FORM #: 62-343.900 (1)
FORM TITLE: JOINT ENVIRONMENTAL RESOURCE PERMIT APPLICATION
DATE: March 26, 2004

SECTION A

FOR AGENCY USE ONLY

ACOE Application #	DEP/WMD Application #
Date Application Received	Date Application Received
Proposed Project Lat.	Fee Received $
Proposed Project Long.	Fee Receipt #

PART 1:

Are any of the activities described in this application proposed to occur in, on, or over wetlands or other surface waters? ☒ yes ☐ no

Is this application being filed by or on behalf of a government entity or drainage district? ☒yes ☐no

PART 2:

A. Type of Environmental Resource Permit Requested (check at least one). See Attachment 2 for thresholds and descriptions.

- ☐ Noticed General - include information requested in Section B.
- ☐ Standard General (Single Family Dwelling) - include information requested in Sections C and D.
- ☐ Standard General (all other Standard General projects) - include information requested in Sections C and E.
- ☐ Individual (Single Family Dwelling) - include information requested in Sections C and D.
- ☐ Individual (all other Individual projects) - include information requested in Sections C and E.
- ☒ Conceptual - include information requested in Sections C and E.
- ☐ Mitigation Bank Permit (construction) - include information requested in Sections C and F. (If the proposed mitigation bank involves the construction of a surface water management system requiring another permit defined above, check the appropriate box and submit the information requested by the applicable section.)
- ☐ Mitigation Bank (conceptual) - include information requested in Sections C and F.

B. Type of activity for which you are applying (check at least one)

- ☐ Construction or operation of a new system, other than a solid waste facility, including dredging or filling in, on or over wetlands and other surface waters.
- ☐ Construction, expansion or modification of a solid waste facility.
- ☒ Alteration or operation of an existing system which was not previously permitted by a WMD or DEP.
- ☐ Modification of a system previously permitted by a WMD or DEP.
  Provide previous permit numbers:_____
  - ☐ Alteration of a system
  - ☐ Abandonment of a system
  - ☐ Removal of a system
  - ☐ Extension of permit duration
  - ☐ Construction of additional phases of a system

C. Are you requesting authorization to use Sovereign Submerged Lands?
☒yes ☐no
(See Section G and Attachment 5 for more information before answering this question.)

D. For activities in, on, or over wetlands or other surface waters, check type of federal dredge and fill permit requested:
☒Individual ☐Programmatic General ☐General
☐Nationwide ☐Not Applicable

E. Are you claiming to qualify for an exemption? ☐yes ☒no
If yes, provide rule number if known. _____

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PART 3: A. OWNER(S) OF LAND	B. ENTITY TO RECEIVE PERMIT (IF OTHER THAN OWNER)
Name Southwest Florida Water Management District	Name
Title and Company	Title and Company
Address 2379 Broad Street (U.S. 41 South)	Address
City, State, Zip Brooksville, Florida 34604-6899	City, State, Zip
Telephone and Fax (352)796-7211 and (352)797-5806	Telephone and Fax
E-mail Address: (optional)	E-mail Address: (optional)

C. AGENT AUTHORIZED TO SECURE PERMIT	D. CONSULTANT (IF DIFFERENT FROM AGENT)
Name	Name Michael P. Timpe, P.E.
Title and Company	Title and Company Project Manager, BCI Engineers & Scientists, Inc
Address	Address 2000 E. Edgewood Drive, Suite 215
City, State, Zip	City, State, Zip Lakeland, FL 33803
Telephone and Fax	Telephone and Fax (863)667-2345 and (863)667-2662
E-mail Address: (optional)	E-mail Address: (optional)

PART 4: (Please provide metric equivalent for federally funded projects):

A. Name of Project, including phase if applicable: Lake Hancock Lake Level Modification Project

B. Is this application for part of a multi-phase project? ☐ Yes ☒ No

C. Total applicant-owned area contiguous to the project? __5,758____ ac.; _2,330__ ha.

D. Total area served by the system: __14,564_____ ac.; ____ 5,894__ ha.

E. Impervious area for which a permit is sought: ___NA________ ac.; ___________ ha.

F. Volume of water that the system is capable of impounding: ___9,300__ ac. ft.; ____ m^3

G. What is the total area of work in, on, or over wetlands or other surface waters?
___<1.0_____ ac.; ________ ha.; ___________ sq. ft.; ___________ sq. m.

H. Total volume of material to be dredged: __**None**_________ yd^3; __________ m^3

I. Number of new boat slips proposed: _**None**_ __ wet slips; _____ dry slips

PART 5:

Project location (use additional sheets if needed):
County(ies) Polk

Section(s) 24, 25, 36	Township 28 South	Range 24 East
Section(s) 19, 20, 29, 30, 31, 32, 33	Township 29 South	Range 25 East
Section(s) 1, 2, 3, 11, 12, 13, 24, 25	Township 28 South	Range 24 East
Section(s) 4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22, 28, 29, 30, 32, 33	Township 29 South	Range 25 East

Land Grant name, if applicable: NA

Tax Parcel Identification Number: _____

Street Address Road or other location:_____

City, Zip Code, if applicable: _____

PART 6: Describe in general terms the proposed project, system, or activity.

Lake Hancock lake level modification project is one of the Southwest Florida Water Management District's (District) proposed recovery strategies to provide additional storage of surface waters within Lake Hancock which then can be used to maintain Minimum Flows and Levels (MFLs) in the upper Peace River when required. Currently, Lake Hancock's water level Control Structure P-11 is operated at 98.5 feet National Geodetic Vertical Datum (NGVD). The top of structure elevation is at 98.7 feet NGVD. The proposed new operation level is to raise the lake level to 100.0 feet NGVD.

The proposed Lake Hancock water level modifications were designed specifically to facilitate the flow recommendations adopted to benefit the upper Peace River downstream of the P-11 structure, consistent with MFL legislation. The MFL objective is to restore perennial flow to the upper Peace River while assuring sufficient flow depths to allow for fish passage 95 percent of the time. This project will meet about 50 percent of the required improvement for critical instream flows in that segment of the river.

The proposed project is similar to a common approach for ecological restoration in Florida where ditch blocks and/or control structures are used as the primary means to modify water levels to restore historic hydropatterns to a landscape.
To achieve the new water level for the lake, the Control Structure P-11 has to be modified, and supplement fix over flow weir tieback levee needs to be constructed. The proposed water level modifications are expected to provide improvements to Lake Hancock's wetland functions, returning a wider range of optimal water depths and inundation duration to the landscape. Some flood-sensitive trees that have encroached into some of the artificially dewatered areas will perish, making way for plant species in better balance with the improved water levels. The proposed water regime will restore some existing uplands back to wetlands, causing a return of 301 acres of wetlands to the landscape. These include the restoration of hydrologic conditions for wet prairie systems, which had been all but eliminated from the area. The proposed net increase of wetlands will partially offset wetland losses that have progressively occurred in the lake's fringe areas since the late 1920's.

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PART 7:

A. If there have been any pre-application meetings, including on-site meetings, with regulatory staff, please list the date(s), location(s), and names of key staff and project representatives.
Approximately monthly meetings were held with the Department between February 2005 and January 2006.

B. Please identify by number any MSSW/Wetland Resource/ERP/ACOE Permits pending, issued or denied for projects at the location, and any related enforcement actions. **N/A**

Agency	Date	No.\Type of Application	Action Taken
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

C. Note: The following information is required for projects proposed to occur in, on or over wetlands that need a federal dredge and fill permit or an authorization to use state owned submerged lands. Please provide the names, addresses and zip codes of property owners whose property directly adjoins the project (excluding application) and/or (for proprietary authorizations) is located within a 500 ft. radius of the applicant's land. Please attach a plan view showing the owner's names and adjoining property lines. Attach additional sheets if necessary.

1.
Summertimes Ranch, Inc.
P. O. Box 7667
Lakeland, Florida 33807-7667

2.

3.

4.

5.

6.

7.

8.

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PART 8:

A. By signing this application form, I am applying, or I am applying on behalf of the applicant, for the permit and any proprietary authorizations identified above, according to the supporting data and other incidental information filed with this application. I am familiar with the information contained in this application and represent that such information is true, complete and accurate. I understand this is an application and not a permit, and that work prior to approval is a violation. I understand that this application and any permit issued or proprietary authorization issued pursuant thereto, does not relive me of any obligation for obtaining any other required federal, state, water management district or local permit prior to commencement of construction. I agree, or I agree on behalf of the applicant, to operate and maintain the permitted system unless the permitting agency authorizes transfer of the permit to a responsible operation entity. I understand that knowingly making any false statement or representation in this application is a violation of Section 373.430, F.S. and 18 U.S.C. Section 1001.

David L. Moore, P.G.
Typed/Printed Name of Applicant (If no Agent is used) or Agent (If one is so authorized below)

8-27-06

Signature of Applicant/Agent | Date

Executive Director
(Corporate Title if applicable)

AN AGENT MAY SIGN ABOVE ONLY IF THE APPLICANT COMPLETES THE FOLLOWING:

B. I hereby designate and authorize the agent listed above to act on my behalf, or on behalf of my corporation, as the agent in the processing of this application for the permit and/or proprietary authorization indicated above; and to furnish, on request, supplemental information in support of the application. In addition, I authorize the above-listed agent to bind me, or my corporation, to perform any requirements which may be necessary to procure the permit or authorization indicated above. I understand that knowingly making any false statement or representation in this application is a violation of Section 373.430, F.S. and 18 U.S.C. Section 1001.

Typed/Printed Name of Applicant	Signature of Applicant	Date

(Corporate Title if applicable)

Please note: The applicant's original signature (not a copy) is required above.

PERSON AUTHORIZING ACCESS TO THE PROPERTY MUST COMPLETE THE FOLLOWING:

C. I either own the property described in this application or I have legal authority to allow access to the property, and I consent, after receiving prior notification, to any site visit on the property by agents or personnel from the Department of Environmental Protection, the Water Management District and the U.S. Army Corps of Engineers necessary for the review and inspection of the proposed project specified in this application. I authorize these agents or personnel to enter the property as many times as may be necessary to make such review and inspection. Further, I agree to provide entry to the project site for such agents or personnel to monitor permitted work if a permit is granted.

David L. Moore, P.G.		8-27-06
Typed/Printed Name of Applicant	Signature of Applicant	Date

Executive Director
(Corporate Title if applicable)

APPROVED BY:	DATE	INITIAL
DEP. EXEC. DIR	8-29-6	
RES. MAN. DIR	8/28/06	
LEGAL DEPT.	8/28/06	

SECTION C

Environmental Resource Permit Notice of Receipt of Application

Note: this form does not need to be submitted for noticed general permits.
This information is required in addition to that required in other sections of the application. Please submit five copies of this notice of receipt of application and all attachments with the other required information. Please submit all information on 8 1/2" x 11" paper. **(See Attached Notice)**

Project Name	**Lake Hancock Lake Level Modification Project**
County	**Polk County**
Owner	**State of Florida**
Applicant:	**Southwest Florida Water Management District**
Applicant's Address:	**2379 Broad Street (U.S. 41 South), Brooksville, FL 34604**

1. Indicate the project boundaries on a USGS quadrangle map. Attach a location map showing the boundary of the proposed activity. The map should also contain a north arrow and a graphic scale; show Section(s), Township(s), and Range(s); and must be of sufficient detail to allow a person unfamiliar with the site to find it. **Figure 1**

2. Provide the names of all wetlands, or other surface waters that would be dredged, filled, impounded, diverted, drained, or would receive discharge (either directly or indirectly), or would otherwise be impacted by the proposed activity, and specify if they are in an Outstanding Florida Water or Aquatic Preserve: **Appendices A -Single Event Watershed Model and D- Wetland Functional Assessment)**

3. Attach a depiction (plan and section views), which clearly shows the works or other facilities proposed to be constructed. Use multiple sheets, if necessary. Use a scale sufficient to show the location and type of works. **Figure 8**

4. Briefly describe the proposed project (such as "construct dock with boat shelter", "replace two existing culverts", "construct surface water management system to serve 150 acre residential development"): **Modify and/or reconstruct the existing Control Structure P-11 and construct a tieback leeve to allow the lake level to be raised to and maintained at 100.0 feet NGVD.**

5. Specify the acreage of wetlands or other surface waters, if any, that are proposed to be filled, excavated, or otherwise disturbed or impacted by the proposed activity: **Appendix D-Wetland Functional Assessment**

   filled 1-1.5 ac.; 0 excavated ac.;

   other impacts ___ ac. **CERP report, Appendix D-Wetland Functional Assessment**

6. Provide a brief statement describing any proposed mitigation for impacts to wetlands and other surface waters (attach additional sheets if necessary):
   Appendix D-Wetland Functional Assessment

FOR AGENCY USE ONLY

Application Name:
Application Number:
Office where the application can be inspected:

Note to Notice recipient: The information in this notice has been submitted by the applicant, and has not been verified by the agency. It may be incorrect, incomplete or may be subject to change.

SECTION C

Environmental Resource Permit Notice of Receipt of Application

Project Name **Lake Hancock Lake Level Modification Project**
Location **Polk County**

Section(s) 24, 25, 36	Township 28 South	Range 24 East
Section(s) 19, 20, 29, 30, 31, 32, 33	Township 29 South	Range 25 East
Section(s) 1, 2, 3, 11, 12, 13, 24, 25	Township 28 South	Range 24 East
Section(s) 4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22, 28, 29, 30, 32, 33	Township 29 South	Range 25 East

Owner **Southwest Florida Water Management District**
Applicant: **Southwest Florida Water Management District**
Applicant's Address: **2379 Broad Street (U.S. 41 South), Brooksville, Fl 34604-6899**
Application No.: ____________________________________

A Conceptual Environmental Resource Permit (CERP) Application has been submitted to the Florida Department of Environmental Protection (FDEP), in Tampa Florida, by the Southwest Florida Water Management District (SWFWMD) for the Lake Hancock Lake Level Modification Project in Polk County, Florida. The goal of the proposed project is to store water in Lake Hancock by raising the control elevation of the existing outflow and slowly release the water during the dry season to meet 50 percent of the minimum flow requirements in the upper Peace River between the USGS gaging Stations at Bartow and Zolfo Springs. The project proposes to increase the normal operating level of Lake Hancock from 98.7 feet to 100.0 feet National Geodetic Vertical Datum (NGVD) by modifying the P-11 outfall structure in Saddle Creek. Lake Hancock is not designated as either an Outstanding Florida Water or an aquatic preserve. The proposed project area encompasses approximately 14,564 acres that includes state, public, and private lands along the shoreline of Lake Hancock and contiguous portions of Banana Creek, Saddle Creek, and Lake Lena Run. The Southwest Florida Water Management District is also applying for State Sovereign Submerged Lands Use Authorization to allow modification of the P-11 Structure located across the lower portion of Saddle Creek to increase the normal operating level of Lake Hancock. CERP Application documents are available for review between the hours of 9:00 a.m and 4:00 p.m., Monday through Friday except holidays, at the Bartow Service Office of the SWFWMD, 170 Century Boulevard Bartow, Florida 33830-7700; and the Tampa Office of the FDEP 13051 N. Telecom Parkway, Temple Terrace, Florida 33637.

SECTION E

INFORMATION REQUESTED FOR STANDARD GENERAL, INDIVIDUAL AND CONCEPTUAL ENVIRONMENTAL RESOURCE PERMIT APPLICATIONS NOT RELATED TO A SINGLE FAMILY DWELLING UNIT

Please provide the information requested below if the proposed project requires either a standard general, individual, or conceptual approval environmental resource permit and is not related to an individual, single family dwelling unit, duplex or quadruplex. The information listed below represents the level of information that is usually required to evaluate an application. The level of information required for a specific project will vary depending on the nature and location of the site and the activity proposed. Conceptual approvals generally do not require the same level of detail as a construction permit. However, providing a greater level of detail will reduce the need to submit additional information at a later date. If an item does not apply to your project, proceed to the next item. Please submit all information that is required by the Department on either 8 1/2 in. X 11 in. paper or 11 in. X 17 in. paper. Larger drawings may be submitted to supplement but not replace these smaller drawings.

I. Site Information

A. Provide a map(s) of the project area and vicinity delineating USDA/SCS soil types.
Figure 3

B. Provide recent aerials, legible for photo interpretation with a scale of 1" = 400 ft, or more detailed, with project boundaries delineated on the aerial.
Map Atlas, Scale:1"-200'

C. Identify the seasonal high water or mean high tide elevation and normal pool or mean low tide elevation for each on site wetland or surface water, including receiving waters into which runoff will be discharged. Include dates, datum, and methods used to determine these elevations.
The normal pool elevation at the Lake Hancock is 98.5 feet NGVD. The proposed normal pool elevation will be at 100.0 feet NGVD.

D. Identify the wet season high water tables at the locations representative of the entire project site. Include dates, datum, and methods used to determine these elevations.
Appendix D – Wetland Functional Assessment

II. Environmental Considerations

A. Provide results of any wildlife surveys that have been conducted on the site, and provide any comments pertaining to the project from the Florida Game and Fresh Water Fish Commission and the U.S. Fish and Wildlife Service.
Appendix D-Wetland Functional Assessment

B. Provide a description of how water quantity, quality, hydroperiod, and habitat will be maintained in on-site wetlands and other surface waters that will be preserved or will remain undisturbed.
Appendices D-Wetland Functional Assessment & E-Water Quality

C. Provide a narrative description of any proposed mitigation plans, including purpose, maintenance, monitoring, and construction sequence and techniques, and estimated costs.
CERP Narrative and Appendix D-Wetland Functional Assessment

D. Describe how boundaries of wetlands or other surface waters were determined. If there has ever been a jurisdictional declaratory statement, a formal wetland determination, a formal determination, a validated informal determination, or a revalidated jurisdictional determination, provide the identifying number.
Appendix D-Wetland Functional Assessment

E. Impact Summary Tables:

1. For all projects, complete Tables 1, 2 and 3 as applicable.
Appendix D-Wetland Functional Assessment

2. For docking facilities or other structures constructed over wetlands or other surface waters, provide the information requested in Table 4.
NA

3. For shoreline stabilization projects, provide the information requested in Table 5.

NA

III. Plans

Provide clear, detailed plans for the system including specifications, plan (overhead) views, cross sections (with the locations of the cross sections shown on the corresponding plan view), and profile (longitudinal) views of the proposed project. The plans must be signed and sealed by an appropriate registered professional as required by law. Plans must include a scale and a north arrow. These plans should show the following:

A. Project area boundary and total land area, including distances and orientation from roads or other land marks; **Figures 1 & 2**

B. Existing land use and land cover (acreage and percentages), and on-site natural communities, including wetlands and other surface waters, aquatic communities, and uplands. Use the Florida Land Use Cover & Classification System (FLUCCS)(Level 3) for projects proposed in the South Florida Water Management District, the St. Johns River Water Management District, and the Suwannee River Water Management District and use the National Wetlands Inventory (NWI) for projects proposed in the Southwest Florida Water Management District. Also identify each community with a unique identification number which must be consistent in all exhibits.

Figure 5

C. The existing topography extending at least 100 feet off the project area, and including adjacent wetlands and other surface waters. All topography shall include the location and a description of known benchmarks, referenced to NGVD. For systems waterward of the mean high water (MHW) or seasonal high water lines, show water depths, referenced to mean low water (MLW) in tidal areas or seasonal low water in non-tidal areas, and list the range between MHW and MLW. For docking facilities, indicate the distance to, location of, and depths of the nearest navigational channel and access routes to the channel.

Figure 6

D. If the project is in the known flood plain of a stream or other water course, identify the following: 1) the flood plain boundary and approximate flooding elevations; and 2) the 100-year flood elevation and floodplain boundary of any lake, stream or other watercourse located on or adjacent to the site;

Appendix A-Single Event Watershed Model and Appendix B – Model Results

E. The boundaries of wetlands and other surface waters within the project area. Distinguish those wetlands and other surface waters that have been delineated by any binding jurisdictional determination;

Appendix D-Wetland Functional Assessment

F. Proposed land use, land cover and natural communities (acreage and percentages), including wetlands and other surface waters, undisturbed uplands, aquatic communities, impervious surfaces, and water management areas. Use the same classification system and community identification number used in III (B) above.

Appendix D-Wetland Functional Assessment

G. Proposed impacts to wetlands and other surface waters, and any proposed connections/outfalls to other surface waters or wetlands;

Appendix D-Wetland Functional Assessment

H. Proposed buffer zones;

NA

I. Pre- and post-development drainage patterns and basin boundaries showing the direction of flows, including any off-site runoff being routed through or around the system; and connections between wetlands and other surface waters; **Appendix A-Single Event Watershed Model**

J. Location of all water management areas with details of size, side slopes, and designed water depths;

No WMAs Proposed

K. Location and details of all water control structures, control elevations, any seasonal water level regulation schedules; and the location and description of benchmarks (minimum of one benchmark per structure);

Modification of Structure P-11 and associated levee - Concept, no details available at this time
CERP Narrative

L. Location, dimensions and elevations of all proposed structures, including docks, seawalls, utility lines, roads, and buildings;

NA

M. Location, size, and design capacity of the internal water management facilities;

No internal water management facilities are proposed.

N. Rights-of-way and easements for the system, including all on-site and off-site areas to be reserved for water management purposes, and rights-of-way and easements for the existing drainage system, if any;

NA

O. Receiving waters or surface water management systems into which runoff from the developed site will be discharged; **Saddle Creek to Peace River**

P. Location and details of the erosion, sediment and turbidity control measures to be implemented during each phase of construction and all permanent control measures to be implemented in post-development conditions;
NA

Q. Location, grading, design water levels, and planting details of all mitigation areas;
NA

R. Site grading details, including perimeter site grading;
NA

S. Disposal site for any excavated material, including temporary and permanent disposal sites;
NA

T. Dewatering plan details;
NA

U. For marina facilities, locations of any sewage pumpout facilities, fueling facilities, boat repair and maintenance facilities, and fish cleaning stations;
NA

V. Location and description of any nearby existing offsite features which might be affected by the proposed construction or development such as stormwater management ponds, buildings or other structures, wetlands or other surface waters.
Refer to CERP Narrative, Appendices A-Surface Water Model, and G&H -North Central Landfill Evaluations

W. For phased projects, provide a master development plan.
NA

IV. Construction Schedule and Techniques

Provide a construction schedule, and a description of construction techniques, sequencing and equipment. This information should specifically include the following:

A. Method for installing any pilings or seawall slabs;
Will provide in construction permit application.

B. Schedule of implementation of temporary or permanent erosion and turbidity control measures;
Will provide in the construction permit application.

C. For projects that involve dredging or excavation in wetlands or other surface waters, describe the method of excavation, and the type of material to be excavated;
Will provide in the construction permit application.

D. For projects that involve fill in wetlands or other surface waters, describe the source and type of fill material to be used. For shoreline stabilization projects that involve the installation of riprap, state how these materials are to be placed, (i.e., individually or with heavy equipment) and whether the rocks will be underlain with filter cloth;
Will provide in the construction permit application.

E. If dewatering is required, detail the dewatering proposal including the methods that are proposed to contain the discharge, methods of isolating dewatering areas, and indicate the period dewatering structures will be in place (Note: a consumptive use or water use permit may by required);
Will provide in the construction permit application.

F. Methods for transporting equipment and materials to and from the work site. If barges are required for access, provide the low water depths and draft of the fully loaded barge;
Will provide in the construction permit application.

G. Demolition plan for any existing structures to be removed; and
Will provide in the construction permit application.

H. Identify the schedule and party responsible for completing monitoring, record drawings, and as-built certifications for the project when completed.
Will provide in the construction permit application.

V. Drainage Information

A. Provide pre-development and post-development drainage calculations, signed and sealed by an appropriate registered professional, as follows:

Appendices A-Single Event Watershed Model & B-Model Results

1. Runoff characteristics, including area, runoff curve number or runoff coefficient, and time of concentration for each drainage basin;

Appendices A-Single Event Watershed Model & B-Model Results

2. Water table elevations (normal and seasonal high) including aerial extent and magnitude of any proposed water table draw down;

Appendices A-Single Event Watershed Model & B-Model Results

3. Receiving water elevations (normal, wet season, design storm);

Appendices A-Single Event Watershed Model & B-Model Results

4. Design storms used including rainfall depth, duration, frequency, and distribution;

Appendices A-Single Event Watershed Model & B-Model Results

5. Runoff hydrograph(s) for each drainage basin, for all required design storm event(s);

Appendices A-Single Event Watershed Model & B-Model Results

6. Stage-storage computations for any area such as a reservoir, close basin, detention area, or channel, used in storage routing;

Appendices A-Single Event Watershed Model & B-Model Results

7. Stage-discharge computations for any storage areas at a selected control point, such as control structure or natural restriction; **Appendices A-Single Event Watershed Model & B-Model Results**

8. Flood routings through on-site conveyance and storage areas;

Appendices A-Single Event Watershed Model & B-Model Results

9. Water surface profiles in the primary drainage system for each required design storm event(s);

Appendices A-Single Event Watershed Model & B-Model Results

10. Runoff peak rates and volumes discharged from the system for each required design storm event(s);

Appendices A-Single Event Watershed Model & B-Model Results

11. Tail water history and justification (time and elevation); and

Appendices A-Single Event Watershed Model & B-Model Results

12. Pump specifications and operating curves for range of possible operating conditions (if used in system).

Appendices A-Single Event Watershed Model & B-Model Results

B. Provide the results of any percolation tests, where appropriate, and soil borings that are representative of the actual site conditions; **NA**

C. Provide the acreage, and percentages of the total project, of the following:

1. Impervious surfaces, excluding wetlands;

NA

2. Pervious surfaces (green areas, not including wetlands);

NA

3. Lakes, canals, retention areas, other open water areas; and

Appendix D – Wetland Functional Assessment and other related Appendices

4. Wetlands.

Appendix D – Wetland Functional Assessment

D. Provide an engineering analysis of floodplain storage and conveyance (if applicable), including:

1. Hydraulic calculations for all proposed traversing works;

Appendices A-Single Event Watershed Model & B-Model Results

2. Backwater water surface profiles showing upstream impact of traversing works;

Appendices A-Single Event Watershed Model & B-Model Results

3. Location and volume of encroachment within regulated floodplain(s); and

Appendices A-Single Event Watershed Model & B-Model Results

4. Plan for compensating floodplain storage, if necessary, and calculations required for determining minimum building and road flood elevations.

Appendices A-Single Event Watershed Model & B-Model Results

E. Provide an analysis of the water quality treatment system including:

Appendices A-Single Event Watershed Model & B-Model Results

1. A description of the proposed stormwater treatment methodology that addresses the type of treatment, pollution abatement volumes, and recovery analysis; and

NA

2. Construction plans and calculations that address stage-storage and design elevations, which demonstrate compliance with the appropriate water quality treatment criteria.

Appendices A-Single Event Watershed Model & B-Model Results

F. Provide a description of the engineering methodology, assumptions and references for the parameters listed above, and a copy of all such computations, engineering plans, and specifications used to analyze the system. If a computer program is used for the analysis, provide the name of the program, a description of the program, input and output data, two diskette copies, if available, and justification for model selection.

Appendices A-Single Event Watershed Model & B-Model Results. GEODATABASE of Parameters is provided.

VI. Operation and Maintenance and Legal Documentation

A. Describe the overall maintenance and operation schedule for the proposed system.

SWFWMD intends to operate and maintain the control structure P-11, Refer to Appendix F-Water Budget and Proposed Operation Schedule.

B. Identify the entity that will be responsible for operating and maintaining the system in perpetuity if different than the permittee, a draft document enumerating the enforceable affirmative obligations on the entity to properly operate and maintain the system for its expected life, and documentation of the entity's financial responsibility for long-term maintenance. If the proposed operation and maintenance entity is not a property owner's association, provide proof of the existence of an entity, or the future acceptance of the system by an entity which will operate and maintain the system. If a property owner's association is the proposed operation and maintenance entity, provide copies of the articles of incorporation for the association and copies of the declaration, restrictive covenants, deed restrictions, or other operational documents that assign responsibility for the operation and maintenance of the system. Provide information ensuring the continued adequate access to the system for maintenance purposes. Before transfer of the system to the operating entity will be approved, the permittee must document that the transferee will be bound by all terms and conditions of the permit.

SWFWMD

C. Provide copies of all proposed conservation easements, storm water management system easements, property owner's association documents, and plats for the property containing the proposed system.

NA

D. Provide indication of how water and waste water service will be supplied. Letters of commitment from off-site suppliers must be included. **NA**

E. Provide a copy of the boundary survey and/or legal description and acreage of the total land area of contiguous property owned/controlled by the applicant. **CERP Narrative**

VII. Water Use

A. Will the surface water system be used for water supply, including landscape irrigation, or recreation.

No water use required

B. If a Consumptive Use or Water Use permit has been issued for the project, state the permit number.

No water use required

C. If no Consumptive Use or Water Use permit has been issued for the project, indicate if such a permit will be required and when the application for a permit will be submitted.

No water use required

D. Indicate how any existing wells located within the project site will be utilized or abandoned.

Any wells associated with necessary lands to be acquired will be properly abandoned.

TABLE 1

Project Impact Summary **(See Appendix D-Wetland Functional Assessment)**

WL & SW ID	WL & SW TYPE	WL & SW SIZE (ac.) ON SITE	WL & SW ACRES NOT IMPACTED	PERMANENT IMPACTS TO WL & SW		TEMPORARY IMPACTS TO WL & SW		MITIGATION ID
				IMPACT SIZE (acres)	IMPACT CODE	IMPACT SIZE (acres)	IMPACT CODE	

WL = Wetland; **SW** = Surface water; **ID** = Identification number, letter, etc.
Wetland Type: Use an established wetland classification system and, in the comments section below, indicate which classification system is being used.
Impact Code (Type): D = dredge; F = fill; H = change hydrology; S = shading; C = clearing; O = other. Indicate the final impact if more than one impact type is proposed in a given area. For example, show F only for an area that will first be demucked and then backfilled.

Note: Multiple entries per cell are not allowed, except in the "Mitigation ID" column. Any given acreage of wetland should be listed in one row only, such that the total of all rows equals the project total for a given category (column). For example, if Wetland No. 1 includes multiple wetland types and multiple impact codes are proposed in each type, then each proposed impact in each wetland type should be shown on a separate row, while the size of each wetland type found in Wetland No. 1 should be listed in only one row.

Comments: ___

TABLE 2
ON-SITE MITIGATION SUMMARY **(See Appendix D-Wetland Functional Assessment)**

MITIGATION ID	CREATION		RESTORATION		ENHANCEMENT		WETLAND PRESERVE		UPLAND PRESERVE		OTHER	
	AREA	TARGET TYPE	AREA	TARGET TYPE	AREA	TARGET TYPE	AREA	TARGET TYPE	AREA	TARGET TYPE	AREA	TARGET TYPE
PROJECT TOTALS:												

CODES (multiple entries per cell not allowed): Target Type or Type = target or existing habitat type from an established wetland classification system or land use classification for non-wetland mitigation

COMMENTS:

TABLE 3

OFF-SITE MITIGATION SUMMARY **(None Proposed)**

MITIGATION ID	CREATION		RESTORATION		ENHANCEMENT		WETLAND PRESERVE		UPLAND PRESERVE		OTHER	
	AREA	TARGET TYPE	AREA	TARGET TYPE	AREA	TARGET TYPE	AREA	TARGET TYPE	AREA	TARGET TYPE	AREA	TARGET TYPE
PROJECT TOTALS:												

CODES (multiple entries per cell not allowed):

Target Type=target or existing habitat type from an established wetland classification system or land use classification for non-wetland mitigation

TABLE 4
DOCKING FACILITY SUMMARY **(None Proposed)**

Type of Structure*	Type of Work**	Number of Identical Docks	Length (feet)	Width (feet)	Height (feet)	Total square feet over water	Number of slips

	TOTALS:	Existing	Proposed
*Dock, Pier, Finger Pier, or other structure (please specify what type)	Number of Slips		
**New, Replaced, Existing (unaltered), Removed, or Altered/Modified	Square Feet over the water		

Use of Structure:

Will the docking facility provide:

Live-aboard Slips? If yes, Number:
Fueling Facilities: If yes, Number
Sewage Pump-out Facilities? If yes, Number:
Other Supplies or Services Required for Boating (excluding refreshments, bait and tackle)
☐ Yes ☐ No

Type of Materials for Decking and Pilings (i.e., CCA, pressure treated wood, plastic, or concrete)

Pilings
Decking
Proposed Dock-Plank Spacing (if applicable)

Proposed Size (length and draft), Type, and Number of Boats Expected to Use or Proposed to be Mooring at the facility)

Table 5: SHORELINE STABILIZATION
IF YOU ARE CONSTRUCTING A SHORELINE STABILIZATION PROJECT, PLEASE PROVIDE THE FOLLOWING: **(None Proposed)**

Type of Stabilization Being Done	Length (in feet) of New	Length (in feet) of Replaced	Length (in feet) of Repaired	Length (in feet) of Removed	Slope: H: V:	Width of the Toe (in feet)
Vertical Seawall						
Seawall plus Rip-Rap						
Rip-Rap						
Rip-Rap plus Vegetation						
Other Type of Stabilization Being Done:						

Size of the Rip Rap: ___

Type of Rip Rap:___

COMMENTS:

SECTION G

Application for Authorization to Use Sovereign Submerged Lands

Part 1: Sovereign Submerged Lands title information (see Attachment 5 for an explanation). Please read and answer the applicable questions listed below:

A. I have a sovereign submerged lands title determination from the Division of State Lands which indicates that the proposed project is NOT ON sovereign submerged lands (Please attach a copy of the title determination to the application). Yes☐ No☒

- If you answered Yes to Question A and you have attached a copy of the Division of State Lands Title Determination to this application, you do not have to answer any other questions under Part I or II of Section G.

B. I have a sovereign submerged lands title determination from the Division of State Lands which indicates that the proposed project is ON sovereign submerged lands (Please attach a copy of the title determination to the application). Yes☐ No☒

- If you answered yes to question B please provide the information requested in Part II. Your application will be deemed incomplete until the requested information is submitted.

C. I am not sure if the proposed project is on sovereign submerged lands (please check here). ☒

- If you have checked this box department staff will request that the Division of State Lands conduct a title determination. If the title determination indicates that the proposed project or portions of the project are located on sovereign submerged lands you will be required to submit the information requested in Part II of this application. The application will be deemed incomplete until the requested information is submitted.

D. I am not sure if the proposed project is on sovereign submerged lands and I DO NOT WISH to contest the Department's findings (please check here). ☐

- If you have checked this box refer to Part II of this application and provide the requested information. The application will be deemed incomplete until the requested information is submitted.

E. It is my position that the proposed project is NOT on sovereign submerged lands (please check here)☐

- If you have evidence that indicates that the proposed project is not on sovereign submerged lands please attach the documentation to the application. If the Division of State Lands title determination indicates that your proposed project or portion of your proposed project are on sovereign submerged lands you will be required to provide the information requested in Part II of this application.

F. If you wish to contest the findings of the title determination conducted by the Division of State Lands please contact the Department of Environmental Protection's Office of General Counsel. Your proposed project will be deemed incomplete until either the information requested in Part II is submitted or a legal ruling indicates that the proposed project is not on sovereign submerged lands.

Part II: If you were referred to this section by Part I, please provide this additional information. Please note that if your proposed project is on sovereign submerged lands and the below requested information is not provided, your application will be considered incomplete.

A. Provide evidence of title to the subject riparian upland property in the form of a recorded deed, title insurance, legal opinion of title, or a long-term lease which specifically includes riparian rights. Evidence submitted must demonstrate that the application has sufficient title interest in the riparian upland property. **(See Attached Property Deeds for Ownership Surrounding the P-11 Structure, that include OFP, Griffin, and Structure P-11 Properties)**

B. Provide a detailed statement describing the existing and proposed upland uses and activities. For commercial uses, indicate the specific type of activity, such as marina, ship repair, dry storage (including the number of storage spaces), commercial fishing/seafood processing, fish camp, hotel, motel resort restaurant, office complex, manufacturing operation, etc. I**n association with the Structure modification or replacement, tie-back levees will be required on both sides of the structure to contain impounded waters. It is estimated that 800 linear feet of levee will be required on the west side and 50 feet on the east side. Levee width at base will be a maximum of 80 feet wide.**

For rental operations, such as trailer or recreational vehicle parks and apartment complexes, indicate the number of wet slip units/spaces available for rent or lease and describe operational details (e.g., are spaces rented on a month-to-month basis or through annual leases). **NA**

For multi-family residential developments, such as condominiums, townhomes, or subdivisions, provide the number of living units/lots and indicate whether or not the common property (including the riparian upland property) is or will be under the control of a homeowners association. **NA**

For projects sponsored by a local government, indicate whether or not the facilities will be open to the general public. Provide a breakdown of any fees that will be assessed, and indicate whether or not such fees will generate revenue or will simply cover costs associates with maintaining the facilities. **NO**

C. Provide a detailed statement describing the existing and proposed activities located on or over the sovereign submerged lands at the project site. This statement must include a description of docks and piers, types of vessels (e.g., commercial fishing, liveaboards, cruise ships, tour boats), length and draft of vessels, sewage pumped facilities, fueling facilities, boat hoists, boat ramps, travel lifts, railways, and any other structure or activities existing or proposed to be located waterward of the mean/ordinary high water line. **Modification of the existing P-11 structure to accommodate the increase operational levels of Lake Hancock.**

If slips are existing and/or proposed, please indicate the number of powerboat slips and sailboat slips and the percentage of those slips available to the general public on a "first come, first served" basis. This statement must include a description of channels, borrow sites, bridges, groins, jetties, pipelines, or other utility crossings, and any other structures or activities existing or proposed to be located waterward of the mean/ordinary high water line. For shoreline stabilization activities, this statement must include a description of seawalls, bulkheads, riprap, filling activities, and any other structure or activities existing or proposed to be located along the shoreline. **NA**

D. Provide the linear footage of shoreline at the mean/ordinary high water line owned by the application which borders sovereign submerged lands. **Approximately 4200 linear feet on the west shoreline of Saddle Creek down stream of the structure and all of the shoreline on the east side beginning along the south shore of Lake Hancock down to Gordonville Road located just north of Hwy 17.**

E. Provide a recent aerial photo of the area. A scale of 1"=200' is preferred. Photos are generally available at minimal cost from your local government property appraiser's office or from district Department of Transportation offices. Indicate on the photo the specific location of your property/project site.
See Figures 8 and 9.

PROPRIETARY PROJECT DESCRIPTIONS

Please check the most applicable activity which applies to your project(s):

Leases

- ☐ Commercial marinas (renting wet slips) including condos, etc., if 50% or more of their wet slips are available to the general public
- ☒ Public/Local governments
- ☐ Yacht Clubs/Country Clubs (when a membership is required)
- ☐ Condominiums (requires upland ownership)
- ☐ Commercial Uplands Activity (temporary docking and/or fishing pier associated with upland revenue generating activities, i.e., restaurants, hotels, motels) for use of the customer at not charge
- ☐ Miscellaneous Commercial Upland Enterprises where there is a charge associated with the use of overwater structure (Charter Boats, Tour Boats, Fishing Piers)
- ☐ Ship Building/Boat Repair Service Facilities
- ☐ Commercial Fishing Related (Offloading, Seafood Processing)
- ☐ Private Single-family Residential Docking Facilities; Townhome Docking Facilities; Subdivision Docking Facilities (upland lots privately owned)

Public Easements and Use Agreements

- ☒ Miscellaneous Public Easements and Use Agreements
- ☐ Bridge Right-of-way (DOT, local government)
- ☐ Breakwater of groin
- ☐ Subaqueous Utility Cable (TV, telephone, electrical)
- ☐ Subaqueous Outfall or Intake
- ☐ Subaqueous Utility Water/Sewer
- ☐ Overhead Utility w/Support Structure on Sovereign Submerged Lands
- ☐ Disposal Site for Dredged Material
- ☐ Pipeline (gas)
- ☐ Borrow Site

Private Easements

- ☐ Miscellaneous Private Easements
- ☐ Bridge Right-of-way
- ☐ Breakwater Groin
- ☐ Subaqueous Utility Cable (TV, telephone, electrical)
- ☐ Subaqueous Outfall or Intake
- ☐ Subaqueous Utility Water/Sewer
- ☐ Overhead Utility Crossing
- ☐ Disposal Site for Dredged Material
- ☐ Pipeline (gas)

Consents of Use

☐ Aerial Utility Crossing w/no support structures on sovereign submerged lands
☐ Private Dock
☐ Public Dock
☐ Multi-family Dock
☐ Fishing Pier (private or Multi-family)
☐ Private Boat Ramp
☐ Sea Wall
☐ Dredge
☐ Maintenance Dredge
☐ Navigation Aids/Markers
☐ Artificial Reef
☐ Riprap
☐ Public Boat Ramp
☐ Public Fishing Pier
☐ Repair/Replace Existing Public Fishing Pier
☐ Repair/Replace Existing Private Dock
☐ Repair/Replace Existing Public Dock
☐ Repair/Replace Existing Multi-family Dock
☐ Repair/Replace Existing Fishing Pier (Private or Multi-family)
☐ Repair/Replace Existing Private Boat Ramp
☐ Repair/Replace Existing Sea Wall, Revetments, or Bulkheads
☒ Repair/Replace/Modify structures/activities within an exiting lease, easement, management agreement or use agreement area or repair/replace existing grandfathered structures
☐ Repair/Replace Existing Public Boat Ramp

Miscellaneous

☐ Biscayne Bay Letters of Consistency/Inconsistency w/258.397, F.S.
☐ Management Agreements - Submerged Lands
☐ Reclamation
☐ Purchase of Filled, Formerly Submerged Lands
☐ Purchase of Reclaimed Lake Bottom
☐ Treasure Salvage
☐ Insect Control Structures/Swales
☐ Miscellaneous projects which do not fall within the activity codes listed above

PROPERTY DEEDS
FOR
SOVEREIGN SUBMERGED LAND USE AUTHORIZATION

INSTR # 2003235741
BK 05590 PG 1816
RECORDED 11/21/2003 02:41:09 PM
RICHARD M WEISS, CLERK OF COURT
POLK COUNTY
DEED DOC 213,500.00
RECORDING FEES 51.00
RECORDED BY B Morris

PREPARED BY & RETURN TO:

FUENTES & KREISCHER TITLE CO.
1407 W. BUSCH BLVD.
TAMPA, FL 33612

FILE NO. 03-1141-L
Q:\USERS\JAN\SWFWMD\DEED REV.DOC

Parcel Identification No.

SPECIAL WARRANTY DEED

THIS INDENTURE, made this 21st day of November, 2003, between **OLD FLORIDA PLANTATION, LTD., formerly known as LAKE HANCOCK, LTD.**, A Florida limited partnership, party of the first part, and **SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT**, a public corporation created by Chapter 61-691, Laws of Florida, whose post office address is 2379 Broad Street, Brooksville, Florida 34604-6899, party of the second part,

WITNESSETH:

That the said party of the first part, for an in consideration of the sum of Ten Dollars, to it in hand paid by the said party of the second part, the receipt whereof is hereby acknowledged, has granted, bargained and sold to the said party of the second part, their heirs and assigns forever, the following described land, to wit:

PURCHASE FROM USX REALTY, December 5, 1991, recorded December 9, 1991, official records book 3401, page 2083:

3041

In Township 29 South, Range 25 East, Polk County, Florida:

Section 9: the fractional S-1/2.

Section 10: SW-1/4

Section 15: That part of Section 15, lying within a tract described as: Begin at the intersection of the north right-of-way line of the Old Winter Haven-Bartow Road and the west boundary of the E-1/4 of W-1/2 of Section 22, Township 29 South, Range 25 East, Polk County, Florida, run thence north along said west boundary 2743.2 feet, thence deflect right 33°15'41" and run 1234 feet to the east boundary of the W-1/2 of Section 15, thence north along said east boundary 4854.2 feet, thence West 200 feet, thence south parallel to the east boundary of the W-1/2 of Section 15, 1350 feet, thence West 600 feet, thence South 660.6 feet, thence East 600 feet, thence South 2786.6 feet, thence deflect right 33°42'22" and run 1234 feet, thence deflect left 33°15'41" and run 2902.96 feet to the north right-of-way line of the Old Winter Haven-Bartow Road, thence northeasterly along the north right-of-way line 225.96 feet to the point of beginning.

The W-1/2, and the W-1/2 of the NW-1/4 of SE-1/4, and the SW-1/4 of SE-1/4, LESS that part of the E-1/2 of W-1/2 cited above.

That part of the North 1/2 of the Northwest 1/4 of the Northeast 1/4 of Section 15, lying West of Sheffield Road and begin further described as follows: Commence at the Northeast corner of said Northwest 1/4 of the Northeast 1/4 of Section 15; thence North 89°41'12" West along the North line of said Section 15 a distance of 311.21 feet to the intersection with the North and Westerly right of way line of aforesaid Sheffield Road, said point also being the Point of Beginning; thence continue North 89°41'12" West still along said North section line 1015.00 feet to the northwest corner of aforesaid Northwest 1/4 of the Northeast 1/4; thence South 00°09'42" West along the west line of said Northwest 1/4 of the Northeast 1/4 a distance of 661.12 feet to the southwest corner of the aforesaid North 1/2 of the Northwest 1/4 of the Northeast 1/4; thence South 89°43'24" East along the south line of said North 1/2 a distance of 631.58 feet to the aforesaid north and westerly right-of-way line of Sheffield Road; thence North 19°24'55" East along said right-of-way line 435.95 feet to the point of curvature of a curve concave to the southwesterly having a radius of 411.97 feet and a central angle of 49°30'11"; thence along said curve 355.94 feet to the Point of Beginning. Said tract containing 11.57 acres, more or less.

Section 16: All fractional section.

Section 19: The fractional NE-1/4 LESS the E-1/2 of NE-1/4 of NE-1/4, the fractional SE-1/4 of NW-1/4, the SE-1/4, and that part of the E-1/2 of SW-1/4 lying east of Saddle Creek, LESS that part of the SE-1/4 of SW-1/4 east of Saddle Creek lying within a tract described as: Commence at the southwest corner of Section 19, run thence East 2056.34 feet to the POINT OF BEGINNING, thence deflect to the right 66°35' and run southerly 69.81 feet, thence deflect 90 left and run northeasterly 180 feet, thence deflect 90 left and run northwesterly 100 feet, thence deflect 90 left and run southwesterly 180 feet, thence deflect 90 left and run southeasterly 30.19 feet to the point of beginning.

Section 20: All fractional section.

Section 21: That part of the E-1/2 and of the East 330 feet of the W-1/2 lying north of the Old Bartow-Winter Haven Road (the East 330 feet of the SE-1/4 of NW-1/4 being otherwise described as the East 330 feet of Lots 1 and 5 of A.B. Ferguson's Subdivision, according to the plat thereof recorded in Deed Book 61, Page 36, Polk County.

The fractional W-1/2, LESS the East 330 feet thereof.

Section 22: That part of Section 22, lying within a tract described as: Begin at the intersection of the north right of way line of the Old Winter Haven-Bartow Road and the west boundary of the E-1/4 of W-1/2 of Section 22, run thence north along said west boundary 2743.2 feet, thence deflect right 33°15'41" and run 1234 feet to the east boundary of the W-1/2 of Section 15, Township 29 South, Range 25 East, thence north along said east boundary 4854.2 feet, thence West 200 feet, thence south parallel to the east boundary of the W-1/2 of Section 15, 1350 feet, thence West 600 feet, thence South 660.6 feet, thence East 600 feet, thence South 2786.6 feet, thence deflect right 33°42'22" and run 1234 feet, thence deflect left 33°15'41" and run 2902.96 feet to the north right of way line of the Old Bartow-Winter Haven Road, thence northeasterly along the north right of way line 225.96 feet to the point of beginning.

The N-1/2 of NW-1/4, and the SW-1/4 of NW-1/4, and the W-1/2 of SE-1/4 of NW-1/4, and the W-3/4 of SW-1/4 lying north of the Old Bartow-Winter Haven Road (being otherwise described as Blocks 5 through 12, and Blocks 19 through 24, and Blocks 35 through 37, and that part of Blocks 34, 38, and 46 lying north of the Old Bartow-Winter Haven Road, of Gordonville, according to the revised plat thereof recorded in Plat Book 3, Page 43, Polk County, Florida), LESS that part of the E-1/2 of W-1/2 described above.

Section 28: That part of the E-1/2 and of the East 330 feet of the W-1/2 lying north of the Old Bartow- Winter Haven Road.

That part of Section 28, described as: Begin on the west boundary of Section 28 at a point 50 feet north of the north right-of-way line of the Old Bartow-Winter Haven Road, run thence north to northwest corner of Section 28, thence east to the northeast corner of the NW-1/4 of NE-1/4 of NE-1/4 of NW-1/4, thence south to the north right-of-way line of the Old Bartow-Winter Haven Road, thence southwesterly along said north right-of-way line to a point directly east of the point of beginning, thence west to the point of beginning.

less the following described parcel:

Begin on the west boundary of Section 28, Township 29 South, Range 25 East and run east for 330 feet to the point where the line will intersect with the north boundary of the Old Bartow-Winter Haven Road for a point of beginning; thence run north along a line 330 feet east of the western boundary of Section 28 for a distance of 2770 feet; thence run East 1980 feet to a point which is 330 feet west of the centerline of Section 28; thence run south along a line 330 feet west of said centerline to the north boundary of the Old Bartow-Winter Haven Road; thence southwesterly along the north road boundary to the point of beginning. This parcel all lies in the west half of Section 28, Township 29 South, Range 25 East and north of the Old Bartow-Winter Haven Road in Polk County, Florida.

Section 29: That part of Section 29, described as: Begin on the east boundary of Section 29 at a point 50 feet north of the north right-of-way line of the Old Bartow-Winter Haven Road, run thence west to a point 200 feet northeasterly of, and measured at right angles to, the northeasterly bank of Saddle Creek, thence run northwesterly along a line parallel to and 200 feet northeasterly of (measured at right angles to) said northeasterly bank to the west boundary of Section 29; thence north to the northwest corner of the section, thence east to the northeast corner of the section, thence south to the point of beginning.

Section 30: Those parts of the NE-1/4, and of the NE-1/4 of NW-1/4 lying northeast of Saddle Creek, in Section 30, LESS that part of the NE-1/4 of NW-1/4 east of Saddle Creek lying within a tract described as: Commence at the southwest corner of Section 19, Township 29 South, Range 25 East, run thence East 2056.34 feet to the POINT OF BEGINNING, thence deflect to the right 66° 35' and run southerly 69.81 feet, thence deflect 90 left and run northeasterly 180 feet, thence deflect 90 left and run northwesterly 100 feet, thence deflect 90 left and run southeasterly 30.19 feet to the point of beginning.

PURCHASE FROM CSX TRANSPORTATION, INC., May 25, 1995, recorded June 22, 1995, official records book 3545, page 0041:

All that portion of CSX Railroad right-of-way according to Right-of-Way and Track Map V-3g-4 and S-4 lying within Section 28, Township 29 South, Range 25 East, Polk County, Florida, less and except road rights-of-ways.

AND:

PURCHASE FROM IMC-AGRICO CO., June 12, 1995, recorded June 23, 1995, official records book 3545, page 1190:

That part of the Northeast Quarter (NE 1/4) of Section 28, Township 29 South, Range 25 East, Polk County, Florida, lying northwesterly of the right of way for State Road 555 (U.S. Highway 17) and southeasterly of the right of way for Old Bartow-Winter Haven Road (a/k/a Bartow-Eagle Lake Road), according to Map Book 2, Pages 137-140, public records of Polk County, Florida; less and except that portion of the above-described property lying within the railroad right of way of CSX Transportation, Inc. and less and except that portion lying within the maintained right of way of Crossover Road according to Map Book 5, Pages 243, public records of Polk County, Florida.

AND:

PURCHASE FROM ROBERT STOKES & BOB STANLEY, August 29, 1995, recorded September 6, 1995, official records book 3735, page 0531:

3575

Lot 4 lying west of Old Bartow-Winter Haven Road; and that part of Lot 17 lying west of Old Bartow-Winter Haven Road less the South 374 feet thereof; and the North 294 feet of Lot 18; all according to the revised plat of Gordonville according to plat thereof recorded in Plat Book 3, Page 43, public records of Polk County, Florida.

