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CITY OF WINTER PARK, FLORIDA
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CITY OF CULTURE AND HERITAGE

CRA STORMWATER MASTER PLAN UPDATE AND EXPANSION

REPORT

Prepared for

City of Winter Park Public Works Department
401 City of Winter Park, Florida
Winter Park, 32789-4386

Prepared by

Geosyntec Consultants, Inc.
3504 Lake Lynda Drive, Suite 155
Orlando, Florida 32817

Project FW10069

December 2024

CRA Study Update and Lake Killarney Expansion Report

Prepared for
City of Winter Park Public Works Department
401 Park Avenue South
Winter Park, Florida 32789-4386

Prepared by
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3504 Lake Lynda Drive, Suite 155
Orlando, Florida 32817

The engineering material and data contained within the enclosed report was prepared by Geosyntec Consultants, Inc. for sole use by the City of Winter Park Public Works Department. This report was prepared under the supervision and direction of the respective undersigned, whose seal as a registered professional engineer is affixed below.

GLORIA TEAGUE LICENSE No 81868 STATE OF FLORIDA PROFESSIONAL ENGINEER

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December 2024

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1. INTRODUCTION AND BACKGROUND

1.1 Introduction

This report presents the results of the study to update and expand the 2020 Community Redevelopment Agency (CRA) Stormwater Master Plan (SMP) to include the contributing areas to Lake Killarney, Lake Bell, Lake Wilderness, and Lake Gem. This study evaluated existing conditions and drainage improvement alternatives for the expanded study area in the City of Winter Park. Geosyntec Consultants (Geosyntec) was tasked by the City of Winter Park's (City) Public Works Department to perform this assessment. The work was performed under Geosyntec's Continuing Contract for Professional, Architectural & Engineering Services – Stormwater Management & Design with the City.

1.2 Background and Location

The study area is located in Winter Park, Florida and is bounded by Kennedy Boulevard to the north, Lakes Maitland and Osceola to the east, Harmon Avenue to the south, and Adanson Street to the west. The study area is within the Howell Creek Watershed in Orange County (County) and under St. John's River Water Management District (SJRWMD) jurisdiction. Refer to **Exhibit 1** and **Exhibit 2** for the Vicinity Map and Site Map, respectively.

The City has reported localized, nuisance flooding and experienced significant flooding during Hurricane Ian in 2022 in the areas around Lake Killarney, Lake Bell, and Lake Mendsen (MLK Park). Specific areas of concern are Lake Killarney, Lake Bell, Lake Mendsen, and Canton Avenue. Lake Killarney and Lake Bell are of concern primarily due to structure flooding during Hurricane Ian, while Canton Avenue is of concern primarily due to nuisance flooding. Lake Mendsen is of concern due to both nuisance flooding and structure flooding during Hurricane Ian. In addition to these specific areas of concern, a general assessment of flooding and water quality deficiencies throughout the expanded CRA area was performed during this study. Lake Killarney, Lake Bell, Lake Mendsen, and Canton Avenue were determined to be the focus areas for this study. Refer to **Exhibit 1** and **Exhibit 2** for the locations of these focus areas.

1.3 Purpose and Goals

The purpose of this study was to develop cost effective and feasible engineering alternatives to mitigate flooding during large storm events around Lake Killarney, Lake Mendsen, and Lake Bell and revisit previous alternatives to reduce nuisance flooding around Lake Mendsen and Canton Avenue. These improvements are aimed at addressing water quantity issues that the City has reported to Geosyntec.

An additional goal of this study was to develop an expanded existing conditions model to include the contributing areas to Lake Killarney, Lake Bell, Lake Wilderness, and Lake Gem. This will provide a means for the City to identify and evaluate other potential flooding and water quality deficiencies within the expanded study area.

2. DATA COLLECTION AND REVIEW

2.1 Previous Studies

The *CRA Stormwater Master Plan* performed by Geosyntec in December 2020 served as the primary reference for this study. In addition, the following additional studies relevant to the study area were compiled, reviewed, and are included with the Electronic Deliverables:

- **2022. *Killarney Drive Drainage Improvements Technical Memorandum.* Geosyntec Consultants.** This County technical memorandum summarizes the flooding assessment of the outfall to Lake Killarney on Euston Road and Lake Killarney Drive and includes drainage improvement alternatives.
- **2022. *Control Structure Inventory Update Report*. CDM Smith.** This report was developed as an update to the County's 2008 Overview of An Integrated Control Structure Report. 2009 survey data on the Lake Killarney outfall as well as structural information on the Lake Bell weir are included in this report.
- **2018. *Evaluation of the Effectiveness of the Alum Sediment Inactivation Treatment to Lake Killarney*. Environmental Research and Design, Inc. (ERD).** This report summarizes the County Environmental Protection Division's study to conduct sediment nutrient inactivation of available phosphorus in Lake Killarney to improve water quality.
- **2015. *Drainwell Model Methodology Technical Memorandum*. Geosyntec Consultants.** This technical memorandum summarizes the development of a methodology to accurately simulate drainwell stage-inflow capacity relationship for hydrologic and hydraulic (H&H) modeling.
- **2014. *Well Completion Report for the Replacement of Ohio Street and Cambridge Avenue (DW-034/DW-035) Drainage Wells*. DEVO Engineering.** This report summarizes well construction and development, geophysical and video logging, load testing, and provides as-built drawing for the six drainwells located on the southwest side of Lake Killarney and the abandonment of existing wells on Ohio Street and Cambridge Avenue.
- **2013. *Well Completion Report for the Construction of Minnesota Ave. Drainage Well (DW-036)*. DEVO Engineering.** This report summarizes well construction and development, geophysical and video logging, and provides as-built drawing for the drainwell on Nicolet pond (located at the intersection of Minnesota Avenue and Nicolet Avenue), and the abandonment of the existing well.
- **2013. *Lake Killarney Hydrologic/Nutrient Budget Evaluation*. ERD.** This report summarizes the joint project between the City and County to quantify and rank hydrologic and pollutant loadings to Lake Killarney. As part of this study a bathymetric survey was performed, contributing drainage basins to Lake Killarney were delineated, and stormwater treatment systems, permitted and natural systems as well as retrofit projects, were inventoried.

- **2011. *DRAFT Howell Creek Basin Watershed Management Plan*. CDM.** This report summarizes the comprehensive drainage and flood level-of-service (LOS) evaluation of the Howell Creek watershed, including floodplain delineation and a water quality improvement summary. The existing conditions Interconnected Channel and Pond Routing computer model (ICPR) model was referenced for this study.

- **2010. *Minnesota Avenue Drainage Evaluation Report*. Inwood Consulting Engineers.** This report summarizes the joint study between the City, County, and City of Orlando to evaluate drainage within the vicinity of Minnesota Ave to address flooding problems. As part of this study an existing conditions ICPR model was developed and proposed improvement concepts were evaluated.

- **2008. *Well Completion Report for the Replacement of the Clay Street (DW-037) Drainage Well*. DEVO Engineering.** This report summarizes well construction and development, geophysical and video logging, and provides as-built drawing for the drainwell located on Miller Avenue near its intersection with Clay Street and the abandonment of the existing well. Load testing was not performed due to the lack of a suitable water source.

- **2004. *Town of Eatonville Stormwater Master Plan*. Spectra Engineering & Research, Inc.** This report summarizes the existing conditions of the stormwater system for the Town of Eatonville and included surveying, inventory and assessment of structures, identification of flooding issues, mapping of the stormwater system, preliminary modeling using ICPR. At this time it is unknown if final modeling and assessment were ever completed as no subsequent report could be found.

2.2 Review of Available Construction Plans, Surveys, and As-Builts

Several plans and documents that contained key information about drainage infrastructure in the study area were provided by the City. Geosyntec also downloaded Environmental Resource Permit (ERP) documents from SJRWMD's permitting website for projects in and around the expanded study area including the Interstate 4 (I-4) drainage plans to delineate accurate basins and determine connectivity to Lake Wilderness. Data from several of these documents were used to parameterize the existing conditions model developed for this study. Relevant documents collected from the City, County, and downloaded from SJRWMD are listed below.

Table 2-1: Summary of Reference Data

Summary of Reference Data		
Environmental Resource Permits		
ERP Number	**Project Name**	**Available Data**
45892	Winter Park Oaks	Drainage infrastructure
46152	Raffertys Doctor Office	Drainage infrastructure
46178	Corporate Square	Drainage infrastructure
46428	NAPA Auto Parts	Drainage infrastructure
105632	Wymore Repump Facility	Drainage infrastructure
128968	4 Rivers Winter Park	Drainage infrastructure

Summary of Reference Data		
ERP Number	**Project Name**	**Available Data**
145693	Hungerford Elementary	Drainage infrastructure
145976	Winter Park Center	Drainage infrastructure
148961	Monroe Ave Drainage Outfall	Drainage infrastructure
150569	Office 436 Wymore	Drainage infrastructure
159496	Raindancer Car Wash	Drainage infrastructure
180095	Lifetime Winter Park	Drainage infrastructure
106953-2	Village Park Senior Housing	Drainage infrastructure
113255-1	BankAtlantic at Winter Park	Drainage infrastructure
114454-1	Central Florida Commuter Rail Transit – Phase 1	Drainage infrastructure
114562-2	Wawa Winter Park	Drainage infrastructure
119071-1	Winter Park 9th Grade Center	Drainage infrastructure
123462-1	Winter Park Community Center	Drainage infrastructure
128708-1	Ravaudage Phase 1	Drainage infrastructure
130498-1	Swoope Condos I	Drainage infrastructure
131899-1	Family Life Center	Drainage infrastructure
142864-1	Lakeside Crossing	Drainage infrastructure
143262-1	OCPS Winter Park Tech	Drainage infrastructure
145751 - 1	1800 Lee Road Townhomes	Drainage infrastructure
148266-1	Maitland Shores Apartment	Drainage infrastructure
149720-1	Lake Killarney	Drainage infrastructure and Lake Killarney data
162228-1	Starbucks Lee Road	Drainage infrastructure
20116-1	Alexan North End	Drainage infrastructure
20624-1	Kennedy Blvd Lake Ave	Drainage infrastructure
20833-3	Winter Park Village Redevelopment REI	Drainage infrastructure
20947-1	Lake Island Park	Drainage infrastructure and Lake Mendsen data
20947-2	Lake Island Killarney Interconnect	Drainage infrastructure and Lake Mendsen data
20947-5	Winter Park Library	Drainage infrastructure and Lake Mendsen data
27882-1	Town Eatonville Community Park	Drainage infrastructure
27929-1	Fields BMW	Drainage infrastructure
28033-1	Winter Park Village	Drainage infrastructure
28033-2	Winter Park Village Redevelopment Chase Bank	Drainage infrastructure

<table>
<tr><th colspan="3">Summary of Reference Data</th></tr>
<tr><th>ERP Number</th><th>Project Name</th><th>Available Data</th></tr>
<tr><td>44453-3</td><td>Rollins College Crummer Building Expansion</td><td>Drainage infrastructure</td></tr>
<tr><td>46105-3</td><td>Valencia Community College – Winter Park Campus</td><td>Drainage infrastructure</td></tr>
<tr><td>46178-3</td><td>Lee Road Extension</td><td>Drainage infrastructure</td></tr>
<tr><td>46178-6</td><td>Winter Park Whole Foods</td><td>Drainage infrastructure</td></tr>
<tr><td>62355-21</td><td>I-4 Ultimate Mainline from Lee Rd W to Kennedy Blvd E</td><td>Drainage infrastructure and FDOT Pond data</td></tr>
<tr><td>64811-1</td><td>Oak Haven Villas</td><td>Drainage infrastructure</td></tr>
<tr><td>67272-1</td><td>Speedway #9862</td><td>Drainage infrastructure</td></tr>
<tr><td>67631-1</td><td>DePugh Nursing Home</td><td>Drainage infrastructure</td></tr>
<tr><td>71640-1</td><td>Winter Park Vet</td><td>Drainage infrastructure</td></tr>
<tr><td>76616-1</td><td>Versailles Condominiums</td><td>Drainage infrastructure</td></tr>
<tr><td>80136-1</td><td>BP Amoco RF #15293</td><td>Drainage infrastructure</td></tr>
<tr><td>80136-3</td><td>TD Bank Winter Park</td><td>Drainage infrastructure</td></tr>
<tr><td>80878-1</td><td>Winter Park Home Depot</td><td>Drainage infrastructure</td></tr>
<tr><td>80878-2</td><td>Winter Park Race Track Home Depot</td><td>Drainage infrastructure</td></tr>
<tr><td>80943-1</td><td>Medallion Convenience Store - Lee Road</td><td>Drainage infrastructure</td></tr>
<tr><td>81655-1</td><td>City of Winter Park Public Safety Building</td><td>Drainage infrastructure</td></tr>
<tr><td>81655-2</td><td>Swoope Water Treatment Plant Improvement</td><td>Drainage infrastructure</td></tr>
<tr><td>85633-1</td><td>Lee Road Retail Center</td><td>Drainage infrastructure</td></tr>
<tr><th colspan="3">CAD Drawings</th></tr>
<tr><th colspan="2">CAD File Name</th><th>Available Data</th></tr>
<tr><td colspan="2">CRA DRAINAGE COMPILATION GEO RECTIFIED PARTIAL.dwg</td><td>A compilation of CAD files containing drainage infrastructure</td></tr>
<tr><td colspan="2">designbase-orange av wp.dwg</td><td>Drainage infrastructure</td></tr>
<tr><td colspan="2">Lake Osceola Alum Treatment Project</td><td>A compilation of CAD files containing design information for an alum injection facility</td></tr>
<tr><td colspan="2">Lake Virginia North Alum Stormwater Treatment System</td><td>A compilation of CAD files containing design information for an alum injection facility</td></tr>
<tr><td colspan="2">Webster Avenue Alum Stormwater Treatment System</td><td>A compilation of CAD files containing design information for an alum injection facility</td></tr>
</table>

Summary of Reference Data	
GIS Data	
GIS Data Name	**Available Data**
WP Stormwater.gdb	Compilation of City drainage infrastructure data including discharge points, inlets, manholes, retrofit locations, control structures, treatment structures, gravity lines, pressurized lines, underdrains, open drains, and retention/detention systems
OC_GIS-SDE_20231218.gdb	Compilation of County GIS's drainage infrastructure including drainwells, inlets, major control structures, pollution control devices, structures, ditches, pipes, and ponds.
OC_PW-SW_20240119.gdb	Compilation of County Public Works Department's drainage infrastructure including drainwells, pond structures, pump stations structures, culverts, ponds, primary canals, and secondary canals.
CDS_and_Baffle_Boxes.shp	Inventory of County Environmental Protection Division (EPD) data including CDS, baffle boxes, and modular wetlands.
CIB_Locations.shp	Inventory of County EPD's curb inlet baskets.
Other City Provided Data	
File Name	**Available Data**
Storm_Atlas_02B.tif	Drainage infrastructure
Storm_Atlas_03B.tif	Drainage infrastructure
Storm_Atlas_06A.tif	Drainage infrastructure
Storm_Atlas_06B.tif	Drainage infrastructure
Storm_Atlas_07A.tif	Drainage infrastructure
Storm_Atlas_07B.tif	Drainage infrastructure
Storm_Atlas_08A.tif	Drainage infrastructure
Storm_Atlas_08B.tif	Drainage infrastructure
Storm_Atlas_09A.tif	Drainage infrastructure
Storm_Atlas_09B.tif	Drainage infrastructure

Summary of Reference Data	
Other City Provided Data	
File Name	**Available Data**
HIGH WATER MARKS POST HURRICAN IAN COMPILATION LAKE BERRY LAKE KILLARNEY AND LAKE VIRGINIA.pdf	High water marks from Hurricane Ian for north and west banks of Lake Killarney
Ian Damage Assessment (Includes Updates from Resident Reports).xlsx	Flooded areas from Hurricane Ian
FLOOD MGMT 3.00.pdf	City's interim adaptive flood management guide (developed in October 2023)
KILLARNEY-DRAIN-WELLS- Exhibit.pdf	Drawing and details of risers on Lake Killarney drainwells
Hurricane Ian Photos	Photos of flooding elevation from Hurricane Ian around Lake Bell, Lake Killarney, MLK, and US 17-92
Global Pump 6GST Cut Sheet.pdf	Specifications for the City's mobile pump

2.3 Vertical Datum Conversion

The vertical datum referenced for all elevations in this study is the North American Vertical Datum of 1988 (NAVD). Data sources referencing the National Geodetic Vertical Datum of 1929 (NGVD) were converted to NAVD using the conversion factor -0.98 for the Howell Branch Watershed from the 2021 Flood Insurance Study (FIS) for the County. It is noted that drainage infrastructure data obtained from the City's Storm Atlas were converted from NGVD to NAVD. Additionally, a majority of the City's GIS data were determined to reference NGVD and were converted to NAVD.

2.4 Soils

A GIS polygon feature class of soils data was obtained from the United States Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey. The hydrologic soil group (HSG) classification data were used in calculating the runoff curve numbers (CNs) in the model. The soils are designated with various HSG classifications, 'A' through 'D', which indicate relative drainage characteristics. An 'A' soil is more freely draining (generally deeper water tables and less runoff potential), and a 'D' soil is more restrictive of drainage (generally higher water tables and more runoff potential). Dual classification soils ('A/D', B/D', and 'C/D') can have varying characteristics during the dry and wet seasons and are often conservatively categorized as HSG 'D' for design-storm based runoff estimations.

Approximately 43% of the soils in the study area are classified as HSG A and approximately 15% are classified as A/D. Approximately 29% of the study area is classified as 'Urban Land' which is typically not assigned an HSG. Urban Land was conservatively estimated as HSG D for the purposes of this study. The remaining study area (13%) is classified as 'Water' and is not typically assigned an HSG.

The soils classifications were used to calculate CNs for hydrologic model runoff calculations. Refer to **Exhibit 3** for a map of the soils in the study area.

2.5 Land Use

Land use polygons for the study area were downloaded from SJRWMD and were dated 2014. The land use polygons were reviewed by Geosyntec and Florida Land Use Cover and Classification System (FLUCCS) code assignments were updated as necessary to reflect current conditions based on a review of 2024 aerials. Land use within the study area is primarily medium density residential (FLUCCS code: 1200) and commercial and services (FLUCCS code: 1400). Refer to **Exhibit 4** for a map of the land use classifications and table summarizing land use percentages in the study area.

2.6 Topography

Topographic data of land surface elevations throughout the study area are based on a Digital Elevation Model (DEM) shown on **Exhibit 5**. The DEM was developed with a resolution of 2.5 ft cells using the 2018-2020 Florida Peninsular LiDAR data collected by the United States Geological Survey. The data was used to establish the overall study area drainage boundary and for development of the H&H model.

2.7 Drainage Infrastructure and Stormwater BMPs

The drainage infrastructure in the expanded study area consists primarily of curb and gutter draining to inlets connected to stormsewer systems typical of urban/suburban land use types. Drainage infrastructure data was compiled and digitized in ArcGIS from the sources summarized in **Section 2.2** and is shown on **Exhibit 6**.

There are various drainwells, exfiltration structures, and stormwater best management practices (BMPs) throughout the expanded study area. As these are given special consideration during model development, a summary of these features is provided below.

- **Drainwells** - The various drainwells in the expanded study area are summarized below.
    - **Center Street Drainwell** – Based on the drainwell video logging, inspection, and evaluation performed by Devo Engineering in June 2015 for the City of Winter Park, this drainwell appears to be almost totally plugged and only achieves a flow rate of approximately 6.4 gallons per minute. The City is not aware of any chronic flooding issues in the drainage network that this drainwell is connected to and therefore, proposed capping this drainwell. This drainwell was not modeled for this study.
    - **Lake Mendsen 20-inch Drainwell** – There is an existing 20-inch drainwell in the center area of Lake Mendsen. The 20-inch drainwell currently has a 6-inch well pump installed within it for irrigation purposes. This drainwell receives water from Lake Mendsen via a control structure.
    - **Lake Mendsen 8-inch Drainwell** – There is an existing 8-inch drainwell on the north side of Lake Mendsen within an existing drainage structure. This drainwell receives water from Lake Mendsen via a control structure.

- **Lake Midget 15-inch Drainwell** – There is an existing 15-inch drainwell on the west side of Lake Midget that serves as the lake's control structure.
- **Lake Killarney Drainwells** – There are 6 existing drainwells on the southwest bank of Lake Killarney that serve as replacements to the Ohio Street and Cambridge Avenue drainage wells:
  - **DW-34**
    - **A** – Existing 10-inch drainwell receiving water from Lake Killarney via an intake pipe.
    - **B** – Existing 12-inch drainwell receiving water from Lake Killarney via a pipe connection with DW-34A.
    - **C** – Existing 12-inch drainwell receiving water from Lake Killarney via a pipe connection with DW-34A.
  - **DW-35**
    - **A** – Existing 10-inch drainwell receiving water from Lake Killarney via an intake pipe with an inline weir.
    - **B** – Existing 12-inch drainwell receiving water from Lake Killarney via a pipe connection with DW-35A.
    - **C** – Existing 12-inch drainwell receiving water from Lake Killarney via a pipe connection with DW-35A.
- **Nicolet Pond 12-inch Drainwell** – There is an existing 12-inch drainwell on the southeast side of Nicolet Pond (at the intersection of Minnesota Avenue and Nicolet Avenue) that serves as a replacement to the previous drainwell in the center of the pond. This drainwell receives water from Nicolet pond via a control structure.
- **Miller Avenue 12-inch Drainwell** – There is an existing 12-inch drainwell on Miller Avenue (east of its intersection with Clay Street) that serves as a replacement to the previous drainwell at the southeast intersection of Miller Avenue and Clay Street. This drainwell receives water from Miller Avenue and Clay Street via a control structure and CDS stormwater treatment unit connected to a curb inlet on the north side of Miler Street.

- **Exfiltration** – The various underground exfiltration structures in the expanded study area are summarized below. Note that not every exfiltration system was included in the model. The exfiltration systems listed below were deemed by Geosyntec to be sufficient enough in size to impact runoff volumes and thus were included in the model.
  - **Winter Park Village** – Nine exfiltration systems were designed to treat 1-inch of runoff and five custom manufactured sedimentation and oil separator baffle boxes provide water quality benefits. The exfiltration systems were designed to provide a combined 3.29 acre-feet (ac-ft) of volumetric storage.
  - **Alfond Stadium at Harper Shepherd Field** – Synthetic turf with an underlying storage layer and underground chambers provide a combined 0.25 ac-ft of volumetric storage. The synthetic turf infield and parking lot stormwater chambers

were designed to increase groundwater recharge and reduce stormwater peak runoff rates.

- **Lakeside Crossing** – Stormwater runoff from the site is managed by an underground offline exfiltration trench, designed to provide water treatment and attenuation. The exfiltration trench was designed to provide 0.524 ac-ft of treatment volume. It is noted that the Lakeside Crossing development is located directly west of Lake Mendsen and any bypass flows from the development are discharged to Lake Mendsen.
- **TD Bank Winter Park** – An underground chamber system provides treatment for the entire site and discharges to an existing curb inlet. The chamber system provides approximately 0.1 ac-ft of volumetric storage and a treatment volume of approximately 0.08 ac-ft.

- **Stormwater BMPs** – The various stormwater BMPs in the expanded study area are summarized below. The exfiltration systems described above are also typically considered a BMP since they reduce the quantity of stormwater discharged from a site and provide treatment via straining during infiltration. It is noted that other BMPs exist throughout the expanded study area, but they are primarily confined to private developments and were not assessed as part of this study.
  - **Canton Avenue Baffle Box** – There is a baffle box located at the east end of Canton Avenue that treats stormwater prior to being discharged to Lake Osceola.
  - **Morse Boulevard Baffle Boxes** – There are two baffle boxes located at the east end of Morse Boulevard that treat stormwater prior to being discharged to Lake Osceola.
  - **Webster Avenue Baffle Box** – There is a baffle box located at the east end of Webster Avenue that treats stormwater prior to being discharged to Lake Osceola.
  - **Lee Road Stormwater Pond** – There is a stormwater wet detention pond located southwest of Lee Road adjacent to Lake Francis that receives stormwater runoff from Lee Road and the private properties on the northeast corner of Lee Road and Orlando Avenue (US 17-92).
  - **Lake Mendsen** – Lake Mendsen is a stormwater park that provides attenuation and treatment of stormwater from the surrounding area. As part of the Lake Island (i.e., "Lake Mendsen")/Killarney Interconnect project, a diversion box was installed near the intersection of Beachview Avenue and Orlando Avenue (US 17-92). The intent of this project was to provide flood control for Lake Mendsen (i.e., provide a hydraulic connection to Lake Killarney) and water quality improvement for Lake Killarney (i.e., treat stormwater runoff from Orlando Avenue prior to being discharged to Lake Killarney).
  - **Swoope Water Treatment Plant Stormwater Pond** – There is a 0.7-acre stormwater dry detention pond that receives runoff from the public safety facility to the southeast, the water treatment plant to the south, and the multi-family housing project to the northwest.

- **9th Grade Center Pond** – There is a stormwater wet detention pond located east of the Winter Park 9th Grade Center. Based on discussions with the City, the stormwater wet detention pond currently operated primarily as a sedimentation pond to remove solids prior to stormwater being discharged to Lake Virginia. Due to the large contributing area and relatively small size of the stormwater pond, the City does not believe the pond currently functions to reduce nutrient loads.
- **Winter Park 9th Grade Center Dry Retention Pond** – There is an existing stormwater dry retention pond located west of the 9th Grade Center Pond that receives runoff from the 9th Grade Center and discharges to the 9th Grade Center Pond.
- **Webster Avenue Alum Facility** – There is an alum injection facility at the east end of Webster Avenue that pumps alum into an upstream drainage structure that discharges to Lake Osceola via a 42-inch pipe.
- **Lake Osceola Alum Facility** – There is an alum injection facility at the east end of Morse Boulevard that pumps alum to drainage structures along Canton Avenue, Lincoln Avenue, Morse Boulevard, and New England Avenue. All alum feed locations are upstream of outfalls that discharge to Lake Osceola.
- **Lake Virginia Alum Facility** – There is an alum injection facility east of the Rollins College field house that pumps alum to two upstream drainage structures that discharge to Lake Virginia via two separate outfalls.
- **Lake Killarney leaf/debris traps** – There are leaf/debris traps on 10 of the 32 stormwater outfalls to Lake Killarney within the City's jurisdiction on the north and east sides of the lake.
- **Lake Killarney curb/grate inlet baskets** – There are 37 curb or grate inlet baskets on stormwater systems with outfalls to Lake Killarney within the County's jurisdiction on the west and south sides of the lake.
- **Lee Road Baffle Box** – There is a baffle box located on the south side of Lee Road east of Turner Road that treats stormwater prior to being discharged to Lake Killarney.
- **Stormwater Management and Reuse Technology (SMART) system** – There is a reuse pipe network provides treatment through on-site irrigation of stormwater runoff for the properties within the City between Wynmore Road and I-4 in the area north of Lee Road.
- **FDOT Pond –** There is a stormwater wet detention pond located north of Lake Wilderness adjacent to Wymore Road that receives stormwater runoff from I-4.

Although not a permanent BMP offering continuous treatment, the 2015-2017 sediment inactivation project on Lake Killarney, discussed in detail in the 2013 ERD report, applied alum treatments to inactive available phosphorus and reduce sediment phosphorus release. Substantial improvements in Lake Killarney were noted as a result of these applications.

2.8 Field Investigation and Survey Needs

A detailed field investigation of the expanded study area to confirm key drainage infrastructure data from plans and previous studies and drainage patterns was conducted by Geosyntec personnel on April 3, 2024. Representative photos from the field investigation are presented below.

Photograph 1: Existing Lake Killarney Outfall

Photograph 2: Weir downstream of Lake Bell

Photograph 3: Commercial Properties downstream of Lake Bell

Photograph 4: View of Lake Bell from northeast (looking southwest)

Photograph 5: South bank of Lake Wilderness

Photograph 6: East bank of Lake Mendsen (looking northwest)

Photograph 7: North bank of Lake Mendsen (looking south)

Photograph 8: Northwest bank of Lake Rose (looking southeast)

Photograph 9: Canal from Park Lake to Lake Maitland (looking downstream)

Photograph 10: Control Structure at Grove Street

Geosyntec identified sites needing field reconnaissance in support of the existing conditions H&H model development. A review of the City stormwater system was performed to determine likely areas that may need to be modeled in greater detail and any sites with missing or incomplete data. Field reconnaissance was performed to verify data needs of these sites and a search of ERPs was performed to see if supplemental drainage information was available. As professional survey was not performed as part of this study, candidate channels and structures were identified that would benefit from future professional survey to support modeling efforts. A map of the survey needs sites are shown on **Exhibit 7**.

To develop an accurate existing conditions model in lieu of survey, data gaps such as features that were inaccessible or required elevation measurements were populated using engineering judgement and available data such as the DEM and adjacent stormwater infrastructure. For example, if a pipe invert elevation was unknown the rim elevation was determined from the DEM and the top of the pipe was assumed to be under 3-ft of cover which would make a 24-inch pipe invert 5-ft below the rim elevation.

2.9 FEMA Floodplains and Flooding Problem Areas

Federal Emergency Management Agency (FEMA) floodplain data from the 2021 Flood Insurance Study (FIS) for the County was used to identify areas in the expanded study area that are within a FEMA designated Special Flood Hazard Area (SFHA). Lake Killarney, Lake Bell, Lake Wilderness, Lake Gem/Park Lake, Lake Midget, Lake Maitland, Lake Osceola, and Lake Virginia are designated as “Zone AE,” with base flood elevations (BFEs) summarized in **Table 2-2**. “Zone AE” is a SFHA subject to inundation by the 1% annual chance flood event. The FDOT pond located southwest of the I-4 and Lee Road intersection is designated as “Zone A” with no established BFE. Lake Mendsen and Lake Francis are designated as “Zone X” and are subject to the 0.2% annual chance flood event. The remainder of the study area is classified as “Zone X” and are areas of minimal flood hazard. The FEMA designated floodplains around the vicinity of the study area are shown on **Exhibit 8**. Note that Lake Gem and Park Lake are distinguished by name but are hydrologically connected and will be grouped as Lake Gem/Park Lake throughout this report.

Table 2-2: Summary of Base Flood Elevations for Lakes in Study Area

Waterbody	Base Flood Elevation (ft NAVD)
Lake Killarney	84.4
Lake Bell	91.4
Lake Wilderness	91.4
Lake Gem/Park Lake	73.6
Lake Midget	91.0
Lake Maitland	68.0
Lake Osceola	68.8
Lake Virginia	68.9

The City-provided records of flooding from Hurricane Ian (see Table 2-1) were georeferenced and digitized to develop a flooding problem areas map illustrating the extent of flooding on structures and roadways during Hurricane Ian (**Exhibit 8)**. This map illustrates that the overtopping of Lake Bell during Hurricane Ian impacted residential structures on the east side of the lake along Turner Road, commercial properties south of Kindel Avenue, and caused roadway flooding on Lee Road. Residential properties on the southeast side of Lake Killarney were also impacted by flooding during Hurricane Ian as well as the residences within the neighborhood directly east of Lake Mendsen bordered by Morse Boulevard on the north, Pennsylvania Avenue on the east, and Comstock Avenue on the South.

2.10 Capital Improvement Projects

The City has several completed and planned capital improvement projects (CIPs) within the study that are targeted at flood improvements. These projects and their status (i.e., completed or planned) are summarized below and their locations are shown on **Exhibit 9**. For planned projects, the timeline of completion was categorized as follows: short-term refers to within the next 2 fiscal years and mid-term refers to within the 5-year Capital Improvement Program cycle. In addition to these projects, the City's Public Works department is investigating options to purchase stormsewer camera equipment to effectively investigate stormwater infrastructure to prioritize, schedule, and perform repairs.

2.10.1 Completed

- ***Lake Killarney Outfall Dredging.*** Project consisted of dredging to remove accumulated sediment for various outfalls into Lake Killarney which receive stormwater runoff from upstream roadway stormsewer networks.

- ***Lake Killarney Canal Dredging***. Project consisted of dredging to remove accumulated material from storm erosion and sedimentation in the canal east of the intersection of Turner Road and Blossom Lane. The accumulation had caused the canal to become very shallow resulting in resident complaints regarding boat navigation during dry season. Dredging deepened the canal allowing for boat navigation and improved conveyance.

- ***Capen Avenue at Symonds Avenue Drainage Improvements.*** Project consisted of replacing 27 feet (ft) of pipe on Capen Avenue at the intersection with Symonds Avenue. This repair was identified and carried out as part of the City's routine maintenance.

- ***Stormsewer Pipe Lining and Repairs***. Projects consist of lining of stormsewer pipe and repairs to maintain conveyance of stormwater system. Sites were identified from depressions in the roadway by the City as part of its routine maintenance or from resident complaints. Repairs were carried out as part of the City's routine maintenance.
    - West Hannibal Square
    - Douglas Avenue
    - Denning Drive at Symonds Avenue
    - Canton Avenue at Capen Avenue
    - 1051 Lake Bell Drive
    - 490 North Orlando Drive
    - Canton Avenue at Pennsylvania Avenue

2.10.2 Planned

- ***Lake Bell Weir Repair.*** Repairs are ongoing to the wing walls of this weir to address erosion and seepage which was exacerbated as a result of Hurricane Ian. Pressure grouting behind each wingwall has been performed, backfill and sodding remains to complete repairs. Project estimated to be completed in the short-term.

- ***Nicolet Avenue Dry Retention Pond.*** Ongoing development of new dry retention pond on Nicolet Avenue north of Minnesota Avenue to provide flood storage and pollution abatement for contributing drainage area along Nicolet Avenue and Minnesota Avenue. Project estimated to be completed in the short-term.

- ***Killarney Drive Drainage Improvements***. Planned project will improve conveyance of stormwater to address flooding along Killarney Drive from Lakeview Avenue to Shoreview Avenue. Improvements will include consolidation of two existing, failing outfalls into one with an internal screen for solids capture, installation of a new high-capacity inlet, as well as repaving and regrading along Killarney Drive to remediate erosion due to failed outfalls. Project estimated to be completed in the short-term.

- ***Turner Road at Blossom Lane Drainage Improvements***. Planned project will improve conveyance of stormwater to address localized flooding near the intersection of Turner Road and Blossom Lane. Improvements will include repaving and regrading to address conveyance issues during intense rain events identified by City staff and resident complaints. Project estimated to be completed in the mid-term.

- ***1311 Minnesota Avenue Repairs.*** Planned project will investigate depression in roadway which indicates stormwater infrastructure failure likely related to existing manhole. No reduction in conveyance or localized flooding has been identified by City staff or reported by residents. Project estimated to be completed in the short-term.

- ***Schultz Avenue Repairs***. Planned project will replace an 80-100 ft section of pipe along Schultz Avenue. The needed repair was identified by City staff during regular inspection. No reduction in conveyance or localized flooding has been identified by City staff or reported by residents. Project estimated to be completed in the short-term.

3. EXISTING CONDITIONS ASSESSMENT

3.1 Potential Water Quality Treatment Deficiencies

An evaluation of existing data was performed to identify stormwater outfalls in the study area that lack water quality treatment or have BMPs that provide substandard water quality treatment. BMPs that are limited to primarily sediment or trash collection (e.g., baffle boxes, curb inlet baskets) generally provide significantly less nutrient reduction than required under current development regulations. A summary of the findings is provided below and shown on **Exhibit 10**.

- **Outfalls with Nutrient Treatment**
  - **East Webster Avenue Outfall to Lake Osceola** – An alum injection facility and baffle box provide treatment for the stormsewer system that drains Webster Avenue, North New York Avenue, North Park Avenue, and North Interlachen Avenue before discharging to Lake Osceola. Per design plans prepared by ERD, dated September 1997, the alum injection facility utilizes a 3,000-gallon alum tank, pump, and alum feed line to dose an upstream drainage structure. The design also includes an alum floc barrier to trap the floc for easier collection and maintenance at the point of discharge to Lake Osceola.
  - **Morse Boulevard Outfall to Lake Osceola** – An alum injection facility and two baffle boxes located at the east end of Morse Boulevard provide treatment for the stormsewer system that drains East Morse Boulevard, South Knowles Avenue, South Center Street, and parts of Interlachen Avenue before discharging to Lake Osceola. Per design plans prepared by ERD, dated March 1992, the alum injection facility utilizes a 6,000-gallon alum tank, pumps, and alum feed lines to dose upstream drainage structures.
  - **Lincoln Avenue Outfall to Lake Osceola** – The alum injection facility located at the east end of Morse Boulevard doses an upstream drainage structure that is part of the stormsewer system that drains Lincoln Avenue and discharges to Lake Osceola. It is noted that Lincoln Avenue is hydraulically connected to East Morse Boulevard which has two existing baffle boxes.
  - **Alexander Place Outfall to Lake Osceola** – The alum injection facility located at the east end of Morse Boulevard doses an upstream drainage structure that is part of the stormsewer system that drains parts of Interlachen Avenue, New England Avenue, and Alexander Place and discharges to Lake Osceola.
  - **Canton Avenue Outfall to Lake Osceola** – The alum injection facility located at the east end of Morse Boulevard and a baffle box provide treatment for the stormsewer system that drains Canton Avenue before discharging to Lake Osceola. Per design plans prepared by ERD, dated January 1995, an alum feed line was extended from the alum injection facility at the east end of Morse Boulevard to dose a drainage structure at the intersection of Canton Avenue and Interlachen Avenue.
  - **East Fairbank Avenue/Rollins College Outfall to Lake Virginia** – An alum injection facility located east of the Rollins College field house provides treatment for two stormsewer systems that drain East Fairbanks Avenue, South Interlachen Avenue, South Park Avenue, and parts of Rollins College before discharging to

Lake Virginia. Per design plans prepared by ERD, dated April 1995, the alum injection facility utilizes an alum storage tank, pumps, and alum feed lines to dose upstream drainage structures.

- **Lakeview Drive Outfall to Lake Virginia** – Stormsewer system that drains approximately 114.2 acres discharges directly to Lake Virginia after minimal treatment in the 9th Grade Center Pond.
- **Winter Park Medical Center Outfall to Lake Killarney –** Stormsewer system that drains the Winter Park Medical Center. Stormwater runoff is collected by a stormwater retention pond prior to discharging to Lake Killarney.
- **Lake Killarney Townhomes Outfalls to Lake Killarney –** Stormsewer system that drains Lake Killarney townhomes includes two (2) outfalls in total. Stormwater runoff is collected by a stormwater retention pond prior to discharging to Lake Killarney at the two outfalls.
- **FDOT Pond Outfall to Lake Wilderness –** Stormsewer system that drains I-4 between Lee Road and West Kennedy Boulevard. Stormwater runoff is collected by the stormwater retention pond (i.e., FDOT Pond), prior to discharging to Lake Killarney.
- **Hungerford Elementary School Outfall to Lake Wilderness –** Stormsewer system that drains Hungerford Elementary School. Stormwater runoff is collected by the stormwater retention pond prior to discharging to Lake Wilderness.
- **Wymore Repump Facility Outfall to Lake Wilderness –** Stormsewer system that drains Wymore Repump Facility. Stormwater runoff is collected by the stormwater retention pond prior to discharging to Lake Wilderness.

- **Outfalls with Trash/Debris Capture**
  - **Beachview Avenue Outfall to Lake Killarney** – Stormsewer system that drains Beachview Avenue and South Orlando Avenue between North Kentucky Avenue and West Webster Avenue. A portion of runoff is diverted to Lake Mendsen for water quality treatment as part of the Lake Island (i.e., "Lake Mendsen")/Killarney Interconnect project. The remaining runoff is discharged directly to Lake Killarney. There is a leaf/debris trap, which consists of a fenced area outside of the stormsewer outfall which uses a filter fabric to filter solids and other debris from the stormwater inflows and retain them within the leaf/debris trap.
  - **Ololu Drive Outfall to Lake Killarney –** Stormsewer system that drains Ololu Drive between Audrey Avenue and Beverly Avenue. There are curb and grate baskets providing trash/debris collection prior to discharging to Lake Killarney.
  - **Euston Road Outfalls to Lake Killarney –** Stormsewer system that drains the entirety of Euston Road, and Pelham Road between Salisbury Boulevard and Euston Road. There are curb and grate baskets at each of the two (2) outfalls providing trash/debris collection prior to discharging to Lake Killarney.
  - **Salisbury Boulevard Outfalls to Lake Killarney –** Stormsewer system that drains Salisbury Boulevard and Pelham Road between Roxbury Road and Salisbury

Boulevard. There are curb and grate baskets providing trash/debris collection prior to discharging to Lake Killarney.

- **Clay Street Outfall to Lake Killarney –** Stormsewer system that drains Clay Street and Killarney Drive between Ohio Street and Starling Road. There is a curb and grate basket providing trash/debris collection prior to discharging to Lake Killarney.
- **West Fairbanks Avenue Outfall to Lake Killarney –** Stormsewer system that drains the medical office building plaza and West Fairbanks Avenue between Kilshore Lane and Cambridge Boulevard. There is a leaf/debris trap, which consists of a fenced area outside of the stormsewer outfall which uses a filter fabric to filter solids and other debris from the stormwater inflows and retain them within the leaf/debris trap.
- **Broadview Avenue Outfall to Lake Killarney –** Stormsewer system that drains Broadview Avenue includes three (3) outfalls in total. There is a leaf/debris trap at each of the three outfalls, which consists of a fenced area outside of the stormsewer outfall site which uses a filter fabric to filter solids and other debris from the stormwater inflows and retain them within the leaf/debris trap.
- **Killarney Bay Court Outfall to Lake Killarney –** Stormsewer system that drains Trovillion Avenue and Killarney Bay Court. There is a leaf/debris trap, which consists of a fenced area outside of the stormsewer outfall which uses a filter fabric to filter solids and other debris from the stormwater inflows and retain them within the leaf/debris trap.
- **Lake Front Boulevard Outfalls to Lake Killarney –** The stormsewer system that drains Lake Front Boulevard and Country Club Drive between Executive Drive and Lake Front Boulevard includes four (4) outfalls in total. Among these outfalls, there are three (3) outfalls that discharges directly to Lake Killarney after no water quality treatment, and one (1) outfall, on the northern end of the road, which has a leaf/debris trap, providing debris treatment.
- **Country Club Drive Outfalls to Lake Killarney** – The stormsewer system that drains Ellen Drive and Country Club Drive between Lake Front Boulevard and Lee Road includes two (2) outfalls in total. At this site, there are leaf/debris traps at each of the two outfalls, which consists of a fenced area outside of the stormsewer outfall which uses a filter fabric to filter solids and other debris from the stormwater inflows and retain them within the leaf/debris trap.
- **Lee Road Outfall to Lake Killarney –** Stormsewer system that drains the plaza located at the address 2001 Lee Road and Lee Road between Beard Avenue and Hanover Avenue and conveys water from Lake Bell. There is a baffle box to remove sediments and debris prior to discharging to Lake Killarney.
- **Monroe Avenue/South Orlando Avenue Outfalls to Lake Gem –** The stormsewer system that drains South Orlando Avenue between North Park Avenue and Lee Road includes two (2) outfalls in total. There are nutrient boxes at the two outfalls to remove sediments and debris prior to discharging to Lake Gem.

- **Outfalls with No Treatment**
  - **Kilshore Lane Outfall to Lake Killarney –** Stormsewer system that drains Kilshore Lane discharges directly to Lake Killarney after no water quality treatment.
  - **Lakeview Avenue Outfall to Lake Killarney –** Stormsewer system that drains Lakeview Avenue discharges directly to Lake Killarney after no water quality treatment.
  - **Shoreview Avenue Outfall to Lake Killarney –** Stormsewer system that drains Shoreview Avenue, the channel downstream from Nicolet Pond, and both West Fairbanks Avenue and Gene Street between Nicolet Avenue and South Orlando Avenue discharges directly to Lake Killarney via two (2) outfalls after no water quality treatment.
  - **Fairview Avenue Outfalls to Lake Killarney –** Stormsewer system that drains Fairview Avenue, Grove Avenue, and Killarney Drive between Broadview Avenue and Beachview Avenue discharges directly to Lake Killarney via two (2) outfalls after no water quality treatment.
  - **Hillstone Restaurant Outfall to Lake Killarney –** Stormsewer system that drains the Hillstone Restaurant Plaza discharges directly to Lake Killarney after no water quality treatment.
  - **Gay Road Outfall to Lake Killarney –** Stormsewer system that drains Center of Winter Park Plaza discharges directly to Lake Killarney after no water quality treatment.
  - **Blossom Lane Outfall to Lake Killarney –** Stormsewer system that drains the northwestern portion of Blossom Lane and Turner Road between Lee Road and Lake Drive discharges directly to Lake Killarney after no water quality treatment.
  - **Lake Drive Outfalls to Lake Killarney –** The stormsewer system that drains Lake Drive, and the southeastern portion of Blossom Lane, includes four (4) outfalls in total. Among these outfalls, all four outfalls discharge directly to Lake Killarney after no water quality treatment.
  - **Rippling Lane Outfalls to Lake Killarney –** The stormsewer system that drains Fountain Lane and Rippling Lane includes three (3) outfalls in total. Among these outfalls, all three outfalls discharge directly to Lake Killarney after no water quality treatment.
  - **Grove Street Outfalls to Park Lake –** Stormsewer system that drains Town Circle, Park Lake Circle, and Grove Street between Villa Circle and Lake Avenue discharges directly to Park Lake after no water quality treatment.
  - **The Adeline Apartment Complex Outfall to Park Lake –** Stormsewer system that drains the Adeline Apartment Complex discharges directly to Park Lake after no water quality treatment.

- **Monroe Avenue Outfall to Lake Gem –** The stormsewer system that drains and Monroe Avenue between Williamson Street and South Orlando Avenue discharges directly to Lake Gem after no water quality treatment.
- **South West Street to Lake Bell –** Stormsewer system that drains Ruffel Street between the eastern end of the road and Moseley Avenue, as well as South West Street between Ruffel Street and Fitzerald Drive, discharges directly to Lake Bell after no water quality treatment.
- **Lake Bell Drive Outfall to Lake Bell –** Stormsewer system that drains Dupont Avenue, Early Avenue, Atomic Court, and Lake Bell Drive between Early Avenue and Dupont Avenue discharges directly to Lake Bell after no water quality treatment.
- **Turner Road Outfall to Lake Bell –** Stormsewer system that drains Turner Road between Kindel Avenue and Durham Drive, as well as Galen Avenue, Eland Avenue, and Durham Avenue, discharges directly to Lake Bell after no water quality treatment.
- **Monroe Avenue Ditch Outfall to Lake Bell –** The channel that drains Jonotey Drive between Berthann Lane and Monroe Avenue, Monroe Avenue between Williamson Street and Jonotey Drive, and Turner Road between Durham Avenue and the northern end of the road, discharges directly to Lake Bell after no water quality treatment.

Based on the review of lake stormwater outfalls, several outfalls to Lake Killarney, Lake Bell, Lake Wilderness, and Lake Gem/Park Lake are potential water quality deficiency locations (**Exhibit 10**). The remaining outfalls have either alum treatment or a combination of both alum treatment and baffle box treatment. It is noted that baffle boxes that do not contain a media filtration component generally function primarily to capture sediment and trash and not necessarily the reduction of nutrient loads. However, in conjunction with alum treatment, both removal of sediment/trash and reduction of nutrient loads can be achieved.

Based on review of the Lake Jesup Basin Management Action Plan (BMAP) Amendment, June 2019, the City's completed and planned projects are sufficient to achieve the required nutrient load reduction over the next five years. The City has currently achieved 79.7% of their required TN reduction and 187.7% of their required TP reduction. Also, the City currently receives a TN reduction credit of 743 lb/yr and a TP reduction credit of 321 lb/yr. The City's TN and TP required reduction for the next five years is 466 lb/yr and 86 lb/yr, respectively.

Although the City has met the BMAP nutrient reduction requirement through 2024, implementation of additional stormwater BMPs (e.g., upflow media filters, pervious pavement, tree box filters, etc.) may help improve the general water quality of the City's lakes from both a nutrient and aesthetics perspective. Geosyntec recommends the following steps for the stormwater outfall locations identified and on **Exhibit 10** that do not currently have a BMP or may have a BMP that provides substandard nutrient load reduction:

- **Existing Conditions Assessment** – Utilizing a pollutant loading model (e.g., BMPTrains), determine the estimated nutrient loading currently discharged from the water quality treatment deficiency location(s).

- **Improvement Alternatives Analysis** – Develop and evaluate improvement alternatives for the identified water quality treatment deficiency location(s).

3.2 Hydrologic and Hydraulic Model Development

The ICPR model (version 4.07.08) was the H&H model used to analyze the drainage systems for this study. The model uses a one-dimensional (1D) node-link representation of real world drainage features such as lakes, ponds, flow junctions (inlets, manholes, etc.), pipes, channels, etc. The model also calculates infiltration and runoff rates for either defined hydrologic units (subbasins) or a two dimensional (2D) overland flow mesh. The runoff is hydraulically routed though the 1D links or on the 2D overland flow surface.

ICPR is also capable of modeling the interaction of surface water with groundwater. This is done either through the incorporation of a 2D groundwater region or incorporation of 1D percolation links that model the flow of water from surface water nodes to a representative groundwater node. 1D percolation links connected to a representative groundwater node were used in this study's model.

The model domain for this study included the previous CRA model developed by Geosyntec in 2020 and the contributing areas to Lake Killarney, Lake Bell, Lake Wilderness, and Lake Gem/Park Lake. The model network outside of the previous CRA study area was focused on the lakes, lake interconnections, and significant flood storage in the contributing areas.

For this study, 1D modeling techniques were primarily used throughout the study area; however, the 2D model developed for the contributing area to Canton Avenue in the 2020 study was retained and updated to better assess City reports of roadway nuisance flooding. Model input files are included with the Electronic Deliverables.

3.3 Hydrologic Model Development

3.3.1 Subbasin Delineation

Delineation of individual subbasins allows for a more detailed analysis and the opportunity to pinpoint specific areas with drainage deficiencies. Subbasins were developed to determine the extent of individual drainage areas within the expanded study area that concentrate runoff to a single point of interest (node). The expanded study area was discretized into 231 subbasins for use in the hydrologic model. The subbasin boundaries were determined using the project DEM, drainage infrastructure, and field observations. Due to the improved DEM, the subbasins from the previous CRA study were revised as part of this effort. Refer to **Exhibit 11** for a map of the subbasin delineations.

3.3.2 Time of Concentration

The Soil Conservation Service (SCS) Unit Hydrograph method requires a time of concentration (Tc) be specified for each subbasin. The Tc represents the amount of time it takes a particle of water to travel from the hydraulically most distant point in the drainage basin to its outlet. The Tc is computed by summing all travel times for consecutive flow components (i.e., sheet flow, shallow concentrated flow, and channel flow) of the subbasin conveyance system in accordance with the NRCS TR-55 methodology.

Sheet flow is flow over plane surfaces with a flow length of less than 100 ft. After 100 ft, sheet flow is assumed to become shallow concentrated flow. Shallow concentrated flow is also used for flow in very small channels such as water flowing along a street curb. Channel flow is used for flow in ditches or pipes. A minimum Tc of 10 minutes was used in the calculations. Tc flow paths and calculations are included with the Electronic Deliverables.

3.3.3 Peaking Factor

The SCS Unit Hydrograph method requires a unit hydrograph peak rate factor (K') be specified. The selection of a K' depends on the geographical area and local conditions. Selection of K' was based on the procedures outlined in the document titled *Procedure for Selection of SCS Peak Rate Factors for Use in MSSW Permit Application* (SJRWMD, April 1990). Specifically, the K' value of 256 was used in the watershed, which based on the SJRWMD 1990 report, is "an average of peak rate factors determined for several measured runoff hydrographs from several basins in central and southern Florida by the U.S. Army Corps of Engineers." In addition, from the SJRWMD 1990 report, the K' of 256 is appropriate for "watersheds with very mild slopes, significant storage throughout the watershed, and limited on-site drainage ditches."

3.3.4 Curve Number (CN) Development

The CN approach was used as the rainfall excess and runoff method. CN values were assigned to each land use and soil combination in a CN Set table in the model. For the 2D component of the model, ICPR divides each honeycomb polygon into sub-polygons for each combination of underlying land use and soil type. The CN for each sub-polygon is determined by the model by looking up the matching land use and soil combination in the CN Set table.

Approximate impervious area percentages were estimated by Geosyntec by performing takeoff calculations at representative locations for each land use type. Approximate directly connected impervious area (DCIA) percentages were also estimated by Geosyntec by takeoff calculations. Lakes, ponds, and other waterbodies were given a CN of 100. The CN representative of open space was used for pervious areas instead of their land use specific CN to avoid double counting the DCIA in the model. CN values for pervious areas are summarized in **Table 3-1**.

Table 3-1: Summary of Curve Number (CN) Values

Open Space HSG Classification	Curve Number
HSG A	39
HSG A/D	80
HSG B/D	80
"Urban" Soil Classification	80
Water	100

A summary of imperviousness and percent DCIA for the different land use types is provided in **Table 3-2**.

Table 3-2: Summary of Land Use Imperviousness and Percent DCIA

Land Use Classification	Percent Impervious	Percent DCIA
1100: Residential, low density - less than 2 dwelling units/acre	39	16
1200: Residential, medium density - 2-5 dwelling units/acre	50	35
1300: Residential, high density - 6 or more dwelling units/acre	60	40
1400: Commercial and services	81.6	54
1480: Cemeteries	11	0
1490: Commercial & services under construction	88	88
1700: Institutional	67	53
1820: Golf courses	0	0
1850: Parks and zoos	44	22
1860: Community recreational facilities	44	22
1890: Other Recreational	10.9	0
1900: Open Land	0	0
1920: Inactive Land with Street Pattern but without Structures	0	0
3100: Herbaceous Upland Nonforested	0	0
4200: Upland Hardwood Forest	0	0
4340: Upland Mixed Coniferous/Hardwood	0	0
5200: Lakes	100	100
5300: Reservoirs - pits, retention ponds, dams	100	100
6210: Cypress	100	100
6300: Wetland Forested Mixed	100	100
6410: Freshwater marshes	100	100
6460: Mixed Scrub-Shrub Wetland	100	100
8120: Railroads	100	100
8140: Roads and highways (divided 4-lanes with medians)	100	100
8330: Water supply plants	68	54
8370: Surface Water Collection Basins	100	100

3.3.5 Rainfall Distribution, Depth, Duration, and Frequency

The rainfall events simulated for this study are presented in **Table 3-3**. All design storm event rainfall depths were referenced from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Point Precipitation Frequency Estimates (https://hdsc.nws.noaa.gov).

Table 3-3: Rainfall Frequency, Duration, Depth, and Distribution

Frequency (years)	Event Duration (hours)	Depth (in)	Distribution
2	24	4.28	SCSII – FLMOD
10	6	4.65	ORANGE
10	24	6.11	SCSII – FLMOD
25	6	5.49	ORANGE
25	24	7.54	SCSII – FLMOD
100	24	10.20	SCSII – FLMOD

3.4 1D Hydraulic Model Development

3.4.1 1D Nodes

1D Nodes in the model are typically defined as Stage/Area, Stage/Volume, or Time/Stage nodes and are used to model storage areas like waterbodies/depressions and can also be used to model manholes in pipe networks or to represent underground exfiltration chambers. A total of 320 Stage/Area, 10 Stage/Volume, and 21 Time/Stage nodes were used in the existing conditions model. The model nodes are shown on **Exhibit 11**.

Initial Stages of nodes were set such that the model simulation would begin in static equilibrium. For nodes connected to a waterbody, the initial stage was set at the greater of the waterbody's Normal High Water Elevation (NHWE) or pipe/weir invert elevations. For waterbodies without a NHWE but with historical water level data available, this data was evaluated and used in place of the NHWE to determine the initial stage. The initial stages of nodes representing waterbodies were set based on the following information:

- **Lake Mendsen (Node: LAKE_MENDSEN)** – Initial stage was set to the weir invert elevation (81.14 ft NAVD) of the control structure upstream of the 20-inch drainwell. This invert functions as the lakes "control elevation" or lowest invert of a control structure weir/orifice.
- **Lake Rose (Node: LAKE_ROSE)** – The City provided Lake Rose stage data dating from January 1998 to April 2018. Based on a review of these data, the time period from December 2013 to August 2017 was used to estimate an initial stage for Lake Rose, as there were consistent monthly measurements taken during this time period. The average stage during this time period was approximately 83.3 ft NAVD and this value was used as the initial stage of Lake Rose for the purposes of this study. Elevations provided by the City were assumed to reference NAVD. Lake Rose is landlocked and does not have an existing control structure.
- **Lake Midget (Node: NA1180)** – Initial stage was set to the drainwell control elevation (83.62 ft NAVD).
- **Lake Killarney (Node: LAKE_KILLARNEY)**– Initial stage was set to the NHWE (82.04 ft NAVD) per the County's Water Atlas (https://orange.wateratlas.usf.edu/).

- **Lake Bell (Node: NB0005)** – Initial stage was set to the NHWE (89.4 ft NAVD) per the County's Water Atlas (https://orange.wateratlas.usf.edu/).
- **Lake Wilderness (Node: NC0005)** – Initial stage was set to the pipe invert elevation (88.76 ft NAVD) of the downstream pipe connected to Lake Bell.
- **Lake Gem/Park Lake (Node: NE0005)** – Initial stage was set to the pipe invert elevation (68.03 ft NAVD) of the downstream pipe connected to Lake Maitland.
- **FDOT Pond (Node: NC0090)** – Initial stage was set to the seasonal high water level (91.15 ft NAVD) per the FDOT construction plans. This elevation matches the invert elevation of the orifice on the pond's control structure.

Warning Stages were set at the elevation at which flooding of concern is expected to occur. Typically, this would be the elevation at which pond berm overtopping, roadway flooding, or structure flooding is likely to occur.

Stage/Area for the Stage/Area type nodes representing storage areas was defined at or below the node initial stage and above the peak node stage from the model results for each node. This was done to accurately define the available storage in each node and prevent any extrapolation or performance issues in the model. The stage/area information for storage nodes was extracted from the study DEM using ArcHydro tools in GIS. For storage ponds representing waterbodies, if construction plans or bathymetric data was available these were used to determine storage below the water surface.

Stage/Volume for the Stage/Volume type nodes representing underground exfiltration systems was defined to account for storage associated with modeled exfiltration systems. This information was referenced from ERP documents downloaded from SJRWMD.

Boundary Conditions – Time/Stage nodes were used to represent the tailwater boundary conditions in the model based on the following information:

- **Lake Maitland (Node: LAKE_MAITLAND)** – Boundary stage sets were developed for all design storm events using time series output from the City's Central Basin ICPR model.
- **Lake Osceola (Node: LAKE_OSCEOLA)** – Boundary stage was set at a constant elevation (67.2 ft NAVD) equal to the peak stage during the mean annual design storm event per the *Draft Howell Creek Basin Watershed Management Plan*, prepared by CDM in 2011.
- **Lake Virginia (Node: LAKE_VIRGINIA)**– Boundary stage was set at a constant elevation (67.2 ft NAVD) equal to the peak stage during the mean annual design storm event per the *Draft Howell Creek Basin Watershed Management Plan*, prepared by CDM in 2011.
- **Lake King (Node: NC0100)** – Boundary stage sets were developed for all design storm events using time series output from the Little Wekiva River ICPR model currently under development for the County.

3.4.2 Links

The model analyzed flow in 1D links, allowing the evaluation of conveyance effectiveness between nodes. The model 1D links are shown on **Exhibit 11**. The link types used in this model include the following:

Pipes – These links were used to represent the various pipe and culvert sections included in the model. A total of 292 pipe links were used in the existing conditions model. Pipe inverts, dimensions, geometry, and material data were referenced from a combination of documents provided by the City or downloaded by Geosyntec. Parameter values used for pipe links are detailed below:

- Manning's Roughness Coefficient – Values were varied based on material as follows:
  - Corrugated Metal Pipe (CMP) – 0.022
  - Reinforced Concrete Pipe (RCP) – 0.012
  - Plastic Pipe (e.g., PVC) – 0.009
  - Ductile Iron Pipe (DIP) – 0.012
  - High Density Polyethylene (HDPE) – 0.012
- Entrance Losses – A representative average value of 0.5 was assigned to all pipes in the model.
- Exit Losses – A value of 1.0 was assigned to pipes that discharge to a static water body. Otherwise a value of 0 was assigned.
- Bend Losses – A bend loss coefficient was assigned to applicable pipes based on the pipe diameter, angle of bend(s), and number of bends. Bend losses were summed if there were multiple bends.

Weirs – These links are used to represent overland flow (outside of the 2D model), inlet characteristics (i.e., linking the 1D interface nodes to the stormsewer network within the 2D model), and some outfall structures. A total of 392 weir links were used in the existing conditions model. The specific geometry of each weir was input into the model. Horizontal weirs were used to model flat inlet structures. Vertical weirs were used to model control structure slots and bleeders along with true weir structures (sharp or broad crested). Parameter values used for weir links are detailed below:

- Weir Coefficient – A value of 2.8 was assigned for broad-crested weirs and 3.2 was assigned for sharp-crested weirs.
- Orifice Coefficient – A value of 0.6 was assigned.

Drop Structures – These links are used to simulate control structure-to-pipe or inlet-to-pipe in series combinations. The weir and pipe data associated with these links is identical to the weir and pipe data discussed above. A total of 40 drop structure links were used in the existing conditions model.

Channels – These links are used to represent open drainage ways like ditches, swales, creeks etc. in the model. Channel geometry was represented by irregular cross-sections extracted from survey data from previous studies. A total of two (2) channel links were used in the existing conditions model.

Rating Curves – Twelve (12) rating curve links were used to represent drainwells or pond infiltration in the existing conditions model. Unless otherwise described, drainwell flow rates were referenced from the *Drainwell Model Methodology Technical Memorandum*, prepared by Geosyntec in March 2015, which is included in the Electronic Deliverables. The parameter development for each rating curve link is described below:

- **Lake Mendsen 20-inch Drainwell (Link: L-2130RC)** – A rating curve link was utilized to model stormwater entering the groundwater via the 20-inch drainwell located in the center of Lake Mendsen. Drainwell flow rates were based on a 19-inch drainwell to account for the decrease in surface area due to the presence of the 6-inch well pump.
- **Lake Mendsen 8-inch Drainwell (Link: L-2150RC)** – A rating curve link was utilized to model stormwater entering the groundwater via the 8-inch drainwell located on the north side of Lake Mendsen.
- **Lake Midget 15-inch Drainwell (Link: L-2140RC)** – A rating curve link was utilized to model stormwater entering the groundwater via the 15-inch drainwell located on the west side of Lake Midget.
- **Swoope Water Treatment Plant Stormwater Pond (Link: PONDSOIL)** – A rating curve link was utilized to model stormwater percolation at the dry detention pond, north of the Swoope water treatment plant. Typically, a percolation link would be utilized for this; however, a rating curve link was utilized by Geosyntec for consistency with the project permit (ERP #81655-2).
- **Lake Killarney Drainwells (Links: RB0350, RB0370, RB0380, RB0390, RB0400, and RB0410)** – Six rating curve links were utilized to model stormwater entering the groundwater via the six drainwells located on the southwest side of Lake Killarney. Each drainwell's maximum flow rate was calculated using the transmissivity determined during the drainwell's load testing.
- **Nicolet Pond 12-inch Drainwell (Link: RB0280)** – A rating curve link was utilized to model stormwater entering the groundwater via the 12-inch drainwell located on the southeast side of Nicolet Pond. The drainwell's maximum flow rate was calculated using the transmissivity determined during the drainwell's load testing.
- **Miller Avenue 12-inch Drainwell (Link: RB0450)** – A rating curve link was utilized to model stormwater entering the groundwater via the 12-inch drainwell located on the north side of Miller Avenue.

