CITY OF HOLLY HILL

STORMWATER MASTER PLAN UPDATE

VOLUME 1

PREPARED BY:
QUENTIN L. HAMPTON ASSOCIATES, INC.
-CONSULTING ENGINEERS-

FEBRUARY 2015

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STORMWATER MASTER PLAN UPDATE

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1.0 INTRODUCTION

This Stormwater Master Plan update has been prepared at the request of the City of Holly Hill's Public Works office in order to identify and prioritize drainage infrastructure improvements. Many of the drainage improvements have been identified in previous studies. The Public Works office requested the plan be updated by examining those previously identified problems and any that have developed since.

1.1 Purpose

The purpose of the Stormwater Master Plan Update is to identify and amend the City's existing master plan, prepared by Quentin L. Hampton Associates 2001, evaluate existing drainage infrastructure, evaluate existing known drainage problems and assess their impacts, assign priorities to projects that improve conditions, and recommend funding mechanism to implement projects.

1.2 Scope and Objectives

Quentin L. Hampton Associates, Inc. (Consultant) prepared this Stormwater Update in a format acceptable to the Bureau of Facility Funding of the Florida Department of Environmental Protection (FDEP). The consultant will assist the City in the acquisition of a stormwater planning loan from the State Revolving Loan Fund. The low interest loan can be used to fund the planning, design, and property acquisition for stormwater projects within the service area.

The Stormwater Master Plan includes the following elements: data collection, limited mapping of the existing systems using County base maps and City supplied stormwater information, sub-basin delineation, identification of existing problems, City staff interviews, and a review of existing reports. The plan identifies areas requiring improvement and

recommends up to three (3) alternatives for addressing each problem. Cost estimates are included for each.

The following is the scope of work agreed to:

1. Prepare a Request for Inclusion on the priority list for stormwater projects. The Revolving Fund Loan Program can include a planning allowance to fund this Master Plan, design fees, property acquisition funds and the construction of improvements.

2. Identify existing flooding areas, system integrity problems, and review available water quality data.

3. Establish "levels of service" (LOS) for water quality and flood protection based on measurable criteria generally acceptable to regulatory agencies.

4. The existing hydraulic model of the drainage systems will be reviewed and updated using a recently updated version of "adICPR" computer modeling program. Deliverables shall include model simulation of three (3) design storm events (mean-annual 25-year/24 hour and 100-year/24 hour), summary of model output and summary of flooding problem identification and prioritization based on LOS ranking.

5. An element will include a review of current regulations and recommendations for modifications. Recommendations shall include mechanisms to reduce major non-point source pollutants and shall be consistent with stormwater NPDES Phase I requirements, and other related jurisdictional laws. A maintenance program review will be performed and recommendations will be made for future maintenance needs.

6. Preliminary designs and planning level cost estimates will be prepared for project areas identified as not meeting LOS levels. Recommended implementation schedules will be included which may be used to assist the creation of a Capital Improvement Program.

2.0 STUDY AREA

2.1 General Description

The City of Holly Hill is located on the west bank of the Halifax River in Volusia County. It has a municipal boundary encompassing approximately 4 square miles. For the purposes of this study, the City limits will be boundary of the study area which is illustrated in **Figure 2.3**.

2.2 History

In June 1875, the administrators of the Chaires estate sold the Fitch grant to William S. and Mary Fleming, residents of New Castle County, Delaware. After the Flemings completed the transaction for $10,000, they soon left their home in Christiana Hundred, Delaware to build a new home in Port Orange. They also constructed a simple wood frame dwelling on their newly acquired property in the Fitch grant, which they named Holly Hill. One tradition contends that the Flemings appropriated the name Holly Hill from their ancestral home in Ireland, while another points to the holly trees then growing along the ridge in their adopted Florida homeplace. During this era, the Flemings acquired several tracts in east Volusia County. In addition to Holly Hill, their Fitch grant property soon became popularly if unofficially known as the Fleming-Fitch tract. Aware of the potential for more land sales and a need to divide their holdings into smaller, more manageable lots, the Flemings subdivided the Fitch grant in November 1875, filing the resulting plat with Volusia County's Clerk of Court in April 1877.

William Wallace Ross arrived here sometime in the 1860's and established a homesite at a point, which he called "Palmetto Point". There he established the first area post office at his home which was called the Palmetto Post Office. Records of the Post Office Department in

the National Archives confirm a Post Office was established at Palmetto Point on July 21, 1868, with Samuel P. Wimple appointed postmaster. It was discontinued on July 12, 1870. This date is corroborated with other information that is known of them.

The landowner, William Samuel Flemming Sr. in the summer of 1876 went to Philadelphia with the express purpose of influencing settlers to come to Florida. He got the promise of fifteen families. Among the families were the Wetherell's and the Simcoe's. William Wetherell first came to America in 1866 to work in Philadelphia, Pennsylvania, on the preparations for the big Centennial celebration. He had left his bride behind in northern England, while he grabbed the opportunity to earn more in this country. He received a job working on the Continental Building.

Holly Hill at that time had no name and in discussion among the settlers Mrs. Monroe would like to have had it named New Port News, after her old home. This was a popular way of naming towns at this time. In the discussions among the settlers however they decided that as Mr. Flemming owned nearly all the land and was the colony founder he should have the naming privilege despite the fact that he still lived in Port Orange. Mr. Flemming decided to name the colony Holly Hill in memory of his Irish Hollywood home because there were lots of holly in the area and there was a bit of a rise in the terrain. One can easily see the similarity between the two areas in old photos.

Mr. Flemming began building a simple frame dwelling on a portion of his riverfront property. The land was cleared just south of the Holly Hill Canal right on the river shore. Unfortunately he died in 1878 before construction was completed. Holly Hill was incorporated in 1901.

(1) Information obtained from City of Holly Hill web site www.hollyhillfl.org

2.3 Weather

The climate of the Holly Hill service area is subtropical. According to the U.S. Weather Bureau, the mean annual temperature is 70°F, and the normal average rainfall is approximately 52 inches. Generally, precipitation is greatest between June and mid-October and accounts for approximately 60 percent of the year's precipitation. Periods of cloudiness or rainfall lasting over two or three days occur infrequently. These periods are usually caused by a stationary front, such as "northeasters" or tropical storms.

The Holly Hill service area is within the "hurricane belt", but chances of having hurricane force winds in any given year are about 1 in 30. Generally, hurricanes pass well offshore or lose most of their force crossing the State before they reach the study area. Hurricane force winds are rarely experienced in the area. Climate has a significant effect upon infiltration and inflow. The Holly Hill treatment plant flow peaks correspond with the high rainfall months. The following are monthly temperatures and rainfall averages with National Weather Service as source of the data used.

