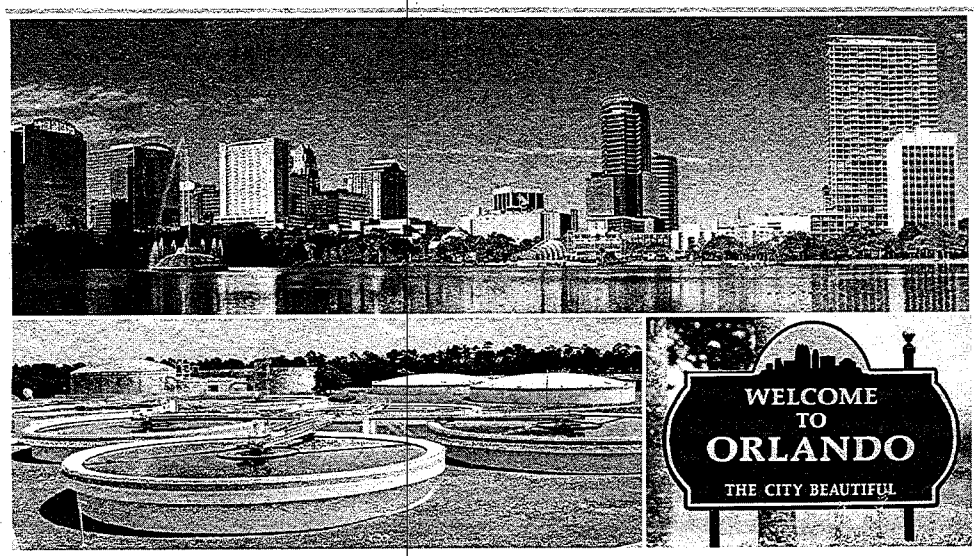
DRAFT

City of Orlando - Clean Water State Revolving Fund Facilities Plan, Volume 1



TETRA TECH

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September 2016

DRAFT

City of Orlando
Clean Water State Revolving Fund
Facilities Plan, Volume 1

#200-08510-16001
September 2016

PRESENTED TO

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EXECUTIVE SUMMARY

OBJECTIVE

This Facilities Plan was prepared to meet the requirements of the Clean Water State Revolving Fund (CWSRF) loan funding for implementing sanitary sewer, wastewater treatment plant, and reclaimed water system improvements. The area considered in this plan includes the City of Orlando's (City) wastewater service area located in Orange County. This Facilities Plan describes alternative methods for addressing identified projects within the City's service area and proposes a specific course of action for each project in accordance with the State and Federal regulations currently in effect.

The Facilities Plan satisfies the requirements set forth by the Florida Department of Environmental Protection (FDEP), as summarized within Section 62-503.700(2) F.A.C. for the State Revolving Loan Program. The City is interested in pursuing SRF loan money to finance the following projects:

- Sanitary sewer improvements on Dean Road.
- Sanitary sewer improvements on Kirkman Road and near the Water Conserv II Water Reclamation Facility (WRF).
- Improvements to Lift Station (LS) No. 1/7.
- Improvements to LS No. 45.
- Improvements to the low voltage system at the Iron Bridge Regional WRF.
- Dewatering improvements at the Iron Bridge Regional WRF.
- Filter replacement at the Water Conserv II WRF.

A map of the proposed project locations is shown on **Figure ES-1**.

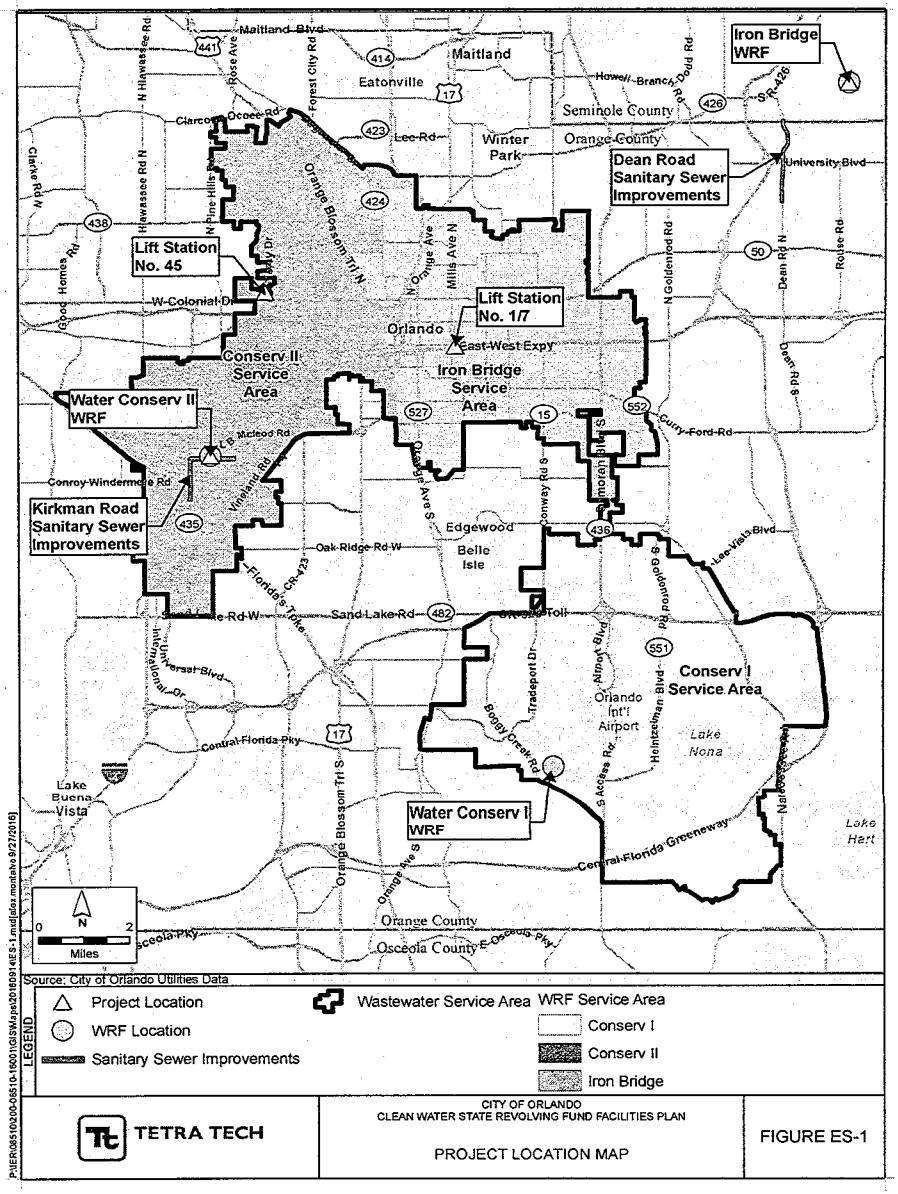
PROJECT DESCRIPTION AND JUSTIFICATION

Each of the projects identified for CWSRF funding involve the replacement or rehabilitation of equipment and infrastructure that is nearing or has exceeded its useful life. In some cases, the City is using this opportunity to expand capacity and upgrade the performance of the older facilities with larger and more modern equipment.

Dean Road Sanitary Sewer Improvements

The sanitary sewer main along Dean Road (from McCulloch Road to Winder Trail), in east Orange County, consists of 9,900 linear feet (LF) of 72 and 78-inch Prestressed Concrete Cylinder Pipe (PCCP) and approximately 24 manholes. The pipeline transports a majority of the wastewater from the City of Orlando to the Iron Bridge WRF. It is anticipated that in the future, when the Water Conserv I WRF is decommissioned, its wastewater flows will be redirected to the Iron Bridge WRF via the Dean Road Interceptor.

Currently, the pipeline is over 30 years old. There have been reports of numerous joint failures. The condition of the pipeline is deteriorating and must be addressed to prevent future failures that could result in leaks, overflows, or collapse of the roadway above the pipeline.



Kirkman Road Sanitary Sewer Improvements

The City intends to address the deteriorating conditions of the large diameter sanitary sewer mains along Kirkman Road and near the Water Conserv II WRF, including the following segments:

- 5200 LF of 48" gravity sewer along Kirkman Road (from the Florida Turnpike to Pine Shadows Parkway).
- 2400 LF of 48" and 2900 LF of 36" gravity sewer along a corridor just south of the Water Conserv II WRF (from Kirkman Road to President Barack Obama Parkway) and 600 LF of 54" gravity sewer into the Water Conserv II WRF site from the south.

Currently, the pipeline is over 30 years old and other pipes near this area have required rehabilitation. This project will continue the City's practice of rehabilitating older pipe in its collection system

Lift Station No. 1/7 Improvements

The City is rehabilitating Lift Station No. 1/7, located at 1300 East South Street, due to the age and condition of the existing facilities, to address corrosion and confined space concerns, and to meet projected flow increases. The stations are separate structures; however, the overall "facility" is referred to as Lift Station No. 1/7.

The general area served by LS No. 1/7 includes the southeastern portion of downtown Orlando; extending south from East Colonial Drive, generally east of I-4, west of Conway Road, and south to Pershing Avenue. The tributary area is approximately eight (8) square miles. The LS collects a large volume of wastewater from a variety of residential and commercial properties in the downtown Orlando area and is a critical piece of infrastructure in the City's collection system.

The overall project will include the decommissioning and abandonment of the existing LS No. 1/7 and construction of a new LS No. 1 at the southwest corner of South Street and Mills Avenue that will include a new wet well, pumps, piping, controls, generator, building, odor control system and miscellaneous site work. Additionally, the project will require reconfiguration of approximately 990 linear feet (LF) of 15-inch, 30-inch, 36-inch, 42-inch and 54-inch diameter gravity sewer main along South Street and Mills Avenue between the existing LS No. 1/7 site and the proposed LS No. 1 site as well as the installation of approximately 1,030 LF of 16-inch and 36-inch diameter force main.

Lift Station No. 45 Improvements

Lift Station No. 45 is a wet-pit/dry-pit facility located at 900 Fairvilla Road. The existing pump station was constructed in 1989 as a replacement to the original station within the same parcel. Major odor control improvements to the facility were implemented in 2015. The facility includes three (3) 3,100 GPM, nonclog wastewater pumps.

The station receives wastewater flow from the gravity collection system located primarily along Mercy Drive, New Hampshire Street, and Brengle Avenue. In addition to the wastewater flows generated by the residents and businesses adjacent to those areas, the gravity collection system receives wastewater flows from multiple lift stations. To address the age of the existing equipment, potential corrosion issues, and confined space concerns, the City plans to construct an entirely new station or implement modifications that result in a facility that features submersible pumps.

Iron Bridge Regional WRF Low Voltage System Improvements

The purpose of this project is to provide upgrades to many of the low voltage systems that have exceeded their useful life and for which replacement parts are no longer available. As a result, these systems need to be replaced in order to improve reliability, maintainability, and the ability to recover from power outages. The project aims to provide improvements to 12 areas at the Iron Bridge Regional WRF, including the administration building, master pump station, deep bed filters and blowers buildings, Bradenpho Phase 2 and 3 (east and west), the maintenance

and warehouse building, solids handling building, post treatment process, aeration building, and power generation building.

Iron Bridge Regional WRF Dewatering Improvements

The biosolids handling equipment at the Iron Bridge WRF has been in operation for over 20 years and has reached the end of its useful life. Consequently the following equipment has been identified for replacement.

- Three (3) gravity belt thickeners (GBTs) and associated progressing cavity feed pumps
- Three (3) 2-belt belt filter presses (BFPs) and associated progressing cavity feed pumps
- Three (3) lime silos

Water Conserv II WRF Filter Replacement

The filters at the Water Conserv II WRF consist of six (6) travelling bridge units that have been in service for approximately 30 years. Due to the age and condition of the filters, as well as performance considerations, the City plans to replace the traveling bridge sand filters with deep bed sand filters similar to those installed at the City's Iron Bridge Regional WRF.

PROJECT COST SUMMARY

Table ES-1 provides a summary of the construction costs, including contingencies and technical services after bid. A total of $61.1 million of total project costs is anticipated to be funded through the CWSRF program. Detailed costs are provided in **Section 6**.

Table ES-1. Project Cost Summary

Project Name	Project Cost (2016 $USD)
Dean Road Sanitary Sewer Improvements	$8,277,614
Kirkman Road Sanitary Sewer Improvements	$7,358,479
Lift Station No. 1/7 Improvements	$12,165,493
Replacement of Lift Station No. 45	$3,148,377
Iron Bridge WRF Low Voltage System Improvements	$9,221,506
Iron Bridge WRF Dewatering Improvements	$6,139,956
Water Conserv II WRF Filter Replacement	$14,763,911
TOTAL COST	**$61,075,335**

PROJECT SCHEDULE

Table ES-2 presents a proposed schedule for the selected alternatives of each project, including design completion, permit completion, and construction start and end dates.

Table ES-2. Project Schedule

Project Name	Bid Documents Complete and Permits Issued	Construction Start	Construction End	Construction Period (mos.)
Dean Road Sanitary Sewer Improvements	July 2017	October 2017	August 2018	11
Kirkman Road Sanitary Sewer Improvements	September 2019	September 2020	September 2021	15
Lift Station No. 1/7 Improvements	February 2017	May 2017	August 2018	16
Replacement of Lift Station No. 45	September 2019	September 2020	January 2022	14
Iron Bridge WRF Low Voltage System Improvements	January 2017	May 2017	August 2018	18
Iron Bridge WRF Dewatering Improvements	April 2017	July 2017	August 2018	12
Water Conserv II WRF Filter Replacement	September 2019	September 2020	March 2022	16

1.0 INTRODUCTION

1.1 OBJECTIVE

This Facilities Plan was prepared to meet the requirements of the Clean Water State Revolving Fund (CWSRF) loan funding for implementing sanitary sewer, wastewater treatment plant, and reclaimed water system improvements. The area considered in this plan includes the City of Orlando's (City) wastewater service area located in Orange County. This Facilities Plan describes alternative methods for addressing identified projects within the City's service area and proposes a specific course of action for each project in accordance with the State and Federal regulations currently in effect.

The Facilities Plan satisfies the requirements set forth by the Florida Department of Environmental Protection (FDEP), as summarized within Section 62-503.700(2) F.A.C. for the State Revolving Loan Program. The City is interested in pursuing SRF loan money to finance the following projects:

- Sanitary sewer improvements on Dean Road.
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- Improvements to LS No. 45.
- Improvements to the low voltage system at the Iron Bridge Regional WRF.
- Dewatering improvements at the Iron Bridge Regional WRF.
- Filter replacement at the Water Conserv II WRF.

1.2 PROJECT LOCATION AND BACKGROUND

The City of Orlando is located in Central Florida in Orange County. The City lies near Lake Apopka, between Sanford and Kissimmee. Situated in the middle of Florida's lakes region, Orlando has more than 50 lakes within its City limits. The City is intersected by U.S. Highway Interstate 4 and State Road 408.

The City was incorporated in 1875 and was previously known as a small community called Jernigan. The community was named after the Jernigan family, who had established the first permanent settlement in the area. Prior to incorporation, the U.S Army built Fort Gatlin south of the present day Orlando City limits to protect settlers from Indian attacks. It later expanded northward and became the City we know today.

Downtown Orlando is home to several museums, Orlando Philharmonic, and the Dr. Phillips Performing Arts Center. The City is also home to a number of higher education institutions that are located wholly, or have a satellite campus in the area, including The University of Central Florida, Valencia Community College, Florida State University, the University of Florida and the Florida Institute of Technology. As one of the top tourist destinations in the world, Orlando boasts dozens of attractions and theme parks, including Walt Disney World Resort, Universal Studios and Sea World.

The City provides a comprehensive range of municipal services including general government, public safety, community development, public works, planning, utilities, and parks and recreation.

1.2.1 Existing Wastewater System

The wastewater service area includes the municipal boundaries of the City of Orlando but also covers portions of unincorporated Orange County. The City is responsible for the collection and treatment of wastewater, as well as the distribution of highly treated reclaimed water for nonpotable reuse. The wastewater service area is divided into

three (3) distinct regions and is comprised of a network of collection and transmission/distribution piping and treatment facilities located in each of these areas:

1. The central portion of the City's service area is pumped to the Iron Bridge Regional WRF, located in neighboring Seminole County.
2. Treatment for the southeast portion of the City service is provided by the Water Conserv I WRF.
3. The western portion of the City's service area is serviced by the Water Conserv II WRF.

Table 1-1 presents a summary of the collection and transmission/distribution system for each WRF.

Table 1-1. WRF Service Area Summary

WRF Service Area	Population Served[1]	Number of Pump Stations	Miles of Gravity Main	Miles of Force Main	WRF Capacity (MGD)
Iron Bridge	110,031	124	336	63	40
Water Conserv I	16,945	100	108	67	7.5
Water Conserv II	103,550	168	339	66	21
Total	**230,526**	**392**	**784**	**197**	**68.5**

[1]Developed from the 2010 U.S. Census and respective service areas of each WRF.

The City's wastewater system is divided into three areas: collection, treatment, and disposal. An estimated 616 miles of public gravity lines, 167 miles of force mains and 213 lift stations make up the City's collection system. The developed portions within the service area that are not serviced by sewer lines are assumed to be on septic tank systems.

The combined capacity of City's three (3) WRFs is 68.5 MGD. The City's wastewater service area and its three (3) existing WRFs, including their respective service areas, are shown on **Figure 1-1**.

1.2.1.1 Iron Bridge Regional Water Reclamation Facility

The Iron Bridge WRF is located at 601 Iron Bridge Circle and provides service to the cities of Orlando, Winter Park, Maitland, Casselberry, and unincorporated portions of Orange and Seminole Counties. The total permitted capacity of the Iron Bridge WRF is 40 million gallons per day (MGD) on an annual average daily flow (AADF) basis and is the largest of the City's WRFs.

The facility utilizes influent mechanical screening, grit removal, flow equalization, biological nutrient removal (5-stage Bardenpho) treatment, secondary clarification, tertiary filtration, and disinfection to treat wastewater to permit standards. Waste activated sludge (WAS) from the biological nutrient removal process is pumped to aerated sludge conditioning tanks. The sludge is dewatered, lime stabilized and hauled off-site for disposal at permitted land application sites.

Effluent produced by the Iron Bridge WRF is reused for:

- Public access reuse, including irrigation within the Eastern Regional Reclaimed Service Area.
- Surface water discharge to the Little Econlockhatchee River (Class III fresh water body).
- A treatment/reuse wetland system that covers 1,640 acres and consists of 17 cells that ultimately discharge to the St. Johns River.

1.2.1.2 Water Conserv I Water Reclamation Facility

The Water Conserv I WRF is located on Richard E. Johnson Blvd. near Boggy Creek Road and provides service to the City's southeast quadrant. The total permitted capacity of the facility is 7.5 MGD on an AADF basis.

Treatment includes mechanical screening, grit removal, primary and secondary clarification, activated sludge process with fine bubble diffused aeration, denitrification basins, final clarification, effluent filtration, and high level disinfection using chlorine. The solids process stream includes dissolved air floatation sludge thickening, anaerobic digestion, belt filter press dewatering, and land application of Class B biosolids.

Effluent produced by the Water Conserv I WRF is reused for:

- Irrigation of public access reuse
- Irrigation of the Orlando International Airport
- Recharge of the surficial aquifer through a series of rapid infiltration basins (RIBs).

The City of Orlando has future plans of decommissioning the facility and diverting the wastewater flow to the Iron Bridge WRF.

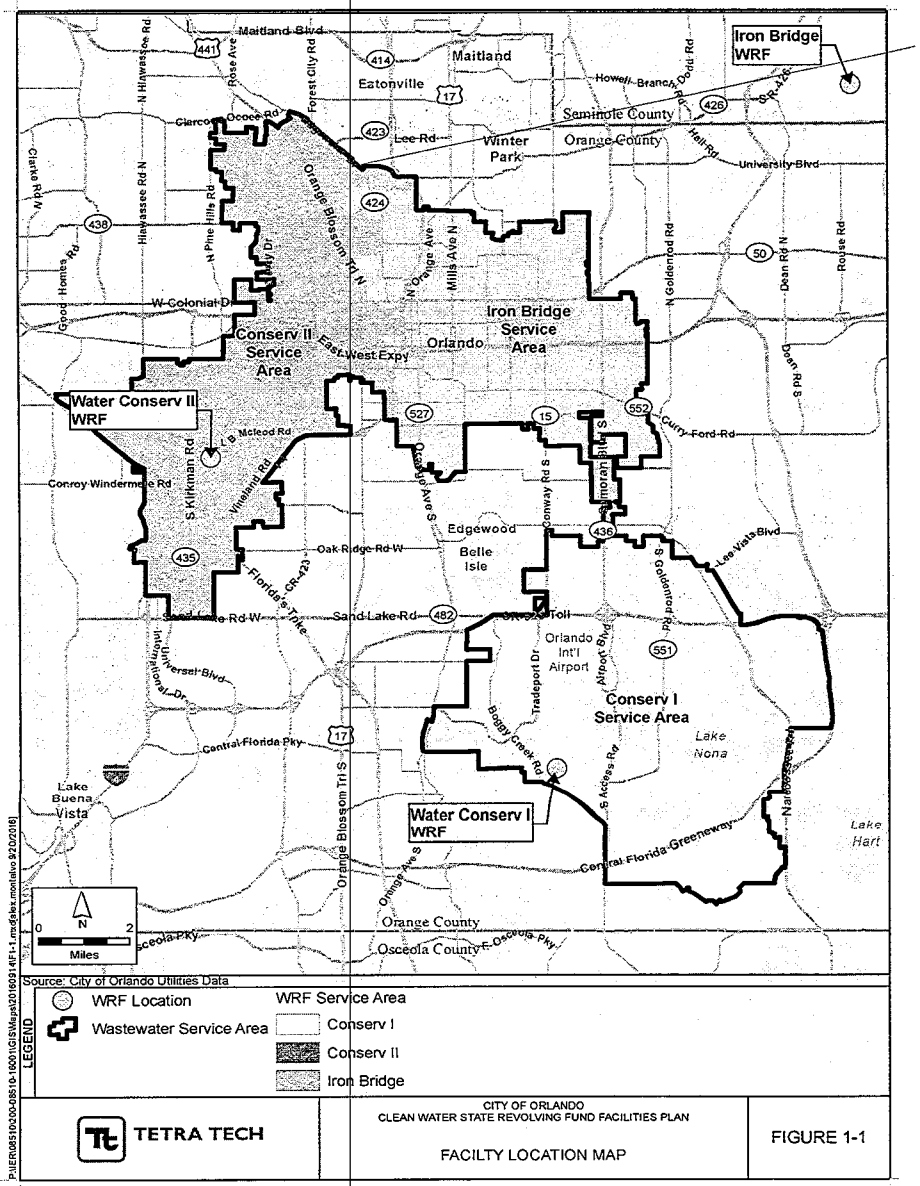
1.2.1.3 Water Conserv II Water Reclamation Facility

The Water Conserv II WRF is located on L.B. McLeod Road and provides service to residential and commercial areas generally west of Interstate 4. The total permitted capacity of the facility is 21 MGD on an AADF basis. The City will soon be stress testing the facility and expects to increase the permitted capacity to 25 MGD.

Currently, the liquid process train consists of mechanical screening, grit removal, primary and secondary clarification, aeration, filtration, and chlorine disinfection. Solids generated by the process are thickened and stabilized using anaerobic digestion. The digested sludge is dewatered using gravity belt filer presses and hauled to land application. The facility uses secondary treatment and high level disinfection to treat the influent wastewater to permit standards.

Effluent produced by the Water Conserv II WRF is reused for:

- Irrigation of citrus groves and urban areas.
- Recharge of the aquifer through a series of RIBs.



Source: City of Orlando Utilities Data

LEGEND

WRF Location

Wastewater Service Area

WRF Service Area

Conserv I

Conserv II

Iron Bridge

TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

FACILTY LOCATION MAP

FIGURE 1-1

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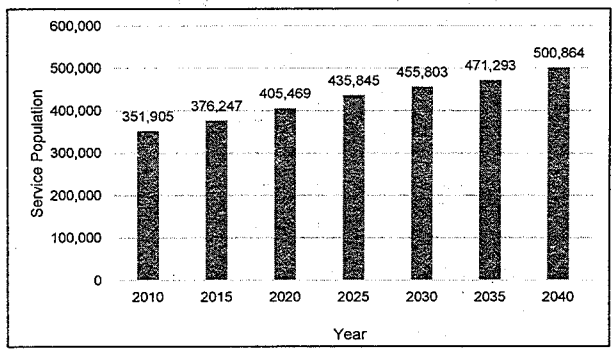
2.0 PROJECTIONS

This section discusses the future population and projected wastewater flows for the City of Orlando.

2.1 POPULATION PROJECTIONS

In 2013, the City of Orlando estimated its "service" population to be approximately 365,000. The service population is the effective population receiving City services and is greater than the base resident population because it also includes tourists, the homeless, and employees from other cities. **Figure 2-1** shows the City's service population projections through 2040.