Percolation – These links are used to model percolation to the groundwater for dry ponds, natural depressions, or exfiltration chambers. Percolation links can be used to model both vertical (unsaturated) and horizontal (saturated) percolation. A total of 10 percolation links were used in the existing conditions model. Data required for percolation links includes Aquifer Base Elevation, Water Table Elevation, Annual Recharge Rate, Horizontal Conductivity, Vertical Conductivity, Fillable Porosity, and Layer Thickness. This information was referenced from ERP documents downloaded from SJRWMD.

3.5 2D Hydraulic Model Development

3.5.1 Overland Flow Region

An overland flow region defines the limits of the area to be modeled and is similar to a watershed area. Unlike traditional 1D modeling, basins are not delineated within the 2D overland flow model domain. Instead, ICPR generates a mesh of polygons called honeycombs (**Section 3.5.2**) within the overland flow region based on user defined parameters and features such as breaklines, breakpoints, etc. Each individual honeycomb polygon is treated as a basin for runoff generation purposes within the model. Since the 2D modeling approach does not rely on a unit hydrograph method, time of concentration and peaking factor are not specified. Refer to **Exhibit 12** for the overland flow region boundary 2D mesh including the honeycombs.

The overland flow region boundary for Canton Avenue developed for the previous CRA study was updated in ArcGIS using the project DEM. The extent of the model domain developed is described below:

- The overland flow region boundary was developed to model overland flow along Canton Avenue, east of the railroad.
- The overland flow region boundary is bounded by the railroad on the west side, Swoope Avenue on the north side, Interlachen Avenue on the east side, and Lincoln Avenue on the south side.
- The overland flow region boundary generally follows the topographic divide of the watershed.

3.5.2 2D Overland Flow Model Development

ICPR uses a flexible triangular computational mesh to model 2D overland flow. ICPR automatically generates the triangular mesh from user defined input parameters and features. Elevations in the triangular mesh are extracted from the raster DEM. From this triangular mesh, ICPR derives two additional layers: one of honeycomb-shaped polygons and another made up of diamond-shaped polygons (the honeycomb and diamond mesh, respectively). These elements are best understood using their analogues from 1D modeling. Each triangle vertex is a node, the triangle sides connecting the vertices to each other are the links, the individual honeycomb polygons are the basins, and the diamonds are similar to cross sections. These elements are only generated within the overland flow region. The features described in the following sections and shown on **Exhibit 12** were added to improve depiction of the terrain and interface the 2D model components with the 1D model components (e.g., when overland flow enters the stormsewer network through an inlet).

3.5.2.1 Breakpoints and Breaklines

Breakpoints can be added to refine the triangular mesh. Triangle vertices are placed at each breakpoint. They can be automatically placed using spacing criteria (e.g., triangle sides must be at least 50 ft long and no breakpoints within 50 ft of the overland flow region boundary) or manually placed to refine the triangular mesh in areas where additional detail is needed.

Breaklines are also used to refine the triangular mesh. Triangle vertices are placed along each vertex (coordinate point) of a breakline, and a triangle side is placed along each breakline.

Breaklines are typically used along collection paths and ridgelines. Overland flow links are formed along the triangle sides with the inverts determined at each vertex from the DEM.

The 2D component of the existing conditions model uses 149 breakpoints and 35 breaklines.

3.5.2.2 Impervious and Pervious Manning's n

The diamond mesh is intersected with a roughness zone layer to determine the area weighted Manning's n for each overland flow link (triangle side). A Roughness Set lookup table is used to vary the Manning's n by roughness zone and over a user specified depth range. Thus, shallow and deep Manning's n values and depth ranges are specified in the lookup table. The 2D component of the existing conditions model uses shallow and deep Manning's n values based on corresponding land use type and typical overland flow values per *Gridded Surface Subsurface Hydrologic Analysis*, September 2006. The Manning's n values for pervious and impervious areas decrease from the shallow to deep values over a depth range of three (3) ft.

3.5.2.3 1D Node Interfaces

The 2D mesh is connected to the 1D hydraulic model using 1D node interfaces. Typically, these are where the overland flow collects on the surface and enters a drainage inlet. A 1D interface node is connected to a 1D node (representing a manhole or catch basin) using one or more 1D links. The existing conditions model uses 29 1D node interfaces to represent where surface (overland) flow enters the stormsewer system along Canton Avenue.

3.5.2.4 Extrusion Areas

Extrusion features are formed by closed polygons and no overland flow is permitted to cross the polygon. Extrusion areas generate stormwater runoff and are assumed to be 100% impervious with no initial abstraction. Extrusions are useful for representing impediments to overland flow such as buildings. The 2D component of the existing conditions model uses 36 extrusion areas to represent buildings along Canton Avenue and within the overland flow region.

3.5.2.5 Boundary Stage Lines

Boundary stage lines force stage elevations as a function of time with all vertices along the boundary stage line operating as a time/stage node that is specified with a boundary stage table. The 2D component of the existing conditions model uses three boundary stage lines to prevent water entering the overland flow region from the 1D area during model start up. To account for flow from the 2D area to the 1D area during storm events, overland weirs were added to cross these boundary stage lines.

3.6 Model Validation

In order to provide independent validation of the model's ability to provide reasonable results, a historical storm event (Hurricane Ian) was simulated and compared to observed flooding. Hurricane Ian (9/27/2022 – 9/29/2022) resulted in approximately 14 inches of rainfall in the City, surpassing the 10.2 inches of rainfall simulated during the 100-year, 24-hour design storm (**Table 3-3**)

Rainfall data for this event was obtained from the Southwest Florida Water Management District which provides 15-minute NEXRAD precipitation data. A representative grid cell overlying Lake Killarney (Grid ID #115079) was selected to represent the study area.

Table 3-4 summarizes modeled peak stage and observed flood stage for sites with available data for comparison. Observed flood stage was estimated from photographs of flooding provided by the City which were referenced to the DEM using aerials to derive the flood stage elevation.

Table 3-4: Summary of Observed Flooding Stages during Hurricane Ian

Node ID	Representative Area	Modeled Peak Stage (ft NAVD)	Observed Flood Stage (ft NAVD)	Difference from Observed (ft)
LAKE_KILLARNEY	Lake Killarney	85.61	85.20	0.41
LAKE_MENDSEN	Lake Mendsen	88.35	87.68	0.67
NA0890	Along N Denning Dr, north of W Morse Blvd	88.38	87.65	0.73
NA0960	Along NW New England Ave, east of S Capen Ave	88.29	86.72	1.57
NA1540	Along Ward Ave, north of W Fairbanks Ave	88.39	87.60	0.79
NA1630	Residences in Hannibal Square, along W New England Ave, west of W Hannibal Sq	88.25	86.70	1.55
NB0005	Swale connected to Lake Bell, at corner of Jonotey Dr and Monroe Ave[1]	92.28	92.18	0.10
NC0005	Driveway to 1032 Early Avenue[2]	93.09	93.00[3]	0.09
NE0005	Intersection of S Orlando Ave and Monroe Ave	75.27	74.32	0.95

[1]Reflective of conditions at Lake Bell
[2]Reflective of conditions at Lake Wilderness
[3]Based on City reports of overtopping of driveway which is at approximately 92.5 ft NAVD

The photographs taken for observed flood stage were likely taken after the peak stage when conditions were safe therefore it is expected that the modeled peak stage would be higher than observed. Overall, based on review of the validation model results these results appear reasonable, and no adjustment of model parameters was performed.

3.7 Model Results

3.7.1 LOS Assessment

The flooding level of service (LOS) criteria listed in **Table 3-5** below were used to evaluate the performance of drainage infrastructure in the study area. Alternatives for flood control improvements were evaluated using the same criteria to assess the LOS benefit provided by the flood improvement concept.

Table 3-5: Criteria for Study LOS Assessment Modeling

Flooding Level of Service (LOS) Standards/Design Criteria			
Facility	**Storm Frequency and Duration**	**Physical Elevation Reference**	**Example in Study Area**
Stormsewer	10 year/Critical Duration[1]	Road Edge of Pavement or Manhole Top Elevation	Curb Inlet along Canton Avenue
Detention Ponds	25 Year/24 Hour	Pond Top of Bank	FDOT Pond
Lake/Pond	100 Year/24 Hour	Habitable Structure Finished Floor	Lake Killarney

[1]For the purposes of this study the 24-hour storm duration used however the 6-hour storm duration was simulated and is included in the model package in the Electronic Deliverables.

A complete summary of node peak stages for the existing conditions model is provided in **Appendix A**. Note that the existing conditions and all other scenarios assume the Lake Mendsen/Lake Killarney interconnect is open. This assumption was confirmed via e-mail correspondence with the City.

3.7.2 Existing Conditions Assessment Results for Focus Areas

The City experienced significant flooding during Hurricane Ian in 2022 and has reported localized, nuisance flooding at certain locations within the expanded study area. Lake Killarney, Lake Bell, Lake Mendsen, and Canton Avenue were determined to be the focus areas for this study. Lake Killarney and Lake Bell are of concern primarily due to flooding during Hurricane Ian, while Canton Avenue is of concern primarily due to nuisance flooding. Lake Mendsen is of concern due to both nuisance flooding and flooding during Hurricane Ian.

Critical flood stage elevations were approximated for yard, roadway, and structure flooding for all focus areas. Yard and roadway elevations were derived from the DEM. To estimate finished floor elevations (FFEs) for structural flooding one foot was added to the yard elevation.

Results from the existing conditions model highlighted drainage deficiencies throughout the study area and supported statements and observations made by the City regarding flooding during Hurricane Ian and nuisance flooding. Specific examples and a discussion of the focus areas is provided below.

3.7.2.1 Lake Killarney

Based on the results of the existing conditions model, Lake Killarney resulted in potential structure flooding starting at the 100-year, 24-hour design storm event. Node peak stages for Lake Killarney are summarized below in **Table 3-6**.

Table 3-6: Existing Conditions Peak Stages at Lake Killarney

Lake Killarney Modeled Peak Stages					
Design Storm Event	2-year, 24-hour	10-year, 24-hour	25-year, 24-hour	100-year, 24-hour	Hurricane Ian
Peak Stage (ft NAVD)	83.01	83.42	83.72	84.34	85.61

Notes: Lake Killarney warning stage is equal to 84.40 ft NAVD for structural flooding, which is the approximate FFE of 2118 Lake Drive. Roadway flooding is anticipated at 85.20 ft NAVD, which is the approximate overtopping elevation to Lakefront Boulevard at the south end of Lakefront Boulevard near the boat ramp. Yard flooding is anticipated at 83.40 ft NAVD.

Currently, Lake Killarney is able to drain via the six drainwells located on the southwest bank of the lake and to Lake Gem via the Lake Killarney outfall on the north bank (**Photograph 1**).

Based on the study area DEM, the finished floor elevation of 2118 Lake Drive is approximately 84.4 ft NAVD and the overtopping elevation to Lakefront Boulevard is approximately 85.2 ft NAVD (at the south end of Lakefront Boulevard near the boat ramp). This suggests that elevated stages in Lake Killarney is resulting in potential structure flooding on Lake Drive starting at the 100-year, 24-hour design storm event. Modeled peak stages for Hurricane Ian support the City's observations of structure flooding on Lake Drive and roadway flooding on Lakefront Boulevard (**Exhibit 8**).

3.7.2.2 Lake Bell

Based on the results of the existing conditions model, Lake Bell resulted in potential roadway flooding starting at the 100-year, 24-hour design storm event. Node peak stages for Lake Bell are summarized below in **Table 3-7**.

Table 3-7: Existing Conditions Peak Stages at Lake Bell

Lake Bell Modeled Peak Stages					
Design Storm Event	2-year, 24-hour	10-year, 24-hour	25-year, 24-hour	100-year, 24-hour	Hurricane Ian
Peak Stage (ft NAVD)	89.43	89.88	90.63	91.62	92.28

Note: Lake Bell warning stage is equal to 91.62 ft NAVD for roadway flooding, which is the approximate overtopping elevation to Turner Road. Structural flooding is anticipated at 91.80 ft NAVD, which is the approximate FFE of 1100 Turner Road. Yard flooding is anticipated at 90.80 ft NAVD.

Currently, Lake Bell is able to drain via a weir to Lake Killarney located on the south bank (**Photograph 2**).

Based on the study area DEM, the overtopping elevation to Turner Road is approximately 91.6 ft NAVD (between 1208 and 1214 Turner Road) and the finished floor elevation of 1100 Turner Road is approximately 91.8 ft NAVD. This suggests that elevated stages in Lake Bell result in potential roadway flooding starting at the 100-year, 24-hour design storm event but does not result in structure flooding during any design storm event. Modeled peak stages for Hurricane Ian support the City's observations of structure and roadway flooding to the east of Lake Bell (**Exhibit 8**).

3.7.2.3 Lake Mendsen

Based on the results of the existing conditions model, Lake Mendsen resulted in potential roadway flooding starting at the 2-year, 24-hour design storm event. Node peak stages for Lake Mendsen are summarized below in **Table 3-8**.

Table 3-8: Existing Conditions Peak Stages at Lake Mendsen

Lake Mendsen Modeled Peak Stages					
Design Storm Event	2-year, 24-hour	10-year, 24-hour	25-year, 24-hour	100-year, 24-hour	Hurricane Ian
Peak Stage (ft NAVD)	85.58	86.79	87.29	87.94	88.35

Note: Lake Mendsen warning stage is equal to 84.82 ft NAVD for roadway flooding, which is the approximate Denning Drive edge of pavement elevation. Structural flooding is anticipated at 86.60 ft NAVD, which is the approximate FFE of 880 West New England Avenue. Yard flooding is anticipated at 85.60 ft NAVD.

Currently, Lake Mendsen is able to drain via the 20-inch drainwell located in the center of the lake, the 8-inch drainwell located within the control structure on the north side of the lake (**Photograph 7**), and to Lake Killarney via the Lake Mendsen/Killarney interconnect.

Based on the study area DEM, the road surface minimum elevation of Denning Drive is approximately 84.8 ft NAVD, and the road surface minimum elevation of Harper Street is approximately 85.7 ft NAVD. This suggests that Lake Mendsen is resulting in potential roadway flooding along Denning Drive starting at the 2-year, 24-hour design storm event and Harper Street starting at the 10-year, 24-hour design storm event. This supports the City's statement that Lake Mendsen occasionally stages up and floods upstream roads during intense rain events.

Per as-builts for the Winter Park Library (ERP #20947-5), the library and events center buildings have a finished floor elevation of 91.0 ft. Therefore, these structures would not be a risk of flooding during any design storm event. However, some of the older residential structures to the east of Lake Mendsen, particularly those on West New England Avenue, have an approximate finished floor elevation of 86.6 ft NAVD (estimated as 1 foot above the study DEM), which indicates potential structure flooding starting at the 10-year, 24-hour design storm event.

Modeled peak stages for Hurricane Ian support the City's observations of structure and roadway flooding to the south and east of Lake Mendsen (**Exhibit 8**).

3.7.2.4 Canton Avenue

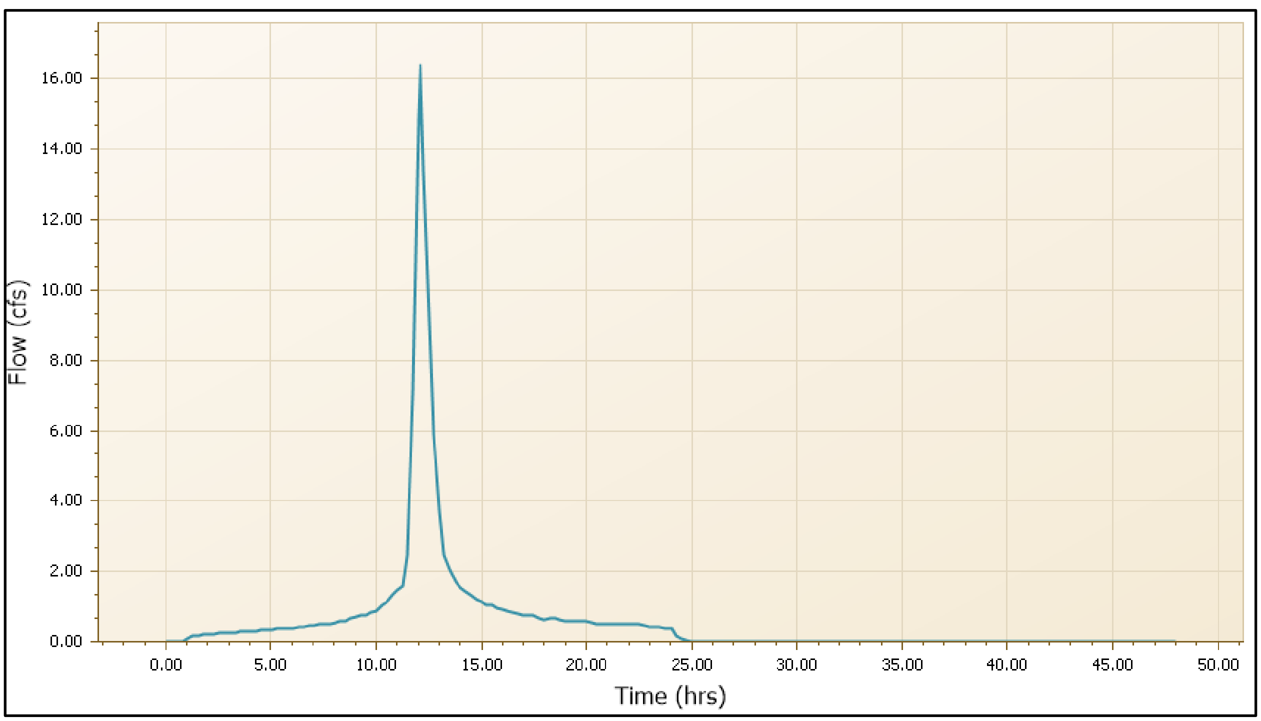
Currently, Canton Avenue drains east to Lake Osceola via a 24-inch pipe. Based on modeling results, roadway flooding along Canton Avenue primarily occurs near the intersections with Park Avenue, Center Street, and Knowles Avenue. Based on the 2D overland flow model, roadway flooding is approximately 1-6 inches along Canton Avenue between Center Street and Knowles Avenue during the 2-year, 24-hour design storm event. As the return period of the design storm increases, so does the extent and severity of roadway flooding along Canton Avenue. During the 100-year, 24-hour design storm event there is approximately 13-inches of roadway flooding at the Canton Avenue and Knowles Avenue intersection. A map of the roadway flooding extent along Canton Avenue is presented as **Exhibit 14**.

Two overland flow weir links were incorporated into the model to represent the overland flow of stormwater from Canton Avenue north along Knowles Avenue and south along Park Avenue (i.e., water leaving the overland flow region). Model results are summarized in **Table 3-9.** Based on model results, the peak overland flow from Canton Avenue to Knowles Avenue ranged from 11.8 cubic feet per second (cfs) during the 2-year, 24-hour design storm to 44.4 cfs during the 100-year, 24-hour design storm. Since the intersection of Canton Avenue and Knowles Avenue is a low spot along Canton Avenue, roadway flooding along Canton Avenue likely results in the overland discharge of stormwater and potential roadway flooding along Knowles Avenue. These results support the City's observations of flooding at the intersection of Canton Avenue and Knowles Avenue.

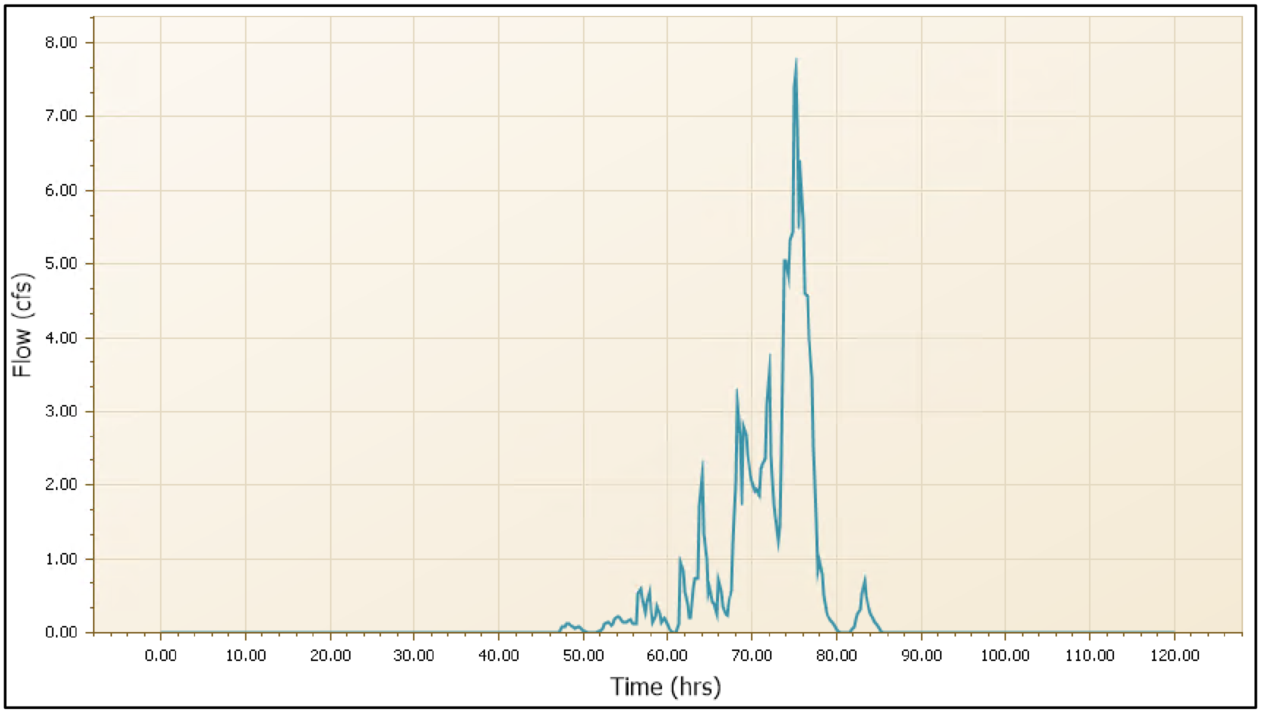
Table 3-9: Existing Conditions Peak Overland Flow Rates on Canton Avenue

Canton Avenue Modeled Peak Overland Flow Rates (cfs)					
Design Storm Event	2-year, 24-hour	10-year, 24-hour	25-year, 24-hour	100-year, 24-hour	Hurricane Ian
North along Knowles Avenue	11.79	21.81	29.75	44.38	12.91
South along Park Avenue	0.00	0.34	3.78	7.44	0.88

Overland flow rates during Hurricane Ian were lower than most of the design storm scenarios due to the Canton Avenue area being sensitive to the intensity of the rainfall, rather than the volume. **Figure 3-1** below shows hydrographs for the 100-year, 24-hour design storm and Hurricane Ian for basin (CRA 2020) adjacent to the overland flow region. Due the greater intensity of rainfall during the 100-year, 24-hour event, flows in this basin exceeded 16 cfs whereas they stayed below 8 cfs during Hurricane Ian.



a)



b)

Figure 3-1: Modeled Hydrographs Representative of Canton Avenue for the a) 100-year, 24-hour design storm and b) Hurricane Ian

3.7.3 Potential Flood Prone Locations

An assessment of the entire study area was performed to identify potential drainage deficiencies that may warrant corrective action and are unrelated to focus areas for this study (Lake Killarney, Lake Bell, Lake Mendsen, and Canton Avenue) which were discussed in **Section 3.7.2**. A summary of the findings is provided below. Identified locations are shown on **Exhibit 13**. Note that peak flood depths are relative to approximate edge of pavement elevations.

- **Nicolet Pond** – Stormwater pond and connected channel near the intersection of Minnesota Avenue and Nicolet Avenue, including Nodes NB0250, NB0260, NB0270, NB0275, NB0280, and NB0300. Based on model results, there was a peak flood depth of approximately 1.08-ft during the 10-year, 24-hour design storm at this location.
- **West End of Miller Avenue** – Stormsewer system at the west end of Miller Avenue, including Nodes NB0420, NB0430, NB0440, NB0450. Based on model results, there was a peak flood depth of approximately 1.50-ft during the 10-year, 24-hour design storm at this location.
- **Intersection of Bennett Avenue and Kindel Avenue** – Stormsewer system at the intersection of Bennett Avenue and Kindel Avenue, including Node NE0079. Based on model results, there was a peak flood depth of approximately 0.2-ft during the 10-year, 24-hour design storm at this location.
- **Lake Francis** – Stormsewer system upstream of Lake Francis along Lee Road, including Nodes NA1900, NA1910, and NA2120. Based on model results, there was a peak flood depth of approximately 2.22-ft during the 10-year, 24-hour design storm at this location.

- Lake Francis does not have an established NHWE and therefore, the initial stage of the lake was set to its control elevation (86.29 ft NAVD). It is noted that if the NHWE of Lake Francis is less than this value, the model may have over-predicted potential flooding upstream of Lake Francis.
- **Lake Midget** – Lake Midget and the upstream stormsewer system along South Denning Drive, including Nodes NA1170 and NA1230. Based on model results, there was a peak flood depth of approximately 1.08-ft during the 10-year, 24-hour design storm at Lake Midget.
- Lake Midget does not have an established NHWE and therefore, the initial stage of the lake was set to its control elevation, which is equal to the drainwell invert (83.62 ft NAVD). It is noted that if the NHWE of Lake Midget is less than this value, the model may have over-predicted potential flooding at Lake Midget and the associated upstream stormsewer system.
- **Intersection of West Lyman Avenue and South Pennsylvania Avenue** – Stormsewer system at the intersection of West Lyman Avenue and South Pennsylvania Avenue, including Nodes NA1010, NA1020 and NA1650. Based on model results, there was a peak flood depth of approximately 0.61-ft during the 10-year, 24-hour design storm at this location.
- Based on correspondence with the City, extensive flooding during Hurricane Ian was reported in this area, which is directly east of Lake Mendsen.
- **East Welbourne Avenue** – Stormsewer system at East Welbourne Avenue between the intersections with South Park Avenue and South Interlachen Avenue, including Nodes NA0140, NA0200, NA0330, and NA0340. Based on model results, there was a peak flood depth of approximately 0.89-ft during the 10-year, 24-hour design storm at this location.
- **East Fairbanks Avenue** – Stormsewer system at East Fairbanks Avenue between the intersections with Chapman Avenue and South Interlachen Avenue, including Nodes NA0500, NA0510, and NA0520. Based on model results, there was a peak flood depth of approximately 0.50-ft during the 10-year, 24-hour design storm at this location.
- **South Orlando Avenue** – Stormsewer system at South Orlando Avenue between the intersections with West Fairbanks Avenue and West Comstock Avenue, including Nodes NA1690 and NA1700. Based on model results, there was a peak flood depth of approximately 0.77-ft during the 10-year, 24-hour design storm at this location.
- **Orange Avenue** – Stormsewer system at Orange Avenue between the intersections with South Pennsylvania Avenue and South Capen Avenue, including Nodes NA1290 and NA1300. Based on model results, there was a peak flood depth of approximately 0.71-ft during the 10-year, 24-hour design storm at this location.
- **East End of East Swoop Avenue** – Stormsewer system at the east end of East Swoop Avenue, including Nodes NA0100 and NA0110. Based on model results, there was a peak flood depth of approximately 1.52-ft during the 10-year, 24-hour design storm at this location.

- **North Interlachen Avenue** – Stormsewer system along North Interlachen Avenue between the intersections of East Webster Avenue and East Swoope Avenue, including Nodes NA0010, NA0080, and NA2010. Based on model results, there was a peak flood depth of approximately 0.71-ft during the 10-year, 24-hour design storm at this location.
- **East Lyman Avenue** – Stormsewer system along Lyman Avenue between the intersections of South New York Avenue and South Interlachen Avenue, including Nodes NA0410, NA0470, and NA0490. Based on model results, there was a peak flood depth of approximately 1.25-ft during the 10-year, 24-hour design storm at this location.
- **East End of Huntington Avenue** – Stormsewer system at the east end of Huntington Avenue, including Nodes NA1090 and NA1120. Based on model results, there was a peak flood depth of approximately 1.95-ft during the 10-year, 24-hour design storm at this location.
- **Douglas Avenue** – Stormsewer system at Douglas Avenue, including Node NA1630. Based on model results, there was a peak flood depth of approximately 1.98-ft during the 10-year, 24-hour design storm at this location.
- Based on correspondence with the City, extensive flooding during Hurricane Ian was reported in this area, which is directly east of Lake Mendsen.
- **Orange Avenue** – Stormsewer system at Orange Avenue between the intersections with South Denning Drive and Aragon Avenue, including Node NA1270. Based on model results, there was a peak flood depth of approximately 0.39-ft during the 10-year, 24-hour design storm at this location.
- **Intersection of Carolina Avenue and North New York Avenue** – Stormsewer system at the intersection of Carolina Avenue and North New York Avenue, including Node NA0250. Based on model results, there was a peak flood depth of approximately 0.51-ft during the 10-year, 24-hour design storm at this location.
- **Intersection of South Orlando Avenue and Gene Street** – Stormsewer system at the intersection of S Orlando Avenue and Gene Street, including Node NB0220. Based on model results, there was a peak flood depth of approximately 0.42-ft during the 10-year, 24-hour design storm at this location.
- **North Orlando Avenue –** Stormsewer system along North Orlando Avenue at the intersections with Gay Road and West Webster Avenue including NA1330, NA1340, NA1350, NA1410, and NA1420. Based on model results, there was a peak flood depth of approximately 1.4 -ft during the 10-year, 24-hour design storm at this location.
- **FDOT Stormwater Pond (southwest of Lee Rd and I-4)** – FDOT pond and the upstream stormsewer system, including Node NC0080. Based on model results, there was a peak flood depth of approximately 0.87-ft during the 10-year, 24-hour design storm at this location.
- **Intersection of Schultz Avenue and Miller Avenue** – Stormsewer system at the intersection of Schultz Avenue and Miller Avenue, including Node NB0320. Based on model results, there was a peak flood depth of approximately 0.94-ft during the 10-year, 24-hour design storm at this location.

- **Intersection of Minnesota Avenue and Shultz Avenue** – Stormsewer system at the intersection of Minnesota Avenue and Shultz Avenue, including Node NB0310. Based on model results, there was a peak flood depth of approximately 0.28-ft during the 10-year, 24-hour design storm at this location.
- **Intersection of West Fairbanks Avenue and Ward Avenue** – Stormsewer system at the intersection of West Fairbanks Avenue and Ward Avenue, including Node NA1490. Based on model results, there was a peak flood depth of approximately 0.47-ft during the 10-year, 24-hour design storm at this location.

Geosyntec recommends that the City review these potential flood prone locations to determine if flooding has been observed or reported in the past and if drainage improvements are warranted.

3.8 Existing Conditions Conclusions

An existing conditions evaluation was performed for the study area. Deficiencies identified throughout the expanded study during this evaluation are summarized below and a complete summary of the LOS assessment is provided in **Appendix A**.

- **Potential Water Quality Treatment Deficiencies** – Water quality deficiencies resulting from lack of water quality treatment or substandard treatment were documented at multiple locations throughout the expanded study area (**Section 3.1**, **Exhibit 10**).
- **Potential Flood Prone Locations** – Potential flooding during the 10-year, 24-hour design storm event was documented at multiple locations throughout the expanded study area (**Section 3.7.2**, **Exhibit 13**).

Based on the results of the existing conditions analysis, City statements regarding deficiencies associated with the focus areas of this study were validated and corrective actions are warranted for Lake Killarney, Lake Bell, Lake Mendsen, or Canton Avenue as summarized below.

- **Lake Killarney** – Based on modeling results, the existing drainwells and control structure that service Lake Mendsen may be insufficient during extreme rain events to effectively manage the peak stage in the lake without resulting in potential flooding adjacent to the lake. Model results suggest that peak stages in Lake Killarney result in potential structure flooding on Lake Drive starting at the 100-year, 24-hour design storm event.
- **Lake Bell** – Based on modeling results, the existing outfall to Lake Killarney may be insufficient during extreme rain events to effectively manage the peak stage in the lake without resulting in potential roadway flooding adjacent to the lake. Model results suggest that peak stages in Lake Bell result in potential roadway flooding on Turner Road starting at the 100-year, 24-hour design storm event.
- **Lake Mendsen** – Based on modeling results, the existing drainwells that service Lake Mendsen are insufficient to effectively manage the peak stage in the lake without resulting in potential flooding adjacent to the lake. Model results suggest that peak stages in Lake Mendsen result in potential roadway flooding starting at the 2-year, 24-hour design storm event and potential structure flooding starting at the 10-year, 24-hour design storm event.
- **Canton Avenue** – As seen in **Exhibit 14**, roadway nuisance flooding starts during the 2-year, 24-hour design storm event along Canton Avenue, primarily between the intersections with Center Street and Knowles Avenue. Based on modeling results, the existing drainage infrastructure is inadequate to capture and effectively convey stormwater runoff from Canton Avenue and the adjacent contributing areas. The existing drainage infrastructure along Canton Avenue is not currently achieving a 10-year LOS, which is typically the design criteria for roadway drainage infrastructure.

Improvement concept alternatives were developed for the study focus areas to address these drainage/water quality deficiencies and are discussed in **Section 4**.

4. IMPROVEMENT ALTERNATIVES ANALYSIS

Flood improvement concepts (FICs) were developed for each focus area to address deficiencies that have been noted by the City and that were validated during the Existing Conditions Assessment, as discussed in **Section 3**. Due to the built-out nature of the study area, open space for traditional stormwater management techniques (e.g., stormwater ponds) is generally not available and therefore, techniques such as pre-storm drawdowns, expansion of existing storage, etc. were the focus during the development of improvement concepts.

For all FICs in the Lake Mendsen, Lake Bell, and Lake Killarney focus areas, a hot start simulation was run to set initial conditions based on pre-storm operations outlined in the City's Interim Adaptive Flood Management Plan released in October 2023. The following operational procedures were simulated, and a no-rain simulation was run for 7 days (168 hours). A comparison of modeled peak stages for the focus areas and downstream waterbodies under existing conditions and pre-storm conditions are presented in **Table 4-1**.

- 7 days prior to storm (hours 1-120):
  - Lake Killarney's six drainwell risers were removed to adjust the elevation from approximately 81.66 ft NAVD (normal operation) to approximately 80.00 ft NAVD (emergency operation)
  - Lake Bell's top weir board was removed to adjust the weir invert elevation from 88.70 ft NAVD (normal operation) to 87.95 ft NAVD (emergency operation)
- 2 days prior to storm (hours 121-168):
  - Continued implementation of operations from hours 1-120
  - Lake Mendsen's 20-inch drainwell weir was adjusted from 81.14 ft NAVD (normal operation) to 77.02 ft NAVD (emergency operation)

Table 4-1: Modeled Peak Stage of Pre-Storm Operations

Modeled Peak Stages (ft NAVD)						
Design Storm Event		2-year, 24-hour	10-year, 24-hour	25-year, 24-hour	100-year, 24-hour	Ian
Lake Mendsen	Existing Conditions	85.58	86.79	87.29	87.94	88.35
	Pre-Storm Conditions	84.06	86.16	86.97	87.70	88.31
	Change in Peak Stage (ft)	-1.52	-0.63	-0.32	-0.24	-0.04
Lake Bell	Existing Conditions	89.43	89.88	90.63	91.62	92.28
	Pre-Storm Conditions	88.92	89.42	90.14	91.43	92.18
	Change in Peak Stage (ft)	-0.51	-0.46	-0.49	-0.19	-0.10

Modeled Peak Stages (ft NAVD)						
Design Storm Event		**2-year, 24-hour**	**10-year, 24-hour**	**25-year, 24-hour**	**100-year, 24-hour**	**Ian**
Lake Killarney	Existing Conditions	83.01	83.42	83.72	84.34	85.61
	Pre-Storm Conditions	82.54	83.09	83.41	83.95	85.28
	Change in Peak Stage (ft)	-0.47	-0.33	-0.31	-0.39	-0.33
Lake Rose	Existing Conditions	83.89	84.16	84.37	84.91	88.36
	Pre-Storm Conditions	83.89	84.16	84.37	84.76	88.33
	Change in Peak Stage (ft)	0.00	0.00	0.00	-0.15	-0.03
Grove Street Wetland	Existing Conditions	80.89	81.03	81.12	81.27	81.18
	Pre-Storm Conditions	80.89	81.03	81.12	81.27	81.18
	Change in Peak Stage (ft)	0.00	0.00	0.00	0.00	0.00
Lake Gem/ Park Lake	Existing Conditions	69.80	71.17	72.26	74.35	75.27
	Pre-Storm Conditions	69.65	70.52	71.48	73.66	75.16
	Change in Peak Stage (ft)	-0.15	-0.65	-0.78	-0.69	-0.11

To distinguish flood benefits of the improvement alternatives from the City's existing pre-storm operations, peak stages were compared to pre-storm conditions.

A preliminary meeting was held with SJRWMD regulatory staff on July 18, 2024, to review the proposed FICs and request feedback on permitting feasibility and any concerns regarding water quality, wetland, and/or downstream impacts (**Appendix B**). Where applicable, feedback from this meeting was included in the FIC discussion.

4.1 CRA Alternative Analysis Re-Evaluation

Improvement alternatives investigated in the 2020 study were reviewed and re-evaluated for Lake Mendsen and Canton Avenue. Based on feedback from the City the underground storage alternative evaluated previously for Lake Mendsen is not considered cost effective and was not re-evaluated as part of this study. Rather, use of additional park land to increase flood storage and a mobile pump for pre-storm drawdowns was considered for Lake Mendsen. The recommended Canton Avenue improvement alternative was reevaluated and adjusted as needed.

4.1.1 FIC #1 – Lake Mendsen: Connection to Lake Rose

The following FIC is a re-evaluation of Lake Mendsen Improvement Alternative 2 from Geosyntec's 2020 study.

4.1.1.1 Improvement Concept

This FIC consists of hydraulically connecting Lake Mendsen to Lake Rose. A new control structure is proposed to convey water from Lake Mendsen to Lake Rose when the stage in Lake Mendsen rises above 83.3 ft NAVD (Lake Rose's assumed normal water elevation). Since Lake Rose currently has no manmade outfalls and only receives water from direct rainfall, it represents an opportunity to supplement the storage provided by Lake Mendsen and mitigate elevated peak stages. A map of the improvement concept is presented as **Exhibit 15**.

4.1.1.2 Proposed Conditions Stormwater Model

The model developed for the existing conditions analysis was modified to include the hydraulic connection to Lake Rose. The Lake Mendsen/Killarney interconnect remained open, and a drop structure link was utilized to model overtopping of a proposed weir at Lake Mendsen and the subsequent pipe flow to Lake Rose. The proposed control structure at Lake Mendsen was modeled as having a 6-ft wide rectangular weir with an invert of 83.3 ft NAVD (Lake Rose's assumed normal water elevation). Water that overtopped this weir was conveyed to Lake Rose via a 36-inch diameter pipe and discharged at the northwest side of Lake Rose.

4.1.1.3 Proposed Conditions Model Results

Modeled peak stages at Lake Mendsen and a comparison to existing conditions and pre-storm conditions are presented in **Table 4-2**. A complete summary of node peak stages for FIC #1 is provided as **Appendix C**. Inundation polygons for the 100-year, 24-hour design storm event under existing and proposed conditions are shown on **Exhibit 15**.

Table 4-2: FIC #1 Modeled Peak Stages

Modeled Peak Stages (ft NAVD)						
Design Storm Event		**2-year, 24-hour**	**10-year, 24-hour**	**25-year, 24-hour**	**100-year, 24-hour**	**Ian**
Lake Mendsen[1]	Existing Conditions	85.58	86.79	87.29	87.94	88.35
	Pre-Storm Conditions	84.06	86.16	86.97	87.70	88.31
	FIC #1	84.03	85.98	86.87	87.62	88.36
	Change in Peak Stage (ft) from FIC	-0.03	-0.18	-0.10	-0.08	+0.05
Downstream Waterbodies						
Lake Rose	Existing Conditions	83.89	84.16	84.37	84.91	88.36
	Pre-Storm Conditions	83.89	84.16	84.37	84.76	88.33
	FIC #1	84.01	85.97	86.81	87.46	88.38
	Change in Peak Stage (ft) from FIC	+0.12	+1.81	+2.44	+2.70	+0.05

Modeled Peak Stages (ft NAVD)						
Design Storm Event		**2-year, 24-hour**	**10-year, 24-hour**	**25-year, 24-hour**	**100-year, 24-hour**	**Ian**
Lake Killarney	Existing Conditions	83.01	83.42	83.72	84.34	85.61
	Pre-Storm Conditions	82.54	83.09	83.41	83.95	85.28
	FIC #1	82.54	83.09	83.41	83.95	85.28
	Change in Peak Stage (ft) from FIC	0.00	0.00	0.00	0.00	0.00
Lake Gem/ Park Lake	Existing Conditions	69.80	71.17	72.26	74.35	75.27
	Pre-Storm Conditions	69.65	70.52	71.48	73.66	75.16
	FIC #1	69.65	70.52	71.48	73.66	75.16
	Change in Peak Stage (ft) from FIC	0.00	0.00	0.00	0.00	0.00

[1]Lake Mendsen warning stage is equal to 84.82 ft NAVD for roadway flooding, which is the approximate Denning Drive edge of pavement elevation. Structural flooding is anticipated at 86.60 ft NAVD, which is the approximate FFE of 880 West New England Avenue. Yard flooding is anticipated at 85.60 ft NAVD.

As seen in **Table 4-2**, Lake Mendsen peak stages are slightly lower in this improvement concept, when compared to pre-storm conditions. A peak stage less than 84.82 ft NAVD during the 2-year, 24-hour design storm event was targeted to address roadway flooding. The modeled peak stage for pre-storm operations during the 2-year, 24-hour design storm event achieved this LOS, and the FIC did not provide any additional benefit. For all other design storms, the peak stage exceeded 84.82 ft NAVD although the FIC provided additional slight reductions in peak stage as compared to pre-storm operations alone. Downstream impacts (i.e., increased peak stage) to Lake Rose begin in the 25-year, 24-hour storm when the peak stage reached the top of bank elevation for Lake Rose (86.8 ft NAVD). No increase in peak stage to downstream waterbodies, Lake Killarney and Lake Gem/Park Lake, are anticipated from this FIC.

Time/Stage data for Lake Mendsen and Lake Rose during the 2-year, 24-hour design storm event are presented in **Figure 4-1**.

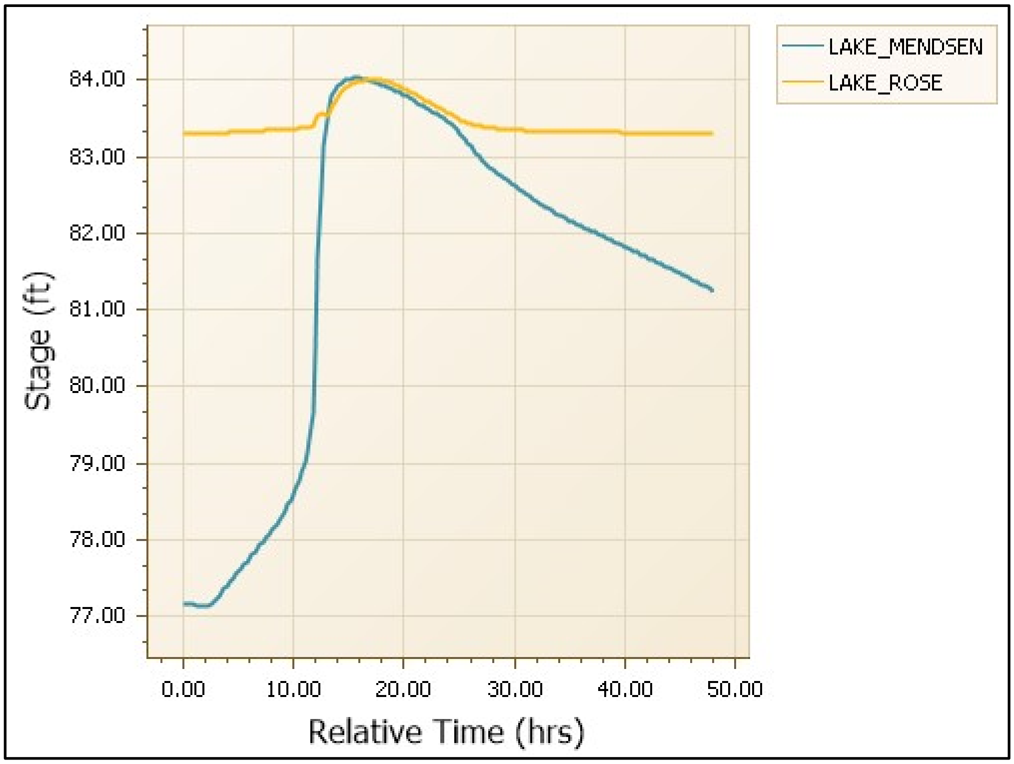


Figure 4-1: Modeled Time/Stage Data for Lake Mendsen and Lake Rose for 2-Year, 24-Hour Design Storm

As seen in **Figure 4-1**, when the stage in Lake Mendsen rises above 83.3 ft NAVD (which occurs at approximately hour 12), water begins moving from Lake Mendsen to Lake Rose. From approximately hour 12 to hour 16, water is conveyed to Lake Rose, resulting in a peak stage at Lake Rose of approximately 84.01 ft NAVD, which is approximately 2.8 ft below the top of bank for Lake Rose. After hour 16, both Lake Mendsen and Lake Rose drain simultaneously via the two existing drainwells and the interconnect to Lake Killarney, until the stage at Lake Rose reaches 83.3 ft NAVD, the elevation of the proposed weir and the lake's assumed normal water elevation. Since Lake Rose was originally formed from a sink hole, conditions may favor relatively quick infiltration; however, this would need to be confirmed by a more detailed hydrogeologic investigation. Further investigation would be necessary to establish a normal and normal high water elevation for Lake Rose prior to pursuing this improvement alternative.

4.1.1.4 Proposed Water Quality Impacts

This FIC may have water quality impacts on Lake Rose. If pursued, pollutant load impacts to Lake Rose would have to be calculated using a 10-year continuous simulation to obtain the annual average loading and a permit obtained through SJRWMD.

4.1.1.5 Implementation Considerations

The following implementation considerations are provided for this FIC:

- <u>Cost</u> – The estimated total (construction and engineering) cost for this improvement concept is $593,269. A detailed cost estimate is provided in **Appendix I**.

- Cost/Benefit – Relative to the other FIC (#2) for Lake Mendsen, this concept was less expensive and more effective at mitigating potential roadway flooding during the 2-year, 24- hour design storm event.
- Engineering Design – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.
- Land Acquisition – The location of the FIC is currently owned by the City of Winter Park. Land acquisition was assumed to not be required.
- Permitting – A permit from SJRWMD is anticipated to be required for this FIC due to the proposed new stormwater discharge to Lake Rose. The preliminary meeting held with SJRWMD on July 18, 2024, confirmed the need for a permit.

4.1.2 FIC #2 – Lake Mendsen: Pump Station and Lake Expansion

The following FIC is not a re-evaluation of one presented in Geosyntec's 2020 study but rather one developed as a result of the model expansion and improved topographical information.

4.1.2.1 Improvement Concept

This FIC consists of increasing the depth of Lake Mendsen and installing infrastructure to allow for pre-storm drawdown using the City's mobile pump. The expanded storage in Lake Mendsen assumed increasing the depth to 73 ft NAVD (current lake bottom is 75 ft NAVD) with 2:1 sideslopes providing approximately 1.8 ac-ft of additional storage. A concrete pad on the north side of the lake near the existing 8-inch drainwell would be constructed to station the mobile pump and a 6-inch HDPE force main would be installed along the south side West Morse Boulevard and tie into the existing stormsewer network at Harper Street with a new manhole. A flange and valve would be installed at the concrete pad to quickly connect the mobile pump to the force main prior to a storm event. Pump specifications provided by the City and communication with the vendor determined a pumping rate of 2.67 cfs. Use of a mobile pump for pre-storm drawdown of Lake Mendsen would occur in conjunction with the drainwells on Lake Mendsen to reduce the lake stage as much as possible. Currently, according to the City, the drainwells drain the lake to 77.02 ft NAVD in approximately 24 hours. Since Lake Mendsen is only able to drain via the 20-inch drainwell located in the center of the lake, the 8-inch drainwell located within the control structure on the north side of the lake, and to Lake Killarney via the Lake Mendsen/Killarney interconnect, this FIC represents an opportunity to create supplemental storage and mitigate elevated peak stages. A map of the improvement concept is presented as **Exhibit 16**.

4.1.2.2 Proposed Conditions Stormwater Model

The model developed for the existing conditions analysis was modified to increase the depth of Lake Mendsen and include the hydraulic connection to Lake Killarney. The expanded storage in Lake Mendsen was incorporated into the node's stage/area table, the Lake Mendsen/Killarney interconnect was closed, a rating curve link was added to model the mobile pump operation using the vendor-suggested pump rate of 2.67 cfs, and a 6-inch pipe link was added to convey water from the mobile pump to the existing stormsewer network at Harper Street. The mobile pump was simulated to be turned off when the new lake bottom elevation (73 ft NAVD) was reached.

The hot start simulation for this alternative included the increased depth of Lake Mendsen for the entire duration (7 days) of pre-storm operations. The mobile pump was turned on and interconnect closed for the last 2 days, when the 20-inch drainwell would begin operating under emergency conditions.

For the design storm event simulations the mobile pump was turned off and the interconnect was opened. This reflects typical operating conditions as the mobile pump would be turned off prior to the storm to prevent damage to equipment and ensure the safety of City staff.

4.1.2.3 Proposed Conditions Model Results

Modeled peak stages at Lake Mendsen and a comparison to existing conditions and pre-storm conditions are presented in **Table 4-3**. A complete summary of node peak stages for FIC #2 is provided as **Appendix D**. Inundation polygons for the 100-year, 24-hour design storm event under existing and proposed conditions are shown on **Exhibit 16.**

Table 4-3: FIC #2 Modeled Peak Stages

Modeled Peak Stages (ft NAVD)						
Design Storm Event		2-year, 24-hour	10-year, 24-hour	25-year, 24-hour	100-year, 24-hour	Ian
Lake Mendsen[1]	Existing Conditions	85.58	86.79	87.29	87.94	88.35
	Pre-Storm Conditions	84.06	86.16	86.97	87.70	88.31
	FIC #2	83.86	86.03	86.92	87.65	88.31
	Change in Peak Stage (ft) from FIC	-0.20	-0.13	-0.05	-0.05	0.00
Downstream Waterbodies						
Lake Killarney	Existing Conditions	83.01	83.42	83.72	84.34	85.61
	Pre-Storm Conditions	82.54	83.09	83.41	83.95	85.28
	FIC #2	82.57	83.11	83.44	83.97	85.30
	Change in Peak Stage (ft) from FIC	+0.03	+0.02	+0.03	+0.02	+0.02
Lake Gem/ Park Lake	Existing Conditions	69.80	71.17	72.26	74.35	75.27
	Pre-Storm Conditions	69.65	70.52	71.48	73.66	75.16
	FIC #2	69.65	70.55	71.52	73.72	75.16
	Change in Peak Stage (ft) from FIC	0.00	+0.03	+0.04	+0.06	0.00

[1]Lake Mendsen warning stage is equal to 84.82 ft NAVD for roadway flooding, which is the approximate Denning Drive edge of pavement elevation. Structural flooding is anticipated at 86.60 ft NAVD, which is the approximate FFE of 880 West New England Avenue. Yard flooding is anticipated at 85.60 ft NAVD.

As seen in **Table 4-3**, Lake Mendsen peak stages are slightly lower in this improvement concept, when compared to pre-storm conditions. A peak stage less than 84.82 ft NAVD during the 2-year, 24-hour design storm event was targeted to address roadway flooding. The modeled peak stage for pre-storm operations during the 2-year, 24-hour design storm event achieved this LOS, and the FIC provided an additional benefit of approximately 2-inches. For all other design storms, the peak stage exceeded 84.82 ft NAVD although the FIC provided additional slight reductions in peak stage as compared to pre-storm operations alone. Increased peak inflows from Orlando Avenue via the interconnect were observed as result of this FIC which likely contributed to the lack of improvement in peak stages in Lake Mendsen. Marginal increases in peak stage to downstream waterbodies, Lake Killarney and Lake Gem/Park Lake, are anticipated from this FIC.

As compared to FIC #1, an additional peak stage reduction of approximately 0.17-ft (2-inches) was observed for the 2-year, 24-hour design storm.

4.1.2.4 Proposed Water Quality Impacts

This FIC may have water quality impacts on Lake Killarney and a treatment train may be required prior to pre-storm releases to Lake Killarney. SJRWMD communicated that there may be potential water quality credit if the expansion increases the residence time of Lake Mendsen, and that the expansion may already be included in existing permit. If pursued, pollutant load impacts to Lake Killarney would have to be calculated using a 10-year continuous simulation to obtain the annual average loading and a permit obtained through SJRWMD. Due to the fact that pre-storm releases are of treated stormwater rather than the non-treated releases from storm events it is plausible that pollutant loading during flood events would be reduced by this FIC as compared to existing conditions.

4.1.2.5 Implementation Considerations

The following implementation considerations are provided for this FIC:

- Cost – The estimated total (construction and engineering) cost for this improvement concept is $905,824. A detailed cost estimate is provided in **Appendix I**.
- Cost/Benefit – Relative to the other FIC (#1) for Lake Mendsen, this concept is more expensive and less effective to mitigate potential roadway flooding during the 2-year, 24-hour design storm event.
- Engineering Design – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.
- Land Acquisition – The location of the FIC is currently owned by the City of Winter Park. Land acquisition was assumed to not be required.
- Permitting – A permit from SJRWMD is anticipated to be required for this FIC due to the potential water quality impacts and increased peak flows to Lake Killarney. The existing permit may already include increasing the depth of Lake Mendsen. The preliminary meeting held with SJRWMD on July 18, 2024, confirmed the need for a permit.

4.1.3 FIC #3 – Canton Avenue: Improved Conveyance

The following FIC is a re-evaluation of the Canton Avenue Improvement Alternative 1 from Geosyntec's 2020 study.

4.1.3.1 Improvement Concept

This FIC consists of upsizing the main trunkline that flows west to east along Canton Avenue to 48-inches, additional inlet structures, and upsizing an existing inlet structure near the intersection with Park Avenue. Since drainage of Canton Avenue is limited by the existing 24-inch trunkline, this FIC represents an opportunity to increase conveyance and mitigate roadway flooding. A map of the improvement concept is presented as **Exhibit 17**. Note that existing inlet and manhole structures downstream of the FIC would likely also have to be replaced due to their age and to accommodate the larger pipe.

As the goal of this improvement concept is to capture and convey more water from Canton Avenue to Lake Osceola, there is the possibility that the existing baffle box is undersized to accommodate this additional flow. To accommodate for this, a diversion structure was incorporated in the improvement concept to divert excess flow around the existing baffle box at the east end of Canton Avenue. The diversion structure consists of a 24-inch pipe to the existing baffle box and an overflow weir that would allow flow to bypass the baffle box and be discharged to Lake Osceola via the proposed 48-inch pipe. As a result of the increased conveyance capacity of the upsized trunkline, more water would likely bypass the baffles during large storm events than under existing conditions and may result in increased pollutant loads to Lake Osceola.

4.1.3.2 Proposed Conditions Stormwater Model

The model developed for the existing conditions analysis was modified to upsize the existing main trunkline along Canton Avenue was from 24-inches to 48-inches. Proposed curb inlet structures near the intersection with Park Avenue were modeled by 1-D interface points connected to a Stage/Area node via a weir link. The geometry of the weir links was input into the model as vertical, sharp crested with a maximum depth and width of 6-inches and 8-ft, respectively. These dimensions represent the opening of a typical FDOT Type 4 curb inlet. A weir coefficient of 3.2 and orifice coefficient of 0.6 was assigned to the weirs. In addition, an existing inlet structure near the Park Avenue intersection was upsized to a FDOT Type 4 curb inlet.

4.1.3.3 Proposed Conditions Model Results

Modeled peak overland flow rates from Canton Avenue and a comparison to existing conditions and pre-storm conditions are presented in **Table 4-4** and shown on **Exhibit 17**.

Table 4-4: FIC #3 Modeled Peak Flow Rates

Canton Avenue Modeled Peak Overland Flow Rates (cfs)						
Design Storm Event		2-year, 24-hour	10-year, 24-hour	25-year, 24-hour	100-year, 24-hour	Ian
North along Knowles Avenue	Existing Conditions	11.79	21.81	29.75	44.38	12.91
	FIC #3	0.00	0.00	0.00	15.96	0.00
	Change in Peak Flow (cfs) from FIC[1]	-11.79	-21.81	-29.75	-28.42	-12.91
South along Park Avenue	Existing Conditions	0.00	0.34	3.78	7.44	0.88
	FIC #3	0.00	0.00	1.11	6.85	0.00
	Change in Peak Flow (cfs) from FIC[1]	0.00	-0.34	-2.67	-0.59	-0.88

[1]Pre-storm operations do not impact Canton Avenue and were therefore not included for comparison

Model results for this FIC indicate a significant decrease in the extent and depth of flooding along Canton Avenue. See **Exhibit 17** for the flood extent and depth for each of the 24-hour design storms. Note that flood depths greater than 2-inches (0.17-ft) are shown on the map. A comparison of the peak flood depths to the existing conditions for the 10-year, 24-hour storm event is presented in **Exhibit 17** as well. This comparison was performed using spatial analyst tools in ArcGIS. As seen in **Exhibit 17**, decreased flood depths of 7-inches (0.58-ft) or greater are observed primarily at the intersections with Center Street and Knowles Avenue (i.e., where roadway flooding was determined to be more severe in the existing conditions).

As discussed in the existing conditions analysis, the intersection of Canton Avenue and Knowles Avenue is a low spot along Canton Avenue and therefore, much of the surface runoff is conveyed to this location. When Canton Avenue becomes inundated, a portion of the stormwater is discharged north along Knowles Avenue via overland flow resulting in roadway flooding of Knowles Avenue which has been observed by the City. As seen in **Table 4-4**, based on model results, overland flow from Canton Avenue to Knowles Avenue is eliminated for all design storm events except the 100-year, 24-hour event where it is significantly reduced.

4.1.3.4 Proposed Water Quality Impacts

This FIC may have additional water quality impacts on Lake Osceola due to more water bypassing the baffle box during large storm events, when compared to existing conditions. The diversion structure incorporated in the FIC, a 24-inch pipe to the existing baffle box and an overflow weir that would allow flow to bypass the baffle box and be discharged to Lake Osceola via the proposed 48-inch pipe, would not alter the volume of water passing through the existing baffle box. However, since more water is being conveyed through the 48-inch pipe in comparison to the existing 24-inch pipe and the existing baffle box is undersized to accommodate additional flow associated with the 48-inch pipe, there is the potential for additional pollutant loading to Lake Osceola, a concern which was confirmed by SJRWMD during the meeting on July 18, 2024. If FIC #3 is pursued, pollutant load impacts to Lake Killarney would have to be calculated using a 10-year continuous simulation to ensure the annual average loading does not exceed existing conditions.

4.1.3.5 Implementation Considerations

The following implementation considerations are provided for this for this FIC:

- <u>Cost</u> – The estimated construction cost for this improvement concept is $2,936,419. A detailed cost estimate is provided in **Appendix I**.
- <u>Cost/Benefit</u> – This concept resulted in a substantial decrease in the extent and severity of potential roadway flooding along Canton Avenue. Based on model results, overland flow from Canton Avenue to Knowles Avenue and Park Avenue was eliminated in 2-year, 24-hour and 10-year, 24-hour design storm events.
- <u>Engineering Design</u> – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.
- <u>Land Acquisition</u> – The location of the FIC is within the East Canton Avenue right-of-way. Land acquisition was assumed to not be required.
- <u>Permitting</u> – A permit from SJRWMD is anticipated to be required for this alternative due to the increased peak flow to Lake Osceola. The preliminary meeting held with SJRWMD on July 18, 2024, confirmed the need for a permit.

4.2 Lake Bell and Lake Killarney Alternatives Analysis

Flood improvement alternative concepts were evaluated for the Lake Bell, Lake Wilderness and Lake Killarney interconnections. The City requested that the following potential alternatives be evaluated – a direct connection from Lake Bell to Park Lake, improvements to the existing connection from Lake Killarney to Lake Gem, and adjustments to the risers on the Lake Killarney drainwells.

Following conversations with SJRWMD on July 18, 2024, adjustments to the risers on the Lake Killarney drainwells was not investigated due to the unlikelihood of obtaining the required permit modification from the Florida Department of Environmental Protection (FDEP).

Four FICs were developed to evaluate a direct connection from Lake Bell to Park Lake (FIC #4), reduced inflows from the FDOT pond north of Lake Wilderness (FIC #5), improved conveyance to from Lake Killarney to Lake Gem (FIC #6), and a combination of FICs #4 and 6 (FIC #7).

4.2.1 FIC #4 – Lake Bell: Connection to Park Lake

The following FIC was requested by the City.

4.2.1.1 Improvement Concept

This FIC consists of hydraulically connecting Lake Bell to Park Lake. A new control structure with an operable gate is proposed to convey water from Lake Bell to the wetland upstream of Park Lake when the stage in Lake Bell is above 86.0 ft NAVD prior to a storm event. The control structure would be located at the northeast side of Lake Bell and have a 6-ft wide rectangular weir with an invert of 86.0 ft NAVD and operable gate. Water overtopping this weir would be conveyed via a 36-inch pipe north to a new manhole at the intersection of West Street and Fitzgerald Drive and then run east along the south side of Fitzgerald Drive past Jonotey Drive until the road terminates. The pipe would then cross Fitzgerald Drive and discharge northeast to the wetland upstream Park Lake (Grove Street wetland). This will allow for pre-storm drawdown via emergency releases to Park Lake. Since Lake Bell’s only outfall is to Lake Killarney, it represents an opportunity to mitigate peak stages at both Lake Bell and Lake Killarney during storm events. A map of the improvement concept is presented as **Exhibit 18**.

4.2.1.2 Proposed Conditions Stormwater Model

The model developed for the existing conditions analysis was modified to include the hydraulic connection to Park Lake. A drop structure link was added to model overtopping of a proposed weir at Lake Bell and the subsequent pipe flow to the Grove Street wetland. The drop structure link had a 6-ft wide rectangular weir with an invert of 86.0 ft NAVD and a 36-inch diameter pipe. Water that overtopped this weir entered the 36-inch pipe and was conveyed along Fitzgerald Drive and discharged into the Grove Street wetland. No modifications were necessary to the control structure at Grove Street for modeling efforts (**Photograph 10**). However, to be conservative, this consideration is shown on **Exhibit 18** and included in the cost estimate (**Appendix I**).

The hot start simulation for this alternative included opening the control structure’s operable gate for the entire duration (7 days) of pre-storm operations.

For the design storm event simulations the operable gate was closed to mitigate increases in peak stages downstream during design storm events.

4.2.1.3 Proposed Conditions Model Results

Modeled peak stages at Lake Bell and a comparison to existing conditions and pre-storm conditions are presented in **Table 4-5**. A complete summary of node peak stages for FIC #4 is provided as **Appendix E**. Inundation polygons for the 100-year, 24-hour design storm event under existing and proposed conditions are shown on **Exhibit 18**.