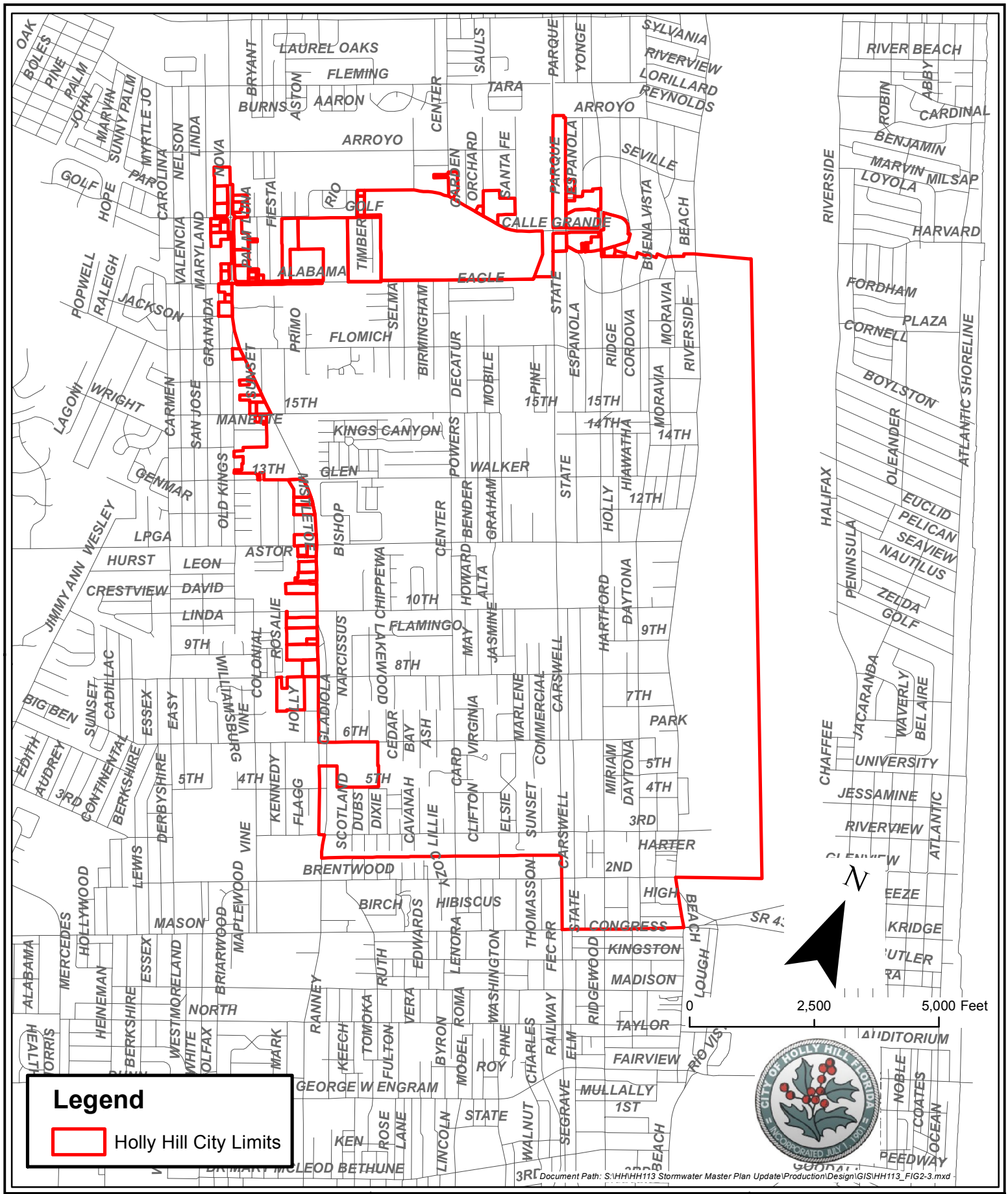
	Temperatures			
Month	High	Mean	Low	Average Monthly Rainfall
Jan.	85	60	26	1.3
Feb.	86	60	27	2.0
Mar.	90	65	36	2.1
Apr.	91	69	39	1.7
May	97	75	54	6.6
June	97	79	61	5.9
July	95	81	68	6.4
Aug.	97	82	69	5.3
Sept.	93	80	62	5.7
Oct.	93	75	44	5.1
Nov.	86	65	39	1.5
Dec.	84	63	36	2.2

2.4 Population

Occupancy categories set forth in TAZ data and subsequently used in this plan relate to dwelling types and variable population centers. Single family and multi-family populations are presumed to be permanent residents; employment centers and universities are not. This is significant in that permanent residents have significantly higher annual water demand and wastewater generation rates. Population categories used for this report are as follows:

- Single Family Dwellings, (resident)
- Multi-Family Dwellings, (resident)
- Transient Dwelling
- Industrial Employment
- Commercial Employment
- Service Employment
- School Enrollment

A map illustrating each of the TAZ zones is included as ***Figure 2.3.*** Population information for each category and zone are tabulated and included below as ***Table 2.3***, "Holly Hill Traffic Analysis Zone Population Data" and graphed in ***Figure 2.4***.



