

Cooperation with local authorities may be needed if they are depended upon for wastewater treatment and the provision of drinking water. Participation in 208 planning programs at the earliest possible point will ensure that Navy interests are accounted for and will demonstrate the Navy's willingness to address such regional problems as non-point source pollution.

Water quality is a regional and local issue, depending largely on the economic make-up of the community and regulations enacted to enforce clean standards. While watershed planning addresses quality issues on a regional scale, community level actions are also effective. Additionally, local site mitigation measures are effective as well, preventing source materials from impacting the overall system.

DEFINITIONS

NPDES –National Pollution Discharge Elimination System

Nonpoint pollution – Pollution originating in a general area, not directly attributable to one source.

Point source pollution – End of pipe discharges; source can be directly traced.

Groundwater - Water that sinks into the soil and is stored in slowly flowing and slowly renewed underground reservoirs called aquifers; underground water in the zone of saturation, below the water table.

Leachate— Solution of dissolved compounds carried from a sanitary landfill site to the ground below.

Turbidity— Water in which dissolved materials are suspended in a high concentration.

Detention pond— Pond used to detain stormwater from flow.

Retention pond— Pond in which water is retained at the site level and allowed to gradually infiltrate into the ground below.

208 Plan – Regional plan required by Section 208 of the Clean Water Act requiring the management of any activities causing water pollution.

9.1.2 Activity Plan

Most water quality issues are addressed at the activity level. The naval activities will determine whether there are increases in point and non-point source pollution requiring compliance with NPDES permit requirements or state and local non-point source pollution control regulations. Compliance with the Safe Drinking Water Act may be required if the activity provides its own source of drinking water.

9.2 Relationship to Other Resource Areas

Soils information is needed in order to design on-site septic systems, solid waste disposal sites, and spill containment programs that do not result in water quality problems. Climatological information, particularly rainfall data, can be used to determine the relative importance of runoff pollution. Geological data can identify the presence of any local aquifers and possible avenues for groundwater contamination such as faults and porous soils and rocks.

Water quality is directly related to hydrologic factors in the planning context. Both point source and non-point source pollution within the watershed will contribute to degraded water quality throughout the entire region. Sources of pollution include primarily agricultural operations, industry, and human sewerage. (See Section 7.2 of Hydrology) Both surface and groundwater sources can be contaminated from these sources, impacting the supply of a large region. Figure 9a on pg. 57 displays water quality data in line graph form, noting trends over time. When displaying a time series, line graphs are often simple and effective in showing trends of different types of data.

Water quality also depends upon solid waste treatment and material transport systems. The utility infrastructure is primarily concentrated at the community level rather than an entire region. Most communities service their immediate area, often forming specific water and sewer authorities for the oversight of such operations. The quality and location of these systems impacts capacities of service and treatment for entire communities. Moneys invested in the continual maintenance of the utilities can result in enhanced water treatment and higher water quality.

9.3 Primary Water Quality Planning Factors

9.3.1 Federal Water Quality Goals

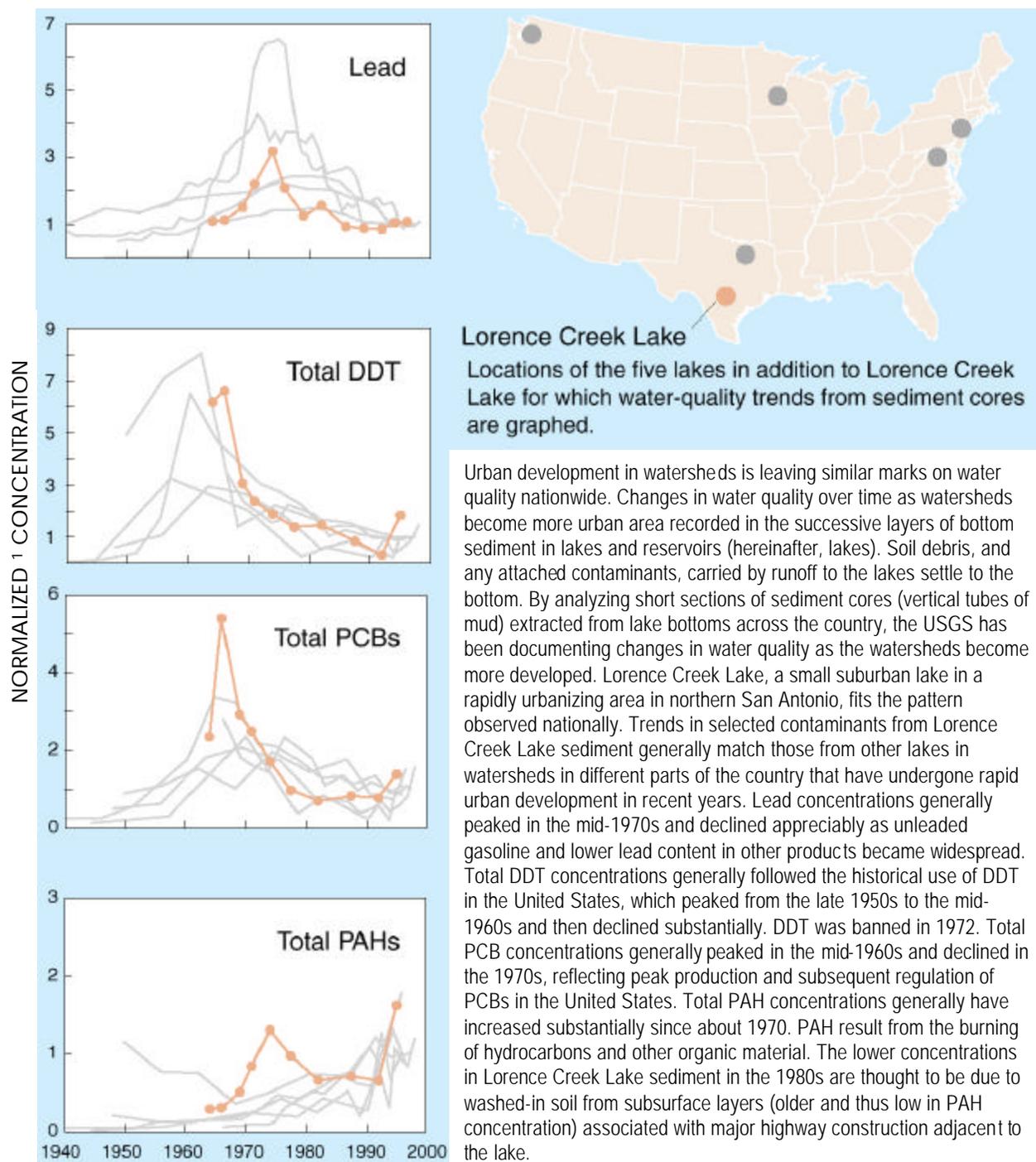
9.3.1.1 All Surface Waters

“The Clean Water Act's primary objective is to restore and maintain the integrity of the nation's waters. This objective translates into two fundamental national goals.

- Eliminate the discharge of pollutants into the nation's waters.
- Achieve water quality levels that are fishable and swimmable.

[The Clean Water Act] provides a comprehensive framework of standards, technical tools, and financial assistance to address the many causes of pollution and poor water quality, including municipal and industrial wastewater discharges, polluted runoff from urban and rural areas, and habitat destruction” (EPAwater, 2001).

Figure 9a
Water Quality - South Central Texas



¹ The graphed contaminant concentrations are "normalized" values - the concentrations down each core were divided by the mean concentration of the top three samples in each core - allowing very different concentrations to be graphed together.

Source: "Water Quality in South Central Texas", Circular 1212, US Department of Interior and US Geological Survey, Texas, 1996-98

To achieve these goals, the NPDES permitting process was developed, which sets interim discharge standards and treatment technology requirements. In addition, states are required to develop area-wide water pollution control plans (called "208" plans) to ensure a cooperative effort to control all sources of water pollution.

9.3.1.2 Drinking Water

The Safe Drinking Water Act requires all operators of public water systems to meet national primary drinking water standards. The standards have required some modifications of standard water treatment systems to protect water users from cancer-causing substances. "The Act authorized EPA to establish safe standards of purity and required all owners or operators of public water systems to comply with primary (health-related) standards. State governments, which assume this power from EPA, also encourage attainment of secondary standards" (EPA, 2001).

9.3.2 Area-wide Water Quality Management Plans

Required of states under Section 208 of the Clean Water Act, the planning process provides a regional approach to wastewater treatment, control of storm water runoff and dredge and fill operations, water recycling and conservation, and sludge disposal. "The Federal Water Pollution Control Act (Clean Water Act) Amendments of 1972 and 1977 required the control of all sources of water pollution for meeting the goals of the Act. Section 208 of the Act requires that all activities associated with water pollution problems be planned and managed through an integrated area-wide water quality management program. It also defines the schedule and scope of area-wide waste treatment management plans" (Clean Water Act, 1977).

9.3.2.1 Point Sources

These are sources of pollution that are discharged at a definable point and include such sources as wastewater treatment plants and commercial and industrial dischargers.

9.3.2.2 Non-Point Sources

The source of this type of pollution can not be traced to a definable point but is spread over a wide area. Stormwater runoff from urban and agricultural lands, seepage from on-site wastewater treatment (septic) systems, and leachate from solid waste disposal sites are examples of non-point source pollution.

Groundwater can be affected by several sources of pollution such as underground injection of fluids, seepage from on-site wastewater treatment (septic systems) leachate from solid waste disposal sites, and accidental spills. Faults and porous soils and rocks are avenues for contamination to groundwater aquifers.

9.3.3 Measures of Water Pollution

Some common substance or characteristics measured in water to determine its quality include:

- Fecal coliforms (bacterial contamination indicating the presence of human waste)
- BOD (biochemical oxygen demand, a measure of the oxygen depleting capacity of the waste)
- DO (dissolved oxygen - a high level indicates good water quality)
- Solids (dissolved and suspended)
- Turbidity

- pH (acidity or basicity)
- Nitrogen and Phosphates (nutrients for algal growth)
- Temperature
- Lead, heavy metals, and toxic substances

In order to effectively communicate the types and concentrations of different pollutants in a water source, a planner could create a table listing the key pieces of information needed for the particular audience (Figure 9b on pg. 59). Communicating scientific data that impacts the community's health is best when clearly stated rather than left for graphic interpretation.

Figure 9b

Detected Pollutant Levels in Water Supply - Newport, RI

Substance	Highest Allowed by Law (MCL)	Highest Levels Detected			Ideal Goals (MCLG)	Major Source
		Naval Station Newport	Fort Adams	City of Newport		
<i>Inorganic Compounds</i>						
Flouride (ppm)	4	1.10	1.15	1.90	4	Naturally occurring
Lead (ppb) (a)	AL=15	6.0 (1998)	5.0	5.6	0	Lead piping and solder
Copper (ppm) (a)	AL=1.3	0.13 (1998)	0.14	<0.05	1.3	Copper piping
Turbidity (NTU) (b)	5.0	NS (e)	NS (e)	1.80	TT	Soil runoff
Monthly turbidity percentile	5%	NS (e)	NS (e)	5%	0%	Soil runoff
Nitrate (ppm)	10	0.9	0.7	0.7	10	Soil runoff from fertilizer use
Chromium (ppb)	100	ND	ND	5	100	Erosion of natural deposits
Cadmium (ppb)	5	ND	ND	1.7	5	Corrosion of galvanized pipes
<i>Radioactive Contaminants</i>						
Beta/photon emitters (pCi/L)	AL=50	3.7	1.7	3.0	0	
Alpha emitters (pCi/L)	15	1.7	ND	ND	15	Erosion of natural deposits
<i>Microbiology</i>						
Total Coliform	5%	<1 (f)	<1 (f)	4.84%	0%	Naturally present
<i>Organic Compounds</i>						
Xylene (ppm)	10	ND	ND	0.011	10	By-product of petroleum
Dichloromethane (ppb)	5	ND	ND	2.6	0	chemical
Haloacetic Acids Four Qtr. Running Average and Range of Results (ppb) (c)	60	27 Range 1 to 62	NS	24 Range 12 to 48	0	By-product of drinking water chlorination
Total Trihalomethanes Four Qtr. Running Average and Range of Results (ppb) (c)	100	72 Range 17 to 77	75 Range 38 to 85	70 Range 11 to 150	0	By-product of drinking water chlorination

See Notes on following page

Source: Naval Station Newport Restoration Advisory Board website - <http://www.nsnpt.navy.mil/Code40/40E/ccr2/page3.html>

NOTES

Definitions

- MCLG (Maximum Contaminant Level Goal) The level of a substance in the drinking water below which there is no known or expected health risk. MCLGs allow for a margin of safety.
- MCL (Maximum Contaminant Level) The highest level of substance that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
- ppm parts per million; equivalent of 1 penny in \$10,000 or 1 milligram per liter (mg/L)
- ppb parts per billion; equivalent of 1 penny in \$10,000,000 or 1 microgram per liter (µg/L)
- AL (Action Level) The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow
- pCi/L picocuries per liter; measure of radioactivity in drinking water.
- NS Not Sampled
- ND Not Detected
- NTU (Nephelometric Turbidity Unit) A measure of very small particulate matter in drinking water.
- TT (Treatment Technique) A required process intended to reduce the level of a contaminant in the drinking water.

Explanation

- (a) Analyzed every three years, the results presented here for Copper and Lead represent the sampling of high-risk locations only. Results typical of delivered water quality are Copper = 0.05 ppm and Lead = Not Detected
- (b) The turbidity level of the filtered water can be greater than or equal to 0.5 NTU in only 5% of the measurements taken each month and shall not exceed 5.0 NTU at any time. Turbidity is only sampled at the treatment plants, which is the reason turbidity was not sampled by the Navy.
- (c) Compliance is based on an average of 4 distribution system samples taken every quarter for 4 consecutive quarters.
- (d) Naval Station results are from 1998, when the system was last sampled for lead and copper. The system will be sampled again in 2001.
- (e) Turbidity samples are only taken from the City of Newport's Drinking Water Treatment Plants
- (f) Systems that take less than 40 samples are allowed one and only one positive total coliform sample per month. Both the Fort Adams and Naval Station Newport systems never exceeded one total positive coliform sample.
- (g) Information from the City of Newport taken from the source water before treatment

9.4 Water Quality Factor Interpretation

9.4.1 Opportunities

- Cooperation in pollution control programs helps in the achievement of better water quality, reducing treatment costs for drinking water, protecting local fisheries, and protecting the recreational values of local waterways.
- Large natural areas and water-edge buffer areas on naval activities often provide important protection from non-point source pollution to local waterways.

9.4.2 Constraints

- NPDES permits are required for all point source wastewater discharges into surface waters. The permit sets effluent standards and the type of treatment technology that must be used.
- Industrial wastewater must often be pretreated before discharge to the wastewater treatment plant to ensure that biological and other treatment processes of the plant are not damaged.
- Drinking water must meet the standards of the Safe Drinking Water Act before distribution to users.
- Injection of fluid underground is regulated by the Safe Drinking Water Act to protect groundwater that may be used as a source of drinking water.
- 208 Plans may require measures to control non-point source pollution. Stormwater management measures designed to reduce pollutant loadings may be required: stormwater detention ponds, stormwater retention ponds, infiltration pits, Dutch drains, and porous pavement.
- Sedimentation and erosion controls must be implemented during construction if sedimentation pollution to local streams is to be prevented.
- Plans should consider cost and land needs for water pollution treatment.

9.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of water quality information on a specific proposed project.

- How is sewage to be treated on site; by wastewater treatment plant or by on-site septic systems?
- Are any industrial discharges expected to be produced? How is this to be treated? Will pretreatment be required?
- Will the project result in an increase in pollutant discharges to local water bodies?
- Will a new NPDES permit be required or will an existing permit need to be modified or amended?
- Will the project increase impermeable surfaces on site thus increasing stormwater runoff pollution? What plans are there for the control of sedimentation and erosion during construction? What local or state regulations regarding non-point source pollution control must be followed?
- Are any solid waste or sludge disposal sites needed? How is the quality of seepage or leachate to be controlled?
- How can provisions be made to control spills of toxic or hazardous substance stored on-site?
- Is the Navy in control of the provisions of drinking water to the activity? Will improvements need to be made to existing drinking water treatment processes to meet the provisions of the Safe Drinking Water Act?

9.6 Data Sources

1. Internet

- <http://www.epa.gov/owm/npdes/htm>
- <http://www.epa.gov/win/law.html>

2. Regional

- Council of Governments (COG)
 - Water resources data on county basis
 - Water supply data
 - Water resources studies
 - Water quality management plan

3. State

- Office of Water Resources, Water Survey Division
- Department of Natural Resources
- Department of Environmental Regulations
 - Water resources studies
 - Water quality management plans
 - Maps of aquifer locations, water use, water quality

4. Federal

- Water Resources Division, USGS (see Hydrology)
- Natural Resources Conservation Service (NRCS) (see Soils)
 - Water resources studies
 - Water resources data on state basis

ADDITIONAL SOURCES

- Local utilities district/commission
- EFD Studies

10.0 AIR QUALITY

The quality of the air is affected by many sources, including natural, man-made, and transportation. Because of its varied source locations, cooperative efforts are required to ensure that air pollution levels are maintained at, or reduced to, acceptable levels. Air quality is defined as the relative purity of ambient air as compared to natural conditions. The Clean Air Act, as last amended in 1990, establishes air quality standards and the mechanisms for obtaining these standards. The standards are based on the maximum acceptable concentrations of six air pollutants in the atmosphere. These six pollutants are labeled criteria pollutants, and states must develop strategies of how to attain and maintain acceptable standards of them. Federal facilities must meet applicable federal, state, interstate, and local regulations designed to assure compliance with the Clean Air Act, though exemptions for military-unique situations may be requested from the EPA. A detailed description of the requirements and duties of Navy planners in the area of air pollution abatement is presented in the "Environmental Protection and Natural Resources Manual" (OPNAVINST 5090.1B).

10.1 Relevance to Planning Studies

10.1.1 Regional Studies

Air quality impacts extend beyond the activity plan levels to the regional level. Cooperation between all pollution sources in a region is required in order to successfully attain ambient air quality standards. Participation in vehicle inspection-maintenance programs, fuel-vapor recovery programs, transportation control strategies, and emission offsetting will often require coordination with EPA, state, and local authorities.

10.1.2 Activity Plan

Required permits for stationary sources and potential requirements to offset emissions are most relevant at the activity levels. Measures to reduce traffic problems at activities must also be addressed at these levels.

DEFINITIONS

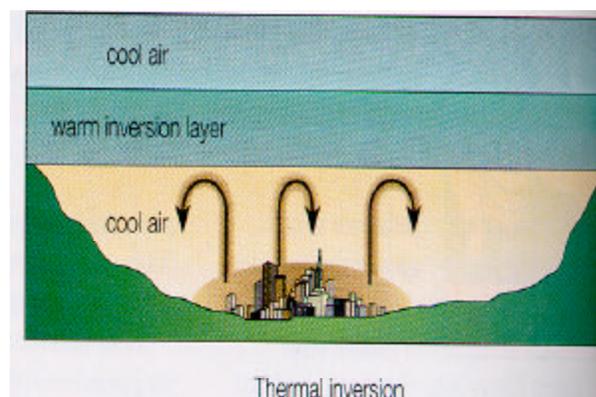
Emissions – Airborne pollutants primarily caused by the combustion of fossil fuels.

Inversion – The trapping of air pollutants in a layer of cool air that cannot rise to carry the pollutants away. This occurs where cool air lies beneath a layer of less dense, warm air in an urban basin or valley.

Non-attainment area – An area considered not to have air quality that meets or exceeds the USEPA health standards used in the Clean Air Act. An area may be an attainment area for one pollutant and a non-attainment area for others.

Pollution abatement— Policies and measures to reduce and/or avoid polluting a natural system.

Fossil fuels— A collective term for coal, petroleum, and natural gas capable of being utilized by combustion as energy sources.



10.2 Relationship to Other Resource Areas

Information on clean fuel availability is needed to assure compliance with air quality emissions standards for fuel burning facilities. Data on traffic levels is important for the design of needed transportation control strategies. Transportation sources are significant contributors to air quality concerns. According to the EPA, transportation sources accounted for approximately 31 percent of total U.S. emissions of Carbon Dioxide in 1998 (EPA, 2000). Progress made in emission reduction from vehicles has been offset by increased number of vehicle trips over the last decades (EPA, 2001a). Climatological and topographical factors also must be considered in the siting and design of facilities. Inversions, or the trapping of pollution in valleys by warm air blanketing cold air masses, result in smog and higher levels of air pollutants in many urban areas. Areas where inversions are common may be particularly troublesome when new facilities are proposed.

Air quality indicators are often a valuable tool in assessing the progress of regulatory efforts in achieving better air quality. Mapping these indicators over a region, whether local or state-wide, the Navy planner can assess areas of improvement and those where extra effort must be concentrated (Figure 10a on pg. 65). Through the use of descriptive categories of each indicator, one can quickly assess areas to target for new efforts as well as those needing continued support.

10.3 Primary Air Quality Planning Factors

10.3.1 *Federal Air Quality*

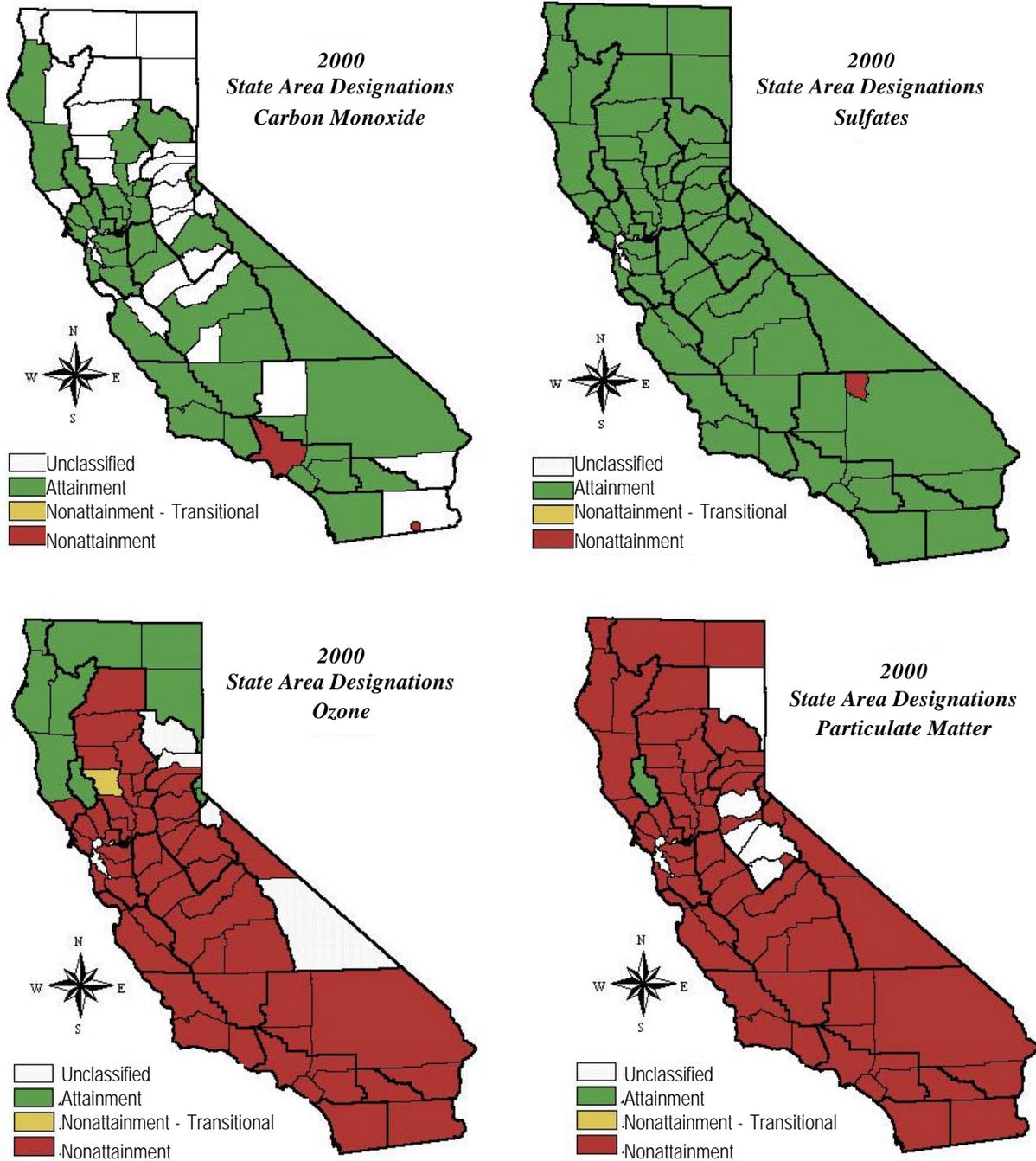
The Clean Air Act of 1990 established a comprehensive program of permitting and market-based incentives to regulate air pollution and quality in the United States. Based upon the earlier version of the Act established in 1970 and amended in 1977 to meet ambient air quality goals, the 1990 Act refines methods of enforcement and deadline adherence (Clean Air Act, as amended, 42 U.S.C. 7401 et seq).

New to this version is the introduction of a permitting system for industry, similar to that in place for water pollution. This market-based approach offers companies choices on how they will reach their pollution reduction goals while allowing the trading of pollution allowances. The air permits flow from companies who produce less pollution than allowed to ones producing more, requiring permits for the additional levels beyond the ambient standards. The distribution of the permits reflects the total amount of pollution allowed; thus, trading amongst firms does not increase overall levels, it merely shifts the concentrations between individuals.

The 1990 Act also includes provisions for increased community participation and enforcement of the regulations. Individuals may sue both the EPA and polluting companies if enforcement of the law is not solving the problem at hand. Citizens may also participate in hearings regarding the state and local pollution plans.

Figure 10a

Air Quality Indicators – CA, 2000



Source : California Air Resources Board website - <http://arbis.arb.ca.gov/design/adm/adm.htm>

10.3.2 State Implementation Plans (SIP)

Each state is required by the Clean Air Act to develop a plan addressing how air pollution in that region will be mitigated. The state's agency overseeing air quality produces this plan with the assistance of metropolitan planning organizations (MPOs), industrial pollution sources, and the community (EPA, 2001a). The plan includes estimates of future air quality, describing a detailed approach to achieve specific air quality goals. It also includes a monitoring program, identification of air pollution sources and in particular the development of an emissions inventory, and the completion of an implementation program. Through monitoring, states have determined those areas which do not meet federal standards (nonattainment areas). The SIP must develop an implementation program to assure timely attainment of the standards in these areas. All other areas must be protected from the significant deterioration of existing air quality.

10.3.3 Sources of Air Pollution



Generally, air pollution sources are categorized as either stationary or mobile sources.

10.3.3.1 Stationary Sources

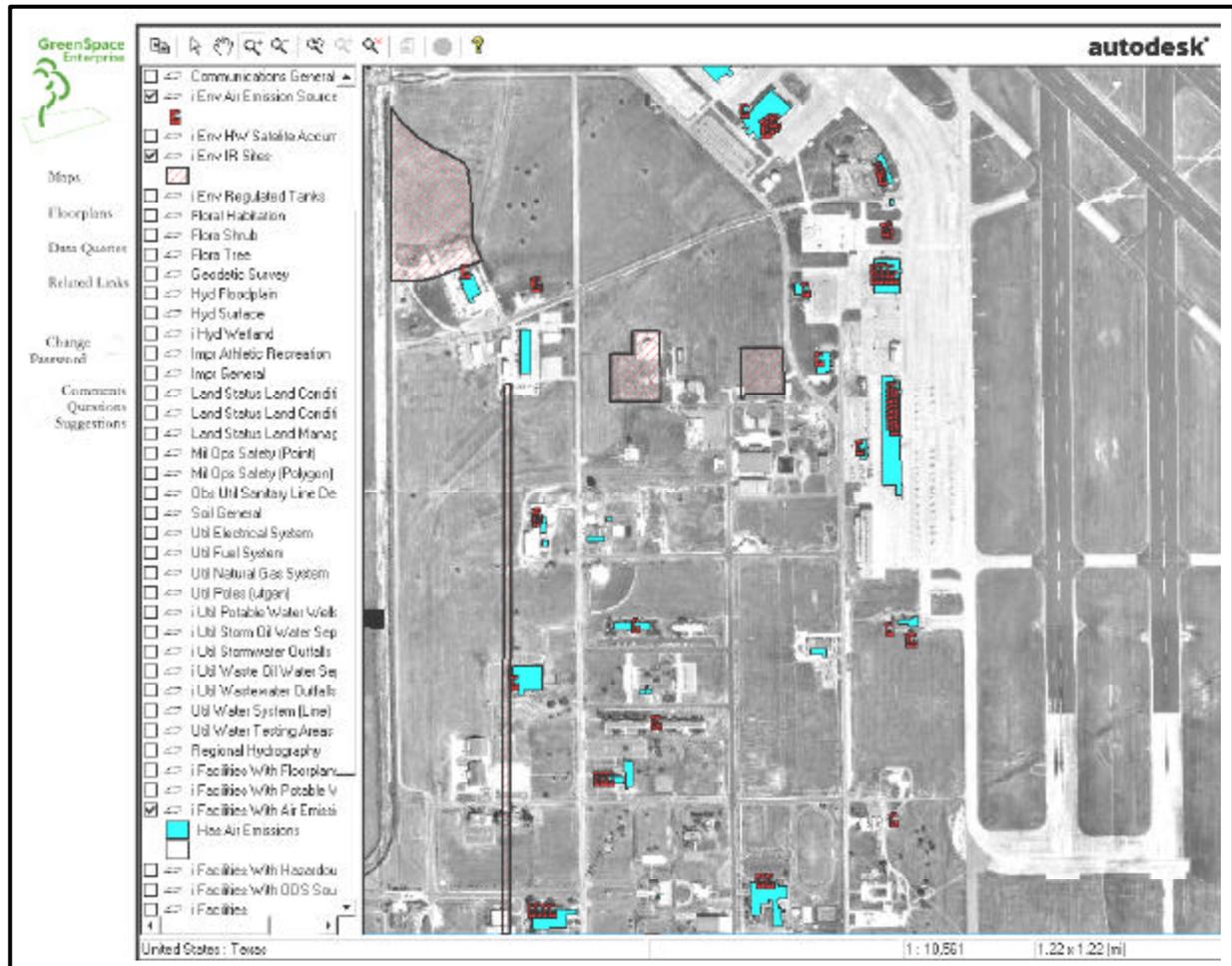
Some stationary sources often found in military installations for which air quality standards exist include: boilers; incinerators; petroleum storage tanks; asphalt concrete plants; firefighting training facilities; sites for open burning of munitions; industrial processes such as plating, spray painting, and abrasive blasting; jet engine test cells; rocket engine test facilities; demolition activities; fueling operations; paint formulation; etc. Permits must be obtained for all stationary sources emitting significant amount of air pollution. These permits set forth emission standards which must be met. Due to permitting and operational regulations, the location of these sources is important to identify for overall facility planning. Using GIS, a planner can clearly identify the sources in relation to other facilities, using the end product as a tool for analysis of development, operational, and hazard constraints (Figure 10b on pg. 67). The Navy may be required to monitor emissions to assure compliance.

10.3.3.2 Mobile Sources

These include motor vehicles such as sedans, buses, trucks, pickups, and motorcycles. Mobile construction equipment, classes of military unique vehicles and military aircraft are not presently regulated. The SIP may require the following pollution control strategies to meet federal air quality goals: retrofitting of old vehicles with air pollution control devices; regulation of traffic flow; regulation of parking; fuel-vapor recovery; and vehicle emission inspection and maintenance.

Figure 10b

Point Sources of Air Pollution - NAS Kingsville



Source: Chief of Naval Education and Training GreenSpace Enterprise Information Portal - <http://greenspace.cnet.navy.mil>

10.4 Air Quality Factor Interpretation

10.4.1 Opportunities

- Since the burning of fuel is often a source of air pollution, reductions in fuel use must often be achieved to meet air quality standards. Reduction of excessive fuel, along with increased efficiency, conserves energy and reduces overall fuel costs. For example, the implementation of a vehicle inspection and maintenance program results in the better engine tuning of motor vehicles so that fuel is burned more efficiently, and therefore less fuel is used.

- Traffic control strategies for air pollution reduction result in more efficient traffic flow in and around military installations.
- Coordinated land use and transportation decision-making in future project location decisions. Compact development decisions and pedestrian-oriented can result in lower number of vehicle trips, lessening air emissions of vehicles.
- Cooperation in pollution abatement programs helps in the achievement of better air quality, thus providing more healthful conditions for Navy personnel and the reduction of property damage due to air pollution.

10.4.2 Constraints

- The emissions of significant amounts of suspended particulate, hydrocarbons, sulfur dioxide, nitrogen dioxide, carbon monoxide, lead, and toxic or hazardous substances from military facilities are regulated by the Clean Air Act.
- Permits are required for all existing stationary sources emitting significant amounts of air pollutants. Air pollution control devices must often be installed.
- New facilities must be approved by the state. Disapprovals may occur when: a performance or emission standard can't be met; the facility would interfere with the attainment or maintenance of a national ambient air quality standard; or the facility would contribute to the degradation of existing air quality.

10.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in evaluating the relative importance of air quality information on a specific proposed project.

- Are existing or predicted air pollution levels at the site above National Air Quality Standards?
- Is the site located in a non-attainment area or in an area requiring the prevention of significant deterioration?
- Will the state require emissions offsets for new facilities proposed?
- Open burning of refuse, trees and shrubs, and munitions can have adverse effects on local and regional air quality. Is there or will there be open burning associated with this project?
- Does this project require new fossil fuel burning boilers for heating, incineration, and air conditioning?
- How many vehicle trips does this project generate? What are their origins and destinations?
- "Fugitive" dust as a result of construction activities or military maneuvers can degrade local and regional air quality. Such activities include demolition, drilling, excavation, cement handling, blasting, aggregate crushing, traffic on unpaved roads, grading, or any other action which exposes large amounts of earth to the wind. Will any of these activities occur on this project?

- Will any increases in industrial activity producing significant air pollution result from this project?
- Will any project-generated emissions contain radioactive or toxic air pollutants?

10.6 Data Sources

1. Internet

- <http://www.epa.gov/oar>
- <http://www.epa.gov>
- <http://www.nsc.org/ehc/airqual.htm>

2. Local

- Local Planning Department
- County air quality data
- County air quality standards

3. Regional

- Council of Governments (COG)
 - Air quality component of regional land use plan
 - Air quality implementation plan

4. State

- Department of Pollution Control
- Department of Natural Resources
- Environmental Management/Protection Agency
- Department of Environmental Protection
 - Annual air quality reports
 - Air quality regulations/standards
 - State air quality data

ADDITIONAL SOURCES

- Environmental Protection Agency, Regional Office, Office of Air Quality Planning and Standards
- Base Division of Natural Resources
- Utilities Commission/Authority

11.0 CLIMATE

Climate influences planning by shaping the landscape on a regional scale and by influencing site-level decisions on major site plan element location, orientation, and construction. Climatic information is particularly useful in planning for energy efficiency; although, it should be recognized that at any given moment, the climatic elements are operating in combination. Climate is defined as the average course or condition of the weather at a place over a period of years as exhibited by temperature, wind velocity, and precipitation.

DEFINITIONS

Microclimate – Local climatic conditions differing from the general climate of a geographic area.

Comfort zone— The combination of various temperatures and humidity that indicate different comfort levels for each individual.

11.1 Relevance to Planning Studies

11.1.1 Regional Studies

Climate data is usually recorded for regions and sub-regions from airport and city center locations. Climate has historically affected the patterns of community development. There has been a remarkable correspondence between specific town, city, site layout, and architectural designs and their respective regional climates. The advent of mechanical heating and air conditioning has allowed similar architectural types to be built in a variety of climate zones, however, the energy demands required to run such systems are usually greater than consumption in buildings designed with climate considerations. Navy planners should utilize complex/site layouts and generic architectural designs responsive to the dynamics and characteristics of regional climates. Such sensitivity in site identification, planning, and design will result in a more cost-effective, livable environment.

11.1.2 Activity Plan

Navy planners can utilize climatic data at the activity level, but the data is usually area or regional in scope. Thus, application must be narrowed to the site level. Temperature and precipitation data can be generally applied directly to on-site energy conscious planning, but site microclimatic characteristics may alter the general data. Site microclimate data will be unique due to local topography, slope orientation, water features (oceans, lakes, rivers, etc.), built structures, and other landscape elements.

11.2 Relationship to Other Resource Areas

Climate has a strong relationship to all of the other natural and cultural processes and data categories. It controls the life cycles of animals and plants and the land use (especially agricultural) practices of man. It affects the character of stream flow and the amount of ground water available. It impacts the air around us, sometimes worsening already polluted

skies.

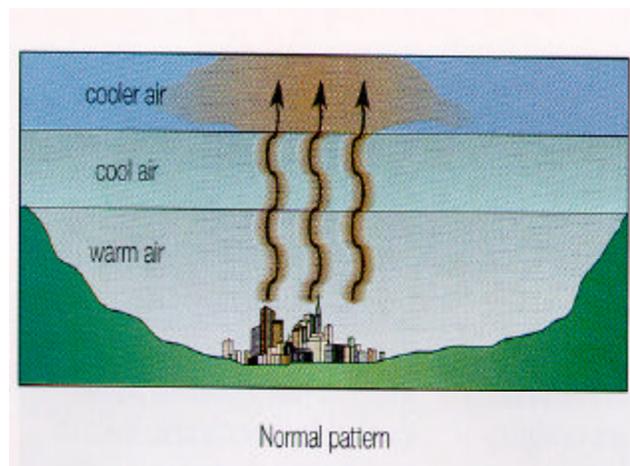
The temperature and humidity of a climate are directly related to the effectiveness of mechanical cooling systems and many construction-related activities. Extreme and rapid changes in weather affect the curing time of concrete, the productivity and safety of workers, and the transportation of goods. The depth of freezing has a strong effect on all forms of construction, and therefore on the built environment.

Climate can be conducive to, or inhibit, outdoor recreational and operational/training activities. Weather conditions impact training schedules of pilots and sailors who are largely dependent upon clear skies for operations. Lost time in a schedule is often cost-ineffective for the Navy. Topographic and vegetative features can create microclimatic zones on a site (e.g. slope orientation; hills and tree lines which act as windbreaks; valleys that "collect" cool air, etc.). Climate has traditionally influenced the location of human settlements making some areas more likely to contain archeological or historic sites than others.

11.3 Primary Climatic Planning Factors

11.3.1 Air Temperature

Air temperature variation is dependent on the relative clearness of the sky. Clear days allow a large radiation movement (incoming and outgoing) and result in a wide temperature range, while the variation is less on cloudy days. Clear winter nights allow a long period of nocturnal outgoing radiation, resulting in colder daily temperature. Cloudy weather usually prevents greater radiation heat losses. Average clear sky conditions are an adequate basis for average day temperature estimates used in planning and design since the extremes of radiation gain and loss are figured into the final estimate.



11.3.2 Radiation Effects

Solar radiation at ground level is considerably less than that falling on an object in space because of a series of radiation losses occurring when the radiation passes through the earth's atmosphere. Reflection off cloud surfaces, absorption by the atmosphere, and diffusion by atmospheric molecules can cause a reduction in the amount of radiation reaching the earth's surface. Some of that radiation which reaches ground level is reflected by the earth's surface. However, most of the energy is absorbed, changing to heat and raising the temperature of the air, ground, and surrounding objects.

11.3.3 Wind

Wind speed and direction should be integrated into planning analyses. The average wind speed and direction can influence airfield and building orientation along with solar factors. Severe winter winds should be buffered, while cooling breezes should be channeled for increased comfort during hot summer months. Wind data is essential in aircraft runway design, location, and evaluation. Major storms (hurricanes, tornadoes, typhoons, etc.) can produce high, damaging wind speeds; therefore, structures should be sited and designed to minimize potential damage from such winds where they may occur.

11.3.4 Precipitation

The effects of precipitation (rain, snow, frost, fog, etc.) are important planning considerations. Data describing different climatic conditions regarding precipitation can be displayed in several ways. Creating a table for the data is valuable for discrete data and raw statistics (Figure 11a on pg. 72). This information can also be displayed graphically, using bar and pie charts to reflect the distribution of data throughout different time periods (Figure 11b on pg. 73). High year-round rainfall, thunderstorms, or short-term major storms (monsoons) call for natural and/or manmade drainage systems to prevent localized flooding. Frequently foggy or storm conditions can impair aircraft operations. Snow loads can affect the structural design of buildings. Deep subsurface frost action can damage building footings and foundations. Covered or enclosed outdoor pedestrian systems may be required.

Figure 11a
International Station Meteorological Climate Summary - NAS Meridian, MS

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:STA 722345 KNMM MERIDIAN NAS, MS, US
:LAT 32 33N: LONG 088 34W: ELEV 317(ft) 97(m): TYPE NAVY SMOS V3 15101996
37-STATION CLIMATIC SUMMARY
POR: (HOURLY): 1961-1995
    
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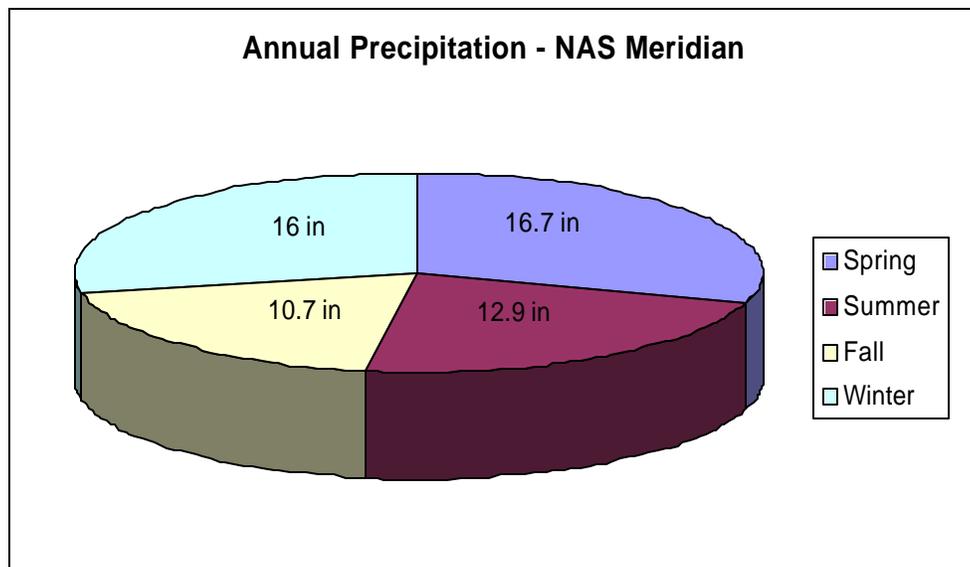
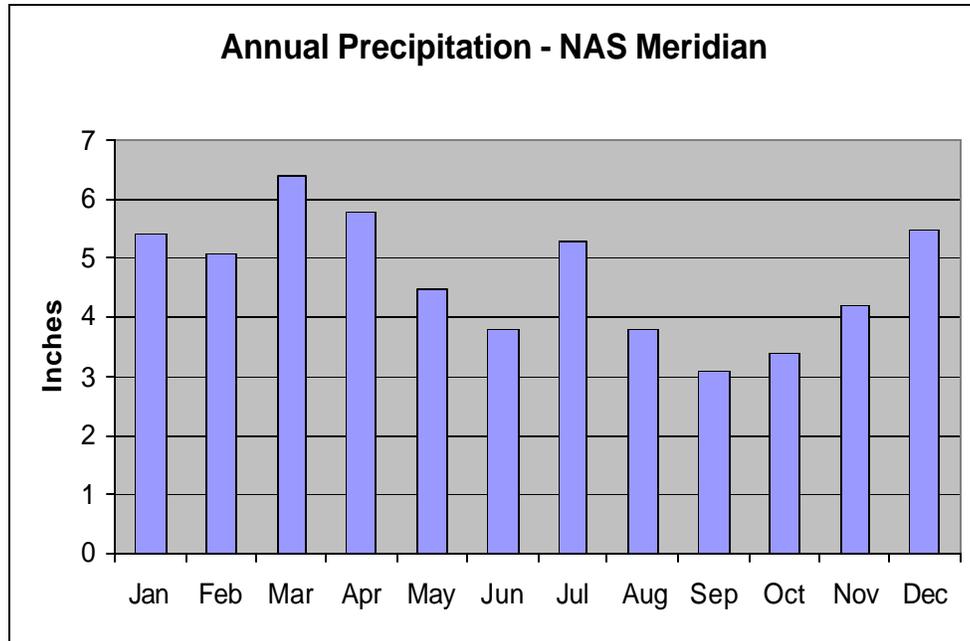
	TEMPERATURE (DEG F)				PRECIPITATION (INCHES) (^)				REL HUM		VAP	DEW PR		WIND(KTS)				MEANS NO. OF DAYS WITH (&)						TEMP (DEG F)							
	MEANS		EXTREME		PRECIP.		SNOWFALL (@)		PERCENT		PR	PT.	ALT	SKY	PRECIP.	SNOW-															
	MAX	MIN	AUG	MAX	MIN	MEAN	MAX	MIN	MAX	MEAN	MAX	MAX	AM	PM	HG.	\$	DIR	SPD	GST	+	>=	>=	>=	>=	STM	*	>=	>=	<=	<=	
											6	15												0.01	0.5	0.1	1.5				
JAN	55	33	45	80	1	5.4	11.4	1	4.9	1	6	4	83	56	0.2	35	65	N	5	50	OVR	11	4	#	#	2	19	0	4	16	1
FEB	60	36	48	86	9	5.1	11.3	1.4	5.9	T	2	2	82	50	0.21	36	70	N	5	43	OVR	9	3	#	#	3	14	0	6	12	#
MAR	69	43	56	89	12	6.4	15	1.8	4.6	T	4	3	83	47	0.28	43	75	S	6	60	OVR	10	4	#	#	5	18	0	16	6	0
APR	77	51	64	97	28	5.8	15.2	0.6	7.6	T	3	2	86	46	0.38	51	65	S	5	68	OVR	9	3	#	#	5	20	1	24	1	0
MAY	83	59	71	97	36	4.5	13.5	0.5	3.6	0	0	0	90	51	0.51	60	55	S	5	42	OVR	9	3	0	0	6	25	5	30	0	0
JUN	90	66	78	106	42	3.8	12.4	0.2	3.4	0	0	0	90	53	0.66	66	50	W	4	58	SCT	9	3	0	0	8	24	16	30	0	0
JUL	92	70	81	107	52	5.3	13.2	1.4	3.8	0	0	0	91	57	0.74	70	40	W	4	45	BRK	12	4	0	0	12	25	22	31	0	0
AUG	91	69	80	103	52	3.8	8.6	0.4	3.9	0	0	0	92	55	0.72	69	45	N	3	47	SCT	9	2	0	0	8	27	20	31	0	0
SEP	86	63	75	101	37	3.1	10.1	0.3	5.1	0	0	0	90	54	0.6	64	45	N	4	44	SCT	7	2	0	0	4	25	11	29	0	0
OCT	77	50	64	98	27	3.4	9.8	T	4.1	T	T	T	88	49	0.4	52	50	N	4	43	CLR	6	2	0	0	1	22	1	26	1	0
NOV	67	42	55	91	17	4.2	11.3	0.7	3.3	T	T	T	86	50	0.29	44	60	N	5	59	OVR	9	3	0	0	2	20	#	14	7	0
DEC	59	36	48	88	2	5.5	12.1	1.1	6.1	T	13	10	83	56	0.23	38	65	N	5	43	OVR	10	4	#	#	2	19	0	6	13	#
ANN	76	52	64	107	1	56.2	78.8	36.4	7.6	1	14	10	87	52	0.4	52	60	N	5	68	OVR	110	37	1	#	58	258	76	247	56	1
POR	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34

T = TRACE AMOUNTS (<.05<.5 INCHES
= MEAN NO. DAYS <.5 DAYS
\$ = PRESSURE ALTITUDE IN TENS OF FEET (I.E. 50-500 FEET)
@ = NAVY STATIONS REPORT HAIL AS SNOWFALL; ALSO NWS FROM JUL, 1948-DEC, 1955
+ = THE PREDOMINANT SKY CONDITION
* = VISIBILITY IS NOT CONSIDERED
& = ANN TOTALS MAY NOT EQUAL SUM OR MONTHLY VALUES DUE TO ROUNDING
^ = 24 HR MAX PRECIP AND SNOWFALL ARE DAILY TOTALS (MID-NIGHT TO MID-NIGHT)
I = EXCESSIVE MISSING DATA - VALUE NOT COMPUTED
" = INCHES

Source : Naval Pacific Meteorology and Oceanography Center, San Diego - <http://www.npmoc-sd.navy.mil/climo/climo.html>

Figure 11b

Average Annual Precipitation - NAS Meridian, MS

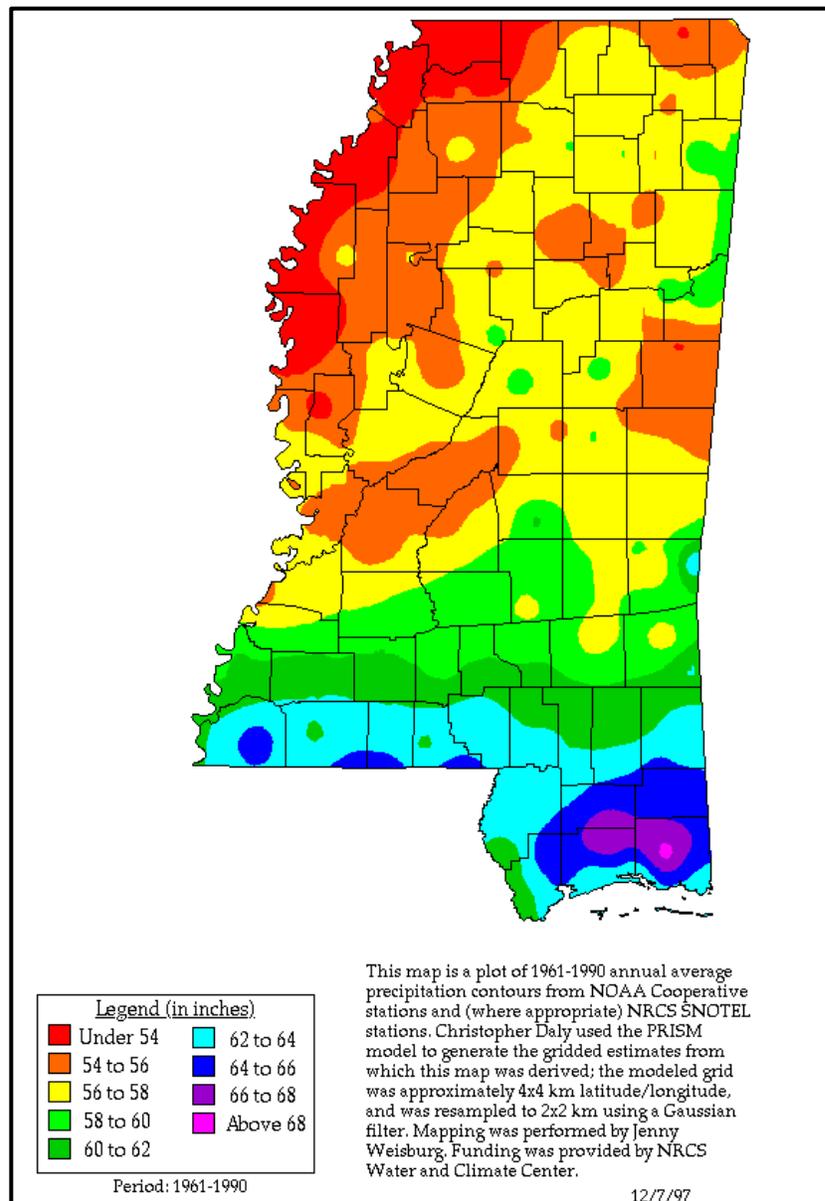


Source : Based on the International Station Meteorological Climate Summary from Naval Pacific Meteorology and Oceanography Center, San Diego.

Precipitation and climate impact naval training schedules, dictating the times and seasons pilots fly sorties. Thus, mapping the amount of precipitation at several different activities allows a planner to analyze the potential for climatic interruptions to training operations. Graduated isoline mapping is an effective tool for assessing a large region and its variations in climatic data (Figure 11c on pg. 74). Using specific data points as grounding locations, the generalized areas of precipitation provide the tool for long-range facility and planning decisions.

Figure 11c

Average Annual Precipitation - Mississippi



Source : Western Regional Climate Center website - <http://www.wrcc.dri.edu/pcpn/ms.gif>

11.3.5 Climate And Comfort

Scientists have correlated a number of climatic factors to define human comfort conditions.

Generally termed the "comfort zone", this approach reflects various combinations of dry-and wet-bulb temperatures and relative humidity. Bioclimatic charts utilize dry-bulb temperature and humidity as major human comfort factors along with the impacts of wind, radiation, and moisture. Human comfort can be a criterion for major activity site selection as well as for locating outdoor personnel training and recreation functions.

11.3.6 Climate and Microclimate

Various regional climatic factors affect heating and cooling of buildings: the average ambient air temperatures, average precipitation, humidity, wind speed/direction, and the amount of sunlight available. Given careful consideration in activity planning and design, these factors can be either minimized or maximized for the most energy conscious plan. A microclimate is the weather patterns peculiar to a specific site or structure. Although linked to the regional climatic character, microclimatic characteristics will be unique due to local topography and landscape elements (trees, lakes, hills, plains, etc.).

11.4 Climatic Factor Interpretation

11.4.1 Opportunities

- Climatic data can be adjusted for site-specific usage according to prescribed formulas. Weather information can usually be obtained for regions from weather stations located at nearby airports or cities. Both sets of information can be combined to define the general climatic environment for a site over an average year. Particularly important factors are precipitation (amounts and forms), temperature, wind (speed and direction), number of cloudy vs. clear days, and solar angles for winter and summer.
- Solar orientation and wind buffering and channeling are useful in planning for energy efficiency and human comfort. Warm climates may require building orientation towards the north on a lot, while colder climates require orientations towards the south.
- Climate can affect and define utility requirements for Navy installations, especially heating and cooling requirements. Weather patterns can affect water and aircraft operations and communications/electronic detection activities. Examples of requirements modifications include covered aircraft washracks and cooled simulator buildings.
- Site analyses can reveal natural and man-made determinants for the energy-efficient plan arrangement of architectural forms and site infrastructure elements. These determinants include climatic patterns such as: solar angles and radiation; south-facing slopes; prevailing wind direction on a seasonal basis; areas exposed to winter winds or summer breezes; precipitation patterns; temperature patterns; and the effects of topography and hydrologic features on microclimate.
- Consideration of additional plantings and fencing/walls could reduce energy consumption by buffering cold winds and channeling summer breezes, thus requiring less energy to run mechanical systems

during extreme temperature/weather periods.

11.4.2 Constraints

- Climatic information gathered by the Naval Oceanographic Command Detachment (NOCD), the National Weather Service, or other similar sources is generally not collected specifically for use by planners. However, most of the data will be in a readily usable form for site analysis and will include some data relevant to energy conservation and solar energy utilization.
- Existing Navy facilities may have been previously sited without regard to climatic impacts, therefore, expensive mechanical and architectural solutions may already be employed to provide the appropriate human comfort conditions inside buildings. Future project development should include these considerations into the costing proposals.
- It may not be economically feasible to convert or adapt buildings and their mechanical systems to more energy-efficient configurations and thus take advantage of solar energy attributes. Environmental requirements and the scope of rehabilitation can make a project cost prohibitive.
- Climate can cause development constraints such as:
 - deep frost line conditions which affect footing/foundation design and construction;
 - heavy rainfall which can affect storm drainage system sizing and location;
 - major rainfall fluctuations which affect site flooding and soil's shrink-swell condition;
 - excessive snowfall which affects roof loads and outdoor circulation;
 - winter winds which require extensive buffering or building insulation;
 - excessively dry periods which affect water supply from surface/subsurface sources;
 - major storm impacts such as hurricane, winds, and flooding; and
 - wind/precipitation effects on ship, aircraft, and/or electronic sensing operations.

11.5 Relevant Impact Questions

These general proposed questions provide additional guidance to the planner in the relative significance of information on a specific project.

- Is the site located in an area of either high rainfall frequency or drought?
- Does the site lie within a high or moderate risk zone for: hurricanes, tornadoes, cyclones, typhoons, floods (including flash floods)?
- Will the project result in changes to air movement, moisture, or temperature, locally or regionally?
- Will decisions regarding this project be influenced by any of the following: area temperatures, precipitation (rain, snow, hail, sleet), humidity, winds, fog, frost, or cloud cover?
- Is the site susceptible to high winds and/or severe local storms?
- What are the natural conditions of the specific project sites? How much vegetation is present and where in relation to your site plans?

11.6 Data Sources

1. Internet

- <http://www.npmoc-sd.navy.mil/>
- <http://www.wcc.nrcs.usda.gov/>
- <http://www.noaa.gov>
- <http://www.ncdc.noaa.gov/>

2. National

- World Data Center for Meteorology, Asheville
 - Local climatological data
 - Tidal data
 - Hourly precipitation data
 - Snow cover survey
 - Storm data

3. Naval

- Naval Pacific Meteorology and Oceanography Center
- Naval Atlantic Meteorology and Oceanography Center
- Fleet Numerical Oceanography Center
- Naval Oceanographic Office – Stennis Space Center
 - Local climatological data
 - tidal data
 - Station climatic summary
 - Storm data

EFD Studies:

- Energy Conservation Surveys

4. DOD

- U.S. Army Corps of Engineers (Local District)
 - Shoreline movement, tidal data
 - Storm data
- Headquarters, Air Force, Engineering Service Center, Tyndall, AFB, Florida

12.0 ENERGY

Energy conservation requires careful consideration of both site and regional factors. More flexibility and innovation in site planning and architectural design will assist in eliminating existing constraints to quality energy conscious planning. Some key considerations in regional planning for energy conservation include land use and transportation interactions, local and regional energy consumption rates, and solar possibilities for large-scale production. Naval Facilities Engineering Command (NAVFAC) has addressed energy issues through comprehensive instructions including OPNAVINST 4100.5D and the sustainable building initiatives for construction. These two documents provide a solid foundation for the incorporation of energy-conserving principles into Navy regional shore planning.

12.1 Relevance to Planning Studies

12.1.1 Regional Studies

Regional plans may utilize many of the energy-based planning techniques applicable on an activity plan basis; but, when regions are involved, the issues become wider in scope. The relationship of housing locations to the workplace, the price of fuel, general climatic effects, mass transit availability, and major power/heat sources all are important at this scale and at the regional scale. Coordination of energy conscious planning goals, objectives, and approaches with local and regional governments is important to the success of Navy regional planning efforts.

Regional energy-saving initiatives exist at various levels, ranging from federal to local. One federal project supported by the Department of Energy is an innovative approach at local redevelopment through environmental and energy-saving means. The Brightfields program redevelops brownfield (See Chapter 27) sites through the use of solar energy. Addressing economic development through an environmentally friendly approach, the initiative currently focuses on the local level. However, the Navy can apply the same concept into its redevelopment efforts of brownfield on the activity level. Through working with the local community and region in efforts such as the brightfields, the Navy can continue to support economic redevelopment of its surrounding regions.

DEFINITIONS

Solar orientation – The orientation of a building on a lot to absorb solar energy in order to heat the area naturally. In the hot months, shaded trees often provide cooling from the natural energy source.

Brightfields – Redevelopment of brownfield sites through the use of solar energy.

Brownfield – Abandoned, idled, or undeveloped industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination.

Mixed use development – A tract of land or building or structure developed for two or more different uses such as, but not limited to, residential, office, manufacturing, retail, public, or entertainment.

Microclimate - Local climatic conditions differing from the general climate of a geographic area.

Cluster development – Development design concentrating buildings together to maximize open space for recreation or preservation.

Energy reduction strategies are important for each activity to consider in its long-term operational and facility planning. An effective method of displaying these reductions in energy over time is a line graph (Figure 12a on pg. 80). Helpful in communicating the general picture of the consumption trends, line graphs also provide specific measurements at points in time. Tables are also useful for displaying discrete data regarding energy consumption rates (See Figure 12b on pg. 81). Consumption rates must be analyzed in order to create energy-saving strategies, and tables are one method of showing a large volume of data with different characteristics.

12.1.2 Activity Plan

Energy efficiency can be applied as a planning criterion at many levels, but the most control can be exercised at the activity individual building siting/design levels. Activity and site level energy planning embraces the following:

- Solar orientation of structures to maximize energy efficiency;
- Compact building clusters to reduce the number and length of auto trips;
- The inclusion of pedestrian and bicycle systems and transit service on site and to off site services;
- Perimeter parking lots with pedestrian/bus links to on-site locations;
- Use of thicker building insulation and window panes to reflect radiation;
- A more flexible attitude and approach to building siting for energy conservation;
- The increased use of active and passive solar energy systems (more effective use of awnings, overhangs, vegetation, and other shading devices); and,
- The use of energy conscious landscape planting/preservation techniques.

12.2 Relationship to Other Resource Areas

Energy-based planning utilizes data from a number of categories, primarily climatic, topographic, and vegetative. This data can be used in planning for active and passive solar energy system usage and to site structures in the landscape to minimize energy loss and maximize gain. Surface hydrologic features such as lakes, rivers, streams, and waterfalls could be sources of hydroelectric power. Geologic thermal features could be utilized as power/steam heating sources in certain instances.

Land use, transportation, and utility planning approaches can have an effect on an activity's energy consumption. Compact land use clusters and mixed-use development cores can reduce fuel costs by reducing auto trips and require less linear footage of utility systems and roads. In some areas of a naval installation, military operational and safety constraints may restrict the opportunities for clustering activity uses efficiently. Mixed use nodes of development must include those uses posing no threat to human safety and including those utilized on a daily basis (e.g. commercial, social, residential, office).

12.3 Primary Energy Conservation Planning Factors

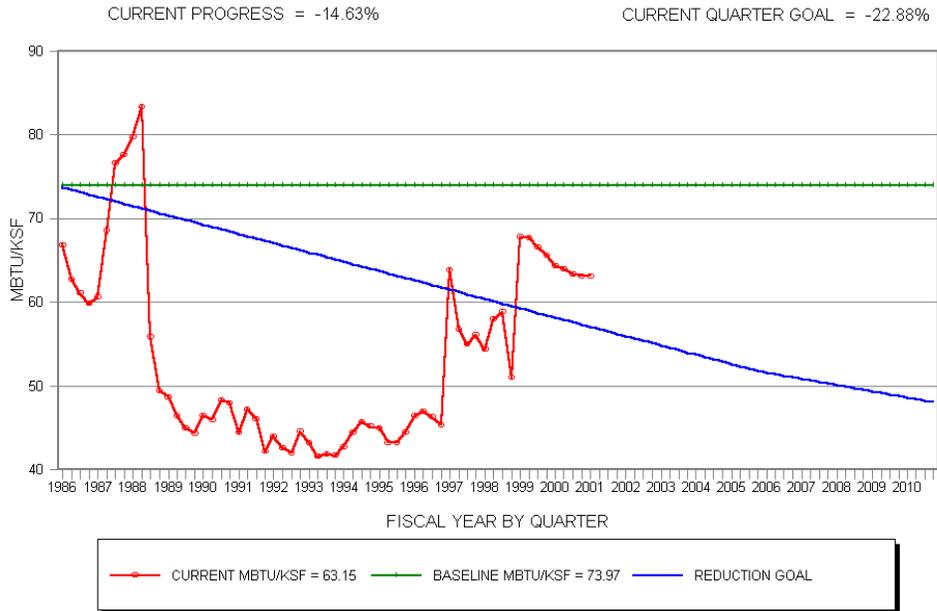
12.3.1 Climate and Microclimate

Various regional climatic factors affect heating and cooling of buildings: the average ambient air

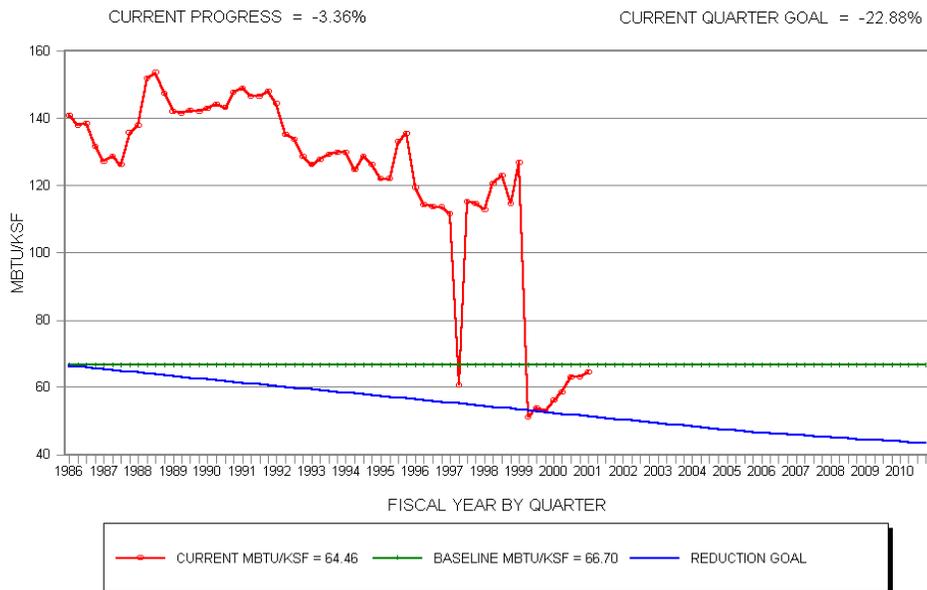
temperatures, average precipitation, humidity, wind speed/direction, and the amount of sunlight available. Given careful consideration in activity planning and design, these factors can be either minimized or maximized for the most energy conscious plan. A microclimate is the weather patterns peculiar to a specific site or structure (Strahler, 1992). Although linked to the regional climatic character, microclimatic characteristics will be unique due to local topography and landscape elements (trees, lakes, hills, plains, etc.).