Table 4-5: FIC #4 Modeled Peak Stages

Modeled Peak Stages (ft NAVD)						
Design Storm Event		**2-year, 24-hour**	**10-year, 24-hour**	**25-year, 24-hour**	**100-year, 24-hour**	**Ian**
Lake Bell[1]	Existing Conditions	89.43	89.88	90.63	91.62	92.28
	Pre-Storm Conditions	88.92	89.42	90.14	91.43	92.18
	FIC #4	88.60	88.94	89.42	90.72	91.97
	Change in Peak Stage (ft) from FIC	-0.32	-0.48	-0.72	-0.71	-0.21
Downstream Waterbodies & Wetlands						
Grove Street Wetland	Existing Conditions	80.89	81.03	81.12	81.27	81.18
	Pre-Storm Conditions	80.89	81.03	81.12	81.27	81.18
	FIC #4	80.90	81.03	81.12	81.27	81.18
	Change in Peak Stage (ft) from FIC	+0.01	0.00	0.00	0.00	0.00
Lake Killarney	Existing Conditions	83.01	83.42	83.72	84.34	85.61
	Pre-Storm Conditions	82.54	83.09	83.41	83.95	85.28
	FIC #4	82.44	82.98	83.34	83.90	85.08
	Change in Peak Stage (ft) from FIC	-0.10	-0.11	-0.07	-0.05	-0.20
Lake Gem/ Park Lake	Existing Conditions	69.80	71.17	72.26	74.35	75.27
	Pre-Storm Conditions	69.65	70.52	71.48	73.66	75.16
	FIC #4	70.03	70.78	71.65	73.74	75.22
	Change in Peak Stage (ft) from FIC	+0.38	+0.26	+0.17	+0.08	+0.06

[1]Lake Bell warning stage is equal to 91.62 ft NAVD for roadway flooding, which is the approximate overtopping elevation to Turner Road. Structural flooding is anticipated at 91.80 ft NAVD, which is the approximate FFE of 1100 Turner Road. Yard flooding is anticipated at 90.80 ft NAVD.

As seen in **Table 4-5**, Lake Bell peak stages are significantly lower in this improvement concept, when compared to pre-storm conditions. A peak stage less than 91.6 ft NAVD during the 100-

year, 24-hour design storm event was targeted to address roadway flooding on Turner Road. This target was achieved for all design storm events using pre-storm operations alone with the FIC providing additional flood benefit of preventing yard flooding during the 100-year, 24-hour design storm event. For Hurricane Ian, the peak stage exceeded 91.6 ft NAVD with yard, roadway, and structural flooding having the potential to occur. The FIC provided a marginal additional benefit of approximately 2-inches as compared to pre-storm operations for the Hurricane Ian storm event. Downstream impacts (i.e., increased peak stage) to Lake Gem/Park Lake begin in the 2-year, 24-hour storm event. No increase in peak stage to the Grove Street Wetland is anticipated and marginal flood benefit (decreased peak stage) is anticipated for Lake Killarney from this FIC.

4.2.1.4 Proposed Water Quality Impacts

This FIC may have water quality impacts on Lake Gem/Park Lake. If pursued, pollutant load impacts to Lake Gem/Park Lake would have to be calculated using a 10-year continuous simulation to obtain the annual average loading and a permit obtained through SJRWMD. Due to the fact that pre-storm releases are of treated stormwater rather than the non-treated releases from storm events it is plausible that pollutant loading during flood events would be reduced by this FIC as compared to existing conditions. At the preliminary meeting held with SJRWMD on July 18, 2024, SJRWMD included the following suggestions to identify and address potential water quality impacts:

- Avoidance of using the wetland for water quality treatment to prevent the need for mitigation of wetland impacts.
- Model pollutant loading from this FIC as well as the Lake Killarney outfall to ensure no net increase in loading to Lake Gem/Park Lake.
- Baffle box installation in route from Lake Killarney to Lake Gem/Park Lake may be a good option to offset additional loading from this FIC to Park Lake.

4.2.1.5 Implementation Considerations

The following implementation considerations are provided for this FIC:

- Cost – The estimated construction cost for this improvement concept is $929,662. A detailed cost estimate is provided in **Appendix I**.
- Cost/Benefit – Relative to the other FIC (#5) for Lake Bell, this concept was less expensive and more effective at mitigating potential roadway flooding along Tuner Road during design storm events. This improvement concept achieved a substantial peak stage reduction at Lake Bell as compared to FIC #5.
- Engineering Design – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.
- Land Acquisition – The location of the FIC is within the City of Maitland and Town of Eatonville. Land acquisition is likely to be required.
- Permitting – A permit from SJRWMD is anticipated to be required for this alternative due to the increased peak flow to and stages in Lake Gem/Park Lake. The preliminary meeting held with SJRWMD on July 18, 2024, confirmed the need for a permit.

4.2.2 FIC #5 – Lake Bell: Reduced Inflows from FDOT Pond Expansion

The following FIC was identified to reduce inflows to Lake Bell via Lake Wilderness.

4.2.2.1 Improvement Concept

This FIC consists of expanding the existing FDOT pond north of Lake Wilderness to reduce peak flow rates during storm events into Lake Wilderness which connects downstream to Lake Bell and ultimately Lake Killarney. Overtopping of Lake Wilderness into Lake Gem was observed during Hurricane Ian. The expansion assumed the footprint of the existing FDOT Pond would expand to the vacant area west of the existing pond while retaining the existing pond's bottom elevation of 85 ft NAVD and 4:1 sideslopes. This expansion would add approximately 2.5 acres of area and 23.1 ac-ft of storage. In addition to the pond expansion, modifications to the existing outfall pipe network to the FDOT pond are proposed to utilize the water quality benefits of the expanded pond. A map of the improvement concept is presented as **Exhibit 19**.

4.2.2.2 Proposed Conditions Stormwater Model

The model developed for the existing conditions analysis was modified to expand the storage of the FDOT pond. The expansion was incorporated into the stage/area table of Lake Wilderness, adding approximately 2.5 acres of area and 23.1 ac-ft of storage.

The expanded pond storage was simulated for the entire duration (7 days) of the hot start simulation and the design storm event simulations.

4.2.2.3 Proposed Conditions Model Results

Modeled peak stages at Lake Bell and a comparison to existing conditions and pre-storm conditions are presented in **Table 4-6**. A complete summary of node peak stages for FIC #5 is provided as **Appendix F**. Inundation polygons for the 100-year, 24-hour design storm event under existing and proposed conditions are shown on **Exhibit 19**.

Table 4-6: FIC #5 Modeled Peak Stages

Modeled Peak Stages (ft NAVD)						
Design Storm Event		**2-year, 24-hour**	**10-year, 24-hour**	**25-year, 24-hour**	**100-year, 24-hour**	**Ian**
Lake Bell[1]	Existing Conditions	89.43	89.88	90.63	91.62	92.28
	Pre-Storm Conditions	88.92	89.42	90.14	91.43	92.18
	FIC #5	88.92	89.41	90.13	91.43	92.17
	Change in Peak Stage (ft) from FIC	0.00	-0.01	-0.01	0.00	-0.01

Modeled Peak Stages (ft NAVD)						
Design Storm Event		2-year, 24-hour	10-year, 24-hour	25-year, 24-hour	100-year, 24-hour	Ian
Downstream Waterbodies & Wetlands						
Grove Street Wetland	Existing Conditions	80.89	81.03	81.12	81.27	81.18
	Pre-Storm Conditions	80.89	81.03	81.12	81.27	81.18
	FIC #5	80.89	81.03	81.12	81.27	81.18
	Change in Peak Stage (ft) from FIC	0.00	0.00	0.00	0.00	0.00
Lake Killarney	Existing Conditions	83.01	83.42	83.72	84.34	85.61
	Pre-Storm Conditions	82.54	83.09	83.41	83.95	85.28
	FIC #5	82.54	83.09	83.41	83.95	85.28
	Change in Peak Stage (ft) from FIC	0.00	0.00	0.00	0.00	0.00
Lake Gem/ Park Lake	Existing Conditions	69.80	71.17	72.26	74.35	75.27
	Pre-Storm Conditions	69.65	70.52	71.48	73.66	75.16
	FIC #5	69.65	70.52	71.48	73.66	75.16
	Change in Peak Stage (ft) from FIC	0.00	0.00	0.00	0.00	0.00

[1]Lake Bell warning stage is equal to 91.62 ft NAVD for roadway flooding, which is the approximate overtopping elevation to Turner Road. Structural flooding is anticipated at 91.80 ft NAVD, which is the approximate FFE of 1100 Turner Road. Yard flooding is anticipated at 90.80 ft NAVD.

As seen in **Table 4-6**, Lake Bell peak stages were not lowered significantly for any design storm event or Hurricane Ian in this improvement concept, when compared to the pre-storm conditions. A peak stage less than 91.6 ft NAVD during the 100-year, 24-hour design storm event was targeted to address roadway flooding on Turner Road for all design storm events. This target was achieved for all design storm events using pre-storm operations alone with the FIC providing no additional peak stage reductions. For Hurricane Ian, the peak stage exceeded 91.6 ft NAVD, and the FIC did not provide additional peak stage reduction. No increase in peak stage to downstream wetlands and waterbodies, Grove Street Wetland, Lake Killarney, and Lake Gem/Park Lake, are anticipated from this FIC.

As compared to FIC #4, FIC #5 does not provide any flood benefit and is more expensive.

4.2.2.4 Proposed Water Quality Impacts

This FIC will have positive water quality impacts on Lake Wilderness or Lake Bell as the expanded FDOT pond would provide a larger permanent pool, which would result in a longer residence time for water quality treatment. SJRWMD had no concerns regarding this alternative during the July 18, 2024, meeting.

4.2.2.5 Implementation Considerations

The following implementation considerations are provided for this FIC:

- Cost – The estimated construction cost for this improvement concept is $3,608,591. A detailed cost estimate is provided in **Appendix I**.
- Cost/Benefit – Relative to the other FIC (#4) for Lake Bell, this concept is more expensive and ineffective at mitigating potential roadway flooding along Tuner Road during design storm events. This improvement concept did not achieve a substantial peak stage reduction at Lake Bell.
- Engineering Design – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.
- Land Acquisition – The location of the FIC is owned by FDOT. Land acquisition may be required.
- Permitting – A general permit for retrofit from SJRWMD is anticipated to be required for this alternative to account for pond excavation/expansion.

4.2.3 FIC #6 – Lake Killarney: Improved Conveyance to Lake Gem

4.2.3.1 Improvement Concept

This FIC consists of installing a 48-inch bypass to the existing outfall structure on Lake Killarney to allow for pre-storm drawdown via emergency releases to Lake Gem prior to a storm event. The bypass consists of a 6-ft wide rectangular weir with an invert of 78.0 ft NAVD and operable gate. Water overtopping this weir would enter a 48-inch pipe that bypasses the existing control on the Lake Killarney outfall structure and ties back into the Lake Killarney outfall structure to be discharged to Lake Gem via the existing 8-ft outfall pipe. Since Lake Killarney's drainwells take 8 days to draw down Lake Killarney to approximately 80 ft NAVD once the risers are removed (drop of 1.6 ft at a rate of 0.1-0.2 ft/day), an alternative is needed to reduce the stage in Lake Killarney prior to a storm event to mitigate peak stages. A map of the improvement concept is presented as **Exhibit 20**.

4.2.3.2 Proposed Conditions Stormwater Model

The model developed for the existing conditions analysis was modified to add the bypass to the Lake Killarney outfall structure. A drop structure link was added to model overtopping of a proposed weir at Lake Killarney with subsequent pipe flow tying into the existing Lake Killarney outfall structure. The drop structure link had a 6-ft wide rectangular weir with an invert of 78.0 ft NAVD and a 48-inch diameter pipe. Water that overtopped this weir entered the 48-inch pipe, bypassed around the existing control on the Lake Killarney outfall structure, and tied back into the Lake Killarney outfall structure to be discharged to Lake Gem via the existing 8-ft outfall pipe.

The hot start simulation for this alternative included opening the control structure's operable gate for the entire duration (7 days) of pre-storm operations.

For the design storm event simulations the operable gate was closed to mitigate increases in peak stages downstream during design storm events.

4.2.3.3 Proposed Conditions Model Results

Modeled peak stages at Lake Killarney and a comparison to existing conditions and pre-storm conditions are presented in **Table 4-7**. A complete summary of node peak stages for FIC #6 is provided as **Appendix G**. Inundation polygons for the 100-year, 24-hour design storm event under existing and proposed conditions are shown on **Exhibit 20**.

Table 4-7: FIC #6 Modeled Peak Stages

Modeled Peak Stages (ft NAVD)						
Design Storm Event		2-year, 24-hour	10-year, 24-hour	25-year, 24-hour	100-year, 24-hour	Ian
Lake Killarney[1]	Existing Conditions	83.01	83.42	83.72	84.34	85.61
	Pre-Storm Conditions	82.54	83.09	83.41	83.95	85.28
	FIC #6	80.98[2]	81.67[2]	82.03	82.85	83.71
	Change in Peak Stage (ft) from FIC	-1.56	-1.42	-1.38	-1.10	-1.57
Downstream Waterbodies						
Lake Gem/ Park Lake	Existing Conditions	69.80	71.17	72.26	74.35	75.27
	Pre-Storm Conditions	69.65	70.52	71.48	73.66	75.16
	FIC #6	70.70	71.39	71.98	73.13	74.67
	Change in Peak Stage (ft) from FIC	+1.05	+0.87	+0.50	-0.53	-0.49

[1]Lake Killarney warning stage is equal to 84.40 ft NAVD for structural flooding, which is the approximate FFE of 2118 Lake Drive. Roadway flooding is anticipated at 85.20 ft NAVD, which is the approximate overtopping elevation to Lakefront Boulevard at the south end of Lakefront Boulevard near the boat ramp. Yard flooding is anticipated at 83.40 ft NAVD.
[2]The 24-hour design storm ran for 140 hours but as stage in Lake Killarney remained below its NHWE (82.04 ft NAVD) it was still rising to this water level at the end of the simulation.

As seen in **Table 4-7**, Lake Killarney peak stages are significantly lower in this improvement concept, when compared to pre-storm conditions. A peak stage less than 84.4 ft NAVD during the 100-year, 24-hour design storm event was targeted to address structure flooding on Lake Drive. This target as well as elimination of roadway flooding was achieved for all design storm events using pre-storm operations alone and for Hurricane Ian using the FIC. Yard flooding was anticipated starting at the 100-year, 24-hour design storm event under pre-storm conditions and starting at Hurricane Ian event with the FIC. Increases in peak stage to the downstream waterbody, Lake Gem/Park Lake, was anticipated from this FIC for the 2-year, 24-hour, 10-year, 24-hour, and 25-year, 24-hour design storms. Decreases in peak stage to Lake Gem/Park Lake during the 100-year, 24-hour design storm event and Hurricane Ian storm event are anticipated from this FIC.

4.2.3.4 Proposed Water Quality Impacts

This FIC may have water quality impacts on Lake Gem/Park Lake. If pursued, pollutant load impacts to Lake Gem/Park Lake would have to be calculated using a 10-year continuous simulation to obtain the annual average loading and a permit obtained through SJRWMD. Due to the fact that pre-storm releases are of treated stormwater rather than the non-treated releases from storm events it is plausible that pollutant loading during flood events would be reduced by this FIC as compared to existing conditions. At the July 18, 2024, meeting, SJRWMD suggested a baffle box installation in route from Lake Killarney to Lake Gem to offset additional loading from this FIC.

4.2.3.5 Implementation Considerations

The following implementation considerations are provided for this FIC:

- Cost – The estimated construction cost for this improvement concept is $301,639. A detailed cost estimate is provided in **Appendix I**.
- Cost/Benefit – This FIC resulted in a decrease in the extent and severity of potential structure flooding around Lake Killarney. Based on model results, structure and roadway flooding was eliminated in all design storms.
- Engineering Design – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.
- Land Acquisition – The location of the FIC is currently owned by the City of Winter Park. Land acquisition was assumed to not be required.
- Permitting – A permit from SJRWMD is anticipated to be required for this alternative due to the increased peak flow to and stages in Lake Gem/Park Lake. The preliminary meeting held with SJRWMD on July 18, 2024, confirmed the need for a permit.

4.2.4 FIC #7 – Combination of FIC #4 and 6

The following FIC was developed to examine the combined impact of implementing FICs #4 and 6.

4.2.4.1 Improvement Concept

This FIC consists of hydraulically connecting Lake Bell to Park Lake and installing 48-inch bypass to the existing outfall structure on Lake Killarney to allow for pre-storm drawdowns via emergency releases of both Lake Bell and Lake Killarney. This combination represents an opportunity to mitigate peak stages at Lake Bell and Lake Killarney and decrease inflows to Lake Killarney from Lake Bell during storm events. A map of each individual improvement concept is presented in **Exhibits 18** and **20**.

4.2.4.2 Proposed Conditions Stormwater Model

The model developed for the existing conditions analysis was modified to include the hydraulic connection to Park Lake and the bypass to Lake Killarney using a drop structure links. Details on model modifications are included in their respective sections (**Sections 4.2.1.2** and **4.2.3.2**).

4.2.4.3 Proposed Conditions Model Results

Modeled peak stages at Lake Bell and Lake Killarney and a comparison to existing conditions and pre-storm conditions are presented in **Table 4-8**. A complete summary of node peak stages for FIC #7 is provided as **Appendix H**. Inundation polygons for the 100-year, 24-hour design storm event under existing and proposed conditions are shown on **Exhibit 21**.

Table 4-8: FIC #7 Modeled Peak Stages

Modeled Peak Stages (ft NAVD)						
Design Storm Event		**2-year, 24-hour**	**10-year, 24-hour**	**25-year, 24-hour**	**100-year, 24-hour**	**Ian**
Lake Bell[1]	Existing Conditions	89.43	89.88	90.63	91.62	92.28
	Pre-Storm Conditions	88.92	89.42	90.14	91.43	92.18
	FIC #7	88.60	88.94	89.42	90.69	91.97
	Change in Peak Stage (ft) from FIC	-0.32	-0.48	-0.72	-0.74	-0.21
Lake Killarney[2]	Existing Conditions	83.01	83.42	83.72	84.34	85.61
	Pre-Storm Conditions	82.54	83.09	83.41	83.95	85.28
	FIC #7	80.71[3]	81.50[3]	81.90	82.73	83.54
	Change in Peak Stage (ft) from FIC	-1.83	-1.59	-1.51	-1.22	-1.74
Downstream Waterbodies & Wetlands						
Grove Street Wetland	Existing Conditions	80.89	81.03	81.12	81.27	81.18
	Pre-Storm Conditions	80.89	81.03	81.12	81.27	81.18
	FIC #7	80.90	81.03	81.12	81.27	81.18
	Change in Peak Stage (ft) from FIC	+0.01	0.00	0.00	0.00	0.00
Lake Gem/ Park Lake	Existing Conditions	69.80	71.17	72.26	74.35	75.27
	Pre-Storm Conditions	69.65	70.52	71.48	73.66	75.16
	FIC #7	70.72	71.40	71.99	73.14	74.64
	Change in Peak Stage (ft) from FIC	+1.07	+0.88	+0.51	-0.52	-0.52

[1]Lake Bell warning stage is equal to 91.62 ft NAVD for roadway flooding, which is the approximate overtopping elevation to Turner Road. Structural flooding is anticipated at 91.80 ft NAVD, which is the approximate FFE of 1100 Turner Road. Yard flooding is anticipated at 90.80 ft NAVD.
[2]Lake Killarney warning stage is equal to 84.40 ft NAVD for structural flooding, which is the approximate FFE of 2118 Lake Drive. Roadway flooding is anticipated at 85.20 ft NAVD, which is the approximate overtopping elevation to Lakefront Boulevard at the south end of Lakefront Boulevard near the boat ramp. Yard flooding is anticipated at 83.40 ft NAVD.
[3]The 24-hour design storm ran for 140 hours but as stage in Lake Killarney remained below its NHWE (82.04 ft NAVD) it was still rising to this water level at the end of the simulation.

As seen in **Table 4-7**, Lake Bell and Lake Killarney peak stages are significantly lower in this improvement concept, when compared to pre-storm conditions.

For Lake Bell, a peak stage less than 91.6 ft NAVD was targeted during the 100-year, 24-hour design storm event to address roadway flooding on Turner Road for all design storm events. This target was achieved for all design storm events using pre-storm operations alone with the FIC providing additional flood benefit of preventing yard flooding during the 100-year, 24-hour design storm events. For Hurricane Ian, the peak stage exceeded 91.6 ft NAVD with yard, roadway, and structural flooding having the potential to occur. The FIC provided a marginal additional benefit of approximately 2-inches as compared to pre-storm operations for the Hurricane Ian storm event.

For Lake Killarney, a peak stage less than 84.4 ft NAVD was targeted during the 100-year, 24-hour design storm event to address structure flooding on Lake Drive. This target as well as elimination of roadway flooding was achieved for all design storm events using pre-storm operations alone and for Hurricane Ian using the FIC. Yard flooding was anticipated starting at the 100-year, 24-hour design storm event under pre-storm conditions and starting at Hurricane Ian event with the FIC.

Increases in peak stage to the downstream waterbody, Lake Gem/Park Lake, was anticipated from this FIC for the 2-year, 24-hour, 10-year, 24-hour, and 25-year, 24-hour design storms. Decreases in peak stage to Lake Gem/Park Lake during the 100-year, 24-hour design storm event and Hurricane Ian storm event are anticipated from this FIC. No increase in peak stage to downstream wetland, Grove Street Wetland, is anticipated from this FIC.

4.2.4.4 Proposed Water Quality Impacts

This FIC will have water quality impacts on Lake Gem/Park Lake. If pursued, pollutant load impacts to Lake Gem/Park Lake would have to be calculated using a 10-year continuous simulation to obtain the annual average loading and a permit obtained through SJRWMD. Due to the fact that pre-storm releases are of treated stormwater rather than the non-treated releases from storm events it is plausible that pollutant loading during flood events would be reduced by this FIC as compared to existing conditions. At the preliminary meeting held with SJRWMD on July 18, 2024, SJRWMD included the following suggestions to identify and address water quality impacts:

- Avoidance of using the wetland for water quality treatment to prevent the need for mitigation of wetland impacts.
- Model pollutant loading from this FIC to ensure no net increase in loading to Lake Gem/Park Lake.
- Baffle box installation in route from Lake Killarney to Lake Gem may be a good option to offset additional loading from this FIC.

4.2.4.5 Implementation Considerations

The following implementation considerations are provided for this FIC:.

- <u>Cost</u> – The estimated construction cost for this improvement concept is $1,231,301. A detailed cost estimate for each individual FIC (#4 and 6) is provided in **Appendix I**.
- <u>Cost/Benefit</u> – This FIC resulted in a substantial decrease in the extent and severity of potential structure flooding around Lake Killarney and roadway flooding along Tuner Road during design storm events. Relative to the other FIC (#5) for Lake Bell, this concept was less expensive and more effective at mitigating potential roadway flooding and achieved a substantial peak stage reduction. Relative to the other FIC (#6) for Lake

Killarney, this concept achieved a substantial peak stage reduction for the 100-year, 24-hour design storm event.

- Engineering Design – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.
- Land Acquisition – The location of FIC #4 is within the City of Maitland and Town of Eatonville. The location of the FIC #6 is currently owned by the City of Winter Park. Land acquisition is likely to be required.
- Permitting – A permit from SJRWMD is anticipated to be required for this alternative due to the increased peak flow to and stages in Lake Gem/Park Lake. The preliminary meeting held with SJRWMD on July 18, 2024, confirmed the need for a permit.

4.3 Interim Project Recommendations

FICs were developed for each of the four identified focus areas (Lake Killarney, Lake Bell, Lake Mendsen, and Canton Avenue) to address deficiencies that have been noted by the City and that were validated during the existing conditions analysis. A summary of the FICs is provided below.

4.3.1 CRA Alternatives Analysis Re-Evaluation

Three FICs were investigated as part of the re-evaluation of the CRA study area. Two improvement alternative concepts developed in the 2020 study were re-evaluated for Lake Mendsen and Canton Avenue. A new FIC was developed for Lake Mendsen to address elevated stages which contributed to occasional roadway nuisance flooding upstream of the lake and significant flooding during Hurricane Ian. The improvement alternatives are summarized below.

- **FIC #1** – This improvement concept consists of hydraulically connecting Lake Mendsen to Lake Rose. A new control structure is proposed to convey water from Lake Mendsen to Lake Rose when the stage in Lake Mendsen rises above 83.3 ft NAVD.
    - FIC #1 resulted in a peak stage approximately 0.03-ft lower than pre-storm conditions during the 2-year, 24-hour design storm event. Based on modeling results, potential roadway flooding may still occur starting at the 10-year, 24-hour design storm. The estimated construction cost for this improvement concept is $593,269.
- **FIC #2** – This improvement concept consists of increasing the depth of Lake Mendsen and installing infrastructure to allow for pre-storm drawdowns of Lake Mendsen using a mobile pump. A new force main is proposed to convey emergency releases of water from Lake Mendsen to Lake Killarney during pre-storm drawdowns.
    - FIC #2 resulted in a peak stage approximately 0.20-ft lower than pre-storm conditions during the 2-year, 24-hour design storm event. Based on modeling results, potential roadway flooding may still occur starting at the 10-year, 24-hour design storm. The estimated construction cost for this improvement concept is $905,678.
- **FIC #3** – This improvement concept consists of upsizing the main trunkline that flows west to east along Canton Avenue, adding additional inlet structures, and upsizing an existing inlet structure near the intersection with Park Avenue.

  - FIC #3 resulted a significant decrease in the extent and depth of flooding along Canton Avenue. Based on modeling results, overland flow from Canton Avenue to Knowles Avenue was eliminated for all design storm events except the 100-year, 24-hour event. The estimated construction cost for this improvement concept is $768,245.

Geosyntec recommends proceeding with FIC #2 for Lake Mendsen with additional investigation into improvements in the watershed upstream and downstream of Lake Mendsen. Investigation should include options to divert flows away from Lake Mendsen, including that from Orlando Avenue, and options for supplemental storage. FIC #2 provides slightly greater peak stage reduction as FIC #1 for the 2-year, 24-hour design storm event without causing flooding in Lake Rose however it is not providing substantial flood benefit to an area subject to frequent flooding. In conjunction with further investigation into watershed improvements, implementation of the pond expansion under FIC #2 may provide the additional runoff attenuation needed to alleviate the chronic flooding in this area.

Geosyntec recommends proceeding with FIC #3 for Canton Avenue to address roadway flooding along Canton Avenue. It is noted that potential upsizing of the existing baffle box at the east end of Canton Avenue, which could be necessary from capturing and conveying more runoff, was not assessed as part of this study. A more detailed analysis of the baffle box's capacity and bypass mechanisms is recommended prior to proceeding with retrofit improvements. Based on survey data provided to Geosyntec by the City, the upstream invert of the baffle box is 76.24 ft NAVD, the downstream invert is 76.05 ft NAVD, and the structure bottom is 72.64 ft NAVD. Based on this and assuming that the baffles are located beneath the pipe inverts, it is not expected that conveying more water to the existing baffle box would cause potential upstream flooding. More water would likely bypass the baffles during large storm events, when compared to existing conditions with potential water quality impacts on Lake Osceola.

4.3.2 Lake Bell and Lake Killarney Alternatives Analysis

Four FICs were investigated for the Lake Bell, Lake Wilderness and Lake Killarney interconnections. Two of the FICs – a direct connection from Lake Bell to Park Lake (FIC #4) and improved conveyance to from Lake Killarney to Lake Gem (FIC #6) were requested by the City. The remaining two FICs investigated reduced inflows from the FDOT pond north of Lake Wilderness (FIC #5) and a combination of FIC #4 and 6 (FIC #7).

- **FIC #4** – This improvement concept consists of hydraulically connecting Lake Bell to Park Lake to allow for pre-storm drawdown via emergency releases. A new control structure is proposed to convey water from Lake Bell to Park Lake when the stage in Lake Bell rises above 86.0 ft NAVD prior to a storm event.
  - FIC #4 resulted in a peak stage approximately 0.71-ft lower than pre-storm conditions during the 100-year, 24-hour design storm event and 0.21-ft lower than pre-storm conditions during the Hurricane Ian storm event. Based on modeling results, roadway flooding on Turner Road was eliminated for all design storm events but not the Hurricane Ian storm event. The estimated construction cost for this improvement concept is $929,662.

- **FIC #5** – This improvement concept consists of expanding the existing FDOT pond north of Lake Wilderness to reduce inflows into Lake Wilderness which connects downstream to Lake Bell and ultimately Lake Killarney.
    - FIC #5 resulted in the same peak stage as pre-storm conditions during the 100-year, 24-hour design storm event and Hurricane Ian storm event. Based on modeling results, roadway flooding on Turner Road was eliminated for all design storm events but not Hurricane Ian due to pre-storm operations. The estimated construction cost for this improvement concept is $3,608,591.
- **FIC #6** – This improvement concept consists of installing a 48-inch bypass to the existing outfall structure on Lake Killarney to allow for pre-storm drawdown via emergency releases to Lake Gem. A new control structure is proposed to convey water from Lake Killarney to Lake Gem when the stage in Lake Killarney is above 78.0 ft NAVD prior to a storm event.
    - FIC #6 resulted in a peak stage approximately 1.10-ft lower than pre-storm conditions during the 100-year, 24-hour design storm event and 1.57-ft lower than pre-storm conditions during the Hurricane Ian storm event. Based on modeling results, structural flooding on Lake Drive would be eliminated for all design storm events and the Hurricane Ian storm event. The estimated construction cost for this improvement concept is $301,639.
- **FIC #7** – This improvement concept consists of hydraulically connecting Lake Bell to Park Lake (FIC #4) and installing 48-inch bypass to the existing outfall structure on Lake Killarney (FIC #6) to allow for pre-storm drawdowns of both Lake Bell and Lake Killarney via emergency releases to Lake Gem/Park Lake.
    - FIC #7 resulted in a peak stage approximately 0.74-ft and 0.21-ft lower than pre-storm conditions for Lake Bell during the 100-year, 24-hour design storm event and Hurricane Ian storm event, respectively. This FIC resulted in peak stage reductions of approximately 1.22-ft and 1.74-ft from pre-storm conditions for Lake Killarney during the 100-year, 24-hour design storm event and Hurricane Ian storm event, respectively. Based on modeling results for Lake Bell, roadway flooding on Turner Road was eliminated for all design storm events but not the Hurricane Ian storm event. Based on modeling results for Lake Killarney, structural flooding on Lake Drive would be eliminated for all design storm events and the Hurricane Ian storm event. The estimated construction cost for this improvement concept is $1,231,301

Geosyntec recommends proceeding with FIC #7 for Lake Bell and Lake Killarney as it provides the greatest peak stage reduction for Lake Bell and Lake Killarney. In order to mitigate increased peak stages at Lake Gem/Park Lake during the smaller design storm events (2-year, 24-hour, 10-year, 24-hour, and 25-year, 24-hour), operational strategies for the operable gates should be investigated to evaluate timing of opening the gate and optimal pre-storm stages depending on storm severity. Due to the cost of implementation and complexity of collaborating with City of Maitland and Town of Eatonville to implement the hydraulic connection between Lake Bell and Park Lake (FIC #4), a phased approach may be taken to implement FIC #6 prior to FIC #4. Modeling the pollutant loading from both of these projects jointly is recommended to ensure there is no net increase in loading to Lake Gem/Park Lake.

5. CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to perform a holistic existing conditions analysis for the expanded study area and to develop cost effective and feasible engineering improvement alternatives for the focus areas: Lake Killarney, Lake Bell, Lake Mendsen, and Canton Avenue.

An existing conditions evaluation was performed for the study area. Deficiencies identified throughout the CRA area during this evaluation are summarized below.

Potential Water Quality Treatment Deficiencies – Water quality deficiencies resulting from lack of water quality treatment or substandard treatment were documented at the locations listed below.

- **Lakeview Drive Outfall to Lake Virginia** – Stormsewer system discharges directly to Lake Virginia after minimal treatment in the 9^{th} Grade Center Pond.
- **Beachview Avenue Outfall to Lake Killarney** – Stormsewer system discharges portion of runoff not treated by Lake Mendsen directly to Lake Killarney after trash/debris collection.
- **Ololu Drive Outfall to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney after trash/debris collection.
- **Euston Road Outfalls to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney after trash/debris collection.
- **Salisbury Boulevard Outfalls to Lake Killarney** – Stormsewer system discharges directly to Lake Killarney after trash/debris collection.
- **Clay Street Outfall to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney after trash/debris collection.
- **West Fairbanks Avenue Outfall to Lake Killarney** – Stormsewer system discharges directly to Lake Killarney after trash/debris collection.
- **Kilshore Lane Outfall to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney without water quality treatment.
- **Lakeview Avenue Outfall to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney without water quality treatment.
- **Shoreview Avenue Outfall to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney without water quality treatment.
- **Broadview Avenue Outfall to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney after trash/debris collection.
- **Fairview Avenue Outfalls to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney without water quality treatment.
- **Hillstone Restaurant Outfall to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney without water quality treatment.

- **Killarney Bay Court Outfall to Lake Killarney** – Stormsewer system discharges directly to Lake Killarney after trash/debris collection.
- **Gay Road Outfall to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney without water quality treatment.
- **Lake Front Boulevard Outfalls to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney after trash/debris collection treatment on one of its four outfalls. The remaining three outfalls discharge directly to Lake Killarney without water quality treatment.
- **Country Club Drive Outfalls to Lake Killarney** – Stormsewer system discharges directly to Lake Killarney after trash/debris collection.
- **Lee Road Outfall to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney after sediment/debris collection.
- **Blossom Lane Outfall to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney without water quality treatment.
- **Lake Drive Outfalls to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney without water quality treatment.
- **Rippling Lane Outfalls to Lake Killarney –** Stormsewer system discharges directly to Lake Killarney without water quality treatment.
- **Grove Street Outfalls to Park Lake –** Stormsewer system discharges directly to Park Lake without water quality treatment.
- **The Adeline Apartment Complex Outfall to Park Lake** – Stormsewer system discharges directly to Park Lake without water quality treatment.
- **Monroe Avenue Outfall to Lake Gem –** Stormsewer system discharges directly to Lake Gem without water quality treatment.
- **Monroe Avenue/South Orlando Avenue Outfalls to Lake Gem –** Stormsewer system discharges directly to Lake Gem after sediment/debris collection.
- **South West Street to Lake Bell –** Stormsewer system discharges directly to Lake Bell without water quality treatment.
- **Lake Bell Drive Outfall to Lake Bell –** Stormsewer system discharges directly to Lake Bell without water quality treatment.
- **Turner Road Outfall to Lake Bell –** Stormsewer system discharges directly to Lake Bell without water quality treatment.
- **Monroe Avenue Ditch Outfall to Lake Bell –** Ditch system discharges directly to Lake Bell without water quality treatment.

Potential Flood Prone Locations – Potential roadway flooding during the 10-year, 24-hour design storm event was documented at the locations listed below.

- **Nicolet Pond** – Stormwater system upstream of Nicolet Pond.

- **West End of Miller Avenue** – Stormsewer system at the west end of Miller Avenue.
- **Intersection of Bennett Avenue and Kindel Avenue** – Stormsewer system at the intersection of Bennett Avenue and Kindel Avenue.
- **Lake Francis** – Stormsewer system upstream of Lake Francis.
- **Lake Midget** – Lake Midget and the upstream stormsewer system.
- **Intersection of West Lyman Avenue and South Pennsylvania Avenue** – Stormsewer system at the intersection of West Lyman Avenue and South Pennsylvania Avenue.
- **East Welbourne Avenue** – Stormsewer system at East Welbourne Avenue between the intersections with South Park Avenue and South Interlachen Avenue.
- **East Fairbanks Avenue** – Stormsewer system at East Fairbanks Avenue between the intersections with Chapman Avenue and South Interlachen Avenue.
- **South Orlando Avenue** – Stormsewer system at South Orlando Avenue between the intersections with West Fairbanks Avenue and West Comstock Avenue.
- **Orange Avenue** – Stormsewer system at Orange Avenue between the intersections with South Pennsylvania Avenue and South Capen Avenue.
- **East End of East Swoop Avenue** – Stormsewer system at the east end of East Swoop Avenue.
- **North Interlachen Avenue** – Stormsewer system along North Interlachen Avenue between the intersections of East Webster Avenue and East Swoope Avenue.
- **East Lyman Avenue** – Stormsewer system along Lyman Avenue between the intersections of South New York Avenue and South Interlachen Avenue.
- **East End of Huntington Avenue** – Stormsewer system at the east end of Huntington Avenue.
- **Douglas Avenue** – Stormsewer system at Douglas Avenue.
- **Orange Avenue** – Stormsewer system at Orange Avenue between the intersections with South Denning Drive and Aragon Avenue.
- **Intersection of Carolina Avenue and North New York Avenue** – Stormsewer system at the intersection of Carolina Avenue and North New York Avenue.
- **Intersection of South Orlando Avenue and Gene Street** – Stormsewer system at the intersection of S Orlando Avenue and Gene Street.
- **North Orlando Avenue –** Stormsewer system along North Orlando Avenue at the intersections with Gay Road and West Webster Avenue.
- FDOT Stormwater Pond (southwest of Lee Rd and I-4) – FDOT pond and the upstream stormsewer system.
- **Intersection of Schultz Avenue and Miller Avenue** – Stormsewer system at the intersection of Schultz Avenue and Miller Avenue.

- **Intersection of Minnesota Avenue and Shultz Avenue** – Stormsewer system at the intersection of Minnesota Avenue and Shultz Avenue.
- **Intersection of West Fairbanks Avenue and Ward Avenue** – Stormsewer system at the intersection of West Fairbanks Avenue and Ward Avenue.

Findings from the existing conditions evaluation for the focus areas are summarized below.

- **Lake Killarney** – Model results indicated potential structure flooding along Lake Drive resulting from elevated stages in Lake Killarney beginning at the 100-year, 24-hour design storm event, potential roadway flooding during the Hurricane Ian storm event, and potential yard flooding along Lake Drive beginning at the 25-year, 24-hour design storm event. These finding suggests that the existing drainwells that service Lake Killarney and existing outfall to Lake Gem Mendsen are insufficient to effectively manage the peak stage in the lake. These findings are consistent with observations reported by City staff.
- **Lake Bell** – Model results indicated potential yard and street flooding along Tuner Road resulting from elevated stages in Lake Bell beginning at the 100-year, 24-hour design storm event and potential structure flooding during the Hurricane Ian storm event. These findings suggests that the existing outfall to Lake Killarney is insufficient to effectively manage the peak stage in the lake. These findings are consistent with observations reported by City staff.
- **Lake Mendsen** – Model results indicated potential street flooding along Denning Drive resulting from elevated stages in Lake Mendsen beginning at the 2-year, 24-hour design storm event and potential yard and structure flooding beginning at the 10-year, 24-hour design storm event. These findings suggests that the existing drainwells that service Lake Mendsen and the Lake Mendsen/Killarney interconnect are insufficient to effectively manage the peak stage in the lake. These findings are consistent with observations reported by City staff.
- **Canton Avenue** – Model results indicated potential roadway flooding for Canton Avenue beginning at the 2-year, 24-hour design storm event. Roadway flooding was most severe between the intersections with Center Street and Knowles Avenue. These findings suggest the existing drainage infrastructure along Canton Avenue is inadequate to capture and convey stormwater runoff from Canton Avenue and the adjacent contributing area. These findings are consistent with observations reported by City staff.

Based on these findings, improvement alternative concepts were developed for each focus area to address the deficiencies above. Improvement alternative recommendations are summarized below.

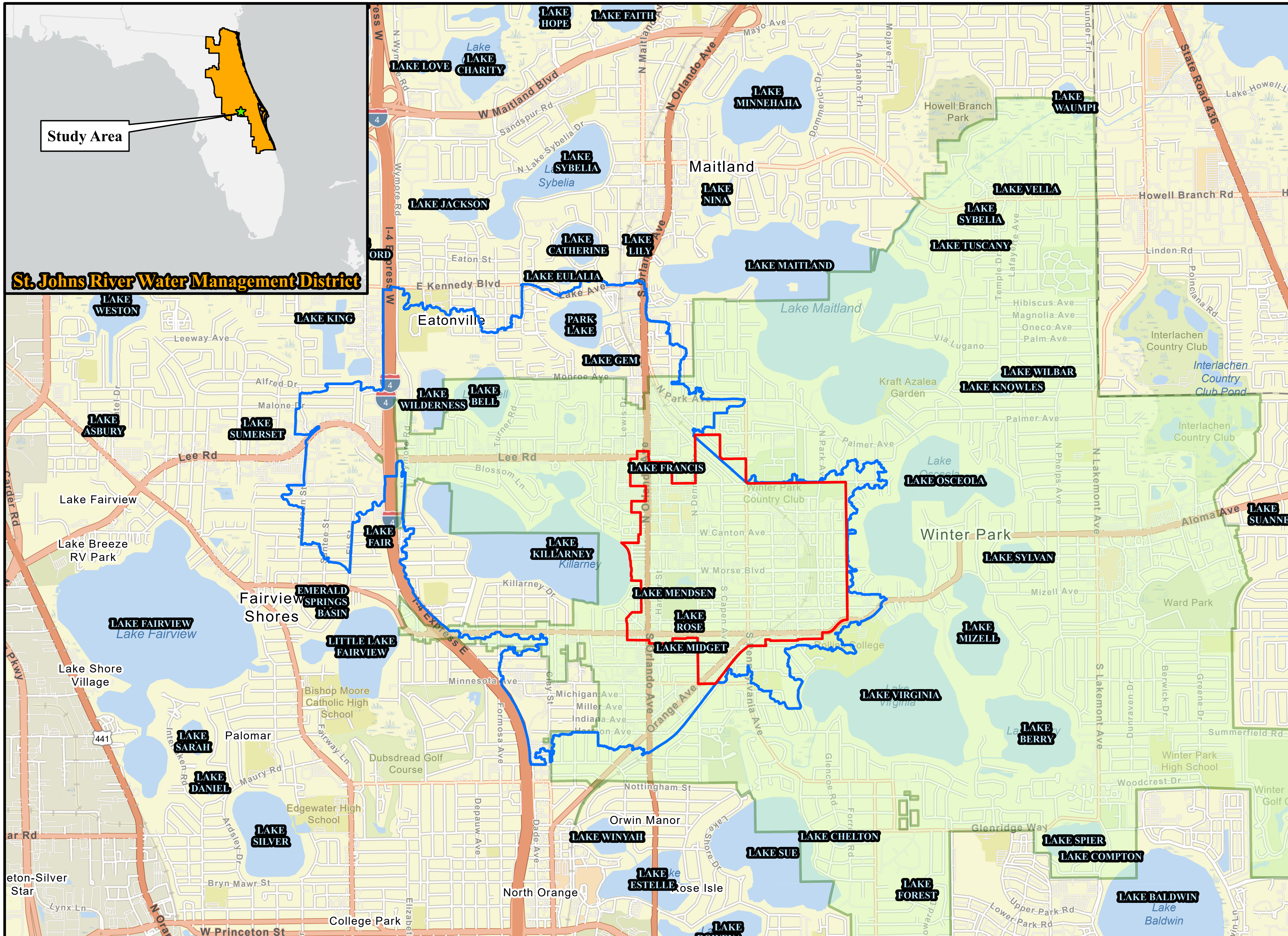
- **Lake Killarney and Lake Bell** – Geosyntec recommends proceeding with FIC #7, creating a hydraulic connection between Lake Bell and Park Lake and installing a 48-inch bypass to the existing outfall structure on Lake Killarney, as the combination of these alternatives provides the greatest peak stage reduction to lake Killarney. In order to mitigate increased peak stages at Lake Gem/Park Lake during the smaller design storm events (2-year, 24-hour, 10-year, 24-hour, and 25-year, 24-hour), operational strategies for the operable gates should be investigated to evaluate timing of opening the gate and optimal pre-storm stages depending on storm severity. Due to the cost of implementation and complexity of collaborating with City of Maitland and Town of Eatonville to implement the hydraulic connection between Lake Bell and Park Lake, a phased approach may be taken to implement FIC #6 prior to FIC #4.

- **Lake Mendsen** – Geosyntec recommends proceeding with FIC #2, mobile pump and Lake Mendsen expansion, with additional investigation into improvements in the watershed upstream and downstream of Lake Mendsen. Investigation should include options to divert flows away from Lake Mendsen, including that from Orlando Avenue, and options for supplemental storage. FIC #2 provides slightly greater peak stage reduction as FIC #1 for the 2-year, 24-hour design storm event without causing flooding in Lake Rose however it is not providing substantial flood benefit to an area subject to frequent flooding. In conjunction with further investigation into watershed improvements, implementation of the pond expansion under FIC #2 may provide the additional runoff attenuation needed to alleviate the chronic flooding in this area.
- **Canton Avenue** – Geosyntec recommends proceeding with FIC #3, upsizing the main trunkline that flows west to east along Canton Avenue, due to the decrease in the extent and depth of roadway flooding along Canton Avenue and overland flow from Canton Avenue along Knowles Avenue and Park Avenue.

Once the City has selected their desired FIC(s), the following steps are recommended to design the project(s) for bidding and construction.

- Permitting – A permit determination meeting is recommended with all relevant permitting agencies.
- Topographic Survey – Collect topographic survey for design and construction plans development along project alignment. Survey should include existing drainage structure details, above and below ground utilities, property lines, and ancillary features (mailboxes, signs, poles, etc.). Topographic survey should be design level sufficient to generate a 3D tin file of the surface along the project alignment.
- Geotechnical Evaluation – Drill borings, test, and evaluate soils and groundwater characteristics in the project footprint to support design and construction. The geotechnical evaluation should include an assessment of suitability of soils related to proposed drainage infrastructure and provide recommendations for construction (excavation, backfill, compaction, removal of any unsuitable soils).
- Design – Develop final design of proposed drainage improvements, construction plans, engineer's cost estimate, and technical specifications to support bidding and construction of the project.
- Utility Coordination – Forward copies of draft plans to identified utilities to solicit input on possible conflicts and conflict resolutions.

EXHIBITS



CITY OF WINTER PARK FLORIDA
ESTABLISHED 1882
CITY OF CULTURE AND HERITAGE

N

0 1,250 2,500 Feet

Legend

- Study Area
- City of Winter Park
- CRA Study Area

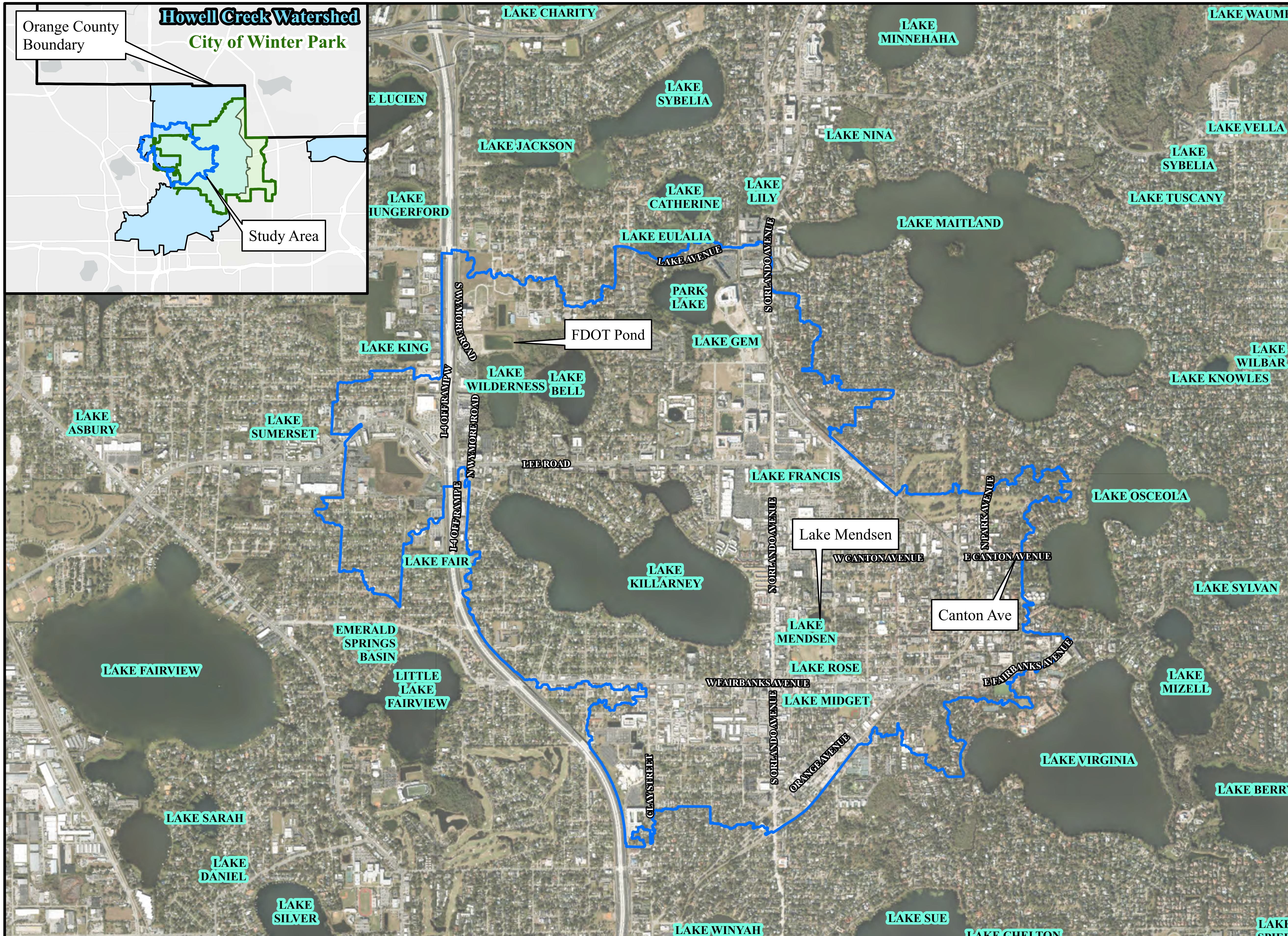
Sources:
Basemap: ESRI, 2024
Lakes: Orange County, 2020
City Boundary: Orange County, 2023

Exhibit
1

Vicinity Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants



CITY OF WINTER PARK FLORIDA
ESTABLISHED 1882
CITY OF CULTURE AND HERITAGE

N

0 1,000 2,000 Feet

Legend

Study Area

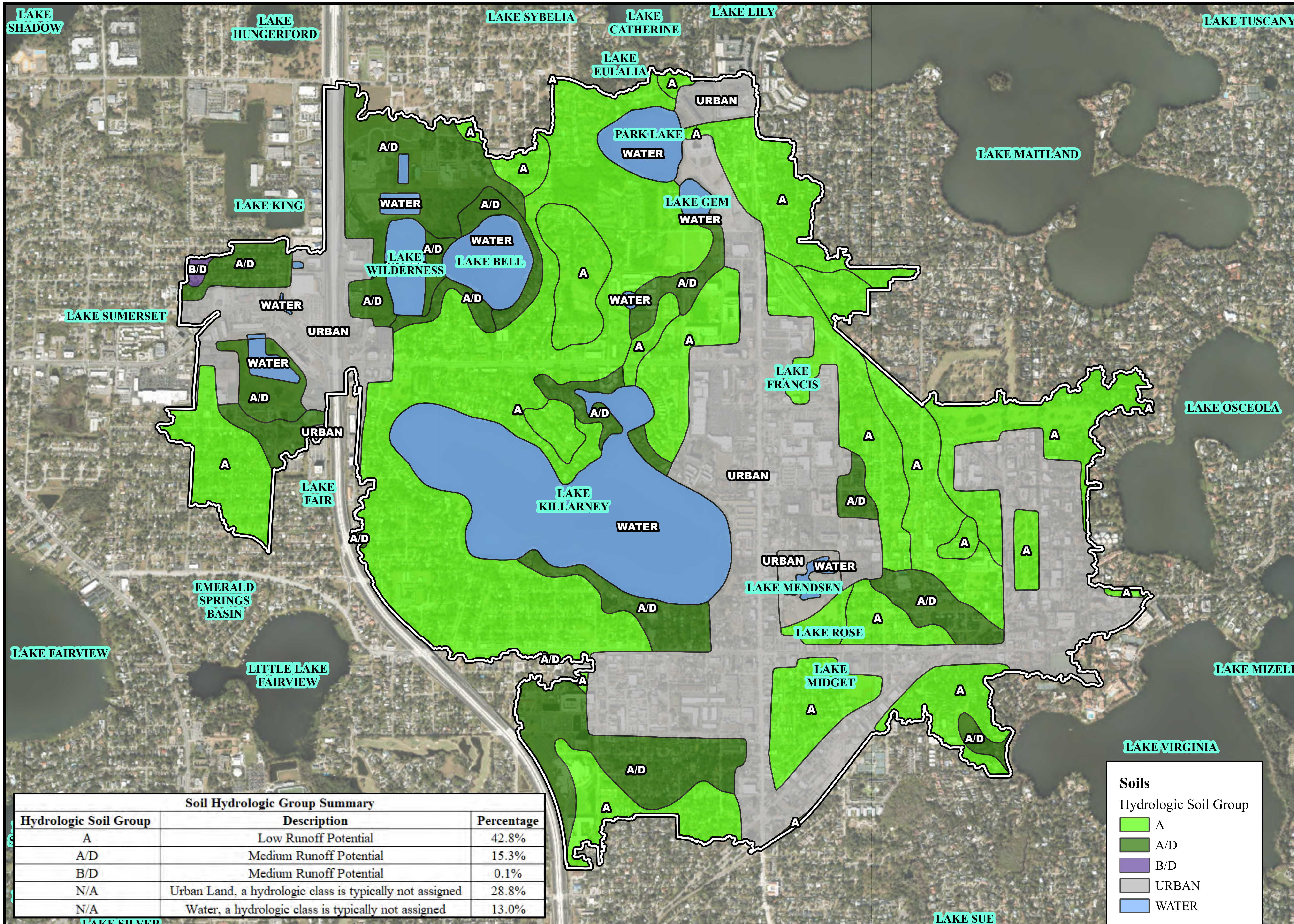
Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020
City Boundary: Orange County, 2023

Exhibit
2

Site Map

Winter Park CRA Study Update
and Lake Killarney
Expansion Report

Geosyntec consultants



Soil Hydrologic Group Summary

Hydrologic Soil Group	Description	Percentage
A	Low Runoff Potential	42.8%
A/D	Medium Runoff Potential	15.3%
B/D	Medium Runoff Potential	0.1%
N/A	Urban Land, a hydrologic class is typically not assigned	28.8%
N/A	Water, a hydrologic class is typically not assigned	13.0%

Soils

Hydrologic Soil Group
- A
- A/D
- B/D
- URBAN
- WATER

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N

0 750 1,500 Feet

Legend

Study Area

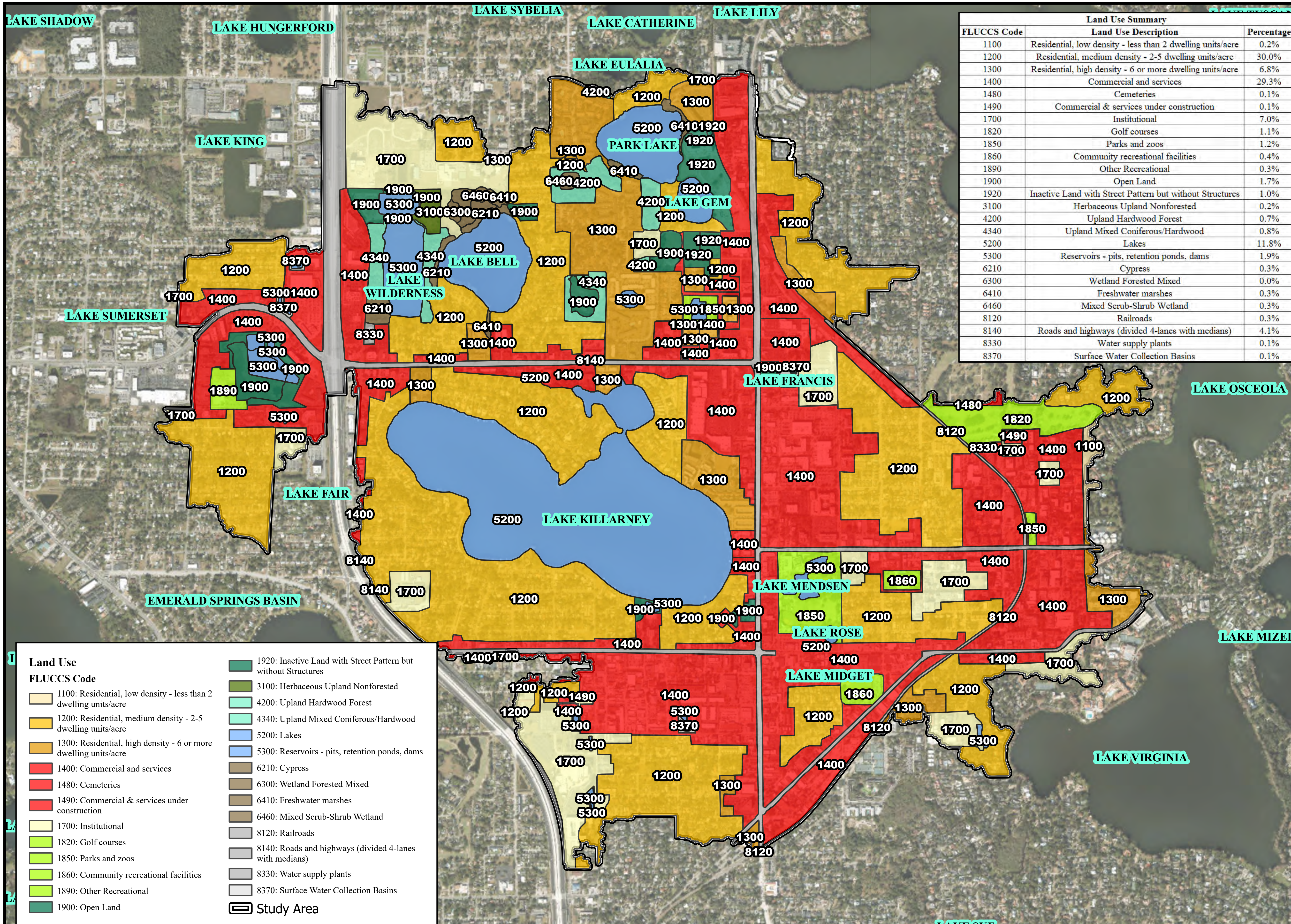
Sources:
Aerial: ESRI, 2023
Soils: NRCS, 2023
Lakes: Orange County, 2020

Exhibit 3

Soils Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants



Land Use Summary		
FLUCCS Code	Land Use Description	Percentage
1100	Residential, low density - less than 2 dwelling units/acre	0.2%
1200	Residential, medium density - 2-5 dwelling units/acre	30.0%
1300	Residential, high density - 6 or more dwelling units/acre	6.8%
1400	Commercial and services	29.3%
1480	Cemeteries	0.1%
1490	Commercial & services under construction	0.1%
1700	Institutional	7.0%
1820	Golf courses	1.1%
1850	Parks and zoos	1.2%
1860	Community recreational facilities	0.4%
1890	Other Recreational	0.3%
1900	Open Land	1.7%
1920	Inactive Land with Street Pattern but without Structures	1.0%
3100	Herbaceous Upland Nonforested	0.2%
4200	Upland Hardwood Forest	0.7%
4340	Upland Mixed Coniferous/Hardwood	0.8%
5200	Lakes	11.8%
5300	Reservoirs - pits, retention ponds, dams	1.9%
6210	Cypress	0.3%
6300	Wetland Forested Mixed	0.0%
6410	Freshwater marshes	0.3%
6460	Mixed Scrub-Shrub Wetland	0.3%
8120	Railroads	0.3%
8140	Roads and highways (divided 4-lanes with medians)	4.1%
8330	Water supply plants	0.1%
8370	Surface Water Collection Basins	0.1%

CITY OF WINTER PARK, FLORIDA — ESTABLISHED 1882 — CITY OF CULTURE AND HERITAGE

N

0 750 1,500 Feet

Legend

Study Area

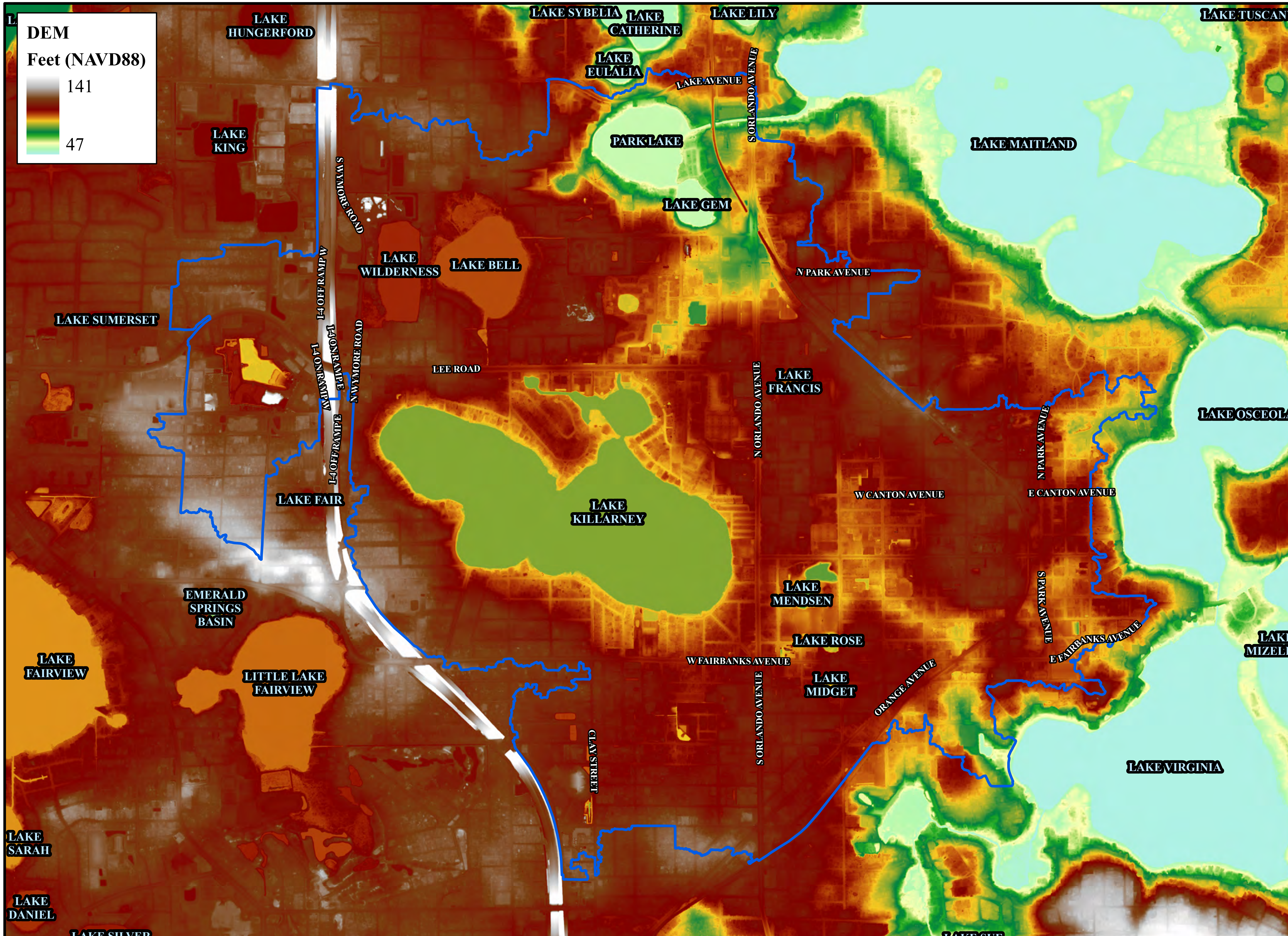
Sources:
Aerial: ESRI, 2023
Land Use: SJRWMD, 2014
Lakes: Orange County, 2020