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 2.3

HOLLY HILL CITY LIMITS

FIGURE 2.4
CITY OF HOLLY HILL
GRAPH OF POPULATION PROJECTIONS PER TAZ DATA

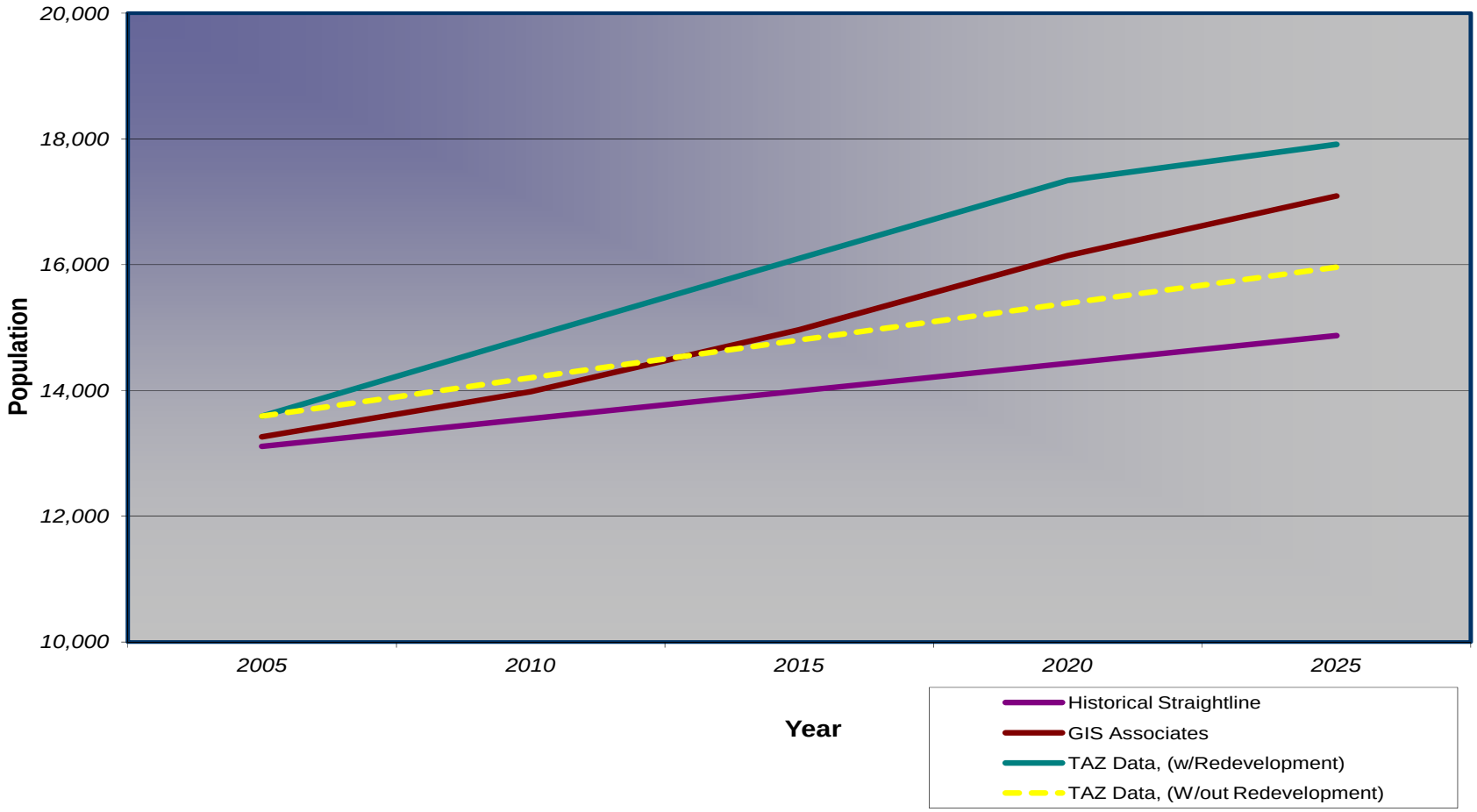

Table 2.3
Holly Hill TAZ Population Data

TAZ	Population 2000	Population 2005	Population 2010	Population 2015	Population 2020
78	1,326	1,36	1,410	1,450	1,489
79	550	58	618	651	68
80	644	66	694	717	74
81	1,829	2,00	2,174	2,343	2,511
82	100	10	100	100	10
83	100	10	100	100	10
90	100	10	100	100	10
92	703	74	795	840	88
93	405	40	406	406	40
94	1,092	1,12	1,159	1,191	1,222
95	706	75	807	856	90
96	183	18	841	1,495	2,150
97	424	44	459	475	49
99	136	14	144	148	15
100	246	25	262	270	27
101	153	15	149	147	14
102	91	9	91	92	92
103	23	2	25	27	29
104	786	82	866	905	94
105	1,123	1,17	1,224	1,272	1,320
106	404	43	457	483	50
107	418	43	454	472	48
108	617	61	615	614	61
109	550	58	620	655	68
110	131	12	143	150	15
Total Population	**12,970**	**13,590**	**14,853**	**16,102**	**17,339**

2.5 Stormwater Utility Ordinance

The Holly Hill Stormwater Management Utility is responsible for the maintenance of existing components, in addition to planning and implementation of infrastructure improvements. The utility was created as an enterprise fund by City Council ordinance 2141 on December 8, 1986.

The utility was established to provide a stable source of revenue to address drainage related needs within the City. The primary programs that fall under the responsibility of the utility include:

1) Administration
2) Operation of system improvements
3) Maintenance of improvements
4) Infrastructure to improve stormwater quality
5) Regulation of the design for new developments within the City

The Ordinance imposed user fees on every developed lot and parcel within the City. The user fee is uniform for residential properties (the base rate) and is individually calculated for commercial and industrial properties based upon the impervious surfaces (in equivalent base rate quantities) constructed on their property.

2.5.1 Residential

In 2014, the City Commission, by resolution established an equivalent residential unit (ERU) rate for stormwater management of $6.00 for each single-family residential dwelling unit. Each single-family residential dwelling unit shall be billed a flat fee of $72.00 annually as established by the City Commission.

2.5.2 Multi-Family Residential and Non-Residential

For nonresidential properties, and multi-family residential properties including hotels and motels, a single-family equivalent unit shall be determined periodically and shall be included in the rate resolution. The single-family equivalent is the average impervious area for single-family dwellings in the City. All nonresidential properties, i.e., enterprises, business establishments, government establishments, buildings, or other residential and nonresidential occupancies not covered by subsection (1) of this section shall be billed based on the total impervious area of the property divided by the single-family equivalent and then multiplied by the rate established for a single-family residential unit. The total impervious area of the property and the number of single-family equivalent units shall be updated by the Public Works Department based on any additions to the impervious area as approved through the permit process. For non-residential and multi-family properties the equivalent residential unit (ERU) has been established at 2,050 square feet. Therefore, for every 2,050 square feet of area, non-residential and multi-family are charged $6/month or $72.00 annually.

3.0 PHYSICAL CHARACTERISTICS

3.1 Existing Land Use

The breakdown of the existing land uses is shown in ***Table 3.1.*** This data was extracted from the City of Holly Hill Comprehensive Plan, (9/2010). The current Holly Hill Zoning Map is included as ***Figure 3.1.***

Table 3.1
Existing Land Use Acreages
City Of Holly Hill

Land Use	Acreage	% Of Total
Single Family Residential	944.9	31.5%
Mobile Home	59.1	2.0%
Multi-Family	227.1	7.6%
General Commercial	222.6	7.4%
Heavy Commercial and Industrial	186.3	6.2%
Institutional/Governmental	158.8	5.3%
Recreation and Public Open Space	149.4	5.0%
Utilities	5.2	0.2%
Right-of-Way, Streets, Ditches, Etc.	476.5	15.9%
Vacant	205.3	6.8%
Open Water (Halifax River)	367	12.2%
Total	**3002.2**	**100%**