Figure 12a

Energy Consumption - NAS Corpus Christi & Pearl Harbor



NAS CORPUS CHRISTI, TX
FIRST QUARTER FY 2001 (JAN 00-DEC 00)



PEARL HARBOR
FIRST QUARTER FY 2001 (JAN 00-DEC 00)

NFESC Energy and Utilities Department website http://energy.nfesc.navy.mil/program_mgt/progress.html

Figure 12b

Texas Residential Energy Consumption Estimates, 1960-1997

Table 276. Residential Energy Consumption Estimates, Selected Years 1960-1997, Texas

Year	Coal			Natural Gas ^b	Petroleum				Wood	Geothermal	Solar ^c	Electricity ^a	Net Energy	Electrical System Energy Losses ^d		Total
	Bituminous Coal and Lignite ^a	Anthracite ^a	Total		Distillate Fuel ^a	Kerosene ^a	LPG ^a	Total						Million Kilowatthours	Million Kilowatthours	
	Thousand Short Tons				Thousand Barrels									Thousand Cords	Total	
1960	6	0	6	172	96	6	10,083	10,185	R 705	-	-	11,316	-	-	28,146	-
1965	2	0	2	183	71	7	13,052	13,131	R 469	-	-	18,745	-	-	44,755	-
1970	1	0	1	232	134	33	15,397	15,565	R 322	-	-	32,591	-	-	78,980	-
1975	0	0	0	232	270	39	11,419	11,728	R 378	-	-	40,892	-	-	98,636	-
1980	(s)	0	(s)	225	8	198	6,131	6,337	R 2,006	-	-	57,178	-	-	139,037	-
1985	2	0	2	213	39	112	7,262	7,414	R 1,188	-	-	71,740	-	-	168,547	-
1986	5	0	5	195	21	46	6,611	6,677	R 1,156	-	-	72,392	-	-	166,523	-
1987	10	0	10	211	82	59	7,046	7,187	R 1,506	-	-	74,369	-	-	169,928	-
1988	16	1	17	210	32	58	6,208	6,298	R 1,564	-	-	77,255	-	-	174,656	-
1989	4	1	5	230	13	49	6,534	6,596	R 1,623	-	-	79,620	-	-	178,891	-
1990	4	0	4	211	3	26	6,133	6,162	746	-	-	82,548	-	-	180,551	-
1991	4	(s)	4	222	3	34	4,040	4,078	786	-	-	84,088	-	-	183,050	-
1992	3	(s)	4	215	2	23	3,448	3,473	827	-	-	81,934	-	-	175,010	-
1993	2	(s)	2	232	3	30	3,674	3,707	725	-	-	87,686	-	-	185,252	-
1994	(s)	(s)	(s)	213	6	20	3,627	3,653	711	-	-	89,793	-	-	187,375	-
1995	0	0	0	206	5	22	3,319	3,346	789	-	-	92,831	-	-	193,396	-
1996	0	0	0	229	(s)	38	2,312	2,351	787	-	-	99,656	-	-	207,405	-
1997	(s)	0	(s)	235	(s)	45	2,312	2,357	573	-	-	101,094	-	-	209,948	-

Trillion Btu																
1960	0.1	0.0	0.1	177.7	0.6	(s)	40.4	41.0	R 14.1	0.0	0.0	38.6	R 271.5	96.0	R 367.6	
1965	(s)	0.0	(s)	189.3	0.4	(s)	52.4	52.8	R 9.4	0.0	0.0	64.0	R 315.5	152.7	R 468.2	
1970	(s)	0.0	(s)	238.5	0.8	0.2	58.2	59.2	R 6.4	0.0	0.0	111.2	R 415.3	269.5	R 684.7	
1975	0.0	0.0	0.0	239.2	1.6	0.2	42.4	44.2	R 7.6	0.0	0.0	139.5	R 430.5	336.5	R 767.1	
1980	(s)	0.0	(s)	231.7	(s)	1.1	22.5	23.7	R 40.1	0.0	0.0	195.1	R 490.6	474.4	R 965.0	
1985	0.1	0.0	0.1	221.0	0.2	0.6	26.2	27.0	R 23.8	0.0	0.0	244.8	R 516.6	575.1	R 1,091.7	
1986	0.1	0.0	0.1	202.9	0.1	0.3	24.1	24.4	R 23.1	0.0	0.0	247.0	R 497.6	568.2	R 1,065.8	
1987	0.2	0.0	0.2	219.6	0.5	0.3	25.8	26.6	R 30.1	0.0	0.0	253.7	R 530.3	579.8	R 1,110.1	
1988	0.4	(s)	0.4	218.4	0.2	0.3	22.7	23.2	R 31.3	0.0	0.0	263.6	R 536.8	595.9	R 1,132.8	
1989	0.1	(s)	0.1	239.2	0.1	0.3	24.1	24.4	R 32.5	0.2	R 0.3	271.7	R 568.4	R 610.4	R 1,178.7	
1990	0.1	0.0	0.1	219.5	(s)	0.1	22.2	22.4	14.9	0.2	0.3	281.7	R 539.1	616.0	R 1,155.1	
1991	0.1	(s)	0.1	231.0	(s)	0.2	14.6	14.8	15.7	0.2	0.4	286.9	R 549.1	R 624.6	R 1,173.7	
1992	0.1	(s)	0.1	225.3	(s)	0.1	12.5	12.6	16.5	0.2	0.4	279.6	R 534.7	597.1	R 1,131.9	
1993	(s)	(s)	(s)	238.5	(s)	0.2	13.2	13.4	14.5	0.2	0.4	299.2	R 566.3	632.1	R 1,198.4	
1994	(s)	(s)	(s)	222.5	(s)	0.1	13.2	13.3	14.2	0.2	0.4	306.4	R 557.1	639.3	R 1,196.4	
1995	0.0	0.0	0.0	215.2	(s)	0.1	12.0	12.2	15.8	0.2	0.4	316.7	R 560.5	R 659.9	R 1,220.4	
1996	0.0	0.0	0.0	237.7	(s)	0.2	8.4	8.6	15.7	0.3	0.5	340.0	R 602.8	707.7	R 1,310.4	
1997	(s)	0.0	(s)	242.0	(s)	0.3	8.4	8.6	11.5	0.3	0.5	344.9	607.8	716.3	1,324.1	

a The continuity of these data series estimates may be affected by changing data sources and estimation methodologies. See the "Additional Notes" under each type of energy in Appendix A.

b Includes supplemental gaseous fuels.

c "Other" is the subtotal of 16 petroleum products consumed in the industrial sector. See a full description in Appendix A, Section 4, "Other Petroleum Products."

d If applicable, through 1988, includes all net imports of electricity, and, from 1989, includes only the portion of imports of electricity that is derived from hydroelectric power.

e "Biomass" is wood, waste, and ethanol. Ethanol blended into motor gasoline is included in motor gasoline and total petroleum. It is also included in the biomass series to give complete biomass data, but it is counted only once in the energy total.

f "Other" is geothermal, wind, photovoltaic, and solar thermal energy. See Appendix A, Section 5, for explanation of estimation methodology.

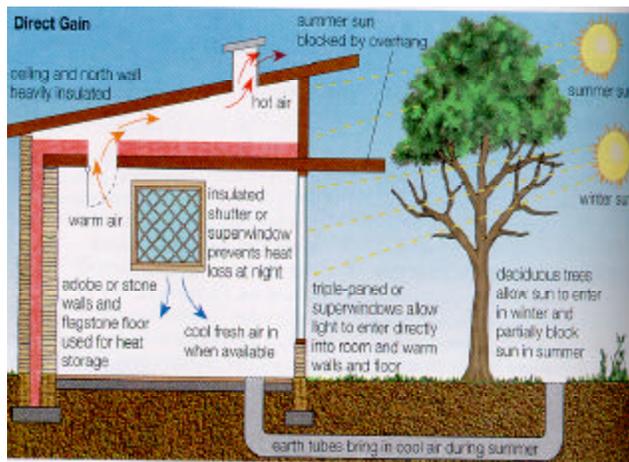
g Net interstate flow of electricity is the difference between the amount of energy in the electricity sold within a State (including associated losses) and the energy input at the electric utilities within the State. A positive number indicates that more electricity (including associated losses) came into the State than went out of the State during the year; conversely, a negative number indicates that more electricity (including associated losses) went out of the State than came into the State.

h From 1989, "Total" does not equal the sum of the columns. Ethanol (which is shown in the transportation sector table) is included in both motor gasoline and biomass data in this table but only once in the total. Net imports of electricity generated from nonrenewable energy sources (shown in appendix Table A8) is included in the total in this table but not in any other columns.

i There is a discontinuity in this time series between 1988 and 1989 due to the expanded coverage of non-electric utility use of renewable energy beginning in 1989.

kWh=kilowatthours. R=Revised data. --=Not applicable. NA=Not available.
 (s)=Btu value less than 0.05 and physical unit value less than 0.5.
 Note: Totals may not equal sum of components due to independent rounding.
 Sources: Data sources, estimation procedures, and assumptions are described in the appendices to this report.

Source : Energy Information Administration State Energy Data Report 1997



12.3.2 Solar Orientation

Of all climatic elements for consideration in planning, the most important is the sun. Primary energy goals are to gain maximum advantage from the sun's warmth in winter and to protect living environments from too much summer heat gain. (Of course, in extremely hot regions, year-round screening from the sun may be warranted.) The sun's path across the sky changes over the year, and its angle above the horizon is determined by the latitude of any particular location; the farther north a site's location, the lower the sun will appear in the sky. The most efficient angle for a sun-oriented structure is that

of the locale's approximate latitude. Generally, a form elongated along the east-west direction is the structure that will receive optimum heating benefit from the sun.

12.3.3 Shade and Wind

Siting of structures and trees to maximize summer shade on heat absorbing paved surfaces and outdoor use areas is desirable. Winter shade can affect solar-accessibility of adjacent structures; avoid siting a tall structure in such a manner that might prevent sunlight from reaching a shorter structure.

The wind has major, obvious impacts in regions with harsh climates; in more temperate areas the wind plays an important role on a microclimatic level. Site planners should consider building orientations offering winter wind protection while taking advantage of summer breezes for cooling (Miller, 1994). Earth berms, trees, and structures can be used to buffer winter winds and channel summer breezes on a site.

12.3.4 Circulation Patterns

Since automobile transportation can account for large energy usage, it is important to consider how site-wide circulation systems layout can reduce vehicle trips and distances. A clear hierarchy of roadways and bicycle/ pedestrian paths can provide for efficient on-site circulation. Shortened travel distances, well-timed signalization, efficient turning movements, and non-auto alternatives (walking, biking) can be incorporated into the plan, resulting in a more energy efficient environment.

12.3.5 Land Use Patterns

More compact, mixed use and clustered site development can reduce fuel consumption and traffic congestion by shortening travel distances, eliminating automobile trips, and encouraging non-auto transportation alternatives. Mixed use and cluster development also requires less site development costs for road and utility infrastructure, allowing for the usage of a variety of on

site energy/heating systems in a centralized manner. Compact development patterns reduce energy requirements of service uses such as deliveries, garbage collection, and security patrols.

12.4 Energy Factor Interpretation

12.4.1 Opportunities

- Comprehensive climatic analysis can provide necessary data for producing an energy-efficient plan. Solar, wind, temperature, and precipitation data can be interpreted for use in building and circulation system siting as well as architectural design toward reducing overall energy consumption.
- The implementation of compact mixed use and cluster development concepts can reduce fuel consumption and utility infrastructure costs as well as traffic congestion at all levels of planning.
- Energy conscious planning and design concepts can add to the quality of life for site users. Shorter driving, biking, and walking distances; mixed and clustered service uses; better mass transit options; human-scale streetscape; increased landscaping; and transportation/recreational pathway systems all contribute to a more enjoyable environment while saving energy and fuel costs.
- Existing site and structure layout and design may not be readily adaptable to current energy conscious planning and design techniques/systems. Solar orientation of structures may be inefficient, land uses may be dispersed over large areas, and individual structures may have poor energy-efficiency conditions (walls, windows, roofs, heating systems, etc.). Site-or area-wide central energy/heat systems may be expensive to replace, relevant to the existing investment in the system. Life-cycle costing analyses can help to determine whether an existing structure, system, or plan should be altered significantly or replaced to produce a more efficient energy usage situation.
- Some sites may require significant adaptation to implement an energy-efficient plan. For instance, a site with little vertical vegetation in a hot climate may require architectural, as well as landscape, energy planning solutions.
- Certain land uses may not function well (or safely) in proximity to one another. Hazardous material or explosive handling/storage/manufacturing areas could not be clustered with personnel service uses or housing. Mixed-use clusters should focus on residential, community-related, and office-related uses that Navy personnel use most often.

12.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in evaluating the relative importance of energy-related information on a specific proposed project.

- Will the project result in the use of substantial amounts of fuel or energy?
- Will the energy requirements of the project foster, or be impacted by, local energy shortages?
- Will the project be of sufficient size to require its own sources of energy?

- Is it possible to consider energy conservation measures as a major part of this project?
- Will either additional or new sources of energy be required to meet the demands of this project?
- Are the site and existing facilities readily adaptable to current solar energy systems in terms of orientation, infrastructure systems, and structural design and quality?

12.6 Data Sources

1. Internet

- <http://www.eren.doe.gov>
- <http://www.buildinggreen.com/news/navypolicy1.html>
- <http://www.nemw.org/energy.html>
- http://www.nemw.org/energy_linx.html

2. Navy

- OPNAVINST 4100.5D Energy Management
- NAVFAC Planning and Design Policy Statement 98-01 “Design of Sustainable Facilities and Infrastructure”
- Activity Public Works Department
 - Station energy consumption patterns
 - Station Transportation Plan
 - EFD Studies: Energy conservation surveys

3. State

- Division of Energy, Department of Commerce or Statistical Department
 - State energy consumption reports
 - Forecasts of state-wide energy use
 - State energy model
 - Energy statistics

4. Regional

- Council of Governments (COG)
 - Regional land use plan (energy and transportation components)
 - Existing and forecast energy consumption rates

ADDITIONAL SOURCES

- Local Planning Office
- U.S. Department of Energy
- Non-profit organizations around wind, solar power, and sustainable building (e.g. Northeast Midwest Institute)

13.0 VEGETATION

The vegetation analysis provides an overview of the ecological systems that characterize an area's natural environment. It is used, in conjunction with the soils, topography, and hydrology analyses to determine building location and siting, to identify resource potential and sensitive areas, and to locate training areas. This information enables the



planner to identify the areas of the site most suitable for construction, while minimizing environmental impact.

13.1 Relevance to Planning Studies

13.1.1 Regional Studies

The value of vegetation information is increasingly applicable in many larger scale studies. Integrated Natural Resource Management Plans (INRMP)s can be regional in scope, encompassing the natural resources of several installations within a geographic region or ecosystem. The vegetation of regions forms the backbone for animal habitat, resulting in the presence or absence of large communities.

Naval projects at the activity level are influenced by regional vegetation through the habitat it supports. Large areas of waterfowl

DEFINITIONS

Buffers – Vegetated areas geographically located on the boundary of non-vegetated lands.

GPS – Geographic Positioning Systems – through the use of satellites in space, one can determine the exact longitude and latitude of a specific spot on earth with a handheld computer.

Habitat -Place or type of place where an organism or a population of organisms lives.

Succession – The gradual process of change in the composition and function of communities, including primary and secondary succession.

Groundcover – The presence of flora covering the barren earth; varies in height and density with location, precipitation, and sunlight.

Ecosystems - Community of different species interacting with one another and with the chemical and physical factors making up the nonliving environment.

Microclimate - Local climatic conditions differing from the general climate of a geographic area.

Watershed – Entire land area that delivers water, sediment, and dissolved substances via small streams to major streams and ultimately to the sea.

Section 404— Section of Clean Water Act that regulates the placement of dredged and fill material into the waters of the U.S., including wetlands.

habitat would support a large community, an important consideration in airfield operations. The presence and maintenance of vegetated areas similar to this example are important to consider in developing regional and activity level shore infrastructure plans.

13.1.2 Activity Plan

Vegetation data is most directly applied at the activity level. Vegetative opportunities and constraints define development arrangements on site, either through the avoidance of prime vegetative resources or rare plants, or through the sensitive siting of compatible uses in wooded areas for shading and aesthetic reasons. Vegetation can provide buffers to severe winter winds and help to channel and cool summer breezes in site development.

Vegetation is increasingly documented at this level by GIS systems and databases. Based on surveys performed with Global Positioning Units (GPS), vegetation type and location is being accurately catalogued. These databases are then used for analyses at the local level, while forming the basis for regional work as well.

13.2 Relationship to Other Resource Areas

A complex group of interacting factors determine vegetation conditions; climate, hydrology, soils, and topography each significantly affect and influence vegetation. Both the overall climate and related soil characteristics determine plant types and associations growing within a region. The amounts of atmospheric and ground moisture determine successional plant growth and the type of climax plant populations. Plant growth is related to soils; primary succession occurs slowly as soils develop in extreme conditions. The thickness of the soil cover and the topographic relief directly affect the amount of vegetative cover.

13.3 Primary Vegetation Planning Factors

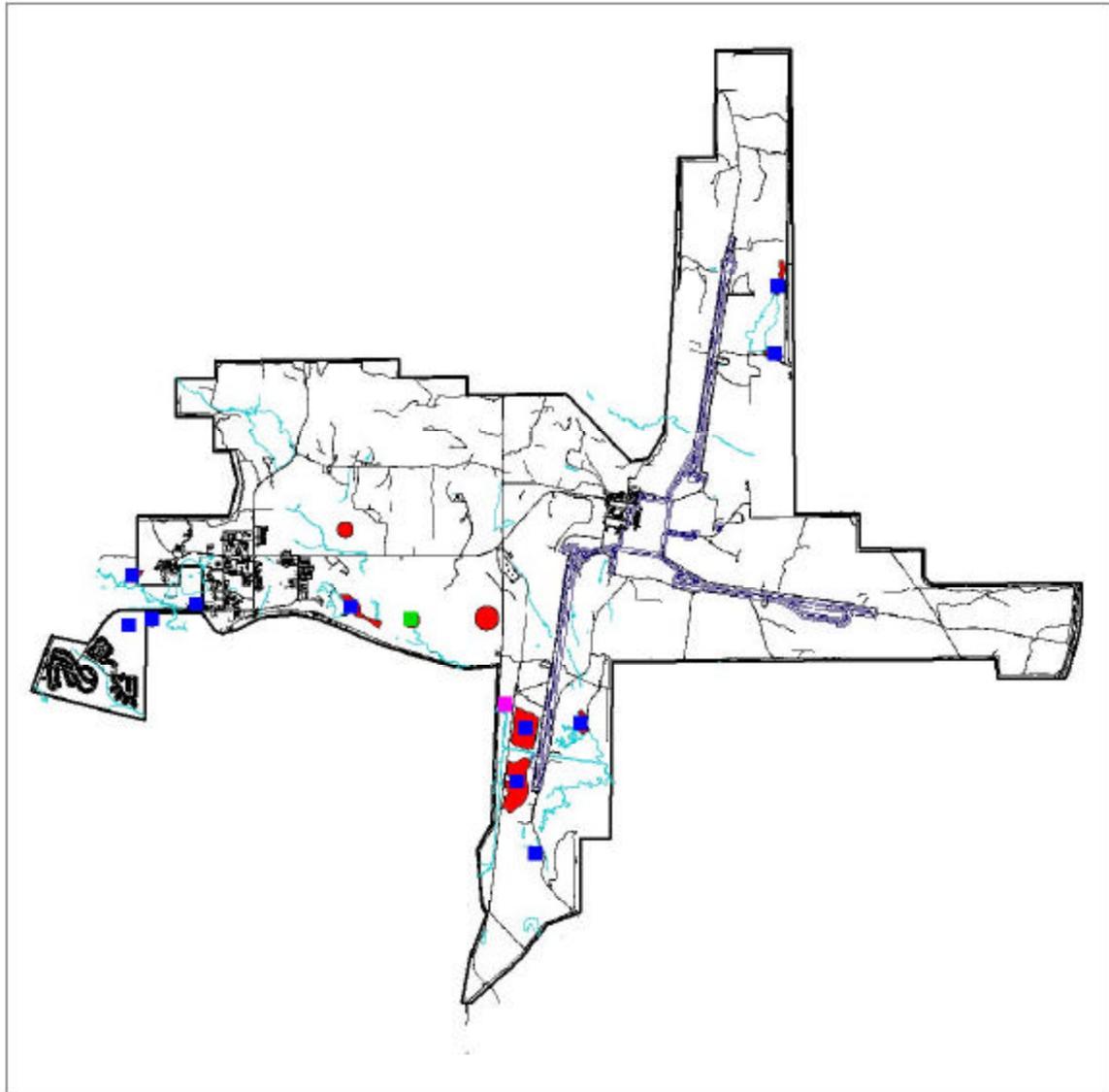
13.3.1 Vegetation Types / Identification

Vegetation consists of three major plant types: trees; shrubs, and groundcover (which may be deciduous or evergreen). Existing vegetation can be identified at a range of scales and community designations: by plant; by plant association; by cover and successive status, and by name. The use of GIS in vegetation identification and analysis has greatly enhanced our knowledge of the types, sizes, and locations of different flora and fauna communities. Efforts within the Navy include those at the regional and activity level to catalogue and identify vegetation in different ecosystems including Hawaii and the Mojave Desert of California. Fragile ecosystems such as these require spatially accurate identification in order to prevent environmental impacts from future mission-related projects.

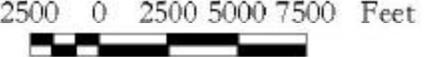
Vegetative cover maps (based on aerial photos or GIS data) on a site-wide, vicinity, or regional scale, usually identify dominant stands (or populations) of vegetation using broad designations such as: grassy field; lowland forest; mixed hardwood forest; marsh, etc. (Figure 13a on pg. 87). Broad-scale vegetation cover maps are most useful for identifying forest resources, training sites, and siting building complexes climatically (responsive to wind and sun) in planning work (Figure 13b on pg. 88).

Figure 13a

Threatened Flora Species - NAS Meridian, MS

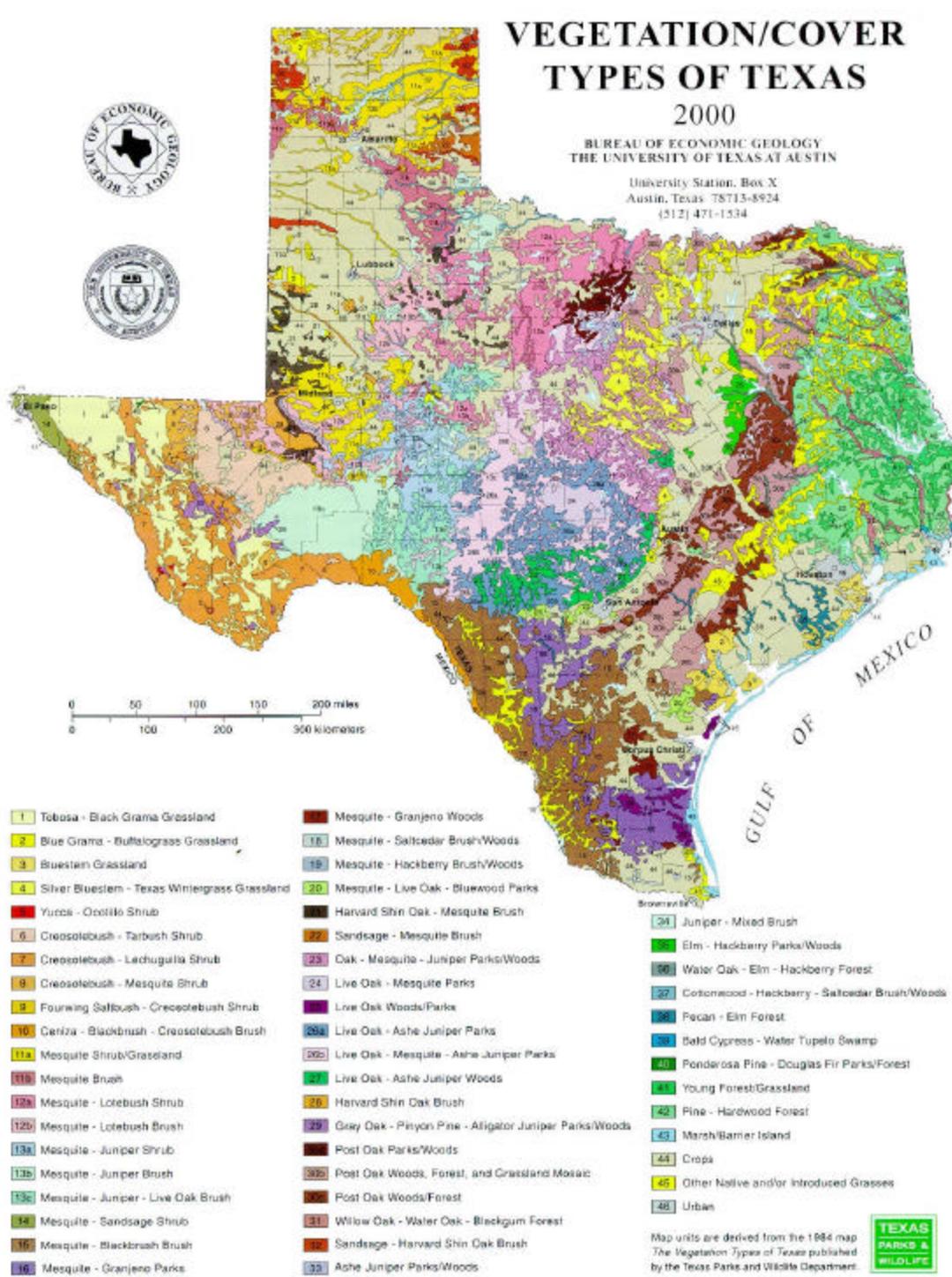


LEGEND

- | | | |
|---|---|--|
| Threatened Species |  Southern shield wood fern |  Airfield |
|  Turks cap lily |  Roads |  |
|  Water willow |  Base Boundary |  |
|  Plant/Wildlife Threatened Areas | | |

Source : NAS Meridian Strategic Facilities Plan, May 2001.

Figure 13b
Vegetation/Cover Types of Texas, 2000



More detailed vegetation data (based on vegetation transects and samplings) is available in ecological inventories which identify plant associations or communities, dominant species, and successive status. Vegetation data at this scale is most useful for determining areas of environmental sensitivity and identifying rare and endangered species. This information is also useful for climatically responsive specific building siting as well as identification of potential animal habitat areas. Using digitally correct data from GPS collection, vegetation data at both the regional and activity scale is often very accurate. Coupled with aerial photographs and field identification, several characteristics of the vegetation can be mapped and analyzed. At the finest level of detail, vegetation is inventoried by plant name, size, vitality, and age during on-site fieldwork. This information is useful for ecological inventories to locate and protect rare and endangered species; location of utilities in order to prevent the growth of undesirable vegetation; building siting; and to protect existing mature specimens which can enhance a building or area.

13.3.2 *Environmental Value of Vegetation*

Vegetation studies enable the planner to conserve and protect the most environmentally valuable and sensitive areas while developing in areas of low environmental value. Environmentally sensitive areas include such areas as prairies; steep mountain slopes; alpine meadows; beaches and dunes; marshes; and wetlands. Federal and State laws now protect environmentally sensitive areas; care should be used in planning construction near or on sensitive areas with endangered vegetative species.

The link between vegetation and the animals it supports is also an important value relevant to local and regional shore planning. The presence of animal communities, whether migratory and temporary or permanent, can influence military operations on the activity level. For example, wetland communities may support migratory birds, leaving and arriving from the vegetated site at various times of the year. The presence of these sites near airfield operations could create conflict with flight operations. Thus, their presence should be considered in the analysis of areas surrounding airfields. As with natural areas, any constructed vegetated areas should be planned in accordance with military operations requirements.

13.3.3 *Other Values of Vegetation*

Vegetation may also have functional value, habitat value, and resource value. It has the ability to moderate climate by screening sun and wind (creating a microclimate) and to provide shade. It provides soil stabilization and watershed protection, retaining steep banks and preventing erosion. Vegetation can buffer noise, maintains and enhances visual character, and has recreation value. It has agricultural and forest resource value as an economic commodity. Lastly, it is one of the most important climatic resources because of its role as a source of oxygen.

Due to its multifaceted importance, different types of vegetation are protected under various federal laws. As with other resource areas, NEPA considerations must be included for federal projects not specifically exempted. Environmental impacts on vegetation are often easily realized, thus, necessitating NEPA documentation. Vegetation is also protected under specific laws governing wetlands and coastal zones. These areas serve as habitat for many species, resulting in the protection of vegetation in order to preserve threatened or endangered wildlife.

13.3.4 *Vegetation and the Built Infrastructure*

Climatic factors often impact the rate of growth of vegetative communities. In areas where vegetation grows quickly, such as warm and moist climates, the built environment can be adversely impacted by this rapid growth. Maintenance to retard the spread of vegetation is often required around buildings, along roadsides, and on mechanical structures. Long-term neglect of the vegetation can result in structural and visual damage to the building. Trees planted close to buildings can cause upheaval in the foundations or adjacent sidewalks, while smothering vines can prevent a building's outer material from allowing heat and moisture to escape. This can result in rotting wood, stucco, and interiors.

13.4 Vegetation Factor Interpretation

13.4.1 *Opportunities*

- Existing vegetation may provide useful outdoor training areas.
- Existing vegetation may have a functional or protective value - wind buffer, sunscreen, and erosion control.
- Existing vegetation provides wildlife habitats, which are important for their recreation potential. Controlled recreational hunting and other recreational opportunities could occur in selected areas.
- Quality vegetative stands of healthy mature specimens may be used as amenity landscape planting in new development areas.

13.4.2 *Constraints*

- Sensitive environmental areas with endangered or rare vegetation are to be avoided. Construction or development of these areas may damage or disrupt wildlife habitats and sensitive or irreplaceable plant communities. Follow all applicable federal laws, including Section 404 guidelines to protect wetlands.
- Rare or endangered species of vegetation may be located on prime developable land. Trade-offs of sensitive areas for buildable land may be allowed when reconstruction of sensitive environments occurs elsewhere on the site. These tradeoffs are allowed only following consultation with state and federal wildlife agencies. Reconstruction and/or relocation should be analyzed within the entire activity's context, ensuring the military mission is not compromised in the mitigative measures.
- Invasive plants or encroaching plants on older buildings may cause structural and cosmetic damage. Invasive tree roots near foundations can cause cracking and upheaval. Heavy leaf fall on roofs or against foundations can provide a substrate for windborne seeds that, after germination, can be unsightly and structurally damaging to mortar and roofs. Overgrown vines can trap moisture against walls and cause rot in wood siding and moisture damage and decay in mortar and bricks.
- Existing vegetation, if susceptible to fire, may be hazardous if retained adjacent to structures.

- Trees are regarded as real property and as such must be sold and harvested as a forestry action, if designated for removal.
- Force protection considerations must be addressed around buildings, structures, and the installation perimeters. Vegetation surrounding these areas can be a hazard in providing a secure, terrorist-free environment. Vegetation provides hiding places for potential terrorist activities.

13.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of vegetation information on a specific proposed project.

- Are there any vegetation areas within the project boundaries?
- Are any of the species of natural vegetation found on or adjacent to this site considered rare or endangered in terms of federal, state, or local regulations?
- Will the project involve extensive clearing of vegetation or will it serve as a barrier to the normal replenishment of existing species?
- Will the project result in alteration to either the number or diversity of vegetative species in the area, including trees, shrubs, grasses, crops, microflora, and aquatic plants?
- Will the project involve the introduction of any new species of vegetation into the specific site to the facility in general?
- Is there any evidence that this area is susceptible to either forest or range fires?
- Do the natural vegetation areas on this site represent a valuable present or potential resource for recreation, forest, or agricultural purposes?
- Are there plants that might have a potentially damaging effect on buildings (trees growing too close to buildings, dense vines growing against wood or masonry walls)?
- Have force protection and security issues been addressed in relation to the installation plan?

13.6 Data Sources

1. Internet

- <http://www.poseidon.fcw.com/pubs/fcw/1998/0914/fcw-frntHawaii-09-14-98.html>
- http://www.rsgis.do.usbr.gov/html/rsgig_veg.html

2. Regional

- Council of Governments (COG)
 - Vegetation component, regional land use plan
 - Reports on agricultural/forest resources
 - GIS information on vegetation cataloging efforts

3. State

- Department of Natural Resources
 - State natural areas inventory
 - Endangered and threatened species list
 - Vegetation types maps and texts
 - GIS data layers

4. Federal

- U.S. Department of Agriculture (through various University Cooperative Extension Programs)
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service

ADDITIONAL SOURCES

- Base Division of Natural Resources
- EFD Natural Resources Management Branch
- Natural Resources Branch, Real Estate Operations, NAVFACENGCOM

14.0 WILDLIFE

It is important for the planner to consider types, locations, and characteristics of wildlife on the site(s) to be planned. A wildlife analysis will provide an understanding of an area's natural environment when coupled with information on the natural vegetation of the ecosystem. The Navy planner is primarily concerned with the aspects of wildlife which affect land use and construction on the site scale, while the interface with vegetation and habitat are important on the regional scale. An analysis of the wildlife characteristics and resource potential will help the planner to assess the suitability of an area for development and construction as well as for wildlife management or preservation.

The Navy has been increasingly aware of wildlife and ecosystem-related issues in the past decade. There has been an, "emergence of a military with an environmental conscience and a compassionate eye for vanishing habitat" since the passage of the 1992 Federal Facilities Compliance Act. The Act required previously exempt federal agencies, such as the DoD, to comply with the same environmental rules as all other agencies. This requirement resulted in a greater awareness, knowledge, and appreciation of the natural resources at Navy installations. Nearly every naval activity has an environmental engineer, if not an entire department, devoted to habitat and ecosystem protection within military operational surroundings.

14.1 Relevance to Planning Studies

14.1.1 Regional Studies

Wildlife data for documented populations is often available at a regional scale. This scale of information may require additional interpretation to apply and use the data at an activity/site scale. It should be noted that such regional data can be applied only generally at a site-specific level; detailed site data can be obtained only by on-site wildlife surveys. Regional wildlife information is important to understand in the context of its impact on more localized populations at a specific activity. Trends or movements of animal populations within a region may serve as indicators of future impacts at a specific activity.

14.1.2 Activity Plan

The study of wildlife and associated habitat is most relevant at the activity and site scale. The location and

DEFINITIONS

Habitat – Place or type of place where an organism or a population of organisms lives.

Ecosystem – Community of different species interacting with one another and with the chemical and physical factors making up the nonliving environment.

Migration – Repeated departure and return of individuals or their offspring to and from an area.

Wetlands – Land that is covered all or part of the year with salt water or fresh water, excluding streams, lakes, and the open ocean.

T/E species – Species classified as threatened or endangered by national listings.

Species – Group of organisms that resemble one another in appearance, behavior, chemical makeup and processes, and genetic structure.

size of specific wildlife communities impact individual projects and functions of the activity. The presence of individual species and their habitats can influence the timeline, size, and scope of site-specific construction (e.g. owl nest in building), while a larger number of species at a location could alter the same elements of activity-level projects (e.g. bird pond near airfields). Analyzing the different wildlife communities on the activity and site level enable the Navy to enhance the natural ecosystems while providing positive benefits for the quality of life of the military and civilian communities.

14.2 Relationship to Other Resource Areas

There is a strong relationship between soil type, vegetation, and the distribution of animals within the protective cover. For example, at a site located between coniferous forests to the north and deciduous forests to the south, the wildlife species present may be characteristic of both vegetative types. Climate and hydrology also affect vegetation species and distribution, since both greatly influence the habitat characteristics. Land use types of various intensities can act as deterrents or attractors to different wildlife species.

14.3 Primary Wildlife Planning Factors

14.3.1 *Wildlife Types / Identification*

Wildlife can be categorized as aquatic or terrestrial, as vertebrate or invertebrate, mammalian or non-mammalian. Wildlife distribution, migration, and activity are directly related to habitat and the environment. In response to a fluctuating environment, animal types also vary. Distribution of wildlife can be correlated with man's activities such as urban uses, farming, and logging. Wildlife is studied and described in terms of its habitat. A specific population is described by plant cover community type (open water provides a habitat primarily for a large variety of fish, amphibians, and invertebrates).

The most common type of wildlife data is the wildlife inventory that identifies and lists the species in a given area; it may also rank dominant species and give population estimates. Wildlife data are gathered by sampling, transects, vegetation mapping, and trapping. Wildlife data may be presented as a listing of dominant and typical species, rare and endangered species, or in a map format showing wildlife distribution and range, migration corridors, commercial and recreation hunting/trapping/fishing areas, and wildlife sightings. Figure 14a on pg. 95 demonstrates a GIS analysis and identification of wildlife areas around MCB Quantico. While some layers and points display location, analysis has also been completed in order to develop the buffers exhibited for one species. This map format is useful in allowing the planner to identify locations and their interrelationships, forming a basis for policy decisions.

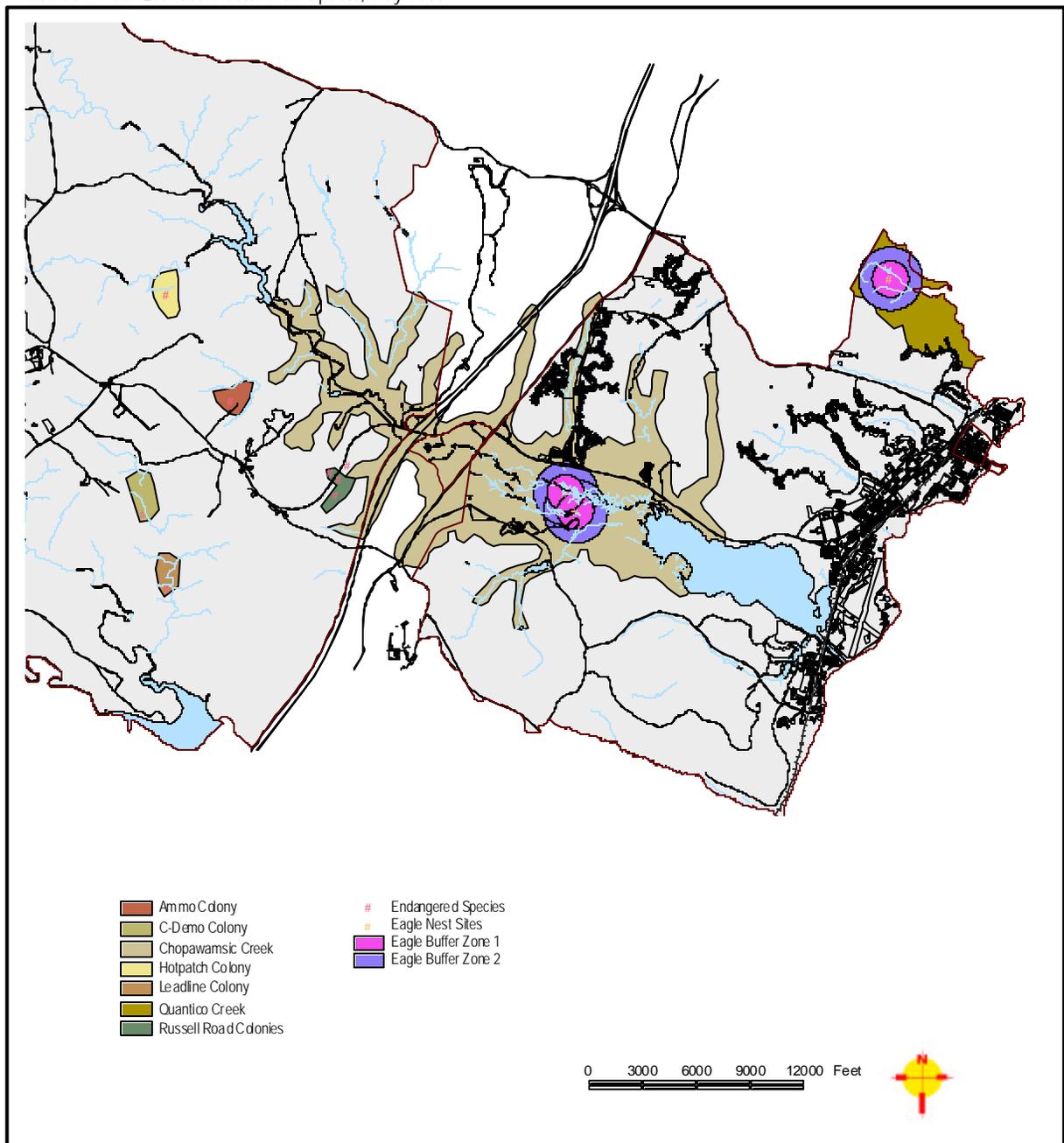
Wildlife data can be obtained from published and unpublished checklists, maps, reports, descriptions, and personal interviews with state, regional, and U.S. Fish and Wildlife Service (USFWS) biologists. Wildlife maps showing habitat areas of species (typical, dominant or endangered species) are the most applicable form of data to the planning process. Sensitive or unique wildlife habitats are areas requiring limited, controlled, or no construction, or are areas to be set aside for protection or management.

14.3.2 Habitat / Wildlife Management

Wildlife is studied in its habitat, or environment. Alterations of the original terrestrial or aquatic wildlife habitats affect the population dynamics of wildlife. Animals differ in their levels of tolerance and in the degree they can continue to live in close proximity with man.

Figure 14a
Wildlife Management Areas - MCB Quantico

Source : MCB Quantico Master Plan Update, May 2000.



Some species are restricted to specific habitat types, and when these are removed or altered to any substantial degree, the animals disappear with them. When one type of habitat is destroyed, though, a new one is created. This may bring an entirely new species or complex of species into the area; those that are pre-adapted to the new habitat may occupy it and flourish.

Wildlife management, or habitat improvement, may be recommended or required on certain sites.

For example, this may include flooding of areas to create new wetland habitats where dredging and filling has occurred in other wetlands and displaced wildlife species. It may include the planting of food plants for wildlife species to ensure their survival and protect their migration patterns. Wildlife management for game recreation (hunting) may include the improvement of forage and browsing areas to maintain or increase deer populations or the promotion of wilderness areas.

INRMPs are the primary method through which regional wildlife management plans are implemented. An INRMP is a planning document that charts the use and conservation of natural resources on lands and waters under DoD control. The INRMP addresses natural resources, including federally listed species and their habitats, through an ecosystem management approach. This approach assesses human activities over the long-term, including military operations, and the natural resources on the island. These needs are then integrated into one plan that will help the Navy manage the natural resources in a manner consistent with the sustainability of those resources and ensure the continued support of the military mission. As part its mission of environmental stewardship, the Navy is interested in controlling erosion, managing invasive species, and protecting endangered species on their lands (Mugu, 2001).

14.3.3 Value / Resource Potential

Wildlife studies, along with vegetation studies, enable the planner to locate the wild life habitat areas that are the most sensitive to disturbance and of highest environmental value. Areas with high concentrations of wildlife are often most susceptible to interference in the military mission.



Surrounding airfields, Bird Aircraft Strike Hazard (BASH) plans aid to plan and locate military uses away from environmentally sensitive nesting grounds and habitats. These plans use data on bird-aircraft collisions as the basis for planning and location decisions. Through the use of these plans, the natural value of the wildlife's habitat is recognized and considered in military operations (BASH, 2001).

Also recognizing the value of wildlife resources is the planning of military operations and activities with consideration of animal migratory routes. Impacting wildlife in the air and on land, migratory routes are essential to maintain in order for species

to survive in the wild. Increasing development pressures threaten these routes, requiring the Navy to be proactive in working around and with these areas to maintain viable wildlife populations in the immediate area and surrounding region.

Wildlife of the highest environmental value includes rare and endangered species on state and federal lists. Wildlife of high environmental value would include migratory species and species of low density which may not be found in adjacent areas. Unique ecosystems and habitats, such

as nesting areas and coastal/marshland fishing and shell fishing areas, need to be protected (Figure 14b on pg. 98).

Wildlife may also have recreational and resource value. Visual recreation such as bird watching and nature studies can occur in wildlife habitat areas, and selective hunting and fishing may be permitted. Commercial fishing can occur within a controlled resource management program.

Land use planners can use wildlife data to identify areas requiring conservation and protection and to designate wildlife habitat areas as passive recreation areas or controlled active recreation areas. Wildlife studies can also be used to identify key resources whose management can enhance the visual and environmental quality of the site.

Similar to assessments of vegetation, several general and specific regulations apply to wildlife protection and planning. NEPA considerations are required for federal actions, as impacts on wildlife are often difficult to avoid when developing previously undeveloped land. Additionally, threatened and endangered species are protected under the Endangered Species Act (ESA) (16 U.S.C. 1532 *et seq*) as is the case with vegetation. Coordinating through other agencies, the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq*) protects these resources from depletion at a national level.

14.4 Wildlife Factor Interpretation

14.4.1 Opportunities

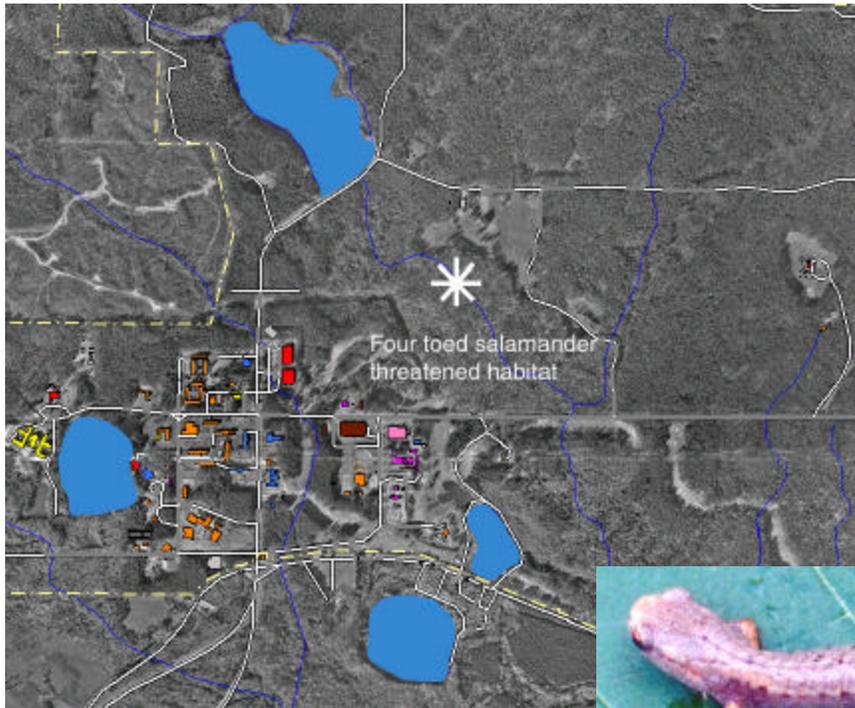
- There may be increased passive recreation opportunities such as bird watching, hiking and camping, and nature studies because of the presence/activity of wildlife on the site.
- Varieties of mammal and bird life can provide aesthetic enjoyment and opportunities for scenic areas on site.
- There may be controlled, active, outdoor recreation opportunities such as hunting and fishing because of the presence/activity of wildlife on the site.
- Preservation and protection of wildlife will help maintain natural systems on site. This may prevent the overpopulation of a site by undesirable species.

14.4.2 Constraints

- There may be evidence of wildlife, which precludes new construction, training, or other operational activities in the area.
- There may be endangered species on the site or adjacent to the site whose presence would affect and limit land uses such as vehicular and aircraft use and building siting.
- There may be environmentally sensitive areas with unique habitats that are located in prime buildable areas.

- Existing wildlife can be a threat to activity work. There may be a threat to safety from raccoons, snakes, jellyfish, rabid, poisonous wildlife, or scavenging animals such as rodents.

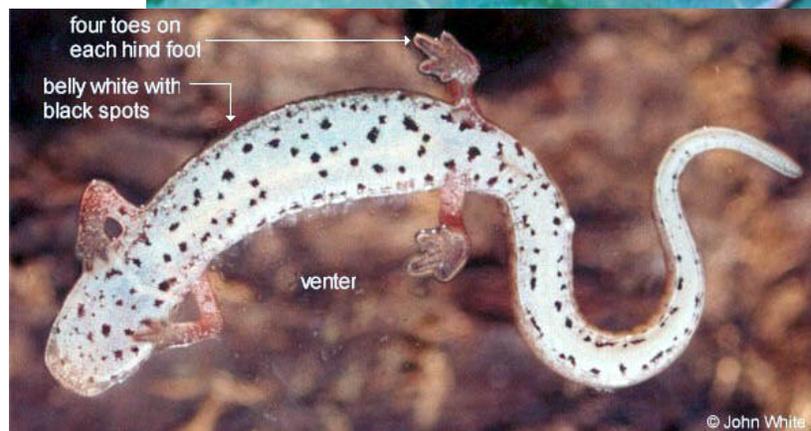
Figure 14b
Four Toed Salamander Habitat and Features



Major Identification Features	Four toes on rear feet. Tail constricted at the base.
Description	Small salamander that may grow to 4 inches in length.
Habitat	Damp hardwood forests and bogs.
Habits	Coils into a tight ball when disturbed. May also shed the tail when bothered.
Diet	Small larvae and other animals and leaf parts.
Breeding	Mate in September. Eggs laid in the spring.



Source : <http://www.museum.gov.ns.ca/mnh/nature/salamand/fourtoe.htm>



- Large populations of wildlife could require controlled management to limit the populations. Controlled populations management (hunting, fishing) could conflict with training activities.

14.5 Relevant Impact Questions

These general questions provide additional guidance to the planner in the relative significance of information on a specific project.

- Is there evidence of any species of wildlife (fauna) in this area?
- Are any of the wildlife species found in this area considered rare or endangered according to federal, state, or local regulations?
- Will the project involve changes to the number, diversity, or distribution of wildlife species in this area, including birds, land animals, marine life and insects or other microfauna?
- Will the project either involve the introduction of new wildlife species into the area, or create a barrier to present migration/movement patterns?
- Will the project result in any changes to existing fish or wildlife habitats? Will construction or natural resource development/management projects (farming, logging) result in habitat disturbance?
- Is there a possibility that burrowing/digging animals may gnaw on underground cables (i.e., woodchucks, coyotes, foxes, black bears)?
- Will timber management affect wildlife management? Will reforestation or timber cutting affect migration and nesting patterns, wildlife habitats, and feeding?
- Industrial growth may affect nearby waterways. Pollutants in urban and industrial runoff or effluent can kill certain fish and aquatic plant species. Will wildlife be affected by on-site or off-site industrial growth?
- As the recreation industry increases and more people recreate what impact will recreation activities (snowmobiling, hunting, camping) have on on-site wildlife?
- Will the project attract, through planting and preservation of existing natural resources, native and migrant wildlife such as birds to the site?

14.6 Data Sources

1. Internet

- <http://www.nmfs.noaa.gov/habitat.html>
- <http://www.denix.cecer.army.mil/denix/public/news/navy/outreach/challenge95/doc18.html>
- <http://www.caller.com/autoconv/newlocal98/newslocal262.html>

2. Regional

- Council of Governments (COG)
 - Wildlife section, regional land use plan
 - Wildlife habitat areas

3. State

- Department of Conservation
- Natural History Survey
- Game & Freshwater Fish Commission
- Department of Natural Resources
 - State natural areas inventory
 - Wildlife/biological inventories
 - Wildlife habitat areas

4. Federal

- National Marine Fisheries Service (NMFS)
- U.S. Forest Service
- Natural Resource Conservation Service (NRCS)
- U.S. Geological Survey
 - State inventories
 - State/national T/E lists
 - Vegetative cover maps (USGS)

ADDITIONAL SOURCES

- Local Planning office
- GIS layers of area wildlife habitat
- Aerial photos of jurisdiction
- EFD Natural Resources Management Branch
- Natural Resources Branch, Real Estate Operations, NAVFACENGCOM

15.0 ARCHAEOLOGY

Proper planning is essential to the efficient administration and management of archaeological resources. Archaeological planning should employ a regional perspective, both because of the organization of the Department of Navy (DoN) and because of the geographic scale of archaeological societies and cultures.

Project-based compliance is complicated and time-consuming. Therefore, careful planning is essential to its success. Archaeological survey and analysis usually take a great deal of time: even a minor project takes at least six months, and often longer, to produce a report after the contract or delivery order is awarded. It is extremely important that project planning attempt to take into account possible changes in the project design before the archaeological survey is begun. It is recommended, for example, that consideration be given to surveying an area somewhat larger than the proposed footprint of a planned project: if it is later decided to shift the project a short distance or to change its orientation or to expand it slightly, it may well be impossible at that time to begin the archaeological survey and evaluation process again for the new affected area.

15.1 Relevance to Planning Studies

15.1.1 Regional Studies

Regional planning is recommended in archaeology not only because it is a rational and efficient approach for the DoN. Equally important, a regional perspective is necessary to understand archaeological data. The historic and prehistoric societies that archaeologists study were all regional in scale and cannot be fully understood if they are studied only as individual sites. For example, a historic

DEFINITIONS:

ACHP - Advisory Council on Historic Preservation-Independent Federal agency charged by Congress to advise the President, Congress, and federal agencies regarding historic preservation and to administer Section 106 of the National Historic Preservation Act(NHPA). Regulations at 36CFR800 provide the ACHP's procedures for complying with Section 106.

Archaeological resources (or sites or remains) - "Any material remains of past human life or activities which are of archaeological interest...at least 100 years of age" (16 U.S.C. 470bb(1)). Compare with definition of "historic property". Purely paleontological items are excluded, unless found in archaeological contexts.

Cultural Items - Five types of archaeological and ethnographic material defined by the Native American Graves Protection and Repatriation Act (NAGPRA). They are: 1) human remains, 2) associated funerary objects, 3) unassociated funerary objects, 4) sacred objects, and 5) objects of cultural patrimony. "Associated" and "unassociated" refer to whether the related human remains are also in the collection (25 U.S.C. 3001(3)).

ICRMP - Integrated Cultural Resources Management Plan - A plan that defines the process for the management of cultural resources on DoD installations – required of all DoD installations by DoD Instruction 4715.3.

National Register of Historic Places (or the National Register) - The federal government's official list of buildings, structures, districts, sites, and objects that are significant in American history, architecture, archaeology, engineering, or culture, and are thereby worthy of consideration for preservation. Significance may be local, state or national in scope. The Secretary of the Interior maintains the National Register.

archaeological site such as a gold miner's camp in California can only be understood in the context of "manifest destiny," the westward expansion, and the national (and international) economic thirst for precious metals. Similarly, prehistoric cultures were often highly mobile or nomadic; they often used resources collected from many different areas, sometimes seasonally; and they sometimes participated in long-distance trading networks extending across hundreds of miles. Therefore, it is usually impossible to appreciate the significance of an archaeological site without considering its social and cultural context, which requires a regional perspective.

15.1.2 Activity Plan

Thoughtful planning can often simplify and speed up the compliance process for individual projects and can also lead to better decisions. Large scale or installation-wide survey and evaluation of archaeological sites can lead to savings of both money and time. Costs often are lower for larger surveys because of economies of scale. There are many fixed costs in an archaeological project that may form a large part of the budget for a small project, but would be only a small portion of the cost of a large project. Therefore, a single large survey is usually much cheaper than several smaller surveys covering the same area with the same methods. Performing a large or comprehensive survey in order to satisfy the requirements of Section 110 of the NHPA is an efficient use of time and resources. If the activity has been completely surveyed and the sites evaluated in advance, individual projects can proceed much more quickly and efficiently.

15.2 Relationship to Other Resource Areas

Climate, soils, vegetation, topography, hydrology, and wildlife affected historic and prehistoric settlement and land-use. Therefore, natural resources and environmental data can be useful in understanding and even predicting the locations of archaeological sites. It is important for efficiency that appropriate environmental data (hydrology, vegetation, geomorphology, soils, etc) be made available -- perhaps through GIS -- for archaeological study and planning.

It is equally, or even more, important that other DoN elements, like the natural resources office, forestry

DEFINITIONS, Cont'd

Historic property - Any resource that meets eligibility criteria for the National Register of Historic Places, whether or not it has been formally registered, identified, or acknowledged as "eligible". The term is used synonymously with "National Register Resource". Although there are exceptions, something usually has to be at least 50 years old before it can become eligible for the National Register; however, merely achieving that age is not sufficient to make a property eligible; there are several other stringent criteria that must be met. State Historic Preservation Officer (SHPO): The official appointed by the Governor in each state and territory in accordance with the NHPA to administer the State Historic Preservation Program. SHPO duties include providing advice and assistance to Federal agencies in carrying out their historic preservation responsibilities.

THPO - Tribal Historic Preservation Officer - The official appointed by a federally recognized Indian tribe in accordance with the NHPA to administer the Tribal Historic Preservation Program and assume the duties and functions of the State Historic Preservation Officer on tribal lands.

Undertaking - Any project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license, or approval; and those subject to state or local regulation administered under a delegation or approval by a Federal agency.

department, Public Works, and all tenants, know how to find out about archaeologically sensitive areas so that they do not inadvertently damage significant sites. The dissemination of archaeological site locations, however, is restricted, which can complicate the process of distributing information. If access to the land is tightly controlled, signage can be used to mark sites, but otherwise all land-disturbing activities should be coordinated with the cultural resources manager.

15.3 Primary Archaeological Planning Factors

15.3.1 *Relevant Laws and Regulation*

The main historic preservation law in the United States is the National Historical Preservation Act of 1966, as amended (NHPA). Two major sections of this law affect many DoN activities and require both local and regional planning to administer properly. Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historical properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on undertakings. Section 110 of the law requires federal agencies to inventory their historic properties, establish a preservation program, and to try to re-use (rather than demolish) their historic properties. The term “undertaking” is broadly defined in the law and regulations to include almost any federal action.

The term “historic property” includes significant archaeological sites and archaeological objects. Therefore, in order to properly plan for DoN activities and to make most efficient use of DoN land, local and regional staff have to consider the effects of their undertakings on archaeological sites and objects. As a practical matter, this means that all projects or actions that can affect archaeological sites need to be reviewed for compliance with the NHPA (and other relevant laws -- see below).

For a particular project, archaeological compliance with Section 106 of the NHPA is a multi-step process (outlined in the Advisory Council’s regulations at 36CFR800) that includes 1) defining the “area of potential effect”; 2) surveying that area for the presence of archaeological remains; 3) determining whether those remains are “historic properties” by evaluating whether they are eligible for the National Register of Historic Places under the criteria developed by the National Park Service (36CFR60.4). If the archaeological site is significant enough to be eligible for the National Register, then adverse effects to it should be avoided, that is, it should be protected from any unnecessary or inadvertent damage. If the DoN project cannot be modified to avoid damage to a site that is eligible for the National Register, then usually part or all of the site is excavated scientifically to recover archaeological data; this is considered in some degree to mitigate the damage to the historic record, but is still considered an adverse effect. The review process normally involves consulting with a state official – the State Historic Preservation Officer (SHPO) – and sometimes with local officials or representatives of federally recognized Indian Tribes.

There are also a number of other laws and regulations that are partly or completely concerned with archaeological sites on federal land. The most important of these laws are the Archaeological Resources Protection Act of 1979 (ARPA) and the Native American Graves Protection and Repatriation Act (NAGPRA). ARPA requires that federal land managers protect archaeological sites on federal and Indian land. It specifies a permitting process for archaeological excavation and prohibits unauthorized excavation. NAGPRA is best known for its requirement that federal agencies and museums return certain kinds of Native American cultural items to federally recognized Indian tribes. However, the law also requires federal agencies to consult with federally recognized Indian tribes prior to undertaking activities that could result in the discovery of Native American cultural items. Since human burials can occur in most kinds of archaeological sites, the practical effect of this provision of law is to require consultation on any DoN projects that may affect archaeological sites.

15.3.2 Historic Contexts

Obviously, then, it is necessary for archaeological and historical sites to be considered within relevant historical contexts. This idea is codified by the National Park Service in its administration of the National Register where it is established that determinations of significance for the National Register must be made within “historic contexts that can be used to weigh the historic significance and integrity of a property” (*National Register Bulletin 16*). The National Park Service and the State (and Tribal) Historic Preservation Offices (SHPO and THPO, respectively) may suggest or establish historic contexts for their areas of responsibility, but other contexts may also be required to understand the particular resources in a specific activity or installation. Installations may discover advantages in adopting a regional approach in their historic context studies. For example, an archaeological site that seems uniquely significant within a single installation may really be fairly common when viewed regionally.

15.3.3 Predictive Modeling

Archaeological predictive modeling is an important tool that planners can use to streamline their archaeological compliance. An archaeological predictive model uses the locations and contexts of known archaeological sites and other archaeological data in combination with paleoenvironmental and geomorphological data to predict the locations of archaeological sites in areas that have not been surveyed. A model may be based only on existing survey data or may also include new, additional survey data. Because of the complexity of the natural and cultural factors that influence the locations of human settlement, such models are never perfect, or even highly accurate. Nevertheless, these models do usually indicate areas that are likely or unlikely to contain ancient settlement. The model can then be used to establish different treatment protocols for areas with different archaeological probabilities or sensitivities. It is good practice to consult with the State, Tribal and local preservation partners about the methods and design of a predictive model to secure their concurrence in the treatment protocols. If the SHPO or THPO concurs in the model's conclusions, it may substantially reduce the burden of compliance. For example, if one can develop a scientifically defensible model of ancient settlement that satisfactorily demonstrates that no sites, or only insignificant sites, occur, say, on ridge tops, then perhaps one can eliminate the need to perform archaeological survey in those areas.

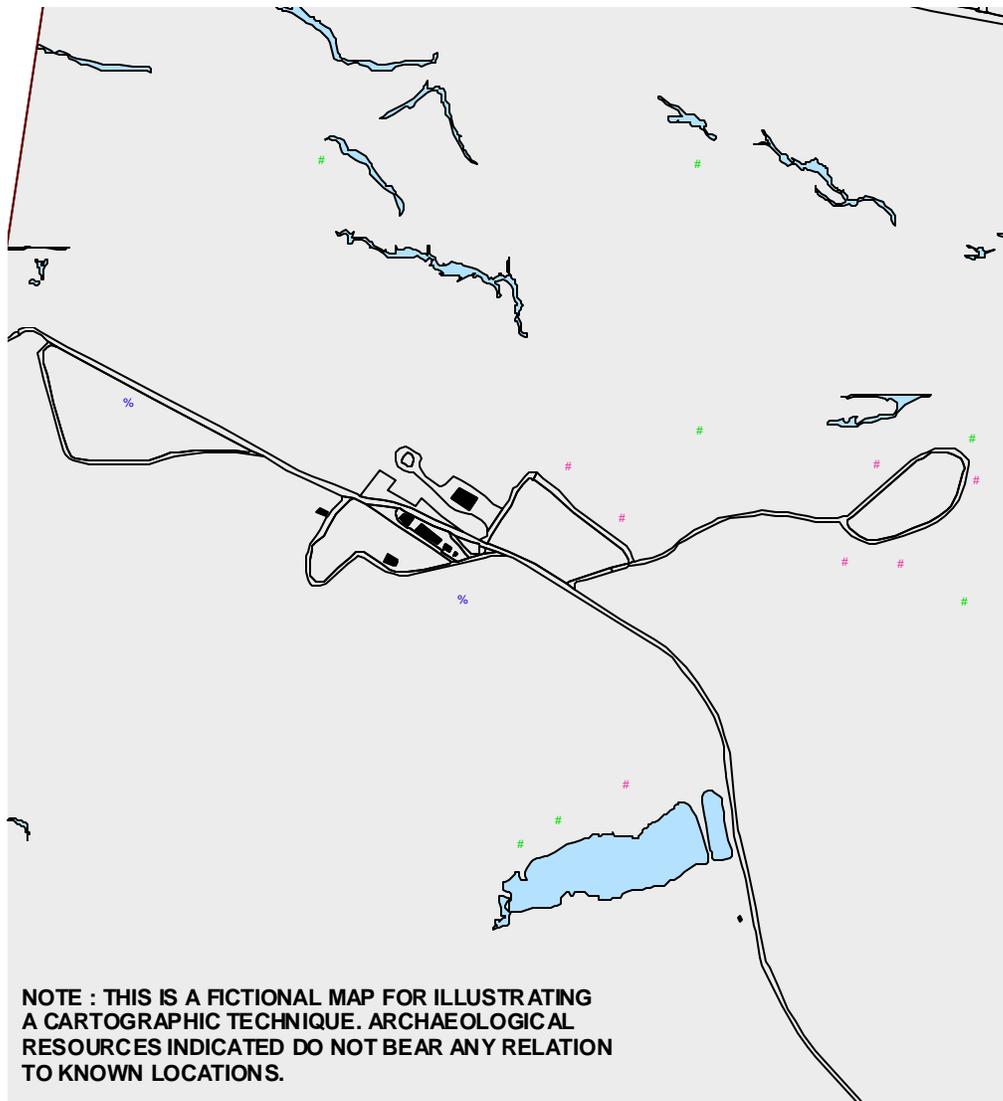
15.3.4 GIS

Geographic information systems (GIS) are important planning and land-management tools that are now being widely used. Archaeological data are geographic in character and are efficiently stored in and studied in GIS applications. It is very efficient to be able to consult digital maps that simultaneously overlay natural resources data, topography, geomorphology, facilities management data, project plans, and archaeological data. Spatial data standards have been promulgated for archaeological and historical data by the (Triservice) Spatial Data Standards Center in Vicksburg, Mississippi. The Navy has adopted those standards for its data management. As a practical matter also, most predictive modeling is performed in a GIS environment. GIS is the recommended vehicle for the storage and retrieval of archaeological data. To be fully effective, a GIS should include not only known archaeological site locations, but also: the characteristics of those sites, information about their ages, cultural affiliations, and the disposition of the artifact collections; areas that have been surveyed and the methods used in the surveys; archaeological sensitivities or probabilities derived from predictive modeling; and areas that have been cleared for construction or other destructive uses.

Navy planners must be careful, however, in graphically displaying archaeological and cultural data. Both ARPA and the NHPA protect archaeological site locations from release, even under a Freedom of Information Act (FOIA) request. Therefore, documents with accurate site locations may not be released to the general public. Such information should not be made widely available through websites or computer applications.

Figure 15a

Archaeological Resources



- % Cemetery Sites
- # Archaeological Sites
- # Old Home Sites

0 3000 6000 9000 Feet



15.3.5 Survey

Archaeological survey is the process of using specified methods for identifying archaeological sites. The methods used during the survey should be appropriate to the modern environment, the geomorphology of the area, the types of sites likely to be found, and the types of impacts likely to affect the area. Methods should be reviewed with the SHPO/THPO and, if possible, their concurrence should be secured in advance.