Exhibit 4

Land Use Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants



CITY OF WINTER PARK FLORIDA
ESTABLISHED 1882
CITY OF CULTURE AND HERITAGE

N

0 750 1,500
Feet

Legend

Study Area

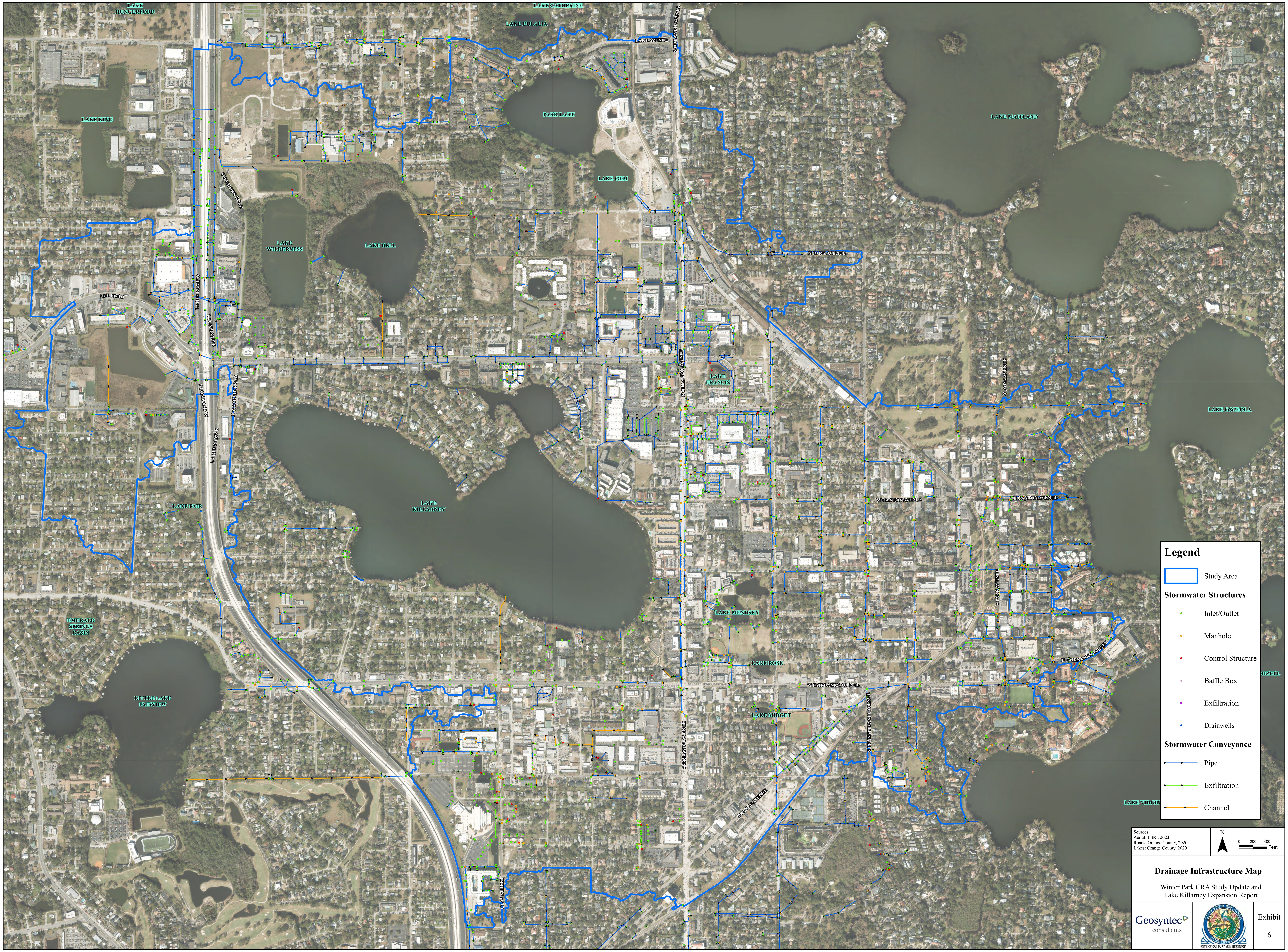
Sources:
Aerial: ESRI, 2023
Lakes: Orange County, 2020
Roads: Orange County, 2020

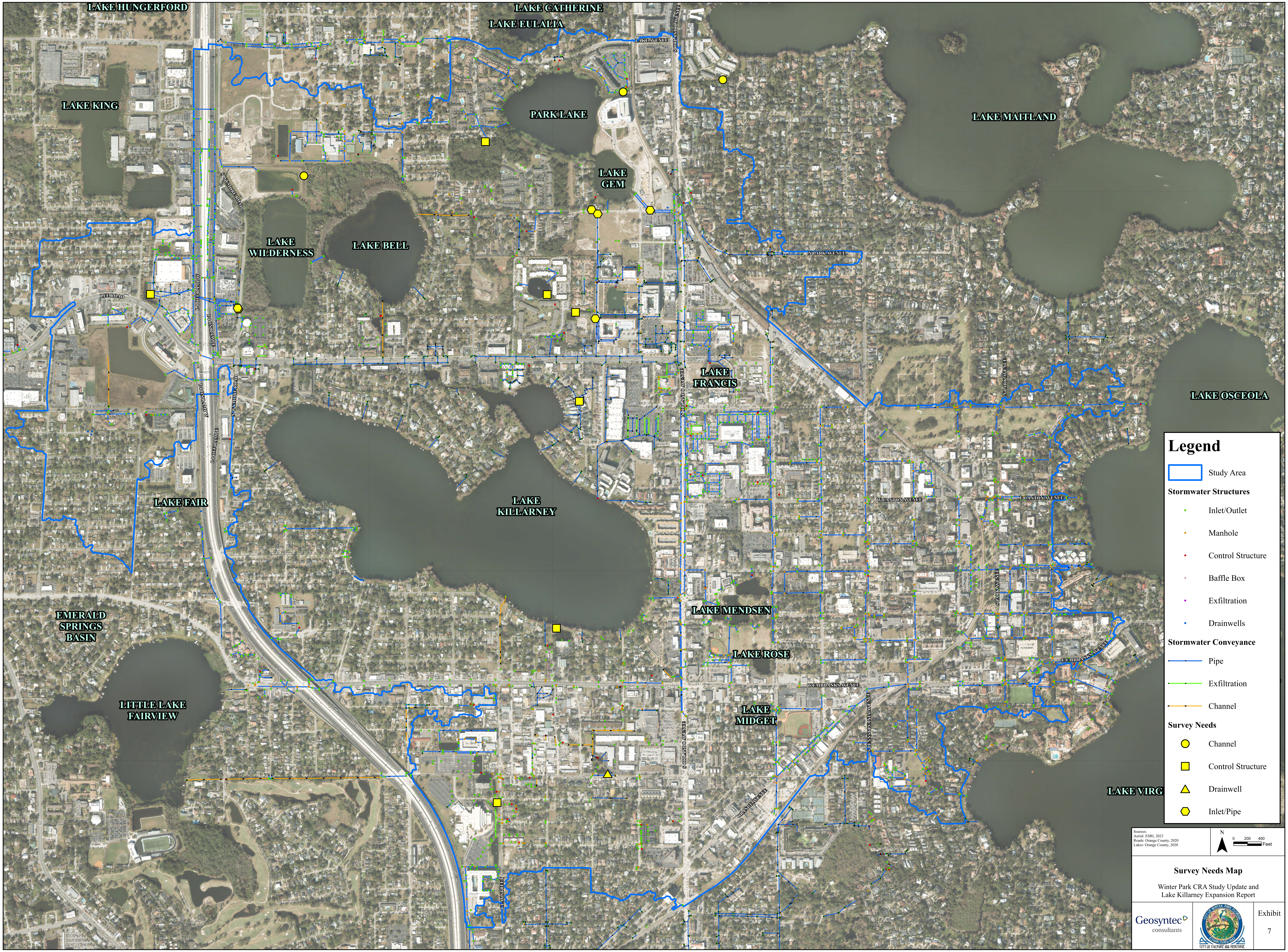
Exhibit
5

DEM Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants


LAKE HUNGERFORD
LAKE CATHERINE
LAKE EULALIA
LAKE KING
PARK LAKE
LAKE MAITLAND
LAKE GEM
LAKE BELL
LAKE WILDERNESS
LAKE FRANCIS
LAKE OSCEOLA
LAKE KILLARNEY
LAKE FAIR
LAKE MENDSEN
EMERALD SPRINGS BASIN
LITTLE LAKE FAIRVIEW
LAKE ROSE
LAKE MIDGET
LAKE VIRGIN
Legend
Study Area
Stormwater Structures
Inlet/Outlet
Manhole
Control Structure
Baffle Box
Exfiltration
Drainwells
Stormwater Conveyance
Pipe
Exfiltration
Channel
Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020
N
0 200 400
Feet
Drainage Infrastructure Map
Winter Park CRA Study Update and
Lake Killarney Expansion Report
Geosyntec consultants
CITY OF WINTER PARK, FLORIDA
ESTABLISHED 1882
CITY OF CULTURE AND HERITAGE
Exhibit
6


LAKE HUNGERFORD
LAKE CATHERINE
LAKE EULALIA
LAKE KING
PARK LAKE
LAKE MAITLAND
LAKE GEM
LAKE WILDERNESS
LAKE BELL
LAKE FRANCIS
LAKE OSCEOLA
LAKE FAIR
LAKE KILLARNEY
EMERALD SPRINGS BASIN
LAKE MENDSEN
LAKE ROSE
LITTLE LAKE FAIRVIEW
LAKE MIDGET
LAKE VIRG
Legend
Study Area
Stormwater Structures
Inlet/Outlet
Manhole
Control Structure
Baffle Box
Exfiltration
Drainwells
Stormwater Conveyance
Pipe
Exfiltration
Channel
Survey Needs
Channel
Control Structure
Drainwell
Inlet/Pipe
Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020
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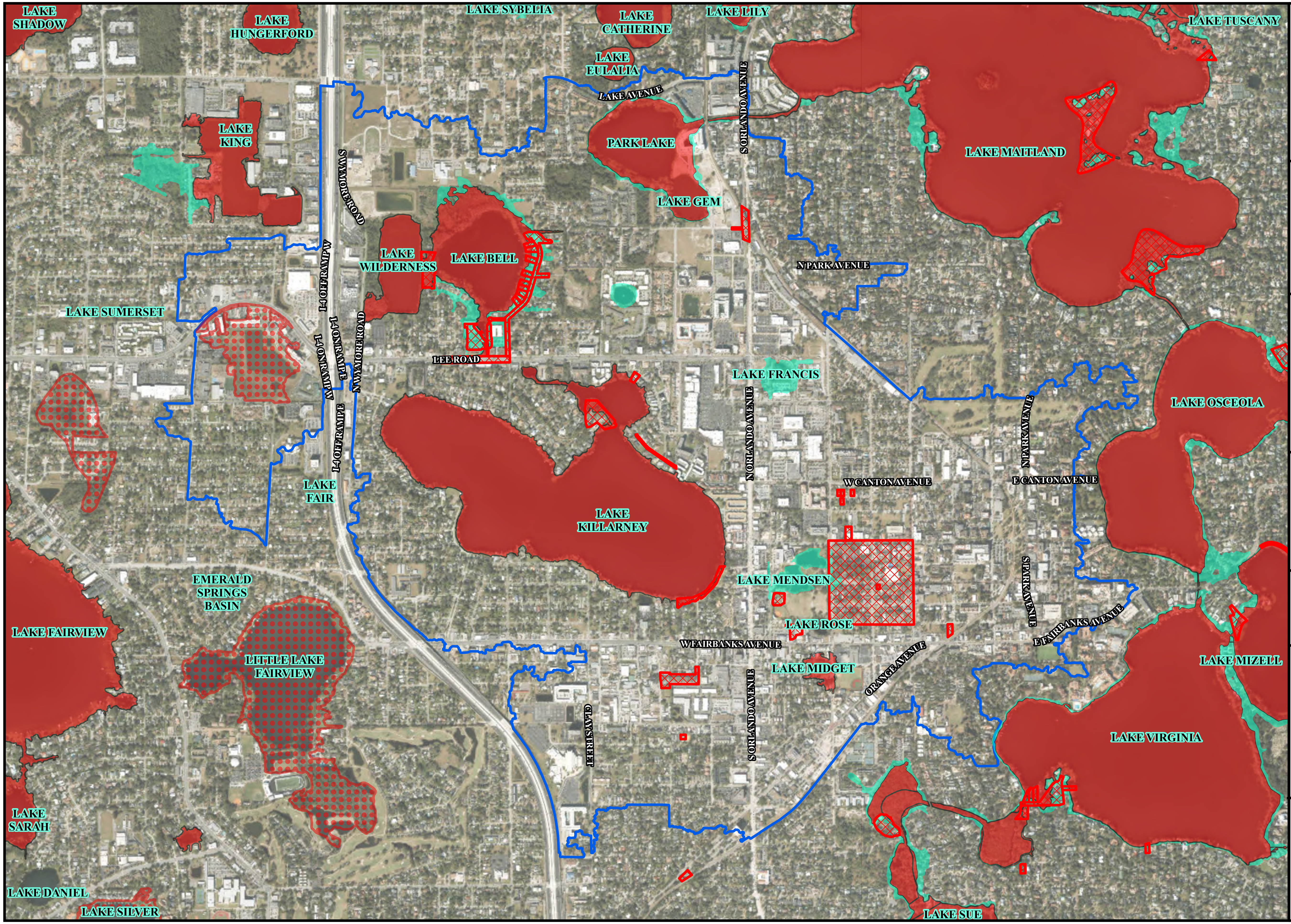
Survey Needs Map
Winter Park CRA Study Update and
Lake Killarney Expansion Report
Geosyntec consultants
CITY OF WINTER PARK, FLORIDA
ESTABLISHED 1882
CITY OF CULTURE AND HERITAGE
Exhibit
7



N

0 750 1,500 Feet

Legend

- Flood Complaints (Hurricane Ian)

Flood Zone

- AE (BFE Determined)
- A (No BFE Determined)
- X (0.2% Annual Chance Flood)
- Study Area

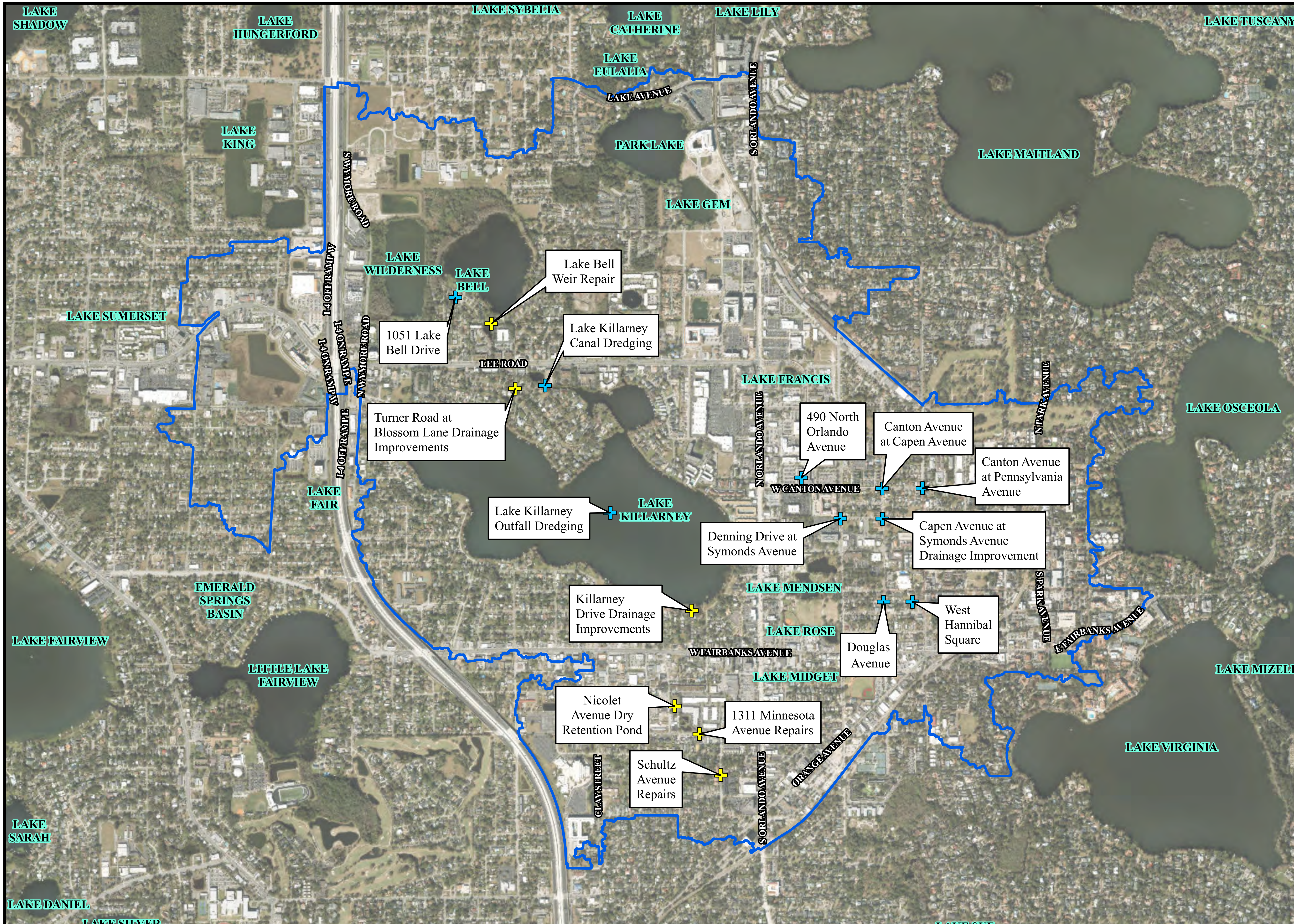
Sources:
Aerial: ESRI, 2023
Lakes: Orange County, 2020
SFHA: FEMA, 2021

Exhibit 8

FEMA Floodplains and Problem Areas Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants



CITY OF WINTER PARK, FLORIDA
ESTABLISHED 1882
CITY OF CULTURE AND HERITAGE

N

0 750 1,500 Feet

Legend

Capital Improvement Projects

- Completed
- Planned
- Study Area

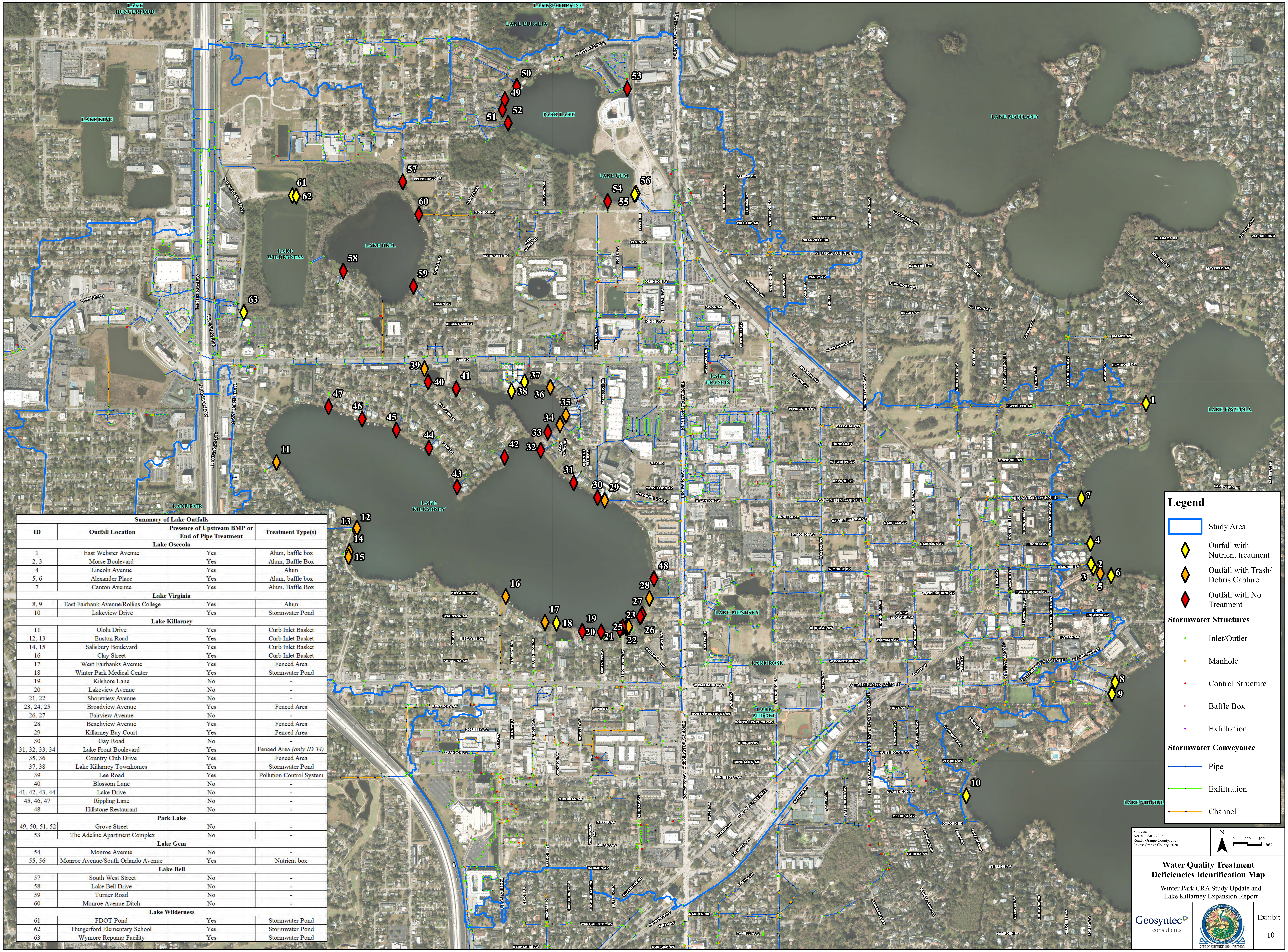
Sources:
Aerial: ESRI, 2023
Lakes: Orange County, 2020
SFHA: FEMA, 2021

Exhibit
9

Capital Improvement Projects Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants



Summary of Lake Outfalls

ID	Outfall Location	Presence of Upstream BMP or End of Pipe Treatment	Treatment Type(s)
Lake Osceola			
1	East Webster Avenue	Yes	Alum, baffle box
2, 3	Morse Boulevard	Yes	Alum, Baffle Box
4	Lincoln Avenue	Yes	Alum
5, 6	Alexander Place	Yes	Alum, baffle box
7	Canton Avenue	Yes	Alum, Baffle Box
Lake Virginia			
8, 9	East Fairbank Avenue/Rollins College	Yes	Alum
10	Lakeview Drive	Yes	Stormwater Pond
Lake Killarney			
11	Ololu Drive	Yes	Curb Inlet Basket
12, 13	Euston Road	Yes	Curb Inlet Basket
14, 15	Salisbury Boulevard	Yes	Curb Inlet Basket
16	Clay Street	Yes	Curb Inlet Basket
17	West Fairbanks Avenue	Yes	Fenced Area
18	Winter Park Medical Center	Yes	Stormwater Pond
19	Kilshore Lane	No	-
20	Lakeview Avenue	No	-
21, 22	Shoreview Avenue	No	-
23, 24, 25	Broadview Avenue	Yes	Fenced Area
26, 27	Fairview Avenue	No	-
28	Beachview Avenue	Yes	Fenced Area
29	Killarney Bay Court	Yes	Fenced Area
30	Gay Road	No	-
31, 32, 33, 34	Lake Front Boulevard	Yes	Fenced Area *(only ID 34)*
35, 36	Country Club Drive	Yes	Fenced Area
37, 38	Lake Killarney Townhomes	Yes	Stormwater Pond
39	Lee Road	Yes	Pollution Control System
40	Blossom Lane	No	-
41, 42, 43, 44	Lake Drive	No	-
45, 46, 47	Rippling Lane	No	-
48	Hillstone Restaurant	No	-
Park Lake			
49, 50, 51, 52	Grove Street	No	-
53	The Adeline Apartment Complex	No	-
Lake Gem			
54	Monroe Avenue	No	-
55, 56	Monroe Avenue/South Orlando Avenue	Yes	Nutrient box
Lake Bell			
57	South West Street	No	-
58	Lake Bell Drive	No	-
59	Turner Road	No	-
60	Monroe Avenue Ditch	No	-
Lake Wilderness			
61	FDOT Pond	Yes	Stormwater Pond
62	Hungerford Elementary School	Yes	Stormwater Pond
63	Wymore Repump Facility	Yes	Stormwater Pond

Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020

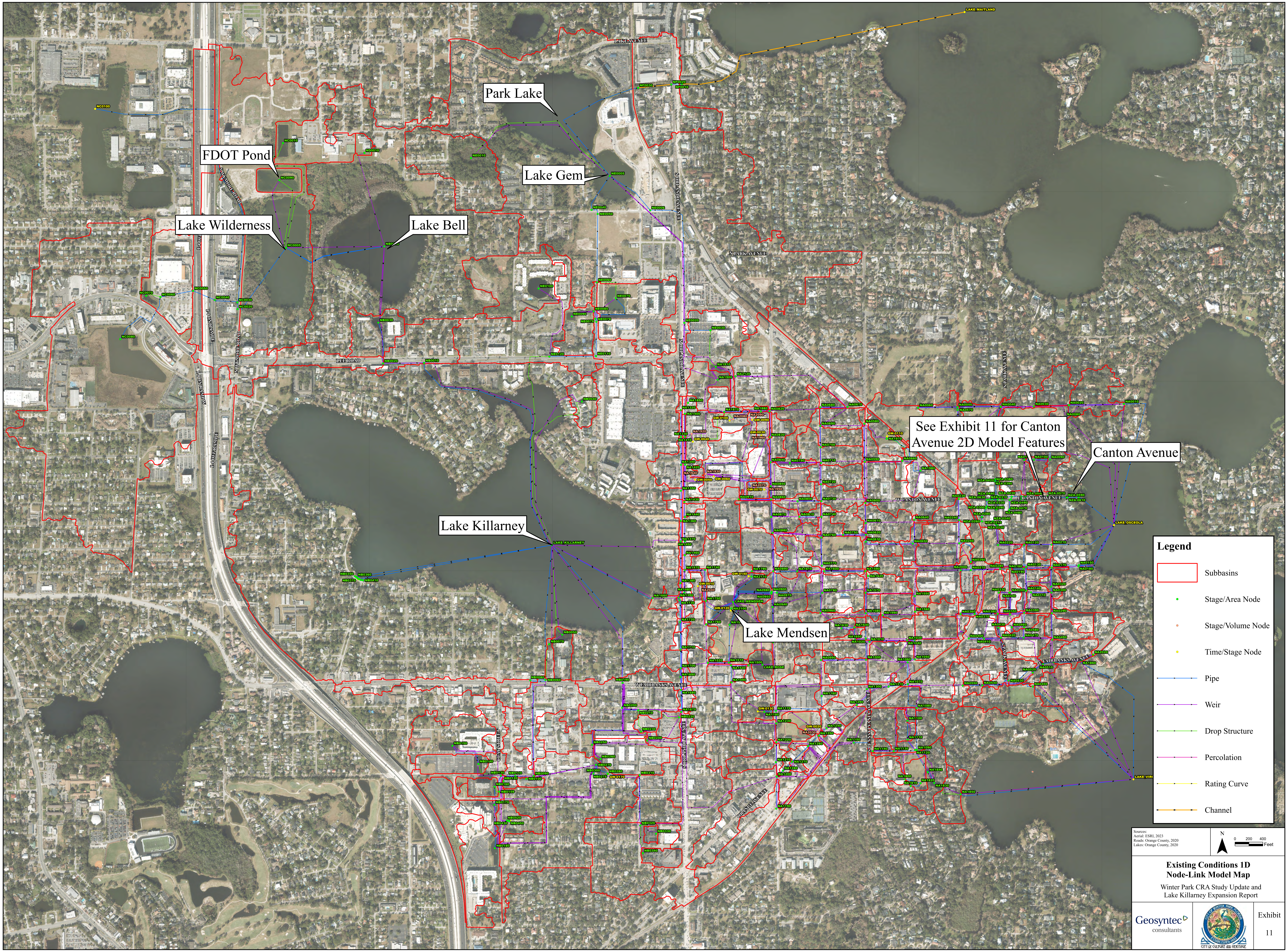
Water Quality Treatment Deficiencies Identification Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants

City of Winter Park, Florida — Established 1882 — City of Culture and Heritage

Exhibit 10


Park Lake
FDOT Pond
Lake Gem
Lake Wilderness
Lake Bell
See Exhibit 11 for Canton Avenue 2D Model Features
Canton Avenue
Lake Killarney
Lake Mendsen
Legend
Subbasins
Stage/Area Node
Stage/Volume Node
Time/Stage Node
Pipe
Weir
Drop Structure
Percolation
Rating Curve
Channel
Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020
N
0 200 400
Feet
Existing Conditions 1D
Node-Link Model Map
Winter Park CRA Study Update and
Lake Killarney Expansion Report
Geosyntec consultants
CITY OF WINTER PARK FLORIDA
ESTABLISHED 1882
CITY OF CULTURE AND HERITAGE
Exhibit
11

Existing Conditions 2D Overland Flow Model Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants

Exhibit 12

LAKE HUNGERFORD
LAKE EULALIA
LAKE CATHERINE
LAKE KING
PARK LAKE
LAKE GEM
LAKE MAITLAND
LAKE WILDERNESS
LAKE BELL
LAKE FRANCIS
LAKE OSCEOLA
LAKE FAIR
LAKE KILLARNEY
LAKE MENDSEN
LAKE ROSE
LAKE MIDGET
EMERALD SPRINGS BASIN
LITTLE LAKE FAIRVIEW
LAKE VIRG
Legend
Study Area
Potential Flooding Location
Flood Complaints (Hurricane Ian)
Stormwater Structures
Inlet/Outlet
Manhole
Control Structure
Baffle Box
Exfiltration
Stormwater Conveyance
Pipe
Exfiltration
Channel
Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020
N
0 200 400
Feet
Flood Prone Locations Map
Winter Park CRA Study Update and
Lake Killarney Expansion Report
Geosyntec consultants
CITY OF WINTER PARK, FLORIDA
ESTABLISHED 1882
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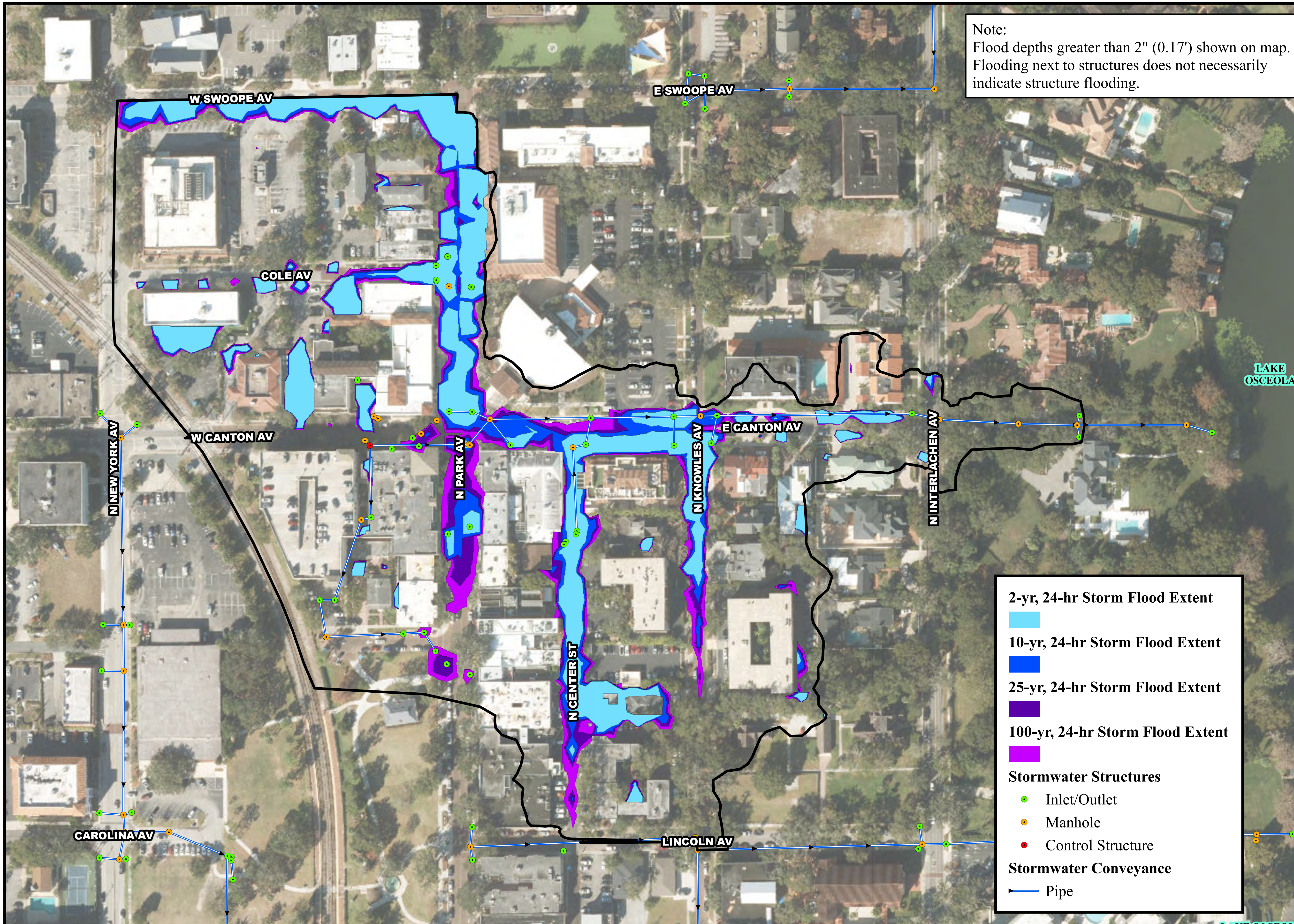
Exhibit
13



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N

0 75 150 Feet

Legend

Overland Flow Region

Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020

Exhibit
14

Canton Avenue Model Results

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants

Problem

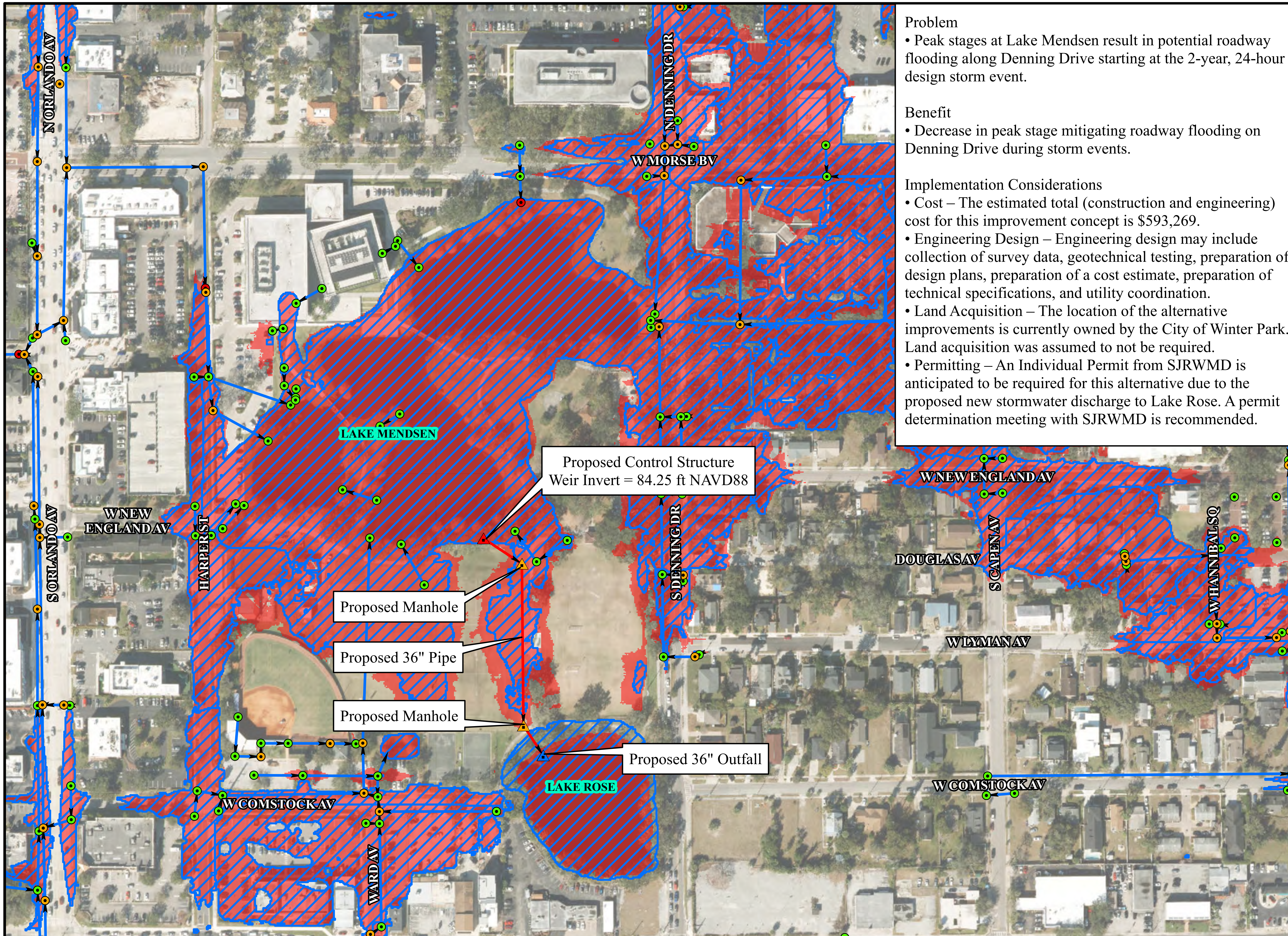
- Peak stages at Lake Mendsen result in potential roadway flooding along Denning Drive starting at the 2-year, 24-hour design storm event.

Benefit

- Decrease in peak stage mitigating roadway flooding on Denning Drive during storm events.

Implementation Considerations

- Cost – The estimated total (construction and engineering) cost for this improvement concept is $593,269.
- Engineering Design – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.
- Land Acquisition – The location of the alternative improvements is currently owned by the City of Winter Park. Land acquisition was assumed to not be required.
- Permitting – An Individual Permit from SJRWMD is anticipated to be required for this alternative due to the proposed new stormwater discharge to Lake Rose. A permit determination meeting with SJRWMD is recommended.



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N

0 100 200 Feet

Legend

- Proposed Manhole
- Proposed Structure
- Proposed Control Structure
- Proposed Pipe

Existing Stormwater Structures

- Inlet/Outlet
- Manhole
- Control Structure
- Existing Pipe
- 100 Year Inundation, Proposed
- 100 Year Inundation, Existing

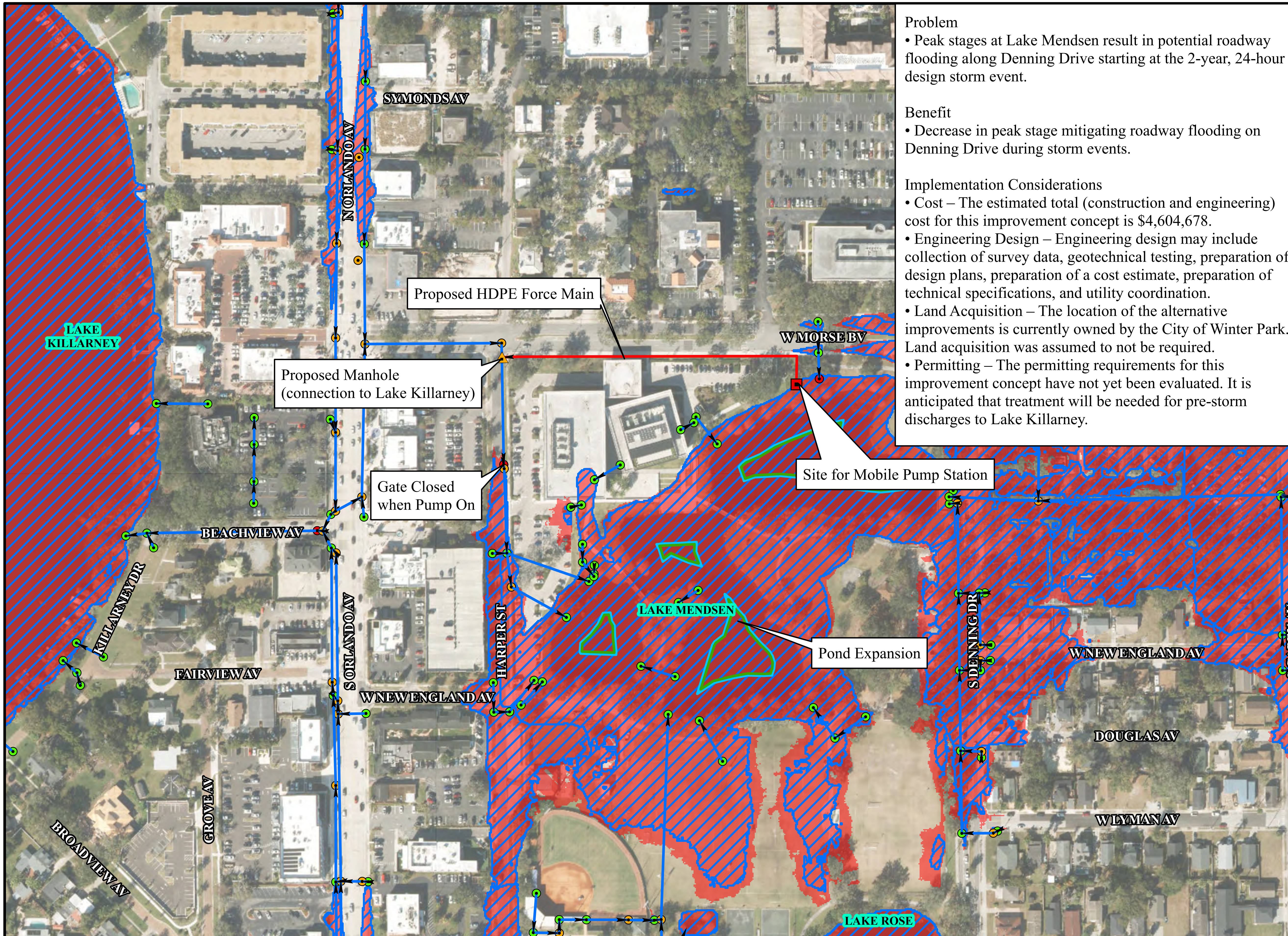
Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020

Exhibit
15

Lake Mendsen: Connection to Lake Rose Concept Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants



Problem

- Peak stages at Lake Mendsen result in potential roadway flooding along Denning Drive starting at the 2-year, 24-hour design storm event.

Benefit

- Decrease in peak stage mitigating roadway flooding on Denning Drive during storm events.

Implementation Considerations

- Cost – The estimated total (construction and engineering) cost for this improvement concept is $4,604,678.
- Engineering Design – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.
- Land Acquisition – The location of the alternative improvements is currently owned by the City of Winter Park. Land acquisition was assumed to not be required.
- Permitting – The permitting requirements for this improvement concept have not yet been evaluated. It is anticipated that treatment will be needed for pre-storm discharges to Lake Killarney.

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N

0 100 200 Feet

Legend

- Proposed Manhole
- Proposed Pump Station
- Proposed Pipe

Existing Stormwater Structures

- Inlet/Outlet
- Manhole
- Control Structure
- Existing Pipe
- 73 ft Proposed Contour (Approximate)
- 75 ft Existing Contour (Approximate)
- 100 Year Inundation, Proposed
- 100 Year Inundation, Existing

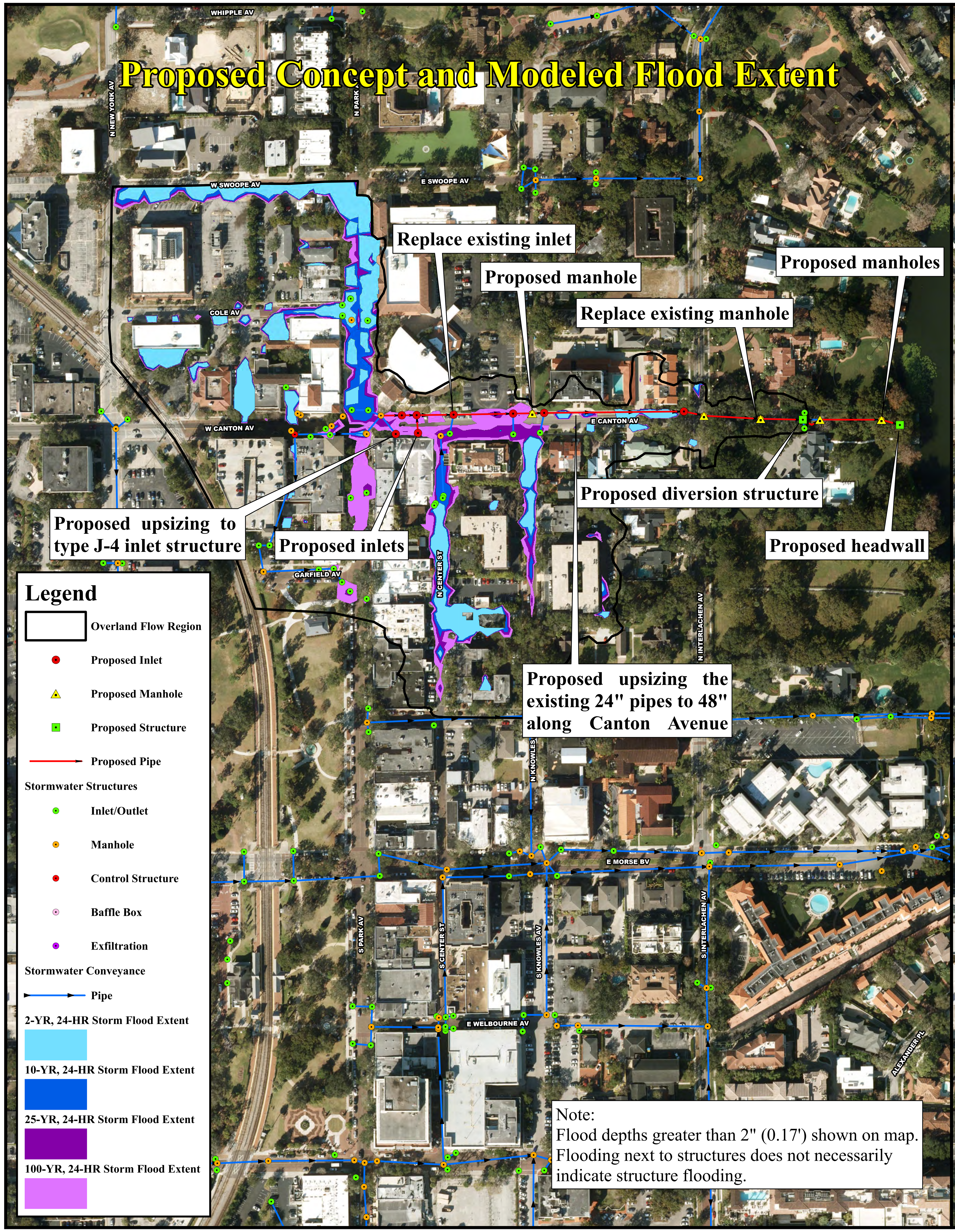
Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020

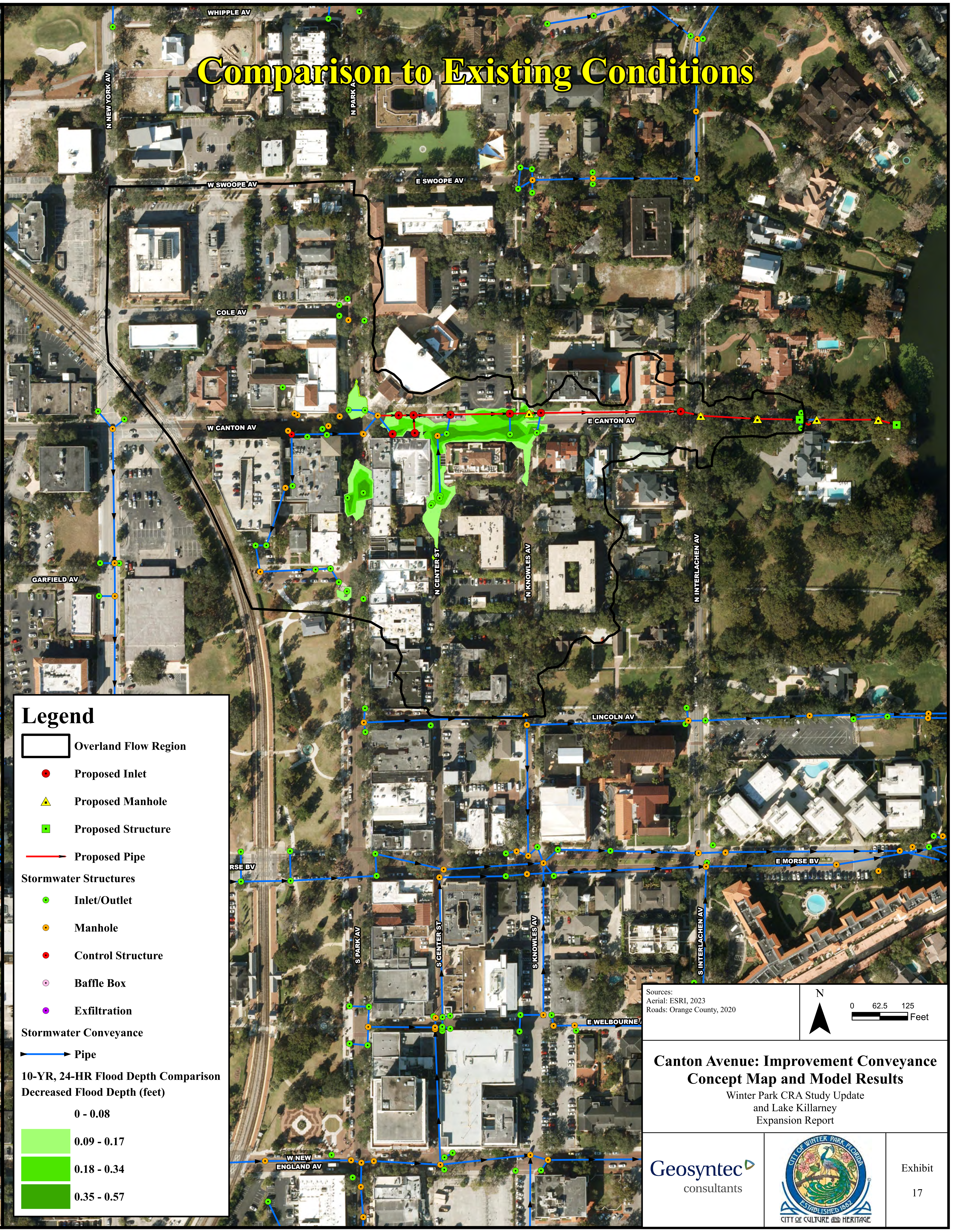
Exhibit 16

Lake Mendsen: Pump Station and Lake Expansion Concept Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants





Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020

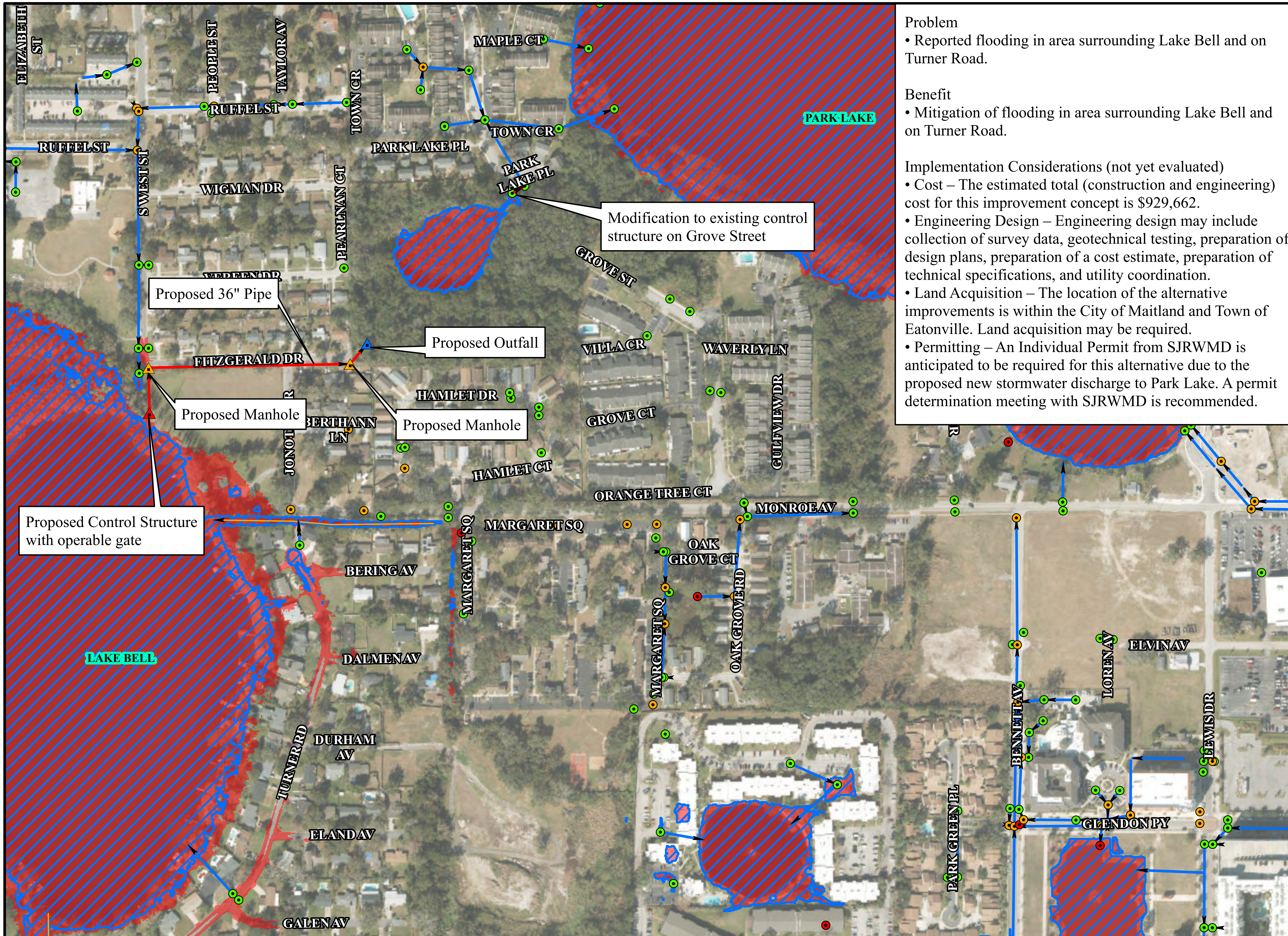
Canton Avenue: Improvement Conveyance Concept Map and Model Results

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants

City of Winter Park Florida — City of Culture and Heritage

Exhibit 17



Problem
• Reported flooding in area surrounding Lake Bell and on Turner Road.

Benefit
• Mitigation of flooding in area surrounding Lake Bell and on Turner Road.

Implementation Considerations (not yet evaluated)
• Cost – The estimated total (construction and engineering) cost for this improvement concept is $929,662.
• Engineering Design – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.
• Land Acquisition – The location of the alternative improvements is within the City of Maitland and Town of Eatonville. Land acquisition may be required.
• Permitting – An Individual Permit from SJRWMD is anticipated to be required for this alternative due to the proposed new stormwater discharge to Park Lake. A permit determination meeting with SJRWMD is recommended.

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N

0 150 300 Feet

Legend
- Proposed Manhole
- Proposed Structure
- Proposed Control Structure
- Proposed Pipe

Existing Stormwater Structures
- Inlet/Outlet
- Manhole
- Control Structure
- Existing Pipe
- 100 Year Inundation, Proposed
- 100 Year Inundation, Existing

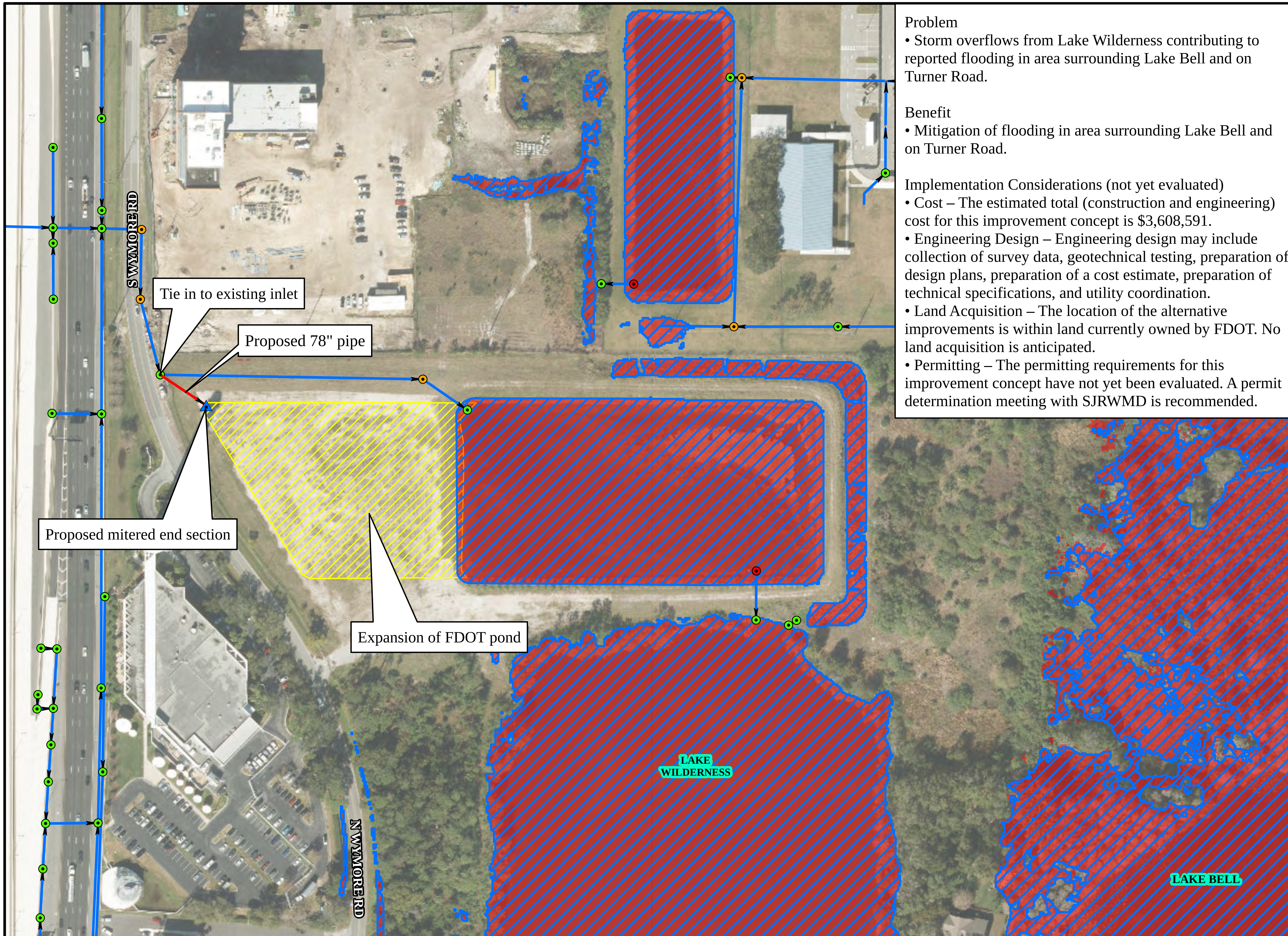
Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020

Exhibit 18

Lake Bell: Connection to Park Lake Concept Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants



Problem
• Storm overflows from Lake Wilderness contributing to reported flooding in area surrounding Lake Bell and on Turner Road.

Benefit
• Mitigation of flooding in area surrounding Lake Bell and on Turner Road.

Implementation Considerations (not yet evaluated)
• Cost – The estimated total (construction and engineering) cost for this improvement concept is $3,608,591.
• Engineering Design – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.
• Land Acquisition – The location of the alternative improvements is within land currently owned by FDOT. No land acquisition is anticipated.
• Permitting – The permitting requirements for this improvement concept have not yet been evaluated. A permit determination meeting with SJRWMD is recommended.