Source: City of Holly Hill, FL – Adopted 2010 Comprehensive Plan

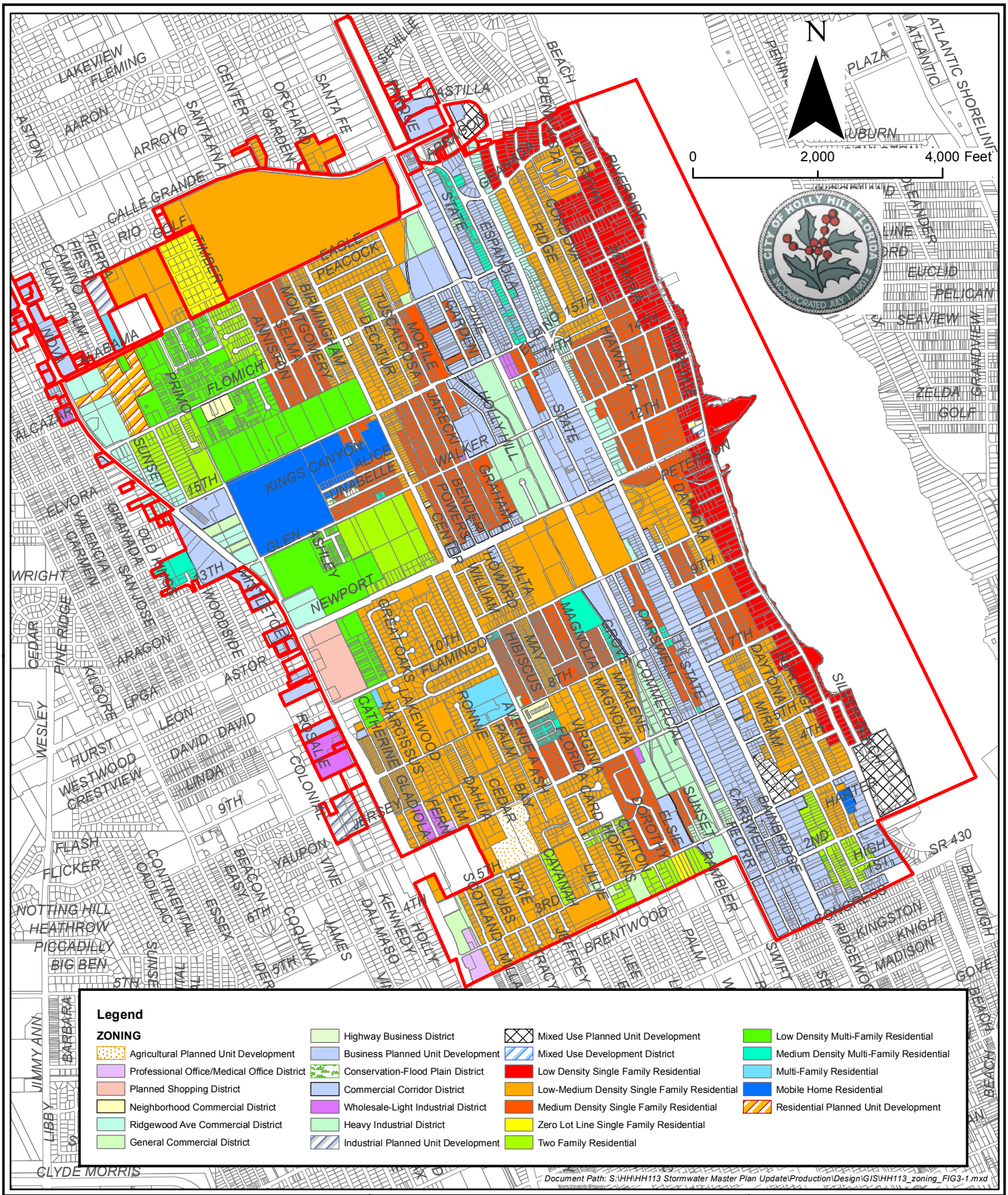

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FIGURE 3.1

ZONING MAP

3.2 Topography

Figure 3.2 details the location of the City of Holly Hill with respect to topographic features. The majority of the service area is located on the Silver Bluff Terrace. Surface topography on the Silver Bluff Terrace is relatively flat with an average elevation of approximately 10 feet above mean sea level (msl). Topographic elevations along the Atlantic Coastal Ridge are approximately fifteen to twenty feet higher. This Ridge roughly parallels Nova Road and represents the west boundary of the service area.

3.3 Geology

Regional geologic data collected by various sources indicates that the wastewater plant is underlain by unconsolidated Pleistocene and Holocene deposits consisting of fine to medium quartz sands, clayey sand and localized shell beds. Surficial deposits are underlain by sediments of Pliocene to late Miocene age consisting of sand, shells and calcareous clay.

Underlying these unconsolidated deposits is the Ocala limestone formation which is composed of cream to white fossiliferous limestone. It's thickness is generally less than 100 feet. Beneath the Ocala limestone is the Avon Park limestone of late-middle Eocene Age. It consists of layers of dark brown dolomite separated by layers of chalky limestone. The formation thickness is estimated at approximately 300 feet (Wyrick, 1960). Production wells at the City's wellfield are open holes from 120 feet to 300 feet below grade, all are withdrawing from the Ocala and Avon Park limestone.

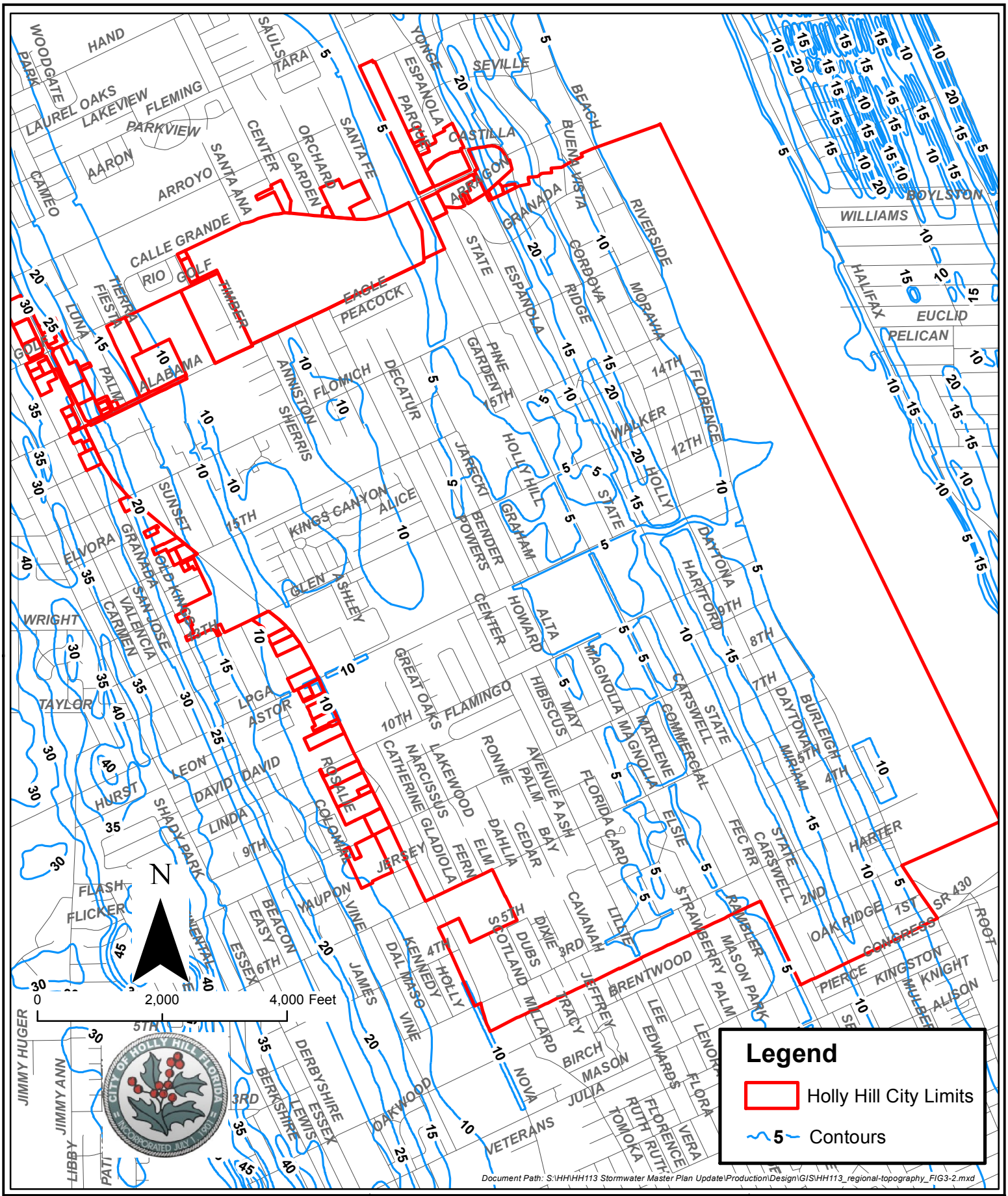

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FIGURE 3.2

REGIONAL TOPOGRAPHY

Soil borings taken during the Holly Hill wellfield development program detail the composition of the shallow aquifer. There is a clay layer at a depth of approximately 60 feet. It is the primary confining layer which establishes the top of the artesian aquifer.

The water supply for the Holly Hill system is the Volusia-Floridan aquifer.