It should be recognized that no survey method is complete or perfect, and so even careful survey does not completely eliminate the possibility that something will be discovered unexpectedly during construction or training. Planning documents and prior consultations should provide for procedures to be followed in cases of unexpected discoveries of archaeological sites (NHPA) or human remains (NAGPRA). Good planning can significantly reduce delays when archaeological materials or human remains are found unexpectedly.

A good survey should provide enough information about each site to provide at least a preliminary evaluation of its eligibility for the National Register with respect to the relevant historic contexts. It should become obvious at this stage that some sites are clearly eligible and some (perhaps most) sites are clearly ineligible. There may be some ambiguous sites that require more extensive evaluation. One should ask the SHPO or THPO to concur in the evaluations provided by the archaeological survey.

15.3.6 Evaluation

While some sites can be adequately evaluated with only survey-level data, some sites may require more extensive excavation or study. Since site evaluation is expensive, there is a temptation to conduct minimal studies; this strategy is efficient until an inadequate evaluation leads to more extensive, but unnecessary excavations. If there are large numbers of sites that require evaluation, then the process and schedule for performing the evaluations should be a matter addressed in the planning process. Consideration should be given to which areas of the installations need to be used most heavily or most frequently, the variety of sites that need to be evaluated, the availability of funds and other factors.

15.3.7 Integrated Cultural Resources Management Plans

DOD Instruction 4715.3 requires DoD installations to prepare Integrated Cultural Resources Management Plans (ICRMPs) and to update them every five years unless exempted by the DASN (ES). This requirement replaces a similar one to prepare Historic and Archaeological Resources Plan (HARP). The ICRMP is an important planning opportunity and should lead to careful consideration of archaeological issues, including those already discussed, such as predictive modeling, survey methods, archaeological probabilities, unexpected discovery protocols, and so forth. The preparation of an ICRMP does not require additional survey or evaluation of sites, but the document should take into account all known information. It should be prepared in consultation with the parties with whom consultation is required under the NHPA. The plan will be most effective if it accurately takes into account the needs and business processes of the operators and activity tenants. ICRMP preparation should be coordinated with other activity planning processes, such as RSIPs, Capital Improvement Plans (CIPs), Air Installation Compatible Use Zone (AICUZ) studies, and INRMPS.

15.3.8 Programmatic Agreements

Programmatic agreements can be negotiated with the SHPO or THPO and other parties to establish protocols for the treatment of archaeological sites, human remains, or other aspects of archaeological compliance. Programmatic agreements can be useful planning tools because they can streamline whole classes of procedures, so that many similar actions do not have to be handled on a case-by-case basis.

15.3.9 Artifacts

Archaeological surveys and evaluations normally produce archaeological artifacts. Under the terms of regulations issued under the authority of the NHPA and ARPA (see 36 CFR 79), these artifacts must be deposited and conserved in appropriate long-term storage facilities. Proper planning requires that curation facilities be identified prior to the initiation of an archaeological project. The DoN command should, if possible, reach an understanding with a curation facility before the collections are conserved and prepared for storage. Archaeological planning should take into account the cost of long-term collections storage. Finally, the regional inventory of archaeological collections should be taken into account when making decisions about what types of collections should be produced through new archaeological excavations.

15.4 Archaeological Factor Interpretation

15.4.1 Opportunities

- It is a pleasure to help preserve the Navy's and the nation's history and prehistory. Part of the Navy's fundamental mission is to protect the nation's heritage and culture.
- The compliance process offers opportunities to participate in archaeological research.
- The compliance process also offers opportunities to participate in public education. Archaeological sites and collections can be great teaching tools.
- Consulting with interested parties, like federally recognized Indian tribes, can help the Navy educate its neighbors about its mission and develop helpful partnerships on other issues.

15.4.2 Constraints

- Archaeological compliance requires time and money, but need not interfere significantly with the mission.
- Poor planning and compliance can cause long delays if resources, NAGPRA cultural items or human remains are discovered during construction.
- If large areas of land contain significant archaeological sites, Navy use of the land may become awkward, restricted, or costly.

15.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of archaeological information on a specific proposed project.

- Does the SHPO's office or the Navy have any record of archaeological sites in the project area?
- Has the area been surveyed using appropriate, modern archaeological techniques?
- Will any known sites be affected by the project?
- Have the known sites been evaluated for eligibility for the National Register?
- Have Native Americans been consulted about traditional cultural properties or sacred sites?
- If the project area extends out over the water, has an underwater archaeological survey been conducted?
- Is there any reason to think the project area cannot contain archaeological sites over 50 years old (i.e., it's all recent fill)?

15.6 Data Sources

1. Internet

- <https://www.denix.osd.mil/denix/Public/ES-Programs/Conservation/Legacy/HARP/harp.html>
- <http://web.dandp.com/enviroweb/cultural/strategic/index.html>
- <http://www.cr.nps.gov>
- <http://www.cr.nps.gov/linklaws.htm>
- <http://www.cr.nps.gov/archaeology.htm>
- <http://www.cast.uark.edu/other.nps.nacd/>
- <http://www.doi.gov/bia/tribes/entry.html>

2. Local

- City/County Planning & Development Department
 - Archaeological component, land use plan (city/county scale)
 - Archaeological survey, inventory
 - Historic records
- Local Historical Society
- State Historic Preservation Office or State Archaeologist

3. Regional

- Council of Governments (COG)
 - Archaeological component, land use plan (city/county scale)
 - Archaeological survey, inventory (regional scale)

4. Navy

- Base Division of Natural Resources Engineering Field Division
 - Archaeological component, activity plan (activity-scale) and AICUZ archaeological and historical

survey, Inventory of activity historic Navy records, Predictive studies, Fieldwork surveys

- NAVFACENGCOM
- SECNAVINST 4000.35

5. **Federal**

- National Register of Historic Places National [Historic Landmarks]

ADDITIONAL SOURCES

- State Department of Cultural Resources
- Bureau of Historic Sites & Properties
- Department of Natural Resources
- State Archaeological Survey
- Division of Archives & History
- Historic Site Division
- State and Local Tribal Councils
- State Archivist

16.0 HISTORICAL RESOURCES

The historic resources survey provides the planner with an analysis of earlier, documented activity on the site and areas adjacent to the site. It is used, along with the archaeological survey (which may form a part of the historical study), to identify cultural resource potential; to describe sensitive historic structures and areas which may affect land use; and to guide building siting in the RSIP. Careful identification and evaluation of historic resources enables the planner to make recommendations for future cultural resource management as well as to minimize the impact of construction on historic site resources.

NHPA, as amended 1980, mandates each Federal agency to locate and inventory all resources of historic, archaeological, cultural, architectural and engineering significance on Federal properties or properties under Federal management. Section 106 mandates consultation, which should be initiated as early as possible in the planning process. Many Navy activities contain structures or buildings of industrial or engineering significance. Section 110, as amended in 1992, “directs the heads of all Federal agencies to assume responsibility for the preservation of National Register listed or eligible historic properties owned or controlled by their agency.” Section 110 also instructs agencies to locate, inventory, and nominate properties to the National Register. Any properties on the agency’s land should also be protected from the adverse effects of federal undertakings.

Historic structures and sites are valuable for their historic significance, particularly those relating to the Navy. The preservation of structures offers the integration of new development into an existing fabric symbolic of the past history of the site. Historic sites and structures can act as community and cultural focal points.

DEFINITIONS

NHPA – Section 106 – The regulatory requirement (36 CFR 800) to consult on historic properties.

National Register – The nation’s official list of buildings, structures, objects, sites, and districts worthy of preservation for their significance in American history, architecture, archaeology, and culture.

ICRMP – Required by DoD INST 4715.3; Designed as large-scale cultural resource plans and inventories, the ICRMP must be in coordination with several Federal and state laws governing historic and cultural resources.

National Historic Landmark — property deemed of national significance; designated by the Secretary of the Interior.

District - Districts comprise more than one site, building, structure or object, all of which have a relationship.

16.1 Relevance to Planning Studies

16.1.1 Regional Studies

Historic information at the regional and area-wide levels of planning can be less site and structure-specific. Site and structure location and significance is more important than actual transects and building plans. The sites of significant historic events, such as major battles, can cover large areas of land and may be important in planning studies. Also, major historic resources can be cultural assets for Navy personnel and their dependents on a regional level. Significant Navy historic sites, districts, and buildings should be considered as assets in all large-scale Navy planning efforts.

16.1.2 Activity Plan

Planners are required to locate and inventory on-site (activity-level) historic resources. Historic surveys will determine National Register eligibility and protection status of the site or structures. Detailed mapping and descriptions of historic sites and structures will provide a baseline so planners can utilize such elements creatively and sensitively as positive activity resources.

Many activities have existing historical inventories in GIS format, requiring occasional updates. ICRMPs may also exist at the activity level, providing detailed information on updated structures, sites, and recent National Register nominations.

16.2 Relationship to Other Resource Areas

Historic information relates strongly to archaeological settlement patterns and all past aspects of urbanization (transportation, land use patterns, etc.). The natural conditions of sites are instrumental in historic resource location and study. Climate-influenced human settlement patterns and ocean/riverine edges historically provided sites for development.

Coordination of historic information with Environmental Impact Statements (EIS) and Environmental Assessments (EA) is also crucial. Under NEPA regulations, the EA and/or EIS must coordinate with applicable federal plans and programs to preserve historic and cultural heritage. As part of the EA and EIS document, impacts of the proposed action and alternatives are assessed against both the historic and cultural environment. These issues should be incorporated into the NEPA process from the beginning scoping through the final Record of Decision (ROD). The inclusion of historical impacts in an EA and/or EIS does not replace the need for compliance with the major historical and cultural regulations. Nor does compliance with these laws imply the ability to exempt from the NEPA process.

16.3 Primary Historical Planning Factors

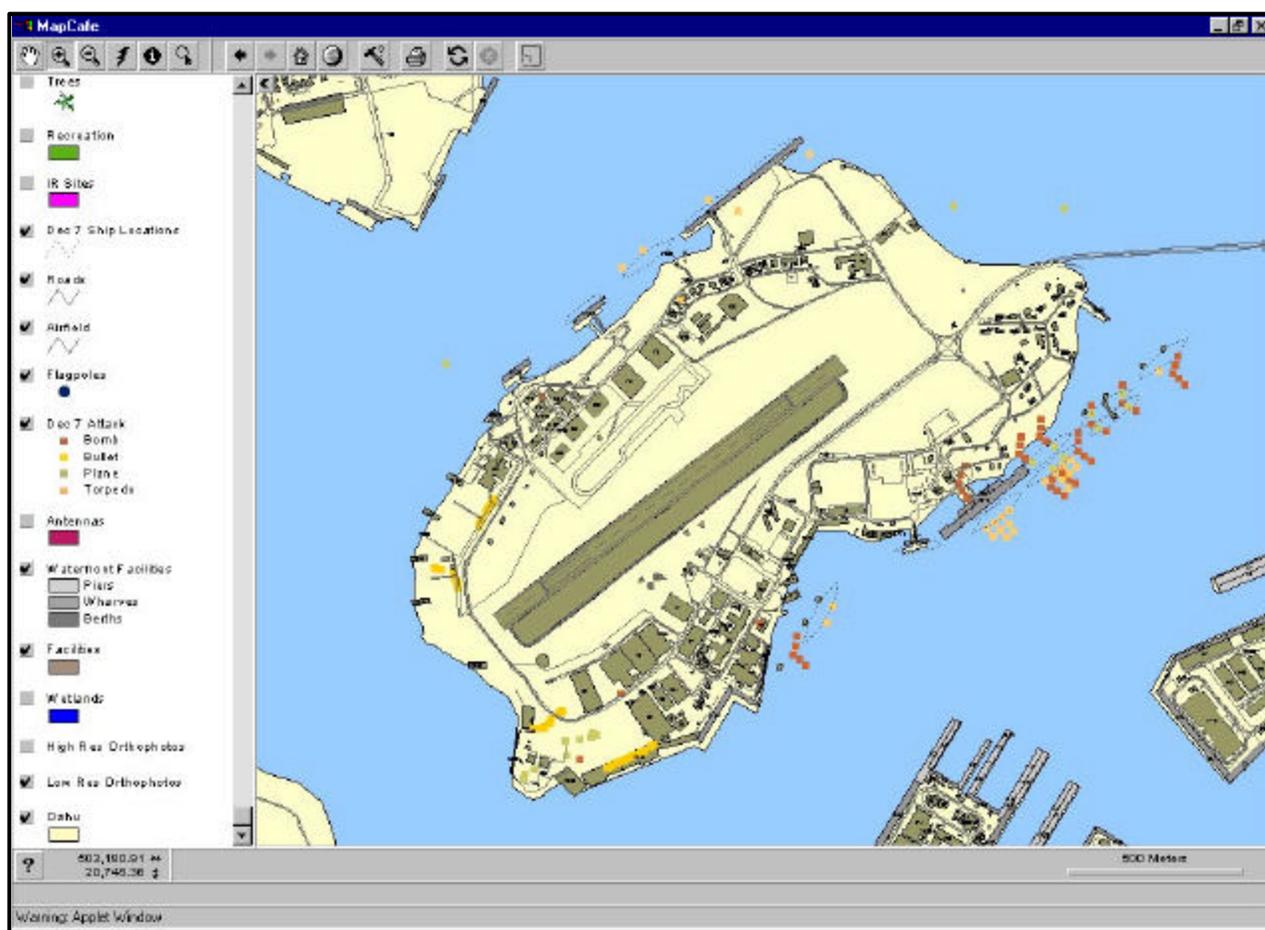
16.3.1 Types / Identification Resources

The National Park Service definition of historic resources includes buildings, sites, objects, structures, and districts. Historic buildings may be notable architecturally (by their style, or as examples of a certain architect's work); they may be significant culturally (they may show the history and development of a craft or profession or may be a record of the experience of a particular cultural group); and they may be important as monuments or records of important events (the workplace of a well-known person, or the site of a major event (Figure 16a on pg. 112)). A site may be an area significant for its historic or archaeological importance (as a source of scientific information, or historic information) or for its cultural importance (as the place where events meaningful to certain groups or the community occurred, such as shrines or battlefields). Using tools such as the RSIP-Link, planners can create GIS-based cultural maps identifying these resources for protection in regional planning efforts. The RSIP-Link will allow the planners to analyze historic resources within the context of the surrounding community and its plans and programs identifying these areas (Figure 16b on pg. 113). Using GIS to display the location of sites in relation to other constraints may be the most effective and efficient use of displaying the information.

Historic objects, as material manifestations of a population or individual, are often the most telling detail about a group of people: objects related to the cultural life of a community or important to research (totem poles, petroglyph boulders) are studied in historic surveys. Structures or buildings for industrial, engineering, and transportation purposes (kilns, quarries, weirs, canals, industrial structures, tunnels, etc.) are also important resources, which provide an understanding of a past community or historical trends. Districts, or groups of related buildings and streetscapes, can provide information on the historical development of an area.

Figure 16a

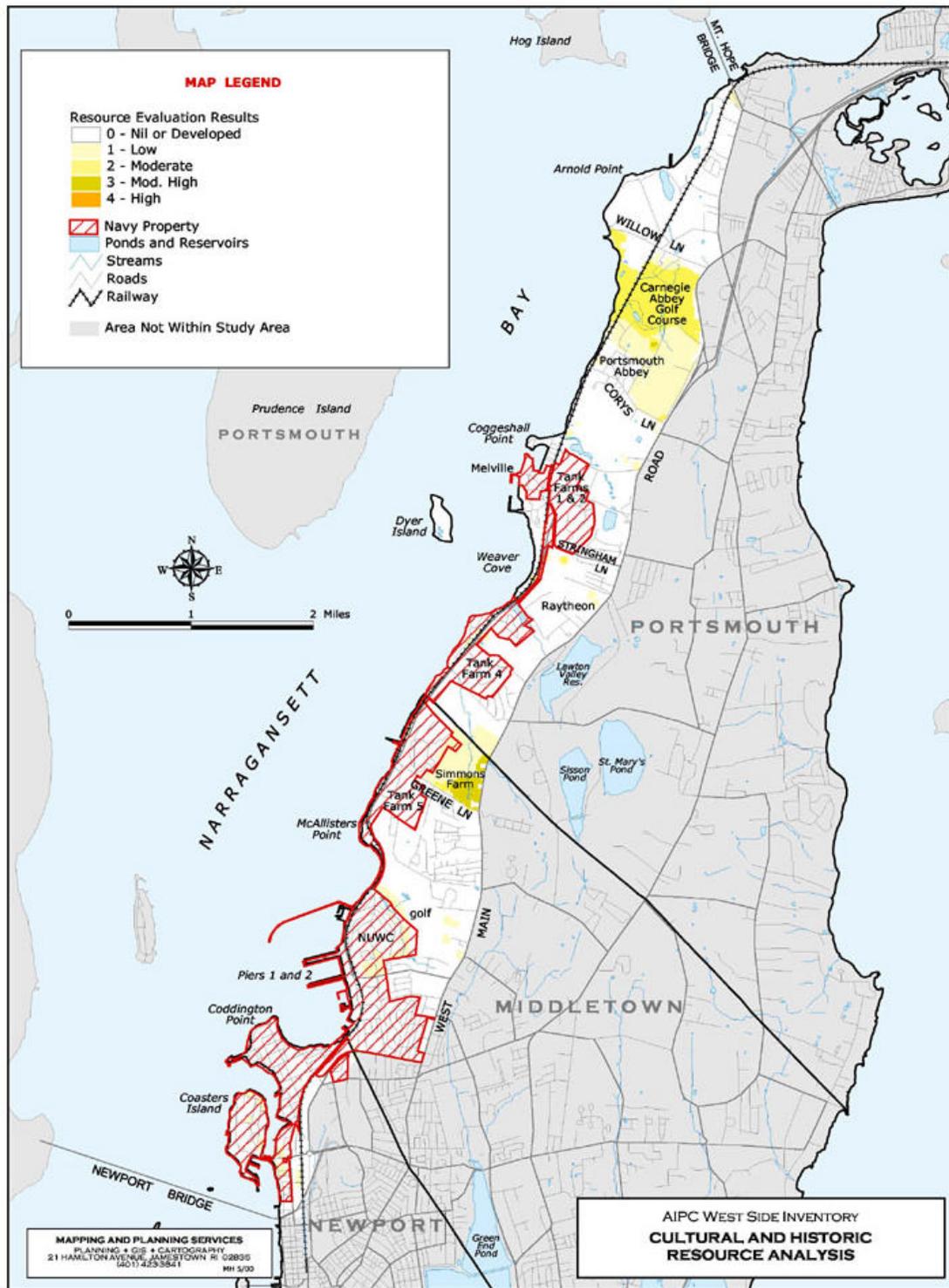
Historical Resources – Ford Island, HI



Source : Pearl Harbor Naval Complex Regional Plan, 1997 - http://emp.efdpac.navy.mil/emp/Docs/PH/ph_home.htm

Figure 16b

Historical Resources - Newport, Middletown, and Portsmouth, RI



Source: Aquidneck Island Planning Commission website - <http://www.aquidneckplanning.org/westside/westmaps/westmap5.html>

16.3.2 *Classification and Dating*

Historic studies and surveys are concerned with the resources of the recorded past. The resources can be dated using a number of designations: by century (a 19th century stone mill), by style (a Federal townhouse), and by type (a coastal fishing community). Accurate dating results from archival research and field work and may be done by testing the material of a structure or building and examining its construction or through comparison to other similar dated objects or places.

16.3.3 *Surveys*

The historic survey is critical to the proper identification and evaluation of historic resources. Historic surveys include archival research, photographic analysis (using both current and historic photos), and fieldwork. Critical elements of historic surveys include the name; location; resource classification; owner; legal description; representation in existing surveys; description of the property; its significance; a bibliography; geographical data; and, the names of the researcher and photographers. These provide an adequate database for identifying and evaluating historic resources.

The survey is most useful to planning when it includes information on the historic, architectural, or cultural significance of the resources. Structural information on individual buildings; information on the physical/development factors affecting buildings or neighborhoods; the social and economic character of the area; and planning information for archaeological sites (its accessibility and susceptibility to interpretation) contribute to the database and provide the information most useful for evaluating a historic resource. The most important result of the survey is that it provides a database upon which regional shore planning decisions can be made.

16.3.4 *Evaluation and Designation*

The purpose of evaluating the historic resources identified in the survey is to designate in the development of the activity those that should be preserved and protected. The National Register has developed criteria for evaluating cultural resources. The evaluation process also identifies properties eligible for the National Register.

16.4 Historic Factor Interpretation

16.4.1 *Opportunities*

- Historic resource data can be used in the regional shore planning process as a criterion for land development sensitivity/suitability.
- Historic sites and structures can become focal points for new site development or major open space and recreational resources.
- Historians and archaeologists can provide the archival and on-site research necessary to describe a set of baseline historic data for use in regional shore planning.

- Historic sites can provide opportunities for rehabilitation and reuse of existing facilities, lessening the need for extensive new infrastructure investments.

16.4.2 Constraints

- Historic sites or structures may be located in a strategic military operational or functional area. Preservation agencies must be consulted (NHPA Section 106). It may be possible to relocate some historic elements to new sites if other activity locations are available, but federal regulations must be adhered to in any such plans or actions. Preservation guidelines discourage moving historic resources. If demolition is necessary, historic resources must be documented before they are destroyed.
- Some operational activities could damage historic resources (noise/vibration impacts, etc.) or development.
- Historic structures on the National Register require adherence to specific rehabilitation guidelines. Some of these may be more expensive to accommodate, or they may conflict with proposed uses and layouts of the structure.

16.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of historic information on a specific proposed project

- Are there any known resources of historical, architectural, engineering, archaeological, or cultural significance within the local vicinity or region that are likely to affect or be affected by this project?
- Are any of these known resources listed on or determined eligible for listing on the National Register of Historic Places?
- Are there any known resources of historical, architectural, engineering, or cultural significance on the Navy site which are likely to affect, or be affected by, the project?
- Is this project likely to affect any burial grounds or American Indian religious sites?
- Does the project involve lands being considered by any American Indian groups for possible reservation re-establishment?

16.6 Data Sources

1. Internet

- <http://www.npi.org/nepa/sect106.html>
- <http://www.arch.state.nc.us/fedlaws.html>
- <http://www.cr.nps.gov/pad/sec110.html>
- <http://www.achp.gov>

2. Navy

- Base Division of Natural Resources Engineering Field Division
 - Historic Section, existing base master plan and AICUZ (activity scale)
 - Fieldwork survey, inventory of base
 - Historic Navy records
 - EFE Archaeological surveys
 - ICRMPs

3. Local

- City/County Planning Department
 - Historic component, land use plan (local/city scale)
 - Historic survey, inventory

4. Regional

- Council of Governments (COG)
 - Historic components, land use plan
 - Historic survey, inventory (regional scale)

5. Federal

- National Register of Historic Places

ADDITIONAL SOURCES

- State Department of Cultural Resources
- Bureau of Historic Sites & Properties
- State Historic Preservation Office (SHPO)
- Department of Natural Resources
- State Archaeological Survey
- Division of Archives and History
- Historic Site Division

17.0 ECONOMIC PROFILE

The economic profile describes and analyzes the production, distribution, and consumption of goods and services in both the private and public sectors. It provides an overview of the existing conditions that characterize an area's economy, measures its productive capacity and outputs, identifies its dependencies and sensitivities to externalities, appraises its ability to support changing demands for goods and services, and assesses the trends and forces that will change the economic status. This information enables the planner to evaluate the relationships between the economic functions of the military installation and its host community in order that inefficiencies and unintentional costs can be avoided by advanced planning.

17.1 Relevance to Planning Studies

17.1.1 Regional Studies

The principal economic issues involved in regional level planning stem from the distribution of Navy functions among multiple sites. The concentration of functions at a single site designed to serve the entire region may affect the spatial distribution of economic impacts within a market area. This intra- metropolitan or intra-regional differentiation among economic factors can generate demand conditions that exceed available supply, thus causing prices to rise. This is often experienced in wage levels, housing prices, retail goods, and personal services. These intra-regional variations in economic forces could cause fiscal imbalances especially where the installations are located in different, but contiguous, jurisdictions. This could affect the ability of the public sector to accommodate the infrastructure requirements of a particular installation in the region.

Economic data is often descriptive of the broader area attendant to an urban center. Analyses at the sub-market scale are useful only in special cases. Navy planning decisions may affect employment, income, and infrastructure costs. Such decisions also must incorporate consideration of the economic demands they generate and whether the local economy can accommodate them efficiently. These analyses of economic impacts and support requirements in both the private and public sectors are best identified, measured, and evaluated at the regional scale.

DEFINITIONS

Labor force—Those persons who are employed and those unemployed seeking work.

Per capita income—An area's total income divided by its population.

Poverty index—Proportion of population whose income falls below the poverty line.

Consumer price index—A measure determining relative cost and price differences, wage levels comparability, and real income variation.

Location quotient – Formula assessing the local distribution of national economic activity by comparing an industry's share of the local economy with that same industry's share of the national economy.

Multiplier—A measure of the cumulative effect of changes in income or employment on the economy.

Capital improvements – Any physical asset constructed or purchased to provide, improve, or replace a public facility and which is large scale and high in cost.

17.1.2 Activity Plan

At the activity scale of shore planning, the principal economic issues relate directly to specific demands and interactions of the installation and its functions and personnel on the host economy. In the private sector, the availability and quality of retail, banking, and other support services may influence decisions regarding their provision by the Navy. In the public sector, the quality and capacity of specific services and facilities to satisfy activity requirements may determine facility location and provision. The availability of selected civilian occupational skills may affect military staffing decisions.

17.2 Relationship to Other Resource Areas

Economic data, indicators, and analyses are inextricably related to population characteristics, transportation systems, physical systems, and political structure. The boundaries of a regional economy have physical determinants such as rivers, swamps, highways, railroads, and settlement densities. The magnitude of demand within an economic system is largely a function of its population size and age distribution. Similarly, the labor-force potential and occupational structure is determined by the population's characteristics. The transportation systems determine the distribution of economic activities, the availability and cost of resources including labor, capital, and land, and the regional balance between imports and exports, which ultimately determine the vitality of the local economy and its standard of living as provided for by personal income levels. The capacity of the economy to develop and support economic growth is a function of the quality and availability of infrastructure and public facilities and services. These are dependent on the fiscal conditions of local government and the tax revenue potential of the area's economy.

17.3 Primary Economic Planning Factors

17.3.1 Employment

The labor force should be examined at the regional scale. It is composed of those persons who are employed and those who are unemployed and seeking work. Labor force participation rates identify the proportion of persons 16 years old and older who are presently in the labor force. These rates are different for males and females and have experienced different trends in recent years. Local rates may differ significantly from national rates. Labor force participation measures the capacity of an area's economy to attract persons into the labor force. Unemployment rates measure the economy's capability to employ those people seeking work. The quality of the labor force, as measured by educational level and productivity (output measures differ by sector), determines its ability to meet the needs of a dynamic economy and affect the level of gross regional output and personal income.

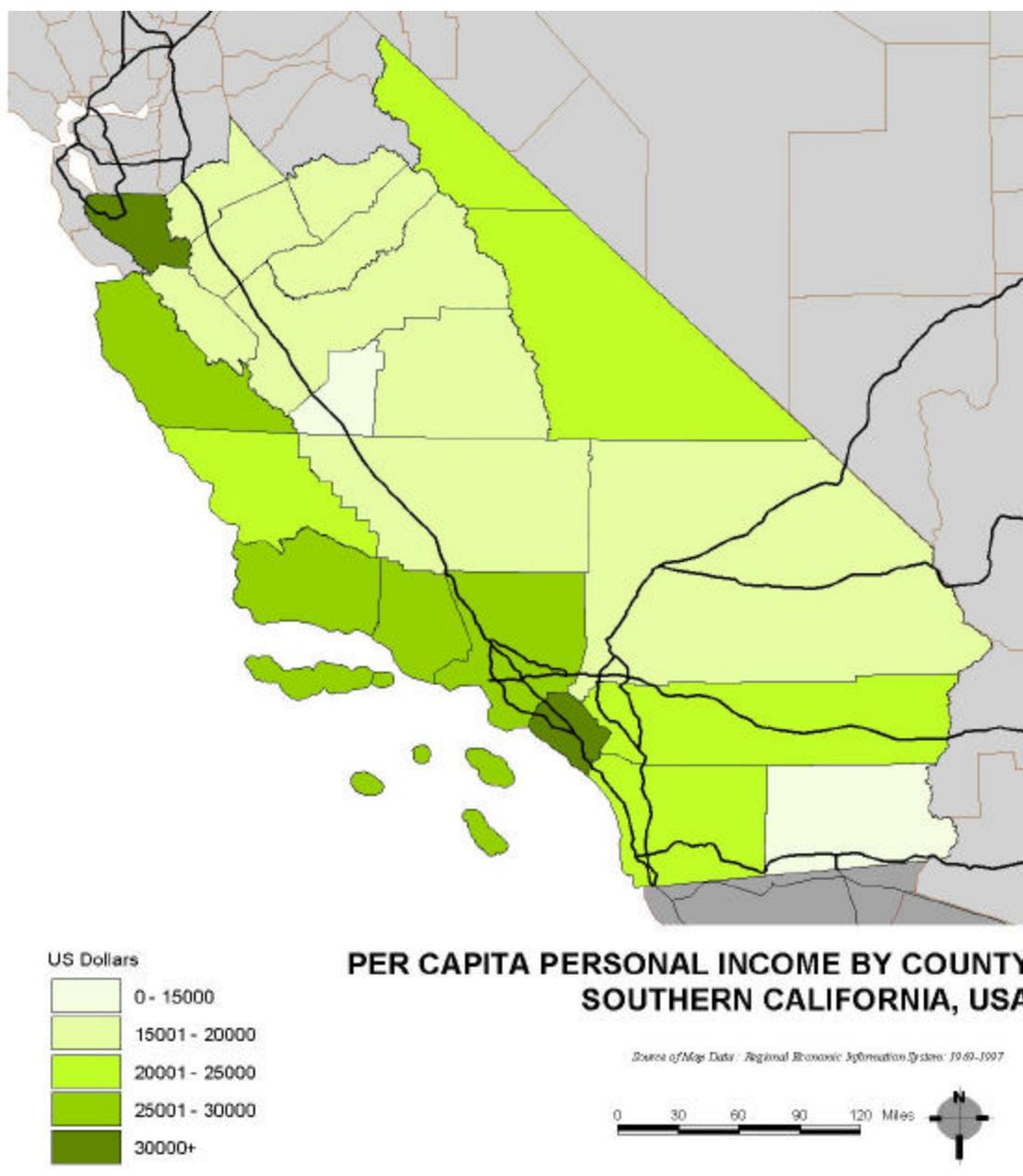
17.3.2 Income

Per capita income level is the most widely accepted indicator of an economy's general productivity and vitality and the standard of living it can support. The distribution of income within the area population measures the equity with which people participate in the economy's benefits. One of the most effective methods of displaying this proportional indicator is using a map with categories based on the range of data points and their frequency (Figure 17a on pg. 119). Grouping the most similar values together, the planner

can create categories of similar data points. The intensity of the variable, income in this example, is then displayed as a range which is easily identified by the reader. The poverty index, which identifies the proportion of the population whose income falls below the poverty line, is a simple measure that can be used to describe the equitability of income distribution. Personal income levels generated by each economic sector indicate the relative productivity and degree of dependencies or specialization of the area's economy when compared to national averages. Local consumer price indices (CPI) can be employed to determine relative cost and price differences, wage level comparability, and real income variation.

Figure 17a

2000 Per Capita Personal Income - California, Southern Counties



17.3.3 Industrial / Occupational Structure

The industrial structure of an economy is evaluated by comparing the local employment distribution by sector with the national sectoral distribution. The resulting index (location quotient) identifies sectoral dominance within the local economy, the presence of which may affect its sensitivity to business cycles, technological change, Navy realignments, and income levels. The quotient, “assesses the local distribution of national economic activity by comparing an industry’s share of the local economy with that same industry’s share of the national economy (Dalton et al, 2000).” Through graphing the different sectors of industry (Figure 17b on pg. 121) within and between regions, the planner can make general deductions about the strength and drivers of a local economy. The summation of these structural effects determines the area's income and employment multiplier, which measures the cumulative effect of changes in income or employment on the economy.

A shift share analysis is an additional tool enabling the planner to isolate the source of changes in a local economy. This analysis will enable one to understand differences between changes reflecting national trends versus those generated in the local environment. Identifying the sectors within a local economy and determining their contribution to local economic growth will aid in assessing the impacts of specific components. Through a shift share analysis, the Navy planner will more thoroughly understand the sectors of influence within the surrounding community. The planner may then identify potential opportunities for cooperative efforts in supporting the local economy through staffing and contracting.

The occupational structure of the labor force identifies the distribution of workers among groupings of jobs (classified by skills and educational requirements). The occupational structure determines wage levels, employment stability, and job flexibility. As the service producing sectors are likely to be influenced to a greater degree by Navy planning decisions, the level of detail developed describing these sectors should be greater than the level of detail for more basic sectors.

Whether the analysis focuses on the specialization of an economy, its composition, or labor force, several pieces of information are crucial to investigate in order to better understand a region and community. Regional Economic Information System (REIS) and the North American Industrial Classification Standard (NAICS), formerly Standard Industrialization Classification (SIC), both detail employment and industry by sector throughout the U.S. These two sources rely upon the reporting of most businesses in the country.

17.3.4 Fiscal Data

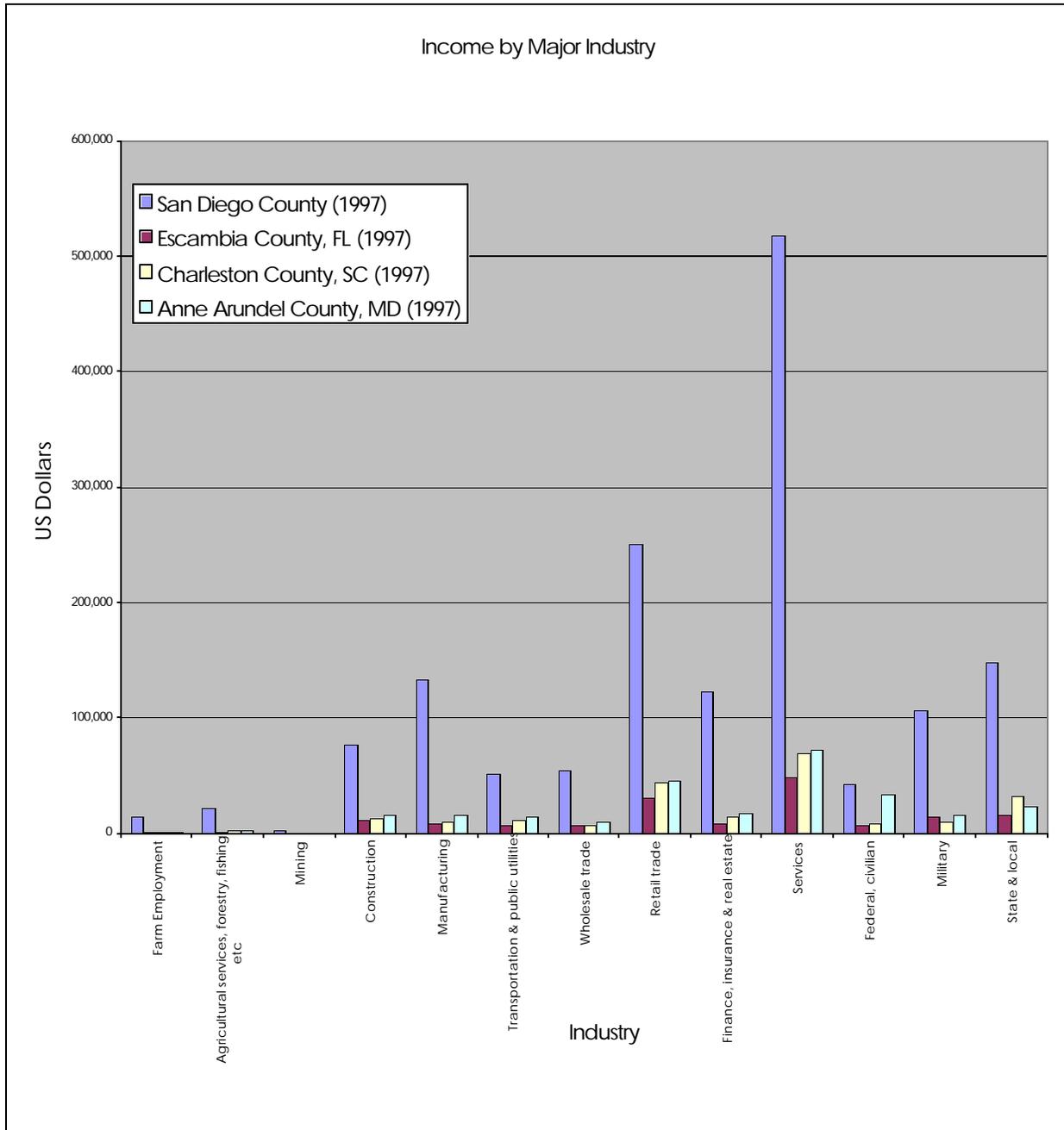
Public expenditure and revenue distributions, tax rates, and assessed value levels provide the information by which the fiscal capacity of a jurisdiction can be determined. The ability to finance capital improvements and extend services in support of Navy planning decisions may affect the scale and timing of project implementation. The method of financing can impact the, “service delivery, use, cost distribution, and location and density of development” (Dalton et al, 2000). Public projects are most often funded through Tax Increment Financing (TIF)s, General Obligation Bonds (G.O. Bond), property, and user taxes. The location and amount of tax burden impacts the degree of potential development. Investments in infrastructure and development can be largely determined by sources of revenue, as well as the burden imposed on specific locations. The degree to which this burden can be shifted can impact economic decisions regarding the timing and purpose of development. Navy projects may be dependent

upon these local decisions, seeking secure methods of local financing for community decisions.

Figure 17b

1997 Income by Major Industry - Selected Counties with Navy Presence

Source: Regional Economic Information System, 1969-1997.



17.4 Economic Factor Profile Interpretation

17.4.1 Opportunities

- Low levels of labor force participation suggest an untapped labor supply that could be available to fulfill the labor requirements imposed by a Navy action or by private sector demand induced by that action.
- An industrial/occupational structure that reflects an advanced or sophisticated economy can better support the goods and services demands of the Navy than a less sophisticated economic structure.
- High labor force quality indicates its ability to adjust to changing job requirements and new technologies. Such conditions might be favorable to a proposed Navy action.
- High levels of per capita income and a low poverty index would be indicative of a viable community attractive to Navy personnel and able to offer a quality living environment.
- A balanced distribution of income sources between goods-producing sectors and services-producing sectors suggests an ability to absorb change, such as an increase or decrease in Navy expenditures, without undue economic consequences.
- A balanced fiscal structure with good bond ratings and sound financial management will enable local government to support growth through timely provision of public facilities and services.

17.4.2 Constraints

- High unemployment levels may be indicative of an obsolete local economy with declining productivity and income growth potential.
- A low labor force participation rate suggests barriers to entry into the economy. Such barriers often discriminate racially and against females. They also represent market imperfections that result in higher costs.
- Low per capita incomes and a skewed income distribution often accompany lower quality of life and suggest inefficiencies in the local economy, which may contribute to supply shortages and higher costs.
- An industrial/occupational structure that is over-specialized is often especially vulnerable to cyclical variation resulting in lower incomes, higher unemployment, and a restricted capacity to accommodate new economic demands.
- Low tax rates, high public debt, and over-dependence on a single revenue source all indicate a low fiscal to support new or increased service and infrastructure

17.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of economic information on a specific proposed project.

- Is the project likely to have any effect on the overall economy of either the local vicinity or the region, including effects on land/property values?
- Is it anticipated that the project will affect either the local vicinity or the region in terms of employment profiles, income levels, and/or occupational or industrial structure?
- In terms of the activity, is the project likely to affect either its need for skilled workers or its overall work force composition, its general payroll, or expenditures for off-base goods and services?
- Are there any anticipated trends or changes in either the local or regional economics, such as plans for industrial or real estate development, which are likely to affect the implementation of this project?
- Will the proposed project generate a change in the magnitude of local tax revenues or public service requirements?

17.6 Data Sources

1. Internet

- <http://govinfo.kerr.orst.edu/reis-stateis.html>
- <http://www.naics.com>
- <http://www.census.gov>
- <http://www.stat-usa.gov>

2. Local

- Planning & Economic Development Offices
 - Employment, population and industrial/occupational statistics for city, reports, forecasts
- Chamber of Commerce

2. Regional

- Council of Governments (COG)
 - Employment statistics for region labor force, occupational structure, unemployment and employment rates, trends in labor force, income sources
 - Population statistics, size, age, distribution
 - Industrial/occupational structure statistics

3. State

- Department of Commerce
- Economic Development Agency
- Department of Labor State Employment Service
 - Employment statistics for State
 - Industrial/occupational statistics, forecasts structure

18.0 POPULATION CHARACTERISTICS

The characteristics of a population describe its number, distinguishing attributes, locational distribution, and trends. As these characteristics are easily influenced by non-demographic factors, they constitute an important reference base for any planning study that could generate actions to which the resident population may be sensitive. Analysis of an area's population characteristics provides the planner with indicators of the area's general economic health as well as information regarding special conditions that may impose limitations or represent advantages in the context of Navy planning. The three primary characteristics of population most applicable to land use planning are size, composition, and spatial distribution (Kaiser, 1995).

18.1 Relevance to Planning Studies

18.1.1 Regional Studies

As the scale of jurisdictional planning increases to a regional one, population characteristics of this larger area are essential to include in the analysis. Differences in population composition - age, sex, race, family structure, density- are discernable at the local level, and regional planning decisions may translate into demographic impacts affecting population subgroups differently. It is possible that the community population composition surrounding one installation in a region may differ substantially from that surrounding other nearby installations, with these differences imposing constraints on certain naval activities. Such conditions could provide the rationale for locating the more population-sensitive activities at a more isolated installation within the region. Examples may include a population with a high number of "sensitive" groups such as the elderly or very young. Intrusive Navy uses and operations, such as jet training, may create more conflict in a more densely populated area with a large elderly and young population rather than in a more rural, isolated location.

Population characteristics and trends are best examined at the regional scale as their complete pattern and locational differences can only be identified in this large geographic context. The regional population analyses establish the analytical framework for both regional and activity planning assessments. Population analysis has the purpose of identifying descriptive characteristics, their trends, and their sub-regional distribution. A regional examination of population trends reveals changes in the total numbers, migration patterns, internal shifts in composition, and intra-regional population shifts which would not be evident at a smaller geographic unit of analysis. For example, a region may be experiencing net in-migration; one

DEFINITIONS

Census tract – A small, relatively permanent statistical subdivision of a county in a metropolitan area or a selected non-metropolitan county, delineated by a local committee of census data users for the purpose of presenting decennial census data.

Migration – Repeated departure and return of individuals or their offspring to and from an area.

Family composition— Age and gender mix of families for demographic purposes.

Dependency rate— Ratio of persons aged 0-16 and 65+ divided by population 17-64 yrs old; number indicates proportion of population restricted in their contribution to the economy.

jurisdiction in the region attracts older migrants while another area gains only younger migrants. Analyzing this situation on a regional scale may provide more accurate explanations and causal relationships than an analysis surrounding only one installation.

18.1.2 Activity Plan

Population characteristics and trends are discernable at the census tract level. Thus, the population dynamics in the area immediately surrounding a Navy installation can be easily identified and evaluated. Understanding the demographic makeup of the surrounding community may assist planners in assessing a potential employment base as well as predicting impacts of future activity planning decisions. With knowledge of the surrounding community's population, opportunities for coordination in potential service provisions could be possible. This knowledge can also assist Navy planners in avoiding unnecessary disruption to local population trends.

18.2 Relationship to Other Data

The characteristics of the population and their rate and direction of change are closely tied to the health of the area's economy and the quality-of-life offered in the community. Just as the increase or decrease of employment opportunities will induce migration to or from the area, the size, diversity, and quality of the population can induce growth or decline in the economy. Population translates into demand for private sector services, public services, housing, and transportation. Population has a physical dimension. Its increase requires land for new housing and services. Its decrease results in the abandonment of land, housing, and infrastructure. The density of this land, housing, and infrastructure is closely related to the impacts on Navy operations. Decreased density of our populations can result in the spread of civilian uses near to and around military activities.

In the basic economic equation, population represents the demand element (the consumer) as well as the labor input. The consumption levels of the population are governed largely by earned income; greater earning power generates increased consumption potential. Increased consumption of natural goods, such as land, water, and energy, can directly impact the quality of life and operations at Navy activities.

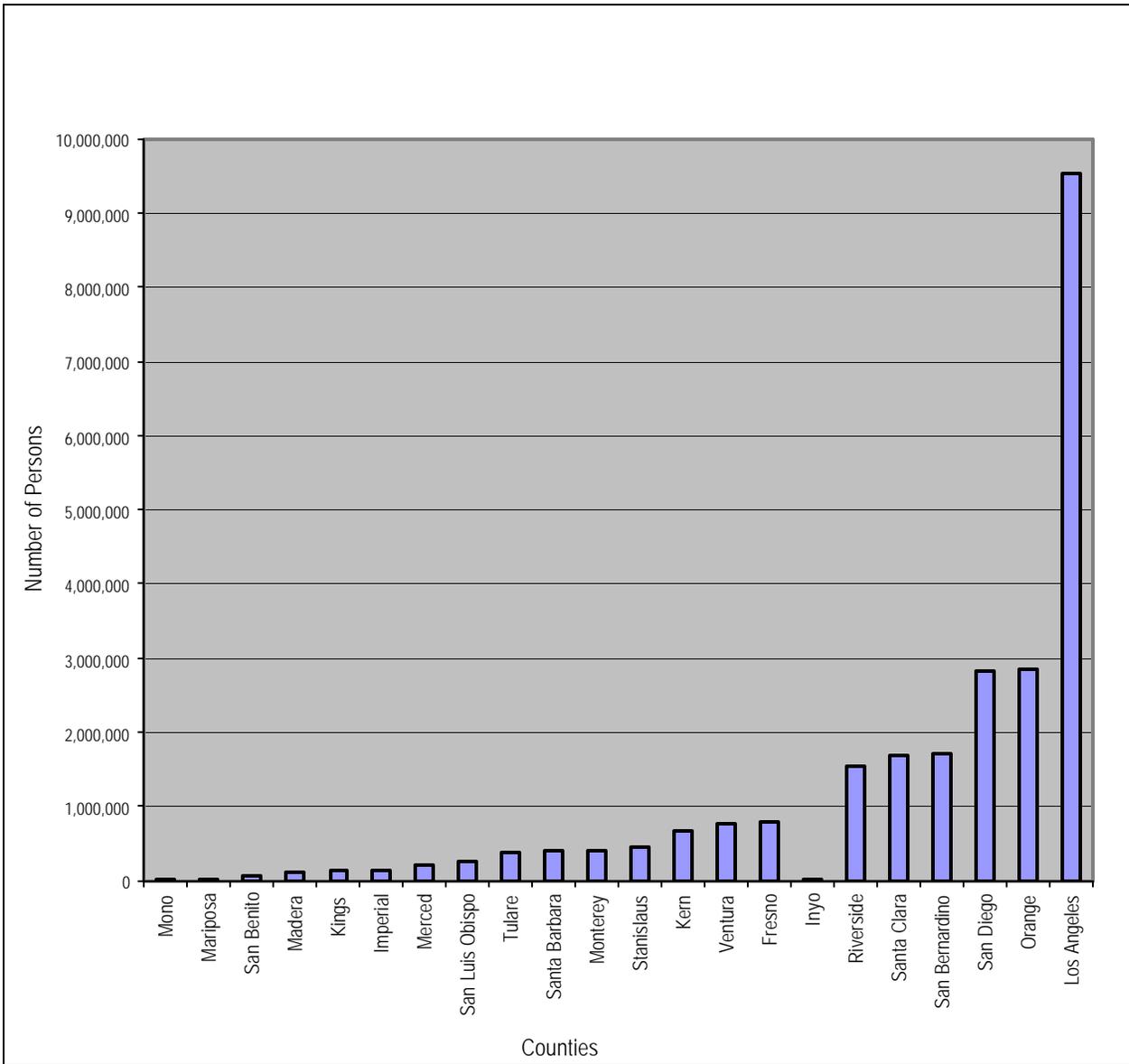
18.3 Primary Population Planning Factors

18.3.1 Population Size

The total number of residents in an area comprises its size. Change in this total number results from the interplay of three factors - births, deaths, and migration. As birth and death rates do not experience major changes in their rates over a planning period, the principal cause of growth or decline in an area is migration. Migration inevitably involves persons both moving away from and to an area. Even areas experiencing net out-migration have some in-migration. Thus, when an area which has long experienced population decline (out-migration has exceeded in-migration plus natural increase) begins to have population growth, it may mean that out-migration has lessened substantially rather than that in-migration has suddenly increased.

The change in population can be effectively displayed using several methods. Bar graphs help the layperson visualize the magnitude of differences in population between different locations (Figure 18a on pg. 126). Assessing the locations with the highest level of employment can be easily displayed through bars, with a trend line adding a time interval of change. Change in total population, locally or regionally, as compared to the national growth rate is a good measure of relative economic health: a rate greater than the U.S. rate is experiencing net in-migration while a rate less than the U.S. rate is experiencing net out-migration.

Figure 18a
2000 Population - California, Southern Counties



Source: US Census 2000

18.3.2 Age Distribution

The distribution of the population by age groupings identifies the presence of unusually high or low levels of dependent persons compared to persons of labor force age. A good measure of dependency is the ratio of persons age 0-16 years plus 65 years and over divided by the population 17 - 64 years old. High ratios indicate a population composed of a disproportionate number of persons whose age restricts their participation in the economy; lower levels of per capita income and higher incidents of poverty usually accompany such a high rate.

Migration tends to be age-selective. Thus, an area experiencing net out- or in-migration probably will have smaller or larger numbers of persons, respectively, in the 20-35 year old age group. Where these are below average, it suggests an aging labor force with lower skills and an above average dependency level in the overall population.

18.3.3 Sex Distribution

The ratio between males and females usually indicates a slightly greater number of females in the population than males. If this imbalance deviates more than a few percentage points from the U.S. average, it could be explained by a large number of elderly persons or age-selective out- or in-migration. Such an excessive imbalance could have serious economic consequences due to the different labor force participation rates between males and females.

18.3.4 Ethnic / Racial Composition

Data on ethnicity is scarcer than for racial composition. This type of information is indicative of cultural distinctions within the population, which could have economic or social implications. While cause and effect consequences between ethnic or racial distinctions and economic or social conditions cannot be assumed, associations do exist. Consequently, the presence of disproportionate numbers of persons of a given ethnic or racial group in the population may be indicative of other conditions such as different birth rates, family sizes and composition, age structure, employment characteristics, educational levels, and labor force participation levels. Ethnicity and racial composition should only be evaluated as explanatory variables and should never be used as predictive variables.

18.3.5 Educational Levels

Years of school completed for the population is one measure of the population's overall level of development. Such a measure may also be an indicator of the population's capacity to accommodate technological change. Higher educational levels tend to be associated with a population that is progressive and interested in participating in decisions affecting the future quality of its living environment. A population with lower levels of education is more susceptible to structural unemployment and may have lower income and employment levels.

18.3.6 Family Composition

The distribution of the population between individuals and families, and the population distribution among family types (single adult head, adults without children, elderly couples, adults with young children, adults with grown children) provides an indication of stability within the population, affects birth rates, and determines demand for housing of various types and sizes. Certain types of families tend to have higher incidents of low income and poverty conditions (minority female headed, single-parent families, and elderly couples). This information may be useful to help explain local economic and social conditions.

18.3.7 Locational Distribution

The geographic distribution of the population and its density are important conditions that affect the demand for public services, accessibility, transportation requirements, and the quality of-life that is available within a given jurisdiction. Population density is best displayed using a proportional graphic technique (Figure 18b on pg. 129). Using the data set of population figures, the similarities and frequency between data points aid in creating a distribution for categories that best describe the range. Mapping these categories displays the gradual increases in density and proportion of population.

Trends in population location appear as demand for new residential development in previously rural areas becomes urbanized. The movement of people into the suburbs places strain on environmental, transportation, and social resources. Open space is developed, traffic congestion increases, air and water quality decrease, and schools become overcrowded. The continuing growth of low-density communities spreading out from the urban centers results in increased opportunities for conflict with military operations at Navy activities. Encroachment of residential, recreational, and commercial uses threatens human safety while increasing noise exposure to “sensitive” civilian land uses. Thus, the relationship between Navy plans for activity operations or expansion must give careful consideration to the evolving population distribution in the host community.

18.4 Population Factor Interpretation

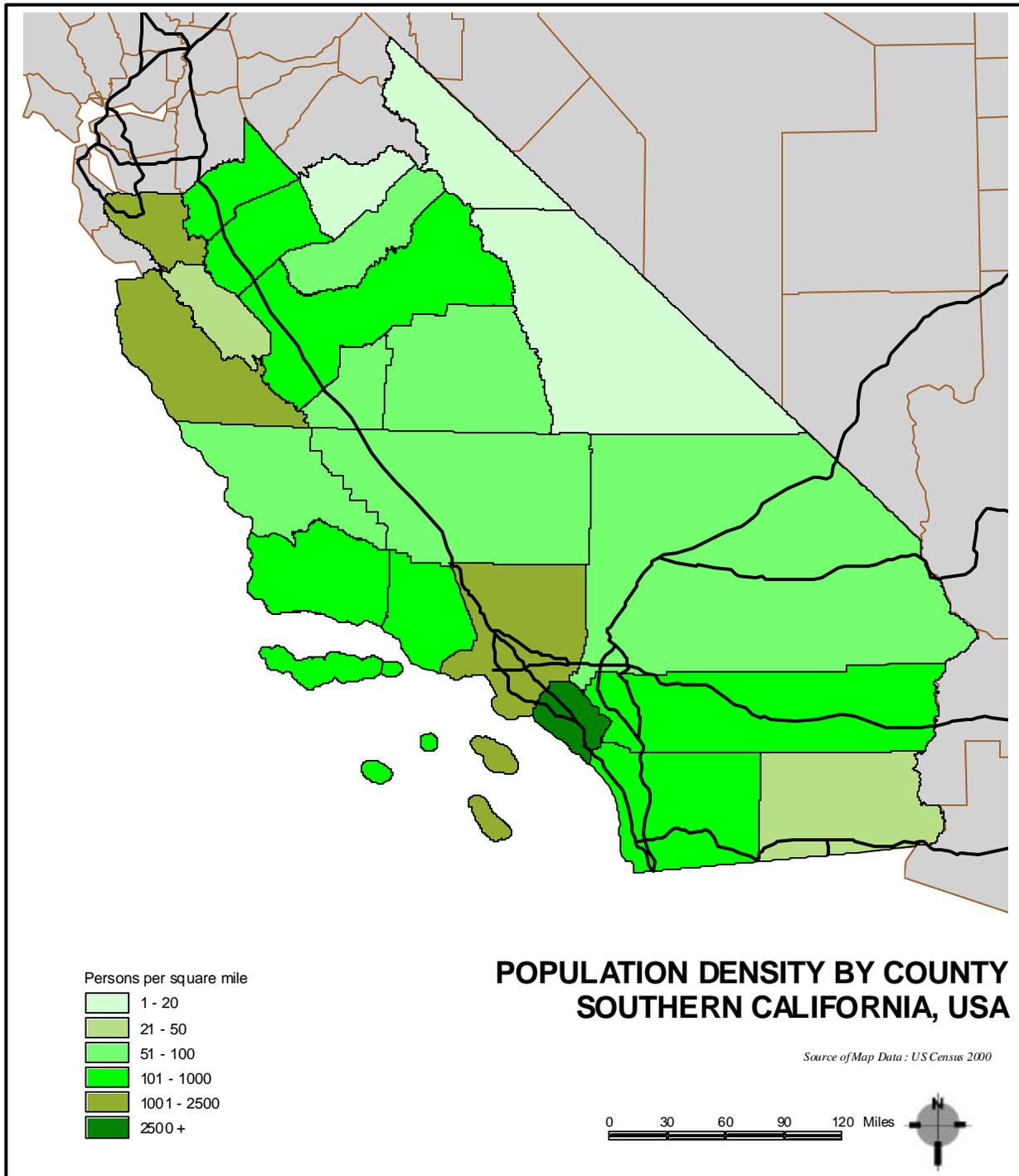
18.4.1 Opportunities

- A growing population with net in-migration is suggestive of an expanding local economy and an attractive and dynamic community with a positive image and good quality of life.
- A population with an average family composition distribution represents a stable community. Such a community may be viewed as a good place for Navy personnel to reside.
- Age-selective in-migration may contribute to a vigorous labor force with above average skills and productivity. This trend could support increasing Navy requirements for civilian employees.
- A balanced male/female ratio and heterogeneous ethnic and racial population composition suggests a community which is diverse and able to accommodate the diverse needs of Navy personnel.
- A local population with high educational levels is indicative of a community offering good quality local public facilities and services and one that has a high quality of life. Such a population may offer the Navy high quality labor resources to satisfy civilian employee requirements.
- A diversity of population densities within a community is indicative of a full range of housing types

and price ranges, which may be able to accommodate the diverse needs of Navy personnel.

Figure 18b

2000 Population Densities - California, Southern Counties



18.4.2 Constraints

- Imbalances in the racial, ethnic or male/female ratio in a population may indicate a potential for tension between Navy personnel residing in a community and the resident population.
- The presence of low educational levels in the host community suggests deficiencies in the local school system or the educational values of the community. Where Navy personnel would rely on local schools for their children, this could present a problem and require the provision of on-base schools.
- A declining population is indicative of a deteriorating economic base and a weakening of a city's capacity to support the present level of public services.
- A population having a high dependency rate may be unable to generate sufficient income to maintain its quality of-life standard.
- Age-selective out-migration of the new and recent entrants to the labor force indicates an economic base unable to create jobs for its best-educated and most productive segment of the population. These circumstances would imply a growing economic dependency by the local economy on the income generated by the Navy.
- Extremes in population density and locational distribution may tend to reduce the host community's ability to adequately accommodate Navy personnel by offering sufficient residential diversity and choice to allow for integration of Navy personnel within the community.

18.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in evaluating the relative importance of population characteristics information on a specific proposed project.

- Will the project affect the demographic character of either the local vicinity or regional populations, over the short- or long-term, with regard to any of the following dimensions? Size, density, distribution by location, age structure, sex ratio, racial/ethnic composition, educational profile, and family composition
- Is the project expected to result in a short- or long-term shift of population from Navy property to the local vicinity or region or vice versa?
- Will the project induce in- or out-migration of civilians from the area?
- Will the area's demographic characteristics affect the design or operation of the proposed project?

18.6 Data Sources

1. Internet

- <http://www.census.gov>
- <http://govinfo.kerr.orst.edu/>
- <http://www.developmentalliance.com/demog>

2. Local

- Planning & Development Office
- Economic Development Agency
 - Voter information
 - Local comprehensive plan; Information on local government structures and personnel
 - Local school district
 - growth management policy information

3. Regional

- Council of Governments (COG)
 - Regional plans
 - Information on regional government structure and personnel

ADDITIONAL SOURCES

- Navy Base Public Works Office,
- U.S. Department of Commerce
- Bureau of Census
- State Data Center

19.0 COMMUNITY FACILITIES AND SERVICES

Support systems encompass all activity and community facilities and services intended to serve the quality of life requirements of naval personnel. Support systems incorporate the broad array of facilities and services normally provided by local and state governments. These systems support residential communities, thus, housing is addressed as a catalyst in requiring different community support systems. The primary support systems most often included in land use planning include educational facilities, sanitation, recreation, fire and police, and transportation. In addition, this section briefly addresses informal community institutional uses such as churches and civic groups. A wide range of public investments exists, and this section does not attempt to discuss all of them. Some of the primary considerations for support service planning, namely housing and transportation are also included in their own chapters within this guidance. Please refer to those for more complete coverage of integral issues.

The purpose of studying support systems in the context of Navy planning is to ascertain the availability, quality, and affordability of the services Navy personnel require during their off-duty hours. Facilities, services, and requirements should be analyzed in order to determine those which are insufficient within the community and should be furnished by the Navy. In cases where new Navy related demands are to occur, these additional needs can be anticipated in advance and facilities and services expanded by the community or Navy as appropriate.

DEFINITIONS

Impact fees – A fee levied on the developer or builder of a project by the county or other public agency as compensation for otherwise unmitigated impacts the project will produce.

Multimodal transportation – Several modes of transportation; e.g. bus, train, walk, in one trip.

Vacancy rates – Percentage of housing units vacant at any one time.

19.1 Relevance to Planning Studies

19.1.1 Activity Plan

The study of support systems has its major relevance at the jurisdictional level as most facilities and services are provided at the city, county, and activity scales. This is the minimum site unit of analysis in which to document the full complement of these public and private support systems. Additionally, the consequences of deficiencies in support systems have a direct impact on the activity plan and the Navy personnel assigned at a specific location.

19.1.2 Regional Studies

Many regional scale community and support systems include regional shopping centers, colleges, large hospitals, and regional parks. Within one region, significant intra-regional variation in the quality, availability, and pricing of these support systems can occur due to different priorities of jurisdictions within

the area. Among the community support systems most regional in nature and significantly impacting Navy life is the provision of housing. When adequate on-base housing is not available, Navy personnel can be expected to search for suitable housing throughout the market area. While the support systems' impacts on the installation have a strong local orientation to the activity, the impact on Navy personnel has a regional focus. As a result, the regional study should include community housing assets and all relevant support systems that contribute to the quality-of-life a community provides to its residents. For a more detailed discussion of public and private housing opportunities for Navy personnel, see Chapter 32.

19.2 Relationship to Other Resource Areas

The scope of inquiry relating to support systems is broad. It encompasses all descriptors relating to the host community's service capacity. While the availability, quality, capacity, and cost of these services relate to demand conditions and economic and fiscal capacity, the support systems profile is relatively self-contained. The population dynamics in the community, exclusive of Navy personnel and dependents, constitute the primary demand for services. Some community services, such as recreation and schools, support both civilian and military populations. Where population growth outpaces service provisions, these facilities will function over capacity. Similarly, where a community's fiscal position is weak or where the economic base is deteriorating, the supply of support system services will be limited and their quality is likely to decrease. Notwithstanding these independencies, the analysis of the support system has as its major objective the determination of the host community's suitability and capacity to satisfy the off-duty needs of Navy personnel and their families. This information helps the Navy planners to assess how good a community is as a place to live based on its housing conditions and the availability of public and private facilities and services to support an acceptable quality-of-life for Navy personnel. While most applicable to those service members living in the community, many services are also utilized by activity personnel, creating additional demand requiring attention in support system planning.

19.3 Primary Support Systems Planning Factors

19.3.1 *Housing (Catalyst for Requirements of Facilities)*

Community housing assets, including existing conditions, past trends, and expected changes, are all-important considerations in assessing the requirements for Navy personnel. Several specific housing supply factors are instrumental in this assessment, including the number, type, age, location, cost, condition, size, ownership pattern, vacancy, and turnover rate of units within the activity's region. Demand conditions such as the number and size of households, income structure, tenure pattern, financing conditions, and terms, as well as construction trends and real estate activity are also important factors in understanding how the local market responds to change. Inherent in high-quality residential communities is a varied support structure of public and community facilities that are easily accessible at the neighborhood, community, and regional scale. The housing needs of Navy personnel - number, size, allowance structure - should be analyzed and housing demand estimated given the availability of Navy-owned housing (unaccompanied and accompanied) and Navy housing policies. These housing studies should be conducted for the entire market area in which the Navy installation is located.

19.3.2 *Educational Facilities*

The objective of analyzing a community's educational facilities is to ascertain whether they can accommodate the needs of Navy personnel and the adequacy (quality) of those services that are available.

The structure of the educational system should be identified to determine the range of facilities -preschool through college - and their location. The types of programs and special educational facilities should be ascertained. Enrollment levels and facility capacity are integral in establishing capacity levels. Estimates of Navy personnel educational facility demand by school grade should be developed and compared with facility capacity levels. This information can be used to judge the impact of Navy personnel, especially planned increases, on the host community's educational resources.

In cases where public/private venture housing is utilized with a local jurisdiction, the impact of additional Navy personnel on the area's schools is sometimes figured into the overall cost of the development. Termed "impact fees", this exaction on the developer accounts for the number of new units constructed and estimate of new children requiring educational facilities. This fee is an increasingly popular method of having development "pay for itself" through assisting in providing public services that will be required from the inhabitation of the new residential units.

19.3.3 Sanitation Services

Sanitation services may include garbage pick-up, street cleaning, litter control, mosquito control, and possibly waste water collection and treatment. The scope of the study should be sufficiently broad to identify the full range of local sanitation services - type, frequency, adequacy, and cost (user fee) if any. These services may be publicly provided; some may be provided privately on a contract basis. Their availability has significant community health implications. If the activity requires any of these services from off base providers, their availability, quality, and cost are important data inputs to planning decisions.

19.3.4 Recreation

The availability of recreation services within a community represents an important amenity and contributes to the quality-of-life of local residents. A comprehensive recreation system includes facilities for all ages, active and passive, indoors and outdoors. These may include both public and private facilities; the latter maybe commercial or membership. To the extent that recreational opportunities are diverse, accessible, and affordable within the community for Navy personnel, the need to provide duplicate services on the activity is diminished. The more specialized or unique recreation services will attract users from greater distances while the general-purpose facility tends to have a localized market. As is true for some other service-types, such as education, recreational services comprise a hierarchy from the most simple and local (neighborhood or vest pocket park) to complex regional parks and capital intensive commercial facilities (golf course, swimming and tennis complex, roller skating rink) with larger market areas required to support increasingly complex activities. The assessment of recreational services should recognize the willingness of facility users to drive or spend time going to and from these services in direct proportion to the complexity of the recreational facility. Thus, basic services should be conveniently accessible to Navy personnel, but an equal level of accessibility is not expected for the more specialized and complex services.