Figure 2–1. Wastewater Service Area Population Projections



Source: City of Orlando Service Population Projections from 2010 to 2040 Source: Growth Management Plan: 2010-2040 Growth Projections Report, City of Orlando, (updated June 30, 2014)

The population projections above are representative of the wastewater customers within the City limits only. Because the City provides wastewater services to customers outside its City limits and population data for each of these service areas is not directly available, Traffic Analysis Zones (TAZs), which are based on population, were used to estimate wastewater flows through 2040 as discussed below.

2.2 WASTEWATER FLOW PROJECTIONS

Historical flows for the most recent ten (10) years was provided by the City's Wastewater Division to help determine future wastewater flows. Wastewater flow projections must take into account the number and type of service connections (e.g. residential, commercial), future service connections, number of persons per connection and per capita wastewater production. As mentioned previously, TAZ analysis and service population from the City of Orlando Growth Management Plan were used to estimate future wastewater flow.

The approach used for wastewater flow projections uses both historical influent flow and population/LOS projection methods. The population/LOS projection uses wastewater generation rates for a given number of connections (or service population), as opposed to the actual wastewater flow that a service population generates. Because of this,

the flows estimated by the population/LOS method are typically greater than the actual flow; however, they account for declining growth rates as the service area approaches build-out. Historical flow data provides actual flows generated by the service population; however, this approach does not account for slowing growth as the service area approaches build-out. To take advantage of the strengths of each method, the two methods are combined to produce an "adjusted" population/LOS that matches the actual flows generated within the service area. Future wastewater flows are then allowed to increase based on the growth rate of the service population.

Using this approach, **Figures 2-2 through 2-5** were developed to show the projected wastewater flows by service area, including the combined flows of the Iron Bridge and Water Conserv I WRFs. **Table 2-1** provides a summary of these projections.

Figure 2–2. Iron Bridge WRF Wastewater Flow Projections

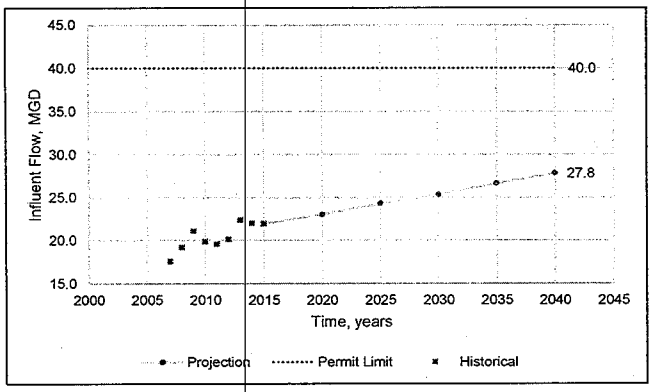


Figure 2–3. Water Conserv I WRF Wastewater Flow Projections

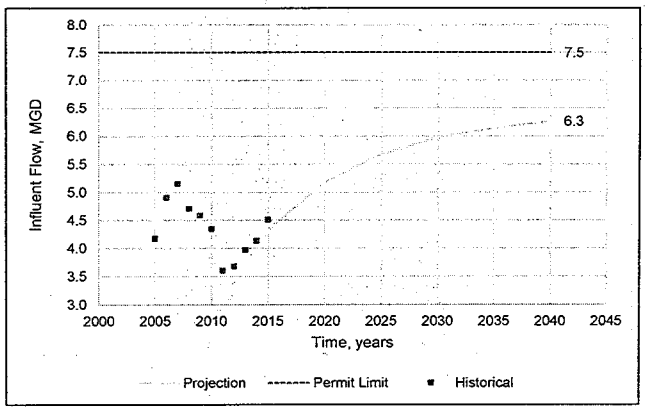


Figure 2–4. Water Conserv II WRF Wastewater Flow Projections

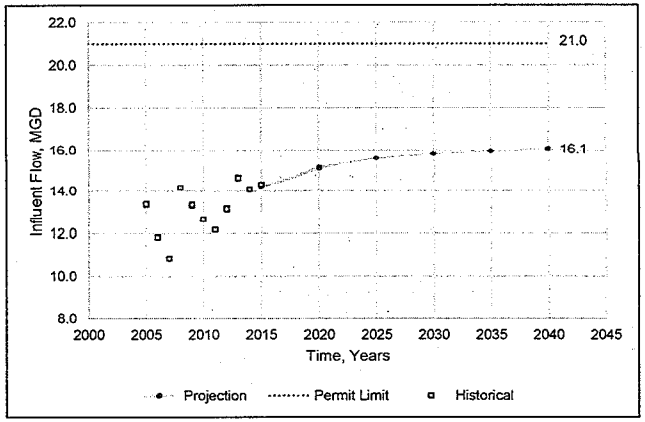


Figure 2-5. Iron Bridge and Water Conserv I WRF Wastewater Flow Projections

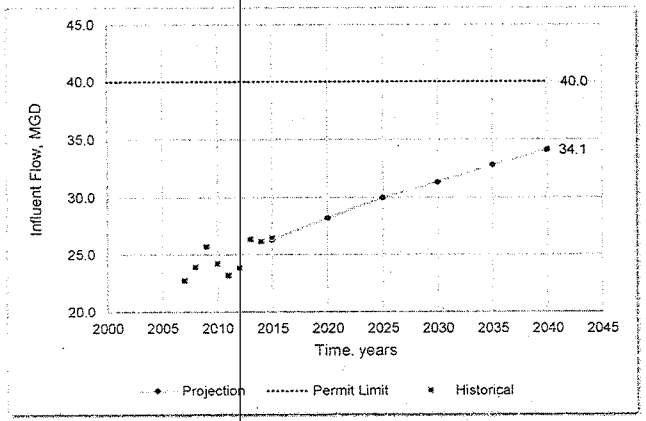


Table 2-1. Wastewater AADF Projections (MGD)

Year	Iron Bridge WRF	Water Conserv I	Water Conserv II	Total
2015	22.0	4.3	14.2	40.5
2020	23.0	5.2	15.1	43.3
2025	24.3	5.7	15.6	45.5
2030	25.3	6.0	15.8	47.1
2035	26.6	6.1	16.0	48.7
2040	27.8	6.3	16.1	50.2

The historical flows for 2015 at the Iron Bridge, Water Conserv I, and Water Conserv II WRFs were 22.0 MGD, 4.3 MGD, and 14.2 MGD, respectively. By the year 2040, total wastewater flows are expected to increase by approximately 10 MGD to a total of 50.2 MGD. In the future, the Water Conserv I WRF will be decommissioned and the flow will be rerouted to the Iron Bridge WRF. Since the Iron Bridge WRF has surplus capacity, rerouting sewage from the Water Conserv I WRF to this facility proves to be a viable option to handle a portion of the City's future wastewater flows.

3.0 PROJECT DESCRIPTION AND JUSTIFICATION

Each of the projects identified for CWSRF funding involve the replacement or rehabilitation of equipment and infrastructure that is nearing or has exceeded its useful life. In some cases, the City is using this opportunity to expand capacity and upgrade the performance of the older facilities with larger and more modern equipment.

3.1 COLLECTION/TRANSMISSION SYSTEM IMPROVEMENTS PROJECTS

Wastewater in the City's service area is collected and conveyed to a central treatment and disposal facility through a combination of gravity sanitary sewers, pumping stations, and force mains. In order to continue providing reliable service and maintain the existing infrastructure, it is essential to implement timely renewal and replacement (R&R) projects for the wastewater collection system. The following collection/transmission system projects have been identified:

- Sanitary sewer system R&R project along Dean Road.
- Sanitary sewer system R&R along Kirkman Road and near the Water Conserv II WRF.
- Improvements to LS No. 1/7.
- Improvements to LS No. 45.

A brief description of the proposed project and its associated improvements is provided below and the improvement alternatives are discussed in subsequent subsections.

3.1.1 Dean Road Sanitary Sewer Improvements

The sanitary sewer main along Dean Road (from McCulloch Road to Winder Trail), in east Orange County, consists of 9,900 linear feet (LF) of 72 and 78-inch prestressed concrete cylinder pipe (PCCP) and approximately 24 manholes. The pipeline transports a majority of the wastewater from the City of Orlando to the Iron Bridge WRF. It is anticipated that in the future, when the Water Conserv I WRF is decommissioned, its wastewater flows will be redirected to the Iron Bridge WRF via the Dean Road Interceptor.

Currently, the pipeline is over 30 years old. There have been reports of numerous joint failures. The condition of the pipeline is deteriorating and must be addressed to prevent future failures that could result in leaks, overflows, or collapse of the roadway above the pipeline.

A map of the project location area is shown on **Figure 3-1**.

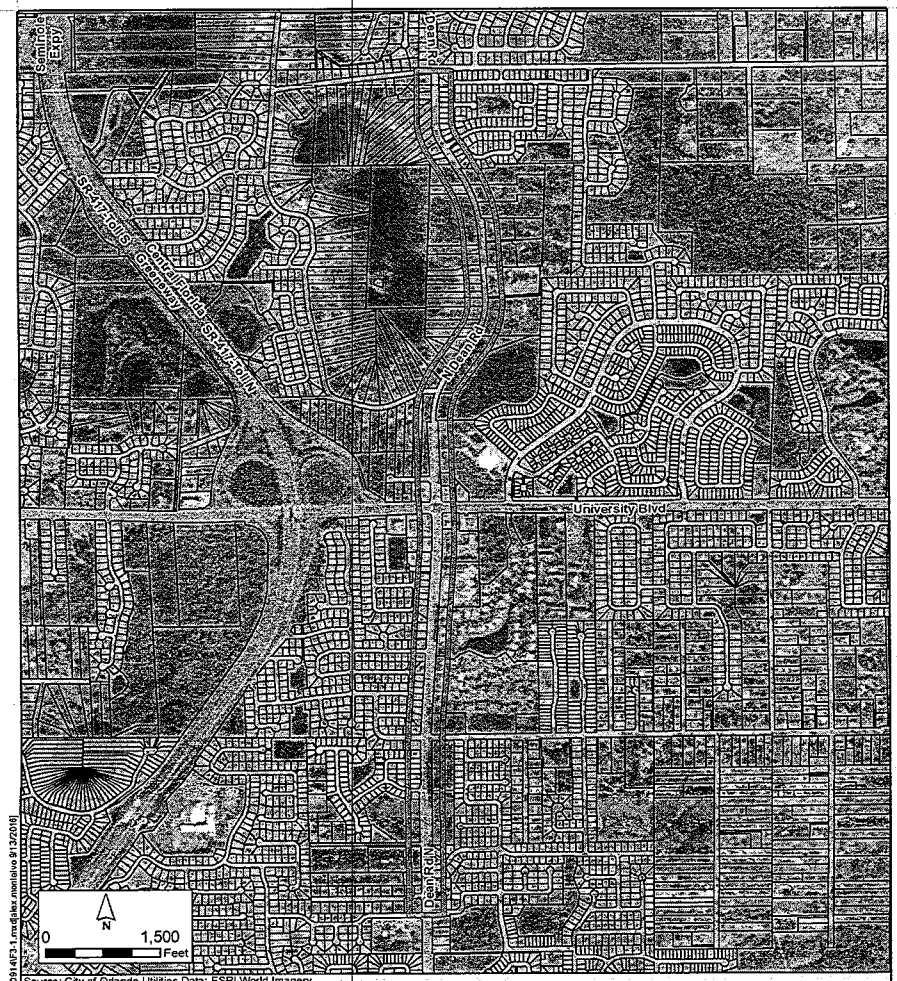
3.1.2 Kirkman Road Sanitary Sewer Improvements

The City intends to address the deteriorating conditions of the large diameter force mains along Kirkman Road and near the Water Conserv II WRF, including the following segments:

- **Phase 1** – 5200 LF of 48" gravity sewer along Kirkman Road (from the Florida Turnpike to Pine Shadows Parkway).
- **Phase 2** – 2400 LF of 48" and 2900 LF of 36" gravity sewer along a corridor just south of the Water Conserv II WRF (from Kirkman Road to President Barack Obama Parkway) and 600 LF of 54" gravity sewer into the Water Conserv II WRF site from the south.

Currently, the pipeline is over 30 years old and other pipes near this area have required rehabilitation. This project will continue the City's practice of rehabilitating older pipe in its collection system

A map of the project location area is shown on **Figure 3-2**.



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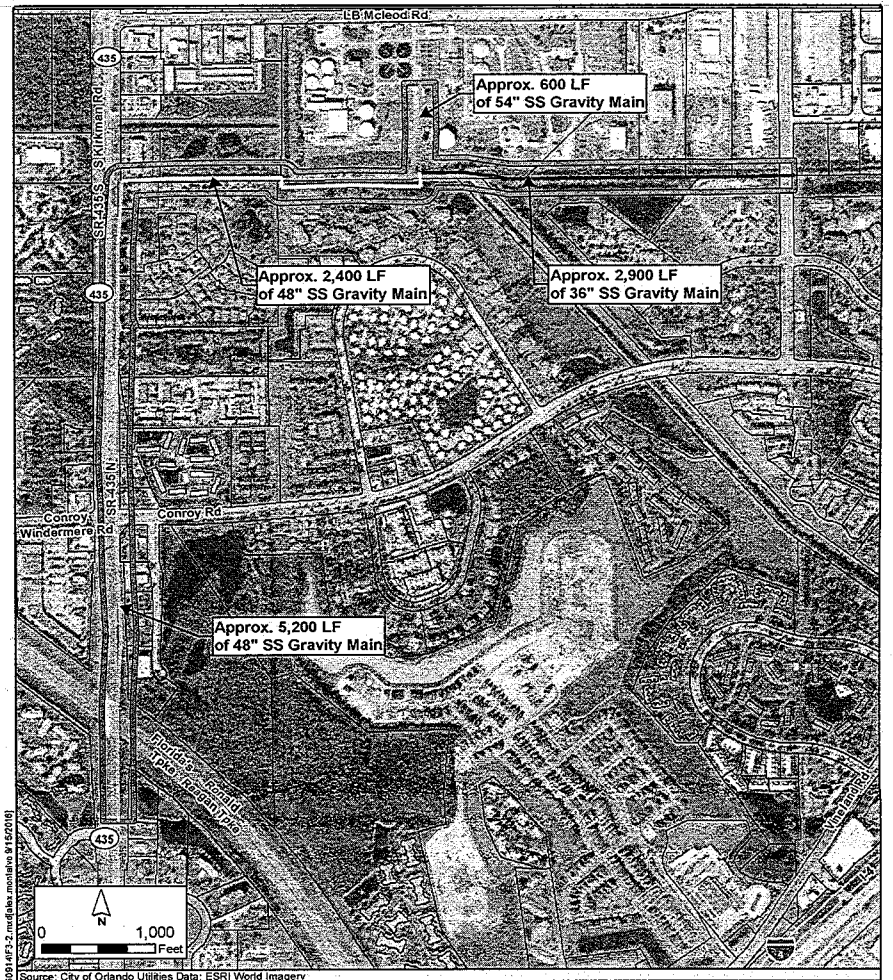
TETRA TECH	CITY OF ORLANDO CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN DEAN ROAD SANITARY SEWER IMPROVEMENTS PROJECT LOCATION	FIGURE 3-1



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TETRA TECH	CITY OF ORLANDO CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN KIRKMAN ROAD SANITARY SEWER IMPROVEMENTS PROJECT LOCATION	FIGURE 3-2

3.1.3 Lift Station No. 1/7 Improvements

The City is the rehabilitating Lift Station No. 1/7, located at 1300 East South Street, due to the age and condition of the existing facilities, to address corrosion and confined space concerns, and to meet projected flow increases. The site actually consists of two lift stations (1 and 7); however, the overall "facility" is referred to as Lift Station No. 1/7.

The general area served by LS No. 1/7 includes the southeastern portion of downtown Orlando; extending south from East Colonial Drive, generally east of I-4, west of Conway Road, and south to Pershing Avenue. The contributing area is approximately eight (8) square miles. The LS collects a large volume of wastewater from a variety of residential and commercial properties in the downtown Orlando area and is a critical piece of infrastructure in the City's collection system.

A map of the project location area is shown on **Figure 3-3**.

3.1.4 Lift Station No. 45 Improvements

Lift Station No. 45 is a wet-pit/dry-pit facility located at 900 Fairvilla Road. The existing pump station was constructed in 1989 as a replacement to the original station within the same parcel. Major odor control improvements to the facility were implemented in 2015. The facility includes three (3) 3,100 GPM, nonclog wastewater pumps. To address the age of the existing equipment, potential corrosion issues, and confined space concerns, the City plans to construct an entirely new station or implement modifications that result in a facility that features submersible pumps.

The station receives wastewater flow from the gravity collection system located primarily along Mercy Drive, New Hampshire Street, and Brengle Avenue. In addition to the wastewater flows generated by the residents and businesses adjacent to those areas, the gravity collection system receives wastewater flows from multiple lift stations.

A map of the project location area is shown on **Figure 3-4**.

3.2 IRON BRIDGE REGIONAL WRF IMPROVEMENTS

The Iron Bridge Regional WRF has provided wastewater treatment to the northeast portion of Orlando and unincorporated sections of Orange and Seminole counties since 1982. As part of the City's ongoing Capital Improvement Program (CIP), the following equipment has reached the end of its useful life and/or needs to be replaced or upgraded to allow the facility to reliably meet treatment requirements:

- Improvements to the WRF's low voltage system
- Improvements to the WRF's sludge dewatering system

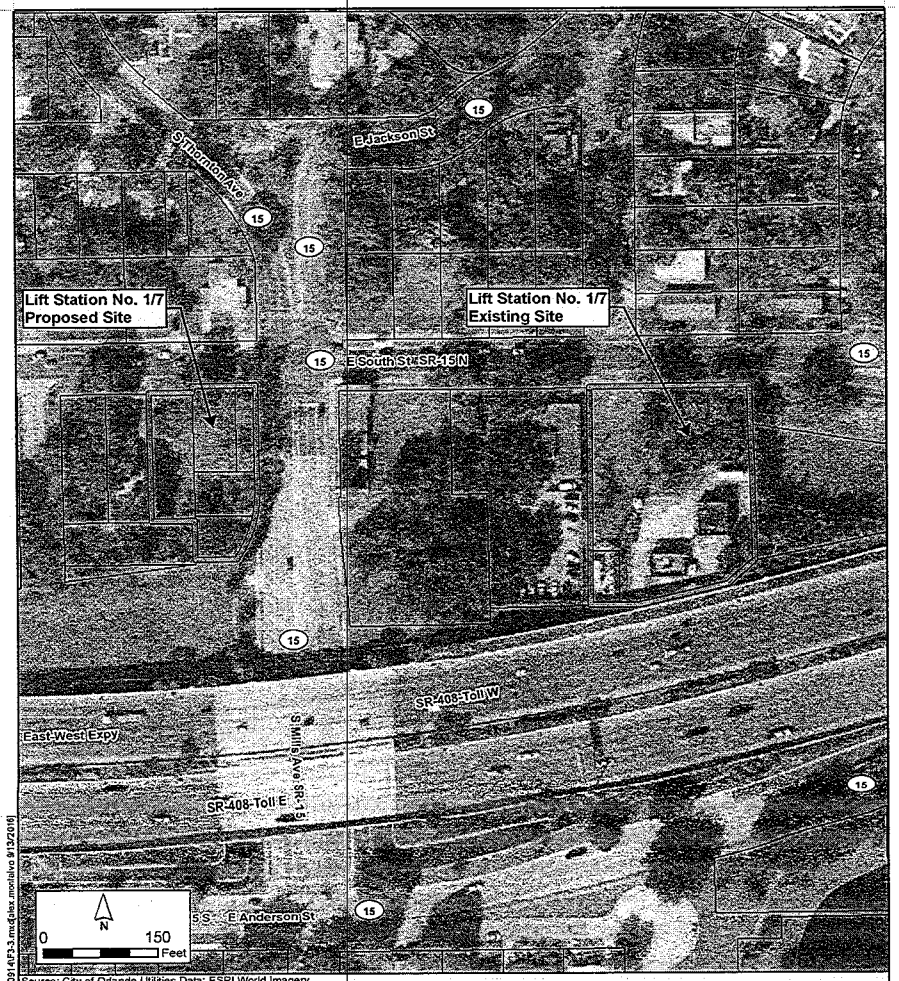
3.2.1 Low Voltage System Improvements

The purpose of this project is to provide upgrades to many of the low voltage systems (typically less than 600 volts) that have exceeded their useful life and which replacement parts are no longer available. Most equipment at the WRF is powered by these low voltage systems. As a result, these systems need to be replaced in order to improve reliability, maintainability, and the ability to recover from power outages. The project aims to provide improvements to 12 areas at the Iron Bridge Regional WRF. As developed in the "Preliminary Design Report" prepared by Milan Engineering, found in **Section 3** of **Volume 2** of this report, the following list identifies the areas that require improvement:

1. Administration Building
    a. No provisions are provided for local standby power.
    b. Service gear violates NEC 110.26.
2. Master Pump Station

    a. Existing main and tie breakers are fixed-mounted and cannot be maintained or replaced without de-energizing entire electrical service.
3. Deep Bed Blowers
    a. No provisions are provided for local standby power.
    b. The electrical distribution cannot accommodate the loss of
4. Deep Bed Filters
    a. There is a single service feeder supplying the structure.
    b. No provisions are provided for local standby power.
5. Bardenpho – Phase II (East)
    a. Automatic transfer switch is a single point of failure.
    b. No provisions are provided for local standby power.
6. Bardenpho – Phase III (West)
    a. Automatic transfer switch is a single point of failure.
    b. No provisions are provided for local standby power.
7. Maintenance Building
    a. Automatic transfer switch is a single point of failure.
    b. No provisions are provided for local standby power.
8. Warehouse
    a. Automatic transfer switch is a single point of failure.
    b. No provisions are provided for local standby power.
9. Post Treatment Area
    a. No provisions are provided for local standby power.
    b. This area is fed from the Reclaimed pump station electrical building; any outage at this location will affect the post treatment area as well.
10. Solids Handling
    a. The electrical service equipment is nearing the end of its useful life and is in need of replacement.
11. Plant Blowers
    a. No substantial modifications are proposed.
12. Power Generation Building
    a. No provisions are provided for local connection of temporary standby power facilities.
    b. No provisions are provided for local connection of load banks, negatively impacting the ability to maintain the standby power system.

A map of the project area is shown on **Figure 3-5**.

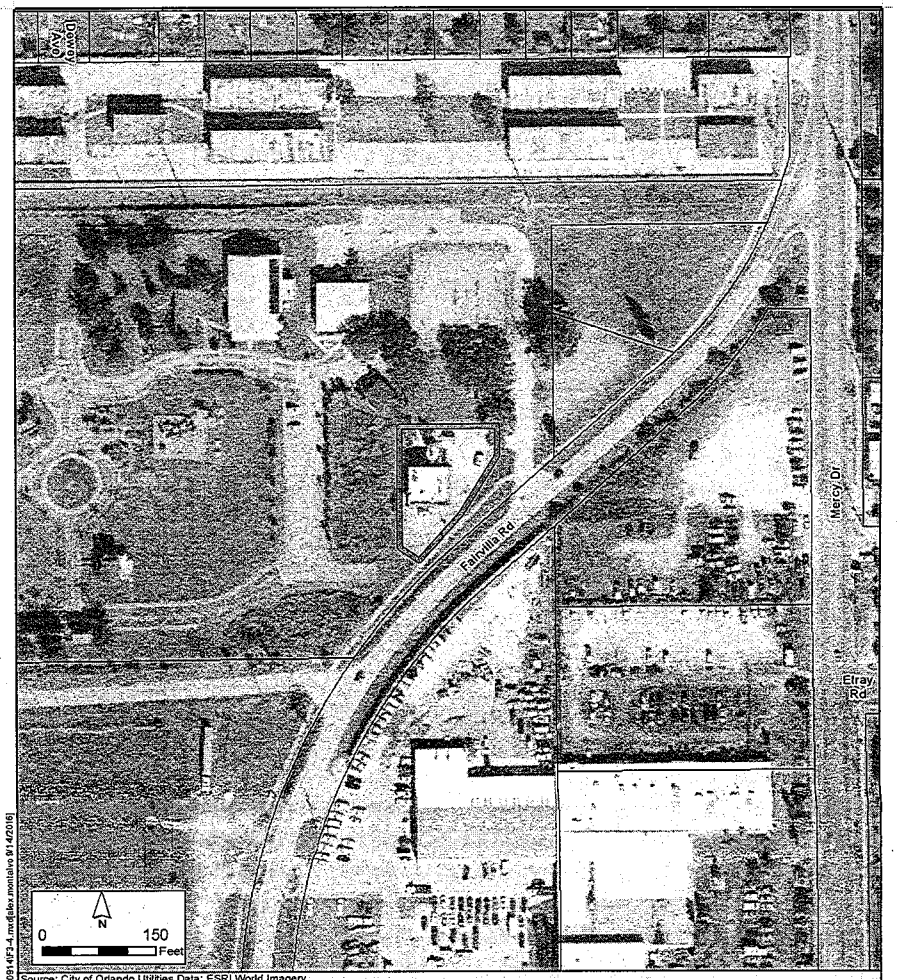


TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

LIFT STATION NO. 1/7
PROJECT LOCATION

FIGURE 3-3

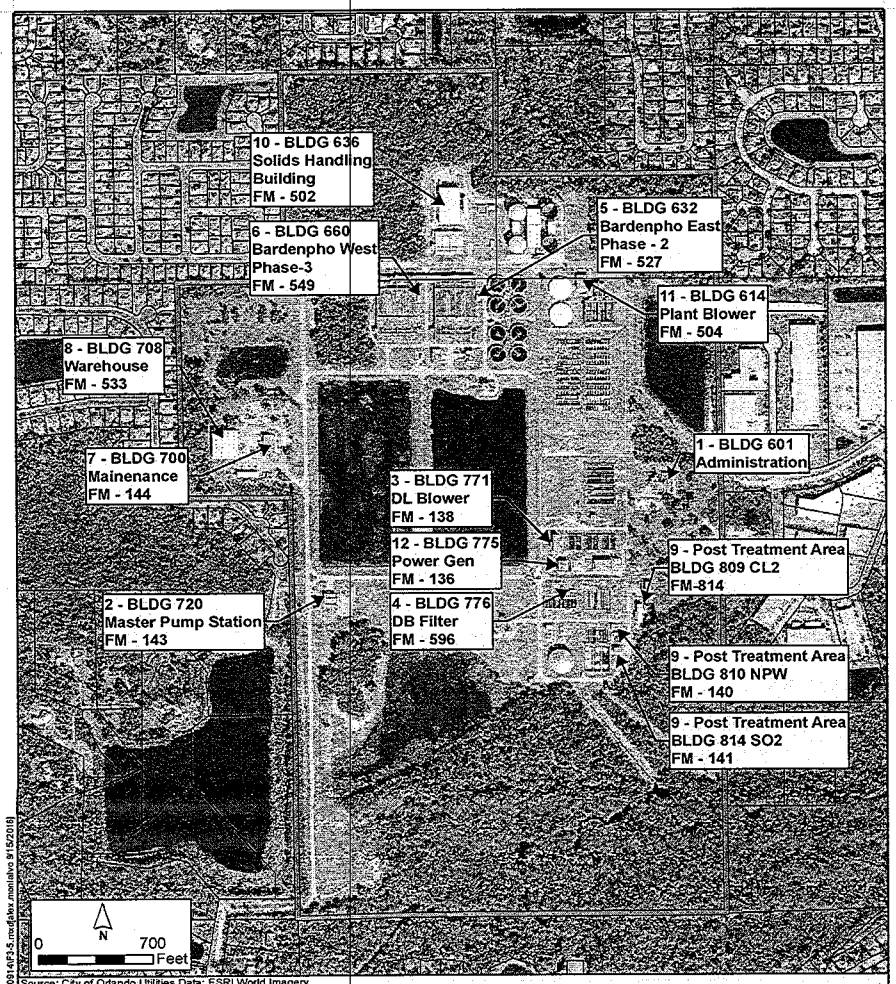


TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

LIFT STATION NO. 45
PROJECT LOCATION

FIGURE 3-4



TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN
IRON BRIDGE WRF LOW VOLTAGE SYSTEM IMPROVEMENTS PROJECT LOCATION

FIGURE 3-5

3.2.2 Dewatering Improvements

The biosolids handling equipment at the Iron Bridge WRF has been in operation for over 20 years and has reached the end of its useful life. Consequently the following equipment has been identified for replacement.