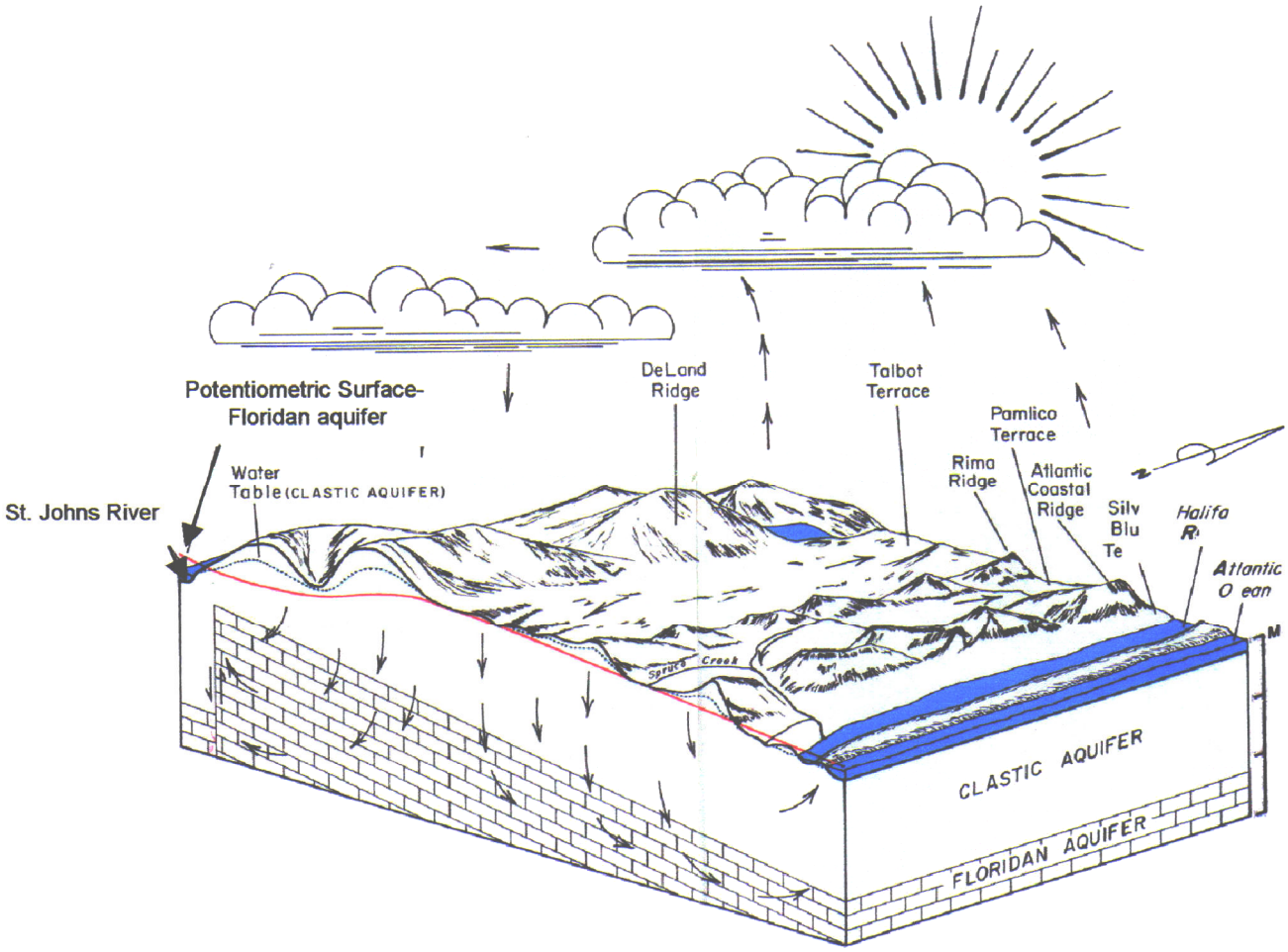
3.4 Aquifer Identification and Source Protection

The original source of potable water in the deep aquifer is recharge that occurred within the confines of Volusia County. The sole source aquifer designation concluded the following: "The recharge zones for the Volusia Floridan aquifer consists of the sandy terraces and ridges of Volusia County and are entirely dependent upon local rainfall". Annual average rainfall in Volusia County is about 54 inches.

Evapotranspiration losses average 35 inches per year. The remainder is available for surface water enhancement and groundwater recharge. U.S. Geological Survey reports identified the Penholoway Terrace, Talbot Terrace and Rima Ridge as productive recharge areas. ***Figure 3.3*** depicts the movement of water in a cross section through Volusia County.

An important objective of groundwater resource management is the retention of the productivity of these zones. Development in prime recharge areas must avoid contamination of the surficial aquifer. Volusia County is reviewing alternatives that will limit residential construction in the Talbot Terrace.

Since the majority of the recharge area falls within the control of the Volusia County Council, that agency must take the steps required to protect the resource. The first step was the adoption of Volusia County Ordinance 90-33 which addressed wellhead protection.



From RI 57, Knochenmus and Beard

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FIGURE 3.3

BLOCK DIAGRAM SHOWING MOVEMENT OF WATER

The City of Holly Hill should support the County's efforts in this area; specifically, in the regulation of agriculture, septic tanks and chemical storage. Agricultural activities have been identified as potential pollution sources. Over fertilization in exceptionally permeable soils can allow nutrients to enter the surficial aquifer and eventually the Floridan. The Soil Conservation Service should be utilized for assistance in the development of best management practice for fertilization and pesticide use.

The County has recently passed legislation designed to reduce septic tank density. When land use density exceeds one unit per acre, sanitary sewer collection system installation is required. The County anticipates the construction of central sewage collection and treatment when population density can support the construction cost in some of the existing septic tank areas.

The underground storage of chemicals and fuels has been identified as a potential threat to groundwater quality. Throughout Florida leaking tanks have been identified and groundwater decontamination has been mandated. The installation of anti-corrosion systems and leak detection programs is essential. The cost to clean up contaminated groundwater far exceeds the retrofit required to prevent and monitor leaks.

3.5 Terrestrial and Aquatic Plant and Animal Communities

Very few coastal vegetative resources remain in the City. The remaining mangroves, seagrass beds, and estuarine marshes located within the City's boundaries are stressed.

Each of these vegetative communities performs important natural functions. Mangroves and estuarine marshes improve water quality, control erosion, and provide protection from storms by trapping sediments and debris, removing excess nitrogen and phosphorous nutrients, stabilizing shorelines, and buffeting winds. Seagrass beds trap and bind sediments improving water quality and stabilizing the shoreline.

Mangroves provide a habitat for many types of fish, crustaceans, and birds. Several species of the birds which frequent mangroves in Volusia County are threatened or endangered such as the Snowy Egret, the Brown Pelican, the Roseate Spoonbill and the Least Tern.

Estuarine marshes serve as habitat for many types of birds and a nursery habitat for many fish. Threatened or endangered fowl include the Snowy Egret and the Least Tern. The seagrass beds provide food and protection for many kinds of juvenile fish.

The pinewoods vegetative community is dominated by the slash pine and includes pine flatwoods. These trees form the highest layer of vegetation above the ground and the floor is usually covered by palmetto bushes. Threatened or endangered wildlife found in the pine flatwoods are the Gopher Frog, the Gopher Tortoise and the Indigo Snake. In addition, nesting Bald Eagles and Osprey are found in these communities.

Freshwater marsh occur in seasonally-flooded depressions and along streams, creeks, lakes and drainage ways. The dominant plant growth is emergent water plants and water tolerant grasses and sedges. Few trees inhabit marsh areas except for low growing, water tolerant species such as the coastal plains willow. Marshes are well suited for wading birds and aquatic wildlife. Threatened or endangered species found in freshwater marshes are the Florida Sandhill Crane, the Snowy Egret, and the Silver Rice Bat. Occasionally, Bald Eagles inhabit freshwater marshes.