19.3.5 Fire, Police, and Emergency Services

The existence of fire, police, and emergency services, their location, complement of personnel, inventory of equipment and services, and area of service determines the quality and availability of such services. These services constitute a most basic public service. Standards for location of such services are usually based on response time rather than population density.

Residential areas where these services are either not available or available on an intermittent basis should

be identified as having serious quality-of-life deficiencies. In those cases where the Navy installation may require emergency service support or back-up from its host community, the capacity of local fire, police, and emergency services to accommodate these Navy demands with acceptable response times must be determined and factored into activity planning decisions.

In graphically displaying police or fire services, it is important to convey the manner in which the general provision of the service is broken into more localized sectors which address smaller, specific areas. Figure 19a on pg. 136 is a clear example of the location of police service sectors in relation to the geographic boundaries of Washington DC. If a planner were to analyze effectiveness of particular sectors, information on incidents and response times could be incorporated into the GIS application in separate layers. Both point and polygon features could represent various interdependent layers of information helpful in assessing the quality of police or emergency services.

19.3.6 *Transportation*

A community's transportation system and its land uses are intrinsically linked, with each impacting the other. Land uses are the source of travel demand. While the specific type of use creates differing intensities of demand, the transportation system drives the allowable uses through accessibility and location. This service, also frequently discussed as part of the essential infrastructure, is multimodal in nature. Thus, non-vehicular and public transportation options should also be considered and planned with the road network.

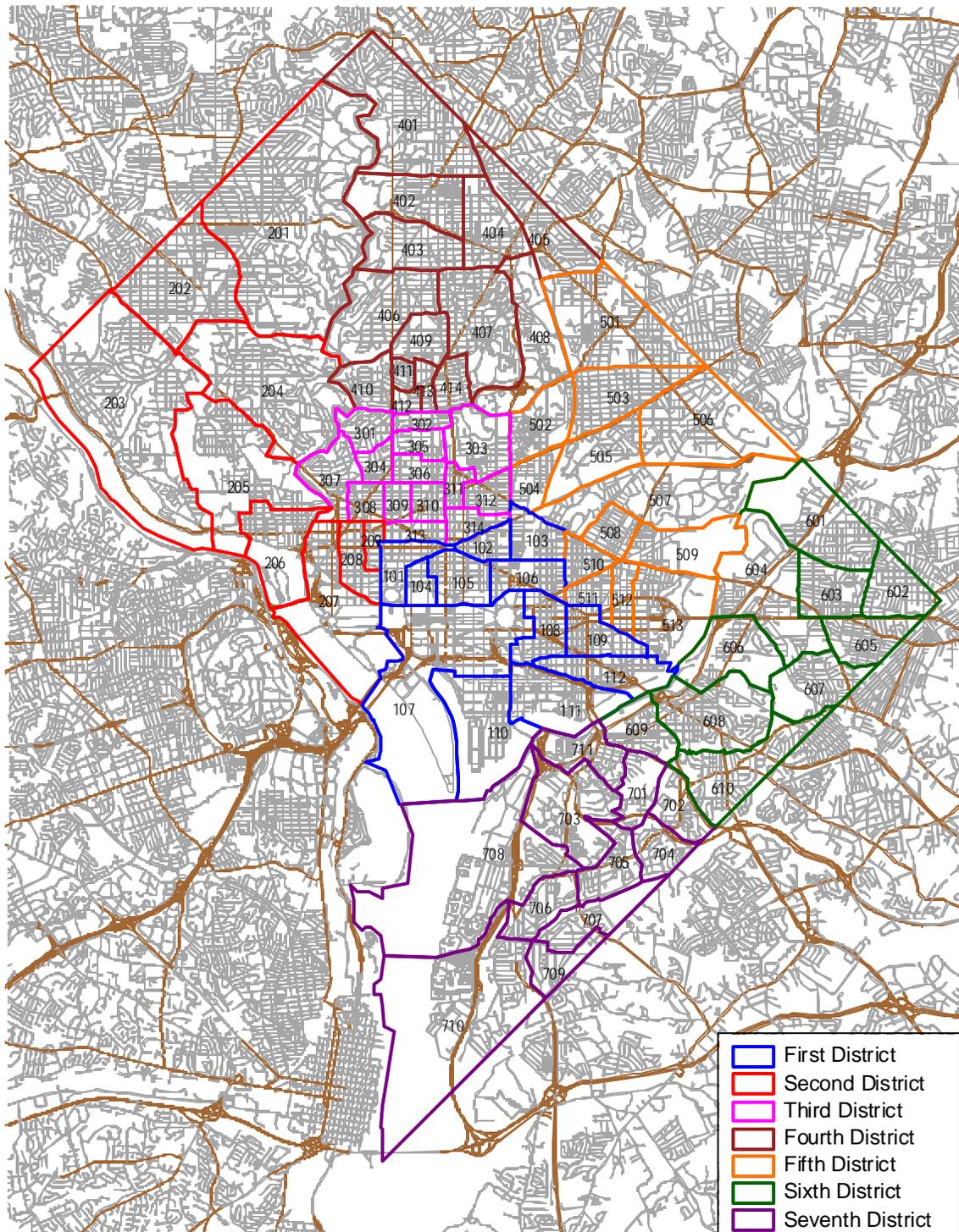
In the context of Navy planning and its impact on the surrounding community, the presence alone of a base or activity in a community generates and attracts vehicle trips. Modes of transportation leading to the activity are all impacted. Additionally, off-base housing (whether existing or new developments through Public-Private Venture PPV) creates demands for vehicular, pedestrian, bicycle, and public transit options (Figure 19b on pg. 137). The adequate provision of this crucial support system enables the Navy activity and its service members to more efficiently conduct their mission and live a higher quality of life within the surrounding community.

Transportation studies of new developments and major existing ones are important to consider in assessing the level of adequacy of public service provision. Studies of impacts are useful for the activity and community transportation network, and the local jurisdictions are potential partners in assessing these services. For more detailed information on transportation planning and impacts, please see the chapter addressing community and installation-wide transportation.

19.3.7 *Informal Community Institutions*

Churches, clubs, and other social groups and organizations comprise the non-governmental support institutions in the community. Their presence, diversity, and purposes contribute to the quality-of-life opportunities available to Navy personnel and their families. Where membership restrictions or the absence of such support institutions permit the availability of these opportunities, the Navy may opt to establish and accommodate these activities on the activity.

Figure 19a
Metropolitan DC Police Districts and Service Areas



Source: Metropolitan Police Department website <http://www.mpd.org>

Figure 19b

Local Bus Service - Naval Amphibious Base Coronado, CA



Source: Regional Transportation Authority website <http://www.ccrta.org/systemmap.html>

19.4 Community Services Factor Interpretation

19.4.1 Opportunities:

- A dynamic housing stock with units distributed broadly among price levels, both for rent and for sale, may be able to accommodate an increase in demand caused by expansion of Navy personnel. Good quality, conveniently located, and affordable housing units may eliminate the need for the Navy to construct additional housing on the activity.
- A full range of public and private facilities and services inclusive, of education, fire and police, sanitary, and recreation, conveniently accessible, of good quality, and with adequate capacity to accommodate increased demand, are indicative of a high quality of life within a community. Such a

community will be attractive to Navy personnel and reduce the need for the Navy to provide these services on the activity.

- A strong institutional and commercial service structure is indicative of a responsive local government and progressive community. Such a community tends to have the capacity to respond constructively to change and can meet a wide range of human and cultural needs. These conditions contribute to a good community image and quality of-life. A lack of services may contribute to a lower quality-of-life for Navy personnel living outside the activity.

19.4.2 Constraints

- Housing supply shortages and low vacancy rates tend to force up housing prices and place the acquisition of suitable housing beyond the ability to pay of many Navy personnel. Such conditions may require the Navy to construct or lease housing units for the segment of its personnel priced out of the private market.
- The absence of community services, public and private, indicates the lack of capacity to accommodate the demands of a growing economy and quality living environment. Such a community will have a negative image and be unattractive to Navy personnel.

19.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in evaluating the relative importance of support systems information on a specific proposed project.

- Is there evidence of existing problems (such as shortages, poor quality or lack of choice), either on-base or in the local vicinity or region, with any of the following support systems?
- Is it anticipated that the project will create either short- or long-term changes in demand on the following Navy, local or regional vicinity support systems?
 - Housing
 - Education
 - Sanitation
 - Recreation
 - Fire/Police/Emergency
 - Transportation
- Will the project cause or contribute to a breakdown in community cohesion as a result of out-migration, a disruption in social interactions, or changes in community traditions or institutions?

19.6 Data Sources

1. Internet

- <http://www.activeparks.org>
- <http://www.ccrta.org>

2. Local

- City/County Planning Department
 - Comprehensive plan
 - Recreation and park plan
 - Transportation plan
 - List/map of churches, schools, etc.
 - Demographic studies
 - Growth trends reports
 - Housing surveys

2. Regional

- Council of Governments (COG)
 - Maps of school districts, park districts
 - Regional master plan, land use plan
 - Housing studies, plans
 - Infrastructure plan
 - Regional open space/recreational plan
 - Demographic studies
 - Growth trends reports
- Water and Sewer Authority

3. State

- Office of State Budget & Management
- State Statistical Abstract

20.0 POLITICAL STRUCTURE

One of the driving forces behind planning processes, whether in the public, private, or military sector, the political structure has tremendous influence on the creation, implementation, and enforcement of large and small scale planning actions. The political structure is important on several levels, ranging from the authority for creation and implementation of a plan or ordinance to high-ranking direction-setting instructions. While operating within its own political structure, regional Navy planning also depends largely on the local structure of the surrounding community. Forms of government control and scope of local power and authority dictate decision making and its resulting impact on the physical and economic development of a locality. Understanding who holds decision-making authority within a jurisdiction will be important for Navy planners in their coordination efforts through the RSIP process.

20.1 Relevance to Planning Studies

20.1.1 Regional Studies

The political structure of an area describes its organization of government, inter-governmental relationships, and relationships between special interest groups and governmental units in the exercise of public authority and the resolution of conflict in the context of the public interest. These conditions establish the institutional framework within which issues and problems affecting the interests of the community can be examined and resolved. This framework consists of existing government units and their interrelationships, local organizations representative of special interest groups, and the political process that establishes the rules by which disputes are resolved in a public forum. Knowledge of this structure and its process permits Navy planning decisions to be coordinated appropriately with the interested governmental and organizational units, contributes to accountability within the decision-making process, and establishes the means by which controversial issues may be resolved to the interest of all affected parties.

Regional-level planning decisions correspond with whole jurisdictions and groups of local jurisdictions, in contrast to the activity level where the planning concern is generally quite localized. The political structure at this level may emphasize intergovernmental relationships in addition to differences within a jurisdiction and among localities. The political process governs the behavior of all organizations and therefore is relevant at this scale of planning.

Regional studies should establish the political structure operating at this scale. This is composed of

DEFINITIONS

Special interest group – A group of stakeholders, or people directly and indirectly impacted by a project, who promote a certain set of interests and goals.

Special district - A district established to accommodate a narrow or special set of uses or for special purposes. The term can signify any district beyond the conventional residential, commercial, industrial, and agricultural districts.

Ordinance – A law or regulation set forth and adopted by a governmental authority, usually a city or county.

MSA - Metropolitan Statistical Area - A county with a central city or adjoining central cities totaling 50,000 or more in population, and the surrounding suburbs or counties that are strongly linked economically and socially.

federal, state, regional, and local governmental units and their intergovernmental linkages. Some non-governmental organizations may operate at this scale (e.g., an association or environmental group), and these should be documented accordingly. The processes and regulations guiding the behavior (responsibilities and authorities) of these organizations and groups should be identified.

20.1.2 Activity Plan

The local political structure, including both formal and ad hoc government and non-governmental organizations, is most directly involved in place-specific issues. Most relevant to the activity and regional level planning inherent in the RSIP process, the services and structure of the local level political structure largely determines the built environment and the human factors influencing it. The political process governs the behavior of these organizations at all levels and therefore is relevant at this scale of planning.

20.2 Relationship to Other Resource Areas

Political structure data describe the organizational framework within which development decisions are formulated, evaluated, and implemented. The character of this organizational framework affects Navy installation planning decisions in a variety of ways. As a source of data for Navy planners, the political structure is of primary importance. Similarly, as a provider of services to Navy personnel residing in the community and to the installation, the political structure affects the local quality of life as well as activity-level public facility and service requirements. The presence of well organized and informed special interest groups can contribute important information input as well as exert constraints on Navy planning decisions that may ultimately affect the facilities and function at the activity. Consequently, data describing the political structure and processes are relatively discrete; the structure and its characteristics can, however, impose additional data requirements on the planning process.

20.3 Primary Political Structure Factors

20.3.1 Governmental Organization

The structure of local government should be identified, indicating the form of local government (e.g., mayor and council) and the type of local representation and respective geographic units (e.g., council members elected at-large or by ward). (Figure 20a on pg. 142) Similarly, the form and organization of government units at succeeding jurisdictional levels (e.g. county and state including federal representation by Congressional Districts) should be identified and jurisdictional boundaries mapped or recorded. The most effective manner of displaying the organization of the governmental structure is through the use of an organizational chart, schematically diagramming the hierarchy of positions and decision-makers. Diagramming the power relationships is helpful to the lay reader and planner alike, providing guidance on the presence of key contacts within an organization.

Additionally it is important to understand the regional Navy organization overseeing the planning process. A graphical display of this organization (Figure 20b on pg. 143) will aid the beginning (novice) Navy planner in targeting offices and programs for coordination with the outside community.

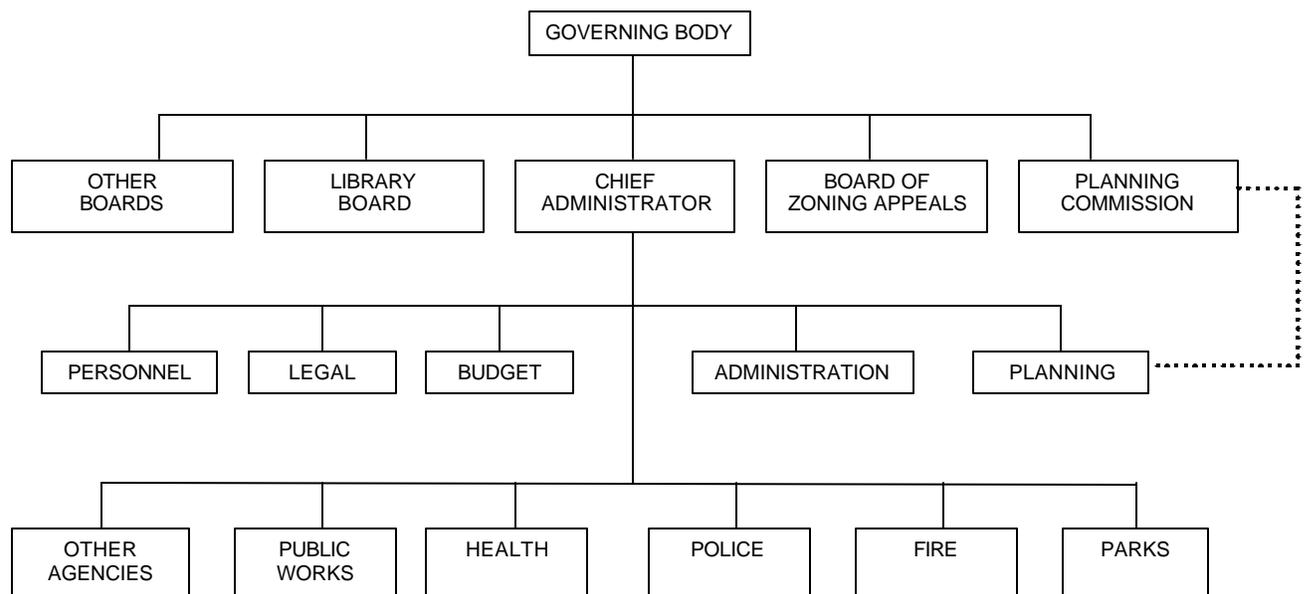
The general responsibilities and functions of each level of government should be determined. In addition to elected government, most areas have authorities with elected or appointed membership. These authorities have been established to supply a special function; school districts and utility districts are common examples. These special districts have important service and taxing implications.

Understanding the decision-making powers of the elected and appointed officials is necessary in assessing the importance and relevance of some planning actions. For example, the County Commission or City Council has the decision-making authority for many development decisions. Acting in its legislative authority, these bodies make policy decisions that are subjective and not required to be based on impartial facts. Political influence and opinion is the strongest factor in these decisions, and some of the largest and most influential potential development projects hinge on this approval. On the contrary, permitting decisions are administrative in nature, based on meeting objective criteria. Political forces influence the creation and adoption of the criteria, however, the actual implementation through permit approval is an objective process.

Understanding the power of the decisions is important as well. In the community planning sphere, only ordinances carry the authority of law. These can be monitored and enforced. However, long-term plans, including comprehensive plans, are only policy documents, with no enforcement powers of law. "Consistency" with a comprehensive plan is a standard test for many developments approved through a subjective decision-making process; however, this is usually only one determinant in the final approval decision. The volatility of the approvals varies between tenures of elected and appointed commissions. While one board may be supportive of coordination in development and policy with the Navy, the next elected board may not. These shifts in power are usually reflected in the policy and approval decisions regarding planning issues of all types.

Figure 20a

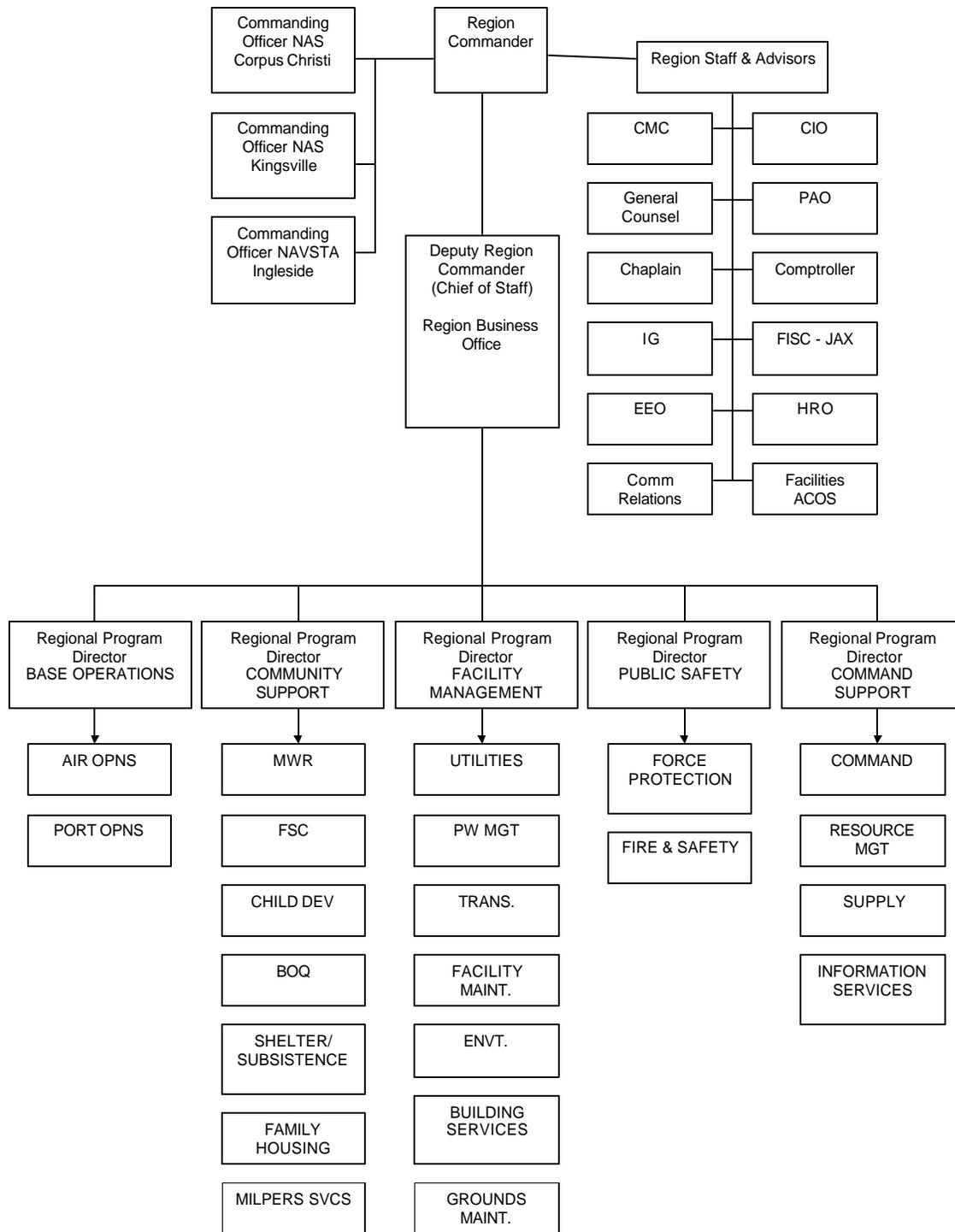
The Role of the Planning Department within a Local Jurisdiction's Organizational Structure



Source: Study Manual for the Comprehensive AICP Exam of the American Institute of Certified Planners, November 1999.

Figure 20b

Navy Region South Texas Organization Chart



Source: Navy Region South Texas, July 2000.

20.3.2 Intergovernmental Relationships

The presence of existing organizations established for the purpose of coordination and cooperation among local jurisdictions should be determined. In a metropolitan setting, these occur in the form of COGs and MPOs. In rural areas, these may be district commissions or development corporations. There may also be formal organizations operated by the state government to facilitate coordination among local governments and state agencies. In other cases, the state may operate regional organizations having specialized purposes, such as administering a coastal zone management district. All such organizations should be identified. These establish an organizational network with which Navy activities may have to coordinate, or they may provide a source of information for planners concerning existing conditions and issues germane to Navy interests.

Intergovernmental agreements and relationships are commonplace in many jurisdictions.

Organizations such as the COGs and MPOs have varying levels of authority and specialization. COGs are regional structures that often have an advisory role in planning for a region. Providing the bridge between many jurisdictions, the COG advises on planning issues, creating the forum and assistance with developing intergovernmental projects and relationships. Serving a more specialized function, the MPO primarily works on regional transportation and planning issues. Functioning at the metropolitan level, based on census designations of Metropolitan Statistical Areas (MSA), MPOs are required for each MSA. The MPO, “coordinates planning for highway, transit, aviation, and rail investment decisions” (Dalton et al, 2000). Both of these entities focus on regional, intergovernmental planning solutions impacting both the civilian and military community.

20.3.3 Non-Governmental Organizations

All areas generally possess a variety of special interest groups and organizations that represent themselves and their interests to local government to assure that their viewpoints and values are not overlooked in the public decision-making process. Some of these organizations and groups are formal, such as the Chamber of Commerce, unions, League of Women Voters, Parent Teachers Association, Realtors Association, or the Sierra Club. Many are ad-hoc groups formed to respond to particular issues. Depending on the nature of the Navy planning assignment, these formal and ad-hoc organizations may become involved, sometimes as a source of information, other times as an interested party who may believe a particular Navy decision may in some way adversely affect its well being. In urbanized areas, neighborhood associations are commonplace. Where Navy decisions may appear to threaten a neighborhood's quality-of-life, such groups may emerge as principal adversaries. Working with these community members will enhance the reputation of the Navy while enabling planners to gain a clear sense of issues important to the impacted group. It is important to know in advance what this non-governmental organizational structure is so that the necessary contacts and coordination can be implemented. Such efforts may effectively defuse situations where confusion and lack of information may generate unnecessary concerns. Working together with these groups in building consensus about an outcome that benefits both the Navy and their community is important to sustain a positive relationship and atmosphere for the future.

20.3.4 Political Process

The governmental and non-governmental organizations identified above function according to procedures, the basis of which are generally established in law. These procedures regulate or determine the authorities and responsibilities of each government unit and non-government organization. Knowledge of federal, state, and local laws and regulations that affect the powers and authorities of these organizations is essential, especially as they affect the Navy's planning process and decisions. In some cases, the Navy is subject to specific laws and regulations (e.g., NEPA, laws affecting hazardous materials, noise, public health); in other cases, such as with local ordinances, the Navy's activities do not fall under the local jurisdiction. Despite this fact, the Navy activity should continue to recognize and work with the ordinances, laws, and regulations of the surrounding community. Failure to coordinate with the community could result in negative future publicity and relations. The procedures that guide the communications process between local organizations and the Navy should be known in order that these can be managed effectively. In cases where a Navy installation requires support from local government facilities and services, this knowledge of governmental decision-making processes is essential.

20.4 Political Structure Factors Interpretation

20.4.1 Opportunities

- A strong government structure has the capacity to respond to a variety of changing requirements for public services and facilities.
- Local and regional organizations can be an excellent source of information relevant to Navy facility planning.
- Non-governmental organizations can provide useful information as well as be a good source of communications regarding local attitudes and values potentially influencing Navy planning decisions.
- Knowledge of local, state, and federal laws and regulations that may affect activity functions can improve the efficiency of the Navy planning process.

20.4.2 Constraints

- Weak governmental structure reduces its capacity to respond to increased demands for local public services; such conditions may lead to a lower quality living environment for Navy personnel and higher operating costs for on-base activities.
- The presence of special interest groups can increase the time required for the planning process; if these groups have become hostile to Navy interests, they may be able to intervene in the Navy's planning process and affect its outcome in a manner unfavorable to these interests.
- The absence of intergovernmental organizations may reduce the quality of information available to Navy planners, and may reduce the Navy's ability to communicate with local governments in their

regional context.

- Situations where the political process is not well established may result in higher Navy costs due to delays in coordination and receipt of local governmental inputs and approvals as well as operational inefficiencies resulting from the absence of responsive public agencies to provide basic services.

20.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in evaluating the relative importance of political structure information on a specific proposed project.

- Are there any issues of significance in either local vicinity or regional politics, such as inter group conflicts, current, or developing public controversies, or jurisdictional questions, likely to affect implementation of this project?
- Are there local government officials and agencies and local non-governmental organizations with which the proposed project's design, implementation, and operation should be coordinated?
- Is the project likely to affect the political status of either the local vicinity or the region in any of the following ways:
 - by creating or stimulating new controversial issues?
 - by involving the Navy in existing public controversies?
 - by disproportionately affecting interest groups?
 - by causing a shift in existing inter-group power balances, including those on the community level?
 - by causing problems regarding military civilian interface?

20.6 Data Sources

1. Internet

- <http://www.naco.org>
- <http://www.icma.org>

2. Local

- Planning & Development Department
 - Population statistics, census tracts and maps (at local scale)
 - Employment statistics
- City or County Manager
- Council or Board of Commissioners

3. Regional

- Council of Governments (COG) Metropolitan Planning Organization (MPO)
 - Population statistics (size, distribution), census tracts, maps
 - Demographic statistics
 - Regional land use plan
 - Population trends

4. State

- Department of Labor
- Department of Commerce
- Statistical Service/Data Center Population statistics, Census tracts and maps (at state scale)
 - Demographic statistics
 - Population trends

21.0 PHYSICAL FACILITIES

Physical conditions describe the state of man-made or adapted elements, structures, or systems at an activity in terms of their capacity, readiness, or effectiveness of use toward meeting the Navy mission(s). Physical conditions refer primarily to the existing built environment or physical program requirements of an activity site, including land use; building use and condition; transportation system layout and condition; and related RSIP planning requirements.

21.1 Relevance to Planning Studies

21.1.1 Regional Studies

The large scale of RSIPs calls for physical condition information at an overview level while addressing details for the individual activities in the study. Activity-specific physical condition data for all activities in a region should be summarized in a common format for use in RSIPs.

21.1.2 Activity Plan

On-site physical conditions are most applicable at the activity level, since the data is building and structure-specific. Such conditions are instrumental in determining the plan requirement program elements. Through an assessment of the adequacy of existing buildings as compared to the calculated requirements, specific space needs can be identified and incorporated into the RSIP of the activity and surrounding region. The physical constraints are meshed with the natural constraints to produce land development suitability criteria for use in activity planning. Acting as a guide for the future development, this suitability analysis rates compatibility from compatible to neutral to incompatible. Through a graphical analysis, the planner may then identify appropriate areas on the activity for specific types of future development.

DEFINITIONS

Suitability analysis – Analyzing the interaction of physical and man-made constraints to determine zones appropriate for development and other activities.

SFPS – Shore Facility Planning System – The method of documenting the facility assets of the shore infrastructure in the U.S. Navy. The assets are compared against space requirements, resulting in a prioritized list of planning actions for the specific activity.

BFR – Basic Facilities Requirements – The calculation of space requirements for Navy facilities, based on standard Navy criteria and specific needs at the activity.

Incompatibility – The notion that military uses are incompatible with residential uses due to health, safety, and welfare concerns.

P-80 – Navy planning guidance for facility space requirements. Space is categorized by category codes, detailing requirements for each one.

MILCON – Military Construction Program – A congressionally-approved program prioritizing facility construction projects greater than \$500K.

EE – Engineering Evaluation – A facility planning document that notes the physical condition of facilities based on walk-throughs of the space.

P-164 – The detailed inventory of naval shore facilities, updated yearly.

21.2 Relationship to Other Resource Areas

On-base physical conditions relate directly to transportation, utility, and land use data as a key descriptive element of the man-made environment. Natural site conditions (hydrology, topography, geology, soils, climate, etc.) can impact the location and the structural condition of on-site facilities. Military missions and operations can change, thereby changing the functional and spatial adequacy of some structures. Community land use and infrastructure system development could affect on-base physical conditions, particularly for those site elements at activity boundaries.

21.3 Primary Physical Facilities Planning Factors

21.3.1 Shore Facility Planning System (SFPS) Data

OPNAVINST 11000.16 sets forth command responsibility for the shore activities, land, and facilities process. It also describes the responsibilities for land and facilities planning. The SFPS provides the method for determination of facility requirements necessary for the accomplishment of specific Navy missions and to ensure optimum use of existing shore activity assets. The SFPS provides the framework for a number of key evaluative activities relating to on-base physical conditions. Basic considerations of the SFPS include: understanding the current activity mission and defining the likely future mission; determining the personnel loading, and facilities and equipment requirements to carry out the future mission of the Navy region; evaluating the existing buildings and structures (assets) at the installation and categorizing them as either adequate, substandard or inadequate by Navy standards (Figure 21a on pg. 149); comparing the facility requirements with the assets; determining alternative methods for correcting deficiencies and/or disposing of surpluses; and, programming/budgeting of recommended planning actions.

The importance of the SFPS functions is that they quantitatively describe the existing physical and functional conditions of all major on-base facilities and structures. These analyses, in conjunction with the other quantitative functional and site analyses, form the basis for activity planning. As part of planning the region, several facility planning documents aid the Navy planner in assessing the condition of man-made assets. Using the Navy Facilities Assets Database, the planner can begin collecting the necessary engineering information for the analysis. The planner must use the P-80 as guidance in preparing the Basic Facilities Requirements (BFR)s. Existing assets are then compared to the requirements in the Facility Planning Document (FPD). These documents support the operational vision and provide the foundation for the facility and land use analysis. This, in turn, leads to an Integrated Priority List (IPL) of proposed construction and demolition projects to satisfy the overarching RSIP goals of the project.

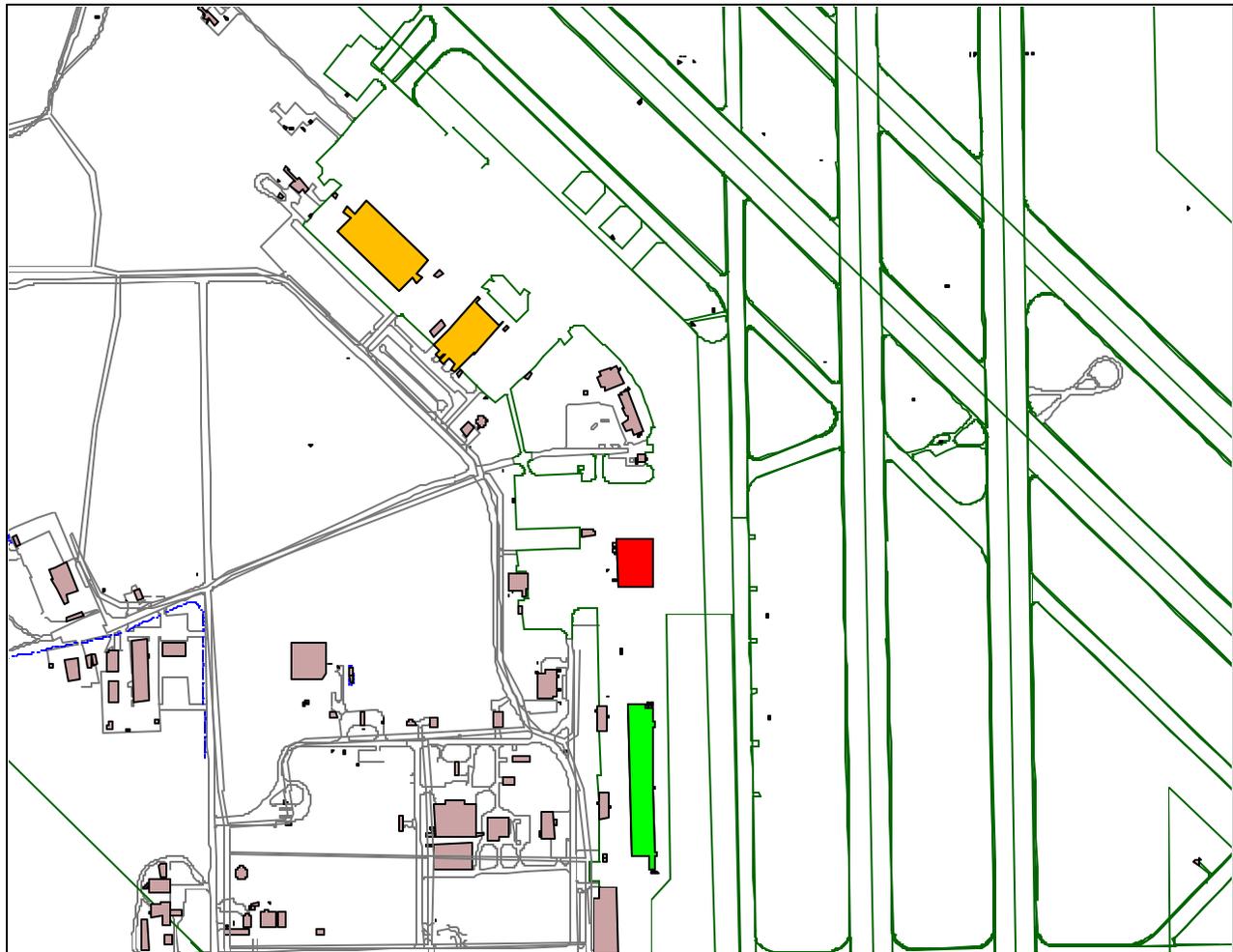
21.3.2 Land Use Relationships

Although the SFPS addresses the functionality of finite building and structure uses, there is a larger scale concern of land use relationships, which aids in describing the overall on-base conditions. Existing land use arrangements should be analyzed in terms of site location applicability and

land use compatibility criteria (see Figure 21b on pg. 150). Man-made site elements (i.e., roads, utilities, pedestrian systems, etc.) should serve land uses well, and natural site conditions (floodplain, soils, etc.) should be favorable for the particular use. Additional man-made constraints related to military operations, such as noise and safety concerns, must be combined with natural ones such as floodplains, wetlands, and endangered species sites in order to determine which lands have the optimal combination of opportunities

and constraints. Land uses can be described as either: compatible (having common characteristics for location, scale and intensity of use, and service/infrastructure needs); neutral (having no significant beneficial or detrimental effects on one another); or incompatible (unsuitable for location in close proximity to one another).

Figure 21a
Hangar Conditions - NAS Kingsville, TX



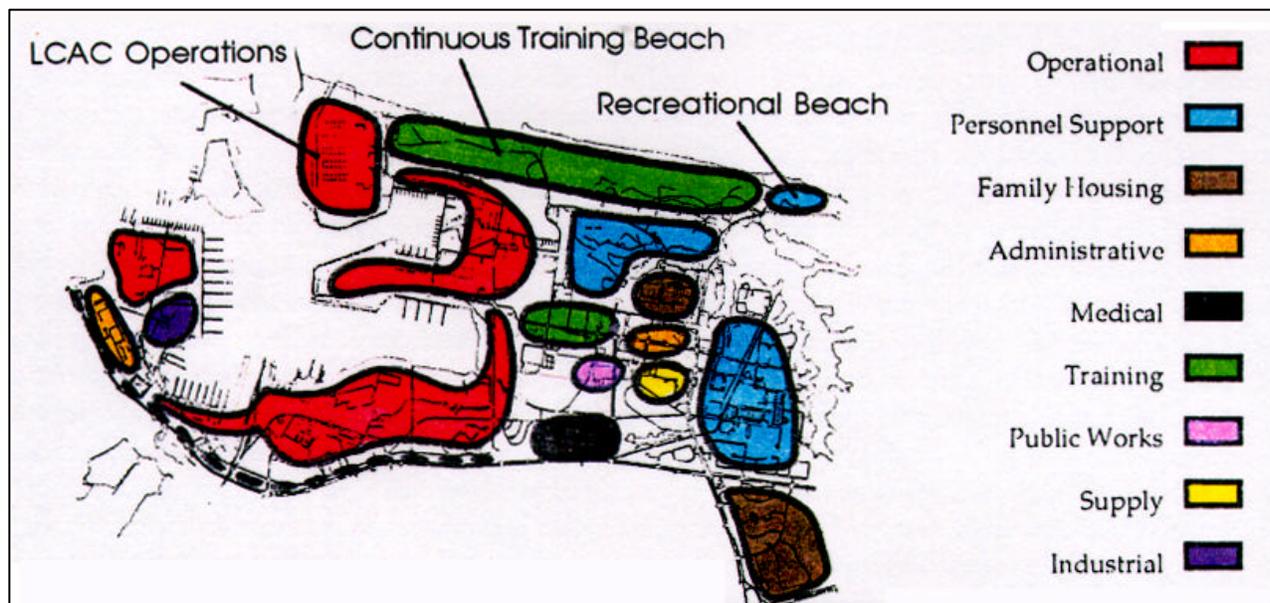
- Legend
- Adequate
 - Substandard
 - Inadequate
 - Airfield

**Facility Conditions
 Hangars - NAS Kingsville**

500 0 500 1000 Feet



Source: 1999 IWARS and Site Survey

Figure 21b**Conceptual Land Use Plan - Naval Amphibious Base Little Creek**

Source: NAB Little Creek Master Plan, 2000

21.3.3 Site Boundary/Access Conditions

Physical visual linkages between the activity and surrounding lands are key elements in planning.

All site access points should be evaluated and categorized in terms of their importance to the activity mission. Site vehicular entries should have circulation/parking systems that allow for the safe and convenient use by military and civilian personnel and visitors to the activity, while providing proper gate security systems. (See Chapter 29 for more details) The visual landscape quality of the entry experience should give a positive impression of the Navy installation and utilize well-designed activity identification, directional, and informational signing to guide motorists to their destinations.

Site perimeter orientation is an important physical condition directly relating to off-site conditions, particularly land use. Land use compatibility criteria should be applied to adjacent land use, and conflicts should be avoided or mitigated through the appropriate siting or buffering techniques.

21.4 Physical Facilities Factor Interpretation

21.4.1 Opportunities

- The SFPS process is a logical approach for identifying on-site building and structural needs, and it generates the program requirements for use in developing planning projects.
- Individual facility functional relationship problems identified in the SFPS process can be addressed in the larger planning context, through land use or circulation arrangement adjustments.
- Desired Navy land use compatibility relationships between generic land uses can be used as a major RSIP evaluation criteria element. A matrix format can display desired land use compatibility relationships and allow quick evaluations of land use plan arrangements.
- Part of the RSIP process provides an analysis of on-site natural conditions to mesh with the (man-made) physical conditions in the form of a combined constraints summary. The combined constraints are then evaluated in terms of development impacts to select those that determine the land's development suitability. Activity proposals in the preferred functional concept arrangements are compared to site development suitability to see how the plan element configuration is limited by physical/natural site constraints.

21.4.2 Constraints

- The SFPS process is primarily a quantitative programming effort that produces proposed alternatives for dealing with facility deficiencies and surpluses. Site-specific planning opportunities and constraints may impact the SFPS-generated project size, content and configuration; projects become well defined as the planning process nears completion.
- Land use compatibility problems often exist due to lack of planning earlier in the activity development period. Some of these incompatibilities can be mitigated through architectural or landscape architectural screening/buffering solutions. Severe incompatibilities may require major land use/building use changes phased over a period of years.
- Site entry zones may functionally extend beyond Navy-controlled property, particularly vehicle stacking space needed in rush-hour traffic conditions. Transportation improvements for these off-site impact areas should be considered in activity planning and brought to the attention of the local government agencies responsible for such improvements.
- Site boundaries are the areas most immediately susceptible to land use encroachment problems. If possible, generous (visual/noise) landscape buffers or architectural screening should separate incompatible Navy and non-Navy uses. Usually, a wide buffer strip is desirable between new on-site facilities and the installation property line.

21.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of physical conditions information on a specific proposed project.

- Is the proposed project designated in the Military Construction (MILCON) requirements list?
- Does the project have interrelationships with either new or existing activity areas?

- Does the project require updated documentation of the existing physical and functional conditions of an activity?
- Will the project result in any short or long-term changes to either the physical or functional conditions of an activity area?

21.6 Data Sources

1. Internet

- <http://www.navfac.navy.mil>
- http://www.efdlant.navfac.navy.mil/lantops_20/P-80/p80.htm
- <http://neds.nebt.daps.mil>
- <http://web7.whs.osd.mil/corres.htm>

2. Navy

- Activity Public Works Office or Facilities Management Office
 - General development maps
 - Base master plan or RSIP
 - Information on general activity conditions
 - Facilities maps
 - Utility maps
 - Facility MILCON and Special Projects reports
 - Property record cards
 - P-164s, BFRs, FPDs
- Engineering Field Division
 - General development maps
 - AICUZ
 - Activity master plan
 - Facilities maps
 - Facility MILCON and Special Projects reports

Other Activity Offices

- Division of Natural Resources Operations Office (Environmental Office)
 - Natural Resource Management Plan, maps
- Family Housing Office
 - Housing maps

ADDITIONAL SOURCES

- Range Command
- Naval Regional Medical Center

22.0 TRANSPORTATION SYSTEMS

Transportation systems are provided by governments at the federal, state, and local levels and by individual land developers at the site level. Transportation networks, including pedestrian, bicycle, auto, rail, and public transit, are all vital elements of a community's infrastructure. These modes of transportation are prevalent in the community surrounding an activity, and many are also present at the activity level as well. In the larger community, Metropolitan Planning Organizations (MPOs) assure the coordination of public transportation and other planning activities. These entities work with federal funding and coordinate local governments to ensure the development of multi-modal and efficient transportation planning programs. The networks influence the movement of people onto and around the activity, impacting the accessibility of employment at the individual activity. Transportation planners, traffic and civil engineers, and planners all work to assure quality transportation system development at both the MPO and local level.

A combination of public and private funding has historically, and currently, drives many improvement programs that are oriented towards the automobile, public transit, and alternative forms (bicycle and pedestrian) of transportation. Federal policy has traditionally guided the development of transportation networks, through providing guidance on investments in public transportation, construction of projects, and regulatory issues. Through legislative efforts such as the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and more recently, the Transportation Equity Act for the 21st Century (TEA-21), the federal government has stated its priorities in funding transportation-related improvements and programs across the nation. Providing funding through the Department of Transportation (DOT), TEA-21 targets a "balanced investment in highways, transit, intermodal projects, and technologies such as Intelligent Transportation Systems" (TEA-21, 1998). There will also exist a strong state and local flexibility in the use of designated funds, providing for greater local control over

DEFINITIONS

MPO – Metropolitan Planning Organization; Regional body coordinating intergovernmental planning studies and transportation efforts.

Intermodal – The use of multiple modes of transportation in reaching a destination, including air, rail, auto, bus, pedestrian, and bicycle.

Signalization – The regulation of traffic along road networks using a system of timed stoplights and other traffic control measures.

Volume/Capacity (V/C) ratio – The ratio of volume to capacity of traffic on road networks.

(HOV) - High-occupancy vehicle – Vehicle travel with more than 2 occupants on any given trip.

Paratransit – Utilization of pedestrian networks and bicycles as means of transportation.

ROW – Right of way; the area within which the roadway and utility corridors are located.

Flexitime – The scheduling of work times such that an 8-5 schedule is not required; The 8-hour workday can be flexibly structured throughout the day.

Level of Service (LOS) – A rating of the functionality of a transportation network, based on speed and efficiency criteria for different networks.

transportation decisions that fit specific locations and their relevant issues. MPOs and state DOTs will work together to create programs fitting local needs on a regional and statewide basis. Project initiatives fall under four main focus areas including the improvement of safety, protection of the environment, expansion of opportunity to disadvantaged, and the promotion of economic growth and trade.

22.1 Relevance to Planning Studies

22.1.1 *Regional Studies*

Public transportation planning is coordinated at regional and/or local government levels.

Transportation data should be readily available and applicable to available Navy regional studies. Navy studies at regional levels can be influenced greatly by regional/local transportation plans. The transportation network of an area provides the urban development growth framework. Working with the MPOs and local planners, Navy planners can assess the direction and intensity of new growth and its impact on an activity. The impacts are largely due to potential encroachment problems from urban development. It is essential for Navy planners to be aware of proposed area transportation policies and projects so that they can tailor their plans or attempt to influence those policies accordingly.

22.1.2 *Activity Plan*

Transportation planning is influential in activity planning at both the site and off-site levels. On-site planning efforts require in-depth analysis of traffic volume and trip generation data. Street layout, size, and parking are major issues to be addressed at the site level. Connections of Navy transportation systems to local public systems require coordination between Navy and local jurisdictions and MPOs. Urban mass transit service to Navy activities can alleviate some of the on-site road and parking needs due to reduced private vehicle usage on-site.

22.2 Relationship to Other Resource Areas

Major transportation facility development can greatly impact the man-made (particularly in urban areas) and natural environment, and thus relates to such data categories as: comprehensive land use planning, natural site conditions (soils, topography, hydrology, etc.) and potential noise/safety/air quality impacts. Energy usage and conservation relates directly to the available transportation systems, their efficiency in carrying passenger volumes and their fuel consumption.

Transportation data relates strongly to land use. Transportation planning is primarily focused around planning for auto trips, the primary means of movement in the U.S. These trips are generated by types of land use where people originate and conclude their movement as well as the location of the use in relation to other nearby facilities. In addition to land use, the presence of utility systems is closely related to transportation due to their location in street rights-of-way. Land development patterns are greatly influenced by existing and proposed transportation improvements. The presence of road networks “opens up” land for development, providing access to land previously unavailable for development. The economic health of an area also depends on quality transportation services, for personal mobility and

commercial/industrial growth. Mass transit systems can reduce auto trips and traffic congestion, thus improving air and noise environmental quality as well as reducing auto accident potential.

22.3 Primary Transportation Planning Factors

22.3.1 Street Systems

Streets serve many purposes in addition to carrying motor vehicles. On-street bicycle and moped traffic has increased dramatically over the past ten years. Street rights-of-way provide space for sidewalks, bikeways, above and belowground utilities, signing, landscaping and other streetscape elements. New development areas can be planned with a street system which is hierarchical in design standards; traffic capacities; and uses served, and provides the primary structure or framework for the community. The three general classes of streets can be described as follows:

- *Freeways, major arterials, arterials* (Traffic streets, whose major function it is to carry vehicles);
- *Major collectors, minor collectors, loop streets, cul-de-sacs* (Service streets, which carry traffic and serve adjacent land uses)
- *Major and minor connectors, and parking connectors* (Connectors, which connect land development with traffic streets but do not serve adjacent land uses)

Several types of information must be collected in order to understand the transportation network and its potential impacts on the region's movement, land use, and physical development. Some data will provide the traffic engineer with information related to the efficiency of the vehicle movement on the existing network, thus impacting the flow of all vehicles. Other data will provide information on volume of the network as related its designed capacity. All of the data relates to each other, providing an overall picture of how much a system can handle and the most efficient methods of moving vehicles on the roads. Traffic engineers and planners use these sources of data below as the foundation for assessing the current system and planning for future improvements. Data necessary to be collected includes:

- Traffic Volumes - Average Daily Traffic (ADT), peak hour volumes, etc.
- Types and location of land use in relation to road networks
- Information on turning movements;
- Signalization of intersections (location and timing of traffic signals)

As part of analyzing the flow and efficiency of the street network, the level of service (LOS) is determined which is a measure of the effect on capacity of prevailing roadway and traffic conditions. Roadways are assigned a LOS rating from A to F, indicating the degree of free-flowing traffic and delay present. See (Kaiser, et al, 1995) for greater detail on LOS calculations in transportation planning.

22.3.2 Transportation Demand Management (TDM)

Transportation demand management is a planning approach that attempts to exact more efficiency and

effectiveness from existing highway, pedestrian, bicycle, and transit systems. TDM provides multiple transportation planning solutions of differing characters, including combined public and private travel modes (mass transit, pedestrian, bicycle, high-occupancy vehicles (HOV), etc.) and peak traffic time manipulation methods (flex-time programs, on-ramp metering). Using techniques to manage the flow within the system, planners can better coordinate long-term demands with existing resources available.

With the resurgence of building high capacity rail and bus mass transit systems has also come interest in the use of “paratransit” alternatives, such as car/van/bus-pooling and demand-responsive (dial-a-ride) services. Large governmental and private employers have formed van and carpool programs to reduce commuting costs for employees, street, and parking congestion and air pollution problems. Dial-a-ride services are considered most suitable for low-density areas and for service to those with restricted mobility.

Data necessary to collect includes:

- Flex-time program information (basic time segments by major employers);
- Statistics on usage of HOV lanes;
- Bicycle/pedestrian systems;
- Car and vanpool schedules and route information

22.3.3 Land Use Trip Generation

People decide their mode of transportation based on various factors, including proximity, ease of access, time available for travel, value placed on time, and income available for transportation services. Through past studies, transportation planners have found that vehicle trip generation characteristics are similar for comparable land use types. Transportation planners have developed land use and intensity-based data that can be applied to alternative future land use plans; therefore, land use alternatives can be evaluated and transportation systems can be planned more effectively. Trip generation can be figured at both the activity and community levels. While trip generation rates cover a broad range of land uses, they would not include specific military uses.

Transportation planners must assess both the origin and destination of trips (Figure 22a on pg. 157). Thus, understanding the type of land use at the origin will enable the planner to assess how much traffic will be generated (in general terms). The Institute of Transportation Engineers (ITE) Trip Generation Manual will assess the planner in assigning standard values for figuring the amount of traffic generated in specific scenarios. General land use categories for which trip generation tables are available include:

- Residential (at varying densities);
- Commercial-office and commercial-retail (at varying intensities);
- Industrial (by intensity of use);
- Public and semi-public (schools, hospitals, public transportation terminals, etc., by user/vehicle intensity).

The density of units can be used to calculate how many trips are generated per acre, providing useful information for determining the amount of traffic generated by new development.

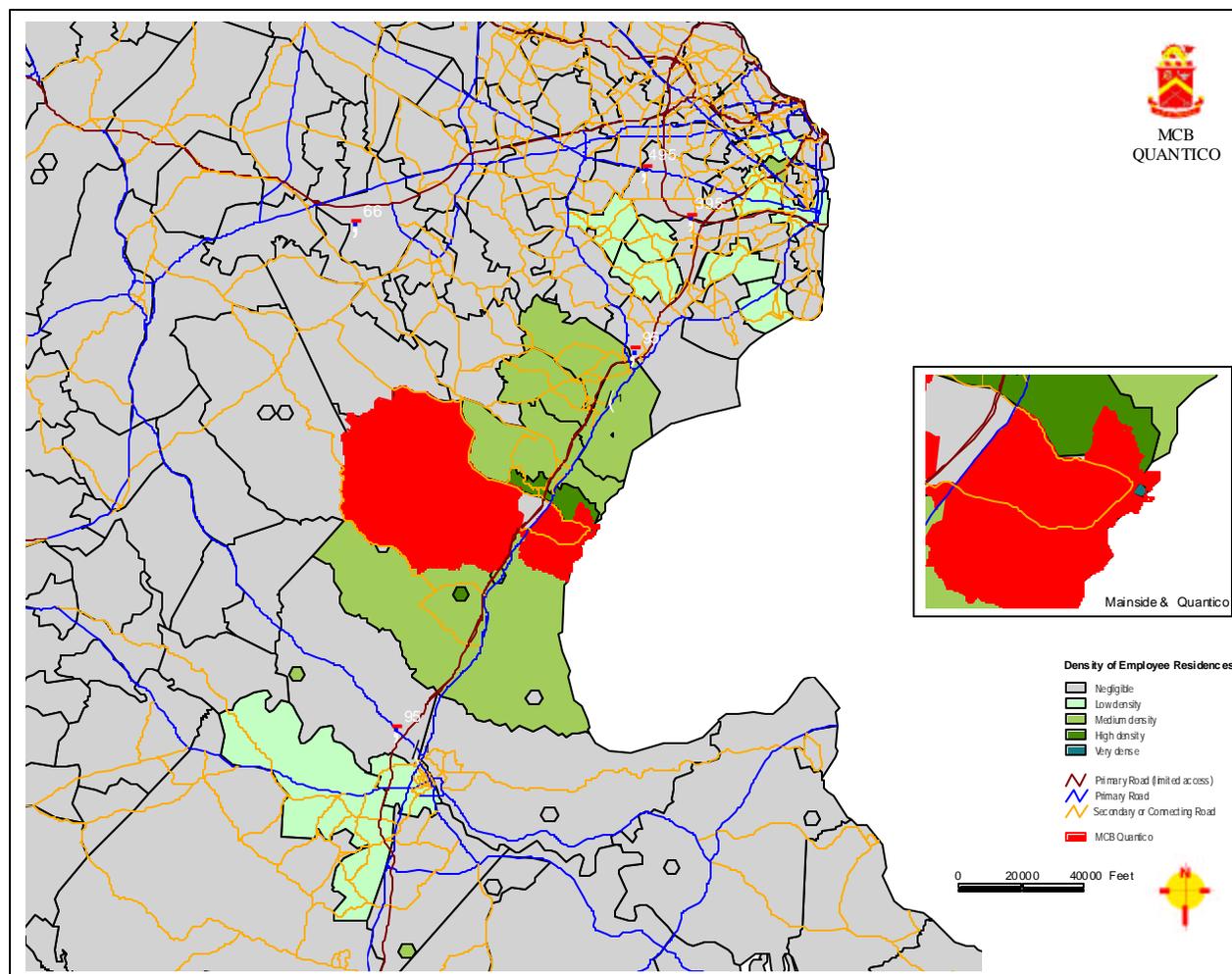
Data necessary to be collected includes:

- 24-hour ADT;

- Peak-hour;
- Vehicle occupancy; and
- Parking.

Figure 22a

Density of Employee Residences by Zip Codes - MCB Quantico



Source: Transportation Management Plan, MCB Quantico, 2000.

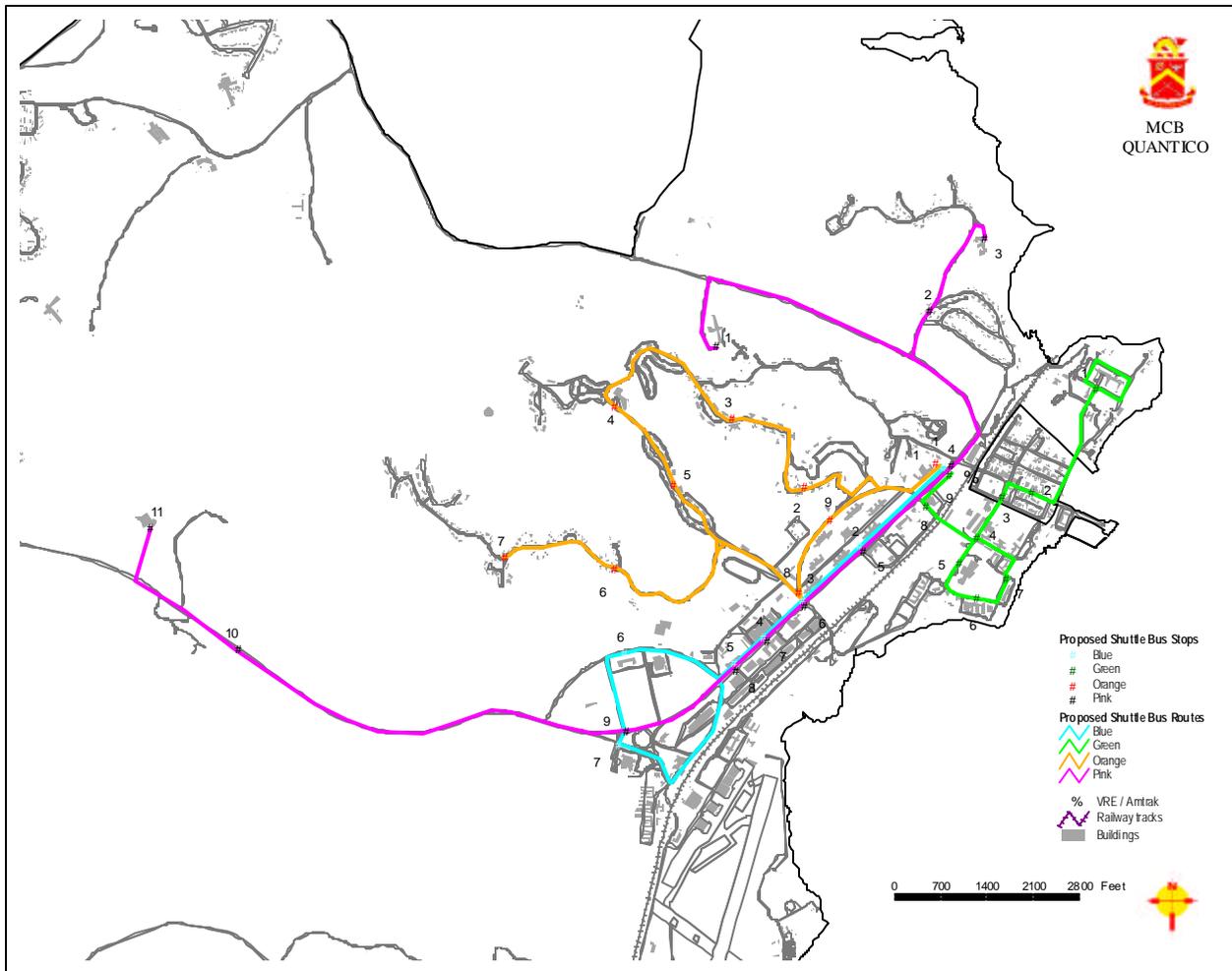
22.3.4 Mass Transit

Although grade separated, fixed-rail rapid transit systems often come to mind when one thinks of urban “mass transit”, these systems are not the main providers of public transit across the country. Conventional, fixed-route, and scheduled bus service remains the predominant mass transit system (Figure 22b on pg. 158), while light-rail systems are being constructed in major cities throughout the country. To achieve social, economic development and environmental goals, mass transit systems are often subsidized since it is difficult to make public transit “pay for itself”. Public bus systems usually provide intensive service during weekday morning and afternoon peak travel times and greatly reduced service late at night and on weekends. Mass

transit systems are most prevalent in urbanized areas, providing access to naval facilities along major routes. Communities outside urban areas often do not have the population density or demand necessary to support extensive public transportation systems that may serve naval facilities.

Figure 22b

Proposed Shuttle Bus Routes - MCB Quantico



Source: Transportation Management Plan, MCB Quantico, 2000.

22.3.5 *Parking*

Parking is a key element in transportation planning. Much of the parking is often directed to off-street surface lots or parking structures (above or below ground) rather than depend solely upon on-street parking. Traditionally, the Navy has not supported the use of parking structures at their facilities, however, the surrounding community and private developments utilize them where land is scarce and parking is needed. As in the case of trip generation, different land uses have varying parking requirements. Residential use parking requirements are usually based on the density of dwelling units or the number of bedrooms per unit. Public and semi-public use parking needs are based on the number of users and seats (as in theaters). Commercial/office/industrial use parking is related to the square footage of the buildings. Parking structures are efficient for parking in areas where developable land is scarce, although the construction cost per square foot is many times higher than that of surface parking. Shared parking between uses that have different peak parking demand times is a method that can minimize total site parking requirements.

Several factors are important to consider in determining parking demand for a project at a Navy facility. The ITE Parking Generation Manual provides many standards used in figuring project impact. Some of the more important ones include:

- Land and building use;
- Parking space availability;
- Accessibility; and
- Number of employee and visitor users.

22.3.6 *Bicycle/Pedestrian Systems*

An important aspect of current transportation planning is the augmentation of auto vehicular systems with pedestrian and bicycle circulation systems (Figure 22c on pg. 160). Now considered a valuable TDM element, pedestrian/bike systems can reduce the vehicle trips and parking requirements for new development projects. Pedestrian/bicycle systems should be hierarchical in design and layout, responding to land use type location and intensity.

Encouraged under the current TEA-21 legislation, bicycle and pedestrian systems are increasingly important project elements to provide at both the activity and community level. As traffic congestion and air quality concerns grow, bicycle and pedestrian modes of transit will become increasingly popular. Density of development and location of uses are both necessary to foster the use of pedestrian and bicycle systems, as services must be closer than in an auto-dependent environment. Developing future facilities that are friendly to pedestrian and bicycle oriented transportation, such as mixed-use development, could help decrease the dependency of many military on their automobiles within the activity boundaries.

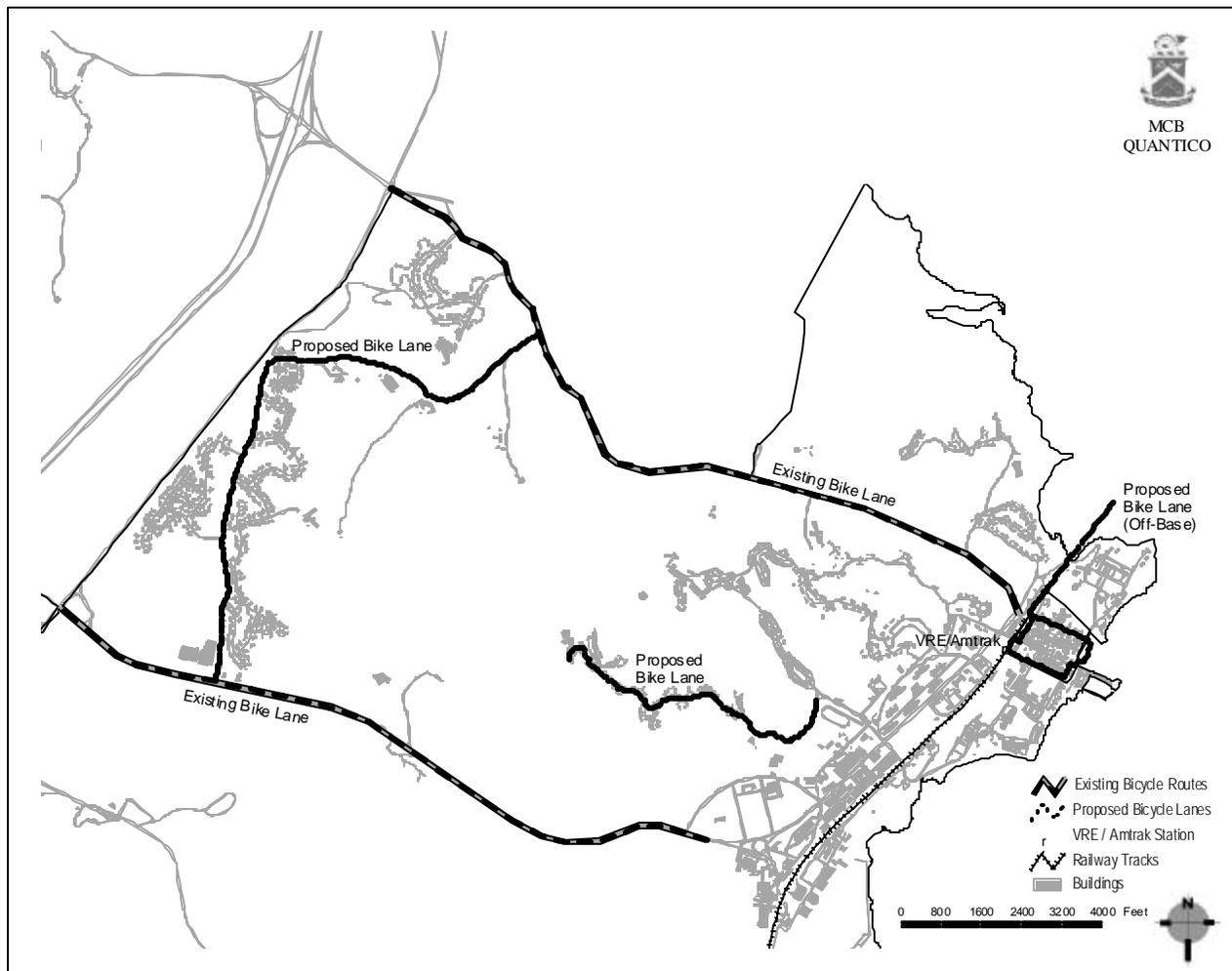
22.3.7 *Service Railroads*

Railroad spurs provide commercial and industrial supply transport to development sites. Existing rail lines offer the potential new spurs to proposed supply, manufacturing or utility sites. Safety, noise and functional criteria, as well as land use compatibility and buffering of ROWs,

should be utilized in planning rail facilities.

Heavy rail also provides transportation alternatives in some metro areas for commuters to and from military sites. MCB Quantico, in the Washington DC area, is near a stop for the heavy-rail regional commuter train to downtown DC. This option enables employees and staff to escape the gridlock of automobile traffic on the surrounding freeways.

Figure 22c
Bicycle Routes - MCB Quantico



Source: Transportation Management Plan, MCB Quantico, 2000.