- Three (3) gravity belt thickeners (GBTs) and associated progressing cavity feed pumps
- Three (3) 2-belt belt filter presses (BFPs) and associated progressing cavity feed pumps
- Three (3) lime silos

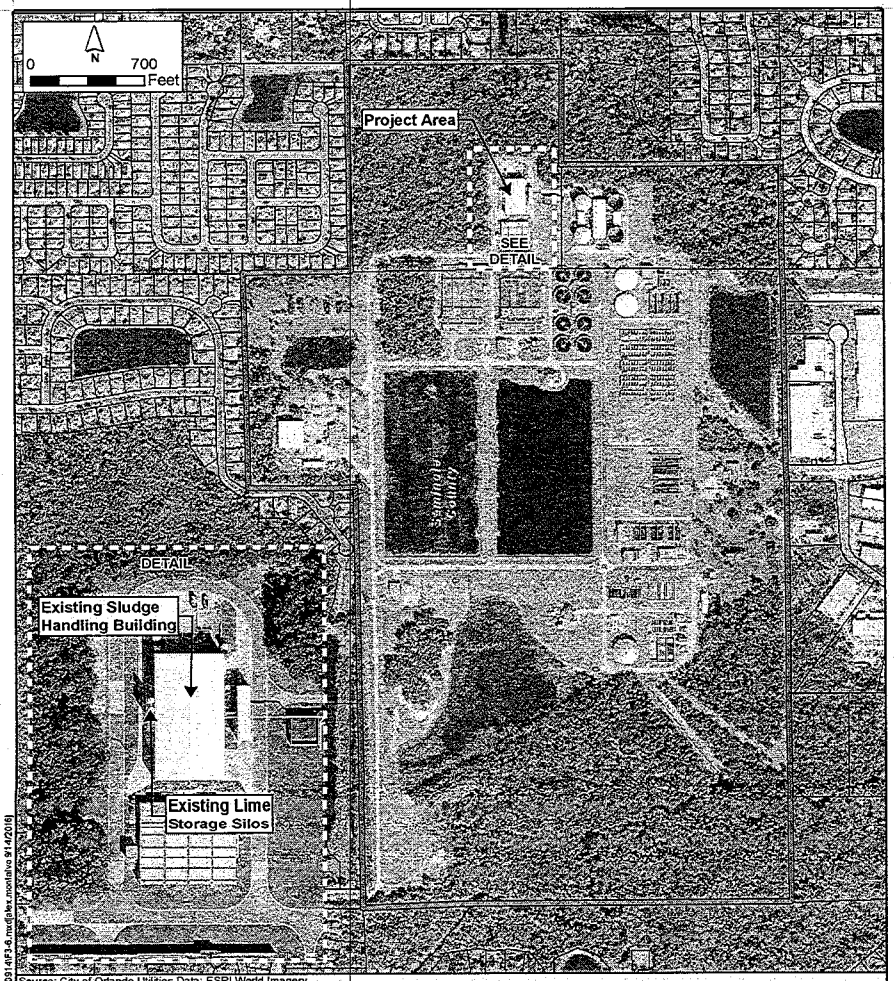
A map of the project location area is shown on **Figure 3-6**.

3.3 WATER CONSERV II WRF IMPROVEMENTS

The Water Conserv II WRF has provided wastewater treatment to the western portion of Orlando since 1964. The filters at the WRF have reached the end of their useful life and require replacement.

The filters at the Water Conserv II WRF consist of six (6) travelling bridge units that have been in service for approximately 30 years. Due to the age and condition of the filters, as well as performance considerations, the City plans replace the traveling bridge sand filters with deep bed sand filters similar to those installed at the City's Iron Bridge Regional WRF.

A map of the project location is shown on **Figure 3-7**.

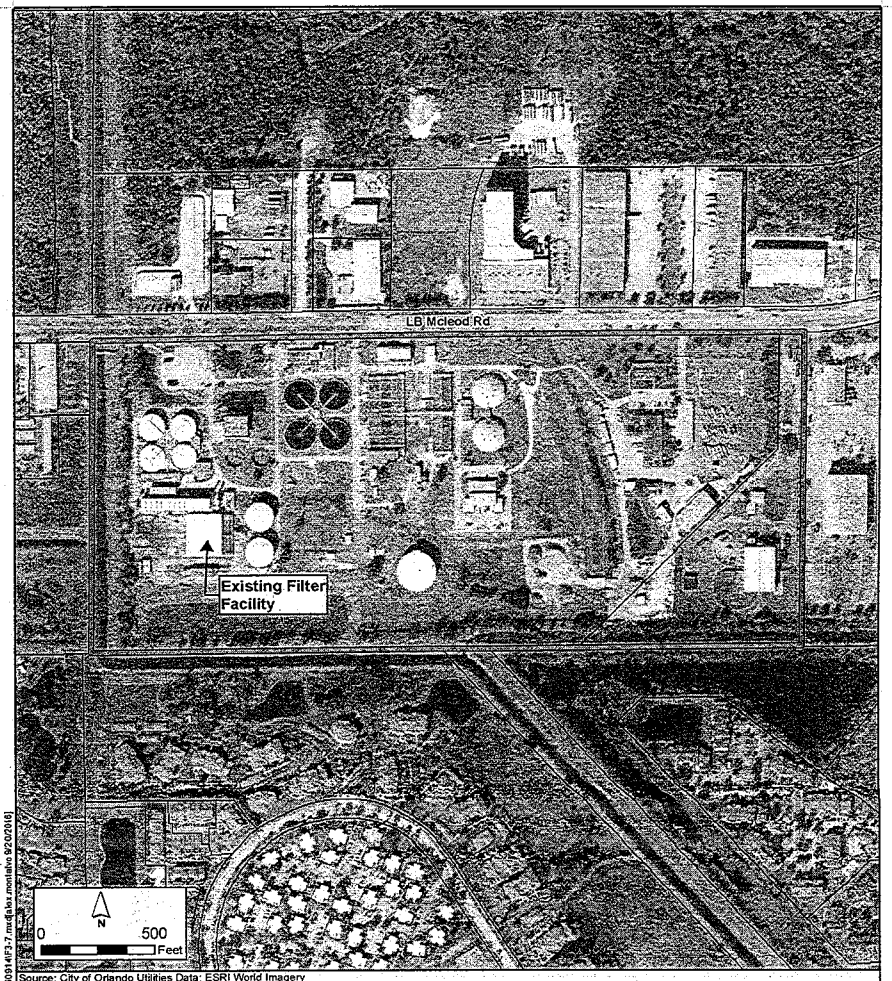


LEGEND

Iron Bridge WRF
Site Boundary

P:\ER\08510\200-08510-1600\10\GIS\Maps\20160914\F3-6.mxd[alex.montalvo 9/14/2016]

TETRA TECH	CITY OF ORLANDO CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN IRON BRIDGE WRF DEWATERING IMPROVEMENTS PROJECT LOCATION	FIGURE 3-6



LEGEND

Water Conserv II
Site Boundary

P:\ER\08510\200-08510-1600\10\GIS\Maps\20160914\F3-7.mxd[alex.montalvo 9/20/2016]

TETRA TECH	CITY OF ORLANDO CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN WATER CONSERV II FILTER REPLACEMENT PROJECT LOCATION	FIGURE 3-7

4.0 ALTERNATIVES ANALYSIS

This section provides a cost and effectiveness analysis for means of improving the sanitary collection system and upgrading equipment at the Iron Bridge and Water Conserv II WRFs.

4.1 DEAN ROAD SANITARY SEWER IMPROVEMENTS

4.1.1 Alternatives

The alternatives considered for this project consist of:

- No Action.
- Five (5) Sanitary Sewer Renewal and Replacement Alternatives:
  1. Cured-in-Place-Pipe (CIPP) lining of the 72-inch and 78-inch gravity interceptor sewer and manholes.
  2. Conventional sliplining of the gravity interceptor sewer and manholes.
  3. Converting gravity interceptor sewer to a force main by sliplining.
  4. Converting the 72-inch gravity sewer to a force main and sliplining the 78-inch gravity sewer and manholes.
  5. Converting the 72-inch gravity sewer to a force main and CIPP lining the 78-inch gravity sewer and manholes.

4.1.1.1 No Action

Under this alternative, the existing sanitary sewer mains will not be repaired or replaced. This alternative has no capital cost, but there are numerous disadvantages with this alternative, including:

- **Increased Infiltration/Inflow** – Cracks or defects in the pipe which allow groundwater to infiltrate the collection system, leading to degradation of water quality and limiting capacity of the system. This can significantly increase the potential for overflows and contamination.
- **Increased potential for infrastructure failures** – As the integrity of the sewer is compromised, voids are created around the pipe/soil system which can cause areas above the pipe (i.e. roads) to collapse. There is also an increased potential for infrastructure failures when the Water Conserv I WRF flows are routed through these pipes due to the increase in capacity. Failure of these gravity mains would likely disrupt sanitary service for many customers and a roadway collapse would pose a serious threat to *public safely*.
- **Increased potential for Sanitary Sewer Overflows (SSO's)** – Either system failures or the lack of adequate capacity can increase the risk of SSOs.

The "No Action" alternative may result in environmental degradation and public safety hazards; therefore, this is not a viable option.

4.1.1.2 Sanitary Sewer Renewal and Replacement

Rehabilitating, the piping will extend the useful life of infrastructure, eliminate infiltration/inflow and reduce the potential for SSOs and failures. Typically, a sewer main is cleaned and televised to inspect the condition of the interior of the pipeline. Although repair methods can include grouting and point repairs to address specific deflects like cracks and leaking joints, the methods for this project focus on complete rehabilitation, including:

- **Cured-in-Place Pipe (CIPP) Lining** – With this type of repair, the interior of the pipeline is repaired with a lining material
- **Sliplining** – With this type of repair, a new pipe is inserted (or sliplined) into the existing pipe.

Based on the wastewater flow projections, the 2040 combined Iron Bridge and Conserv I WRF peak wastewater flow was estimated to be 53 MGD. The rehabilitation methods can meet this capacity requirement; consequently, replacement alternatives are not required.

A "Preliminary Design Report", found in **Section 1** of **Volume 2** of this report, was prepared by Woolpert, Inc. to analyze alternative methods for the rehabilitation of the Dean Road Sanitary Sewer Improvements. In the report, alternatives were developed that would use either a single rehabilitation method or a combination of methods that are standard in the wastewater industry. The materials have been designed and tested to withstand the harsh environment present in a wastewater interceptor main and the anticipated life expectancy of each alternative, if constructed properly and with no significant modifications, is expected to be 100 years or more.

4.1.2 Cost Comparison

Each rehabilitation method creates a smaller inside pipe dimeter and a corresponding lower capacity than the original pipe; consequently, the cost per million gallons of capacity was considered in the evaluation of the project.

Table 4-1. Dean Road Alternative Capacity Analysis

Alternative	Description	ID of 72" Segment (inch)	ID of 78" Segment (inch)	Capacity (MGD)
1	CIPP 72" and 78" Gravity Sewer	70	78	94
2	Slipline 72" and 78" Gravity Sewer	63	66	78
3	Slipline 72" and 78" with 63" Forcemain	63	63	78
4	Slipline 72" Forcemain and 78" Gravity Sewer	63	66	78
5	Slipline 72" Forcemain and CIPP 78" Gravity Sewer	63	76	78

*Peak hour flow projection for 2040 is 53 MGD.

Table 4-2 summarizes the estimated construction cost and cost per million gallons of capacity for each alternative. The construction costs include mobilization/demobilization, cleaning and TVing the pipe, sliplining and/or using a CIPP liner on the existing pipe, manhole rehabilitation, and all other items required for the successful construction of each alternative.

Table 4-2. Dean Road Alternative Cost Analysis

Alternative	Description	Construction Cost (2016 $USD)	Cost/MGD (2016 $USD)
1	CIPP 72" and 78" Gravity Sewer	$11,296,000	$120,174
2	Slipline 72" and 78" Gravity Sewer	$7,513,000	$96,315
3	Slipline 72" and 78" with 63" Force main	$7,815,000	$100,198
4	Slipline 72" Force main and 78" Gravity Sewer	$7,684,000	$98,561
5	Slipline 72" Force main and CIPP 78" Gravity Sewer	$9,810,000	$125,773

4.1.3 Additional Considerations

Some other considerations regarding the effectiveness of alternatives are summarized as follows:

- Due to the need for by-pass pumping, the CIPP lining alternatives (Alternatives 1 and 5) will likely have more impact on the public and traffic than the sliplining alternatives
- Converting the gravity sewer to a force main would eliminate the access points (i.e. manholes) and the possibility of future inspection of the mains; consequently, alternatives that include force main segments (Alternatives 3, 4 and 5) are considered less viable than alternatives that preserve the ability to inspect the system.

4.2 KIRKMAN ROAD SANITARY SEWER IMPROVEMENTS

4.2.1 Alternatives

The alternatives considered for this project consist of:

- No Action.
- Cured-in-Place Pipe Lining.
- Sliplining.

4.2.1.1 No Action

Under this alternative, the existing sanitary sewer mains will not be repaired or replaced. This alternative has no capital cost, but there are numerous disadvantages with this alternative, including:

- **Increased Infiltration/Inflow** – Cracks or defects in the pipe which allow groundwater to infiltrate the collection system, leading to degradation of water quality and limiting capacity of the system. This can significantly increase the potential for overflows and contamination.
- **Increased potential for infrastructure failures** – As the integrity of the sewer is compromised, voids are created around the pipe/soil system which can cause areas above the pipe (i.e. roads) to collapse. Failure of these gravity mains would likely disrupt sanitary service for many customers and a roadway collapse would pose a serious threat to public safety.
- **Increased potential for Sanitary Sewer Overflows (SSO's)** – Either system failures or the lack of adequate capacity can increase the risk of SSOs.

The "No Action" alternative may result in environmental degradation and public safety hazards; therefore, this is not a viable option.

4.2.1.2 Cured-in-Place Pipe Lining

With this type of repair, the interior of the pipeline is repaired with resin-saturated tubes that are inverted or pulled into the damaged pipe. CIPP lining utilizes a trenchless technology in which no excavation is required to rehabilitate the existing pipe. The pipe is typically accessed through a manhole or other existing access point. The liner is cured in place to form a tight-fitting, jointless, and corrosion resistant replacement pipe. Once the liner is installed, the lateral connections are restored through the use of a remote controlled device that drills a hole into the applied liner at the connection point.

There are some limitations with this alternative. Installing a CIPP liner requires bypass pumping of the flow in the existing pipeline while the liner is installed. Obstructions in the pipeline, such as protruding laterals, must be removed before installation. Additionally, the curing system must be monitored closely and can take up to 30 hours in some cases. CIPP lining also has the potential to release chemical agents utilized in the reaction process and contaminate downstream rehabilitated pipes. With this method, groundwater has the potential to seep between the existing pipe and the liner, which can lead to leaks and other future problems.

4.2.1.3 Sliplining

With this alternative, a new "carrier" pipe is inserted (or sliplined) into the existing "host" pipe. This rehabilitation method is very easy to install and requires tools and equipment that are widely available to any contractor.

With this method, large staging areas are typically required for construction materials. It is also important to note that the capacity of the pipe is reduced due to the reduced cross sectional area caused by the insertion of a smaller "carrier" pipe into the larger "host" pipe. Installation of the pipe requires excavation at both the insertion and receiving pits. Additionally, excavation is required at the sewer laterals for reconnection to the sliplined pipe.

4.2.2 Cost Comparison

Table 4-3 summarizes the estimated construction cost for each alternative. The construction costs include mobilization/demobilization, contingency, general requirements, cleaning and TVing the pipe, sliplining and/or using a CIPP liner on the existing pipe, manhole rehabilitation, and all other items required for the successful construction of the project.

Table 4-3. Kirkman Road Alternative Cost Analysis

Alternative	Description	Construction Cost (2016 $USD)
1	No Action	$0
2	Cured-in-Place Pipe (CIPP) Lining	$7,934,000
3	Sliplining	$7,042,000

4.3 LIFT STATION NO. 1/7 IMPROVEMENTS

4.3.1 Alternatives

The alternatives to be considered for this project consist of:

- No Action.
- New Structure On-Site.
- New Station Off-Site.

4.3.1.1 No Action

Under this alternative, LS No. 1/7 would not be rehabilitated or replaced. This alternative has no capital cost, but there are problems associated with this option, including:

- **Increased wastewater flow without increased capacity** – As development in the downtown area resumes, if the capacity of the sewer system and lift stations is not expanded, the increased wastewater flows will tax the existing system and can lead to overflows, which in turn are a public health hazard as raw sewage may seep into public areas.
- **Increased potential for equipment failures** – As the equipment continues to age and the potential for corrosion is increased, there is a greater risk of equipment failure. Failure to address these issues could result in the temporary shutdown of the wastewater pumping station and would create problems upstream of the facility.

Based on this item, the "No Action" alternative may result in public health hazards. Therefore, this is not a viable option.

4.3.1.2 New Structure On-Site

Under this alternative, an entirely new structure would be constructed and the existing wet well, building, sanitary sewer lines, generators, and electrical components would be decommissioned. Reconfiguration of incoming sanitary sewer mains, including the installation of six (6) new manholes and the rehabilitation of two (2) existing manholes would also be required. Additionally, the project would include miscellaneous site improvements such as fence replacement, new CMU walls, driveway replacement, asphalt removal and replacement, grading, gravel, and landscaping.

It was initially intended to construct the new lift station within the current site. However, after a thorough geotechnical investigation, it was determined that four (4) large underground imhoff wastewater tanks were present at the site and would not allow construction within the site limits. This alternative was deemed to be too complicated and costly to remove the below grade treatment tanks. Therefore, this alternative is not a viable option.

4.3.1.3 New Station Off-Site

Due to the complications presented in the previous alternative, relocating the proposed station was evaluated by Tetra Tech, Inc. and the "Preliminary Engineering Memorandum" can be found in **Section 2** of **Volume 2** of this report. A nearby property, with adequate space for the construction of a new station, is available for purchase and is in the process of being acquired by the City. Under this alternative, the project will include the decommissioning and abandonment of the existing LS No. 1/7 and construction of a new LS No. 1 at the southwest corner of South Street and Mills Avenue. Similar work will be required that was presented in the previous alternative, including: a new wet well, pumps, piping, controls, generator, building, odor control system and miscellaneous site work. An entirely new submersible wastewater pumping facility would be constructed and the use of the existing pump building would be used to house the electrical facilities.

4.3.2 Cost Comparison

Table 4-4 summarizes the estimated construction costs for the proposed alternatives. The construction costs include mobilization/demobilization, contingency, general requirements, bypass pumping, installation of wet well, building, discharge piping, gravity sewer, pumps, site work, electrical and lighting, and all other items required for the successful construction of the project.

Table 4-4. Lift Station No. 1/7 Alternative Cost Analysis

Alternative	Description	Construction Cost (2016 $USD)
1	No Action	$0
2	New Structure On-Site	N/A[1]
3	New Station Off-Site	$11,637,000

[1]Alternative deemed not viable.

4.4 LIFT STATION NO. 45 IMPROVEMENTS

4.4.1 Alternatives

The alternatives considered for this project consist of:

- No Action.
- Rehabilitation of Existing Wet Well.
- Construction of New Wet Well.

4.4.1.1 No Action

Under this alternative, LS No. 45 would not be rehabilitated or replaced. This alternative has no capital cost, but there are problems associated with this option, including:

- **Increased potential for equipment failures** – As the equipment continues to age and the potential for corrosion is increased, there is a greater risk of equipment failure. Failure to address these issues could result in the temporary shutdown of the wastewater pumping station and would create problems upstream of the facility.
- **Operator safety concerns** – Confined space is a concern at the lift station site. The current configuration of the lift station is outdated and could benefit from a redesign to increase operator safety and ensure that industry standards are followed.
- **Increased wastewater flow without increased capacity** – As development resumes, if the capacity of the sewer system and lift stations are not expanded, the increased wastewater flows will tax the existing system and can lead to overflows, which in turn are a public health hazard as raw sewage may seep into public areas.

Based on this item, the "No Action" alternative may result in public health hazards. Therefore, this is not a viable option.

4.4.1.2 Rehabilitation of Existing Wet Well

This alternative proposes to modify the existing structure to accommodate standard submersible wastewater pumps, above-grade discharge piping, and associated electrical facilities.

To implement this alternative, it will be necessary to bypass flows from an existing manhole east of the existing wet well and subsequently complete structural modifications and rehabilitative efforts. Additionally, mechanical and electrical improvements will be required. It should be noted that retrofitting the existing wet well to the use of submersible pumps will necessitate the removal of some existing channels and walls. In turn, this will require the construction of lateral bracing to compensate for the loss of the existing structural elements. The bracing would not need to be especially complex or expensive and it could be constructed within the existing dry put which would ultimately be abandoned.

The discharge piping would be located within the existing building above the wet well with only minimal modifications. Also, the electrical equipment, including the switchboards and variable frequency drives (VFDs), would be located above the existing dry pit without the need for major structural enhancements; however, the building would have to be expanded to the south to accommodate the electrical facilities. The new standby generator set would be installed in the addition to the existing building or within a sound-attenuating enclosure.

4.4.1.3 Construction of New Wet Well

Under this alternative, an entirely new wet well would be constructed for a submersible wastewater pumping facility and the use of the existing pump building would be used to house the electrical facilities.

The current site is fairly large and can likely accommodate a new structure but there are a few challenges associated with this option. First, the new structure will need to be located in an area where it can be connected to existing piping in a reasonably logical and cost-effective manner. Second, the overall layout will need to address the need for bypass pumping equipment, placement of excavated soil, and the location of construction equipment.

Based upon a preliminary evaluation of the site, it appears that the optimal location of the wet well would be the northeast portion of the existing pump station. Unfortunately, this location appears to contain the remnant of another structure that was abandoned decades ago. A thorough geotechnical investigation is required to fully identify the extent of this structure and ultimately it will need to be removed.

4.4.2 Cost Comparison

Table 4-5 summarizes the estimated construction costs for the proposed alternatives. The construction costs include mobilization/demobilization, contingency, general requirements, bypass pumping, installation of wet well, building, discharge piping, gravity sewer, pumps, site work, electrical and lighting, and all other items required for the successful construction of the project.