The deciduous communities are characterized by pure or mixed strands of mature hardwood dominant trees. Historically, the upland forest or hardwood hammocks occupy the ridges. Today, small stands (less than 100 acres) are scattered throughout the County. The City contains only a few of these stands. Vegetation consists of live oak, laurel oak, hickory trees and, if conditions are suitable, red cedar, cabbage palm, magnolia, and red bay. Threatened or endangered wildlife associated with these communities are the Indigo Snake and the Gopher Tortoise, the Osprey nests in these areas.

Improved pasture sites are 75 to 95 percent open grasslands with a few scattered trees. Few native wildlife species inhabit these areas because of the lack of available food. Common garden varieties of birds, such as the house sparrow and starling make up the majority of wildlife in these areas.

The sites proposed for stormwater retention will be fully evaluated for environmental impact by a qualified biologist. Improvements will have no detrimental impact upon flora and fauna or threatened and endangered species. To the contrary, the retention areas will have a positive effect due to the reduction in pollutants discharged to the Halifax River.

3.6 Endangered Species

There are several mammals, birds, amphibians, and reptiles listed as endangered, threatened, or species of special concern that nest, breed, feed or winter in Volusia County. The following is a list of the more commonly know species:

<u>Birds</u>

American Oystercatcher	Limpkin
Red-cockaded Woodpecker	Snowy Egret
Brown Pelican	Southeastern Kestrel
Florida Sandhill Crane	Southeastern Kestrel
Least Tern	Tri-colored Heron
Little Blue Heron	Wood Stork

Mammals

West Indian Manatee
Florida Mouse
Florida Panther
Shermans Fox Squirrel
West Indian Manatee

Amphibians

Gopher Frog

Reptiles

American Alligator
Indigo Snake
Florida Pine Snake
Gopher Tortoise
Atlantic Salt Marsh Water Snake

The proposed projects identified in the Facility Plan will have no impact upon the endangered or threatened species in the Volusia County North East service area.

3.7 Wetlands and Floodplains

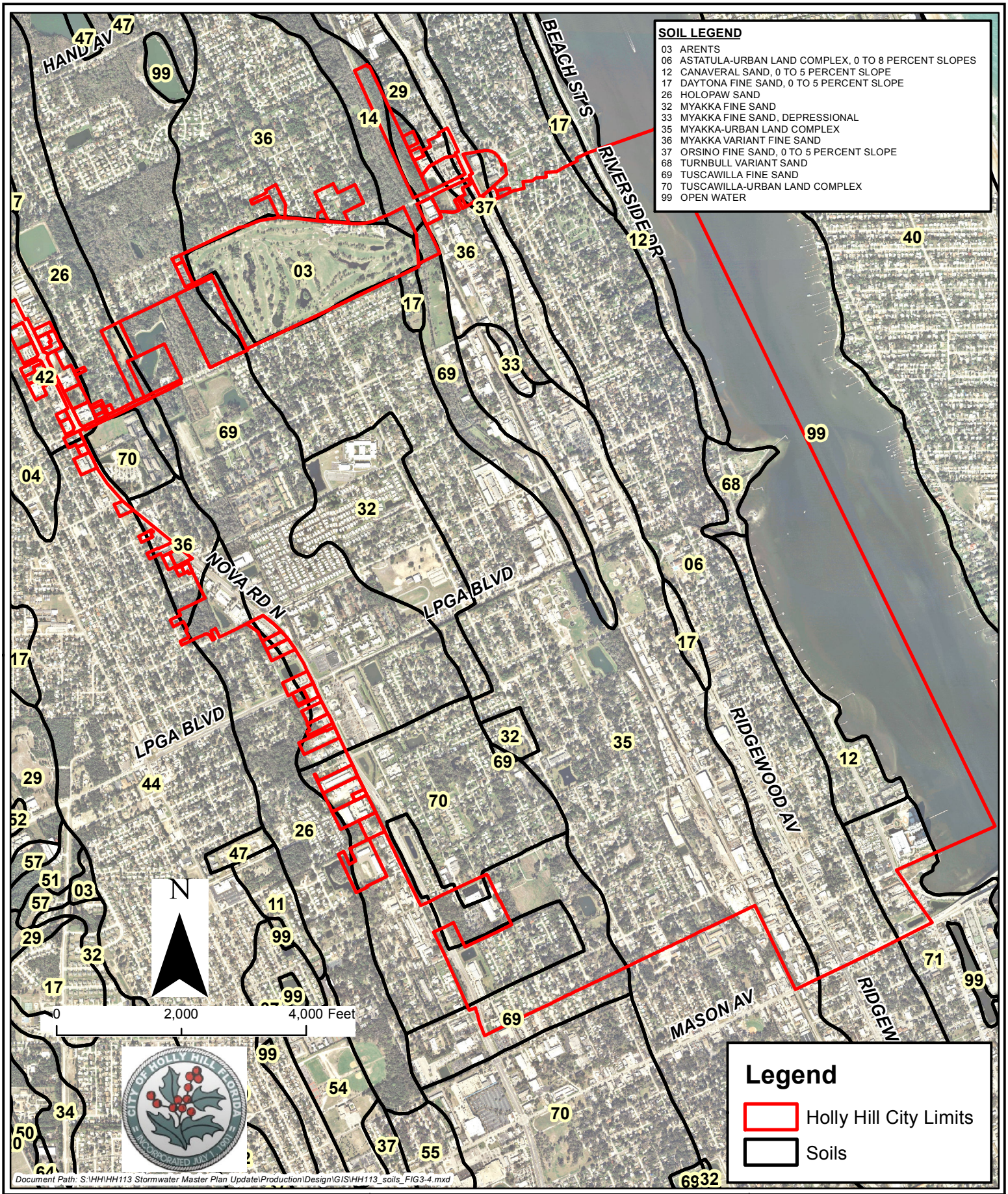
The City of Holly Hill contains several areas that are deemed wetlands. These particular areas are located mainly along the Northeast Canal and can be further located utilizing the soils map shown in ***Figure 3.4*** and ***Table 3.2***. The Type 'D' soils indicate an area of high groundwater table and low permeability soils. There are several pockets of wetlands throughout the City which can be identified through detailed investigations by a qualified biologist but is beyond the scope of this study.

The 100-year floodplain is identified in ***Figure 3.5***. As shown, the floodplain elevation 5.0 feet in vertical datum NAVD, covers a significant area of the City limits extending north and south along the Northeast and Southeast canals, north along the Northwest canal, and areas west of Center Street and south of LPGA Boulevard. The floodplain boundaries were updated recently with the Nova Canal Watershed Study and modeling by CDM, 2010.

Table 3.2
City Of Holly Hill, Florida
Soil Potential for Community Development

MAP KEY	SOIL TYPE	DEVELOPMENT POTENTIAL	DESIGNATION
3	Arents	Not Rated	--
6	Astatula-Urban Land Complex	High	A
12	Canaveral Sand (0-5%)	Medium	C
14	Chobee Fine Sandy Loam	Very Low	B/D
17	Daytona Sand (0-5%)	High	B
26	Holopaw Sand	Low	B/D
32	Myakka Fine Sand	Low-Medium	A/D
33	Myakka Fine Sand Depressional	Very Low	A/D
35	Myakka-Urban Land Complex	Not Rated	A/D
36	Myakka Variant Fine Sand	Low	D
37	Orsino Find Sand (0-5%)	Medium	A
68	Turnbull Variant Sand	Low	C
69	Tuscawilla Fine Sand	Medium	D
70	Tuscawilla-Urban Land Complex	Not Rated	D
71	Urban Land	Not Rated	--

Source: Soil Survey of Volusia County, Florida, U.S. Soil Conservation Service, February 1980.