22.4 Transportation Factor Interpretation

22.4.1 Opportunities

- Transportation systems can define and serve land use areas through providing the proper hierarchical road/path type for those uses and volumes of trips. Properly planned transportation systems reinforce the site development organization and clearly direct users through the site in a safe, efficient manner.
- Pedestrian/bicycle systems and mass transit services can augment auto vehicular transportation systems to provide a more efficient, less costly overall transportation network.
- The use of land use trip generation tables can aid the planner in evaluating the transportation impact of various plan alternatives. Land use arrangements and intensities can be adjusted and moderated through an understanding of proposed individual and cumulative development site transportation requirements.
- The use of shared parking concepts can reduce the total parking requirements for a proposed complex. If they are compatible in other respects, certain land uses that have different peak parking demand times can't share the same parking areas. An example of this is an office complex (weekday peak) sharing parking facilities with a church (weekend peak) or a theatre (nighttime peak).
- The TDM planning approach allows the examination and use of a variety of transportation alternatives to serve a proposed development project. For instance, the provision of a quality pedestrian/bicycle system linking residential areas to the workplace can reduce auto vehicle trips generated by those uses, improve air quality, and provide outdoor recreation opportunities.
- Mass transit service can greatly reduce peak hour auto traffic volumes to employment cores. Since public system routes are often based on political, social and economic development objectives, it is possible that Navy activities that would not qualify for bus service solely on ridership volumes could obtain that transit service by virtue of other transit system objectives.

22.4.2 Constraints

- Many Navy sites were developed in the 1940s when per capita auto usage was lower for Navy personnel; therefore, streets and parking areas were inadequate by today's standards, particularly at urban sites. Such situations may lead today's planner to consider TDM measures (such as flextime, car or van-pooling, pedestrian/bicycle systems, and bus service) in addition to standard vehicular circulation planning techniques.
- At-grade railroad crossings may cause safety and traffic congestion problems. Grade separated intersections should be provided when the frequency and schedule of train usage conflicts with auto vehicular and pedestrian system patterns.
- Many rural sites are totally dependent on auto vehicular transportation service. These situations will require extensive parking areas; these parking zones should be located peripherally, but in proximity to major activity nodes.

- Off-site roadway congestion can create problems for Navy activity functions, particularly at gate entry areas. Navy planners should coordinate with local government planners to assure provision of public transportation improvements that are compatible with Navy transportation needs and efforts.

22.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in evaluating the relative importance of transportation information on a specific proposed project.

- Traffic circulation requirements are directly related to land use since each type of land use (housing, commercial, supply, etc.) generates its own type and volume of traffic. Does the plan generate any land use changes that necessitate circulation systems changes?
- Are there existing congestion problems that could be alleviated by roadway capacity improvements such as signalization, road widening or parking restrictions, or by a ridesharing program?
- Are there particular areas where a high accident frequency may justify roadway characteristic changes (speed limit, geometrics, and intersection control)?
- Do parking shortages exist or will proposed projects generate additional parking requirements?
- Will the project activity generate changes in the demand for rail, air, or water transportation systems in the area?
- Will the project alter activity access patterns by opening a new gate, closing an existing gate, or changing traffic patterns or volumes?
- Will improved pedestrian and/or bicycle path systems help to alleviate project vehicular circulation or parking congestion?

22.6 Data Sources

1. Internet

- <http://www.planning.org/govt/tranguid.html>
- <http://www.fta.dot.gov/library/planning/MTPISTEA/424MTP.htm>
- <http://www.fhwa.dot.gov/tea21/summary.htm>

2. Activity

- Public Works Office
 - Base traffic counts/surveys
 - Base traffic/transportation plan
 - General development maps

3. Regional/Local

- Council of Governments (COG)
- Local Planning and/or Engineering Department

- Area/regional transportation plan
- Regional land use plan, transportation component
- Transit ridership data/reports
- Airport transportation studies
- Support service plan/report
- Traffic surveys

4. State

- Department of Transportation/Highways
- State transportation plan
- City/Regional/County/Transportation Studies/Plans

23.0 UTILITY SYSTEMS

Utility systems are those groups of devices, objects, or organizations forming networks, especially for distributing services (such as electric power or water) to public, private or institutional users. Municipal and Navy-owned utility Systems provide the necessary services to Navy activities. Regional or municipal utility services include water supplies, treatment facilities, and distribution systems; wastewater collection systems and treatment facilities; and solid waste removal and disposal systems sites. Public utilities not usually under municipal control include: electric power, natural gas, and telephone services.

23.1 Relevance to Planning Studies

23.1.1 Regional Studies

Many utility systems are regional or citywide in scope and administration; therefore, there is usually a great deal of data that is readily applicable to Navy regional studies. Long range utility goals and objectives and policies by local governments and authorities must be evaluated in regard to their potential impact on Navy missions in areas served by those utilities. The Navy should play an active role in policy and goal formulation to assure the provision of the required Navy utility requirements over the short and long term. Utility system location, particularly that of water and sewer, is a key urban growth determinant to be considered by Navy planners in terms of potential future encroachment pressures on Navy facilities at all scales.

23.1.2 Activity Plan

Utility systems information is directly applicable at the activity planning level. Existing capacity data and system layout plans are available from local utilities for use as a detailed site-level baseline. Future plans and capacities are less explicit but become more finite as individual facilities are planned to accommodate urban growth. Connections of Navy utility systems to local public systems underscore the need for coordination between Navy and local public planners and engineers.

Many utility systems, including water, sanitary, and storm sewers, are the activities' original systems. The decay of this essential infrastructure is impacting operations at Navy activities throughout the service. Future attention must be given to these systems if operations are to continue.

DEFINITIONS

APFO – Adequate Public Facilities Ordinance; Local government ordinance that requires provision of adequate facilities and infrastructure as a condition for permitting development.

Treatment Plant – Location where wastewater is treated (cleaned) through three processes before being released back into surface waters.

CATV – Cable TV System

PSTN – Public Shared Telephone Network; Network over which telephone calls are transferred and delivered.

ISP – Internet Service Provider – The company providing the means for one to connect into the internet.

23.2 Relationship to Other Resource Areas

Utility systems information relates to natural resource supplies (such as water, gas, and oil) which fall under the broad data categories of hydrology and geology. Utility systems location often coincides with that of transportation systems. Land use and comprehensive planning efforts are strongly dependent on utility provision and location as determinants of urban growth.

Natural site conditions (soils, topography, hydrology, geology, etc.) affect utility placement, particularly underground utilities. Utility systems are often laid according to topographical features of an area, depending largely on gravity as the main means of transport of liquid to gathering places such as treatment plants for sewers. Archeological and historic sites may be unearthed or disturbed during underground utility placement.

23.3 Primary Utility Systems Planning Factors

The provision of utilities opens up land for development, much like the introduction of transportation networks. Funded primarily through the local budget, which is supported by taxes, the provision of utilities is an expensive undertaking for any community, as well as Navy activities. Many communities now require utilities to be in place before development is allowed to commence, often regulated through Adequate Public Facilities Ordinances (APFO). While other services are included, water and sewers are primary targets of these ordinances. Developers are also required to pay impact fees for new development in many communities, offsetting the costs to the jurisdiction of extending water and sewer lines as well as other services such as schools and parks. Cost and potential for new development are the key factors in considering the utility planning factors both in the community and at a Navy activity. Navy planners should consider these impacts in developing cost-efficient facility plans and programs.

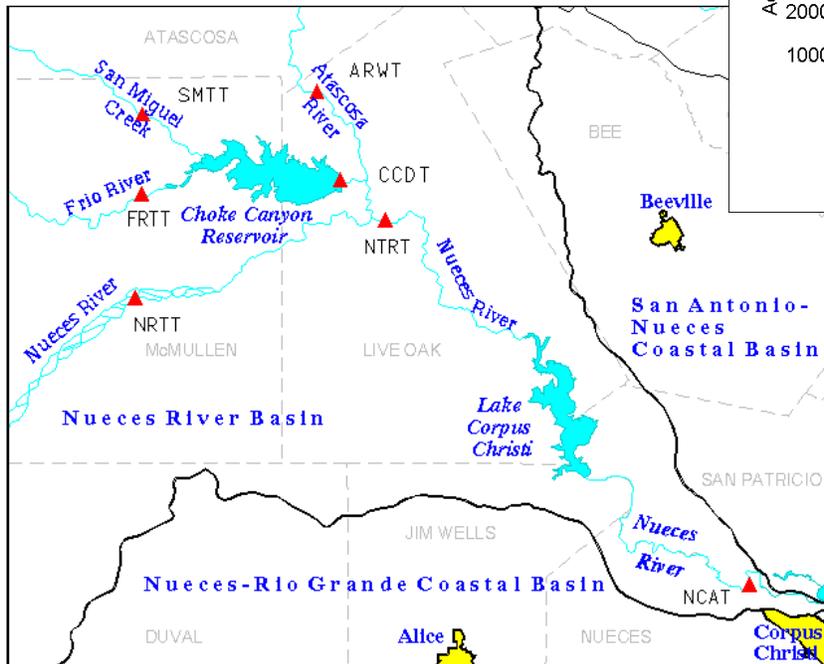
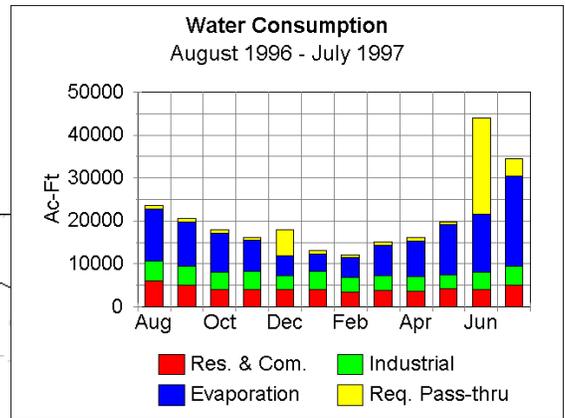
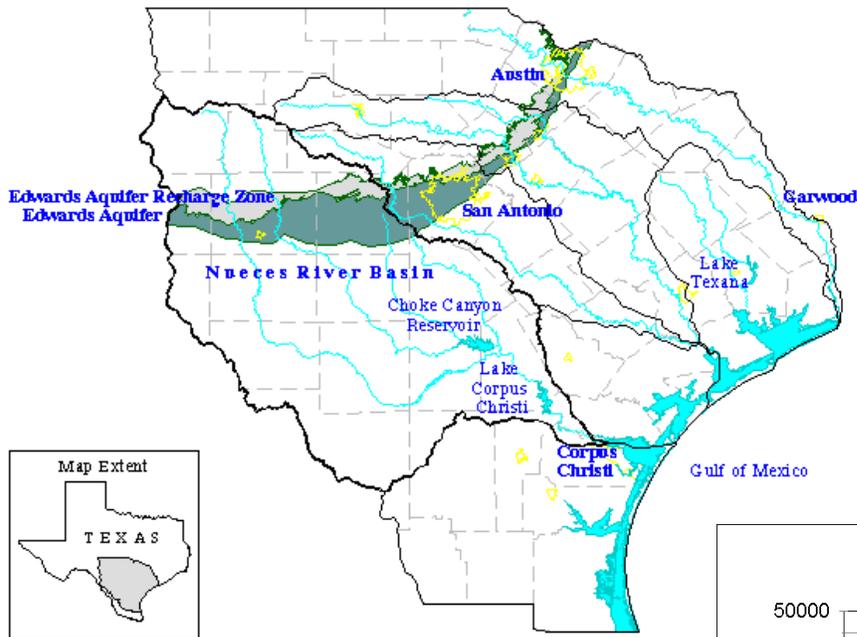
23.3.1 Water Supply

The provision of dependable potable water is a service necessary for all permanent living and working developments, whether they are cities or individual sites. The water demand for personal purposes (drinking and bathing) is dramatically lower than the overall water needs for residential, commercial, industrial and recreation uses (Figure 23a on pg. 166). For instance, our total need can average as much as 100 to 150 gallons per capita per day (due to personal use, residential, commercial, industrial, etc. use requirements). Peak demand of water use is considerably greater than the hourly average; adequate water supply must be available to meet this peak pressure and quantity demand. Rural and urban fringe sites frequently depend upon individual wells for water supplies. When densities increase in an area to the point where it is no longer possible to use on-site water supply (wells) and sewage disposal (septic fields/lagoons) safely, there is a need for public water and sewer services.

A water supply system is comprised of a source, a linkage system from source to treatment plant, a treatment (purification) plant, and a distribution system. The link from the source to the treatment plant may be a gravity or pressurized system. The distribution system is pressurized and may be one of two basic types: the gridiron system which allows water to flow in more than one direction in a loop arrangement; or, the dead-end system which is a dendritic pattern of successively smaller branches emanating from the central supply line (see Figure 23b on pg. 167).

Figure 23a

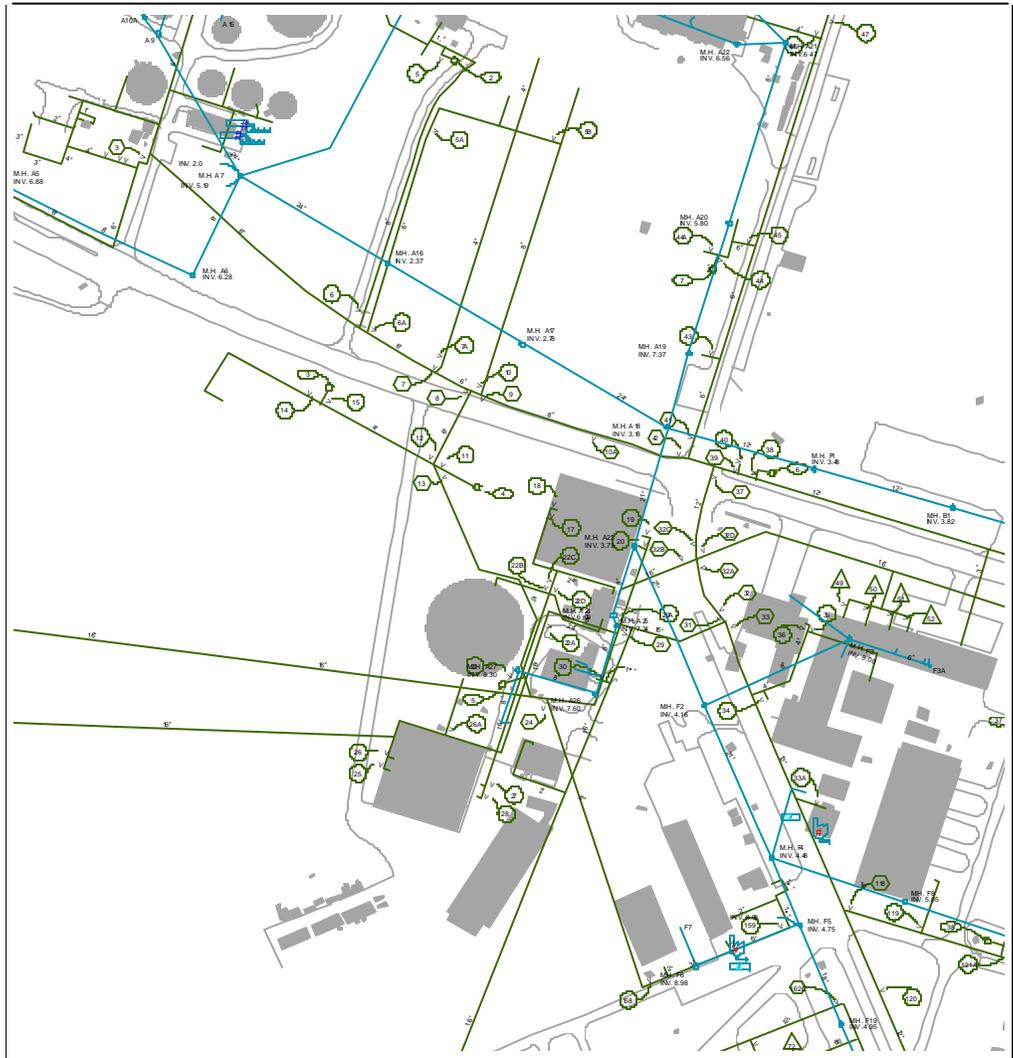
Water Supply System - City of Corpus Christi, TX



- GAUGING STATIONS**
- SMTT: San Miguel Creek at Tilden
 - FRTT: Frio River at Tilden
 - NRTT: Nueces River at Tilden
 - ARWT: Atascosa River at Whisset
 - NTRT: Nueces River at Three Rivers
 - NCAT: Nueces River at Calallen
 - CCDT: Pass Through from Choke Canyon Reservoir

Figure 23b

Water Supply and Waste Water System for NAS Corpus Christi, TX



Source: NAS Corpus Christi Public Works and Engineering, 1998

23.3.2 Wastewater

Although the provision of a suitable sewer system is necessary for the maintenance of the public health and welfare, there is a strong link between sewer infrastructure location and major land development patterns. In low development intensity areas or sites where the soil and hydrologic conditions are suitable, on-site sewage disposal systems may be utilized in an environmentally acceptable manner.

A wastewater treatment system is comprised of a collection system, a treatment facility, and a disposal system. Besides residential, commercial and other land use wastes, there may be stormwater and groundwater infiltration volumes contributing to the total flow of urban sewer systems, although some cities have separate stormwater collection systems. Population, land use, and infiltration projections are used to determine future sewer system requirements. Sewer pipes must be sized to carry peak flows; usually, the smaller the upstream (user) population, the larger the ratio of peak flow to average flow volume. Sewer systems are most economical when they are gravity flow types, but force or pressure main systems are often utilized in flat terrain areas and have the benefit of flowing in two alternate directions.

23.3.3 Solid Waste Management

Solid waste collection and disposal may not be the direct concern of every activity planning effort, but the service must be provided by either Navy, other governmental or private systems. The major planning issue of solid waste systems is that of landfill or dumpsite location, operation, and use. Federal and local regulations prohibit burning of dumps and require daily minimum cover-age of six inches of clean soil over deposited waste. Both these actions have caused existing landfill sites to be filled more rapidly, creating a demand for new sites. Former landfill sites can be valuable community development sites (particularly for recreation) if they were properly operated during their life and they have been capped and reclaimed according to the strictest standards.

Frequency of refuse collection is directly related to the cost for the service. Efficiency in collection activities can be gained through use of combined curbside pickup from standard containers in residential areas and "dumpsters" in commercial/industrial areas. Recycling programs where refuse materials are separated at the source (before they are mixed) have been successful in many communities. Once collected, solid waste must be taken to the disposal site. If the landfill is not convenient to the service area, the concept of the transfer station may be employed. The collection vehicles deliver the refuse to a central point where it is compacted and transferred to larger vehicles which then transport the material the longer distance to the landfill site.

The options for final disposition of solid waste include: marginal volume reduction on-site and shredding for volume reduction; and resource recovery combined with one or both of the previous methods. Suburban and rural communities will likely utilize the low cost landfill solution for final solid waste disposal. Urban areas may not have the land availability for such an option; therefore, they may utilize advanced, more expensive, treatment processes.

23.3.4 Other Utility Systems

In addition to water, sewer and solid waste services, natural gas, electric power, telephone and other communications services are also important in planning Navy activities. These services are usually provided by public agencies, quasi-public companies, or private companies and are governed by federal, state and/or local authorities. Many of these technologies, particularly the newer ones in the phone and

internet arena, relate to extremely complex standards based on rapidly changing technology. They are influenced by government policies, with multiple national variants as well as relating to a tariff controlled system. At the activity level, Navy planners must consider how to plan for the location and service of these utilities long-term. Similar in general location to water and sewer lines noted above, the utilities below, including electric, phone, fiber optic, and gas all should be designated in locations that are easily accessible for regular servicing without creating disruption in other areas of the activity. Utility corridors are a viable planning tool that designates land area under which the utilities lie. This land is kept free of major development and encumbrances, allowing the easy access to lines for repair and replacement. Traditionally, utility lines have run under the roads and sidewalks, however, disruption in traffic and pedestrian circulation is the norm when servicing or replacement of utilities is required. Planning utilities within a corridor can often result in the most efficient path, lessening the costs of extra lineage potentially required.

23.3.4.1 Gas

Gas systems include all facilities and functions required in conveying natural gas to the individual user. Primary system elements include: collection facilities; transmission lines from source to distribution points; and, the distribution lines from these points to individual users. Gas systems have branching or looped patterns, and lines are usually laid within the street right-of-way.

23.3.4.2 Electric

Electric power systems are comprised of all the functions and facilities required to deliver electric power to the user. Major system features include: generation systems (hydroelectric, nuclear, coal-fired, etc. plants); transmission systems (bulk power carriers and associated switching and substations); sub-transmission systems (bulk power carriers from transmission systems to distribution system substations); and, distribution systems (power systems connecting sub-transmission systems to individual user meters). Major electric utility issues focus primarily on power-plant developmental issues and overall cost issues.

23.3.4.3 Cable TV

The idea is simple. Divide the frequency spectrum into small ranges and broadcasting station a particular range to transmit audio/video/data. The frequency ranges are regulated by FCC (Federal Communications Commission). In cable TV systems, waves travel through a coaxial cable that can support a far higher range and also higher quality of reception than traditional antennas. As technology evolved, signals came from satellites revolving in geosynchronous orbits and transmitting waves to cable systems. Dish antennas (large in size) are used to receive waves from very far off distances. As technology improved and better compression techniques evolved, cable systems allowed a very large number of frequency ranges or channels.

Today, most cable TV systems use fiber optic cables to carry information from homes to the head-end, the location where the cable system receives programming from various sources, assigns the programming to channels, and retransmits it onto cables. Fiber optic cables don't suffer distortion and noise as much as coaxial cables, hence, an improved picture quality. Digital television channels now digitize the analog waves, (turn them into 0s and 1s), encrypt them, and send them through the cable systems.

23.3.4.4 Cable modems

The very same infrastructure that brings cable to home over optical fiber cables is now gaining popularity to also bring internet to the individual home. This technological device is called cable modem. Through the use of cable modems, the cable company also becomes your Internet Service Provider (ISP). Each television channel in the wire cable (whether co-axial or fiber) is 6MHz. It is very small compared to the overall capacity of the cable. Hence, internet comes to you as another 6MHz channel just like a regular TV channel. The only difference is that the internet channel has different bandwidth downstream and upstream. Cable TV has no upstream requirement, however, internet access does. The idea is to use lower bandwidth for upstream than downstream. People download more than upload on the internet. Hence, downstream bandwidth for internet data is 6MHz like any other cable TV channel and upstream is 2MHz. Also, internet access requires special equipment both at the customer premises, called the cable modem, and at the head-end or cable company's premises called the Cable Modem Terminating System (CMTS).

23.3.4.5 Telephone

Telephone and other wire communications systems are similar in planning requirements. An important consideration is the need to provide continuous telephone service, especially as it relates to insuring military operational and emergency communications dependability. Other features of telephone systems are: the central switching/administrative facility and external facilities consisting of interstate long distance and city-to-city circuits, local trunks and local customer loop circuits. The telephone system is comprised of traditional systems with stationary lines, or mobile cellular phones.

A standard telephone can be analog or the more recent digital telephone. The PSTN (Public Switched Telephone Network) is hierarchical. Consider an apartment complex with about 100 units and each unit has a phone line. A phone line that connects to your phone or modem is a pair of twisted copper wires. All these lines get aggregated in to a box some place in the complex and the box is connected to the local exchange or end office. A set of local exchanges, usually geographically adjacent, are connected to a central office. It's like the Postal Service. The local post office sends the mail to a larger post office if it has to go outside the town.

The cellular network is a mobile communications system that uses a combination of radio transmission and conventional telephone switching to permit telephone communication to and from mobile subscribers within a specified coverage area. Mobile communication devices (for example, cell phones and pagers) send and receive signals from a cellular base station, which provides service within a coverage area known as a cell. The cellular provider's coverage area consists of multiple cells, each with a specific number of frequencies that can be assigned to users requesting service. The actual size and number of cells within a coverage area is dependent upon the availability of frequencies. As the number of subscribers within a coverage area increases, the total number of cells tends to increase as the size of each cell decreases. Mobile Switching Centers (MSCs) provide the interface between the radio-based cellular base stations and the PSTN. The MSC performs all of the signaling functions required to establish calls to and from mobile stations.

23.3.4.6 The Future

The future of these utilities is dependent upon technology. Currently, combined voice, video and data is the direction for future planning and considerations: Both telecommunication networks and data networks are converging. Cable modems can be used to send audio/telephone data to other subscribers. Similarly, telephone data can traverse through the internet to be received by another subscriber. So, a telephone call

would be like sending an email; cheap, affordable, and may be combined with video and other features. The key here is services, the "unified messaging", "follow me" service. All of them depend on our ability to be able to combine the telecommunications networks with the packet networks (internet) and provide services over the internet. This in networking terms is called "Next Generation Networks".

Navy planners must consider these technological advances in utility services. Historically, the Navy has been in the forefront of technological advances on activities and within regions. Understanding where the technology is heading will equip the planner with the necessary tools to aid their region in achieving the functionality that accompanies new advances in communication and operations. Understanding the state of technological utilities in the surrounding community is also key, as many of these advances depend upon a network and infrastructure to support such improvements.

23.4 Utility Systems Factor Interpretation

23.4.1 Opportunities

- Quality utility infrastructure system allows for potential Navy facility growth with few service constraints. On-site utilities can be expanded to serve new buildings and other operations as long as the capacity of the system will accommodate new volume requirements. Cost may be the largest deterrent to expansion, and projects should consider this factor in planning location of new facilities.
- Per capita and land use-based utility use rates can be used by Navy planners to evaluate the potential utility systems impacts of proposed plan alternatives.
- On-site utility systems such as wells and septic facilities can be options for the use of large-scale wastewater collection treatment systems or off-site water supply usage, especially in remote sites. However, environmental considerations must be addressed to ensure local conditions permit the use of septic facilities and wells.
- Utility use patterns on-base can be altered so that the peak demand times are "spread out" over a longer time frame. This reduces the system and supply capacity needs; although, care must be taken to assure accommodation of emergency and military operational peak loads.
- The designation and development of utility corridors (associated at points with transportation corridors) can result in more efficient land use patterns and the potential to buffer unsightly utility uses effectively.
- Overhead utilities should be located in the landscape with a minimum vegetative impact, and should be screened from view of major activity areas on-site. Whenever possible, utilities should be placed underground in utility corridors.
- Stormwater collection, retention, and detention facilities can be utilized to reduce soil erosion and sedimentation while offering open space amenities (such as ponds and grassy swabs).
- Major utility substations should be located with land use compatibility in mind and visual screening should buffer incompatible adjacent uses. Some utility elements, such as water towers, can be site focal points or landmarks.

23.4.2 Constraints

- Overhead utilities can be unsightly and should be relocated underground whenever possible. Ideally, utility corridors under streets should be used, but a potential problem associated with such locations is traffic disruption for needed repairs.
- Some development sites are not served by municipal utilities, thus, on-site water supply and wastewater treatment facilities must be provided. Natural environmental constraints such as topographic, soils, hydrologic, water quality and geologic characteristics must be considered when planning wells and septic systems, as well as other underground facilities.
- Soil erosion and sedimentation controls and vegetation protection techniques should be used in utility system location and design.
- When Navy activities are dependent upon non-Navy utilities, it is important to understand the sources, existing and planned supply, and distribution capacities. Future utility system plans and general user cost fluctuations should be studied also. Constraints in supply, distribution, and/or costs of utilities to Navy activities must be mitigated through appropriate alternative planning and/or user fee proposals and actions.

23.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in evaluating the relative importance of utility systems information on a specific proposed project.

- Will the project place new demands on existing on- and off-site utility systems?
- What is the capacity of the existing utility system-water, sewer, treatment plant, etc.?
- Do existing on-site utility systems lack adequate supplies and facilities to serve the project?
- Is it or will it be necessary to tap into any off-site utility systems as a result of this project?
- If needed, do local public utility systems lack adequate supplies and facilities for this project?
- Are there any planned or proposed changes to local public utility policies or systems that will affect the utility need of this project?
- Will the project be affected by odors or other problems caused by local sewage treatment facilities?

23.6 Data Sources

1. **Navy**
 - Base Public Works Office
 - Base Utilities Maps
 - Utilities component of Base Master Plan
 - Updates on utility capability and expansion

2. Local

- Utilities/Engineering Department
- Utilities Commission
- Sanitary District
 - Water and sewer maps
 - Facilities planning studies
 - Consumption data

3. Regional

- Council of Governments (COG)
 - Utilities component, Regional land use plan
 - Regional Solid Waste Management Plan, Water consumption plan

ADDITIONAL SOURCES

- State Department of Natural Resources
- Water Resources Division, USGS

24.0 NOISE

24.1 Relevance to Planning Studies

It is important for the planner to consider both the sources of noise and the varied noise receivers in order to ensure that the health and welfare of on-base personnel and residents and users of land surrounding the activity are protected from the adverse impacts of high levels of noise. Noise is defined as unwanted sound, that which interferes with hearing, communication, or activities. Guidelines for protecting the public health, safety, and welfare have been developed in response to the Noise Control Act of 1972 (42 U.S.C. 4901 *et seq.*) and the Occupational Health and Safety Act of 1970 (P.L. 91-596) and are presented in AFM 19-10, TM5-803-2, NAVFAC P-970, "Planning in the Noise Environment." These standards aid in the identification of potential noise problems. The planner must determine the extent of the Navy's role in preventing conflicts between people and noise and prepare a regional shore plan reducing the conflicts through direct elimination, mitigation, or cooperative efforts with outside receivers.

24.1.1 Regional Studies

Noise impacts transcend the activity plan level and impact the surrounding region. Usually, however, noise impacts can be directly tied to specific sources so that some form of mitigation can be implemented. The Air Installations Compatible Use Zone (AICUZ) Program addresses regional-level noise issues as they relate to Navy and Marine Corps air installations. The key mitigation tool employed in AICUZ Programs is that of local land use control in high noise impact zones. A high degree of coordination is required between Navy and local/regional civilian planners to address major AICUZ issues properly.

DEFINITIONS

AICUZ— Air Installation Compatible Use Zone Program; Navy program assessing the compatibility of land uses around military air installations in order to provide a safe community setting while ensuring uninterrupted military operations.

Sensitive receptors – land uses most sensitive to noise impacts, including schools, residential, hospitals, and retirement communities.

Noise contour— A method of displaying similar noise levels around a source using isoline mapping, connecting points of identical values to one another to form a region of similar impact.

C-Weighted sound level – A quantity, in decibels, read from a standard sound-level meter that is switched to the weighting network labeled "C". The C-weighting network weights the frequencies between 70Hz and 4000Hz uniformly, but below and above these limits, frequencies are slightly weighted to reflect the human ear's sensitivity.

NOTE: AICUZ also addresses accident potential. Refer to the Military Constraints section.

24.1.2 Activity Plan

Noise impact aspects of planning are most readily applied at the activity level. Activity noise

conflicts should be resolved through proper land use relationships, structural/landscape design, and construction methods. Noise sources outside the activity should be addressed specifically at this level, particularly as they impact activity personnel. Activity noise source impacts on any receiver should be mitigated to levels within allowable federal guidelines.

24.2 Relationship to Other Resource Areas

In order to assess the significance of noise impacts, activity and community level data on transportation, land use, vegetation, and topography is needed. Data on transportation is needed to determine the noise sources (e.g. aircraft, trucks, military vehicles) and to estimate existing and projected noise levels. Information on existing and planned land uses is needed to determine whether noise-sensitive land uses are present and may be affected by high noise operations. Information on topography and vegetation is needed to assess whether the natural landform and its cover act to screen or partially screen the noise source from receivers.

24.3 Primary Noise Planning Factors

24.3.1 Noise Sources

Aircraft noise: This includes noise generated by all types of aircraft from both airports and heliports at the activity and in surrounding areas. Both military and commercial aircraft noise should be considered. Aircraft type, number of operations, flight paths, and scheduling (day vs. night flights) affect the significance of the noise impact.

Highway noise: Major activity roadways and adjacent public highways are sources to be evaluated. Noise levels are affected by traffic volume, speed, traffic mix (trucks and heavy vehicles vs. automobiles) timing (peak hours, day vs. night) distance to the receiver, and the presence of natural or man-made barriers to noise.

Railroad noise: Noise levels from both military and commercial railways are impacted by factors including the volume of trains, the timing of passes (day vs. night), number of cars, type of track, distance to the receiver, presence of grade-separated intersections with roads, and the presence of natural or man-made barriers to noise.

Blast Noise (Artillery ranges): Location of gunnery and impact zones, types of equipment and munitions used, timing of blasts, and location of the receiver will affect the noise impact.

Fixed Noise Sources: Power plants, testing facilities, maintenance facilities, high voltage transformers, and manufacturing plants often produce high external noise levels that should be considered.

24.3.2 Noise Receivers

On-base personnel: Personnel are affected in various activities. The significance of the impact depends on the noise level and the type of activity. Residential, hospital, educational, and outdoor entertainment uses are highly impacted. Recreational and office/administration uses are also affected, but to a lesser degree. Residential uses are typically highly sensitive to noise, however, the proximity of on-base units to military operations cannot necessarily be mitigated if personnel must live on the activity.

Local community: Similar to the activity level environment, the type of activity determines the sensitivity to noise as described above. The Navy planning process can be used to lessen activity generated noise impacts; however cooperation from local officials is needed to ensure the prevention of noise-incompatible land uses surrounding the activity. Impacts on community uses are greatest on residential uses and those classified as “sensitive receptors”. These receptors include schools, livestock operations, religious facilities, and senior living facilities. These uses should be directed away from military installations through local land use control and regulation.

24.3.3 Measurement of Noise

Noise is measured in units of sound intensity called decibels (dB). Often decibels on an A-weighted scale (dBA) are used to measure environmental noise. This measure weights certain frequencies more heavily than others in order to emphasize those that the human ear is most able to hear. The decibel, when used alone, describes a sound level at a given instant or at a steady level. The terms Leq, and DNL, when used with dBA, are examples of noise descriptors for noise levels that vary over time. The term Leq describes varying levels of sound by stating the energy equivalent in terms of a continuous sound level. For example, 58 dBA Leq describes a noise exposure with varying sound levels equivalent in sound energy to a continuous sound level of 58 dBA. DNL measures varying sound levels over a 24-hour period but weights nighttime sound more heavily than daytime sound. These last three descriptors (dBA, Leq and DNL) are often used to describe airfield, highway and railroad noise.

Associated with these noise levels are suggested land uses that are appropriate for each category. A matrix format is the simplest method of displaying these allowed uses (Figure 24a on pg. 187).

Note: In the State of California, the Navy uses the Community Noise Equivalent Level (CNEL) descriptor. CNEL is identical to DNL, except that the 24-hour period is divided into day, evening, and night periods with penalties applied to both evening and night noise events. For comparison purposes,

- DNL 65 dBA = CNEL 65 dBA;
- DNL 75 dBA = CNEL 75 dBA.

In addition to the level of noise, the type of noise is important to consider in assessing impacts on humans and structures. Military operations have varying results that depend upon the specific action. High amplitude impulse noise is one type that results from artillery and demolition activities. Described in terms of the C-weighted DNL, high amplitude noise is comprised of low frequency sound waves. The C-weighting scale primarily measures low frequency elements of noise rather than higher frequency A-waves. The C- scale weights sound to include low frequency energy responsible for structural pulsing. The low frequency noise may result in impacts to structures surrounding the activity, causing windows and structures to rattle and shake. This disturbance results in an increased annoyance of the surrounding community who is directly affected (RCUZ, 1993).

Another direct impact of military operation-related noise is the vibration effects on structures and people. Sound transmits through structures, resulting in vibration levels that correspond to the level of noise. Higher sound levels have greater impacts on structures, affecting windows, walls, and ceilings. Generally, noise levels greater than 130dB may result in structural damage of some type. The duration of the noise will determine the extent of damage. In addition to structure damage, noise-induced vibration effects also impact the surrounding human population. These secondary vibrations may result in rattling of objects and windows. These impacts normally occur at noise levels that are above those normally considered compatible for residential land uses. Thus, noise control and land use compatibility should continue to

consider these vibrations effects in planning efforts (Zusman, 1998).

Figure 24a
Land Use Compatibility in Noise Zones

LAND USE	Transportation Impulse	NOISE ZONES					
		3		2		1	
		80	75	70	65	60	55 dBA
		70	66	62	58	dBC	
Residential - Single Family, Duplex, Mobile Homes						A	
Residential - Multiple Family						A	
Transient Lodging				A	A		
School Classrooms, Libraries, Churches						B	
Hospitals						B	
Auditoriums				B	B		
Outdoor Spectator Sports							
Playgrounds, Neighborhood Parks							
Golf Courses, Riding Stables, Water Recreation							
Administrative Building, Community Support Facilities					C		
Commercial - Retail, Movie Theaters, Restaurants				C	C		
Industrial, Warehouse, Supplies, Utilities				C	C		
Livestock Farming							
Agriculture (Except Livestock), Mining							
Public Right-of-Way							
Extensive Natural Recreation Areas							
Military Training Activity							

-  Incompatible
-  Conditionally Compatible (Notes A, B, and C, see following page)
-  Compatible

24.3.4 Assessment of Noise Levels

In assessing the impacts of noise in the environment, it is important to consider not only existing noise levels but also to make an estimate of what future noise levels may be. A planning horizon of at least 10 years is recommended. Also to be considered is the cumulative impact of multiple noise sources.

Noise levels from roadways can be predicted in terms of decibel levels at specific distances from the roadway centerline by the use of nomographs described in Chapter 3 of "Planning in the Noise Environment", (See data source list at end of section). A noise prediction model is also available from the Federal Highway Administration (FHWA Traffic Noise Model, FHWA TNM, March, 1998). This model replaced the (Highway Traffic Noise Prediction Model, FHWA RD-77-108, December, 1980). This model provides a more accurate assessment of noise levels than does the nomograph.

Chapter 3 of "Planning in the Noise Environment" also presents methodologies for predicting noise levels for railroads and fixed noise sources.

24.3.5 Recommended Noise Levels

The Navy has set certain levels of noise exposure as land use compatibility guidelines in the planning of both military and civil developments. These noise levels are measured in DNL and vary according to the type of land use (i.e., type of receivers).

24.3.6 Noise Mitigation Measures: The AICUZ Program

The planner can suggest changes in flight patterns and act to design or redesign activity facility, land use, and transportation plans so as to reduce impact of high noise levels emitted. In order to make these recommendations, planners must first map the location of the noise contours in relation to the surrounding land uses. Using GIS, the planner may assess the interaction of land use, noise level, and recorded community complaint (Figure 24b on pg. 179). By noting the interaction between these layers of information, the most effective modifications in policy or operations may be implemented. Noise mitigation through activity planning is accomplished in four general ways:

1. **Locating the sensitive noise receiver an adequate distance from the noise source.** For example, activity residential and educational facilities should be located away from major roads and outside of AICUZ high noise zones (DNL greater than 75). Noise contours and recommended planning levels should be used to define areas where noise-sensitive land uses should not be located.
2. **Providing noise absorptive vegetation between the noise source and receivers.** High grass, shrubs, and wooded areas can attenuate railroad and highway noise levels at the ground level. For one-story buildings, the distance between the noise source and building can be reduced if the intervening land is vegetated rather than paved. This measure has no effect on overhead aircraft noise, but can aid attenuation of noise from aircraft operations on the ground.
3. **Constructing barriers between the noise source and receiver such as walls, berms, other**

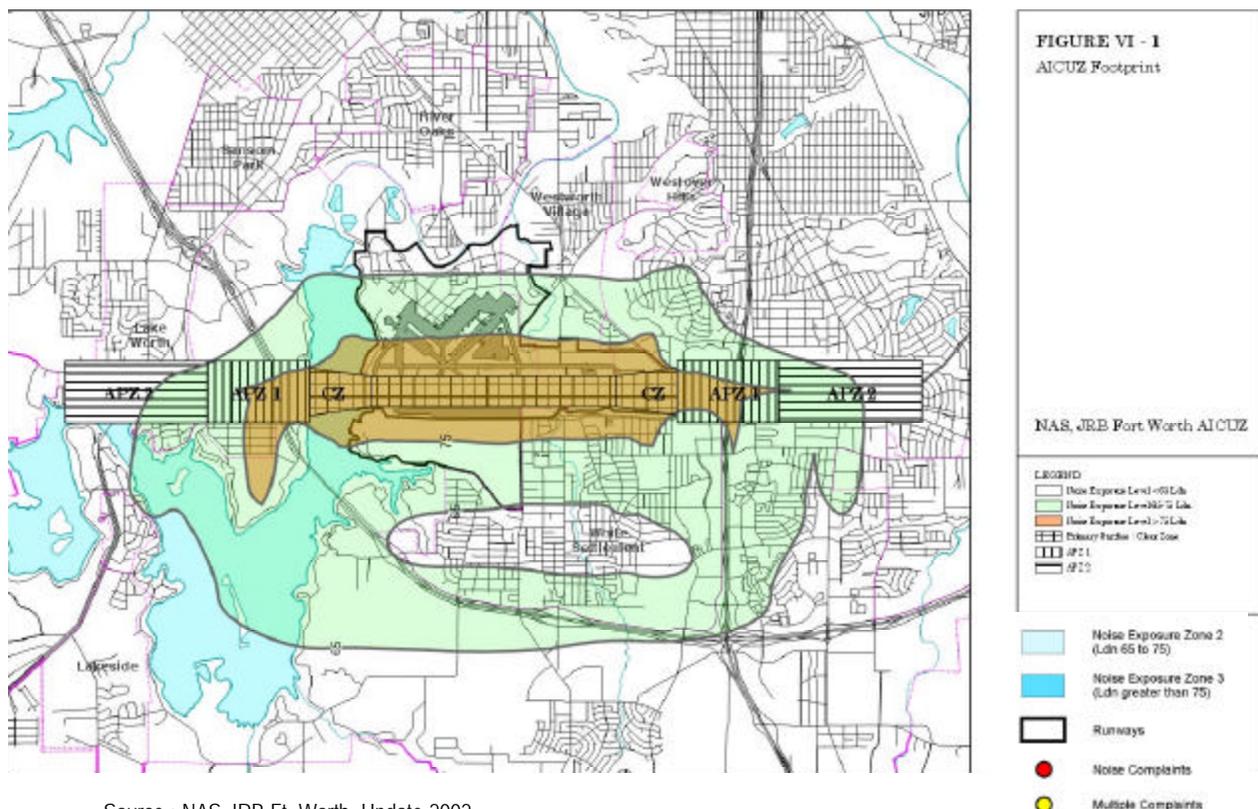
buildings. This is only feasible for highway, ground level, aircraft operation, and railroad noise. Sometimes existing topography provides a natural barrier. Both provide limited attenuation of noise from aircraft caused by ground run-ups, taxiing etc.

4. **Acoustical treatment of buildings.** Thicker walls, heavier insulation, and storm windows and doors can reduce interior noise levels. This technique is useful for attenuating noise from all sources, including aircraft and gunnery and bombing ranges.

The purpose of the AICUZ (Air Installations Compatible Use Zones) program is to protect the public health, safety, and welfare while precluding degradation of the operational capability of military air installations through efforts to prevent incompatible development in local communities adjacent to Navy and Marine Corps airfields. Both noise and safety impacts are addressed in this program which is more fully described in DOD Instruction 4165.57 of 8 November 1977, Air Installations Compatible Use Zones, and OPNAVINST 11010.36A of April 1988, Air Installations Compatible Use Zones (AICUZ) Program.

Figure 24b

AICUZ Footprint, NAS JRB Ft. Worth



Source : NAS JRB Ft. Worth, Update 2002

An AICUZ study addresses several levels of planning issues at both the activity and in the surrounding region. Analyses of land use activities, military constraints, and noise generators enables the planner to make final recommendations regarding the compatibility of future land uses in and around the activity. Following established guidelines for appropriate uses, the development of sensitive land uses can be directed away from unsafe or loud areas. Through these actions, military operations may continue while respecting and protecting the surrounding community.

24.4 Noise Factor Interpretation

24.4.1 Opportunities

- Land uses incompatible to military operations due to noise and safety concerns can be avoided in development with coordination between the Navy and community planners.
- Community complaints regarding noise and vibration effects of military operations can be lessened through continued education and coordination efforts

24.4.2 Constraints

- Changes in mission at naval activities can result in increased noise and vibration impacts due to aircraft platform introductions.
- Communities with little land use regulation cannot effectively keep incompatible development out of noise and safety areas designated by the activity.
- Increased development around activities will result in increased complaints regarding noise and vibration impacts of aircraft and/or bombing.

24.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of information on noise impacts from a specific proposed project.

- Will construction or operation of the proposed activity cause noise levels at the site's boundary to exceed environmental standards or to have an adverse impact on neighboring activities?
- Are there any existing, proposed, or expanding military or commercial airports close to the site?
- Will surrounding airport operations cause harm to a “sensitive” proposed project?
- What do the airport plans for surrounding communities envision for their facilities in the upcoming years? What are their means for mitigating noise impacts? Will these impact your project?
- Will the project involve the use of new, noisier types of aircraft, an increase in the number of aircraft operations, the use of new approach and departure tracks, the location of new ground testing facilities or any changes in airfield mission?
- Are there any existing or proposed major traffic arterials, aboveground rapid transit lines, or railroads close to the site?
- Will the project result in any long-term increases in vehicle volume on or near the site?
- Some types of high voltage transformers generate significant levels of low frequency noise, audible

over great distances and penetrating structures in close proximity. Does the project involve the use of high voltage transformers within 1000 feet of any noise sensitive land uses (e.g., hospitals, nursing homes, schools, residential areas)?

- Are there artillery ranges involved in the project?
- Does, or is the project planned to, involve sources of vibration which could damage nearby structures or have adverse impacts on surrounding activities?
- What is the extent of existing and projected high noise zones from aircraft, roadway, and railroad noise sources?
- What existing noise-sensitive land uses are found within these zones? How can new uses be avoided in these zones?

24.6 Data Sources

1. Internet

- http://www.efdlant.navfac.navy.mil/lantops_15/
- <http://neds.nebt.daps.mil/Directives/11010a36.pdf>

2. Navy

- Engineering Field Division
 - AICUZ studies and instructions
 - Noise data
 - Aeronautical charts

3. Regional

- Council of Governments (COG)
 - Noise components, regional land use plan
 - Noise models
 - Airport systems plans, master plans
 - Noise management studies

4. State

- Department of Environmental Regulation/Protection,
- Department of Health, Noise Pollution Control Office,
- Department of Transportation
 - Noise contours for airports
 - Noise regulations
 - Noise data
 - Aeronautical charts

ADDITIONAL SOURCES

- Environmental Protection Agency
- "Planning in the Noise Environment", AFM 19-10, TMS-803-2, NAVFAC 9-970
- 23 CFR PART 772

25.0 MILITARY CONSTRAINTS

Military constraints are those constraints that are safety, health, or noise-based impacts on both the activity and community levels. These constraints manifest themselves in the form of facility construction and siting criteria intended to assure the separation of potential hazard/danger sources from other facilities, equipment, and personnel at an activity and outside its immediate boundaries. Special facility design and construction criteria may be applied to structures in order to contain or limit the potential hazards of explosive ordnance, dangerous substances to people, buildings, or equipment. Safety distance setbacks and/or land use limitations may be required around potential hazard areas/facilities to provide further protection. General military constraints are those related to: ammunition and explosives; range safety; electromagnetic hazards; airfield safety hazards; security considerations; and hazardous materials; high noise levels.

25.1 Relevance to Planning Studies

25.1.1 Regional Studies

Military operations affecting adjacent communities are most relevant to these more general levels of planning. AICUZ related land use constraints and military bombing range issues are obvious large scale planning concerns. Hazardous material/waste handling, storage, and disposal can be potential environmental threats to the immediate area and regional environments (e.g., air quality, water quality, noise, etc.). Military operations may also create general citizen health and safety concerns, particularly in areas near military airfields, test ranges, and hazardous substance handling/ storage sites. Land use compatibility standards are the primary tool for regulating the location and type of development around these areas of safety concern. Navy planning and policy decisions should be sensitive to potential area-wide impacts posed

DEFINITIONS

ESQD Arcs – Explosive Safety Quantity Distance - An established distance away from explosive hazard sources in which development is limited or prohibited.

EMR Setbacks – Minimum safe distance from equipment to protect against electromagnetic radiation.

Separation Distance – The distance required between explosive hazards and ordnance, fuels, and personnel in order to protect human health, safety, and welfare.

HERO – Hazards of Electromagnetic Radiation; 3 types exist, addressing ordnance, fuels, and personnel.

AICUZ – Air Installation Compatible Use Zone - Concept of achieving compatible land use around military airfields.

RAICUZ – Range Compatible Use Zone - Achieve compatibility between air to ground training ranges and existing and proposed land use and airspace in the vicinity of the range.

APZ – Accident Potential Zone - The probable impact area if an accident were to occur at an airfield.

CZ – Clear Zone - The area extending immediately beyond the end of a runway.

Pollution Abatement – The use of policy and action to reduce pollutants of air, water, and land.

by military operations and weigh such impacts against operational/mission requirements.

25.1.2 Activity Plan

Military constraints are important planning considerations at the activity level, since specific structures and activity areas are initially located at this level. Most military constraints requirements translate to safety zones, setbacks, or separation distances that can be measured and literally applied to an activity plan constraints map as a "man-made constraint". ESQD arcs, Crash and Accident Potential Zones (provided for in AICUZ planning activities), Electromagnetic Radiation (EMR) setbacks, and other safety setbacks and man-made constraints can be meshed with natural constraints to produce land development suitability criteria for planning.

25.2 Relationship to Other Resource Areas

Military constraints relate directly to land use; building condition/location; environmental systems and quality (air, water, land, etc.); and transportation and utility systems locations. Natural site conditions (hydrology, soils, geology, etc.) can impact the location and structural condition of on-site ammunition/explosives and hazardous substance storage/handling facilities (Figure 25a on pg. 184). Figure 25a is a composite of many natural and man-made military constraints, displaying the interaction between different non-buildable areas. On/off-base land use and infrastructure systems are affected by AICUZ-based noise and accident potential zone locations at airfields. Gunnery, target, and bombing range activities can create noise impacts on and off-site. Personnel safety and comfort can be threatened if building conditions are inadequate to prevent explosive-related damage. Transportation and pedestrian systems can affect building and activity security, particularly as it relates to site and building access. Adjacent land use types and intensity of development can also impact activity perimeter security.

25.3 Primary Military Constraint Planning Factors

25.3.1 Ammunition and Explosives

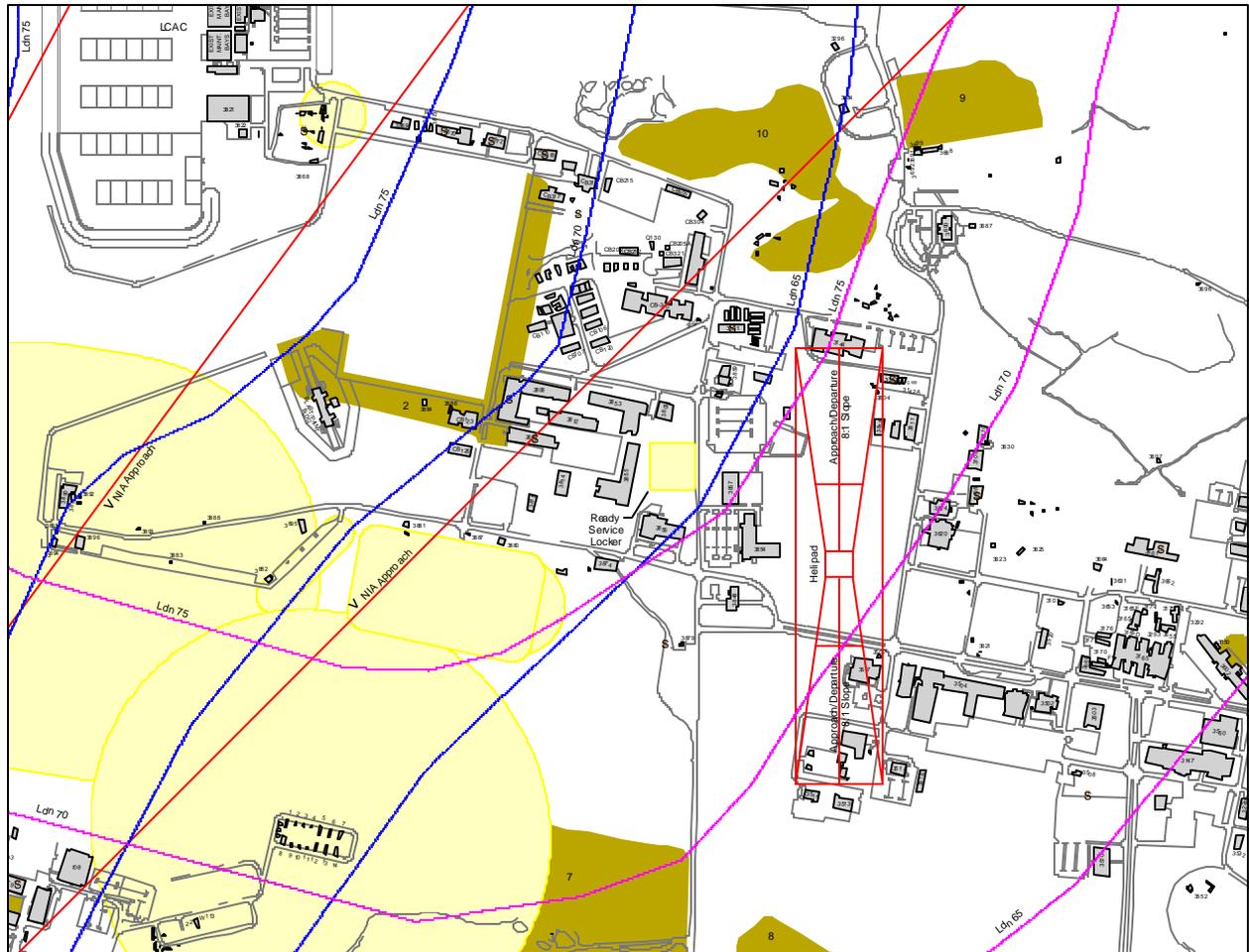
NAVSEA OP-5 Volume I documents Navy and Marine Corps activity safety policies, regulations and criteria regarding ammunition and explosives (ashore). Of particular relevance to planning are: Chapter 7, "Quantity Distance Requirements and Standards", and Chapter 8, "Facilities". Ordnance safety aspects became a major concern in planning after a major accident at Lake Denmark, New Jersey in 1926. As a result of this event, the Army-Navy Ammunition Storage Board was established and later became the Department of Defense Explosives Safety Board (DDESB). Both DDESB and Navy research and testing programs have contributed toward the current ammunition/ explosives safety criteria described in NAVSEA OP-5.

A major criterion regarding explosive ordnance planning requirements is that of separation distance, that is, the minimum safety distance between the hazard source and other facilities, equipment, and/or personnel. Separation distances are based on several factors: type of ammunition; amount of ammunition; operations being conducted; target; and barricades.

Separation distances are not absolute safe distances but are derived from experience, testing, and observation; therefore, they do assure a certain degree of protection. NAVSEA OP-5 (Vol. 1, Chapter 7) describes the degree of protection afforded by specific separation distances with respect to: inhabited buildings; public transportation routes (vehicular, rail); magazines; intra-line distances; and ship unit separations. There are nine classes of hazardous materials; ammunition and explosives are categorized as Class I and are further divided as: non-mass detonating (fragment producing); mass detonating; mass fire; and moderate fire.

The formula for distance separation is $D = KW^{1/3}$, where D = separation distance; W = weight of explosives in pounds; K = constant factor which varies depending upon the degree of damage that is acceptable (the value of K as applied in various situations is given in the tabular data of NAVSEA OP-5).

Figure 25a
Military Constraints Composite



- | | | | |
|---|---------------------------|---|----------------------------|
|  | ESQD Arc Area |  | Imaginary Surfaces |
|  | Contaminated Soils Area |  | Buildings |
|  | Underground Storage Tanks |  | Water |
|  | NIA Noise Contours |  | Roads, Parking, Pedestrian |
|  | LCAC Noise Contours |  | SPECWARCOM Boundary |

Source: Facilities Development Plan, Force 21 Realignment, NAB Little Creek, VA, January 2001

As the value of K decreases, the separation distance decreases, indicating acceptance of a greater amount of damage than for correspondingly larger values of K. K factors range from 1.1 to 50; following are some relevant K factors for various planning applications:

- 1.1 to 11, intermagazine distances for prevention of propagation of explosion, but not personnel or building protection;
- 9 to 18, intraline distances for prevention of propagation to other buildings, although damage and injuries will occur;
- 11 to 18, pier separation distances;
- 24 to 30, passenger railroad and public highway separation distances; 30 is also used for targets at airfields;
- 40, unrelated ship separation distances;
- 40 to 50, inhabited buildings separation distances; will prevent significant damage to buildings or harm to personnel;

Some explosives operations require fixed, minimum setback distances:

- 80', pipelines
- 400', freight rail lines
- 500', torpedo handling at pier
- 1250', minimum Class 1, Division 1 explosives (unless specified for type of material).
- 1800', wharf yards
- Passenger railway and public highway separation distances are calculated as 60% of the Calculated Inhabited Building Distance.

Some operations do not require separation distances:

- Ammunition in transit
- Interchange and classification yards
- Inspection sites
- Ammunition loaded aboard (combatant) ships.

Aside from separation distances employed in planning, the construction aspects of hazardous material structures is important. According to NAVSEA OP-5 (Paragraph 8-2.5), "properly constructed barricades or undisturbed natural earth are effective means for protecting ammunition and explosives, structures, or operations against high velocity, low angle fragments..." Interior barricades of concrete and steel construction are also discussed in this document.

It is emphasized that a detailed knowledge of the type, classification, and net weight of explosive should be applied to the formulae and criteria (tables) in NAVSEA OP-5 to ascertain the most accurate planning criteria in regard to separation distance requirements.

25.3.2 Electromagnetic Radiation (EMR)

An electromagnetic radiation hazard exists when military or civilian transmitting equipment generate electromagnetic (wave) fields of a magnitude which: induce currents/ voltages great enough to trigger electroexplosive devices (EED) in ordnance; cause harmful effects to

humans or wildlife; or, create sparks having sufficient magnitude to ignite flammable substances in the area. These potential hazards are categorized as:

- HERO: Hazards of Electromagnetic Radiation to Ordnance
- HERF: Hazards of Electromagnetic Radiation to Fuel
- HERP: Hazards of Electromagnetic Radiation to Personnel
- EMI: Electromagnetic Interference

EMR-related requirements are offered in NAVSEA OP-3565. Minimum safe distances (from equipment) for various equipment types are given for ordnance, fuel, and personnel. These distances are utilized in a manner similar to Explosive Safety Quantity Distance arcs in the planning process.

25.3.3 Range Safety

Bombing ranges, firing ranges, restricted air space and other (on or offshore) operational and training areas present special planning concerns. Navy technical guidance regarding safety setbacks for various firing and bombing ranges should be applied. OPNAVINST 3550.1 provides guidance for the RAICUZ program, "which is designed to protect public health, safety, and welfare, while preventing encroachment from degrading the operational capability of air-to-ground ranges." It includes range safety and noise analyses while providing land use recommendations compatible with range safety zones and noise levels associated with military range operations (OPNAVINST 3550.1, 1998). These danger zones must be designated clearly as land use constraints in planning efforts. Possible safety problems can sometimes be avoided by scheduling range operations at times when no use conflicts/ hazards exist.

25.3.4 Airfield Safety

The primary concern regarding airfield safety is that of accident potential. AICUZ studies (reference OPNAVINST 11010.36A) address accident potential and noise issues, as well as act as the premier information source for the airfield safety aspects of regional planning. In AICUZ study nomenclature, areas that have a measurable potential for aircraft accidents are called Accident Potential Zones (APZ). Basic data used in calculating APZ are aircraft type, flight patterns, and frequency of use. AICUZ studies for specific airfields should be utilized in shore planning efforts at those locations, but AICUZ APZ can be described generally as follows:

- Clear Zone (CZ):
The area immediately beyond the end of the runway which possesses a high potential for aircraft accidents. The clear zone for Navy and Marine Corps installations is trapezoidal or "fan shaped," spreading out from the end of the runway. The clear zone is required for all active runway ends (reference NAVFAC P-80.3).
- Accident Potential Zone I (APZ I):
The area beyond the clear zone which possesses a significant potential for accidents; normally designated under (approach) flight paths experiencing 5,000 or more annual operations. The configuration of this zone may be modified to reflect the actual curve of a flight path.

- Accident Potential Zone II (APZ II):
The area beyond APZ I which has a measurable potential for aircraft accidents. APZ II is usually applied in conjunction with an APZ I requirement, although it is possible to have a demonstrated APZ II requirement without an APZ I requirement. The APZ II configuration may also be modified to reflect the actual flight path curve.

The accident potential concept is not based directly on accident probability, rather it analyzes the acceptability of certain land uses assuming a crash did occur in the CZ, APZ I, or APZ II areas. For example, agricultural uses are usually more acceptable than are housing uses in any of these zones. AICUZ studies define land use acceptability in these zones as either: clearly compatible; normally compatible; normally incompatible; or clearly incompatible. Land use compatibility is based on the kind of buildings and/or anticipated density of people at the land use activity. Potential secondary hazards (due to aircraft accidents) to the surrounding population (e.g., petroleum/plastics fires, high voltage electrical transmission lines, etc.) are also considered.

25.3.5 Security Considerations

Certain facilities at Navy installations require higher than normal levels of security. This can affect planning by virtue of security structures required (e.g., fencing, walls, gates, guardhouses, etc.) as well as increased distance separations from other uses. Proper siting of high security facilities can alleviate many use incompatibilities. If possible, remote locations with good perimeter visibility are preferred. Vehicular circulation systems should serve such facilities well while providing for necessary vehicle checkpoints. See the resource section on Force Protection for more detailed discussions of design criteria and characteristics for Navy installations.

25.3.6 Hazardous Materials/Wastes

The Navy Environmental Manual and Natural Resources Program (OPNAVINST 5090.1B) provides Navy policy and procedural guidance regarding the prevention and control of pollution from hazardous materials at Navy shore facilities. Figure 25b on pg. 188 is a location map showing restoration program sites. At a small scale, detail regarding surrounding natural and manmade features can be seen, while at a larger scale, the planner could assess the location of all IRP sites on an entire activity and their relation to multiple features. Hazardous materials or hazardous substances include material, which because of its quantity, concentration or physical, chemical or infectious characteristics may pose a substantial hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed." Hazardous waste includes "any discarded material, liquid, solid or gaseous, that meets the definition of a hazardous material and/or is designated a hazardous waste by the EPA or State hazardous control authority (OPNAVINST 5090.1B)".

To clean up the hazardous waste generated at DoD facilities, the Installation Restoration Program (IRP) was instituted. Developed to identify, assess, characterize, and control contamination from past disposal and spills, the IR Program works within the context of various federal and state environmental laws including The Resource Conservation and Recovery Act (RCRA), The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and Superfund Amendments and Reauthorization Act (SARA) (IRP, 2001).

RCRA is the federal legislation governing hazardous waste. EPA implementation of RCRA involves identification, management, and tracking of hazardous waste from time of generation to time of its proper disposal. The Defense Logistic Agency (DLA), an agency within DoD, is the responsible agency for disposal of most materials, except those such as radioactive and classified ones that are specifically disposed of by DoD itself. DLA responsibilities include management of waste storage, handling, and disposal; the Navy is responsible for providing necessary data to DLA for environmental documentation (e.g., waste profile sheets). The Navy may also retain custody of hazardous materials under specific DLA guidelines. (Navy guidance regarding hazardous materials/ waste management include: NESO 20.2-024; NESO 20.2-029; NESO 8-027; NAVSUP 573; NAVSUPINST 4440.128D; OPNAVINST 4110.2)

Figure 25b

Hazardous and Installation Restoration Program Sites



Source: CNET GreenSpace Enterprise Information Portal website - <http://greenspace.cnet.navy.mil>

25.4 Military Constraints Factor Interpretation

25.4.1 Opportunities

The various Navy guidance documented earlier provides logical approaches to many military constraint planning considerations. NAVSEA OP-5 provides criteria for ammunition and explosives siting and safety distances; AICUZ studies provide site-specific land use guidance related to aircraft accident potential zones; and OPNAVINST 5090.1B provides policy assistance in dealing with hazardous materials/waste at Navy installations.

25.4.2 Constraints

In as much as the military impacts discussed here are labeled "constraints", all of the major planning factors can act as land use limitations at specific Navy installations. ESQD arcs define land areas in which certain functions and structures cannot exist. EMR safety setbacks create similar land use restrictions around specific equipment. AICUZ-based APZ are explicit land use oriented constraints. Hazardous materials and wastes can be confined and controlled within specifically designed/ constructed structures and areas, but potential waste spills are constant environmental concerns. The planner must be aware of the existence of such substances on-site so that proper separation distances and engineering alternatives can be employed. Site, area, and building security can be enhanced through quality planning regarding site location, site characteristics and vehicular/pedestrian access control.

25.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of military constraints on a specific proposed project.

- Is any ordnance to be stored or handled on this site or within the vicinity?
- Is there or will there be an airfield or helipad on the site or in the vicinity?
- Are any electromagnetic transmitters used on the site or in the vicinity?
- Are there, or will there bombing ranges, gunnery small arms ranges or other ranges on the site?
- Is there evidence that, in the past, chemicals or other harmful, industrial substances were buried on this site?
- Is there evidence that any part of this site was contaminated by earlier ordnance use which has not been cleared out to date?

Note: All of the above items are regulated by official Federal Legislation or Department of Defense criteria for planning. A 'YES' response to any item would indicate the need to refer to specific guidance documents.

25.6 Data Sources

1. Internet

- <http://www.denix.osd.mil/denix/Public/News/news.html>

2. Activity Operations

- Maps of restricted areas (Ordnance Dept)
- Maps and standard operating procedures for training facilities and services of training areas (Training Operations Office)
- Maps of aircraft zone, areas, airspace

3. Activity Public Works

- General development maps with ESQD arcs
- Electromagnetic radiation hazard areas maps
- Maps of restricted areas
- Maps of operations, training areas

4. EFD

- Hazardous waste site survey
- Airfield and ammunition hazard waivers

5. Navy

- Naval Ordnance Safety and Security Activity (N711)
- Space and Naval Warfare Systems Center (SPAWARSYSCEN), Charleston (Code 323)
- Naval Air Systems Command (Air 8.0)
- Naval Surface Warfare Center, Dahlgren Division (Code J50)

26.0 ADAPTIVE REUSE

Reusing existing military facilities is becoming more common place due to financial constraints. Adaptive reuse encompasses the creation of new uses for buildings that no longer require their current use. Examples in the Navy and other military installations include the transition of hangars to service, community areas, and office complexes. On bases closed under the Base Realignment and Closure (BRAC), warehouses become private office buildings after renovations. The reuse of old structures is rapidly gaining acceptance in the U.S., providing opportunities to recycle space, land, and infrastructure rather than develop a new site.

