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East Central Florida Water Supply Initiative
St. Johns River Water Supply Project

Surface Water Treatment Plant Siting Study
Level 1 Analysis:
Preliminary Study Area Screening

TECHNICAL MEMORANDUM D1A

EAST-CENTRAL FLORIDA WATER SUPPLY INITIATIVE
ST. JOHNS RIVER WATER SUPPLY PROJECT

SURFACE WATER TREATMENT PLANT SITING STUDY

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SE408AA

CONTENTS

CERCLIS	Comprehensive Environmental Response Compensation and Liability Information System
FDEP	Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
FGDL	Florida Geographic Data Library
FNAI	Florida Natural Areas Inventory
GIS	Geographic Information System
LG GEN	Large Generators of Hazardous Wastes
NPL	National Priorities List
RCRA	Resource Conservation and Recovery Act
SHCA	Strategic Habitat Conservation Areas
SJRWMD	St. Johns River Water Management District
TSD	Treatment, Storage and Disposal Facilities

INTRODUCTION

The St. Johns River Water Management District (SJRWMD) implemented an interactive program with the utilities, residents and other interested parties to develop the District Water Supply Plan (DWSP) through the Water 2020 planning process. The need for alternative water supplies from the traditional use of groundwater became apparent through this process. The St. Johns River Water Supply Project of the East-Central Florida Water Supply Initiative comprises five projects: the St. Johns River Treatability and Demineralized Concentrate Management Study, the Surface Water Treatment Plant Siting Study, the Demand Projection and Affordability Study, the USGS Water Quality Study, and Middle St. Johns River Minimum Flows and Levels Work. These projects focus on the evaluation of surface water withdrawn from the St. Johns River as an alternative or supplemental source of supply for portions of Seminole and Volusia counties, Florida. Three individual projects, the Surface Water Treatment Plant Siting Study, the St. Johns River Treatability Study, and the Demand Projection and Affordability Study, will help to facilitate design, location, and costing of a complete surface water treatment facility on a reach of the St. Johns River between the southern end of Lake Monroe and DeLand, Florida.

The purpose of this technical memorandum (TM) is to outline the methodology that will be used to complete the Surface Water Treatment Plant Siting Study (Siting Study). The Siting Study will include the following project components:

- River intake structure
- Treatment plant
- Raw or treated water storage facility
- Demineralized concentrate disposal area
- Pipeline corridors

The proposed methodology for this siting study comprises three levels of detail, ranging from a general analysis of the study area to a detailed analysis for specific sites, and will result in the selection of a recommended site for the proposed water treatment facility. Each level of this analysis includes several common components, including natural resources, social and engineering data collection; the use of geographic information system (GIS) technology and mapping; and public outreach.

METHODS

This TM provides the detailed methods of data collection and analyses that will occur in the siting study. Public outreach is part of each of the three levels of analyses as described below.

LEVEL 1 ANALYSIS, PRELIMINARY STUDY AREA SCREENING

The Level 1 analysis, preliminary screening, portion of the project consists of data collection and preliminary analysis of the entire study area. The study area includes a reach of the St. Johns River between the southern end of Lake Monroe in Sanford and DeLand and extends five miles on each side of the river. The objective of the Level I analysis is identification of environmental constraints and areas of opportunity within the study area and the selection of up to 10 initial sites for the water treatment facility location that will be reviewed further in the Level 2 analysis, preliminary site specific screening.

Data Collection

The preliminary data collection will use existing GIS files from sources that include SJRWMD, the Florida Geographic Data Library (FGDL), the Florida Department of Environmental Protection (FDEP), the Florida Fish and Wildlife Conservation Commission (FWC), the Florida Natural Areas Inventory (FNAI), and local governments (e.g., Seminole County, Lake County, and Volusia County). Additional GIS databases will be generated from the Demand Projection and Affordability Study and may also be used for this analysis.

Data will include basemap coverages (such as streets, political boundaries, and conservation lands) and coverages of environmental constraints (e.g., land use/land cover, wetlands, soils, floodplains, and listed species element occurrence records). The list of environmental constraints themes will include those in Table 1. Once the above data have been collected, a basemap including the environmental constraints data will be created for the entire study area.