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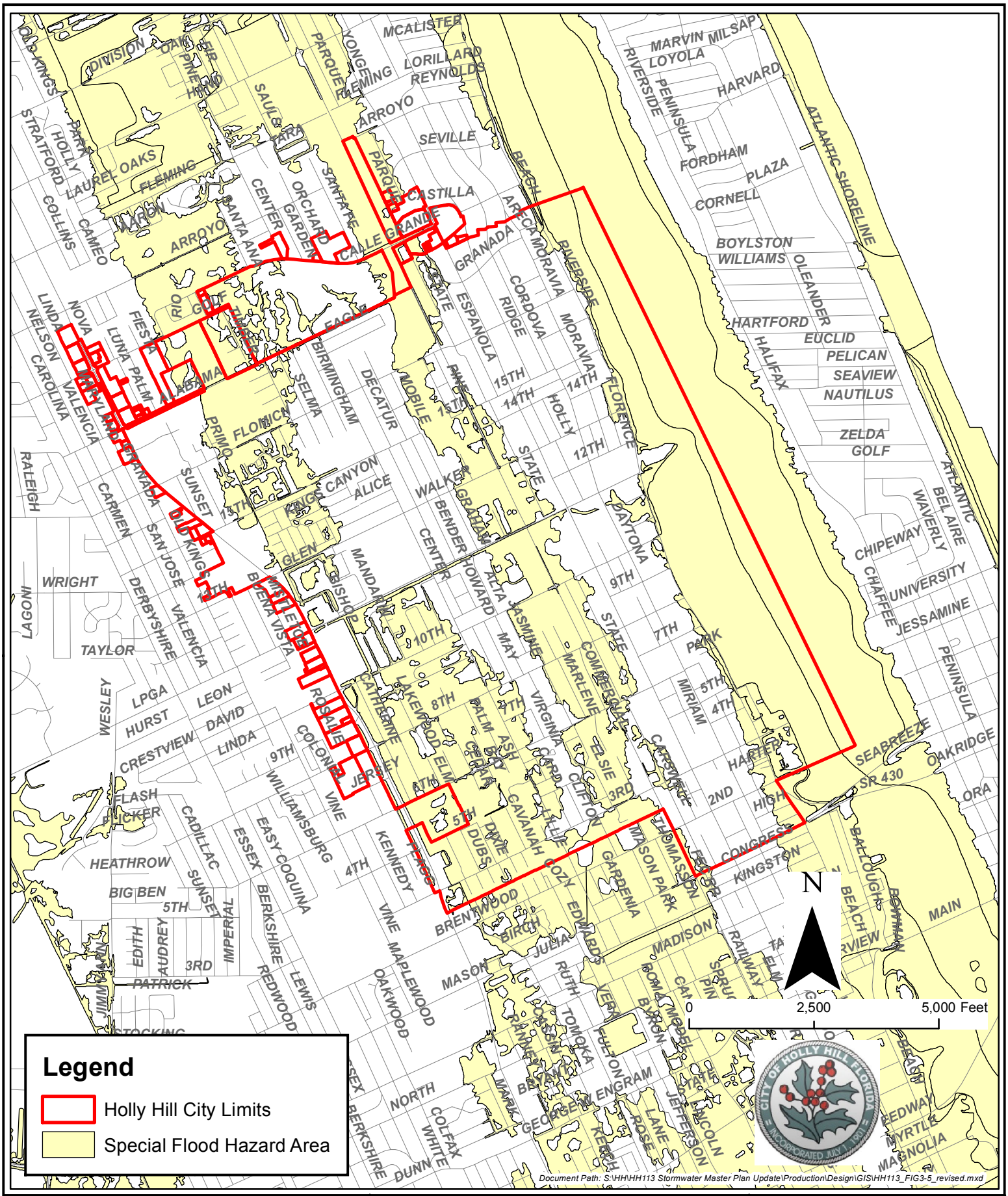
CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 3.4

SOILS



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 3.5

100 YEAR FLOOD PLAIN

3.8 Archaeological and Historical Sites

There are no known archaeological sites in the City of Holly Hill. An archaeological site survey has not been performed for Holly Hill. Based on the known locations of archaeological sites in other environmentally similar areas of Florida, it is very likely that sites would be found along the shore of the Halifax River. The rich resources of this area, principally fish and shellfish, were intensively exploited by prehistoric groups in northeast Florida.

The sites and structures inventoried here are not generally the kind which would be included in a state of federal register of historic sites. The only requirement for eligibility was that the site or structure must have existed prior to 1900. Qualitative measures relating to architectural features, uniqueness of siting, and historical significance were not considered. However, the pivotal consideration is that the sites identified are noteworthy in terms of local interest. ***Figure 3.6*** identifies the historic sites and structures with locations.

The pipeline routes follow developed rights of way and do not impact archeological or historical sites. If facilities are constructed or expanded, the sites will be reviewed prior to project plan development and sites of archaeological or historical significance will not be considered for development.

MAP 6 HISTORICAL SITES AND STRUCTURES - CITY OF HOLLY HILL

Map Key	Description of Site and/or Structure
1	"Union Congregational Church" – constructed in 1911.
2	"First Building Built for a School" - Constructed in the 1920's.
3	"Old Wetherell Home" - Wood frame home, pre-1900s located at 132 Eleventh Street-
4	"First Shopping Center" - Constructed in mid 1930's.
5	"Site of Old Lumber Mill" - located east of Riverside Drive at tip of 14th St., is now Big Tree Park.
6	Charles Wetherell Home - constructed prior to 1900s.
7	Twelve Oaks Greek Style Plantation Revival built in 1918,
8	McCoy House - Constructed in 1887
9	"Old Peterson Home" - Constructed prior to 1900s.
10	"First School House" – Constructed in the early 1900's
11	"Dr. Rawls Homestead and First Post Office" – built in 1878
12	Meahl Memorial Hospital – Constructed in 1935 by Bertha Meahl.
13	Holly Hill City Hall - Constructed in 1940 (WPA Project)
14	The Halifax Farmers Market – Constructed in the 1940's (WPA Project)
15	Riviera Hotel – Constructed in 1923.

NOTE: The historic sites and structures identified on Figure II-4, generally occur in a fairly compact area near the Halifax River. This is the area of the City which developed between 1870 and 1900.

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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 3.6

HISTORICAL SITES AND STRUCTURES

4.0 EXISTING DRAINAGE SYSTEM

4.1 General

Holly Hill's drainage system consists of four (4) tributaries – LPGA Canal, Northeast Canal, Southeast Canal, Nova Canal and the B-7 Canal that collects and conveys stormwater runoff to the east emptying into the Halifax River which borders the City to the east. ***Figure 4.1*** depicts the location of each of the tributaries.