AND:

PURCHASE FROM THE ESTATE OF J.K. STUART, September 14, 1995, recorded September 21, 1995, official records book 3581, page 1677:

IN TOWNSHIP 29 SOUTH, RANGE 25 EAST, POLK COUNTY, FLORIDA:

That portion of the west half of Section 28 lying westerly of CSX Railroad right of way and southeasterly of Old Bartow-Winter Haven Road;

AND:

That portion of the southeast quarter of the southeast quarter of Section 29 lying southeasterly of Old Bartow-Winter Haven Road;

AND:

That portion of the northeast quarter of the northeast quarter of Section 32 lying southeasterly of Old Bartow-Winter Haven Road;

AND:

Begin at the NW corner of Section 33, Township 29 South, Range 25 East, then run East along the North boundary line of said Section 33 a distance of 706.71 feet to a point on the West boundary line of the right-of-way of the Seaboard Coast Line

Railroad Company, then run South-westerly along said right-of-way line a distance of 1477.74 feet to a point on the West boundary line of said Section 33, then run North along the west boundary line of said Section 33 a distance of 1318.20 feet to the point of beginning.

All lying in Township 29 South, Range 25 East, Polk County, Florida.

AND:

PURCHASE FROM CSX TRANSPORTATION, INC., January 22, 1996, recorded February 9, 1996, official records book 3636, page 1640:

All that certain portion of Grantor's former operating property line and being near Bartow, Polk County, Florida, situate in the west half of the northwest quarter of Section 33, Township 29 South, Range 25 East, and lying on either side of Grantor's former centerline of railroad track, more particularly described as follows:

Beginning with the intersection of said centerline and the west line of Section 33; extending in a northeasterly direction 1,730 feet, more or less, and ending with the intersection of said centerline and the north line of Section 33, said former operating property being 100 feet wide, 50 feet on either side of said centerline in the southwest quarter of the northwest quarter of said Section 33 and 200 feet wide, 100 feet on either side of said centerline in the northwest quarter of the northwest quarter of said Section 33. Containing 7.25 acres, more or less, and being as shown crosshatched on fragment print of Grantor's Valuation Section V3g Fla, Map 4, marked Exhibit A-1 attached hereto.

LESS AND EXCEPT the portion thereof conveyed to the State of Florida Department of Transportation described in Final Judgment of Civil Action No. 666-81-2637, and recorded among the Official Records of Polk County, Florida in Book 2079, Page 1652.

Leaving a net conveyance of 6.6 acres, more or less.

BEING a portion of the property granted to the Jacksonville, Tampa & Key West Railway Company, a predecessor of Grantor, from the State of Florida pursuant to Section 24 of an Act approved by the Florida Legislative on February 19, 1874 (Chapter 1987, Laws of Florida 1874).

Under foreclosure of April 8, 1893 the Jacksonville, Tampa & Key West Railway Company conveyed its property to the Plant Investment Company. On June 26, 1885, the Plant Investment Company conveyed a portion of its property to the South Florida Railroad Company, which changed its name to the Savannah, Florida and Western Railway Company. The Savannah, Florida and Western Railway Company was merged into the Atlantic Coast Line Railroad Company, effective July 1, 1902. On July 1, 1967 the Atlantic Coast Line Railroad Company merged with the Seaboard Air Line Railroad Company to form the Seaboard Coast Line Railroad Company. On December 29, 1982 the Louisville and Nashville Railroad Company merged into Seaboard Coast Line Railroad Company, and the name of the surviving corporation changed to Seaboard System Railroad, Inc. On July 1, 1986, Seaboard System Railroad, Inc. changed its name to CSX Transportation, Inc.

LESS AND EXCEPT PARCEL "A":

That part of Section 22, Township 29 South, Range 25 East, Polk County, Florida, described as follows:

Commence at the Southeast corner of Lot 24 as per the Map of Correction of the Town of Gordonville recorded in Plat Book 3, Page 43, Public Records of Polk County, Florida; thence North 00°24'10"West along the east line of said Lot 24 a distance of 345.23 feet to the POINT OF BEGINNING; thence South 89°35'50" West a distance of 22.00 feet; thence North 00°24'10" West a distance of 55.00 feet; thence North 89°35'50" East a distance of 22.00 feet to said east line of Lot 24; thence South 00°24'10" East along said east line a distance of 55.00 feet to the Point of Beginning.

AND LESS AND EXCEPT PARCEL "B":

That part of Section 22, Township 29 South, Range 25 East, Polk County, Florida, described as follows:

Commence at the Southeast corner of Lot 24 as per the Map of Correction of the Town of Gordonville recorded in Plat Book 3, Page 43, Public Records of Polk County, Florida; thence North 00°24'10"West along the east line of Lot 24 and Lot 19 a distance of 890.14 feet to the POINT OF BEGINNING, said point also being 444 feet south of the northwest corner of Lot 18; thence South 89°35'50" West a distance of 25.00 feet; thence North 00°24'10" West and parallel with the east line of said Lot 19 a distance of 159.96 feet; thence North 89°30'03" East and parallel with the south line of the north 294 feet of Lot 18 a distance of 189.75 feet; thence South 00°29'57" East a distance of 10.00 feet to the south line of said north 294 feet of Lot 18; thence South 89°30'03" West along said south line of the north 294 feet of Lot 18 a distance of 164.76 feet to the common line between Lots 18 and 19; thence South 00°24'10" East along the east line of said Lot 19 a distance of 150.00 feet to the Point of Beginning.

LESS AND EXCEPT all parts of the above-described Property lying below an elevation of 100.5 feet NGVD.

TO HAVE AND TO HOLD the same unto the said party of the second part in fee simple.

And the said party of the first part does hereby covenant with the said party of the second part that, at the time of the delivery of this deed the premises were free from all encumbrances made by it, and that it will warrant and defend the same against the lawful claims and demands of all persons claiming by, through or under it, but against none other, except as to those matters set forth on **EXHIBIT "A", the "Permitted Exceptions,"** with the understanding that this reference shall not operate to reimpose any of them.

Signed and Sealed in
the presence of:

Print: Albert C. Kretscher, Jr.

Print: Ann M. Zyndorf

OLD FLORIDA PLANTATION, LTD.,
F/K/A LAKE HANCOCK, LTD.,
a Florida limited partnership

By:
Name: Louis L. Roeder, III
Its: Co-General Partner

By: LUC Lake Hancock Limited Partnership
Its: Co-General Partner

By: Land Use Corporation, a West Virginia corporation
Its: General Partner

By:
Name: William T. Bright
Its: CEO & Chairman of the Board

Print: James E. Davis

Print: Shirley A. Fink

STATE OF FLORIDA
COUNTY OF HILLSBOROUGH

The foregoing instrument was acknowledged before me this 21st day of November, 2003, by Louis L. Roeder, III, as Co-General Partner of Old Florida Plantation, Ltd., a Florida limited partnership. He is personally known to me or has produced FDL as identification.

Ann M Zyndorf
NOTARY PUBLIC

(Print notary name)

My Commission Expires:

ANN M. ZYNDORF
MY COMMISSION # DD 151143
EXPIRES: September 18, 2006
Bonded Thru Notary Public Underwriters

STATE OF WEST VIRGINIA
COUNTY OF NICHOLAS

The foregoing instrument was acknowledged before me this 19th day of November, 2003, by William T. Bright, as Chief Executive Officer and Chairman of the Board of Land Use Corporation, a West Virginia corporation, General Partner of LUC Lake Hancock Limited Partnership, a Florida limited partnership, as Co-General Partner of Old Florida Plantation, Ltd., a Florida limited partnership. He is personally known to me or has produced ______________ as identification.

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
SUSAN B. TAWNEY
HC 66, BOX 137
JODIE, WV 26674-9701
My Commission Expires May 19, 2009

Susan B. Tawney
NOTARY PUBLIC
Susan B Tawney
(Print notary name)

My Commission Expires: May 19, 2009

EXHIBIT "A"

Permitted Exceptions

(Note: The recording reference for all instruments listed below is in Polk County, Florida, unless otherwise indicated.)

1. Terms, conditions, and provisions of a January 16, 2001, unrecorded Amended Development Order for the Old Florida Plantation ("OFP") Development of Regional Impact ("DRI"), the Notice of Adoption of which by the City of Bartow was dated April 30, 2001, recorded May 1, 2001, Official Records Book 4688, Page 1452. The Amended Development Order and recorded Notice thereof replaced and superceded a previous Development Order for the OFP DRI issued by Polk County, Florida, on September 28, 1999, and the recorded Notice thereof, which was dated October 6, 1999, recorded November 19, 1999, Official Records Book 4355, Page 1021.

2. Avigation easement covering the Property granted by OFP to the City of Bartow and the Bartow Municipal Airport Development Authority, dated September 1, 1999, recorded December 8, 1999, Official Records Book 4364, Page 1885.

3. City of Bartow Annexation Ordinance No. 1923-A, adopted August 7, 2000, Recorded August 14, 2000, Official Records Book 4511, Page 1888, and an unrecorded Annexation Agreement related thereto between OFP and the City dated August 7, 2000.

4. Natural gas pipeline easement in favor of Gulfstream Natural Gas System, L.L.C., along or near the eastern edge of the Property, as reflected in a Stipulated Order of Taking entered October 5, 2001, recorded October 11, 2001, Official Records Book 4821, Page 1149, in eminent domain proceedings filed by Gulfstream against OFP in the Circuit Court for the Tenth Judicial Circuit, Polk County, Florida, Case Number GCG-01-2708.
An Amended Stipulated Order of Taking (affecting survey sketches and legal descriptions) was entered June 24, 2002, and an Order of Taking adding more parcels was entered on April 17, 2003. A Stipulated Final Judgement and Order Disbursing Funds was entered September 23, 2003, recorded September 25, 2003, Official Records Book 5524, Page 302.

5. Land use restrictions imposed by OFP on a narrow strip of land lying adjacent to the Gulfstream pipeline referenced above under a Declaration of Covenants, Conditions and Restrictions, dated September 26, 2003, recorded September 29, 2003, Official Records Book 5527, Page 1644.

6. Unrecorded Easement for a 4-inch sewer line 15.0 feet in width extending across that part of the Property lying between the rights-of-way of Old Bartow-Eagle Lake Road and U. S. Highway 17, given by OFP to the City of Bartow, dated September 4, 2001.

7. Waste water effluent line easement along or near the east side of the Property given by OFP to Polk County, Florida, dated July 2, 1997, recorded August 14, 1997, Official Records Book 3884, Page 1694, amended by an agreement between the parties thereto, dated May 15, 2002, recorded June 21, 2002, Official Records Book 5040, Page 290.

8. Access easement extending from Sheffield Road across the northern portion of the Property to land presently owned by Messrs. Coscia and Nguyen and their respective spouses, adjoining the north boundary of the Property, as reflected in a warranty deed given by USX Corporation to Bartow Rod & Reel Associates, Ltd., dated January 5, 1987, recorded May 5, 987, Official Records Book 2525, Page 210. The exact location of the access easement is currently in dispute and the subject of a legal action filed by OFP against Coscia, Nguyen and spouses, Polk County Circuit Court Case No. G012328, as reflected in a Lis Pendens, filed by the defendants in the action, dated July 23, 2001, recorded August 3, 2001, Official Records Book 4766, Page 30, in a Temporary Injunction related thereto issued February 6, 2003, recorded February 10, 2003, Official Records Book 5257, Page 1177, in a Second Amended Temporary Injunction related thereto, issued by the Court on February 6, 2003, recorded February 10, 2003, Official Records Book 5257, Page 1177.

INSTR # 2003235743
BK 05590 PG 1837
RECORDED 11/21/2003 02:41:09 PM
RICHARD M WEISS, CLERK OF COURT
POLK COUNTY
DEED DOC 0.70
RECORDING FEES 42.00
RECORDED BY B Morris

PREPARED BY & RETURN TO:

FUENTES & KREISCHER TITLE CO.
1407 W. BUSCH BLVD.
TAMPA, FL 33612

FILE NO. 03-1141-L
Q:\Users\JAN\swfwmd\qcd rev.doc

Parcel Identification No.

QUIT CLAIM DEED

This Indenture, made this 21st day of November, 2003, by **OLD FLORIDA PLANTATION, LTD.**, a Florida limited partnership, Grantor, to **SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT**, a public corporation created by Chapter 61-691, Laws of Florida, whose post office address is 2379 Broad Street, Brooksville, Florida 34604-6899, Grantee,

WITNESSETH, that the Grantor, for and in consideration of the sum of Ten Dollars and other good and valuable consideration, in hand paid by the said Grantee, the receipt whereof is hereby acknowledged, has remised, released and quitclaimed, and by these presents does remise, release and quitclaim unto the said Grantee all the right, title, interest claim and demand which the said Grantor has in and to the following described lot, piece or parcel of land, situate lying and being in the County of Polk, State of Florida, to-wit:

That portion of the following described Property lying below an elevation of 100.5 feet NGVD:

PURCHASE FROM USX REALTY, December 5, 1991, recorded December 9, 1991, official records book 3401 page 2083:

3041

In Township 29 South, Range 25 East, Polk County, Florida:

Section 9: the fractional S-1/2.

Section 10: SW-1/4

Section 15: That part of Section 15, lying within a tract described as: Begin at the intersection of the north right-of-way line of the Old Winter Haven-Bartow Road and the west boundary of the E-1/4 of W-1/2 of Section 22, Township 29 South, Range 25 East, Polk County, Florida, run thence north along said west boundary 2743.2 feet, thence deflect right 33°15'41" and run 1234 feet to the east boundary of the W-1/2 of Section 15, thence north along said east boundary 4854.2 feet, thence West 200 feet, thence south parallel to the east boundary of the W-1/2 of Section 15, 1350 feet, thence West 600 feet, thence South 660.6 feet, thence East 600 feet, thence South 2786.6 feet, thence deflect right 33°42'22" and run 1234 feet, thence deflect left 33°15'41" and run 2902.96 feet to the north right-of-way line of the Old Winter Haven-Bartow Road, thence northeasterly along the north right-of-way line 225.96 feet to the point of beginning.

The W-1/2, and the W-1/2 of the NW-1/4 of SE-1/4, and the SW-1/4 of SE-1/4, LESS that part of the E-1/2 of W-1/2 cited above.

That part of the North 1/2 of the Northwest 1/4 of the Northeast 1/4 of Section 15, lying West of Sheffield Road and begin further described as follows: Commence at the Northeast corner of said Northwest 1/4 of the Northeast 1/4 of Section 15; thence North 89°41'12" West along the North line of said Section 15 a distance of 311.21 feet to the intersection with the North and Westerly right of way line of aforesaid Sheffield Road, said point also being the Point of Beginning; thence continue North 89°41'12" West still along said North section line 1015.00 feet to the northwest corner of aforesaid Northwest 1/4 of the Northeast 1/4; thence South 00°09'42" West along the west line of said Northwest 1/4 of the Northeast 1/4 a distance of 661.12 feet to the southwest corner of the aforesaid North 1/2 of the Northwest 1/4 of the Northeast 1/4; thence South 89°43'24" East along the south line of said North 1/2 a distance of 631.58 feet to the aforesaid north and westerly right-of-way line of Sheffield Road; thence North 19°24'55" East along said right-of-way line 435.95 feet to the point of curvature of a curve concave to the southwesterly having a radius of 411.97 feet and a central angle of 49°30'11"; thence along said curve 355.94 feet to the Point of Beginning. Said tract containing 11.57 acres, more or less.

Section 16: All fractional section.

Section 19: The fractional NE-1/4 LESS the E-1/2 of NE-1/4 of NE-1/4, the fractional SE-1/4 of NW-1/4, the SE-1/4, and that part of the E-1/2 of SW-1/4 lying east of Saddle Creek, LESS that part of the SE-1/4 of SW-1/4 east of Saddle Creek lying within a tract described as: Commence at the southwest corner of Section 19, run thence East 2056.34 feet to the POINT OF BEGINNING, thence deflect to the right 66°35' and run southerly 69.81 feet, thence deflect 90 left and run northeasterly

180 feet, thence deflect 90 left and run northwesterly 100 feet, thence deflect 90 left and run southwesterly 180 feet, thence deflect 90 left and run southeasterly 30.19 feet to the point of beginning.

Section 20: All fractional section.

Section 21: That part of the E-1/2 and of the East 330 feet of the W-1/2 lying north of the Old Bartow-Winter Haven Road (the East 330 feet of the SE-1/4 of NW-1/4 being otherwise described as the East 330 feet of Lots 1 and 5 of A.B. Ferguson's Subdivision, according to the plat thereof recorded in Deed Book 61, Page 36, Polk County.

The fractional W-1/2, LESS the East 330 feet thereof.

Section 22: That part of Section 22, lying within a tract described as: Begin at the intersection of the north right of way line of the Old Winter Haven-Bartow Road and the west boundary of the E-1/4 of W-1/2 of Section 22, run thence north along said west boundary 2743.2 feet, thence deflect right 33°15'41" and run 1234 feet to the east boundary of the W-1/2 of Section 15, Township 29 South, Range 25 East, thence north along said east boundary 4854.2 feet, thence West 200 feet, thence south parallel to the east boundary of the W-1/2 of Section 15, 1350 feet, thence West 600 feet, thence South 660.6 feet, thence East 600 feet, thence South 2786.6 feet, thence deflect right 33°42'22" and run 1234 feet, thence deflect left 33°15'41" and run 2902.96 feet to the north right of way line of the Old Bartow-Winter Haven Road, thence northeasterly along the north right of way line 225.96 feet to the point of beginning.

The N-1/2 of NW-1/4, and the SW-1/4 of NW-1/4, and the W-1/2 of SE-1/4 of NW-1/4, and the W-3/4 of SW-1/4 lying north of the Old Bartow-Winter Haven Road (being otherwise described as Blocks 5 through 12, and Blocks 19 through 24, and Blocks 35 through 37, and that part of Blocks 34, 38, and 46 lying north of the Old Bartow-Winter Haven Road, of Gordonville, according to the revised plat thereof recorded in Plat Book 3, Page 43, Polk County, Florida), LESS that part of the E-1/2 of W-1/2 described above.

Section 28: That part of the E-1/2 and of the East 330 feet of the W-1/2 lying north of the Old Bartow- Winter Haven Road.

That part of Section 28, described as: Begin on the west boundary of Section 28 at a point 50 feet north of the north right-of-way line of the Old Bartow-Winter Haven Road, run thence north to northwest corner of Section 28, thence east to the northeast corner of the NW-1/4 of NE-1/4 of NE-1/4 of NW-1/4, thence south to the north right-of-way line of the Old Bartow-Winter Haven Road, thence southwesterly along said north right-of-way line to a point directly east of the point of beginning, thence west to the point of beginning.

less the following described parcel:

Begin on the west boundary of Section 28, Township 29 South, Range 25 East and run east for 330 feet to the point where the line will intersect with the north boundary of the Old Bartow-Winter Haven Road for a point of beginning; thence run north along a line 330 feet east of the western boundary of Section 28 for a distance of 2770 feet; thence run East 1980 feet to a point which is 330 feet west of the centerline of Section 28; thence run south along a line 330 feet west of said centerline to the north boundary of the Old Bartow-Winter Haven Road; thence southwesterly along the north road boundary to the point of beginning. This parcel all lies in the west half of Section 28, Township 29 South, Range 25 East and north of the Old Bartow-Winter Haven Road in Polk County, Florida.

Section 29: That part of Section 29, described as: Begin on the east boundary of Section 29 at a point 50 feet north of the north right-of-way line of the Old Bartow-Winter Haven Road, run thence west to a point 200 feet northeasterly of, and measured at right angles to, the northeasterly bank of Saddle Creek, thence run northwesterly along a line parallel to and 200 feet northeasterly of (measured at right angles to) said northeasterly bank to the west boundary of Section 29; thence north to the northwest corner of the section, thence east to the northeast corner of the section, thence south to the point of beginning.

Section 30: Those parts of the NE-1/4, and of the NE-1/4 of NW-1/4 lying northeast of Saddle Creek, in Section 30, LESS that part of the NE-1/4 of NW-1/4 east of Saddle Creek lying within a tract described as: Commence at the southwest corner of Section 19, Township 29 South, Range 25 East, run thence East 2056.34 feet to the POINT OF BEGINNING, thence deflect to the right 66° 35' and run southerly 69.81 feet, thence deflect 90 left and run northeasterly 180 feet, thence deflect 90 left and run northwesterly 100 feet, thence deflect 90 left and run southeasterly 30.19 feet to the point of beginning.

PURCHASE FROM CSX TRANSPORTATION, INC., May 25, 1995, recorded June 22, 1995, official records book 3545, page 0041:

All that portion of CSX Railroad right-of-way according to Right-of-Way and Track Map V-3g-4 and S-4 lying within Section 28, Township 29 South, Range 25 East, Polk County, Florida, less and except road rights-of-ways.

AND:

PURCHASE FROM IMC-AGRICO CO., June 12, 1995, recorded June 23, 1995, official records book 3545, page 1190:

That part of the Northeast Quarter (NE 1/4) of Section 28, Township 29 South, Range 25 East, Polk County, Florida, lying northwesterly of the right of way for State Road 555 (U.S. Highway 17) and southeasterly of the right of way for Old Bartow-Winter Haven Road (a/k/a Bartow-Eagle Lake Road), according to Map Book 2, Pages 137-140, public records of Polk County, Florida; less and except that portion of the above-described property lying within the railroad right of way of CSX Transportation, Inc. and less and except that portion lying within the maintained right of way of Crossover Road according to Map Book 5, Pages 243, public records of Polk County, Florida.

AND:

PURCHASE FROM ROBERT STOKES & BOB STANLEY, August 29, 1995, recorded September 6, 1995, official records book 3735, page 0531:

3575

Lot 4 lying west of Old Bartow-Winter Haven Road; and that part of Lot 17 lying west of Old Bartow-Winter Haven Road less the South 374 feet thereof; and the North 294 feet of Lot 18; all according to the revised plat of Gordonville according to plat thereof recorded in Plat Book 3, Page 43, public records of Polk County, Florida.

AND:

PURCHASE FROM THE ESTATE OF J.K. STUART, September 14, 1995, recorded September 21, 1995, official records book 3581, page 1677:

IN TOWNSHIP 29 SOUTH, RANGE 25 EAST, POLK COUNTY, FLORIDA:

That portion of the west half of Section 28 lying westerly of CSX Railroad right of way and southeasterly of Old Bartow-Winter Haven Road;

AND:

That portion of the southeast quarter of the southeast quarter of Section 29 lying southeasterly of Old Bartow-Winter Haven Road;

AND:

That portion of the northeast quarter of the northeast quarter of Section 32 lying southeasterly of Old Bartow-Winter Haven Road;

AND:

Begin at the NW corner of Section 33, Township 29 South, Range 25 East, then run

East along the North boundary line of said Section 33 a distance of 706.71 feet to a point on the West boundary line of the right-of-way of the Seaboard Coast Line Railroad Company, then run South-westerly along said right-of-way line a distance of 1477.74 feet to a point on the West boundary line of said Section 33, then run North along the west boundary line of said Section 33 a distance of 1318.20 feet to the point of beginning.

All lying in Township 29 South, Range 25 East, Polk County, Florida.

AND:

PURCHASE FROM CSX TRANSPORTATION, INC., January 22, 1996, recorded February 9, 1996, official records book 3636, page 1640:

All that certain portion of Grantor's former operating property line and being near Bartow, Polk County, Florida, situate in the west half of the northwest quarter of Section 33, Township 29 South, Range 25 East, and lying on either side of Grantor's former centerline of railroad track, more particularly described as follows:

Beginning with the intersection of said centerline and the west line of Section 33; extending in a northeasterly direction 1,730 feet, more or less, and ending with the intersection of said centerline and the north line of Section 33, said former operating property being 100 feet wide, 50 feet on either side of said centerline in the southwest quarter of the northwest quarter of said Section 33 and 200 feet wide, 100 feet on either side of said centerline in the northwest quarter of the northwest quarter of said Section 33. Containing 7.25 acres, more or less, and being as shown crosshatched on fragment print of Grantor's Valuation Section V3g Fla, Map 4, marked Exhibit A-1 attached hereto.

LESS AND EXCEPT the portion thereof conveyed to the State of Florida Department of Transportation described in Final Judgment of Civil Action No. 666-81-2637, and recorded among the Official Records of Polk County, Florida in Book 2079, Page 1652.

Leaving a net conveyance of 6.6 acres, more or less.

BEING a portion of the property granted to the Jacksonville, Tampa & Key West Railway Company, a predecessor of Grantor, from the State of Florida pursuant to Section 24 of an Act approved by the Florida Legislative on February 19, 1874 (Chapter 1987, Laws of Florida 1874).

Under foreclosure of April 8, 1893 the Jacksonville, Tampa & Key West Railway Company conveyed its property to the Plant Investment Company. On June 26, 1885, the Plant Investment Company conveyed a portion of its property to the South

Florida Railroad Company, which changed its name to the Savannah, Florida and Western Railway Company. The Savannah, Florida and Western Railway Company was merged into the Atlantic Coast Line Railroad Company, effective July 1, 1902. On July 1, 1967 the Atlantic Coast Line Railroad Company merged with the Seaboard Air Line Railroad Company to form the Seaboard Coast Line Railroad Company. On December 29, 1982 the Louisville and Nashville Railroad Company merged into Seaboard Coast Line Railroad Company, and the name of the surviving corporation changed to Seaboard System Railroad, Inc. On July 1, 1986, Seaboard System Railroad, Inc. changed its name to CSX Transportation, Inc.

LESS AND EXCEPT PARCEL "A":

That part of Section 22, Township 29 South, Range 25 East, Polk County, Florida, described as follows:

Commence at the Southeast corner of Lot 24 as per the Map of Correction of the Town of Gordonville recorded in Plat Book 3, Page 43, Public Records of Polk County, Florida; thence North 00°24'10"West along the east line of said Lot 24 a distance of 345.23 feet to the POINT OF BEGINNING; thence South 89°35'50" West a distance of 22.00 feet; thence North 00°24'10" West a distance of 55.00 feet; thence North 89°35'50" East a distance of 22.00 feet to said east line of Lot 24; thence South 00°24'10" East along said east line a distance of 55.00 feet to the Point of Beginning.

AND LESS AND EXCEPT PARCEL "B":

That part of Section 22, Township 29 South, Range 25 East, Polk County, Florida, described as follows:

Commence at the Southeast corner of Lot 24 as per the Map of Correction of the Town of Gordonville recorded in Plat Book 3, Page 43, Public Records of Polk County, Florida; thence North 00°24'10"West along the east line of Lot 24 and Lot 19 a distance of 890.14 feet to the POINT OF BEGINNING, said point also being 444 feet south of the northwest corner of Lot 18; thence South 89°35'50" West a distance of 25.00 feet; thence North 00°24'10" West and parallel with the east line of said Lot 19 a distance of 159.96 feet; thence North 89°30'03" East and parallel with the south line of the north 294 feet of Lot 18 a distance of 189.75 feet; thence South 00°29'57" East a distance of 10.00 feet to the south line of said north 294 feet of Lot 18; thence South 89°30'03" West along said south line of the north 294 feet of Lot 18 a distance of 164.76 feet to the common line between Lots 18 and 19; thence South 00°24'10" East along the east line of said Lot 19 a distance of 150.00 feet to the Point of Beginning.

TO HAVE AND TO HOLD the same, together with all and singular the appurtenances thereunto belonging or in anywise appertaining, and all the estate, right, title, interest and claim whatsoever of the Grantor, either in law or equity, to the only proper use, benefit and behoof of the said Grantee.

IN WITNESS WHEREOF, the Grantor has hereunto set its hand and seal the day and year first above written.

Signed and Sealed in
the presence of:

Print: Albert C. Kreischer, Jr.

Print: Ann M. Zyndorf

OLD FLORIDA PLANTATION, LTD.,
a Florida limited partnership

By:
Name: Louis L. Roeder, III
Its: Co-General Partner

By: LUC Lake Hancock Limited Partnership
Its: Co-General Partner

By: Land Use Corporation, a West Virginia corporation
Its: General Partner

By:
Name: William T. Bright
Its: CEO & Chairman of the Board

Print: James E. Davis

Print: Shirley A. Fink

STATE OF FLORIDA
COUNTY OF HILLSBOROUGH

The foregoing instrument was acknowledged before me this 21st day of November, 2003, by Louis L. Roeder, III, as Co-General Partner of Old Florida Plantation, Ltd., a Florida limited partnership. He is personally known to me or has produced FDL as identification.

NOTARY PUBLIC

(Print notary name)

My Commission Expires:

ANN M. ZYNDORF
MY COMMISSION # DD 151143
EXPIRES: September 18, 2006
Bonded Thru Notary Public Underwriters

STATE OF WEST VIRGINIA
COUNTY OF NICHOLAS

The foregoing instrument was acknowledged before me this 19th day of November, 2003, by William T. Bright, as Chief Executive Officer and Chairman of the Board of Land Use Corporation, a West Virginia corporation, General Partner of LUC Lake Hancock Limited Partnership, a Florida limited partnership, as Co-General Partner of Old Florida Plantation, Ltd., a Florida limited partnership. He is personally known to me or has produced ______________ as identification.

Susan B. Tawney
NOTARY PUBLIC
Susan B. Tawney
(Print notary name)

My Commission Expires: May 19, 2009

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
SUSAN B. TAWNEY
BOX 197
WV 26874-9701
My Commission Expires May 19, 2009

INSTR # 2005001919
BK 06039 PG 0911 PG(s)1
RECORDED 01/04/2005 02:58:43 PM
RICHARD M WEISS, CLERK OF COURT
POLK COUNTY
DEED DOC 34,300.00
RECORDING FEES 10.00
RECORDED BY B Morris

Prepared by and Return to:
Fuentes and Kreischer Title Co.
1407 West Busch Boulevard
Tampa, Florida 33612
Our File Number: 03-1143-L

For official use by Clerk's office only

STATE OF Florida)
COUNTY OF Polk)
)

SPECIAL WARRANTY DEED
(Corporate Seller)

THIS INDENTURE, made this December 30, 2004, between **S & M Saddle Creek Corporation**, a Florida corporation, whose mailing address is*, party of the first part, and **Southwest Florida Water Management District**, whose mailing address is** party/parties of the second part, *1900 E.F.Griffin Rd, Bartow, Fl 33830, **2379 Broad St., Brooksville, Fl 34604

WITNESSETH:

First party, for and in consideration of the sum of TEN AND NO/100 DOLLARS ($10.00) and other valuable considerations, receipt whereof is hereby acknowledged, does hereby grant, bargain, sell, aliens, remises, releases, conveys and confirms unto second party/parties, his/her/their heirs and assigns, the following described property, towit:

Those lands described below lying above the ordinary high water line of Saddle Creek

Parcel #1

NW 1/4 East of RR and West of East Bank of Saddle Creek Canal and NE 1/4 W of East Bank of Saddle Creek Canal Less that part Beginning 2056.34 Feet East of NW corner of Section for Point of Beginning, deflect 66°35' to the South for 69.81 feet, deflect 90° to the left 180 feet, deflect 90° to left to North line of Section West to the Point of Beginning, all lying and being in Section 30, Township 29 South, Range 25 East Polk County, Florida.

and

Parcel #2

The East 1/2 of the Northeast 1/4 , lying East of Rail Road Way in Section 25, Township 29 South, Range 24 East of the Public Records of Polk County, Florida.

Subject, however, to all covenants, conditions, restrictions, reservations, limitations, easements and to all applicable zoning ordinances and/and restrictions and prohibitions imposed by governmental authorities, if any.

TOGETHER with all the tenements, hereditaments and appurtenances thereto belonging or in anywise appertaining.

TO HAVE AND TO HOLD the same in fee simple forever.

AND the party of the first part hereby covenants with said party of the second part, that it is lawfully seized of said land in fee simple: that it has good right and lawful authority to sell and convey said land; that it hereby fully warrants the title to said land and will defend the same against the lawful claims of all persons claiming by, through or under the party of the first part.

IN WITNESS WHEREOF, first party has signed and sealed these present the date set forth on December 30, 2004.

Signed, sealed and delivered in the presence of:

Witness signature
Timothy F. Campbell
Print witness name

Witness signature
Albert C. Kreischer
Print witness name

S & M Saddle Creek Corporation

By: Emmett F. Griffin
Print Name: Emmett F. Griffin
Title: president

J. Richard Griffin (Corporate Seal)
By: J. Richard Griffin, secretary/treasurer

State of Florida
County of POLK

THE FOREGOING INSTRUMENT was acknowledged before me this 30th day of December, 2004 by Emmett F. Griffin, president*** of S & M Saddle Creek Corporation who is personally known to me or who has produced ______ as identification. ***and J. Richard Griffin as secretary/treasurer

TIMOTHY F. CAMPBELL
MY COMMISSION # DD 283503
EXPIRES: March 24, 2008
Bonded Thru Notary Public Underwriters

Notary Public

DEED - Special Warranty Deed - Corporate
Closers' Choice

6/1/41
BZ #13

97888 OFF REC 677 PAGE 47

QUITCLAIM DEED AND ROADWAY EASEMENT

The Grantors, JAMES H. GRIFFIN and LUCY C. GRIFFIN, his wife, of Polk County, Florida, in consideration of the sum of one dollar and other valuable considerations received from the Grantee, hereby quitclaim unto the Grantee, PEACE RIVER VALLEY WATER CONSERVATION AND DRAINAGE DISTRICT, a public corporation existing under the laws of the State of Florida (Chapter 59-1002, Laws of Florida, Acts of 1959, as amended), whose post office address is P. O. Box 448, Bartow, Florida, its successors and assigns, the real property described below, hereafter called the "Water Control Structure Site," as portrayed upon the drawing marked "right-of-way" and attached hereto.

> All of that portion of the following described tract, lot, or parcel of land lying West and Westerly of the East and Easterly bank of that certain canal (or creek) running in a Northerly and Southerly direction through the said tract, lot, or parcel of land, which canal is known as "Saddle Creek" (or "Saddle Creek Canal"), lying in and comprising a portion of Section 19, Township 29 South, Range 25 East, Polk County, Florida:
>
> Commence at the Southwest corner of Section 19, Township 29 South, Range 25 East, thence run Easterly along the South line of said section for a distance of 2056.34 feet to a point of beginning, thence deflect 66 degrees, 35 minutes to the Southerly, and run 69.81 feet, thence deflect 90 degrees to the East and North and run 180 feet, thence deflect 90 degrees to the North and West and run 100 feet, thence deflect 90 degrees to the West and South and run 180 feet, thence deflect 90 degrees to the South and East and run 30.19 feet to point of beginning.

STATE of FLORIDA DOCUMENTARY STAMP TAX FEB-7'63 .20 COMPTROLLER PB 130127

POLK COUNTY

'63 FEB 7 PM 4:27

In order to provide access to the Water Control Structure Site, the Grantors grant to the Grantee, its successors and assigns, a non-exclusive access easement over an existing farm road as the same runs through any lands of the Grantors, or either of them, in the SE-1/4 of SE-1/4 of Section 24, Township 29 South, Range 24 East, and the S-1/2 of SW-1/4 of Section 19, Township 29 South, Range 25 East, said farm road running from a point on the northeastern right-of-way line of State Road 700 (U. S. Highway 98), said point being approximately 130 feet southeasterly along said right-of-way line from the south line of said Section 24, and running northeasterly and easterly through Sections 25 and 24, Township 29 South, Range 24 East, and through Section 19, Township 29 South, Range 25 East, to a point near Saddle Creek, as portrayed upon the drawing marked "access road" and attached hereto.

The easement granted above may be used by the Grantee, its successors and assigns, only for such access to the Water Control Structure Site as may be reasonably necessary for the construction, maintenance, repair, and inspection of any water control structure or device at the Water Control Structure Site, where such access is not available by some other reasonably available and suitable route.

The Grantors, for themselves, their heirs, devisees, personal representatives, and assigns, reserve the right, at any time, and from time to time, to relocate the route of easement granted above from the route identified above to a substitute route made available by the Grantors, provided such substitute route is reasonably suitable for the purposes contemplated herein. The Grantors may accomplish such relocation by filing with the Clerk of the Circuit Court of Polk County, Florida, a certificate or declaration thereof, accompanied by a map or drawing portraying with reasonable precision the location of such substitute route. The Grantors shall not be obligated to provide a route having a width of more than thirty feet nor shall the Grantors be obligated to grade or otherwise construct a road over the substitute route.

The Grantors, for themselves, their heirs, devisees, personal representatives, and assigns, reserve the right to cancel and terminate this easement fully in the event the Grantors, their heirs, devisees, personal representatives, or assigns, shall grant, sell, or convey their fee simple title, or mineral and mining rights, in and to all of the lands owned by them in the SE-1/4 of SE-1/4 of Section 24, Township 29 South, Range 24 East, and in the S-1/2 of SW-1/4 of Section 19, Township 29 South, Range 25 East. The Grantors may accomplish such cancellation and termination by filing with the Clerk of the Circuit Court of Polk County, Florida, a certificate or declaration thereof.

The rights of relocation and cancellation reserved by the Grantors are an essential condition and consideration for the quitclaim of the Water Control Structure Site and for the grant of the access easement by the Grantors. The Grantee, its successors and assigns, shall acquire no easement by prescription, nor any implied, common law, or statutory way of necessity, against the Grantors, their heirs, devisees, personal representatives, or assigns.

Dated this 31st day of December, 1962.

Signed, sealed, and delivered in the presence of:

Wallace L. Storey

W. A. Cross

Two witnesses as to James H. Griffin and Lucy C. Griffin

James H. Griffin (SEAL)
James H. Griffin

Lucy C. Griffin (SEAL)
Lucy C. Griffin

STATE OF FLORIDA

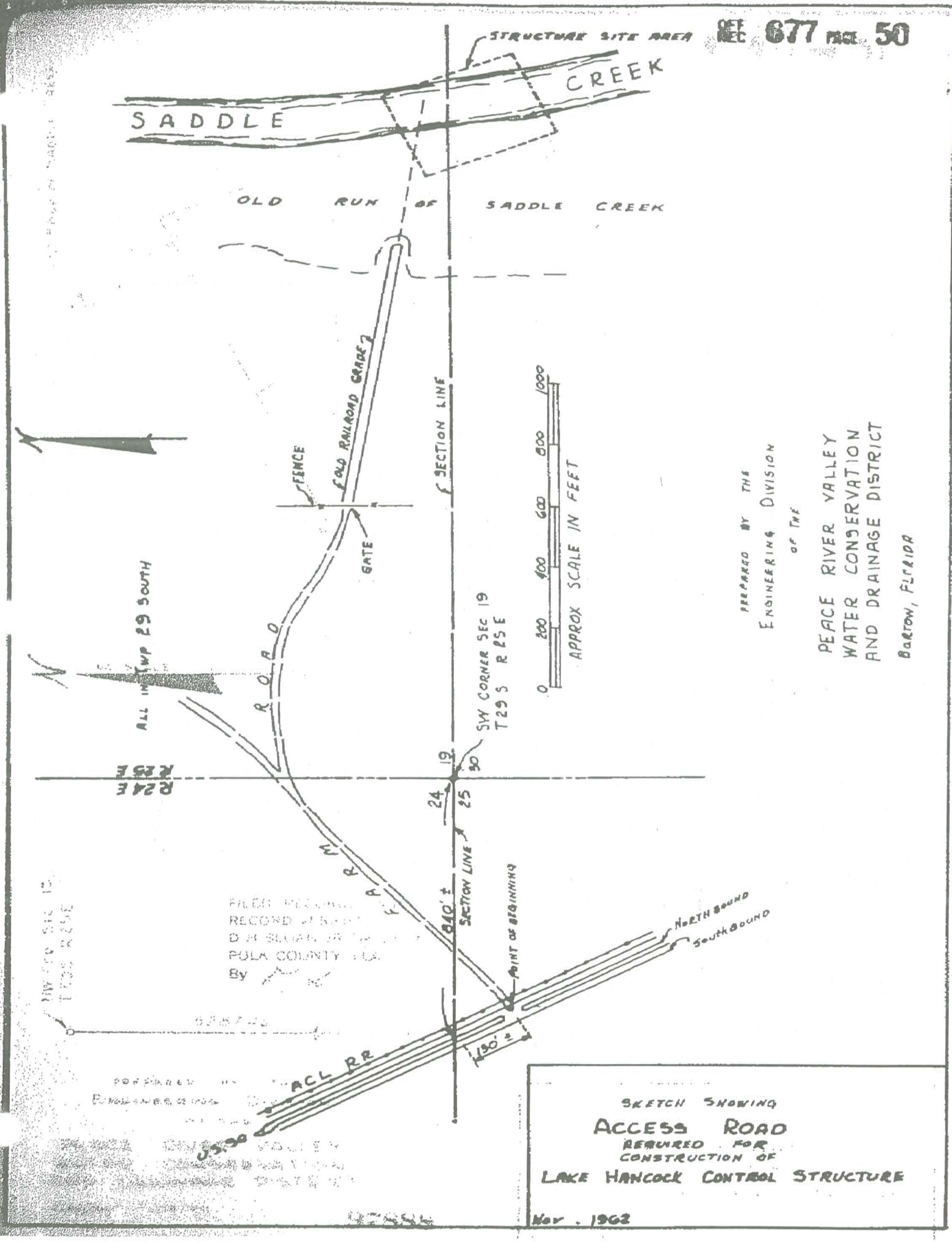
COUNTY OF POLK

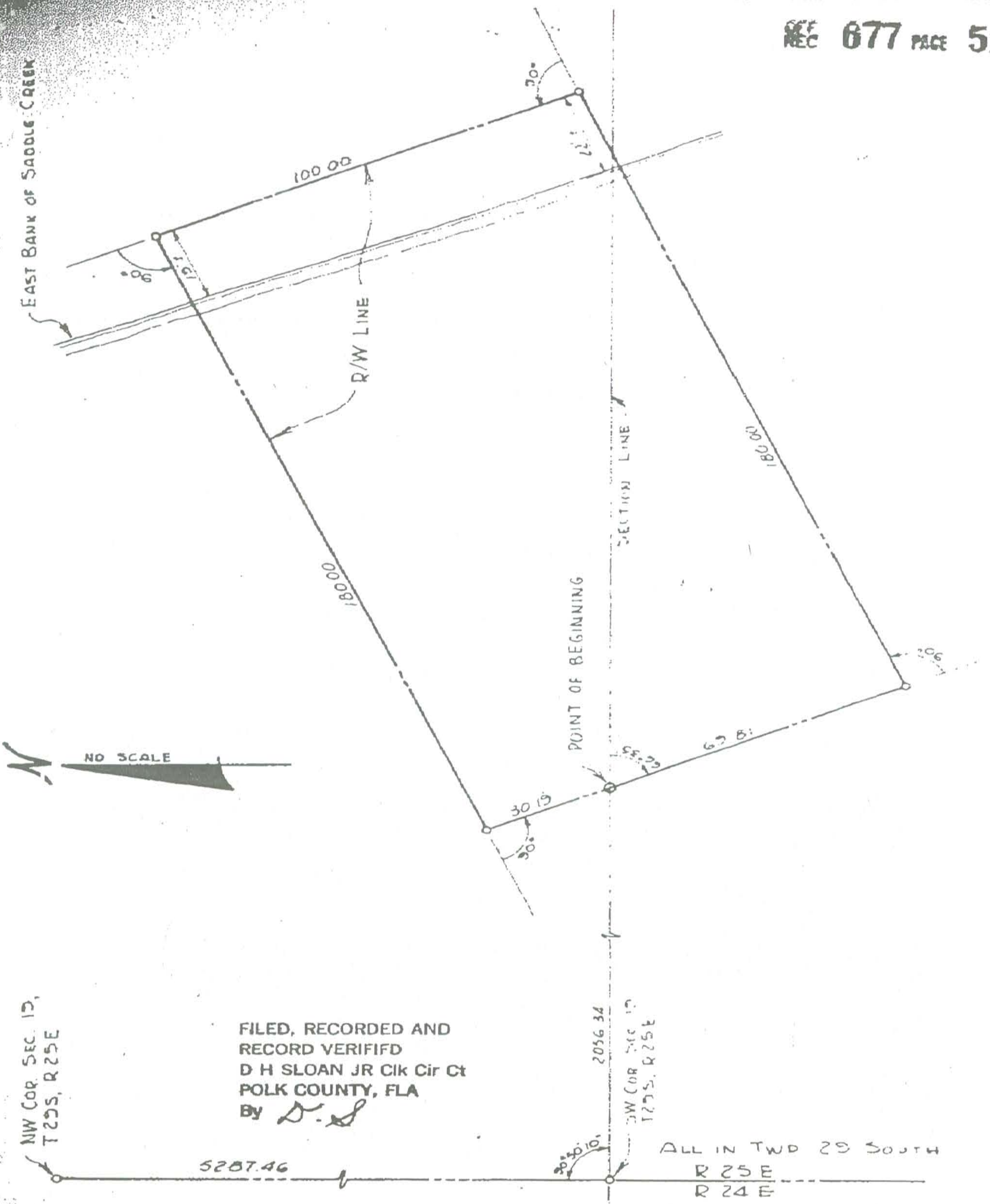
I hereby certify that on this day before me, the undersigned notary public authorized in the state and county named above to administer oaths and take acknowledgments, personally appeared JAMES H. GRIFFIN and LUCY C. GRIFFIN, his wife, known to me to be the persons described in and who executed the foregoing instrument, and they acknowledged before me that they executed the same. Witness my hand and official seal in the state and county named above this 31st day of December, 1962.

Wallace L. Storey
Notary Public, State of Florida at Large

My commission expires: June 27, 1966

(Affix notarial seal)


STRUCTURE SITE AREA
SADDLE CREEK
OLD RUN OF SADDLE CREEK
OLD RAILROAD GRADE
FENCE
GATE
SECTION LINE
ROAD
FARM
ALL IN TWP 29 SOUTH
R25E
R24E
19
30
24
25
SW CORNER SEC 19 T29S R25E
SECTION LINE
840'±
POINT OF BEGINNING
NORTH BOUND
SOUTH BOUND
130'±
ACL RR
U.S. 98
0
200
400
600
800
1000
APPROX SCALE IN FEET
PREPARED BY THE ENGINEERING DIVISION OF THE
PEACE RIVER VALLEY WATER CONSERVATION AND DRAINAGE DISTRICT
BARTOW, FLORIDA
SKETCH SHOWING
ACCESS ROAD
REQUIRED FOR CONSTRUCTION OF
LAKE HANCOCK CONTROL STRUCTURE
NOV. 1962
POLK COUNTY, FLA.