N

0 80 160 Feet

Legend

Proposed Structure
Proposed Pipe
Proposed Pond
Existing Stormwater Structures
Inlet/Outlet
Manhole
Control Structure
Existing Pipe
100 Year Inundation, Proposed
100 Year Inundation, Existing

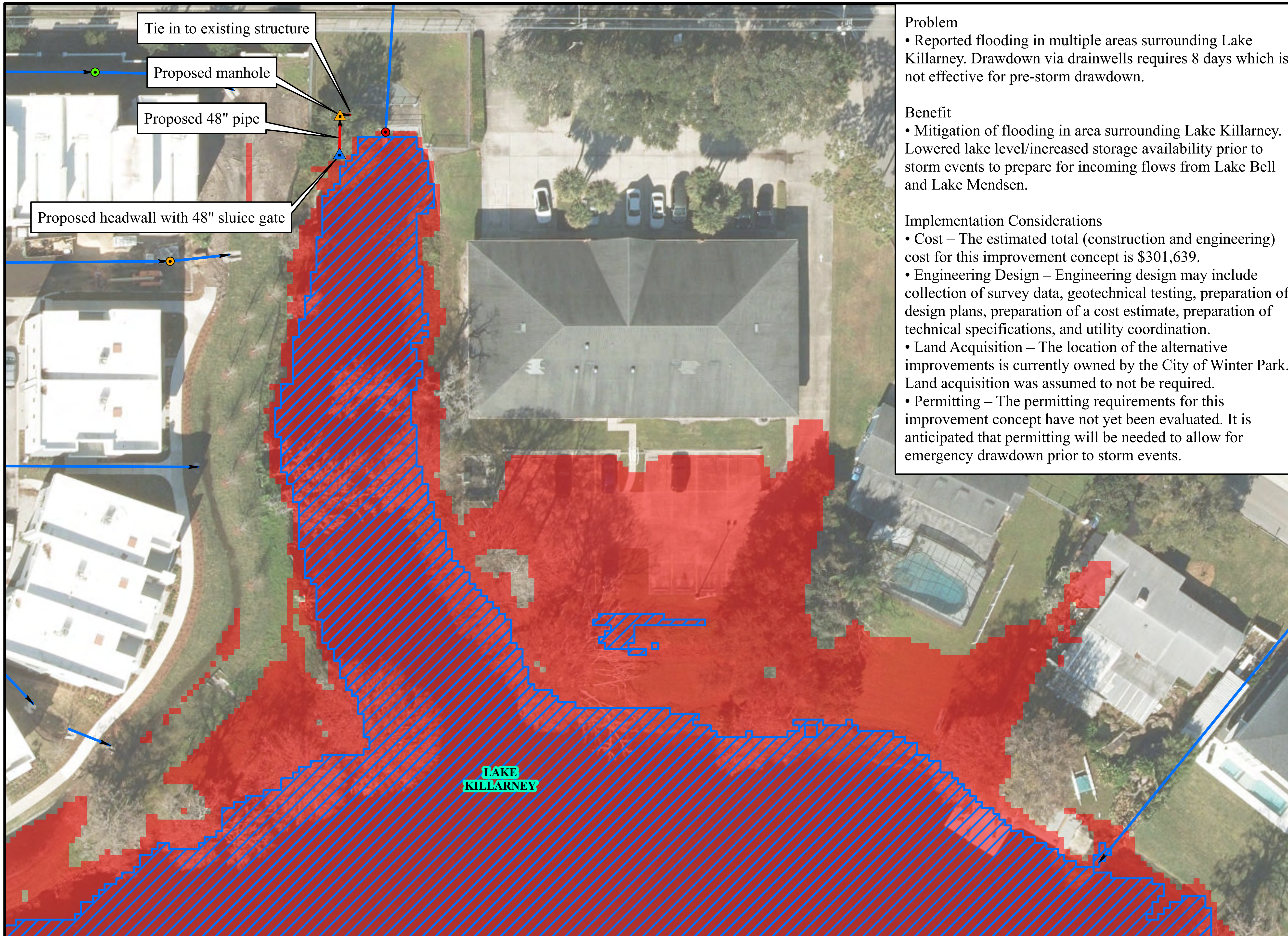
Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020

Exhibit
19

Lake Bell: Reduced Inflows from FDOT Pond Concept Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants



Problem

• Reported flooding in multiple areas surrounding Lake Killarney. Drawdown via drainwells requires 8 days which is not effective for pre-storm drawdown.

Benefit

• Mitigation of flooding in area surrounding Lake Killarney. Lowered lake level/increased storage availability prior to storm events to prepare for incoming flows from Lake Bell and Lake Mendsen.

Implementation Considerations

• Cost – The estimated total (construction and engineering) cost for this improvement concept is $301,639.

• Engineering Design – Engineering design may include collection of survey data, geotechnical testing, preparation of design plans, preparation of a cost estimate, preparation of technical specifications, and utility coordination.

• Land Acquisition – The location of the alternative improvements is currently owned by the City of Winter Park. Land acquisition was assumed to not be required.

• Permitting – The permitting requirements for this improvement concept have not yet been evaluated. It is anticipated that permitting will be needed to allow for emergency drawdown prior to storm events.

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N

0 20 40 Feet

Legend

- Proposed Manhole
- Proposed Structure
- Proposed Pipe

Existing Stormwater Structures

- Inlet/Outlet
- Manhole
- Control Structure
- Existing Pipe
- 100 Year Inundation, Existing
- 100 Year Inundation, Proposed

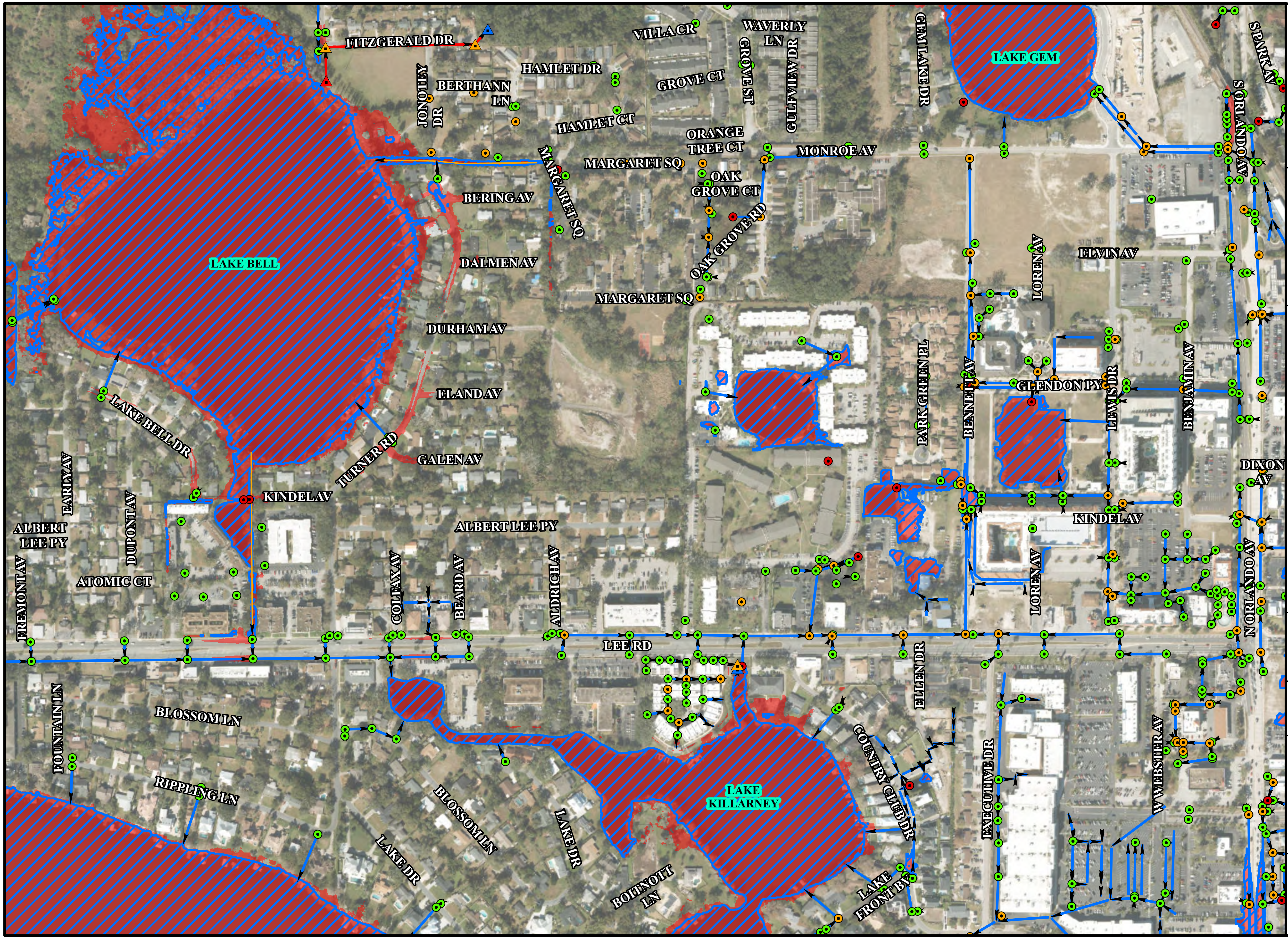
Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020

Exhibit
20

Lake Killarney: Improved Conveyance to Lake Gem Concept Map

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants



N

0 400 Feet

Legend

- Proposed Manhole
- Proposed Structure
- Proposed Control Structure
- Proposed Pipe

Existing Stormwater Structures

- Inlet/Outlet
- Manhole
- Control Structure
- Existing Pipe
- 100 Year Inundation, Existing
- 100 Year Inundation, Proposed

Sources:
Aerial: ESRI, 2023
Roads: Orange County, 2020
Lakes: Orange County, 2020

Exhibit 21

FIC #7: Inundation for 100-yr, 24-hr Design Storm Event

Winter Park CRA Study Update and Lake Killarney Expansion Report

Geosyntec consultants

APPENDIX A

Existing Conditions Model Results

Geosyntec consultants

Appendix A - Existing Conditions Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
LAKE_KILLARNEY	82.04	Control Elevation	84.40	Finished floor elevation	83.07	-	83.53	-	83.83	-	**84.41**	0.01
LAKE_MENDSEN	81.14	Normal high water elevation	84.82	Approximate edge of pavement	**85.58**	0.76	**86.79**	1.97	**87.29**	2.47	**87.94**	3.12
LAKE_ROSE	83.30	Approximate water surface elevation	91.01	Bank overtopping	83.89	-	84.16	-	84.37	-	84.91	-
NA0010	72.14	Bottom of structure	78.79	Approximate edge of pavement	77.96	-	**79.49**	0.70	**79.77**	0.98	**80.07**	1.28
NA0020	72.87	Bottom of structure	83.54	Approximate edge of pavement	79.41	-	82.1	-	82.5	-	82.82	-
NA0030	76.82	Bottom of structure	86.32	Approximate edge of pavement	79.79	-	83.07	-	84.42	-	**86.38**	0.06
NA0040	82.00	Bottom of structure	89.63	Approximate edge of pavement	83.88	-	84.48	-	86.22	-	**89.8**	0.17
NA0050	85.66	Bottom of structure	91.51	Approximate edge of pavement	87.82	-	88.23	-	88.67	-	91.19	-
NA0060	88.12	Bottom of structure	92.97	Approximate edge of pavement	88.6	-	88.82	-	89.26	-	92.9	-
NA0070	85.52	Bottom of structure	90.82	Approximate edge of pavement	85.93	-	86.02	-	86.29	-	89.85	-
NA0080	76.22	Bottom of structure	82.01	Approximate edge of pavement	79.68	-	**82.39**	0.38	**82.57**	0.56	**82.74**	0.73
NA0090	78.51	Bottom of structure	85.83	Approximate edge of pavement	84.4	-	85.22	-	85.33	-	85.44	-
NA0100	80.27	Bottom of structure	83.79	Approximate edge of pavement	**84.84**	1.05	**85.3**	1.51	**85.39**	1.60	**85.48**	1.69
NA0110	81.13	Bottom of structure	84.29	Approximate edge of pavement	**85.17**	0.88	**85.36**	1.07	**85.44**	1.15	**85.52**	1.23
NA0120	82.90	Bottom of structure	91.22	Approximate edge of pavement	84.16	-	84.39	-	85.54	-	86.98	-
NA0130	77.12	Bottom of structure	88.40	Approximate edge of pavement	80.94	-	83.94	-	85.61	-	87.16	-
NA0140	81.42	Bottom of structure	85.91	Approximate edge of pavement	82.89	-	**86.3**	0.39	**86.72**	0.81	**87.34**	1.43
NA0150	76.23	Bottom of structure	86.30	Approximate edge of pavement	79.77	-	81.53	-	82.41	-	83.23	-
NA0160	80.32	Bottom of structure	88.35	Approximate edge of pavement	84.78	-	85.2	-	85.5	-	85.93	-
NA0170	79.47	Bottom of structure	90.12	Approximate edge of pavement	83.99	-	84.43	-	84.63	-	84.95	-
NA0180	71.31	Bottom of structure	87.26	Approximate edge of pavement	74.6	-	75.03	-	75.23	-	75.56	-
NA0190	80.82	Bottom of structure	89.89	Approximate edge of pavement	85.22	-	85.64	-	85.98	-	86.48	-
NA0200	81.52	Bottom of structure	85.45	Approximate edge of pavement	**85.93**	0.48	**86.34**	0.89	**86.75**	1.30	**87.36**	1.91
NA0210	80.80	Bottom of structure	88.76	Approximate edge of pavement	83.19	-	84.03	-	85.04	-	86.61	-
NA0220	86.72	Bottom of structure	90.75	Approximate edge of pavement	89	-	90.52	-	**90.86**	0.11	**91.12**	0.37
NA0230	91.44	Bottom of structure	96.15	Approximate edge of pavement	92.44	-	92.99	-	93.29	-	93.82	-
NA0240	88.61	Bottom of structure	93.98	Approximate edge of pavement	92.4	-	92.95	-	93.24	-	93.77	-
NA0250	87.54	Bottom of structure	92.19	Approximate edge of pavement	**92.31**	0.12	**92.7**	0.51	**92.81**	0.62	**92.92**	0.73
NA0260	86.29	Bottom of structure	91.93	Approximate edge of pavement	89.35	-	90.32	-	91.78	-	**92.07**	0.14
NA0270	85.32	Bottom of structure	90.61	Approximate edge of pavement	87.95	-	88.92	-	89.96	-	**91.79**	1.18
NA0280	82.32	Bottom of structure	91.56	Approximate edge of pavement	85.28	-	86.42	-	88	-	90.95	-
NA0290	75.96	Bottom of structure	89.24	Approximate edge of pavement	85.82	-	86.81	-	87.05	-	87.28	-
NA0300	81.61	Bottom of structure	88.92	Approximate edge of pavement	85.82	-	86.54	-	86.76	-	87.21	-
NA0310	83.67	Bottom of structure	86.50	Approximate edge of pavement	86.06	-	**86.5**	0.00	**86.76**	0.26	**87.35**	0.85
NA0320	83.58	Bottom of structure	88.77	Approximate edge of pavement	85.64	-	86.38	-	86.59	-	87.08	-
NA0330	83.24	Bottom of structure	86.37	Approximate edge of pavement	**86.37**	0.00	**86.64**	0.27	**86.84**	0.47	**87.41**	1.04
NA0340	81.46	Bottom of structure	85.60	Approximate edge of pavement	**85.96**	0.36	**86.37**	0.77	**86.77**	1.17	**87.38**	1.78
NA0350	78.17	Bottom of structure	87.25	Approximate edge of pavement	85.93	-	86.93	-	87.18	-	**87.4**	0.15
NA0360	88.33	Bottom of structure	94.12	Approximate edge of pavement	89.3	-	91.29	-	91.38	-	91.59	-
NA0370	86.22	Bottom of structure	91.16	Approximate edge of pavement	89.22	-	**91.21**	0.05	**91.26**	0.10	**91.32**	0.16
NA0380	84.62	Bottom of structure	88.11	Approximate edge of pavement	86.01	-	87.19	-	87.58	-	88.02	-
NA0390	77.48	Bottom of structure	87.47	Approximate edge of pavement	85.87	-	86.86	-	87.1	-	87.32	-
NA0400	87.42	Bottom of structure	91.46	Approximate edge of pavement	88.36	-	89	-	89.59	-	90.82	-
NA0410	85.24	Bottom of structure	87.80	Approximate edge of pavement	**88.28**	0.48	**88.78**	0.98	**89.04**	1.24	**89.19**	1.39
NA0420	82.03	Bottom of structure	89.00	Approximate edge of pavement	85.99	-	87.34	-	87.93	-	88.69	-
NA0430	82.26	Bottom of structure	88.32	Approximate edge of pavement	86.01	-	87.29	-	87.86	-	**88.62**	0.30
NA0440	81.27	Bottom of structure	89.46	Approximate edge of pavement	85.89	-	87.31	-	87.98	-	88.75	-

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Appendix A - Existing Conditions Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0450	80.02	Bottom of structure	88.29	Approximate edge of pavement	84.37	-	85.92	-	86.94	-	87.91	-
NA0460	82.60	Bottom of structure	88.09	Approximate edge of pavement	86.06	-	86.64	-	86.81	-	87.14	-
NA0470	79.57	Bottom of structure	85.32	Approximate edge of pavement	**86.01**	0.69	**86.57**	1.25	**86.7**	1.38	**86.81**	1.49
NA0480	80.26	Bottom of structure	86.75	Approximate edge of pavement	85.91	-	86.67	-	**86.8**	0.05	**86.88**	0.13
NA0490	81.66	Bottom of structure	86.12	Approximate edge of pavement	85.05	-	**86.5**	0.38	**86.65**	0.53	**86.75**	0.63
NA0500	78.02	Bottom of structure	84.24	Approximate edge of pavement	82.93	-	**84.61**	0.37	**84.94**	0.70	**85.14**	0.90
NA0510	79.52	Bottom of structure	84.82	Approximate edge of pavement	83.55	-	**85.32**	0.50	**85.51**	0.69	**85.72**	0.90
NA0520	81.44	Bottom of structure	85.49	Approximate edge of pavement	84.03	-	**85.97**	0.48	**86.14**	0.65	**86.27**	0.78
NA0530	83.62	Bottom of structure	88.82	Approximate edge of pavement	86.07	-	86.99	-	87.67	-	**88.92**	0.10
NA0540	85.97	Bottom of structure	90.45	Approximate edge of pavement	87.62	-	88.5	-	89.9	-	**90.84**	0.39
NA0550	87.66	Bottom of structure	91.28	Approximate edge of pavement	89.07	-	90.15	-	**91.5**	0.22	**91.68**	0.40
NA0560	87.18	Bottom of structure	91.56	Approximate edge of pavement	88.69	-	89.32	-	90.46	-	**92.02**	0.46
NA0570	85.65	Bottom of structure	91.06	Approximate edge of pavement	87.92	-	88.45	-	89.02	-	**91.35**	0.29
NA0580	92.68	Bottom of structure	96.76	Approximate edge of pavement	93	-	93.1	-	93.18	-	93.34	-
NA0590	89.02	Bottom of structure	93.58	Approximate edge of pavement	90.15	-	90.76	-	91.08	-	92.77	-
NA0600	85.05	Bottom of structure	90.93	Approximate edge of pavement	87.01	-	88.38	-	89.83	-	**91.37**	0.44
NA0610	83.91	Bottom of structure	89.93	Approximate edge of pavement	86.14	-	87.99	-	89.18	-	**90.72**	0.79
NA0620	83.12	Bottom of structure	90.59	Approximate edge of pavement	85.96	-	87.77	-	88.81	-	90.19	-
NA0630	85.42	Bottom of structure	90.77	Approximate edge of pavement	86.51	-	87.84	-	88.92	-	90.43	-
NA0640	91.02	Bottom of structure	95.50	Approximate edge of pavement	91.37	-	91.47	-	91.63	-	94.85	-
NA0650	90.02	Bottom of structure	94.83	Approximate edge of pavement	90.92	-	91.23	-	91.5	-	94.76	-
NA0660	90.23	Bottom of structure	94.85	Approximate edge of pavement	91.46	-	92.21	-	93.05	-	94.48	-
NA0670	92.30	Bottom of structure	97.97	Approximate edge of pavement	93.54	-	96.44	-	**98.52**	0.55	**98.61**	0.64
NA0680	90.33	Bottom of structure	96.79	Approximate edge of pavement	91.66	-	94.21	-	96.57	-	**97.22**	0.43
NA0690	88.62	Bottom of structure	94.25	Approximate edge of pavement	90.38	-	93	-	**94.5**	0.25	**94.6**	0.35
NA0700	86.32	Bottom of structure	91.79	Approximate edge of pavement	87.87	-	89.57	-	90.83	-	**91.96**	0.17
NA0710	84.94	Bottom of structure	90.28	Approximate edge of pavement	87.23	-	89.2	-	90.21	-	**90.6**	0.32
NA0720	83.55	Bottom of structure	89.40	Approximate edge of pavement	85.94	-	87.49	-	88.26	-	88.91	-
NA0730	82.98	Bottom of structure	88.88	Approximate edge of pavement	85.87	-	87.3	-	88.02	-	88.53	-
NA0740	81.14	Lake Mendsen NHWE	88.51	Approximate edge of pavement	85.82	-	87.21	-	87.85	-	88.36	-
NA0750	81.14	Lake Mendsen NHWE	89.42	Approximate edge of pavement	85.87	-	87.5	-	88.36	-	**89.48**	0.06
NA0760	81.14	Lake Mendsen NHWE	87.92	Approximate edge of pavement	85.79	-	87.09	-	87.67	-	**88.22**	0.30
NA0770	81.14	Lake Mendsen NHWE	87.19	Approximate edge of pavement	85.75	-	86.88	-	**87.34**	0.15	**87.99**	0.80
NA0780	81.14	Lake Mendsen NHWE	84.82	Approximate edge of pavement	**85.71**	0.89	**86.82**	2.00	**87.24**	2.42	**87.9**	3.08
NA0790	85.72	Bottom of structure	89.36	Approximate edge of pavement	87.3	-	89.29	-	**90.26**	0.90	**90.49**	1.13
NA0800	82.98	Bottom of structure	87.39	Approximate edge of pavement	85.91	-	87.35	-	**88.18**	0.79	**88.51**	1.12
NA0810	81.14	Bottom of structure	87.43	Approximate edge of pavement	85.86	-	87.27	-	**87.77**	0.34	**88.07**	0.64
NA0820	84.16	Bottom of structure	92.65	Approximate edge of pavement	86.61	-	90.19	-	90.89	-	92	-
NA0830	84.16	Bottom of structure	91.73	Approximate edge of pavement	86.53	-	90.04	-	90.71	-	91.54	-
NA0840	82.97	Bottom of structure	89.94	Approximate edge of pavement	85.99	-	88.72	-	89.27	-	**90.1**	0.16
NA0850	81.14	Lake Mendsen NHWE	86.88	Approximate edge of pavement	85.81	-	**87.95**	1.07	**88.26**	1.38	**88.56**	1.68
NA0860	81.14	Lake Mendsen NHWE	87.59	Approximate edge of pavement	85.77	-	**87.68**	0.09	**88.11**	0.52	**88.46**	0.87
NA0870	81.14	Lake Mendsen NHWE	86.66	Approximate edge of pavement	85.74	-	**87.38**	0.72	**87.72**	1.06	**88.04**	1.38
NA0880	81.14	Lake Mendsen NHWE	87.14	Approximate edge of pavement	85.7	-	87.07	-	**87.44**	0.30	**88**	0.86
NA0890	81.14	Lake Mendsen NHWE	86.19	Approximate edge of pavement	85.66	-	**86.88**	0.69	**87.35**	1.16	**87.97**	1.78
NA0900	81.14	Lake Mendsen NHWE	85.06	Approximate edge of pavement	**85.62**	0.56	**86.84**	1.78	**87.32**	2.26	**87.95**	2.89
NA0910	85.88	Bottom of structure	91.89	Approximate edge of pavement	87.49	-	87.89	-	88.28	-	88.88	-

Geosyntec consultants

Appendix A - Existing Conditions Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0920	81.29	Bottom of structure	87.69	Approximate edge of pavement	85.67	-	86.91	-	87.46	-	88	0.31
NA0930	81.14	Lake Mendsen NHWE	86.09	Approximate edge of pavement	85.63	-	86.84	0.75	87.3	1.21	87.95	1.86
NA0940	81.14	Lake Mendsen NHWE	84.77	Approximate edge of pavement	85.6	0.83	86.82	2.05	87.28	2.51	87.93	3.16
NA0950	81.14	Lake Mendsen NHWE	84.84	Approximate edge of pavement	85.59	0.75	86.81	1.97	87.28	2.44	87.93	3.09
NA0960	81.14	Lake Mendsen NHWE	85.58	Approximate edge of pavement	85.73	0.15	86.78	1.20	87.18	1.60	87.85	2.27
NA0970	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	85.67	0.01	86.82	1.16	87.26	1.60	87.92	2.26
NA0980	81.14	Lake Mendsen NHWE	84.95	Approximate edge of pavement	85.62	0.67	86.81	1.86	87.27	2.32	87.93	2.98
NA0990	87.41	Bottom of structure	90.80	Approximate edge of pavement	88.27	-	88.54	-	88.76	-	89.54	-
NA1000	82.94	Bottom of structure	87.49	Approximate edge of pavement	84.5	-	86.17	-	87.3	-	88.21	0.72
NA1010	78.97	Bottom of structure	85.37	Approximate edge of pavement	81.88	-	85.62	0.25	86.55	1.18	87.7	2.33
NA1020	80.47	Bottom of structure	85.47	Approximate edge of pavement	83.12	-	85.89	0.42	86.59	1.12	87.72	2.25
NA1030	77.85	Bottom of structure	85.55	Approximate edge of pavement	81.34	-	84.94	-	85.61	0.06	87.68	2.13
NA1040	77.76	Bottom of structure	85.24	Approximate edge of pavement	81.19	-	84.75	-	85.43	0.19	87.69	2.45
NA1050	77.44	Bottom of structure	84.28	Approximate edge of pavement	80.85	-	84.28	-	84.93	0.65	87.67	3.39
NA1060	76.61	Bottom of structure	83.43	Approximate edge of pavement	80.7	-	84	0.57	84.79	1.36	87.66	4.23
NA1070	75.87	Bottom of structure	89.34	Approximate edge of pavement	80.4	-	83.4	-	84.1	-	85.96	-
NA1080	74.25	Bottom of structure	85.11	Approximate edge of pavement	78.97	-	81.02	-	81.48	-	82.46	-
NA1090	73.79	Bottom of structure	76.62	Approximate edge of pavement	77.73	1.11	78.57	1.95	78.77	2.15	79.19	2.57
NA1100	77.15	Bottom of structure	83.03	Approximate edge of pavement	78.07	-	79.42	-	83	-	83.28	0.25
NA1110	74.23	Bottom of structure	80.07	Approximate edge of pavement	77.24	-	77.67	-	78.77	-	79.23	-
NA1120	73.79	Bottom of structure	76.34	Approximate edge of pavement	77.17	0.83	77.28	0.94	77.51	1.17	77.81	1.47
NA1130	78.93	Bottom of structure	83.69	Approximate edge of pavement	81.87	-	84.34	0.65	84.73	1.04	85.15	1.46
NA1140	79.43	Bottom of structure	86.76	Approximate edge of pavement	84.16	-	87.26	0.50	87.53	0.77	87.85	1.09
NA1150	80.96	Bottom of structure	83.93	Approximate edge of pavement	87.31	3.38	88.47	4.54	88.67	4.74	88.91	4.98
NA1160	87.02	Bottom of structure	91.63	Approximate edge of pavement	90.04	-	91.59	-	91.98	0.35	92.17	0.54
NA1170	83.62	Bottom of structure	89.26	Approximate edge of pavement	89.99	0.73	90.34	1.08	90.52	1.26	90.71	1.45
NA1180	83.62	Lake Midget control elevation	90.40	Bank overtopping	89.96	-	90.31	-	90.48	0.08	90.67	0.27
NA1190	83.89	Bottom of structure	88.91	Approximate edge of pavement	89.94	1.03	90.04	1.13	90.09	1.18	90.16	1.25
NA1200	83.89	Bottom of structure	91.04	Approximate edge of pavement	89.89	-	89.99	-	90.04	-	90.11	-
NA1210	83.62	Bottom of structure	90.46	Approximate edge of pavement	89.92	-	90.11	-	90.26	-	90.46	-
NA1220	83.62	Bottom of structure	91.71	Approximate edge of pavement	89.96	-	90.23	-	90.43	-	90.68	-
NA1230	83.62	Bottom of structure	90.28	Approximate edge of pavement	89.97	-	90.3	0.02	90.49	0.21	90.69	0.41
NA1240	87.78	Bottom of structure	91.07	Approximate edge of pavement	90.07	-	90.61	-	91.02	-	91.13	0.06
NA1250	87.42	Bottom of structure	90.70	Approximate edge of pavement	89.97	-	90.04	-	90.08	-	90.13	-
NA1260	86.18	Bottom of structure	90.64	Approximate edge of pavement	89.87	-	89.97	-	90.01	-	90.08	-
NA1270	85.80	Bottom of structure	89.67	Approximate edge of pavement	89.94	0.27	90.06	0.39	90.14	0.47	90.22	0.55
NA1280	85.60	Bottom of structure	90.74	Approximate edge of pavement	89.93	-	90.04	-	90.1	-	90.17	-
NA1290	88.32	Bottom of structure	90.86	Approximate edge of pavement	91.06	0.20	91.19	0.33	91.24	0.38	91.3	0.44
NA1300	86.73	Bottom of structure	90.10	Approximate edge of pavement	90.44	0.34	90.81	0.71	90.91	0.81	90.99	0.89
NA1310	83.30	Bottom of structure	87.94	Approximate edge of pavement	86.04	-	87.53	-	88.56	0.62	88.72	0.78
NA1320	88.52	Bottom of structure	92.53	Approximate edge of pavement	89.8	-	91.01	-	91.34	-	91.73	-
NA1330	84.72	Bottom of structure	90.29	Approximate edge of pavement	89.75	-	90.96	0.67	91.3	1.01	91.67	1.38
NA1340	85.32	Bottom of structure	89.55	Approximate edge of pavement	89.58	0.03	90.92	1.37	91.26	1.71	91.62	2.07
NA1350	84.62	Bottom of structure	90.45	Approximate edge of pavement	88.81	-	90.68	0.23	91.2	0.75	91.56	1.11
NA1360	82.50	Bottom of structure	89.84	Approximate edge of pavement	87.62	-	89.1	-	90.23	0.39	90.74	0.90
NA1370	82.50	Bottom of structure	88.96	Approximate edge of pavement	86.44	-	87.58	-	88.67	-	90.05	1.09
NA1380	82.50	Bottom of structure	89.60	Approximate edge of pavement	85.59	-	86.49	-	87.04	-	87.95	-

Geosyntec consultants

Appendix A - Existing Conditions Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1390	82.04	Bottom of structure	89.38	Approximate edge of pavement	85.15	-	85.92	-	86.21	-	86.88	-
NA1400	86.52	Bottom of structure	92.24	Approximate edge of pavement	89.91	-	91.29	-	91.74	-	**92.36**	0.12
NA1410	84.72	Bottom of structure	90.35	Approximate edge of pavement	89.76	-	**90.96**	0.61	**91.3**	0.95	**91.68**	1.33
NA1420	81.52	Bottom of structure	89.36	Approximate edge of pavement	87.97	-	**90.51**	1.15	**91.24**	1.88	**91.63**	2.27
NA1430	81.13	Bottom of structure	90.79	Approximate edge of pavement	87.04	-	89.06	-	89.79	-	**91.38**	0.59
NA1440	81.13	Bottom of structure	90.11	Approximate edge of pavement	86.53	-	88.36	-	89.08	-	**90.67**	0.56
NA1450	81.13	Bottom of structure	88.88	Approximate edge of pavement	86.19	-	87.92	-	88.66	-	**90.14**	1.26
NA1460	81.13	Bottom of structure	89.61	Approximate edge of pavement	85.8	-	87.28	-	87.93	-	89.52	-
NA1470	81.13	Bottom of structure	90.19	Approximate edge of pavement	85.37	-	86.59	-	87.15	-	88.42	-
NA1480	81.13	Bottom of structure	89.23	Approximate edge of pavement	85.28	-	86.33	-	86.78	-	87.76	-
NA1490	82.72	Bottom of structure	87.50	Approximate edge of pavement	87.31	-	**87.97**	0.47	**88.22**	0.72	**88.54**	1.04
NA1500	83.44	Bottom of structure	87.27	Approximate edge of pavement	85.72	-	86.95	-	**87.6**	0.33	**88.17**	0.90
NA1510	81.14	Lake Mendsen NHWE	85.25	Approximate edge of pavement	**85.66**	0.41	**86.9**	1.65	**87.55**	2.30	**88.13**	2.88
NA1520	82.42	Bottom of structure	86.11	Approximate edge of pavement	85.69	-	**86.92**	0.81	**87.52**	1.41	**88.1**	1.99
NA1530	81.14	Lake Mendsen NHWE	86.90	Approximate edge of pavement	85.62	-	86.84	-	**87.33**	0.43	**87.97**	1.07
NA1540	81.14	Lake Mendsen NHWE	85.15	Approximate edge of pavement	**85.69**	0.54	**86.91**	1.76	**87.56**	2.41	**88.15**	3.00
NA1550	90.36	Bottom of structure	94.47	Approximate edge of pavement	92	-	93.68	-	**94.5**	0.03	**94.87**	0.40
NA1560	89.67	Bottom of structure	94.46	Approximate edge of pavement	90.89	-	91.33	-	91.52	-	91.64	-
NA1570	87.27	Bottom of structure	91.49	Approximate edge of pavement	88.41	-	88.82	-	89.61	-	**91.61**	0.12
NA1580	84.57	Bottom of structure	89.81	Approximate edge of pavement	86.39	-	87	-	87.84	-	89.37	-
NA1590	82.97	Bottom of structure	91.69	Approximate edge of pavement	88.51	-	88.8	-	89.02	-	89.46	-
NA1600	82.97	Bottom of structure	87.71	Approximate edge of pavement	85.74	-	86.88	-	87.35	-	**87.96**	0.25
NA1610	81.80	Bottom of structure	85.34	Approximate edge of pavement	**85.71**	0.37	**86.85**	1.51	**87.31**	1.97	**87.96**	2.62
NA1620	90.03	Bottom of structure	92.24	Approximate edge of pavement	90.03	-	90.03	-	90.03	-	91.6	-
NA1630	81.92	Bottom of structure	84.78	Approximate edge of pavement	**85.05**	0.27	**86.73**	1.95	**87.13**	2.35	**87.81**	3.03
NA1640	81.54	Bottom of structure	87.01	Approximate edge of pavement	84.53	-	86.46	-	86.91	-	**87.78**	0.77
NA1650	80.90	Bottom of structure	85.58	Approximate edge of pavement	83.75	-	**86.16**	0.58	**86.65**	1.07	**87.76**	2.18
NA1660	82.04	Lake Killarney tailwater	85.25	Approximate edge of pavement	83.14	-	83.81	-	84.17	-	84.8	-
NA1670	84.22	Bottom of structure	92.63	Approximate edge of pavement	89.19	-	91.53	-	92.15	-	**92.8**	0.17
NA1680	83.52	Bottom of structure	90.33	Approximate edge of pavement	88.62	-	90.29	-	**90.47**	0.14	**90.58**	0.25
NA1690	82.52	Bottom of structure	89.14	Approximate edge of pavement	88.16	-	**89.35**	0.21	**89.44**	0.30	**89.55**	0.41
NA1700	82.04	Bottom of structure	88.40	Approximate edge of pavement	87.75	-	**89.17**	0.77	**89.28**	0.88	**89.41**	1.01
NA1710	82.04	Bottom of structure	89.18	Approximate edge of pavement	86.92	-	88.14	-	88.35	-	88.7	-
NA1720	82.04	Bottom of structure	89.94	Approximate edge of pavement	85.69	-	86.58	-	86.87	-	87.43	-
NA1730	82.04	Bottom of structure	89.12	Approximate edge of pavement	85.23	-	86.02	-	86.31	-	86.96	-
NA1740	81.14	Bottom of structure	90.16	Approximate edge of pavement	85.02	-	86.42	-	87.12	-	88.11	-
NA1750	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	85.2	-	**86.73**	1.07	**87.25**	1.59	**87.91**	2.25
NA1760	81.13	Lake Mendsen NHWE	85.45	Approximate edge of pavement	**85.6**	0.15	**86.78**	1.33	**87.29**	1.84	**87.95**	2.50
NA1790	82.93	Bottom of structure	88.04	Approximate edge of pavement	85.81	-	87.65	-	**88.47**	0.43	**88.72**	0.68
NA1800	76.40	Bottom of structure	88.11	Approximate edge of pavement	78.24	-	78.39	-	78.48	-	78.68	-
NA1810	77.43	Bottom of structure	86.98	Approximate edge of pavement	79.6	-	79.79	-	79.94	-	80.24	-
NA1820	70.50	Bottom of dry pond	78.99	Bank overtopping	78.19	-	78.32	-	78.41	-	78.54	-
NA1830	67.20	9th Grade Pond Control Elevation	77.76	Bank overtopping	71.35	-	72.05	-	72.27	-	72.61	-
NA1840	67.20	Bottom of structure	77.60	Approximate edge of pavement	71.97	-	73.16	-	73.53	-	74.25	-
NA1850	67.20	Lake Virginia tailwater	70.48	Approximate edge of pavement	69.13	-	**70.63**	0.15	**70.95**	0.47	**71.29**	0.81
NA1860	77.47	Bottom of structure	86.40	Approximate edge of pavement	82.44	-	84.09	-	84.52	-	84.79	-
NA1870	87.63	Bottom of structure	92.36	Approximate edge of pavement	89.54	-	91.95	-	92.34	-	**92.59**	0.23

Appendix A - Existing Conditions Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1880	85.16	Bottom of structure	92.62	Approximate edge of pavement	86.67	-	90.27	-	90.97	-	92.06	-
NA1890	92.07	Bottom of structure	94.36	Approximate edge of pavement	92.38	-	92.47	-	92.53	-	92.75	-
NA1900	86.29	Lake Francis Control Elevation	89.99	Bank overtopping	**91.82**	1.83	**92.21**	2.22	**92.38**	2.39	**92.6**	2.61
NA1910	87.03	Lee Road pond control elevation	90.58	Bank overtopping	**91.8**	1.22	**92.2**	1.62	**92.37**	1.79	**92.61**	2.03
NA1970	86.00	Bottom of dry pond	94.89	Bank overtopping	92.32	-	92.79	-	93.25	-	94.58	-
NA1980	89.70	Bottom of structure	95.10	Approximate edge of pavement	92.37	-	92.86	-	93.31	-	94.65	-
NA1990	86.66	Bottom of structure	90.12	Approximate edge of pavement	87.9	-	88.29	-	88.62	-	**90.29**	0.17
NA2000	87.47	Bottom of structure	92.54	Approximate edge of pavement	90.11	-	90.88	-	91.52	-	**93.02**	0.48
NA2010	77.85	Bottom of structure	82.90	Approximate edge of pavement	82.83	-	**83.36**	0.46	**83.44**	0.54	**83.55**	0.65
NA2020	79.52	Bottom of structure	88.37	Approximate edge of pavement	82.5	-	84.15	-	84.59	-	84.93	-
NA2030	87.08	Bottom of structure	92.37	Approximate edge of pavement	90.15	-	90.84	-	91.42	-	91.5	-
NA2100	80.70	Bottom of structure	85.92	Approximate edge of pavement	85.5	-	**86.71**	0.79	**87.21**	1.29	**87.86**	1.94
NA2110	82.19	Bottom of structure	81.74	Approximate edge of pavement	**85.38**	3.64	**86.59**	4.85	**87.09**	5.35	**87.74**	6.00
NA2120	90.41	Bottom of structure	90.89	Approximate edge of pavement	**91.86**	0.97	**92.27**	1.38	**92.44**	1.55	**92.66**	1.77
NB0005	88.75	Approximate water surface elevation	91.82	Finished Floor Elevation	89.43	-	89.88	-	90.63	-	91.62	-
NB0010	81.87	Botom of structure	89.15	Approximate edge of pavement	85.14	-	86.62	-	87.39	-	**89.31**	0.16
NB0020	82.31	Botom of structure	90.36	Approximate edge of pavement	86.93	-	89.03	-	89.62	-	**91.27**	0.91
NB0030	86.97	Approximate water surface elevation	92.39	Finished floor elevation	89.19	-	89.78	-	90.57	-	91.56	-
NB0040	82.50	Pond control structure	89.07	Bank overtopping	85.19	-	85.23	-	85.26	-	85.32	-
NB0050	83.14	Pond control structure	85.33	Bank overtopping	84.62	-	85.02	-	85.21	-	**85.42**	0.09
NB0060	82.04	Bottom of structure	90.41	Approximate edge of pavement	83.35	-	84.75	-	85.82	-	87.73	-
NB0070	86.01	Pond control structure	88.50	Bank overtopping	88.45	-	**88.52**	0.02	**88.57**	0.07	**88.61**	0.11
NB0080	82.04	Bottom of structure	91.31	Approximate edge of pavement	83.58	-	85.05	-	86.27	-	88.58	-

APPENDIX B

SJRWMD Preliminary Meeting Summary

WINTER PARK CRA STUDY UPDATE

Meeting Summary

1:00 pm / July 18, 2024
In-person Meeting

Meeting Attendees

- City of Winter Park (City) – Shannon Monahan (PM; Engineer, Public Works Department), Don Marcotte (Assistant Director, Public Works Department), Charles Ramdatt (Director, Public Works Department)
- St. Johns River Water Management District (SJRWMD) – Cammie Dewey
- Geosyntec – Gloria Teague (PM), Thomas Amstadt (PD)
- SAI/Halff – Mark Troilo, Chris Spargo
- Baxter & Woodman – Claude Cassagnol

Purpose

- A preliminary meeting was held with SJRWMD regulatory staff to review proposed flood mitigation strategies for the City's three study regions (west, central, and east) and request feedback on each strategy's permitting feasibility.

Western Study Region (Geosyntec)

- Flood Improvement Concept #1 – Lake Mendsen: Connection to Lake Rose
  - SJRWMD Comments
    - Water quality – permit would need to address water quality into Lake Rose and not create a local flooding issue.
    - Wetland impacts – no wetland impacts expected due to nature of Lake Rose (steep sides, lack of vegetation)
- Flood Improvement Concept #2 – Lake Mendsen: Pump Station and Lake Expansion
  - SJRWMD Comments
    - Pond expansion
      - Check existing permit, excavation/expansion may already be permitted
      - Potential credit for larger residence time
    - Pump station
      - Permit would need to address water quality into Lake Killarney, design may require treatment train.
      - Pre-storm lake drawdowns undesirable as it is preferred to keep water in basin and avoid perception of causing downstream flooding issues. Downstream residents commonly complain that pre-storm releases worsened their flooding issues.
    - Examples of projects that are preferable to SJRWMD and favorable for FDEP cost-share include daily skimming, chlorine treatment, and discharging into the reclaimed water system. These

projects are recommended for FDEP cost-share as they have a water quality benefit, water supply benefit, and occasionally natural system benefit. Examples include:

    - City of Altamonte Springs – A-First
    - City of Debary
    - City of Orange City – Mill Lake

- Flood Improvement Concept #3 – Canton Avenue: Improved Conveyance
  - SJRWMD Comments
    - Water quality – may need to upsize baffle box at outlet
- Flood Improvement Concept #4 – Lake Bell: Connection to Lake Park
  - SJRWMD Comments
    - Pre-storm lake drawdowns undesirable as it is preferred to keep water in basin and avoid perception of causing downstream flooding issues.
    - Water quality
      - Avoid using wetland for water quality treatment or will need to mitigate for wetland impacts.
      - Concern whether volume/load of releases to Lake Gem/Park Lake will increase from wetland.
        - Investigate total load into Lake Gem/Park Lake from Lake Killarney and compare to load from Killarney and this project to ensure no net increase in loading to Lake Gem/Park Lake.
      - Retrofit to add baffle box in route from Lake Killarney to Lake Gem/Park Lake may be a good option to offset additional loading from this project.
      - To determine annual average loading for design standard would need to run 10-year simulation.
      - Possible argument to offset nutrient loading by converting septic to sewer around Lake Bell.
- Flood Improvement Concept #5 – Lake Bell: Reduced Inflows from FDOT Pond
  - SJRWMD Comments
    - None
- Flood Improvement Concept #6 – Lake Killarney: Conveyance to Lake Gem
  - SJRWMD Comments
    - Pre-storm lake drawdowns undesirable as it is preferred to keep water in basin and avoid perception of causing downstream flooding issues.
    - Ensure drainwells would not lose recharge to aquifer as a result of this project. FDEP is not receptive to additional drainwells or modifications to the intake pipe elevation on existing drainwells but does recognize that drainwells on lakes serve as an important recharge source and are preferred to drainwells on inlets due to better water quality.

APPENDIX C

FIC# 1 – Lake Mendsen: Connection to Lake Rose Model Results

Geosyntec consultants

APPENDIX C - FIC #1 – Lake Mendsen: Connection to Lake Rose Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
LAKE_KILLARNEY	82.04	Control Elevation	84.40	Finished floor elevation	82.54	-	83.08	-	83.41	-	83.95	-
LAKE_MENDSEN	81.14	Normal high water elevation	84.82	Approximate edge of pavement	84.06	-	**85.98**	1.16	**86.87**	2.05	**87.62**	2.80
LAKE_ROSE	83.30	Approximate water surface elevation	91.01	Bank overtopping	83.89	-	85.97	-	86.8	-	87.45	-
NA0010	72.14	Bottom of structure	78.79	Approximate edge of pavement	77.96	-	**79.49**	0.70	**79.77**	0.98	**80.07**	1.28
NA0020	72.87	Bottom of structure	83.54	Approximate edge of pavement	79.41	-	82.1	-	82.5	-	82.82	-
NA0030	76.82	Bottom of structure	86.32	Approximate edge of pavement	79.79	-	83.07	-	84.42	-	**86.38**	0.06
NA0040	82.00	Bottom of structure	89.63	Approximate edge of pavement	83.88	-	84.48	-	86.22	-	**89.8**	0.17
NA0050	85.66	Bottom of structure	91.51	Approximate edge of pavement	87.82	-	88.23	-	88.67	-	91.19	-
NA0060	88.12	Bottom of structure	92.97	Approximate edge of pavement	88.6	-	88.82	-	89.26	-	92.9	-
NA0070	85.52	Bottom of structure	90.82	Approximate edge of pavement	85.93	-	86.02	-	86.29	-	89.85	-
NA0080	76.22	Bottom of structure	82.01	Approximate edge of pavement	79.68	-	**82.39**	0.38	**82.57**	0.56	**82.74**	0.73
NA0090	78.51	Bottom of structure	85.83	Approximate edge of pavement	84.4	-	85.22	-	85.33	-	85.44	-
NA0100	80.27	Bottom of structure	83.79	Approximate edge of pavement	**84.84**	1.05	**85.3**	1.51	**85.39**	1.60	**85.48**	1.69
NA0110	81.13	Bottom of structure	84.29	Approximate edge of pavement	**85.17**	0.88	**85.36**	1.07	**85.44**	1.15	**85.52**	1.23
NA0120	82.90	Bottom of structure	91.22	Approximate edge of pavement	84.16	-	84.39	-	85.54	-	86.98	-
NA0130	77.12	Bottom of structure	88.40	Approximate edge of pavement	80.94	-	83.94	-	85.61	-	87.16	-
NA0140	81.42	Bottom of structure	85.91	Approximate edge of pavement	82.89	-	**86.3**	0.39	**86.72**	0.81	**87.34**	1.43
NA0150	76.23	Bottom of structure	86.30	Approximate edge of pavement	79.77	-	81.53	-	82.41	-	83.23	-
NA0160	80.32	Bottom of structure	88.35	Approximate edge of pavement	84.78	-	85.2	-	85.5	-	85.93	-
NA0170	79.47	Bottom of structure	90.12	Approximate edge of pavement	83.99	-	84.43	-	84.63	-	84.95	-
NA0180	71.31	Bottom of structure	87.26	Approximate edge of pavement	74.6	-	75.03	-	75.23	-	75.56	-
NA0190	80.82	Bottom of structure	89.89	Approximate edge of pavement	85.22	-	85.64	-	85.98	-	86.48	-
NA0200	81.52	Bottom of structure	85.45	Approximate edge of pavement	**85.93**	0.48	**86.34**	0.89	**86.75**	1.30	**87.36**	1.91
NA0210	80.80	Bottom of structure	88.76	Approximate edge of pavement	83.19	-	84.03	-	85.04	-	86.61	-
NA0220	86.72	Bottom of structure	90.75	Approximate edge of pavement	89	-	90.52	-	**90.86**	0.11	**91.12**	0.37
NA0230	91.44	Bottom of structure	96.15	Approximate edge of pavement	92.44	-	92.99	-	93.29	-	93.82	-
NA0240	88.61	Bottom of structure	93.98	Approximate edge of pavement	92.4	-	92.95	-	93.24	-	93.77	-
NA0250	87.54	Bottom of structure	92.19	Approximate edge of pavement	**92.31**	0.12	**92.7**	0.51	**92.81**	0.62	**92.92**	0.73
NA0260	86.29	Bottom of structure	91.93	Approximate edge of pavement	89.35	-	90.32	-	91.78	-	**92.07**	0.14
NA0270	85.32	Bottom of structure	90.61	Approximate edge of pavement	87.95	-	88.92	-	89.96	-	**91.79**	1.18
NA0280	82.32	Bottom of structure	91.56	Approximate edge of pavement	85.28	-	86.42	-	88	-	90.95	-
NA0290	75.96	Bottom of structure	89.24	Approximate edge of pavement	85.82	-	86.81	-	87.05	-	87.28	-
NA0300	81.61	Bottom of structure	88.92	Approximate edge of pavement	85.82	-	86.54	-	86.76	-	87.21	-
NA0310	83.67	Bottom of structure	86.50	Approximate edge of pavement	86.06	-	**86.5**	0.00	**86.76**	0.26	**87.35**	0.85
NA0320	83.58	Bottom of structure	88.77	Approximate edge of pavement	85.64	-	86.38	-	86.59	-	87.08	-
NA0330	83.24	Bottom of structure	86.37	Approximate edge of pavement	**86.37**	0.00	**86.64**	0.27	**86.84**	0.47	**87.41**	1.04
NA0340	81.46	Bottom of structure	85.60	Approximate edge of pavement	**85.96**	0.36	**86.37**	0.77	**86.77**	1.17	**87.38**	1.78
NA0350	78.17	Bottom of structure	87.25	Approximate edge of pavement	85.93	-	86.93	-	87.18	-	**87.4**	0.15
NA0360	88.33	Bottom of structure	94.12	Approximate edge of pavement	89.3	-	91.29	-	91.38	-	91.59	-
NA0370	86.22	Bottom of structure	91.16	Approximate edge of pavement	89.22	-	**91.21**	0.05	**91.26**	0.10	**91.32**	0.16
NA0380	84.62	Bottom of structure	88.11	Approximate edge of pavement	86.01	-	87.19	-	87.58	-	88.02	-
NA0390	77.48	Bottom of structure	87.47	Approximate edge of pavement	85.87	-	86.86	-	87.1	-	87.32	-
NA0400	87.42	Bottom of structure	91.46	Approximate edge of pavement	88.36	-	89	-	89.59	-	90.82	-
NA0410	85.24	Bottom of structure	87.80	Approximate edge of pavement	**88.28**	0.48	**88.78**	0.98	**89.04**	1.24	**89.19**	1.39
NA0420	82.03	Bottom of structure	89.00	Approximate edge of pavement	85.99	-	87.34	-	87.93	-	88.69	-
NA0430	82.26	Bottom of structure	88.32	Approximate edge of pavement	86.01	-	87.29	-	87.86	-	**88.62**	0.30
NA0440	81.27	Bottom of structure	89.46	Approximate edge of pavement	85.89	-	87.31	-	87.98	-	88.75	-

Geosyntec consultants

APPENDIX C - FIC #1 – Lake Mendsen: Connection to Lake Rose Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0450	80.02	Bottom of structure	88.29	Approximate edge of pavement	84.37	-	85.92	-	86.94	-	87.91	-
NA0460	82.60	Bottom of structure	88.09	Approximate edge of pavement	86.06	-	86.64	-	86.81	-	87.14	-
NA0470	79.57	Bottom of structure	85.32	Approximate edge of pavement	**86.01**	0.69	**86.57**	1.25	**86.7**	1.38	**86.81**	1.49
NA0480	80.26	Bottom of structure	86.75	Approximate edge of pavement	85.91	-	86.67	-	**86.8**	0.05	**86.88**	0.13
NA0490	81.66	Bottom of structure	86.12	Approximate edge of pavement	85.05	-	**86.5**	0.38	**86.65**	0.53	**86.75**	0.63
NA0500	78.02	Bottom of structure	84.24	Approximate edge of pavement	82.93	-	**84.61**	0.37	**84.94**	0.70	**85.14**	0.90
NA0510	79.52	Bottom of structure	84.82	Approximate edge of pavement	83.55	-	**85.32**	0.50	**85.51**	0.69	**85.72**	0.90
NA0520	81.44	Bottom of structure	85.49	Approximate edge of pavement	84.03	-	**85.97**	0.48	**86.14**	0.65	**86.27**	0.78
NA0530	83.62	Bottom of structure	88.82	Approximate edge of pavement	86.07	-	86.99	-	87.67	-	**88.92**	0.10
NA0540	85.97	Bottom of structure	90.45	Approximate edge of pavement	87.62	-	88.5	-	89.9	-	**90.84**	0.39
NA0550	87.66	Bottom of structure	91.28	Approximate edge of pavement	89.07	-	90.15	-	**91.5**	0.22	**91.68**	0.40
NA0560	87.18	Bottom of structure	91.56	Approximate edge of pavement	88.69	-	89.32	-	90.46	-	**92.02**	0.46
NA0570	85.65	Bottom of structure	91.06	Approximate edge of pavement	87.92	-	88.45	-	89.02	-	**91.35**	0.29
NA0580	92.68	Bottom of structure	96.76	Approximate edge of pavement	93	-	93.1	-	93.18	-	93.34	-
NA0590	89.02	Bottom of structure	93.58	Approximate edge of pavement	90.15	-	90.76	-	91.02	-	92.76	-
NA0600	85.05	Bottom of structure	90.93	Approximate edge of pavement	87.01	-	87.89	-	89.69	-	**91.37**	0.44
NA0610	83.91	Bottom of structure	89.93	Approximate edge of pavement	85.99	-	87.5	-	89.02	-	**90.7**	0.77
NA0620	83.12	Bottom of structure	90.59	Approximate edge of pavement	85.32	-	87.3	-	88.65	-	90.15	-
NA0630	85.42	Bottom of structure	90.77	Approximate edge of pavement	86.51	-	87.37	-	88.75	-	90.39	-
NA0640	91.02	Bottom of structure	95.50	Approximate edge of pavement	91.37	-	91.47	-	91.63	-	94.82	-
NA0650	90.02	Bottom of structure	94.83	Approximate edge of pavement	90.92	-	91.23	-	91.5	-	94.73	-
NA0660	90.23	Bottom of structure	94.85	Approximate edge of pavement	91.46	-	92.21	-	93.03	-	94.47	-
NA0670	92.30	Bottom of structure	97.97	Approximate edge of pavement	93.54	-	96.36	-	**98.52**	0.55	**98.61**	0.64
NA0680	90.33	Bottom of structure	96.79	Approximate edge of pavement	91.66	-	93.81	-	96.54	-	**97.22**	0.43
NA0690	88.62	Bottom of structure	94.25	Approximate edge of pavement	90.38	-	92.57	-	**94.5**	0.25	**94.6**	0.35
NA0700	86.32	Bottom of structure	91.79	Approximate edge of pavement	87.87	-	89.09	-	90.75	-	**91.96**	0.17
NA0710	84.94	Bottom of structure	90.28	Approximate edge of pavement	87.23	-	88.71	-	90.15	-	**90.59**	0.31
NA0720	83.55	Bottom of structure	89.40	Approximate edge of pavement	85.2	-	87.04	-	88.06	-	88.86	-
NA0730	82.98	Bottom of structure	88.88	Approximate edge of pavement	85.02	-	86.86	-	87.82	-	88.47	-
NA0740	81.14	Lake Mendsen NHWE	88.51	Approximate edge of pavement	84.26	-	86.78	-	87.67	-	88.29	-
NA0750	81.14	Lake Mendsen NHWE	89.42	Approximate edge of pavement	84.27	-	87.06	-	88.2	-	89.4	-
NA0760	81.14	Lake Mendsen NHWE	87.92	Approximate edge of pavement	84.23	-	86.68	-	87.51	-	**88.12**	0.20
NA0770	81.14	Lake Mendsen NHWE	87.19	Approximate edge of pavement	84.2	-	86.42	-	87.05	-	**87.69**	0.50
NA0780	81.14	Lake Mendsen NHWE	84.82	Approximate edge of pavement	84.17	-	**86.18**	1.36	**86.89**	2.07	**87.59**	2.77
NA0790	85.72	Bottom of structure	89.36	Approximate edge of pavement	87.3	-	88.81	-	**90.22**	0.86	**90.49**	1.13
NA0800	82.98	Bottom of structure	87.39	Approximate edge of pavement	85.06	-	86.91	-	**87.9**	0.51	**88.5**	1.11
NA0810	81.14	Bottom of structure	87.43	Approximate edge of pavement	84.28	-	86.84	-	**87.62**	0.19	**88**	0.57
NA0820	84.16	Bottom of structure	92.65	Approximate edge of pavement	86.61	-	89.77	-	90.81	-	91.98	-
NA0830	84.16	Bottom of structure	91.73	Approximate edge of pavement	86.53	-	89.6	-	90.63	-	91.53	-
NA0840	82.97	Bottom of structure	89.94	Approximate edge of pavement	85.35	-	88.12	-	89.13	-	**90.09**	0.15
NA0850	81.14	Lake Mendsen NHWE	86.88	Approximate edge of pavement	84.26	-	**87.24**	0.36	**88.15**	1.27	**88.55**	1.67
NA0860	81.14	Lake Mendsen NHWE	87.59	Approximate edge of pavement	84.23	-	86.86	-	**87.9**	0.31	**88.44**	0.85
NA0870	81.14	Lake Mendsen NHWE	86.66	Approximate edge of pavement	84.2	-	86.42	-	**87.53**	0.87	**87.95**	1.29
NA0880	81.14	Lake Mendsen NHWE	87.14	Approximate edge of pavement	84.16	-	86.11	-	**87.16**	0.02	**87.72**	0.58
NA0890	81.14	Lake Mendsen NHWE	86.19	Approximate edge of pavement	84.13	-	86.06	-	**86.97**	0.78	**87.67**	1.48
NA0900	81.14	Lake Mendsen NHWE	85.06	Approximate edge of pavement	84.09	-	**86.02**	0.96	**86.92**	1.86	**87.64**	2.58
NA0910	85.88	Bottom of structure	91.89	Approximate edge of pavement	87.49	-	87.89	-	88.17	-	88.82	-

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NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0920	81.29	Bottom of structure	87.69	Approximate edge of pavement	84.19	-	86.07	-	87	-	**87.86**	0.17
NA0930	81.14	Lake Mendsen NHWE	86.09	Approximate edge of pavement	84.15	-	86.03	-	**86.92**	0.83	**87.64**	1.55
NA0940	81.14	Lake Mendsen NHWE	84.77	Approximate edge of pavement	84.13	-	**86**	1.23	**86.9**	2.13	**87.62**	2.85
NA0950	81.14	Lake Mendsen NHWE	84.84	Approximate edge of pavement	84.09	-	**85.99**	1.15	**86.88**	2.04	**87.62**	2.78
NA0960	81.14	Lake Mendsen NHWE	85.58	Approximate edge of pavement	84.19	-	**86.21**	0.63	**86.85**	1.27	**87.53**	1.95
NA0970	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	84.14	-	**86.07**	0.41	**86.89**	1.23	**87.61**	1.95
NA0980	81.14	Lake Mendsen NHWE	84.95	Approximate edge of pavement	84.09	-	**86.02**	1.07	**86.88**	1.93	**87.61**	2.66
NA0990	87.41	Bottom of structure	90.80	Approximate edge of pavement	88.27	-	88.54	-	88.76	-	89.54	-
NA1000	82.94	Bottom of structure	87.49	Approximate edge of pavement	84.5	-	86.17	-	87.3	-	**88.21**	0.72
NA1010	78.97	Bottom of structure	85.37	Approximate edge of pavement	81.88	-	**85.62**	0.25	**86.28**	0.91	**87.36**	1.99
NA1020	80.47	Bottom of structure	85.47	Approximate edge of pavement	83.12	-	**85.89**	0.42	**86.31**	0.84	**87.38**	1.91
NA1030	77.85	Bottom of structure	85.55	Approximate edge of pavement	81.34	-	84.94	-	**85.61**	0.06	**87.34**	1.79
NA1040	77.76	Bottom of structure	85.24	Approximate edge of pavement	81.19	-	84.75	-	**85.43**	0.19	**87.34**	2.10
NA1050	77.44	Bottom of structure	84.28	Approximate edge of pavement	80.85	-	84.28	-	**84.93**	0.65	**87.32**	3.04
NA1060	76.61	Bottom of structure	83.43	Approximate edge of pavement	80.7	-	**84**	0.57	**84.78**	1.35	**87.31**	3.88
NA1070	75.87	Bottom of structure	89.34	Approximate edge of pavement	80.4	-	83.4	-	84.1	-	85.62	-
NA1080	74.25	Bottom of structure	85.11	Approximate edge of pavement	78.97	-	81.02	-	81.47	-	82.24	-
NA1090	73.79	Bottom of structure	76.62	Approximate edge of pavement	**77.73**	1.11	**78.57**	1.95	**78.77**	2.15	**79.1**	2.48
NA1100	77.15	Bottom of structure	83.03	Approximate edge of pavement	78.07	-	79.42	-	83	-	**83.28**	0.25
NA1110	74.23	Bottom of structure	80.07	Approximate edge of pavement	77.24	-	77.6	-	78.76	-	79.23	-
NA1120	73.79	Bottom of structure	76.34	Approximate edge of pavement	**77.17**	0.83	**77.28**	0.94	**77.47**	1.13	**77.81**	1.47
NA1130	78.93	Bottom of structure	83.69	Approximate edge of pavement	81.87	-	**84.34**	0.65	**84.73**	1.04	**85.15**	1.46
NA1140	79.43	Bottom of structure	86.76	Approximate edge of pavement	84.17	-	**87.26**	0.50	**87.53**	0.77	**87.85**	1.09
NA1150	80.96	Bottom of structure	83.93	Approximate edge of pavement	**87.31**	3.38	**88.47**	4.54	**88.67**	4.74	**88.91**	4.98
NA1160	87.02	Bottom of structure	91.63	Approximate edge of pavement	90.04	-	91.59	-	**91.98**	0.35	**92.17**	0.54
NA1170	83.62	Bottom of structure	89.26	Approximate edge of pavement	**89.99**	0.73	**90.34**	1.08	**90.52**	1.26	**90.71**	1.45
NA1180	83.62	Lake Midget control elevation	90.40	Bank overtopping	89.96	-	90.31	-	**90.48**	0.08	**90.67**	0.27
NA1190	83.89	Bottom of structure	88.91	Approximate edge of pavement	**89.94**	1.03	**90.04**	1.13	**90.09**	1.18	**90.16**	1.25
NA1200	83.89	Bottom of structure	91.04	Approximate edge of pavement	89.89	-	89.99	-	90.04	-	90.11	-
NA1210	83.62	Bottom of structure	90.46	Approximate edge of pavement	89.92	-	90.11	-	90.26	-	90.46	-
NA1220	83.62	Bottom of structure	91.71	Approximate edge of pavement	89.96	-	90.23	-	90.43	-	90.68	-
NA1230	83.62	Bottom of structure	90.28	Approximate edge of pavement	89.97	-	**90.3**	0.02	**90.49**	0.21	**90.69**	0.41
NA1240	87.78	Bottom of structure	91.07	Approximate edge of pavement	90.07	-	90.61	-	91.02	-	**91.13**	0.06
NA1250	87.42	Bottom of structure	90.70	Approximate edge of pavement	89.97	-	90.04	-	90.08	-	90.13	-
NA1260	86.18	Bottom of structure	90.64	Approximate edge of pavement	89.87	-	89.97	-	90.01	-	90.08	-
NA1270	85.80	Bottom of structure	89.67	Approximate edge of pavement	**89.94**	0.27	**90.06**	0.39	**90.14**	0.47	**90.22**	0.55
NA1280	85.60	Bottom of structure	90.74	Approximate edge of pavement	89.93	-	90.04	-	90.1	-	90.17	-
NA1290	88.32	Bottom of structure	90.86	Approximate edge of pavement	**91.06**	0.20	**91.19**	0.33	**91.24**	0.38	**91.3**	0.44
NA1300	86.73	Bottom of structure	90.10	Approximate edge of pavement	**90.44**	0.34	**90.81**	0.71	**90.91**	0.81	**90.99**	0.89
NA1310	83.30	Bottom of structure	87.94	Approximate edge of pavement	86.04	-	87.53	-	**88.56**	0.62	**88.72**	0.78
NA1320	88.52	Bottom of structure	92.53	Approximate edge of pavement	89.46	-	90.98	-	91.3	-	91.72	-
NA1330	84.72	Bottom of structure	90.29	Approximate edge of pavement	89.4	-	**90.93**	0.64	**91.25**	0.96	**91.66**	1.37
NA1340	85.32	Bottom of structure	89.55	Approximate edge of pavement	89.27	-	**90.9**	1.35	**91.22**	1.67	**91.62**	2.07
NA1350	84.62	Bottom of structure	90.45	Approximate edge of pavement	88.51	-	**90.56**	0.11	**91.16**	0.71	**91.56**	1.11
NA1360	82.50	Bottom of structure	89.84	Approximate edge of pavement	87.3	-	88.95	-	**90.1**	0.26	**90.73**	0.89
NA1370	82.50	Bottom of structure	88.96	Approximate edge of pavement	86.1	-	87.4	-	88.24	-	**90.04**	1.08
NA1380	82.50	Bottom of structure	89.60	Approximate edge of pavement	85.24	-	86.28	-	86.75	-	87.77	-