Table 4-5. Lift Station No. 45 Alternative Cost Analysis

Alternative	Description	Construction Cost (2016 $USD)
1	No Action	$0
2	Rehabilitation of Existing Wet Well	$3,013,000
3	Construction of New Wet Well	$4,389,000

4.5 IRON BRIDGE REGIONAL WRF LOW VOLTAGE SYSTEM IMPROVEMENT

4.5.1 Alternatives

The primary objective for this project is to provide a reliable and maintainable power distribution system. The alternatives considered consist of the following:

- No action.
- Re-build service equipment using three breaker configuration and provide means for connection of temporary generators at each area.
- Re-build service equipment using three breaker configuration and provide permanently installed generators and fuel storage at each area.

4.5.1.1 No Action

Under this alternative, the low voltage systems would not be improved. This alternative has no capital cost, but there are problems associated with not upgrading the low voltage system. These problems are listed below:

- **Inability to recover from electrical failure –** As installed, the electrical distribution system lacks the ability to easily recover from an electrical equipment failure. Currently, there are no provisions provided for local standby power at the buildings.
- **Code violations –** Failure to upgrade the system will result in violation of certain National Electric Codes (NEC).

- **Increased potential for equipment failures –** As the electrical equipment continues to age, this increases the risk of equipment failure. This could lead to operational problems at the facility and result in temporary shutdown or require emergency services to be provided.

As currently configured, the existing system cannot be maintained without disconnecting power. As a result, maintenance is difficult and requires an interruption of the normal WRF operations.

There is no capital cost associated with not improving the electrical facilities; however, there will be future maintenance costs and equipment outages that will result from the limitations of the existing system.

4.5.1.2 Replacement of Electrical Service Gear with Three Breaker Configuration and Provide Means for Connection of Temporary Generators

This alternative was developed by Milan Engineering and the analysis is presented in the "Preliminary Design Report", found in **Section 3** of **Volume 2** of this report. Under this alternative, much of the electrical service gear associated with the low voltage distribution will be replaced to allow for routine maintenance. A three breaker electrical system consists of two main breakers and one (or more) tie breakers. This configuration provides redundancy by providing multiple electrical service delivery points to a given piece of electrical gear. If one electrical service is lost, the main breaker associated with that feed can be opened, the tie breaker can be closed and the electrical distribution can be supplied from the remaining service while maintenance is performed.

In addition, this configuration facilitates maintenance of the electrical system. If the tie breaker and a single main breaker are opened, half of the electrical gear will be de-energized to allow maintenance or modification to be safely performed. During this maintenance or modification, critical equipment can be powered from the energized bus in the equipment. Provisions for connection of a local, temporary standby power system will be provided at each area. The following generally describes the work required to implement the proposed upgrades throughout the plant.

1. Administration Building
    a. Provide new three breaker switchgear with provision for connection of temporary standby power generator.
2. Master Pump Station
    a. Replace existing fixed-mount main and tie breakers with draw out style devices.
    b. Provide new generator connection cabinet to accommodate temporary generator connection.
3. Deep Bed Blowers
    a. Provide new switchgear lineup up with Main-Tie-Tie-Main configuration to maintain electrical service to two blowers and two pumps after the failure of a breaker or bus.
    b. Provide new generator connection cabinet to accommodate temporary generator connection.
4. Deep Bed Filters
    a. Provide a new 480V distribution panel.
    b. Provide a new automatic transfer switch (ATS) and second (redundant) utility power feed.
    c. Provide a double throw switch on the load side of the ATS to allow for the connection of a temporary generator.
5. Bardenpho – Phase II (East)
    a. Provide new three breaker switchgear.
    b. Provide new generator connection cabinet to accommodate temporary generator connection.
6. Bardenpho – Phase III (West)
    a. Provide new three breaker switchgear.
    b. Provide new generator connection cabinet to accommodate temporary generator connection.
7. Maintenance Building
    a. Provide new three breaker switchgear to serve the maintenance building and the warehouse.
    b. Provide new generator connection cabinet to accommodate temporary generator connection.
8. Warehouse
    a. Provide new three breaker switchgear to serve the maintenance building and the warehouse.

b. Provide new generator connection cabinet to accommodate temporary generator connection.

9. Post Treatment Area
   a. Provide a new three breaker switchgear to serve the post treatment systems.
   b. Provide a dedicated ATS at each post treatment system. Two, redundant utility services will be provided to each ATS.
   c. Provide a double throw switch on the load side of the ATS to allow for the connection of a temporary generator.
10. Solids Handling
    a. Provide new three breaker switchgear.
    b. Provide new generator connection cabinet to accommodate temporary generator connection.
11. Plant Blowers
    a. No substantial modifications are proposed.
12. Power Generation Building
    a. Modify existing switchgear to allow for connection of temporary generator or load bank.

4.5.1.3 Replacement of Electrical Service Gear with Three Breaker Configuration and Permanent Installation of Generators & Fuel Storage

This alternative closely mirrors that purposed in section 4.4.1.2. All switchgear modifications indicated in that section are also included in this alternative. In addition to those upgrades, this alternative proposes that a permanently installed, standby diesel generator be included for each process area. Each generator would be installed outside in a weatherproof, sound attenuating enclosure. Diesel storage will also be provided at each location in the form of a double-wall, aboveground storage tank. Each tank will be of sufficient size to allow for 72 hours of generator full load operation without the need for refueling. The following list indicates the generator capacity and diesel fuel storage requirements for each area.

1. Administration Building
   a. Generator Capacity – 300 kVA
   b. Diesel Tank Capacity – 2,000 gallons
2. Master Pump Station
   a. Generator Capacity – 2,500 kVA
   b. Diesel Tank Capacity – 14,000 gallons
3. Deep Bed Blowers
   a. Generator Capacity – 1,500 kVA
   b. Diesel Tank Capacity – 8,000 gallons
4. Deep Bed Filters
   a. Generator Capacity – 300 kVA
   b. Diesel Tank Capacity – 2,000 gallons
5. Bardenpho – Phase II (East)
   a. Generator Capacity – 1,500 kVA
   b. Diesel Tank Capacity – 8,000 gallons
6. Bardenpho – Phase III (West)
   a. Generator Capacity – 1,500 kVA
   b. Diesel Tank Capacity – 8,000 gallons
7. Maintenance Building
   a. Generator Capacity – 500kVA
   b. Diesel Tank Capacity – 3,000 gallons
8. Warehouse
   a. Generator is shared with Maintenance Building
9. Post Treatment Area
   a. Generator Capacity – 3,000 kVA
   b. Diesel Tank Capacity – 16,000 gallons

10. Solids Handling
    a. Generator Capacity – 2,000 kVA
    b. Diesel Tank Capacity – 10,000 gallons
11. Plant Blowers
    a. Generator Capacity – 2,500 kVA
    b. Diesel Tank Capacity – 14,000 gallons
12. Power Generation Building
    a. No substantial modifications are proposed.

In addition to the cost of the generators and fuel tanks, additional feeders and environmental permitting costs are required.

4.5.2 Cost Comparison

Table 4-6 summarizes the estimated construction costs for the proposed alternatives. The construction costs generally include general requirements, contingency, permits and fees, electrical, HVAC, plumbing, and all other items required for the successful construction of the project.

Table 4-6. Iron Bridge WRF Low Voltage Alternative Cost Analysis

Alternative	Description	Construction Cost (2016 $USD)
1	No Action	$0
2	Three-Breaker System with Connection for Temporary Generators	$8,821,000
3	Three-Breaker System with Permanent Generators and Fuel Storage	$14,950,000

4.6 IRON BRIDGE REGIONAL WRF DEWATERING IMPROVEMENTS

4.6.1 Alternatives

The biosolids handling system consists of three (3) gravity belt thickeners, three (3) 2-belt BFPs and three (3) 3-belt BFPs, as well as ancillary equipment (i.e. pumps, chemical feed, storage and dewatered sludge loading systems). The 3-belt belt filter presses have the capability to operate the top belt as a thickener, so the biosolids can be thickened and dewatered using the same unit.

The alternatives considered for this project include an in-kind replacement of the existing belt thickeners and belt presses or a replacement of the equipment with 3-belt presses that also thicken the sludge. The following are considered

- No action
- Biosolids Handling Equipment Replacement (In-Kind Replacement)
- Biosolids Handling Equipment Replacement (3-Belt Units)

4.6.1.1 No Action

Under this alternative, the dewatering system would not be upgraded. This alternative has no capital cost, but there are problems associated with this option, including:

- **Increased biosolids production without increased capacity** – The current dewatering system will not be able to handle the future projected biosolids as the WRF treats additional wastewater. This will become an even greater issue once the flows from Water Conserv I WRF are routed to the Iron Bridge WRF. This could lead to performance issues in dewatering efficiency and operational problems at the facility.
- **Increased potential for equipment failures** – As the equipment continues to age, the risk of equipment failure increases. This could lead to operational problems at the facility and result in temporary shutdown or require emergency services to be provided.

The "No Action" alternative may result in public health hazards; therefore, this is not a viable alternative.

4.6.1.2 Biosolids Handling Equipment Replacement (In-Kind Replacement)

Under this alternative, the existing gravity belt thickeners and 2-belt filter presses would be replaced (i.e. in-kind replacement). In addition, the operation and condition of the biosolids handling equipment, electrical systems, controls and ancillary systems, as well as equipment capacity and biosolids processing requirements were also evaluated. Based on these evaluations, it was concluded that the following additional improvements would be required:

- Replacement of sludge feed and transfer sludge pumps, polymer feed units and wash water booster pumping systems.
- New motor control center and associated electrical systems.
- Expansion of an electrical room to accommodate new electrical equipment.
- New control panels for the existing 3-belt filter press units.
- The lime silos have developed stress cracks, and therefore, are near the end of their useful life. The three silos will be replaced with new lime silos of similar capacity.

This is a viable alternative; however, compared to the 3-belt alternative, in-kind replacement would result in a more complicated system. Separate thickeners and dewatering units would require more equipment to operate and maintain as oppose to having one (1) 3-belt unit as discussed in the next alternative.

4.6.1.3 Biosolids Handling Equipment Replacement (3-Belt Units)

Under this alternative, developed by Carollo Engineers in the "Basis of Design Report" found in **Section 4** of **Volume 2** of this report, the existing gravity belt thickeners and 2-belt filter presses would be replaced with two (2) 3-belt filter presses. In addition, the operation and condition of the biosolids handling equipment, electrical systems, controls and ancillary systems, as well as equipment capacity and biosolids processing requirements were also evaluated. Based on these evaluations, it was concluded that the following additional improvements would be required:

- Replacement of sludge feed and transfer sludge pumps, polymer feed units and wash water booster pumping systems.
- New motor control center and associated electrical systems.
- Structural modification to accommodate the new 3-belt units.
- Expansion of an electrical room to accommodate new electrical equipment.
- New control panels for the existing 3-belt filter press units.
- The lime silos have developed stress cracks, and therefore, are near the end of their useful life. The three silos will be replaced with new lime silos of similar capacity.

This is a viable alternative and, compared to the in-kind alternative, would result in a less complicated system to operate and maintain. Contrary to the previous alternative, one (1) 3-belt unit replaces the need for a gravity belt thickener, resulting in less equipment to operate and maintain.

4.6.2 Cost Comparison

Table 4-7 summarizes the estimated construction costs for the proposed alternatives. The construction costs include contractor general conditions, contingency, replacement of biosolids handling equipment, new lime silos, piping and valves, electrical, and all other items required for the successful construction of the project.

Table 4-7. Iron Bridge WRF Dewatering Alternative Cost Analysis

Alternative	Description	Construction Cost (2016 $USD)
1	No Action	$0
2	Biosolids Handling Equipment Replacement (In-Kind Replacement)	$6,900,000
3	Biosolids Handling Equipment Replacement (3-Belt Units)	$5,900,000

4.7 WATER CONSERV II WRF FILTER REPLACEMENT

4.7.1 Alternatives

There are various challenges associated with this project which include, but are not limited to, space constraints, hydraulic profile considerations, maintenance of treatment during construction, and the potential presence of soils that may be unsuitable for support of the proposed structures. The City has identified acceptable approaches to address these challenges and to establish a capital budget for implementation of the proposed improvements. The alternatives to be considered for the filter replacement consist of:

- No Action
- Site Location A: Sites the filters 110-feet south and west of the existing reclaimed storage tank and encroaches on the northern boundary of Stormwater Pond 1A.
- Site Location B: Sites the filters at the existing flocculation tanks and traveling bridge sand filters

4.7.1.1 No Action

Under this alternative, the filtering system would not be upgraded. This alternative is the least costly, but there are problems associated with not upgrading and expanding the system. These problems are listed below:

- **Permit Violations** – The current filtering system will not be able to handle the influent wastewater to the facility and would result in effluent that exceeds permit limits, endangering public health.
- **Potential Failure of Existing Filters** – As the filters continue to age, the risk of equipment failure is increased. This failure could lead to operational problems at the facility and result in temporary shutdown or require emergency services to be provided.

Based on this item, the "No Action" alternative may result in public health hazards. Therefore, this is not a viable alternative.

4.7.1.2 Site Location A

Two (2) potential locations for the filters were analyzed by Tetra Tech, Inc. in the "Feasibility Study" found in **Section 5** of **Volume 2** of this report. The concept for Site Location A is to construct a new filter structure south and west of the existing reclaimed storage tank within the boundary of existing Stormwater Pond 1A. In order to accommodate the construction of the new filter approximately 18,000 square feet of Pond 1A will need to be filled and reconfigured. The impacted area and volume of Pond 1A will be offset by extending the existing stormwater Pond 1B to the east.

The two ponds are interconnected by a 24-inch RCP culvert. The existing outfall structure located on the southwest corner of Pond 1A will not be impacted by filling a portion of Pond 1A to accommodate the filters.

The filter structure will consist of eight (8) filter cells, a filter effluent chamber, and a piping gallery. The filter piping gallery will consist of a lower level and an intermediate level. The filter cells will be arranged in a single row of eight (8) filters with the effluent chamber located at the west end of the row of filters. The weir in the filter effluent chamber will keep the media in the filters submerged. To fit the new filter structure into the hydraulic profile of the existing facility, approximately half of the filter structure will be below grade. The gallery piping will consist of two (2) 54-inch fabricated steel headers, 20-inch ductile iron filter influent and effluent piping, 20-inch backwash water piping, and 12-inch stainless steel air piping.

The filter cells and filter effluent chamber will be covered with flat panel aluminum covers. The flat panel aluminum covers will include access hatches to facilitate filter maintenance, flanged connections to accept level instruments, and vents to accommodate the backwash air flow.

Two (2) dedicated backwash air blowers, one duty and one standby, and two (2) backwash water pumps, one duty and one standby, will be located on a slab on grade adjacent to the filter piping gallery. Clean backwash water will be pumped from the reclaimed water storage tank to the filter cells. Dirty backwash water will flow by gravity from the filter cells to the existing master pump station.

4.7.1.3 Site Location B

The concept for Site Location B is to construct a new filter structure on the site of the existing flocculation tanks and filters. The demolition of the existing flocculation tanks, existing filters, and concrete cover will be completed in two (2) phases in order to maintain plant operation without the need to purchase temporary filtration facilities. No stormwater modifications are required for this site location.

The location of the filter structure for Site Location B requires temporary piping between the existing intermediate pump station and the existing filter influent channel. The existing flocculation tanks will be demolished once the temporary piping is placed into service to allow construction of the new filters within the footprint of the existing flocculation tanks.

The filter structure will consist of eight (8) filters cells, a filter effluent chamber, and a piping gallery. The filter piping gallery will consist of a lower level and an intermediate level. The filter cells will be arranged in two (2) rows of four (4) filters with the gallery located between the two rows of filters. The weir in the filter effluent chamber will keep the media in the filters submerged. To fit the new filter structure into the existing hydraulic profile, approximately half of the filter structure will be below grade. The gallery piping will consist of a single 54-inch effluent header, 20-inch ductile effluent piping, 20-inch ductile iron backwash piping, and 12-inch stainless steel air piping. The filter influent will be concrete channel.

The filter cells and filter effluent chamber will be covered with flat panel aluminum covers. The flat panel aluminum covers will include access hatches to facilitate filter maintenance, flanged connections to accept level instruments, and vents to accommodate the backwash air flow.

Two (2) dedicated backwash air blowers, one duty and one standby, and two (2) backwash water pumps, one duty and one standby, will be located on a slab on grade adjacent to the filter piping gallery. Clean backwash water will be pumped from the reclaimed water storage tank to the filter cells. Dirty backwash water will flow by gravity from the filter cells to the existing master pump station.

4.7.2 Cost Comparison

Table 4-8 summarizes the estimated construction costs for the proposed alternatives. The construction costs include contractor mobilization/demobilization, contingency, site work, deep bed filter replacement, electrical, and all other items required for the successful construction of the project.

Table 4-8. Water Conserv II WRF Filter Replacement Alternative Cost Analysis

Alternative	Description	Construction Cost (2016 $USD)
1	No Action	$0
2	Site Location A	$15,746,000
3	Site Location B	$14,122,000

5.0 ENVIRONMENTAL EFFECTS

5.1 PROJECT BENEFITS

Maintaining functional infrastructure will allow the City to continue wastewater treatment. The proposed projects have several benefits as described below:

- **Dean Road and Kirkman Road Sanitary Sewer Improvements:** Replacing and repairing cracks and leaks in the aging collection system pipelines should help solve inflow and infiltration (I&I) problems, will prevent wastewater from contaminating groundwater and surface water bodies, and help to avoid potential collapse of the roadway or ground surface above the pipelines. Replacing aged pipes is also expected to reduce the occurrence of sanitary sewer overflows (SSOs) at lift stations.
- **Lift Station No. 1/7 & No. 45:** Upgrading and/or replacing the City's lift stations will allow continued transfer of wastewater to the treatment facilities for their respective service areas. These improvements will ensure that the increased projected wastewater flows will be accommodated. Additionally, this will help prevent any overflows or operational problems at the facility, which would create a public and environmental health hazard.
- **Iron Bridge WRF and Water Conserv II WRF:** Replacing and upgrading equipment at the City's Iron Bridge WRF and Water Conserv II WRF will allow continued treatment of influent wastewater for their respective service areas. These improvements will also reduce the potential for operational problems at the facility, which would result in effluent that exceeds permit limits and would, in turn, endanger public health. By maintaining the facility and ensuring that all equipment is kept operational, this reduces the potential for negative environmental impacts.

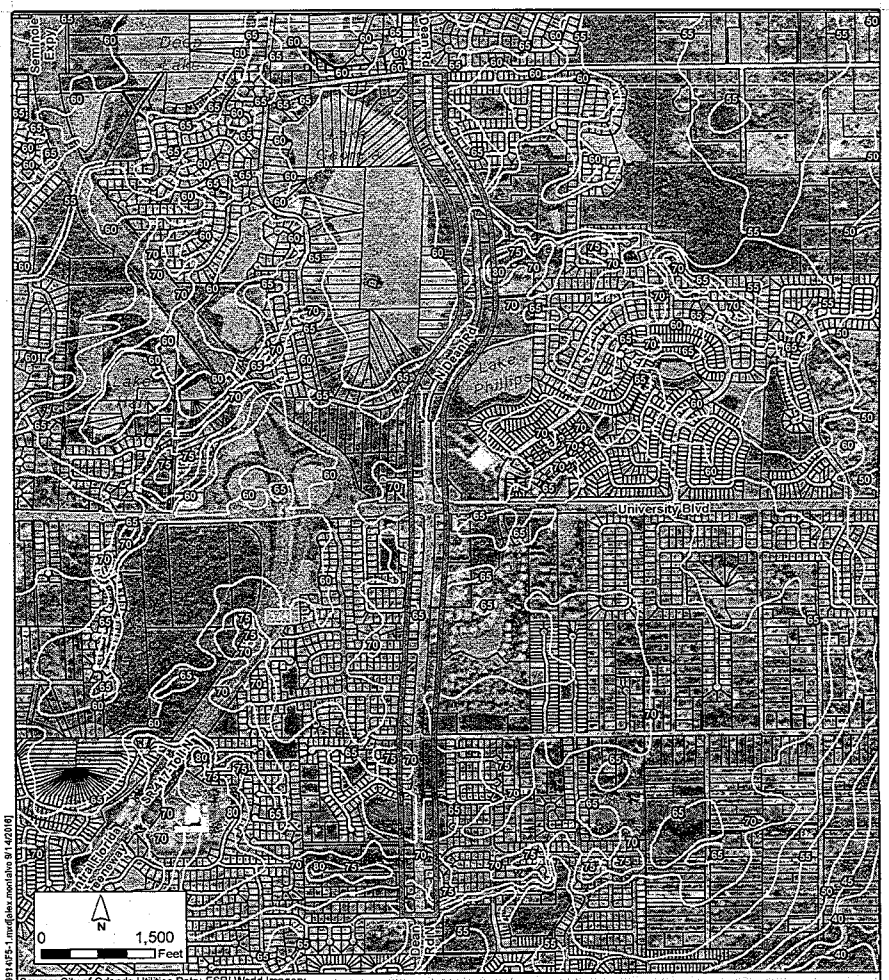
5.2 TOPOGRAPHY AND SURFACE WATERS

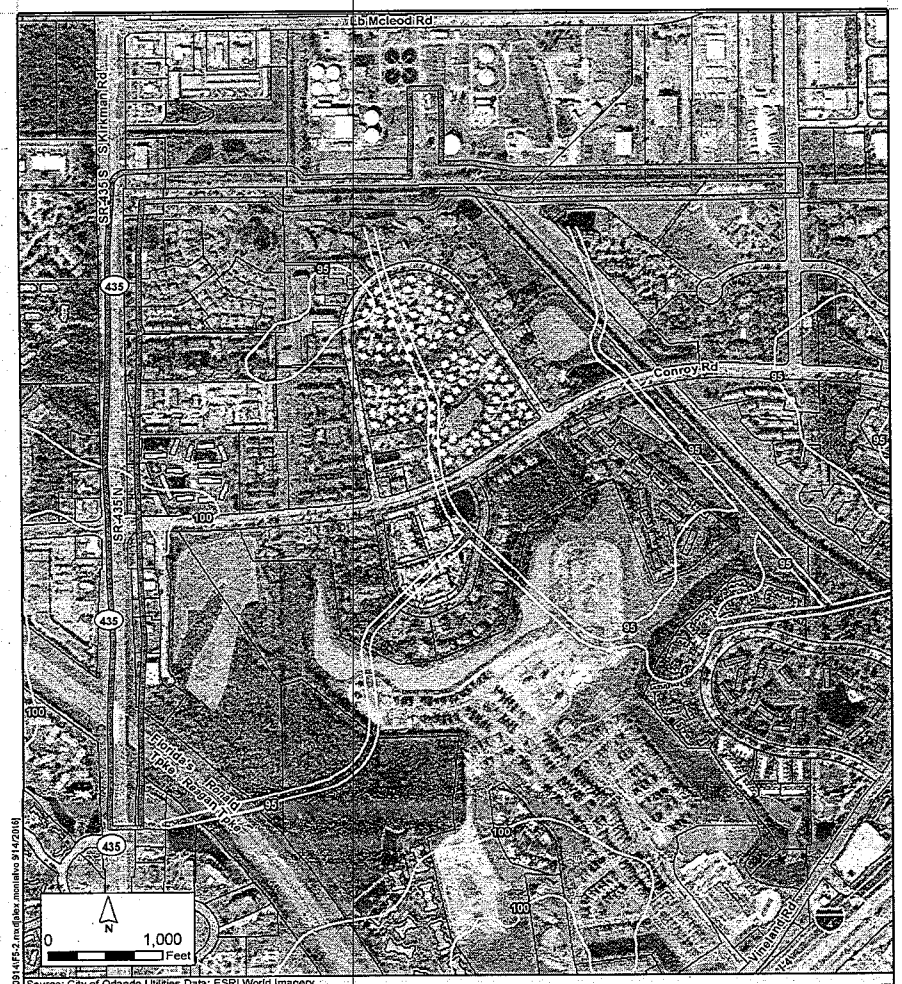
The City's wastewater service area is characterized by relatively flat terrain and much of the area has been developed. The City is situated in the middle of Florida's lakes region and has more than 50 lakes that are typically of sinkhole origin within its City limits.

Figures 5-1 through **5-6** depict the land and surface waters elevations within the wastewater service area for each project. The topographical information was obtained from the United States Geological Survey (U.S.G.S). The projects included in this report herein are at the following approximate elevations above sea level:

- Dean Road: 68-75 feet
- Kirkman Road: 94-123 feet
- Lift Station No. 1/7: 78 feet
- Lift Station No. 45: 104 feet
- Iron Bridge WRF: 60 feet
- Water Conserv II: 103 feet

Proposed construction activities associated with each project will abide by federal, state, and City requirements. Proper erosion sedimentation control measures will be taken to prevent any adverse impacts of nearby surface water bodies.