PREPARED BY THE
ENGINEERING DIVISION
OF THE
PEACE RIVER VALLEY
WATER CONSERVATION
AND DRAINAGE DISTRICT
BARTOW, FLORIDA

97888

SKETCH SHOWING
RIGHT-OF-WAY
REQUIRED FOR
LAKE HANCOCK CONTROL STRUCTURE

NOV 1962

APPLICATION FIGURES

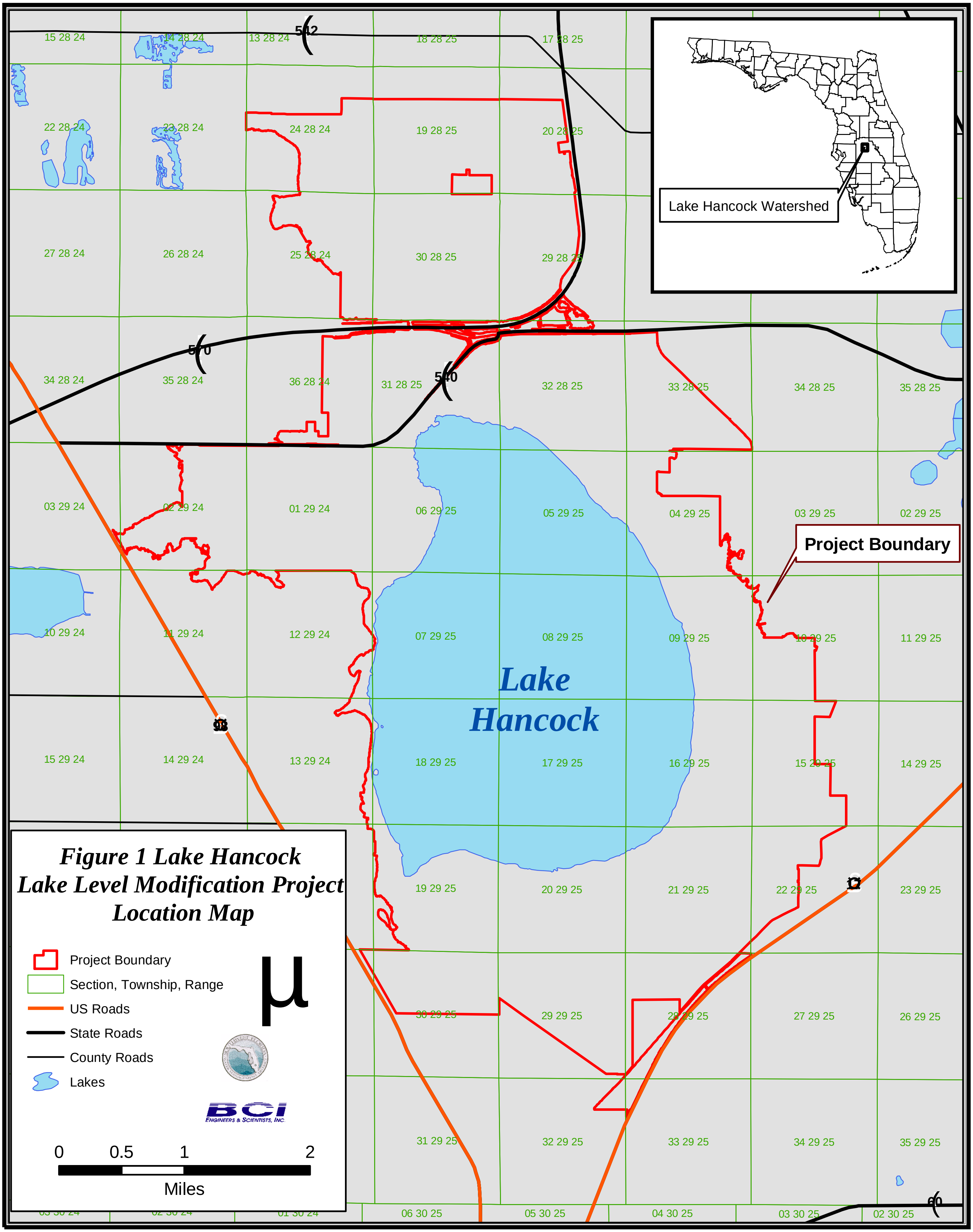


Figure 1 Lake Hancock Lake Level Modification Project Location Map

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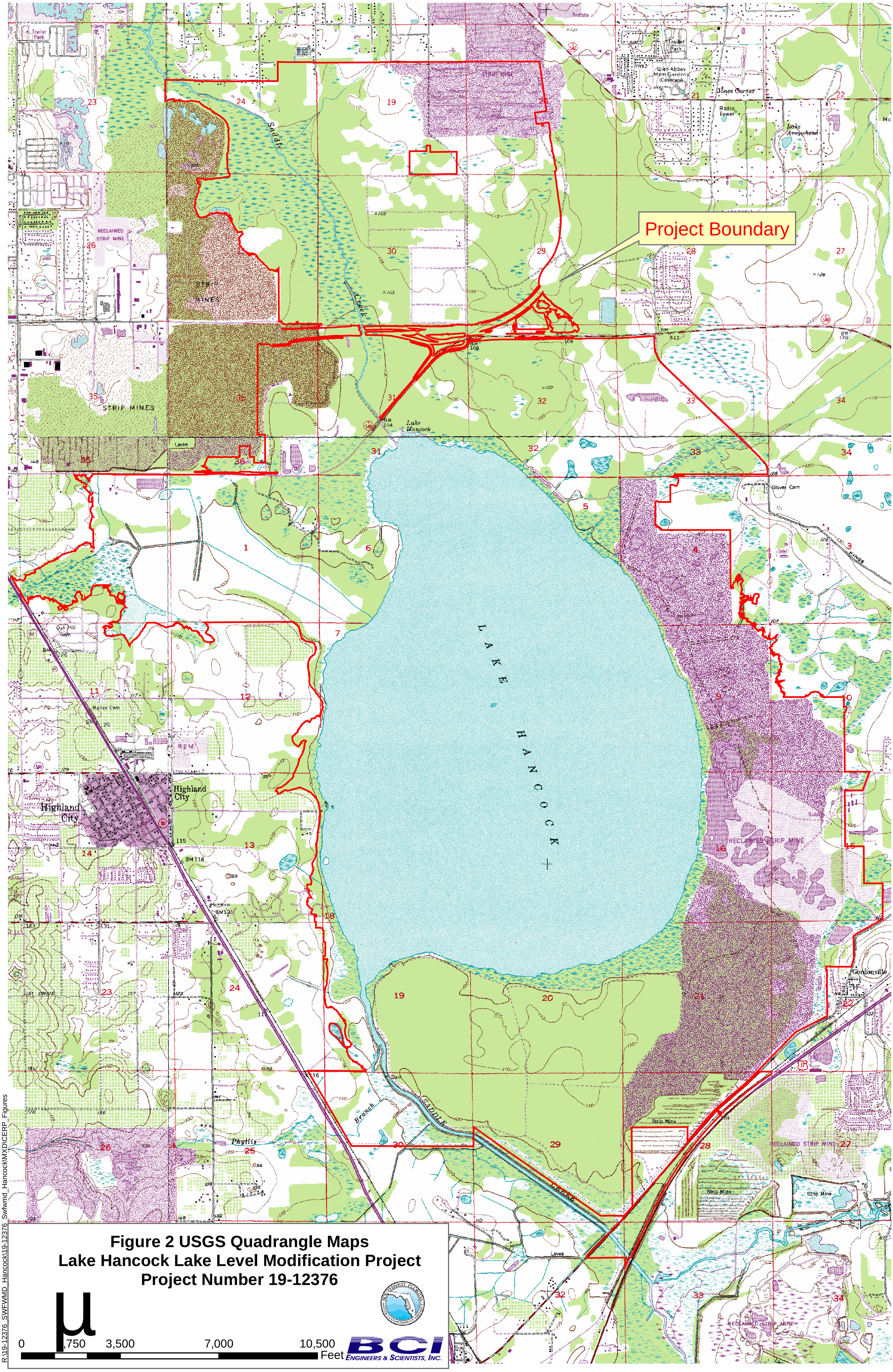

Figure 2 USGS Quadrangle Maps
Lake Hancock Lake Level Modification Project
Project Number 19-12376

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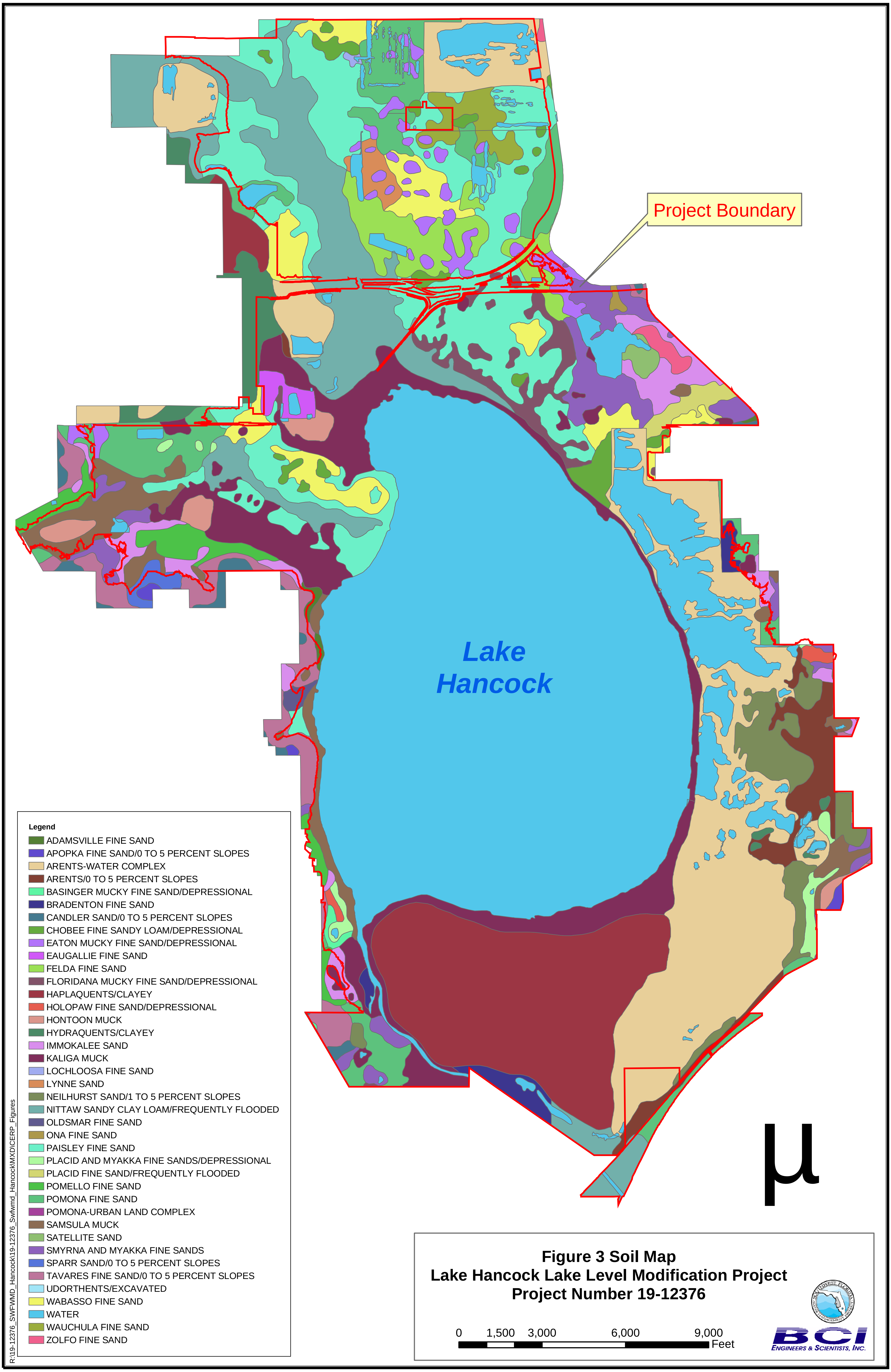

Figure 3 Soil Map
Lake Hancock Lake Level Modification Project
Project Number 19-12376

Figure 4 Aerial Photography
Lake Hancock Lake Level Modification Project
Project Number 19-12376

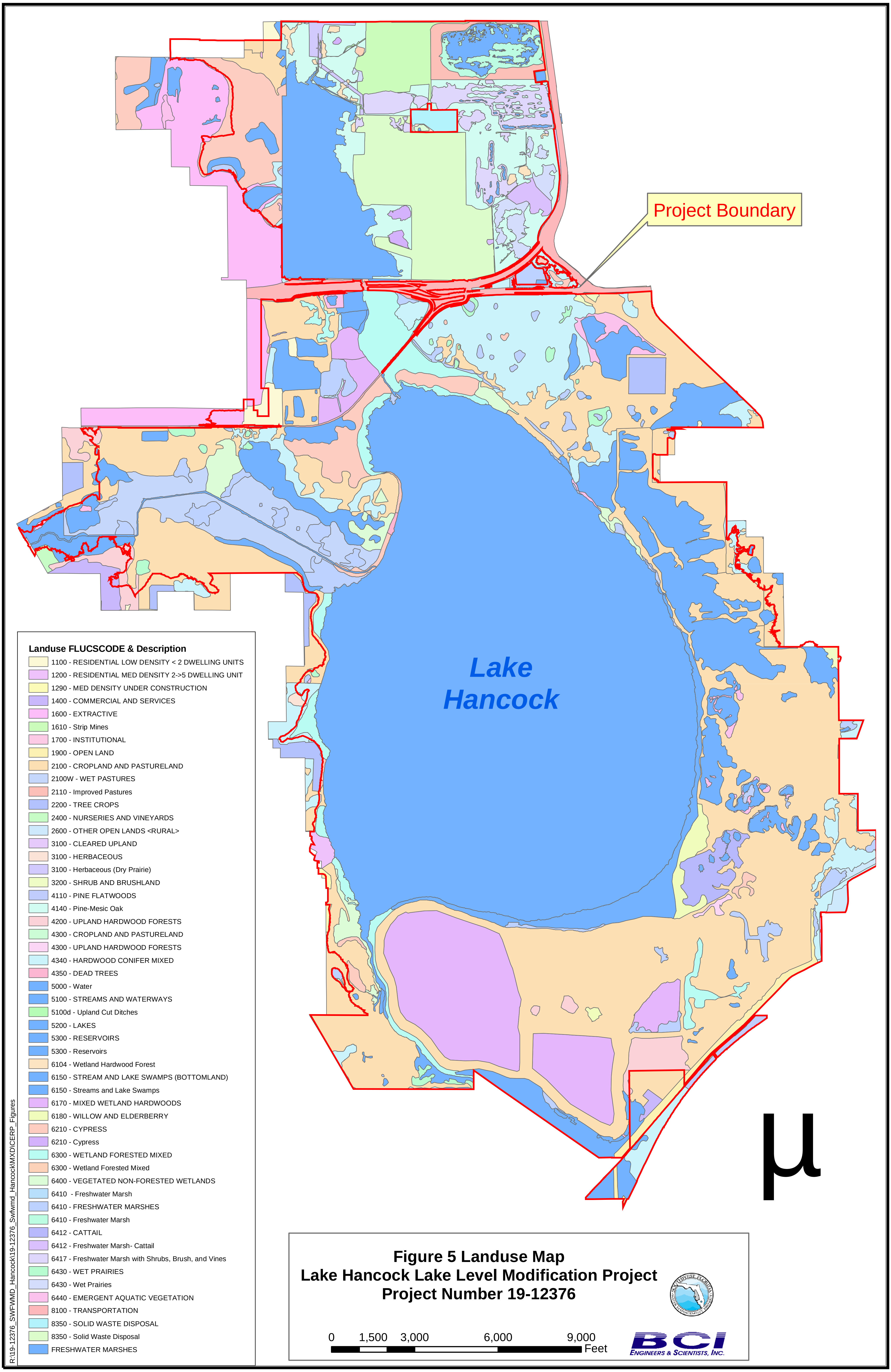

Figure 5 Landuse Map
Lake Hancock Lake Level Modification Project
Project Number 19-12376

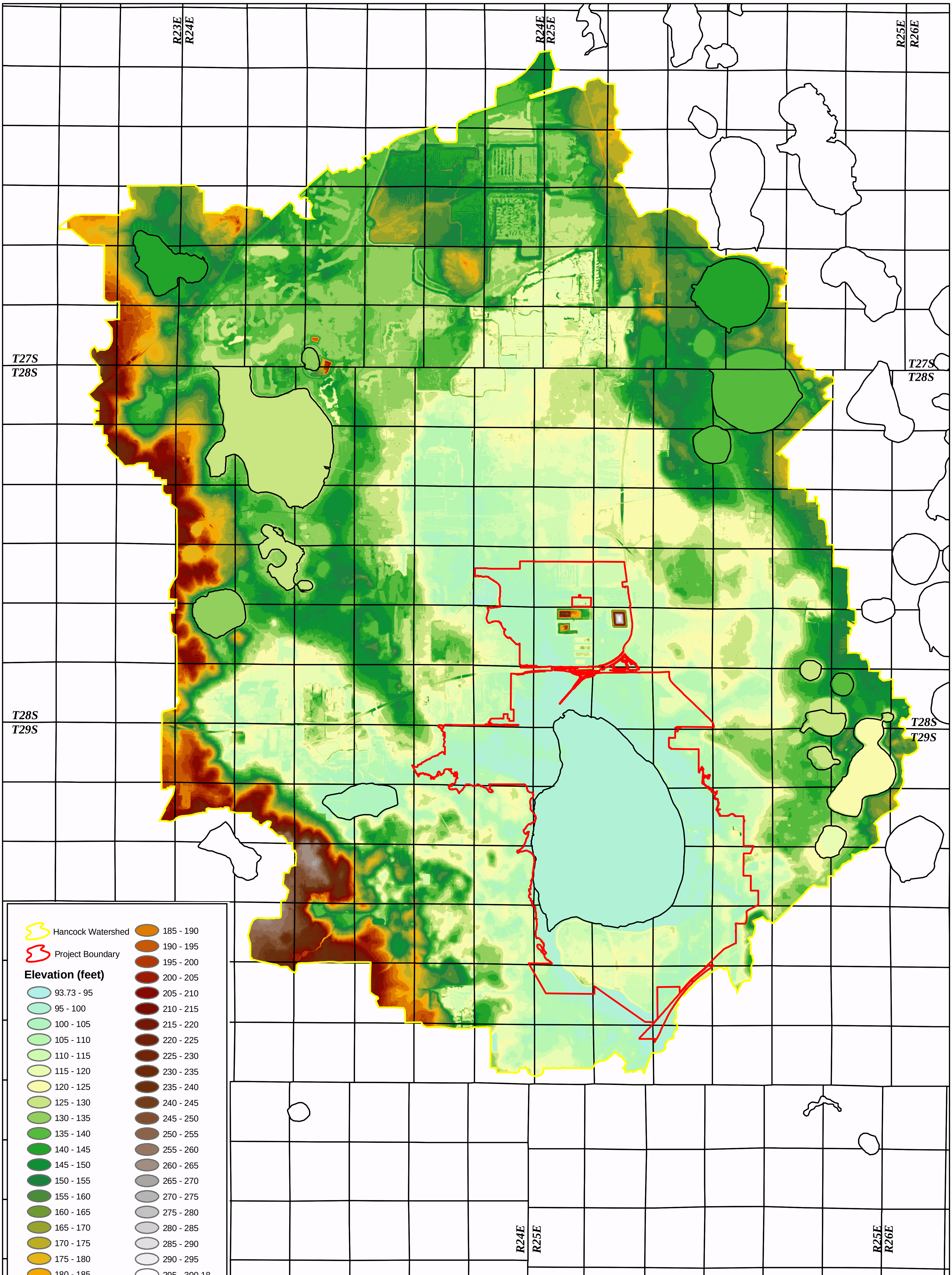

Figure 6
Topographic Surface Elevations[a]
Lake Hancock Lake Level Modification Project
Project Number 19-12376

Topographic surface elevations derived from TIN
National Geodetic Vertical Datum of 1929

0 1.5 3 4.5
Miles

BCI Engineers & Scientists, Inc.

8

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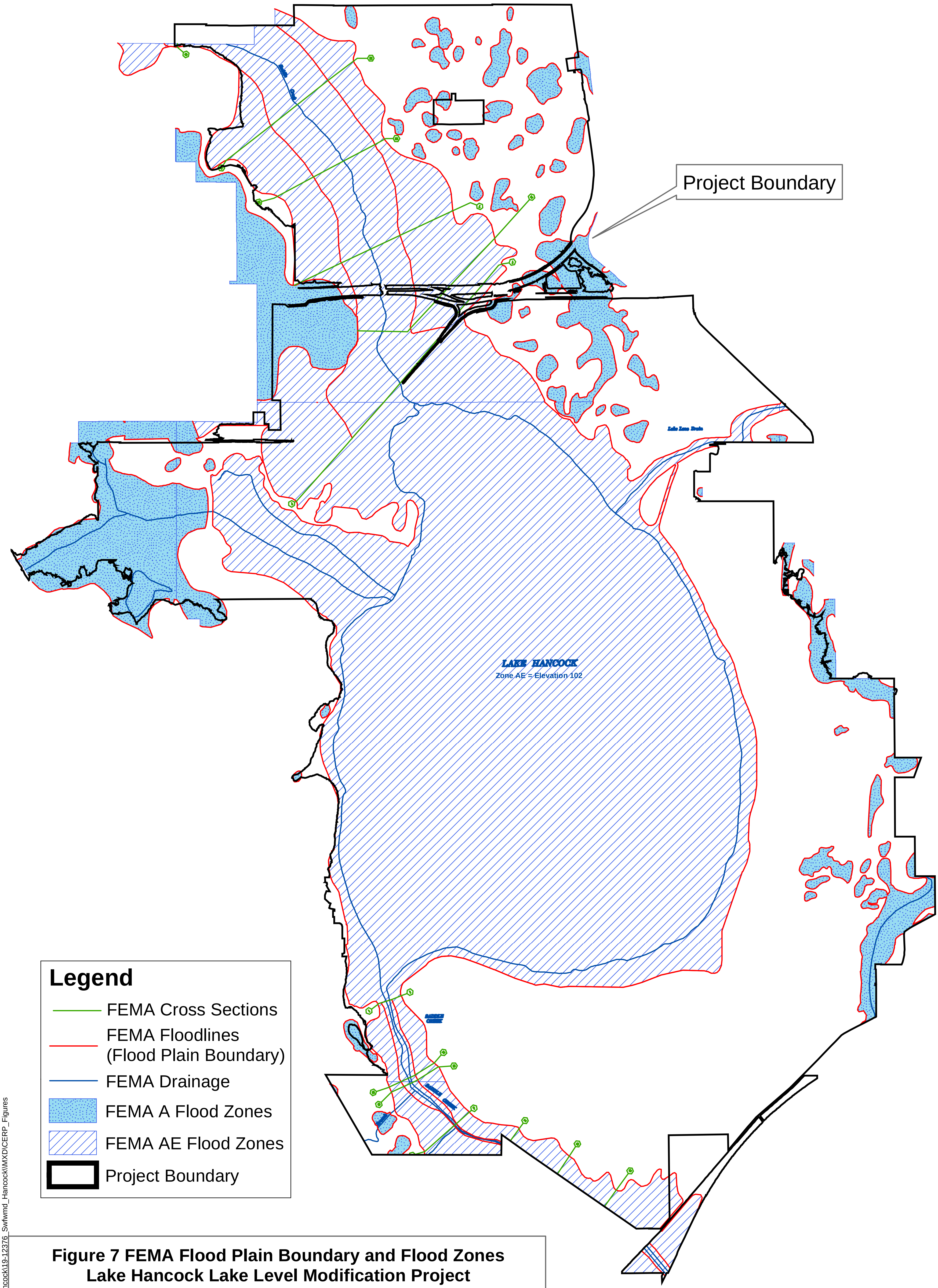

Figure 7 FEMA Flood Plain Boundary and Flood Zones
Lake Hancock Lake Level Modification Project
Project Number 19-12376

0 1,500 3,000 6,000 9,000 Feet

BCI Engineers & Scientists, Inc.

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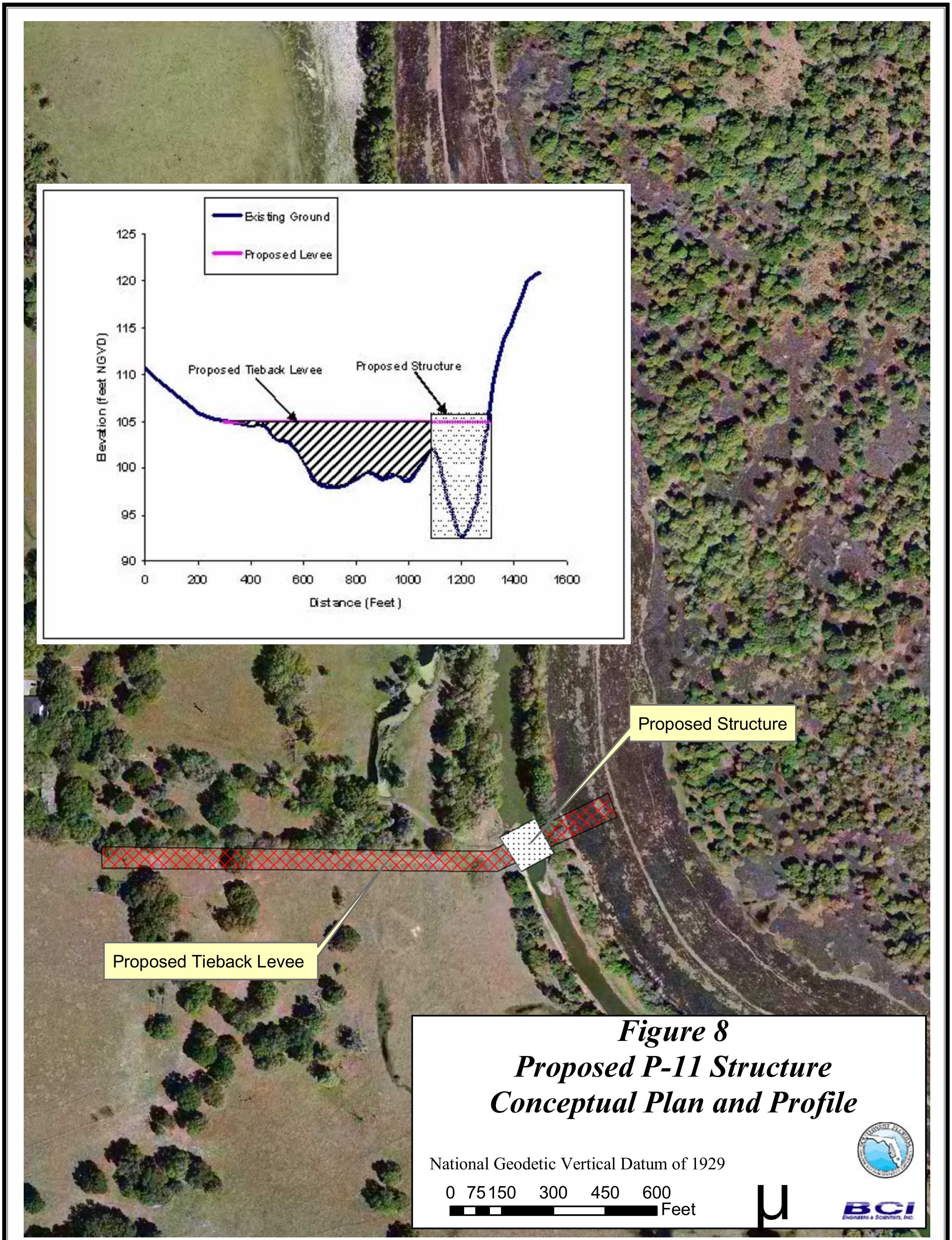

Figure 8
Proposed P-11 Structure
Conceptual Plan and Profile

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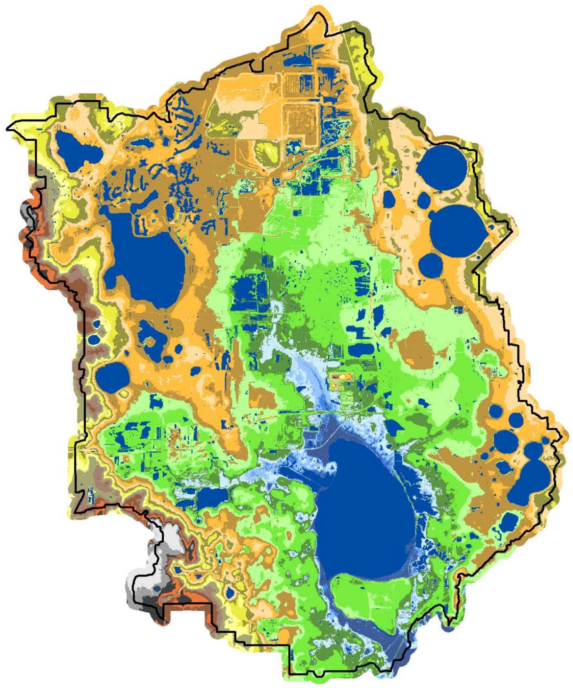
Figure 9 Recent Aerial Photo of P-11 Structure (2005 Aerial Photo)

LAKE HANCOCK LAKE LEVEL MODIFICATION PROJECT
MINIMUM FLOWS AND LEVELS RECOVERY
CONCEPTUAL ERP SUBMITTAL



Produced for:

Southwest Florida Water Management District

Prepared by:

BCI Engineers & Scientists, Inc.

2000 E. Edgewood Drive, Suite 215
Lakeland, Florida 33803

BCI Project No. 12-19376

August 30, 2006

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1.0 OVERVIEW

1.1 Project Authorization

The Southwest Florida Water Management District (District or SWFWMD) contracted BCI Engineers and Scientists, Inc. (BCI) to conduct an evaluation of benefits and impacts associated with raising Lake Hancock's operating level as part of the upper Peace River's Minimum Flows and Levels recovery. This builds on BCI's previous investigation, Lake Hancock Lake Level Modification Preliminary Evaluation, which assessed the District's proposed recovery strategy to provide additional storage of surface waters within Lake Hancock that can be used to maintain Minimum Flows and Levels (MFLs) in the River. Lake Hancock's water level control Structure P-11 current operation level is 98.5 feet National Geodetic Vertical Datum 1929 (NGVD). The top of structure elevation is 98.7 feet NGVD. After analyzing three alternative lake levels, BCI was contracted specifically to evaluate the benefits of raising the Lake's operating level to 100.0 feet NGVD for meeting the MFLs, to determine the impacts associated with raising the operating level, to develop a mitigation plan, and submit a Conceptual Environmental Resource Permit Application on behalf of the District.

Lake Hancock Lake Level Modification is one of several projects the District proposes to implement to restore MFLs to the upper Peace River as provided in the Southern Water Use Caution Area Recovery Plan (SWFWMD, 2006). It is likely to be the keystone project, providing the greatest overall benefits for the following reasons,

1. Lake Hancock, at 4,500 acres, is the largest single open water body located in the headwater portion of the Upper Peace River watershed.
2. The District is highly experienced managing the Lake's stage and flow regime by use of the hydraulic control structure under its jurisdiction (P-11) and the lake has proven to be a readily manageable system for controlled flow release and building storage volume.
3. It has a relatively undeveloped shoreline for a lake of its size.
4. Lake Hancock drains a large watershed, about 135 square miles, and is a water resource that produces relatively large net outflow.
5. Lake Hancock's water levels have been historically reduced by artificial drainage, via the Lower Saddle Creek canal, draining hundreds of acres of lacustrine wetlands. Raising the lake levels has the potential to restore lost wetland functions around the lake.

This report summarizes BCI's assessment of the effects of the proposed Lake Hancock Lake Level Modification Project on regional water resources and various adjacent land uses. It synthesizes the findings of a series of highly detailed technical and scientific assessments which are more fully explained in Appendices A through J. Each of those Appendices was written to serve as a stand-alone document for those interested in a particular topic. For example, Appendix D, the "Wetland Functional Assessment," provides more than 40 pages of additional narrative and over 50 figures concerning that topic. This portion of the submittal is more than an executive summary, providing an important descriptive bridge among all of BCI's investigations conducted concerning this project; therefore, it is recommend as a starting point for review. The

Florida Department of Environmental Protection (FDEP) Forms A, C, E and G, attached to this document, provide a summary of the various Appendices and act as pointers for locating information details required by a Conceptual Environmental Resource Permit (CERP). Much of the work embodied in those studies was conducted to address comments and requests made by the FDEP, Polk County officials, City of Lakeland staff, and various private landowners during numerous pre-application and public meetings.

The main set of questions this investigation addressed includes (with reference to the governing Appendices),

- What changes will occur to base flood elevations and the extent of the 100 year floodplain? (**Appendices A, B**)
- Will the project affect groundwater levels at the Polk County North Central Landfill (NCLF)? (**Appendix G**)
- Will the project affect stormwater management at the NCLF? (**Appendices C, H**)
- Will the project affect Polk County's plans for a 70-year build-out at the NCLF? (**Appendix H**)
- What mitigation might be necessary at the NCLF as a result of the project? (**Appendices A, C, G, H**)
- How will the project affect flood risks and other properties within the project boundary (level of service)? (**Appendices A, B**)
- What changes will occur to the wetlands and upland habitats around the lake and do they create a net functional loss or gain in accordance with the Unified Mitigation Assessment Method (UMAM)? (**Appendix D**)
- Will the project cause adverse changes to water quality or compromise the ability of the system to meet TMDL requirements? (**Appendix E**)
- To what extent will the project restore MFLs in the upper Peace River? (**Appendix F**)

1.2 Upper Peace River Minimum Flows and Levels

The primary purpose of this project is to reestablish the minimum flows and levels (MFLs) in the upper Peace River. The Florida Legislature, through Chapter 373.042, Florida Statutes, mandates that the five water management districts establish minimum flows and levels for all surface watercourses that include lakes and streams, and the minimum level of the groundwater in an aquifer. In this statute, the minimum flow is defined as **"the minimum flow for a given watercourse shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area."** Minimum levels are defined as **"the minimum water levels shall be the level of groundwater in an aquifer and the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area."** The establishment of MFLs for flowing watercourses considers minimum stream levels and the flows necessary to maintain those levels.

The basic premise of the legislation is to ensure that the hydrologic requirements of natural systems associated with lakes, streams and rivers are given high priority when evaluating impacts generated from ground water and surface water withdrawals. Establishment and implementation of MFLs through planning and regulatory efforts ensures that the hydrologic requirements of natural systems will be maintained while allowing waters to be available for agricultural, industrial, commercial, and residential uses.

The Peace River has been analyzed for minimum low flows and levels whereby it has been concluded that the upper Peace River is a surface watercourse experiencing a reduction in flows with significant harm. In the draft report entitled, "Upper Peace River An Analysis of Minimum Flows and Levels" (SWFWMD, 2002), documentation is provided supporting this conclusion. Justification for adoption of minimum flows and levels was based on site-specific information. Biological transects, stream cross sections, historical flow data, and other stream morphological indicators were used to make this determination.

SWFWMD recognizes that multiple minimum flows are necessary to maintain the River's flow regime and the health of the aquatic ecosystem. The maintenance of a particular aquatic system is dependent upon the existence of specific in-stream conditions. Hill et al. (1991) identified four types of flows that should be considered when analyzing river flow requirements for aquatic ecosystems: flood flows, overbank flows, in-channel flows, and critical in-stream flows. The SWFWMD focused on the most impacted of these types in the upper Peace River, the minimum low flows (critical in-stream flows).

Minimum flows have been proposed for the upper Peace River at the United States Geological Survey (USGS) gaging stations located near Bartow, Fort Meade, and Zolfo Springs where the River has been historically monitored. The proposed minimum flows are focused on returning perennial flow conditions to the upper Peace River. Specifically, they are based on maintaining the water elevations needed for fish passage (0.6 feet or 7.2 inches) or the lowest wetted perimeter inflection point (maximum stream bed coverage with the least amount of flow). This approach yielded minimum low flows of 17 cubic feet per second (cfs), or 11.0 million gallons per day (mgd) at Bartow. For the Fort Meade and Zolfo Springs USGS gages, minimum flows of 27 cfs (17.5 mgd) and 45 cfs (29.1 mgd) were determined, respectively. These flows are proposed to be met or exceeded 95 percent of the time on an annual basis, which is 348 days per year.

The Upper Peace River Analysis Report indicates that the proposed minimum flow criteria at Bartow (17 cfs) was met twice between the years of 1985 and 2000 while Fort Meade's minimum flow (27 cfs) was not met for any of the years. Zolfo Spring’s fares better with its minimum flow (45 cfs) being met for all years except for three.

Kissengen Spring, located along the River Section between Bartow and Fort Meade, ceased flowing on a continual basis around 1950 and completely ceased flowing in 1960 when Floridan aquifer levels dropped below the elevation of the streambed as a result of ground-water withdrawals. Polk County ground-water withdrawals grew from 230 mgd in 1960 to a peak of 410 mgd in 1975 (Marella 1992, Duerr and Trommer 1981). The spring used to flow at a rate of 20-30 cfs or 12-19 million gallons a day providing a majority of the baseflow to the River. The artesian aquifer now functions as a sink for surface water with the result that the river section between Bartow and Fort Meade is a losing stream where water enters sinks connecting to the aquifer. Trends in rainfall have also been noted to significantly affect Peace River flows, especially in the middle and lower portions. Ground-water withdrawal appears to be the most important factor in the reduction of flows in the upper Peace River.

1.3 Upper Peace River Recovery

When it has been determined that a water course is experiencing significant harm due to reduction in low flows, Chapter 373.0421, Florida Statutes, directs the District to expeditiously implement a recovery or prevention strategy. In keeping with these statutes, the District developed a recovery plan for the upper Peace River and surrounding areas (Southern Water Use Caution Area Recovery Strategy, (SWFWMD, March 2006). The goals of the SWUCA recovery strategy are to accomplish the following in an economically, environmentally and technologically feasible manner:

- restore minimum levels to priority lakes in the Lake Wales Ridge by 2015;
- restore minimum flows to the upper Peace River by 2015;
- reduce the rate of saltwater intrusion in coastal Hillsborough, Manatee and Sarasota counties by achieving the proposed minimum aquifer levels for saltwater intrusion by 2020; and
- ensure that there are sufficient water supplies for all existing and projected reasonable-beneficial uses.

This project addresses the second goal, restoration of flows in the upper Peace River by modifying the control structure of Lake Hancock to store excess water and operate the structure to slowly release the stored water to meet the minimum flows and levels requirements.

A strategy investigated, but not being pursued, is the reduction of ground-water withdrawals to restore aquifer levels. Ground-water withdrawals in Polk County have decreased by about 135 mgd since a peak of 410 mgd in 1975 as a result of water conserving practices in agriculture and mining. This decrease in withdrawals has resulted in a partial rebound of the Floridan aquifer in the area, but not to the point where MFL flows in the upper River are reestablished.

In a draft report entitled, "Predicted Change in Hydrologic Conditions along the Upper Peace River due to a Reduction in Ground-Water Withdrawals", (District, May 2002), the required reduction to return the spring flows in a 676 square-mile area (26 mi x 26 mi) around Kissengen Springs was presented. Fifty-percent and 100-percent reduction scenarios in ground-water withdrawals within the area were analyzed using the Eastern Tampa Bay Regional Ground-Water Flow model. Results indicate that the 50-percent reduction (105 mgd) would not return Kissengen Spring flow while the 100-percent reduction (210 mgd) generates the potential for the return. This 210 mgd reduction represents approximately 76% of Polk County's total ground-water use. The ability of businesses dependent upon ground-water use to absorb such an economic impact was considered too great to implement this recovery strategy.

Lake Hancock provides a unique opportunity with its limited lakefront development, large public ownership, and its location in the headwaters of the Peace River where it can be used to provide the storage necessary to supplement the low flows. Significant portions of the Lake Hancock floodplain are in public ownership as part of the Green Ways Corridor for the Peace River and Green Swamp. Surface waters can be captured and stored in Lake Hancock by modifying the existing outfall Structure P-11. Operating the Structure P-11 to a level of 100.0-feet would provide approximately 9,300 acre-feet of additional storage, which is three billion gallons of water. Over a 90-day period, this amount of storage could sustain a flow of 52 cfs or 34 mgd. No other natural surface water body located within the headwaters of the Peace River has the potential to provide this amount of storage for release to the river.

In addition to Lake Hancock Project, other options or projects are recommended in the SWUCA Recovery Strategy Report for the upper Peace River. These include storing runoff in areas located within previously mined phosphate areas, restoration of the upper Peace Creek Canal area that was ditched and drained for agricultural purposes, and the management of stream flow losses through existing sinks located within the riverbed between Bartow and Fort Meade. Preliminary results generated from this study indicate that other similar projects will be required to help meet the minimum flow compliance criteria in the upper Peace River.

2.0 PEACE RIVER WATERSHED

2.1 Description of the Peace River Watershed

The following description of the Peace River is from Canter Brown, Jr.'s, prologue to *"Florida's Peace River Frontier"*, University of Central Florida Press, Orlando, 1991:

> *"The Peace River originates in Lake Hamilton, one of many beautiful lakes that dot the heart of Interior peninsular Florida in northern Polk County, although some of its waters can be traced as far to the north and northwest as the great reservoir of the Green Swamp ….. Just to the east of the river's source and paralleling its course through Polk County is Florida's natural spine, the chain of high sandy hills known as "The Ridge," which marked in ancient times all of peninsular Florida remaining above the sea.*
>
> *From Lake Hamilton the narrow stream of the Peace River today is channeled by drainage canals first to the south and then to the west where, just to the north of Polk's county seat of Bartow, it joins Saddle Creek, an outlet of Lake Hancock two miles to the north. From the junction, the river plunges southward again past Bartow and the town of Fort Meade. Three miles below Fort Meade the stream, continuing its southward course, is combined with the waters of Bowlegs Creek, which rises to the east on the Ridge, near Lake Buffum.*
>
> *At Bowling Green, a little less than 40 miles along its course, the river enters Hardee County as well as beginnings of the low South Florida prairie through which it will pass on most of its remaining journey to the sea. For half of the distance through Hardees's 21-mile width, the river continues it southward flow, edging in its progress the county seat of Wauchula. At Zolfo Springs, however, its course bows to the southwest, and then turns to the south before bowing again, this time to the southeast and a junction with Charlie Apopka Creek at a point just to the north of the Desoto County line. The enlarged river then carries its waters to the southwest and, on an ever more twisting and turning course, passes Arcadia and Fort Odgen, strengthened along the way by the discharges of Joshua and Horse Creeks. Three miles below Fort Ogden the widening stream enters Charlotte County and begins a slow turn to the west, which carries it beyond Punta Gorda to its meeting with the sea at Charlotte Harbor on Florida's southwest Gulf of Mexico coast. On a straight line Peace River's length totals only about 110 miles, but its often serpentine course doubles that distance."*

2.1.1 Permitted Uses of Surface Waters

There are no known significant existing permitted uses of surface waters from the Peace River between Lake Hancock and Arcadia. Below the Peace River at Arcadia, a Water Use Permit (WUP No. 2010420.04-S) has been issued for the Peace River Manasota River Water Supply Authority for a regional water supply for Desoto, Charlotte, Manatee, and Sarasota

Counties. The Water Supply Authority has a permitted average daily withdraw rate of 32,700,000 gallons per day (gpd) or 50 cfs and a peak daily withdraw amount of 90,000,000 gpd or 140 cfs from the Peace River. Permit conditions specify that they can withdraw 10% of the Arcadia flows as long as the flows are not lowered below 130 cfs and at their peak the withdrawal rate is 90 mgd or 140 cfs.

2.1.2 Streambed (Sink) Losses

An important component in the recovery of the upper Peace River includes addressing sink losses within the streambed between Bartow and Fort Meade. Within streambed sink losses have been estimated by the USGS and the District to be as high as 25 cfs during low flow conditions between the river and the Floridan aquifer. Additional over bank sink losses during high flow conditions have been estimated between 100 to 500 cfs. The District has an ongoing project with the USGS to better estimate the streambed losses.

2.2 Upper Peace River

The Peace River has a watershed area of 2,350 square-miles, and is approximately 105 miles long from the confluence of Peace Creek Drainage Canal and South Saddle Creek (outfall for the Lake Hancock Watershed) to Charlotte Harbor. The watershed resides in portions of Polk, Hillsborough, Manatee, Hardee, Desoto, Highlands, Sarasota, Glades, and Charlotte Counties. The Peace River has been divided into three sections for analysis purposes: the upper, middle, and lower sections. Minimum Flows and Levels have been determined for the upper section only which has been designated the upper Peace River Watershed. The upper Peace River Watershed occupies 826 square-miles above the Zolfo Springs Gage (**Figure 1**). United States Geological Survey (USGS) gaging stations at Bartow, Fort Meade, and Zolfo Springs (located in the upper Peace River Watershed), and Arcadia are referred to in this report. Numbers and IDs of the stations are provided in **Table 1**.

Table 1
Gaging Station Identification

Gaging Station	USGS Number	District Site ID
Bartow	02294650	79
Fort Meade	02294898	78
Zolfo Springs	02295637	77
Arcadia	02296750	80

The USGS gaging station at Bartow is located on the downstream side of the Highway 60 bridge just below the confluence of South Saddle Creek, which conveys surface runoff from Lake Hancock through Structure P-11, and the Peace Creek Canal, which conveys surface runoff from the Lake Alfred and the Winter Haven areas. The Fort Meade gage is located near Fort Meade on the downstream side of the Highway 98 bridge and 5 miles from the Bartow gage. The Zolfo Springs gage is located 23 miles downstream of the Fort Meade gage on the downstream side of the Highway 17 bridge about 0.8 miles north of Zolfo Springs, which is located at the southern boundary of the upper Peace River Watershed. Another gage referenced in this report is the Arcadia gage, which is located in Arcadia, 33 miles south of the Zolfo Springs gage, and about 500 feet upstream of the Highway 70 bridge. Although, the Arcadia gage is not within the Upper Peace River Watershed, it is also used to evaluate predicted flow changes as a result of the proposed Lake Hancock Lake Level Modification, recognizing the continuum of flow through riparian corridors and the Water Supply Authority's permit.

Arcadia's gage data covers the longest period of record of the four river gaging stations from April 1, 1931 to the present. Zolfo Springs has the next longest record from September 1, 1933 to present. Bartow's record covers a period from October 1, 1939 to present while Fort Meade's record is from June 1, 1974 to present. The Arcadia and Zolfo Spring's gage record contains a significant flood event that occurred in September 1933 as a result of a hurricane. Recorded flows during this time are about one-third higher than the next largest magnitude storm recorded for these gages. Arcadia had a record peak flow of 36,200 cubic feet per second (cfs), while Zolfo springs had a peak flow of 26,300 cfs. In addition to the recorded floods at Arcadia, USGS had a historical peak flood account in 1912 at Arcadia with an estimated flow of 43,000 cfs. Bartow's recorded maximum of 4,690 cfs occurred in September 2004, while Fort Meade's 2,450 cfs recorded maximum occurred in September of 2004 as a result of Hurricane Frances. USGS is reviewing these flows due to the significant difference recorded between the Bartow and Fort Meade Gages.

As previously stated, Minimum Flows and Levels (MFL) have been established for Bartow, Fort Meade, and Zolfo Springs of 17, 27, and 45 cfs, respectively (District, August 2002). The number of below minimum flow days for each of the gaging stations from January 1, 1975 to December 31, 2004 are 2,063, 2,795, and 524 days, respectively. The Lake Hancock Lake Level Modification Project (Project) proposes to reduce the number of below MFL days for each of these gaging stations. **Table 2** provides descriptive flow statistics for each of the gaging stations while **Table 3** provides descriptive level statistics. **Figures 2-5** contain the flow hydrographs for the USGS gaging stations at Bartow, Fort Meade, Zolfo Springs and Arcadia for their period of record. **Figures 6-9** contain the level hydrographs for the respective stations.

Table 2
Gaging Station Flow Statistics

		Flows in Cubic Feet Per Second (cfs)					
Station	**Yrs of Record through Dec 2004**	**Min**	**Mean**	**Median**	**Max**	**MFL Rate**	**MFL-Days**
Bartow	65	0	228	103	4,140	17	2,088
Fort Meade	30*	0.06	208	81	2,450	27	2,835
Zolfo Springs	71	3.6	636	322	26,300	45	522
Arcadia	73	5.6	1085	460	36,200	Not Det.	---

* Fort Meade Gaging Station Initiated in June 1974.

Table 3
Gaging Station Level Statistics

Station	Years of Record thru Dec 2003	Levels in Feet NGVD 1929				
		Min	Mean	Median	Max	Std Dev.
Bartow	65	88.22	92.91	93.05	98.67	1.49
Fort Meade	30*	69.57	72.27	71.66	80.84	1.99
Zolfo Springs	71	32.72	37.42	36.58	54.62	2.73
Arcadia	73	6.49	10.33	9.45	25.9	2.85

* Fort Meade Gaging Station Initiated in June 1974.

3.0 LAKE HANCOCK WATERSHED

3.1 Description of Watershed

The Lake Hancock watershed is located within west-central Polk County near the geographic center of peninsular Florida (**Figure 10**). **Figure 11** provides an aerial photograph of the area. Polk County is part of the highland area that trends along the north-south axis of peninsular Florida. Within the county are three ridges separated by relatively flat lowland areas. The Lake Hancock watershed occupies the area between the Lakeland Ridge on the western boundary and Winter Haven Ridge along the eastern boundary. Land surface elevations typically vary from 265 feet National Geodetic Vertical Datum of 1929 (NGVD 1929) for highs along the ridges and then sloping down into the valleys where elevations gradually decrease to around 98 feet near the outfall on South Saddle Creek. Significant portions of the watershed have been mined creating remnant overburden spoil piles, clay settling area embankments, and water filled depressions. The tributary watershed to Structure P-11, which regulates flow from Lake Hancock, is 135 sq-miles. Lakes within the watershed occupy an area of about 20 square-miles.

Lake Hancock receives inflow from three major tributaries. Saddle Creek originates east of the City of Lakeland generally flowing south through a swampy area before entering into the Lake. Lake Lena Run originates in Auburndale and enters Lake Hancock on the northeast side. Banana Lake, located about 1-mile northwest of Highland City, discharges into the Banana Lake Overflow Canal that enters the west side of the Lake. These three tributaries account for 81% of the Lake Hancock Watershed. The Eagle Lake system located below Lake Lena Run is a minor tributary that originates in the Eagle Lake area and enters Lake Hancock on the southeast side. Remaining areas of the watershed are contiguous to the Lake.

3.2 Climate

The climate is subtropical with humid, rainy summers, and dry mild winters. Average monthly temperatures range from 61°F in January to 82°F in July and August. About half of the annual rainfall occurs during the summer months of June through September. There has been an extended period of below normal rainfall in the Lake Hancock area and in central Florida generally since 1960.

3.3 Watershed Hydrogeology

A layer of sand, clay, and limestone underlies the Lake Hancock Watershed, ranging in thickness from about 100 feet to 400 feet. Under the surficial layer is several thousand feet of limestone and dolomite. The formations comprising the watershed (Hammett, Snell, Joyner; USGS 1981) can be divided into three hydrogeologic units: (1) the surficial aquifer, (2) secondary artesian aquifers and confining beds, and (3) the Floridan aquifer. The surficial aquifer is composed of sand, sandy clay, and pebble phosphate deposits, which in Polk County have been mined extensively. Thickness of this unit varies between 20 and 130 feet. The secondary artesian aquifers and confining beds are composed of clay, dolomite, and limestone of the Hawthorn Formation and Tampa Limestone. The thickness of this unit varies between 50 and 150 feet.

Mining for phosphate near Lake Hancock began between 1941 and 1952. No mining near Lake Hancock is evident in a 1941 aerial photograph of the Lake. By 1952, aerial photographs indicate some areas approximately one mile to the northeast of the lake were being mined. Areas to the south of the lake showed mining activity by 1958. These areas were ultimately converted to clay settling areas. The 1968 aerials show active mining along the majority of the east side of the lake. Most of these mined areas have been reclaimed.

The Floridan aquifer consists of limestone and dolomite of the Suwannee Limestone, Ocala Limestone, and Avon Park Limestone. Drilling logs indicate that zones within the limestone and dolomite contain numerous cavities and honeycomb features, which have resulted from dissolution of the carbonate rock by circulating groundwater. Weaknesses in the geologic structure caused by dissolution are responsible for sinkhole collapses. Ardaman and Associates, Inc. in 1976 reported that between the years 1956 and 1975 more than 20 sinkhole collapses had occurred within two miles of Lake Hancock. Groundwater in the surficial and the secondary artesian aquifers typically flows from the ridge areas to the streams and lakes of the lowland areas. However, the lowering of the Florida aquifer due to ground-water withdrawals has created a downward movement of the surficial waters into the secondary artesian system in the area of Lake Hancock and the upper Peace River.

Lake Hancock occupies an approximate area of 4,500 acres with an average lake depth of 4 to 5 feet. A muck layer ranging in thickness from 1 to 4 feet covers the bottom of the lake. Underlying the muck are surficial deposits ranging from 9 to 17 feet in thickness, which reside on top of the Bone Valley Formation containing phosphatic sands, gravels, and clays (Patton, 1980). Below the Bone Valley formation are Hawthorne limestones, which have been dissolutioned by lateral movement of water to form the lake.

3.4 Water Budget

A water budget was conducted on Lake Hancock by the USGS for the period from 1964 through 1977. During that time, the average annual rainfall was 48.61 inches and average annual evaporation for the Lake was about 50 inches. Measured net surface inflow into the Lake averaged 132.49 inches per year over the Lake while the outflow averaged 106.30 inches per year generating a net gain of 26.19 inches. Since the Lake stage was fairly constant during this time period, this yielded an average loss to the ground-water system from the Lake of about 25 inches per year. The outflow in terms of average annual net runoff depth over the 135 square-mile watershed is about 6 inches per year, which is equivalent to the measured average daily discharge of the P-11 structure of 62-63 cfs between the period of 1975 to 2004 when converted to an average daily discharge rate.

In the report entitled, "Lake Hancock Water and Nutrient Budget and Water Quality Improvement Project," (Harper et al, 1999) it was indicated that stormwater inputs represented 71.1% of the total Lake inflow, rainfall on the Lake 23.6%, and ground-water seepage 5.3% with a total average annual input of 79,217 acre-feet per year for the period between 1969-1998. Of the total stormwater inputs, the Saddle Creek Watershed represented the largest portion at 76.9%, Lake Lena Run 8.2%, Banana Creek 3.1%, and the other tributary basins 11.8%. Ground-water seepage into the Lake was estimated based on seepage monitors installed in the Lake bottom.

Losses from Lake Hancock are represented by discharges from Structure P-11 at 54.2%, direct Lake evaporation of 24.8%, and deep ground-water losses of 21.0%. Deep ground-water losses were calculated as a residual of the inputs minus the known outputs. The deep ground-water losses calculated were 2/3 greater than those calculated by the USGS yielding a range from 25 to about 40 inches per year for the Lake area.

3.4.1 Point Source Discharges

A review of available data from the Florida Department of Environmental Protection (FDEP) indicates that several point source discharges contributed or have contributed a significant portion of the inflows into Lake Hancock. One significant source that has been discontinued is the City of Lakeland's Waste Water Treatment Plant, which discharged into Stahl Canal, a tributary to Banana Lake, until April 1987. Between January 1975 and April 1987, the plant discharged on average 6.4 million gallons per day or 9.9 cfs. This is about 16 percent of the historical outflows through Structure P-11. This point source inflow was accounted for in the simulation model. Lake Hancock inflows were reduced by the point source discharge to better predict the expected recovery, and downstream gaging station flows were modified to reflect the removal of the point source inflow. The average outflow from Lake Hancock for the time period between January 1975 and December 2004 was reduced from 62.6 cfs to 59 cfs. The predicted number of MFL days at Fort Meade (i.e. days where the minimum flow was not satisfied) increased from about 2800 days to 3024 days for the 30 year period as a result of the removal of the point source inflow.

3.5 Water Quality

3.5.1 Water Quality Parameters

Lake Hancock, the primary receiver of all inflows from the watershed, has been characterized as hypereutrophic and of poor water quality. Nutrient concentrations within the Lake promote the growth of phytoplankton with a predominance of blue-green algae species such as *Anacystic* and *Anabaena*. Due to the shallow configuration of the Lake, winds can also easily stir up the organic bottom material making the Lake turbid. Mean water quality characteristics of the combined runoff and baseflow from the three major tributaries to the Lake between December 1998 and June 1999 are provided in **Table 4** (Harper, 1999).

Table 4
Mean Water Quality Characteristics

Parameter	Units	Mean Value: Banana Creek	Mean Value: Lake Lena Run	Mean Value: Saddle Creek
pH	s.u.	7.97	8.14	7.94
Specific Conductivity	µmho/cm	230	398	298
Alkalinity	mg/l	60.1	138	122
NH_3	µg/l	381	60	57
NO_x	µg/l	441	331	280
Dissolved Organic Nitrogen	µg/l	1364	761	586
Particulate Nitrogen	µg/l	2570	326	161
Total Nitrogen	µg/l	4756	1478	1084
Orthophosphorus	µg/l	351	193	327
Particulate Phosphorus	µg/l	657	118	75
Total Phosphorus	µg/l	1059	348	423
Color	Pt-Co	47	107	84
TSS	mg/l	65.3	6.9	6.8
BOD	mg/l	15.8	1.7	1.8

Banana Creek runoff contained the highest concentrations of nutrients (nitrogen and phosphorous especially in the particulate forms. Because of the green coloration of the water columns, the nutrients appear to be associated with algal biomass particulates. The measured mean concentration of total nitrogen for Banana Creek of 4756 µg/l is approximately 2-3 times the concentrations typically observed in urban runoff and baseflow. Lake Lena Run has the second highest concentration of nitrogen and third highest concentration of phosphorus; however, the predominant species is in the dissolved form. Saddle Creek has the third highest concentration of nitrogen in the dissolved form, but has the second highest concentration of phosphorus. Nutrient concentrations found in Saddle Creek and Lake Lena Run are more characteristic of urban runoff. The higher concentration of nutrients in Banana Creek is attributed to the historic discharge of effluent from a wastewater treatment plant.

Saddle Creek has the highest loading rate of most constituents due to the volume of runoff generated from this tributary at 76.9%, Lake Lena Run 8.2%, Banana Creek 3.1%, and the other tributary basins 11.8%. Estimated loadings generated from runoff, groundwater seepage and rainfall are summarized in **Table 5**.