Geosyntec consultants

APPENDIX C - FIC #1 – Lake Mendsen: Connection to Lake Rose Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1390	82.04	Bottom of structure	89.38	Approximate edge of pavement	84.79	-	85.69	-	85.99	-	86.62	-
NA1400	86.52	Bottom of structure	92.24	Approximate edge of pavement	89.56	-	91.28	-	91.74	-	**92.35**	0.11
NA1410	84.72	Bottom of structure	90.35	Approximate edge of pavement	89.41	-	**90.94**	0.59	**91.26**	0.91	**91.68**	1.33
NA1420	81.52	Bottom of structure	89.36	Approximate edge of pavement	87.49	-	**90.34**	0.98	**91.19**	1.83	**91.62**	2.26
NA1430	81.13	Bottom of structure	90.79	Approximate edge of pavement	86.53	-	88.78	-	89.59	-	**91.35**	0.56
NA1440	81.13	Bottom of structure	90.11	Approximate edge of pavement	86.01	-	88.02	-	88.8	-	**90.59**	0.48
NA1450	81.13	Bottom of structure	88.88	Approximate edge of pavement	85.67	-	87.53	-	88.33	-	**89.96**	1.08
NA1460	81.13	Bottom of structure	89.61	Approximate edge of pavement	85.28	-	86.84	-	87.55	-	89.15	-
NA1470	81.13	Bottom of structure	90.19	Approximate edge of pavement	84.88	-	86.1	-	86.7	-	88.07	-
NA1480	81.13	Bottom of structure	89.23	Approximate edge of pavement	84.85	-	85.95	-	86.44	-	87.45	-
NA1490	82.72	Bottom of structure	87.50	Approximate edge of pavement	85.98	-	**87.94**	0.44	**88.2**	0.70	**88.53**	1.03
NA1500	83.44	Bottom of structure	87.27	Approximate edge of pavement	84.2	-	86.23	-	**87.41**	0.14	**88.12**	0.85
NA1510	81.14	Lake Mendsen NHWE	85.25	Approximate edge of pavement	84.13	-	**86.13**	0.88	**87.33**	2.08	**88.08**	2.83
NA1520	82.42	Bottom of structure	86.11	Approximate edge of pavement	84.16	-	**86.45**	0.34	**87.32**	1.21	**88.05**	1.94
NA1530	81.14	Lake Mendsen NHWE	86.90	Approximate edge of pavement	84.09	-	86.02	-	**86.94**	0.04	**87.7**	0.80
NA1540	81.14	Lake Mendsen NHWE	85.15	Approximate edge of pavement	84.17	-	**86.16**	1.01	**87.36**	2.21	**88.1**	2.95
NA1550	90.36	Bottom of structure	94.47	Approximate edge of pavement	92	-	93.68	-	**94.5**	0.03	**94.87**	0.40
NA1560	89.67	Bottom of structure	94.46	Approximate edge of pavement	90.89	-	91.33	-	91.52	-	91.64	-
NA1570	87.27	Bottom of structure	91.49	Approximate edge of pavement	88.41	-	88.82	-	89.61	-	**91.61**	0.12
NA1580	84.57	Bottom of structure	89.81	Approximate edge of pavement	86.39	-	87	-	87.84	-	89.36	-
NA1590	82.97	Bottom of structure	91.69	Approximate edge of pavement	88.51	-	88.79	-	89.02	-	89.46	-
NA1600	82.97	Bottom of structure	87.71	Approximate edge of pavement	84.2	-	86.27	-	86.97	-	87.7	-
NA1610	81.80	Bottom of structure	85.34	Approximate edge of pavement	84.17	-	**86.19**	0.85	**86.93**	1.59	**87.65**	2.31
NA1620	90.03	Bottom of structure	92.24	Approximate edge of pavement	90.03	-	90.03	-	90.03	-	91.6	-
NA1630	81.92	Bottom of structure	84.78	Approximate edge of pavement	**85.05**	0.27	**85.98**	1.20	**86.8**	2.02	**87.49**	2.71
NA1640	81.54	Bottom of structure	87.01	Approximate edge of pavement	84.53	-	85.96	-	86.53	-	**87.45**	0.44
NA1650	80.90	Bottom of structure	85.58	Approximate edge of pavement	83.75	-	**85.94**	0.36	**86.32**	0.74	**87.42**	1.84
NA1660	82.04	Lake Killarney tailwater	85.25	Approximate edge of pavement	82.67	-	83.41	-	83.71	-	84.4	-
NA1670	84.22	Bottom of structure	92.63	Approximate edge of pavement	88.97	-	91.52	-	92.15	-	**92.8**	0.17
NA1680	83.52	Bottom of structure	90.33	Approximate edge of pavement	88.39	-	90.28	-	**90.47**	0.14	**90.57**	0.24
NA1690	82.52	Bottom of structure	89.14	Approximate edge of pavement	87.94	-	**89.33**	0.19	**89.43**	0.29	**89.54**	0.40
NA1700	82.04	Bottom of structure	88.40	Approximate edge of pavement	87.53	-	**89.15**	0.75	**89.26**	0.86	**89.39**	0.99
NA1710	82.04	Bottom of structure	89.18	Approximate edge of pavement	86.69	-	88.05	-	88.26	-	88.62	-
NA1720	82.04	Bottom of structure	89.94	Approximate edge of pavement	85.46	-	86.4	-	86.69	-	87.21	-
NA1730	82.04	Bottom of structure	89.12	Approximate edge of pavement	84.88	-	85.8	-	86.1	-	86.71	-
NA1740	81.14	Bottom of structure	90.16	Approximate edge of pavement	83.92	-	85.55	-	86.57	-	87.76	-
NA1750	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	83.92	-	85.65	-	**86.81**	1.15	**87.63**	1.97
NA1760	81.13	Lake Mendsen NHWE	85.45	Approximate edge of pavement	84.1	-	**85.96**	0.51	**86.85**	1.40	**87.65**	2.20
NA1790	82.93	Bottom of structure	88.04	Approximate edge of pavement	85.81	-	87.59	-	**88.41**	0.37	**88.66**	0.62
NA1800	76.40	Bottom of structure	88.11	Approximate edge of pavement	78.24	-	78.39	-	78.48	-	78.68	-
NA1810	77.43	Bottom of structure	86.98	Approximate edge of pavement	79.6	-	79.79	-	79.94	-	80.24	-
NA1820	70.50	Bottom of dry pond	78.99	Bank overtopping	78.19	-	78.32	-	78.41	-	78.54	-
NA1830	67.20	9th Grade Pond Control Elevation	77.76	Bank overtopping	71.35	-	72.05	-	72.25	-	72.6	-
NA1840	67.20	Bottom of structure	77.60	Approximate edge of pavement	71.97	-	73.16	-	73.53	-	74.15	-
NA1850	67.20	Lake Virginia tailwater	70.48	Approximate edge of pavement	69.13	-	**70.63**	0.15	**70.92**	0.44	**71.28**	0.80
NA1860	77.47	Bottom of structure	86.40	Approximate edge of pavement	82.44	-	84.09	-	84.52	-	84.79	-
NA1870	87.63	Bottom of structure	92.36	Approximate edge of pavement	89.54	-	91.81	-	92.33	-	**92.59**	0.23

Geosyntec consultants

APPENDIX C - FIC #1 – Lake Mendsen: Connection to Lake Rose Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1880	85.16	Bottom of structure	92.62	Approximate edge of pavement	86.67	-	89.85	-	90.88	-	92.04	-
NA1890	92.07	Bottom of structure	94.36	Approximate edge of pavement	92.38	-	92.47	-	92.53	-	92.75	-
NA1900	86.29	Lake Francis Control Elevation	89.99	Bank overtopping	**91.82**	1.83	**92.21**	2.22	**92.38**	2.39	**92.6**	2.61
NA1910	87.03	Lee Road pond control elevation	90.58	Bank overtopping	**91.8**	1.22	**92.2**	1.62	**92.37**	1.79	**92.61**	2.03
NA1970	86.00	Bottom of dry pond	94.89	Bank overtopping	92.32	-	92.79	-	93.24	-	94.58	-
NA1980	89.70	Bottom of structure	95.10	Approximate edge of pavement	92.37	-	92.86	-	93.31	-	94.64	-
NA1990	86.66	Bottom of structure	90.12	Approximate edge of pavement	87.9	-	88.29	-	88.62	-	**90.29**	0.17
NA2000	87.47	Bottom of structure	92.54	Approximate edge of pavement	90.11	-	90.88	-	91.52	-	**93.02**	0.48
NA2010	77.85	Bottom of structure	82.90	Approximate edge of pavement	82.83	-	**83.36**	0.46	**83.44**	0.54	**83.55**	0.65
NA2020	79.52	Bottom of structure	88.37	Approximate edge of pavement	82.5	-	84.15	-	84.59	-	84.93	-
NA2030	87.08	Bottom of structure	92.37	Approximate edge of pavement	90.15	-	90.84	-	91.42	-	91.5	-
NA2100	80.70	Bottom of structure	85.92	Approximate edge of pavement	83.97	-	85.9	-	**86.79**	0.87	**87.54**	1.62
NA2110	82.19	Bottom of structure	81.74	Approximate edge of pavement	**83.86**	2.12	**85.78**	4.04	**86.67**	4.93	**87.42**	5.68
NA2120	90.41	Bottom of structure	90.89	Approximate edge of pavement	**91.86**	0.97	**92.27**	1.38	**92.44**	1.55	**92.66**	1.77
NB0005	88.75	Approximate water surface elevation	91.82	Finished Floor Elevation	88.92	-	89.42	-	90.14	-	91.43	-
NB0010	81.87	Botom of structure	89.15	Approximate edge of pavement	85	-	86.38	-	87.15	-	88.65	-
NB0020	82.31	Botom of structure	90.36	Approximate edge of pavement	86.59	-	88.48	-	88.89	-	**91.05**	0.69
NB0030	86.97	Approximate water surface elevation	92.39	Finished floor elevation	88.7	-	89.31	-	90.07	-	91.38	-
NB0040	82.50	Pond control structure	89.07	Bank overtopping	85.19	-	85.23	-	85.26	-	85.32	-
NB0050	83.14	Pond control structure	85.33	Bank overtopping	84.62	-	85.02	-	85.21	-	**85.42**	0.09
NB0060	82.04	Bottom of structure	90.41	Approximate edge of pavement	82.97	-	84.24	-	85.42	-	87.35	-
NB0070	86.01	Pond control structure	88.50	Bank overtopping	88.45	-	**88.52**	0.02	**88.57**	0.07	**88.61**	0.11
NB0080	82.04	Bottom of structure	91.31	Approximate edge of pavement	83.3	-	84.54	-	85.87	-	88.21	-

APPENDIX D

FIC #2 – Lake Mendsen: Pump Station and Lake Expansion Model Results

APPENDIX D - FIC #2 – Lake Mendsen: Pump Station and Lake Expansion Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
LAKE_KILLARNEY	82.04	Control Elevation	84.40	Finished floor elevation	82.54	-	83.08	-	83.41	-	83.97	-
LAKE_MENDSEN	81.14	Normal high water elevation	84.82	Approximate edge of pavement	84.06	-	**85.98**	1.16	**86.87**	2.05	**87.65**	2.83
LAKE_ROSE	83.30	Approximate water surface elevation	91.01	Bank overtopping	83.89	-	85.97	-	86.8	-	84.76	-
NA0010	72.14	Bottom of structure	78.79	Approximate edge of pavement	77.96	-	**79.49**	0.70	**79.77**	0.98	**80.07**	1.28
NA0020	72.87	Bottom of structure	83.54	Approximate edge of pavement	79.41	-	82.1	-	82.5	-	82.82	-
NA0030	76.82	Bottom of structure	86.32	Approximate edge of pavement	79.79	-	83.07	-	84.42	-	**86.38**	0.06
NA0040	82.00	Bottom of structure	89.63	Approximate edge of pavement	83.88	-	84.48	-	86.22	-	**89.8**	0.17
NA0050	85.66	Bottom of structure	91.51	Approximate edge of pavement	87.82	-	88.23	-	88.67	-	91.19	-
NA0060	88.12	Bottom of structure	92.97	Approximate edge of pavement	88.6	-	88.82	-	89.26	-	92.9	-
NA0070	85.52	Bottom of structure	90.82	Approximate edge of pavement	85.93	-	86.02	-	86.29	-	89.85	-
NA0080	76.22	Bottom of structure	82.01	Approximate edge of pavement	79.68	-	**82.39**	0.38	**82.57**	0.56	**82.74**	0.73
NA0090	78.51	Bottom of structure	85.83	Approximate edge of pavement	84.4	-	85.22	-	85.33	-	85.44	-
NA0100	80.27	Bottom of structure	83.79	Approximate edge of pavement	**84.84**	1.05	**85.3**	1.51	**85.39**	1.60	**85.48**	1.69
NA0110	81.13	Bottom of structure	84.29	Approximate edge of pavement	**85.17**	0.88	**85.36**	1.07	**85.44**	1.15	**85.52**	1.23
NA0120	82.90	Bottom of structure	91.22	Approximate edge of pavement	84.16	-	84.39	-	85.54	-	86.98	-
NA0130	77.12	Bottom of structure	88.40	Approximate edge of pavement	80.94	-	83.94	-	85.61	-	87.16	-
NA0140	81.42	Bottom of structure	85.91	Approximate edge of pavement	82.89	-	**86.3**	0.39	**86.72**	0.81	**87.34**	1.43
NA0150	76.23	Bottom of structure	86.30	Approximate edge of pavement	79.77	-	81.53	-	82.41	-	83.23	-
NA0160	80.32	Bottom of structure	88.35	Approximate edge of pavement	84.78	-	85.2	-	85.5	-	85.93	-
NA0170	79.47	Bottom of structure	90.12	Approximate edge of pavement	83.99	-	84.43	-	84.63	-	84.95	-
NA0180	71.31	Bottom of structure	87.26	Approximate edge of pavement	74.6	-	75.03	-	75.23	-	75.56	-
NA0190	80.82	Bottom of structure	89.89	Approximate edge of pavement	85.22	-	85.64	-	85.98	-	86.48	-
NA0200	81.52	Bottom of structure	85.45	Approximate edge of pavement	**85.93**	0.48	**86.34**	0.89	**86.75**	1.30	**87.36**	1.91
NA0210	80.80	Bottom of structure	88.76	Approximate edge of pavement	83.19	-	84.03	-	85.04	-	86.61	-
NA0220	86.72	Bottom of structure	90.75	Approximate edge of pavement	89	-	90.52	-	**90.86**	0.11	**91.12**	0.37
NA0230	91.44	Bottom of structure	96.15	Approximate edge of pavement	92.44	-	92.99	-	93.29	-	93.82	-
NA0240	88.61	Bottom of structure	93.98	Approximate edge of pavement	92.4	-	92.95	-	93.24	-	93.77	-
NA0250	87.54	Bottom of structure	92.19	Approximate edge of pavement	**92.31**	0.12	**92.7**	0.51	**92.81**	0.62	**92.92**	0.73
NA0260	86.29	Bottom of structure	91.93	Approximate edge of pavement	89.35	-	90.32	-	91.78	-	**92.07**	0.14
NA0270	85.32	Bottom of structure	90.61	Approximate edge of pavement	87.95	-	88.92	-	89.96	-	**91.79**	1.18
NA0280	82.32	Bottom of structure	91.56	Approximate edge of pavement	85.28	-	86.42	-	88	-	90.95	-
NA0290	75.96	Bottom of structure	89.24	Approximate edge of pavement	85.82	-	86.81	-	87.05	-	87.28	-
NA0300	81.61	Bottom of structure	88.92	Approximate edge of pavement	85.82	-	86.54	-	86.76	-	87.21	-
NA0310	83.67	Bottom of structure	86.50	Approximate edge of pavement	86.06	-	**86.5**	0.00	**86.76**	0.26	**87.35**	0.85
NA0320	83.58	Bottom of structure	88.77	Approximate edge of pavement	85.64	-	86.38	-	86.59	-	87.08	-
NA0330	83.24	Bottom of structure	86.37	Approximate edge of pavement	**86.37**	0.00	**86.64**	0.27	**86.84**	0.47	**87.41**	1.04
NA0340	81.46	Bottom of structure	85.60	Approximate edge of pavement	**85.96**	0.36	**86.37**	0.77	**86.77**	1.17	**87.38**	1.78
NA0350	78.17	Bottom of structure	87.25	Approximate edge of pavement	85.93	-	86.93	-	87.18	-	**87.4**	0.15
NA0360	88.33	Bottom of structure	94.12	Approximate edge of pavement	89.3	-	91.29	-	91.38	-	91.59	-
NA0370	86.22	Bottom of structure	91.16	Approximate edge of pavement	89.22	-	**91.21**	0.05	**91.26**	0.10	**91.32**	0.16
NA0380	84.62	Bottom of structure	88.11	Approximate edge of pavement	86.01	-	87.19	-	87.58	-	88.02	-
NA0390	77.48	Bottom of structure	87.47	Approximate edge of pavement	85.87	-	86.86	-	87.1	-	87.32	-
NA0400	87.42	Bottom of structure	91.46	Approximate edge of pavement	88.36	-	89	-	89.59	-	90.82	-
NA0410	85.24	Bottom of structure	87.80	Approximate edge of pavement	**88.28**	0.48	**88.78**	0.98	**89.04**	1.24	**89.19**	1.39
NA0420	82.03	Bottom of structure	89.00	Approximate edge of pavement	85.99	-	87.34	-	87.93	-	88.69	-
NA0430	82.26	Bottom of structure	88.32	Approximate edge of pavement	86.01	-	87.29	-	87.86	-	**88.62**	0.30
NA0440	81.27	Bottom of structure	89.46	Approximate edge of pavement	85.89	-	87.31	-	87.98	-	88.75	-

Geosyntec consultants

APPENDIX D - FIC #2 – Lake Mendsen: Pump Station and Lake Expansion Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0450	80.02	Bottom of structure	88.29	Approximate edge of pavement	84.37	-	85.92	-	86.94	-	87.91	-
NA0460	82.60	Bottom of structure	88.09	Approximate edge of pavement	86.06	-	86.64	-	86.81	-	87.14	-
NA0470	79.57	Bottom of structure	85.32	Approximate edge of pavement	**86.01**	0.69	**86.57**	1.25	**86.7**	1.38	**86.81**	1.49
NA0480	80.26	Bottom of structure	86.75	Approximate edge of pavement	85.91	-	86.67	-	**86.8**	0.05	**86.88**	0.13
NA0490	81.66	Bottom of structure	86.12	Approximate edge of pavement	85.05	-	**86.5**	0.38	**86.65**	0.53	**86.75**	0.63
NA0500	78.02	Bottom of structure	84.24	Approximate edge of pavement	82.93	-	**84.61**	0.37	**84.94**	0.70	**85.14**	0.90
NA0510	79.52	Bottom of structure	84.82	Approximate edge of pavement	83.55	-	**85.32**	0.50	**85.51**	0.69	**85.72**	0.90
NA0520	81.44	Bottom of structure	85.49	Approximate edge of pavement	84.03	-	**85.97**	0.48	**86.14**	0.65	**86.27**	0.78
NA0530	83.62	Bottom of structure	88.82	Approximate edge of pavement	86.07	-	86.99	-	87.67	-	**88.92**	0.10
NA0540	85.97	Bottom of structure	90.45	Approximate edge of pavement	87.62	-	88.5	-	89.9	-	**90.84**	0.39
NA0550	87.66	Bottom of structure	91.28	Approximate edge of pavement	89.07	-	90.15	-	**91.5**	0.22	**91.68**	0.40
NA0560	87.18	Bottom of structure	91.56	Approximate edge of pavement	88.69	-	89.32	-	90.46	-	**92.02**	0.46
NA0570	85.65	Bottom of structure	91.06	Approximate edge of pavement	87.92	-	88.45	-	89.02	-	**91.35**	0.29
NA0580	92.68	Bottom of structure	96.76	Approximate edge of pavement	93	-	93.1	-	93.18	-	93.34	-
NA0590	89.02	Bottom of structure	93.58	Approximate edge of pavement	90.15	-	90.76	-	91.02	-	92.76	-
NA0600	85.05	Bottom of structure	90.93	Approximate edge of pavement	87.01	-	87.89	-	89.69	-	**91.37**	0.44
NA0610	83.91	Bottom of structure	89.93	Approximate edge of pavement	85.99	-	87.5	-	89.02	-	**90.7**	0.77
NA0620	83.12	Bottom of structure	90.59	Approximate edge of pavement	85.32	-	87.3	-	88.65	-	90.14	-
NA0630	85.42	Bottom of structure	90.77	Approximate edge of pavement	86.51	-	87.37	-	88.75	-	90.38	-
NA0640	91.02	Bottom of structure	95.50	Approximate edge of pavement	91.37	-	91.47	-	91.63	-	94.82	-
NA0650	90.02	Bottom of structure	94.83	Approximate edge of pavement	90.92	-	91.23	-	91.5	-	94.72	-
NA0660	90.23	Bottom of structure	94.85	Approximate edge of pavement	91.46	-	92.21	-	93.03	-	94.47	-
NA0670	92.30	Bottom of structure	97.97	Approximate edge of pavement	93.54	-	96.36	-	**98.52**	0.55	**98.61**	0.64
NA0680	90.33	Bottom of structure	96.79	Approximate edge of pavement	91.66	-	93.81	-	96.54	-	**97.22**	0.43
NA0690	88.62	Bottom of structure	94.25	Approximate edge of pavement	90.38	-	92.57	-	**94.5**	0.25	**94.6**	0.35
NA0700	86.32	Bottom of structure	91.79	Approximate edge of pavement	87.87	-	89.09	-	90.75	-	**91.96**	0.17
NA0710	84.94	Bottom of structure	90.28	Approximate edge of pavement	87.23	-	88.71	-	90.15	-	**90.59**	0.31
NA0720	83.55	Bottom of structure	89.40	Approximate edge of pavement	85.2	-	87.04	-	88.06	-	88.85	-
NA0730	82.98	Bottom of structure	88.88	Approximate edge of pavement	85.02	-	86.86	-	87.82	-	88.47	-
NA0740	81.14	Lake Mendsen NHWE	88.51	Approximate edge of pavement	84.26	-	86.78	-	87.67	-	88.28	-
NA0750	81.14	Lake Mendsen NHWE	89.42	Approximate edge of pavement	84.27	-	87.06	-	88.2	-	89.4	-
NA0760	81.14	Lake Mendsen NHWE	87.92	Approximate edge of pavement	84.23	-	86.68	-	87.51	-	**88.11**	0.19
NA0770	81.14	Lake Mendsen NHWE	87.19	Approximate edge of pavement	84.2	-	86.42	-	87.05	-	**87.7**	0.51
NA0780	81.14	Lake Mendsen NHWE	84.82	Approximate edge of pavement	84.17	-	**86.18**	1.36	**86.89**	2.07	**87.6**	2.78
NA0790	85.72	Bottom of structure	89.36	Approximate edge of pavement	87.3	-	88.81	-	**90.22**	0.86	**90.49**	1.13
NA0800	82.98	Bottom of structure	87.39	Approximate edge of pavement	85.06	-	86.91	-	**87.9**	0.51	**88.5**	1.11
NA0810	81.14	Bottom of structure	87.43	Approximate edge of pavement	84.28	-	86.84	-	**87.62**	0.19	**88**	0.57
NA0820	84.16	Bottom of structure	92.65	Approximate edge of pavement	86.61	-	89.77	-	90.81	-	91.97	-
NA0830	84.16	Bottom of structure	91.73	Approximate edge of pavement	86.53	-	89.6	-	90.63	-	91.53	-
NA0840	82.97	Bottom of structure	89.94	Approximate edge of pavement	85.35	-	88.12	-	89.13	-	**90.09**	0.15
NA0850	81.14	Lake Mendsen NHWE	86.88	Approximate edge of pavement	84.26	-	**87.24**	0.36	**88.15**	1.27	**88.55**	1.67
NA0860	81.14	Lake Mendsen NHWE	87.59	Approximate edge of pavement	84.23	-	86.86	-	**87.9**	0.31	**88.44**	0.85
NA0870	81.14	Lake Mendsen NHWE	86.66	Approximate edge of pavement	84.2	-	86.42	-	**87.53**	0.87	**87.94**	1.28
NA0880	81.14	Lake Mendsen NHWE	87.14	Approximate edge of pavement	84.16	-	86.11	-	**87.16**	0.02	**87.73**	0.59
NA0890	81.14	Lake Mendsen NHWE	86.19	Approximate edge of pavement	84.13	-	86.06	-	**86.97**	0.78	**87.69**	1.50
NA0900	81.14	Lake Mendsen NHWE	85.06	Approximate edge of pavement	84.09	-	**86.02**	0.96	**86.92**	1.86	**87.67**	2.61
NA0910	85.88	Bottom of structure	91.89	Approximate edge of pavement	87.49	-	87.89	-	88.17	-	88.8	-

APPENDIX D - FIC #2 – Lake Mendsen: Pump Station and Lake Expansion Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0920	81.29	Bottom of structure	87.69	Approximate edge of pavement	84.19	-	86.07	-	87	-	**87.86**	0.17
NA0930	81.14	Lake Mendsen NHWE	86.09	Approximate edge of pavement	84.15	-	86.03	-	**86.92**	0.83	**87.66**	1.57
NA0940	81.14	Lake Mendsen NHWE	84.77	Approximate edge of pavement	84.13	-	**86**	1.23	**86.9**	2.13	**87.64**	2.87
NA0950	81.14	Lake Mendsen NHWE	84.84	Approximate edge of pavement	84.09	-	**85.99**	1.15	**86.88**	2.04	**87.65**	2.81
NA0960	81.14	Lake Mendsen NHWE	85.58	Approximate edge of pavement	84.19	-	**86.21**	0.63	**86.85**	1.27	**87.55**	1.97
NA0970	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	84.14	-	**86.07**	0.41	**86.89**	1.23	**87.63**	1.97
NA0980	81.14	Lake Mendsen NHWE	84.95	Approximate edge of pavement	84.09	-	**86.02**	1.07	**86.88**	1.93	**87.64**	2.69
NA0990	87.41	Bottom of structure	90.80	Approximate edge of pavement	88.27	-	88.54	-	88.76	-	89.54	-
NA1000	82.94	Bottom of structure	87.49	Approximate edge of pavement	84.5	-	86.17	-	87.3	-	**88.21**	0.72
NA1010	78.97	Bottom of structure	85.37	Approximate edge of pavement	81.88	-	**85.62**	0.25	**86.28**	0.91	**87.38**	2.01
NA1020	80.47	Bottom of structure	85.47	Approximate edge of pavement	83.12	-	**85.89**	0.42	**86.31**	0.84	**87.4**	1.93
NA1030	77.85	Bottom of structure	85.55	Approximate edge of pavement	81.34	-	84.94	-	**85.61**	0.06	**87.36**	1.81
NA1040	77.76	Bottom of structure	85.24	Approximate edge of pavement	81.19	-	84.75	-	**85.43**	0.19	**87.36**	2.12
NA1050	77.44	Bottom of structure	84.28	Approximate edge of pavement	80.85	-	84.28	-	**84.93**	0.65	**87.35**	3.07
NA1060	76.61	Bottom of structure	83.43	Approximate edge of pavement	80.7	-	**84**	0.57	**84.78**	1.35	**87.33**	3.90
NA1070	75.87	Bottom of structure	89.34	Approximate edge of pavement	80.4	-	83.4	-	84.1	-	85.63	-
NA1080	74.25	Bottom of structure	85.11	Approximate edge of pavement	78.97	-	81.02	-	81.47	-	82.24	-
NA1090	73.79	Bottom of structure	76.62	Approximate edge of pavement	**77.73**	1.11	**78.57**	1.95	**78.77**	2.15	**79.1**	2.48
NA1100	77.15	Bottom of structure	83.03	Approximate edge of pavement	78.07	-	79.42	-	83	-	**83.28**	0.25
NA1110	74.23	Bottom of structure	80.07	Approximate edge of pavement	77.24	-	77.6	-	78.76	-	79.23	-
NA1120	73.79	Bottom of structure	76.34	Approximate edge of pavement	**77.17**	0.83	**77.28**	0.94	**77.47**	1.13	**77.81**	1.47
NA1130	78.93	Bottom of structure	83.69	Approximate edge of pavement	81.87	-	**84.34**	0.65	**84.73**	1.04	**85.15**	1.46
NA1140	79.43	Bottom of structure	86.76	Approximate edge of pavement	84.17	-	**87.26**	0.50	**87.53**	0.77	**87.85**	1.09
NA1150	80.96	Bottom of structure	83.93	Approximate edge of pavement	**87.31**	3.38	**88.47**	4.54	**88.67**	4.74	**88.91**	4.98
NA1160	87.02	Bottom of structure	91.63	Approximate edge of pavement	90.04	-	91.59	-	**91.98**	0.35	**92.17**	0.54
NA1170	83.62	Bottom of structure	89.26	Approximate edge of pavement	**89.99**	0.73	**90.34**	1.08	**90.52**	1.26	**90.71**	1.45
NA1180	83.62	Lake Midget control elevation	90.40	Bank overtopping	89.96	-	90.31	-	**90.48**	0.08	**90.67**	0.27
NA1190	83.89	Bottom of structure	88.91	Approximate edge of pavement	**89.94**	1.03	**90.04**	1.13	**90.09**	1.18	**90.16**	1.25
NA1200	83.89	Bottom of structure	91.04	Approximate edge of pavement	89.89	-	89.99	-	90.04	-	90.11	-
NA1210	83.62	Bottom of structure	90.46	Approximate edge of pavement	89.92	-	90.11	-	90.26	-	90.46	-
NA1220	83.62	Bottom of structure	91.71	Approximate edge of pavement	89.96	-	90.23	-	90.43	-	90.68	-
NA1230	83.62	Bottom of structure	90.28	Approximate edge of pavement	89.97	-	**90.3**	0.02	**90.49**	0.21	**90.69**	0.41
NA1240	87.78	Bottom of structure	91.07	Approximate edge of pavement	90.07	-	90.61	-	91.02	-	**91.13**	0.06
NA1250	87.42	Bottom of structure	90.70	Approximate edge of pavement	89.97	-	90.04	-	90.08	-	90.13	-
NA1260	86.18	Bottom of structure	90.64	Approximate edge of pavement	89.87	-	89.97	-	90.01	-	90.08	-
NA1270	85.80	Bottom of structure	89.67	Approximate edge of pavement	**89.94**	0.27	**90.06**	0.39	**90.14**	0.47	**90.22**	0.55
NA1280	85.60	Bottom of structure	90.74	Approximate edge of pavement	89.93	-	90.04	-	90.1	-	90.17	-
NA1290	88.32	Bottom of structure	90.86	Approximate edge of pavement	**91.06**	0.20	**91.19**	0.33	**91.24**	0.38	**91.3**	0.44
NA1300	86.73	Bottom of structure	90.10	Approximate edge of pavement	**90.44**	0.34	**90.81**	0.71	**90.91**	0.81	**90.99**	0.89
NA1310	83.30	Bottom of structure	87.94	Approximate edge of pavement	86.04	-	87.53	-	**88.56**	0.62	**88.72**	0.78
NA1320	88.52	Bottom of structure	92.53	Approximate edge of pavement	89.46	-	90.98	-	91.3	-	91.72	-
NA1330	84.72	Bottom of structure	90.29	Approximate edge of pavement	89.4	-	**90.93**	0.64	**91.25**	0.96	**91.66**	1.37
NA1340	85.32	Bottom of structure	89.55	Approximate edge of pavement	89.27	-	**90.9**	1.35	**91.22**	1.67	**91.62**	2.07
NA1350	84.62	Bottom of structure	90.45	Approximate edge of pavement	88.51	-	**90.56**	0.11	**91.16**	0.71	**91.56**	1.11
NA1360	82.50	Bottom of structure	89.84	Approximate edge of pavement	87.3	-	88.95	-	**90.1**	0.26	**90.73**	0.89
NA1370	82.50	Bottom of structure	88.96	Approximate edge of pavement	86.1	-	87.4	-	88.24	-	**90.03**	1.07
NA1380	82.50	Bottom of structure	89.60	Approximate edge of pavement	85.24	-	86.28	-	86.75	-	87.77	-

APPENDIX D - FIC #2 – Lake Mendsen: Pump Station and Lake Expansion Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1390	82.04	Bottom of structure	89.38	Approximate edge of pavement	84.79	-	85.69	-	85.99	-	86.62	-
NA1400	86.52	Bottom of structure	92.24	Approximate edge of pavement	89.56	-	91.28	-	91.74	-	**92.35**	0.11
NA1410	84.72	Bottom of structure	90.35	Approximate edge of pavement	89.41	-	**90.94**	0.59	**91.26**	0.91	**91.68**	1.33
NA1420	81.52	Bottom of structure	89.36	Approximate edge of pavement	87.49	-	**90.34**	0.98	**91.19**	1.83	**91.62**	2.26
NA1430	81.13	Bottom of structure	90.79	Approximate edge of pavement	86.53	-	88.78	-	89.59	-	**91.35**	0.56
NA1440	81.13	Bottom of structure	90.11	Approximate edge of pavement	86.01	-	88.02	-	88.8	-	**90.58**	0.47
NA1450	81.13	Bottom of structure	88.88	Approximate edge of pavement	85.67	-	87.53	-	88.33	-	**89.94**	1.06
NA1460	81.13	Bottom of structure	89.61	Approximate edge of pavement	85.28	-	86.84	-	87.55	-	89.12	-
NA1470	81.13	Bottom of structure	90.19	Approximate edge of pavement	84.88	-	86.1	-	86.7	-	88.04	-
NA1480	81.13	Bottom of structure	89.23	Approximate edge of pavement	84.85	-	85.95	-	86.44	-	87.43	-
NA1490	82.72	Bottom of structure	87.50	Approximate edge of pavement	85.98	-	**87.94**	0.44	**88.2**	0.70	**88.53**	1.03
NA1500	83.44	Bottom of structure	87.27	Approximate edge of pavement	84.2	-	86.23	-	**87.41**	0.14	**88.11**	0.84
NA1510	81.14	Lake Mendsen NHWE	85.25	Approximate edge of pavement	84.13	-	**86.13**	0.88	**87.33**	2.08	**88.07**	2.82
NA1520	82.42	Bottom of structure	86.11	Approximate edge of pavement	84.16	-	**86.45**	0.34	**87.32**	1.21	**88.04**	1.93
NA1530	81.14	Lake Mendsen NHWE	86.90	Approximate edge of pavement	84.09	-	86.02	-	**86.94**	0.04	**87.7**	0.80
NA1540	81.14	Lake Mendsen NHWE	85.15	Approximate edge of pavement	84.17	-	**86.16**	1.01	**87.36**	2.21	**88.09**	2.94
NA1550	90.36	Bottom of structure	94.47	Approximate edge of pavement	92	-	93.68	-	**94.5**	0.03	**94.87**	0.40
NA1560	89.67	Bottom of structure	94.46	Approximate edge of pavement	90.89	-	91.33	-	91.52	-	91.64	-
NA1570	87.27	Bottom of structure	91.49	Approximate edge of pavement	88.41	-	88.82	-	89.61	-	**91.61**	0.12
NA1580	84.57	Bottom of structure	89.81	Approximate edge of pavement	86.39	-	87	-	87.84	-	89.36	-
NA1590	82.97	Bottom of structure	91.69	Approximate edge of pavement	88.51	-	88.79	-	89.02	-	89.46	-
NA1600	82.97	Bottom of structure	87.71	Approximate edge of pavement	84.2	-	86.27	-	86.97	-	**87.72**	0.01
NA1610	81.80	Bottom of structure	85.34	Approximate edge of pavement	84.17	-	**86.19**	0.85	**86.93**	1.59	**87.67**	2.33
NA1620	90.03	Bottom of structure	92.24	Approximate edge of pavement	90.03	-	90.03	-	90.03	-	91.6	-
NA1630	81.92	Bottom of structure	84.78	Approximate edge of pavement	**85.05**	0.27	**85.98**	1.20	**86.8**	2.02	**87.51**	2.73
NA1640	81.54	Bottom of structure	87.01	Approximate edge of pavement	84.53	-	85.96	-	86.53	-	**87.47**	0.46
NA1650	80.90	Bottom of structure	85.58	Approximate edge of pavement	83.75	-	**85.94**	0.36	**86.32**	0.74	**87.44**	1.86
NA1660	82.04	Lake Killarney tailwater	85.25	Approximate edge of pavement	82.67	-	83.41	-	83.71	-	84.42	-
NA1670	84.22	Bottom of structure	92.63	Approximate edge of pavement	88.97	-	91.52	-	92.15	-	**92.8**	0.17
NA1680	83.52	Bottom of structure	90.33	Approximate edge of pavement	88.39	-	90.28	-	**90.47**	0.14	**90.57**	0.24
NA1690	82.52	Bottom of structure	89.14	Approximate edge of pavement	87.94	-	**89.33**	0.19	**89.43**	0.29	**89.54**	0.40
NA1700	82.04	Bottom of structure	88.40	Approximate edge of pavement	87.53	-	**89.15**	0.75	**89.26**	0.86	**89.39**	0.99
NA1710	82.04	Bottom of structure	89.18	Approximate edge of pavement	86.69	-	88.05	-	88.26	-	88.62	-
NA1720	82.04	Bottom of structure	89.94	Approximate edge of pavement	85.46	-	86.4	-	86.69	-	87.21	-
NA1730	82.04	Bottom of structure	89.12	Approximate edge of pavement	84.88	-	85.8	-	86.1	-	86.71	-
NA1740	81.14	Bottom of structure	90.16	Approximate edge of pavement	83.92	-	85.55	-	86.57	-	87.75	-
NA1750	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	83.92	-	85.65	-	**86.81**	1.15	**87.64**	1.98
NA1760	81.13	Lake Mendsen NHWE	85.45	Approximate edge of pavement	84.1	-	**85.96**	0.51	**86.85**	1.40	**87.66**	2.21
NA1790	82.93	Bottom of structure	88.04	Approximate edge of pavement	85.81	-	87.59	-	**88.41**	0.37	**88.65**	0.61
NA1800	76.40	Bottom of structure	88.11	Approximate edge of pavement	78.24	-	78.39	-	78.48	-	78.68	-
NA1810	77.43	Bottom of structure	86.98	Approximate edge of pavement	79.6	-	79.79	-	79.94	-	80.24	-
NA1820	70.50	Bottom of dry pond	78.99	Bank overtopping	78.19	-	78.32	-	78.41	-	78.54	-
NA1830	67.20	9th Grade Pond Control Elevation	77.76	Bank overtopping	71.35	-	72.05	-	72.25	-	72.6	-
NA1840	67.20	Bottom of structure	77.60	Approximate edge of pavement	71.97	-	73.16	-	73.53	-	74.15	-
NA1850	67.20	Lake Virginia tailwater	70.48	Approximate edge of pavement	69.13	-	**70.63**	0.15	**70.92**	0.44	**71.28**	0.80
NA1860	77.47	Bottom of structure	86.40	Approximate edge of pavement	82.44	-	84.09	-	84.52	-	84.79	-
NA1870	87.63	Bottom of structure	92.36	Approximate edge of pavement	89.54	-	91.81	-	92.33	-	**92.59**	0.23

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APPENDIX D - FIC #2 – Lake Mendsen: Pump Station and Lake Expansion Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1880	85.16	Bottom of structure	92.62	Approximate edge of pavement	86.67	-	89.85	-	90.88	-	92.04	-
NA1890	92.07	Bottom of structure	94.36	Approximate edge of pavement	92.38	-	92.47	-	92.53	-	92.75	-
NA1900	86.29	Lake Francis Control Elevation	89.99	Bank overtopping	**91.82**	1.83	**92.21**	2.22	**92.38**	2.39	**92.6**	2.61
NA1910	87.03	Lee Road pond control elevation	90.58	Bank overtopping	**91.8**	1.22	**92.2**	1.62	**92.37**	1.79	**92.61**	2.03
NA1970	86.00	Bottom of dry pond	94.89	Bank overtopping	92.32	-	92.79	-	93.24	-	94.57	-
NA1980	89.70	Bottom of structure	95.10	Approximate edge of pavement	92.37	-	92.86	-	93.31	-	94.64	-
NA1990	86.66	Bottom of structure	90.12	Approximate edge of pavement	87.9	-	88.29	-	88.62	-	**90.29**	0.17
NA2000	87.47	Bottom of structure	92.54	Approximate edge of pavement	90.11	-	90.88	-	91.52	-	**93.02**	0.48
NA2010	77.85	Bottom of structure	82.90	Approximate edge of pavement	82.83	-	**83.36**	0.46	**83.44**	0.54	**83.55**	0.65
NA2020	79.52	Bottom of structure	88.37	Approximate edge of pavement	82.5	-	84.15	-	84.59	-	84.93	-
NA2030	87.08	Bottom of structure	92.37	Approximate edge of pavement	90.15	-	90.84	-	91.42	-	91.5	-
NA2100	80.70	Bottom of structure	85.92	Approximate edge of pavement	83.97	-	85.9	-	**86.79**	0.87	**87.58**	1.66
NA2110	82.19	Bottom of structure	81.74	Approximate edge of pavement	**83.86**	2.12	**85.78**	4.04	**86.67**	4.93	**87.46**	5.72
NA2120	90.41	Bottom of structure	90.89	Approximate edge of pavement	**91.86**	0.97	**92.27**	1.38	**92.44**	1.55	**92.66**	1.77
NB0005	88.75	Approximate water surface elevation	91.82	Finished Floor Elevation	88.92	-	89.42	-	90.14	-	91.43	-
NB0010	81.87	Botom of structure	89.15	Approximate edge of pavement	85	-	86.38	-	87.15	-	88.65	-
NB0020	82.31	Botom of structure	90.36	Approximate edge of pavement	86.59	-	88.48	-	88.89	-	**91.05**	0.69
NB0030	86.97	Approximate water surface elevation	92.39	Finished floor elevation	88.7	-	89.31	-	90.07	-	91.38	-
NB0040	82.50	Pond control structure	89.07	Bank overtopping	85.19	-	85.23	-	85.26	-	85.32	-
NB0050	83.14	Pond control structure	85.33	Bank overtopping	84.62	-	85.02	-	85.21	-	**85.42**	0.09
NB0060	82.04	Bottom of structure	90.41	Approximate edge of pavement	82.97	-	84.24	-	85.42	-	87.38	-
NB0070	86.01	Pond control structure	88.50	Bank overtopping	88.45	-	**88.52**	0.02	**88.57**	0.07	**88.61**	0.11
NB0080	82.04	Bottom of structure	91.31	Approximate edge of pavement	83.3	-	84.54	-	85.87	-	88.24	-

APPENDIX E

FIC #4 – Lake Bell: Connection to Park Lake Model Results

APPENDIX E - FIC #4 – Lake Bell: Connection to Park Lake Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
LAKE_KILLARNEY	82.04	Control Elevation	84.40	Finished floor elevation	82.54	-	83.08	-	83.41	-	83.9	-
LAKE_MENDSEN	81.14	Normal high water elevation	84.82	Approximate edge of pavement	84.06	-	85.98	1.16	86.87	2.05	87.7	2.88
LAKE_ROSE	83.30	Approximate water surface elevation	91.01	Bank overtopping	83.89	-	85.97	-	86.8	-	84.76	-
NA0010	72.14	Bottom of structure	78.79	Approximate edge of pavement	77.96	-	79.49	0.70	79.77	0.98	80.07	1.28
NA0020	72.87	Bottom of structure	83.54	Approximate edge of pavement	79.41	-	82.1	-	82.5	-	82.82	-
NA0030	76.82	Bottom of structure	86.32	Approximate edge of pavement	79.79	-	83.07	-	84.42	-	86.38	0.06
NA0040	82.00	Bottom of structure	89.63	Approximate edge of pavement	83.88	-	84.48	-	86.22	-	89.8	0.17
NA0050	85.66	Bottom of structure	91.51	Approximate edge of pavement	87.82	-	88.23	-	88.67	-	91.19	-
NA0060	88.12	Bottom of structure	92.97	Approximate edge of pavement	88.6	-	88.82	-	89.26	-	92.9	-
NA0070	85.52	Bottom of structure	90.82	Approximate edge of pavement	85.93	-	86.02	-	86.29	-	89.85	-
NA0080	76.22	Bottom of structure	82.01	Approximate edge of pavement	79.68	-	82.39	0.38	82.57	0.56	82.74	0.73
NA0090	78.51	Bottom of structure	85.83	Approximate edge of pavement	84.4	-	85.22	-	85.33	-	85.44	-
NA0100	80.27	Bottom of structure	83.79	Approximate edge of pavement	84.84	1.05	85.3	1.51	85.39	1.60	85.48	1.69
NA0110	81.13	Bottom of structure	84.29	Approximate edge of pavement	85.17	0.88	85.36	1.07	85.44	1.15	85.52	1.23
NA0120	82.90	Bottom of structure	91.22	Approximate edge of pavement	84.16	-	84.39	-	85.54	-	86.98	-
NA0130	77.12	Bottom of structure	88.40	Approximate edge of pavement	80.94	-	83.94	-	85.61	-	87.16	-
NA0140	81.42	Bottom of structure	85.91	Approximate edge of pavement	82.89	-	86.3	0.39	86.72	0.81	87.34	1.43
NA0150	76.23	Bottom of structure	86.30	Approximate edge of pavement	79.77	-	81.53	-	82.41	-	83.23	-
NA0160	80.32	Bottom of structure	88.35	Approximate edge of pavement	84.78	-	85.2	-	85.5	-	85.93	-
NA0170	79.47	Bottom of structure	90.12	Approximate edge of pavement	83.99	-	84.43	-	84.63	-	84.95	-
NA0180	71.31	Bottom of structure	87.26	Approximate edge of pavement	74.6	-	75.03	-	75.23	-	75.56	-
NA0190	80.82	Bottom of structure	89.89	Approximate edge of pavement	85.22	-	85.64	-	85.98	-	86.48	-
NA0200	81.52	Bottom of structure	85.45	Approximate edge of pavement	85.93	0.48	86.34	0.89	86.75	1.30	87.36	1.91
NA0210	80.80	Bottom of structure	88.76	Approximate edge of pavement	83.19	-	84.03	-	85.04	-	86.61	-
NA0220	86.72	Bottom of structure	90.75	Approximate edge of pavement	89	-	90.52	-	90.86	0.11	91.12	0.37
NA0230	91.44	Bottom of structure	96.15	Approximate edge of pavement	92.44	-	92.99	-	93.29	-	93.82	-
NA0240	88.61	Bottom of structure	93.98	Approximate edge of pavement	92.4	-	92.95	-	93.24	-	93.77	-
NA0250	87.54	Bottom of structure	92.19	Approximate edge of pavement	92.31	0.12	92.7	0.51	92.81	0.62	92.92	0.73
NA0260	86.29	Bottom of structure	91.93	Approximate edge of pavement	89.35	-	90.32	-	91.78	-	92.07	0.14
NA0270	85.32	Bottom of structure	90.61	Approximate edge of pavement	87.95	-	88.92	-	89.96	-	91.79	1.18
NA0280	82.32	Bottom of structure	91.56	Approximate edge of pavement	85.28	-	86.42	-	88	-	90.95	-
NA0290	75.96	Bottom of structure	89.24	Approximate edge of pavement	85.82	-	86.81	-	87.05	-	87.28	-
NA0300	81.61	Bottom of structure	88.92	Approximate edge of pavement	85.82	-	86.54	-	86.76	-	87.21	-
NA0310	83.67	Bottom of structure	86.50	Approximate edge of pavement	86.06	-	86.5	0.00	86.76	0.26	87.35	0.85
NA0320	83.58	Bottom of structure	88.77	Approximate edge of pavement	85.64	-	86.38	-	86.59	-	87.08	-
NA0330	83.24	Bottom of structure	86.37	Approximate edge of pavement	86.37	0.00	86.64	0.27	86.84	0.47	87.41	1.04
NA0340	81.46	Bottom of structure	85.60	Approximate edge of pavement	85.96	0.36	86.37	0.77	86.77	1.17	87.38	1.78
NA0350	78.17	Bottom of structure	87.25	Approximate edge of pavement	85.93	-	86.93	-	87.18	-	87.4	0.15
NA0360	88.33	Bottom of structure	94.12	Approximate edge of pavement	89.3	-	91.29	-	91.38	-	91.59	-
NA0370	86.22	Bottom of structure	91.16	Approximate edge of pavement	89.22	-	91.21	0.05	91.26	0.10	91.32	0.16
NA0380	84.62	Bottom of structure	88.11	Approximate edge of pavement	86.01	-	87.19	-	87.58	-	88.02	-
NA0390	77.48	Bottom of structure	87.47	Approximate edge of pavement	85.87	-	86.86	-	87.1	-	87.32	-
NA0400	87.42	Bottom of structure	91.46	Approximate edge of pavement	88.36	-	89	-	89.59	-	90.82	-
NA0410	85.24	Bottom of structure	87.80	Approximate edge of pavement	88.28	0.48	88.78	0.98	89.04	1.24	89.19	1.39
NA0420	82.03	Bottom of structure	89.00	Approximate edge of pavement	85.99	-	87.34	-	87.93	-	88.69	-
NA0430	82.26	Bottom of structure	88.32	Approximate edge of pavement	86.01	-	87.29	-	87.86	-	88.62	0.30
NA0440	81.27	Bottom of structure	89.46	Approximate edge of pavement	85.89	-	87.31	-	87.98	-	88.75	-

Geosyntec consultants

APPENDIX E - FIC #4 – Lake Bell: Connection to Park Lake Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0450	80.02	Bottom of structure	88.29	Approximate edge of pavement	84.37	-	85.92	-	86.94	-	87.91	-
NA0460	82.60	Bottom of structure	88.09	Approximate edge of pavement	86.06	-	86.64	-	86.81	-	87.14	-
NA0470	79.57	Bottom of structure	85.32	Approximate edge of pavement	**86.01**	0.69	**86.57**	1.25	**86.7**	1.38	**86.81**	1.49
NA0480	80.26	Bottom of structure	86.75	Approximate edge of pavement	85.91	-	86.67	-	**86.8**	0.05	**86.88**	0.13
NA0490	81.66	Bottom of structure	86.12	Approximate edge of pavement	85.05	-	**86.5**	0.38	**86.65**	0.53	**86.75**	0.63
NA0500	78.02	Bottom of structure	84.24	Approximate edge of pavement	82.93	-	**84.61**	0.37	**84.94**	0.70	**85.14**	0.90
NA0510	79.52	Bottom of structure	84.82	Approximate edge of pavement	83.55	-	**85.32**	0.50	**85.51**	0.69	**85.72**	0.90
NA0520	81.44	Bottom of structure	85.49	Approximate edge of pavement	84.03	-	**85.97**	0.48	**86.14**	0.65	**86.27**	0.78
NA0530	83.62	Bottom of structure	88.82	Approximate edge of pavement	86.07	-	86.99	-	87.67	-	**88.92**	0.10
NA0540	85.97	Bottom of structure	90.45	Approximate edge of pavement	87.62	-	88.5	-	89.9	-	**90.84**	0.39
NA0550	87.66	Bottom of structure	91.28	Approximate edge of pavement	89.07	-	90.15	-	**91.5**	0.22	**91.68**	0.40
NA0560	87.18	Bottom of structure	91.56	Approximate edge of pavement	88.69	-	89.32	-	90.46	-	**92.02**	0.46
NA0570	85.65	Bottom of structure	91.06	Approximate edge of pavement	87.92	-	88.45	-	89.02	-	**91.35**	0.29
NA0580	92.68	Bottom of structure	96.76	Approximate edge of pavement	93	-	93.1	-	93.18	-	93.34	-
NA0590	89.02	Bottom of structure	93.58	Approximate edge of pavement	90.15	-	90.76	-	91.02	-	92.76	-
NA0600	85.05	Bottom of structure	90.93	Approximate edge of pavement	87.01	-	87.89	-	89.69	-	**91.37**	0.44
NA0610	83.91	Bottom of structure	89.93	Approximate edge of pavement	85.99	-	87.5	-	89.02	-	**90.7**	0.77
NA0620	83.12	Bottom of structure	90.59	Approximate edge of pavement	85.32	-	87.3	-	88.65	-	90.15	-
NA0630	85.42	Bottom of structure	90.77	Approximate edge of pavement	86.51	-	87.37	-	88.75	-	90.39	-
NA0640	91.02	Bottom of structure	95.50	Approximate edge of pavement	91.37	-	91.47	-	91.63	-	94.82	-
NA0650	90.02	Bottom of structure	94.83	Approximate edge of pavement	90.92	-	91.23	-	91.5	-	94.73	-
NA0660	90.23	Bottom of structure	94.85	Approximate edge of pavement	91.46	-	92.21	-	93.03	-	94.47	-
NA0670	92.30	Bottom of structure	97.97	Approximate edge of pavement	93.54	-	96.36	-	**98.52**	0.55	**98.61**	0.64
NA0680	90.33	Bottom of structure	96.79	Approximate edge of pavement	91.66	-	93.81	-	96.54	-	**97.22**	0.43
NA0690	88.62	Bottom of structure	94.25	Approximate edge of pavement	90.38	-	92.57	-	**94.5**	0.25	**94.6**	0.35
NA0700	86.32	Bottom of structure	91.79	Approximate edge of pavement	87.87	-	89.09	-	90.75	-	**91.96**	0.17
NA0710	84.94	Bottom of structure	90.28	Approximate edge of pavement	87.23	-	88.71	-	90.15	-	**90.59**	0.31
NA0720	83.55	Bottom of structure	89.40	Approximate edge of pavement	85.2	-	87.04	-	88.06	-	88.86	-
NA0730	82.98	Bottom of structure	88.88	Approximate edge of pavement	85.02	-	86.86	-	87.82	-	88.47	-
NA0740	81.14	Lake Mendsen NHWE	88.51	Approximate edge of pavement	84.26	-	86.78	-	87.67	-	88.29	-
NA0750	81.14	Lake Mendsen NHWE	89.42	Approximate edge of pavement	84.27	-	87.06	-	88.2	-	89.41	-
NA0760	81.14	Lake Mendsen NHWE	87.92	Approximate edge of pavement	84.23	-	86.68	-	87.51	-	**88.13**	0.21
NA0770	81.14	Lake Mendsen NHWE	87.19	Approximate edge of pavement	84.2	-	86.42	-	87.05	-	**87.75**	0.56
NA0780	81.14	Lake Mendsen NHWE	84.82	Approximate edge of pavement	84.17	-	**86.18**	1.36	**86.89**	2.07	**87.65**	2.83
NA0790	85.72	Bottom of structure	89.36	Approximate edge of pavement	87.3	-	88.81	-	**90.22**	0.86	**90.49**	1.13
NA0800	82.98	Bottom of structure	87.39	Approximate edge of pavement	85.06	-	86.91	-	**87.9**	0.51	**88.5**	1.11
NA0810	81.14	Bottom of structure	87.43	Approximate edge of pavement	84.28	-	86.84	-	**87.62**	0.19	**88**	0.57
NA0820	84.16	Bottom of structure	92.65	Approximate edge of pavement	86.61	-	89.77	-	90.81	-	91.98	-
NA0830	84.16	Bottom of structure	91.73	Approximate edge of pavement	86.53	-	89.6	-	90.63	-	91.53	-
NA0840	82.97	Bottom of structure	89.94	Approximate edge of pavement	85.35	-	88.12	-	89.13	-	**90.09**	0.15
NA0850	81.14	Lake Mendsen NHWE	86.88	Approximate edge of pavement	84.26	-	**87.24**	0.36	**88.15**	1.27	**88.55**	1.67
NA0860	81.14	Lake Mendsen NHWE	87.59	Approximate edge of pavement	84.23	-	86.86	-	**87.9**	0.31	**88.44**	0.85
NA0870	81.14	Lake Mendsen NHWE	86.66	Approximate edge of pavement	84.2	-	86.42	-	**87.53**	0.87	**87.95**	1.29
NA0880	81.14	Lake Mendsen NHWE	87.14	Approximate edge of pavement	84.16	-	86.11	-	**87.16**	0.02	**87.77**	0.63
NA0890	81.14	Lake Mendsen NHWE	86.19	Approximate edge of pavement	84.13	-	86.06	-	**86.97**	0.78	**87.74**	1.55
NA0900	81.14	Lake Mendsen NHWE	85.06	Approximate edge of pavement	84.09	-	**86.02**	0.96	**86.92**	1.86	**87.72**	2.66
NA0910	85.88	Bottom of structure	91.89	Approximate edge of pavement	87.49	-	87.89	-	88.17	-	88.82	-

APPENDIX E - FIC #4 – Lake Bell: Connection to Park Lake Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0920	81.29	Bottom of structure	87.69	Approximate edge of pavement	84.19	-	86.07	-	87	-	**87.87**	0.18
NA0930	81.14	Lake Mendsen NHWE	86.09	Approximate edge of pavement	84.15	-	86.03	-	**86.92**	0.83	**87.71**	1.62
NA0940	81.14	Lake Mendsen NHWE	84.77	Approximate edge of pavement	84.13	-	**86**	1.23	**86.9**	2.13	**87.69**	2.92
NA0950	81.14	Lake Mendsen NHWE	84.84	Approximate edge of pavement	84.09	-	**85.99**	1.15	**86.88**	2.04	**87.7**	2.86
NA0960	81.14	Lake Mendsen NHWE	85.58	Approximate edge of pavement	84.19	-	**86.21**	0.63	**86.85**	1.27	**87.6**	2.02
NA0970	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	84.14	-	**86.07**	0.41	**86.89**	1.23	**87.68**	2.02
NA0980	81.14	Lake Mendsen NHWE	84.95	Approximate edge of pavement	84.09	-	**86.02**	1.07	**86.88**	1.93	**87.69**	2.74
NA0990	87.41	Bottom of structure	90.80	Approximate edge of pavement	88.27	-	88.54	-	88.76	-	89.54	-
NA1000	82.94	Bottom of structure	87.49	Approximate edge of pavement	84.5	-	86.17	-	87.3	-	**88.21**	0.72
NA1010	78.97	Bottom of structure	85.37	Approximate edge of pavement	81.88	-	**85.62**	0.25	**86.28**	0.91	**87.44**	2.07
NA1020	80.47	Bottom of structure	85.47	Approximate edge of pavement	83.12	-	**85.89**	0.42	**86.31**	0.84	**87.46**	1.99
NA1030	77.85	Bottom of structure	85.55	Approximate edge of pavement	81.34	-	84.94	-	**85.61**	0.06	**87.41**	1.86
NA1040	77.76	Bottom of structure	85.24	Approximate edge of pavement	81.19	-	84.75	-	**85.43**	0.19	**87.42**	2.18
NA1050	77.44	Bottom of structure	84.28	Approximate edge of pavement	80.85	-	84.28	-	**84.93**	0.65	**87.4**	3.12
NA1060	76.61	Bottom of structure	83.43	Approximate edge of pavement	80.7	-	**84**	0.57	**84.78**	1.35	**87.39**	3.96
NA1070	75.87	Bottom of structure	89.34	Approximate edge of pavement	80.4	-	83.4	-	84.1	-	85.68	-
NA1080	74.25	Bottom of structure	85.11	Approximate edge of pavement	78.97	-	81.02	-	81.47	-	82.24	-
NA1090	73.79	Bottom of structure	76.62	Approximate edge of pavement	**77.73**	1.11	**78.57**	1.95	**78.77**	2.15	**79.1**	2.48
NA1100	77.15	Bottom of structure	83.03	Approximate edge of pavement	78.07	-	79.42	-	83	-	**83.28**	0.25
NA1110	74.23	Bottom of structure	80.07	Approximate edge of pavement	77.24	-	77.6	-	78.76	-	79.23	-
NA1120	73.79	Bottom of structure	76.34	Approximate edge of pavement	**77.17**	0.83	**77.28**	0.94	**77.47**	1.13	**77.81**	1.47
NA1130	78.93	Bottom of structure	83.69	Approximate edge of pavement	81.87	-	**84.34**	0.65	**84.73**	1.04	**85.15**	1.46
NA1140	79.43	Bottom of structure	86.76	Approximate edge of pavement	84.17	-	**87.26**	0.50	**87.53**	0.77	**87.85**	1.09
NA1150	80.96	Bottom of structure	83.93	Approximate edge of pavement	**87.31**	3.38	**88.47**	4.54	**88.67**	4.74	**88.91**	4.98
NA1160	87.02	Bottom of structure	91.63	Approximate edge of pavement	90.04	-	91.59	-	**91.98**	0.35	**92.17**	0.54
NA1170	83.62	Bottom of structure	89.26	Approximate edge of pavement	**89.99**	0.73	**90.34**	1.08	**90.52**	1.26	**90.71**	1.45
NA1180	83.62	Lake Midget control elevation	90.40	Bank overtopping	89.96	-	90.31	-	**90.48**	0.08	**90.67**	0.27
NA1190	83.89	Bottom of structure	88.91	Approximate edge of pavement	**89.94**	1.03	**90.04**	1.13	**90.09**	1.18	**90.16**	1.25
NA1200	83.89	Bottom of structure	91.04	Approximate edge of pavement	89.89	-	89.99	-	90.04	-	90.11	-
NA1210	83.62	Bottom of structure	90.46	Approximate edge of pavement	89.92	-	90.11	-	90.26	-	90.46	-
NA1220	83.62	Bottom of structure	91.71	Approximate edge of pavement	89.96	-	90.23	-	90.43	-	90.68	-
NA1230	83.62	Bottom of structure	90.28	Approximate edge of pavement	89.97	-	**90.3**	0.02	**90.49**	0.21	**90.69**	0.41
NA1240	87.78	Bottom of structure	91.07	Approximate edge of pavement	90.07	-	90.61	-	91.02	-	**91.13**	0.06
NA1250	87.42	Bottom of structure	90.70	Approximate edge of pavement	89.97	-	90.04	-	90.08	-	90.13	-
NA1260	86.18	Bottom of structure	90.64	Approximate edge of pavement	89.87	-	89.97	-	90.01	-	90.08	-
NA1270	85.80	Bottom of structure	89.67	Approximate edge of pavement	**89.94**	0.27	**90.06**	0.39	**90.14**	0.47	**90.22**	0.55
NA1280	85.60	Bottom of structure	90.74	Approximate edge of pavement	89.93	-	90.04	-	90.1	-	90.17	-
NA1290	88.32	Bottom of structure	90.86	Approximate edge of pavement	**91.06**	0.20	**91.19**	0.33	**91.24**	0.38	**91.3**	0.44
NA1300	86.73	Bottom of structure	90.10	Approximate edge of pavement	**90.44**	0.34	**90.81**	0.71	**90.91**	0.81	**90.99**	0.89
NA1310	83.30	Bottom of structure	87.94	Approximate edge of pavement	86.04	-	87.53	-	**88.56**	0.62	**88.72**	0.78
NA1320	88.52	Bottom of structure	92.53	Approximate edge of pavement	89.46	-	90.98	-	91.3	-	91.72	-
NA1330	84.72	Bottom of structure	90.29	Approximate edge of pavement	89.4	-	**90.93**	0.64	**91.25**	0.96	**91.66**	1.37
NA1340	85.32	Bottom of structure	89.55	Approximate edge of pavement	89.27	-	**90.9**	1.35	**91.22**	1.67	**91.62**	2.07
NA1350	84.62	Bottom of structure	90.45	Approximate edge of pavement	88.51	-	**90.56**	0.11	**91.16**	0.71	**91.56**	1.11
NA1360	82.50	Bottom of structure	89.84	Approximate edge of pavement	87.3	-	88.95	-	**90.1**	0.26	**90.73**	0.89
NA1370	82.50	Bottom of structure	88.96	Approximate edge of pavement	86.1	-	87.4	-	88.24	-	**90.04**	1.08
NA1380	82.50	Bottom of structure	89.60	Approximate edge of pavement	85.24	-	86.28	-	86.75	-	87.77	-