The decision of whether to renovate or rebuild a structure often depends on various factors. The type of construction, building code upgrades, market acceptability, and estimated costs of renovation are all important to consider in the final cost analysis of a project (California Base Closure, 1998). Whether in the private sector or on a military activity, the adaptability of the former structure to a potential reuse is crucial. Many Navy activities have older architecture, with buildings available for transition to a “higher and better use”. The opportunities should be explored by the Navy planner rather than automatically plan a potential project on an undeveloped site.

DEFINITIONS

Greenfield development – Development on farmland and open space where no prior development has occurred.

Public Private Venture (PPV) – Program in which a public and private entity join in financing and managing a project that benefits both. (E.g. Navy off-base housing provision).

26.1 Relevance to Planning Studies

26.1.1 Regional Level

Usually not at the regional scale, adaptive reuse projects are typically within a localized area rather than across a region. While older, unused facilities may exist at several facilities within a region, they are usually renovated to complement the surrounding area, uses, and architecture.

26.1.2 Activity Level

Adaptive reuse is most common at the site and vicinity scale. Reuse is typically a viable option for one or more buildings around an area. Individual projects and existing building stock will often drive the scale and complexity of the renovations. Location of the existing building and the proposed use should also be considered in the activity’s long-term land use vision.

26.2 Relationship to Other Data

Adaptive reuse allows for the efficient use of existing infrastructure. Utilizing utility systems already in place, the renovation and reuse of facilities provides more cost-effective alternatives to infrastructure provision. Although upgrades may be required due to the age of the existing systems, costs will most likely be less than providing new water, sewer, roads, and electric service to an undeveloped site.

Through the recycling of existing structures (Figures 26a and 26b on pg. 192 and 193), the further development of “green” lands can also be avoided. Planning efforts at Navy activities focus primarily on the construction of new facilities to serve a mission’s requirements. However, building out the Navy’s finite amount of space within the boundaries will eventually lead to lack of open space and increased impermeable surfaces. The construction of new facilities and their associated parking areas will result in increased runoff, leading to decreased water quality on the activity and within the downstream region. Visual and recreational benefits from open space networks may be sacrificed with more building, resulting in decreased quality of service (QOS) for the community members.

Figure 26a

Adaptive Reuse of a Factory to an Administrative Office



Source: Stewart Brand, "How Buildings Learn: What Happens After They're Built", Penguin Books, New York, 1994, pg. 174

Through the reuse of existing buildings, historic structures can be saved and parts of the Navy’s past can be preserved. Stations that have considerable historic value, such as Ford Island in Pearl Harbor, HI, are prime opportunities for reuse as historic preservation tools. Often times, historic structures dating from the 1940s and 50s will be constructed of brick, providing additional energy conserving properties over buildings built since that time.

26.3 Primary Adaptive Reuse Planning Factors

26.3.1 Cost of Renovation

In many cases, reuse opportunities provide greater savings than new construction. These savings are largely dependent upon the scale of the project, as well as the new use proposed for the site. Also a factor is the condition of the existing structure inside. Dilapidated or failing systems will contribute to higher related costs. Vacancy of these units contributes to structural decay if not regularly maintained. Broken glass allows exposure to the elements, clogged and cracked utility systems, and vandalism and theft. If these conditions are prevalent in the property, renovation costs should be carefully compared with demolition and building costs. Additionally, any environmental hazards requiring mitigation, such as

asbestos and lead paint clean up, may drive the costs of the project past its budget or the cost of a new building. If demolition and rebuilding is cheaper, it is ideal to reuse the existing site rather than develop a "green" one.

26.3.2 Updating Building Codes

When considering adaptive reuse for a military property, current building codes must be addressed in the project proposal and cost. Buildings most likely targeted for rehabilitation and extended reuse are decades old, with fire and structural codes to match. Updates in codes, especially in seismic areas such as California, have occurred regularly. Strict structural standards must be met for seismic hazard areas, including tying of the overhead beams to the foundation with steel reinforcing rods.

Alternative methods to meeting the updated code can often escalate the project cost near to or past the original estimate. In some cases, a new structure may be the best choice for the new use due to the ability to design space configurations instead of working within old ones. A new facility on the old site would provide greater customization to the proposed use.

Figure 26b

Historic Silos Converted to Hotel Use- Akron, OH



1979 - The downtown of Akron, Ohio, grew right around the monumental grain silos (1932) of the Quaker Oats Company.



1990 - The downtown location made the property central enough to support a hotel and the preservationist incentives from the government made the project economically attractive. The hotel is known as the Quaker Hilton.

Source: Stewart Brand, "How Buildings Learn: What Happens After They're Built", Penguin Books, New York, 1994, pg. 105

26.3.3 Market Acceptability

Many reuse examples to date have occurred on Navy activities closed through the BRAC process. Through the reuse planning process, individual buildings and complexes have been proposed for various uses by either public or private entities. In these situations, the community, military, and other federal agencies will work together to develop a reuse plan most beneficial to all parties. The plans often provide economic and social benefits to the surrounding community.

When reuse projects are implemented on active activities, however, the military remains the owner of such a complex. Working with the private developer in construction and operation, the Navy will still retain ownership of the property. Joint ventures with the private community exist where the Navy owns and provides partial funding for the project while the private sector provides expertise, construction, operational, and maintenance support. Preserving the historical structures while reducing dependence upon the MILCON program, is a positive step towards serving a new use and contributing to the regional economy.

26.4 Adaptive Reuse Interpretation

26.4.1 Opportunities

- Project cost savings over new building construction costs
- Decreased development of “green” sites on Navy activities
- Use of existing utility systems, including water, sewer, electricity, and roads
- Preservation of historical structures
- Public-Private development ventures for Navy and surrounding community
- Decreased reliance on Navy MILCON program for facilities requirements

26.4.2 Constraints

- Utilities may be dilapidated beyond cost-effective repair
- Lack of maintenance may result in overall building disrepair
- Meeting updated building codes may be cost-prohibitive, especially in earthquake hazard areas of the U.S.
- Federal historic designations of potential property may limit appearance and construction in older structure
- Space layout of older structure may be inefficient for proposed reuse
- Environmental hazards (e.g. asbestos, lead paint, etc) may cost more to mitigate than project allows

26.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of information on impacts from a specific proposed project.

- Do historical or older buildings exist on-base that are currently unused?
- Does the proposed project have approximately the same square footage as existing, unused buildings?

- Are environmental hazards requiring mitigation present?
- Does the existing building meet current building codes? Is any seismic retrofitting required?
- Will the new project generate additional needs for services or traffic in its new location?
- Is adequate parking available for the new use?
- Will the new project generate additional needs from the surrounding community? (e.g. services, recreation, traffic, residential)

26.6 Data Sources

1. Internet

- http://www.cedar.ca.gov/military/bc_news/98dec/story8.html
- <http://www.graham.sannet.gov/ntc/>
- http://www.propsolve.com/body_adaptive_reuse.html

2. Local

- Local Redevelopment Authority
- Local Economic Development Authority
- Local Planning Department (Historic Designations)

3. State

- State Historic Preservation Office
- State Economic Development Authority

4. Military

- Navy Division Real Estate Office
- Public/Private Venture Program
- Public Works Office
- Base Environmental Division

27.0 BROWNFIELDS

According to the EPA, brownfields can be defined as, “abandoned, idled, or under-used industrial and commercial properties where redevelopment is complicated by real or perceived environmental contamination” (EPA MOU, 1997). These military sites have been contaminated from a variety of sources, similar to those found in privately contaminated sites. Contaminants include petroleum, oil, and solvents, contaminated storage areas, underground storage tanks, landfills, spill sites, waste treatment plants, groundwater aquifers, unexploded ordnance, and chemical explosives. Many of the contaminated military sites are concentrated in states where defense activities have played a large role in the economy and community. Concentrations lie in Texas, California, Virginia, New York, and Pennsylvania (EPA, 2000a).

Several barriers to reuse of these lands and facilities exist, including costs of environmental cleanup, inability to secure project funding, higher transaction costs, uncertain cleanup process, and negative public attitudes. Several federal programs have been created to address the cleanup process, however, reuse of these lands is still often costlier than developing on “green” lands with no contamination. Related closely to adaptive reuse, brownfield redevelopment on federal properties encourages the reuse of lands instead of using new, undeveloped sites.

27.1 Relevance to Planning Studies

27.1.1 Regional Level

Brownfield redevelopment of active military sites realizes the most immediate and direct benefits on-site. Small-scale redevelopment projects on an open activity would most likely be focused on a building or small complex. The benefits of this cleanup and redevelopment would not be directly realized at the regional level.

However, military sites listed for Base Realignment and Closure (BRAC) actions present excellent opportunities for local community and economic

DEFINITIONS

Greenfield development - Development on farmland and open space where no prior development has occurred.

Sprawl – Low-density land use patterns that are automobile-dependent, energy and land consumptive, and require a very high ratio of road surface to development served.

Redevelopment – Any proposed expansion, addition, or major façade change to an existing buildings, structure, or parking facility.

Adaptive reuse – Rehabilitation or renovation of existing building (s) or structures for an use (s) other than the present use (s).

Infrastructure – The basic facilities such as roads, schools, power plants, transmission lines, transportation, and communication systems on which the continuance and growth of a community depends.

Remediation – The action or measures taken, or to be taken, to lessen, clean up, remove, or mitigate the existence of hazardous materials existing on the property to such standards, specifications, or requirements as may be established or required by federal, state, or county statute, rule, or regulation.

Superfund – Comprehensive Environmental Response Compensation and Liability Act of 1980; Cleanup of inactive hazardous waste sites and distribution cost of cleanup among those responsible for waste handling and generation

Brightfields - Redevelopment of brownfield sites through the use of solar energy.

development. The reuse of buildings or parcels of land will help prevent further development of “green” sites. The EPA states that, “this trend [greenfield development] not only encourages the use of undeveloped land – leading to suburban sprawl, increased traffic congestion, and the destruction of habitat – it also restricts the redevelopment of urban areas, thus limiting economic growth” (EPA, 2001b). Through the development of an existing site, communities may increase economic development opportunities in the local region through job and sector development.

27.1.2 Activity Level

The reuse of brownfields is most applicable at the activity level. Focusing on usually the site level, environmental problems are primarily due to contamination from one or more buildings within the activity boundaries. While environmental contamination may contribute to downstream impacts, the clean up is focused at the source.

27.2 Relationship to Other Resource Areas

As stated above, the reuse of brownfield sites is closely related to the concepts of adaptive reuse, regional growth management, and several environmental topic areas. Reuse of land and facilities is a recycling of the built environment, requiring less investment in new infrastructure and services. In brownfield development, the costs of reuse are distributed differently than with adaptive reuse, focusing on environmental remediation of the land and/or facility. Where costs for adaptive reuse projects are often less than new construction, brownfield redevelopment is often more. Project costs can balloon past expectations due to the scope of cleanup and stringent nature of environmental standards required.

The use of existing sites and infrastructure can result in the decreased use of undeveloped land for new projects. Encouraging development of used sites can also promote a more compact form of the built environment. Transportation impacts are lessened from decreased automobile usage. Brownfield sites are often older sites, sometimes located near other uses at the activity. This close proximity to other uses provides more pedestrian-friendly access than new development on the edges of the activity. According to GSA, “Reusing federal real property makes efficient use of existing infrastructure while providing an alternative to developing open space and contributing to urban sprawl” (GSA, 2001).

Brownfield development is also related to the improvement of environmental resource quality. As a condition of the development, the site must be cleaned to stringent environmental standards. For redevelopment of environmentally sensitive uses to occur, e.g. residential, the standards for remediation are very strict. If the planned uses on the site are industrial, storage, maintenance, or other less sensitive ones, the degree of cleanup required lessens. Despite the level of cleanup, regional environmental issues such as water quality, air quality, and hydrogeology are all improved from each site completed.

27.3 Primary Brownfield Planning Factors

27.3.1 Regulation

The DoD created the Defense Environmental Restoration Program (DERP), in 1984, to begin evaluation and cleanup of contaminated installations. This program began the focus on decades of poor waste-handling practices that resulted in contaminated military sites around the country. More attention has

been focused on the cleanups since the initiation of the BRAC program, where installations could be transferred and sold to communities.

Two primary laws govern the military's responsibility for cleaning sites with environmental contamination. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), was instituted in 1980 and is commonly known as the Superfund Program. The law established a fund to clean up environmentally contaminated sites around the country. Included for cleanup are primarily hazardous waste dump sites and leaking underground storage tanks. EPA has created a National Priority List of sites designated for cleanups. The list is updated regularly, containing a large number of DoD sites as well as other public and private ones.

In 1986, The Superfund Amendments and Reauthorization Act (SARA) was enacted to expand the cleanup requirements for federal facilities (Figure 27a on pg. 199). In addition to cleaning the site, federal agencies must include detailed descriptions regarding the type of waste and its cleanup and disposal methods. The amendments also required DoD to cleanup all contaminated facilities, irregardless of their ownership and use status. DoD created a separate budget account in order to provide competition-free funding sources for cleanup activities. It was also directed to manage the approval process for military construction (EPA, 2000).

DoD has also developed policy, the Defense and State Memorandum of Agreement (DSMOA), to ensure a state's authority in the oversight of military cleanup projects. The DoD views compliance with state regulations and law as a crucial part of the environmental cleanup processes.

27.3.2 Costs

Significant costs have been expended through the Department of Defense on cleanup activities (Figure 27b on pg. 200). Approximately 97 percent of contaminated military sites have had a Phase 1 assessment, identifying the scope and nature of the cleanup needed. However, it is estimated only 2 percent of all military sites have been successfully cleaned, despite the outlay of nearly \$10 million to date.

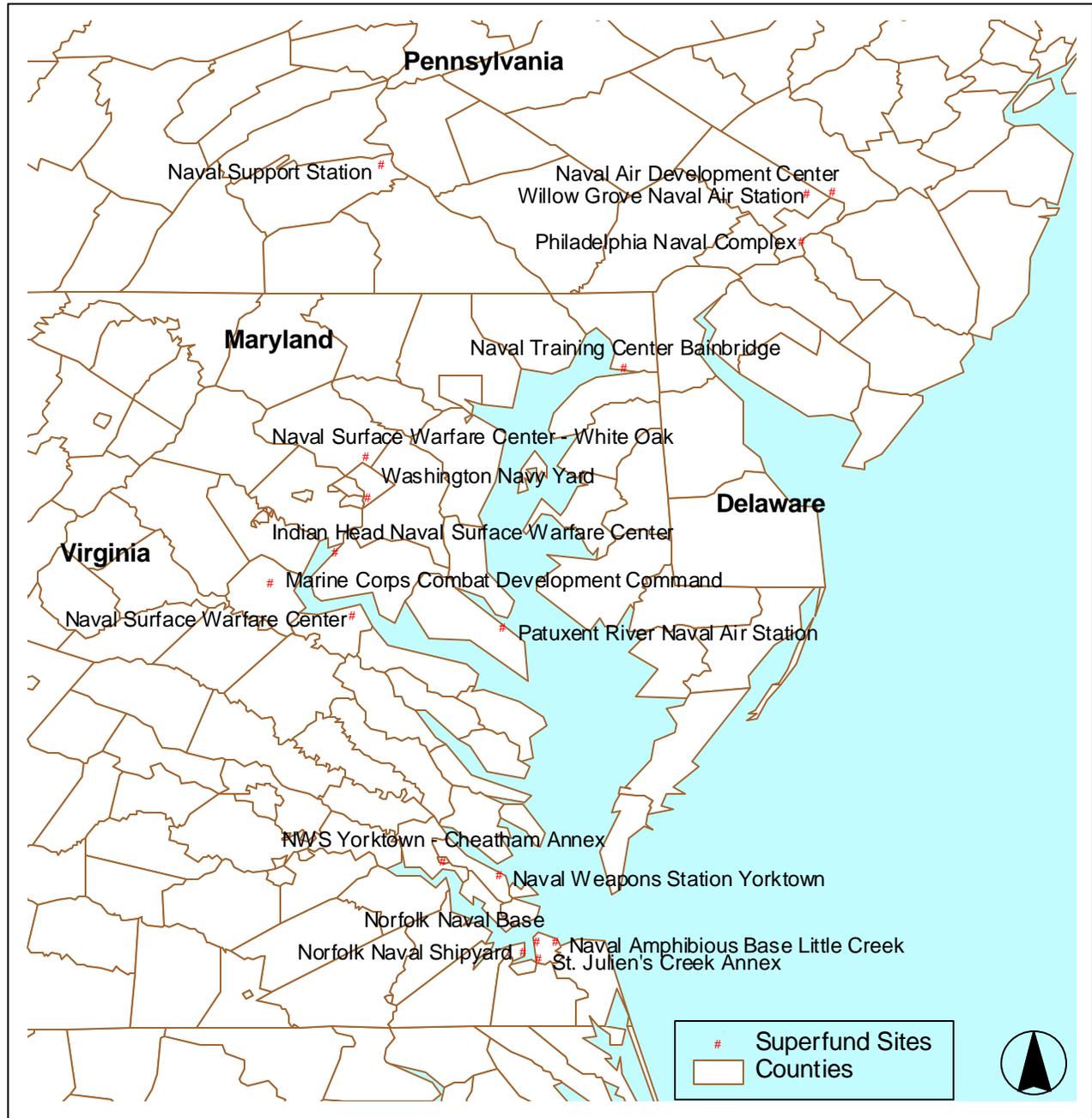
Difficulties arise at the site level in accurately predicting the costs of each project. Costs often rise past the initial estimation when the extent of the contamination is greater than expected. Difficulties in accurately pinpointing the extent is due largely to the varied uses of many of the sites over decades. Many military sites had different uses, including some or all of the potential environmental hazards listed in the introduction of this chapter. The time elapsed from initial pollution to cleanup also impacts the extent of regional effects. Over time, pollution can seep through soils into water supplies, spreading gradually and potentially impacting large areas.

27.3.3 Cleanup Technologies and Liabilities

Standard cleanup technologies include methods such as removal of contaminated soils, pump and treatment of groundwater, and incineration of soils. These methods are traditionally expensive while potentially creating their own impacts and lacking effectiveness in the end. New technologies must be researched, developed, and funded in order to more effectively clean brownfield sites.

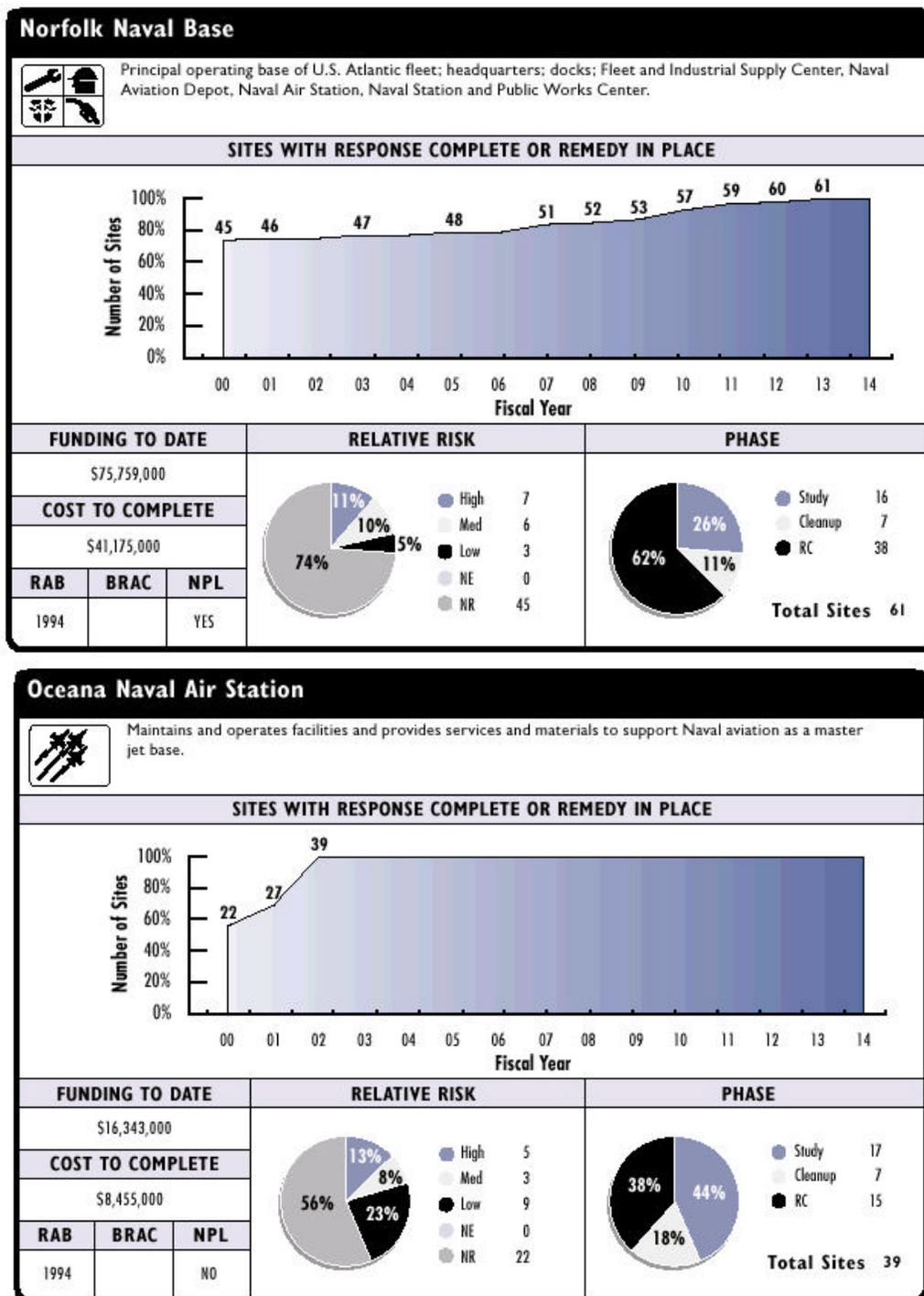
Figure 27a

Superfund Sites on Navy Property - EPA Region 3 Federal Facilities List



Source: Environmental Protection Agency Hazardous Site Cleanup Division website - <http://www.epa.gov/reg3hwm/super/ff.htm>

Figure 27b
Cleanup of Brownfields on Navy Property in Virginia



Source: Department of Navy Environmental Restoration website - <http://5yrplan.nfesc.navy.mil>

The DoD conducts environmental research through the Strategic Environmental Research and Development Program (SERDP). Partnering with the EPA, the program's mission is to, "develop

innovative site characterization techniques, improve monitoring capabilities, and develop cost-effective remediation technologies for soil and groundwater” (Gorte, 1999). SERDP has several military test sites, allowing both public and private -sector developers to test and evaluate new cleanup technologies. The DoD also has a program, the Environmental Security Technology Certification Program (ESTCP), whose goal is to, “validate and demonstrate promising technologies that target DoDs most difficult environmental problems, including site cleanup” (Gorte, 1999). This program provides demonstrations of new technologies and overviews of particular techniques whose effectiveness has been evaluated and tested. Some of these remediation processes include phytoremediation, the use of plants and natural materials to clean the soils and water. Uses for lightly contaminated brownfields also include energy generation through photovoltaic facilities. These solar-based energy producers would require a lower degree of cleanup than a more sensitive use.

Under CERCLA, the EPA has the authority to sue former landowners for cleanup costs of facilities. For an active military facility, the government must assume these costs. However, there are questions regarding dealing with private entities that were contracted to do work resulting in the production of hazardous materials. DoD faces the potential situation of reimbursing those defense contractors who have been held liable through CERCLA. Through the strict, joint, several, and retroactive liability of CERCLA, current or past owners, even if not directly responsible for the contamination, may be held responsible for remediation.

27.4 Brownfield Functional Use Area Interpretation

27.4.1 Opportunities

- *Reuse of existing facilities and infrastructure can reduce need for “green” development at the activity.*
- *Cleanup of site helps avert future environmental contamination on site and in region.*
- *Low standard of cleanup and rehabilitation may cost less than new construction.*
- *Opportunities for alternative energy generation through less sensitive uses of site.*

27.4.2 Constraints

- *Sensitivity of use can result in high cleanup costs, past value of structure.*
- *Liability reimbursements to former defense contractors will tap budget for redevelopment.*
- *The effectiveness of cleanup can be uncertain.*
- *Magnitude and scale of pollution can be significantly greater than first estimated.*
- *Attitudes regarding reuse of contaminated site may block reuse options.*

27.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of information on impacts from a specific proposed project.

- *Does the proposed project require an environmentally pristine site?*
- *Are there specific size and space requirements for the project that may rule out reuse of another building?*
- *What types of pollution are present at the brownfield site under consideration for reuse?*
- *Is the brownfield listed as a priority site for cleanup?*

- *Is the site in close proximity to other uses that will be complementary to the proposed use?*

27.6 Data Sources

1. **Internet**

- <http://www.epa.gov/swerosps/bf.html>
- <http://www.nemw.org/brownfields.html>
- <http://www.bri.gsa.gov/brownfields/home>
- <http://www.hud.gov/bfields.cfm>
- <http://www.unc.edu/depts/dcrpweb/courses/261/hinkley/brownmn.htm>

2. **Military**

- *Activity Environmental Office*
- *Public Works Office*

3. **State/Federal**

- *Environmental Protection Agency (EPA)*
- *Department of Natural Resources*
- *State Economic Development Agency*

ADDITIONAL SOURCES

- *Northeast-Midwest Institute*
- *International City/County Management Association (ICMA)*
- *Environmental Defense Fund*
- *Conservation Law Foundation*

28.0 MIXED-USE DEVELOPMENT

The physical and functional integration of various land uses within a specific project development most often characterizes mixed-use development. Most often including residential, commercial, and office uses, mixed-use developments thrive in a dense, pedestrian-friendly environment where interactions are high between residents, workers, and shoppers. Relying heavily upon the concept that people want to shop and work where they live, mixed-use communities often use the “convenience” factor as a selling point for approval of these projects to the public. Typically, mixed-use development is in an environment where auto-dependency is less, prompting more human interaction and community building as well as benefiting environmentally.

At Navy activities, the concept of mixed-use development may be more successful if altered to fit the specific needs and uses at a military installation. Rather than a commercial-residential-office mix, perhaps an administration-residential-services mix may be appropriate (Figure 28a on pg. 204). The primary goal of mixed-use project planning and development at Navy facilities is to promote pedestrian activity and enhancement of quality of life on the military site. Additionally, environmental benefits relating to air quality improvements may be realized through a decreased dependency on automobiles at the activity level.

DEFINITIONS

Footprint Reduction – Demolishing structures that are no longer needed or cost efficient in a facility infrastructure; consolidating uses within buildings to lessen the requirement of separate facilities.

Shared Parking – Targeting parking to different needs, often dependent on the time of day; program results in decreased requirements for parking.

Walkable environment – A localized environment in which the immediate environs have residential uses within ¼ mile of commercial, office, and recreational uses, accessible by a network of systems and crosswalks connecting these uses.

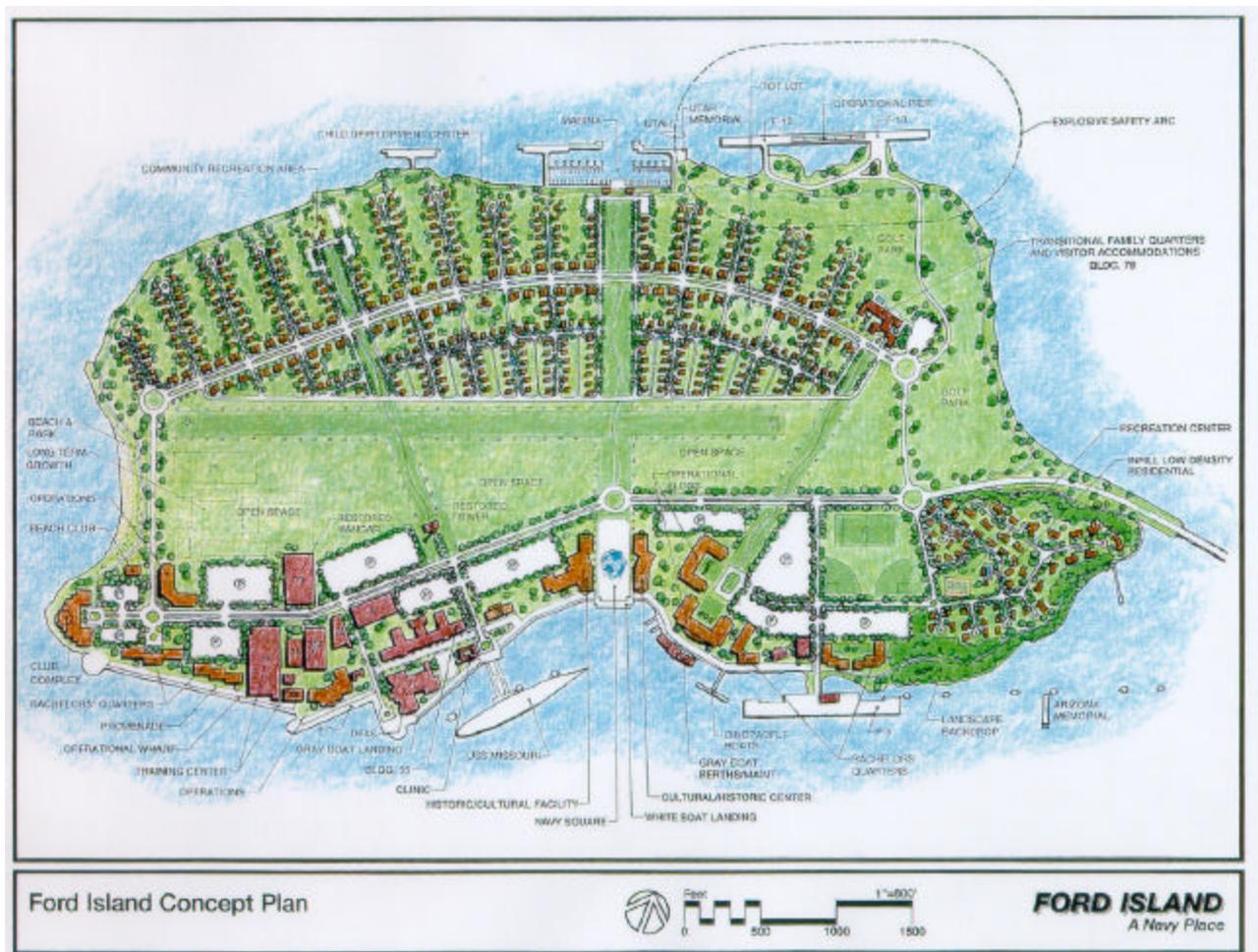
28.1 Relevance to Planning Studies

28.1.1 Regional Studies

Mixed-use developments are site developments that are part of a community and regional development plan. As part of meeting community and regional goals, mixed-use development is considered for environmental and quality of life benefits. Communities employing mixed-use development are typically less auto-dependent and more focused on human interactions as the foundation for building community life.

28.1.2 Activity Plan

Mixed-use development is most applicable at the activity level. The concept is a localized one, applying to site development. Whether considering the reorganization of current uses or the construction of new ones, encouraging mixed use development at the activity level is the most feasible in terms of realizing quality of life benefits.

Figure 28a**Mixed Use Development - Ford Island**

Source: Ford Island Concept Plan, Design Policies, and Implementation Guide, September 1997.

28.2 Relationship to Other Resource Areas

Mixed-use development is closely related to environmental and built factors through its design and proposed benefits. By increasing pedestrian activity and lessening auto dependency, air quality benefits are realized through reductions in traffic volumes. Additionally, parking requirements may be less in a denser, mixed-use environment due to increased pedestrian activity. Energy factors can be realized through associated traffic and building footprint reductions. These footprint reductions, gained through the combination of uses in one building rather than separate ones also relates to maintaining a denser activity environment, enabling the protection and preservation of natural landscapes. Shared infrastructure is also possible, with the provision of sewer, water, gas, parking, and streets to one building or complex rather than multiple ones.

28.3 Primary Mixed Use Development Planning Factors

28.3.1 *Mix of Uses*

The concept of mixed-use development is most often based upon three or more revenue producing uses, including office, residential, and retail commercial. The primary aim of mixed-use developments is to achieve a mix that will achieve three primary goals:

1. Provide each other with continuing, mutual support;
2. Span the widest possible activity period – incorporate permanent attractions as well as time-sensitive ones (e.g. evening recreation)
3. Respond to the broadest possible audience (resident, civilian, shopper, and visitor)

(ULI, 1976)

As stated at the beginning, the mix of uses on a military activity will not necessarily include revenue producing ones, nor will it have the exact same mix. Opportunities for mixing uses on military activities focus on housing, administrative, academic, recreation, and service (dining hall, Navy Exchange (NEX), fast food, etc). The population of the activity is more captive in many respects than a typical community, more similar to a campus environment. Capitalizing on this captivity and relatively close proximity, the Navy activity should create walkable environments for residents and civilian staff, placing compatible uses together and ensuring the pedestrian network is present to support the design.

The design should incorporate uses that will attract activity at all times. Incorporating recreational uses into the design will also provide activity at various times of the day and evening. Providing a mix that enables residents, students, civilians, and visitors to be actively using the area at all times will enhance interactions between all groups, providing an increased sense of community beyond just the student and civilian worker realm.

28.3.2 *Efficiency of Infrastructure*

Creating developments where uses are condensed can result in infrastructure savings. The consolidation of uses in a central site can result in decreased demands for utility extensions and provision, resulting in increased project savings. Due to its centralized location of uses, requirements for roads and parking may also be lessened, creating further savings at the project level.

Shared parking is a concept that can be utilized in accordance with changes in activity throughout the day and evening. Day parking may be a concentration of civilian, administrative personnel who commute to the Navy activity. Residents will also utilize parking; however, their varied schedules may allow more movement off the activity to the surrounding community during the day. Nighttime activities, primarily in recreation, may draw military personnel living off-base to the complex, using facilities previously used by daytime staffers. Combined with the decreased need of spaces due to increased pedestrian circulation, parking resources can be an area for flexible scheduling and calculation of requirements.

28.4 Mixed Use Development Factor Interpretation

28.4.1 Opportunities

- Increased savings on infrastructure costs (water, sewer, parking, roads) from consolidated facilities
- Decreased dependence on the automobile at military activities
- Increased community interaction through pedestrian-friendly environment

28.4.2 Constraints

- Existing Navy facilities would potentially require new construction and adaptation of uses in buildings.
- Realignment of facilities solely to promote increased walkability and interaction is not a high funding priority as compared to repair and upkeep of operational functions.

28.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of information on impacts from a specific proposed project.

- Can the project be co-located with other accommodating uses?
- Is their opportunity for creating a synergy of uses between the new project and existing spaces?
- Will the new use (project) generate pedestrian activity throughout the day or evening?
- Is there a developed pedestrian network surrounding the proposed project site in order to encourage movement of people to and around site to nearby buildings?

28.6 Data Sources

1. Internet

- <http://www.api.ucla.edu/RHNAdev/HousingStrategiesPlans/HousingStrategies/Abag/MixedUse.htm>
- <http://www.sustainable.doe.gov/landuse/mixed.shtml>

2. Local/Regional

- City/County Planning Department (examples of standards)
 - Zoning ordinance
 - Comprehensive plan

3. Navy

- PWO
 - Facilities
 - Transportation
 - Utilities
- Environmental Office
 - Master plans or RSIPs

29.0 FORCE PROTECTION

The heightened awareness of terrorist threats over the last decade has resulted in both site and activity level design criteria to protect service-members and their families. Criteria are primarily focused at the site and construction level, controlling distances between buildings and access points. On an activity level, protection of the installation perimeter is crucial, preventing unauthorized access to internal facilities. The control of access points and installation boundaries are the most significant elements impacting land use planning at the activity and regional level. Providing authority for force protection, OPNAV 3300.55 outlines the Navy Combating Terrorism Program Standards. Additional Navy-specific guidance is provided in NAVFAC Interim Technical Guidance AT/FP, January 2000.

29.1 Relevance to Planning Studies

29.1.1 Regional Studies

On the regional level, force protection is most important in establishing an installation perimeter boundary that is not threatened by community uses. Ideally, encroachment issues would be solved through local land use control, however, increasing growth continues to surround Navy activities.

Additionally, the level of service of transportation networks within a region can be impacted by anti-terrorism policies. Car searches, slow access queues, and identification verification can cause significant delays at peak travel times near the entrance to the activity. Efforts are usually focused on the activity and its surrounding area; however, activities and installations within an entire region abroad may be targeted due to political instability or local conditions.

29.1.2 Activity Plan

Most applicable to the activity level is the control of access into and around the installation. Terrorists must have some means of accessing Navy facilities, and measures controlling identification verification and traffic flow are the most common means of assessing who is on the activity at any time. Also relevant at the activity level is the integrity of the installation boundary. Protecting the entire activity from intruders, means of controlling access at these points, whether vehicular or not, would prevent unauthorized visitors. Lastly, site and construction standards would be applicable at the activity level. Designating individual construction standards for sites within an activity is crucial for protection of sensitive uses, such as bachelor quarters and family housing, as well as any regularly-inhabited building such as administrative and instructional.

DEFINITIONS

Standoff Distance – The distance separating a building from a structure or area designated as a threat for terrorist activities (e.g. separation of buildings from garbage dumpsters.)

Concealment Area – The area around a building or structure which can provide a hidden place for anti-terrorist activities.

Primary Access – The largest and most obvious entrance in and out of a building.

Cadastral - A system of real-estate identification referring to property boundaries and descriptions.

29.2 Relationship to Other Resource Areas

Force protection and anti-terrorism efforts are primarily related to transportation networks, real estate information, facility condition, and utilities. As access is a primary control point of force protection, the condition and capacity of transportation networks within and outside the fence is important to consider in planning policies for the activity and region. Also points of access are the activity boundaries, reflecting cadastral and real estate information on their location in respect to surrounding uses and intensity. Facilities and utilities can both be targets of terrorist aggression, as they form the backbone of the development infrastructure of the activity as well as housing specific people, assets, and programs.

29.3 Primary Force Protection Factors

29.3.1 Building and Construction Standards

DoD and the Department of the Navy have developed minimum construction standards as part of the antiterrorism and force protection planning initiatives. The DoD Antiterrorism Minimum Construction Standards apply to new construction and major renovations undertaken by all services. The objective of the regulations is to provide, “appropriate, implementable, and enforceable ways to establish a baseline level of protection to reduce the likelihood of mass casualties in the event of a terrorist attack against DoD personnel where they work and live (DoD Draft, 2001).” According to the standards, incorporating protective measures into new construction projects is the most cost-effective and easily implementable method of achieving the highest level of security. The document cites four primary areas of opportunity in providing the optimal degree of force protection.

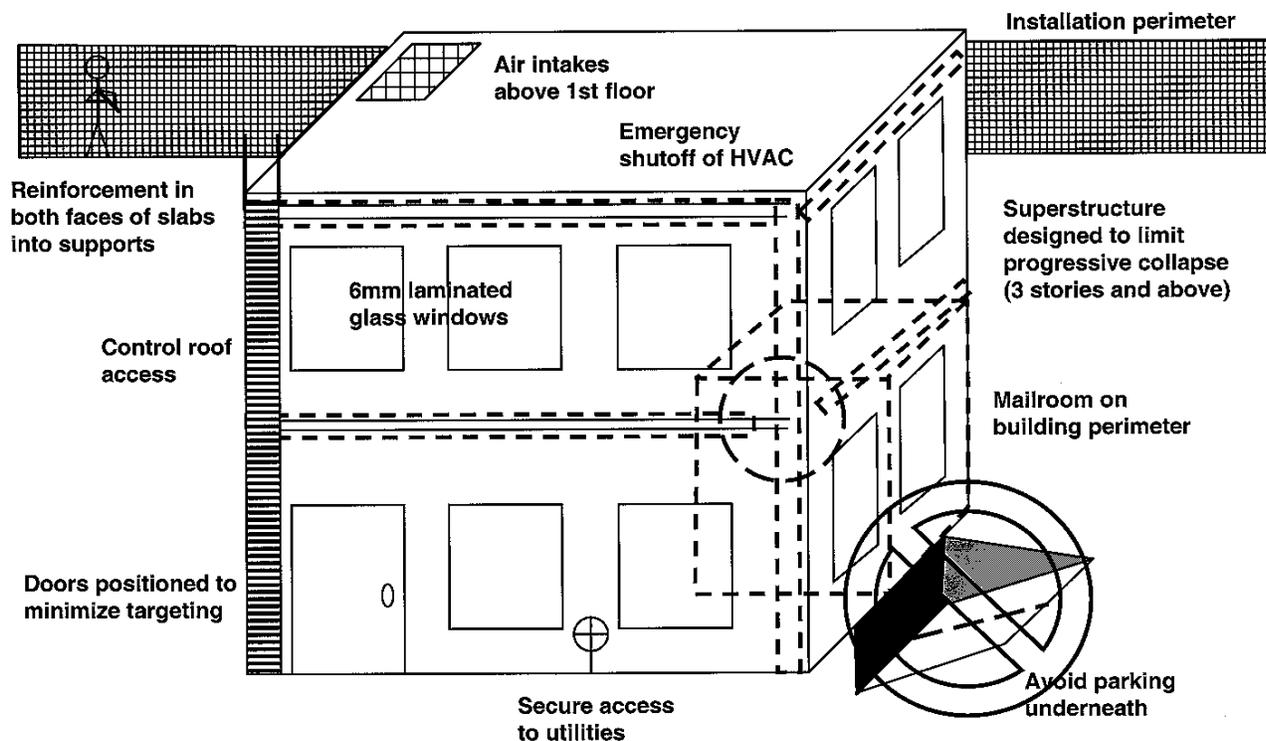
- Maximize standoff distance
- Prevent progressive collapse
- Minimize hazardous flying debris
- Facilitate future operational measures

Implementation of these standards is mandatory in new construction beginning in FY04. All construction accommodating DoD personnel must follow the standards, regardless of the funding source used. Where renovation costs exceed 50% of replacement cost for facilities, the standards are also mandatory beginning in FY04. In leasing arrangements, the standards are mandatory beginning with leases initiated after 1 October 02 as well as those renewed after December 31, 2006.

The standards address standoff distances, concealment areas, building integrity and entrances, and vehicle access as the primary elements to consider at the facility level for planning (Figure 29a on pg. 209). Standoff distances, referring to the distance between an inhabited building and potential explosives, require different degrees of separation by use. Separation from trash containers and parking lots are identical, while the distance from the installation perimeter is greater. Many of these also relate to site development standards in their scope and purpose of prevention in a general area of the activity.

Landscaping and natural vegetation considerations must also be addressed in assessing the level of security around structures on a site. Vegetation which serves as a hiding place for people or items posing terrorist threats must be reduced in size and volume so that buildings and their perimeters are in plain view at all times.

Figure 29a
Building Standards for Force Protection



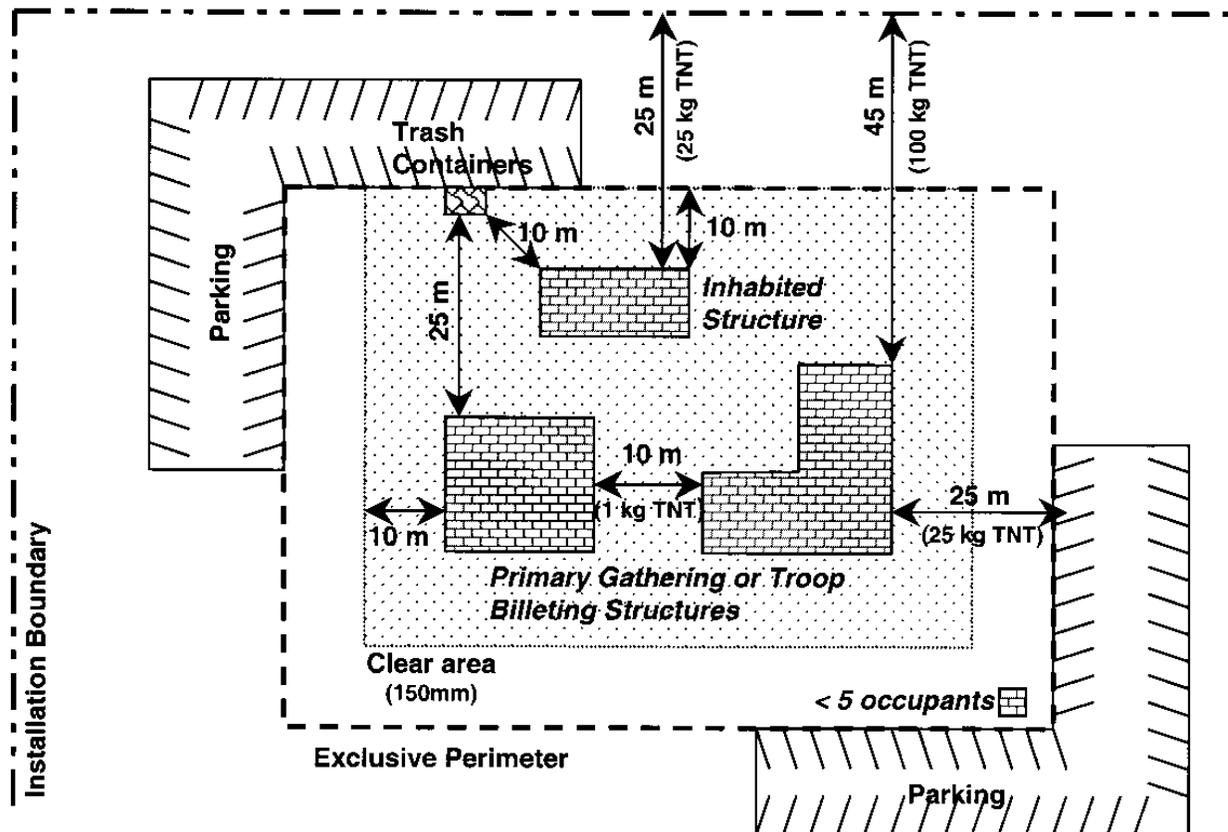
Source: Preliminary Draft DoD AT Construction Standards of 6 April 2001

29.3.2 Site Standards

At the site level, construction and distance standards aim to achieve a primary goal of consolidating appropriate and enforceable methods of reducing the likelihood of mass casualties in the event of a terrorist attack against DoD personnel. Three objectives to this goal exist, including maximizing standoff distances, building better buildings, and reducing future risk. These objectives summarize the policies of site standards, including designating specific standoff distances and building locations in relation to other buildings and the activity boundary (Figure 29b on pg. 210).

Several levels of explosives exist in developing force protection standards. As the level of protection decreases, the potential structural damage and injury of personnel increases. With no protection measures implemented, significant damage and a high number of fatalities is likely. When a high level of measures are in place, only superficial structural damage occurs as well as light injury counts.

Figure 29b
Sitework Standards for Force Protection



Source: Preliminary Draft DoD AT Construction Standards of 6 April 2001

29.3.3 Access Control

Important at both the building and activity level, control of automobile and pedestrian movement is a crucial element of the planning considerations. Controlling automobile flow through the entrance gates is often achieved through identification verification. Controlling traffic around sites relates to the standoff distances required through the construction standards, as well as parking standards developed for each activity. Pedestrian traffic must be considered as well, both through the entrance gate and around buildings.

Several elements of access control at the site level exist which Navy planners must consider in providing safe access. Minimum access control considerations include:

- Eliminate potential hiding places near facilities;
- Eliminate lines of approach perpendicular to the building;
- Minimize vehicle access points; and

- Eliminate parking beneath facilities.

29.4 Force Protection Factor Interpretation

29.4.1 Opportunities

- Provide enhanced security for DoD personnel and their families from potentially life-threatening events
- Decrease likelihood of sensitive and confidential information being transmitted to unauthorized personnel
- Increase quality of service standards for both residents at the installation and civilian employees

29.4.2 Constraints

- Additional funding may be required to retrofit existing facilities to new guidelines for landscaping, parking, and standoff distances
- Site constraints may limit possibility of including adequate standoff distances; choices of appropriate development sites may become limited due to force protection requirements

29.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of information on impacts from a specific proposed project.

- Has the level of threat/vulnerability of your project site and activity been assessed?
- Does the proposed project include force protection measures within its budget and design?
- Is the new project located near the installation perimeter or near the interior?
- What landscaping currently exists around the proposed project site?
- What is the terrain around the project site?
- Is the transportation network surrounding the project sited including force protection considerations?

29.6 Data Sources

1. Internet

- http://www.dsca.osd.mil/fp_links.htm
- <http://security.crane.navy.mil/security/fps.html>
- http://www.efdlant.navfac.navy.mil/Lantops_15/FORCE_PROTECTION.HTM
- <http://www.nfesc.navy.mil/shore/atfp/>

2. Navy

- Base Security Office
 - Circulation plans
 - Manpower forecasts for gate house and security
 - Access information of activity
- Public Works
 - Transportation plans

- Facility MILCON lists
- Site engineering and landscaping designs for new projects
- Natural resources plan

3. Local

- City/County Planning Department
 - Open space/natural resources plan
 - Comprehensive plan
 - Zoning ordinance
 - Transportation plan

4. Regional

- MPO
 - Transportation Improvement Plan
 - Traffic counts

30.0 LAND USE

Land use designations are used to describe specifically how developed land is utilized. The most common designations, residential, commercial, industrial, and agricultural, describe the majority of land surface in our country. Regulations at the local level establish these categories, often building upon the standard categories to fit the specific needs in an area. Using land use designations as a basis, zoning directs specific uses into zones that minimize incompatibilities due to noise, safety, or environmental concerns. Zoning is the one of two planning tools, or regulations, enforceable by law. Another primary tool of community planning is focused on long-term objectives and spatial relationships. The comprehensive plan addresses long-term development objectives of the entire community, acting as a guide in meeting goals and objectives as related to the built environment. Acting as a policy document without the enforcement of law, citizens work with local planning departments in preparing a plan and gaining approval from the jurisdiction's governing body. The authority of a local jurisdiction to enact zoning and subdivision regulations and land use plans comes from the individual state enabling regulations. Based on the 1928 Standard City Planning Enabling Act (SCPEA), many current state enabling laws follow many of the same authority-granting tenets as the original regulation.

Navy land located on-base is not subject to the local land use planning designations. Operating under its own system of categorization, similar in some ways to the local one, the Navy is not legally responsible for coordinating the military land use system with the surrounding community. However, with increasing public/private partnerships and coordination efforts, it is politically wise to work in conjunction with local policies, understanding them and their impacts on Navy lands.

30.1 Relevance to Planning Studies

30.1.1 Regional Studies

Land use planning can encompass a wide range of actions, influencing Navy regional plans. Most local governments (town, city, or county) have planning agencies involved in regulating land development and land use through zoning and subdivision regulations. Of particular

DEFINITIONS

Zoning – The division of a city or county by legislative regulations into areas, or zones, which specify allowable uses for real property and size restrictions for buildings within these areas.

Comprehensive plan – A plan for development of an area that recognizes the physical, economic, social, political, aesthetic, and related factors of the community involved.

Enabling legislation – A legislative act authorizing a government agency to do something that previously could not be done.

Ordinance - A law or regulation set forth and adopted by a governmental authority, usually a city or county.

Mixed use development - A tract of land or building or structure developed for two or more different uses such as, but not limited to, residential, office, manufacturing, retail, public, or entertainment.

Subdivision regulations – The control of the division of a tract of land by requiring development according to design standards and procedures adopted by local ordinance.

Encroachment – The increasing development of community land uses around military establishments; presents safety and health concerns for the civilian community.

interest to Navy planners are land use plans and zoning regulations for the immediate vicinity of an activity location; jurisdiction-wide plans can also affect the location of municipal and private services in relation to naval facilities and personnel housing. Although the Navy does not directly control off-base land use, it can be influenced and addressed in the Navy planning process, particularly in regard to public service and potential land use encroachment issues (Figure 30a on pg. 215).

Land use, zoning, and subdivision controls are administered on a city or countywide basis. Regions may contain numerous municipal governments, often working through a regional governmental entity to address area issues (such as transportation, housing, economic issues, air quality, and cumulative land use issues). The regional government also acts as a forum for inter-governmental issue discussion and problem resolution. Navy plans can be influenced greatly by regional and local land use trends, especially in regard to encroachment due to land uses incompatible to military operations.

30.1.2 Activity Plan

Off-base land use affects activity planning whenever on-site operations and facilities impact nearby non-Navy uses and vice-versa. Noise, air pollution, visual and safety conflicts are major contributors to land use incompatibilities. The increase of residential and commercial development around the immediate activity boundaries couples with Navy operations in producing the land use incompatibilities. Regular monitoring of and participation in local municipal planning and decision-making can provide Navy planners with the necessary awareness to adapt Navy plans and influence local government plans.

30.2 Relationship to Other Resource Areas

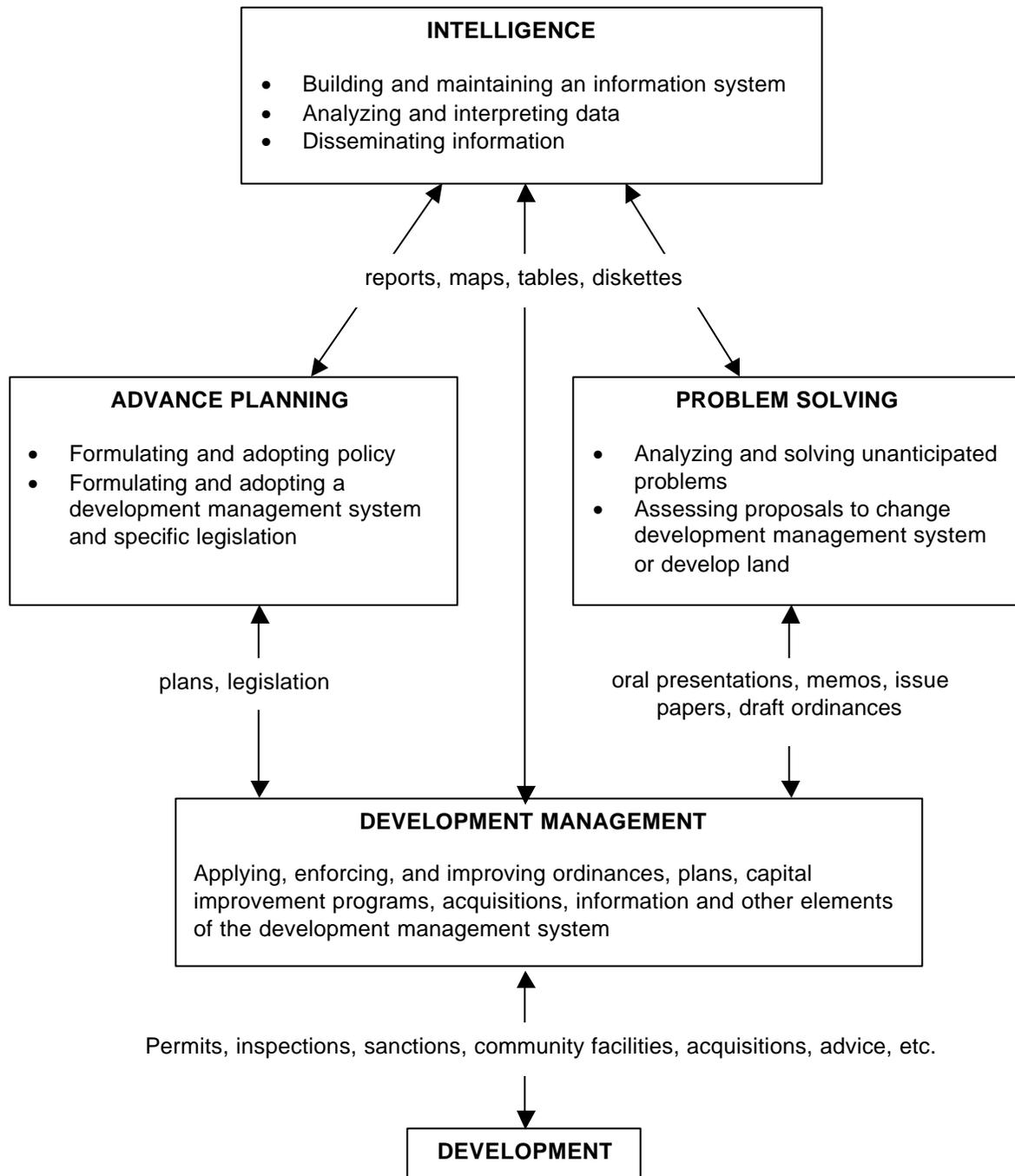
Community land use information is closely interrelated with transportation and utility provision. The presence of transportation networks and utilities encourages development. Requirements exist in the subdivision process for transportation and utilities to be provided, and existing systems prevent the developer from incurring those costs. Conversely, the lack of transportation and utilities can restrict land use conversion from agriculture to more intensive uses. Many local governments employ regulations attempting to ensure development only occurs where utilities are already present rather than encouraging the construction and expansion of the existing networks. Developers are also assessed fees for contributing to the need for utilities, roads, and other public services. These help ensure the development in the community helps support itself within the local tax base.

Land use decisions also relate to socioeconomic aspects such as population, economic trends, and support systems/facilities. Within a community, the location and quantity of public services is dependent upon the residential land uses, and many residents will locate near public services if an affordable option is provided. The type of these services is driven by the demographics of the community.

Natural systems are important determinants in community land use decisions as well. The topography of an area will determine the location of development. Steep slopes are considered un-buildable for hazard and environmental reasons. The topography of sites within a community limits the intensity of building and is often used for its visual appeal in marketing developments. These factors all contribute to the nature of neighborhoods and developments

within a local community as well as the type of use for that site. Soils also help determine the land use of an area. Based on the national soil survey, soils suitable for prime farmland and agriculture are often targeted for cultivation or open space rather than residential uses. On sites within already developed areas, soil classifications do not determine the type of use as much as the intensity of it.

Figure 30a
Land Use Planning Process



Source: The four functions of a land use planning program, their sub-elements, and their linkages. (Kaiser et al, 1995)

Off base, community land uses can be affected by military operations and (vice-versa) should such uses be too near one another. Increased intensity of development can create many forms of encroachment threats to Navy aircraft, shipping, and weapon testing/training operations. These threats are due largely to increased population densities that are affected by potential noise and safety impacts of operations.

30.3 Primary Land Use Planning Factors

30.3.1 *Land Use Patterns and Character*

Existing land use patterns are shown on generalized maps of large major areas by basic land use type. Basic community land use types include office, commercial, industrial, residential, institutional, community services/public facilities, and parks/recreational/open space. Existing land use maps are a "snapshot" of the adjacent land use at a given point in time. These maps are different than zoning maps, which show what the community envisions the land use pattern to look like over time. The long-range comprehensive plan is the tool through which the zoning map will be implemented. Although existing land use does not reveal a particular property's existing zoning or its proposed land use, future land use plans and area growth trends can reveal whether existing land uses in an area are likely to remain stable or change dramatically.

As the zoning ordinance is amended and new categories are developed, including mixed-use development, floodplain areas, and historic districts, the character and appearance of a community changes. While the foundation of the ordinance reflects the goals and objectives of the comprehensive plan, communities insert their own twists on development desires into the land use regulations. These modifications create a need for Navy planners to stay current with the emerging patterns and character of the land use decisions in the surrounding community in order to increase opportunities for coordination.

30.3.2 *Zoning and Subdivision Regulations*

Subdivision regulations are, "land use controls that govern the division of land into two or more lots, parcels, or sites for building"(Dalton et al, 2000). Local governments usually regulate subdivisions through prescribing general standards for: site size, layout and construction standards, and relationships to surrounding uses; and, the allocation of public infrastructure costs through dedications and fees by the developer to the municipality. Public infrastructure dedications may include streets, sidewalks, storm and sanitary sewers, street lighting, parkland, school sites or street/buffer plantings. Subdivision regulations dictate the eventual parcel development criteria and can affect the overall built environment's quality, especially street design and layout.

Zoning is the division of a municipality into districts (zones) for the purpose of regulating private land uses. The underlying purpose of zoning is preventing incompatible uses. A traditional example of an incompatible use is the co-location of industrial and residential uses. Residential uses are the most "sensitive" of uses, incompatible with uses resulting in environmental, noise, or safety concerns. Each district is represented on a zoning map (called an 'atlas') and is tied to regulatory text that is included in a zoning ordinance. Zoning ordinances specify permitted land uses; building height/bulk; required front, back and side yards; required parking; and other development requirements. Zoning and subdivision controls are used together, yet they are usually distinct regulatory entities. Zoning controls traditionally

focus on land use and building dimensions, and subdivision controls deal with general street, utility, and other public facility provision/design.

The zoning ordinance requires occasional revisions. Modifications in the local governing body, comprehensive plan, or state and federal statutes may require updating the zoning ordinance to ensure it is accurately reflecting the associated policy changes (Dalton et al, 2000). Since the ordinance is designed to be a consistent reflection and implementation tool for the goals and objectives of the comprehensive plan and governing political body, it is important that the ordinance accurately reflect the current land use planning characteristics of the community.

30.3.3 Land Use Encroachment

Any off base, community land use or action which inhibits or impedes Navy mission performance at an activity can be considered land use encroachment. When an adjacent, vacant or low-density site changes its use, especially to residential development, it may conflict with adjoining Navy uses/activities. Land use changes may also create secondary problems such as increased traffic congestion, over-taxed public facilities, or increased environmental pollution. It is important to realize that land use patterns can change dramatically over time, and Navy planners should attempt to project impacts of future land use patterns on Navy activities. Comprehensive or general land use plans by local planning agencies can provide good information on future land use.

Encroachment is a significant problem at many Navy activity in urban to semi-urban localities. Especially important where Navy aviation operations occur, the continuing growth of residential, commercial, and community uses near activity boundaries presents continued roadblocks in planning (Figure 30b on pg. 218). Navy planners must work with the local community in their current and long-term comprehensive planning efforts to target growth away from activity boundaries. Through courtesy review of development near the activity, or participation in planning coordination efforts, the activity can continue to plan for long-term changes in the community's built environment.

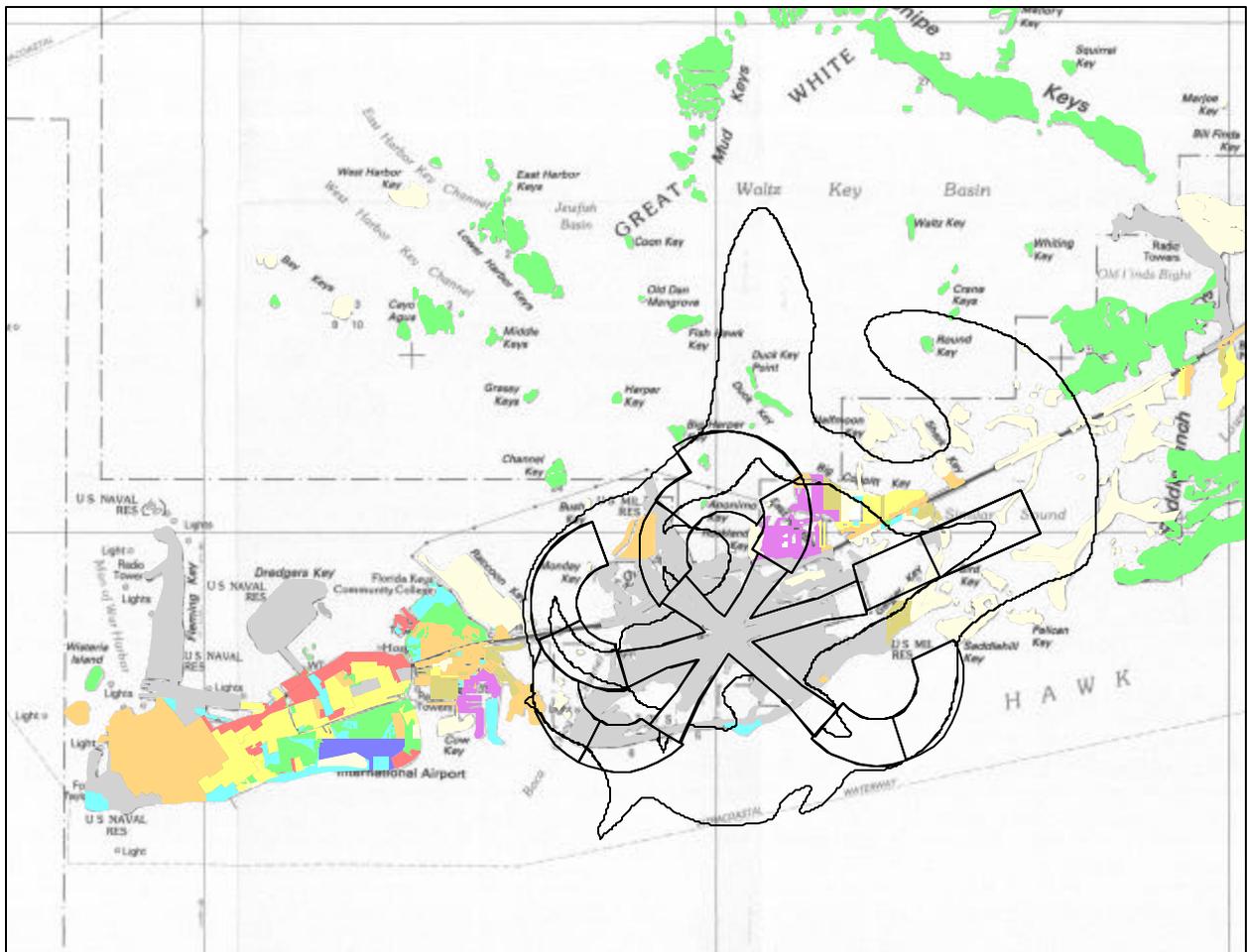
30.4 Community Land Use Factor Interpretation

30.4.1 Opportunities

- Local municipal land use zoning and subdivision controls are a primary source of data for describing existing land use patterns in the context of Navy regional planning. Future land use plans are usually available from the same source, although such plans are policy guides and can only be used as indications of future trends.
- Analysis of existing zoning and proposed land use plans can assist in identifying off-base land use conditions which might affect the Navy mission in the short term. More detailed analysis can identify likely future land use encroachment areas.
- On-going land use changes can be monitored and incorporated into the planning processes to identify and address potential encroachment issues in advance of their becoming serious problems. Active Navy participation in local government planning commission proposals and meetings can provide an early information source as well as a forum in which to state Navy concerns/needs.