Table 5
Summary of Loadings

Source	Annual Mass Load (kg/yr)				Percent of Total (%)			
	TN	TP	BOD	TSS	TN	TP	BOD	TSS
Banana Creek	10,009	2,229	33,249	137,415	6	6	14	13
Lake Lena Run	8,240	1,940	9,649	206,989	5	6	4	19
Saddle Creek	56,775	22,218	95,819	355,525	32	63	41	34
Miscellaneous Basins	16,133	2,175	41,577	212,016	9	6	18	20
Tributaries Subtotal	91,157	28,562	180,294	911,945	52	81	77	86
Rainfall	18,127	1,878	18,473	143,168	10	6	7	14
Ground-water Seepage	66,595	4,646	36,693	0	38	13	16	0
Totals	175,879	35,086	235,460	1,055,113	100	100	100	100

3.5.2 Trophic State Index

Trophic State Index (TSI) values were calculated for Lake Hancock based upon the Florida Trophic State Index proposed by Brezonik (1984). The TSI provides an indication of the biological productivity of the lake and which biological communities may be favored (plant or fish habitat). TSI values are calculated based on chlorophyll-a concentration, phosphorus concentration, and Secchi disk depth visibility. The average of the three values is then used to estimate the TSI for the Lake, which provides an indication of the Lake's ability to support plant and fish life. Average trophic state values less than 50 indicate oligotrophic conditions (low nutrient concentrations with low support for plant or fish production), values between 50 and 60 indicate mesotrophic conditions (adequate nutrients with conditions favorable for balanced plant and fish production), and values from 61-70 indicate eutrophic conditions (tending toward over nourishment favoring plant production over fish), while values over 70 represent hypereutrophic conditions (highly over nourished with high tendency to favor plant production over fish in the form of algae or phytoplankton). Lake Hancock's average TSI is 91 (Harper, 1999), hypereutrophic.

Results from a study of the Lake sediments performed by the University of Florida (Brenner, Whitmore, et al, 2002) indicated that the trophic state of Lake was mesotrophic to eutrophic prior to it becoming hypereutrophic. The diatom assemblages, coupled with the results of the Lead 210 dating, suggest that the shift to a hypertrophic state probably occurred within the last 100 years.

3.5.3 Biological Characterization

The following Lake Hancock's biological characterization is summarized from the report entitled, "Lake Hancock Restoration Management Plan," (Camp Dresser and McKee, January 2002). Lake Hancock and its shoreline sustain a large, highly diverse fauna including one of Central Florida's largest colonial wading bird rookeries and a dense American alligator population. Much of the lake open water is bordered by cypress dominated forested swamps. Red maple and black willow dominate the understory and are the dominant woody species when cypress is absent. Submerged, floating and emergent nuisance species occur throughout the lake. Historical documentation (soils maps and aerial photographs) indicates that the lake and its associated shoreline wetland formerly occupied a larger area than in its current condition.

Sport fishery has been limited in the lake for many years due to poor water quality and lack of quality aquatic habitat. Some fish species have the ability to take advantage of the hypereutrophic conditions dominating the population. Two native fish species, gizzard shad *(Dorosoma cepedianum)* and the threadfin shad *(Dorosoma petenense)* often respond favorably to nutrient enriched lakes because of the high level of algal growth upon which they feed. Many other native fish species will exhibit a decline because the algae which out-compete other plants on which prey fish need to feed disrupt the food web. Hypereutrophic conditions result in the frequent occurrence of anoxic conditions, which eliminate many fish and invertebrates that are intolerant of low oxygen conditions. Another non-native species, suckermouth catfish *(Hypostomus plecostomus)*, has also become abundant in Lake Hancock and other lakes within the region.

3.6 Commercial and Recreational Uses

Lake Hancock presently supports a commercial fishery for tilapia and catfish. In Lake Hancock and other lakes in Florida, blue tilapia *(Oreochromis aurea)*, a non-native species introduced in 1961, has been able to flourish as a result of the hypereutrophic state of the lake. Commercial harvests began in the early 1970s, initially as part of rough fish removal programs in various lakes, with blue tilapia as the economic incentive for fishing.

Recreational use of the Lake by boaters, sport fishermen, and water sport enthusiasts (such as swimmers and water skiers) is limited due to poor quality, shallow depth, and limited access.

3.7 Existing Lake Hancock Levels

3.7.1 Operation History

Lake Hancock's levels are regulated by releases through the Outfall Structure P-11 located approximately 3,500 feet south of the Lake in South Saddle Creek (**Figure 12)**. Structure P-11 was constructed in 1963 to replace a structure that consisted of concrete, timber piles, and removable boards. This current structure is operated and maintained by the Southwest Florida Water Management District (District). Two 7-foot high by 20-foot wide radial gates with an invert of 91.7 feet NGVD are used to regulate the flows until an elevation of 98.7 feet is attained (**Figure 13**). When the level of the Lake attains this elevation, surface water will begin to flow around the structure.

The United States Geological Survey (USGS) and the District on a regular basis have monitored water levels on Lake Hancock since August 1959. Discharges and elevations associated with Structure P-11 structure have been monitored by the USGS since November 1963. **Figure 14** provides a hydrograph of Lake levels for the period from 1959 to December 2004 while **Figure 15** provides a hydrograph of the discharges from P-11 for the period of 1963 to December 2004. **Figure 14** indicates that Lake Hancock levels typically vary between 96 to 99.5 feet around a mean of 97.7 feet NGVD.

Statistics for Lake levels and P-11 outflows are provided in **Table 6**. Lake Hancock's maximum level of record (101.88 feet) occurred on September 16, 1960 after Hurricane Donna passed through the area. The low of record occurred on May 23, 1968 as a result of a sink hole that opened up near the center of the Lake. The median elevation of the Lake is 97.87 feet indicating that half the time the Lake is above and half the time the Lake is below that elevation. Maintenance of a specific level is impossible due to the hydrogeologic setting of the Lake and watershed.

Table 6
Statistics for Lake Hancock Levels and Structure P-11 Flows

Item	No. Obs	Mean	Median	Min	Max	Std. Dev	Range
Lk. Hancock Levels (Feet NGVD 1929)	10814	97.7	97.87	93.98	101.88	0.844	7.9
P-11 Flows (cfs)	14672	63.6	0.86	0	936	118.0	936

3.7.2 Adopted Levels

In September 1980, management levels were adopted for Lake Hancock by the District to provide guidance regarding expected water level fluctuations. The levels adopted include the Ten (10) Year Flood Guidance Level - 102.4 feet, the High Level - 99.0 feet, the Low Level - 96.0 feet, and the Extreme Low Level - 94.0 feet. A Maximum Desirable Level of 98.5 feet, not an adopted level, is used by District operations as a guide to manage the Lake. The adopted levels for Lake Hancock are shown on **Figure 14**. Definitions for these levels are as follows:

Ten (10) Year Flood Guidance Level – means that elevation, in feet above mean sea level (same as NGVD 1929), which approximates the level of flooding expected on a frequency of not less that the ten (10) year recurring interval, or on a frequency of not greater than a 10 percent (10%) probability of occurrence in any given year, as determined from analysis of best available data. This is an advisory level provided as a discretionary guideline for lakeshore development.

High Level – means the highest level to which a surface water body shall be allowed to fluctuate without interference as approved by the Board for the purpose of conserving the waters in the state so as to realize their full beneficial use. Such level shall be expressed as an elevation, in feet above mean sea level. Drainage works in the lake require District permits to ensure proper design and prevent over drainage, so that the lake's ability to reach the minimum flood level is maintained. For lakes associated with control structures, this is the maximum level, which the lake would achieve by operation of the control structure. It is a peaking elevation and not one which is held.

Low Level – The normal yearly low level used as a guide for operation of a lake control structure

Extreme Low Level – This is a drought year low level used to operate a lake control structure. It is not a drawdown level, but merely a normal cyclic low that the lake should reach only periodically for the biological health of the lake. This level is provided as information for consumptive use permitting.

Maximum Desirable Level – is the lake elevation, which provides optimum aesthetic and recreational benefits, based on the existing development on the shoreline and floodplain. Established by determining:

1. An elevation historically equaled or exceeded 20% (range 10-30%) of the period of record as determined from a stage-duration curve.
2. An elevation one foot (1') below most dock decks. An elevation one-half foot (1/2') below most seawall caps (tops).
3. The highest elevation to which most lake residents would like to have the lake come up relative to their property.
4. An elevation that will saturate soil around willow (Salix sp.) and Buttonbush (Cephalanthus sp.) and approach the elevation of the fern (Blechnum). In addition, this elevation should back up water into bordering swamps where interior vegetation is indicative of seasonal flood, e.g. St. John's Wort (Hypericum fasciculatum).

3.7.3 Existing Operational Protocol

Typically, releases from the Lake Hancock through Structure P-11 occur when a flood is imminent or when the Lake level approaches or exceeds the 98.5 foot Maximum Desirable Level. When levels are rapidly approaching or exceed the Maximum Desirable level, Structure P-11 is opened permitting discharge to the Peace River. As the Lake continues to rise, Structure P-11 will be overtopped at an elevation of 98.7 feet and downstream conditions in the Peace River and South Saddle Creek will control the discharge from the Lake. As the level declines below the Maximum Desirable Level, Structure P-11 is usually closed to minimize further draining of the Lake, which may continue as a result of ground-water seepage and evaporation.

Below 98.0 feet, the structure remains closed until that elevation is reestablished when an upward cycle of Lake levels reoccurs, then the release protocol will be reinitiated. Based on discussions with District Structure Operations staff, requests have been made by Lake front property owners for the District to lower the Lake below the Maximum Desirable level to an elevation around 98.2 feet to prevent continued saturation of yards where residential encroachments have occurred. **Figure 16** provides an example of the operation protocol described by comparing the Lake levels and the P-11 releases for a 5-year period between January 1995 to December 2000.

3.8 Evidence of Higher Lake Levels

Geologic and other information that is more recent indicates that the Lake Hancock previously experienced higher water levels prior to the man-made alterations to the South Saddle Creek outfall. Historical shorelines at different Lake levels are evidenced by geologic terraces that are formed. Shorelines of lakes are subject to continuous erosional action by waves which washout and carry away the finer materials from the beach zone, leaving the larger heavier materials behind. This combined action of landward erosion and lakeward deposition of materials will over time create a bench or terrace that marks the shoreline. Several years of stabilized lake levels are required for these benches or terraces to form.

Lake Hancock's shoreline is marked by the presence of several terraces (Patton, 1980). Based upon clustering of terrace elevations derived from transect data taken from the surrounding Lake area, two cluster levels stand out with significance. One group of terrace elevations clusters between 100.4 and 100.8 feet while the second group clusters between 102.5 and 103.3 feet. The 103-foot terrace, based on morphological evidence, is clearly older than the 100.5-foot terrace. This sequence of terraces indicates a two-step drop in the level of Lake Hancock, from a level near 103 feet down to 100 - 101 feet, then down to the present level of 98.0 feet. The most probable reasons for such shifts are either a change in the elevation of the South Saddle creek outlet or a change in the conditions of the local water table, or both.

More recent information indicating the potential lowering of Lake Hancock came from an overlay of the existing and proposed operating level of 100.0 feet and the 1927 Polk County Soils map, **(Figure 17)**. The proposed level of 100.0 feet reasonably approximates the Lake level at the time of the soils mapping. A significant portion of the eastern shoreline of the Lake previously formed a large floodplain wetland. **Figure 18** provides a scanned portion of the 1949 USGS Bartow quadrangle, which shows the landward fringe of the littoral wetlands contiguous to the lake at an approximate elevation of 100.0 NGVD. Land surveys conducted in the 1850s also suggest that the Lake was higher at that time, as marshy wetlands were encountered in the same locations as is shown in the 1927 soils map.

District staff, using techniques for determining minimum flows and levels (MFLs) for Florida lakes surveyed cypress trees at two locations; those that border the Lake at present, and those that are older and which are found farther from the Lake. Using the same relationship between water level and the buttress inflection point that is used to set MFLs, the older, more distant cypress trees probably established and grew at a time when the lake's level was approximately 100.4 feet, a value that matches the observations from Patton (1980). Wetland trees that are currently found at ground elevations between 98.1 and 99.6 feet would have been within the Lake at its previous higher level. Ten trees were carefully evaluated for age within this elevation range with the oldest tree aged at less than 70 years old. This suggest that cypress, maple, elm and laurel oaks that now grow along the waters edge of Lake Hancock probably became established during the time that the Lake's level of 98.5 feet, and this change probably occurred sometime between 1927 and 1944.

4.0 WATERSHED MODELING

4.1 Continuous Simulations

Two major categories of watershed modeling assessments were conducted to assess this project, 1) continuous simulations, and 2) single event models. Continuous models are useful for assessing chronic or long-term effects from the project that occur on a variable daily basis for many years, while event simulations are aimed at determining the project effects on flood hazards during design storms that unfold over the course of several days or less. These two types of time series assessments typically require different modeling approaches. Therefore, the watershed modeling efforts are summarized by categorizing them based on their time-series emphasis.

During implementation of the proposed Lake Hancock Levels Modification Project, wet season water levels in the lake are expected to increase and water level fluctuations in the lake are expected to change. These changes are the incidental result of a lake management protocol designed to positively affect minimum flows and levels downstream of the lake in the upper Peace River, without increasing downstream flooding. The actual time-varying stage and amounts of water fluctuations in Lake Hancock are functions of the hydrologic cycle and are sensitive to rainfall, surface water inflow to the lake from uncontrolled streams, and surface water outflow from the District's management of the P-11 control structure. This means that assessment of the MFL benefits of the project required a long-term continuous simulation relating management schedules of the outfall structure to riverine flow volumes downstream.

The lake forms a "level pool" of water that extends across a littoral shelf adjacent to the open water body. Most of the littoral shelf is comprised of lacustrine fringe wetlands in varying states of cultural impact, ranging from mature forested wetlands to dewatered marshes converted to upland pastures. Changes to the lake's level pool fluctuations are likely to affect wetland functions related to hydroperiod and water levels in the lacustrine fringe. Assessment of how the project will alter wetlands required a long-term continuous simulation that related management schedules of the outfall structure to lake stage. An empirically-based water budget model was developed to provide a 30-year (January 1, 1975 through December 31, 2004) daily lake stage and lake outflow record for the purpose of comparing the existing and proposed lake level management schemes on Lake Hancock's lacustrine wetlands and on the river discharge downstream of the lake. The model developed to make such comparisons is described in more detail in **Appendix F** as are the conclusions drawn concerning the project's effects on riverine flows. **Appendix D** provides detailed findings concerning the effects on lacustrine wetlands. Brief summaries of these findings are also provided in Sections 5 and 6 of the current report.

The daily lake levels also set tailwater conditions for upper Saddle Creek, the largest stream channel which discharges to the lake. The closer a stream approaches its receiving waterbody, the more its flowing water levels are affected by the tailwater elevations. The degree of that effect is also a function of the amount of flow in the stream. This means that the stream stage dynamically varies along the channel as a function of distance from the lake, the amount of flow in the channel, and the lake stage. Increased water levels in Lake Hancock can cause higher water levels in Saddle Creek and potential impacts on stormwater facilities north of the lake. Therefore a mechanistic flow and stage model, ICPR (described more fully in **Section 4.2.2**), was coupled to the water budget model to provide an appropriate characterization of the dynamic routing effects in the stream as it approaches the lake.

Specifically, a model was developed representing conditions along Saddle Creek upstream of Lake Hancock and adjacent to the Polk County's North Central Landfill (NCLF) for a 30 year period. The simulation of the 30 year period was conducted to compare Upper Saddle Creek's water surface profile under the existing lake level fluctuation regime to the water surface profile under the proposed lake level fluctuation regime. This model was used to estimate the potential impacts within the NCLF from the proposed modifications at Lake Hancock. A detailed description of the continuous model simulations is provided in **Appendix C** of the report.

The coupled ICPR-water budget model was focused primarily on changes in the vicinity of the NCLF to estimate potential impacts to the operations of stormwater facilities at the NCLF. The model results were also used to provide a reasonable basis for estimating persistent surface water elevations in Saddle Creek adjacent to the landfill in support of a model analysis to estimate potential impacts to the ground water system at the NCLF caused by proposed operations at Lake Hancock (see **Appendix G**). In addition, tailwater conditions of the north and south stormwater wet treatment ponds within the NCLF were evaluated to determine if their intended treatment function would be impacted.

The simulations conducted as part of this investigation indicate that water levels in Saddle Creek closer to Lake Hancock will be more greatly influenced by the proposed modifications at Lake Hancock. Moving further upstream away from Lake Hancock, the stream bottom elevations increase and the water levels in Lake Hancock have less effect on the stream stage. Conversely, the stream bottom elevations are lower near Lake Hancock and (particularly for low and no-flow conditions) the stages in Saddle Creek and in Lake Hancock are closer in elevation.

4.1.1 Continuous Stream Simulation Model Approach and Input Data

The Interconnect Pond Routing model, ICPR, was used to represent hydrodynamic (i.e., stream flows and water body storage) processes, and a spreadsheet model was used to represent hydrologic process (i.e., rainfall, abstraction, and runoff). The hydrodynamic model components used in this investigation are a subset of those used in the event simulations described below and more fully in **Appendix A** (Single Event Watershed Model). Estimated and recorded stream flows at CR 542 (United States Geological Survey Gaging Station at CR 542, USGS gage #02294217) were used as an upstream boundary condition in the simulations. Recorded and estimated water levels of Lake Hancock from a water budget analysis (**Appendix F**: Lake Hancock Water Budget and Proposed Operations Description) were used as a downstream boundary condition in the model simulations.

A spreadsheet model employing the SCS Curve Number method for runoff calculation was used to estimate runoff from subbasins in un-gauged areas using daily rainfall data. Approximately 3.75 miles of Saddle Creek are represented in the model, including the entire reach adjacent to the NCLF.

A location map showing the overall area represented in the continuous simulation model is provided as **Figure 19**. **Figure 20** provides a more detailed overview of the model footprint and components. The model network elements highlighted in orange were represented directly in the model. This figure also shows the location of the USGS gage at CR 542 that was used to characterize inflows from the upstream areas of the watershed that discharge via Saddle Creek. **Figure 21** shows greater detail of the model network in the vicinity of the NCLF. Model node N3252W represents the North Stormwater Pond (NSP) of the NCLF and Node 3328 represents Saddle Creek adjacent to the NSP. Model node N3252U represents the South Stormwater Pond (SSP) of the NCLF and Node 3326 represents Saddle Creek adjacent to the SSP.

4.1.2 Summary of Existing and Proposed Continuous Simulation Results

Figure 22 shows the simulated duration of stages within Saddle Creek adjacent to the NSP of the NCLF. The simulations indicate that there will in general be higher water levels in Saddle Creek as a result of the proposed modifications at Lake Hancock. **Figure 23** shows the simulated duration of stages within the NSP of the NCLF. The results from the simulations indicate that little or no change in the frequency of stages within the NSP is expected as a result of the proposed modifications at Lake Hancock. This is due to the fact that water levels in the NSP are generally higher than those of Saddle Creek adjacent to the pond. In addition, the water levels of the NSP are generally above the weir slot with a crest elevation of 101.0 ft NGVD at the lower discharge control structure of the two structures installed at this pond.

Figure 24 shows the simulated duration of stages within Saddle Creek adjacent to the South Stormwater Pond (SSP) of the NCLF. The simulations indicate that there will in general be higher water levels in Saddle Creek as a result of the proposed modifications at Lake Hancock. **Figure 25** shows the simulated duration of stages within the SSP of the NCLF. The results from the simulations indicate that little or no change in the frequency of stages within the SSP is expected as a result of the proposed modifications at Lake Hancock. This is due to the fact that water levels in the SSP are generally higher than those of Saddle Creek adjacent to the pond. In addition, the water levels of the SSP are generally above the weir slot with a crest elevation of 101.3 ft NGVD at the discharge control for this pond.

For some conditions, water levels in Saddle Creek exceed the weir and weir slot elevation, potentially limiting discharge from the NSP and SSP of the NCLF. A statistical summary of the water level data comparing simulated water levels for existing and proposed conditions indicates that there may be a negligible (less than 1 percent) increase in the number of days that water levels adjacent to the weir and weir slots at these stormwater ponds will increase for the proposed conditions at Lake Hancock. Little or no impact to the frequency and duration of water levels within the NSP or SSP was determined, concluding that limited impact to stormwater treatment capability is expected.

Figure 26 provides a profile plot along Saddle Creek. The plot shows the maximum stages achieved during the 30 year continuous surface water simulations for existing and proposed conditions. The plot also shows the 25th, 50th, and 75th percentile stages for the simulation period. This figure illustrates the upstream location in Saddle Creek where the stage regimes diverge between existing and proposed conditions.

4.2 Single Event Modeling

Event modeling was conducted primarily to compare the effects of the lake's proposed wet season tailwater condition on the extent and duration of uncommon flood events versus the existing management protocols. Flood profiles around the lake and its inflow tributaries were calculated for a suite of design storms up to and including the 500-year, 5-day event. The event modeling details are described in **Appendices A and B**, and a brief summary follows.

4.2.1 Description of the Watershed

Figure 10 shows the location of the Lake Hancock watershed within Polk County Florida. The Lake Hancock watershed is also known as the Saddle Creek watershed, which is a major tributary to the Upper Peace River watershed and includes parts of the cities of Lakeland, Auburndale, Highland City, and Eagle Lake. The watershed extends north of Interstate-4 and south to U.S. Highway-17. The Lake Hancock watershed comprises approximately 157 square miles, terminating at the confluence with the Peace Creek Drainage Canal and forming the Peace River. Numerous lakes occupy an area of over 20 square miles and water and wetland features comprise over 28% of the watershed. **Figure 11** provides an aerial photograph of the watershed.

Ten hydrologic subwatersheds were identified within the Lake Hancock watershed (**Figure 27)**. Generally, these basins represent distinct drainage systems. However, the Polk County North Central Landfill (NCLF) was modeled as a separate subwatershed due to its proximity to Lake Hancock and the need to evaluate various expansion plans at that location. Topographic surface elevations within the overall watershed range between 93 and 270 feet National Vertical Geodetic Datum (NGVD) (**Figure 28**).

4.2.2 Overview of Lake Hancock Watershed Model Development

Three versions of the single event watershed model were constructed for use in providing supporting calculations. The initial version represents the watershed conditions of 2004 and is designated the 'Base' model. This version was used for the model validation calculations performed with the Hurricane Frances and Hurricane Jeanne simulations. Work completed with this version of the model is documented in **Appendix A**.

A second model version was constructed to represent 'existing' watershed conditions in 2006. This version was used to perform all calculations for the design storm events. The 'existing' watershed condition includes completed construction activities at the Circle B Bar Ranch property along Banana Creek. The major alterations to the property include backfilling of a number of channels to reinstitute a sheetflow regime and construction of two access roads spanning the Banana Creek floodplain. The model also incorporates changes in the watershed that are underway (in construction) at the Polk County North Central Landfill. At the request of FDEP, the ‘existing’ watershed condition includes the fully-filled and closed configuration of the Phase III expansion and its associated stormwater systems. This version of the model includes the comparative analyses completed to determine event peak stages and flows for existing and proposed lake levels. The existing lake level simulations assumed that the lake was brim-full to the maximum structure elevation of 98.7 feet NGVD at the start of each design storm simulation. The proposed lake level simulations assumed that the lake was brim-full to the maximum structure elevation of 100.0 feet NGVD at the start of each design storm simulation. Work completed with this version of the model is documented in **Appendix A**.

A third version of the model was configured to represent the final build-out condition at the NCLF based on a model scenario provided by Polk County’s consultant. This scenario includes the currently proposed long-term condition of the NCLF site at the end of its useful life as a landfill. Analysis for this scenario is provided in **Appendix H**.

Extensive model development work was completed during the preliminary evaluation study to determine the target proposed lake level. Work during this phase effectively doubled the level of detail incorporated in the model and focused more heavily on areas near to Lake Hancock that might exhibit changes in hydrologic and hydraulic performance following project implementation. As documented in **Appendix A**, data for the model update was obtained from numerous sources, including new survey efforts, permit files, state, city and county databases, extensive field reconnaissance, and previous modeling studies. Topographic data sources included watershed-wide light detection and ranging (LiDAR) data collected in January 2004 and several earlier LiDAR datasets and photogrammetric datasets providing 1 foot contour information. Following evaluation, the best available data was selected to develop the watershed digital terrain model (DTM), shown in **Figure 28**.

The computer simulation model selected for this project is a version of Interconnected Channel and Pond Routing (ICPR) (Singhofen, 1995). ICPR is a Streamline Technologies, Inc. computer software product that is commonly used for hydrodynamic watershed analysis and is widely accepted by regulatory agencies in Florida. ICPR is a FEMA accepted model for use in floodplain delineation; however, model calibration is recommended by FEMA when ICPR is used (FEMA, 2004). ICPR uses the NRCS rainfall excess and unit hydrograph methods to transform rainfall over pervious and impervious areas of a basin into surface water runoff. Groundwater or baseflow is not explicitly determined by this method. Final simulations were completed with ICPR version 3.02 SP 8.

ICPR computes direct runoff based on rainfall and runoff parameters specified by the user. Rainfall parameters include depths and temporal distributions while runoff parameters are specified based on subbasin characterization. ICPR generates a runoff hydrograph for each subbasin and then hydro-dynamically routes the flow through a network of stream channels, pipes, weirs, and reservoirs, etc.

The model input data and model calculations are based on the procedures described in the NRCS National Engineering Handbook, Section 4, Hydrology (NEH-4), (SCS, 1985).

Hydrologic or rainfall excess parameters used in the model were determined by evaluating each subbasin's land use and soil type using GIS software. Spatially rectified Land Use and Soil Type GIS coverages were obtained from the SWFWMD internet site (SWFWMD, 2003). The mapping was updated as needed using January 2004 aerial photography to reflect new development in the watershed. The method selected for runoff calculations within ICPR uses both the contribution from impervious areas using the NRCS Curve Number method and the contribution from directly connected impervious areas (DCIA). Curve numbers were assigned to each combination of landuse and soil according to the procedures in the Natural Resources Conservation Service (formerly SCS) Technical Release 55 (TR-55) (SCS, 1986). A composite CN was calculated using GIS overlay analysis for each subbasin by weighted area averaging. In urban and developed areas, CN assignments were based on the underlying characteristics of open lands and pasture (i.e. lawns) and were exclusive of impervious areas since the runoff calculation method chosen evaluates the contribution from directly connected impervious areas (DCIA) separately. DCIA values were assigned to each land use classification to support this calculation.

Using the watershed DTM and survey information, new cross section definitions were developed or existing cross section definitions were updated to more accurately reflect channel geometry. Storage area characterization is also important to determining accurate flood elevations. For modeling purposes, storage areas can be defined as any area that can hold water that is not specified by other means, such as a channel defined with detailed cross section information across the complete floodplain. Storage areas include lakes, ponds, wetlands and simple topographic depressions that can temporarily impound water and can also include floodplain overbank areas where little or no flow is expected to occur. The watershed DTM was used to prepare detailed stage-storage calculations for all water storage areas in the watershed using the GIS software.

Model water surface starting elevations were assumed at wet season conditions, which is typically performed for permit evaluation. Starting elevations for the design rainfall-event model simulations were assigned by assuming that all water bodies regulated by a control structure were brim-full and ready to discharge. In other words, all water storage areas that would reasonably be expected to contain standing water were assumed to contain water up to the invert elevation of the downstream controlling structure or overflow. Starting elevations for isolated topographic depressions were set at the apparent seasonal high for those containing a water or wetland feature and at the depression bottom for developed areas not exhibiting any water features. Seasonal high elevations were estimated for these areas by a combination of careful review of the 2004 aerial photography and field reconnaissance. In addition, aerial photographs obtained in March 1998 during an extremely wet period were consulted, as were a countywide set of false color aerial photographs taken during October 2004 shortly after the series of hurricanes experienced that year.

Flood events of record provide useful information to guide overall model development and determine suitable boundary conditions for large events. Limited information is available concerning significant historic floods on Saddle Creek, Lake Hancock and the Upper Peace River. Flow records at Arcadia date back to 1931, while records for the Bartow gaging station are available back to 1939. Lake Hancock water levels have been recorded since 1958, with discharge from Structure P-11 reported since 1963. The record contained eleven major storms or very wet periods to guide development of boundary conditions, including the unusual sequence of three hurricanes passing over the watershed in 2004.

The flow and stage records available for large events for the Lake Hancock outfall Structure P-11 and the Peace River at Bartow USGS Gage 02294650 were used to develop the downstream time and stage boundary conditions for the modeled events. The Bartow gage is located approximately 16,400 feet downstream from Structure P-11. The Lake Hancock model terminates with a boundary condition at the confluence of Saddle Creek with Peace Creek Canal. This location is approximately 10,300 feet downstream from Structure P-11. Details regarding the development of boundary conditions are provided in **Appendix A**.

Model validation simulations were conducted for hurricanes Frances and Jeanne of 2004 to determine whether the hydrologic and hydraulic components of the watershed model reasonably represents the rainfall - runoff processes of the watershed. These hurricanes provided a unique opportunity to compare the simulated results on a real time basis to the observed data during the events. The SWFWMD had recently acquired Doppler derived rainfall that provided the ability to use rainfall data that could be spatially and temporally distributed over the watershed according to the actual events.

The various simulations conducted as a part of the calibration and verification process were compared and evaluated by using the integral square error, ISE (Marsalek et al, 1975). The ISE is a statistical measure that describes the agreement between the time distribution of observed and computed values of variables such as flood depth and flow. Flood depth values were normalized to depth above either the structure or channel invert elevation, depending on which location was being evaluated.

Smaller ISEs indicate better agreement between observed and computed values. The following ratings have been recommended by Sarma, Delleur and Rao (1969) (in Singhofen, 2001).

0.0% $\leq$ ISE $\leq$ 3.0%	excellent
3.0% $\leq$ ISE $\leq$ 6.0%	very good
6.0% $\leq$ ISE $\leq$ 10.0%	good
10.0% $\leq$ ISE $\leq$ 25.0%	fair
25.0 % $\leq$ ISE	poor

A summary of ISE values for each of the two hurricane ICPR simulations is provided in **Table 7**. The ISE was calculated for each of the hurricanes and at each of the gauges. The ISE values indicate “excellent” fits to observed stages and “excellent”, “very good” or “good” fits to observed flows. Figures showing the hydrographs at these locations are provided in **Appendix A**.

Table 7
Summary of ISE Values for Hurricanes Frances and Jeanne Model Simulations

	Lake Parker Outlet		USGS Gauge CR-542		Lake Hancock Structure P 11	
	Stage	**Flow**	**Stage**	**Flow**	**Stage**	**Flow**
Hurricane Frances	2.36%	5.54 %	2.09 %	3.57 %	1.58 %	5.39 %
Hurricane Jeanne	1.96 %	5.19 %	1.06 %	7.97 %	0.98 %	2.95 %

Overall, the hurricane simulations reasonably reproduced the watershed's responses to the two hurricane events verifying that the model runoff, conveyance, and storage parameters are sufficiently validated. Differences between predicted and observed flows and water surface elevations were typically less than 10 percent of the full range of fluctuation, which is acceptable.

The modeling conducted during this study was to determine flood elevations for existing watershed conditions (98.7 feet NGVD starting elevation) and for the proposed lake level modification (100.0 feet NGVD starting elevation) and to depict the spatial extent of the expected flooding. Flood elevations were determined based on specified rainfall of various return intervals. The SWFWMD Watershed Management Program Guidelines and Specifications (G&S) (August 2002) specifies the rainfall to be used for evaluation purposes. For determination of project effects, the 24-hour and the 5-day, 100-year design storms were used. The G&S specifies that the 24-hour rainfall depths provided in the SWFWMD's Environmental Resource Permitting Information Manual Part D Project Design Aids are to be used in the evaluation. The NRCS Type II Florida Modified dimensionless hydrograph is to be used to distribute the 24-hour rainfall. The SWFWMD's G&S (Table 3 in that document) defines the appropriate rainfall depth total for the 5-Day, 100-Year Storm Event for Polk County as 16.0 inches total rainfall depth. The G&S also prescribes the rainfall distribution to be used for 5-Day events in Table 4 of that document.

Typically, watershed areas that are located in "high relief areas" with no significant backwater effects exhibit higher flood elevations using the 24-hour design storm. "Low lying areas" affected by upstream runoff and tailwater conditions typically exhibit higher flood elevations for the multi-day rainfall events. Another way this is described is that high relief areas tend to be more rate-sensitive, while low lying areas frequently drain more slowly and thus tend to be more volume sensitive.

The model simulations were conducted to assess flood conditions resulting from various storm events based on the existing stage of Lake Hancock, and from the proposed level of 100.0 feet NGVD. The District decided that multiple events should be modeled (**Table 8)**.

Table 8
Modeled Rainfall Events

Rainfall Distribution Period	Return Period (yrs)	Precipitation (inches)
24 hr	2.33 (mean annual)	4.3
24 hr	25	7.5
24 hr	100	10.5
5 day	10	10.6
5 day	50	14.1
5 day	100	16.0
5 day	500	19.2

4.2.3 Model Results and Floodplain Delineation

The general procedure used for creating the floodplain inundation mapping required the detailed setup of mapping cross sections and polygons for each node where water surface elevations were calculated by the ICPR computer model. Cross-section mapping is appropriate for flow-ways such as channel systems while polygon mapping is needed for lakes, wetlands, and other ponded areas. ICPR model results are manually exported to ArcGIS or other GIS software to facilitate the process by assigning the resultant flood elevations to the appropriate map locations.

The model result tables of peak stage elevations for each node are then joined to the mapping cross-sections and polygons. Results from different model runs can then be imported to the mapping elements to assign elevations for automatic floodplain creation.

The watershed DEM was originally produced in Triangulated Irregular Network (TIN) format using ESRI's 3D Analyst and ArcGIS 8.3 software. A watershed-wide five-foot raster grid of elevation data was produced from the TIN. In order to produce the mapping of the inundated areas resulting from the surface water modeling analysis, a new TIN reflecting water surface elevations is produced by combining the model-predicted water surface elevations with mapping elements that represent the ponding areas and channel cross-sections. Via conversion to grid format also using a five-foot grid, the resulting water surface TIN can be subtracted from the existing topographic grid to produce the inundation boundaries. The floodplain grid thus produced is then converted to a shape file to generate the final inundation polygon.

Flood elevations were completed for both the 100-year return interval, 24-hour design storm and the 100-year return interval, 5-day design storm events to determine the extent of the affected areas from the raising of Lake Hancock. The 5-day event proved to be the critical event for Lake Hancock and the immediately associated floodplain areas. Other outlying areas in the watershed responded with higher stages to the 24-hour, 100-year return interval design storm.

Appendix B provides summary tables (**Tables B1 – B9 of the Appendix**) which provide the results for the seven design storm event simulations completed during this study for each of the major conveyances in the subwatersheds. Results are summarized for the 'Base' model that represents 2004 conditions. This version was used for the hurricane model validation simulations. Results are also provided for the Existing and Proposed lake level simulations. These simulations were completed using the 'Existing' model that represents 2006 watershed conditions and incorporates completed construction activities at the Circle B Bar Reserve along Banana Creek and Phase III Expansion activities at the NCLF. **Tables B10** through **B30** of **Appendix B** provide complete listings of model results for all model nodes for all simulations.

Appendix B provides summary tables (Tables B1 – B8) tabulating results from the seven design storm event simulations completed during this study. **Appendix B** also provides large maps (**Figures B1 & B2**) identifying model node locations and labeling.

The predicted peak stage obtained for Lake Hancock for the 100 year flood simulation with a lake starting level of 98.7 feet NGVD (existing conditions) is 102.86 feet NGVD.

The predicted peak stage obtained for Lake Hancock for the 100 year flood simulation with a lake starting level of 100.0 feet NGVD (proposed conditions) is 103.85 feet NGVD.

Flood mapping was prepared by selecting the maximum value from either the 100 year, 24 hour event simulation or the 100 year, 5 day event simulation. **Figure 29** shows the predicted inundated areas resulting from the existing conditions model with a 98.7 feet NGVD lake starting elevation. **Figure 30a** provides a mapping of the predicted inundated areas resulting from the proposed conditions model with a 100.0 feet NGVD lake starting elevation. The inundated areas depicted in these figures includes the water surface elevations for the lake for existing and proposed conditions and extends well beyond areas upstream in the various tributaries that are predicted to display any change in inundation depth or duration. **Figure 30b** shows the floodplain within the project limits and distinguishes between areas that are affected and unaffected by the project. Discussion of the criteria used to distinguish between affected and unaffected areas and development of the project limits is provided in **Section 6**. **Figure 31** provides a stage duration plot for existing and proposed conditions for Lake Hancock.

Additional information regarding specific changes in each tributary is provided in **Appendix A**. Detailed information regarding any particular location represented in the models may be obtained from the tabular listings provided in **Appendix B**. **Appendix J** provides a set of 1"=200' flood maps showing the existing and proposed 100 year flood elevations.

5.0 PROJECT BENEFITS

5.1 Hydrologic Restoration

The proposed Lake Hancock water level modifications were designed specifically to facilitate the flow recommendation adopted to benefit the upper Peace River downstream of the P-11 structure, consistent with MFL legislation. The MFL objective is to restore perennial flow to the upper Peace River while assuring sufficient flow depths to allow for fish passage 95 percent of the time. This project will meet about 50 percent of the required improvement for critical in-stream flows in that segment of the river on an annual basis.

The water level modifications were also designed in a manner that restores Lake Hancock's seasonal high water levels and improves the lake's seasonal and inter-annual stage fluctuations. Lake Hancock and its fringe wetlands have an altered hydrologic regime with lower overall water levels and greatly dampened fluctuations than the system had prior to substantial human alterations. The proposed project is similar to a common approach for ecological restoration in Florida where ditch blocks and/or control structures are used as the primary means to modify water levels to restore historic hydropatterns to a landscape.

The proposed water level modifications will provide improvements to Lake Hancock's wetland functions, returning a wider range of optimal water depths and inundation durations to the landscape. Some flood-sensitive trees that have encroached into some of the artificially dewatered areas will give way to plant species in better balance with the improved water levels. The proposed water regime will restore some existing uplands back to wetlands, causing a return of 301 acres of wetlands to the landscape. These will include the restoration of hydrologic conditions for wet prairie systems, which had been all but eliminated from the area. The proposed net increase of wetlands will partially offset wetland losses that have progressively occurred in the lake's fringe areas since the late 1920's.

Overall, the proposed water regime will enhance wetland function to the area by providing higher water level pulses and greater water level fluctuations that will seasonally interconnect various aquatic and wetland habitats in a manner beneficial to a wide variety of wetland-dependent wildlife especially wading birds, fish, amphibians, alligators, turtles, eagles, and waterfowl. A greater volume of water will be distributed in contact with wetlands for longer durations versus the existing condition. More of the existing landscape's natural capacity for water detention will be utilized. These factors will add to the lacustrine area's capacity to provide wetland functions and values related to flood flow attenuation, water quality transformations, food chain support, wildlife habitat, recreation, in addition to support of the river's minimum flows and levels.

5.2 MFL Recovery at Bartow, Fort Meade, and Zolfo Springs

Previous investigations, (Basso, 2004), have indicated that minimum flows and levels (MFL) were not achieved 19 percent of the time at Bartow and 26 percent of the time at Ft. Meade in the period of 1975 through 2003. This record includes the flow input from the City of

Lakeland's wastewater treatment plant, which was discontinued during 1987. For the proposed project, water budget calculations contrasting the existing Lake Hancock stage regulation schedule versus the proposed schedule did not include Lakeland's former discharge to form a more equitable and accurate comparison.

The MFL Criteria adopted by rule for the upper Peace River tracks success or failure on a calendar year basis. The rule defines a successful year as having at least 95 percent of the daily flow quantities at or above the minimum flow threshold set for each gaging station. This 95 percent goal, when met, will define the flow regime for the upper Peace to be effectively perennial versus seasonally intermittent. Conversely, when daily flow conditions fail to meet the low-flow threshold for at least 5 percent of the calendar year, that year classifies as failing the MFL objective. This means that the MFL benefits of a project are necessarily tracked in terms of how many successful years occur over a long term period with the project versus without it.

The results of this investigation indicate that the proposed Lake Hancock water level modifications and flow delivery schedule will improve MFL's in the Peace River at the Bartow, Ft. Meade, and Zolfo gages moving them substantially closer to the MFL Criteria objective. For conditions evaluated using data from a 30-year period (1975 through 2004), the existing Lake Hancock operating schedule would meet the MFL objective less than 17 percent of years at Bartow, with every year failing at Ft. Meade. The proposed lake level modifications and flow delivery schedule is projected to increase the years meeting the MFL objective to 67 percent at Bartow and 40 percent at Ft. Meade for the period of evaluation. Conditions at the Zolfo gage are not as severe. The Lake Hancock Lake Level Modification Project will meet the Zolfo MFL objective for 87 percent of the years under the proposed condition versus 73 percent for the existing operations schedule.

This project will move the Peace River significantly closer to a perennial stream with ample fish passage, forming the keystone of a multiple project approach necessary to fully satisfy the MFL objectives of the upper river. An evaluation comparing the total number of days for existing versus proposed project conditions indicate 20% more of the MFL objective is met at the two most impacted USGS gages (Bartow and Fort Meade). The result is 96 and 92 percent (respectively) of the critical in-stream MFL requirement on a daily basis for the 30-year simulation period will be met by the proposed project (**Table 9)**.

Table 9
Upper Peace River MFL Benefits

Station	Minimum Flow (cfs)	Frequency Minimum Flow Equaled or Exceeded		Percentage of MFL Objective Met	
		Existing	Proposed	Existing	Proposed
Bartow	17	73%	91%	77	96
Ft. Meade	27	68%	87%	71	92
Zolfo	45	92%	94%	97	99

5.3 Other Expected Benefits

Wetland resources around Lake Hancock will expand, providing greater habitat area for wetland-dependent wildlife. About 300 acres of freshwater marshes, willow swamps, and wet prairies will be recovered. These shallow wetland additions are likely to benefit key wildlife populations already benefiting from the ecosystem such as wading birds, alligators, ducks, and forage fish (shiners, mollies, small sunfish), by providing more forage, nesting sites, and vegetative cover with water. Bald eagles will benefit from some additional forage sites. Suitable habitat will likely be increased for some species currently with small or marginal local populations such as Florida sandhill cranes and round-tailed muskrats.

Furthermore, the amount of seasonal water-level fluctuation will more than double from an existing range of 1.1 feet to 2.4 feet. This amount of increased fluctuation will create foraging opportunities for protected (Listed) wading bird species that depend on such hydropatterns to isolate and concentrate fish, especially white ibis and wood storks.

The combined effects of restoring seasonal high water and recovering a greater amount of water level fluctuations will promote wetland function restoration suggested by Edelson and Collopy (1990) necessary to promote the long-term sustainability of Lake Hancock's diverse and abundant wading bird nesting colonies. Furthermore, these nesting colonies benefit from the low amount of development around the lake that reduces disturbances.

Many of the ecological values associated with the natural systems adjacent to Lake Hancock have been protected through the conservation land program by both the District and Polk County. These lands also contribute to efforts to connect the Peace River and Green Swamp by way of a corridor of conservation lands. The fact that these lands have been acquired greatly enhances the feasibility of completing this proposed project by reducing the amount of private area affected. The District is prepared to acquire the lands or portions of land in private ownership whose land use will be impacted by the proposed project. Those purchases, along with the recent formation of Polk County's Circle B Bar Reserve, means that Lake Hancock's relatively undeveloped shoreline will largely remain at its current land use designation of conservation.

The dewatered condition of Lake Hancock created a lower “base level” or tailwater elevation for streams discharging into the lake. This, coupled with extensive ditching of these streams (upper Saddle Creek, Lena Run, and Banana Creek) near Lake Hancock, has resulted in the flow being largely confined to artificial channels instead of spreading across the adjacent bottomland swamps. This means that much of the normal wetland treatment and carbon exchange between the streams and their floodplains has been lost. This loss is greatest in Saddle Creek. The proposed higher base-level lake stage will promote a more natural regime of bottomland swamp inundation for waters before they enter the lake, essentially allowing the flowing water to more frequently spread across the floodplain swamps. This means that more of the water and associated nutrient loads will be treated by organic soils and wetland vegetation. The tannic color of that water should increase and nutrient loads, especially those associated with algal solids and other particulates, should decrease. Saddle Creek contributes about 32 percent of the total nitrogen, about 63 percent of the total phosphorus, and 34 percent of the total suspended solids loads into the Lake (Harper et al. 1999).

Banana Creek’s water will be restored to contact extensive freshwater marshes independently of the proposed Lake Hancock project as a result of the Circle B Bar FDOT mitigation plan using a series of levees and small hydraulic control structures with seasonal high water levels between 100 and 101 feet NGVD 1929. However, this extensive marsh will be recaptured as a littoral system of the Lake upon restoration of the lake’s seasonal high water levels as well. The higher Lake Hancock base levels will mean that the Circle B Bar restoration will rely less on artificial controls with sudden drops in elevation across structures. The more routinely level gradient across these culverts will promote better fish passage as a two way exchange between the marsh and lake.

6.0 AREAS AFFECTED BY PROJECT

6.1 Project Limits

A significant portion of the evaluation was to determine the areas that will be affected by the project thereby determining the project limits. Delineation of the project limits was based primarily on the surface water modeling results used to evaluate the lake level modification. The criteria for determining the project limits was to identify where the stages and durations for the proposed condition 100 year flood event becomes coincident with the existing condition 100 year flood event. The 100 year flood levels are based on the greater of either the 100 year return interval, 24 hour design storm event or the 100 year return interval, 5 day design storm event at any location. Areas sensitive to runoff rates tend to respond with higher stages from the 24 hour design storm, while areas that are volume sensitive will respond with higher stages from the 5 day design storm.

Most but not all locations within the project limits proved to be rainfall volume rather than peak rainfall rate sensitive, generating higher stages for the 5 day storm event. The criteria for determining the location where proposed and existing conditions become coincident were based on a change of less than less than 0.02 feet (¼-inch) for the 100 year, 5 day event for peak stage, and a maximum difference along other portions of the stage hydrographs for the 5 day event of less than 0.042 feet (½-inch) for water elevations greater than 102 feet NGVD. Elevations of 102 feet and lower are less than the current projected 100 year flood level for Lake Hancock. Typical ERP application review, conducted by District staff in the Polk County area, uses a 0.1 foot difference in the 100 year, 1 day event peak elevation as the threshold between pre and proposed project conditions. A more strict criteria was applied in this situation to determine all potentially affected properties.

Figure 29 shows the existing 100 year floodplain. **Figure 30a** outlines the limits of the projected 100 year floodplain effects as a result of the proposed project. The floodplain shown includes areas that are affected and unaffected by the project. **Figure 30b** shows the floodplain within the project limits and distinguishes between areas that are affected and unaffected by the project. Affected areas exhibit a change in floodplain peak stage elevation or differences in the stage hydrograph based on the criteria described above while unaffected areas show the same performance for existing and proposed conditions.

Total floodplain within the project limits is approximately 11,031 acres. The affected floodplain within the project limits is 9,762 acres. The major difference in total floodplain area and affected floodplain area (11,031 vs. 9,762) is primarily the floodplain associated with the elevated clay settling areas located within the OFP property (south of lake) that are not affected by the project. Similarly, a lake to the north of the landfill, a former borrow pit on private land, a stormwater pond associated with the Polk Parkway, and a private pond on land that the District has under contract for acquisition are also unaffected. The total floodplain increase between existing and proposed conditions is 243 acres.

The resultant project limit boundary (**Figure 32**) was determined by merging information from the 100 year floodplain limits; and boundary information for lands currently owned by SWFWMD and/or Polk County affected by the proposed floodplain, and under contract for acquisition by SWFWMD. Total land area within the project limits is approximately 14,564 acres and encompasses the 9,762-acre floodplain affected by the proposed project. It should be noted that the floodplain and project limit boundaries are approximate since field surveys have not been conducted to determine the exact boundary. No project mitigation or associated construction is planned beyond the project limit boundary.

6.2 Land Ownership Within Project Limits

Sovereign submerged lands, SWFWMD and Polk County Owned Lands, the City of Lakeland Oak Hill Burial Park, private properties, Audubon Society, and other public owned lands: such as the Florida Department of Transportation and college campus properties, are the types of properties encountered within the project limits. A breakdown of land ownership types within the project limits is provided in **Table 10** and shown in **Figure 33**.

Table 10
Breakdown of Land Ownerships within Project Limits

Ownership Description	Acres
Lake	4,725
SWFWMD (Owned or Contracted)	4,486
SWFWMD and County Jointly Owned Lands	1,272
North Central Landfill	1,228
Conservation Easement	753
Cemetery	53
College	19
Private	1,965
Miscellaneous	63
Total:	**14,564**

6.2.1 Lake Hancock

The Lake Hancock acreage (4,725 acres) listed in **Table 10** and shown in **Figure 33** is based on Polk County's parcel map (July, 2006) and the lake-ward parcel boundaries of properties currently owned by SWFWMD. Estimated Lake Hancock acreage at the level pool elevation of 98.7 feet NGVD is 5,657 acres and will increase to 6,747 acres at the proposed operating level of 100 feet NGVD (**Figures 34 and 35**). The sovereign extent of Lake Hancock has not been determined and is currently under evaluation by the State of Florida.

6.2.2 District Lands (Owned and Contracted)

The SWFWMD has purchased or has under contract several parcels around Lake Hancock as part of the Peace River Greenways Connector. SWFWMD solely owns 4,118 acres (former Coscia, OFP, and Griffin Properties) and has under contract 368 acres of the Kent properties for a total of 4,486 acres. SWFWMD also jointly owns 1,272 acres with Polk County, which is known as the Circle B Bar Reserve (formerly the Bellotto Ranch). Restoration of the Banana Creek system through the reserve was recently completed in association with the Florida Department of Transportation (FDOT) wetland mitigation for roadways constructed in the Peace River Basin. Restoration activities within Circle B Bar Reserve were designed to accommodate the proposed Lake Hancock levels. Approximately 2,499 acres of the proposed affected floodplain is contained within these publicly owned properties.

6.2.3 North Central Landfill

The North Central Landfill is located in the Northeastern portion of the project area. Extensive analyses have been performed regarding potential effects to the operation of the facility and are provided in **Appendices C, G, and H** and is discussed in more detail later in this section. The portion of the North Central Landfill area used for solid waste disposal and the Conservation Easement being conveyed to the SWFWMD from Polk County occupies approximately 1,228 and 753 acres respectively. Most if not all of the projected peak changes in floodplain levels will occur within the Conservation Easement. No changes in peak elevations are expected within the landfill area; however, there will be increases in the duration of levels during magnitude events that can be managed using existing onsite facilities. A Memorandum of Agreement (MOA) has been developed between Polk County and the SWFWMD regarding each party's responsibilities regarding future operation and expansion of the facility, and implementation of the proposed Lake Hancock project. A copy of the MOA is provided in **Appendix I**.

6.2.4 City of Lakeland Cemetery and College

The City of Lakeland owns about 186 acres that is used for the Oak Hill Burial Park. The cemetery is located along the west portion of the project limit boundary and south of the Circle B Bar Reserve. The 53 acres designated in **Table 10** is just the area that can be potentially affected by the proposed project. Of the 53 acres affected, 2.5 acres represents the burial plots that could be affected for the more extreme flood and wet conditions. Project effects at the cemetery are discussed in more detail later in this section.

College property affected by the proposed project is about 19 acres all within the proposed affected floodplain. This area is already in the existing floodplain and is characterized as wetlands. No significant changes in peak flood elevations are predicted, and only minor increases in the duration of levels are expected.

6.2.5 Private Properties

Agricultural, residential, Audubon Society, home owners association infrastructure (includes: roads, club houses, and stormwater facilities), industrial, and unplatted lands make up the private properties. The industrial property is currently vacant. About 1,350 acres of the 1,965 acres listed are within the proposed affected floodplain. The 1,965 acres represent about 109 parcels and 46 homesites. Thirty-seven residential structures will be within the proposed floodplain, while 9 are in close proximity. Sixty substantial structures have been identified on these private properties that include homes, mobile homes, barns, and other detached buildings. Lots and homes in proximity to the 100 year floodplain or in areas where only minimal changes in flood elevations occur will be further evaluated to determine whether they will be adversely affected. Currently the project boundary includes these lots. For a comparison of homes and other structures within the existing and proposed floodplain see **Section 6.3.3.1** and **Table 11**.

6.2.6 Miscellaneous

These areas represent lands primarily associated with transportation. The miscellaneous area represents the difference between project limit area and what is accounted for by the Polk County Parcel Map. Proposed project effects on transportation infrastructure are discussed in more detail in **Section 6.3.3.2**. The 63 acres represents 4.3 percent of the total within the project limits.