Table 1. GIS Data layers for Level 1 screening

GIS Theme	Source(s)	Description
Biodiversity hotspots	FWC	Areas of high biodiversity
Boating hazards	HDR	Navigation channels and public boat ramps
Conservation lands	SJRWMD	Federal, state and District public lands
Conservation lands	Local Governments	County and city parks and recreation lands
DOQQs	SJRWMD, FDEP	Digital Orthophoto Quarter Quad aerial imagery
Floodplains	SJRWMD, FEMA	100-year floodplains (Zone A), 25-year floodplains (WMD)
Hazardous materials sites	EPA, FDEP	CERCLA, RCRA, TRI site locations
Hydrography	TIGER, DLG	1:100,000 scale TIGER or 1:24,000 DLG, as appropriate
Land use/land cover	SJRWMD	General land use and land cover, including wetlands
Listed species occurrences	FNAI	Threatened or endangered species observations
OFW boundaries	SJRWMD, FDEP	Outstanding Florida Waters boundaries
Political boundaries	TIGER	County and city boundaries
Roads	TIGER, DLG	1:100,000 scale TIGER or 1:24,000 DLG, as appropriate
SHCA	FWC	Strategic Habitat Conservation Areas
SSURGO soils	SJRWMD, NRCS	Detailed soil survey, including hydric soils

Suitability Modeling Process Development

Upon completion of a basemap and the identification of environmental constraints, a site suitability model will be developed to isolate those parts of the study area that possess no "fatal flaw" constraints and the fewest other constraints for placement of the proposed water treatment plant.

Environmental factors contributing to the model include wetlands and hydric soils, floodplains, floral and faunal habitat, land use, water constraints such as wetlands or surface waters, and hazardous materials sites. Some of these environmental factors will be created using multiple GIS coverages. For example, the floral

and faunal environmental factor will be created by combining information from the FWC's "Biodiversity Hotspots," "Strategic Habitat Conservation Areas" (SHCA), and FNAI's element occurrence database. This practice will result in one factor for evaluating sensitive species and their habitat.

Once the environmental factors have been created and identified within the database, each of these environmental factors will then be assigned to "high," "moderate," or "low" suitability classes, based on constraint thresholds, and will be coded as such. The thresholds for each of the environmental factors are identified in Table 2.

Suitability Modeling, Mapping, and Quantification

Following the development of environmental factors and assigning them their suitability classes, those factors will be combined using GIS technology in an analytical model designed to screen out areas unsuitable for placement of a water treatment plant within the study area.

The basic analytical model will overlay the environmental factors and recode them, based on their combined suitability classes to produce an output theme for various portions of the study area. The code will range from 1 to 5, where 1 represents an area with very low constraints, 5 represents an area that is severely constrained, and 2, 3, and 4 represent an area with varying combinations of moderate constraints. To ensure that areas of high constraints in any environmental factor will be treated as a highly constrained area and will not be "diluted" by several low or moderate constraint factors, any area represented as a "high" constraint in any of the environmental factors will result in a value of 5 (severely constrained) in the output. Table 3 defines each of the output codes. As portions of the study area are eliminated based on this preliminary screening of environmental constraints, additional analysis will be completed, as appropriate, to identify candidate sites for the various infrastructure components of the water treatment plant system that meet certain criteria from an engineering and design perspective. These criteria will be developed by a project team composed of the consultants completing the studies (surface water treatment plant siting, treatability, and demand projection and affordability), with approval by the District project manager. The engineering and

design criteria to be determined by the project team include the following:

- The minimum amount of land required for the potential water treatment plant sites
- The minimum amount of land required for the potential water storage facility sites
- The maximum distance of the potential river intake sites from the nearest shoreline

SJRWMD is currently conducting a study on the appropriate mechanisms for concentrate disposal. The findings of this study will be relied upon to identify potential disposal mechanisms and their relative distance to the shortlisted water treatment plant sites.