Geosyntec consultants

APPENDIX E - FIC #4 – Lake Bell: Connection to Park Lake Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1390	82.04	Bottom of structure	89.38	Approximate edge of pavement	84.79	-	85.69	-	85.99	-	86.61	-
NA1400	86.52	Bottom of structure	92.24	Approximate edge of pavement	89.56	-	91.28	-	91.74	-	**92.35**	0.11
NA1410	84.72	Bottom of structure	90.35	Approximate edge of pavement	89.41	-	**90.94**	0.59	**91.26**	0.91	**91.68**	1.33
NA1420	81.52	Bottom of structure	89.36	Approximate edge of pavement	87.49	-	**90.34**	0.98	**91.19**	1.83	**91.62**	2.26
NA1430	81.13	Bottom of structure	90.79	Approximate edge of pavement	86.53	-	88.78	-	89.59	-	**91.35**	0.56
NA1440	81.13	Bottom of structure	90.11	Approximate edge of pavement	86.01	-	88.02	-	88.8	-	**90.59**	0.48
NA1450	81.13	Bottom of structure	88.88	Approximate edge of pavement	85.67	-	87.53	-	88.33	-	**89.97**	1.09
NA1460	81.13	Bottom of structure	89.61	Approximate edge of pavement	85.28	-	86.84	-	87.55	-	89.16	-
NA1470	81.13	Bottom of structure	90.19	Approximate edge of pavement	84.88	-	86.1	-	86.7	-	88.08	-
NA1480	81.13	Bottom of structure	89.23	Approximate edge of pavement	84.85	-	85.95	-	86.44	-	87.45	-
NA1490	82.72	Bottom of structure	87.50	Approximate edge of pavement	85.98	-	**87.94**	0.44	**88.2**	0.70	**88.53**	1.03
NA1500	83.44	Bottom of structure	87.27	Approximate edge of pavement	84.2	-	86.23	-	**87.41**	0.14	**88.12**	0.85
NA1510	81.14	Lake Mendsen NHWE	85.25	Approximate edge of pavement	84.13	-	**86.13**	0.88	**87.33**	2.08	**88.08**	2.83
NA1520	82.42	Bottom of structure	86.11	Approximate edge of pavement	84.16	-	**86.45**	0.34	**87.32**	1.21	**88.05**	1.94
NA1530	81.14	Lake Mendsen NHWE	86.90	Approximate edge of pavement	84.09	-	86.02	-	**86.94**	0.04	**87.74**	0.84
NA1540	81.14	Lake Mendsen NHWE	85.15	Approximate edge of pavement	84.17	-	**86.16**	1.01	**87.36**	2.21	**88.1**	2.95
NA1550	90.36	Bottom of structure	94.47	Approximate edge of pavement	92	-	93.68	-	**94.5**	0.03	**94.87**	0.40
NA1560	89.67	Bottom of structure	94.46	Approximate edge of pavement	90.89	-	91.33	-	91.52	-	91.64	-
NA1570	87.27	Bottom of structure	91.49	Approximate edge of pavement	88.41	-	88.82	-	89.61	-	**91.61**	0.12
NA1580	84.57	Bottom of structure	89.81	Approximate edge of pavement	86.39	-	87	-	87.84	-	89.36	-
NA1590	82.97	Bottom of structure	91.69	Approximate edge of pavement	88.51	-	88.79	-	89.02	-	89.46	-
NA1600	82.97	Bottom of structure	87.71	Approximate edge of pavement	84.2	-	86.27	-	86.97	-	**87.76**	0.05
NA1610	81.80	Bottom of structure	85.34	Approximate edge of pavement	84.17	-	**86.19**	0.85	**86.93**	1.59	**87.72**	2.38
NA1620	90.03	Bottom of structure	92.24	Approximate edge of pavement	90.03	-	90.03	-	90.03	-	91.6	-
NA1630	81.92	Bottom of structure	84.78	Approximate edge of pavement	**85.05**	0.27	**85.98**	1.20	**86.8**	2.02	**87.56**	2.78
NA1640	81.54	Bottom of structure	87.01	Approximate edge of pavement	84.53	-	85.96	-	86.53	-	**87.52**	0.51
NA1650	80.90	Bottom of structure	85.58	Approximate edge of pavement	83.75	-	**85.94**	0.36	**86.32**	0.74	**87.49**	1.91
NA1660	82.04	Lake Killarney tailwater	85.25	Approximate edge of pavement	82.67	-	83.41	-	83.71	-	84.37	-
NA1670	84.22	Bottom of structure	92.63	Approximate edge of pavement	88.97	-	91.52	-	92.15	-	**92.8**	0.17
NA1680	83.52	Bottom of structure	90.33	Approximate edge of pavement	88.39	-	90.28	-	**90.47**	0.14	**90.57**	0.24
NA1690	82.52	Bottom of structure	89.14	Approximate edge of pavement	87.94	-	**89.33**	0.19	**89.43**	0.29	**89.54**	0.40
NA1700	82.04	Bottom of structure	88.40	Approximate edge of pavement	87.53	-	**89.15**	0.75	**89.26**	0.86	**89.39**	0.99
NA1710	82.04	Bottom of structure	89.18	Approximate edge of pavement	86.69	-	88.05	-	88.26	-	88.61	-
NA1720	82.04	Bottom of structure	89.94	Approximate edge of pavement	85.46	-	86.4	-	86.69	-	87.2	-
NA1730	82.04	Bottom of structure	89.12	Approximate edge of pavement	84.88	-	85.8	-	86.1	-	86.7	-
NA1740	81.14	Bottom of structure	90.16	Approximate edge of pavement	83.92	-	85.55	-	86.57	-	87.8	-
NA1750	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	83.92	-	85.65	-	**86.81**	1.15	**87.68**	2.02
NA1760	81.13	Lake Mendsen NHWE	85.45	Approximate edge of pavement	84.1	-	**85.96**	0.51	**86.85**	1.40	**87.71**	2.26
NA1790	82.93	Bottom of structure	88.04	Approximate edge of pavement	85.81	-	87.59	-	**88.41**	0.37	**88.66**	0.62
NA1800	76.40	Bottom of structure	88.11	Approximate edge of pavement	78.24	-	78.39	-	78.48	-	78.68	-
NA1810	77.43	Bottom of structure	86.98	Approximate edge of pavement	79.6	-	79.79	-	79.94	-	80.24	-
NA1820	70.50	Bottom of dry pond	78.99	Bank overtopping	78.19	-	78.32	-	78.41	-	78.54	-
NA1830	67.20	9th Grade Pond Control Elevation	77.76	Bank overtopping	71.35	-	72.05	-	72.25	-	72.6	-
NA1840	67.20	Bottom of structure	77.60	Approximate edge of pavement	71.97	-	73.16	-	73.53	-	74.16	-
NA1850	67.20	Lake Virginia tailwater	70.48	Approximate edge of pavement	69.13	-	**70.63**	0.15	**70.92**	0.44	**71.28**	0.80
NA1860	77.47	Bottom of structure	86.40	Approximate edge of pavement	82.44	-	84.09	-	84.52	-	84.79	-
NA1870	87.63	Bottom of structure	92.36	Approximate edge of pavement	89.54	-	91.81	-	92.33	-	**92.59**	0.23

APPENDIX E - FIC #4 – Lake Bell: Connection to Park Lake Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1880	85.16	Bottom of structure	92.62	Approximate edge of pavement	86.67	-	89.85	-	90.88	-	92.04	-
NA1890	92.07	Bottom of structure	94.36	Approximate edge of pavement	92.38	-	92.47	-	92.53	-	92.75	-
NA1900	86.29	Lake Francis Control Elevation	89.99	Bank overtopping	**91.82**	1.83	**92.21**	2.22	**92.38**	2.39	**92.6**	2.61
NA1910	87.03	Lee Road pond control elevation	90.58	Bank overtopping	**91.8**	1.22	**92.2**	1.62	**92.37**	1.79	**92.61**	2.03
NA1970	86.00	Bottom of dry pond	94.89	Bank overtopping	92.32	-	92.79	-	93.24	-	94.58	-
NA1980	89.70	Bottom of structure	95.10	Approximate edge of pavement	92.37	-	92.86	-	93.31	-	94.64	-
NA1990	86.66	Bottom of structure	90.12	Approximate edge of pavement	87.9	-	88.29	-	88.62	-	**90.29**	0.17
NA2000	87.47	Bottom of structure	92.54	Approximate edge of pavement	90.11	-	90.88	-	91.52	-	**93.02**	0.48
NA2010	77.85	Bottom of structure	82.90	Approximate edge of pavement	82.83	-	**83.36**	0.46	**83.44**	0.54	**83.55**	0.65
NA2020	79.52	Bottom of structure	88.37	Approximate edge of pavement	82.5	-	84.15	-	84.59	-	84.93	-
NA2030	87.08	Bottom of structure	92.37	Approximate edge of pavement	90.15	-	90.84	-	91.42	-	91.5	-
NA2100	80.70	Bottom of structure	85.92	Approximate edge of pavement	83.97	-	85.9	-	**86.79**	0.87	**87.62**	1.70
NA2110	82.19	Bottom of structure	81.74	Approximate edge of pavement	**83.86**	2.12	**85.78**	4.04	**86.67**	4.93	**87.5**	5.76
NA2120	90.41	Bottom of structure	90.89	Approximate edge of pavement	**91.86**	0.97	**92.27**	1.38	**92.44**	1.55	**92.66**	1.77
NB0005	88.75	Approximate water surface elevation	91.82	Finished Floor Elevation	88.92	-	89.42	-	90.14	-	90.72	-
NB0010	81.87	Botom of structure	89.15	Approximate edge of pavement	85	-	86.38	-	87.15	-	88.57	-
NB0020	82.31	Botom of structure	90.36	Approximate edge of pavement	86.59	-	88.48	-	88.89	-	89.7	-
NB0030	86.97	Approximate water surface elevation	92.39	Finished floor elevation	88.7	-	89.31	-	90.07	-	90.66	-
NB0040	82.50	Pond control structure	89.07	Bank overtopping	85.19	-	85.23	-	85.26	-	85.32	-
NB0050	83.14	Pond control structure	85.33	Bank overtopping	84.62	-	85.02	-	85.21	-	**85.42**	0.09
NB0060	82.04	Bottom of structure	90.41	Approximate edge of pavement	82.97	-	84.24	-	85.42	-	87.32	-
NB0070	86.01	Pond control structure	88.50	Bank overtopping	88.45	-	**88.52**	0.02	**88.57**	0.07	**88.61**	0.11
NB0080	82.04	Bottom of structure	91.31	Approximate edge of pavement	83.3	-	84.54	-	85.87	-	88.18	-

APPENDIX F

FIC #5 – Lake Bell: Reduced Inflows from FDOT Pond Model Results

Geosyntec consultants

APPENDIX F - FIC #5 – Lake Bell: Reduced Inflows from FDOT Pond Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
LAKE_KILLARNEY	82.04	Control Elevation	84.40	Finished floor elevation	82.54	-	83.08	-	83.41	-	83.95	-
LAKE_MENDSEN	81.14	Normal high water elevation	84.82	Approximate edge of pavement	84.06	-	**85.98**	1.16	**86.87**	2.05	**87.7**	2.88
LAKE_ROSE	83.30	Approximate water surface elevation	91.01	Bank overtopping	83.89	-	85.97	-	86.8	-	84.76	-
NA0010	72.14	Bottom of structure	78.79	Approximate edge of pavement	77.96	-	**79.49**	0.70	**79.77**	0.98	**80.07**	1.28
NA0020	72.87	Bottom of structure	83.54	Approximate edge of pavement	79.41	-	82.1	-	82.5	-	82.82	-
NA0030	76.82	Bottom of structure	86.32	Approximate edge of pavement	79.79	-	83.07	-	84.42	-	**86.38**	0.06
NA0040	82.00	Bottom of structure	89.63	Approximate edge of pavement	83.88	-	84.48	-	86.22	-	**89.8**	0.17
NA0050	85.66	Bottom of structure	91.51	Approximate edge of pavement	87.82	-	88.23	-	88.67	-	91.19	-
NA0060	88.12	Bottom of structure	92.97	Approximate edge of pavement	88.6	-	88.82	-	89.26	-	92.9	-
NA0070	85.52	Bottom of structure	90.82	Approximate edge of pavement	85.93	-	86.02	-	86.29	-	89.85	-
NA0080	76.22	Bottom of structure	82.01	Approximate edge of pavement	79.68	-	**82.39**	0.38	**82.57**	0.56	**82.74**	0.73
NA0090	78.51	Bottom of structure	85.83	Approximate edge of pavement	84.4	-	85.22	-	85.33	-	85.44	-
NA0100	80.27	Bottom of structure	83.79	Approximate edge of pavement	**84.84**	1.05	**85.3**	1.51	**85.39**	1.60	**85.48**	1.69
NA0110	81.13	Bottom of structure	84.29	Approximate edge of pavement	**85.17**	0.88	**85.36**	1.07	**85.44**	1.15	**85.52**	1.23
NA0120	82.90	Bottom of structure	91.22	Approximate edge of pavement	84.16	-	84.39	-	85.54	-	86.98	-
NA0130	77.12	Bottom of structure	88.40	Approximate edge of pavement	80.94	-	83.94	-	85.61	-	87.16	-
NA0140	81.42	Bottom of structure	85.91	Approximate edge of pavement	82.89	-	**86.3**	0.39	**86.72**	0.81	**87.34**	1.43
NA0150	76.23	Bottom of structure	86.30	Approximate edge of pavement	79.77	-	81.53	-	82.41	-	83.23	-
NA0160	80.32	Bottom of structure	88.35	Approximate edge of pavement	84.78	-	85.2	-	85.5	-	85.93	-
NA0170	79.47	Bottom of structure	90.12	Approximate edge of pavement	83.99	-	84.43	-	84.63	-	84.95	-
NA0180	71.31	Bottom of structure	87.26	Approximate edge of pavement	74.6	-	75.03	-	75.23	-	75.56	-
NA0190	80.82	Bottom of structure	89.89	Approximate edge of pavement	85.22	-	85.64	-	85.98	-	86.48	-
NA0200	81.52	Bottom of structure	85.45	Approximate edge of pavement	**85.93**	0.48	**86.34**	0.89	**86.75**	1.30	**87.36**	1.91
NA0210	80.80	Bottom of structure	88.76	Approximate edge of pavement	83.19	-	84.03	-	85.04	-	86.61	-
NA0220	86.72	Bottom of structure	90.75	Approximate edge of pavement	89	-	90.52	-	**90.86**	0.11	**91.12**	0.37
NA0230	91.44	Bottom of structure	96.15	Approximate edge of pavement	92.44	-	92.99	-	93.29	-	93.82	-
NA0240	88.61	Bottom of structure	93.98	Approximate edge of pavement	92.4	-	92.95	-	93.24	-	93.77	-
NA0250	87.54	Bottom of structure	92.19	Approximate edge of pavement	**92.31**	0.12	**92.7**	0.51	**92.81**	0.62	**92.92**	0.73
NA0260	86.29	Bottom of structure	91.93	Approximate edge of pavement	89.35	-	90.32	-	91.78	-	**92.07**	0.14
NA0270	85.32	Bottom of structure	90.61	Approximate edge of pavement	87.95	-	88.92	-	89.96	-	**91.79**	1.18
NA0280	82.32	Bottom of structure	91.56	Approximate edge of pavement	85.28	-	86.42	-	88	-	90.95	-
NA0290	75.96	Bottom of structure	89.24	Approximate edge of pavement	85.82	-	86.81	-	87.05	-	87.28	-
NA0300	81.61	Bottom of structure	88.92	Approximate edge of pavement	85.82	-	86.54	-	86.76	-	87.21	-
NA0310	83.67	Bottom of structure	86.50	Approximate edge of pavement	86.06	-	**86.5**	0.00	**86.76**	0.26	**87.35**	0.85
NA0320	83.58	Bottom of structure	88.77	Approximate edge of pavement	85.64	-	86.38	-	86.59	-	87.08	-
NA0330	83.24	Bottom of structure	86.37	Approximate edge of pavement	**86.37**	0.00	**86.64**	0.27	**86.84**	0.47	**87.41**	1.04
NA0340	81.46	Bottom of structure	85.60	Approximate edge of pavement	**85.96**	0.36	**86.37**	0.77	**86.77**	1.17	**87.38**	1.78
NA0350	78.17	Bottom of structure	87.25	Approximate edge of pavement	85.93	-	86.93	-	87.18	-	**87.4**	0.15
NA0360	88.33	Bottom of structure	94.12	Approximate edge of pavement	89.3	-	91.29	-	91.38	-	91.59	-
NA0370	86.22	Bottom of structure	91.16	Approximate edge of pavement	89.22	-	**91.21**	0.05	**91.26**	0.10	**91.32**	0.16
NA0380	84.62	Bottom of structure	88.11	Approximate edge of pavement	86.01	-	87.19	-	87.58	-	88.02	-
NA0390	77.48	Bottom of structure	87.47	Approximate edge of pavement	85.87	-	86.86	-	87.1	-	87.32	-
NA0400	87.42	Bottom of structure	91.46	Approximate edge of pavement	88.36	-	89	-	89.59	-	90.82	-
NA0410	85.24	Bottom of structure	87.80	Approximate edge of pavement	**88.28**	0.48	**88.78**	0.98	**89.04**	1.24	**89.19**	1.39
NA0420	82.03	Bottom of structure	89.00	Approximate edge of pavement	85.99	-	87.34	-	87.93	-	88.69	-
NA0430	82.26	Bottom of structure	88.32	Approximate edge of pavement	86.01	-	87.29	-	87.86	-	**88.62**	0.30
NA0440	81.27	Bottom of structure	89.46	Approximate edge of pavement	85.89	-	87.31	-	87.98	-	88.75	-

APPENDIX F - FIC #5 – Lake Bell: Reduced Inflows from FDOT Pond Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0450	80.02	Bottom of structure	88.29	Approximate edge of pavement	84.37	-	85.92	-	86.94	-	87.91	-
NA0460	82.60	Bottom of structure	88.09	Approximate edge of pavement	86.06	-	86.64	-	86.81	-	87.14	-
NA0470	79.57	Bottom of structure	85.32	Approximate edge of pavement	**86.01**	0.69	**86.57**	1.25	**86.7**	1.38	**86.81**	1.49
NA0480	80.26	Bottom of structure	86.75	Approximate edge of pavement	85.91	-	86.67	-	**86.8**	0.05	**86.88**	0.13
NA0490	81.66	Bottom of structure	86.12	Approximate edge of pavement	85.05	-	**86.5**	0.38	**86.65**	0.53	**86.75**	0.63
NA0500	78.02	Bottom of structure	84.24	Approximate edge of pavement	82.93	-	**84.61**	0.37	**84.94**	0.70	**85.14**	0.90
NA0510	79.52	Bottom of structure	84.82	Approximate edge of pavement	83.55	-	**85.32**	0.50	**85.51**	0.69	**85.72**	0.90
NA0520	81.44	Bottom of structure	85.49	Approximate edge of pavement	84.03	-	**85.97**	0.48	**86.14**	0.65	**86.27**	0.78
NA0530	83.62	Bottom of structure	88.82	Approximate edge of pavement	86.07	-	86.99	-	87.67	-	**88.92**	0.10
NA0540	85.97	Bottom of structure	90.45	Approximate edge of pavement	87.62	-	88.5	-	89.9	-	**90.84**	0.39
NA0550	87.66	Bottom of structure	91.28	Approximate edge of pavement	89.07	-	90.15	-	**91.5**	0.22	**91.68**	0.40
NA0560	87.18	Bottom of structure	91.56	Approximate edge of pavement	88.69	-	89.32	-	90.46	-	**92.02**	0.46
NA0570	85.65	Bottom of structure	91.06	Approximate edge of pavement	87.92	-	88.45	-	89.02	-	**91.35**	0.29
NA0580	92.68	Bottom of structure	96.76	Approximate edge of pavement	93	-	93.1	-	93.18	-	93.34	-
NA0590	89.02	Bottom of structure	93.58	Approximate edge of pavement	90.15	-	90.76	-	91.02	-	92.76	-
NA0600	85.05	Bottom of structure	90.93	Approximate edge of pavement	87.01	-	87.89	-	89.69	-	**91.37**	0.44
NA0610	83.91	Bottom of structure	89.93	Approximate edge of pavement	85.99	-	87.5	-	89.02	-	**90.7**	0.77
NA0620	83.12	Bottom of structure	90.59	Approximate edge of pavement	85.32	-	87.3	-	88.65	-	90.15	-
NA0630	85.42	Bottom of structure	90.77	Approximate edge of pavement	86.51	-	87.37	-	88.75	-	90.39	-
NA0640	91.02	Bottom of structure	95.50	Approximate edge of pavement	91.37	-	91.47	-	91.63	-	94.82	-
NA0650	90.02	Bottom of structure	94.83	Approximate edge of pavement	90.92	-	91.23	-	91.5	-	94.73	-
NA0660	90.23	Bottom of structure	94.85	Approximate edge of pavement	91.46	-	92.21	-	93.03	-	94.47	-
NA0670	92.30	Bottom of structure	97.97	Approximate edge of pavement	93.54	-	96.36	-	**98.52**	0.55	**98.61**	0.64
NA0680	90.33	Bottom of structure	96.79	Approximate edge of pavement	91.66	-	93.81	-	96.54	-	**97.22**	0.43
NA0690	88.62	Bottom of structure	94.25	Approximate edge of pavement	90.38	-	92.57	-	**94.5**	0.25	**94.6**	0.35
NA0700	86.32	Bottom of structure	91.79	Approximate edge of pavement	87.87	-	89.09	-	90.75	-	**91.96**	0.17
NA0710	84.94	Bottom of structure	90.28	Approximate edge of pavement	87.23	-	88.71	-	90.15	-	**90.59**	0.31
NA0720	83.55	Bottom of structure	89.40	Approximate edge of pavement	85.2	-	87.04	-	88.06	-	88.86	-
NA0730	82.98	Bottom of structure	88.88	Approximate edge of pavement	85.02	-	86.86	-	87.82	-	88.47	-
NA0740	81.14	Lake Mendsen NHWE	88.51	Approximate edge of pavement	84.26	-	86.78	-	87.67	-	88.29	-
NA0750	81.14	Lake Mendsen NHWE	89.42	Approximate edge of pavement	84.27	-	87.06	-	88.2	-	89.41	-
NA0760	81.14	Lake Mendsen NHWE	87.92	Approximate edge of pavement	84.23	-	86.68	-	87.51	-	**88.13**	0.21
NA0770	81.14	Lake Mendsen NHWE	87.19	Approximate edge of pavement	84.2	-	86.42	-	87.05	-	**87.75**	0.56
NA0780	81.14	Lake Mendsen NHWE	84.82	Approximate edge of pavement	84.17	-	**86.18**	1.36	**86.89**	2.07	**87.66**	2.84
NA0790	85.72	Bottom of structure	89.36	Approximate edge of pavement	87.3	-	88.81	-	**90.22**	0.86	**90.49**	1.13
NA0800	82.98	Bottom of structure	87.39	Approximate edge of pavement	85.06	-	86.91	-	**87.9**	0.51	**88.5**	1.11
NA0810	81.14	Bottom of structure	87.43	Approximate edge of pavement	84.28	-	86.84	-	**87.62**	0.19	**88**	0.57
NA0820	84.16	Bottom of structure	92.65	Approximate edge of pavement	86.61	-	89.77	-	90.81	-	91.98	-
NA0830	84.16	Bottom of structure	91.73	Approximate edge of pavement	86.53	-	89.6	-	90.63	-	91.53	-
NA0840	82.97	Bottom of structure	89.94	Approximate edge of pavement	85.35	-	88.12	-	89.13	-	**90.09**	0.15
NA0850	81.14	Lake Mendsen NHWE	86.88	Approximate edge of pavement	84.26	-	**87.24**	0.36	**88.15**	1.27	**88.55**	1.67
NA0860	81.14	Lake Mendsen NHWE	87.59	Approximate edge of pavement	84.23	-	86.86	-	**87.9**	0.31	**88.44**	0.85
NA0870	81.14	Lake Mendsen NHWE	86.66	Approximate edge of pavement	84.2	-	86.42	-	**87.53**	0.87	**87.95**	1.29
NA0880	81.14	Lake Mendsen NHWE	87.14	Approximate edge of pavement	84.16	-	86.11	-	**87.16**	0.02	**87.78**	0.64
NA0890	81.14	Lake Mendsen NHWE	86.19	Approximate edge of pavement	84.13	-	86.06	-	**86.97**	0.78	**87.74**	1.55
NA0900	81.14	Lake Mendsen NHWE	85.06	Approximate edge of pavement	84.09	-	**86.02**	0.96	**86.92**	1.86	**87.72**	2.66
NA0910	85.88	Bottom of structure	91.89	Approximate edge of pavement	87.49	-	87.89	-	88.17	-	88.82	-

APPENDIX F - FIC #5 – Lake Bell: Reduced Inflows from FDOT Pond Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0920	81.29	Bottom of structure	87.69	Approximate edge of pavement	84.19	-	86.07	-	87	-	**87.87**	0.18
NA0930	81.14	Lake Mendsen NHWE	86.09	Approximate edge of pavement	84.15	-	86.03	-	**86.92**	0.83	**87.71**	1.62
NA0940	81.14	Lake Mendsen NHWE	84.77	Approximate edge of pavement	84.13	-	**86**	1.23	**86.9**	2.13	**87.69**	2.92
NA0950	81.14	Lake Mendsen NHWE	84.84	Approximate edge of pavement	84.09	-	**85.99**	1.15	**86.88**	2.04	**87.7**	2.86
NA0960	81.14	Lake Mendsen NHWE	85.58	Approximate edge of pavement	84.19	-	**86.21**	0.63	**86.85**	1.27	**87.6**	2.02
NA0970	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	84.14	-	**86.07**	0.41	**86.89**	1.23	**87.68**	2.02
NA0980	81.14	Lake Mendsen NHWE	84.95	Approximate edge of pavement	84.09	-	**86.02**	1.07	**86.88**	1.93	**87.69**	2.74
NA0990	87.41	Bottom of structure	90.80	Approximate edge of pavement	88.27	-	88.54	-	88.76	-	89.54	-
NA1000	82.94	Bottom of structure	87.49	Approximate edge of pavement	84.5	-	86.17	-	87.3	-	**88.21**	0.72
NA1010	78.97	Bottom of structure	85.37	Approximate edge of pavement	81.88	-	**85.62**	0.25	**86.28**	0.91	**87.44**	2.07
NA1020	80.47	Bottom of structure	85.47	Approximate edge of pavement	83.12	-	**85.89**	0.42	**86.31**	0.84	**87.46**	1.99
NA1030	77.85	Bottom of structure	85.55	Approximate edge of pavement	81.34	-	84.94	-	**85.61**	0.06	**87.42**	1.87
NA1040	77.76	Bottom of structure	85.24	Approximate edge of pavement	81.19	-	84.75	-	**85.43**	0.19	**87.42**	2.18
NA1050	77.44	Bottom of structure	84.28	Approximate edge of pavement	80.85	-	84.28	-	**84.93**	0.65	**87.4**	3.12
NA1060	76.61	Bottom of structure	83.43	Approximate edge of pavement	80.7	-	**84**	0.57	**84.78**	1.35	**87.39**	3.96
NA1070	75.87	Bottom of structure	89.34	Approximate edge of pavement	80.4	-	83.4	-	84.1	-	85.68	-
NA1080	74.25	Bottom of structure	85.11	Approximate edge of pavement	78.97	-	81.02	-	81.47	-	82.24	-
NA1090	73.79	Bottom of structure	76.62	Approximate edge of pavement	**77.73**	1.11	**78.57**	1.95	**78.77**	2.15	**79.1**	2.48
NA1100	77.15	Bottom of structure	83.03	Approximate edge of pavement	78.07	-	79.42	-	83	-	**83.28**	0.25
NA1110	74.23	Bottom of structure	80.07	Approximate edge of pavement	77.24	-	77.6	-	78.76	-	79.23	-
NA1120	73.79	Bottom of structure	76.34	Approximate edge of pavement	**77.17**	0.83	**77.28**	0.94	**77.47**	1.13	**77.81**	1.47
NA1130	78.93	Bottom of structure	83.69	Approximate edge of pavement	81.87	-	**84.34**	0.65	**84.73**	1.04	**85.15**	1.46
NA1140	79.43	Bottom of structure	86.76	Approximate edge of pavement	84.17	-	**87.26**	0.50	**87.53**	0.77	**87.85**	1.09
NA1150	80.96	Bottom of structure	83.93	Approximate edge of pavement	**87.31**	3.38	**88.47**	4.54	**88.67**	4.74	**88.91**	4.98
NA1160	87.02	Bottom of structure	91.63	Approximate edge of pavement	90.04	-	91.59	-	**91.98**	0.35	**92.17**	0.54
NA1170	83.62	Bottom of structure	89.26	Approximate edge of pavement	**89.99**	0.73	**90.34**	1.08	**90.52**	1.26	**90.71**	1.45
NA1180	83.62	Lake Midget control elevation	90.40	Bank overtopping	89.96	-	90.31	-	**90.48**	0.08	**90.67**	0.27
NA1190	83.89	Bottom of structure	88.91	Approximate edge of pavement	**89.94**	1.03	**90.04**	1.13	**90.09**	1.18	**90.16**	1.25
NA1200	83.89	Bottom of structure	91.04	Approximate edge of pavement	89.89	-	89.99	-	90.04	-	90.11	-
NA1210	83.62	Bottom of structure	90.46	Approximate edge of pavement	89.92	-	90.11	-	90.26	-	90.46	-
NA1220	83.62	Bottom of structure	91.71	Approximate edge of pavement	89.96	-	90.23	-	90.43	-	90.68	-
NA1230	83.62	Bottom of structure	90.28	Approximate edge of pavement	89.97	-	**90.3**	0.02	**90.49**	0.21	**90.69**	0.41
NA1240	87.78	Bottom of structure	91.07	Approximate edge of pavement	90.07	-	90.61	-	91.02	-	**91.13**	0.06
NA1250	87.42	Bottom of structure	90.70	Approximate edge of pavement	89.97	-	90.04	-	90.08	-	90.13	-
NA1260	86.18	Bottom of structure	90.64	Approximate edge of pavement	89.87	-	89.97	-	90.01	-	90.08	-
NA1270	85.80	Bottom of structure	89.67	Approximate edge of pavement	**89.94**	0.27	**90.06**	0.39	**90.14**	0.47	**90.22**	0.55
NA1280	85.60	Bottom of structure	90.74	Approximate edge of pavement	89.93	-	90.04	-	90.1	-	90.17	-
NA1290	88.32	Bottom of structure	90.86	Approximate edge of pavement	**91.06**	0.20	**91.19**	0.33	**91.24**	0.38	**91.3**	0.44
NA1300	86.73	Bottom of structure	90.10	Approximate edge of pavement	**90.44**	0.34	**90.81**	0.71	**90.91**	0.81	**90.99**	0.89
NA1310	83.30	Bottom of structure	87.94	Approximate edge of pavement	86.04	-	87.53	-	**88.56**	0.62	**88.72**	0.78
NA1320	88.52	Bottom of structure	92.53	Approximate edge of pavement	89.46	-	90.98	-	91.3	-	91.72	-
NA1330	84.72	Bottom of structure	90.29	Approximate edge of pavement	89.4	-	**90.93**	0.64	**91.25**	0.96	**91.66**	1.37
NA1340	85.32	Bottom of structure	89.55	Approximate edge of pavement	89.27	-	**90.9**	1.35	**91.22**	1.67	**91.62**	2.07
NA1350	84.62	Bottom of structure	90.45	Approximate edge of pavement	88.51	-	**90.56**	0.11	**91.16**	0.71	**91.56**	1.11
NA1360	82.50	Bottom of structure	89.84	Approximate edge of pavement	87.3	-	88.95	-	**90.1**	0.26	**90.73**	0.89
NA1370	82.50	Bottom of structure	88.96	Approximate edge of pavement	86.1	-	87.4	-	88.24	-	**90.04**	1.08
NA1380	82.50	Bottom of structure	89.60	Approximate edge of pavement	85.24	-	86.28	-	86.75	-	87.78	-

APPENDIX F - FIC #5 – Lake Bell: Reduced Inflows from FDOT Pond Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1390	82.04	Bottom of structure	89.38	Approximate edge of pavement	84.79	-	85.69	-	85.99	-	86.63	-
NA1400	86.52	Bottom of structure	92.24	Approximate edge of pavement	89.56	-	91.28	-	91.74	-	**92.35**	0.11
NA1410	84.72	Bottom of structure	90.35	Approximate edge of pavement	89.41	-	**90.94**	0.59	**91.26**	0.91	**91.68**	1.33
NA1420	81.52	Bottom of structure	89.36	Approximate edge of pavement	87.49	-	**90.34**	0.98	**91.19**	1.83	**91.62**	2.26
NA1430	81.13	Bottom of structure	90.79	Approximate edge of pavement	86.53	-	88.78	-	89.59	-	**91.35**	0.56
NA1440	81.13	Bottom of structure	90.11	Approximate edge of pavement	86.01	-	88.02	-	88.8	-	**90.59**	0.48
NA1450	81.13	Bottom of structure	88.88	Approximate edge of pavement	85.67	-	87.53	-	88.33	-	**89.97**	1.09
NA1460	81.13	Bottom of structure	89.61	Approximate edge of pavement	85.28	-	86.84	-	87.55	-	89.17	-
NA1470	81.13	Bottom of structure	90.19	Approximate edge of pavement	84.88	-	86.1	-	86.7	-	88.09	-
NA1480	81.13	Bottom of structure	89.23	Approximate edge of pavement	84.85	-	85.95	-	86.44	-	87.46	-
NA1490	82.72	Bottom of structure	87.50	Approximate edge of pavement	85.98	-	**87.94**	0.44	**88.2**	0.70	**88.53**	1.03
NA1500	83.44	Bottom of structure	87.27	Approximate edge of pavement	84.2	-	86.23	-	**87.41**	0.14	**88.12**	0.85
NA1510	81.14	Lake Mendsen NHWE	85.25	Approximate edge of pavement	84.13	-	**86.13**	0.88	**87.33**	2.08	**88.08**	2.83
NA1520	82.42	Bottom of structure	86.11	Approximate edge of pavement	84.16	-	**86.45**	0.34	**87.32**	1.21	**88.05**	1.94
NA1530	81.14	Lake Mendsen NHWE	86.90	Approximate edge of pavement	84.09	-	86.02	-	**86.94**	0.04	**87.74**	0.84
NA1540	81.14	Lake Mendsen NHWE	85.15	Approximate edge of pavement	84.17	-	**86.16**	1.01	**87.36**	2.21	**88.1**	2.95
NA1550	90.36	Bottom of structure	94.47	Approximate edge of pavement	92	-	93.68	-	**94.5**	0.03	**94.87**	0.40
NA1560	89.67	Bottom of structure	94.46	Approximate edge of pavement	90.89	-	91.33	-	91.52	-	91.64	-
NA1570	87.27	Bottom of structure	91.49	Approximate edge of pavement	88.41	-	88.82	-	89.61	-	**91.61**	0.12
NA1580	84.57	Bottom of structure	89.81	Approximate edge of pavement	86.39	-	87	-	87.84	-	89.36	-
NA1590	82.97	Bottom of structure	91.69	Approximate edge of pavement	88.51	-	88.79	-	89.02	-	89.46	-
NA1600	82.97	Bottom of structure	87.71	Approximate edge of pavement	84.2	-	86.27	-	86.97	-	**87.76**	0.05
NA1610	81.80	Bottom of structure	85.34	Approximate edge of pavement	84.17	-	**86.19**	0.85	**86.93**	1.59	**87.72**	2.38
NA1620	90.03	Bottom of structure	92.24	Approximate edge of pavement	90.03	-	90.03	-	90.03	-	91.6	-
NA1630	81.92	Bottom of structure	84.78	Approximate edge of pavement	**85.05**	0.27	**85.98**	1.20	**86.8**	2.02	**87.56**	2.78
NA1640	81.54	Bottom of structure	87.01	Approximate edge of pavement	84.53	-	85.96	-	86.53	-	**87.52**	0.51
NA1650	80.90	Bottom of structure	85.58	Approximate edge of pavement	83.75	-	**85.94**	0.36	**86.32**	0.74	**87.49**	1.91
NA1660	82.04	Lake Killarney tailwater	85.25	Approximate edge of pavement	82.67	-	83.41	-	83.71	-	84.4	-
NA1670	84.22	Bottom of structure	92.63	Approximate edge of pavement	88.97	-	91.52	-	92.15	-	**92.8**	0.17
NA1680	83.52	Bottom of structure	90.33	Approximate edge of pavement	88.39	-	90.28	-	**90.47**	0.14	**90.57**	0.24
NA1690	82.52	Bottom of structure	89.14	Approximate edge of pavement	87.94	-	**89.33**	0.19	**89.43**	0.29	**89.54**	0.40
NA1700	82.04	Bottom of structure	88.40	Approximate edge of pavement	87.53	-	**89.15**	0.75	**89.26**	0.86	**89.39**	0.99
NA1710	82.04	Bottom of structure	89.18	Approximate edge of pavement	86.69	-	88.05	-	88.26	-	88.62	-
NA1720	82.04	Bottom of structure	89.94	Approximate edge of pavement	85.46	-	86.4	-	86.69	-	87.21	-
NA1730	82.04	Bottom of structure	89.12	Approximate edge of pavement	84.88	-	85.8	-	86.1	-	86.72	-
NA1740	81.14	Bottom of structure	90.16	Approximate edge of pavement	83.92	-	85.55	-	86.57	-	87.8	-
NA1750	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	83.92	-	85.65	-	**86.81**	1.15	**87.68**	2.02
NA1760	81.13	Lake Mendsen NHWE	85.45	Approximate edge of pavement	84.1	-	**85.96**	0.51	**86.85**	1.40	**87.71**	2.26
NA1790	82.93	Bottom of structure	88.04	Approximate edge of pavement	85.81	-	87.59	-	**88.41**	0.37	**88.66**	0.62
NA1800	76.40	Bottom of structure	88.11	Approximate edge of pavement	78.24	-	78.39	-	78.48	-	78.68	-
NA1810	77.43	Bottom of structure	86.98	Approximate edge of pavement	79.6	-	79.79	-	79.94	-	80.24	-
NA1820	70.50	Bottom of dry pond	78.99	Bank overtopping	78.19	-	78.32	-	78.41	-	78.54	-
NA1830	67.20	9th Grade Pond Control Elevation	77.76	Bank overtopping	71.35	-	72.05	-	72.25	-	72.6	-
NA1840	67.20	Bottom of structure	77.60	Approximate edge of pavement	71.97	-	73.16	-	73.53	-	74.16	-
NA1850	67.20	Lake Virginia tailwater	70.48	Approximate edge of pavement	69.13	-	**70.63**	0.15	**70.92**	0.44	**71.28**	0.80
NA1860	77.47	Bottom of structure	86.40	Approximate edge of pavement	82.44	-	84.09	-	84.52	-	84.79	-
NA1870	87.63	Bottom of structure	92.36	Approximate edge of pavement	89.54	-	91.81	-	92.33	-	**92.59**	0.23

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APPENDIX F - FIC #5 – Lake Bell: Reduced Inflows from FDOT Pond Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1880	85.16	Bottom of structure	92.62	Approximate edge of pavement	86.67	-	89.85	-	90.88	-	92.04	-
NA1890	92.07	Bottom of structure	94.36	Approximate edge of pavement	92.38	-	92.47	-	92.53	-	92.75	-
NA1900	86.29	Lake Francis Control Elevation	89.99	Bank overtopping	**91.82**	1.83	**92.21**	2.22	**92.38**	2.39	**92.6**	2.61
NA1910	87.03	Lee Road pond control elevation	90.58	Bank overtopping	**91.8**	1.22	**92.2**	1.62	**92.37**	1.79	**92.61**	2.03
NA1970	86.00	Bottom of dry pond	94.89	Bank overtopping	92.32	-	92.79	-	93.24	-	94.58	-
NA1980	89.70	Bottom of structure	95.10	Approximate edge of pavement	92.37	-	92.86	-	93.31	-	94.64	-
NA1990	86.66	Bottom of structure	90.12	Approximate edge of pavement	87.9	-	88.29	-	88.62	-	**90.29**	0.17
NA2000	87.47	Bottom of structure	92.54	Approximate edge of pavement	90.11	-	90.88	-	91.52	-	**93.02**	0.48
NA2010	77.85	Bottom of structure	82.90	Approximate edge of pavement	82.83	-	**83.36**	0.46	**83.44**	0.54	**83.55**	0.65
NA2020	79.52	Bottom of structure	88.37	Approximate edge of pavement	82.5	-	84.15	-	84.59	-	84.93	-
NA2030	87.08	Bottom of structure	92.37	Approximate edge of pavement	90.15	-	90.84	-	91.42	-	91.5	-
NA2100	80.70	Bottom of structure	85.92	Approximate edge of pavement	83.97	-	85.9	-	**86.79**	0.87	**87.62**	1.70
NA2110	82.19	Bottom of structure	81.74	Approximate edge of pavement	**83.86**	2.12	**85.78**	4.04	**86.67**	4.93	**87.5**	5.76
NA2120	90.41	Bottom of structure	90.89	Approximate edge of pavement	**91.86**	0.97	**92.27**	1.38	**92.44**	1.55	**92.66**	1.77
NB0005	88.75	Approximate water surface elevation	91.82	Finished Floor Elevation	88.92	-	89.42	-	90.14	-	91.43	-
NB0010	81.87	Botom of structure	89.15	Approximate edge of pavement	85	-	86.38	-	87.15	-	88.65	-
NB0020	82.31	Botom of structure	90.36	Approximate edge of pavement	86.59	-	88.48	-	88.89	-	**91.04**	0.68
NB0030	86.97	Approximate water surface elevation	92.39	Finished floor elevation	88.7	-	89.31	-	90.07	-	91.38	-
NB0040	82.50	Pond control structure	89.07	Bank overtopping	85.19	-	85.23	-	85.26	-	85.32	-
NB0050	83.14	Pond control structure	85.33	Bank overtopping	84.62	-	85.02	-	85.21	-	**85.42**	0.09
NB0060	82.04	Bottom of structure	90.41	Approximate edge of pavement	82.97	-	84.24	-	85.42	-	87.35	-
NB0070	86.01	Pond control structure	88.50	Bank overtopping	88.45	-	**88.52**	0.02	**88.57**	0.07	**88.61**	0.11
NB0080	82.04	Bottom of structure	91.31	Approximate edge of pavement	83.3	-	84.54	-	85.87	-	88.21	-

APPENDIX G

FIC #6 – Lake Killarney: Improved Conveyance to Lake Gem Model Results

Geosyntec consultants

APPENDIX G - FIC #6 – Lake Killarney: Improved Conveyance to Lake Gem Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
LAKE_KILLARNEY	82.04	Control Elevation	84.40	Finished floor elevation	80.98	-	81.67	-	82.03	-	82.85	-
LAKE_MENDSEN	81.14	Normal high water elevation	84.82	Approximate edge of pavement	84.05	-	**86.16**	1.34	**86.97**	2.15	**87.7**	2.88
LAKE_ROSE	83.30	Approximate water surface elevation	91.01	Bank overtopping	83.89	-	84.16	-	84.37	-	84.76	-
NA0010	72.14	Bottom of structure	78.79	Approximate edge of pavement	77.96	-	**79.49**	0.70	**79.77**	0.98	**80.07**	1.28
NA0020	72.87	Bottom of structure	83.54	Approximate edge of pavement	79.41	-	82.1	-	82.5	-	82.82	-
NA0030	76.82	Bottom of structure	86.32	Approximate edge of pavement	79.79	-	83.07	-	84.42	-	**86.38**	0.06
NA0040	82.00	Bottom of structure	89.63	Approximate edge of pavement	83.88	-	84.48	-	86.22	-	**89.8**	0.17
NA0050	85.66	Bottom of structure	91.51	Approximate edge of pavement	87.82	-	88.23	-	88.67	-	91.19	-
NA0060	88.12	Bottom of structure	92.97	Approximate edge of pavement	88.6	-	88.82	-	89.26	-	92.9	-
NA0070	85.52	Bottom of structure	90.82	Approximate edge of pavement	85.93	-	86.02	-	86.29	-	89.85	-
NA0080	76.22	Bottom of structure	82.01	Approximate edge of pavement	79.68	-	**82.39**	0.38	**82.57**	0.56	**82.74**	0.73
NA0090	78.51	Bottom of structure	85.83	Approximate edge of pavement	84.4	-	85.22	-	85.33	-	85.44	-
NA0100	80.27	Bottom of structure	83.79	Approximate edge of pavement	**84.84**	1.05	**85.3**	1.51	**85.39**	1.60	**85.48**	1.69
NA0110	81.13	Bottom of structure	84.29	Approximate edge of pavement	**85.17**	0.88	**85.36**	1.07	**85.44**	1.15	**85.52**	1.23
NA0120	82.90	Bottom of structure	91.22	Approximate edge of pavement	84.16	-	84.39	-	85.54	-	86.98	-
NA0130	77.12	Bottom of structure	88.40	Approximate edge of pavement	80.94	-	83.94	-	85.61	-	87.16	-
NA0140	81.42	Bottom of structure	85.91	Approximate edge of pavement	82.89	-	**86.3**	0.39	**86.72**	0.81	**87.34**	1.43
NA0150	76.23	Bottom of structure	86.30	Approximate edge of pavement	79.77	-	81.53	-	82.41	-	83.23	-
NA0160	80.32	Bottom of structure	88.35	Approximate edge of pavement	84.78	-	85.2	-	85.5	-	85.93	-
NA0170	79.47	Bottom of structure	90.12	Approximate edge of pavement	83.99	-	84.43	-	84.63	-	84.95	-
NA0180	71.31	Bottom of structure	87.26	Approximate edge of pavement	74.6	-	75.03	-	75.23	-	75.56	-
NA0190	80.82	Bottom of structure	89.89	Approximate edge of pavement	85.22	-	85.64	-	85.98	-	86.48	-
NA0200	81.52	Bottom of structure	85.45	Approximate edge of pavement	**85.93**	0.48	**86.34**	0.89	**86.75**	1.30	**87.36**	1.91
NA0210	80.80	Bottom of structure	88.76	Approximate edge of pavement	83.19	-	84.03	-	85.04	-	86.61	-
NA0220	86.72	Bottom of structure	90.75	Approximate edge of pavement	89	-	90.52	-	**90.86**	0.11	**91.12**	0.37
NA0230	91.44	Bottom of structure	96.15	Approximate edge of pavement	92.44	-	92.99	-	93.29	-	93.82	-
NA0240	88.61	Bottom of structure	93.98	Approximate edge of pavement	92.4	-	92.95	-	93.24	-	93.77	-
NA0250	87.54	Bottom of structure	92.19	Approximate edge of pavement	**92.31**	0.12	**92.7**	0.51	**92.81**	0.62	**92.92**	0.73
NA0260	86.29	Bottom of structure	91.93	Approximate edge of pavement	89.35	-	90.32	-	91.78	-	**92.07**	0.14
NA0270	85.32	Bottom of structure	90.61	Approximate edge of pavement	87.95	-	88.92	-	89.96	-	**91.79**	1.18
NA0280	82.32	Bottom of structure	91.56	Approximate edge of pavement	85.28	-	86.42	-	88	-	90.95	-
NA0290	75.96	Bottom of structure	89.24	Approximate edge of pavement	85.82	-	86.81	-	87.05	-	87.28	-
NA0300	81.61	Bottom of structure	88.92	Approximate edge of pavement	85.82	-	86.54	-	86.76	-	87.21	-
NA0310	83.67	Bottom of structure	86.50	Approximate edge of pavement	86.06	-	**86.5**	0.00	**86.76**	0.26	**87.35**	0.85
NA0320	83.58	Bottom of structure	88.77	Approximate edge of pavement	85.64	-	86.38	-	86.59	-	87.08	-
NA0330	83.24	Bottom of structure	86.37	Approximate edge of pavement	**86.37**	0.00	**86.64**	0.27	**86.84**	0.47	**87.41**	1.04
NA0340	81.46	Bottom of structure	85.60	Approximate edge of pavement	**85.96**	0.36	**86.37**	0.77	**86.77**	1.17	**87.38**	1.78
NA0350	78.17	Bottom of structure	87.25	Approximate edge of pavement	85.93	-	86.93	-	87.18	-	**87.4**	0.15
NA0360	88.33	Bottom of structure	94.12	Approximate edge of pavement	89.3	-	91.29	-	91.38	-	91.59	-
NA0370	86.22	Bottom of structure	91.16	Approximate edge of pavement	89.22	-	**91.21**	0.05	**91.26**	0.10	**91.32**	0.16
NA0380	84.62	Bottom of structure	88.11	Approximate edge of pavement	86.01	-	87.19	-	87.58	-	88.02	-
NA0390	77.48	Bottom of structure	87.47	Approximate edge of pavement	85.87	-	86.86	-	87.1	-	87.32	-
NA0400	87.42	Bottom of structure	91.46	Approximate edge of pavement	88.36	-	89	-	89.59	-	90.82	-
NA0410	85.24	Bottom of structure	87.80	Approximate edge of pavement	**88.28**	0.48	**88.78**	0.98	**89.04**	1.24	**89.19**	1.39
NA0420	82.03	Bottom of structure	89.00	Approximate edge of pavement	85.99	-	87.34	-	87.93	-	88.69	-
NA0430	82.26	Bottom of structure	88.32	Approximate edge of pavement	86.01	-	87.29	-	87.86	-	**88.62**	0.30
NA0440	81.27	Bottom of structure	89.46	Approximate edge of pavement	85.89	-	87.31	-	87.98	-	88.75	-

Geosyntec consultants

APPENDIX G - FIC #6 – Lake Killarney: Improved Conveyance to Lake Gem Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0450	80.02	Bottom of structure	88.29	Approximate edge of pavement	84.37	-	85.92	-	86.94	-	87.91	-
NA0460	82.60	Bottom of structure	88.09	Approximate edge of pavement	86.06	-	86.64	-	86.81	-	87.14	-
NA0470	79.57	Bottom of structure	85.32	Approximate edge of pavement	**86.01**	0.69	**86.57**	1.25	**86.7**	1.38	**86.81**	1.49
NA0480	80.26	Bottom of structure	86.75	Approximate edge of pavement	85.91	-	86.67	-	**86.8**	0.05	**86.88**	0.13
NA0490	81.66	Bottom of structure	86.12	Approximate edge of pavement	85.05	-	**86.5**	0.38	**86.65**	0.53	**86.75**	0.63
NA0500	78.02	Bottom of structure	84.24	Approximate edge of pavement	82.93	-	**84.61**	0.37	**84.94**	0.70	**85.14**	0.90
NA0510	79.52	Bottom of structure	84.82	Approximate edge of pavement	83.55	-	**85.32**	0.50	**85.51**	0.69	**85.72**	0.90
NA0520	81.44	Bottom of structure	85.49	Approximate edge of pavement	84.03	-	**85.97**	0.48	**86.14**	0.65	**86.27**	0.78
NA0530	83.62	Bottom of structure	88.82	Approximate edge of pavement	86.07	-	86.99	-	87.67	-	**88.92**	0.10
NA0540	85.97	Bottom of structure	90.45	Approximate edge of pavement	87.62	-	88.5	-	89.9	-	**90.84**	0.39
NA0550	87.66	Bottom of structure	91.28	Approximate edge of pavement	89.07	-	90.15	-	**91.5**	0.22	**91.68**	0.40
NA0560	87.18	Bottom of structure	91.56	Approximate edge of pavement	88.69	-	89.32	-	90.46	-	**92.02**	0.46
NA0570	85.65	Bottom of structure	91.06	Approximate edge of pavement	87.92	-	88.45	-	89.02	-	**91.35**	0.29
NA0580	92.68	Bottom of structure	96.76	Approximate edge of pavement	93	-	93.1	-	93.18	-	93.34	-
NA0590	89.02	Bottom of structure	93.58	Approximate edge of pavement	90.15	-	90.76	-	91.02	-	92.76	-
NA0600	85.05	Bottom of structure	90.93	Approximate edge of pavement	87.01	-	87.89	-	89.69	-	**91.37**	0.44
NA0610	83.91	Bottom of structure	89.93	Approximate edge of pavement	85.99	-	87.5	-	89.02	-	**90.7**	0.77
NA0620	83.12	Bottom of structure	90.59	Approximate edge of pavement	85.32	-	87.3	-	88.65	-	90.15	-
NA0630	85.42	Bottom of structure	90.77	Approximate edge of pavement	86.51	-	87.37	-	88.75	-	90.39	-
NA0640	91.02	Bottom of structure	95.50	Approximate edge of pavement	91.37	-	91.47	-	91.63	-	94.82	-
NA0650	90.02	Bottom of structure	94.83	Approximate edge of pavement	90.92	-	91.23	-	91.5	-	94.73	-
NA0660	90.23	Bottom of structure	94.85	Approximate edge of pavement	91.46	-	92.21	-	93.03	-	94.47	-
NA0670	92.30	Bottom of structure	97.97	Approximate edge of pavement	93.54	-	96.36	-	**98.52**	0.55	**98.61**	0.64
NA0680	90.33	Bottom of structure	96.79	Approximate edge of pavement	91.66	-	93.81	-	96.54	-	**97.22**	0.43
NA0690	88.62	Bottom of structure	94.25	Approximate edge of pavement	90.38	-	92.57	-	**94.5**	0.25	**94.6**	0.35
NA0700	86.32	Bottom of structure	91.79	Approximate edge of pavement	87.87	-	89.09	-	90.75	-	**91.96**	0.17
NA0710	84.94	Bottom of structure	90.28	Approximate edge of pavement	87.23	-	88.71	-	90.15	-	**90.59**	0.31
NA0720	83.55	Bottom of structure	89.40	Approximate edge of pavement	85.2	-	87.04	-	88.06	-	88.86	-
NA0730	82.98	Bottom of structure	88.88	Approximate edge of pavement	85.02	-	86.86	-	87.82	-	88.47	-
NA0740	81.14	Lake Mendsen NHWE	88.51	Approximate edge of pavement	84.25	-	86.78	-	87.67	-	88.29	-
NA0750	81.14	Lake Mendsen NHWE	89.42	Approximate edge of pavement	84.26	-	87.06	-	88.2	-	89.41	-
NA0760	81.14	Lake Mendsen NHWE	87.92	Approximate edge of pavement	84.23	-	86.68	-	87.51	-	**88.13**	0.21
NA0770	81.14	Lake Mendsen NHWE	87.19	Approximate edge of pavement	84.2	-	86.42	-	87.05	-	**87.75**	0.56
NA0780	81.14	Lake Mendsen NHWE	84.82	Approximate edge of pavement	84.17	-	**86.25**	1.43	**86.96**	2.14	**87.65**	2.83
NA0790	85.72	Bottom of structure	89.36	Approximate edge of pavement	87.3	-	88.81	-	**90.22**	0.86	**90.49**	1.13
NA0800	82.98	Bottom of structure	87.39	Approximate edge of pavement	85.06	-	86.91	-	**87.9**	0.51	**88.5**	1.11
NA0810	81.14	Bottom of structure	87.43	Approximate edge of pavement	84.27	-	86.84	-	**87.62**	0.19	**88**	0.57
NA0820	84.16	Bottom of structure	92.65	Approximate edge of pavement	86.61	-	89.77	-	90.81	-	91.98	-
NA0830	84.16	Bottom of structure	91.73	Approximate edge of pavement	86.53	-	89.6	-	90.63	-	91.53	-
NA0840	82.97	Bottom of structure	89.94	Approximate edge of pavement	85.35	-	88.12	-	89.13	-	**90.09**	0.15
NA0850	81.14	Lake Mendsen NHWE	86.88	Approximate edge of pavement	84.26	-	**87.24**	0.36	**88.15**	1.27	**88.55**	1.67
NA0860	81.14	Lake Mendsen NHWE	87.59	Approximate edge of pavement	84.22	-	86.86	-	**87.9**	0.31	**88.44**	0.85
NA0870	81.14	Lake Mendsen NHWE	86.66	Approximate edge of pavement	84.19	-	86.42	-	**87.53**	0.87	**87.95**	1.29
NA0880	81.14	Lake Mendsen NHWE	87.14	Approximate edge of pavement	84.16	-	86.29	-	**87.17**	0.03	**87.77**	0.63
NA0890	81.14	Lake Mendsen NHWE	86.19	Approximate edge of pavement	84.12	-	**86.24**	0.05	**87.06**	0.87	**87.73**	1.54
NA0900	81.14	Lake Mendsen NHWE	85.06	Approximate edge of pavement	84.09	-	**86.2**	1.14	**87.02**	1.96	**87.71**	2.65
NA0910	85.88	Bottom of structure	91.89	Approximate edge of pavement	87.49	-	87.89	-	88.17	-	88.82	-

APPENDIX G - FIC #6 – Lake Killarney: Improved Conveyance to Lake Gem Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0920	81.29	Bottom of structure	87.69	Approximate edge of pavement	84.18	-	86.26	-	87.1	-	**87.87**	0.18
NA0930	81.14	Lake Mendsen NHWE	86.09	Approximate edge of pavement	84.15	-	**86.22**	0.13	**87.02**	0.93	**87.71**	1.62
NA0940	81.14	Lake Mendsen NHWE	84.77	Approximate edge of pavement	84.13	-	**86.19**	1.42	**86.99**	2.22	**87.68**	2.91
NA0950	81.14	Lake Mendsen NHWE	84.84	Approximate edge of pavement	84.09	-	**86.17**	1.33	**86.98**	2.14	**87.69**	2.85
NA0960	81.14	Lake Mendsen NHWE	85.58	Approximate edge of pavement	84.19	-	**86.26**	0.68	**86.92**	1.34	**87.6**	2.02
NA0970	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	84.13	-	**86.22**	0.56	**86.98**	1.32	**87.67**	2.01
NA0980	81.14	Lake Mendsen NHWE	84.95	Approximate edge of pavement	84.09	-	**86.19**	1.24	**86.98**	2.03	**87.68**	2.73
NA0990	87.41	Bottom of structure	90.80	Approximate edge of pavement	88.27	-	88.54	-	88.76	-	89.54	-
NA1000	82.94	Bottom of structure	87.49	Approximate edge of pavement	84.5	-	86.17	-	87.3	-	**88.21**	0.72
NA1010	78.97	Bottom of structure	85.37	Approximate edge of pavement	81.88	-	**85.62**	0.25	**86.28**	0.91	**87.43**	2.06
NA1020	80.47	Bottom of structure	85.47	Approximate edge of pavement	83.12	-	**85.89**	0.42	**86.31**	0.84	**87.45**	1.98
NA1030	77.85	Bottom of structure	85.55	Approximate edge of pavement	81.34	-	84.94	-	**85.61**	0.06	**87.41**	1.86
NA1040	77.76	Bottom of structure	85.24	Approximate edge of pavement	81.19	-	84.75	-	**85.43**	0.19	**87.41**	2.17
NA1050	77.44	Bottom of structure	84.28	Approximate edge of pavement	80.85	-	84.28	-	**84.93**	0.65	**87.4**	3.12
NA1060	76.61	Bottom of structure	83.43	Approximate edge of pavement	80.7	-	**84**	0.57	**84.78**	1.35	**87.39**	3.96
NA1070	75.87	Bottom of structure	89.34	Approximate edge of pavement	80.4	-	83.4	-	84.1	-	85.67	-
NA1080	74.25	Bottom of structure	85.11	Approximate edge of pavement	78.97	-	81.02	-	81.47	-	82.24	-
NA1090	73.79	Bottom of structure	76.62	Approximate edge of pavement	**77.73**	1.11	**78.57**	1.95	**78.77**	2.15	**79.1**	2.48
NA1100	77.15	Bottom of structure	83.03	Approximate edge of pavement	78.07	-	79.42	-	83	-	**83.28**	0.25
NA1110	74.23	Bottom of structure	80.07	Approximate edge of pavement	77.24	-	77.6	-	78.76	-	79.23	-
NA1120	73.79	Bottom of structure	76.34	Approximate edge of pavement	**77.17**	0.83	**77.28**	0.94	**77.47**	1.13	**77.81**	1.47
NA1130	78.93	Bottom of structure	83.69	Approximate edge of pavement	81.87	-	**84.34**	0.65	**84.73**	1.04	**85.15**	1.46
NA1140	79.43	Bottom of structure	86.76	Approximate edge of pavement	84.17	-	**87.26**	0.50	**87.53**	0.77	**87.85**	1.09
NA1150	80.96	Bottom of structure	83.93	Approximate edge of pavement	**87.31**	3.38	**88.47**	4.54	**88.67**	4.74	**88.91**	4.98
NA1160	87.02	Bottom of structure	91.63	Approximate edge of pavement	90.04	-	91.59	-	**91.98**	0.35	**92.17**	0.54
NA1170	83.62	Bottom of structure	89.26	Approximate edge of pavement	**89.99**	0.73	**90.34**	1.08	**90.52**	1.26	**90.71**	1.45
NA1180	83.62	Lake Midget control elevation	90.40	Bank overtopping	89.96	-	90.31	-	**90.48**	0.08	**90.67**	0.27
NA1190	83.89	Bottom of structure	88.91	Approximate edge of pavement	**89.94**	1.03	**90.04**	1.13	**90.09**	1.18	**90.16**	1.25
NA1200	83.89	Bottom of structure	91.04	Approximate edge of pavement	89.89	-	89.99	-	90.04	-	90.11	-
NA1210	83.62	Bottom of structure	90.46	Approximate edge of pavement	89.92	-	90.11	-	90.26	-	90.46	-
NA1220	83.62	Bottom of structure	91.71	Approximate edge of pavement	89.96	-	90.23	-	90.43	-	90.68	-
NA1230	83.62	Bottom of structure	90.28	Approximate edge of pavement	89.97	-	**90.3**	0.02	**90.49**	0.21	**90.69**	0.41
NA1240	87.78	Bottom of structure	91.07	Approximate edge of pavement	90.07	-	90.61	-	91.02	-	**91.13**	0.06
NA1250	87.42	Bottom of structure	90.70	Approximate edge of pavement	89.97	-	90.04	-	90.08	-	90.13	-
NA1260	86.18	Bottom of structure	90.64	Approximate edge of pavement	89.87	-	89.97	-	90.01	-	90.08	-
NA1270	85.80	Bottom of structure	89.67	Approximate edge of pavement	**89.94**	0.27	**90.06**	0.39	**90.14**	0.47	**90.22**	0.55
NA1280	85.60	Bottom of structure	90.74	Approximate edge of pavement	89.93	-	90.04	-	90.1	-	90.17	-
NA1290	88.32	Bottom of structure	90.86	Approximate edge of pavement	**91.06**	0.20	**91.19**	0.33	**91.24**	0.38	**91.3**	0.44
NA1300	86.73	Bottom of structure	90.10	Approximate edge of pavement	**90.44**	0.34	**90.81**	0.71	**90.91**	0.81	**90.99**	0.89
NA1310	83.30	Bottom of structure	87.94	Approximate edge of pavement	86.04	-	87.53	-	**88.56**	0.62	**88.72**	0.78
NA1320	88.52	Bottom of structure	92.53	Approximate edge of pavement	89.44	-	90.98	-	91.3	-	91.72	-
NA1330	84.72	Bottom of structure	90.29	Approximate edge of pavement	89.39	-	**90.94**	0.65	**91.25**	0.96	**91.66**	1.37
NA1340	85.32	Bottom of structure	89.55	Approximate edge of pavement	89.25	-	**90.9**	1.35	**91.22**	1.67	**91.62**	2.07
NA1350	84.62	Bottom of structure	90.45	Approximate edge of pavement	88.49	-	**90.57**	0.12	**91.16**	0.71	**91.56**	1.11
NA1360	82.50	Bottom of structure	89.84	Approximate edge of pavement	87.28	-	88.96	-	**90.1**	0.26	**90.73**	0.89
NA1370	82.50	Bottom of structure	88.96	Approximate edge of pavement	86.09	-	87.42	-	88.26	-	**90.03**	1.07
NA1380	82.50	Bottom of structure	89.60	Approximate edge of pavement	85.22	-	86.31	-	86.77	-	87.73	-