Source: City of Orlando Utilities Data; ESRI World Imagery

LEGEND

Kirkman Rd Sanitary Sewer Improvements
Site Boundary

USGS 5' Contour (NGVD 29)

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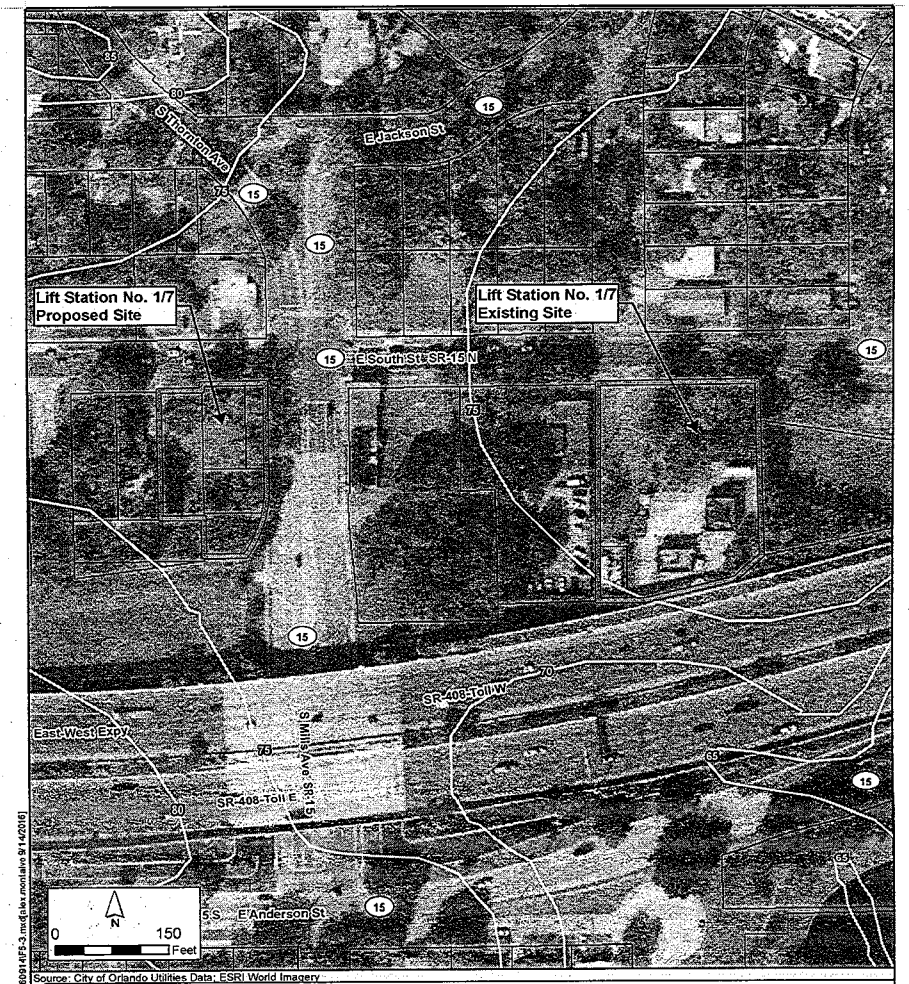
TETRA TECH	CITY OF ORLANDO CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN KIRKMAN ROAD SANITARY SEWER IMPROVEMENTS LAND SURFACE AND WATER ELEVATIONS	FIGURE 5-2



Source: City of Orlando Utilities Data; ESRI World Imagery

LEGEND

LS No. 1/7
Site Boundary

USGS 5' Contour (NGVD 29)

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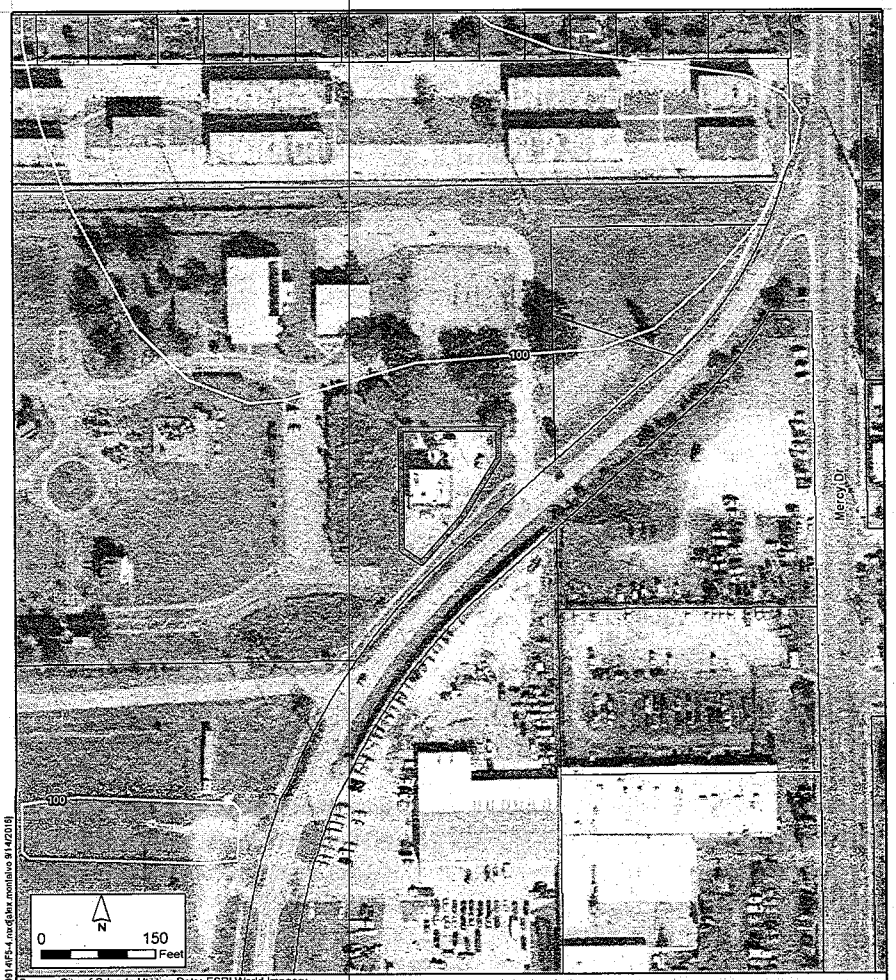
TETRA TECH	CITY OF ORLANDO CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN LIFT STATION NO. 1/7 LAND SURFACE AND WATER ELEVATIONS	FIGURE 5-3

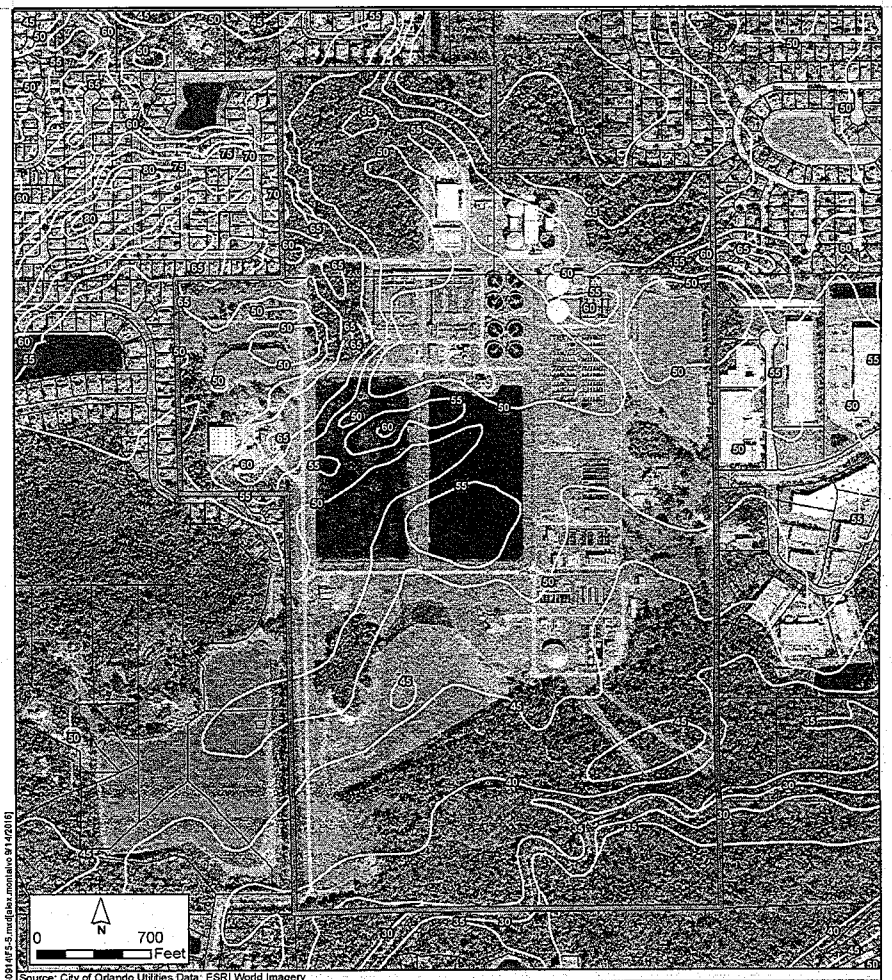


TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

LIFT STATION NO. 45
LAND SURFACE AND WATER ELEVATIONS

FIGURE 5-4

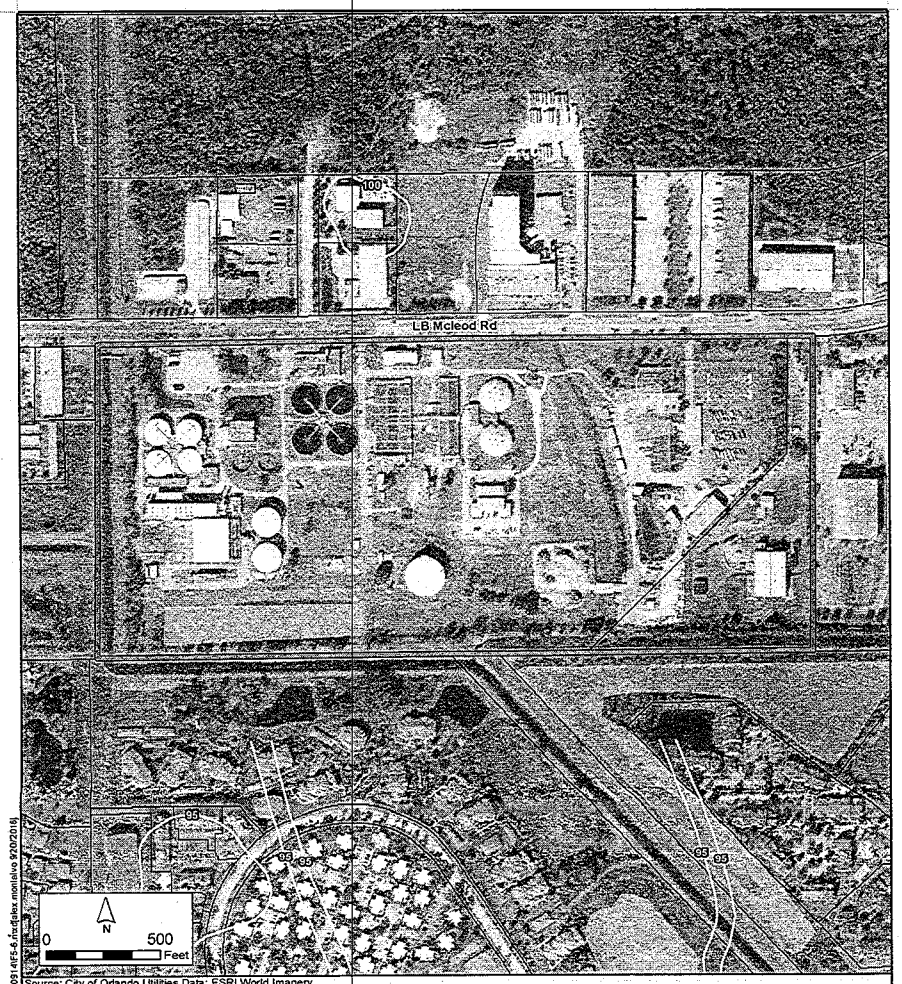


TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

IRON BRIDGE WRF
LAND SURFACE AND WATER ELEVATIONS

FIGURE 5-5



5.3 ENVIRONMENTALLY SENSTIVE AREAS

5.3.1 Existing Land Use

The City's wastewater service area is primarily urban development and largely built out. **Figures 5-7** through **5-12** show the existing land uses for each project area obtained from the St. Johns River Water Management District's Land Use Land Cover. The proposed projects either include construction at existing treatment facilities and City owned land or public rights-of-way. Because of this, it is expected that there will be no significant adverse effects upon flora, fauna, threatened or endangered animal species, surface water bodies, prime agricultural lands, wetlands, or undisturbed areas. All federal, state, and City guidelines will be followed and all precautionary measures will be taken to ensure that each project minimizes any potential effects on environmentally sensitive areas.

5.3.1.1 Dean Road

The proposed project area along the Dean Road corridor is characterized by a variety of different land uses as it stretches approximately two (2) miles. Comprised of mostly residential land use, it is also surrounded by commercial, institutional, upland forested and non-forested, and wetlands land use types. The project proposes to rehabilitate the existing pipe and the work would be contained in the right-of-way, reducing impacts to nearby wetlands and other land uses.

5.3.1.2 Kirkman Road

Similarly to Dean Road, the project area is characterized by a variety of different land uses due to the total footprint of the proposed pipe rehabilitation. This project area lies near the following zoning types: residential, commercial, industrial, agricultural, upland, and wetlands. The project proposes to rehabilitate the existing pipe and the work would be contained in the right-of-way, reducing impacts to nearby wetlands and other land uses.

5.3.1.3 Lift Station No. 1/7

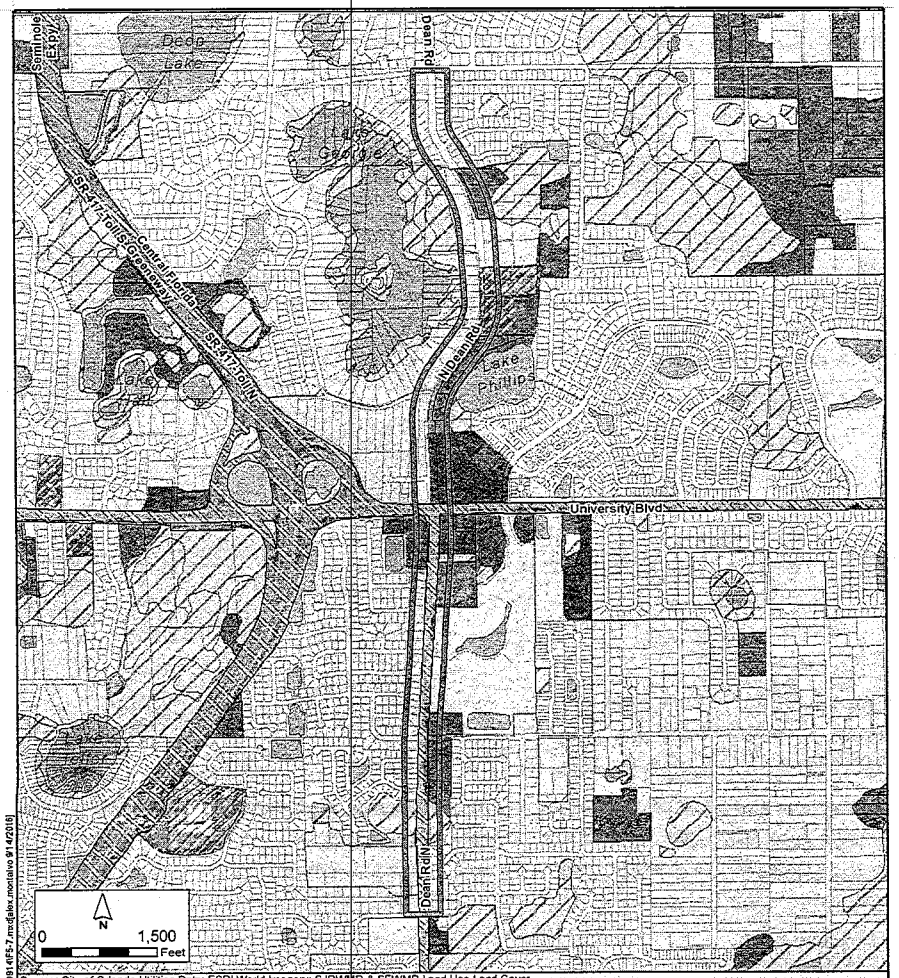
Lift Station No. 1/7 is located in the Downtown Orlando area and is surrounded by residential and transportation zoning. The existing site is currently situated on commercial and services land use. The new proposed lift station, where the City has acquired the land, would place it in residential zoning. In an effort to maintain aesthetics, the proposed lift station will be constructed to resemble that of a residential home to help blend in with its surroundings. The closest identified wetland is approximately 450 feet from the existing lift station site and it is not anticipated that this project will have any adverse effects on this wetland.

5.3.1.4 Lift Station No. 45

Lift Station No. 45 sits on institutional zoning land, adjacent to The Children's Safety Village of Central Florida. It also includes some recreational and commercial zones in close proximity to the site. Although all work is proposed on site and no new land is expected to be acquired, all precautionary measures will be taken to ensure public and environmental safety.

5.3.1.5 Iron Bridge WRF (Low Voltage and Dewatering Improvements)

The Iron Bridge WRF is situated on utility zoning and is surrounded by mostly upland forest, surface water bodies, some commercial and residential zoning areas, and a few wetlands. The proposed low voltage and dewatering projects are at existing buildings at the facility and are not expected to interfere with adjacent wetlands or other land use types.


Seminole Expy
Dean Rd
Deep Lake
Lake George
SR 417 Toll
Central Florida Greeneway
SR 417 Toll
Lake Phillips
Lake
University Blvd
Dean Rd
N
0
1,500
Feet
Source: City of Orlando Utilities Data; ESRI World Imagery; SJRWMD & SFWMD Land Use Land Cover
LEGEND
Dean Rd
Sanitary Sewer Improvements
Site Boundary
Existing Land Use
Residential
Commercial
Industrial
Institutional
Recreational
Agircultural
Upland
Wetlands
Barren Land
Trans,Comm, Utility
Water
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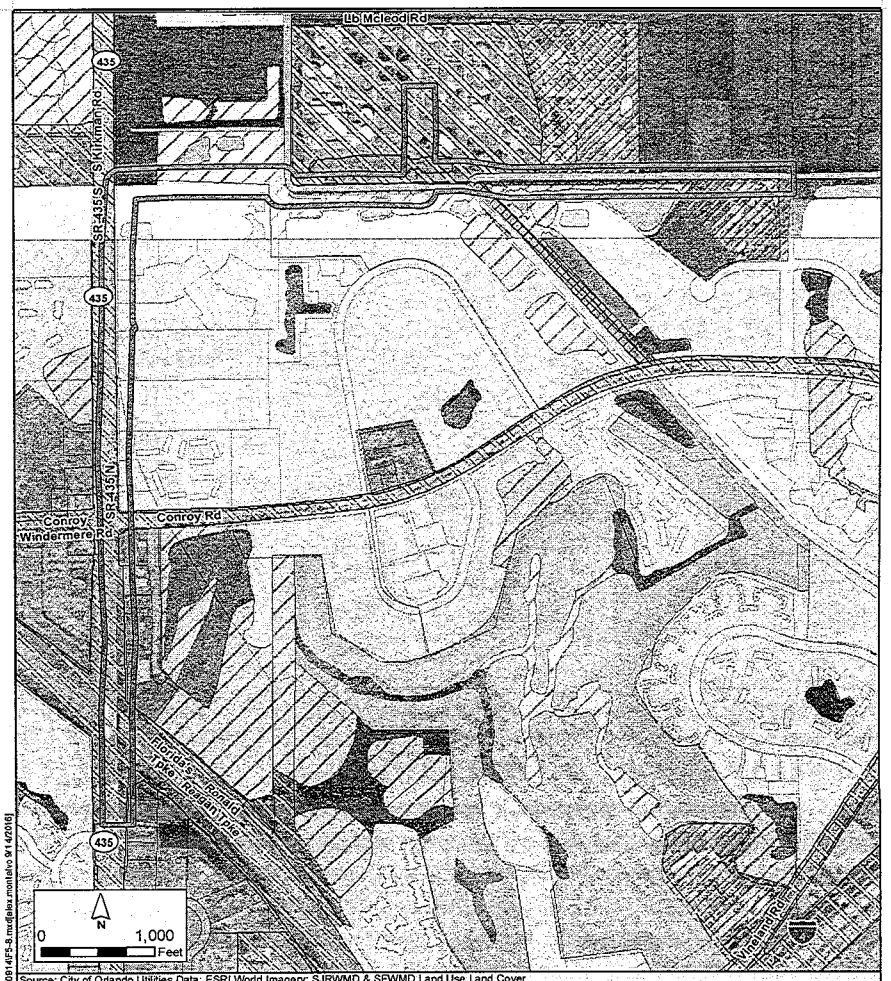
TETRA TECH
CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN
DEAN ROAD SANITARY SEWER IMPROVEMENTS
EXISTING LAND USE
FIGURE 5-7


Lb Mcleod Rd
435
S Kirkman Rd
SR 435 S
SR 435 N
Conroy
Windermere Rd
Conroy Rd
Florida's Turnpike
Florida's Turnpike
Vineland Rd
N
0
1,000
Feet
Source: City of Orlando Utilities Data; ESRI World Imagery; SJRWMD & SFWMD Land Use Land Cover
LEGEND
Kirkman Rd
Sanitary Sewer Improvements
Site Boundary
Existing Land Use
Residential
Commercial
Industrial
Institutional
Recreational
Agircultural
Upland
Wetlands
Barren Land
Trans,Comm, Utility
Water
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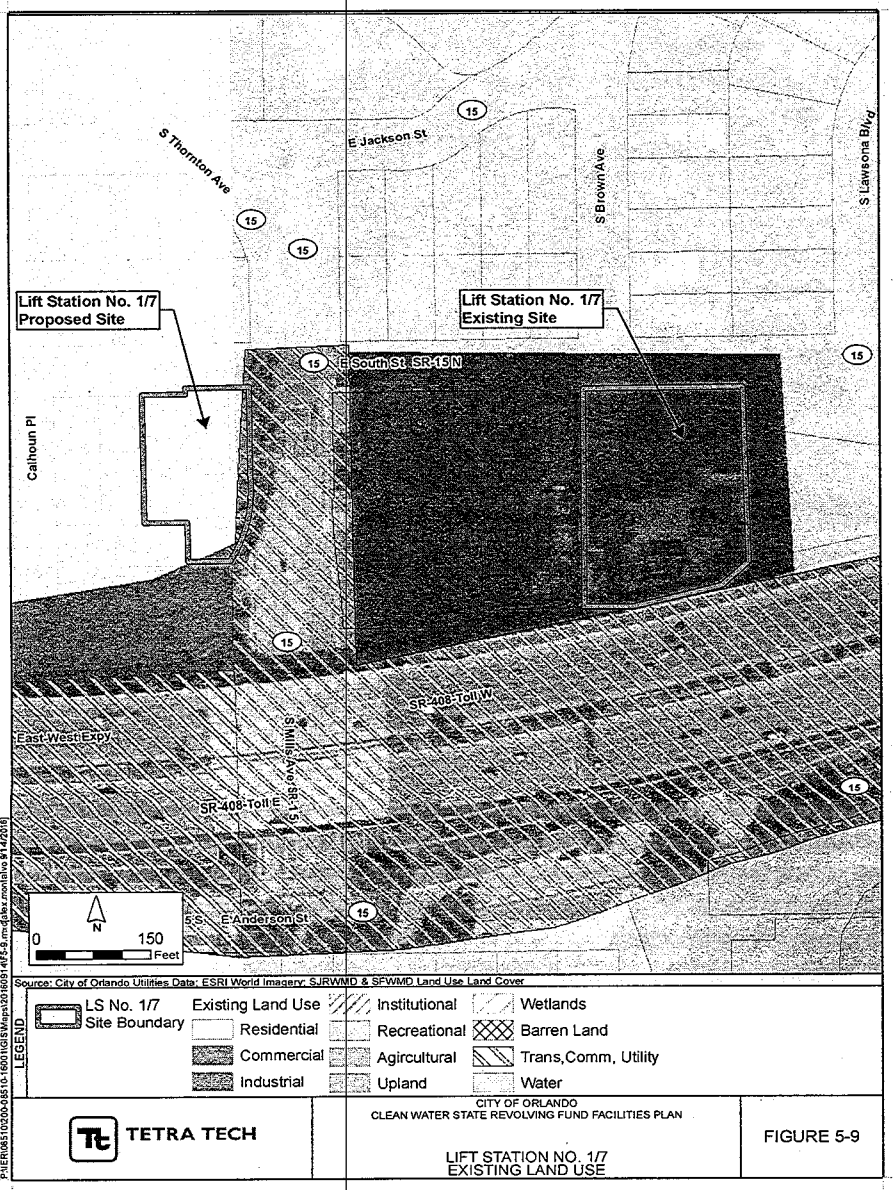
TETRA TECH
CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN
KIRKMAN ROAD SANITARY SEWER IMPROVEMENTS
EXISTING LAND USE
FIGURE 5-8