The Level 1 analysis, preliminary screening, will result in up to 10 initial sites that will be evaluated further in the Level 2 preliminary site-specific analysis. Those sites will have the lowest number of constraints and will meet the engineering and design requirements for the water treatment plant facility site identified above.

Table 2. Level 1 analysis — Suitability model

Factor Number	Constraint Factors	Criteria	No Constraints	Moderate Constraints	High Constraints
1	Wetlands and Hydric Soils	Avoid areas of wetlands and hydric soils	Outside wetlands	Within non-forested wetlands	Within forested wetlands
2	Floodplains	Avoid flood hazard areas	Outside 100-year floodplain	Within 100-year floodplain	Within 25-year floodplain
3	Floral and faunal habitat	Avoid biodiversity hotspots, SHCAs, and USFWS-established T&E species protection zones	Outside USFWS buffers, > 1,000 ft from FNAI element occurrences, biodiversity hotspots < 3 species	Within USFWS secondary buffer, within 1,000 ft of FNAI element occurrences, biodiversity hotspots 3 - 6 species	Within USFWS no-disturbance buffer, within 500 ft of FNAI element occurrence, SHCA or biodiversity hotspots > 7 species
4	Land use	Avoid existing urban uses and agricultural uses	Non-urban, non-agricultural	Agricultural	Commercial, industrial or residential
5	Waterward constraints	Avoid OFW waters, waters near channels & boat ramps, waters adjacent to wetlands or urbanized shorelines, and areas near industrial discharges	No OFW, > 200 ft from channels and boat ramps, no adjacent wetlands or urban land use	No OFW, within 1,000 ft of industrial discharge or > 100 ft from channels and boat ramps	Within OFW, within 100 ft of channels or boat ramps, within 500 ft of industrial discharge, or adjacent to wetlands or urban land use
6	Hazardous materials sites	Avoid contaminated sites	No contaminated sites	N/A	Listed contaminated sites

Table 3. Level 1 Screening model output codes.

Code	Constraint Classification	Constraint Definition
1	Very low constraints	Areas with no high or moderate constraints
2	One moderate constraint	Areas with only one factor valued as a moderate constraint
3	Few moderate constraints	Areas with only two to three factors valued as a moderate constraint
4	Many moderate constraints	Areas with four or more factors valued as a moderate constraint
5	Severely constrained	Areas with at least one factor valued as a high constraint

Public Outreach Program

The need for a comprehensive and effective public outreach program is of paramount importance throughout the siting study. The primary objectives of the public outreach program are to establish and maintain an open line of communication with key stakeholders throughout the site selection process; to identify and resolve issues promptly to avoid controversy, minimize opposition, and prevent delays; and to develop community support and build relationships with stakeholders. All public outreach activities conducted and communication tools developed as a part of the public outreach program will be coordinated with and approved by appropriate staff of the District's Office of Communication and Governmental Affairs.

The public outreach program associated with the Level 1, preliminary screening analysis, is important because it will result in the first impression for both the key stakeholders and the public and provides an opportunity to set the tone for the "open and on-going dialogue" that the District will be seeking with these key audience groups.

During the Level I analysis, the public outreach program will include the project pre-announcement with key stakeholders, which include affected property owners and residents; nearby neighbors; federal, state, and local officials; regulatory agencies; environmental groups; the media; civic groups; and special interest groups. The pre-announcement to key stakeholders at this time will be important to ensure that the project team is the "first and best source of information" about the project.

As the preliminary data collection and analysis is being completed, the public outreach program will include identifying the community's level of knowledge, issues, and concerns about the proposed water treatment facility. This will also be the opportunity to compile a complete mailing list for the stakeholder database and appropriate informational materials for public meetings. Information regarding the project will be provided to the District for inclusion on the District's Web page. The Web site information will be used to communicate with the stakeholders and will be updated as project milestones are met.

At the end of the Level 1 preliminary screening analysis, a public meeting will be held to introduce the project to the public as a whole. At that meeting, the need for the project will be explained as well as the opportunities for public input at various points of the project. The initial sites (up to 10 sites) will be identified to the public and an explanation of the Level 1 preliminary screening process that resulted in the selection of these initial sites will be given. The public will also be given an opportunity to identify additional sites that may lie outside of the defined study area, five miles on each side of the St. Johns River between the southern end of Lake Monroe in Sanford and DeLand. In addition, public comment will be taken to identify any related issues and concerns.