6.2.7 Summary

Of the 14,564 acres within the project limits, 4,725 acres is represented by the lake, 5,758 acres are owned by the SWFWMD and Polk County, and 1,981 acres are associated with the North Central Landfill and Conservation Area. These areas represent either sovereign submerged lands, lands owned by SWFWMD, or lands where agreements between SWFWMD and County have been formally or informally made. Of the 14,564 acres, there are approximately 1,965 acres of properties that may require further mitigation. Mitigation for necessary properties may include constructed flood protection alternatives or inundation easements and/or acquisition. Additional information regarding project effects is provided in the following sections. For further details regarding proposed mitigation alternatives see **Section 7.0**.

6.3 Determination of Flooding Potential from Lake Level Modifications

6.3.1 Watershed Model Description

Lake Hancock surface water modeling was completed using the Interconnected Pond Routing (ICPR) hydrodynamic model. The event model summary description is provided in Section 4.2 and model development details are provided in **Appendix A**. Flood elevations associated with the surface water modeling are not furnished in this section of the report. **Appendix B** contains tabulated elevations for the various locations represented in the model.

6.3.2 Existing and Proposed Flood Levels

6.3.2.1 100-Year Flood Level - 98.7 feet NGVD (Existing)

The area of inundation projected from the 100 year flood event with a Lake Hancock starting elevation of 98.7 feet NGVD is outlined in **Figure 29.** The 98.7 foot elevation represents the top of the structure when it is closed and the elevation is within 2 tenths of foot of the maximum desirable elevation for the Lake. Structure P-11 was assumed to remain open for the duration of the simulated event. The resultant area of inundation from the 98.7-foot starting level and 100 year flood covers approximately 10,788 acres within the project limits. Approximately 1,269 acres is the floodplain projected for the clay settling areas at OFP that is not affected by the project. Remaining unaffected floodplains are along the eastern boundaries and a lake north of the North Central Landfill. A former borrow pit on private land, a stormwater pond associated with the Polk Parkway, and a private pond on land that the District has under contract for acquisition are also unaffected.

6.3.2.2 100-Year Flood Level - 100.0 feet NGVD (Proposed)

The resultant area of inundation for the 100.0-foot start level and 100 year maximum flood event is outlined in **Figures 30a and 30b** and covers approximately 11,031 acres. This is an increase of 243 acres inundated from the 98.7-foot starting level. The limits of the area of impact were based on the inundation areas that had changes in predicted maximum water surface levels or in the hydrograph recession curve between the existing level starting condition of 98.7 feet and the proposed starting level condition of 100.0 feet as previously discussed.

6.3.3 Impacts from Potential Changes in Flood Level

6.3.3.1 Property Owners/Residents

The 100 year flood simulation for the 100.0 foot lake level predicts that 1,438 acres of the 1,965 acres of privately-owned lands identified within the project limits are within the floodplain. The predicted area of inundation is an increase of 111 acres over the floodplain area under existing conditions.

Impacts that might be experienced under the proposed levels include direct inundation of structures. The term ‘structures’ as used in this report includes homes, out buildings such as sheds, barns and separate garages. A total of 92 structures were identified within the project limits. A total of 26 living units and 9 out structures were identified as potentially impacted by the 100 year flood under existing lake level conditions. An additional 15 living units and 2 out structures are in close proximity to the floodplain. Out structures include detached garages, sheds, barns, gazebos, etc. Similarly, a total of 37 living units and 9 out structures were identified as potentially impacted by the 100 year flood under proposed lake level conditions. An additional 9 living units and 2 out structures in close proximity will be further evaluated to determine if there are adverse impacts.

Table 11 summarizes the number of structures that are within the impact area based on finished floor elevations or current topographic elevations near the structures or building sites. A survey of all structure elevations has not been completed. Survey information, if available, or nearby ground elevations derived from the available topographic information were used to assess whether a structure was likely to be impacted. A structure was also assumed to be impacted if it was encroached on or surrounded by flood waters regardless of finished floor elevation.

Table 11
Estimated Number of Structures with Flood Impacts

Structure Type within Inundated Area	**Lake Hancock Operating Level (feet NGVD)**	
	98.7	**100.0**
Living Units	26	37
Out Structures	9	9
Living Units in close proximity	15	9
Out Structures in close proximity	2	2

6.3.3.2 Infrastructure

Sanitary/wastewater Impacts -The primary impacts to sanitary facilities such as septic tanks would be their impaired function due to increased water levels and direct overtopping. Septic tank impacts during flooding would be approximately equivalent to the number of living units identified in **Table 11**. The 37 homes sites within the 100 year floodplain are considered to have their septic systems affected. The 9 homes in close proximity to the proposed 100 year floodplain will be further evaluated to determine whether septic systems will be affected.

Local Roadways - **Table 12** provides a summary of the impacts to local roadways and private drives (no public access) resulting from the increase in flood levels and extent as a result of the 100-Year flood simulations for proposed lake levels. Increases of 271 feet of local roadway flooding and 129 feet of private drive flooding are expected.

Table 12
Estimated Impacts on Local Roadway and Private Drive Flooding

Potential Impact	Lake Hancock Operating Level (feet NGVD)	
	98.7	**100.0**
Linear Feet of Local Roadway Inundated by 100 year flood	1,815	2,086
Linear Feet of Private Drive Inundated by 100 year flood	4,635	4,764

Limited Access & Primary Highways – SR 540 is the only highway potentially impacted by the project. The current 2000, Polk County, Federal Emergency Management Agency (FEMA), Federal Insurance Rate Map (FIRM) indicates that SR 540 is overtopped by the 100-year flood. The analysis completed during the current study indicates that SR 540 would be nearly overtopped by the 100 year flood event with the existing condition starting level of 98.7 feet for Lake Hancock and minimally overtopped for the simulations at the higher lake starting level. Highway flooding is summarized in **Table 13**, below. The highway was considered flooded if a single lane or both lanes were obstructed.

Table 13
Estimated Impacts on Highway Flooding

Potential Impact	Lake Hancock Operating Level (feet NGVD)	
	98.7	**100.0**
Linear Feet of Highway Inundated by 100 year flood	363	1,433

6.3.4 Wetlands

The existing ecosystem condition of the Hancock project area is the product of a variable history of human alteration with some of the most dramatic changes occurring several decades ago that lowered the normal level of the lake. This has resulted in some of the altered areas now supporting plant assemblages with trees that are 20 or more years old. The restoration of seasonal high water levels and attendant increases in hydroperiod will cause different thresholds of community changes within the existing system. In some areas, some flood-sensitive trees that have encroached into artificially dewatered areas will make way for plant species in better balance with the improved water levels. Initial tree mortality will create variable light gaps that may take a long time to succeed to a swamp with the proposed water level regime.

It should be noted that the selective mortality of tree species with lower flood tolerance is often used as a success criteria for hydrologic restoration projects in Florida. Conversely, for this project, areas with more than 10 percent projected tree mortality were viewed as impacts. This provides a significant implicit margin of safety for comparing the existing and proposed conditions. The District proposes to allow natural ecological revegetation in areas identified with potential tree mortality or where open upland areas are projected to transition to wetlands.

6.3.4.1 Methodology

The Uniform Mitigation Assessment Method (UMAM) was used as a wetland function assessment tool to compare the relative functional losses and gains of the project. Assessment areas were identified and delineated based on existing plant communities, location, change in water environment, and potential for functional changes from the ways these factors interact. Several recovery classifications emerged from this assessment:

- Type 1: Uplands converting to herbaceous wetlands
- Type 2: Marginal herbaceous wetlands stressed from lack of water with probability of good seedbanks and recovery upon rehydration
- Type 3: Forested or herbaceous wetland sites with improvement to the water environment and with scattered mortality to existing stands resulting in less than a 10 percent increase in canopy gaps and no significant potential for a shift to lower quality vegetation
- Type 4: Sites with no net increase or decrease in overall function attributable to the combination of changes in their water environment or community structure
- Type 5: Forested sites with patchy mortality resulting in less than a 30 percent increase in canopy gaps and medium potential for a shift to lower quality vegetation but with an improved water environment
- Type 6: Forested sites with potentially significant mortality resulting in a greater than 30 percent increase in canopy gaps and high potential for a shift to lower quality vegetation but an improved water environment

Types 1, 2, and 3 are quantified as mitigation assessment areas with net functional gains.

Type 4 areas are "project neutral" resulting in no net functional loss or gain.

Type 5 and 6 areas are predicted to lose community structure functions that exceed their gain in water environment function, providing a net functional loss.

Assessment of the potential impacts and wetland recoveries was conducted with ESRI spatial analyst and was supported by ground truthing. Maps were produced using ESRI ArcMap version 8.3. A Digital Elevation Model (DEM) derived from LiDAR flown in 2004 was modified by updating the Lake Hancock area with a bathymetry grid. A raster analysis was then conducted to produce hydroperiods grid based on the model results. Additional basic layers included the 1999 SWFWMD land use and the 2004 LABINS true-color aerial photographs. The base land use layer was compiled at a District-wide scale. The land use layer was then refined by updating the land use based on the 2004 aerial photography. Additional refinements were made to more accurately represent wetland systems wherever appropriate for the assessment area. This required ground truthing on about 10 square miles of land within the total assessment area.

The 1999 land use mapping was also adjusted to be consistent with characterizations made by Polk County on their property near Saddle Creek and the North Central Landfill (NCLF) (source B.J. Bukata of JEA, Inc.). JEA's maps were generally consistent with BCI's observations and acceptable for this submittal.

Relationships between hydroperiod and seasonal high water and seasonal low stages were calculated by assigning seasonal water levels at the P_{17} and P_{83} stage-duration frequencies. The seasonal high water level (SHW) corresponds to flood elevations that are exceeded 2 months out of a year. That gives a probability, or frequency, of exceedance of 17 percent (hence P_{17}). Analogously, water levels will fall below the seasonal low stage (SLW), on average, 2 months out of the year. In other words, SLW has a probability of exceedance of 83 percent (P_{83}), or a 17 percent frequency for lower stages.

The frequency histogram was extracted from the 30-year daily time-step hydrology model of the proposed water budget for the lake.

The following relationships were directly considered in assessing whether a community type shift would occur.

- seasonal water stages versus depth of inundation.
- hydroperiod duration versus seasonal water depth.
- range of acceptable hydroperiods and seasonal water depths by plant community.
- relationships between tree mortality and inundation depth.

For each map section, seasonal water depths and hydroperiod were determined based on a DEM derived from LiDAR. Land uses (wetland types) were queried for consistency with the proposed hydropattern. If the system was dominated by forested wetlands, regression relationships for water depth versus mortality for cypress and for hardwoods were applied to predict mortality. These relationships are conservative as they were originally determined for the Ocklawaha River floodplain impacts from the Rodman Reservoir (Harms et al. 1980), which had a more stable water level regime when the regressions were developed than the proposed regime for Lake Hancock. In other words, the Rodman Reservoir regressions reflect a condition that does not seasonally fluctuate as much as the Lake Hancock Project will and therefore predicts greater stress on trees as they get minimal dry season relief from the high water.

For laurel oak forests, greater than 30 percent mortality was applied if seasonal high water depths exceeded 1 foot. If seasonal high water reached 0.5 feet (5 month hydroperiod), greater than 10 percent mortality was applied for these oaks. The laurel-oak thresholds were based on local effects observed subsequent to the 2004 hurricanes near Lake Hancock.

Figure 36 summarizes the decision tree used to assign recovery Type classifications to the assessment area. This assessment was conducted utilizing the GIS with layers representing the existing topography (1-foot contours), the proposed hydroperiod (1 month intervals), the existing cover classifications and land use, and true-color high-resolution aerial imagery. The overlay of this information was assessed with knowledge of site-specific conditions obtained during field visits.

Once each wetland Recovery Type was assigned and mapped, typical UMAM deltas were assigned by Type and multiplied by the total area assigned to each Type to arrive at a summary determination of the overall functional losses and gains related to the project. Based on observations at a variety of specific wetland areas, typical assessment areas were selected to assign UMAM scores for the various existing communities in each of the different wetland systems described around the lake. The recovery Types were developed to account for particular changes, some positive and some negative, that readily lend themselves to characterizing functional increases or decreases versus the existing conditions. This approach allows for rather typical and generic proposed condition scores to be assigned to relatively large land areas by adjusting the existing UMAM scores up or down based on restoration classification Type. This provides for a fair comparison of the restorative value of the project to its specific impacts with a sufficient degree of scientific robustness to quantify that comparison for a conceptual ERP assessment. If the site were to be used as a mitigation bank to sell the restoration credits, that might warrant a more finely discretized and detailed assessment.

The assessments for all areas are consistent, comparing current conditions to the proposed changes related to the project. Sites with a negative delta are accounted for as an impact assessment (functional loss) area and sites with a positive delta are accounted for as mitigation (relative functional gain) areas based on the following convention,

delta = score with project impact – score of current condition

6.3.4.2 Vegetation Assessment Analysis Results

The combined effects of the proposed water level modifications will result in three types of changes to the existing wetland landscape, 1) hydrogeomorphic changes, 2) land use and cover type categories, and 3) functional attributes.

The hydrogeomorphic changes center on recovery of palustrine areas as part of the lacustrine fringe or level-pool wetland-lake complex. Approximately 301 acres of existing uplands will be restored to wetlands (Type 1 modification) outside of the Circle B Bar Reserve FDOT Mitigation Site. The level-pool (lacustrine-fringe) wetlands currently extend across a land area of about 1,067 acres around Lake Hancock. Under the proposed water level modifications, the total amount of littoral wetlands will be 2,340 acres. While this is a substantial increase above the existing condition, it does not represent a full recovery to the historic geomorphic condition of about 3,000 littoral wetland acres that likely occurred prior to the 1930's. Full recovery to the 1930's hydrogeomorphic condition is largely precluded given that substantial areas east and south of the lake have higher than historic grade as a result of mine spoil and clay redistribution.

About 1,040 acres of existing palustrine wetlands (currently at elevations higher than the lake's existing SHW levels) will become part of the proposed "level-pool" wetland system again, and another roughly 1,000 acres of wetlands currently fringing the Lake will remain as lacustrine-fringe wetlands. Although some wetlands convert to other types of wetlands, no measurable wetland losses will occur.

The land use and cover changes will result in about 306.8 acres of areas with upland FLUCCs that will be converted to wetland communities (**Table 14**). This includes 301.3 acres of areas that are clearly uplands and about 5.5 acres of pasture areas that typically only express wetland vegetation during higher than average periods of annual rainfall. Net increases will occur for freshwater marshes, wet prairies, willow shrub wetlands, and floating leaf emergent communities adding about 333.8 acres of non-forested wetlands to the landscape. While most of these net increases are derived from conversion of uplands, about 27.1 acres of these net increases will result from conversions of existing forested wetlands to non-forested wetlands. Another 8.7 acres of existing mixed forested wetlands and bottomland swamps will convert to cypress dominated communities. The Lake Hancock littoral wetlands under proposed conditions are shown in **Figure 37**.

Table 14
Existing versus Proposed FLUCCS in the Affected Area

Land Use Description	FLUCCS	Existing Acres	Proposed Acres	Difference
Residential	110, 120	8.4	--	-8.4
Pastures	210, 211	257.6	--	-257.6
Freshwater Marshes	210W, 640, 641	682.4	856.1	173.7
Upland Forest	400, 434, 435	80.7	39.9	-40.8
Wetland Hardwood Forests	610, 617	104.6	95.6	-9.0
Bottomland Swamp	615	721.4	702.7	-18.7
Willow	618	47.6	110.5	62.9
Cypress	621	149.7	158.4	8.7
Wetland Forested Mixed	630	270.0	261.9	-8.1
Wet Prairie	643	2.6	95.4	92.8
Floating Leaf Emergent	644	7.7	12.1	4.4
Intermittent Ponds	653	5.2	5.2	--

Net functional improvements are expected to occur on 990.4 acres (Types 1, 2, and 3) (**Table 15** and **Figures 38, 39, 40**, respectively). The project's water levels will encompass about 1,166.7 acres that will not result in any net change in overall wetland function (Type 4) (**Figure 41**). The proposed water level modifications will cause wetland tree mortality and associated short-term functional losses on portions of about 178.8 acres (Types 5 and 6) (**Figures 42 and 43**, respectively).

Table 15
Wetland Recovery Types and Area

Recovery Type	Description	Area (acres)
1	Uplands recovered to wetlands	301.3
2	Marginal wetlands with restored water environment and improved community structure	5.5
3	Wetlands with improved water environment	683.6
4	Wetlands with no net functional change	1166.7
5	Wetlands with improved water environment and moderate tree mortality	162.8
6	Wetlands with improved water environment and substantial tree mortality	18.0

Type 1 represents areas where existing uplands will be recovered as wetlands. The term "recovered" is warranted because such areas where the existing topography has not been altered by mining simply returns dewatered wetland areas to their historic wetland configuration. A good example can be seen by comparing the outer shapes of the marsh and wet prairie signatures apparent on the 1941 aerials along the lake's northeastern area with the predicted extents of Type 1 wetlands restored by the proposed hydroperiod alterations. The similarity of the proposed wetland shapes to the historic limits is rather striking.

Types 2 and 3 are existing wetlands where the project will provide positive deltas resulting in net functional gains. Type 4 areas were project neutral. Types 5 and 6 produced negative deltas resulting in net functional losses applied to the areas affected. The total functional gain predicted for the project is 234.6 units (**Table 16**). This is partially offset by a total functional loss of about 6.0 units. Therefore, the project has a net benefit of 228.6 wetland functional units. That is about a 39:1 ratio of functional gain versus functional loss.

Table 16
UMAM Functional Gains and Losses

Recovery Type	Area (acres)	Generic Delta	Functional Gain	Functional Loss	Net Gain
1	301.3	0.700	210.9		
2	5.5	0.200	1.1		
3	683.6	0.033	22.6		
4	1166.7	0.000	--	--	
5	162.8	-0.033		-5.4	
6	18.0	-0.033		-0.6	
TOTAL	**2,338**		**234.6**	**-6.0**	**228.6**

This result is not surprising given that the project creates a net gain of 301 acres of wetlands and restores seasonal high water levels to another approximately 2,000 acres of existing wetlands. The newly recovered wetlands will result in 174 acres of freshwater marshes and the re-introduction of wet prairie hydropatterns on 93 acres to the lacustrine wetland system (Table 10). The project restores historic seasonal high water levels to a system that has been altered by lower lake levels and ditched streams and sloughs leading into the lake. This hydrologic recovery will cause localized tree thinning where historically inappropriate species have invaded and will convert about 27 acres of existing swamps to marsh communities. Despite these canopy conversions, comparatively large, extensive stands of wetland forests will remain intact within the affected area (more than 1,200 acres). The main differences caused by the proposed project will be that the affected areas will have restored flood durations more typical of lacustrine bottomlands than what currently exists.

Therefore, the proposed Lake Hancock lake level modifications will have a positive effect on the functional capacity of the assessment area’s wetlands. The positive effects primarily benefit the water environment by restoring more natural water level fluctuations and historic seasonal high water levels around the lake. This will increase the water quality functions and flow attenuation functions of the system. A diverse array of wetland-dependent wildlife species will also benefit from the project, especially nesting and foraging wading birds. This project was conceived primarily to provide ecosystem benefits to the Upper Peace River related to the river’s requirements for restoring minimum flows and levels. It will also benefit the historically dewatered lacustrine wetlands around Lake Hancock itself.

6.3.5 Water Quality

It is not unreasonable to speculate that modifying the water level of Lake Hancock might modify the lake's water quality. As a test of whether or not water quality in Lake Hancock varies in a predictable manner with variation in lake levels, phytoplankton abundance from Polk County's extensive water quality monitoring program was paired with data on lake levels for that same day. These two parameters were plotted against each other in **Figure 44**.

No statistically significant relationships could be found between these two variables for the range of elevations that occurred during the study period (96.6 to 98.7 feet NGVD). Consequently, there does not appear to be a reasonable basis for concluding that water quality (as represented by phytoplankton biomass) would improve or degrade in response to modifications of the lake's water level alone. Algal biomass is an appropriate variable to focus upon because it is directly caused by the nutrient abundance within the lake and is also a major forcing function related to daily dissolved oxygen crashes in the lake.

Due to the large algal biomass in the lake, the lake’s waters experience wide swings in pH and dissolved oxygen during the course of a day. ERD (2005) found pH values varied between less than 8 to greater than 10 in a 24 hour period, while dissolved oxygen levels varied from less than 1 mg / liter to greater than 12 mg / liter during that same time period. Increases in lake level values for Lake Hancock are unlikely to degrade water quality any further, given such conditions.

However, water quality entering the lake may improve simply because the higher tailwater conditions in the Lake will allow more of the water from upper Saddle Creek to be filtered by bottomland swamps as opposed to being directly conveyed via the artificial ditch that has replaced the stream. This could increase humic coloration and reduce nutrient loads. These improvements are unlikely to allow the Lake to reach any kind of measurable improvement in trophic status, but is a step in the right direction.

The District's proposed lake level modification project for Lake Hancock is expected to redistribute existing flows such that there would be lower hydrologic loads to the Peace River in the wet season, and higher hydrologic loads in the dry season. Overall flow volumes from Lake Hancock, on an annualized basis, are expected to change by less than one percent.

In many river systems, nutrient concentrations are often inversely related to flows. That is, concentrations are lower under high flow conditions, and higher under low flow conditions. If that were the case in the Peace River as well, it would be possible for nutrient load changes to be of greater magnitude than hydrologic load changes alone. For example, if nutrient concentrations were highest under low flow conditions, then an increase in flows occurring during low flow regimes might be accompanied by concurrent elevated nutrient concentrations, resulting in a proportional nutrient load increase greater than the proportional increase in hydrologic loads.

To determine if such a situation could occur with altered flow regimes associated with the Lake Hancock lake level modification project, Water Year 2003 data were analyzed at a number of gage locations in the Peace River watershed. Data were tested to determine if there was a relationship between flows and nutrient concentrations. Results from several of these locations are shown in **Figure 45**.

None of the four locations exhibited a statistically significant relationship between flow rates and nutrient concentrations. Consequently, there is no evidence to suggest that nutrient concentrations would either increase or decrease in any predictable manner with variation in discharge rates.

As annual rates of discharge are expected to vary by less than one percent in response to the lake level modification project, nutrient load changes would be expected to change by less than one percent as well. Although phytoplankton levels in the Upper Peace River are related to nitrogen availability, no demonstrable impact to water quality in the Upper Peace River is expected to occur, in response to the altered flow regimes that would accompany the Lake Hancock lake level modification project.

The results of water quality analyses can be summarized as follows: 1) Water quality in Lake Hancock, Peace River, and Charlotte Harbor can be characterized as poor, poor to fair, and good (respectively), 2) primary production in all three systems appears to be nitrogen-limited, 3) water quality in Lake Hancock is not expected to measurably increase or decrease in response to an increase in lake levels, and 4) water quality in the Peace River and Charlotte Harbor is not expected to either increase or decrease in response to altered flow regimes that would accompany the Lake Hancock lake level modification project.

6.3.6 Polk County North Central Landfill

The Polk County North Central Landfill (NCLF) is located east of Saddle Creek, north of Lake Hancock. The southern edge of the property is approximately ¾ mile north of the lake. The currently active area (Phase II) is about 1.75 miles north of the lake and the northern extent of the property is about 2.5 miles from the lake. The NCLF would not be directly inundated by a change in the operating level of Lake Hancock. However, the Lake Hancock water level modifications potentially could alter conditions at the landfill in two ways, 1) the higher tailwater conditions in the lake and Saddle Creek could cause a persistent rise in the groundwater table at the landfill and 2) the higher tailwater conditions could cause greater backwater effects during high volume storm events causing increased inundation at the landfill.

Potential effects to the NCLF resulting from possible changes in water elevation that were thoroughly analyzed include:

1. Increased leachate migration resulting from greater groundwater contact with unlined waste cells.
2. Uplifting and interference with existing facilities such as liners, piping, and leachate collection systems.
3. Reduced capacity in existing stormwater systems due to higher ground-water levels.
4. Loss of solid waste volume and increased construction costs resulting from raising the new facilities to higher base elevations.
5. Potential changes to the flood hazard level of service within the landfill.
6. Possible permit issues with a proposed vertical expansion and other components of the ultimate (e.g. 70-year) conceptual buildout of the NCLF.

BCI conducted several analyses comparing two sets of conditions, the existing lake tailwater regime versus the proposed regime, to assess these concerns, including:

1. A steady-state 2-D groundwater model representing vertical slices at several transects across the landfill extending down to Saddle Creek. This model explored possibilities for persistent rises in the groundwater table at critical liners and unlined cells to address concerns Number 1, 2, and 4 listed above. The model represented the surficial and Floridan aquifers at the site. Details are provided in **Appendix G**.
2. A continuous water-balance and dynamic surface conveyance simulation for a 30-year period to assess the effects on the existing stormwater ponds to address concern Number 3 (summarized in Section 4 of the current report and covered in detail in **Appendix C**).
3. Event modeling for engineering design storms to address concern Number 5 (detailed in **Appendices A and B**).
4. Event and continuous simulations were conducted to represent conditions expected by Polk County's consultant for the NCLF's ultimate buildout concept. These simulations compared existing versus proposed lake tailwater conditions on flood level-of-service and stormwater management for the County's desired buildout plans addressing concern Number 6. Details are provided in **Appendix H**.

6.3.6.1 NCLF Ground Water Model

Lake Hancock's water levels will reach a seasonal high of about 100 feet NGVD as a persistent condition versus the existing persistent levels of about 98.3 feet NGVD. 'Vertical slices' through the area of the NCLF were represented by a ground water model, SEEP/W, to assess the affects of these tailwater systems on the groundwater profile through the landfill at three transects. The upper layers of the model represent the Surficial aquifer and landfill cells. The Intermediate confining unit and Upper Floridan aquifer were also represented as layers underlying those model elements representing the Surficial aquifer. Fixed head boundary conditions are used to represent Saddle Creek, Lake Hancock, unlined perimeter ditches, wetlands, and storm water ponds. The bottom of the Upper Floridan aquifer is assumed to be a no-flow boundary of the bottom layer. Site geologic parameters were based on information provided by landfill staff and consultants.

Bottom liners at the landfill are assumed to be no-flow boundaries with no ground water recharge. Since leachate is collected and kept separate from stormwater in these areas, the areas above the bottom liners were not included in the model.

The SEEP/W simulations and available monitoring well data demonstrated that the landfill's ditch and pond systems exert substantial control on the groundwater table. If those hydraulic systems are managed much as they are today, the groundwater table will rise about a maximum of one-tenth (0.1) of a foot in lined and unlined waste disposal areas as a result of the proposed project. If it is deemed that this rise is adverse, the simulations predict that the stormwater ponds or ditches could be hydraulically controlled to more than mitigate this effect. For example, simply lowering the weir inverts of the North and South stormwater ponds by about two-tenths (0.2) of a foot would cause a net decrease in the groundwater table, which is more than sufficient to overcome the effects of the Lake Hancock water level modification. **Appendix G** provides a summary report.

In retrospect, this result is not surprising considering the relative elevations of water levels embayed by Lake Hancock in Saddle Creek, which are proposed to be at 100 feet NGVD, versus the NCLF's existing pond and ditch control elevations, which exert groundwater control in the landfill at an elevation of around 101 feet NGVD or higher. The proposed Lake Hancock water level modifications, which are projected to cause a persistent wet season rise of about 1.7 feet (20 inches) in the Saddle Creek bottomlands near the landfill, would have to rise about 2.7 feet before embaying the NCLF's groundwater control systems.

Furthermore, the continuous simulations, which include the effects of rare hurricane events, indicate that the inherently wide range of riparian stage fluctuations of Saddle Creek are not increased in amplitude by the proposed lake level modifications adjacent to the landfill. That would appear to preclude problems related to increased liner flexures related to increased groundwater fluctuations as a result of the proposed Lake Hancock project, even if the groundwater system were not under sufficient internal ditch and pond controls within the landfill property.

6.3.6.2 NCLF Surface Water Event Models

Event modeling presented for the watershed includes the completed NCLF Phase III configuration that is currently in construction. The Phase III model provided by the County's consultant was incorporated within the full watershed model to ensure consistency of the approach and the County's nomenclature for model elements was retained. Phase III was designed assuming proposed Lake Hancock levels for the MFL recovery. The watershed modeling work is described in detail in **Appendix A**.

6.3.6.3 NCLF Buildout Surface Water Models

Polk County has developed a long-term conceptual plan for utilization of the North Central Landfill (NCLF) site. The conceptual plan covers future operations for approximately 70 years. Both the continuous surface water model and the event model used for other analyses during the permitting process were modified to include the final buildout configuration for the NCLF to ensure that future plans are compatible with the proposed lake level modification. **Appendix H** provides a summary report describing the continuous surface water modeling and event modeling completed for the NCLF final buildout configuration. Again, the ultimate buildout concept was based on the proposed Lake Hancock levels for MFL recovery.

A continuous surface water simulation representing a 30-year period (January 1, 1975 through December 31, 2004) was conducted to evaluate changes in the Upper Saddle Creek flow regime north of Lake Hancock associated with the proposed lake level modification. The simulation of the 30 year period was conducted to compare Upper Saddle Creek's water surface profile under the existing lake level fluctuation regime to the water surface profile under the proposed lake level fluctuation regime. The analysis described in this report represents conditions after the final North Central Landfill expansion plans have been implemented.

The continuous surface water modeling exercise focuses primarily on proposed changes in the vicinity of Polk County's North Central Landfill (NCLF). The modeling estimates potential impacts to the operations of stormwater facilities at the NCLF. In addition, tailwater conditions of the proposed west stormwater treatment/attenuation pond within the NCLF were evaluated to determine if its intended treatment function would be impacted. The impacts of diverting the runoff from the NCLF to northern portions of Saddle Creek were evaluated for change in stages in Saddle Creek and Lake Hancock. The continuous simulation modeling conducted during this exercise is exactly analogous to the analysis prepared in **Appendix C**, which can be consulted for additional details on procedures and for review of results.

A continuous surface water modeling study incorporating the changes proposed at the NCLF for the final buildout expansion plans was conducted to estimate the changes in Saddle Creek and Lake Hancock stages as compared to the proposed lake level conditions for the existing landfill, as documented in Appendix C. The modeling study allowed evaluation of the potential impacts of higher stages in Saddle Creek resulting from modified Lake Hancock water levels on the perimeter ditch systems and stormwater ponds associated with the final buildout plans.

With the exception of a minimal increase in stage duration characteristics at the model node location receiving the majority of the NCLF site stormwater discharges in the buildout scenario (41.5 % of time exceeding 100.0 feet for buildout conditions versus 40.4 % of time exceeding 100.0 feet for existing NCLF conditions), performance at all nodes within Saddle Creek included in the simulation was very similar to the performance reported in the continuous surface water modeling simulations summarized in **Appendix C**. The future site configuration of the NCLF under the final buildout scenario is expected to have very minimal impact on the flow characteristics of Saddle Creek.

During extremely wet conditions, water levels in Saddle Creek exceed the weir slot elevation and potentially limit the discharge from the WSP of the NCLF. A summary tabulation of water level data comparing simulated water levels for existing and proposed conditions indicates that there may be a very slight increase in the number of occurrences and the number of days per occurrence that the weir slot at the storm water pond will be inundated under proposed conditions at Lake Hancock. However very little or no impact to the frequency and duration of water levels within the WSP and ESP is projected and similarly limited or no impact to the stormwater pond treatment capability is expected. The recent modification to raise the weir slot elevation from 102.3 feet NGVD to 102.5 feet NGVD further reduces the number of occurrences and the number of days per occurrence that the weir slot at the storm water pond would be predicted to be inundated under existing or proposed conditions at Lake Hancock. The main weir elevation of 104.0 feet NGVD was not predicted to be exceeded during the 30 year simulation period under either existing or proposed lake level operations for the final buildout conditions.

The event model for the watershed was likewise updated to include the proposed changes in the vicinity of the NCLF resulting from the long-term buildout plan. Methodology for this exercise was the same as described in **Appendix A**. The simulations were conducted for the proposed lake level of 100.0 feet NGVD. The results from the final buildout scenario event simulations were compared to the proposed lake level simulations conducted with the 2006 watershed conditions model.

A detailed storm event modeling analysis incorporating the landfill final buildout expansion plan was conducted to complete the evaluation of the site. Model simulation with the proposed lake level and the NCLF final buildout conditions was completed to evaluate any changes in predicted stage at Lake Hancock and Saddle Creek for comparison with results from the watershed model representing 2006 watershed conditions. An analysis of other potential offsite impacts from the expansion of the landfill was also completed. The 100 year return interval design storm of 5 days duration was considered for the purpose of this exercise.

The event modeling analysis placed the proposed final buildout configuration of the NCLF within the full Lake Hancock watershed model for simulation. The implementation of the NCLF final buildout expansion plan has minimal or no effect on Lake Hancock or Saddle Creek stages. The proposed modification in Lake Hancock lake level to 100 feet NGVD appears to be compatible with the function of the proposed landfill stormwater treatment and attenuation systems. No adverse floodplain impacts were identified as the design appears to adequately address floodplain compensation issues for the NCLF site based on similar hydraulic performance within Saddle Creek and at Lake Hancock when comparing 2006 watershed model results and the final buildout model results. Offsite impacts associated with apparent undersized diversion streams around the site identified with the full watershed model implementation were considered minor and can be readily remedied during final design.

The stormwater and groundwater controls proposed by Polk County’s consultant for the NCLF’s ultimate buildout conditions appear to be designed such that they are inherently compatible with the District’s proposed Lake Hancock water level modifications.

6.3.7 City of Lakeland Oak Hill Burial Park

The City of Lakeland’s Oak Hill Burial Park is located west of Lake Hancock and contiguous with the Circle B Bar Reserve, south of Banana Creek. The Lake Hancock water level modifications could conceivably alter conditions at the cemetery in two ways, 1) the higher tailwater conditions in the lake could cause a persistent rise in the groundwater table at the cemetery and 2) the higher tailwater conditions could cause greater backwater effects during high volume storm events causing increased flooding at the cemetery.

To address the potential impacts at the cemetery, single event modeling results for the existing and proposed conditions were evaluated. Model results at node N5012E2 indicate that peak stage changes occurred for only the 100 year, 5 day results at this location. The elevation increase was 0.16 feet. This node represents the 2.5 acres of concern within the Oak Hill Burial Park.

The existing and proposed condition surface water modeling results include the works performed by the SWFWMD and Polk County on the Circle B Bar Reserve to restore the sheet flow characteristics of the Banana Creek system. The restoration work at Circle B Bar allowed the lowering of a control invert for the cemetery from approximately 102.5 to 101.5 feet NGVD. Models used in the evaluation include this modification.

Monitoring wells have been installed at the burial park to provide additional insight into water table fluctuations. The purpose of the monitoring wells is to determine whether water table fluctuations are influenced by local or offsite conditions.

7.0 MITIGATION

7.1 Introduction

The primary component of this project is to provide recovery for about 20% of the Minimum Flows and Levels (MFL) days not met in the upper Peace River that have been impacted by groundwater withdrawals. Sufficient detail has been provided in other sections of the application regarding the purpose of the Lake Hancock Project, so it will not be re-hashed in this section. This section summarizes the mitigation of incidental aspects of implementing the proposed lake level modifications.

This section specifically addresses the mitigation concerns related to the Conceptual Environmental Resource Permit (CERP) application for implementation of the proposed Lake Hancock Project as it will affect

- Floodplains
- Private property
- Wetlands
- Water quality
- Endangered species
- Transportation
- Solid waste disposal (NCLF)
- Cemetery (Oak Hill Burial Park)

The purpose of this section is to provide a brief description of the proposed mitigation and why the mitigation is necessary. Appendices that provide detailed background information regarding each of these mitigation areas are referenced.

7.2 Floodplain

7.2.1 P-11 Structure Replacement

Currently, releases from the lake are controlled by the structure until it is overtopped at an elevation of 98.7 feet. NGVD. Raising the lake level to the proposed elevation of 100.0 feet. NGVD will necessitate replacement or significant modification of the P-11 structure. Existing P-11 discharges are influenced by downstream water levels or tailwater conditions. When the structure becomes overtopped, outflows become predominantly controlled by the downstream conveyance capacity of Saddle Creek and Peace River. The existing capacity of the P-11 structure and associated Saddle Creek/Peace River conveyance was determined by reviewing historical stage and flow data.

Lake levels for the proposed project condition were modeled with the condition that floodplain effects would be limited to those areas upstream of the P-11 structure by maintaining the historical capacity of the system. The proposed replacement structure will be designed and operated to maintain the current flow capacity of the existing outfall to keep all project effects upstream. In other words, the replacement control structure will be designed and operated to maintain the existing flood flow releases such that they are not increased downstream. The continuous and event simulations were developed in accordance with this management protocol. **Figure 46** provides a conceptual plan and profile for the proposed P-11 structure.

7.2.2 Private Properties

The raising of Lake Hancock's normal operating level to provide storage for MFLs will increase the depth and spatial extent of the areas inundated during storm events. Both continuous and single event surface water modeling of the total watershed were conducted to determine the extent and magnitude of these effects in the vicinity of Lake Hancock. The spatial extent of the areas affected by the project have been identified in the application form, **Section 6**, **Appendices A, B, and J,** and **Figure 32**. The Southwest Florida Water Management District (SWFWMD) will negotiate with the affected owners to determine the mitigation requirements (acquisition or inundation easements) to accommodate the expected increase in inundation.

Just east of the Old Florida Plantation (OFP) property (SWFWMD Parcel 20-502-101), some inundation of private property was determined to occur beyond the current property boundary. To mitigate for the minor increases in inundation, it is proposed that structures connecting several ponds on OFP that function as conveyance ways for the offsite runoff be increased. This mitigation measure will also provide some flood protection for flood prone properties in the Gordonville Road and in the Eagle Lake outfall areas as identified by Polk County.

7.2.3 City of Lakeland Cemetery - Oak Hill Burial Park

The Oak Hill Burial Park is located along the Banana Creek tributary and south of the Circle B Bar Reserve just west of Lake Hancock and has been in existence since 1927. The eastern portion of the Burial Park has experienced shallow flooding and high water table conditions in the past and during Hurricane Frances in 2004. The cause of the flooding was a combination of the accumulation of local runoff and high water levels within Banana Creek flowing onto the Burial Park. Hurricane flood waters reached an elevation of approximately 103.5-103.7 feet NGVD within the Burial Park. Burial Park staff created a temporary berm to isolate the ponded area and deployed a temporary pump to alleviate the problem.

Since the 2004 flooding, the SWFWMD and Polk County have restored a large portion of the Banana Creek sheetflow regime. When the area was under private ownership, a main channel was constructed with berms to contain the Banana Creek flows to allow pasturing of the historical floodplain. Pumps were installed in the bermed off areas to keep them dry. Perimeter berms were also constructed that blocked some of the offsite inflow to the property in the vicinity of Burial Park. Restoration of the site removed a significant portion of the berms and their effects. Before the restoration, water could not move in or out of a wetland depression located just east of the Burial Park until an elevation of approximately 102.5 ft. NGVD was achieved. Water can now move in or out at an elevation of 101.5 ft. approximately. These restoration effects were incorporated into the existing and proposed surface water modeling.

Comparison of the existing and proposed water surface elevations for Lake Hancock in the potentially effected area of the Burial Park showed no effects from the proposed Lake Level project until a 50-year, 5-day magnitude rainfall event occurs, which is greater in magnitude than the Hurricanes of 2004. Based on historical data, this event compares to Hurricane Donna that occurred in 1960 that generated the stage of record for Lake Hancock. The effect for the 50-year event is not an increase in water levels, but an increase in the duration of the levels. It is not until the 100-year, 5-day event that an increase in peak levels and durations are realized from the proposed project. The increase in peak elevations for this event is just under 0.2 feet or 2.2 inches from an existing elevation of 103.73 to 103.91.

Lowering of the overflow in the depression is expected to provide additional movement of groundwater away from the cemetery. Historically the outlet ditch draining the wetland depression east of the cemetery had an overflow elevation of around 102.5 feet NGVD maintaining a higher water level for longer periods during significant runoff events. Field reconnaissance of the Burial Park, plus the observed inundation that occurred during the hurricanes of 2004 suggests that this area has periodically experienced, in the past, either inundation and/or high water table conditions. Channels have been constructed between the eastern portion of the Burial Park and Banana Creek to remove surface waters. The channel leading to Banana Creek was never connected until just recently to allow exchange of water from the wetland at a lower elevation. The normal seasonal high water elevation in the depression was identified as approximately 99-101 feet NGVD, which is in keeping with predisturbed terrain for the area. The improved connection will serve to decrease flood elevations and antecedent conditions within the Burial Park for all events up to the 50-year, 5-day event for proposed lake levels without affecting the historic wetland functions of the depression linked to the outlet ditch.

No mitigation for the Burial Park is proposed at this time, other than what has already been achieved through the restoration of the Banana Creek system within the Circle B Bar Reserve. Two surficial wells have been constructed and one intermediate aquifer well located on the Burial Park have been set up for continuous monitoring. One surficial well is located within the wetland depression while the other is located within the Burial Park near the irrigation well. The aquifer well is located along the southern boundary of the Burial Park. During construction of the surficial wells in May 2006, no groundwater was observed indicating some degree of connection with the deeper Floridan Aquifer. Several feet of impervious clays were encountered in the pilot test wells at the wetland depression and the aquifer well. At the pump house well, approximately 25 feet of sand overlays dissolved limestone and silt with no clays encountered. The water level in the aquifer well was estimated around 72 ft. NGVD in May 2006. Data from these wells will be analyzed after sufficient record has been obtained to determine whether mitigation is necessary.

7.2.4 Polk County – North Central Landfill (NCLF)

Continuous surface water, single event, and groundwater modeling have been conducted to determine the potential effects of the proposed project on the operation of the landfill facility. Modeling results suggest that the proposed project can be implemented with minimal mitigation for the current configuration of the facility. Model results show no increase in peak flood stages throughout the facility. The only concern is that the duration of the recession portion of the stage hydrographs for magnitude events (10-year or greater return frequencies) may occur that could affect existing and proposed water table controls throughout the landfill. Operation of existing pumps can be extended if it is decided to control groundwater levels to a greater degree. No floodplain compensation as a result of the project is required for the existing facility or the ultimate build-out.

The SWFWMD and Polk County have negotiated a Memorandum of Agreement (MOA) to address Lake Hancock project and landfill interactions. The MOA is included in **Appendix I** for reference. The MOA provides a cooperative framework to facilitate decisions to maximize the compatibility between the Lake Hancock water level project and continuing landfill development. It provides a basis for District compensation to Polk County should the lake level project require mitigation that has economic impacts on the landfill infrastructure or operations. The MOA is also framed to assure that permit reviewers are provided with a consistent set of data, design plans, and modeling input parameters for areas where the two project evaluations intersect.

7.2.5 Transportation

Local public roadways that provide access to private properties that become impassable as a result of the project will be raised to ensure continued access. Only a few hundred feet are affected during magnitude events. Hwy 540 (SR 540) just north of Lake Hancock is the only major public highway affected during the proposed project 100 year 5 day event for both existing and proposed conditions. If the service level of the highway is affected by the project then either drainage improvements will be made and/or portions of the roadway will be raised.

Potential impacts were identified for a series of stormwater ponds at the interchange of SR 540 and SR 591 (Polk Parkway) and for some individual ponds associated with the Parkway when comparing existing and proposed Lake level conditions for this project. Design storm modeling used in permitting of the Parkway differed from that used during this study so it is difficult to make a definitive comparison. Existing Lake conditions water surface results for the Parkway design model are higher than the proposed condition results for the Lake Hancock Project. It could be potentially concluded that the project will not have an effect on the interchange and Parkway ponds as designed.

7.3 Wetlands

Implementation of the proposed lake level, and associated fluctuations that will occur as a result of MFL recovery and natural climatic factors have been demonstrated to greatly improve wetland conditions within the project area. Evaluation of historical photos of the wetland fringe surrounding Lake Hancock indicate that several hundred acres have been affected by the historical draining and lowering of the lake. Analyses of projected water level fluctuations expected from the project indicate that wetland function for these areas will greatly be improved. The project on its own merits has been demonstrated to provide substantial recovery for past wetland impacts (**Section 6.3.5, Appendix D**). Calculated net lift from the proposed project is 228.6 units of credit using the Unified Mitigation Assessment Method (UMAM) scores.

Other components of the project requiring wetland mitigation not fully considered at this time will be included in the UMAM score. Such components include the modification of the P-11 structure, wetland mitigation requirements for the North Central Landfill as directly affected by the project, and wetland mitigation requirements for the Development of Regional Impact (DRI) associated with the OFP property. Projected credit use for the outstanding components is about 50% of the current net credits.

7.4 Water Quality

The Lake Hancock project is not a generator of pollutants that would directly affect water quality. Any impacts to water quality as a result of raising the lake would have to result from a change in in-lake processes that would either enhance the production or release of pollutants into the water column. Statistical evaluation of lake stage to phytoplankton biomass resulted in no correlation. Therefore it is concluded that changes in in-lake processes will not occur as a result of raising the operational level by 1.3 feet.

Another concern is for change in the Peace River's water quality due to the MFL recovery. Flow alteration for MFL recovery is expected to redistribute existing flows such that there would be slightly lower hydrologic loads in the wet season and higher hydrologic loads in the dry season. Statistical reviews of nutrient concentrations versus flows along the Peace River suggest no trends with flows. Therefore, existing water quality characterization along the river should remain unchanged with respect to cumulative or total maximum daily pollutant loads. No water quality mitigation is proposed for the lake or its discharge.

7.5 Endangered Species

No listed species will be adversely affected by the project. It is possible that some wetland-dependant listed species will benefit from the restoration of wetland hydroperiods and recovery of wet-prairie hydrology around the lake.

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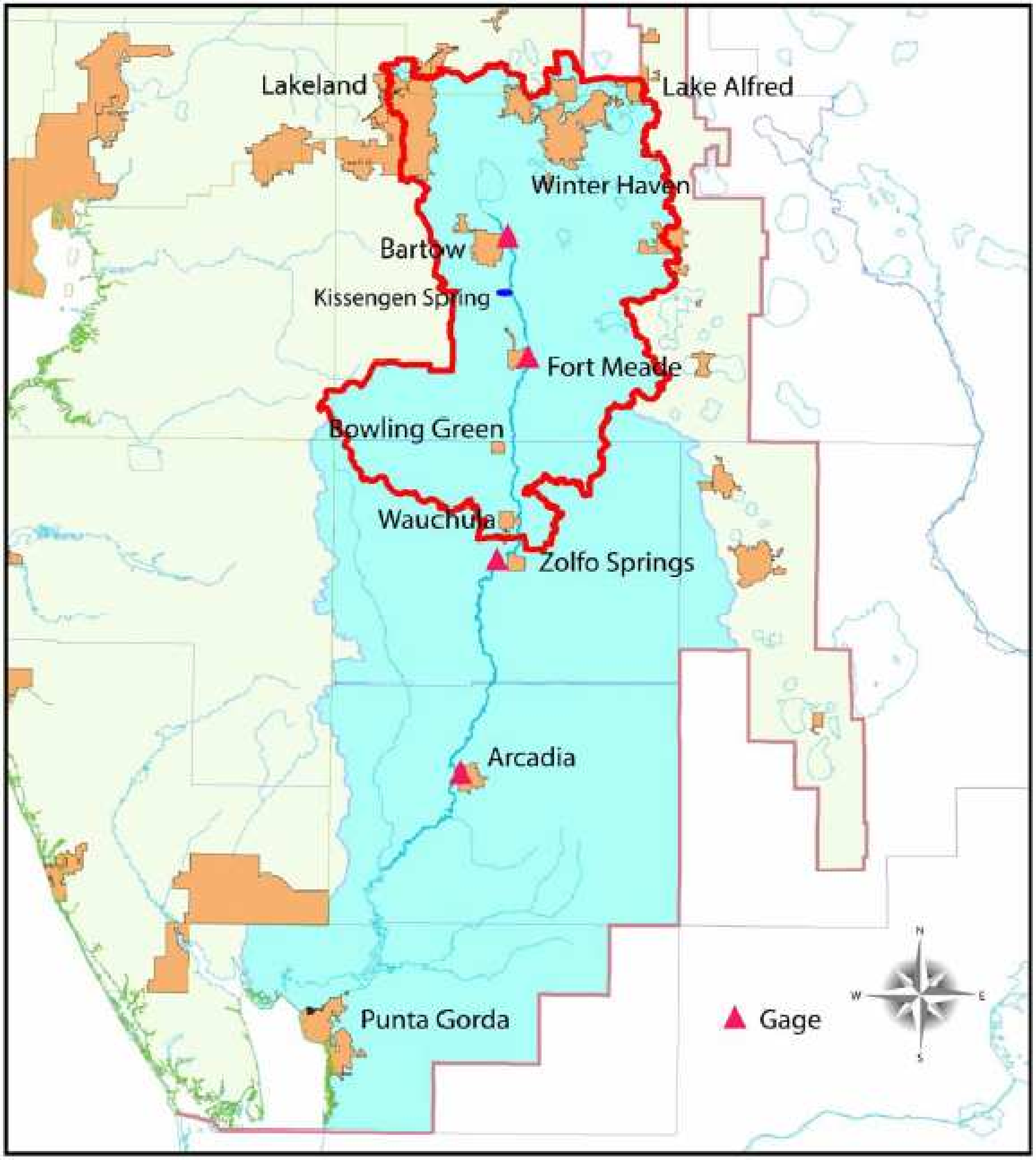


Figure 1 Peace River watershed showing locations of USGS gage sites. The Upper Peace River is the portion of the watershed above the USGS Zolfo Springs gage and is outlined in red.