Figure 30b

Future Land Use with AICUZ Footprint - NAS Key West



- | | |
|--|--|
|  High Density Residential |  Historical/Mixed Use |
|  Medium Density Residential |  Public/Institutional |
|  Low Density Residential |  Undeveloped/Conservation/Agriculture |
|  Commercial |  Airport |
|  Military |  Industrial |

Source: AICUZ Study Update NAS Key West, Pre-Draft, September 2000.

30.4.2 Constraints

- The most negatively impacting land use changes are those immediately adjacent to a Navy installation which result in severe use incompatibilities between that use and the Navy's land use. Proximity of land uses is critical in terms of visual, noise, environmental, traffic, and safety impacts.
- General land use changes in the vicinity of Navy installations can cause secondary impacts, such as overcrowded schools, congested highways, increased real estate taxes for Navy personnel living off base, etc. Major community facility improvements can improve Navy personnel quality of life while also resulting in the area more desirable for intensive development.
- Navy operations that affect the adjacent community can be adversely affected by land conversion to more intensive uses. Such activities may include aircraft operation; weapon training; explosive or flammable cargo transfer via public roads; or, heavy industrial operations.
- Off-base land use can be a descriptor of available housing supplies and support services, which may be exceeded in the event of increased activity loading.

30.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in evaluating the relative importance of land use information on a specific proposed project.

- Will the project create or induce changes in existing and/or proposed land uses for the area immediately outside the installation or the region?
- Does the project require significant amounts of new housing and/or support services to be developed in the surrounding local area?
- Are local area development permits required for this project?
- Will the project be affected by the local comprehensive plan or any local area management or development plans?
- Will the project activity hinder access to environmental resources such as beaches, wetlands, recreation areas, historical or cultural sites, and archeological sites?
- Will the project include land uses that may be perceived as incompatible with surrounding land uses?

30.6 Data Sources

1. Internet

- <http://cyburbia.ap.buffalo.edu/pairc/>
- <http://www.ar.utexas.edu/Planning/links.html>

2. Local

- City/County Planning Department
 - Local comprehensive land use plan
 - Local zoning maps
 - Trends/forecasts reports
 - Demographic studies
 - Economic development plans/projections of business

3. Regional

- Council of Governments (COG)
- Metropolitan Planning Organization (MPO)
 - Future land use maps
 - Transportation plan
 - Regional land use plan
 - Regional economic development strategies

ADDITIONAL SOURCES

- Navy EFD
- Natural Resources Conservation Service (NRCS)

31.0 COMPREHENSIVE PLANNING STUDIES

Comprehensive studies are broad examinations or analyses of current and potential planning issues facing the government(s) and residents of a geographic, demographic, or jurisdictional area. These studies usually examine a broad range of issues in varying levels of detail so that governments may identify critical impacts and the mitigation alternatives to them.

Comprehensive planning studies today are usually policy-oriented; they are not detailed physical plans for all city development. They may provide only a general guide to what is desired for the future city development. Land use and public infrastructure (roads, water, sewer, public facilities, etc.) are key focal points of current comprehensive plans, as are policies and general plans for directing the growth and location of these elements. Every municipality has a unique set of circumstances and needs which dictate the nature of its comprehensive plan.

31.1 Relevance to Planning Studies

31.1.1 Regional Studies

Comprehensive studies are conducted on a city, county, or regional basis; therefore, they are excellent data sources for Navy RSIPs. The level of detail in data presentation and analysis is directly applicable to larger scale Navy planning efforts. Issues are much the same in both municipal and RSIPs (e.g. transportation, utilities, housing, economic development trends, social and community services, land use, encroachment, etc.). The Navy can influence regional and local comprehensive planning studies through an active participation in the public planning process. This participation provides a forum for presenting the benefits of the Navy presence (such as housing and retail services usage and the provision of jobs to local residents).

DEFINITIONS

CIP – Capital Improvements Plan - A proposed schedule of all future projects listed in order of construction priority together with cost estimates and the anticipated means of financing each project. Included are all major projects requiring the expenditure of public funds, over and above the annual local government's operating expenses, for the purchase, construction, or replacement of the physical assets of the community.

Capital Improvement Budget – a one-year element of the CIP, indicating the prorated amount to be expended for each project listed, including the sources of revenue.

TIF – Tax Increment Financing - A tool used by cities and other development authorities to finance certain types of development costs. The public purposes of TIF are the redevelopment of blighted areas, construction of low-and moderate-income housing, provision of employment opportunities, and improvement of the tax base. With TIFs, a development authority captures the additional property taxes generated by the development that would have gone to other taxing jurisdictions and uses the tax increments to finance the development costs.

Fiscal Impact Analysis – a projection of the direct public costs and revenues resulting from population or employment change to the local jurisdiction in which the change is taking place. Enables local governments to evaluate relative fiscal merits of general plans, specific plans, or projects.

31.1.2 Activity Plan

Comprehensive studies provide general information for use at the activity planning level. Major city growth policies and directions can assist Navy planners in assessing the general context of an activity, and hence the potential for encroachment. But more detailed analyses of zoning and land use documents may be required to provide the necessary level of detail to assess any specific site's municipal planning impacts. Local government Capital Improvement Plans (CIP) usually identify specific proposed projects and describe their purpose, size, location, cost, and anticipated construction date. This information can be invaluable to Navy planners in assessing municipal service availability as well as indicators of nearby private development growth rates and locations.

31.2 Relationship to Other Data

Comprehensive studies can provide information in virtually all (natural and man-made) data categories, including the physical, biological, cultural, socioeconomic, and built and regulatory environment systems of information. The primary focus of comprehensive plans tends to be land use change and the direct and secondary causes and impacts of such change. The development process, environmental and community concerns, and the economic well being of the community are major concerns. The comprehensive nature of these studies means that they touch upon many planning issues/topics and provide overview data for decision-making, focusing on detailed data in each category found in specific preliminary studies on those topics.

31.3 Primary Comprehensive Studies Planning Factors

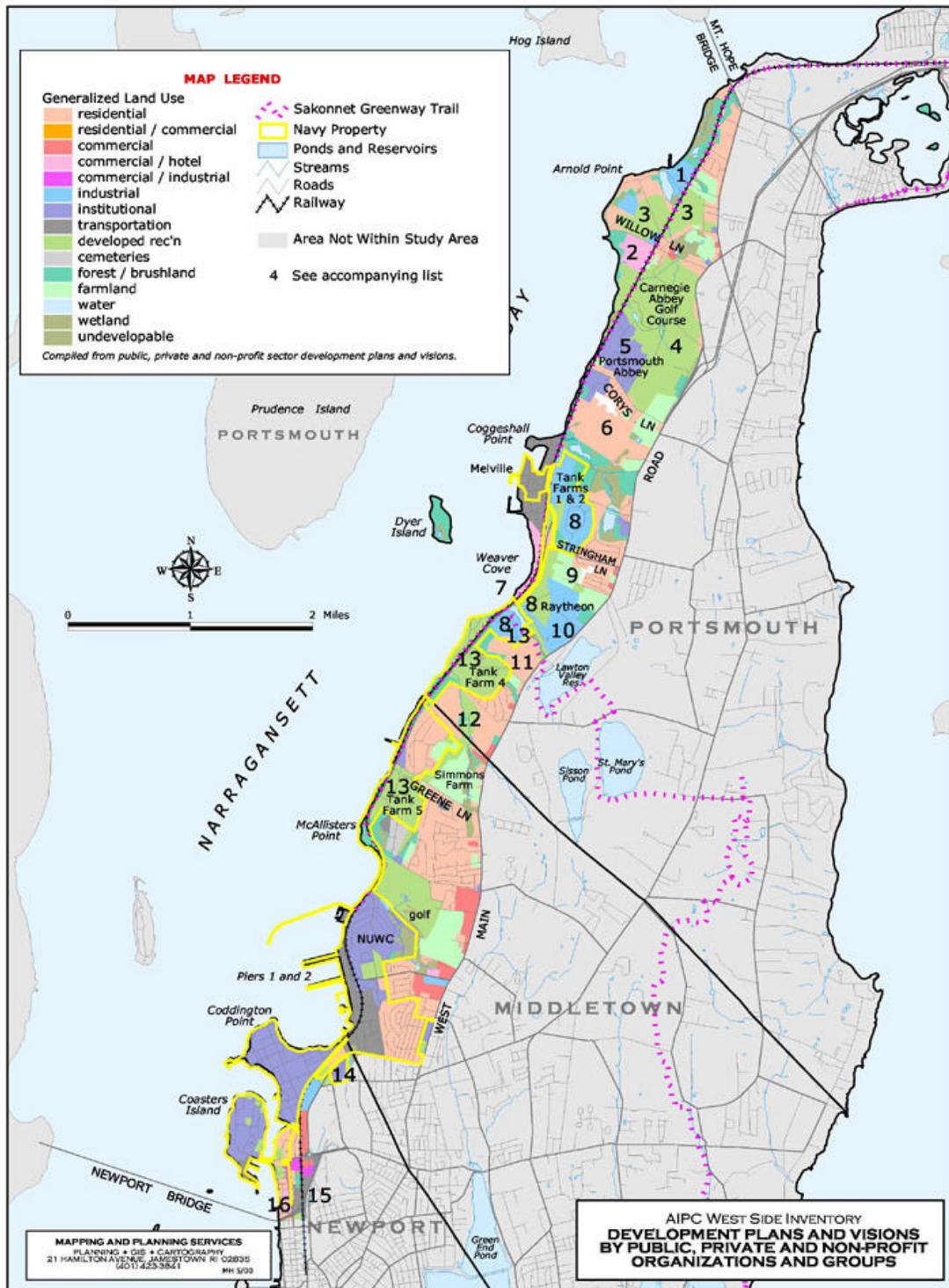
31.3.1 Land Use Plan

The land use plan is a key component in comprehensive planning studies; it proposes a model of physical land development by land use type for a medium to long range time span -usually five to twenty years (Figure 31a and b on pg. 223 and 224). In displaying general plans, the level of information displayed should convey the most crucial information while not giving more detail than the reader needs to understand the general purpose. The plan does not represent zoning changes, and it may or may not reflect the existing zoning of specific parcels. The plan is a general policy guide by which future specific land use decisions (e.g. zoning changes) can be made, and it has a degree of flexibility to accommodate evolving social, environmental, and economic trends over the long term. The proposed land use plan represents current municipal growth goals for the future and is supported by proposed transportation, utility, and other public improvements.

This plan is most often part of the community's comprehensive plan. Acting as a policy guide, this plan guides the future land use and development of the community using regulatory tools including zoning, land acquisition, development standards, and exactions. Zoning is the most common legal tool through which the goals and objectives of the comprehensive land use plan are enacted. Amended in text and on the official map, the zoning patchwork of a community suggests a future development pattern to a planner. Understanding how a specific zoning ordinance and other regulations implement a comprehensive land use plan's goals is crucial for the Navy planner in assessing the future built environment of the activity's surrounding environs.

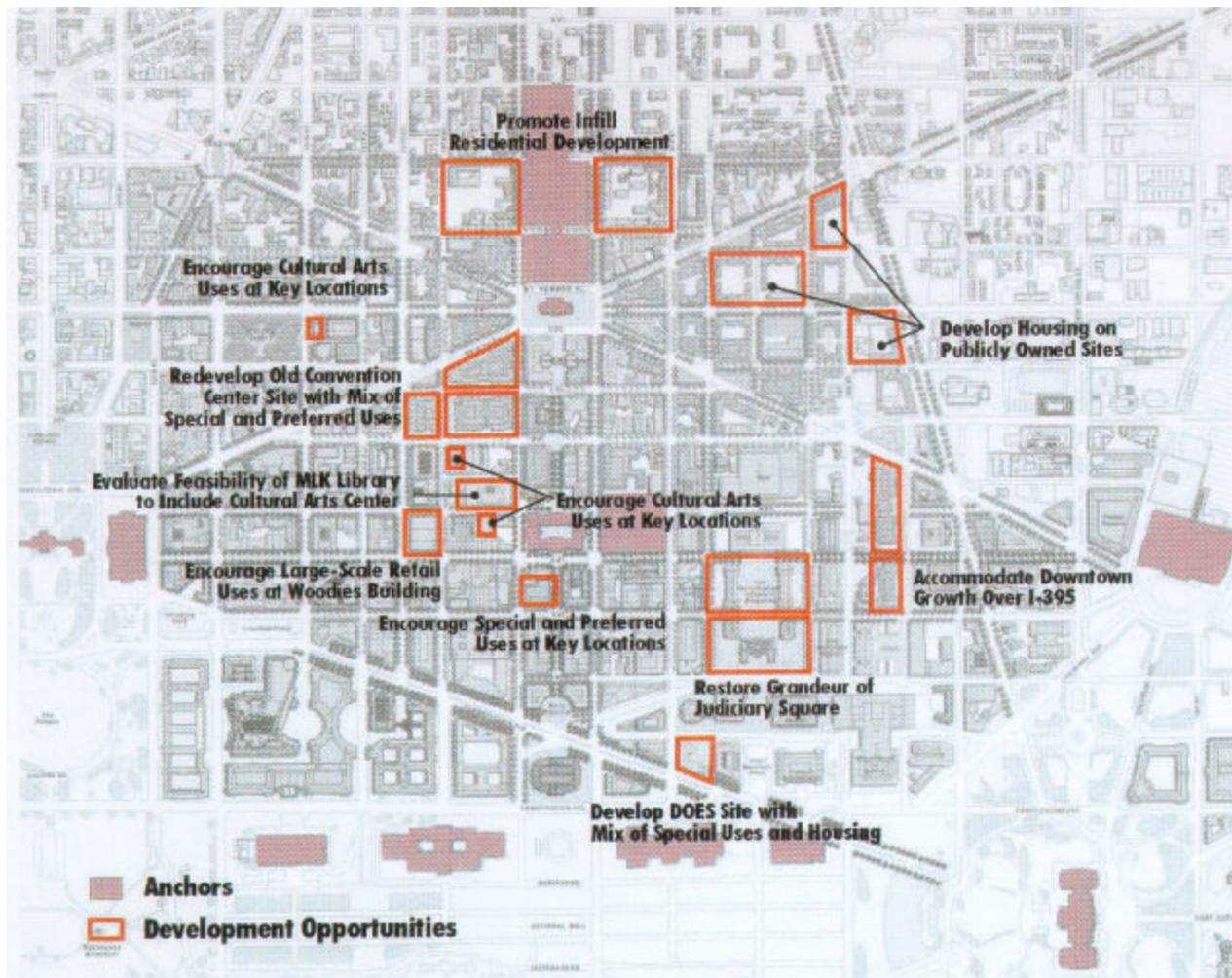
Figure 31a

Proposed Land Use - Newport, Middletown, and Portsmouth, RI



Source: Aquidneck Island Planning Commission website - <http://www.aquidneckplanning.org/westside/westmaps/westmap9.html>

Figure 31b
Strategy for Downtown Revitalization, Washington, DC



Sites	Recommended Uses	Strategy Achieved
Old Convention Center (Squares 373, 374, 344)	Mix of Special and Preferred Uses	Supports Downtown as Destination, Housing and Civic Space
DOES Site (Square 491)	Special Uses and Residential	Expands Penn Quarter
Mount Vernon Triangle	Residential with Retail	Develops Housing on Public Sites
Square 562	Residential	Initiates Residential in Mount Vernon Triangle
Square 516W	Residential	Initiates Residential in Mount Vernon Triangle
Mather Building	Residential	Expands Downtown Housing and Arts
I-395 Air Rights	Commercial with Retail	Directs Downtown Growth
Woodies Building	Large-scale Retail/ Entertainment	Strengthens F Street and Traditional Downtown Core
Evans Property (Square 406)	Arts, Retail	Expands Penn Quarter/ Strengthens E St. Theater Row

Source: Washington DC Office of Planning website - http://www.planning.dc.gov/project/downtown_ap/index_daa.shtml

Often created by local planning department staff, the comprehensive plan is forwarded to an appointed planning commission before going in front of the commissioners, council, or supervisors of the jurisdiction for approval. This approval is a subjective policy decision, requiring no objective criteria or evidence to accept or reject the plan. Thus, political realities influence the adoption and adherence to the plan and its objectives within the community. Navy planners should be an active part of the community dialogue in the creation and/or update of these documents in order to further advance and represent the position of the activity in protecting its ability to perform its stated mission. The Navy planner must understand the power of the local officials in the planning process in order to most effectively work within the system to protect Navy interests while acting as a good neighbor with the community.

31.3.2 Capital Improvements Program (CIP)

A CIP is a multiple-year (usually five years) scheduling of planned public improvements based on studies of available fiscal resources and the set of specific public improvements to be constructed for the CIP period. The definition of "capital improvement" may vary from city to city, but such improvements are generally new, permanent projects (or expansion projects) of a relatively large scale and cost with long-term usefulness. Some examples include streets and highways; schools and libraries; water and sewer lines and treatment plants; and, parks and recreation facilities. The CIP is tied closely to projected land use patterns in terms of the capital improvements required to support those types and magnitudes of development. Methods of financing the CIP vary, including general obligation bonds, lease-purchase, special districts, special assessments, state and federal grants, and tax increment financing (TIF).

The capital improvement budget refers to those facilities programmed for the next fiscal year in the CIP. Unlike the CIP, the capital improvement budget may become part of a legally adopted operating budget. The longer-term program does not necessarily have any legal significance.

Capital expenditures have a significant impact on the form of our built environment. Based on long-range projects, studies, and fiscal analyses, decisions related to capital expenditures (most often infrastructure-related) drive development potential. These expenditures create accessibility, the primary driver behind growth. The presence of infrastructure and investment in related capital shapes the form of development in a community, preferably following the goals and vision presented in the community's comprehensive plan.

31.3.3 Fiscal Impact Analysis

A Fiscal Impact Analysis is a projection of direct, current public costs and revenues resulting from population or employment change within a local governmental jurisdiction. The analysis determines whether a project will generate adequate revenue to offset costs associated with public services. Many municipalities will not approve proposed development projects requiring public costs that exceed anticipated public revenues from those projects; a "negative fiscal impact" would result in these cases. Fiscal impact analyses emphasize "current" dollar costs to the public entity (the local government). They focus on cost-revenue analyses, not cost benefit analyses (which compares community gains from a project to its sacrifices to achieve it) or cost-effective analyses (which compare and advocate policies by quantifying the total costs and effects). The cost-revenue analysis focuses on the costs and revenues associated with a specific form of growth. All of these cost analysis methods are associated with managing a cost-efficient public office as well as understanding the fiscalization of land use, changes in the land use pattern, and impact of local annexations.

31.3.4 *Infrastructure Plans*

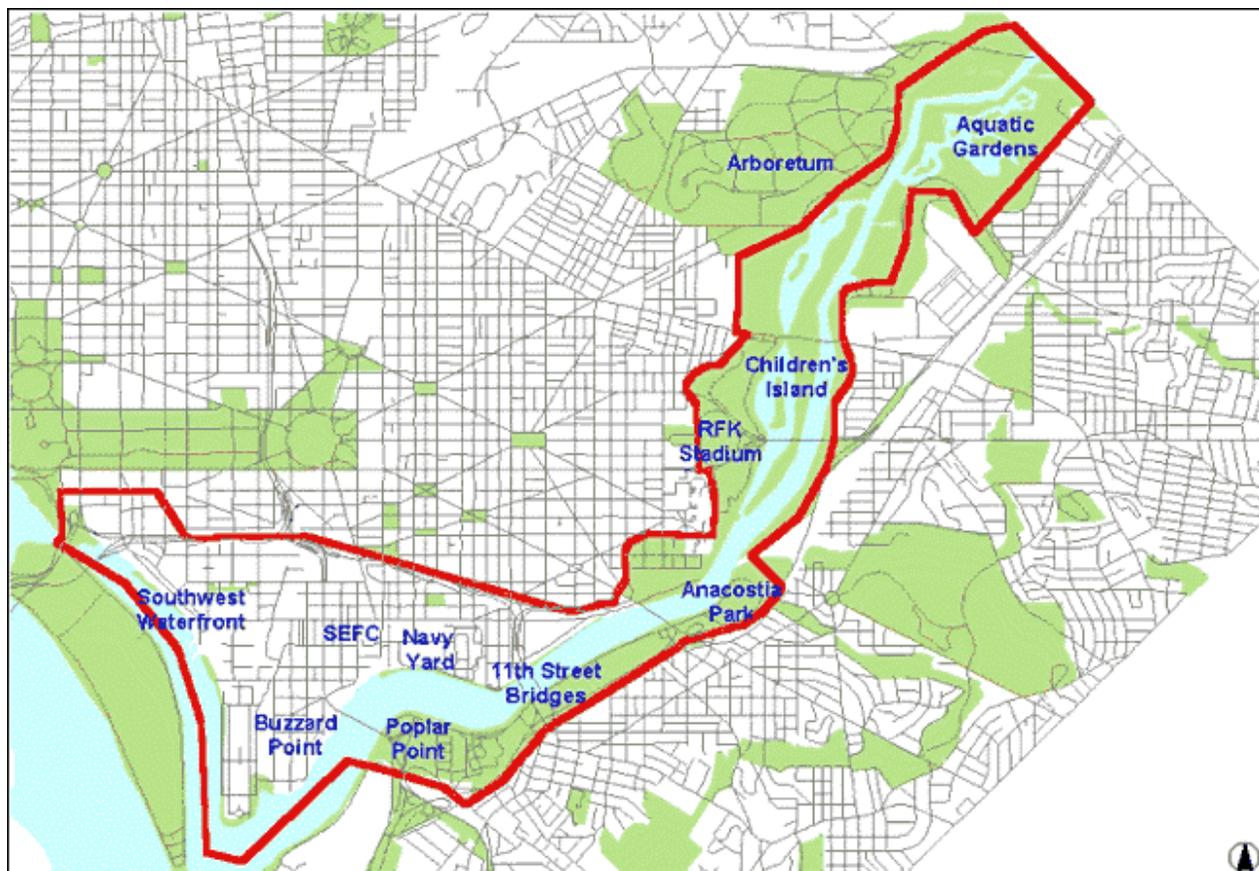
Closely associated with land use plans are the proposed public infrastructure plans. There are usually two major infrastructure areas: utilities and transportation. Utilities infrastructure planning looks at the extent of each service area, the ultimate service area population, and the projected per capita service level requirements. Major public utilities include water supplies, treatment facilities and distribution systems; wastewater treatment facilities and distribution systems; and solid waste removal and disposal systems/sites.

Transportation infrastructure provision is essential to the quality growth of urban areas. Planning for such future improvements is usually linked to land use plans for an area, yet it may be carried out as a separate activity within the overall planning process due to special state and federal funding for such activities. MPOs are responsible for much of the regional transportation planning and budgeting, relying upon federal funding for the projects. Integrating these plans with regional land use programs developed by the Council of Government (COG) in an area, the MPO concentrates on coordinated land use and transportation planning efforts for an entire region. Since many interstate highways, urban expressways, and major highways have been built, a major focus of transportation planners at the county and city levels are to plan for community-level transportation needs. However, regional transportation planning must continue to provide the framework for smaller studies. Transportation planning encompasses street systems classification and layout, traffic engineering, land user-based trip generation, transit systems, parking, pedestrian systems, the relationship between the land development process, transportation improvement provision, and the social, economic, and environmental impacts of such improvements.

31.3.5 *Community Facilities and Recreation/Open Space Plans*

Schools, libraries, police/fire stations, museums, civic centers, etc. are termed community facilities and are planned in conjunction with future land use and population growth in mind. These elements are integrated into a city's CIP to assure project timing and funding in accordance with population growth and land use change. Recreation facilities (swimming pools, playfields, etc.) and open space lands (parks, stream and river valleys, water bodies, etc.) are important elements in the comprehensive plan. They provide the public with active and passive recreational opportunities while also providing quality scenic attractions and pedestrian systems (Figure 31c on pg. 227). These elements are capital improvement components in a city's CIP, much like other infrastructure systems.

Due to the open and public nature of these resources, many Navy personnel within the communities surrounding an activity will often take advantage of these facilities. In calculating the requirements for recreation and open space areas, the community planner must consider that the military population will use some resources as much as any citizen might. Funding these resources can then become difficult when facilities are provided without the corresponding tax revenue of a military household to help defray the costs. Thus, communities and military activities often work together to find a compromise and planning method which allows for cost-efficient operation of community and recreation facilities while providing these services to all members of the community.

Figure 31c**Anacostia Waterfront Initiative, Washington DC**

Source: Washington DC Office of Planning website - <http://www.planning.dc.gov/project/waterfront/index.shtm>

31.4 Comprehensive Studies Factor Interpretation

31.4.1 Opportunities

- Comprehensive studies can provide Navy planners with a broad overview of municipal or regional conditions and the public policies and plans for future municipal growth. Much relevant data can be obtained on major land use, transportation, utility, and community facility proposals, potentially impacting Navy planning.
- Comprehensive plans reflect policies and opinions that add to the qualitative understanding of how Navy functions are perceived by local governments and citizens. Major private sector development trends may also be described in comprehensive plan documents.

- Social, economic, and community issues and goals are usually stated in these plans, and such issues/goals can be important to the quality of life of Navy personnel in a particular geographic area. They may also provide information on potential encroachment problems.
- Through understanding the plans and goals of the community, opportunities for coordination between the Navy, public, and private entities may arise for the provision of services (e.g. housing, recreation, and open space).

31.4.2 Constraints

- Comprehensive plans usually cover such broad categories and issues that they do not always provide adequate detail for Navy planners to appraise any single planning aspect. Further investigation of each subject area can usually be accomplished by speaking with the local city/regional planning, transportation, utility, housing, and parks/recreation agencies.
- Comprehensive plans are not updated annually. In many cases, amendments are used for the annual update. An up-to date comprehensive plan document is essential for use by Navy planners. If possible, seek an update with community visioning as the primary means of developing the goals and objectives of the plan.
- Comprehensive plans are not always legal documents as are zoning ordinances; rather, they are general policy guides. Thus, many policies may not always be adhered to by the planning commissions and legislative bodies on any specific project. It is important to know whether or not a community's comprehensive plan is respected and adhered to by the political and development processes.

31.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in evaluating the relative importance of local government comprehensive study information on a specific proposed project:

- Is the proposed project of significant scale and environmental, social, or economic impact to affect the local community's or region's comprehensive planning policies, objectives, or plans for services?
- Will the project be affected by current comprehensive plan policies? Does it require significant municipal infrastructure (such as utility or transportation) system services?
- Does the local comprehensive plan project adequate community facilities and housing to serve any increase in Navy personnel and their dependents created by Navy projects or mission/loading changes?
- Does the proposed project significantly affect Navy land use patterns such that the adjacent public comprehensive plan proposals may require adjustments?

31.6 Data Sources

1. Internet

- <http://www.cyburbia.com>
- <http://www.ar.utexas.edu/Planning/links.html>
- <http://www.landuselaw.edu>
- <http://www.municode.com>

2. City/Local

- Local Planning Department
 - Comprehensive land use plan
 - Master recreation and parks plan
 - Infrastructure plans
 - Zoning ordinance and atlas
 - Subdivision ordinance
- Local Budget Department
 - CIP (Program)
 - Capital improvement budget for year
- Tax Assessor's Office
 - Land tax records and ownership information
 - Parcel-level ownership data (often GIS form)

3. Navy

- Engineering Field Division
 - AICUZ (Air Installation Compatible Use Zones)
 - Activity plan
 - Land use compatibility studies

4. Regional

- Council of Governments (COG)
- Metropolitan Planning Organization (MPO)
 - Regional land use plan or comprehensive plan
 - Regional transportation plan

ADDITIONAL SOURCES

- State Department of Natural Resources
- Office of Coastal Management (CAMA Plans)

32.0 HOUSING

Residential housing areas serve several functions. The housing should support the needs of residents in a manner furthering community goals of environmental quality and efficiency. The areas are comprised of neighborhoods, providing shelter, security, social interaction, leisure, and accessibility to its residents (Kaiser, 1995). These tenets can be satisfied through efficient residential design and provision of adequate housing to an area's population.

Navy housing currently faces two major problems. First, the condition of DoD-owned housing is poor and inadequate in many cases. Second, a shortage of affordable, quality private housing is available to Navy personnel and their dependents. These two factors, coupled with insufficient maintenance and repair over the past decades, have resulted in poor quality living conditions for many service members and their families. The shortage of units prompts many to search for housing in the private sector, sometimes unable to afford market prices even after their subsidies.

In 1996, the National Defense Authorization Act, Public Law 104-106 110 Stat 186 Section 2801, was signed, including the military housing privatization initiative. This Act included authorities allowing DoD to work with the private sector in building and renovating military housing. DoD's goals for the program included the following:

- Obtain private capital to leverage government dollars,
- Make efficient use of limited resources, and
- Use a variety of private sector approaches to build and renovate military housing faster and at a lower cost to American taxpayers.

By December 2000, DoD had awarded nine housing privatization projects (Figure 32a on pg. 231), while an additional eleven projects were in solicitation. These projects equaled nearly 6,000 units awarded with another 20,000 in solicitation.

DEFINITIONS:

PPV-Public Private Venture – Program in which a public and private entity join in financing and managing a project that benefits both. (e.g. Navy off-base housing provision).

Guaranteed occupancy – Situation in which the Navy guarantees a private developer a certain percentage of occupancy on a development built under a public-private venture agreement.

BAH – Basic Allowance for Housing– amount of pay provided to military dependents to cover the costs of rent and utilities if living off-base.

Differential lease payments – DoD pays the difference between negotiated rent and the BAH to increase affordability of housing.

Limited partnerships – Private, non-governmental entities involved in acquisition and/or construction of residential units and their associated services.

32.1 Relevance to Planning Studies

32.1.1 Regional Level

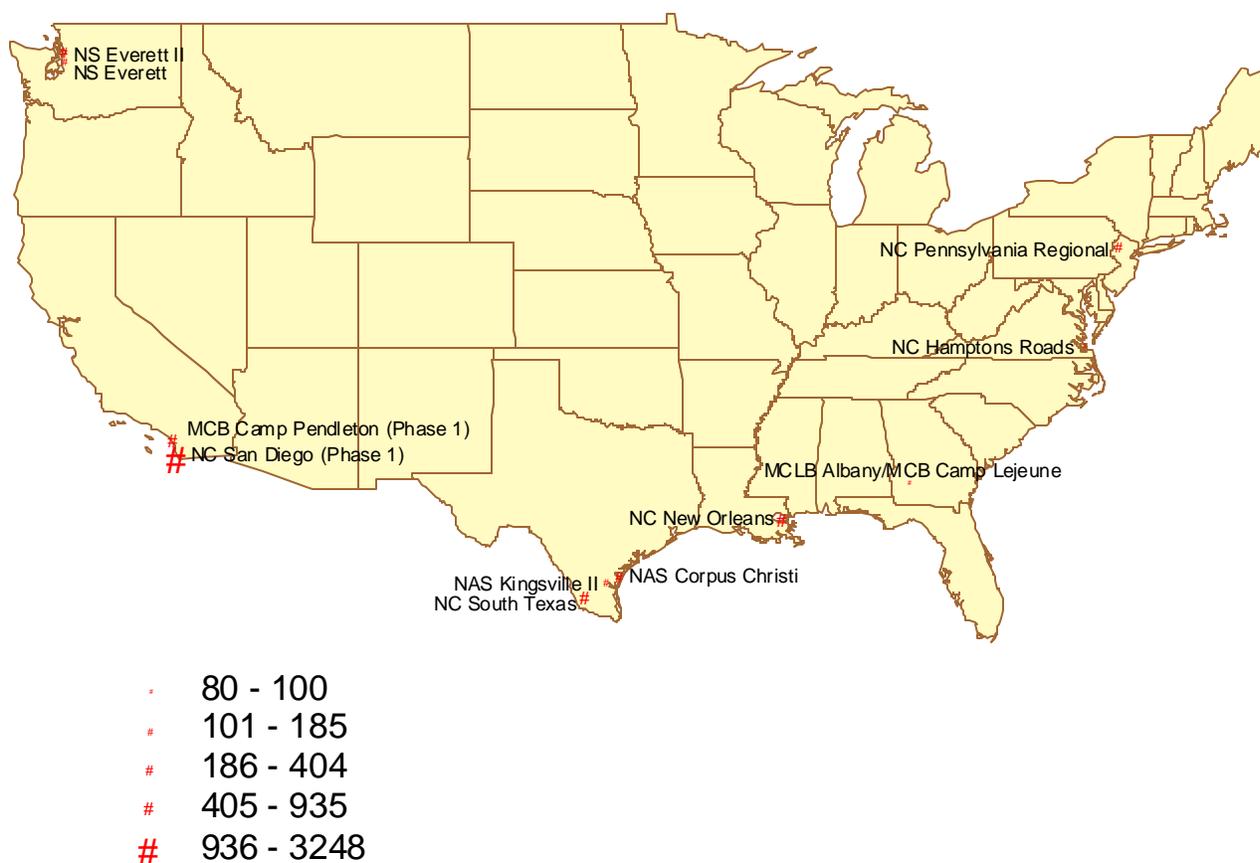
With the passage of the 1996 Act, housing on a regional scale includes the public/private ventures of the DoD and private developers. Serving a regional area, public/private ventures like those supported under the legislation, aim to provide more housing for service members than traditional MILCON construction

methods could otherwise. The DoD expects to leverage military construction dollars at approximately a 3:1 ratio, meaning that nearly three times as many housing units can be produced for the same amount as through traditional MILCON funding options of on-base housing.

On the regional housing market, subsidized units are available first for Navy personnel. However, if personnel pass on vacancies, units may be rented to civilians in the private market. The number of units released to the private market would determine the impact on the region. In Corpus Christi, TX, 15 percent of the new units were released to the private market due to Navy personnel's inability to pay the market rents that were not entirely covered by the federal housing allowance. The availability of units for the private sector is only part of the new public/private venture programs.

Figure 32a

Navy Housing Privatization Projects, January 2001.



Source: Military Housing Privatization website - www.acq.osd.mil/installation/hrso/plist_0101.htm

32.1.2 Activity Level

On-base housing is essential to providing shelter for many service members and their families. The quality of this housing contributes to the overall quality of life for Navy personnel. Quality of life considerations couple with quality of work issues to form an overall standard of quality of service. As directed by the CNO, quality of service upgrades are a necessary piece of the retention puzzle. First priority for many would be living on the activity, near work, training, and recreation facilities. However, the quality of older, post WWII housing has forced people into the surrounding region and private markets (Figure 32b on pg. 232).

Figure 32b

Housing Options – NAS Corpus Christi, TX



Navy Housing



Public Private Venture (PPV) Housing

Source: Site photos

32.2 Relationship to Other Resource Areas

The provision of housing depends upon both natural and man-made issues, including demographics, population characteristics, transportation, utility infrastructure, and natural site design. Each of these areas must be considered both on and off-base, however, the scale and scope of appropriate analysis will change dependent upon the housing's location and funding sources (e.g. public vs. private).

In order to construct and provide housing to most adequately meet demand, providers must know the demographic group to which they are catering. Increasing from 1976, the percentage of Navy personnel married and with children has increased dramatically, necessitating different housing styles and community amenities than facilities for single soldiers. The incorporation of playgrounds, open space, and multi-bedroom units is important in the design of both on and off-base housing constructed and maintained for Navy personnel.

The population shifts at Navy installations are also fluid, necessitating the facility planner to have current population counts and projections. These shifts in populations provide the basis for determination of adequacy in amount of available housing. Population shifts in the surrounding region should be noted as well. With public private ventures, changes in civilian populations and demand may influence the rate at which housing released by the Navy is occupied. This may, in-turn, impact future availability for Navy personnel.

The presence of transportation and utility systems is also an indicator of more efficient locations for housing projects. In cases of new construction, housing should be placed in areas with existing road networks and utilities (e.g. water, sewer). Building housing where these elements are not already present increases the costs of utility extensions and road constructions. Building housing in previously undeveloped areas with no roads or utilities also contributes to sprawling built form, something prevalent in civilian residential areas. It is important to require adequate facilities where housing is constructed, following local zoning and planning regulations for public/private ventures.

Existing and new housing impact both the infrastructure and natural environment of their surroundings. The design, location, and placement of housing units influence a multitude of natural site-related issues. Vegetation shading, slope, topography, soil, and hydrology of a site are all influenced by housing development. Housing development will necessitate regard of natural features in its site development.

32.3 Primary Housing Planning Factors

32.3.1 Aging Housing

The majority of the Navy housing stock dates back to post-WWII. Construction and materials used at that time were not always the highest quality, resulting in facilities requiring expensive upgrades. Living spaces designed 50 years ago were also geared towards a different demographic and population. Interior space demands and uses have changed, facilitating a need for larger living space including kitchens, bathrooms, and closets.

DoD currently owns approximately 300,000 family housing units and 400,000 barracks. Nearly 60 percent of the units require replacement or renovation due to insufficient maintenance and modernization. Through the MILCON program alone, it would take approximately 30-40 years to perform the necessary upgrades to

existing housing units. However, privatization of the construction and leasing process is predicted to significantly improve the speed and efficiency of delivery of units.

32.3.2 Privatization of Housing Development Process

In order to provide additional units of military housing to service members without affordable options, the National Defense Authorization Act of 1996 provided DoD with various options for engaging in public/private ventures. These options allow the Navy to obtain funding and expertise from the private sector. Termed "authorities", these tools include loan and rental guarantees; conveyance/leasing of existing property and facilities; differential lease payments; investments, both limited partnerships and stock/bond ownership; and direct loans (DON, 2001).

The DoD can guarantee several items to potential developers, including mortgage payments; limited protection against BRAC closures, force deployments, or reductions; mortgage insurance; and rent and occupancy levels. These guarantees limit the risk usually inherent in developing residential communities. Through guaranteeing occupancy levels alone, the potential private developer eliminates the largest economic risk factor. Above and beyond rentals, DoD can also lease or convey units to private citizens in order to assist in financing future privatization initiatives.

In order to assure the affordability of the new market rate rentals, DoD can provide the difference between the negotiated rent and Basic Allowance for Housing (BAH) for service members. Currently, many enlisted and junior grade officers with families face off-base rents higher than BAH. This necessitates the service member using out-of-pocket pay to supplement their housing and utilities expenses (Figure 32c on pg. 235).

DoD can also participate in funding Limited Partnerships, private, non-governmental entities involved in the acquisition and/or construction of residential units and associated services. DoD will not manage the partnership while providing funding. Funding caps exist on DoD contributions, equaling 33.33 percent of the capital cost of a project. If DoD chooses to convey land or facilities in addition, 45 percent is the maximum contribution to the entity. In cases of renovation, replacement, and support facilities, 45 percent is also the approved maximum contribution. These contributions can provide impetus and groundwork for private investment in housing opportunities within the military community (DON, 2001).

In addition to funding private entities through partnerships, DoD may also hold stock in a project. In this case, DoD may act as a manager without losing its limited liability. DoD could have control of a project if capital is provided through a loan, bond, or mortgage. Loans can be provided to a developer, and the title, land, and improvements will remain with that private individual or entity.

There are several advantages to the public/private ventures listed above. Military housing is built faster and cheaper than through the MILCON process. Commercial construction is less costly than the military process due to different construction standards for many types of units. Local investment opportunities are also available in the surrounding community, providing venture capital potential as well as stimulating the economy through construction (DON, 2001).

Figure 32c**Housing Availability and Costs at NAS Kingsville, April 2001.****Family Housing Waiting List in months**

	E1-E3	E4-E6	E7-E9	W1-O3	O4-O5	O6
2BR	0-3	0-3	N/A	0-3	N/A	N/A
3BR	0-3	0-3	0-3	0-3	0-3	N/A
4BR	1-3	1-3	1-3	0-3	0-3	0

Basic Allowance for Housing

	E1-E3	E4-E6	E7-E9	W1-O3	O4-O5	O6
Basic Allowance for Housing with Dependents	\$469.00	\$521-709	\$757-868	\$710-841	\$934-998	\$1,006.00

Average Community Housing Costs

	Rent	Purchase
2BR	\$500-550	\$65,000
3BR	\$650-750	\$90,000
4BR	\$850	\$99,000

Source: PCS Housing Assistance website - www.housing.navy.mil/pcshouse/

32.3.3 New Housing Issues

Several issues surround the provision of new housing due to demolition and replacement of existing, inadequate units. Housing standards can be considered in the construction of new housing, reflecting current service standards in terms of room and area ratio to family size and personnel rank. Much of the older housing stock may not meet this ratio. Updated design standards are also in the forefront of new construction. Increased energy efficiency and decreased maintenance expenditures are two features of newer construction. Increased efficiency translates into lower utility costs for the service member, resulting in decreased overall housing costs. Lastly, the cost-effective maintenance and apportionment of new housing is greater than for remodeled existing units. Large-scale purchasing of appliances and materials is more cost-effective than piecemeal acquisition required with remodeling.

32.4 Housing Functional Use Area Interpretation

32.4.1 Opportunities

- Increased leverage in fiscal power for government through public/private partnerships.
- Increased speed of delivery of new units over existing MILCON funding sources.
- Increased quality and efficiency of new construction over existing units.
- Ability of new construction and remodeled units to meet updated service standards for living space according to rank.
- Positive economic benefits to surrounding community through labor and materials support in local economy.
- Supplement of difference between rent and base pay allows service member to fully utilize pay instead of diverting to housing expenses.

32.4.2 Constraints

- The negotiated rent of some developments may be higher than the BAH, resulting in service members turning down housing due to cost.
- Increased off-base housing may lead to more fragmented sense of community than that with a majority of members on-base.
- Remodeling and rehabilitation may cost more than new development if piecemeal upgrades are necessary.
- Some housing structures may be listed as National or local Historic Places. Under these designations, appearance, materials, and any modifications may be dictated by ordinance or regulations.

32.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of information on impacts from a specific proposed project.

- Have facility planning studies indicated a need for more or less adequate housing?
- Have PPV projects been implemented before in your community? Are there developers who already are comfortable working on PPVs with the Navy?
- What is the forecasted personnel loading at your activity for the next 10-20 years? Will a housing shortage arise?
- Do opportunities exist for rehabilitating existing housing rather than constructing new units?
- Can newly constructed housing be placed near other services, such as academic, administrative, and recreational uses?
- Has a pedestrian network been included in the plans for the new or rehabilitated units?
- Does the BAH in your area cover the rent and utilities costs for enlisted and officers?

32.6 Data Sources

1. Internet

- <http://www.acq.osd.mil/installation/hrso/>
- <http://www.denix.osd.mil/denix/Public/ES-Programs/Conservation/Legacy/Housing/housing.html>

2. Military/Navy

- DoD Military Housing Privatization Program
- Activity Housing Office
- Activity Environmental Office or Facilities Office (historic structure information)

3. State/Local

- State Historic Preservation Office (SHPO)
- Local Planning Office (developer contacts, permitting)
- Economic Development Office

33.0 VISIONING AND SCENARIO PLANNING

Typical long-range plans for Navy facilities and public communities have relied upon the prediction of the future, based on the present, to form policy and requirements. In the public planning realm, public meetings were the basis for citizen and stakeholder participation in decision-making. These forums lacked creative interaction from all groups with a stake in the development process. Navy planning decisions were made at two levels: activity CO and outside consultants. Consultants would present a plan for the approval and input of select few, based on projections of the status quo into the future. However, the technique of visioning as determining facilities and land requirements has quickly gained respect as an inclusive method of meeting several interests, building consensus, and developing a creative and forward-thinking plan with measurable outcomes. Visioning can be defined as, “a simple projection of what is desired regardless of the existing reality” (Becker, 1999). Scenario planning incorporates the presentation of pre-crafted scenarios for the stakeholders to use as springboards for considering future options. Developed by Navy staff and consultants, the scenarios usually encompass a status quo situation and opposite ends of the probability spectrum in terms of future options. An integral part of the Navy RSIP process, multi-stakeholder visioning serves as the baseline for requirements development of both Functional and Overview Plans (Figure 33a on pg. 239).

33.1 Relevance to Planning Studies

33.1.1 Regional Level

Visioning for RSIPs includes stakeholders outside the fence of the Navy activity. Different than traditional Master Plans, which primarily focused on impacts and outcomes within the fence, RSIPs are changing the planning paradigm to incorporate a regional and community perspective into the methods of long-range facility planning. Working through public/private funding mechanisms, development, and coordination, RSIPs recognize the interdependent impacts of Navy activities and the surrounding regions. Building on this recognition, policies that leverage community support and financing, are win-win opportunities for Navy planning and development within a region. Visioning is the tool enabling this long-term, regional, unencumbered view of the area’s future. Incorporating public input and perspectives into the visioning process provides a wealth of opportunities for coordination between the military and civilian sectors.

DEFINITIONS:

Stakeholders –Those persons who directly impact or are impacted by a planning action.

Scenario Planning – The use of possible future scenarios with different outcomes to stimulate the visioning process.

Current Situation – A description of an area’s existing scenario in regards to facilities, population, demographics, economics, and physical resources.

Ground Rules –Basic rules of understanding governing meetings and/or planning sessions that emphasize mutual respect and sharing of ideas.

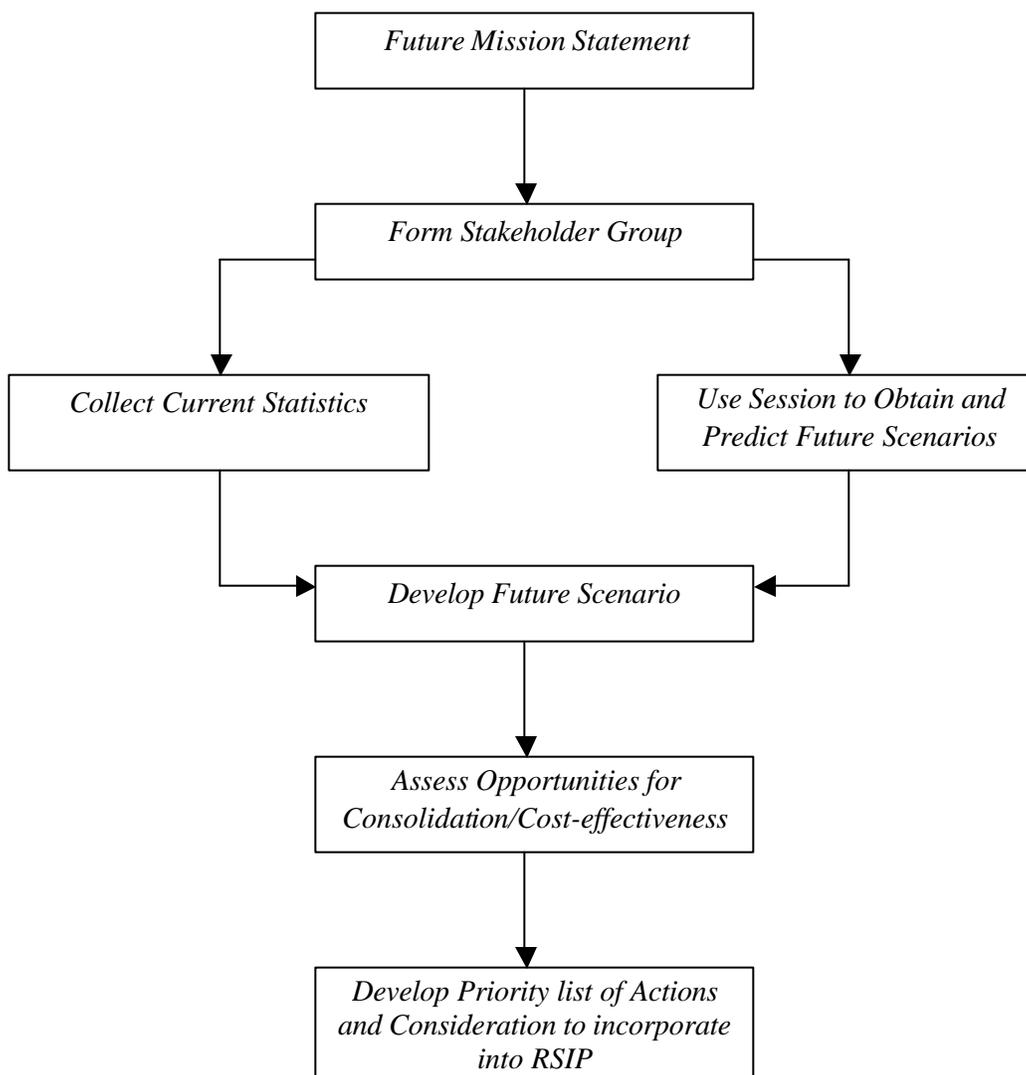
Consensus – A point of mutual understanding and respect for the final decision; it is often a compromise of various positions and interests.

33.1.2 Activity Level

Visioning directly impacts the long-term outcome of planning at the activity level. Stakeholders for RSIPs include many military and civilian personnel working and living on base. The essential purpose of visioning is to gauge those perspectives at the activity level to create a long-term plan resulting in an efficient and cost-effective, quality location to live and work.

Figure 33a

Sample Visioning Process



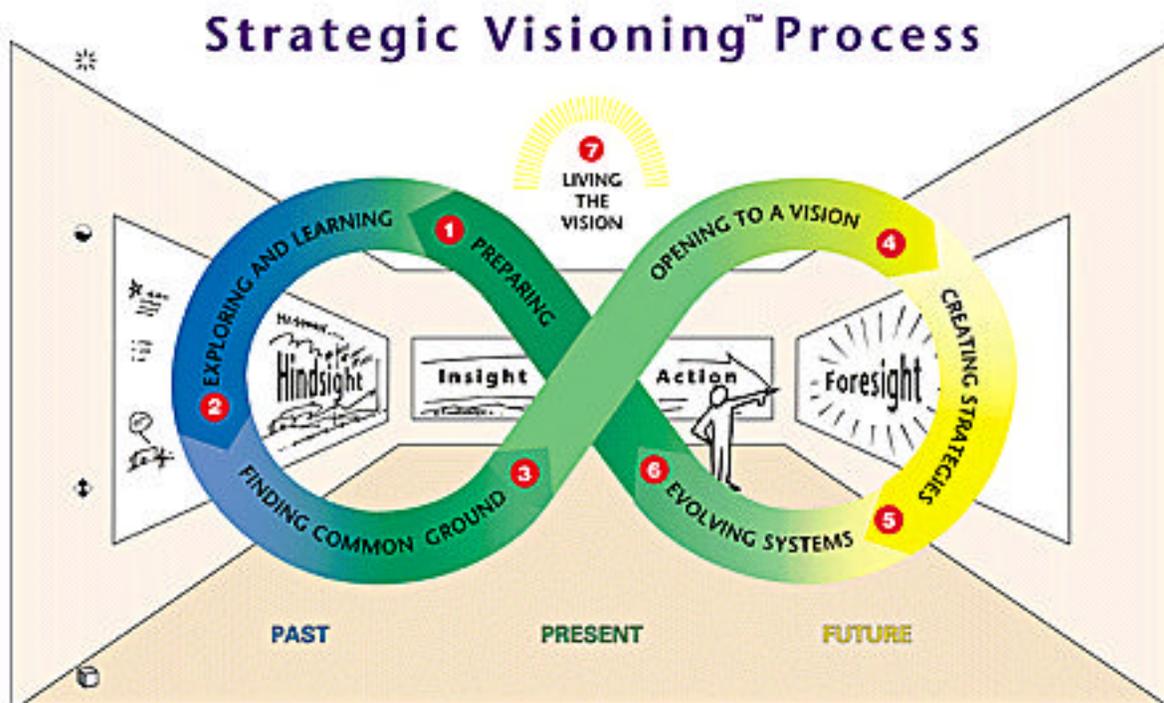
Source: The Onyx Group, 2001

33.2 Relationship to Other Resource Areas

Visioning and scenario planning are tools enabling stakeholders to share knowledge regarding the resource areas discussed in this guidance (Figure 33b on pg. 240). They are the means through which those pieces of knowledge are synthesized into specific requirements and guidelines for future planning.

Figure 33b

A Tool to Guide the Visioning Process



Source: The Grove Consultants International

33.3 Primary Visioning Planning Factors

33.3.1 Stakeholder Identification and Involvement

In order to understand the different perspectives of a planning issue, stakeholders representing varied issues should be involved in the RSIP process. Emphasized as the foundation of Navy RSIP planning, the stakeholder involvement phase should target the operators at the activity. The rank of stakeholder will depend largely upon the specific plan. Often, the more tenured civilian employees and Navy Commanders, Captains, and Admirals will represent the operators at the activity. For example, for a Flight Training Functional RSIP, captains of training squadrons are daily stakeholders impacted by the long-term plans

created. Commanders and captains also are in charge of the facilities used for training. These serve as general examples of how different ranks may serve as daily operators and stakeholders.

Once the ranking officer in charge of the activity has identified these members, formal invitations to participate should be used as means of primary involvement in the process. Expectations of each stakeholder should be highlighted, focusing on the outcomes and objectives of the planning process. Clear communication should be maintained with the stakeholders throughout the process in order to ensure continued involvement and commitment.

33.3.2 Pulling the Stakeholders Together

After the planning process has begun with a formal kickoff presentation, mobilization for the visioning session should be initiated. If a consultant is working with Navy staff, the planner in charge and consultants should plan a date for the visioning session. Scheduling far in advance to accommodate as many stakeholders as possible, the visioning should ideally be limited to a one-day session. The session should be in the most central location for all stakeholders, perhaps at the activity of the activity or unit in charge.

Several techniques exist for the development of the vision. Where the future mission is similar to the past, scenario planning is often a useful technique. In this case, knowledge of the history is particularly valuable in developing the requirements for the future. For example, if an air station's aircraft complement does not change in platforms, training in the future may be similar to training with those aircraft in the past. However, if a new aircraft platform is expected to rollout, impacting the training process, history may be less important in figuring the future force projection. In the latter case, an unconstrained visioning session of how the new platform impacts will influence facility infrastructure would be appropriate.

Scenario planning often begins with understanding the existing conditions of the area. The consultants and planner in charge should assemble a "current situation" of the applicable area, assembling materials for the stakeholders to read and understand before attending the visioning session. The level of detail and purpose of the RSIP will drive the content of the current situation report. Typically, the existing situation is documented, in terms of facilities, loading rates, and other applicable figures. This



report will serve as the baseline from which stakeholders will springboard into widening the scope of visualizing the future. Along with a current situation, stakeholders should receive broad level items addressing their role in the process, the end goals and objectives, and the timeline. This information may be further confirmation for some who were part of the process at the beginning, and it may be new to the stakeholders included later. Either way, solidifying these messages is crucial at every stage of the process in order to manage expectations and communication.

The current situation often serves as the baseline scenario for examining the impacts of status quo operations on the future. Continuing the current policies into the future, with all current assumptions intact, will often result in the status quo scenario. Most likely this is not what the vision is aimed towards, since the activity would not need to engage in visioning if everything about the current situation was acceptable. The Navy planning staff and consultants will then often prepare two scenarios representing opposite ends of the spectrum. For example, one scenario may assess impacts if no budgetary constraints exist, while the other would look at the situation if more existed than now. These scenarios are useful tools for engaging the stakeholders in thinking about the long-term impact of the policy decisions and clearly identifying the elements that will result in consensus.

33.3.3 *Building Consensus*

Once the stakeholders are assembled at the visioning session, it is important to solidify the expectations for the session, as well as establish ground rules for the process. Using standard “meeting ground rules” such as courtesy in answering, mutual respect, and consideration for others, your consultant (perhaps a facilitator) will have the necessary foundation for keeping the process on track. Most important in this initial process, stakeholders must be reminded that this visioning process is a projection of what is desired, regardless of the current reality. The ability to think in big picture terms, past small details, is crucial in developing the vision. The process of the visioning is unscientific, using brainstorming techniques to assess the specific changes initiated in the future by the specific driver (e.g. new aircraft platform). Grouping these ideas together into common themes helps identify the primary areas of impact on the facilities.

Begin the process by reviewing the group’s, plan’s, or facilities’ histories in order to make sure everyone is starting from the same point for the process. As part of finding common ground between different stakeholder interests, develop an abbreviated form of the existing context of the planning process. Different from the current situation, this brainstorming will focus on identifying different trends, uncertainties, driving forces, and microclimates surrounding the planning issue. Small, breakout groups are often helpful at this stage, enabling everyone to feel comfortable sharing their opinions and experiences in a closer environment. Once these are elaborated and consolidated in the large group, the facilitator can help the group establish similarities. Transitioning into the next activity, the group should identify different strengths, weaknesses, opportunities, and threats to the future of the specific mission and its facilities. This matrix will help specifically identify the positives and negatives that may have arisen in the previous exercise.

After identifying these elements, several methods could be utilized for grouping and ranking ideas that represent the stakeholder values. If ranked into common groupings, the stakeholders can visualize the areas that will eventually help form the long-term vision. These commonalities that will serve as the basis for the vision are the consensus of the group. Building on the strengths and minimizing the weaknesses will help focus the brainstorming into long-term objectives for the RSIP.

The facilitator would then form the information from the previous exercises into future goals and objectives that will serve as the base of the vision. The group of stakeholders will be led through the development of identifying the steps needed, both long and short term, to achieving those goals. Policy actions will serve as the foundation for these actions, detailing how different players will aid in achieving the final end product – a base that will serve the Navy most efficiently in the long-term.

33.3.4 Documenting the Vision and Implementation

In order to maintain momentum in the implementation of the vision, constant communication and documentation should be carried past the visioning workshop. Ensuring that each stakeholder takes ownership in the vision is crucial to its success. Maintaining communication of ideas, expectations, and results is important in making sure the vision produces results.

During its implementation, ensure that each stakeholder understands the accountability for individual tasks and programs. Implementing the vision will be a long-term task, requiring each of the stakeholders to contribute in some manner. Some may bear more of the burden due to specific details of the RSIP, while others may serve in a monitoring function.

33.4 Visioning Functional Area Use Interpretation

33.4.1 Opportunities

- Accessible method of engaging many different stakeholders with varied perspectives.
- Large numbers of stakeholders can be involved in the planning process and decision-making. Excellent for regional-scale plans like RSIPs.
- Effective method of assessing stakeholder interests, motives, and positions.
- Starting point for building consensus in future due to its non-confrontational and open atmosphere.
- Navy operators working at the activity have input into the future policies and plans for their work and living space.
- Expertise on different aspects of the Navy activity and its mission is considered in making long-term decisions.

33.4.2 Constraints

- Effective visioning requires the use of a trained facilitator/mediator. The person should have knowledge of the Navy planning process and the stakeholders.
- False hopes and expectations can be raised through the visioning process. Some see it as a silver bullet, neatly laying out exactly what will occur and when, achieving a “utopian” state of perfection. Realistic constraints must be factored into the vision in order to validate the consensus achieved through the process.
- Traditionally, Navy planning has focused on looking into the future based on what exists. Visioning acknowledges the present condition, but looks past it in forming the vision. It is not a constraint. Many Navy planners have not planned in this way before, thus it will be an adjustment for most.
- Effective Navy visioning works on the broader scale rather than “in the weeds”. Due to the tools used in facility planning, such as Basic Facilities Requirements, P-164s, and Engineering Evaluations, many Navy planners are used to working at a detailed level concerning space requirements. Those details are useful in other phases, as they prevent many from looking at the big picture.

33.5 Relevant Impact Questions

As Visioning is a tool rather than resource areas, the more traditional impact questions do not relate to this area. However, there may be consequences or unexpected outcomes from a visioning process.

- Is there one, primary Navy planner in charge directing the process and implementation?
- Are there political agendas steering the objectives of the visioning process in different directions?
- Are your stakeholders interested in the visioning outcome? Do they support long-range planning?
- Is the scope of your RSIP well defined? Have you already established the level of detail for your RSIP?

33.6 Data Sources

1. Internet

- <http://www.asu.edu/caed/proceedings97/ames.html>
- [http://www.flashcreative.com/About/Approach/Business/Visioning\(b\).htm](http://www.flashcreative.com/About/Approach/Business/Visioning(b).htm)

2. Local

- City/County Planning offices engaged in visioning for long-term planning.

3. Navy

- NAVFAC visioning efforts on other RSIPs.

ADDITIONAL SOURCES

- Non-profit groups interested in community-based planning.
- Private firms specializing in visioning techniques in planning.

34.0 SUSTAINABLE DEVELOPMENT

Developing our built environment within the context of the natural world is a key tenet of sustainable development, recognizing that humans coexist with natural systems, including air, water, land, and energy. In planning for sustainable development, planners must always assess visions, objectives, goals, policies, and actions in the context of their coexistence with these natural systems. As well as natural systems, human systems such as cultural and historic resources must be considered holistically in planning the built environment. Although these are human resources, their value of preservation, similar to that of the natural environment, demands it be treated likewise within the framework of sustainable development. Multi-disciplinary and intra-organizational considerations must also be addressed, providing a completely holistic view of the elements of the long-term plan and vision.

The scope and breadth of sustainable development as a framework is evident when discussed in terms of all natural and historical systems. Considerations around all related areas addressing the physical media (air, water, land, energy) all factor into the manner in which we create and live within our built environment. Practical solutions exist for planners to create objectives and policies that fall within this framework while meeting the overarching goals established by the military and/or civilian community. “The goal of planning should be sustainable development that supports the mission, not development projects.” (DoD, 1996)

DEFINITIONS:

Indicator – Method of measuring how well a community is meeting the needs and expectations of its present and future members.

Cadastral – A system of real-estate identification referring to property boundaries and descriptions.

Encroachment – The condition of increasing development and growth of civilian uses around military installations.

34.1 Relevance to Planning Studies

34.1.1 Regional Studies

Sustainability is regional in nature, encompassing all natural and man-made environments in its application. Working past the activity level, Navy policy and plans can encourage sustainable community policies through partnerships with the surrounding jurisdictions. Encouraging policies that promote sustainable use of environmental, social, and economic resources within the surrounding communities can result in benefits for the Navy activity. Recognizing that many of these resource areas, primarily environmental in nature, do not correspond to cadastral boundaries, issues such as water and air quality can be addressed through regional partnerships.

34.1.2 Activity Plan

Sustainability at the activity level incorporates human actions and behaviors as well as site design considerations. The balance between social, economic, and environmental facets of the military community can be understood through policies and actions regarding operations, quality of life, and administration. Sustainable policy can be created which recognizes the interdependencies between resource areas, focusing on using site and structure-specific measures for achieving this sustainability.

Examples of design-specific measures include those conserving energy and water resources, which contributes to overall sustainability and conservation at the activity level.

34.2 Relationship to Other Resource Areas

Sustainability encompasses all aspects of the physical and built environment. Assessing a community's quality of life is directly related to sustainability. The ability of the community to provide a healthy and balanced life for its residents incorporates considerations of air and water quality, transportation, open space, and economic health. Utilizing natural resources at a renewable rate is a cornerstone of sustainability, promoting the balance between the man-made environment and surrounding natural resources. Thus, the assessment of natural resource areas included in this instruction is important in relation to those discussed in the built environment section.

34.3 Primary Sustainable Development Factors

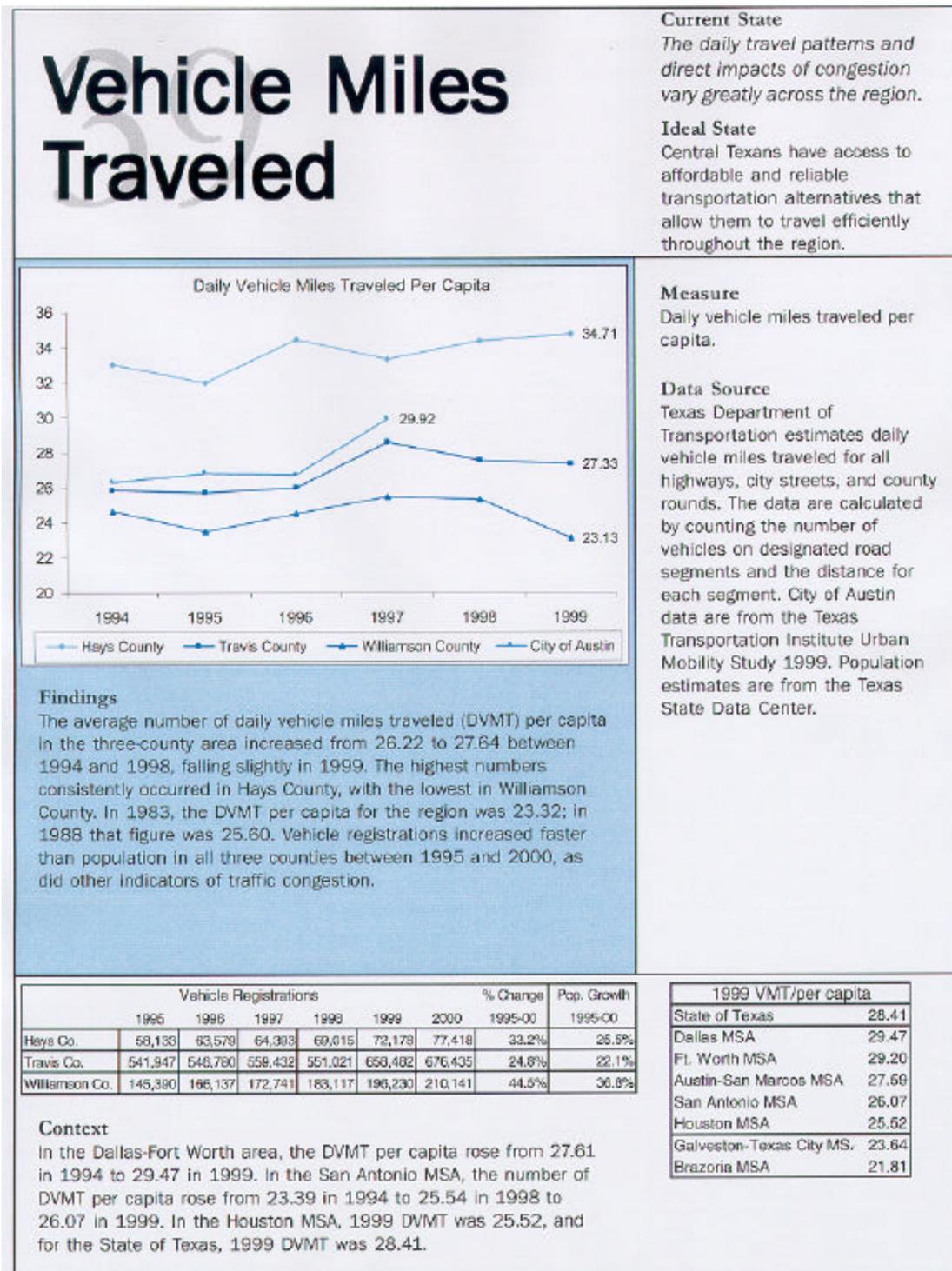
34.3.1 Sustainable Indicators

Indicators of sustainability are measures of weakness in a system, pointing the policy-maker to improvements needed for optimal function. An indicator allows one to assess the current situation, as well as the required future scenario. These indicators alert a policy-maker to potential problem areas, whether social, economic, or environmental, that result in a reduction of quality of life (Figures 34a,b,c on pg. 247-249). Often used as a measure of success in achieving a particular policy outcome, indicators are excellent tools for analyzing the shortfalls in service and resources within a community.