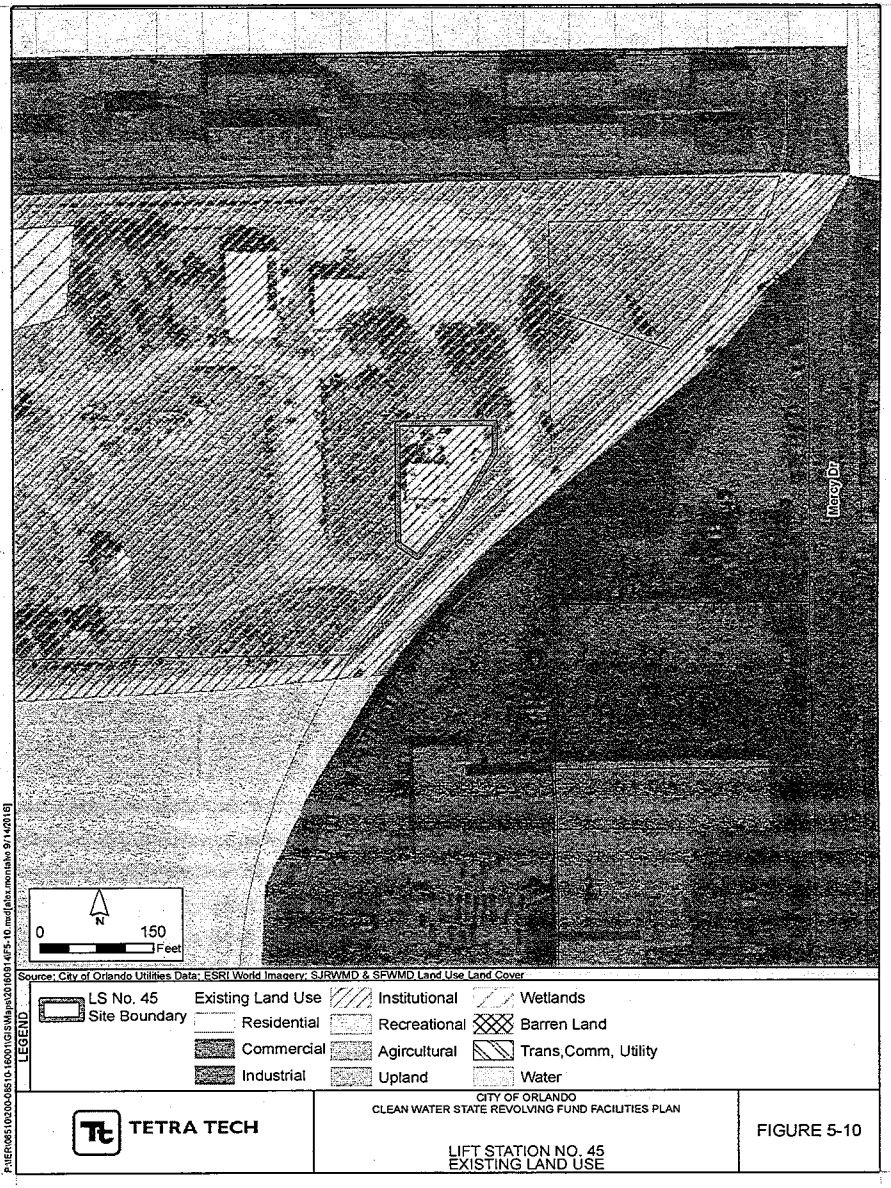


TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

LIFT STATION NO. 1/7
EXISTING LAND USE

FIGURE 5-9

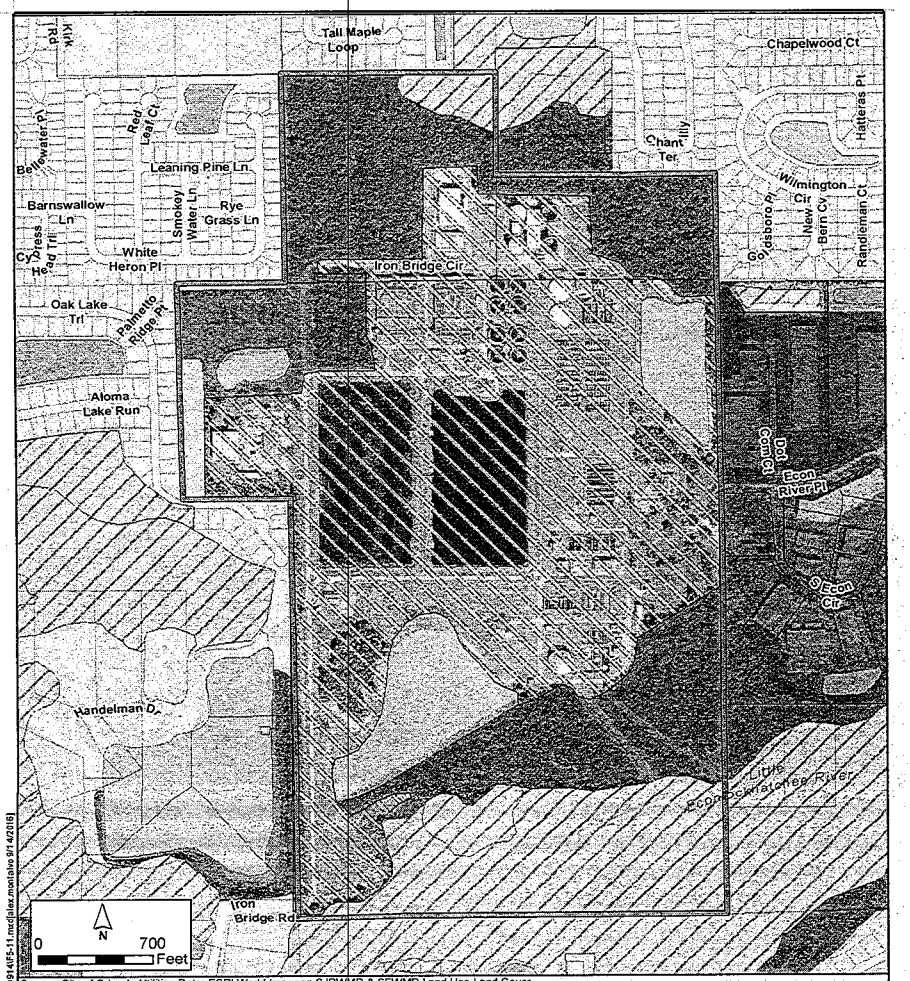


TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

LIFT STATION NO. 45
EXISTING LAND USE

FIGURE 5-10



Source: City of Orlando Utilities Data; ESRI World Imagery; SJRWMD & SFWMD Land Use Land Cover

LEGEND

Iron Bridge WRF Site Boundary

Existing Land Use

- Residential
- Commercial
- Industrial
- Institutional
- Recreational
- Agricultural
- Upland
- Wetlands
- Barren Land
- Trans,Comm, Utility
- Water

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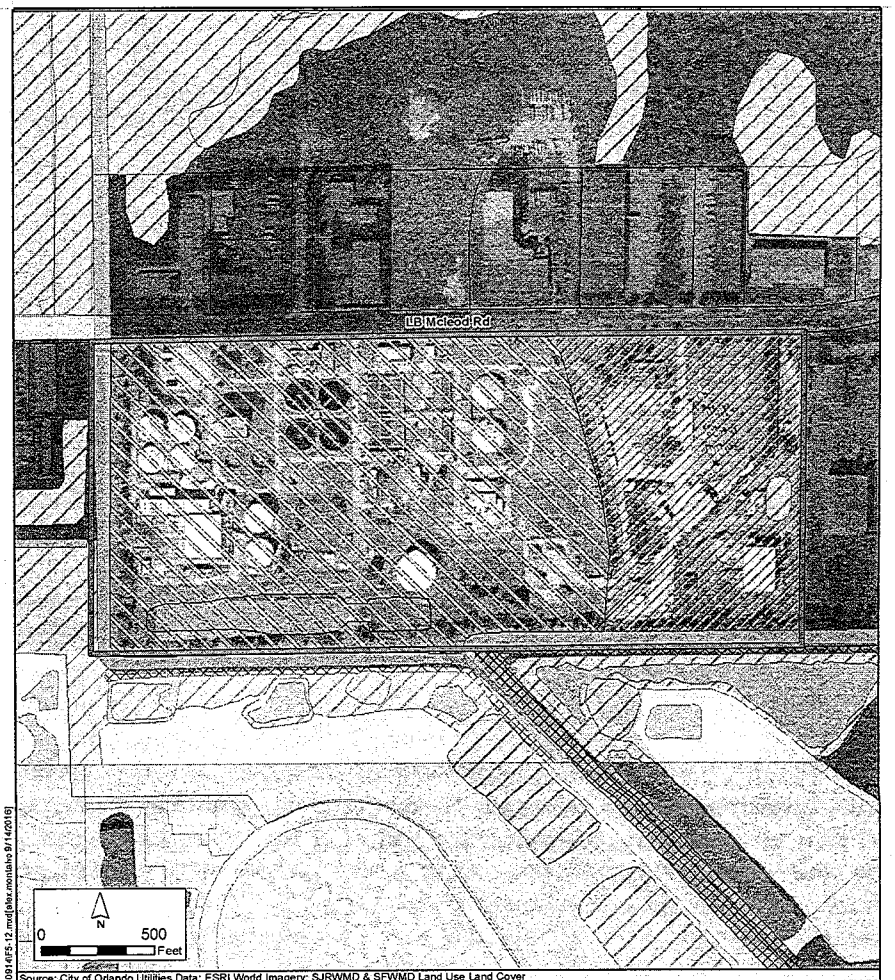
TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

IRON BRIDGE WRF
EXISTING LAND USE

FIGURE 5-11



Source: City of Orlando Utilities Data; ESRI World Imagery; SJRWMD & SFWMD Land Use Land Cover

LEGEND

Water Conserv II Site Boundary

Existing Land Use

- Residential
- Commercial
- Industrial
- Institutional
- Recreational
- Agricultural
- Upland
- Wetlands
- Barren Land
- Trans,Comm, Utility
- Water

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TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

WATER CONSERV II
EXISTING LAND USE

FIGURE 5-12

5.3.1.6 Water Conserv II WRF

Water Conserv II WRF is also located on utility zoning. Land uses adjacent to the facility include: residential, commercial/industrial, and wetlands. Similarly to Iron Bridge WRF, the improvements at the Water Conserv II are not anticipated to have any adverse effects on adjacent land as the project is confined to one of the buildings on-site.

5.3.2 Endangered/Threatened Species

Human population growth has threatened and endangered many plant and animal species with extinction. It is imperative that the negative effects of future growth among these species are kept to a minimum. **Table 5-1** provides a list of these endangered and threatened plants and animals found in Orlando.

Table 5-1. Endangered/Threatened Plant and Animal Species

Category	Species Common Name	Species Scientific Name	Code[1]
Mammals	West Indian (Florida) Manatee	Trichechus manatus latirostris	E/CH
	Audubon's Crested Caracara	Polyborus plancus audubinii	T
	Everglade Snail Kite	Rostrhamus sociabilis plumbeus	E
Birds	Florida Scrub-jay	Aphelocoma coeruluscens	T
	Wood Stork	Mycteria americana	E
	Red-cockaded Woodpecker	Picoides borealis	E
	Gopher Tortoise	Gopherus polyphemus	C
Reptiles	Sand Skink	Neoseps reynoldsi	T
	Eastern Indigo Snake	Dymarchon corais couperi	T
Amphibians	Striped Newt	Notophthalmus perstriatus	C
	Britton's Beargrass	Nolina brittoniana	E
	Florida Bonamia	Bonamia grandiflora	T
	Scrub Lupine	Lupinus aridorum	E
Plants	Beautiful Pawpaw	Deeringothamnus pulchellus	E
	Sandlace	Polygonella myriophylla	E
	Papery Whitlow-wort	Paronychia chartacea = Nyachia pulvinata	T
	Scrub Wild Buckwheat	Eriogonum longifolium var. gnaphalifolium	T

[1] Code Key: E = Endangered, T = Threatened, CH = Critical Habitat Designated

*The species list was obtained from U.S Fish and Wildlife Service, North Ecological Services Office, in which Orange and Seminole Counties Federally Listed Species are available:

- http://www.fws.gov/northflorida/CountyList/Orange.htm
- http://www.fws.gov/northflorida/CountyList/Seminole.htm

The local threatened and endangered species are not anticipated to be affected by the proposed construction. However, if discovery of any species listed above does occur, measures will be followed to minimize any impacts.

5.4 FEMA FLOOD PLAIN ZONES

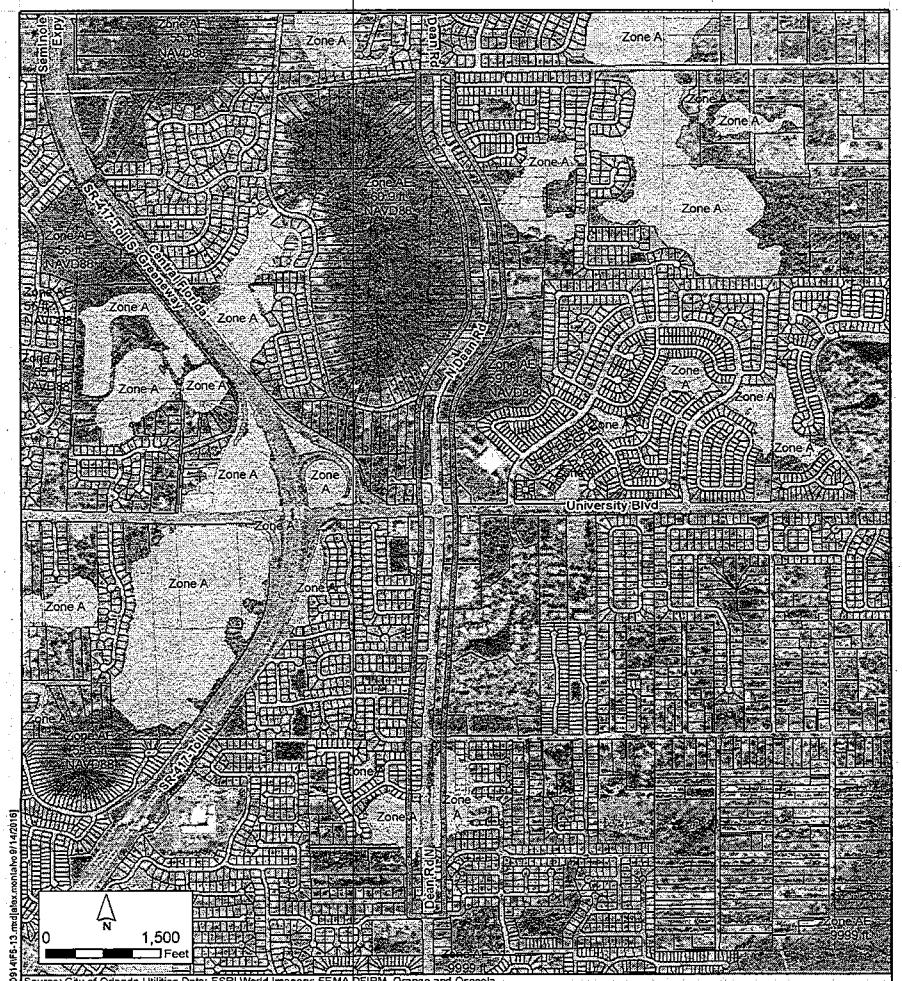
The Florida Emergency Management Agency (FEMA) provides flood plain zoning maps that are available to identify areas that are prone to flooding. **Figures 5-13** through **5-18** show the flood plain map for each proposed project area. The following have been identified to be in a flood plain zone:

- Dean Road Sanitary Sewer Improvements (Zones A and AE)
- Kirkman Road Sanitary Sewer Improvements (Zones A and AE)
- Lift Station No. 1/7 Improvements (Zone AE)
- Iron Bridge WRF (Zone A)
- Water Conserv WRF II (Zone A and AE)

According to FEMA, the zones indicated in the figures are defined as the following:

- **Zone A** - Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- **Zone AE** - Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.

Essentially, both Zones A and AE are areas located in a flood plain zone and have a 1% chance of experiencing a flood event on an annual basis. The only difference is that Zone AE areas have BFEs identified because hydraulic analyses have been performed while Zone A areas do not have these BFEs established. The BFEs for Zone AE areas are shown in the flood plain figures. Occasionally, the BFEs for Zones AE have not been published for a variety of possible reasons and, in this case, the BFE is shown as "-9999 ft".



Source: City of Orlando Utilities Data; ESRI World Imagery; FEMA DFIRM, Orange and Osceola

LEGEND

Dean Rd Sanitary Sewer Improvements Site Boundary

FEMA Flood Zone
- Zone A
- Zone AE

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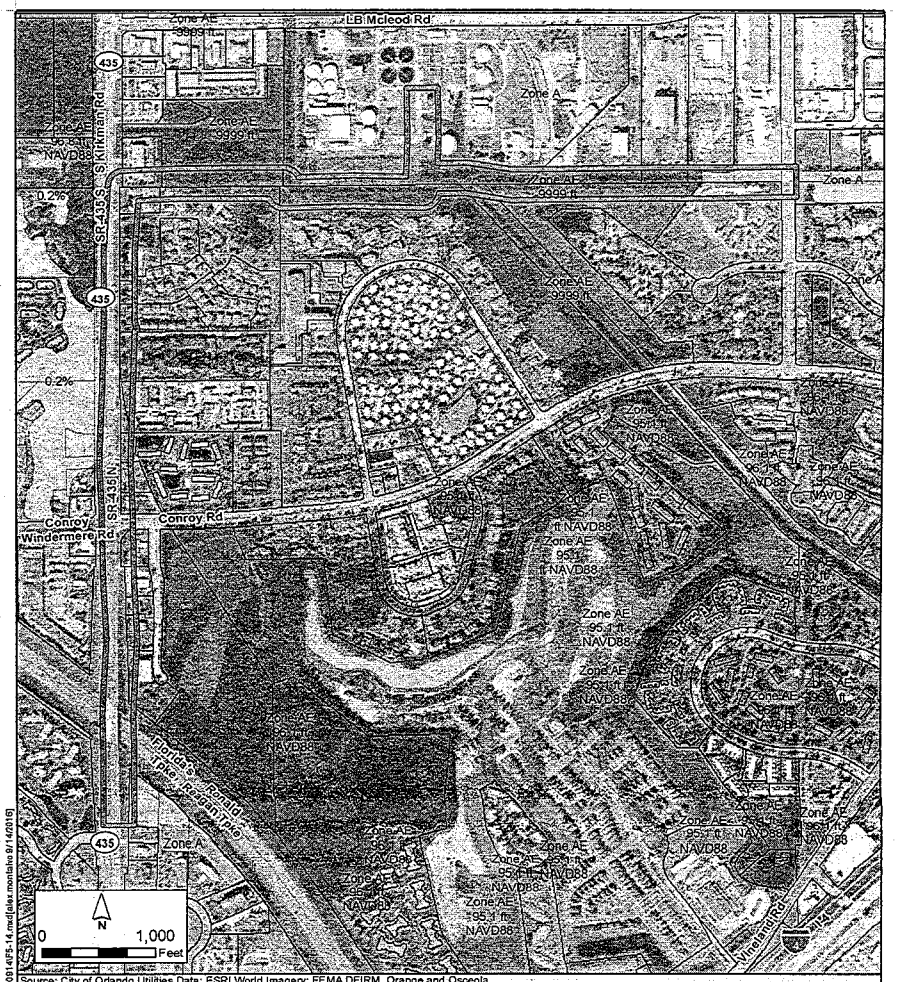
TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

DEAN ROAD SANITARY SEWER IMPROVEMENTS
FLOOD PLAIN

FIGURE 5-13



Source: City of Orlando Utilities Data; ESRI World Imagery; FEMA DFIRM, Orange and Osceola

LEGEND

Kirkman Rd Sanitary Sewer Improvements Site Boundary

FEMA Flood Zone
- 0.2 PCT Annual Chance Flood Hazard
- Zone A
- Zone AE

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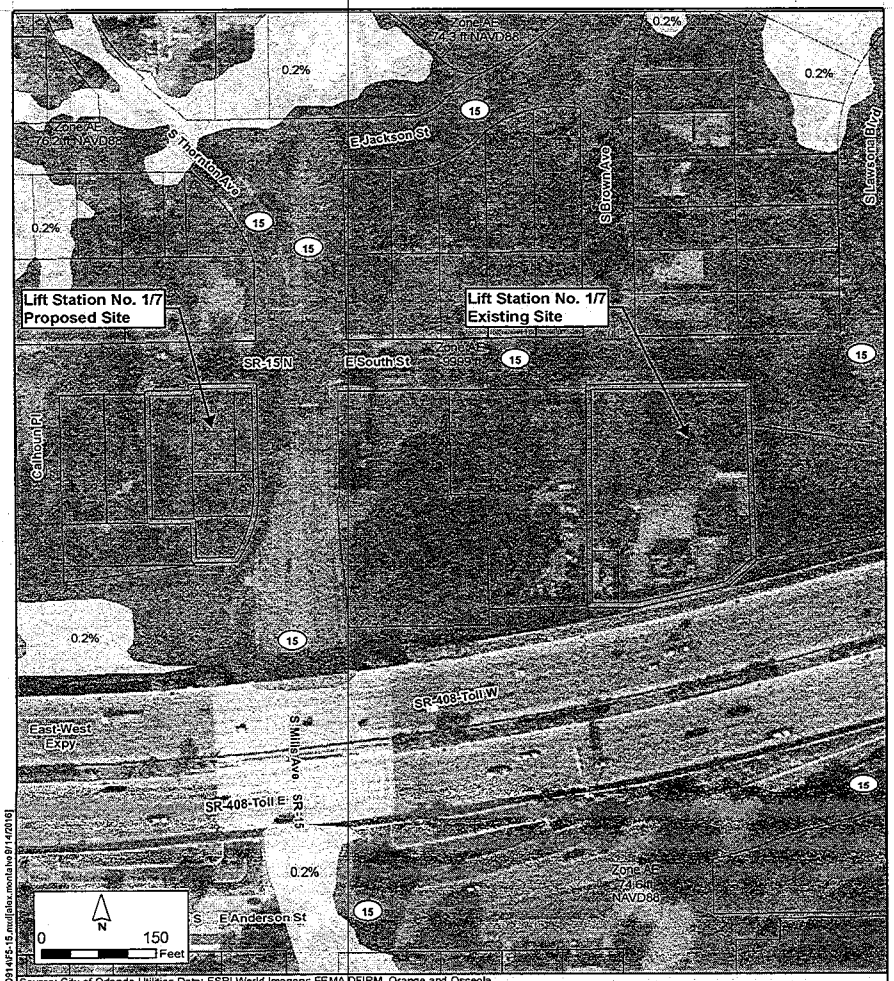
TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

KIRKMAN ROAD SANITARY SEWER IMPROVEMENTS
FLOOD PLAIN

FIGURE 5-14



Source: City of Orlando Utilities Data; ESRI World Imagery; FEMA DFIRM, Orange and Osceola

LEGEND

LS No. 1/7 Site Boundary

FEMA Flood Zone
0.2 PCT Annual Chance Flood Hazard
Zone AE

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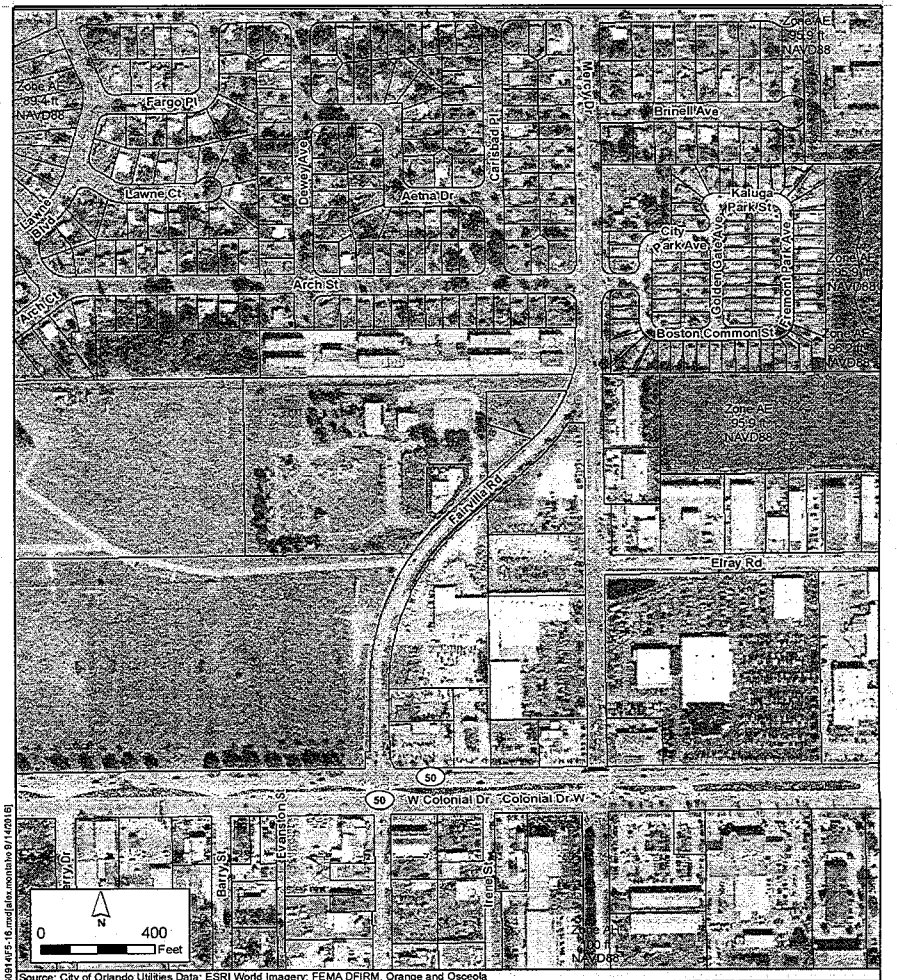
TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