Figure 2
Peace River Average Daily Flows at Bartow
USGS Site No. 02294650

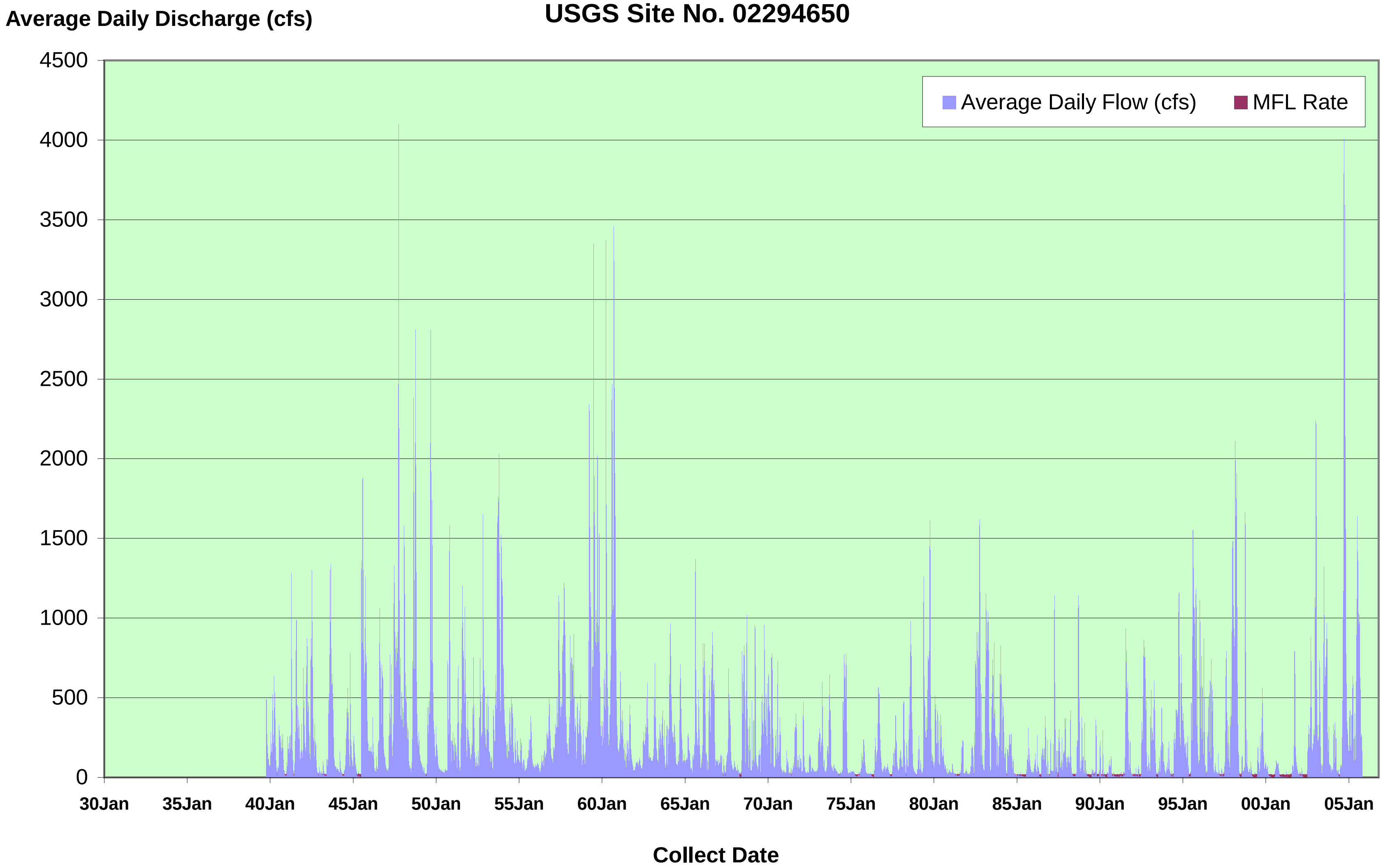


Figure 3
Peace River Average Daily Flows at Fort Meade
USGS Site No. 02294898

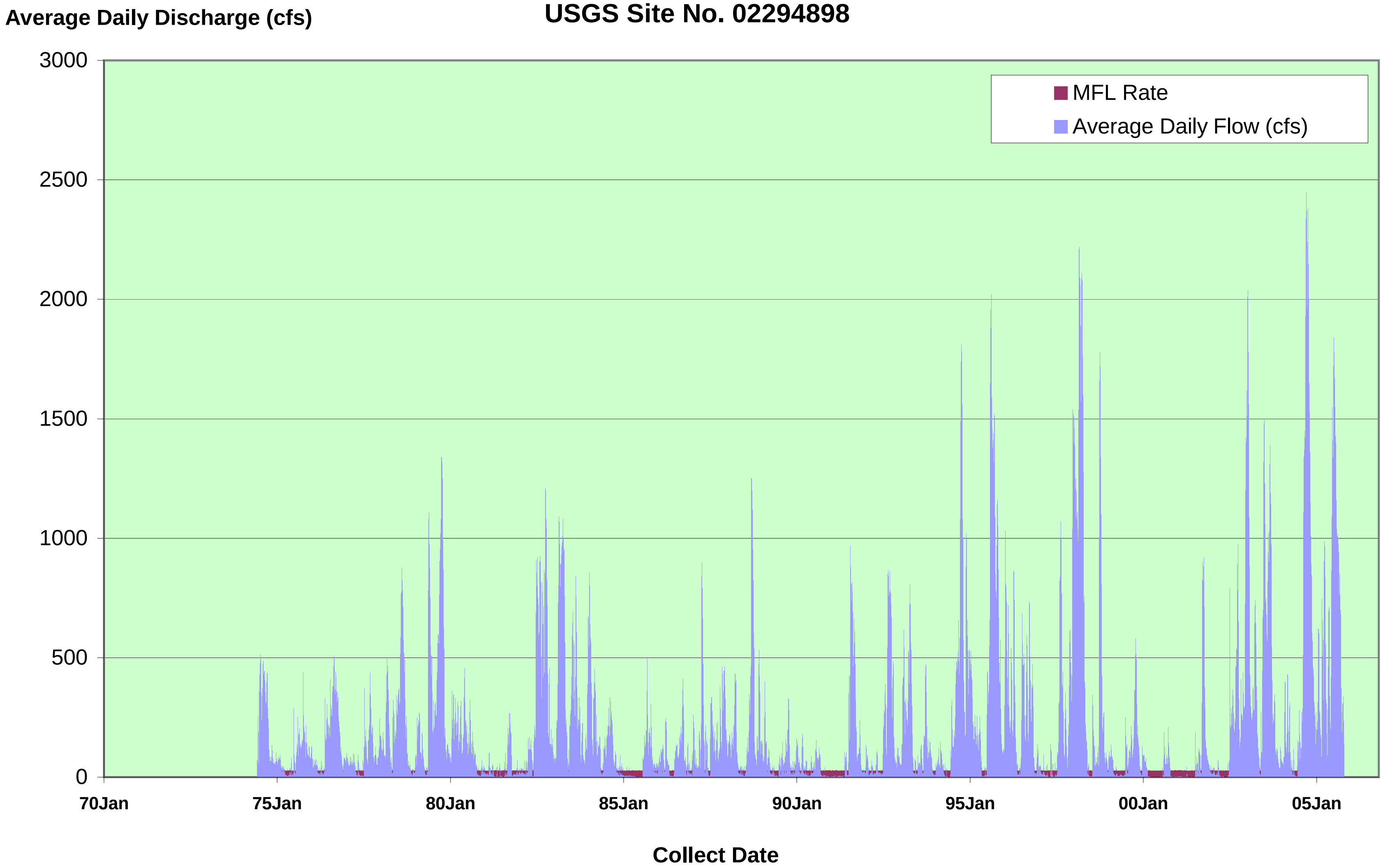


Figure 4
Peace River Average Daily Flows at Zolfo Springs
USGS Site No. 02295637

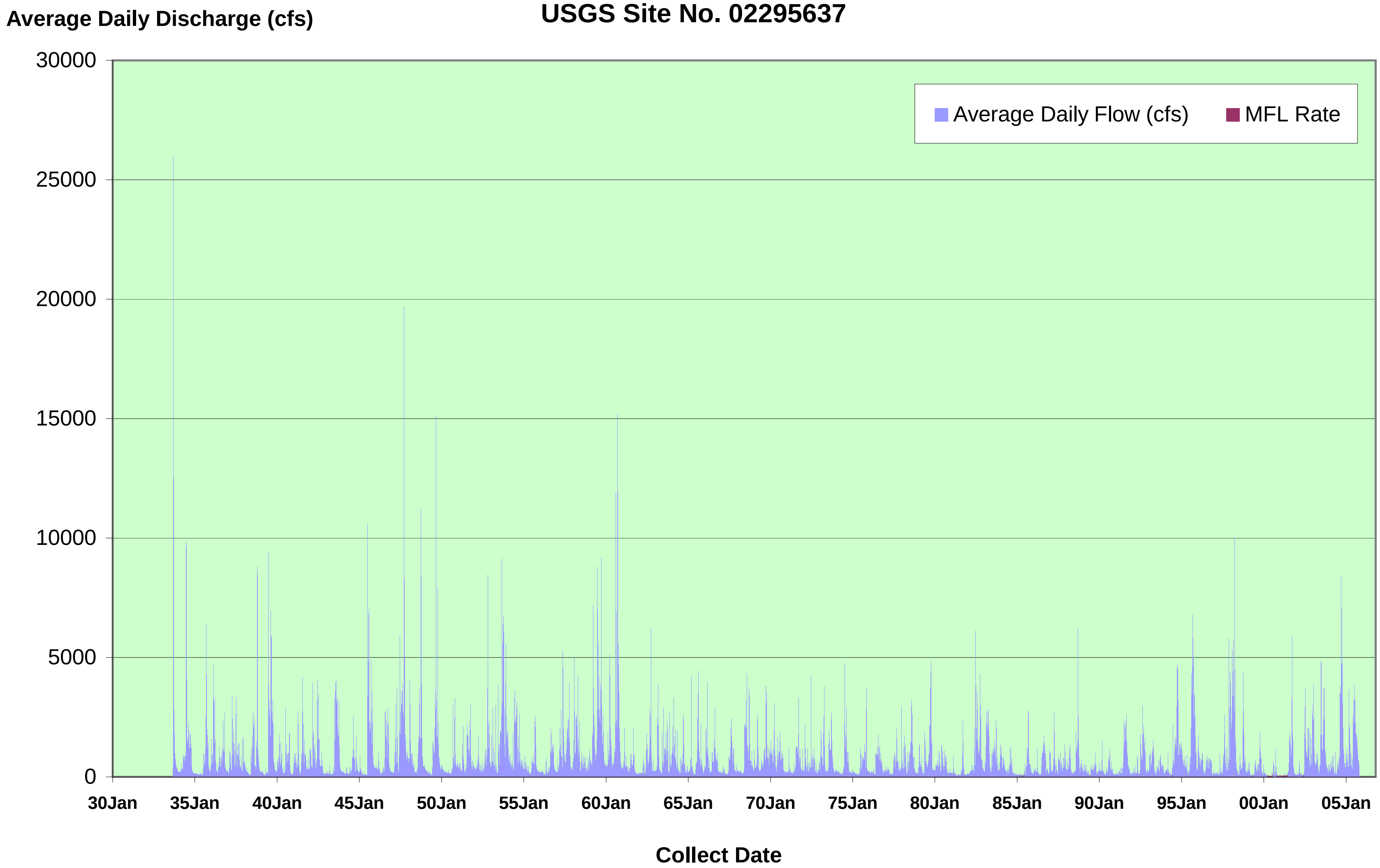


Figure 5
Peace River Average Daily Flows at Arcadia
USGS Site No. 02296750

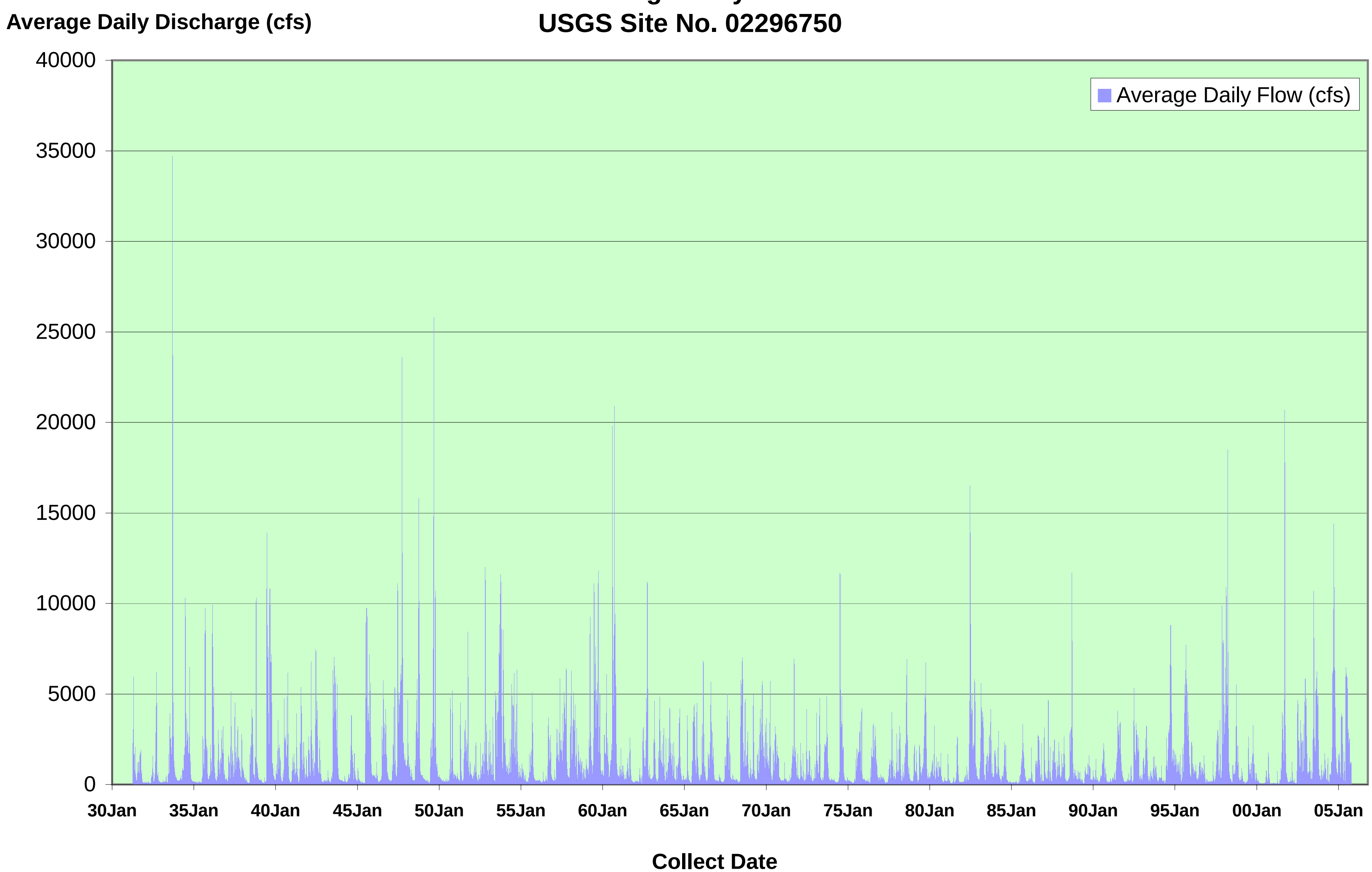


Figure 6
Peace River Daily Water Levels at Bartow
USGS Site No. 02294650

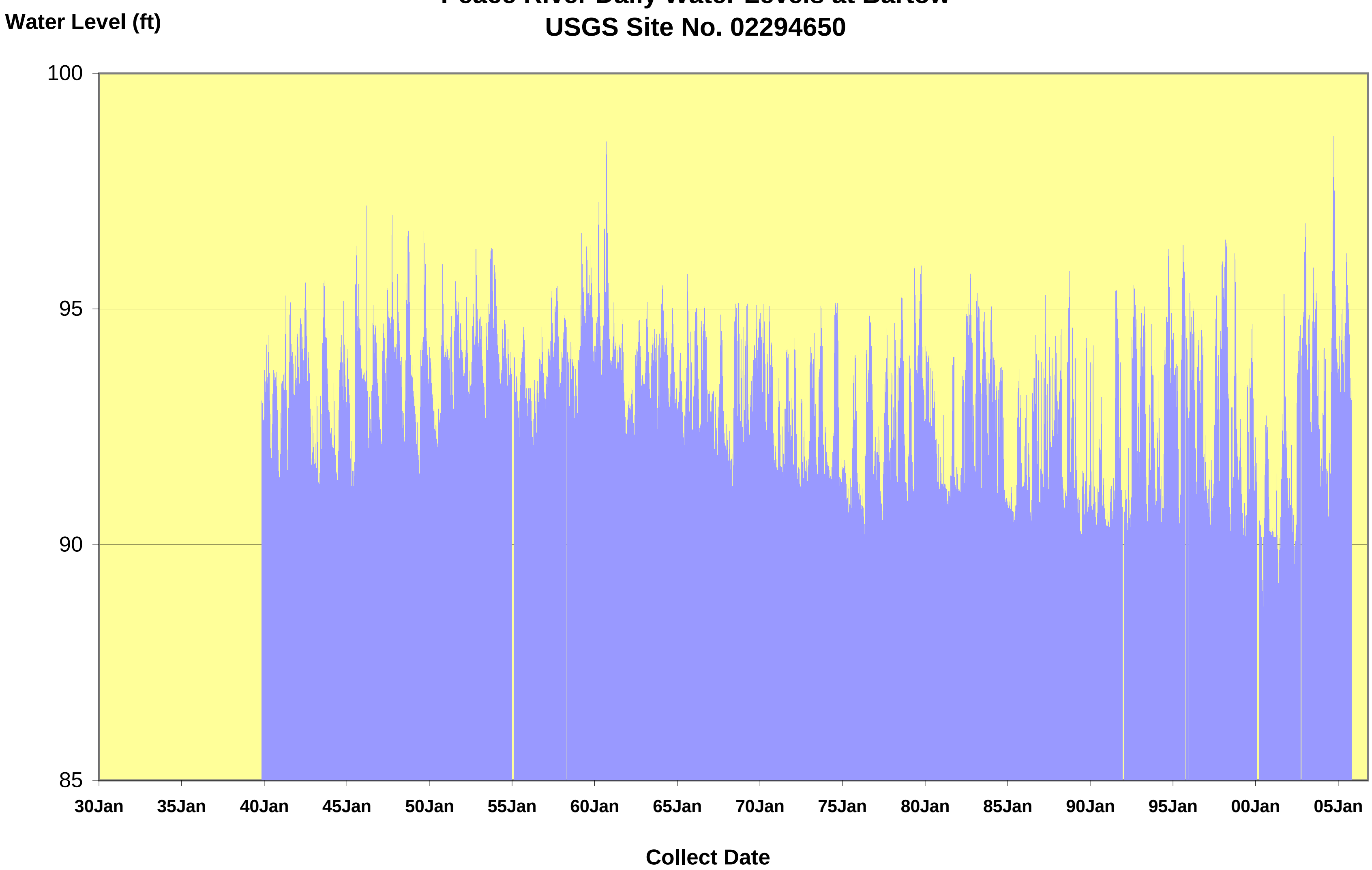


Figure 7
Peace River Daily Water Levels at Fort Meade
USGS Site No. 02294898

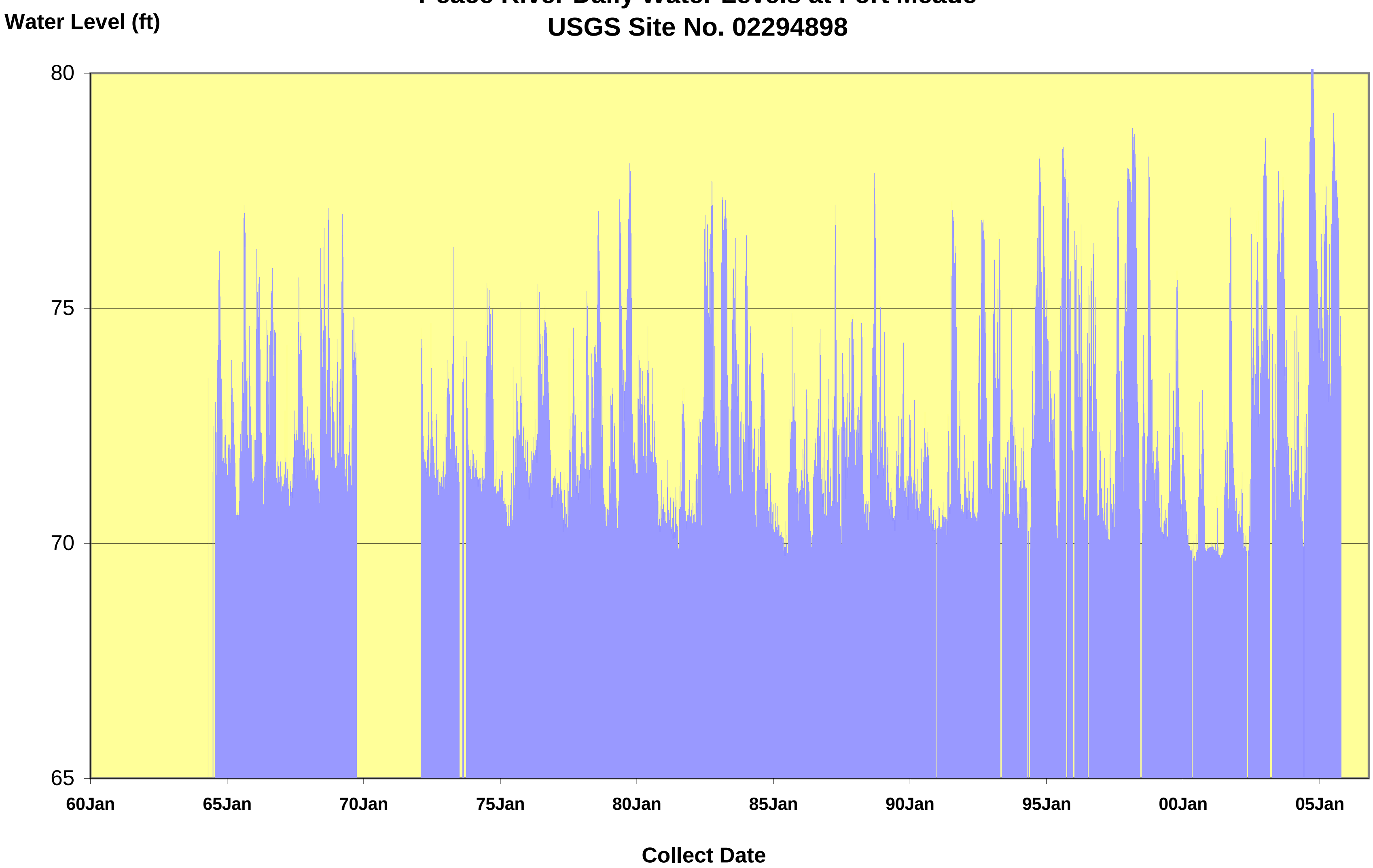


Figure 8
Peace River Daily Water Levels at Zolfo Springs
USGS Site No. 02295637

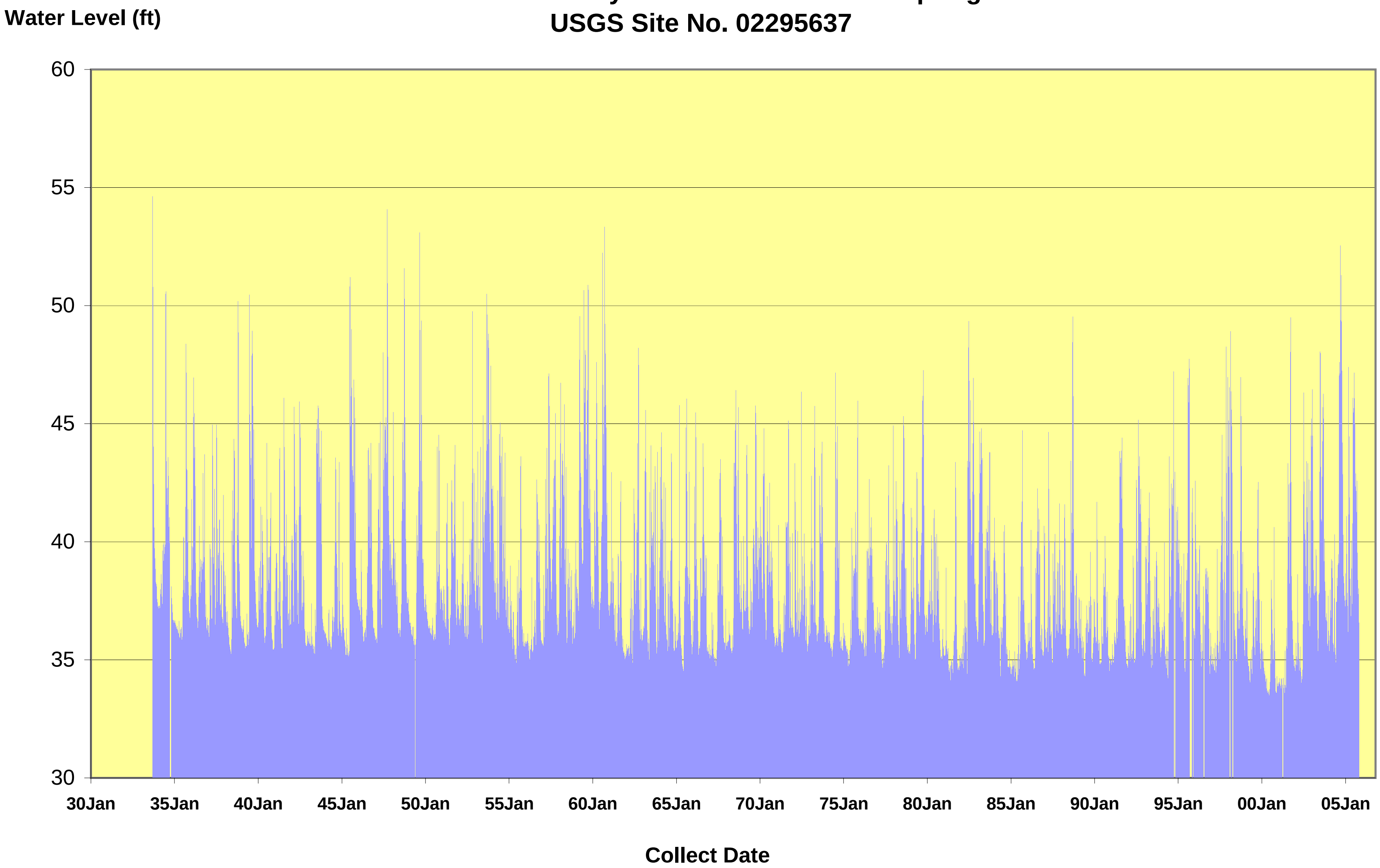
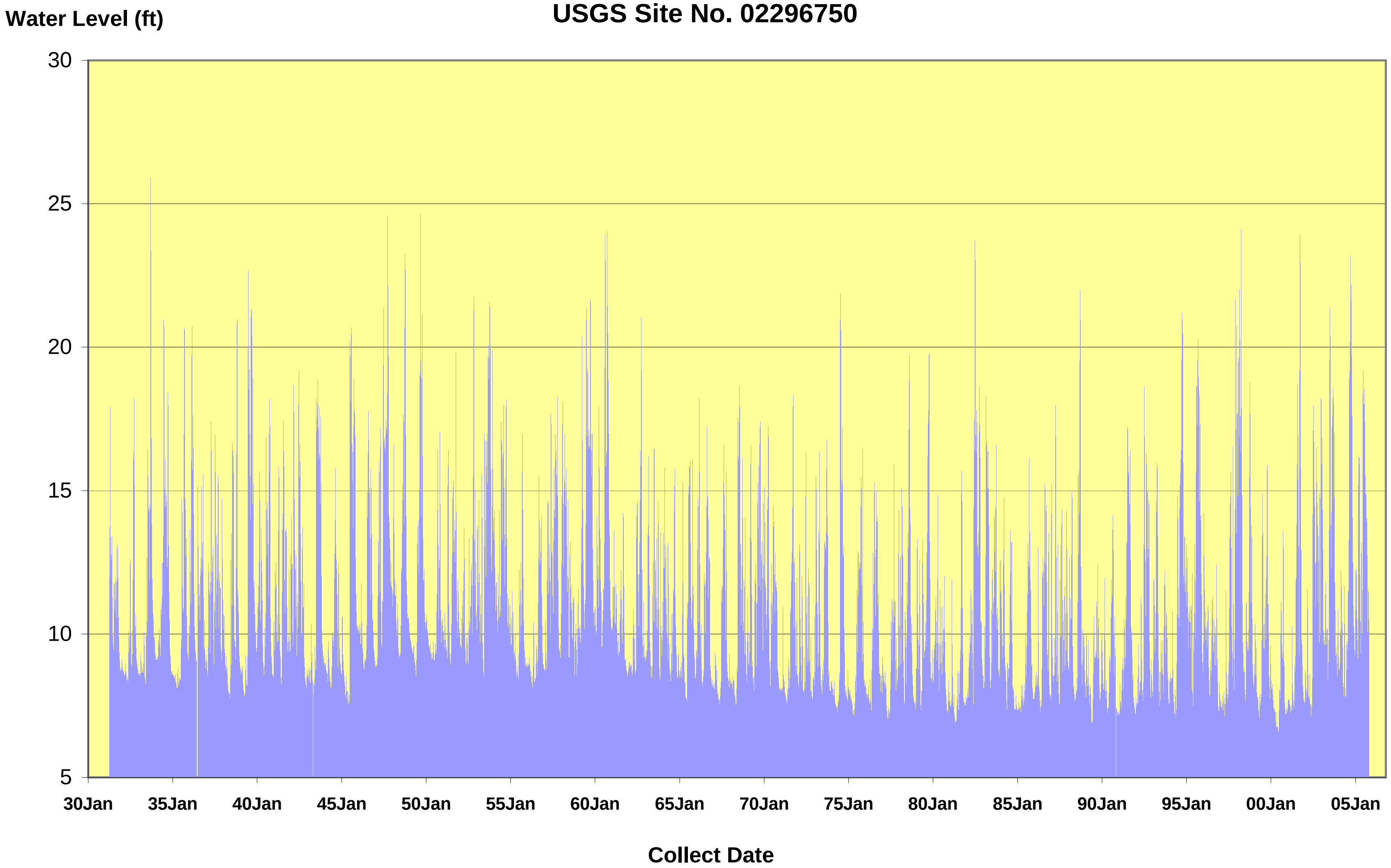


Figure 9
Peace River Daily Water Levels at Arcadia
USGS Site No. 02296750



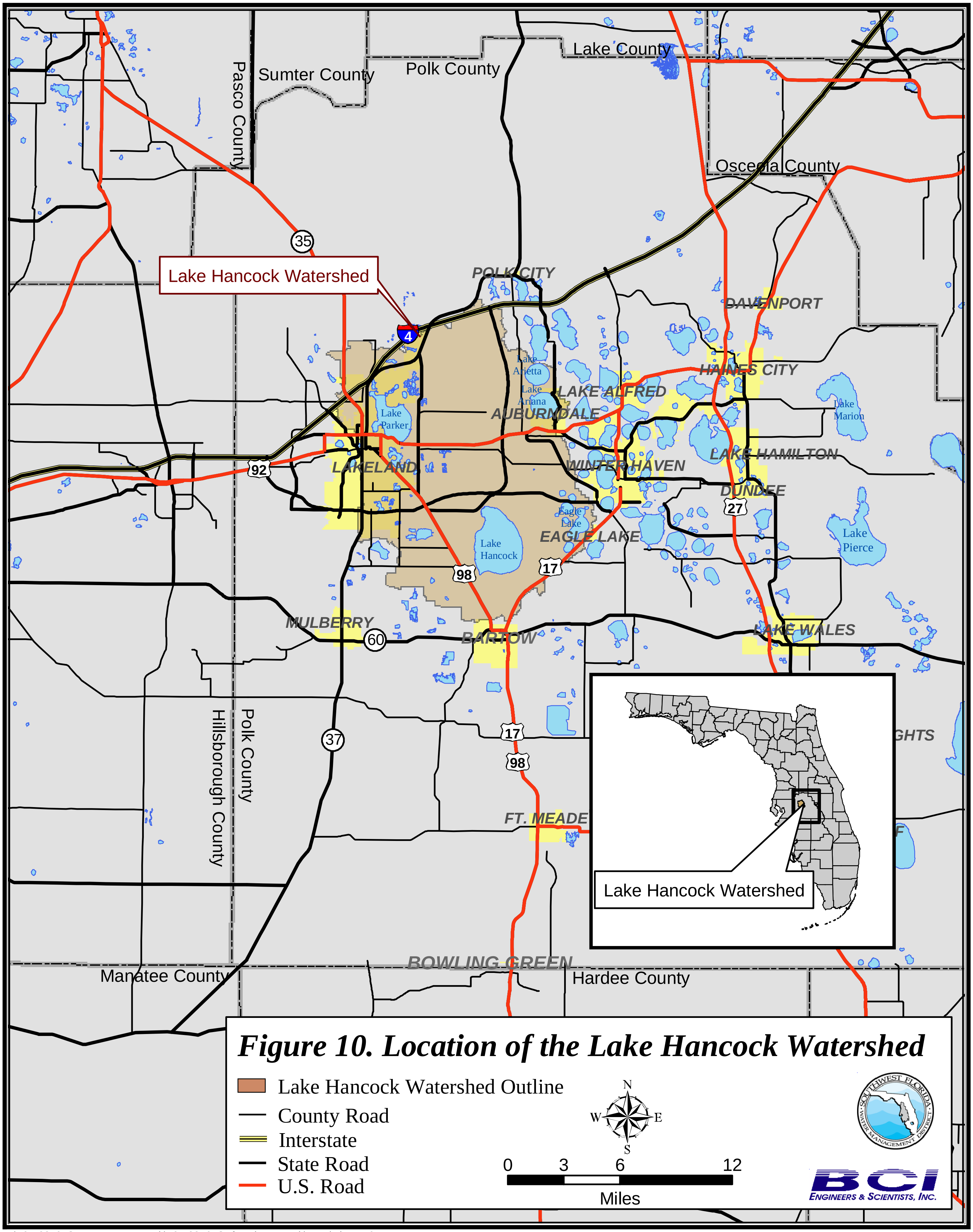


Figure 10. Location of the Lake Hancock Watershed

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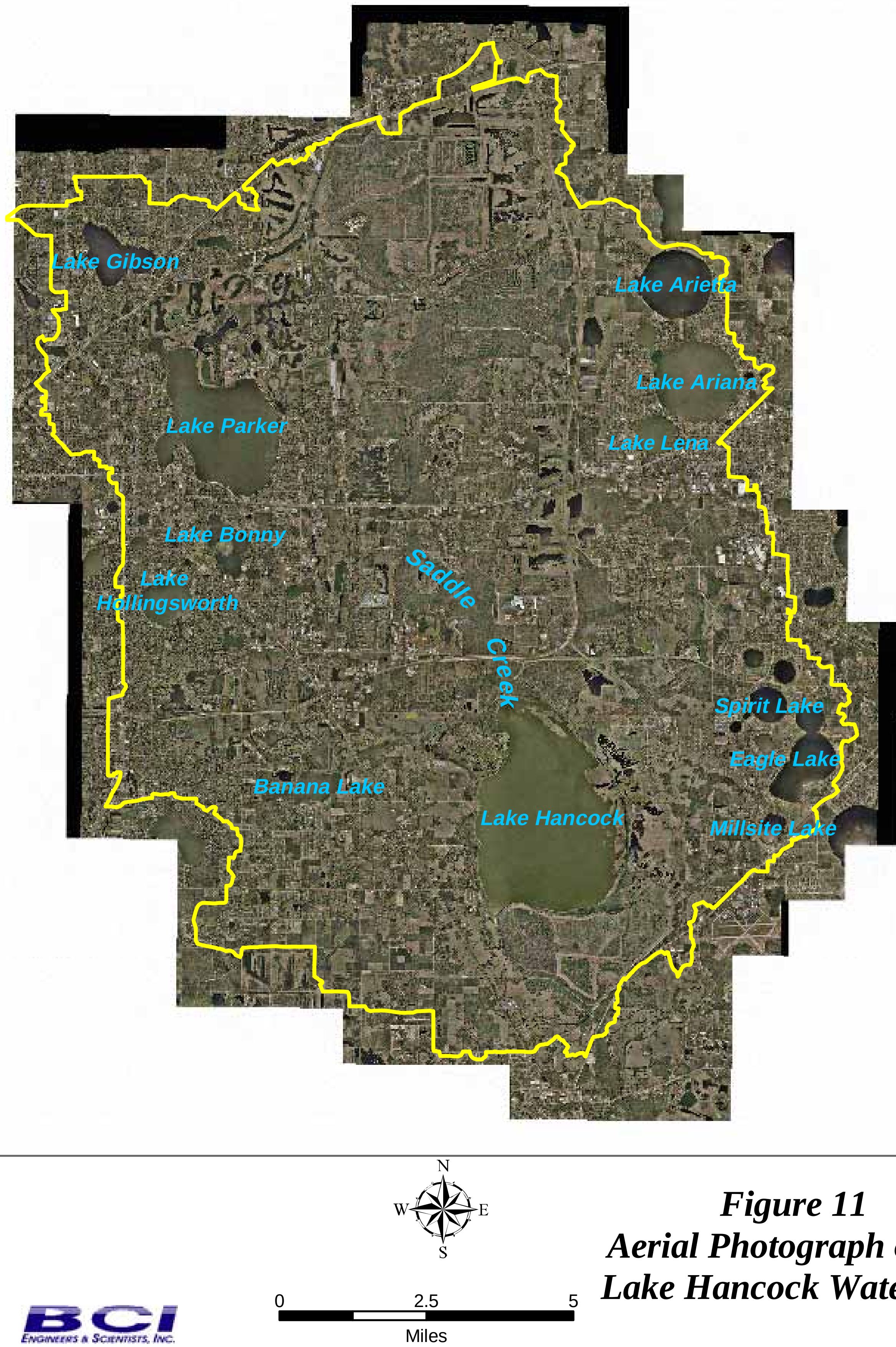

Figure 11
Aerial Photograph of the Lake Hancock Watershed

BCI ENGINEERS & SCIENTISTS, INC.

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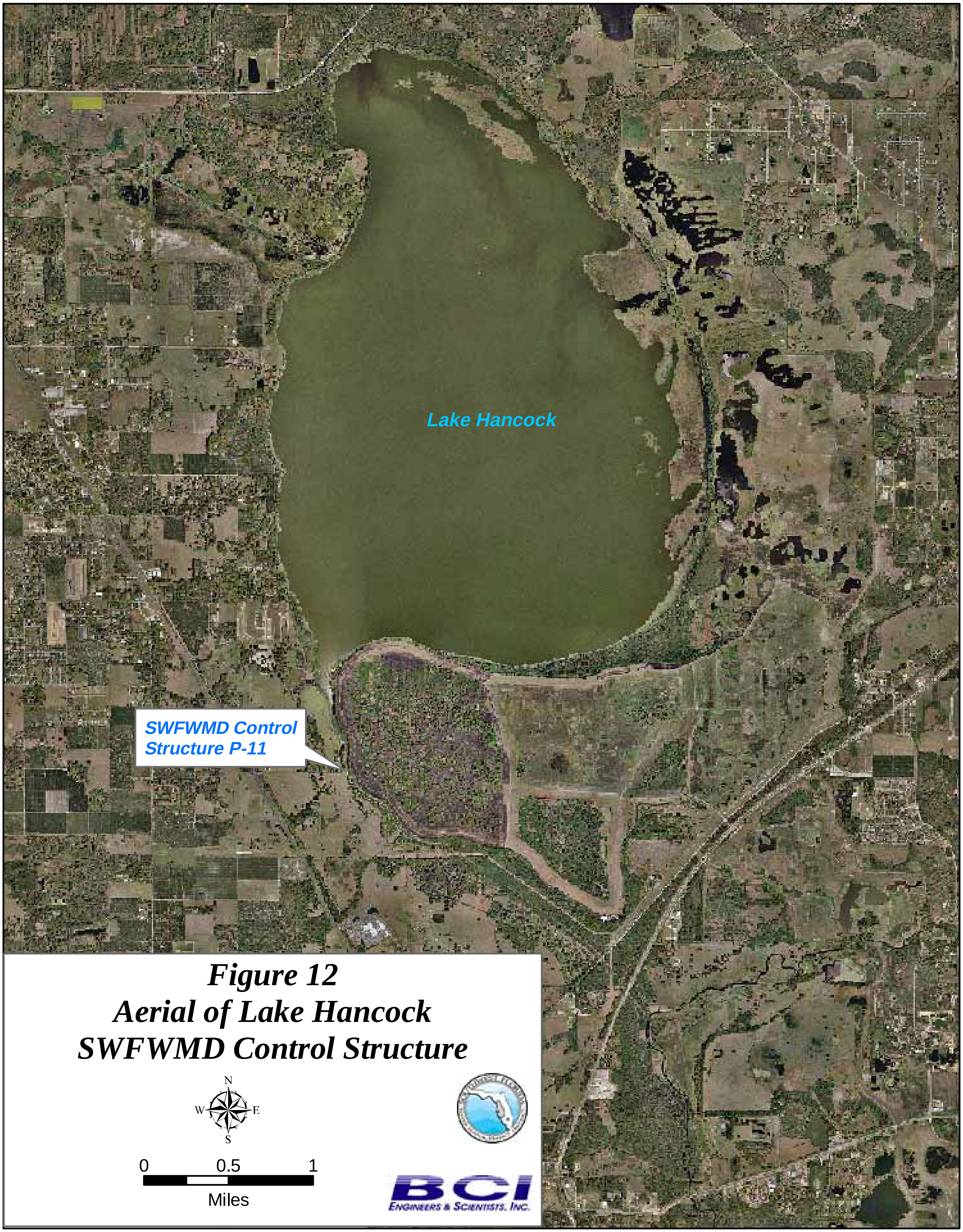


Figure 12
Aerial of Lake Hancock
SWFWMD Control Structure

R:\19-12376_SWFWMD_Hancock\19-12376_Swfwmd_Hancock\MXD\Figure12

Figure 13
Structure P-11

Figure 14
Existing Lake Hancock Lake Levels
Years 1959 - 2004

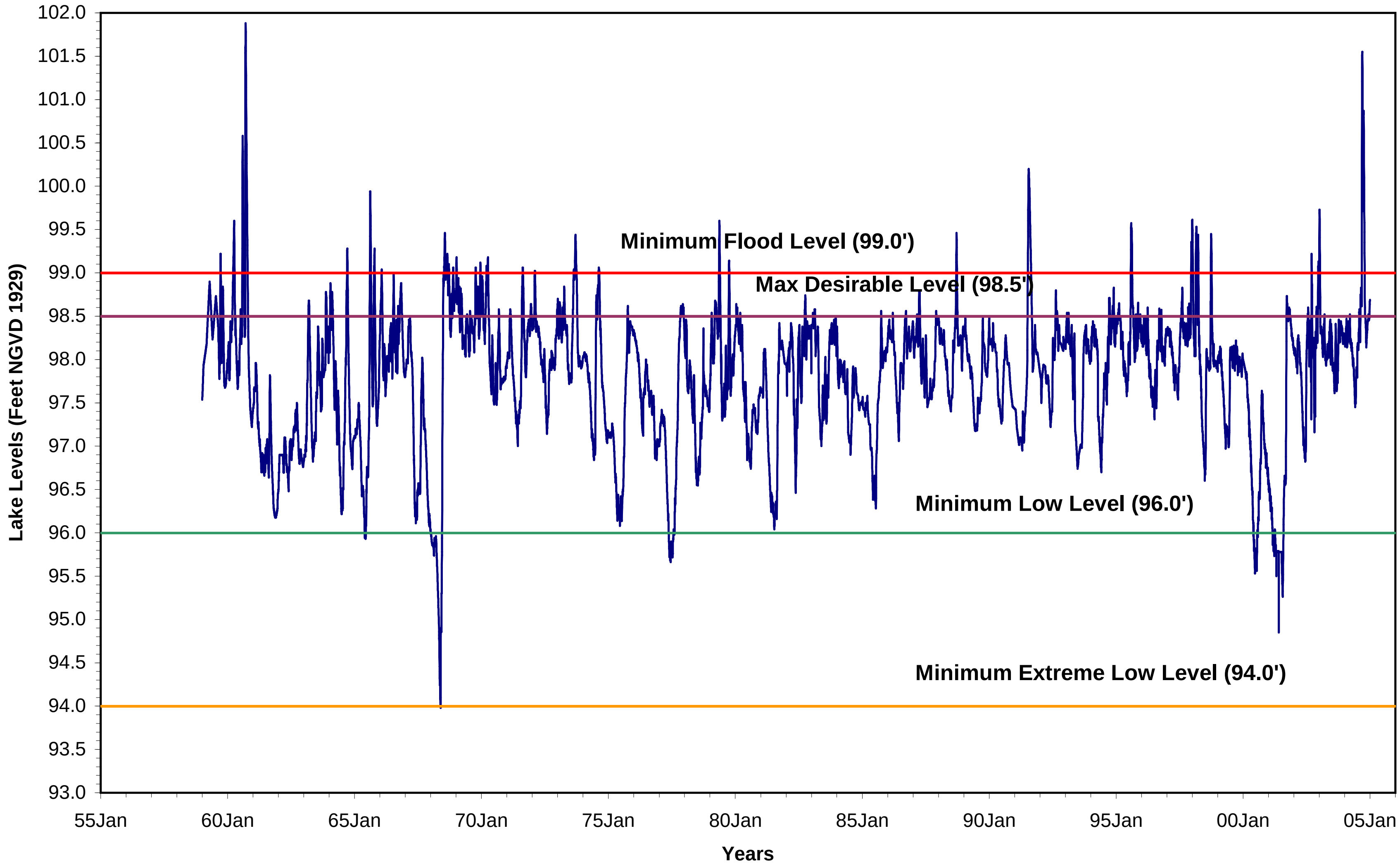


Figure 15
Structure P-11 Flows
South Saddle Creek, Years 1963 - 2004

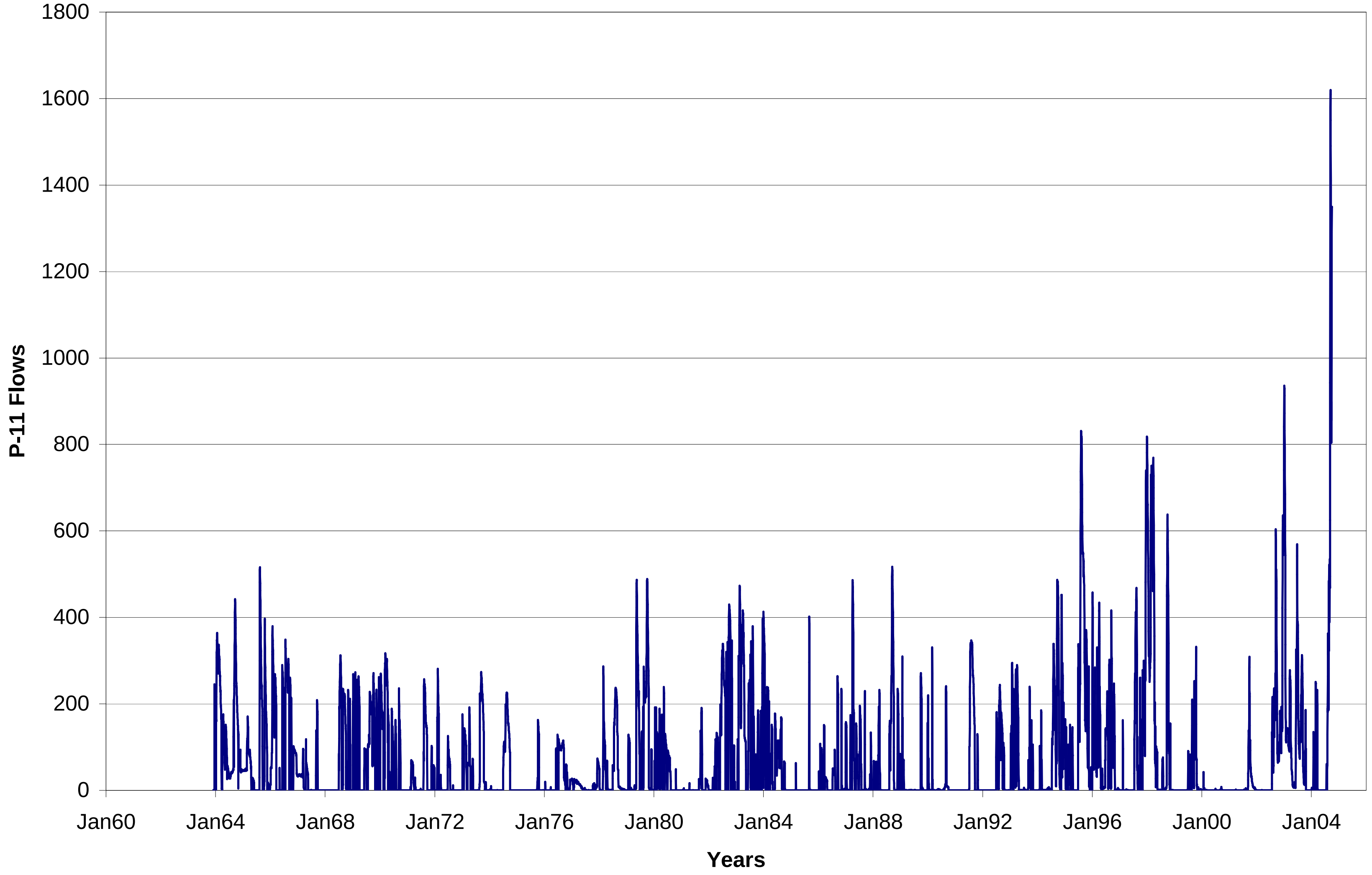
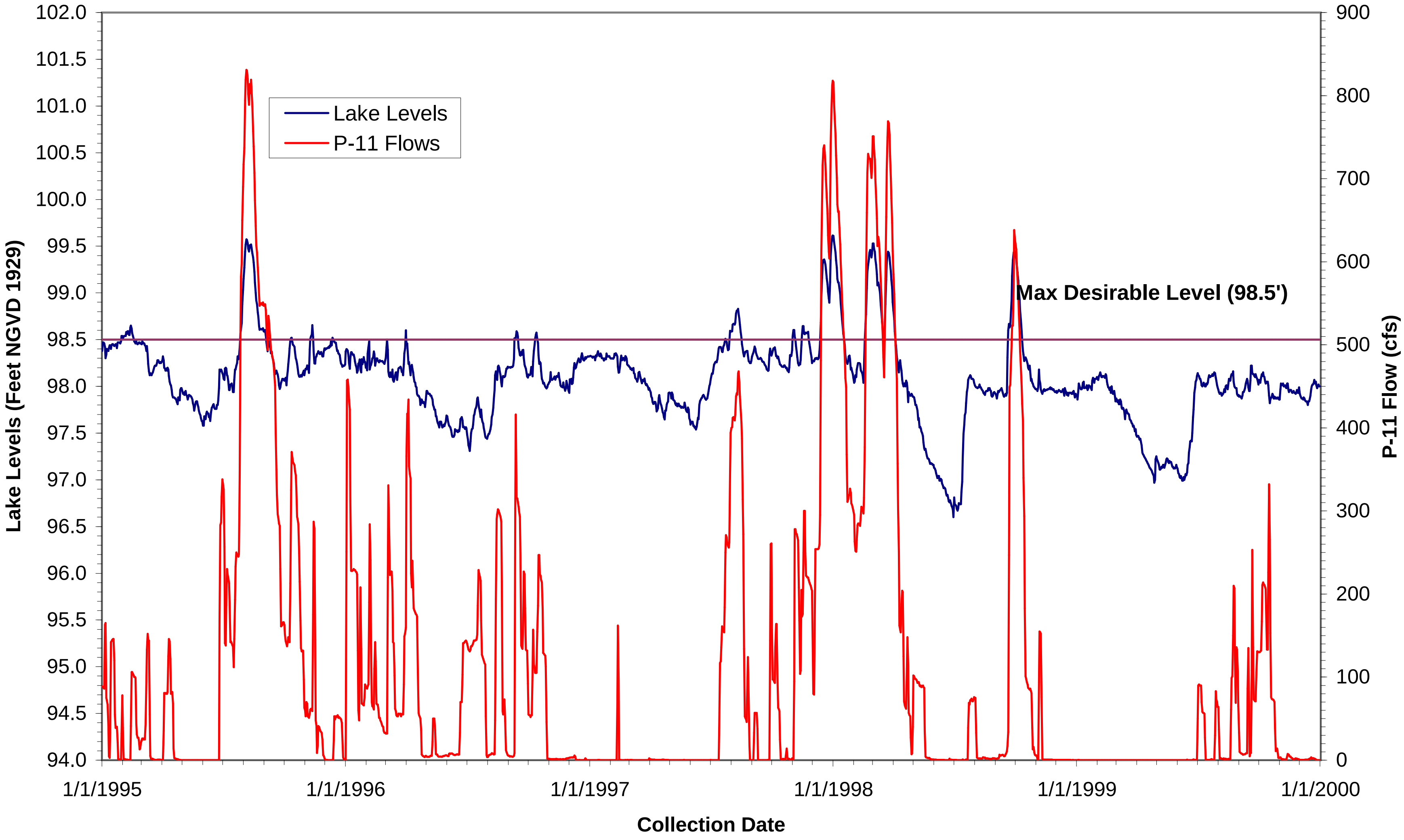