LEVEL 2 ANALYSIS, PRELIMINARY SITE-SPECIFIC SCREENING

The Level 2 analysis is a preliminary site-specific screening analysis. This analysis will include additional data collection and impact quantification for the initial sites identified through Level 1, preliminary study area screening. The Level 2 analysis will result in the selection of up to five sites for the water treatment facility location that will be further reviewed in the Level 3 analysis. In addition, the Level 2 analysis will provide the initial identification of pipeline routes from the potential intake locations to the water treatment plant sites and from the water treatment plant sites to the distribution nodes. Concentrate disposal and raw water storage options will also be identified for the water treatment plant sites.

Data Collection and Data Entry

Additional site-specific data will be collected for each of the potential water treatment facility sites. Once these data have been collected, the information will be entered into the project GIS database to be used for further analysis. The data collected will include detailed wetland jurisdictional boundaries, locations of listed species observations and habitat, potential hazardous materials sites, and sites of archeological or historic structures. In addition, some of the data collected as part of the Level 1 analysis will be ground-truthed. Data for this level of analysis will be collected in digital format through local governments or other agencies when available. In addition, field staff will obtain some data, such as the location of docks, cultural sites, listed species observations and wetland jurisdictional boundaries. Field staff will use GPS to collect point location data in the field to within 10

meters for biological data and one meter for physical structures, such as docks or outfalls.

Wetland jurisdictional boundaries will be determined photogrammetrically from digital orthophoto quads and verified in the field. Quantitative data will be compiled for wetlands, primarily because costs associated with mitigation can be determined and included in the cost comparison analysis. Other natural features such as upland habitats and stream and river channels will be evaluated on a qualitative basis, specifically for presence/absence and their relation to surrounding land uses/ecosystems.

Preliminary data collection for noise or visual impacts to surrounding land uses will be completed and evaluated on a qualitative basis.

A more detailed review of potential hazardous materials factors will be completed during the Level 2 analysis. A complete review of existing databases will be accomplished to evaluate potential hazardous materials sites. The existing sources of information that will be used include the National Priorities List (NPL), the Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS), the Resource Conservation and Recovery Act (RCRA) program's Treatment, Storage and Disposal Facilities (TSD), the RCRA program's Large Generators of Hazardous Wastes (LG GEN), the Toxic Release Inventory, the PDS List, the Solid Waste Facilities List (GMS 80), and the Stationary Tank Inventory System, ST1PO2.

In addition to environmental data collection, preliminary data collection will be completed during the Level 2 analysis for each site that will include the number of property owners affected, estimated land values and cost of acquisition, and potential relocations. Land values and the number of affected property owners will be determined through the use of REDI aerials and the County's Property Appraiser's office and then averaged for a selection of parcels. The costs for the market value of the property will be based on tax records. The values presented in this phase of the study are intended to provide approximate costs for the acquisition and to provide reliable data for the comparison of property values between alternative sites. Visual review of the REDI maps will also provide information on the number of

potential relocations, if any are required. This process will result in an approximate number achieved by counting the number of structures on the REDI aerials.

Mapping and Impact Quantification

With the additional data collected, GIS mapping will be completed at a site-specific level to depict the constraints present. These maps will depict both the constraints identified in the Level 1 screening analysis and those Level 2 data that are available in digital format.

To help evaluate the relative suitability of each proposed water treatment plant site, the Level 1 and Level 2 constraint factors for each site will be quantified using GIS technology and an Excel spreadsheet. Quantification data will be expressed as acres of potential impact for area resources, as linear feet of impact for linear resources, and as a site count for point location resources. Impact quantification may include the entire water treatment plant site or just the footprint of areas of potential effect where facilities may be sited within a larger reservation of land. The quantification data will be summarized in a potential impacts matrix comparing all viable alternative sites. Qualitative data will also be included in the spreadsheet to ensure each factor is evaluated during the site selection process.