LIFT STATION NO. 1/7
FLOOD PLAIN

FIGURE 5-15



Source: City of Orlando Utilities Data; ESRI World Imagery; FEMA DFIRM, Orange and Osceola

LEGEND

LS No. 45 Site Boundary

FEMA Flood Zone
Zone AE
Zone AH

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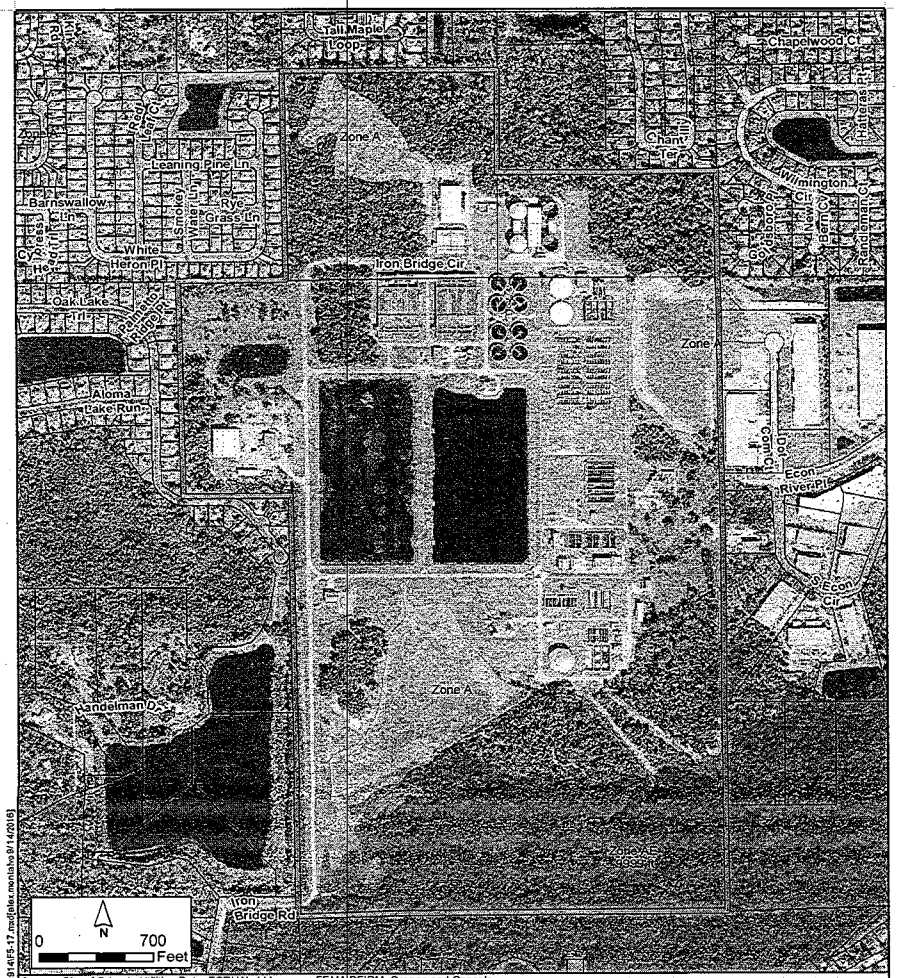
TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

LIFT STATION NO. 45
FLOOD PLAIN

FIGURE 5-16

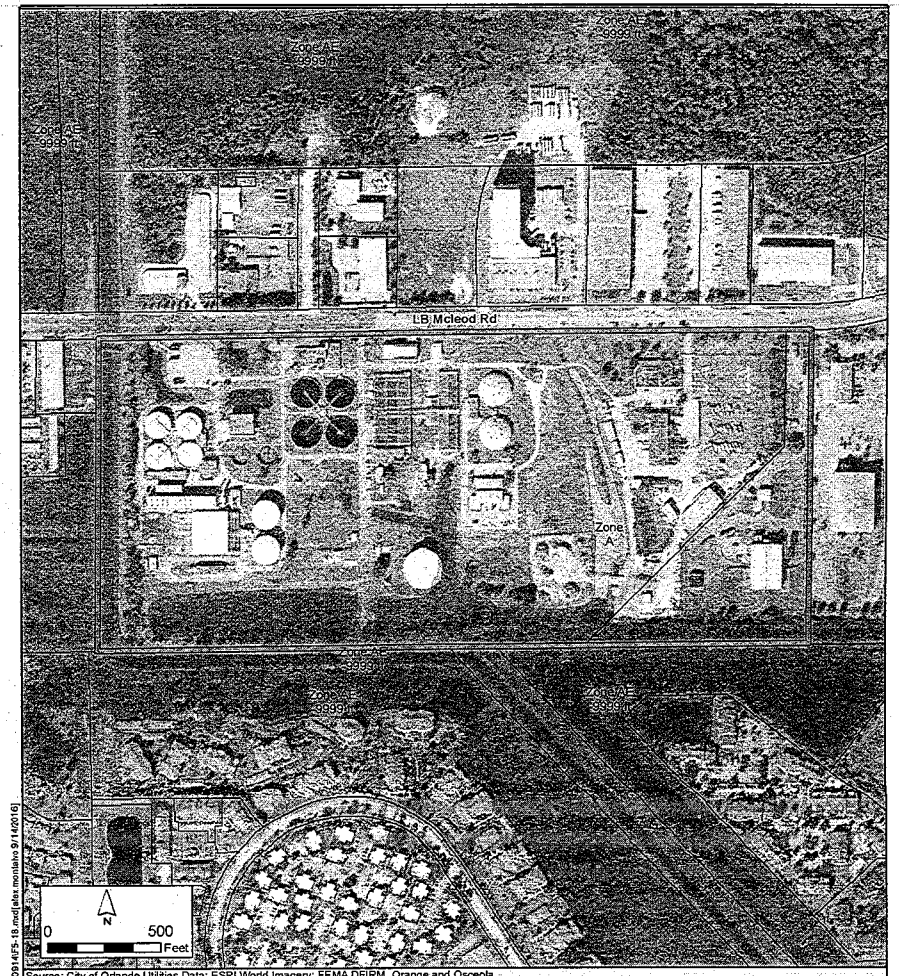


TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

IRON BRIDGE WRF
FLOOD PLAIN

FIGURE 5-17



TETRA TECH

CITY OF ORLANDO
CLEAN WATER STATE REVOLVING FUND FACILITIES PLAN

WATER CONSERV II
FLOOD PLAIN

FIGURE 5-18

6.0 SELECTED ALTERNATIVE

This section provides a description of the recommended facilities and a detailed cost estimate for each project's selected alternative.

6.1 DEAN ROAD SANITARY SEWER IMPROVEMENTS

6.1.1 Recommended Facilities

Alternative 2 (conventional sliplining of the gravity interceptor sewer and manholes) is selected for implementation. Alternative 2 has both the lowest construction cost and lowest cost per million gallons. The slip lining will also have the least impact during construction. In addition, maintaining the gravity operation and access points will preserve the ability to inspect the system in the future.

6.1.2 Cost Estimate

A detailed cost estimate of the selected alternative for the Dean Road Sanitary System Improvements is presented in **Table 6-1.** The total anticipated project cost is $7,198,000.

Table 6-1. Dean Road Sanitary System Improvements Probable Construction Cost

Item	Description	Construction Cost (2016 $USD)
1	Mobilization/Demobilization (5%)	$343,000
2	Insertion Pits In and Out	$595,000
3	Clean Existing Pipe	$281,700
4	TV Existing Pipe	$103,290
5	Temporary Roads around Pits on Shoulders	$400,000
6	Hobas Flush Relining 66" OD Pipe	$1,395,904
7	Hobas Flush Relining 69.2" OD Pipe	$1,277,400
8	Slipline 72" w/ 66" OD HOBAS	$333,580
9	Slipline 78" w/ 69.2" OD HOBAS	$298,060
10	Traffic Control	$150,000
11	Grout 66" in 72"	$502,700
12	Grout 66" in 78"	$133,650
13	Grout 69.2" in 78"	$735,350
14	Clean and Seed P (Median Areas)	$45,000
15	Repave Pits (Roadway Areas)	$120,000
16	Rehabilitation of Manholes	$380,000
17	Post TV Inspection	$103,290
	TOTAL ESTIMATED CONSTRUCTION COST	**$7,197,924**

Source: "Preliminary Design Report" prepared by Woolpert, Inc. found in **Section 1** of **Volume 2** of this report.

6.2 KIRKMAN ROAD SANITARY SEWER IMPROVEMENTS

6.2.1 Recommended Facilities

Alternative 3 (conventional sliplining of the gravity sewer and manholes) is selected for implementation. Alternative 3 has the lowest construction cost and was determined to be the most viable option due to its minimal impacts on public and environmental health during construction. In addition, maintaining the gravity operation and access points will preserve the ability to inspect the system in the future.

6.2.2 Cost Estimate

A detailed cost estimate of the selected alternative for the Kirkman Road Sanitary System Improvements is presented in **Table 6-2.** The total anticipated project cost is $7,042,000.

Table 6-2. Kirkman Road Sanitary System Improvements Probable Construction Cost

Item	Description	Construction Cost (2016 $USD)
1	Insertion Pits In and Out	$595,000
2	Clean Existing Pipe	$403,500
3	TV Existing Pipe	$31,000
4	Temporary Roads around Pits on Shoulders	$240,000
5	Slipline 36"	$551,000
6	Slipline 48"	$1,900,000
7	Slipline 54"	$156,000
8	Maintenance of Traffic	$75,000
9	Grout 36"	$107,250
10	Grout 48"	$471,250
11	Grout 54"	$48,750
12	Restoration of Green Space	$22,500
13	Restoration of Roadway	$80,000
14	Rehabilitation of Manholes	$620,000
15	Post TV Inspection	$33,300
	SUBTOTAL	**$5,334,550**
16	General Requirements (5%)	$266,728
17	Mobilization/Demobilization (5%)	$266,728
	SUBTOTAL	**$5,868,005**
18	Contingency (20%)	$1,173,601
	TOTAL ESTIMATED CONSTRUCTION COST	**$7,041,606**

Source: Developed by Tetra Tech

6.3 LIFT STATION NO. 1/7 IMPROVEMENTS

6.3.1 Recommended Facilities

Based on discussions with the City's Engineering and Wastewater Staff and review of proposed site layout alternatives, the alternative to construct an entirely new lift station off-site was determined to be the best option. Due to site constraints, the project will include the decommissioning and abandonment of the existing LS No. 1/7 and construction of a new LS No. 1 at the southwest corner of South Street and Mills Avenue that will include a new wet well, pumps, piping, controls, generator, building, odor control system and miscellaneous site work. The following general improvements have been established for LS No. 1/7:

1. Reconfiguration of incoming sanitary sewer mains, including installation of twelve (12) new manholes.
2. Reconfiguration of the discharge force mains.
3. Installation of dual chamber wet well designed to accommodate six (6) pumps with a bridge crane system for pump removal.
4. Installation of one (1) emergency backup generator in a generator room and one (1) fuel storage tank capable of powering all equipment and controls.
5. Construction of new building to enclose the wet well, electrical equipment, and standby generator set.
6. Installation of new electrical system, switchgear, control panels and SCADA system.
7. Installation of a dual flow meter assembly to measure flows to LS No. 248 and LS No. 5. Electrically actuated control valves will be located adjacent to the flow meters to facilitate remote valve positioning.
8. Installation of a biological odor control system.
9. Miscellaneous site work, including installation of a decorative wall with open iron picket fencing, construction of a driveway providing access from Mills Avenue and South Street, site grading, gravel, and landscaping.
10. Decommissioning of existing wet wells, buildings, selected sanitary sewer lines, generators, electrical components and miscellaneous site work. Items will be demolished, abandoned in place, or salvaged depending upon direction from the City.

6.3.2 Cost Estimate

A detailed cost estimate of the selected alternative for the LS No. 1/7 improvements is presented in **Table 6-3.** The total anticipated project cost is $11,637,000.

Table 6-3. LS No. 1/7 Improvements Probable Construction Cost

Item	Description	Construction Cost (2016 $USD)
1	Bypass Pumping	$60,000
2	Demolition	$100,000
3	Excavation, Pipe Sheeting, Bracing and Installation	$1,000,000
4	Wet Well	$1,107,500
5	Facility Building	$606,420
6	Submersible Pumps	$540,000
7	Monorail Crane	$100,000
8	Discharge Piping, Fittings and Valves	$300,000
9	15-inch Gravity Sewer Installation	$35,750
10	18-inch Gravity Sewer Installation	$13,125
11	24-inch Gravity Sewer Installation	$27,500
12	30-inch Gravity Sewer Installation	$202,500
13	36-inch Gravity Sewer Installation	$32,000
14	42-inch Gravity Sewer Installation	$51,300
15	54-inch Gravity Sewer Installation	$12,500
16	16-inch FM Installation	$36,000
17	36-inch FM Installation	$261,000
18	Manhole Refurbishment & Installation	$135,000
19	Concrete Driveway, Sidewalk, Pads, Asphalt Pavement	$297,000
20	Odor Control System and Appurtenances	$200,000
21	Chain-Link Fence, Curbing, Landscaping/Restoration, CMU Wall	$89,750
22	Electrical, HVAC, Conduit & Wire, Lighting, Switches, Panels, etc.	$853,000
23	Generator and Fuel Storage	$1,000,000
24	Instrumentation and Controls	$750,000
	SUBTOTAL	**$8,810,165**
25	Maintenance of Traffic	$50,000
26	Mobilization/Demobilization (5%)	$440,508
27	General Requirements (2%)	$176,203
28	Bonds and Insurance (2.5%)	$220,254
	SUBTOTAL	**$9,697,131**
29	Contingency (20%)	$1,939,426
	TOTAL ESTIMATED CONSTRUCTION COST	**$11,636,557**

Source: "Preliminary Engineering Memorandum" prepared by Tetra Tech, Inc. found in **Section 2 of Volume 2 of this report.**

6.4 LIFT STATION NO. 45 IMPROVEMENTS

6.4.1 Recommended Facilities

Based on discussions with the City's engineering and wastewater staff and review of proposed site layout alternatives, the alternative to rehabilitate the existing wet well was determined to be the best option. The lower capital costs, complications involved with construction of a new structure, and the elimination of requiring the use of the caisson construction method for the existing wet well are all reasons that reusing the existing wet well is the most viable option.

6.4.2 Cost Estimate

A detailed cost estimate of the selected alternative for the LS No. 45 improvements is presented in **Table 6-5.** The total anticipated project cost is $3,013,000.

Table 6-4. LS No. 45 Improvements Probable Construction Cost

Item	Description	Construction Cost (2016 $USD)
1	Bypass Pumping	$80,000
2	Demolition, Fill Existing Dry Well	$64,000
3	Refurbish Existing Wet Well	$137,500
4	Relocate Existing Odor Control	$50,000
5	Bridge Crane	$150,000
6	Submersible Pumps	$300,000
7	Discharge Piping, Fittings, and Valves	$200,000
8	Gravity Sewer Improvements	$100,000
9	Manhole Rehabilitation	$120,000
10	Concrete Driveway	$10,500
11	Gravel	$5,000
12	Fencing, Curbing, Access Gate	$50,000
13	Site/Civil	$125,000
14	Electrical and Generator Building	$400,000
	SUBTOTAL	**$1,792,000**
15	Mobilization/Demobilization (5%)	$89,600
16	General Requirements (2%)	$35,840
17	Bonds and Insurance (2.5%)	$44,800
18	Electrical, Gen Set, I&C (25%)	$448,000
	SUBTOTAL	**$2,410,240**
19	Contingency (25%)	$602,560
	TOTAL ESTIMATED CONSTRUCTION COST	**$3,012,800**

Source: Developed by Tetra Tech

6.5 IRON BRIDGE REGIONAL WRF LOW VOLTAGE SYSTEM IMPROVEMENTS

6.5.1 Recommended Facilities

The permanent installation of standby power systems at each area as described in **Section 4.5.1.3** would provide additional reliability, but would incur an additional capital expenditure of approximately $6,000,000. In addition, the installation of permanent standby generators will necessitate a substantial investment by the owner to maintain and service the additional equipment. For this reason, the preferred alternate for this project is the replacement of the electrical service gear with a three-breaker configuration as described in **Section 4.5.1.2** of this report. This alternate meets the objectives by providing a reliable and maintainable power distribution system.

6.5.2 Cost Estimate

A cost estimate of the selected alternative for the Iron Bridge Regional WRF Low Voltage System Improvements is presented in **Table 6-4.** The total anticipated project cost is $8,821,000.

Table 6-5. Iron Bridge Low Voltage Probable Construction Cost

Item	Description	Construction Cost (2016 $USD)
1	General Requirements	$331,210
2	Existing Conditions	$14,868
3	Concrete	$22,622
4	Masonry	$53,681
5	Metals	$21,176
6	Thermal & Moisture Protection	$40,063
7	Doors & Windows	$38,793
8	Finishes	$73,152
9	Plumbing	$22,066
10	Heating/Ventilation/Air Conditioning	$83,194
11	Electrical	$5,524,140
12	Site – Stormwater	$30,448
13	General Conditions, Contractor Allowances, Permits, Fees, Etc.	$1,763,295
	SUBTOTAL	$8,018,700
14	Contingency (10%)	$801,870
	TOTAL ESTIMATED CONSTRUCTION COST	**$8,821,000**

Source: "Cost Estimate Package" prepared by Milan Engineering, found in **Section 3** of **Volume 2** of this report.

6.6 IRON BRIDGE REGIONAL WRF DEWATERING IMPROVEMENTS

6.6.1 Recommended Facilities

Based on discussions with the City's engineering and wastewater staff, replacement with the 3-belt filter press units was recommended. Of the viable alternatives, this alternative has the lowest capital cost, reduced operating costs, and provides the simplest system to operate and maintain.

6.6.2 Cost Estimate

A detailed cost estimate of the selected alternative for the Iron Bridge Regional WRF dewatering improvements is presented in **Table 6-6.** The total anticipated project cost is $5,873,000.

Table 6-6. Iron Bridge Dewatering Probable Construction Cost

Item	Description	Construction Cost (2016 $USD)
1	Equipment Demolition and/or Removal	$100,000
2	Belt Filter Presses (2.0 meter Klampress), 5 PLC Control Panels, Spare Parts	$1,317,000
3	BFP Feed Pump (Moyno Series 2000 Model 2J220G1 CDQ3AAA)	$138,000
4	BFP Thickened Sludge Transfer Pump (Moyno Series 2000 open-throat)	$116,000
5	BFP Polymer Feed Pump (Moyno EZ Strip Model Z14KS81VPNE)	$16,000
6	Washwater Booster Pump (ITT-Goulds Model 3796 iFrame)	$54,000
7	Piping, Valves and Appurtenances	$68,000
8	Intelligent MCC-10	$528,000
9	New Lime Storage Silos	$498,000
10	Structural Concrete Supports, Aluminum Walkway and Pipe Supports	$90,000
11	Expansion of the existing "Super Critical Process" Electrical Room	$20,000
12	Project Electrical and Instrumentation/Controls	$640,000
	TOTAL DIRECT COST (TDC)	**$3,585,000**
13	Project Contingency (20% of TDC)	$717,000
	SUBTOTAL	**$4,302,000**
14	Contractor GC, Insurance, Bonds, OH&P (30% of Subtotal)	$1,291,000
	SUBTOTAL	**$5,593,000**
15	Escalation to Mid-Point (2.9% of Subtotal)	$163,000
	SUBTOTAL	**$5,756,000**
16	Sales Tax (6.5 percent of 50% of the TDC)	$117,000
	TOTAL ESTIMATED CONSTRUCTION COST	**$5,873,000**

Source: "Basis of Design Report" prepared by Carollo Engineers, found in **Section 4** of **Volume 2** of this report.

6.7 WATER CONSERV II WRF FILTER REPLACEMENT

6.7.1 Recommended Facilities

Both filter alternatives considered can be constructed within the existing facility constraints and will provide reliable treatment. Both alternatives provide facilities with comparable accessibility for operation and maintenance. Alternative 1, the stand-alone filter, requires less phasing during construction but requires more site work and more yard piping. Alternative 2 requires more phasing during construction, has tighter constraints for construction, but requires less site work and less yard piping.

Both alternatives present their own challenges during construction, however, the alternatives are comparable in construction cost. Alternative 1 may minimize potential process interruptions during installation and may pose fewer construction challenges but is slightly more costly. By constructing new filters at the site of the existing flocculation tanks and filters, Alternative 2 offers the City the ability to save space on a constrained site. For this reason, Alternative 2 is selected.

6.7.2 Cost Estimate

A detailed cost estimate of the selected alternative for the Water Conserv II WRF Filter Replacement is presented in **Table 6-7.** The total anticipated project cost is $14,122,000.

Table 6-7. Water Conserv II WRF Filter Replacement Probable Construction Cost

Item	Description	Construction Cost (2016 $USD)
1	Bonds and Insurance	$ 96,000
2	Mobilization	$ 476,000
3	Demolition	$ 1,030,000
4	Concrete	$ 2,554,000
5	Miscellaneous Metals	$ 136,000
6	Site work and Yard Piping	$ 842,000
7	Deep Bed Filter Equipment	$ 3,150,000
8	Filter Gallery Piping	$ 577,000
9	Filter Covers	$ 608,000
10	Electrical and Instrumentation	$ 617,000
	SUBTOTAL	**$ 10,087,000**
11	Markup (20%)	$ 1,513,000
12	Contingency (25%)	$ 2,522,000
	TOTAL ESTIMATED CONSTRUCTION COST	**$14,122,000.**

Source: "Feasibility Study" prepared by Tetra Tech, Inc., found in **Section 5** of **Volume 2** of this report.

7.0 IMPLEMENTATION PLAN

This section presents the plan for implementing the City's recommended wastewater improvements, including a financial plan, implementation schedule, and public participation.

7.1 SCHEDULE

Table 7-1 provides a schedule for the selected alternatives including design completion, permit completion, construction start and construction complete dates.

Table 7-1. Schedule for Selected Alternatives

Project Name	Bid Documents Complete and Permits Issued	Construction Start	Construction End	Construction Period (mos)
Dean Road Sanitary Sewer Improvements	July 2017	October 2017	August 2018	11
Kirkman Road Sanitary Sewer Improvements	September 2019	September 2020	September 2021	15
Lift Station No. 1/7 Improvements	February 2017	May 2017	August 2018	16
Replacement of Lift Station No. 45	September 2019	September 2020	January 2022	14
Iron Bridge WRF Low Voltage System Improvements	January 2017	May 2017	August 2018	18
Iron Bridge WRF Dewatering Improvements	April 2017	July 2017	August 2018	12
Water Conserv II WRF Filter Replacement	September 2019	September 2020	March 2022	16

Generally, the project schedules fall into two (2) groups with the first group consisting of near term projects with construction completion estimated in later 2018 and a second group of projects ending in late 2021 and early 2022. Despite the variability in scheduling pursuant to CWSRF format requirements, the financial planning at this preliminary level considers all projects commencing concurrently. As the City proceeds through the application process with more detailed bidding documents funding requirements for each project, a more detailed financial plan will be prepared.

7.2 FINANCIAL PLAN

The City of Orlando will be responsible for financing its wastewater program over the next five (5) five years. This program will be funded with a mix of cash-on-hand, rate revenues, bond issues, and other debt instruments, including the CWSRF program. Pledged revenue supporting debt funding will be the operating revenues generated by user rates of the wastewater system. **Table 7-2** presents the current user rates for the City's wastewater system that have been in effect since November 1, 2014. **Appendix A** presents a copy of Section 30.18 of the City code concerning the City's wastewater treatment rates and fees. In the future, additional rate increases are expected to cover the increasing costs of operating and maintaining the wastewater system.

Table 7-2. Wastewater User Rates

Rate	Inside City	Outside City
Residential		
Capacity Charge (per mo.)	$18.73	$23.42
Commodity Charge (per 1,000 gallons)	$4.52 (14,000 gallon cap)	$5.64 (14,000 gallon cap)
Multifamily Unit Flat Rate		
One bedroom or Efficiency (per mo.)	$37.71 per unit	$45.85 per unit
Two or more bedrooms (per mo.)	$47.11 per unit	$57.26 per unit
Commercial		
Capacity Charge (per mo.)	Factor[1] times $18.73	Factor[1] times $23.42
Commodity Charge (per 1,000 gallons)	$4.52	$5.64

[1]Capacity factor determined from the twelve month moving average of water usage divided by 7000.