Geosyntec consultants

APPENDIX G - FIC #6 – Lake Killarney: Improved Conveyance to Lake Gem Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1390	82.04	Bottom of structure	89.38	Approximate edge of pavement	84.78	-	85.72	-	86.04	-	86.57	-
NA1400	86.52	Bottom of structure	92.24	Approximate edge of pavement	89.54	-	91.28	-	91.74	-	**92.35**	0.11
NA1410	84.72	Bottom of structure	90.35	Approximate edge of pavement	89.39	-	**90.94**	0.59	**91.26**	0.91	**91.68**	1.33
NA1420	81.52	Bottom of structure	89.36	Approximate edge of pavement	87.47	-	**90.34**	0.98	**91.19**	1.83	**91.62**	2.26
NA1430	81.13	Bottom of structure	90.79	Approximate edge of pavement	86.51	-	88.79	-	89.6	-	**91.35**	0.56
NA1440	81.13	Bottom of structure	90.11	Approximate edge of pavement	85.99	-	88.04	-	88.82	-	**90.59**	0.48
NA1450	81.13	Bottom of structure	88.88	Approximate edge of pavement	85.65	-	87.55	-	88.35	-	**89.96**	1.08
NA1460	81.13	Bottom of structure	89.61	Approximate edge of pavement	85.27	-	86.86	-	87.58	-	89.13	-
NA1470	81.13	Bottom of structure	90.19	Approximate edge of pavement	84.87	-	86.11	-	86.71	-	88.03	-
NA1480	81.13	Bottom of structure	89.23	Approximate edge of pavement	84.83	-	85.97	-	86.47	-	87.38	-
NA1490	82.72	Bottom of structure	87.50	Approximate edge of pavement	85.98	-	**87.94**	0.44	**88.2**	0.70	**88.53**	1.03
NA1500	83.44	Bottom of structure	87.27	Approximate edge of pavement	84.19	-	86.29	-	**87.41**	0.14	**88.12**	0.85
NA1510	81.14	Lake Mendsen NHWE	85.25	Approximate edge of pavement	84.13	-	**86.25**	1.00	**87.34**	2.09	**88.08**	2.83
NA1520	82.42	Bottom of structure	86.11	Approximate edge of pavement	84.15	-	**86.46**	0.35	**87.32**	1.21	**88.05**	1.94
NA1530	81.14	Lake Mendsen NHWE	86.90	Approximate edge of pavement	84.09	-	86.2	-	**87.03**	0.13	**87.73**	0.83
NA1540	81.14	Lake Mendsen NHWE	85.15	Approximate edge of pavement	84.17	-	**86.26**	1.11	**87.36**	2.21	**88.1**	2.95
NA1550	90.36	Bottom of structure	94.47	Approximate edge of pavement	92	-	93.68	-	**94.5**	0.03	**94.87**	0.40
NA1560	89.67	Bottom of structure	94.46	Approximate edge of pavement	90.89	-	91.33	-	91.52	-	91.64	-
NA1570	87.27	Bottom of structure	91.49	Approximate edge of pavement	88.41	-	88.82	-	89.61	-	**91.61**	0.12
NA1580	84.57	Bottom of structure	89.81	Approximate edge of pavement	86.39	-	87	-	87.84	-	89.36	-
NA1590	82.97	Bottom of structure	91.69	Approximate edge of pavement	88.51	-	88.79	-	89.02	-	89.46	-
NA1600	82.97	Bottom of structure	87.71	Approximate edge of pavement	84.19	-	86.27	-	87.06	-	**87.76**	0.05
NA1610	81.80	Bottom of structure	85.34	Approximate edge of pavement	84.17	-	**86.24**	0.90	**87.02**	1.68	**87.72**	2.38
NA1620	90.03	Bottom of structure	92.24	Approximate edge of pavement	90.03	-	90.03	-	90.03	-	91.6	-
NA1630	81.92	Bottom of structure	84.78	Approximate edge of pavement	**85.05**	0.27	**85.98**	1.20	**86.87**	2.09	**87.55**	2.77
NA1640	81.54	Bottom of structure	87.01	Approximate edge of pavement	84.53	-	85.96	-	86.6	-	**87.52**	0.51
NA1650	80.90	Bottom of structure	85.58	Approximate edge of pavement	83.75	-	**85.94**	0.36	**86.32**	0.74	**87.49**	1.91
NA1660	82.04	Lake Killarney tailwater	85.25	Approximate edge of pavement	82.58	-	83.54	-	83.83	-	84.23	-
NA1670	84.22	Bottom of structure	92.63	Approximate edge of pavement	88.96	-	91.52	-	92.15	-	**92.8**	0.17
NA1680	83.52	Bottom of structure	90.33	Approximate edge of pavement	88.38	-	90.28	-	**90.47**	0.14	**90.57**	0.24
NA1690	82.52	Bottom of structure	89.14	Approximate edge of pavement	87.93	-	**89.33**	0.19	**89.43**	0.29	**89.54**	0.40
NA1700	82.04	Bottom of structure	88.40	Approximate edge of pavement	87.51	-	**89.15**	0.75	**89.26**	0.86	**89.39**	0.99
NA1710	82.04	Bottom of structure	89.18	Approximate edge of pavement	86.68	-	88.06	-	88.28	-	88.64	-
NA1720	82.04	Bottom of structure	89.94	Approximate edge of pavement	85.45	-	86.42	-	86.73	-	87.22	-
NA1730	82.04	Bottom of structure	89.12	Approximate edge of pavement	84.86	-	85.83	-	86.14	-	86.67	-
NA1740	81.14	Bottom of structure	90.16	Approximate edge of pavement	83.9	-	85.55	-	86.62	-	87.76	-
NA1750	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	83.91	-	**85.99**	0.33	**86.91**	1.25	**87.67**	2.01
NA1760	81.13	Lake Mendsen NHWE	85.45	Approximate edge of pavement	84.1	-	**86.13**	0.68	**86.96**	1.51	**87.71**	2.26
NA1790	82.93	Bottom of structure	88.04	Approximate edge of pavement	85.81	-	87.59	-	**88.41**	0.37	**88.66**	0.62
NA1800	76.40	Bottom of structure	88.11	Approximate edge of pavement	78.24	-	78.39	-	78.48	-	78.68	-
NA1810	77.43	Bottom of structure	86.98	Approximate edge of pavement	79.6	-	79.79	-	79.94	-	80.24	-
NA1820	70.50	Bottom of dry pond	78.99	Bank overtopping	78.19	-	78.32	-	78.41	-	78.54	-
NA1830	67.20	9th Grade Pond Control Elevation	77.76	Bank overtopping	71.35	-	72.05	-	72.25	-	72.6	-
NA1840	67.20	Bottom of structure	77.60	Approximate edge of pavement	71.97	-	73.16	-	73.53	-	74.16	-
NA1850	67.20	Lake Virginia tailwater	70.48	Approximate edge of pavement	69.13	-	**70.63**	0.15	**70.92**	0.44	**71.28**	0.80
NA1860	77.47	Bottom of structure	86.40	Approximate edge of pavement	82.44	-	84.09	-	84.52	-	84.79	-
NA1870	87.63	Bottom of structure	92.36	Approximate edge of pavement	89.54	-	91.81	-	92.33	-	**92.59**	0.23

Geosyntec consultants

APPENDIX G - FIC #6 – Lake Killarney: Improved Conveyance to Lake Gem Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1880	85.16	Bottom of structure	92.62	Approximate edge of pavement	86.67	-	89.85	-	90.88	-	92.04	-
NA1890	92.07	Bottom of structure	94.36	Approximate edge of pavement	92.38	-	92.47	-	92.53	-	92.75	-
NA1900	86.29	Lake Francis Control Elevation	89.99	Bank overtopping	**91.82**	1.83	**92.21**	2.22	**92.38**	2.39	**92.6**	2.61
NA1910	87.03	Lee Road pond control elevation	90.58	Bank overtopping	**91.8**	1.22	**92.2**	1.62	**92.37**	1.79	**92.61**	2.03
NA1970	86.00	Bottom of dry pond	94.89	Bank overtopping	92.32	-	92.79	-	93.24	-	94.58	-
NA1980	89.70	Bottom of structure	95.10	Approximate edge of pavement	92.37	-	92.86	-	93.31	-	94.64	-
NA1990	86.66	Bottom of structure	90.12	Approximate edge of pavement	87.9	-	88.29	-	88.62	-	**90.29**	0.17
NA2000	87.47	Bottom of structure	92.54	Approximate edge of pavement	90.11	-	90.88	-	91.52	-	**93.02**	0.48
NA2010	77.85	Bottom of structure	82.90	Approximate edge of pavement	82.83	-	**83.36**	0.46	**83.44**	0.54	**83.55**	0.65
NA2020	79.52	Bottom of structure	88.37	Approximate edge of pavement	82.5	-	84.15	-	84.59	-	84.93	-
NA2030	87.08	Bottom of structure	92.37	Approximate edge of pavement	90.15	-	90.84	-	91.42	-	91.5	-
NA2100	80.70	Bottom of structure	85.92	Approximate edge of pavement	83.97	-	**86.08**	0.16	**86.89**	0.97	**87.62**	1.70
NA2110	82.19	Bottom of structure	81.74	Approximate edge of pavement	**83.85**	2.11	**85.96**	4.22	**86.77**	5.03	**87.5**	5.76
NA2120	90.41	Bottom of structure	90.89	Approximate edge of pavement	**91.86**	0.97	**92.27**	1.38	**92.44**	1.55	**92.66**	1.77
NB0005	88.75	Approximate water surface elevation	91.82	Finished Floor Elevation	88.92	-	89.42	-	90.14	-	91.42	-
NB0010	81.87	Botom of structure	89.15	Approximate edge of pavement	85	-	86.38	-	87.15	-	88.65	-
NB0020	82.31	Botom of structure	90.36	Approximate edge of pavement	86.59	-	88.48	-	88.89	-	**91.01**	0.65
NB0030	86.97	Approximate water surface elevation	92.39	Finished floor elevation	88.7	-	89.31	-	90.07	-	91.37	-
NB0040	82.50	Pond control structure	89.07	Bank overtopping	85.19	-	85.23	-	85.26	-	85.32	-
NB0050	83.14	Pond control structure	85.33	Bank overtopping	84.62	-	85.02	-	85.21	-	**85.42**	0.09
NB0060	82.04	Bottom of structure	90.41	Approximate edge of pavement	81.83	-	82.69	-	83.67	-	85.77	-
NB0070	86.01	Pond control structure	88.50	Bank overtopping	88.45	-	**88.52**	0.02	**88.57**	0.07	**88.61**	0.11
NB0080	82.04	Bottom of structure	91.31	Approximate edge of pavement	83.05	-	83.51	-	84.21	-	86.61	-

APPENDIX H

FIC #7 – Combination of FICs #4 and 6 Model Results

APPENDIX H - FIC #7 – Combination of FICs #4 and 6 Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
LAKE_KILLARNEY	82.04	Control Elevation	84.40	Finished floor elevation	80.71	-	81.5	-	81.9	-	82.73	-
LAKE_MENDSEN	81.14	Normal high water elevation	84.82	Approximate edge of pavement	84.05	-	**86.16**	1.34	**86.97**	2.15	**87.7**	2.88
LAKE_ROSE	83.30	Approximate water surface elevation	91.01	Bank overtopping	83.89	-	84.16	-	84.37	-	84.76	-
NA0010	72.14	Bottom of structure	78.79	Approximate edge of pavement	77.96	-	**79.49**	0.70	**79.77**	0.98	**80.07**	1.28
NA0020	72.87	Bottom of structure	83.54	Approximate edge of pavement	79.41	-	82.1	-	82.5	-	82.82	-
NA0030	76.82	Bottom of structure	86.32	Approximate edge of pavement	79.79	-	83.07	-	84.42	-	**86.38**	0.06
NA0040	82.00	Bottom of structure	89.63	Approximate edge of pavement	83.88	-	84.48	-	86.22	-	**89.8**	0.17
NA0050	85.66	Bottom of structure	91.51	Approximate edge of pavement	87.82	-	88.23	-	88.67	-	91.19	-
NA0060	88.12	Bottom of structure	92.97	Approximate edge of pavement	88.6	-	88.82	-	89.26	-	92.9	-
NA0070	85.52	Bottom of structure	90.82	Approximate edge of pavement	85.93	-	86.02	-	86.29	-	89.85	-
NA0080	76.22	Bottom of structure	82.01	Approximate edge of pavement	79.68	-	**82.39**	0.38	**82.57**	0.56	**82.74**	0.73
NA0090	78.51	Bottom of structure	85.83	Approximate edge of pavement	84.4	-	85.22	-	85.33	-	85.44	-
NA0100	80.27	Bottom of structure	83.79	Approximate edge of pavement	**84.84**	1.05	**85.3**	1.51	**85.39**	1.60	**85.48**	1.69
NA0110	81.13	Bottom of structure	84.29	Approximate edge of pavement	**85.17**	0.88	**85.36**	1.07	**85.44**	1.15	**85.52**	1.23
NA0120	82.90	Bottom of structure	91.22	Approximate edge of pavement	84.16	-	84.39	-	85.54	-	86.98	-
NA0130	77.12	Bottom of structure	88.40	Approximate edge of pavement	80.94	-	83.94	-	85.61	-	87.16	-
NA0140	81.42	Bottom of structure	85.91	Approximate edge of pavement	82.89	-	**86.3**	0.39	**86.72**	0.81	**87.34**	1.43
NA0150	76.23	Bottom of structure	86.30	Approximate edge of pavement	79.77	-	81.53	-	82.41	-	83.23	-
NA0160	80.32	Bottom of structure	88.35	Approximate edge of pavement	84.78	-	85.2	-	85.5	-	85.93	-
NA0170	79.47	Bottom of structure	90.12	Approximate edge of pavement	83.99	-	84.43	-	84.63	-	84.95	-
NA0180	71.31	Bottom of structure	87.26	Approximate edge of pavement	74.6	-	75.03	-	75.23	-	75.56	-
NA0190	80.82	Bottom of structure	89.89	Approximate edge of pavement	85.22	-	85.64	-	85.98	-	86.48	-
NA0200	81.52	Bottom of structure	85.45	Approximate edge of pavement	**85.93**	0.48	**86.34**	0.89	**86.75**	1.30	**87.36**	1.91
NA0210	80.80	Bottom of structure	88.76	Approximate edge of pavement	83.19	-	84.03	-	85.04	-	86.61	-
NA0220	86.72	Bottom of structure	90.75	Approximate edge of pavement	89	-	90.52	-	**90.86**	0.11	**91.12**	0.37
NA0230	91.44	Bottom of structure	96.15	Approximate edge of pavement	92.44	-	92.99	-	93.29	-	93.82	-
NA0240	88.61	Bottom of structure	93.98	Approximate edge of pavement	92.4	-	92.95	-	93.24	-	93.77	-
NA0250	87.54	Bottom of structure	92.19	Approximate edge of pavement	**92.31**	0.12	**92.7**	0.51	**92.81**	0.62	**92.92**	0.73
NA0260	86.29	Bottom of structure	91.93	Approximate edge of pavement	89.35	-	90.32	-	91.78	-	**92.07**	0.14
NA0270	85.32	Bottom of structure	90.61	Approximate edge of pavement	87.95	-	88.92	-	89.96	-	**91.79**	1.18
NA0280	82.32	Bottom of structure	91.56	Approximate edge of pavement	85.28	-	86.42	-	88	-	90.95	-
NA0290	75.96	Bottom of structure	89.24	Approximate edge of pavement	85.82	-	86.81	-	87.05	-	87.28	-
NA0300	81.61	Bottom of structure	88.92	Approximate edge of pavement	85.82	-	86.54	-	86.76	-	87.21	-
NA0310	83.67	Bottom of structure	86.50	Approximate edge of pavement	86.06	-	**86.5**	0.00	**86.76**	0.26	**87.35**	0.85
NA0320	83.58	Bottom of structure	88.77	Approximate edge of pavement	85.64	-	86.38	-	86.59	-	87.08	-
NA0330	83.24	Bottom of structure	86.37	Approximate edge of pavement	**86.37**	0.00	**86.64**	0.27	**86.84**	0.47	**87.41**	1.04
NA0340	81.46	Bottom of structure	85.60	Approximate edge of pavement	**85.96**	0.36	**86.37**	0.77	**86.77**	1.17	**87.38**	1.78
NA0350	78.17	Bottom of structure	87.25	Approximate edge of pavement	85.93	-	86.93	-	87.18	-	**87.4**	0.15
NA0360	88.33	Bottom of structure	94.12	Approximate edge of pavement	89.3	-	91.29	-	91.38	-	91.59	-
NA0370	86.22	Bottom of structure	91.16	Approximate edge of pavement	89.22	-	**91.21**	0.05	**91.26**	0.10	**91.32**	0.16
NA0380	84.62	Bottom of structure	88.11	Approximate edge of pavement	86.01	-	87.19	-	87.58	-	88.02	-
NA0390	77.48	Bottom of structure	87.47	Approximate edge of pavement	85.87	-	86.86	-	87.1	-	87.32	-
NA0400	87.42	Bottom of structure	91.46	Approximate edge of pavement	88.36	-	89	-	89.59	-	90.82	-
NA0410	85.24	Bottom of structure	87.80	Approximate edge of pavement	**88.28**	0.48	**88.78**	0.98	**89.04**	1.24	**89.19**	1.39
NA0420	82.03	Bottom of structure	89.00	Approximate edge of pavement	85.99	-	87.34	-	87.93	-	88.69	-
NA0430	82.26	Bottom of structure	88.32	Approximate edge of pavement	86.01	-	87.29	-	87.86	-	**88.62**	0.30
NA0440	81.27	Bottom of structure	89.46	Approximate edge of pavement	85.89	-	87.31	-	87.98	-	88.75	-

APPENDIX H - FIC #7 – Combination of FICs #4 and 6 Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0450	80.02	Bottom of structure	88.29	Approximate edge of pavement	84.37	-	85.92	-	86.94	-	87.91	-
NA0460	82.60	Bottom of structure	88.09	Approximate edge of pavement	86.06	-	86.64	-	86.81	-	87.14	-
NA0470	79.57	Bottom of structure	85.32	Approximate edge of pavement	**86.01**	0.69	**86.57**	1.25	**86.7**	1.38	**86.81**	1.49
NA0480	80.26	Bottom of structure	86.75	Approximate edge of pavement	85.91	-	86.67	-	**86.8**	0.05	**86.88**	0.13
NA0490	81.66	Bottom of structure	86.12	Approximate edge of pavement	85.05	-	**86.5**	0.38	**86.65**	0.53	**86.75**	0.63
NA0500	78.02	Bottom of structure	84.24	Approximate edge of pavement	82.93	-	**84.61**	0.37	**84.94**	0.70	**85.14**	0.90
NA0510	79.52	Bottom of structure	84.82	Approximate edge of pavement	83.55	-	**85.32**	0.50	**85.51**	0.69	**85.72**	0.90
NA0520	81.44	Bottom of structure	85.49	Approximate edge of pavement	84.03	-	**85.97**	0.48	**86.14**	0.65	**86.27**	0.78
NA0530	83.62	Bottom of structure	88.82	Approximate edge of pavement	86.07	-	86.99	-	87.67	-	**88.92**	0.10
NA0540	85.97	Bottom of structure	90.45	Approximate edge of pavement	87.62	-	88.5	-	89.9	-	**90.84**	0.39
NA0550	87.66	Bottom of structure	91.28	Approximate edge of pavement	89.07	-	90.15	-	**91.5**	0.22	**91.68**	0.40
NA0560	87.18	Bottom of structure	91.56	Approximate edge of pavement	88.69	-	89.32	-	90.46	-	**92.02**	0.46
NA0570	85.65	Bottom of structure	91.06	Approximate edge of pavement	87.92	-	88.45	-	89.02	-	**91.35**	0.29
NA0580	92.68	Bottom of structure	96.76	Approximate edge of pavement	93	-	93.1	-	93.18	-	93.34	-
NA0590	89.02	Bottom of structure	93.58	Approximate edge of pavement	90.15	-	90.76	-	91.02	-	92.76	-
NA0600	85.05	Bottom of structure	90.93	Approximate edge of pavement	87.01	-	87.89	-	89.69	-	**91.37**	0.44
NA0610	83.91	Bottom of structure	89.93	Approximate edge of pavement	85.99	-	87.5	-	89.02	-	**90.7**	0.77
NA0620	83.12	Bottom of structure	90.59	Approximate edge of pavement	85.32	-	87.3	-	88.65	-	90.15	-
NA0630	85.42	Bottom of structure	90.77	Approximate edge of pavement	86.51	-	87.37	-	88.75	-	90.39	-
NA0640	91.02	Bottom of structure	95.50	Approximate edge of pavement	91.37	-	91.47	-	91.63	-	94.82	-
NA0650	90.02	Bottom of structure	94.83	Approximate edge of pavement	90.92	-	91.23	-	91.5	-	94.73	-
NA0660	90.23	Bottom of structure	94.85	Approximate edge of pavement	91.46	-	92.21	-	93.03	-	94.47	-
NA0670	92.30	Bottom of structure	97.97	Approximate edge of pavement	93.54	-	96.36	-	**98.52**	0.55	**98.61**	0.64
NA0680	90.33	Bottom of structure	96.79	Approximate edge of pavement	91.66	-	93.81	-	96.54	-	**97.22**	0.43
NA0690	88.62	Bottom of structure	94.25	Approximate edge of pavement	90.38	-	92.57	-	**94.5**	0.25	**94.6**	0.35
NA0700	86.32	Bottom of structure	91.79	Approximate edge of pavement	87.87	-	89.09	-	90.75	-	**91.96**	0.17
NA0710	84.94	Bottom of structure	90.28	Approximate edge of pavement	87.23	-	88.71	-	90.15	-	**90.59**	0.31
NA0720	83.55	Bottom of structure	89.40	Approximate edge of pavement	85.2	-	87.04	-	88.06	-	88.86	-
NA0730	82.98	Bottom of structure	88.88	Approximate edge of pavement	85.02	-	86.86	-	87.82	-	88.47	-
NA0740	81.14	Lake Mendsen NHWE	88.51	Approximate edge of pavement	84.25	-	86.78	-	87.67	-	88.29	-
NA0750	81.14	Lake Mendsen NHWE	89.42	Approximate edge of pavement	84.26	-	87.06	-	88.2	-	89.41	-
NA0760	81.14	Lake Mendsen NHWE	87.92	Approximate edge of pavement	84.23	-	86.68	-	87.51	-	**88.13**	0.21
NA0770	81.14	Lake Mendsen NHWE	87.19	Approximate edge of pavement	84.2	-	86.42	-	87.05	-	**87.75**	0.56
NA0780	81.14	Lake Mendsen NHWE	84.82	Approximate edge of pavement	84.17	-	**86.25**	1.43	**86.96**	2.14	**87.65**	2.83
NA0790	85.72	Bottom of structure	89.36	Approximate edge of pavement	87.3	-	88.81	-	**90.22**	0.86	**90.49**	1.13
NA0800	82.98	Bottom of structure	87.39	Approximate edge of pavement	85.06	-	86.91	-	**87.9**	0.51	**88.5**	1.11
NA0810	81.14	Bottom of structure	87.43	Approximate edge of pavement	84.27	-	86.84	-	**87.62**	0.19	**88**	0.57
NA0820	84.16	Bottom of structure	92.65	Approximate edge of pavement	86.61	-	89.77	-	90.81	-	91.98	-
NA0830	84.16	Bottom of structure	91.73	Approximate edge of pavement	86.53	-	89.6	-	90.63	-	91.53	-
NA0840	82.97	Bottom of structure	89.94	Approximate edge of pavement	85.35	-	88.12	-	89.13	-	**90.09**	0.15
NA0850	81.14	Lake Mendsen NHWE	86.88	Approximate edge of pavement	84.26	-	**87.24**	0.36	**88.15**	1.27	**88.55**	1.67
NA0860	81.14	Lake Mendsen NHWE	87.59	Approximate edge of pavement	84.22	-	86.86	-	**87.9**	0.31	**88.44**	0.85
NA0870	81.14	Lake Mendsen NHWE	86.66	Approximate edge of pavement	84.19	-	86.42	-	**87.53**	0.87	**87.95**	1.29
NA0880	81.14	Lake Mendsen NHWE	87.14	Approximate edge of pavement	84.16	-	86.29	-	**87.17**	0.03	**87.77**	0.63
NA0890	81.14	Lake Mendsen NHWE	86.19	Approximate edge of pavement	84.12	-	**86.25**	0.06	**87.06**	0.87	**87.73**	1.54
NA0900	81.14	Lake Mendsen NHWE	85.06	Approximate edge of pavement	84.09	-	**86.2**	1.14	**87.02**	1.96	**87.71**	2.65
NA0910	85.88	Bottom of structure	91.89	Approximate edge of pavement	87.49	-	87.89	-	88.17	-	88.82	-

APPENDIX H - FIC #7 – Combination of FICs #4 and 6 Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA0920	81.29	Bottom of structure	87.69	Approximate edge of pavement	84.18	-	86.26	-	87.1	-	**87.87**	0.18
NA0930	81.14	Lake Mendsen NHWE	86.09	Approximate edge of pavement	84.15	-	**86.22**	0.13	**87.02**	0.93	**87.71**	1.62
NA0940	81.14	Lake Mendsen NHWE	84.77	Approximate edge of pavement	84.13	-	**86.19**	1.42	**86.99**	2.22	**87.68**	2.91
NA0950	81.14	Lake Mendsen NHWE	84.84	Approximate edge of pavement	84.09	-	**86.17**	1.33	**86.98**	2.14	**87.69**	2.85
NA0960	81.14	Lake Mendsen NHWE	85.58	Approximate edge of pavement	84.19	-	**86.26**	0.68	**86.92**	1.34	**87.6**	2.02
NA0970	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	84.13	-	**86.22**	0.56	**86.98**	1.32	**87.67**	2.01
NA0980	81.14	Lake Mendsen NHWE	84.95	Approximate edge of pavement	84.09	-	**86.19**	1.24	**86.98**	2.03	**87.68**	2.73
NA0990	87.41	Bottom of structure	90.80	Approximate edge of pavement	88.27	-	88.54	-	88.76	-	89.54	-
NA1000	82.94	Bottom of structure	87.49	Approximate edge of pavement	84.5	-	86.17	-	87.3	-	**88.21**	0.72
NA1010	78.97	Bottom of structure	85.37	Approximate edge of pavement	81.88	-	**85.62**	0.25	**86.28**	0.91	**87.43**	2.06
NA1020	80.47	Bottom of structure	85.47	Approximate edge of pavement	83.12	-	**85.89**	0.42	**86.31**	0.84	**87.45**	1.98
NA1030	77.85	Bottom of structure	85.55	Approximate edge of pavement	81.34	-	84.94	-	**85.61**	0.06	**87.41**	1.86
NA1040	77.76	Bottom of structure	85.24	Approximate edge of pavement	81.19	-	84.75	-	**85.43**	0.19	**87.41**	2.17
NA1050	77.44	Bottom of structure	84.28	Approximate edge of pavement	80.85	-	84.28	-	**84.93**	0.65	**87.4**	3.12
NA1060	76.61	Bottom of structure	83.43	Approximate edge of pavement	80.7	-	**84**	0.57	**84.78**	1.35	**87.39**	3.96
NA1070	75.87	Bottom of structure	89.34	Approximate edge of pavement	80.4	-	83.4	-	84.1	-	85.67	-
NA1080	74.25	Bottom of structure	85.11	Approximate edge of pavement	78.97	-	81.02	-	81.47	-	82.24	-
NA1090	73.79	Bottom of structure	76.62	Approximate edge of pavement	**77.73**	1.11	**78.57**	1.95	**78.77**	2.15	**79.1**	2.48
NA1100	77.15	Bottom of structure	83.03	Approximate edge of pavement	78.07	-	79.42	-	83	-	**83.28**	0.25
NA1110	74.23	Bottom of structure	80.07	Approximate edge of pavement	77.24	-	77.6	-	78.76	-	79.23	-
NA1120	73.79	Bottom of structure	76.34	Approximate edge of pavement	**77.17**	0.83	**77.28**	0.94	**77.47**	1.13	**77.81**	1.47
NA1130	78.93	Bottom of structure	83.69	Approximate edge of pavement	81.87	-	**84.34**	0.65	**84.73**	1.04	**85.15**	1.46
NA1140	79.43	Bottom of structure	86.76	Approximate edge of pavement	84.17	-	**87.26**	0.50	**87.53**	0.77	**87.85**	1.09
NA1150	80.96	Bottom of structure	83.93	Approximate edge of pavement	**87.31**	3.38	**88.47**	4.54	**88.67**	4.74	**88.91**	4.98
NA1160	87.02	Bottom of structure	91.63	Approximate edge of pavement	90.04	-	91.59	-	**91.98**	0.35	**92.17**	0.54
NA1170	83.62	Bottom of structure	89.26	Approximate edge of pavement	**89.99**	0.73	**90.34**	1.08	**90.52**	1.26	**90.71**	1.45
NA1180	83.62	Lake Midget control elevation	90.40	Bank overtopping	89.96	-	90.31	-	**90.48**	0.08	**90.67**	0.27
NA1190	83.89	Bottom of structure	88.91	Approximate edge of pavement	**89.94**	1.03	**90.04**	1.13	**90.09**	1.18	**90.16**	1.25
NA1200	83.89	Bottom of structure	91.04	Approximate edge of pavement	89.89	-	89.99	-	90.04	-	90.11	-
NA1210	83.62	Bottom of structure	90.46	Approximate edge of pavement	89.92	-	90.11	-	90.26	-	90.46	-
NA1220	83.62	Bottom of structure	91.71	Approximate edge of pavement	89.96	-	90.23	-	90.43	-	90.68	-
NA1230	83.62	Bottom of structure	90.28	Approximate edge of pavement	89.97	-	**90.3**	0.02	**90.49**	0.21	**90.69**	0.41
NA1240	87.78	Bottom of structure	91.07	Approximate edge of pavement	90.07	-	90.61	-	91.02	-	**91.13**	0.06
NA1250	87.42	Bottom of structure	90.70	Approximate edge of pavement	89.97	-	90.04	-	90.08	-	90.13	-
NA1260	86.18	Bottom of structure	90.64	Approximate edge of pavement	89.87	-	89.97	-	90.01	-	90.08	-
NA1270	85.80	Bottom of structure	89.67	Approximate edge of pavement	**89.94**	0.27	**90.06**	0.39	**90.14**	0.47	**90.22**	0.55
NA1280	85.60	Bottom of structure	90.74	Approximate edge of pavement	89.93	-	90.04	-	90.1	-	90.17	-
NA1290	88.32	Bottom of structure	90.86	Approximate edge of pavement	**91.06**	0.20	**91.19**	0.33	**91.24**	0.38	**91.3**	0.44
NA1300	86.73	Bottom of structure	90.10	Approximate edge of pavement	**90.44**	0.34	**90.81**	0.71	**90.91**	0.81	**90.99**	0.89
NA1310	83.30	Bottom of structure	87.94	Approximate edge of pavement	86.04	-	87.53	-	**88.56**	0.62	**88.72**	0.78
NA1320	88.52	Bottom of structure	92.53	Approximate edge of pavement	89.44	-	90.98	-	91.3	-	91.72	-
NA1330	84.72	Bottom of structure	90.29	Approximate edge of pavement	89.39	-	**90.94**	0.65	**91.25**	0.96	**91.66**	1.37
NA1340	85.32	Bottom of structure	89.55	Approximate edge of pavement	89.25	-	**90.9**	1.35	**91.22**	1.67	**91.62**	2.07
NA1350	84.62	Bottom of structure	90.45	Approximate edge of pavement	88.49	-	**90.57**	0.12	**91.16**	0.71	**91.56**	1.11
NA1360	82.50	Bottom of structure	89.84	Approximate edge of pavement	87.28	-	88.96	-	**90.1**	0.26	**90.73**	0.89
NA1370	82.50	Bottom of structure	88.96	Approximate edge of pavement	86.09	-	87.42	-	88.26	-	**90.03**	1.07
NA1380	82.50	Bottom of structure	89.60	Approximate edge of pavement	85.22	-	86.31	-	86.77	-	87.73	-

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APPENDIX H - FIC #7 – Combination of FICs #4 and 6 Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1390	82.04	Bottom of structure	89.38	Approximate edge of pavement	84.78	-	85.72	-	86.04	-	86.57	-
NA1400	86.52	Bottom of structure	92.24	Approximate edge of pavement	89.54	-	91.28	-	91.74	-	**92.35**	0.11
NA1410	84.72	Bottom of structure	90.35	Approximate edge of pavement	89.39	-	**90.94**	0.59	**91.26**	0.91	**91.68**	1.33
NA1420	81.52	Bottom of structure	89.36	Approximate edge of pavement	87.47	-	**90.34**	0.98	**91.19**	1.83	**91.62**	2.26
NA1430	81.13	Bottom of structure	90.79	Approximate edge of pavement	86.51	-	88.79	-	89.6	-	**91.35**	0.56
NA1440	81.13	Bottom of structure	90.11	Approximate edge of pavement	85.99	-	88.04	-	88.82	-	**90.59**	0.48
NA1450	81.13	Bottom of structure	88.88	Approximate edge of pavement	85.65	-	87.55	-	88.35	-	**89.96**	1.08
NA1460	81.13	Bottom of structure	89.61	Approximate edge of pavement	85.27	-	86.86	-	87.58	-	89.13	-
NA1470	81.13	Bottom of structure	90.19	Approximate edge of pavement	84.87	-	86.11	-	86.71	-	88.03	-
NA1480	81.13	Bottom of structure	89.23	Approximate edge of pavement	84.83	-	85.97	-	86.47	-	87.38	-
NA1490	82.72	Bottom of structure	87.50	Approximate edge of pavement	85.98	-	**87.94**	0.44	**88.2**	0.70	**88.53**	1.03
NA1500	83.44	Bottom of structure	87.27	Approximate edge of pavement	84.19	-	86.29	-	**87.41**	0.14	**88.12**	0.85
NA1510	81.14	Lake Mendsen NHWE	85.25	Approximate edge of pavement	84.13	-	**86.25**	1.00	**87.34**	2.09	**88.08**	2.83
NA1520	82.42	Bottom of structure	86.11	Approximate edge of pavement	84.15	-	**86.46**	0.35	**87.32**	1.21	**88.05**	1.94
NA1530	81.14	Lake Mendsen NHWE	86.90	Approximate edge of pavement	84.09	-	86.2	-	**87.03**	0.13	**87.73**	0.83
NA1540	81.14	Lake Mendsen NHWE	85.15	Approximate edge of pavement	84.17	-	**86.26**	1.11	**87.36**	2.21	**88.1**	2.95
NA1550	90.36	Bottom of structure	94.47	Approximate edge of pavement	92	-	93.68	-	**94.5**	0.03	**94.87**	0.40
NA1560	89.67	Bottom of structure	94.46	Approximate edge of pavement	90.89	-	91.33	-	91.52	-	91.64	-
NA1570	87.27	Bottom of structure	91.49	Approximate edge of pavement	88.41	-	88.82	-	89.61	-	**91.61**	0.12
NA1580	84.57	Bottom of structure	89.81	Approximate edge of pavement	86.39	-	87	-	87.84	-	89.36	-
NA1590	82.97	Bottom of structure	91.69	Approximate edge of pavement	88.51	-	88.79	-	89.02	-	89.46	-
NA1600	82.97	Bottom of structure	87.71	Approximate edge of pavement	84.19	-	86.27	-	87.06	-	**87.76**	0.05
NA1610	81.80	Bottom of structure	85.34	Approximate edge of pavement	84.17	-	**86.24**	0.90	**87.02**	1.68	**87.72**	2.38
NA1620	90.03	Bottom of structure	92.24	Approximate edge of pavement	90.03	-	90.03	-	90.03	-	91.6	-
NA1630	81.92	Bottom of structure	84.78	Approximate edge of pavement	**85.05**	0.27	**85.98**	1.20	**86.87**	2.09	**87.55**	2.77
NA1640	81.54	Bottom of structure	87.01	Approximate edge of pavement	84.53	-	85.96	-	86.6	-	**87.52**	0.51
NA1650	80.90	Bottom of structure	85.58	Approximate edge of pavement	83.75	-	**85.94**	0.36	**86.32**	0.74	**87.49**	1.91
NA1660	82.04	Lake Killarney tailwater	85.25	Approximate edge of pavement	82.58	-	83.54	-	83.83	-	84.23	-
NA1670	84.22	Bottom of structure	92.63	Approximate edge of pavement	88.96	-	91.52	-	92.15	-	**92.8**	0.17
NA1680	83.52	Bottom of structure	90.33	Approximate edge of pavement	88.38	-	90.28	-	**90.47**	0.14	**90.57**	0.24
NA1690	82.52	Bottom of structure	89.14	Approximate edge of pavement	87.93	-	**89.33**	0.19	**89.43**	0.29	**89.54**	0.40
NA1700	82.04	Bottom of structure	88.40	Approximate edge of pavement	87.51	-	**89.15**	0.75	**89.26**	0.86	**89.39**	0.99
NA1710	82.04	Bottom of structure	89.18	Approximate edge of pavement	86.68	-	88.06	-	88.28	-	88.64	-
NA1720	82.04	Bottom of structure	89.94	Approximate edge of pavement	85.45	-	86.42	-	86.73	-	87.22	-
NA1730	82.04	Bottom of structure	89.12	Approximate edge of pavement	84.86	-	85.83	-	86.14	-	86.67	-
NA1740	81.14	Bottom of structure	90.16	Approximate edge of pavement	83.9	-	85.55	-	86.62	-	87.76	-
NA1750	81.14	Lake Mendsen NHWE	85.66	Approximate edge of pavement	83.91	-	**85.99**	0.33	**86.91**	1.25	**87.67**	2.01
NA1760	81.13	Lake Mendsen NHWE	85.45	Approximate edge of pavement	84.1	-	**86.13**	0.68	**86.96**	1.51	**87.71**	2.26
NA1790	82.93	Bottom of structure	88.04	Approximate edge of pavement	85.81	-	87.59	-	**88.41**	0.37	**88.66**	0.62
NA1800	76.40	Bottom of structure	88.11	Approximate edge of pavement	78.24	-	78.39	-	78.48	-	78.68	-
NA1810	77.43	Bottom of structure	86.98	Approximate edge of pavement	79.6	-	79.79	-	79.94	-	80.24	-
NA1820	70.50	Bottom of dry pond	78.99	Bank overtopping	78.19	-	78.32	-	78.41	-	78.54	-
NA1830	67.20	9th Grade Pond Control Elevation	77.76	Bank overtopping	71.35	-	72.05	-	72.25	-	72.6	-
NA1840	67.20	Bottom of structure	77.60	Approximate edge of pavement	71.97	-	73.16	-	73.53	-	74.16	-
NA1850	67.20	Lake Virginia tailwater	70.48	Approximate edge of pavement	69.13	-	**70.63**	0.15	**70.92**	0.44	**71.28**	0.80
NA1860	77.47	Bottom of structure	86.40	Approximate edge of pavement	82.44	-	84.09	-	84.52	-	84.79	-
NA1870	87.63	Bottom of structure	92.36	Approximate edge of pavement	89.54	-	91.81	-	92.33	-	**92.59**	0.23

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APPENDIX H - FIC #7 – Combination of FICs #4 and 6 Model Results

NODE NAME	INITIAL STAGE		WARNING STAGE		2 YEAR / 24 HOUR		10 YEAR / 24 HOUR		25 YEAR / 24 HOUR		100 YEAR / 24 HOUR	
	ELEVATION	DESCRIPTION	ELEVATION	DESCRIPTION	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)	PEAK STAGE (FT)	FLOOD DEPTH (FT)
NA1880	85.16	Bottom of structure	92.62	Approximate edge of pavement	86.67	-	89.85	-	90.88	-	92.04	-
NA1890	92.07	Bottom of structure	94.36	Approximate edge of pavement	92.38	-	92.47	-	92.53	-	92.75	-
NA1900	86.29	Lake Francis Control Elevation	89.99	Bank overtopping	**91.82**	1.83	**92.21**	2.22	**92.38**	2.39	**92.6**	2.61
NA1910	87.03	Lee Road pond control elevation	90.58	Bank overtopping	**91.8**	1.22	**92.2**	1.62	**92.37**	1.79	**92.61**	2.03
NA1970	86.00	Bottom of dry pond	94.89	Bank overtopping	92.32	-	92.79	-	93.24	-	94.58	-
NA1980	89.70	Bottom of structure	95.10	Approximate edge of pavement	92.37	-	92.86	-	93.31	-	94.64	-
NA1990	86.66	Bottom of structure	90.12	Approximate edge of pavement	87.9	-	88.29	-	88.62	-	**90.29**	0.17
NA2000	87.47	Bottom of structure	92.54	Approximate edge of pavement	90.11	-	90.88	-	91.52	-	**93.02**	0.48
NA2010	77.85	Bottom of structure	82.90	Approximate edge of pavement	82.83	-	**83.36**	0.46	**83.44**	0.54	**83.55**	0.65
NA2020	79.52	Bottom of structure	88.37	Approximate edge of pavement	82.5	-	84.15	-	84.59	-	84.93	-
NA2030	87.08	Bottom of structure	92.37	Approximate edge of pavement	90.15	-	90.84	-	91.42	-	91.5	-
NA2100	80.70	Bottom of structure	85.92	Approximate edge of pavement	83.97	-	**86.08**	0.16	**86.89**	0.97	**87.62**	1.70
NA2110	82.19	Bottom of structure	81.74	Approximate edge of pavement	**83.85**	2.11	**85.96**	4.22	**86.77**	5.03	**87.5**	5.76
NA2120	90.41	Bottom of structure	90.89	Approximate edge of pavement	**91.86**	0.97	**92.27**	1.38	**92.44**	1.55	**92.66**	1.77
NB0005	88.75	Approximate water surface elevation	91.82	Finished Floor Elevation	88.6	-	88.94	-	89.42	-	90.69	-
NB0010	81.87	Botom of structure	89.15	Approximate edge of pavement	84.8	-	86.3	-	87.07	-	88.57	-
NB0020	82.31	Botom of structure	90.36	Approximate edge of pavement	86.14	-	88.32	-	88.74	-	89.57	-
NB0030	86.97	Approximate water surface elevation	92.39	Finished floor elevation	88.25	-	88.73	-	89.31	-	90.63	-
NB0040	82.50	Pond control structure	89.07	Bank overtopping	85.19	-	85.23	-	85.26	-	85.32	-
NB0050	83.14	Pond control structure	85.33	Bank overtopping	84.62	-	85.02	-	85.21	-	**85.42**	0.09
NB0060	82.04	Bottom of structure	90.41	Approximate edge of pavement	81.83	-	82.7	-	83.68	-	85.78	-
NB0070	86.01	Pond control structure	88.50	Bank overtopping	88.45	-	**88.52**	0.02	**88.57**	0.07	**88.61**	0.11
NB0080	82.04	Bottom of structure	91.31	Approximate edge of pavement	83.05	-	83.51	-	84.22	-	86.62	-

APPENDIX I

Cost Estimates

PRELIMINARY FLOOD IMPROVEMENT CONCEPT #1
LAKE MENDSEN: CONNECTION TO LAKE ROSE
PRELIMINARY ESTIMATE OF IMPROVEMENT COSTS

Item	Pay Item No.	Description	Units	Unit Cost	Quantity	Total
1	101-1	Mobilization (10% of Total)	LS	varies	1	$36,318
2	102-1	Maintenance of Traffic (5% of Total)	LS	varies	1	$18,159
3	104-1	Prevention, Control and Abatement of Erosion and Water Pollution (7% of Total)	LS	varies	1	$25,422
4	110-1-1	Clearing and Grubbing (10% of Total)	LS	varies	1	$36,318
5	425-1581	Inlets, Ditch Bottom, Type H, <10'	EA	$11,000.00	1	$11,000
6	425-2-71	Manhole, J-7, <10'	EA	$14,850.00	2	$29,700
7	430-175-136	Pipe Culvert, RCP, Round, 36", S/CD	LF	$305.00	525	$160,125
8	430-982-138	Mitered End Section, Round, 36", CD	EA	$8,850.00	1	$8,850
9	570-1-2	Performance Turf, Sod	SY	$11.00	3,500	$38,500
					CONSTRUCTION SUBTOTAL:	$364,391
10	999-1	Design & Permitting	LS	$50,000.00	1	$50,000
11	999-2	Survey	LS	$10,000.00	1	$10,000
12	999-3	Ecological Services	LS	$10,000.00	1	$10,000
13	999-4	Geotechnical Services	LS	$10,000.00	1	$10,000
14	999-5	Construction Administration	LS	$35,000.00	1	$35,000
15	999-6	Construction Inspection and Oversight	LS	$15,000.00	1	$15,000
					ENGINEERING SUBTOTAL:	$130,000
					CONTINGENCY (20%):	$98,878
					ESTIMATED TOTAL COST:	**$593,269**

Notes:

1) Unit costs based on current FDOT MPIL Statewide Unit Cost Averages along with Engineer's experience with recent projects.
2) Above estimate does not include cost for potential utility relocations.
3) Estimate does not include potential additional costs associated with removal of muck or unsuitable soils. The extent of onsite muck or unsuitable material would be delineated during the design phase of the project.
4) Pay Item 425-1-583 is the total installed cost for the proposed Lake Mendsen control structure.
5) Pay Item 570-1-2, the area in square-yards was determined by the pipe length in feet under sod, multiplied by 60, assuming they will dig 30 feet on either side per one foot of pipe to install under existing sod. The unit cost is based on recent experience with Orange County projects.
6) Pay Item 570-1-2, the unit cost is based on recent experience with Orange County projects.
7) The estimates for Engineering items are based on similar services on recent projects adjusting for project size and complexity.

PRELIMINARY FLOOD IMPROVEMENT CONCEPT #2
LAKE MENDSEN: PUMP STATION AND LAKE EXPANSION
PRELIMINARY ESTIMATE OF IMPROVEMENT COSTS

Item	Pay Item No.	Description	Units	Unit Cost	Quantity	Total
1	101-1	Mobilization (10% of Total)	LS	varies	1	$52,811
2	102-1	Maintenance of Traffic (5% of Total)	LS	varies	1	$36,968
3	104-1	Prevention, Control and Abatement of Erosion and Water Pollution (7% of Total)	LS	varies	1	$36,968
4	120-2-2	Borrow Excavation, Truck Measure	CY	$55.00	2,948	$162,116
5	160-4	Type B Stabilization (12")	SY	$11.00	149	$1,635
6	285-704	Optional Base, Base Group 04 (6")	SY	$32.00	149	$4,756
7	334-1-13	Superpave Asphaltic Concrete, Traffic C (2")	SY	$160.00	149	$23,778
8	350-3-1	Plain cement concrete pavement, 6"	SY	$125.00	5	$625
9	425-2-71	Manhole, J-7, <10'	EA	$14,850.00	1	$14,850
10	570-1-2	Performance Turf, Sod	SY	$11.00	1,768	$19,449
11	1050-31206	Utility Pipe - Polyvinylchloride, Furnish and Install, Water/Sewer - 6"	LF	$110.00	690	$75,900
					CONSTRUCTION SUBTOTAL:	$429,853
12	999-1	Design & Permitting	LS	$150,000.00	1	$150,000
13	999-2	Survey	LS	$30,000.00	1	$30,000
14	999-3	Ecological Services	LS	$10,000.00	1	$10,000
15	999-4	Geotechnical Services	LS	$20,000.00	1	$20,000
16	999-5	Construction Administration	LS	$15,000.00	1	$15,000
17	999-6	Construction Inspection and Oversight	LS	$100,000.00	1	$100,000
					ENGINEERING SUBTOTAL:	$325,000
					CONTINGENCY (20%):	$150,971
					ESTIMATED TOTAL COST:	**$905,824**

Notes:

1) Unit costs based on current FDOT MPIL Statewide Unit Cost Averages along with Engineer's experience with recent projects.
2) Above estimate does not include cost for potential utility relocations.
3) Estimate does not include potential additional costs associated with removal of muck or unsuitable soils. The extent of onsite muck or unsuitable material would be delineated during the design phase of the project.
4) Pay Item 120-2-2, the volume of the soil to be excavated from the pond was estimated by calulcating the existing area of pond at 75 feet NAVD88, and increasing the depth by 6 feet to 69 feet NAVD88 with 4:1 sideslopes. This includes a modification of the current pond side slopes from 78.9-76 feet NAVD88 from 2:1 to 4:1.
5) Pay Items 160-4, 285-704, and 334-1-13, the area in square-yards was determined by the pipe length in feet under concrete, multiplied by 25, assuming they will dig ~12 feet on either side per one foot of pipe to install under existing cement.
6) Pay Item 350-3-1, the area of cement concrete pavement was determined referencing the dimensions of the mobile pump station, 6GST SAE Mount Global Standard Trash.
7) Pay Item 570-1-2, the unit cost is based on recent experience with Orange County projects.
8) The estimates for Engineering items are based on similar services on recent projects adjusting for project size and complexity.

PRELIMINARY FLOOD IMPROVEMENT CONCEPT #3
CANTON AVENUE: IMPROVED CONVEYANCE
PRELIMINARY ESTIMATE OF IMPROVEMENT COSTS

Item	Pay Item No.	Description	Units	Unit Cost	Quantity	Total
1	101-1	Mobilization (10% of Total)	LS	varies	1	$175,705
2	102-1	Maintenance of Traffic (10% of Total)	LS	varies	1	$175,705
3	104-1	Prevention, Control and Abatement of Erosion and Water Pollution (5% of Total)	LS	varies	1	$87,852
4	110-1-1	Clearing and Grubbing (10% of Total)	LS	varies	1	$175,705
5	160-4	Type B Stabilization (12")	SY	$11.00	3,333	$36,663
6	285-704	Optional Base, Base Group 04 (6")	SY	$32.00	3,333	$106,656
7	334-1-13	Superpave Asphaltic Concrete, Traffic C (2")	SY	$160.00	3,333	$533,280
8	425-1441	Curb Inlet, Type J-4, <10'	EA	$19,500.00	8	$156,000
9	425-2-71	Manholes, J-7, <10'	EA	$14,850.00	5	$74,250
10	430-175-148	Pipe Culvert, RCP, Round, 48"	LF	$455.00	1,200	$546,000
11	430-548-100	Straight Concrete Endwall, 48", Single, 0 Degrees, Round	EA	$30,000.00	1	$30,000
12	520-1-10	Concrete Curb & Gutter, Type F	LF	$50.00	1,100	$55,000
13	522-1	Concrete Sidewalk and Driveways, 4" Thick	SY	$80.00	365	$29,200
					CONSTRUCTION SUBTOTAL:	$2,182,016
14	999-1	Design & Permitting	LS	$100,000.00	1	$100,000
15	999-2	Survey	LS	$30,000.00	1	$30,000
16	999-3	Ecological Services	LS	$10,000.00	1	$10,000
17	999-4	Geotechnical Services	LS	$15,000.00	1	$15,000
18	999-5	Construction Administration	LS	$35,000.00	1	$35,000
19	999-6	Construction Inspection and Oversight	LS	$75,000.00	1	$75,000
					ENGINEERING SUBTOTAL:	$265,000
					CONTINGENCY (20%):	$489,403
					ESTIMATED TOTAL COST:	**$2,936,419**

Notes:

1) Unit costs based on current FDOT MPIL Statewide Unit Cost Averages along with Engineer's experience with recent projects.
2) Above estimate does not include cost for potential utility relocations.
3) Estimate does not include potential additional costs associated with removal of muck or unsuitable soils. The extent of onsite muck or unsuitable material would be delineated during the design phase of the project.
4) Pay Items 160-4, 285-704, and 334-1-13, the area in square-yards was determined by the pipe length in feet under concrete, multiplied by 25, assuming they will dig ~12 feet on either side per one foot of pipe to install under existing cement.
5) Pay Item 425-2-71, one manhole will have a diversion structure within the manhole. The concerte for the diverson structure is assumed to be included in the structure cost.
6) The estimates for Engineering items are based on similar services on recent projects adjusting for project size and complexity.

PRELIMINARY FLOOD IMPROVEMENT CONCEPT #4
LAKE BELL: CONNECTION TO PARK LAKE
PRELIMINARY ESTIMATE OF IMPROVEMENT COSTS

Item	Pay Item No.	Description	Units	Unit Cost	Quantity	Total
1	101-1	Mobilization (10% of Total)	LS	varies	1	$57,554
2	102-1	Maintenance of Traffic (5% of Total)	LS	varies	1	$28,777
3	104-1	Prevention, Control and Abatement of Erosion and Water Pollution (7% of Total)	LS	varies	1	$40,288
4	110-1-1	Clearing and Grubbing (10% of Total)	LS	varies	1	$57,554
5	160-4	Type B Stabilization (12")	SY	$11.00	198	$2,176
6	285-704	Optional Base, Base Group 04 (6")	SY	$32.00	198	$6,329
7	334-1-13	Superpave Asphaltic Concrete, Traffic C (2")	SY	$160.00	198	$31,644
8	425-11	Modify Existing Drainage Structure	EA	$4,750.00	1	$4,750
9	425-1549	Inlet, Ditch Bottom, Type D	EA	$10,400.00	1	$10,400
10	425-2-71	Manhole, J-7, <10'	EA	$14,850.00	2	$29,700
11	430-175-136	Pipe Culvert, RCP, Round, 36", S/CD	LF	$305.00	875	$266,875
12	430-982-138	Mitered End Section, Round, 36", CD	EA	$8,850.00	1	$8,850
13	570-1-2	Performance Turf, Sod	SY	$11.00	2,620	$28,820
14	999-1	Sluice Gate	LS	$20,000.00	1	$20,000
15	999-2	Property acquisition/easements	LS	$21,000.00	1	$21,000
					CONSTRUCTION SUBTOTAL:	$614,718
16	999-3	Design & Permitting	LS	$75,000.00	1	$75,000
17	999-4	Survey	LS	$20,000.00	1	$20,000
18	999-5	Ecological Services	LS	$20,000.00	1	$20,000
19	999-6	Geotechnical Services	LS	$10,000.00	1	$10,000
20	999-7	Construction Administration	LS	$20,000.00	1	$20,000
21	999-8	Construction Inspection and Oversight	LS	$15,000.00	1	$15,000
					ENGINEERING SUBTOTAL:	$160,000
					CONTINGENCY (20%):	$154,944
					ESTIMATED TOTAL COST:	**$929,662**

Notes:

1) Unit costs based on current FDOT MPIL Statewide Unit Cost Averages along with Engineer's experience with recent projects.
2) Above estimate does not include cost for potential utility relocations.
3) Estimate does not include potential additional costs associated with removal of muck or unsuitable soils. The extent of onsite muck or unsuitable material would be delineated during the design phase of the project.
4) Pay Items 160-4, 285-704, and 334-1-13, the area in square-yards was determined by the pipe length in feet under concrete,
5) Pay item 425-11 is the cost of modification to the existing control structure on Grove Street.
6) Pay item 425-1549 is the cost of the proposed control structure for Lake Bell.
7) Pay Item 570-1-2, the area in square-yards was determined by the pipe length in feet under sod, multiplied by 60, assuming
8) Pay Item 570-1-2, the unit cost is based on recent experience with Orange County projects.
9) Pay Item 999-1 is the installed cost for sluice gate based on values given from the manufacturer.
10) Pay Item 999-2 is the easement acquisition cost, this was determined by using the property's 2023 market value multiplied by the percentage of the property that was estimated to be needed for the easement.
11) The estimates for Engineering items are based on similar services on recent projects adjusting for project size and complexity.

PRELIMINARY FLOOD IMPROVEMENT CONCEPT #5
LAKE KILLARNEY: REDUCED INFLOWS FROM FDOT POND
PRELIMINARY ESTIMATE OF IMPROVEMENT COSTS

Item	Pay Item No.	Description	Units	Unit Cost	Quantity	Total
1	101-1	Mobilization (10% of Total)	LS	varies	1	$244,439
2	102-1	Maintenance of Traffic (5% of Total)	LS	varies	1	$122,220
3	104-1	Prevention, Control and Abatement of Erosion and Water Pollution (7% of Total)	LS	varies	1	$171,107
4	120-2-2	Borrow excavation, truck measure	CY	$55.00	37,327	$2,052,996
5	145-71	Reinforcement Grid for Soil Stabilization	SY	$11.00	1,798	$19,780
6	430-175-172	Pipe Culvert, RCP, Round, 78", S/CD	LF	$1,600.00	95	$152,000
7	430-830	Plug and abandon existing 78" pipe	CY	$370.00	47	$17,541
8	430-982-143	Mitered End Section, Round, 78", CD	EA	$18,750.00	1	$18,750
9	570-1-2	Performance Turf, Sod	SY	$11.00	5,302	$58,326
10	999-1	Modify Existing Drainage Structure	EA	$30,000.00	1	$30,000
					CONSTRUCTION SUBTOTAL:	$2,887,159
11	999-2	Design & Permitting	LS	$50,000.00	1	$50,000
12	999-3	Survey	LS	$15,000.00	1	$15,000
13	999-4	Ecological Services	LS	$5,000.00	1	$5,000
14	999-5	Geotechnical Services	LS	$10,000.00	1	$10,000
15	999-6	Construction Administration	LS	$15,000.00	1	$15,000
16	999-7	Construction Inspection and Oversight	LS	$25,000.00	1	$25,000
					ENGINEERING SUBTOTAL:	$120,000
					CONTINGENCY (20%):	$601,432
					ESTIMATED TOTAL COST:	**$3,608,591**

Notes:

1) Unit costs based on current FDOT MPIL Statewide Unit Cost Averages along with Engineer's experience with recent projects.
2) Above estimate does not include cost for potential utility relocations.
3) Estimate does not include potential additional costs associated with removal of muck or unsuitable soils. The extent of onsite muck or unsuitable material would be delineated during the design phase of the project.
4) Pay Item 120-2-2, the volume of the soil to be excavated was estimated assuming a pond expansion into the adjacent parcel matching the existing pond bottom elevation of 85 feet NAVD88 with 4:1 sideslopes.
5) Pay Item 145-71 assumes a maintenance berm along all sides of the proposed pond except the boundary with the existing pond.
6) Pay Item 430-175-172 includes the cost for a 72" RCP pipe, the proposed pipe is 78" however this pay item was used as it is the closest pay item to the pipe size necessary for the proposed improvement. It is assumed that the 78" pipe will have similar cost.
7) Pay Item 430-480, the area in cubic-yards was determined by assuming a 10 feet x 10 feet area exposed to plug the pipe and multiplying by the depth from ground surface to the pipe invert.
8) Pay Item 430-982-143 includes the cost for a 60" MES, the proposed MES is 78" however this pay item was used as it is the closest pay item to the size necessary for the proposed improvement. It is assumed that the 78" MES will have similar cost.
9) Pay Item 570-1-2, the unit cost is based on recent experience with Orange County projects.
10) Pay Item 999-1 includes the cost for modifying the existing inlet that will be used as a tie in for the proposed pipe to the expanded pond.
11) The estimates for Engineering items are based on similar services on recent projects adjusting for project size and complexity.

PRELIMINARY FLOOD IMPROVEMENT CONCEPT #6
LAKE KILLARNEY: IMPROVED CONEVEYANCE TO LAKE GEM
PRELIMINARY ESTIMATE OF IMPROVEMENT COSTS

Item	Pay Item No.	Description	Units	Unit Cost	Quantity	Total
1	101-1	Mobilization (15% of Total)	LS	varies	1	$26,860
2	102-1	Maintenance of Traffic (10% of Total)	LS	varies	1	$17,907
3	104-1	Prevention, Control and Abatement of Erosion and Water Pollution (7% of Total)	LS	varies	1	$12,535
4	425-11	Modify existing drainage structure	EA	$4,750.00	1	$4,750
5	425-2-71	Manholes, J-7, <10'	EA	$19,305.00	1	$19,305
6	430-175-148	Pipe Culvert, RCP, Round, 48"	LF	$455.00	22	$10,010
7	430-548-100	Straight Concrete Endwall, 48", Single, 0 Degrees, Round	EA	$30,000.00	1	$30,000
8	999-1	Sluice Gate	EA	$20,000.00	1	$20,000
					CONSTRUCTION SUBTOTAL:	$141,366
9	999-2	Design & Permitting	LS	$50,000.00	1	$50,000
10	999-3	Survey	LS	$10,000.00	1	$10,000
11	999-4	Ecological Services	LS	$10,000.00	1	$10,000
12	999-5	Geotechnical Services	LS	$10,000.00	1	$10,000
13	999-6	Construction Administration	LS	$15,000.00	1	$15,000
14	999-7	Construction Inspection and Oversight	LS	$15,000.00	1	$15,000
					ENGINEERING SUBTOTAL:	$110,000
					CONTINGENCY (20%):	$50,273
					ESTIMATED TOTAL COST:	**$301,639**

Notes:

1) Unit costs based on current FDOT MPIL Statewide Unit Cost Averages along with Engineer's experience with recent projects.
2) Above estimate does not include cost for potential utility relocations.
3) Estimate does not include potential additional costs associated with removal of muck or unsuitable soils. The extent of onsite muck or unsuitable material would be delineated during the design phase of the project.
4) Pay Item 425-11 will serve as the modification associated with the tie in to the existing outfall structure for Lake Killarney
5) Pay Item 425-2-71 unit cost was increased by 30% as the box will be larger than average to accommodate the 90 degree turn for the 48" pipes.
6) Pay Item 999-1 is the installed cost for sluice gate based on values given from the manufacturer.
7) The estimates for Engineering items are based on similar services on recent projects adjusting for project size and complexity.