Figure 16
Comparison of Lake Levels to Structure P-11 Flows
Years 1995 - 1999



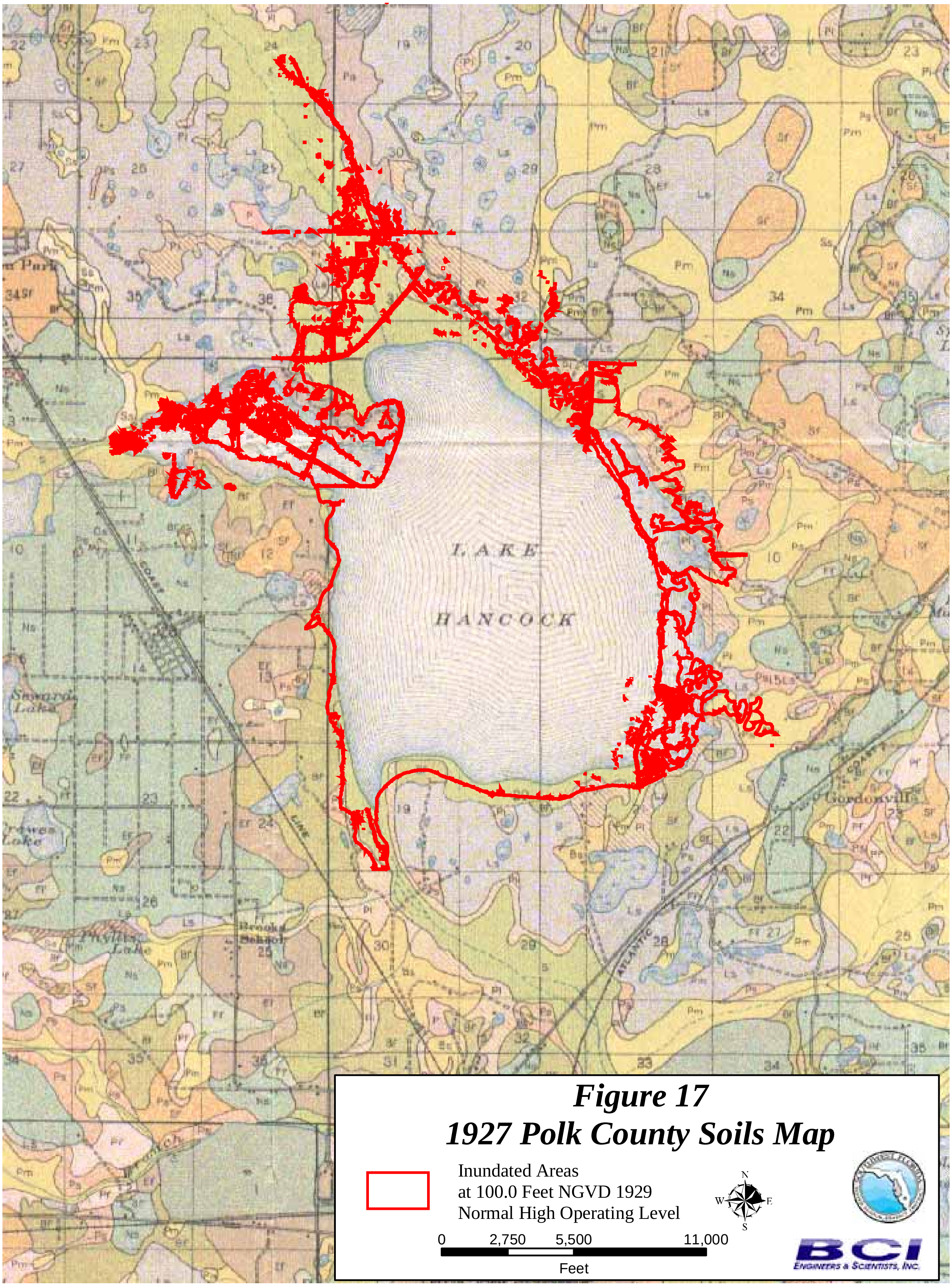


Figure 17
1927 Polk County Soils Map

Inundated Areas
at 100.0 Feet NGVD 1929
Normal High Operating Level

0 2,750 5,500 11,000
Feet

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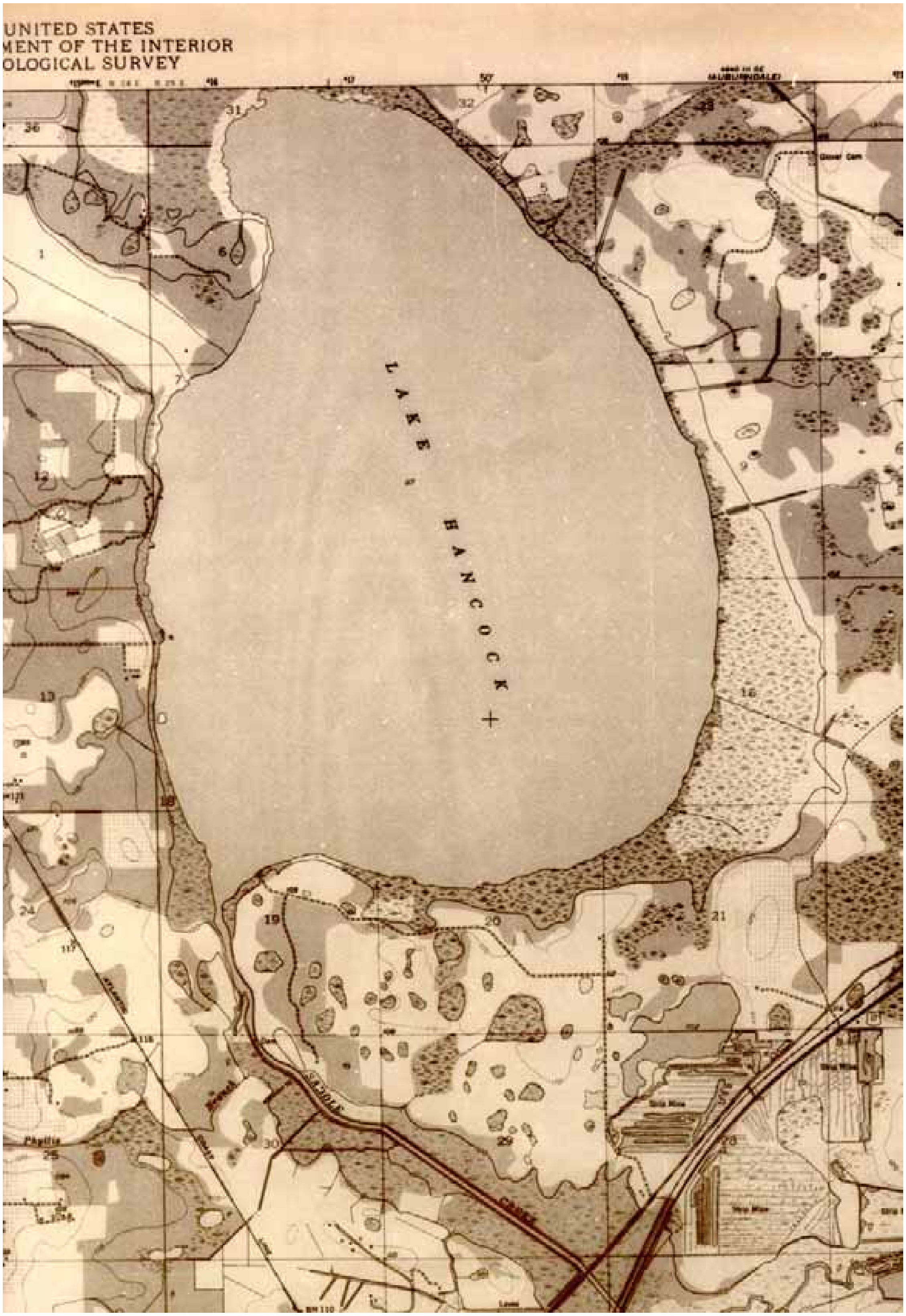

Figure 18 USGS 1949 Bartow Quadrangle Map

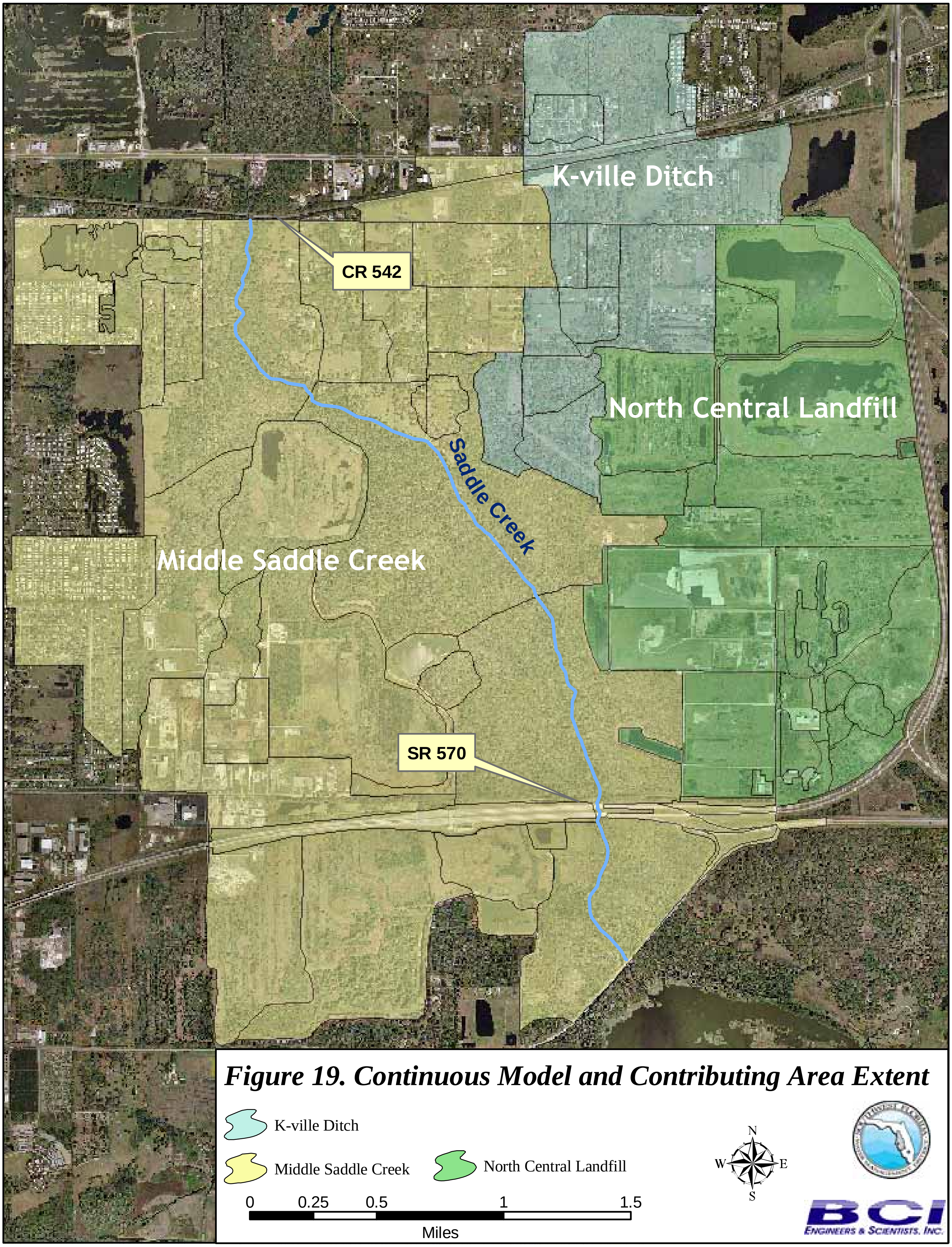

Figure 19. Continuous Model and Contributing Area Extent

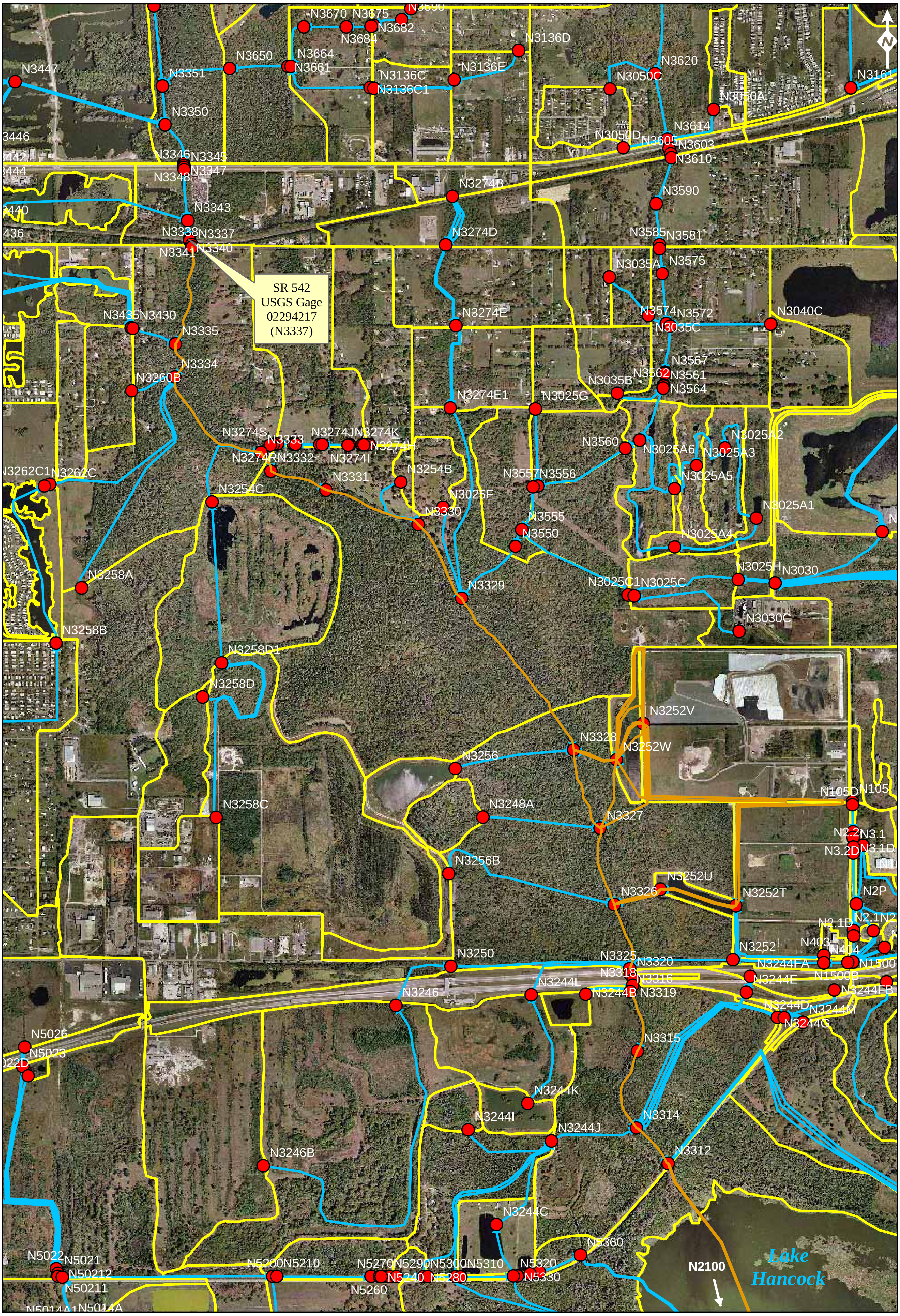

Figure 20. Continuous Model Subset of Watershed Model Base Network and Basins

Junction

Basins

Reach

Modeled in Continuous Model

0 750 1,500 3,000

Feet

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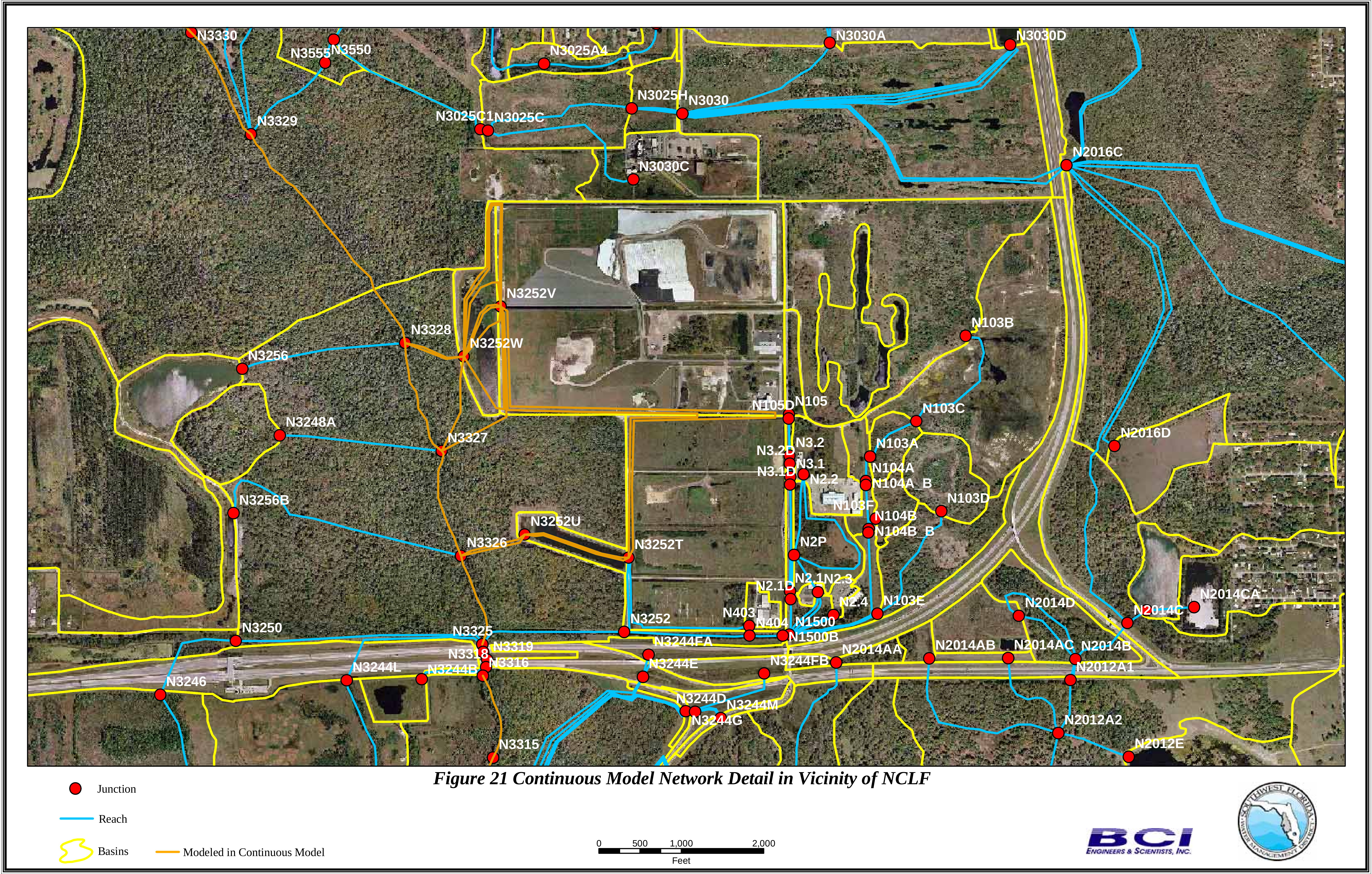


Figure 21 Continuous Model Network Detail in Vicinity of NCLF

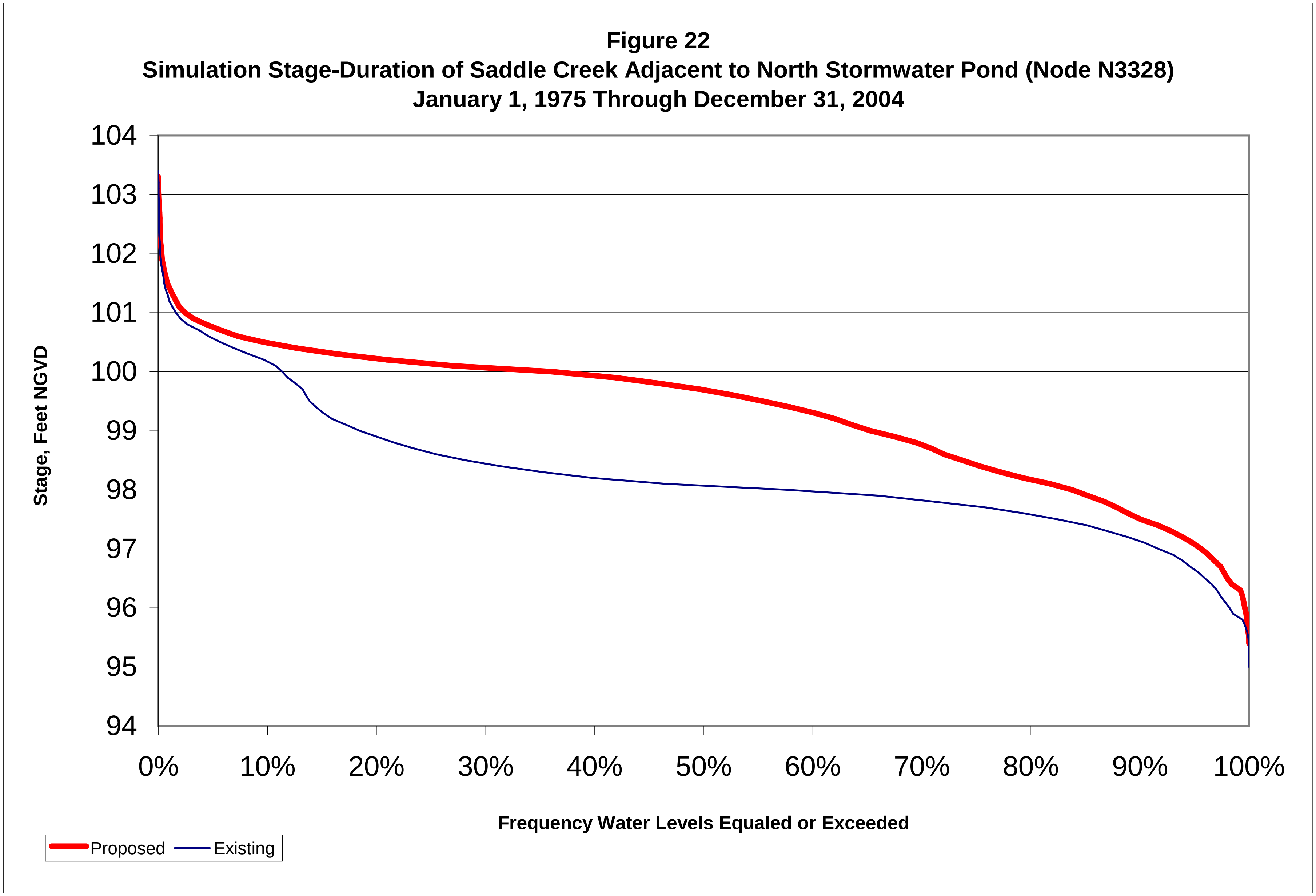


Figure 22
Simulation Stage-Duration of Saddle Creek Adjacent to North Stormwater Pond (Node N3328)
January 1, 1975 Through December 31, 2004
Stage, Feet NGVD
104
103
102
101
100
99
98
97
96
95
94
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency Water Levels Equaled or Exceeded
Proposed
Existing

Figure 23
Simulated Stage-Duration of North Stormwater Pond (Node N3252W)
January 1, 1975 Through December 31, 2004

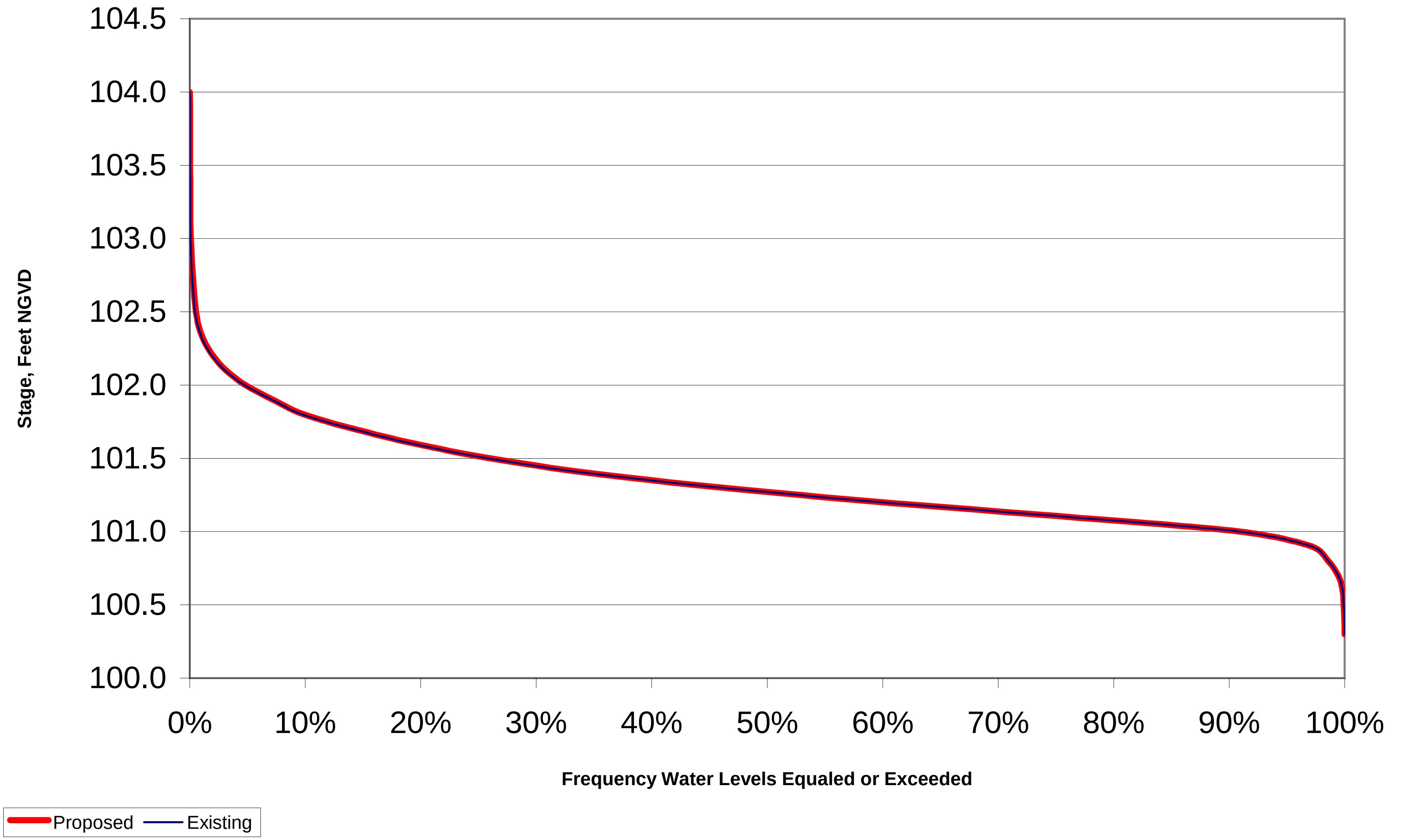
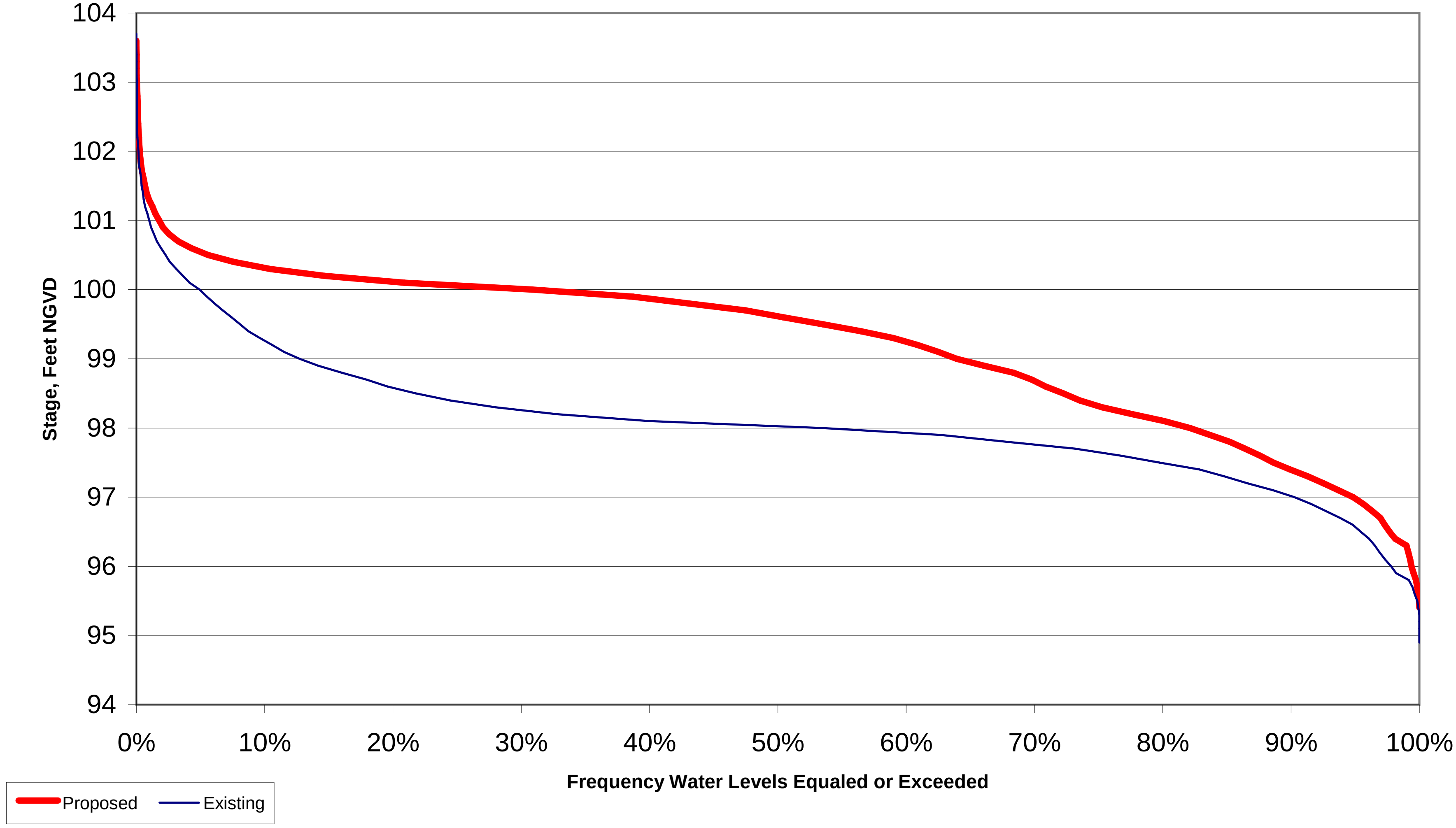


Figure 24
Simulated Stage-Duration of Saddle Creek West of South Stormwater Pond (Node N3326)
January 1, 1975 Through December 31, 2004



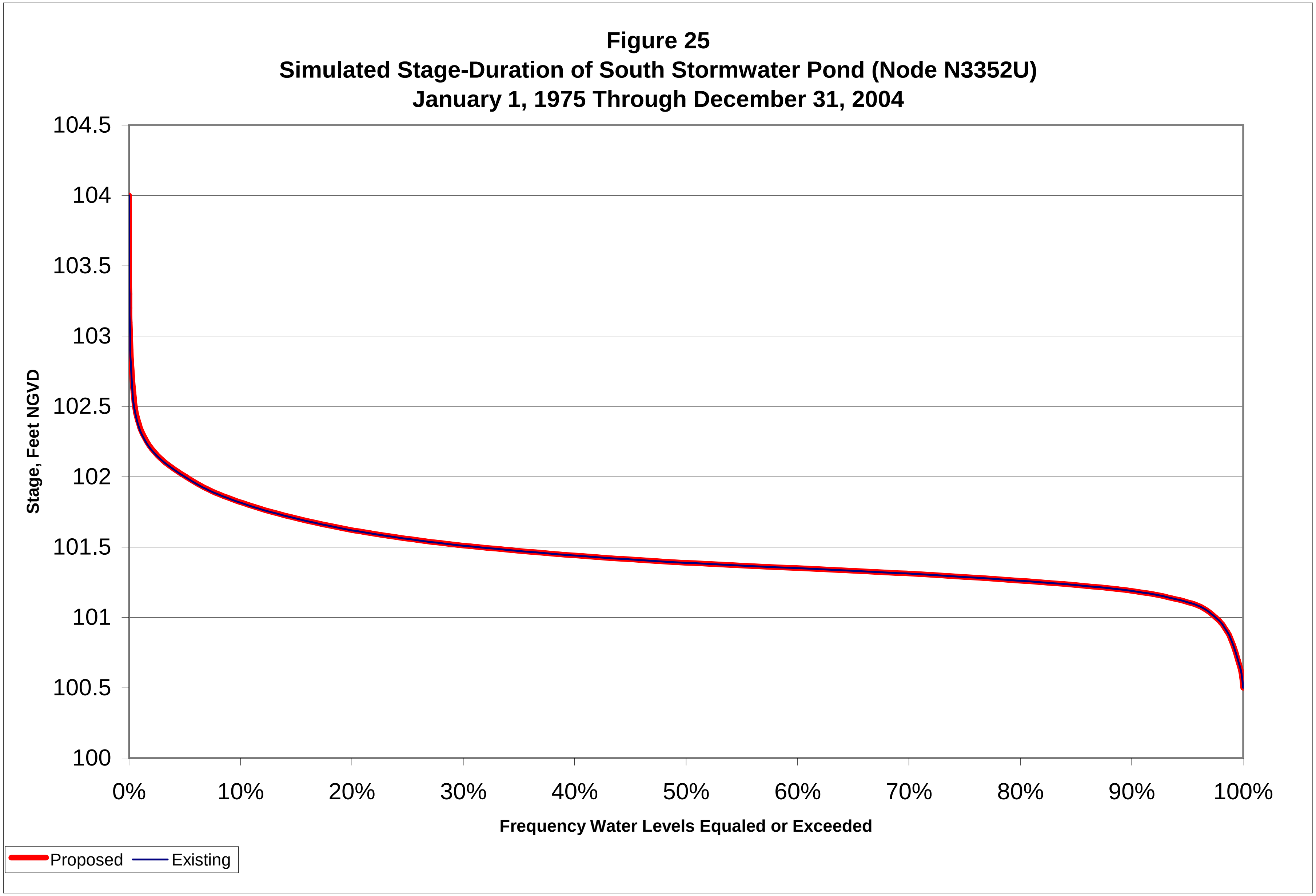


Figure 25
Simulated Stage-Duration of South Stormwater Pond (Node N3352U)
January 1, 1975 Through December 31, 2004
Stage, Feet NGVD
104.5
104
103.5
103
102.5
102
101.5
101
100.5
100
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Frequency Water Levels Equaled or Exceeded
Proposed
Existing

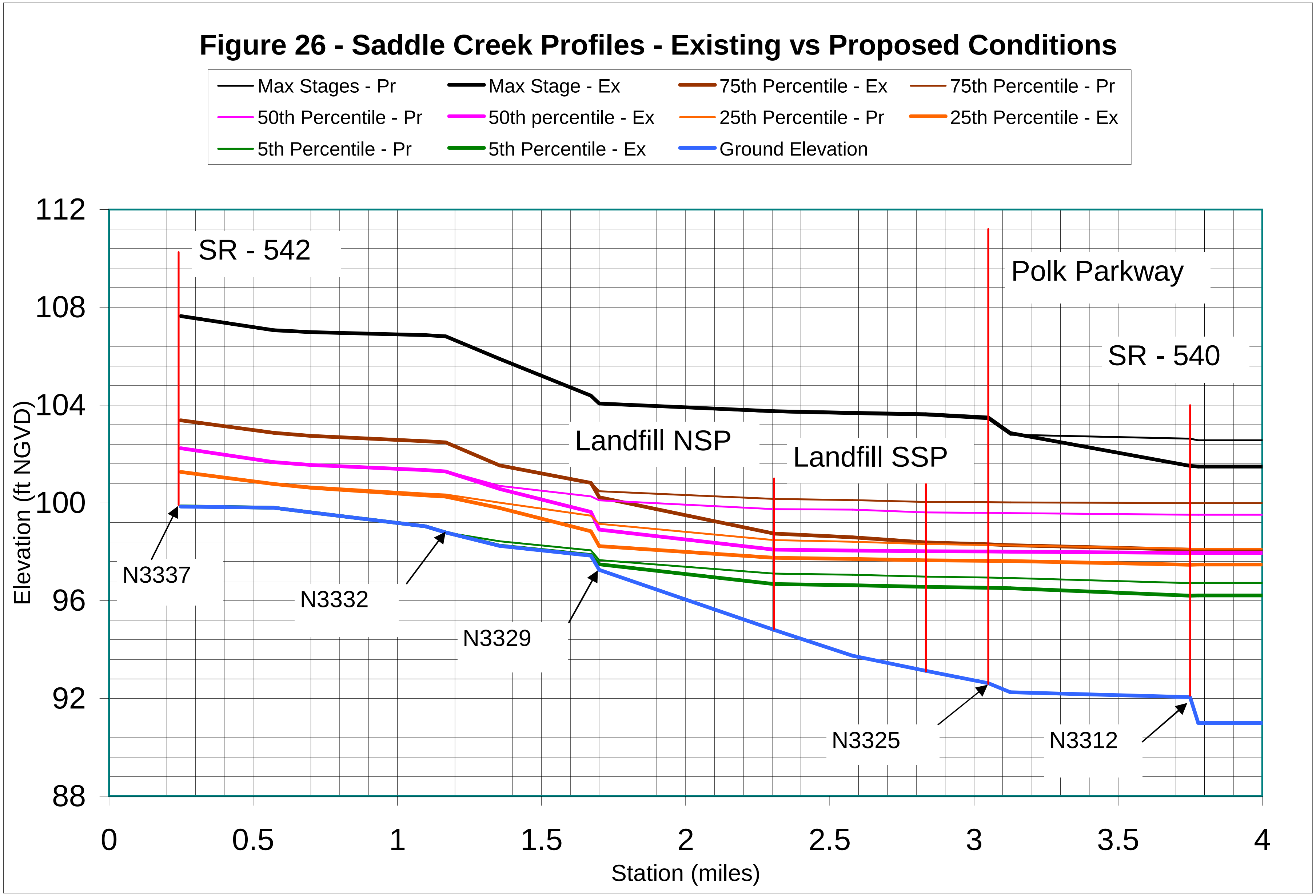
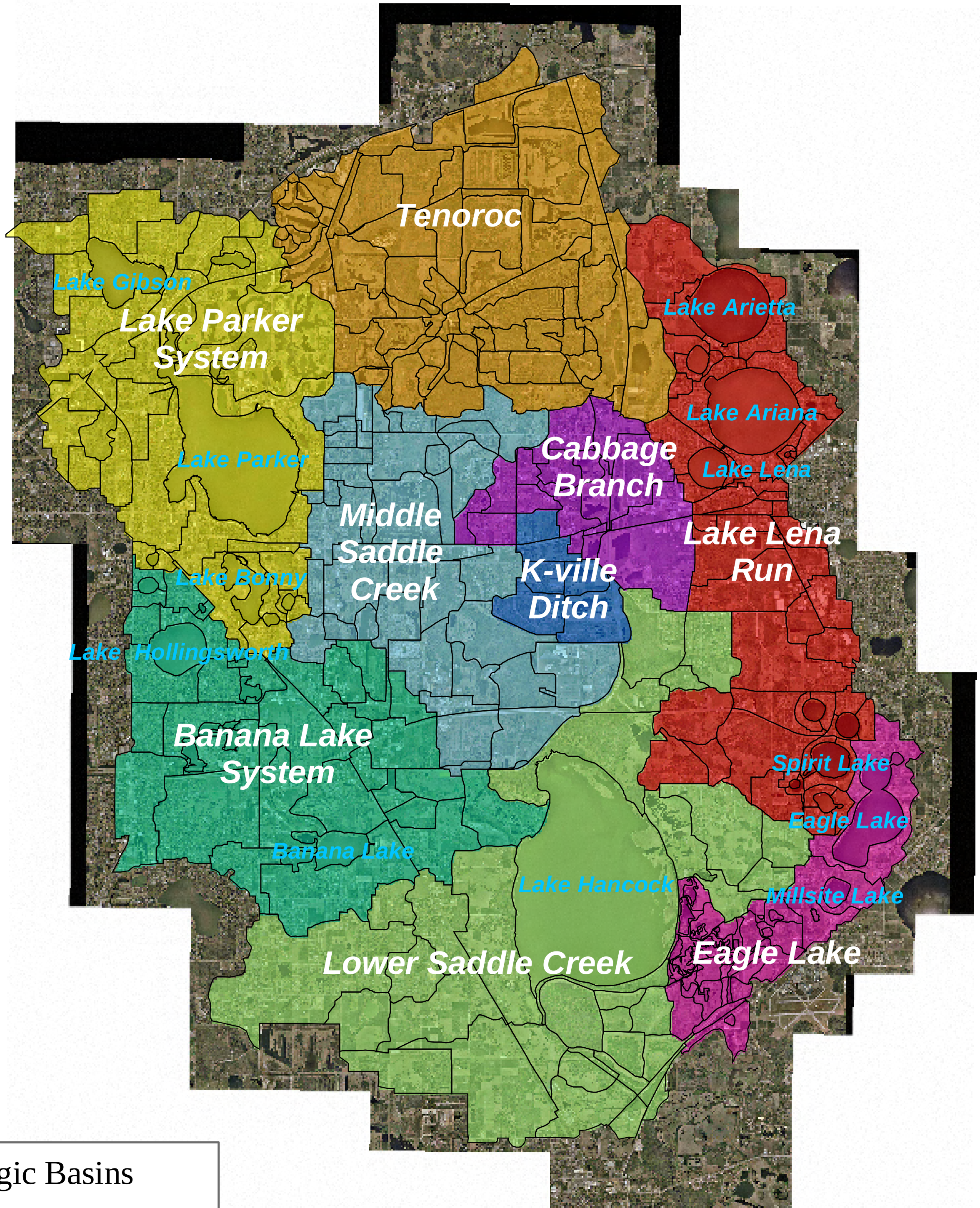


Figure 26 - Saddle Creek Profiles - Existing vs Proposed Conditions
Max Stages - Pr
Max Stage - Ex
75th Percentile - Ex
75th Percentile - Pr
50th Percentile - Pr
50th percentile - Ex
25th Percentile - Pr
25th Percentile - Ex
5th Percentile - Pr
5th Percentile - Ex
Ground Elevation
SR - 542
Polk Parkway
SR - 540
Landfill NSP
Landfill SSP
N3337
N3332
N3329
N3325
N3312
Elevation (ft NGVD)
112
108
104
100
96
92
88
0
0.5
1
1.5
2
2.5
3
3.5
4
Station (miles)



Hydrologic Basins

- Banana Lake System
- Cabbage Branch
- Eagle Lake
- K-ville Ditch
- Lake Lena Run
- Lake Parker System
- Lower Saddle Creek
- Middle Saddle Creek
- Tenoroc

Figure 27 Major Hydrologic Basins of the Lake Hancock Watershed

N
W E
S

0 1.25 2.5 5
Miles

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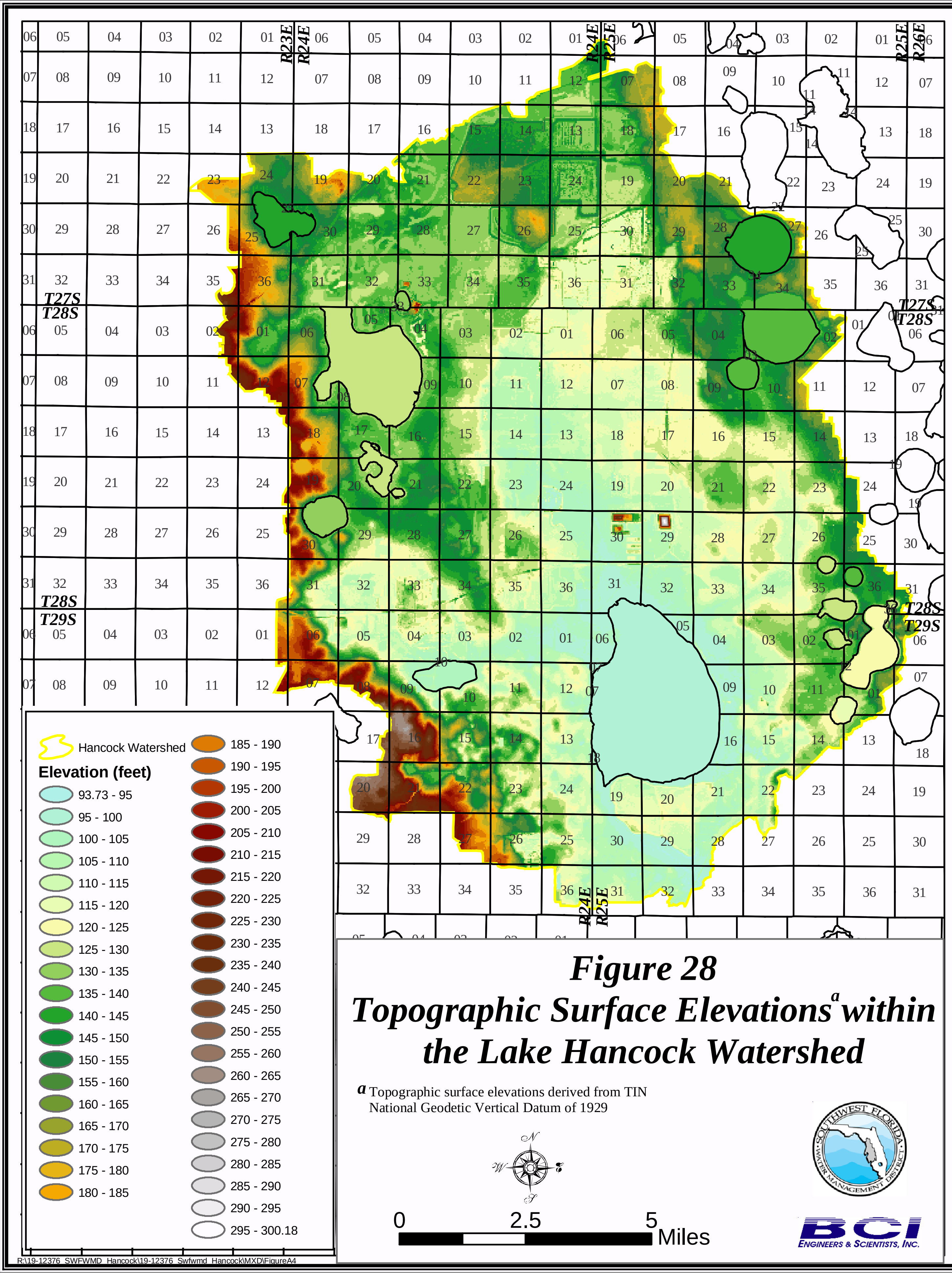

Figure 28

Topographic Surface Elevations[a] within the Lake Hancock Watershed

[a] Topographic surface elevations derived from TIN
National Geodetic Vertical Datum of 1929

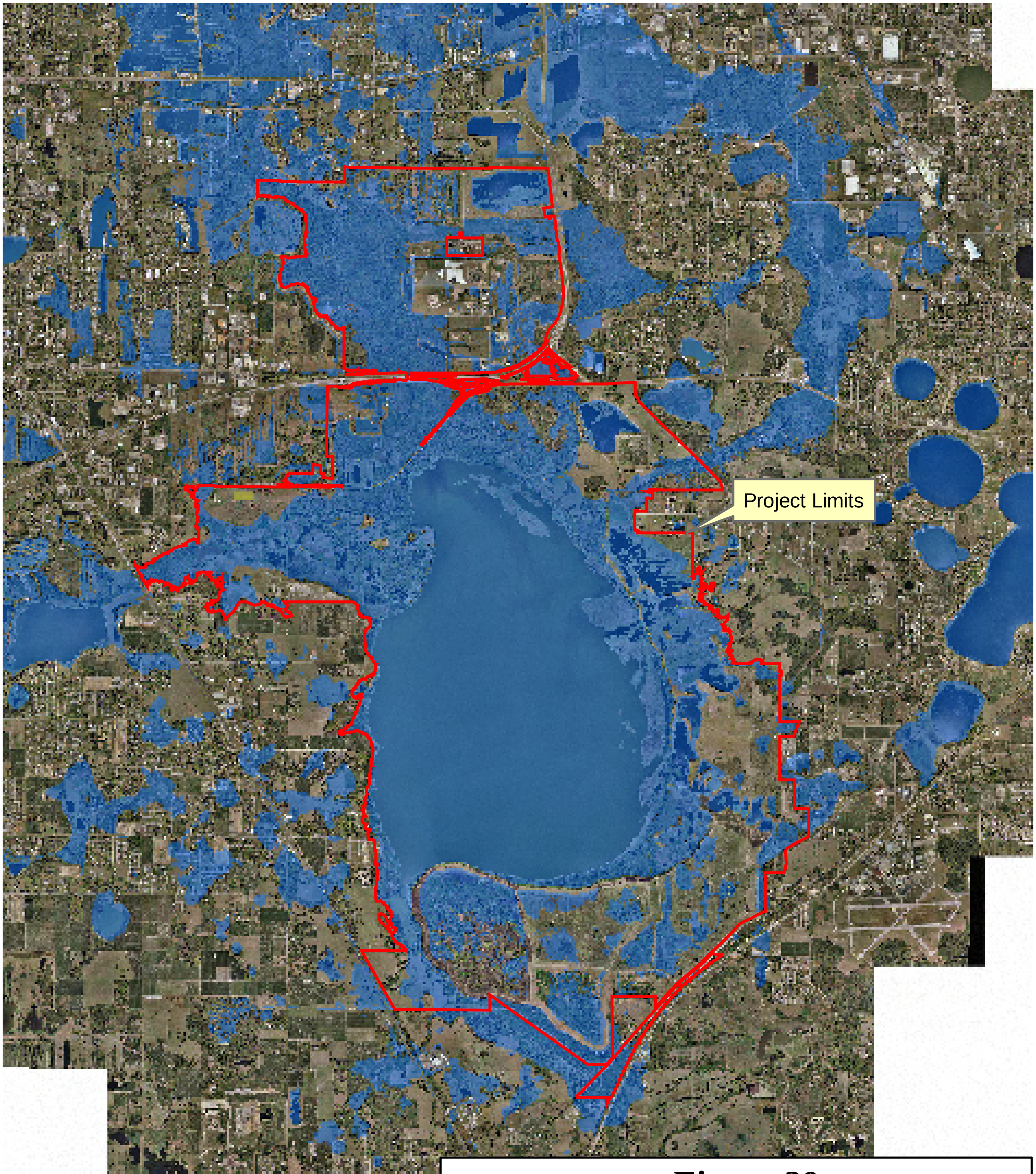

Figure 29
98.7 Max 100 Year Storm Event

Inundated Areas

National Geodetic Vertical Datum of 1929

0 0.625 1.25 2.5

Miles

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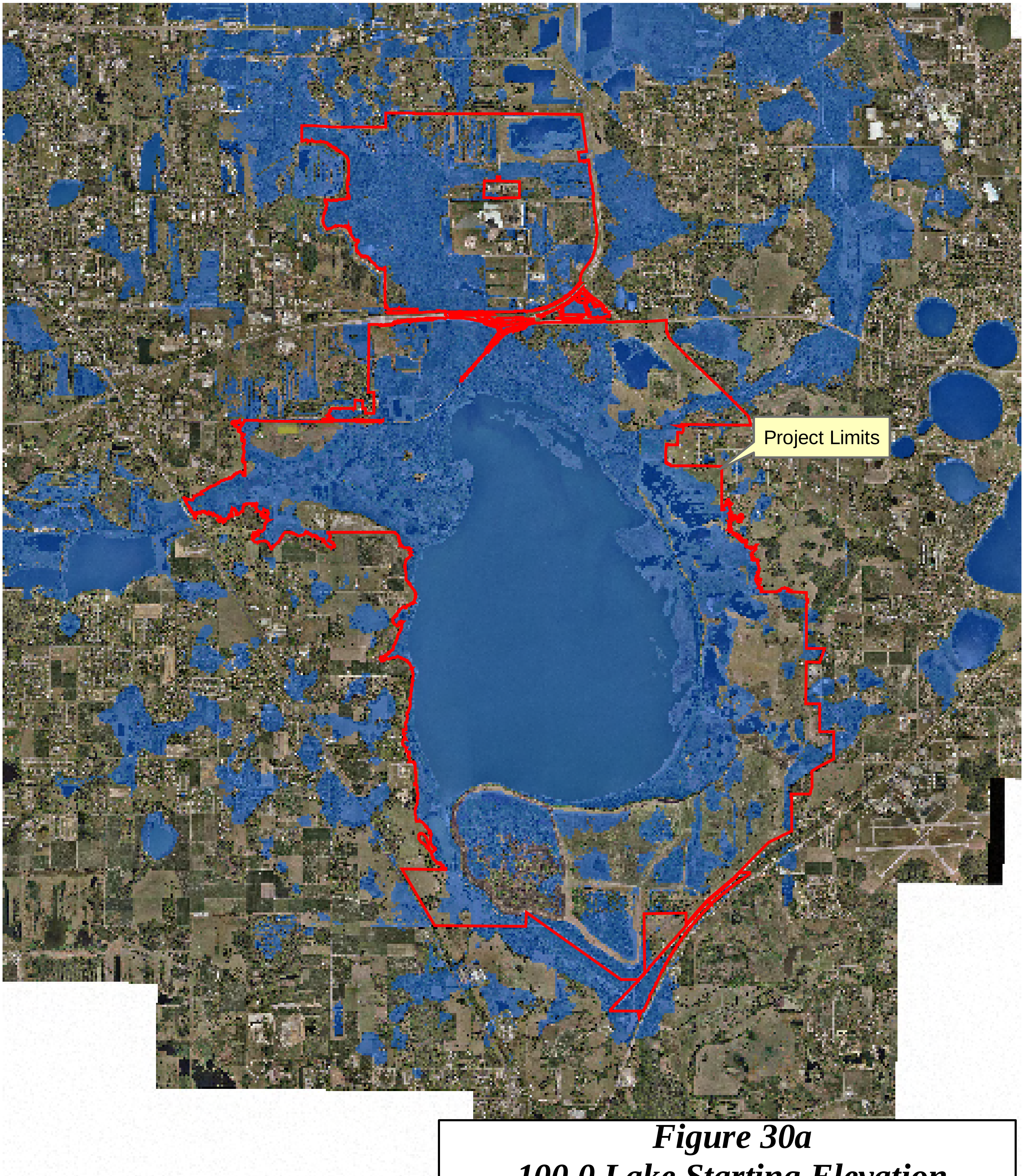