Table 7-3 provides a summary of the construction costs, including contingencies and technical services atter bid. A total of $61.1 million of total project costs is anticipated to be funded through the CWSRF program.

Table 7-3. Project Cost Estimates

Project Name	Project Cost (2016 $USD)
Dean Road Sanitary Sewer Improvements	$8,277,614
Kirkman Road Sanitary Sewer Improvements	$7,358,479
Lift Station No. 1/7 Improvements	$12,165,493
Replacement of Lift Station No. 45	$3,148,377
Iron Bridge WRF Low Voltage System Improvements	$9,221,506
Iron Bridge WRF Dewatering Improvements	$6,139,956
Water Conserv II WRF Filter Replacement	$14,763,911
TOTAL COST	**$61,075,335**

An aggregate estimate of debt service for the total costs, provided in **Table 7-4**, is estimated at approximately $3.29 million. It is important to note that the actual debt service will be calculated on a project by project basis as the application process moves forward.

Table 7-4. Estimate of Debt Service

Description	Project Cost (2016 $USD)
Capital Cost	$61,075,335
Loan Service Fee (2% of capital cost)	$1,221,507
Subtotal	$62,296,842
Capitalized Interest[1)]	$233,613
Par Amount	$62,530,455
Annual Debt Service[2)]	$3,293,257

[1]Based on an 18 month construction time and a 0.5% interest rate.
[2]Based on a 20 year loan period and a 0.5% interest rate.

It is anticipated that the Iron Bridge WRF Low Voltage Improvements and Lift Station No. 1/7 Improvements will receive funding in fiscal year (FY) 2017, while the remaining projects anticipate receiving funding in future years.

Appendix B presents the required Capital Financing Plan (form WW-02b), which contains a summary of the City's wastewater utility debt service and projected financial performance, including the $3.29 million annual debt service estimated above. The City's wastewater system has a history of meeting all expenses and debt service with sufficient funds to meet debt service requirements. With modest increases to user rates, the City will continue to meet its projected expenses and debt service (including the proposed SRF payments contemplated herein) with the associated debt service requirements.

7.3 ADOPTING RESOLUTION

An advertised public hearing will be held to inform the public about this facilities plan. Citizens will be encouraged to offer comments regarding the proposed programs. A record of this hearing will be kept for public record and review. The minutes from this hearing will be incorporated in this document as **Appendix C**. Also included in **Appendix C** are the public notice and resolutions that were adopted in support of the SRF loan.

APPENDIX A – WASTEWATER TREATMENT RATES AND FEES

Sec. 30.18. - Wastewater Treatment Rates and Fees.

1. *General.* A uniform schedule of rates has been established for the use of the services and facilities of the municipal sanitary sewer system by each dwelling unit, business establishment, church, hospital and every other type of private or public building, structure or activity producing wastewater or wastes. Effective on October 1, 2009, the monthly rates for users of the City's sanitary sewer system are detailed in the remainder of this section.

2. *Rates within City Limits.*

   (a) Living Quarters:

      (i) Single-Family Living Units*

      $3.28 per 1,000 gallons of metered water up to a maximum of $45.92 for 14,000 gallons, plus a capacity charge of $13.62, resulting in a total maximum of $59.54.

      (ii) Multiple-Family Living Units**

         (a) Efficiency and One Bedroom Units

         $27.40 flat rate per unit if certified by property owner. This rate will take effect only after certification by the property owner and there will be no retroactivity credit. Rate is comprised of $3.28 per 1,000 gallons for 4,200 gallons, plus a capacity charge of $13.62.

         (b) Two or More Bedrooms

         $33.30 flat rate per unit. Rate is comprised of $3.28 per 1,000 gallons for 6,000 gallons, plus a capacity charge of $13.62.

      (iii) Multiple-Family Living Units***

      $3.28 per 1,000 gallons of metered water with no cap on usage, plus a capacity charge of $13.62 for each ERC or portion thereof rounded to the nearest 0.1 unit.

   (b) Commercial, Institutional, Churches and Others

   $3.28 per 1,000 gallons of metered water with no cap on usage, plus a capacity charge of $13.62 for each ERC or portion thereof rounded to the nearest 0.1 unit.

   * All classifications if served by an individual water meter, including single-family dwellings, apartments, condominiums, town houses, mobile homes, etc.

   ** All classifications if served by a common water meter including apartments, condominiums, townhouses, mobile homes, etc.

   *** Master meter.

3. *Rates in Unincorporated Areas.* The rate schedule in (2) above shall not preclude the City Council from assessing a higher sewer service charge for users outside the corporate limits of the City, provided that such service charges comply with applicable State laws and regulations.

   (a) Living Quarters:

      (i) Single-Family Living Units*

      $4.10 per 1,000 gallons of metered water with a maximum of $57.40 for 14,000 gallons, plus a capacity charge of $17.02, resulting in a total maximum of $74.42.

      (ii) Multiple-Family Living Units**

         (a) Efficiency or One Bedroom Units

         $34.24 flat rate per unit if certified by property owner. This rate will take effect only after certification by the property owner and there will be no retroactivity credit. Rate is comprised of $4.10 per 1,000 gallons for 4,200 gallons, plus a capacity charge of $17.02.

         (b) Two or More Bedroom Units

         $41.62 flat rate per unit. Rate is comprised of $4.10 per 1,000 gallons for 6,000 gallons, plus a capacity charge of $17.02.

      (c) Multiple-Family Living Units***

      $4.10 per 1,000 gallons of metered water with no cap on usage, plus a capacity charge of $17.02 for each ERC or portion thereof, rounded to the nearest 0.1 unit.

   * All classifications if served by an individual water meter, including single-family dwellings, apartments, condominiums, townhouses, mobile homes, etc.

   ** All classifications if served by a common water meter including apartments, condominiums, townhouses, mobile homes, etc.

   *** Master meter

   (b) Commercial, Institutional, Churches and Others

   $4.10 per 1,000 gallons of metered water with no cap on usage, plus a capacity charge of $17.02 for each ERC or portion thereof, rounded to the nearest 0.1 unit.

4. *Multi-Service Meters.* Where a single water meter serves two (2) or more types of customers as set forth in this section, the sewer service charge shall be the greater of the following:

   (a) The actual consumption figure of water usage multiplied by the highest applicable City or non-City commodity and capacity rates, as set out above, or

   (b) The applicable City or non-City flat rate as set out above.

5. *Pretreatment Program.* The City may adopt reasonable fees for reimbursement of costs to implement and enforce the Pretreatment Program, such reasonable fees may include:

   (a) Fees for Industrial User Discharge Permit applications; including the cost of processing such applications;

   (b) Fees for monitoring, inspection, and surveillance procedures including the cost of sample collection and analysis of a user's discharge, and reviewing self monitoring reports;

   (c) Fees for reviewing and responding to accidental discharge procedures and construction;

   (d) Application fee for new Industrial User Discharge Permits shall be $200.

   (e) Industrial User Discharge Permit Renewal fee shall be $200.

6. *Oil and Grease Management Program.* The current schedule of fees for the Oil and Grease Management Program, which becomes effective upon adoption of this Chapter by the City Council, shall include:

   (a) Monthly administrative of $20.

   (b) Monthly administrative charge may be adjusted following a financial analysis.

   (c) Additional facility inspections for compliance purposes shall be $100 per visit.

   (d) Pump-out of the oil and grease interceptor or oil/water separator shall be at the rate stated in the City's current contract with the appropriate vendor.

(e) Sample collection and laboratory analysis related to enforcement activities shall be at the rates stated in the Schedule of Costs (fees) for the certified commercial laboratory under contract with the City.

7. *Fees for Other Programs.*

(a) The City may adopt other reasonable fees as deemed necessary to carry out the requirements and programs in this Chapter. These fees relate solely to the matters covered by this Chapter and are separate from all other fees, fines, and penalties assessed by the City. These fees are charged to recover the costs incurred by the City to implement and enforce the provisions of this Chapter.

(b) Additional facility inspections for compliance purposes shall be $100 per visit for users subject to the Best Management Practices Plan for Silver Dischargers.

8. *Required Sewer Service Connection.* Except as may be expressly authorized by the City Council, no connection shall be made to the municipal wastewater system from any structure unless such structure is connected to, and served by the water and electric system of the Orlando Utilities Commission or the electric system of Florida Power Corporation.

9. *Charges For Sewer Service.*

(a) There shall be no free service rendered by the municipal sewer system.

(b) Effective November 1, 1968, sewer service shall be considered as rendered to each customer, the property owner or user of developed property who has connected to the sewer system, and the monthly sewer service charge shall be imposed.

10. *Sewer Deposits.* The City through the Orlando Utilities Commission shall collect from all new residential customers a cash deposit to guarantee the payment of sewer bills. Such deposit shall be at least Fifty Dollars ($50.00) for sewer service and shall be handled in accordance with the Administrative Policy of the Orlando Utilities Commission.

11. *Billing.*

(a) *Standard Service.* Bills for standard sewer service shall be rendered monthly. If any such bill for sewer service shall not be paid within thirty (31) days from the date of original billing, the City shall cause water service to such customer to be discontinued. Such water service shall not be reconnected until all past due bills for sewer service are paid, together with all reconnection charges and/or implement administrative actions as set forth under Section 30.11(7)(b).

(b) *Special Service.* Billings for surcharge or reduction credit in accordance with Section 30.15(3)(a)(iv) and Section 30.16(5), respectively, shall be rendered for each billing cycle, typically on a quarterly basis. Delinquent payments for special service billings shall be subject to conditions set forth under subsection (a) above and/or Section 30.11(7)(b).

(c) *Charges For Portion Of Billing Period.* Charges for sewer service rendered for a portion of the regular monthly billing period shall be computed according to the percentages established in billing for electric and water service for portions of a monthly billing period by the Orlando Utilities Commission.

(d) *Reconnection charges.* If sewer service is discontinued for non-payment of sewer service charges or other violation of the provisions of this Chapter, there shall be imposed a reconnection charge in an amount established by the Orlando Utilities Commission in accordance with their current practice and procedures in regard to the establishment of reconnection charges for water and electric service.

12. *Other Miscellaneous Provisions.*

(a) It shall be unlawful for any person to tap, cut or in any way use any building sewer, other public sewer or part of the sanitary sewerage system or utility, without a written permit issued by the Director of Public Works and without the payment of all rates and charges required by the City for the use of such utility.

(b) Billing for sewer services as specified in this Chapter, shall be accomplished in such manner as the City Council shall from time to time arrange and determine.

(c) Billing for surcharges or credit reductions for abnormal strength compatible wastes, as provided by this Chapter, shall be computed and processed by the Director of Public Works, and coordinated through the Chief Financial Officer.

(d) Private wells that contribute discharge to the municipal sewer system shall be metered at the expense of the property owner and such meter shall be made available for reading and billing purposes.

(e) The wastewater monthly user rate shall be automatically increased each year in September by 5.0 percent unless specific action is taken by City Council to prevent said increase from being implemented.

(f) In September 2010, a supplementary rate increase of 5.0 percent shall be added to the automatic increase programmed for that year. In September 2011, a supplementary rate increase of 3.0 percent shall be added to the automatic increase programmed for that year.

13. *Credit for Nonsewer Discharged Water.*

(a) A major institutional, commercial, or industrial user may receive a credit against the standard sewer rates based upon water usage as provided above if the user consumes or uses at least twenty-five percent (25%) of the water or twenty thousand (20,000) gallons per month, whichever is less, in such a manner so that it is not discharged into the City sewer system.

(b) To be eligible for the credit for nonsewer discharged water, the user shall comply with all program requirements, including any applicable discharge standards that the Director of Public Works may apply at the source of the discharge.

The credit shall be based upon a separate meter measuring the water, which is not discharged into the City sewer system. This credit meter shall be an Orlando Utilities Commission approved, radio transmitting/remote reading water meter. In a cooling tower application, the credit meter reading will be offset by the volume of water discharged to the sewer system as blowdown.

(c) The user shall credit meter readings, including the actual meter readings and total gallons used during each monthly period, and shall submit the said tabulation to the City in a format established by the City by the tenth day of the following month. If the meter readings are not submitted as herein prescribed, the Director of Public Works may disallow the credit for nonsewer discharged water.

(d) The user shall maintain the credit meters in good working order. Credit meter readings are subject to regular review and spot checks by the City. If an error in the credit meter reading which was submitted by the user to the City for a credit is discovered, then the credit requested may be disallowed by the Director of Public Works. Repeated errors in credit meter readings may constitute grounds for permanently disallowing credit for nonsewer discharged water.

(e) The User shall not divert water downstream of the credit meter to uses that may result in discharge of water to the sanitary sewer system. If any such diversion occurs without the prior approval of the Public Works Director, the Public Works Director may disallow the credit from the date of the diversion. If the date of the diversion is not known, an estimated date will be used.

(f) The credit for nonsewer discharged water shall be deducted from subsequent sewer service billing and shall be calculated as follows:

$$C = A - B$$

Where,

C = Credit due

A = Charge for sewer service determined on a water bill based upon the entire amount of water used.

B = Charge for sewer service determined on a water bill based upon an amount of water equal to the total amount of water used minus the amount of nonsewer discharged water used.

(g) Participants in the credit meter program shall be prohibited from discharging molybdenum to the sanitary sewer system in an amount greater than 0.3 mg/l. Violations of this standard by the User may constitute grounds for disallowing credit under the then current billing cycle. Continued violations may cause the User to be removed from the credit meter program for a period of twelve months. Continued violations following reinstatement shall be grounds for permanently removing the User from the credit program.

(Ord. of 6-12-2000, § 2, Doc. #33005; Ord. of 5-6-2002, Doc. #020506701; Ord. of 8-23-2004, § 1, Doc. #040823901; Ord. No. 9-21-2009, § 1, Doc. #09092111101)

APPENDIX B – CAPITAL FINANCING PLAN

CAPITAL FINANCING PLAN

WW-02b

City of Orlando
(Project Sponsor)

(Authorized Representative and Title)
400 South Orange Avenue, Orlando, FL 32801
(City, State, and Zip Code)

Kristi Fries P.E.
(Capital Financing Plan Contact, Title and Telephone Number)
400 South Orlando Avenue
(Mailing Address)
Orlando, FL 32801
(City, State, and Zip Code)

The Department needs to know about the financial capabilities of potential State Revolving Fund (SRF) loan applicants. Therefore, a financial capability demonstration (and certification) is required well before the evaluation of the actual loan application.

The sources of revenues being dedicated to repayment of the SRF loan are Utility Operating Revenues

(Note: Projects pledging utility operating revenues should attach a copy of the existing/proposed rate ordinance)

Estimate of Proposed SRF Loan Debt Service

Capital Cost*	$61,075,335
Loan Service Fee (2% of capital cost)	1,221,507
Subtotal	$62,296,842
Capitalized Interest**	$233,613
Total Cost to be Amortized	$62,530,455
Interest Rate***	0.50%
Annual Debt Service	$3,293,257
Annual Debt Service Including Coverage Factor****	$3,787,246

* Capital Cost = Allowance + Construction Cost (including a 10% contingency) + Technical Services after Bid Opening.
** Estimated Capitalized Interest = Subtotal times Interest Rate times construction time in years divided by two.
***20 GO Bond Rate times Affordability Index divided by 200.
**** Coverage Factor is generally 15%. However, it may be higher if other than utility operating revenues are pledged.

Revised: 03/24/16

SCHEDULE OF PRIOR AND PARITY LIENS

List annual debt service beginning two years before the anticipated loan agreement date and continuing at least fifteen fiscal years. Use additional pages as necessary.

IDENTIFY EACH OBLIGATION

#1 Revenue Bonds, Series 2013 **Coverage % 1.25** **Insured (Yes/No) No**	**#2 SRF Loan #65001S** **Coverage % 1.15** **Insured (Yes/No) No**	**#3 SRF Loan #65002P** **Coverage % 1.15** **Insured (Yes/No) No**
#4 SRF Loan #65003P **Coverage % 1.15** **Insured (Yes/No) No**	**#5 SRF Loan 650040** **Coverage % 1.15** **Insured (Yes/No) No**	**#6 SRF Loan 650060** **Coverage % 1.15** **Insured (Yes/No) No**

Fiscal Year	Annual Debt Service (Principal + Interest)						Total Non-SRF Debt Service w/coverage	Total SRF Debt Service w/coverage
	#1	#2	#3	#4	#5	#6		
2014	1,641,600	1,871,319	102,287	87,522	1,988,144	1,106,141		
2015	2,871,500	1,871,319	102,287	75,644	1,449,988	1,106,141		
2016	2,863,775	1,871,319	102,287	75,644	911,832	1,106,141		
2017	2,875,600	1,871,319	102,287	75,644	911,832	1,106,141		
2018	2,871,750	1,871,319	102,287	75,644	911,832	1,106,141		
2019	2,861,700	1,871,319	102,287	75,644	911,832	1,106,141		
2020	2,861,325	1,871,319	102,287	75,644	911,832	1,106,141		
2021	2,865,300	1,871,319	102,287	75,644	911,832	1,106,141		
2022	2,855,775	1,871,319	102,287	75,644	911,832	1,106,141		
2023	2,854,400	1,871,319	102,287	75,644	911,832	1,106,141		
2024	2,848,775	1,871,319	102,287	75,644	911,832	1,106,141		
2025	2,877,900	1,871,319	102,287	75,644	911,832	1,106,141		
2026	2,848,650	1,871,319	102,287	75,644	911,832	1,106,141		
2027	2,846,650	935,660	102,287	75,644	911,832	1,106,141		
2028	2,844,525		102,287	75,644	911,832	1,106,141		
2029	2,842,025			75,644	911,832			
2030	2,838,900			75,644	911,832			
2031	2,853,950			75,644	911,832			
2032	2,833,750			37,822				
2033								
2034								
2035								
2036								
2037								
2038								
2039								
2040								

Revised: 03/24/16

SCHEDULE OF PRIOR AND PARITY LIENS

List annual debt service beginning two years before the anticipated loan agreement date and continuing at least fifteen fiscal years. Use additional pages as necessary.

IDENTIFY EACH OBLIGATION

#7 SRF Loan #480400 **Coverage % 1.15** **Insured (Yes/No) No**	**#8 SRF Loan #480410** **Coverage % 1.15** **Insured (Yes/No) No**	**#9 SRF Loan #480420** **Coverage % 1.15** **Insured (Yes/No) No**
#10 SRF Loan #480430 **Coverage % 1.15** **Insured (Yes/No) No**	**#11 SRF Loan #650041** **Coverage % 1.15** **Insured (Yes/No) No**	**#12** **Coverage %** **Insured (Yes/No)**

Fiscal Year	Annual Debt Service (Principal + Interest)						Total Non-SRF Debt Service w/coverage	Total SRF Debt Service w/coverage
	#7	#8	#9	#10	#11	#12		
2014	797,612	0	0	0	0		1,641,600	5,953,026
2015	785,462	199,619	79,846	87,502	0		2,871,500	5,757,809
2016	773,311	284,028	169,123	175,004	0		2,863,775	5,468,690
2017	773,311	284,028	178,554	175,004	0		2,875,600	5,478,121
2018	773,311	284,028	178,554	175,004	425,576		2,871,750	5,903,697
2019	773,311	284,028	178,554	175,004	851,152		2,861,700	6,329,273
2020	773,311	284,028	178,554	175,004	851,152		2,861,325	6,329,273
2021	773,311	284,028	178,554	175,004	851,152		2,865,300	6,329,273
2022	773,311	284,028	178,554	175,004	851,152		2,855,775	6,329,273
2023	773,311	284,028	178,554	175,004	851,152		2,854,400	6,329,273
2024	773,311	284,028	178,554	175,004	851,152		2,848,775	6,329,273
2025	773,311	284,028	178,554	175,004	851,152		2,877,900	6,329,273
2026	773,311	284,028	178,554	175,004	851,152		2,848,650	6,329,273
2027	773,311	284,028	178,554	175,004	851,152		2,846,650	5,393,613
2028	773,311	284,028	178,554	175,004	851,152		2,844,525	4,457,953
2029	773,311	284,028	178,554	175,004	851,152		2,842,025	3,249,525
2030	773,311	284,028	178,554	175,004	851,152		2,838,900	3,249,525
2031	773,311	284,028	178,554	175,004	851,152		2,853,950	3,249,525
2032	773,311	284,028	178,554	175,004	851,152		2,833,750	2,299,871
2033	773,311	284,028	178,554	175,004	851,152			2,262,049
2034		284,028	178,554	175,004	851,152			1,488,738
2035		284,028	178,554	87,502	851,152			1,259,222
2036			89,277		851,152			940,429
2037					851,152			851,152
2038					425,576			425,576
2039								
2040								

SCHEDULE OF ACTUAL REVENUES AND DEBT COVERAGE FOR PLEDGED REVENUE

(Provide information for the two fiscal years preceding the anticipated date of the SRF loan agreement)

		FY2014	FY2015
(a)	Operating Revenues (Identify)		
	User Charges	$83,181,317	$89,875,758
(b)	Interest Income		
(c)	Other Incomes or Revenues (Identify)		
	Fees	$44,400	$14,679
	Other Income	1,264,885	70,758
(d)	Total Revenues	**$84,490,602**	**$89,961,195**
(e)	Operating Expenses (excluding interest on debt, depreciation, and other non-cash items)	$52,931,605	$52,179,977
(f)	**Net Revenues (f = d – e)**	**$31,558,997**	**$37,781,218**
(g)	Debt Service (including coverage) Excluding SRF Loans	$2,052,000	$3,589,375
(h)	Debt Service (including coverage) for Outstanding SRF Loans	$6,845,980	$6,621,480
(i)	**Net Revenues After Debt Service (i = f – g – h)**	**$22,661,017**	**$27,570,363**

Source: Revenues and operating expenses taken from the 2014 and 2015 CAFR; Debt Service figures taken from debt service schedules

Notes: Line (g) includes debt service and a 25% coverage factor
Line (h) includes all SRF debt service and a 15% coverage factor

SCHEDULE OF PROJECTED REVENUES AND DEBT COVERAGE
FOR PLEDGED REVENUE
(Begin with the fiscal year preceding first anticipated semiannual loan payment)

		FY 2018	FY 2019	FY 2020	FY 2021	FY 2022
(a)	Operating Revenues (Identify)					
	User Rates	$93,760,278	$96,055,512	$98,398,679	$100,448,670	$102,541,369
(b)	Interest Income	630,234	683,815	735,109	735,109	735,109
(c)	Other Incomes or Revenues (Identify)					
	Other Revenues	170,309	170,309	170,309	170,309	170,309
(d)	Total Revenues	**$94,560,821**	**$96,909,636**	**$99,304,097**	**$101,354,088**	**$103,446,787**
(e)	Operating Expenses	$53,209,962	$54,985,666	$56,820,200	$58,874,538	$61,003,151
(f)	**Net Revenues (f = d - e)**	**$41,350,859**	**$41,923,970**	**$42,483,897**	**$42,479,549**	**$42,443,636**
(g)	Existing Debt Service on Non-SRF Projects (including coverage)	$3,625,063	$3,623,063	$3,622,125	$3,581,625	$3,569,719
(h)	Existing SRF Loan Debt Service (including coverage)	7,074,741	7,278,663	7,278,663	7,278,664	7,278,664
(i)	**Total Existing Debt Service (i = g + h)**	**$10,697,804**	**$10,903,600**	**$10,900,788**	**$10,900,788**	**$10,900,788**
(j)	Projected Debt Service on Non-SRF Future Projects (including coverage)	$3,503,998	$6,370,748	$6,370,748	$6,370,748	$6,370,748
(k)	Projected SRF Loan Debt Service (including coverage)	0	3,787,246	3,787,246	3,787,246	3,787,246
(l)	**Total Debt Service (Existing and Projected) (l = i + j + k)**	**$3,503,998**	**$10,157,993**	**$10,157,993**	**$10,157,993**	**$10,157,993**
(m)	**Net Revenues After Debt Service (m = f – l)**	**$27,149,058**	**$20,862,376**	**$21,425,116**	**$21,461,268**	**$21,437,260**

Source: Lines (a) through (j) for FY 2018 to 2020 based on data provided by the City's rate consultant, PRMG; Data for FY 2021 and FY 2022 projected at an annual rate of 2.08% for revenues and 3.62% for operating expenses.

Notes:
1. Operating Expenses include expenses for existing and proposed facilities, excluding interest on debt, depreciation, and other non-cash items.
2. Projected and existing non-SRF debt service includes a 1.25 coverage factor.
3. Projected and existing SRF debt service includes a 1.15 coverage factor.
4. User rates include annual rates increases of 1.50% in 2018, 2019, 2020.

CERTIFICATION

I, _____ (Chief Financial Officer (please print)), certify that I have reviewed the information included in the preceding capital financing plan worksheets, and to the best of my knowledge, this information accurately reflects the financial capability of the City of Orlando (Project Sponsor).

I further certify that City of Orlando (Project Sponsor) has the financial capability to ensure adequate construction, operation, and maintenance of the system, including this SRF project.

_____ Signature

_____ Date

APPENDIX C - PUBLIC PARTICIPATION HEARING MINUTES AND ADOPTED RESOLUTIONS

To be provided at a later date.

TETRA TECH

Tetra Tech
201 E. Pine Street, Suite 1000
Orlando, FL 32801

tetratech.com