The initial sites will be compared in the evaluation spreadsheet and the team will consider both the qualitative and quantitative environmental data and the costs associated with land use acquisition, relocations, and wetland mitigation. The Level 2 analysis will result in up to five sites that will be evaluated further in the Level 3 analysis. The potential sites will also be evaluated for compatibility with the concentrate management strategies identified in the Treatability Study completed for the project and the availability of water storage.

Pipeline Routing Analysis

Using the data collected in the Level 1 and Level 2 analyses, a screening analysis will be completed to identify up to five pairs of pipeline termini for each site for the endpoints of pipelines leading from the potential intake locations to the potential water treatment plant sites, and from the potential water treatment sites to the distribution nodes. The distribution nodes used will be obtained

through information from the Demand Projection and Affordability Study. A least-cost path analysis will be performed between each potential origin point and the alternative destination points to locate the optimum path between those locations.

After the least-cost path analyses are complete for all sets of origin and destination points, the optimum paths for each site will be mapped and evaluated to determine which are the most desirable. The evaluation of pipeline paths will include, but not be limited to, the following factors:

- Length — All other things being equal, the pipelines with the shortest length will be preferable because they will reduce the cost of the pipeline.
- Environmental impact quantification — Candidate routes will be compared on the route's possible effects on wetlands, floodplains, and other environmental constraints.
- Land value and acquisition — All other things being equal, the pipelines with the least amount of land acquisition will be preferable because they will help to reduce the cost associated with the pipeline.

At the end of the pipeline routing analysis, a preferable pipeline route will be selected for each of the remaining potential water treatment plant sites from the potential intake point to the treatment facility and from the treatment facility to the destination nodes. These preferable pipeline routes will aim to minimize land acquisition cost, construction cost, and environmental impacts.

Public Outreach

Public outreach will be a major portion of the Level 2 analysis portion of the project. As the above data and analysis are being completed, an ad hoc residents/agency committee will be organized to assist in the development of the site selection criteria and the relative weighting factors of selection criteria. This committee will be composed of regulatory agency representatives, residents, environmental group representatives, and community group representatives.

To assist the committee in developing criteria and weighting factors, several exercises will be initiated. An example worksheet is provided in Figure 1. This worksheet will be used to help

determine the relative importance between criteria. The site selection criteria on the example worksheet include site size, proximity to compatible and incompatible land use, proximity to demand centers, suitability for concentrate management, public acceptance, availability and cost of power, and land ownership.

Other criteria that may be evaluated include total site and construction cost, environmental effects/benefits, and long-range planning. The final criteria to be evaluated will be determined by the District with input from the ad hoc residents/agency committee. Once the Level 2 analysis data collection and impact quantification is completed, the committee will apply the site selection criteria and weighting factors to the remaining sites. Based on these site selection criteria, developed with the assistance of the committee and implemented by the technical team and the District, up to five sites will be selected for further evaluation and detailed cost analysis. These selected sites will also be presented at a public meeting prior to the start of the Level 3 detailed screening analysis. This will provide the public with an opportunity to review the three to five remaining sites, understand the site selection criteria and weighting factors and how they were applied, and provide comments on the remaining sites.

Figure 1. Example Paired Comparison Matrix

	1	2	3	4	5	6	7
1 Size		1 vs. 2	1 vs. 3	1 vs. 4	1 vs. 5	1 vs. 6	1 vs. 7
2 Proximity to compatible and incompatible land use			2 vs. 3	2 vs. 4	2 vs. 5	2 vs. 6	2 vs. 7
3 Proximity to demand centers				3 vs. 4	3 vs. 5	3 vs. 6	3 vs. 7
4 Suitability for concentrate management					4 vs. 5	4 vs. 6	4 vs. 7
5 Public acceptance						5 vs. 6	5 vs. 7
6 Availability and cost of power							6 vs. 7
7 Land ownership							

How many times did you circle:

1? _____

2? _____

3? _____

4? _____

5? _____

6? _____

7? _____

Example

(3) vs. 7

INSTRUCTIONS: The matrix allows comparison of seven site selection criteria. In each box of the matrix, circle the number of the criterion that you think is the more important of the two (see example). If you consider the two criteria being compared to be essentially equal, circle both. Once you have completed all the comparisons, count the number of times you circle each number. Write the score in the blanks on the right side of the matrix.