Traditional indicators do not represent the interactions between economic, social, and environmental resources. Focusing only on the specific resource in question, indicators such as the Gross National Product (GNP) or Gross Domestic Product (GDP) are national-level indicators of economic well being. However, this measure does not recognize the resource areas depending on the size of GNP or those contributing to it. Without assessing these connections, indicators are singular measurements, reflecting only a portion of the community and region's overall well being.

Sustainable indicators focus on the drivers behind the problem. Most often, these drivers focus on local-level issues, whether they are employment and education or specific pollution-causing activities. Indicators that are successful in reflecting the local conditions have several elements in common. Successful sustainable indicators share the traits of being relevant, easy to understand, reliable, and based on accessible data (Hart, 1999). Sustainable indicators are often offshoots of traditional ones. For example, a traditional indicator may assess number of jobs in a community while a sustainable one assesses the number of jobs earning a living wage. The former indicator would lead to solutions perpetuating the status quo, which is not sustainable. The latter indicator considers the interaction between economic and social factors, resulting in a better quality of life for more of the population.

Figure 34a
Sustainability Indicator - Transportation



Source: Central Texas Sustainability Indicators Project 2001 website - <http://www.centex-indicators.org/report.html>

Figure 34b

Sustainability Indicator - Job Options

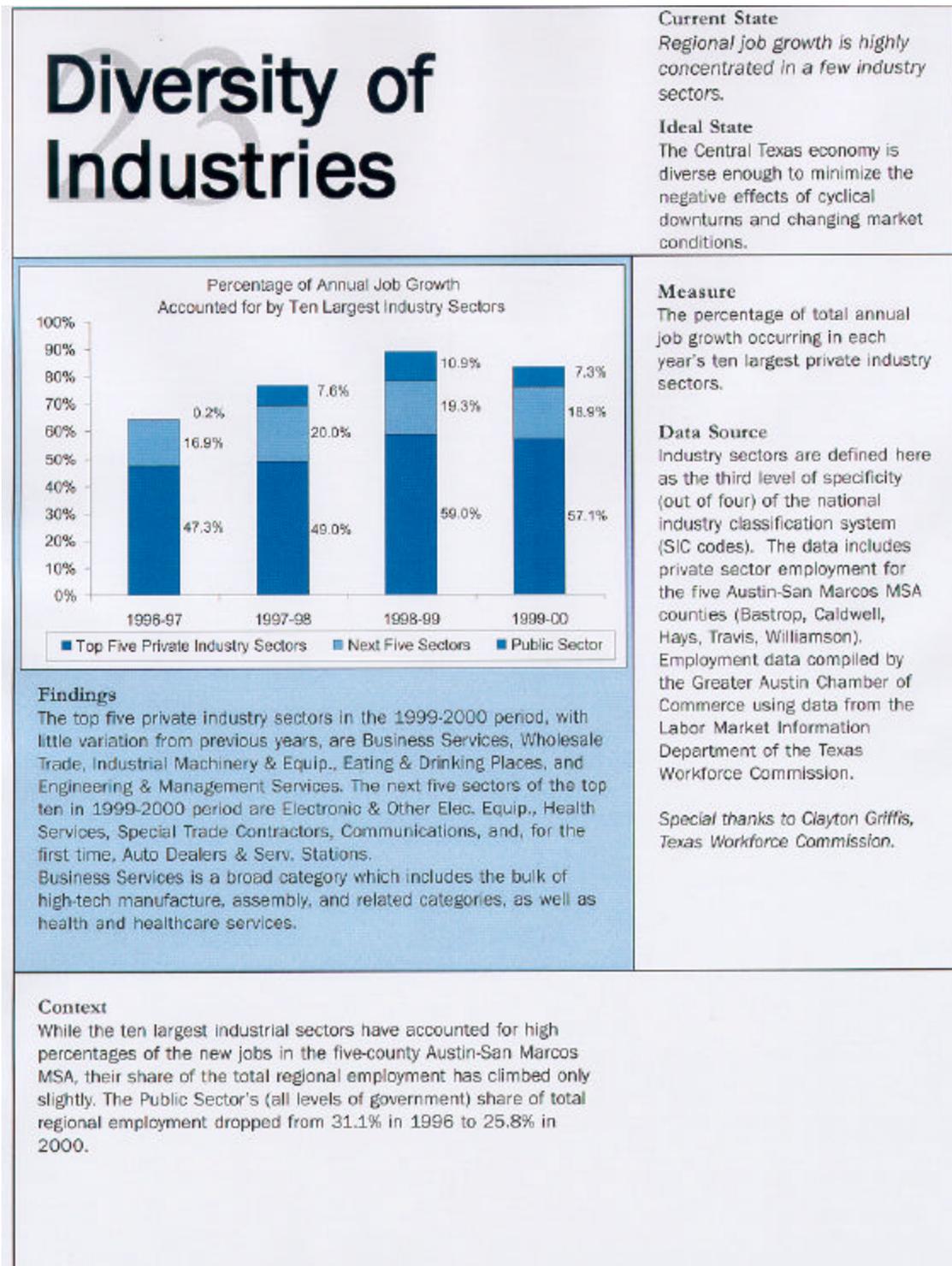
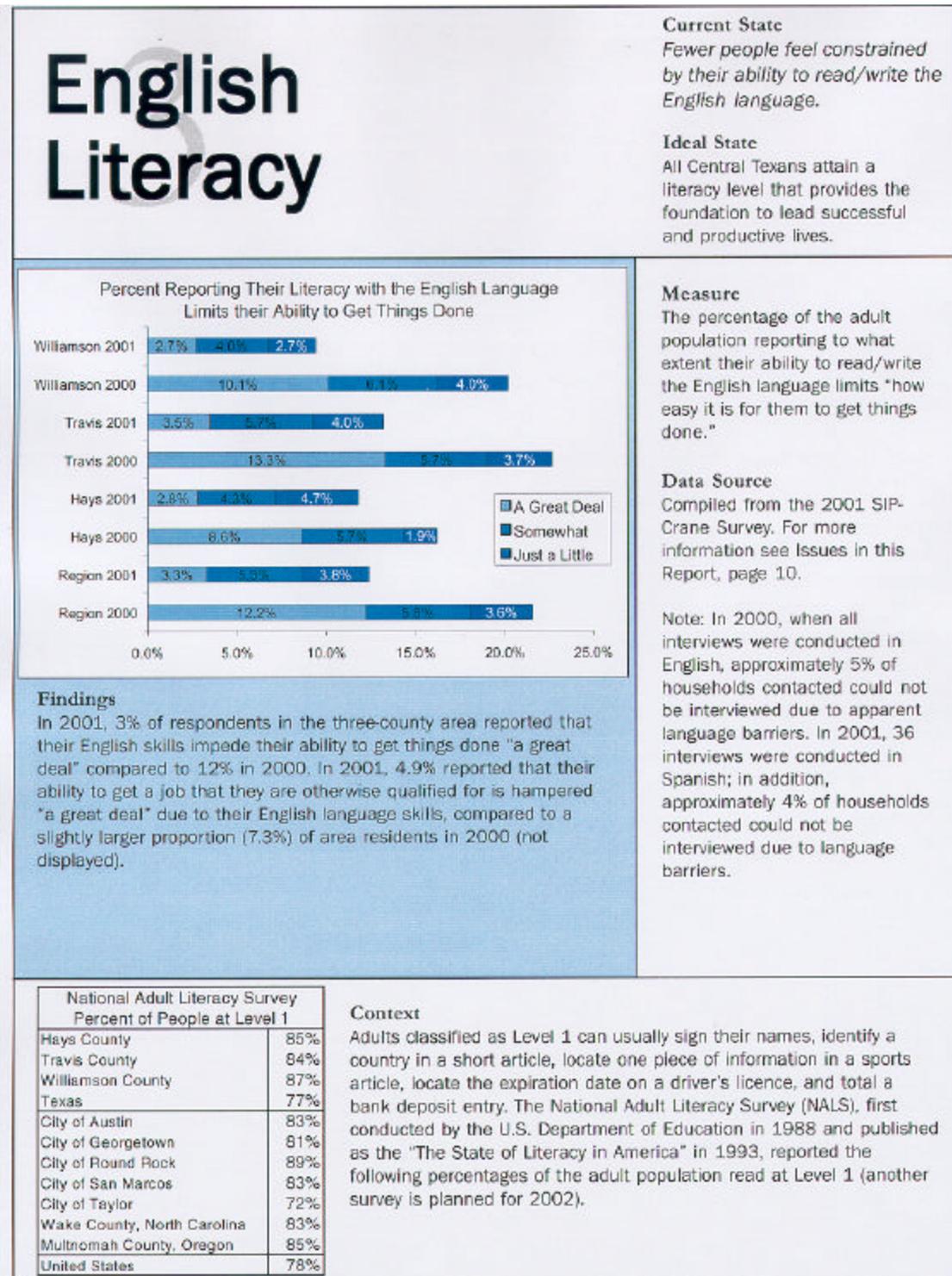


Figure 34c

Sustainability Indicator - Education



34.3.2 *Interdependence of Resource Areas*

The interdependence of these indicators is essential to the concept of sustainability. As discussed previously, traditional indicators did not account for the impacts of other resource areas. Sustainability is built upon achieving that balance between the built and natural environments; this cannot be accomplished without assessing the mutual impacts between resource areas. Through this more holistic view of planning allows for interaction between resource areas and the professionals who typically work in those fields.

The interdependence of areas begs for a multi-disciplinary and intra-organizational approach for sustainable planning at the Navy and community levels. Trained planners are not the only professionals creating policy impacting our natural and built environments. Architects, engineers, scientists, and academic researchers are all valuable resources for partnering in creating sustainable policy and indicators. This multi-disciplinary approach in developing long-term Navy and community plans will provide balanced policy enhancing the quality of life at both the activity and regional scale.

34.3.3 *Civilian And Military Cooperation*

Much like intra-organizational cooperation at the activity level, coordination with the community surrounding the Navy activity is essential. The RSIP process incorporates and requires enhanced cooperation with planning regulations and community leaders. The quality of relationships with surrounding communities differs among Navy sites. However, major issues, such as increasing civilian encroachment, is a standard problem among nearly all installations.

Working with local planning regulations will enable Navy planners to contribute to the formation of land use policy. Navy representation is important to consider from a community planner's perspective, due to economic, social, and physical impacts from the military presence in their community. As important is the need for Navy planners to be informed of the regulations implemented as policy within their surrounding community. This policy will ultimately affect the degree of community encroachment and cooperation of civilian residents and the Navy site.

In order to achieve the greatest efficiency in Navy shore infrastructure, opportunities for consolidation of regional resources must be investigated. This should include assessing opportunities for working with the surrounding community to provide quality-of-life related services through mutual agreements or public-private funding ventures. Cost-effective and efficient regional infrastructure is sustainable in nature, minimizing unnecessary costs related to infrastructure or land development. Promoting this efficiency will result in resulting sustainable actions that promote a higher quality of service for military service members and employees.

34.4 Sustainable Development Factor Interpretation

34.4.1 *Opportunities*

- Developing multi-disciplinary policies addressing the impacts of major resource areas on each other, providing for a higher quality of life.
- Reduced shore infrastructure costs in Navy operation through streamlined facility and resource use

- Increased cooperation of Navy and community planners in developing sustainable policies for the entire region.
- Decreased operating costs for Navy under sustainable policy implementation (e.g. savings in energy, housing, transportation).

34.4.2 Constraints

- Sustainable indicators resulting in different solutions than the traditional, are challenging to develop and implement.
- Savings from implementation of sustainable policies are slow to realize in some resource areas.
- Multi-disciplinary approaches to planning policy development requires more effort and time in development due to increased interaction and learning inherent in the process.

34.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of information relating to sustainable development on a specific proposed project.

- Does the project create impacts that are multi-faceted, i.e. affect economic, social, and environmental resource areas?
- Does Navy or community policy currently address impacts caused by this project?
- Does the project create any impacts currently affecting community planning policy?
- Does the project impact significant areas of open and natural space?
- Does the project create additional, cost-inefficient infrastructure or development?

34.6 Data Sources

1. Internet

- <http://www.sustainablemeasures.com/Indicators/index.html>
- <http://www.sustainable.doe.gov/>
- <http://www.wri.org/sdis/>

2. Local

- City and County comprehensive plans
- Natural resource management plans
- Cultural resource management plans
- Park and recreation plans

3. Regional

- MPOs
 - Transportation improvement plans
 - Regional transportation forecasts
- COGs
 - Energy resource plans
 - Land preservation plans
 - Housing plans

- Land use plans

- 4. Navy**
- Public Works
 - Facilities plan
 - MILCON lists
 - Special Projects lists
 - NFADB information

- Environmental
 - Wetland inventory
 - Floodplain inventory

35.0 LAND PRESERVATION

The large-scale preservation of open space and natural features has been spurred by increasing development in both urban and rural areas. Land is preserved for several reasons and functions, sometimes providing a green oasis as a park in the middle of existing development or as a working agricultural operation on the edge of urbanization. The most prevalent reasons for open space protection are to retain visual amenities, provide recreation opportunities, or protect agricultural lands and opportunities. Protection of open space in communities is often gained through legal real estate means, involving deed easements or donation of land. Most relevant to Navy planning is the protection of land on the activity and in the surrounding community. While land on the activity does not require legal easements, it must be planned for the function of dedicated open space in order to prevent future development. Protection of open space resources in the surrounding community will benefit Navy personnel within the entire region through the provision of vistas, recreational opportunities, and economies with healthy agricultural sectors.

35.1 Relevance to Planning Studies

35.1.1 Regional Studies

Preservation on the regional scale moves past the immediate military environs into the community in which many Navy service members live. Protecting the natural vistas and recreation opportunities across the region will improve the quality of life for service members through enhancing available resources. Preservation programs are becoming increasingly popular at the community level, often supported by comprehensive studies of the existing natural and recreational opportunities. Often cited as an important element in community visioning and plan-making programs, the protection of open space elements can be a driver in programming and allocating resources within a community. Working with a community to encourage open space protection for visual, environmental, recreational, and economical reasons will be beneficial for the Navy in attracting and retaining service members due to increased quality of life provisions.

35.1.2 Activity Plan

Planning for open space at the activity level has three primary objectives: protect environmentally-sensitive areas such as wetlands and fauna habitat; protect and enhance views of natural open space for people throughout the activity; and provide active and passive recreation opportunities. Once these areas are designated, they should be preserved through the changing of commands, retaining the long-term benefits for the military community. Taking advantage of the natural areas at Navy activities, vistas and

DEFINITIONS:

Easement – A grant by a property owner to the use of land by the public, a corporation, or persons for a specific purpose.

Passive Recreation - Recreational activities that generally do not require a developed site.

Vista – A range of sight including pleasing vistas or prospects or scenes.

Impervious Surface – Any hard-surfaced, man-made area that does not readily absorb or retain water, including but not limited to, building roofs, parking and driveway areas, graveled areas, sidewalks, and paved recreation areas.

Infill – The development or redevelopment of land that has been bypassed, remained vacant, and/or is underused as a result of the continuing urban development process.

recreation opportunities may also be served through non-invasive solutions such as benches and small boardwalks or interpretive trails.

35.2 Relationship to Other Resource Areas

Land preservation is closely related to natural resources information such as wildlife, vegetation, hydrology, water quality, soils, and topography. Whether coastal marshland, riparian corridor, or grassland, various benefits can be found for animals and vegetation as well as water quality, soil erosion prevention, and water systems. Preserved vistas are often related to hydrologic factors, whether coastal or inland, and natural relief in the landscape (topography), provides recreational and visual amenities as well. Preservation of lands for agricultural uses, which benefits the local economy through its low demand for services accompanying a high economic base multiplier, is related to the socioeconomic and demographic conditions of a community. Additionally, through the preservation of open space, whether in small or large parcels, continued urbanization and development can be managed and controlled to prevent future problems with traffic congestion, air quality, and infrastructure requirements.

35.3 Primary Land Preservation Planning Factors

35.3.1 Visual Amenities

Protecting visual amenities is important to many communities. Considered a significant quality of life issue, the creation and enhancement of natural vistas has been long desired in site and community design. Whether natural or thoughtfully constructed, the accessibility of open space is important in the residential and general community environment. Visual amenities may include views of mountains, coastlines, islands, forests, prairies, or other bodies of water. These are usually naturally occurring and are not available in each community. Where natural vistas of features such as these are not present, some features can be created. Lakes and water features can be constructed on a small scale in close proximity to living and working areas. Vegetation can be designed and planted to create a natural sense of place. These amenities are crucial to protect and enhance for quality of life and recreational purposes.

35.3.2 Environmental Benefits

Protecting open space often has environmental benefits, most often targeting wildlife and vegetation of an area. Preserving areas such as wetlands, coastlines, and forests from development enhances species richness and diversity around the activity and throughout the region. Additionally, secondary benefits such as water quality and soil stabilization can be realized through maintaining vegetated areas rather than impervious surfaces where runoff is increased. Retaining the natural, vegetated areas will allow the downward filtration of water through the soils, recharging groundwater sources. The increase in impervious surface, where land is covered by development, results in a larger volume of precipitation runoff. This eventually pollutes water supplies by carrying chemicals such as petroleum, oil, and lubricants from the asphalt and concrete surface.

35.3.3 Cost of Community Services

Preservation of open space on a large scale saves money. In order to develop land, utilities and transportation access must be present. The provision of these services is costly to the taxpayer, whether

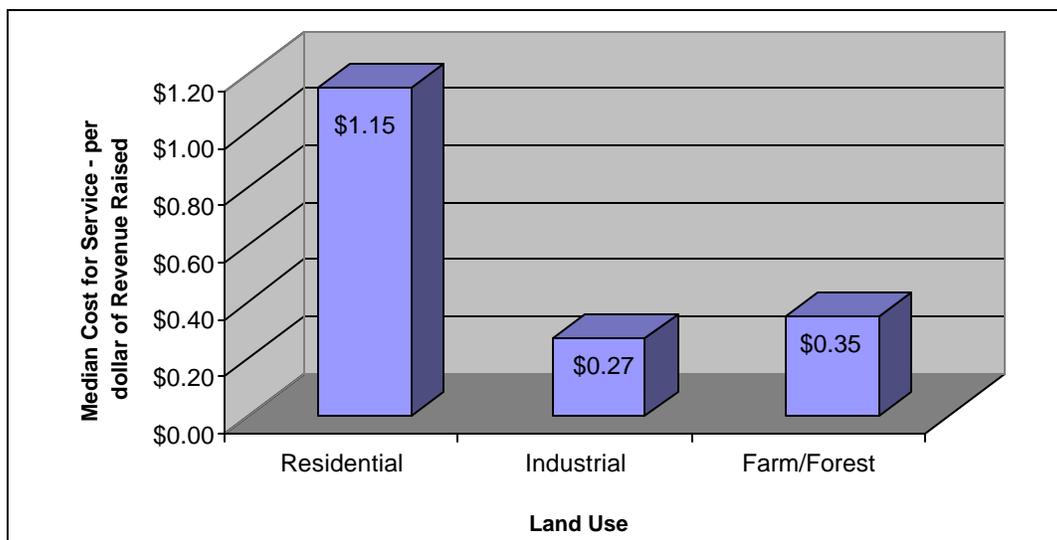
through the use of local funds in the community or federal funds on a Navy activity. Open space that is perpetually preserved in its natural state will not require the provision of facilities.

Local communities must consider the type of development present in building and maintaining a tax base that will sustain long-term capital improvement programs. Different land uses require varying levels of service, ranging from no service for open land to full service for residential land. Residential units require not only utilities and roads, but also schools and recreation facilities. Commercial and industrial land uses require a level of services in the middle, including only utilities and transportation. Requiring no services, open space is one of the most-efficient land use to maintain with a tax base. Requiring approximately \$.35 per tax dollar for maintenance and service, as compared to nearly \$1.15 for residential land, open space is an economical asset to a community tax base that contributes multiple benefits for civilians and service members alike (Figure 35a on pg. 255).

Similar at a Navy activity, services and utilities are costly to provide. In the facility planning and long-term programming, the Navy planner should consider the costs of different alternatives in the context of utilities and transportation provisions as well as functional adjacencies of land uses.

Figure 35a

Cost of Community Services



Source: American Farmland Trust, Farmland Information Center, 2001

35.3.4 Community Acquisition and Protection

Communities fund open space acquisition through different means. Some open space is donated by private landowners in fee. Titles are transferred to the local jurisdiction, and restrictions may be placed on the deed. These restrictions, or conservation easements, usually prevent any development on the land for a period of time (30 years) or perpetually. If not donated, conservation easements are purchased from a landowner by a public or nonprofit entity. Increasingly popular, whether donated or purchased, conservation easements are real estate tools used to maintain open space forever. The rights to develop the land, or those restricted in the easement, are purchased. However, the title of the land remains in the hand of the private landowner. Thus, the landowner owns land that may never be developed, even if the title is transferred through later sales. This land is retained as open space, often in its natural state or used for agricultural operations.

The local tax base often funds programs to acquire open space. Designated through the annual budget and Capital Improvements Plan (CIP), or specifically funded through bonds approved by local voters, open space preservation programs typically use ranking systems to prioritize purchases according to goals established by the particular community. Whether for visual amenities, recreation, or agriculture, the community often helps decide where funding should be targeted for such acquisitions.

35.3.5 Managing Urbanization and Development

Large-scale open space preservation is often used as a buffer to development and growth in many communities. Potentially beneficial to adjacent Navy activities, land preservation for growth management can aid in keeping communities' development within boundaries and aid in preventing further potential conflicts from encroachment. A community focused on growth management and preservation will work towards increasing density through infill of existing neighborhoods while retaining the rural and natural character of much of the surrounding land. Depending on the location of the Navy activity within the community, the maintenance of an informal "urban services boundary" or areas to where services will not be extended, could aid in preventing continuing sprawl around the site. While Navy activities may not be best served by being isolated, due to their need for utility hook-ups, preventing further growth around the immediate military environs will aid in smoother operations and mission fulfillment.

35.4 Land Preservation Factor Interpretation

35.4.1 Opportunities

- *Passive and active recreation opportunities can be increased at the site and regional level through small and large-scale preservation efforts.*
- *The preservation of visual amenities both on site and in the region can add to the overall quality of life for service members and visitors alike.*
- *Environmental benefits from open space versus developed land help to contribute to improved water quality and decreased runoff.*
- *Urban growth in surrounding communities can be tempered and slowed through large-scale preservation efforts, preventing the outward expansion of community development potentially surrounding a Navy activity.*

- *Community tax bases will benefit from the decreased responsibility of providing services to land designated as open space. The community will get “more for their money” in tax dollar and budget expenditures.*

35.4.2 Constraints

These questions provide additional general guidance to the planner in deciding the relative significance of land preservation information and issues on a specific proposed project.

- *Preservation costs money. In order to most effectively preserve land at the community and regional level, the land should be purchased or the rights purchased through an easement.*
- *Long-term plans must be adhered to in order to assure long-term preservation. Navy Commanding Officers have control over individual activities, with tenure changing every two years. No enforcement mechanism exists for long-term plans.*
- *Many Navy activities exist in already developed and urbanized settings. Remaining open space may not be available in a desirable location for use through recreation or for aesthetic purposes.*
- *Large-scale preservation efforts often require significant community education efforts regarding owner’s rights and trust of government entities involved.*

35.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of information on impacts from a specific proposed project.

- *Does the project develop previously undeveloped land?*
- *Do utilities already exist or must they be extended and expanded to serve the new project?*
- *Does the project develop land that provides recreational or visual benefits to surrounding uses such as residential units?*
- *Does the project create impacts (such as water quality, soil erosion, etc) that may impact other adjacent preserved open space?*

35.6 Data Sources

1. *Internet*

- <http://www.lta.org>
- <http://www.patuxent-tidewater.org>
- <http://www.farmland.org>

2. *Local*

- *City/County Planning Department*
 - *Natural resource management plans*
 - *Comprehensive plans*
 - *Zoning ordinance*
- *City/County Tax Assessor*

3. *State*

- *Department of Environmental Conservation*
- *Department of Natural Resources*

4. *Activity*

- *Environmental Office*
- *Public Works*

36.0 TECHNOLOGY

The use of technology in planning has increased dramatically in the last 50 years. The first computers, as we know them, were being developed in the late 1940s and 1950s. By the 1960s, large mainframe computers were enabling people to store data and automate manual procedures. This ability allowed planners and scientists alike to begin assessing the interdependencies between data sources. Planning began to use models to better understand their resources, while continuing to provide “up-to-date” automated information for the science of the field. At this time, the technology to spatially analyze different pieces of data was emerging. Geographic Information System technologies, addressed briefly in the previous section, provided the platform for more accurate and descriptive spatial analysis of the built and physical environment. Data gradually became geo-referenced and digital. Standards for creating this digital data were developed, helping ensure the data’s accuracy and content. This ability changed the means of wide-scale analysis, enabling visual graphics to reflect the physical and built world more realistically. The progression from these technologies is now the development of an interactive GIS interface that links the user to updated databases of information, both at the Navy site and in the local community and region. Enabling the Navy planner to access reliable data in real-time will enhance the foundation of the shore infrastructure plans under development.

36.1 Relevance to Planning Studies

36.1.1 Regional Level

The use of integrated land and facility information throughout a region is in its early stages. The opportunities of this technology to work with the emerging RSIP process are enormous. Reducing costs and maximizing facility and service efficiencies are the primary goals, eventually aiding in facility construction, renovation, or demolition decision-making. This technology has been tied to the RSIP process through the RSIP-Link, an interactive tool providing the planner with up-to-date information on data both internal and external to the Navy planning system.

DEFINITIONS:

GIS –Geographic Information System—A method of storing geographic information on computers. Information can be obtained for a variety of sources, including topographical maps, soil maps, aerial and satellite photographs, and remote sensing technology.

Geo-referenced—The process of registering an image to geographic space; transformation of image coordinates into real world x,y coordinates.

SFPS- Shore Facility Planning System – The method of documenting the facility assets of the shore infrastructure in the U.S. Navy. The assets are compared against space requirements, resulting in a prioritized list of construction projects for the specific activity.

Remote sensing - Acquiring information about an object without contacting it physically. Methods include aerial photography, radar, and satellite imaging.

RSIP-Link – A graphic web interface allowing a user to access land and facility data using GIS and a relational database management system to get up- to-date information at a Navy activity. The program enables Navy data to be linked to outside sources through the web interface, providing supporting community information to Navy planners.

36.1.2 Activity Level

The Shore Facilities Planning System (SFPS) is currently at the activity level throughout the Navy shore infrastructure. Containing asset information, the SFPS provides the basis for Navy facilities planning. The inventory of facilities, land holdings, and leases provides the planner with the basis for figuring space requirements by mission. Traditionally, these requirements were then translated into projects for construction. However, under the regional planning paradigm instituted through the CRPI, the stakeholder's vision will drive the requirements, eventually translated into cost reductions and gains in efficiencies. The SFPS must be continually updated to reflect the current state of the activity's built environment.

Based on the SFPS, the introduction of the RSIP-Link system to many activities allows the planner to analyze both the natural and built environments through a GIS user interface. Using digitized floorplans, drawings, and maps, RSIP-Link enables planners at the activity to update graphic and tabular features of their site. The use of the GIS technology results in more accurate analyses and sharing of information between activities. The ability of the planner to see the interaction of natural and built conditions at other sites in the region will aid in more opportunities for regional efforts to increase facility efficiencies.

36.2 Relationship to Other Resource Areas

The planning technology available to planners today is linked to every functional resource area. The technology is the tool enhancing the analysis of the interdependencies between the data sources, visually displaying it, and enabling the sharing of information. GIS technology and the internet are two sources providing the planner the ability to quickly retrieve data, update it, understand it, and display it. Types of analysis and display will vary between functional areas, ranging from topographic maps of a site to population density maps of a region.

The internet is a tool for further research and exploration of functional areas. The use of this technology, as applied to functional areas, enhances information sharing opportunities and encourages collaborative decision-making. In addition to its uses for gaining information, the internet and World Wide Web (www) allow for more technological participation and decision making from all stakeholders. Plans, documents, and graphics can be displayed on the web, soliciting comment and response from stakeholders not present in the live process.

Lastly, information can be displayed through computer models. Including simulation models, planners display their functional area data through these models to help determine the impacts of decisions on future events. Planners must be able to look into the future, fairly predicting conditions of the physical and built environments.

36.3 Primary Technological Planning Factors

36.3.1 GIS

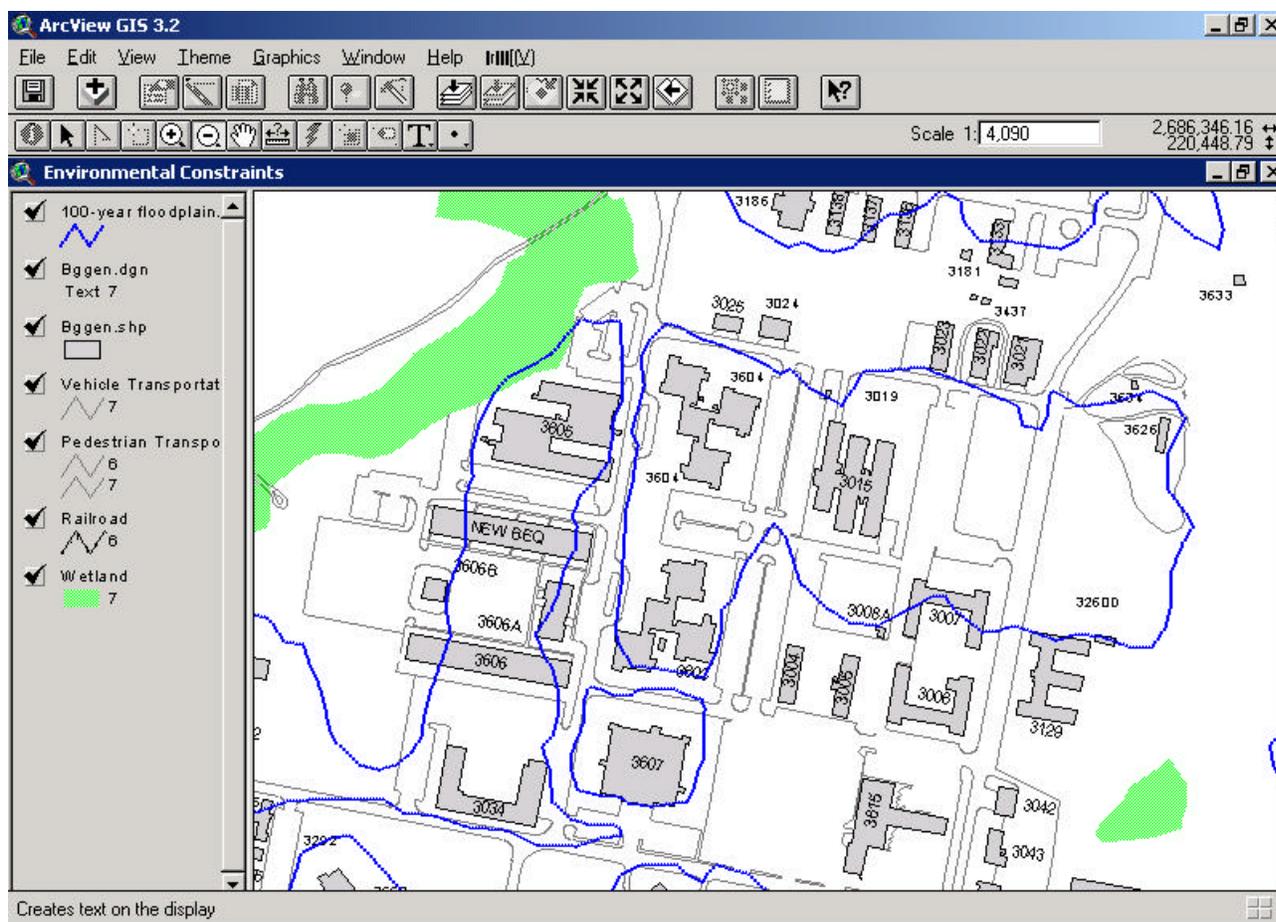
“GIS is a computer-based system for the capture, storage, analysis, and display of spatial data.” (Klosterman, 2000) The “bible” of community and regional planners, The Practice of Local Government Planning, uses this definition to concisely describe the range of this technological tool. The combination of

mapping and database analysis allows the planner to assess spatial relationships between functional use areas under study. Navy planners around the country use GIS at the activity and regional level to understand the forces impacting their shore infrastructure plans (see Figure 36a on pg. 261).

Beginning in the 1960s, reaching the military and academic spheres by the 1970s and 80s, and arriving on the desktops of planning practitioners around the world by the 1990s, GIS is a tool for planners in the public and private spheres (Klosterman, 2000). Most Navy sites have GIS capabilities, differing in software and hardware configurations and data sources. The most important feature of GIS is the data it uses.

Figure 36a

A GIS Software Application - ArcView 3.2



Accurate and complete digital data is needed to make this a useful tool. The data for a naval site and its surrounding region comes from various sources. Communities often develop their data through in-house collection and digitizing or larger contracted projects such as aerial photography and remote sensing. Navy sites utilize the same methods, performing some data collection and translation in-house while contracting other aspects out. Both sectors also rely upon the internet and federal agencies for inexpensive (if not free) and easily accessible data. The range and detail of free data varies on the internet, usually requiring some payment as the complexity and accuracy of the dataset and its components increases.

This desktop interface provides for easy layout and spatial analysis of data, with and without associated data attributes. GIS software runs easily on a standard PC computer and is easily learned from user documentation. As in any layout program, the quality of presentation will be dependent not only on a planner's knowledge of the tool, but design and cartographic (map making) skills as well.

36.3.2 Electronic Spreadsheets

Developed for large-scale functional use in the 1980s, spreadsheets are an invaluable software tool for all planners performing analysis of data (Klosterman, 2000). The tool enables planners to create rudimentary databases for their information, providing an easy interface for logically examining sets of data. It allows the planner to share information with others, building in automatic calculated formulas and display features that move with the file to another person. Perhaps the most valuable asset a spreadsheet offers is the ability to experiment with data scenarios, using embedded formulas and linking mechanisms to “run the numbers” in different permutations (Klosterman, 2000). When crafting different scenarios for development and regional planning, the underlying data assumptions and values will change. Spreadsheets allow the planner to test these scenarios, providing “real time” answers to questions about future conditions or impacts of decisions.

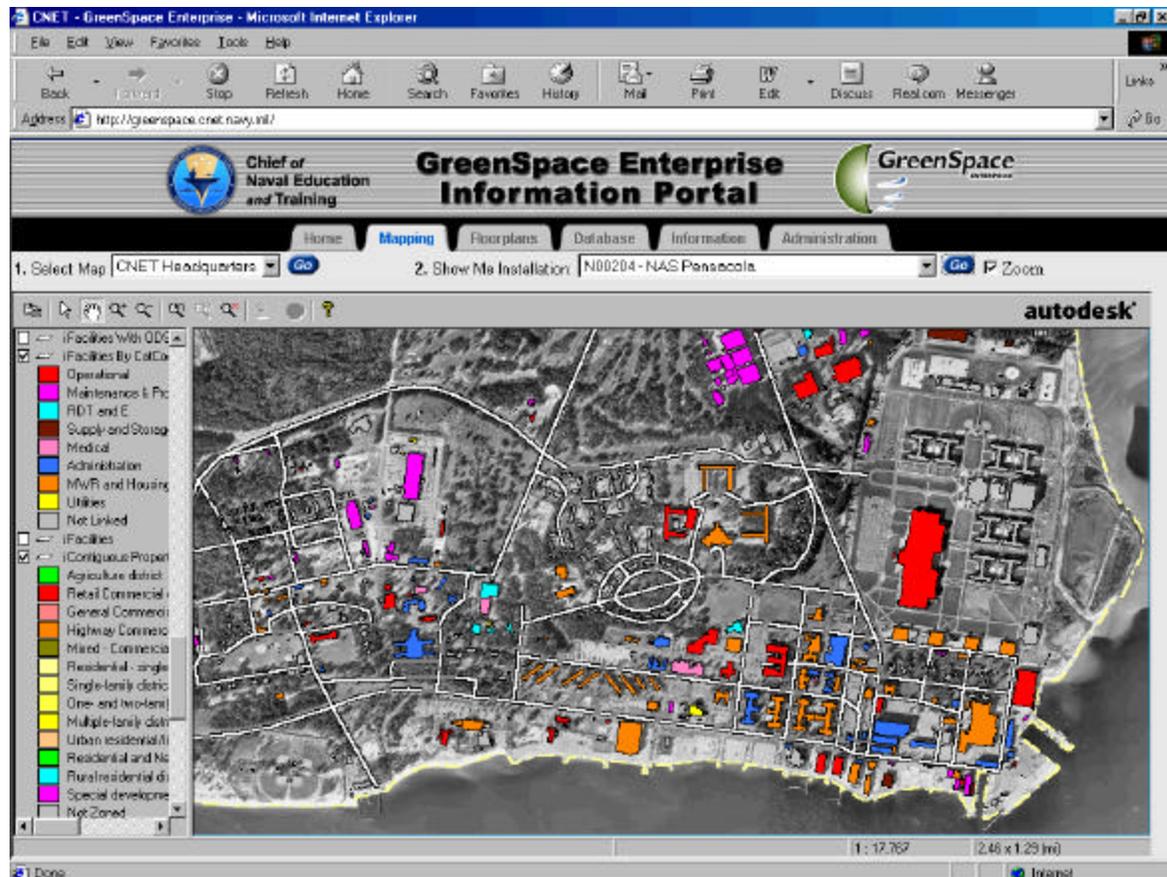
36.3.3 Internet

Valued by planners for its continual accessibility and breadth of information offered, the World Wide Web feature of the internet provides a data source serving as either a primary or secondary location for obtaining necessary functional use area information. It's capability lies beyond its vast data stores, able to provide real-time updates of information and connect coworkers electronically (Klosterman, 2000).

For regional Navy planning, the web provides a gateway to publicizing planning efforts (see Figure 36b on pg. 263). Using this tool to educate, Navy planners can inform military and civilian personnel and the surrounding communities of site specific planning efforts. On a broader scale, the activity can advertise its working relationships with the surrounding communities in physical, economic, and environmental planning efforts. This means of communicating both “inside the fence” and “outside the fence” will enhance the functionality and usefulness of the plan for both parties involved. The collaboration on planning efforts will result in increased trust between the Navy and its surrounding neighbors, as well as among personnel at the activity.

Figure 36b

An Internet Based Information Portal



Source: <http://greenspace.cnet.navy.mil/>

36.3.4 CADD/CAFM

Computer-aided drafting (CAD) technology was first introduced in the mid 1960's as a tool for the production of drawings without the use of traditional drafting tools. The drawings were created and displayed by manipulating graphic elements on the computer screen instead of drawing them by hand. Designers began to realize the benefits of CAD technology and the name was changed to CADD. CADD technology has become the preferred method for the preparation, distribution, storage, and maintenance of architectural and engineering type drawings.

It has become the Navy's policy to acquire CADD deliverables to maximize the use of electronic digital data. Digital data are especially useful for life cycle management of an installation, from planning to facilities management. To further improve the use of digital data and to have the capability to share databases among various Navy activities and regions, graphic and non-graphic standards must be mandated. In 1992, the Tri-Service CADD/GIS Technology Center (TSTC) was established at the U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi to consolidate and promote

the use of CADD and GIS standards within the Tri-Services. These standards have been endorsed by the Navy and are currently made available to Navy planner in the Tri-Service A/E CADD Standard that can be found on the Tri-Service web site (<http://tsc.wes.army.mil>).

NAVFAC is charged with the management of planning, design, construction and technical support of some 200,000 facilities around the world. Computer-Aided Facility Management (CAFM) is a high-tech tool used by Navy facility professionals to track and manage virtually any facility-related asset. CAFM provides managers and decision-makers with the ability to analyze the effective use of space more readily than ever. CAFM utilizes the baseline CADD graphic facility information and links this information with a facility information database. The use of CAFM is just now beginning to become one of the key tools available to Navy planners at the region or activity level. Information contained within a CAFM system can be used to understand the current utilization of facility space and to perform interactive analysis on space usage, occupancy, and efficiencies.

36.3.5 RSIP- Link Information Portal

RSIP-Link is the tool that fulfills the immediate requirement of OPNAVINST 11000.16A for electronic planning, but more importantly, utilizes information technology in the development and distribution of a wide range of planning solutions conforming to Department of the Navy, Information Technology for the 21st Century (DON IT-21) strategies. RSIP-Link incorporates the regional and global sharing of information using commercial off-the-shelf software and web-based tools as a cornerstone of the planning and management process.

The RSIP-Link acts as a central access point or information portal for all facility, infrastructure, natural and environmental, real estate, and historical and cultural data in a relational format. Through the means of an inter-related computer network, the RSIP-Link becomes a shared resource with shared responsibilities, whereby all data is maintained at its source and integrated into the system. Managers, planners, decision-makers, and authorized users are thus afforded interactive querying and viewing capabilities of critical enterprise-level data through this information portal (see Figure 36c on pg. 265).

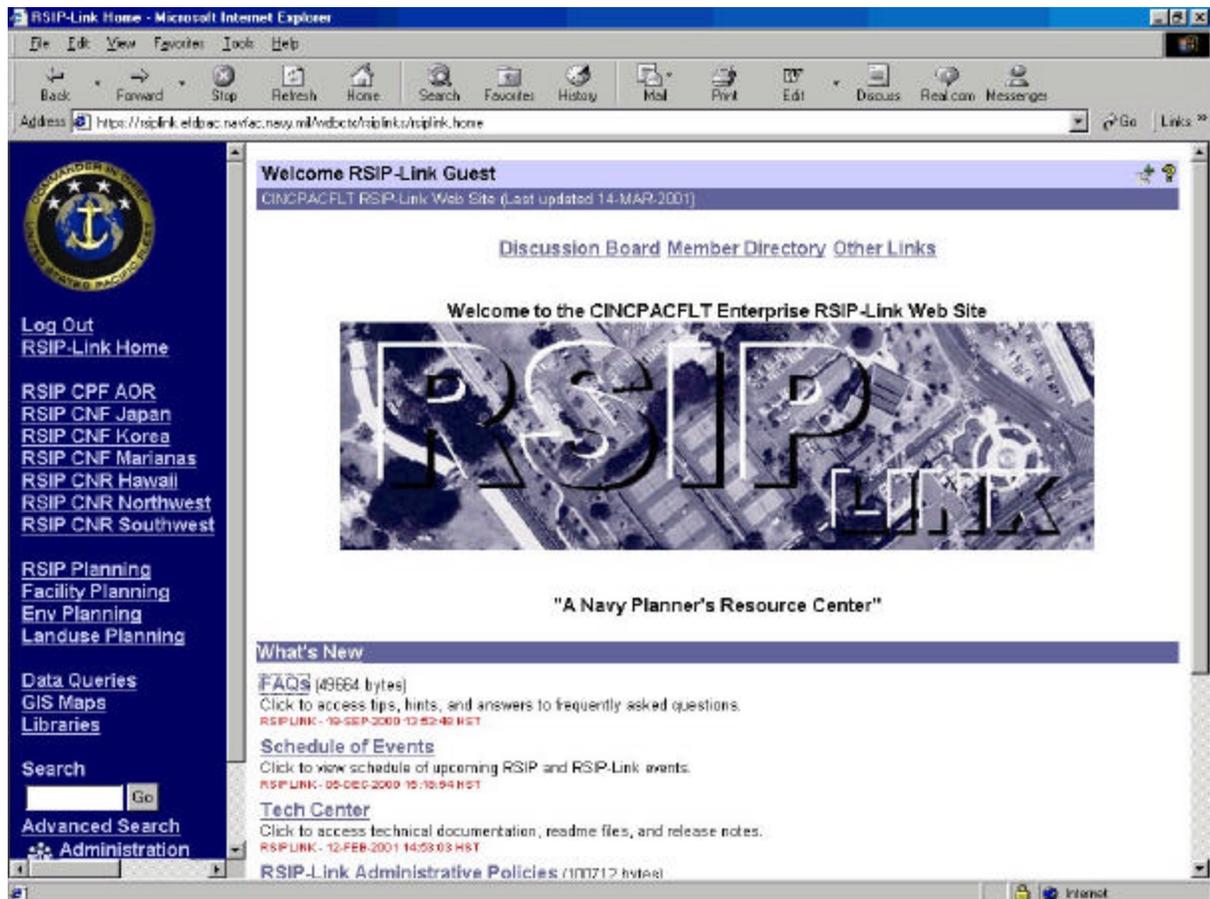
36.4 Technology Functional Use Area Interpretation

36.4.1 Opportunities

- *Further development of Navy activity tabular and geo-spatial data in digital form to maximize data analysis and decision-making.*
- *Explore GIS data sources from other federal agencies for potential increased accuracy or decreased cost.*
- *Use RSIP-Link tool to enhance usage of community and other data sources.*
- *Use the internet for basic searches. Concentrate on targeted and focused searches for optimal results in researching planning topics.*
- *Spreadsheets improve the efficiency of a planner's data analysis. Use a Navy standard platform to ease in file and information sharing.*

Figure 36c

NAVFAC PACDIV RSIP- Link



Source: <https://rsiplink.efdpac.navy.mil/wdbctx/rsiplinks/rsiplink.home>

36.4.2 Constraints

- *Military-specific data may not be as available for some informational topics. Traditional data collection methods should also be used for sensitive material*
- *Continued update and development of GIS layers of information for Navy sites requires dedicated project funding. Constraints on funding may impact the scope of work optimally needed by planners using the information.*
- *Increasing technology requires continual upgrades in both software and hardware. New programs and tools may require more “storage space” on the planner’s network or individual hardware.*
- *Accuracy and reliability of data should always be investigated and detailed. Without using a trusted source for data, inconsistencies or errors could impact the planner’s analysis.*
- *Political support of the planning and technology enhancing efforts can vary with the change in command.*

36.5 Relevant Impact Questions

These questions provide additional general guidance to the planner in deciding the relative significance of technologically-based information on a specific proposed project.

- *Does the activity currently have a GIS system established in-house?*
- *Does your project require spatial analysis and graphic documentation?*
- *What data is available in GIS form for the activity?*
- *What GIS information is available for surrounding communities? What are the communities' sources of information?*
- *Does an RSIP-Link exist within the activity or region?*
- *Is your project suitable for integration into an RSIP link format?*
- *Is the specific activity supportive of advances in planning technologies as it applies to the project at hand?*

36.6 Data Sources

1. Internet

- <http://www.esri.com>
- <http://www.gis.com>
- <http://www.peo-it.navy.mil/nmci.html>
- <http://tsc.wes.army.mil>
- <http://cad2.wes.army.mil/>
- <http://www.navfac.navy.mil/compt/itlinks.html>
- <http://ucso2.hq.navy.mil>
- <http://www.nsi.navfac.navy.mil/>
- <http://www.nsi.navfac.mil/infads/home.html>
- <http://navfacilitator.navfac.navy.mil>
- <http://nitc.navfac.navy.mil>
- <http://navfacilitator.navfac.navy.mil/cio/default.cfm>

2. Navy

- *RSIP-Link (local or regional)*

37.0 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

Enacted in 1969, the National Environmental Policy Act (NEPA) establishes national policy promoting the harmonious interaction between humans and their environment. The Act established the Council on Environmental Quality (CEQ) as well as a process for documenting environmental and social impacts of major federal actions. Through the development of Environmental Assessments (EA), Environmental Impact Statements (EIS), and Finding of No Significant Impact (FONSI) documents, federal actions are assessed for their impacts on surrounding ecological and human communities. NEPA is an unfunded mandate. Under NEPA, documentation of impacts must be performed on federal actions; however, Congress does not provide funding to agencies for the completion of these studies.

The CEQ establishes the policy guidance and review function for submitted impact studies, ensuring that all effects of a federal action are adequately and comprehensively documented. Many affected agencies review the document, providing a ruling on their acceptance, and CEQ has the final authority to accept it. However, once accepted, no authority or regulation requires the end recommendations be followed.

The EA is usually a more concise document than an EIS, assessing whether an impact exists that warrants more detailed analysis. If the EA determines that no significant impact exists, a FONSI will be issued and the process will end. The EA and EIS are structured alike, following CEQ guidelines. The core document is based on the proposed action, or project requiring analysis. The affected environment of the project is then described, detailing it in terms of every resource area. The analysis of the environmental consequences of each alternative action and proposed action follows. Finally, proposed mitigation measures for the environmental impacts are detailed before the Record of Decision (ROD) is issued by the Council for Environmental Quality (CEQ).

DEFINITIONS:

CATEX-Categorical Exclusion-A federal facility that is exempt from performing an EA or EIS due to the commonplace nature of the activity.

EIS – Environmental Impact Statement – A detailed social and environmental analysis of the impacts of a proposed project and its alternative actions on the natural and human environment.

FONSI – Finding of No Significant Impact- Through the EA process, no significant impact on the natural or human environment was documented.

EA – Environmental Assessment – The first document in the NEPA process, required to determine whether significant impacts may exist, at which time an EIS would then be required. Otherwise, a FONSI is issued for the proposed federal project.

Cumulative impacts – Analysis of the incremental impact of the action when added to other past, present, and future actions.

Scoping – The initial process of citizen involvement into the NEPA process. The applicable federal agency accepts input regarding the scope and direction of the proposed project and study.

Alternative actions – Alternative projects proposed to counter the action under study. The actions may or may not have less impact.

Significance – The threshold for determining the impact of a proposed project and its actions on the natural and human environment.

Unfunded mandate – A legal requirement to fulfill without dedicated funding provided by the federal, state, or local government.

Record of Decision – The final decision rendered on the EIS once complete.

37.1 Relevance to Planning Studies

37.1.1 Regional Level

NEPA is applicable to those actions at the regional level, which are not included on the CATEX list, similar to the case at the activity level as noted above. Actions are not necessarily more prone to NEPA review due only to its regional scope. Since many actions at the regional level are routine as well as on one Base, each project should be evaluated against the CATEX list to determine its NEPA eligibility.

37.1.2 Activity Level

NEPA is applicable to most federal actions, including those on an individual activity. However, there are some actions, where under normal conditions, do not require the NEPA process. These actions, termed Categorical Exclusions (CATEX), are often those involved in routine maintenance and operation of an individual activity. Each federal agency lists the CATEXs applicable to their branch, and the Navy has identified their list under OPNAVINST 5090.1B. Thus, activity level actions should be checked against the CATEX list to ensure the NEPA process is not required.

37.2 Relationship to Other Resource Areas

The requirement to analyze potential impacts of projects under NEPA covers all environmental, socioeconomic, and cultural resource areas. As part of an EA or EIS, most of the physical, biological, and built environment resource areas covered within the CRPI must be evaluated for impacts. Additionally, the cumulative impacts of each of these resource areas must be separately identified. The cumulative impacts analysis assesses the, “incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 C.F.R. §1508.7 (1991)).”

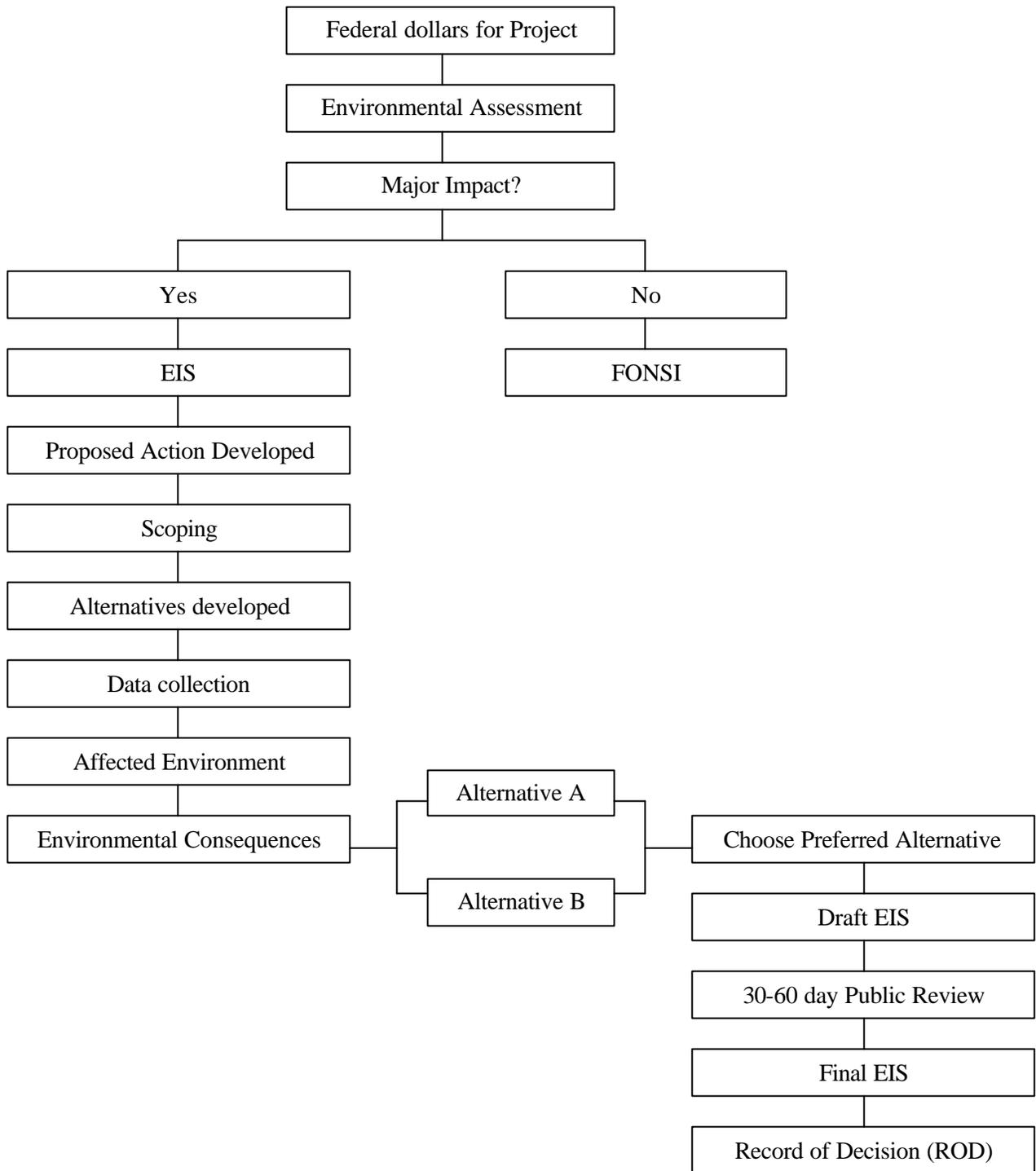
37.3 Primary NEPA Planning Factors

The factors described below apply to any EA or EIS. Across all federal projects, the process and regulations governing the NEPA documentation is standardized. Due to its wide breadth of applicability, NEPA is an issue federal agencies often address and of which they must remain mindful. Many projects have interrelated impacts, requiring thorough analysis in order to adequately address all potential impacts (Figure 37a on pg. 269).

37.3.1 Scoping

As the beginning phase of the NEPA process, the federal agency in charge of the EA or EIS uses scoping to inform the public of the upcoming project while also soliciting comments from agencies on the project scope, alternatives, and impacts to be addressed. Scoping is required by CEQ to begin as soon as is practical once the decision to perform an EA or EIS is made. The agency in charge of completing the analysis invites other affected federal, state, local, and tribal entities. These entities include both agencies and non-governmental ones, including public interest groups and the general community (Spensley, 1993).

Figure 37a
NEPA Process



Source: *The Onyx Group, 2001*

During the scoping, significant issues requiring attention are identified, while less crucial items not suffering significant impacts are deleted from the study and data list. In addition to refining the data collection list, coordination with other related EAs or EISs is sought in order to provide for the maximum coordination and minimum duplication. Finally, the timeline of the project is established along with the final proposed action to study.

37.3.2 Selection of Alternatives and Impact Analysis

The analysis of the alternative actions to the proposed action is the most important part of the EIS. Understanding the impacts of the different actions enables the decision-makers to find compromise solutions that minimize environmental and social effects on a community. According to Spensley, “Once the affected environment and environmental consequences are described, the discussion of the proposed action and alternatives should be presented in a comparative form in order to sharply define the issues and provide a clear basis for the choice among options by the decision-maker and the public (Spensley, 1993)”(Figure 37b on pg. 271). As a guide for selecting alternatives, CEQ requires that all “reasonable” alternatives to the proposed action be discussed, as well as the no-action situation where no project would occur at all. CEQ provides guidance in selecting “reasonable” alternatives as part of the requirement.

Once the alternatives are established, the description and analysis of the proposed project may begin. The affected environment provides a detailed description of the geographic, cadastral, environmental, and socioeconomic conditions of each alternative. This sets the stage for understanding the analysis of the environmental consequences. Within the environmental consequences section, the analysis of both direct and indirect impacts and conflict with state, regional, or local plans or policies is included. These impacts are all discussed in the context of the physical, biological, social, and economic functional areas (e.g. water quality, vegetation, wildlife, public services, land use, and transportation).

The discussion of the direct and indirect impacts is centered on the terminology rating the “significance” of the project’s effect. Significance is the centerpiece of the analysis discussion. During the EIS process, objective standards and criteria for determining significance in each resource area should be developed in order to justify the conclusions. Impacts should be described in terms of being non-significant, moderately significant, or significant. Using this continuum enables the decision-maker to more clearly understand the degree of environmental or social impact. The distinction between direct and indirect impacts, most often when termed significant, is an area where dispute is most often targeted (Spensley, 1993). The line is not clear between the two categories, especially when assessing the socioeconomic impacts around a region or state. Human-related factors are sometimes more difficult to precisely predict in their long-term outcomes.

Lastly, the cumulative impacts of the project and mitigation measures to resolve them are discussed. In assessing the impacts of all actions figured together, the scale and degree of overall project impact can be understood. This analysis takes into account all resource areas, as previously mentioned, and it assess the impacts in addition to all likely, unrelated forces predicted to occur as well. These are the “reasonably foreseeable” actions that the new impacts will only compound. Once the entire breadth of impacts is determined, specific mitigative measures must be detailed for each alternative. These measures will focus on the significant impacts, both direct and indirect.

Figure 37b
Comparison of Alternatives for an EIS

Environmental Resources	Alternatives																
	WS 1	WS 2	WS 3A	WS 3B	WS 4A	WS 4B	WW 1	WW 2	WW 3A	WW 3B	WW 3C	Elec. Serv. A	Elec. Serv. B	Nat. Gas A	Nat. Gas B	Rd Impr	No Act-ion
Topography, geology, and Soils (acres of surface disturbance)	3.69	4.55	3.46	3.95	2.71	3.21	1.39	1.77	2.95	3.24	3.73	1.85	2.31	3.40	3.90	5.8	N
Water Resources	No impacts to wetlands are expected. Normal sediment and erosion control measures during construction would make impacts to surface waters from runoff negligible. Only utility stream crossing is in WS1 and WS2, which routes water line along bridge over Chopawamsic Creek. Roadway improvements of Russell Road and MCB-2 do not propose to replace existing bridges or culverts.																N
Vegetation and Wildlife (acres of vegetation disturbed)	Avoids endangered species and is not expected to affect wildlife.																N
	0.10	0.10	0.46	0.46	0.10	0.10	N	N	N	0.06	0.06	N	N	N	N	N	N
Air Quality (tons/year) NOx/VOC	5.98	7.56	5.53	6.48	4.83	5.78	3.12	3.94	5.46	6.14	7.29	1.05	1.33	1.92	2.20	3.30	N
	0.42	0.53	0.39	0.46	0.34	0.41	0.22	0.28	0.39	0.44	0.52	0.61	0.08	0.11	0.13	0.21	N
Noise	A slight increase in daytime noise levels would be expected to result from motorized equipment.																N
Infrastructure/ Utilities	The existing utilities and infrastructure would be improved.																N
Land Use	Placement of buried utilities will not change land use; supporting tanks and pump stations could add -0.5 acres of facilities. Obtaining uniform 24-foot widths and improved Russell Road/MCB-1 intersection adds -5.8 acres of pavement along roadway right-of-way.																N
Transportation	During construction, a slight increase in daytime congestion would occur from single-lane blockage during the emplacement of utilities or roadway improvements. After construction, transportation/access would be improved.																N
Socioeconomics/ Environmental Justice	A slight increase in economic activity may occur from employment of construction crews; however, effort is very small compared to level of construction activity in greater Washington area from which crews are drawn. Therefore, impacts are not significant. There is no indication that any disproportionately negative impacts would occur to minority or low-income populations.																N
Cultural Resources	Avoids cultural resources in area.																N
Human Health and Safety	Improves transportation safety. Does not generate hazardous waste or contribute to unsafe conditions.																N

N = Impact would be negligible and too small to quantify

Source: Environmental Assessment for Westside Infrastructure Project P-505, MCB Quantico, February 2001.

37.3.3 Public Involvement

Public involvement occurs at three points within the EIS process. Input is given in the developmental stages of the document and at review of the draft and final. The scoping meetings are the first available forums for public input. Public feedback on potential impacts, as well as proposed alternatives, is beneficial information solicited through this process. At draft stage, the document is circulated to potentially affected parties, including the general public, tribal councils, and agencies (Spensley, 1993). Normally, the public contacted at the review stage is those community members who expressed interest as part of the initial scoping process. Comments solicited at the draft stage are then addressed in the final document production through one of several methods. The comment may result in a direct change in the document, or the preparer may explain why a comment does not require substantive agency response. Lastly, the final draft, including appropriate corrections and comments, will be forwarded to the same citizens and agencies as received the first draft.

37.4 NEPA Functional Use Area Interpretation

37.4.1 Opportunities

- The EIS process provides a thorough understanding of the potential impacts of a project. Thus, related planning efforts can be coordinated with the outcome of the EIS in order to prevent additional impacts on related areas or initiatives.
- A positive relationship between the Navy and surrounding community can develop through the scoping and comment processes. Community trust can be fostered through open and respectful coordination.
- Increased opportunities for enhanced communication and education of the community exist. Through explaining the process, project, and impacts, future tensions may be lessened in intensity.
- The NEPA process is required by law. Careful and diligent compliance with the CEQ regulations ensures respect from outside the naval community for addressing environmental and social impacts in a responsible manner.

37.4.2 Constraints

- NEPA is an unfunded mandate. While the law requires the process be followed, no targeted and specific funding is provided. Funding for the required documents and efforts is then not available for other Navy endeavors.
- The time and scope of an EIS can sometimes be long. Often taking at least a year, an EIS involves a considerable amount of Navy personnel time, as well as that of potential consultants creating the document.
- Controversial projects can create additional tension with the surrounding community that may have been otherwise lessened through the traditional Navy planning and construction methods. While communication about projects can be enhanced, the visibility of the project may create its own additional PR problems.

37.5 Relevant Impact Questions For NEPA

These questions provide additional general guidance to the planner in deciding the relative significance of environmental information and processes on a specific proposed project:

- Is the proposed project covered under the Navy CATEX list?
- Has an EA or EIS been recently prepared on a related issue or project at the activity or in the region?
- Are there coordination opportunities with community initiatives or projects that can be used as public relations tools for the citizenry?
- What agencies will require coordination and roles in the EA or EIS preparation process?
- Is the community known for volatility and reaction to federal or environmentally sensitive projects?

37.6 Data Sources

1. Internet

- <http://ceq.eh.doe.gov/nepa/nepanet.htm>
- <http://tis.eh.doe.gov/nepa/>
- <http://es.epa.gov/oeca/ofa/nepa.html>
- <http://ceq.eh.doe.gov/nepa/regs/40/40p3.htm>
- <http://www.nawcwpns.navy.mil/~epo/NEPACE.html>

2. Local

- City/County Planning Departments
 - All relevant statistics related to resource areas

3. Regional

- Council of Governments (COG)
- Metropolitan Planning Organization (MPO)
- Economic Development Agency (EDA)

4. State

- Department of Natural Resources (DNR)
- Pollution Control Agency (PCA)
- Department of Commerce
- Department of Transportation
- Economic Development Authority

5. Military

- Base Public Works
- Base Environmental Office
- Base Housing Office

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15:Archaeology

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20:Political Structure

(Dalton et al, 2000) Dalton, Linda C., Hoch, Charles J., and So, Frank S. eds. 2000. The Practice of Local Government Planning. 3rd Ed. Washington, D.C.: ICMA University.

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- Approved Basic Stock Level of Ammunition for Various Installations (ABSLA).²
- Technical Manual on Electromagnetic Radiation Hazards, NAVSEA OP-3565, Volume 1, 5th revision.

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- OPNAV Instruction 5090.1B: Environmental Protection and Natural Resources Manual.
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Port Hueneme, CA 93043

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¹ May not be issued to non-military

² May be classified information

- NAVFAC DM-1 Series, Architecture.
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- NAVFAC DM-33 Series, Hospital and Medical Facilities.
- NAVFAC DM-34 Series, Administrative Facilities.
- NAVFAC DM-36 Series, Troop Housing
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- NAVFAC Instruction 11010.5713: Site Approval of Naval Shore Facilities.
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