Figure 30a
100.0 Lake Starting Elevation
Max 100 Year Storm Event

Inundated Areas

National Geodetic Vertical Datum of 1929

0 0.625 1.25 2.5

Miles

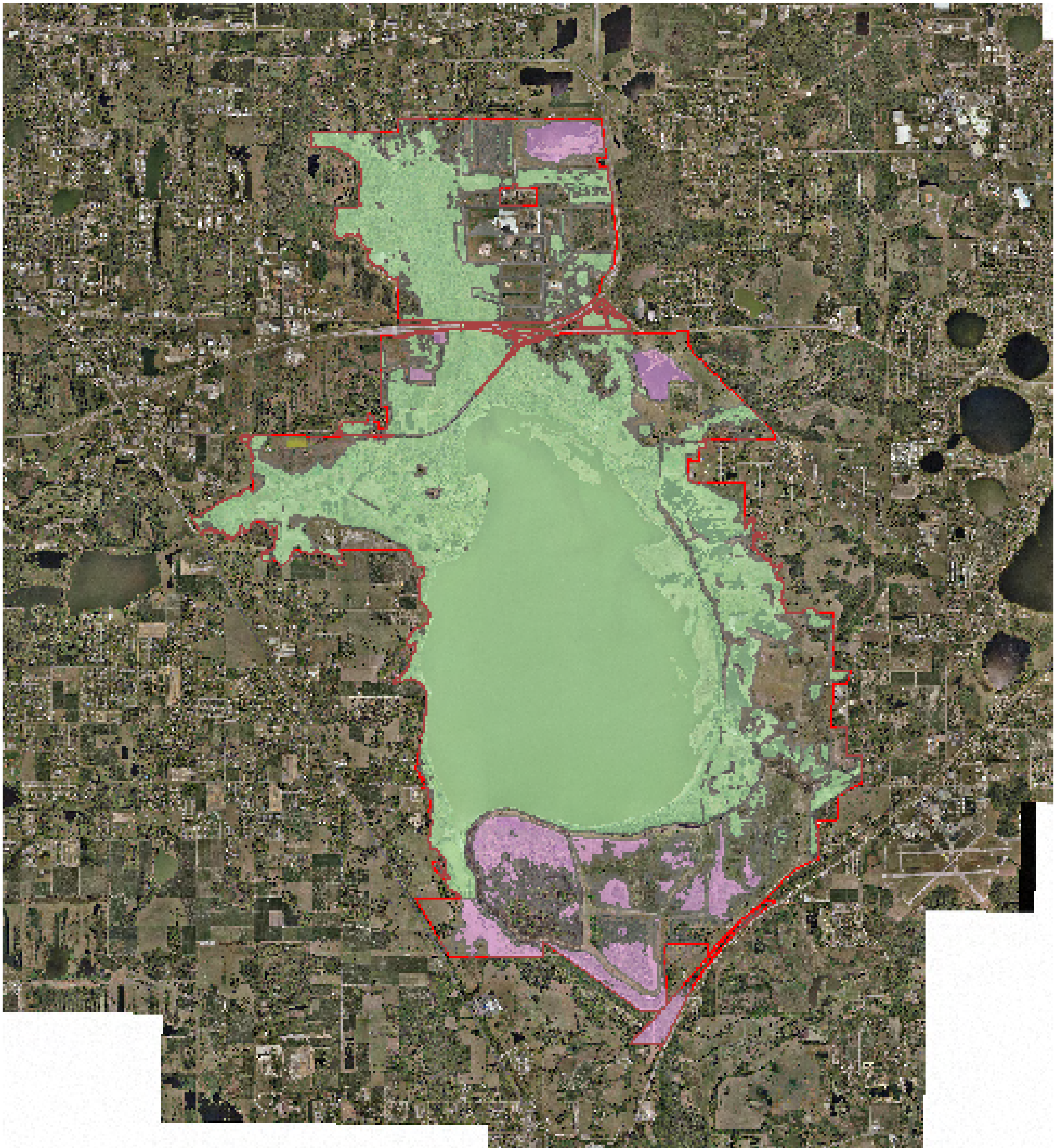


Figure 30b
100.0 Lake Starting Elevation
Max 100 Year Storm Event
Affected Floodplain

National Geodetic Vertical Datum of 1929

0 0.625 1.25 2.5
Miles

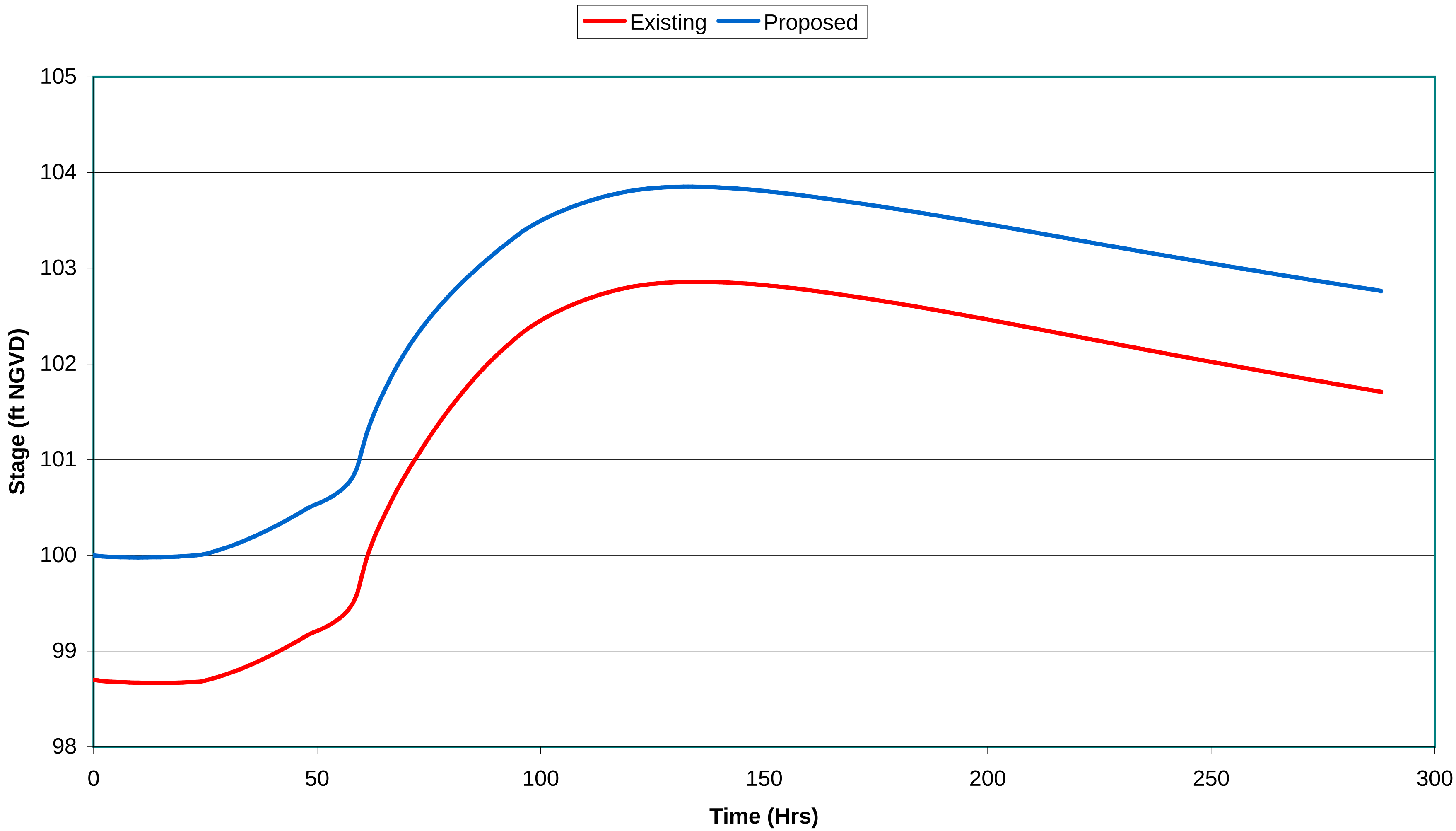
Legend

Project Limits

AFFECTED

UNAFFECTED

Figure 31
Stage-Duration for 100 Year Flood for Existing And Proposed Conditions at Lake Hancock (Node N2100)



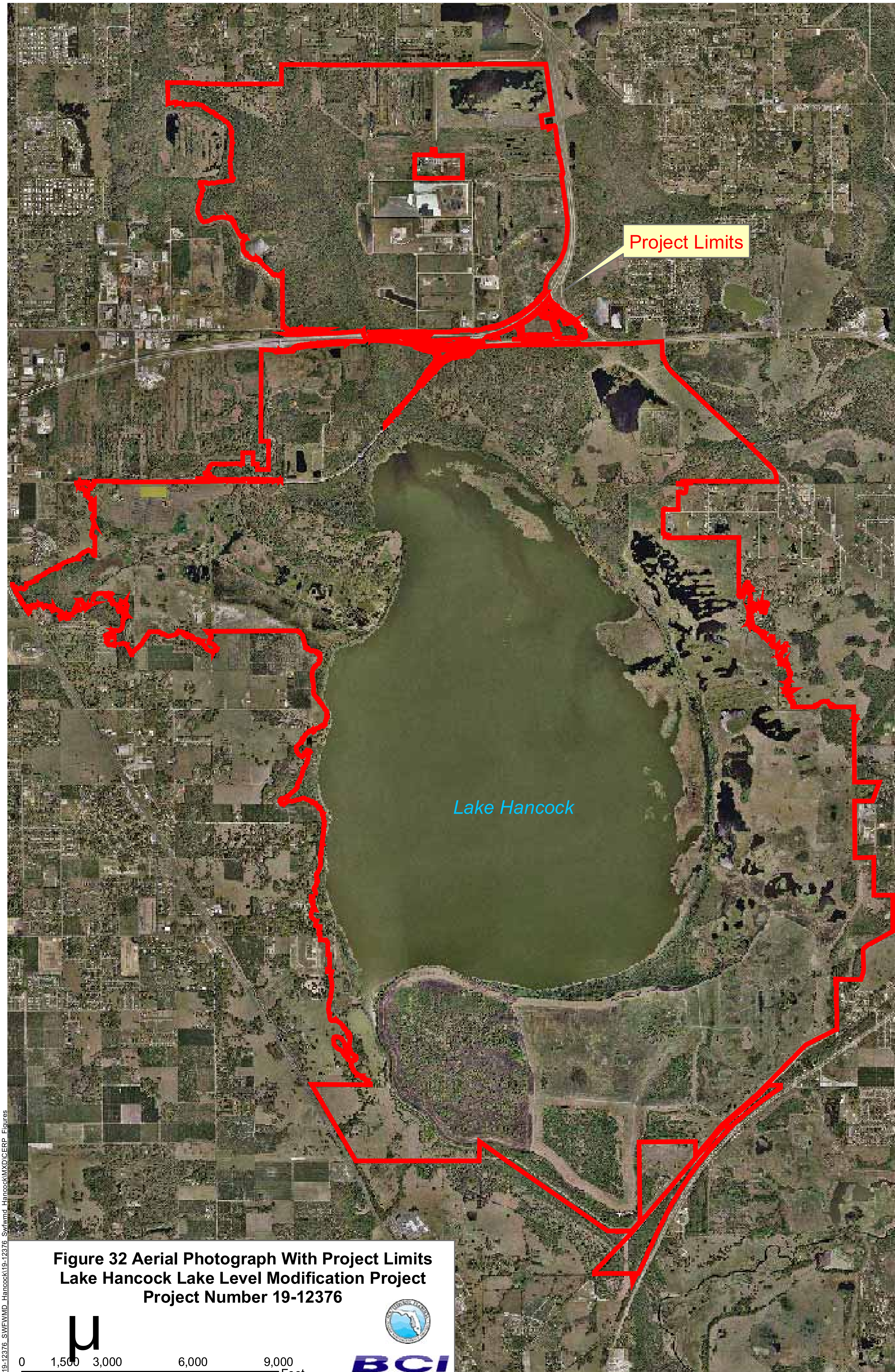


Figure 32 Aerial Photograph With Project Limits
Lake Hancock Lake Level Modification Project
Project Number 19-12376

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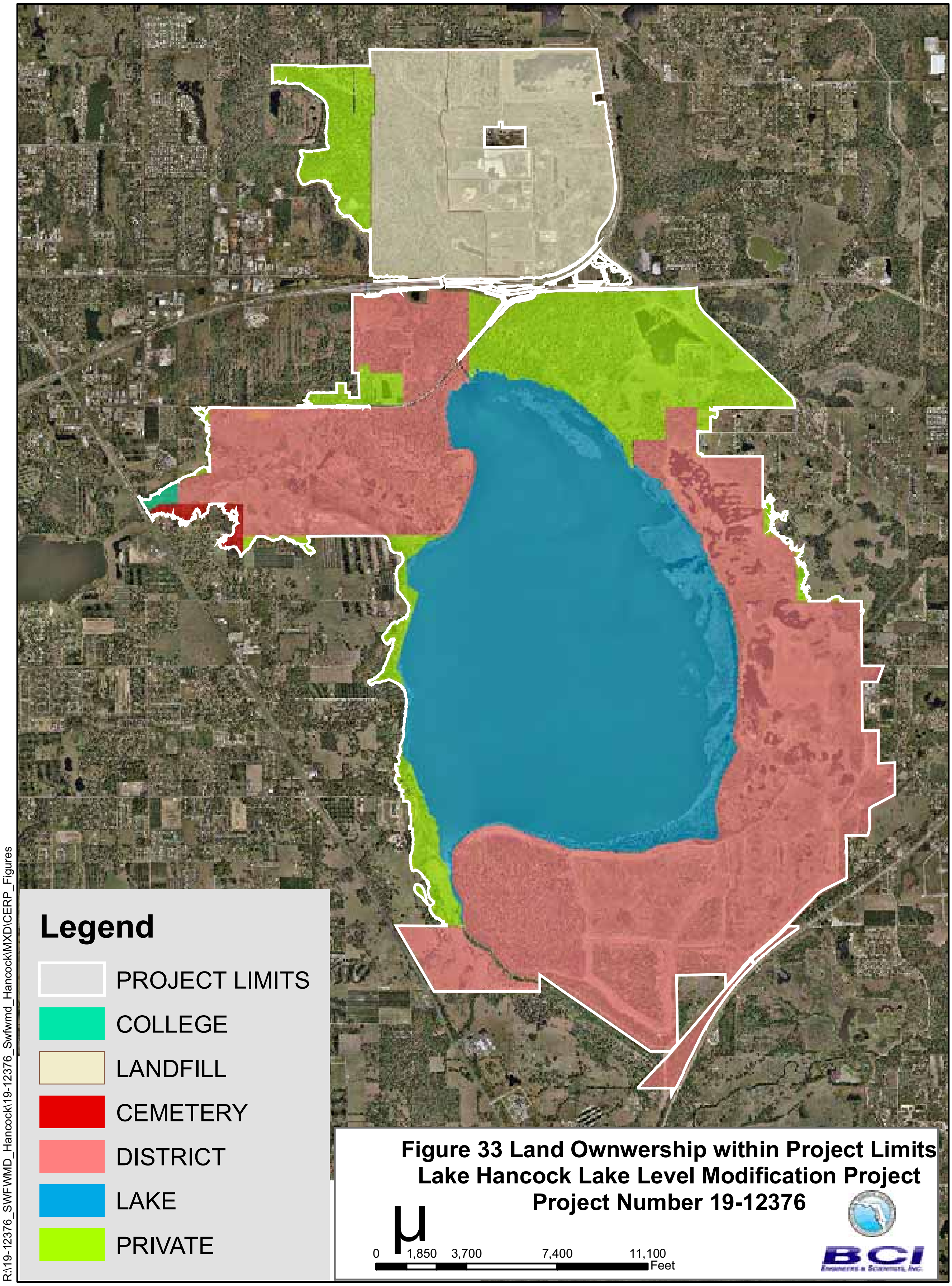

Figure 33 Land Ownwership within Project Limits
Lake Hancock Lake Level Modification Project
Project Number 19-12376

Figure 34
98.7 Level Pool (Existing)
Inundated Areas
National Geodetic Vertical Datum of 1929
0
0.5
1
2
Miles
BCI

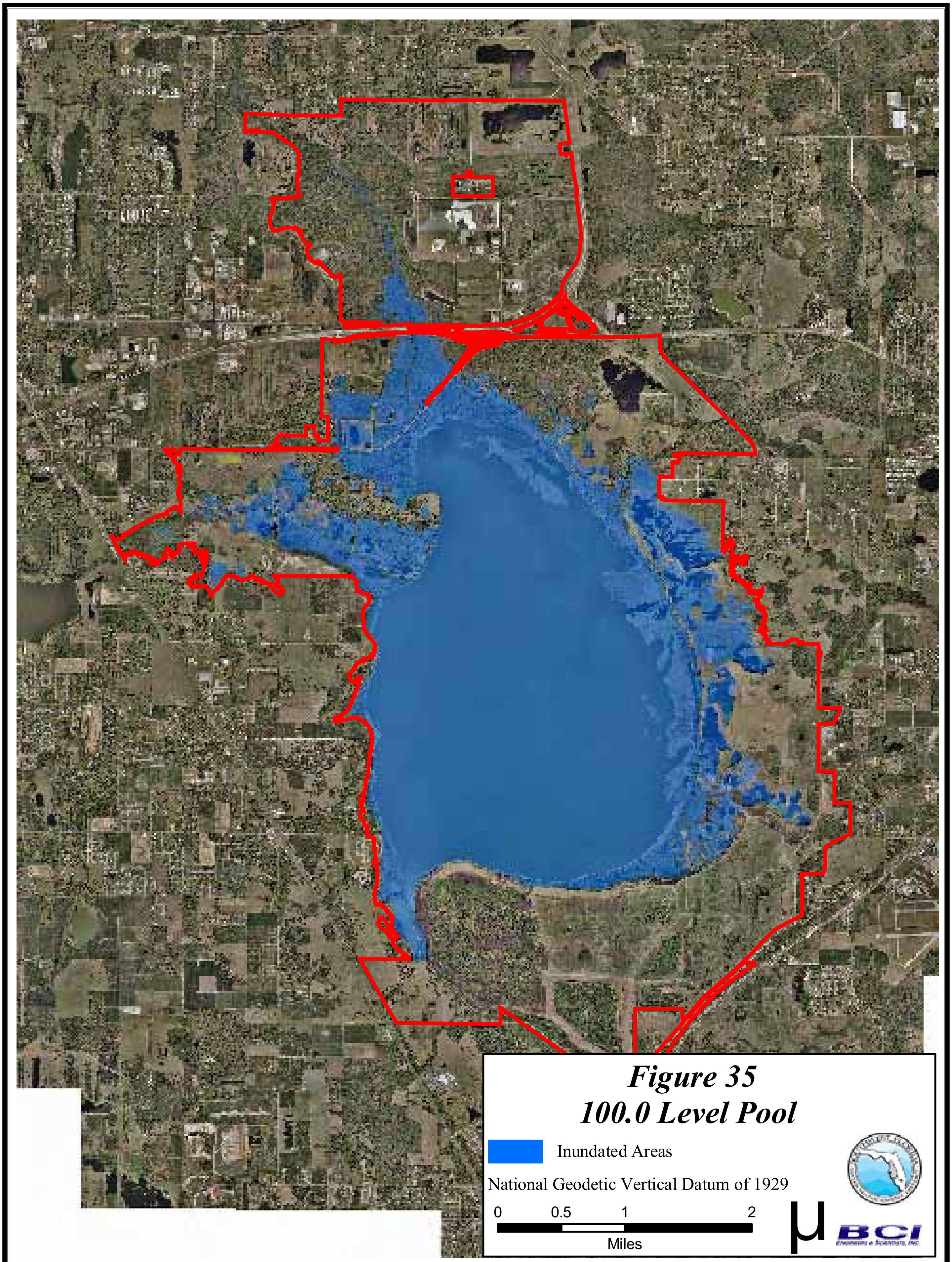

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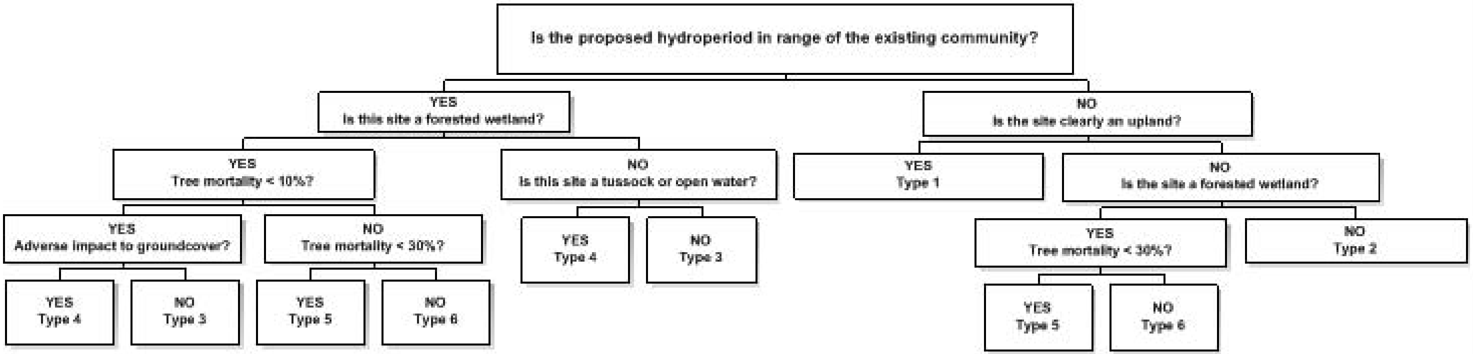
FIGURE 36. RESTORATION CLASSIFICATION DECISION TREE



Type 1 = Upland restored to a wetland. Net Credit.
Type 2 = Marginally wet site restored to a robust marsh. Net Credit.
Type 3 = Wetland with an enhanced water environment and no adverse impact to community structure. Net Credit.
Type 4 = Wetland with no net functional change. No Credit or Loss.
Type 5 = Wetland with an enhanced water environment and moderate impact to community structure. Net Loss.
Type 6 = Wetland with an enhanced water environment and substantial impact to community structure. Net Loss.

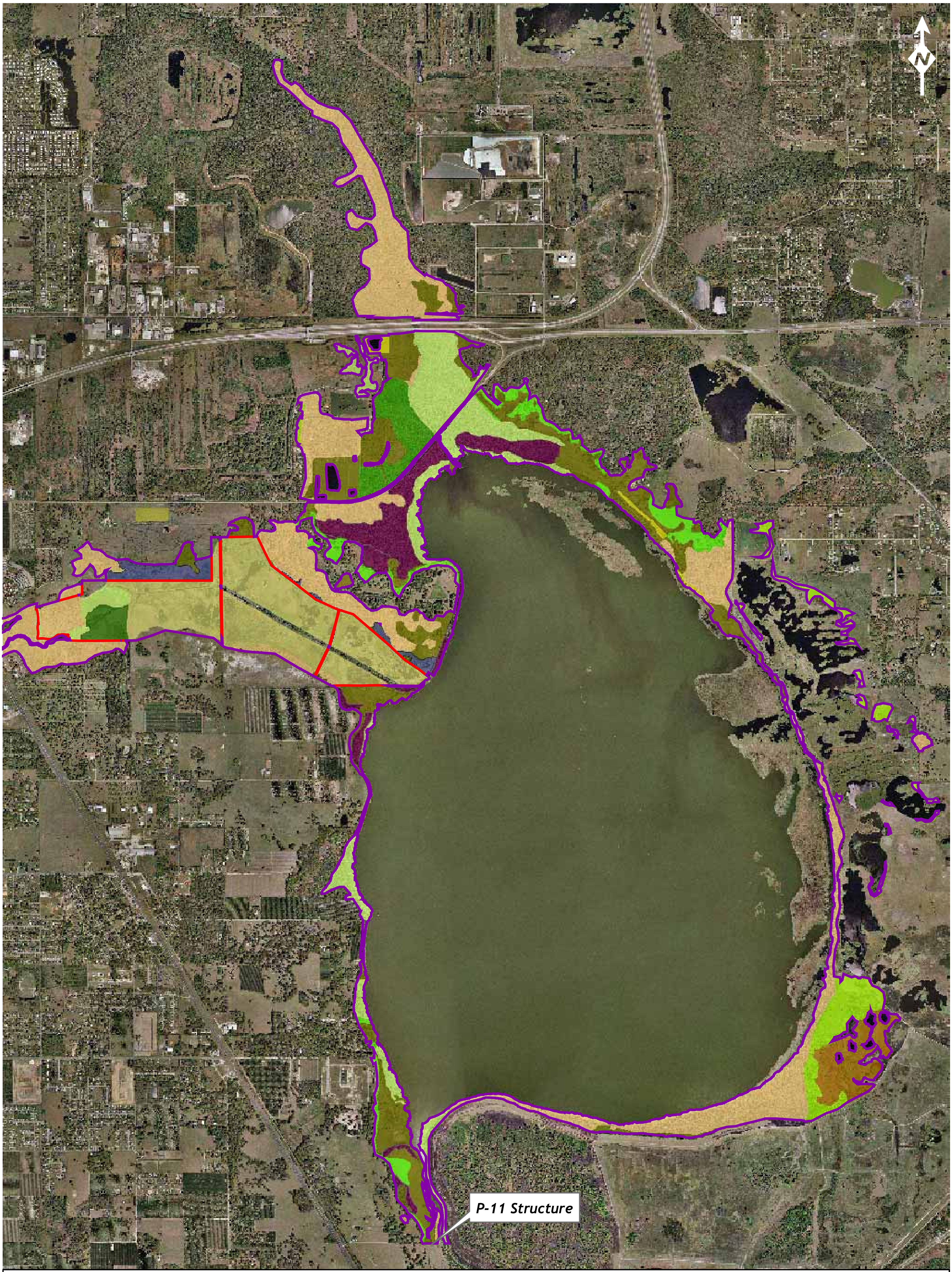


Figure 37
Lake Hancock Proposed Littoral Wetlands

Proposed Littoral Wetlands
Boundary of FDOT Circle B BAR Ranch
2100W - WET PASTURES
6100 - WETLAND HARDWOOD FORESTS
6150 - STREAM AND LAKE SWAMPS (BOTTOMLAND)
6170 - MIXED WETLAND HARDWOODS
6180 - WILLOW AND ELDERBERRY
6210 - CYPRESS
6300 - WETLAND FORESTED MIXED
6400 - VEGETATED NON-FORESTED WETLANDS
6410 - FRESHWATER MARSHES
6412 - CATTAIL
6430 - WET PRAIRIES
6440 - EMERGENT AQUATIC VEGETATION

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0 0.5 1
Miles

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Figure 38 - Type 1 Areas
Uplands Restored to Wetlands

Boundary of FDOT Circle B BAR Ranch
6410 - FRESHWATER MARSHES
6180 - WILLOW AND ELDERBERRY
6430 - WET PRAIRIES

0 0.5 1
Miles

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Figure 39 - Type 2 Areas
Hydrologic Enhancement, Community Improvement

Boundary of FDOT Circle B BAR Ranch
6410 - FRESHWATER MARSHES
6430 - WET PRAIRIES

0 0.5 1
Miles

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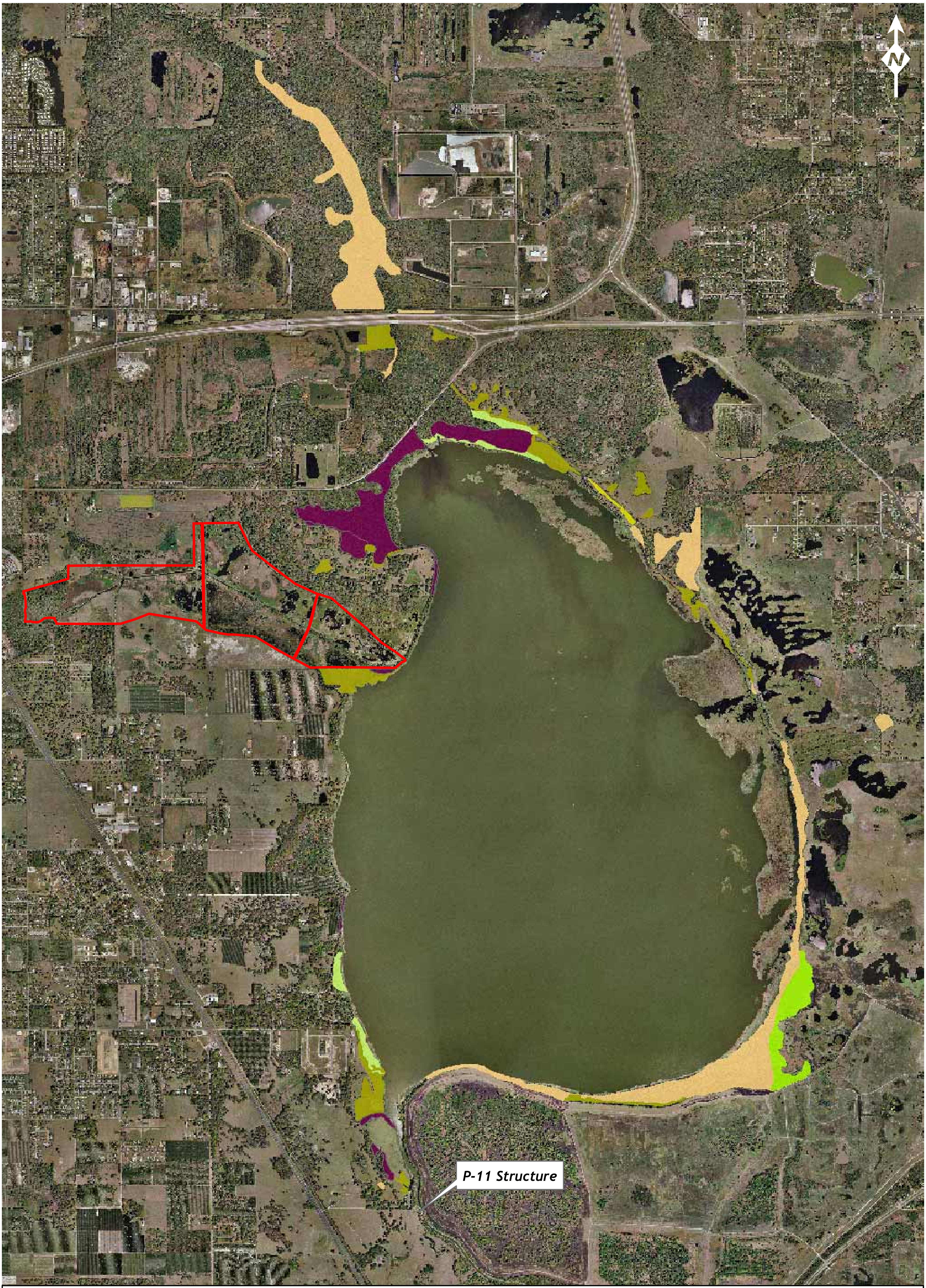

Figure 40 - Type 3 Areas
Hydrologic Enhancement, No Community Changes

- Boundary of FDOT Circle B BAR Ranch
- 6150 - STREAM AND LAKE SWAMPS (BOTTOMLAND)
- 6180 - WILLOW AND ELDERBERRY
- 6210 - CYPRESS
- 6300 - WETLAND FORESTED MIXED
- 6410 - FRESHWATER MARSHES
- 6440 - EMERGENT AQUATIC VEGETATION

0 0.5 1
Miles

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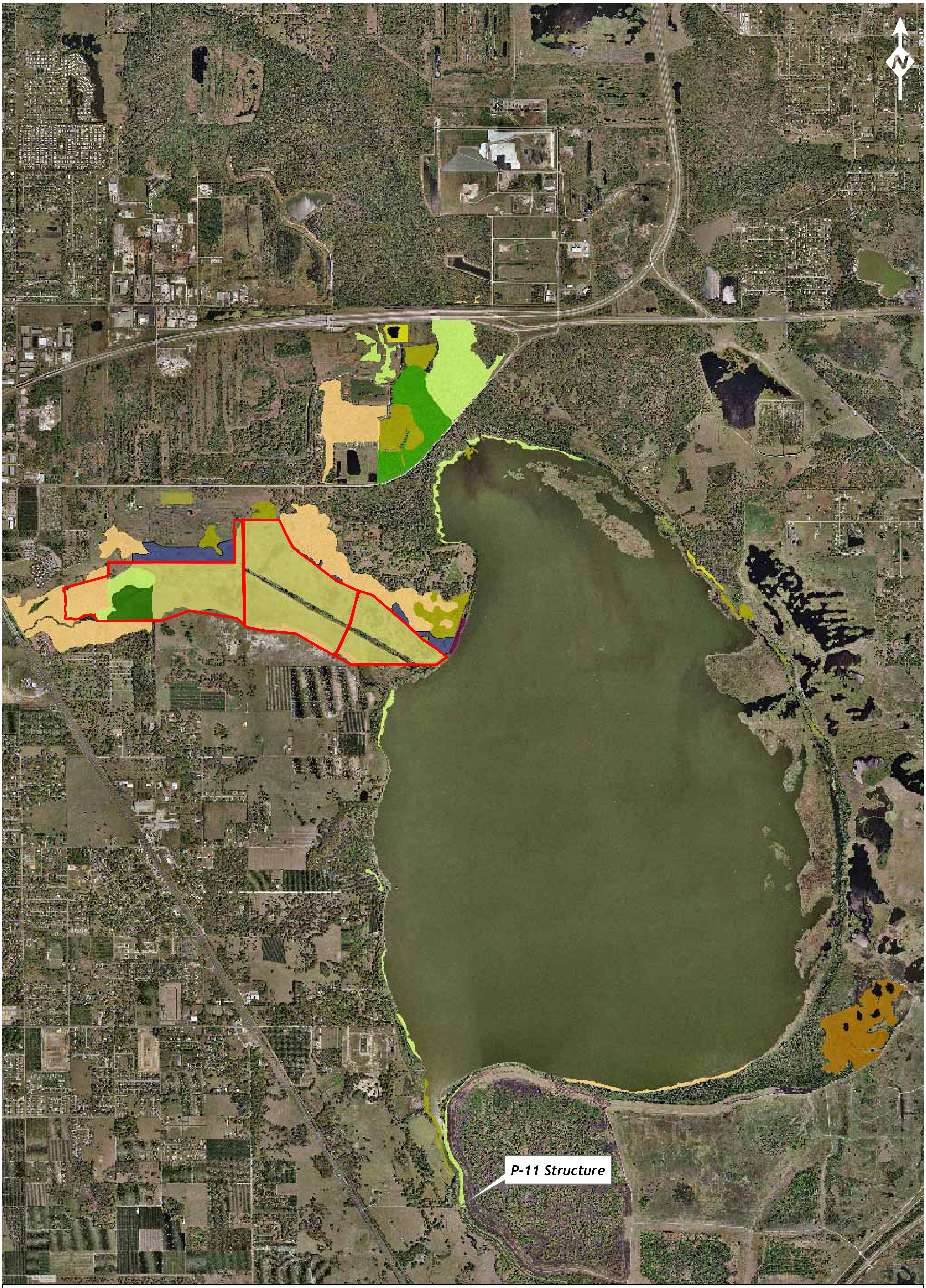

Figure 41 - Type 4 Areas (No Net Change)

- Boundary of FDOT Circle B BAR Ranch
- 2100W - WET PASTURES
- 6100 - WETLAND HARDWOOD FORESTS
- 6150 - STREAM AND LAKE SWAMPS (BOTTOMLAND)
- 6170 - MIXED WETLAND HARDWOODS
- 6210 - CYPRESS
- 6300 - WETLAND FORESTED MIXED
- 6400 - VEGETATED NON-FORESTED WETLANDS
- 6410 - FRESHWATER MARSHES
- 6412 - CATTAIL
- 6440 - EMERGENT AQUATIC VEGETATION

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0 0.5 1
Miles

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Figure 42 - Type 5 Areas
Hydrologic Enhancement, Moderate Canopy Gaps

- Boundary of FDOT Circle B BAR Ranch
- 6150 - STREAM AND LAKE SWAMPS (BOTTOMLAND)
- 6210 - CYPRESS
- 6300 - WETLAND FORESTED MIXED
- 6410 - FRESHWATER MARSHES

0 0.5 1
Miles

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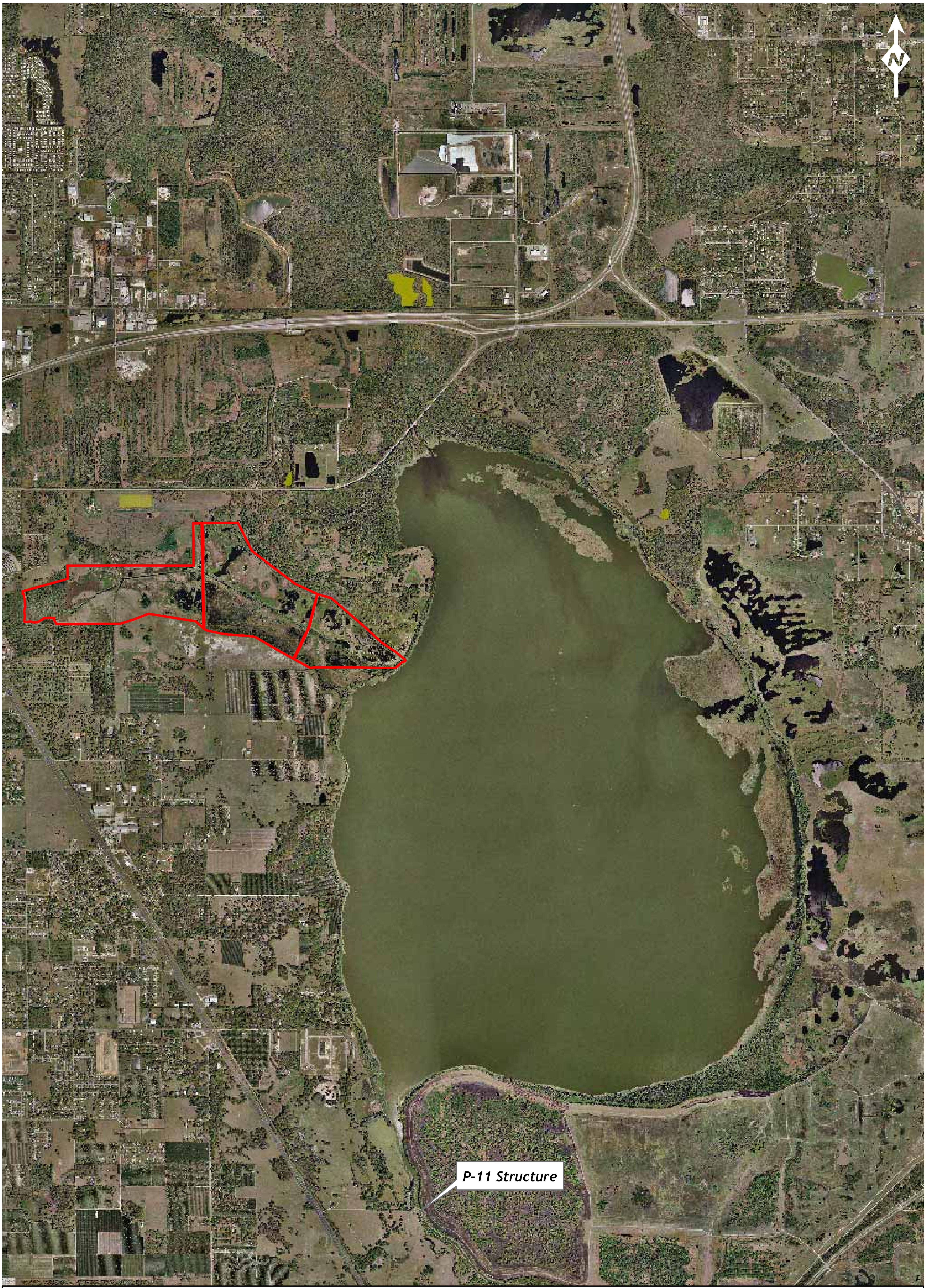

Figure 43 - Type 6 Areas
Hydrologic Enhancement, Significant Canopy Gaps

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0 0.5 1
Miles

Boundary of FDOT Circle B BAR Ranch
6410 - FRESHWATER MARSHES

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Figure 44
Total Nitrogen (TN) Concentrations (mg / liter) vs. Flows (cfs) for WY2003 for Saddle Creek at P-11, Peace River at Bartow, Peace River at Ft. Meade, and Peace River at Arcadia Gage Sites.

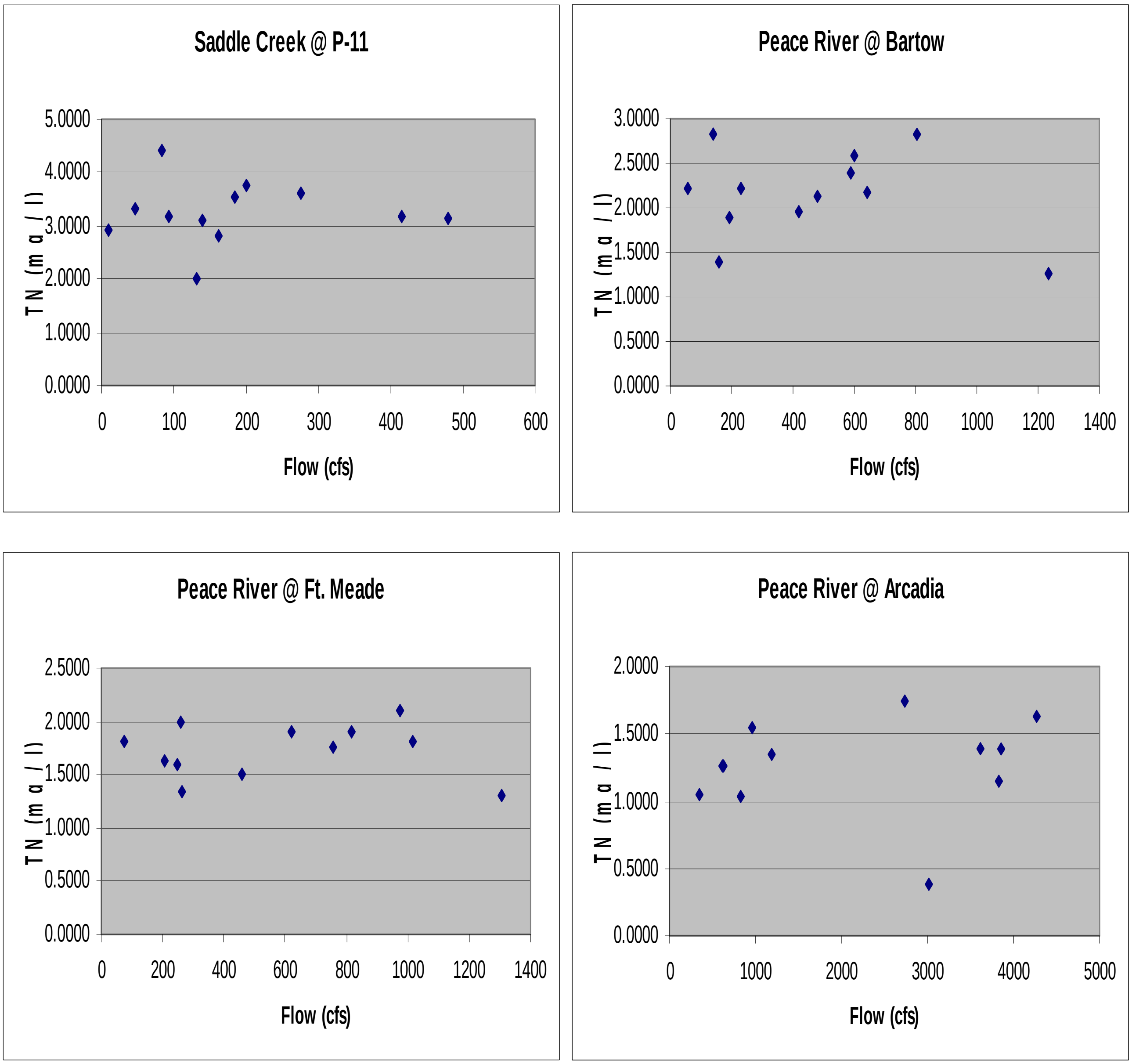
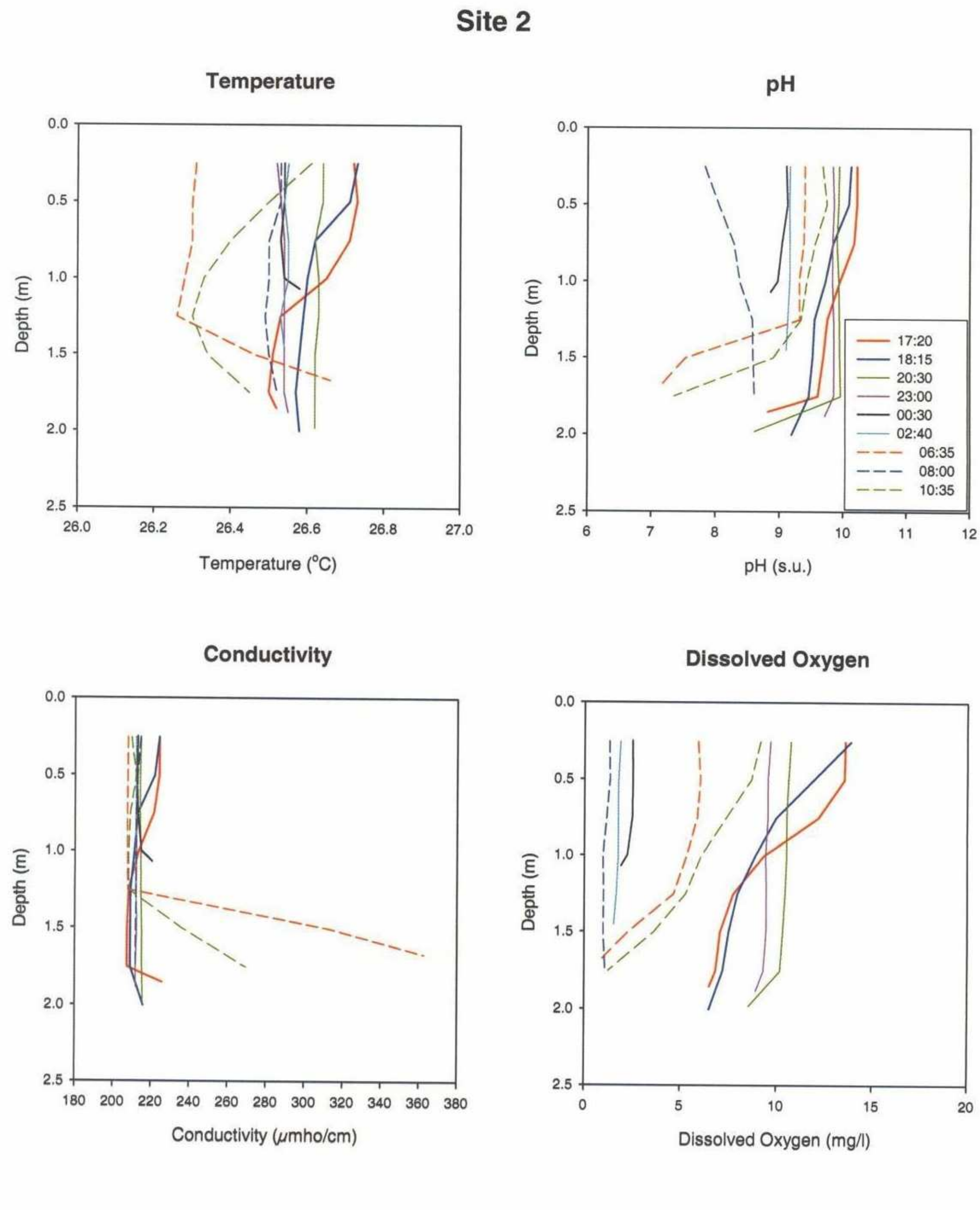


Figure 45
Diurnal Water Quality Data from Lake Hancock in July 2004.
Data are from ERD (2005).



Compilation of diurnal vertical profiles collected at site 2 in Lake Hancock on July 20, 2004.

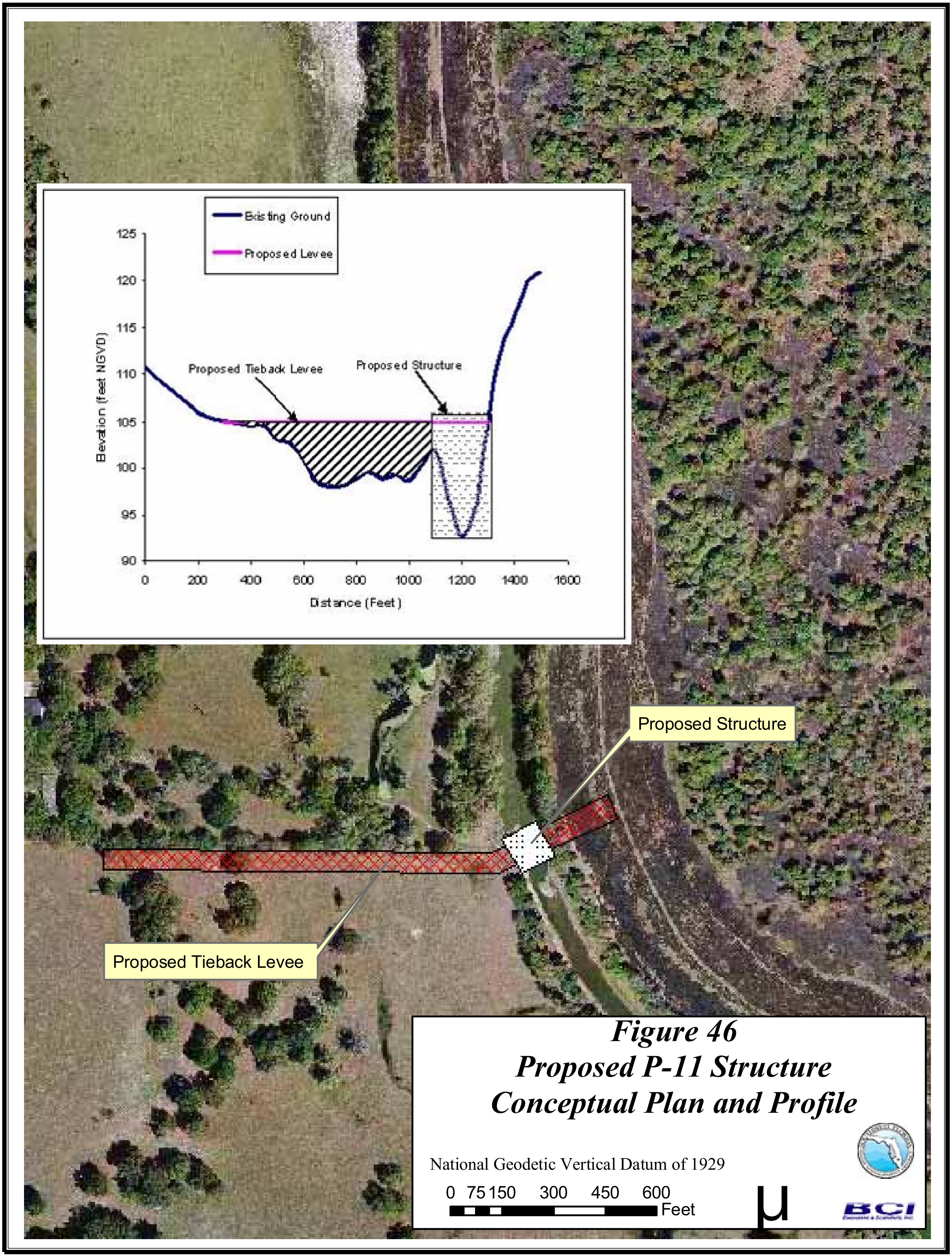


Figure 46
Proposed P-11 Structure
Conceptual Plan and Profile

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