LEVEL 3 ANALYSIS, DETAILED SCREENING

The Level 3 detailed screening analysis will be completed on the final three to five sites as selected in the Level 2 analysis, using the selection criteria and weighting factors of the ad hoc residents/agency committee.

Data Collection and Impact Analysis

The remaining data to be collected will require additional fieldwork for environmental data collection and land acquisition cost information. Data collection at this level will focus on the opportunity for the placement of the various components of the water treatment plant facility on each of the remaining sites.

Further analysis to be conducted on these sites includes the identification of wetland issues, clarification of land use issues and the development of detailed capital cost estimates for a water treatment plant, the routing of the pipeline for surface water intake, and the pipeline(s) to the demand center(s). In addition, the opportunity for future expansion of each site will be evaluated. A summary of the additional analysis conducted will be provided for each of the five sites.

Public Outreach

A public meeting will be held after the Level 3 detailed screening analysis has been completed. This meeting will also focus on the process that was used to select the site(s) and the public involvement opportunities that have been provided.

Although this may be the final public meeting for the siting study, the public outreach program will continue in several ways and should be carried on through design and construction phases of the project.

During the Level 3 analysis, the public outreach program may also include providing tours of the remaining potential sites to interested parties, the media, or government officials; separate presentations to civic or environmental groups; and prompt responses to concerned individuals or groups.

DISCUSSION

The siting methodology established in this TM is the initial basis of review of the potential water treatment plant sites and other components of the St. Johns River Water Supply Project. This methodology may be revised throughout the process as a result of public comment or the findings of a previous level of site investigation.

SUMMARY

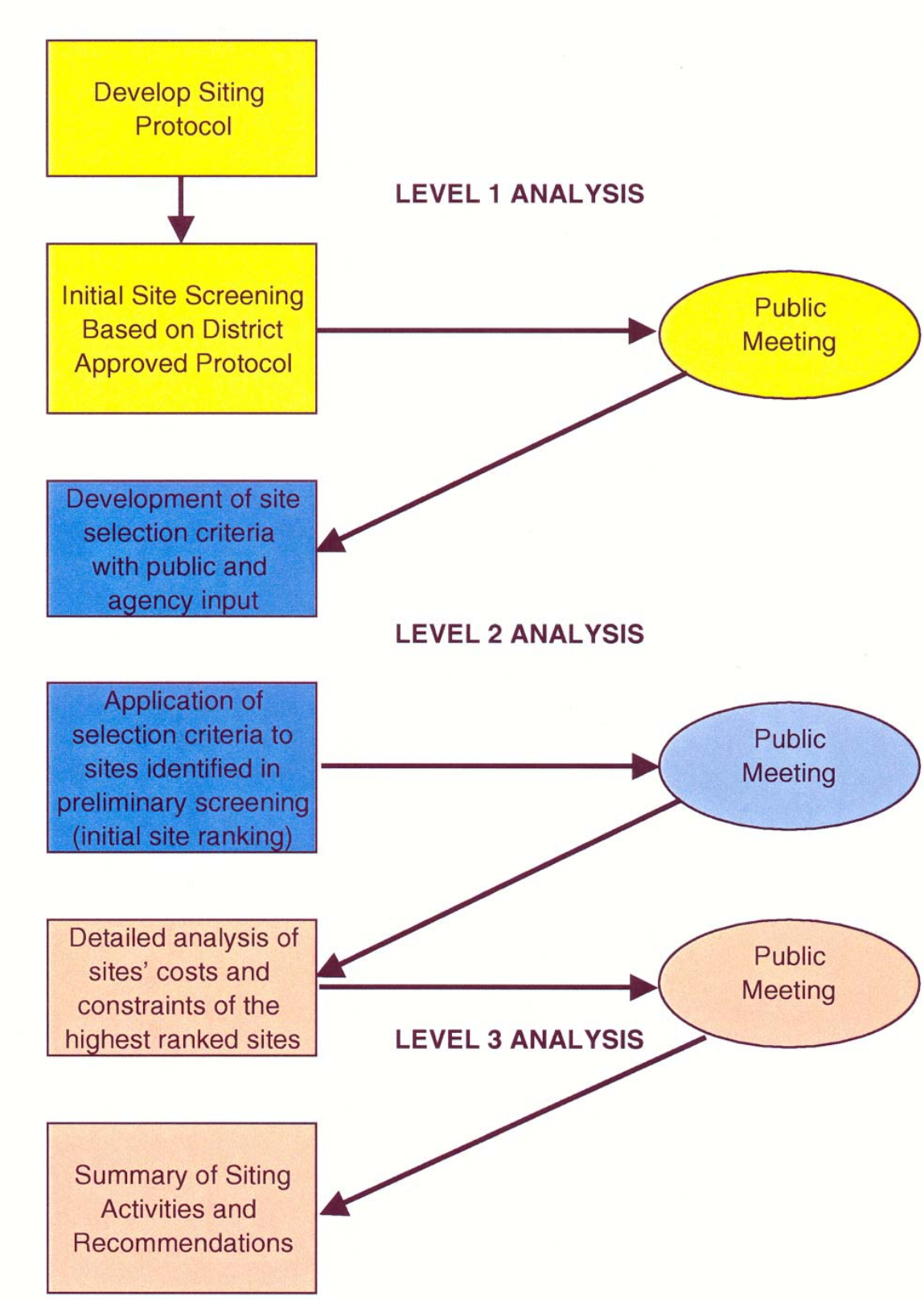
The methodology for the water treatment plant siting study includes three levels of analysis (Figure 2). Public outreach will be included as a portion of each of the levels of analysis and key stakeholders will be identified and notified early on in this process.

The first level of analysis will provide a preliminary screening of the study area to identify environmental and engineering constraints and areas of opportunity for the water treatment site. Through the development of a suitability modeling, using GIS technology, up to 10 initial sites will be identified for further site-specific analysis.

The second level of analysis will include a closer, more site-specific review of the initial sites identified in the Level 1 analysis. This level of analysis includes further GIS data collection, additional field reviews and ground-truthing of GIS data, preliminary land acquisition costs and property owner impacts, and impact quantification. During the Level 2 analysis, initial pipeline routes and concentrate disposal and raw water storage options will also be identified. A qualitative and quantitative evaluation will be completed on the initial sites, and up to five sites will be selected to move forward in the selection process.

During the Level 2 analysis, an ad hoc residents/agency committee will be organized to assist in the development of the site selection criteria and the relative weighting factors of selection criteria. Once the Level 2 analysis data collection and impact quantification is completed, the committee will apply the site selection criteria and weighting factors to the remaining sites. Based on the site selection criteria, developed with the assistance of the committee and implemented by the technical team and the District, up to five sites will be selected for further evaluation and detailed cost analysis.

Figure 2. Summary of Siting Analysis



The Level 3 detailed screening analysis will be completed on the remaining five sites. Data collection at this level will focus on the opportunity for the placement of the various components of the water treatment plant facility on the remaining sites including a more precise identification of wetland issues, clarification of land use issues. In addition, the development of a detailed capital cost estimate for the water treatment plant, the routing of the pipeline for surface water intake, and the pipeline to the demand center. The opportunity for future expansion will also be evaluated for each site.

Public outreach will be important throughout the project and will be included during each level of analysis. In addition to the creation of the ad hoc residents/agency committee, opportunities for public input will occur at the end of each level of analysis to provide information on the site evaluations and selections for further analysis. Information will be provided to the District for inclusion on a Web site that will be created for project information and to inform the stakeholders when project milestones are met. Opportunities may also occur for tours of the potential sites and presentations to smaller interested groups and organizations.

The siting methodology established in this TM is the initial basis of review for the potential water treatment sites. This methodology will result in a recommended final site or sites for the water treatment plant.