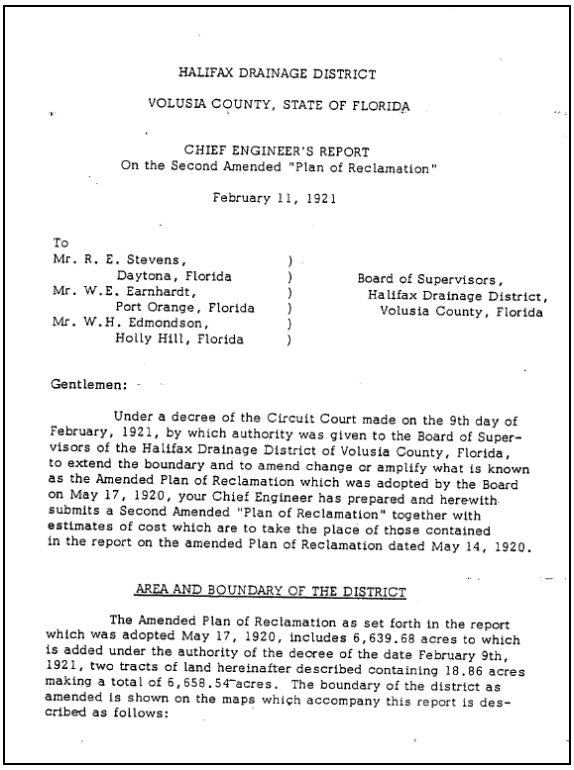
The topography of the City can be described graphically as shown previously in ***Figure 3.2***. Starting at the Halifax River, the ground elevation rises from six (6) feet to 20 feet in approximately 1,000 feet from Riverside Drive to the west of Daytona Avenue. Continuing west, the grade drops to eight (8) and nine (9) feet along Ridgewood Avenue in about 400 feet. The elevation continues a slight slope moving west to the Florida East Coast (FEC) railroad to grades of five (5) and six (6) feet approximately 800 feet west of Ridgewood Avenue.

The grade starts a constant incline having the railroad canals moving toward Center Street which has an elevation around eight (8) feet. A slope of three (3) feet rises in 2,100 feet of run.

Continuing west towards Nova Road the grade stays relatively flat with some variation from eight (8) feet to nine (9) feet, and eventually ending at 10 feet at Nova Road, 2,600 feet west of Center Street.

The west boundary of the LPGA Canal Watershed is defined by a ridge that is approximately 3,000 feet west of Nova Road. The watershed area that eventually discharges to the LPGA Canal is approximately 280 acres.

The existing canal system was designed and constructed in the early 1920s by the Halifax Drainage District. An excerpt from the Engineer's Report states that "We have designed the ditches to remove the drainage due to a rainfall of 5 inches of rainfall in 24 hours". This amount of rainfall is equivalent to a mean annual storm event – one that usually occurs once a year. The land use at that time was undeveloped, forested or pasture for the majority of the area.



HALIFAX DRAINAGE DISTRICT

VOLUSIA COUNTY, STATE OF FLORIDA

CHIEF ENGINEER'S REPORT
On the Second Amended "Plan of Reclamation"

February 11, 1921

To
Mr. R. E. Stevens,)
Daytona, Florida)
Mr. W.E. Earnhardt,)
Port Orange, Florida)
Mr. W.H. Edmondson,)
Holly Hill, Florida)

Board of Supervisors,
Halifax Drainage District,
Volusia County, Florida

Gentlemen:

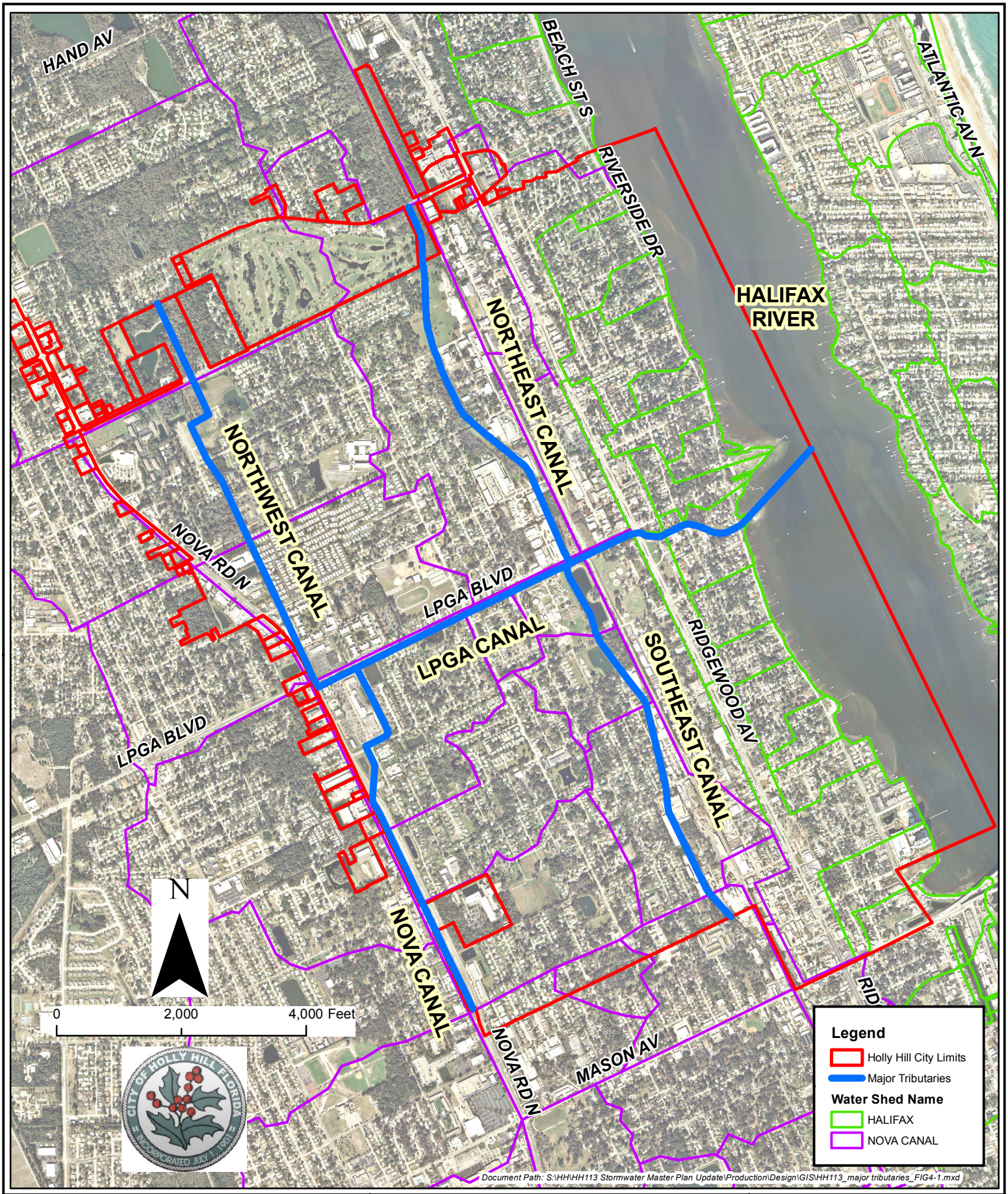
Under a decree of the Circuit Court made on the 9th day of February, 1921, by which authority was given to the Board of Supervisors of the Halifax Drainage District of Volusia County, Florida, to extend the boundary and to amend change or amplify what is known as the Amended Plan of Reclamation which was adopted by the Board on May 17, 1920, your Chief Engineer has prepared and herewith submits a Second Amended "Plan of Reclamation" together with estimates of cost which are to take the place of those contained in the report on the amended Plan of Reclamation dated May 14, 1920.

AREA AND BOUNDARY OF THE DISTRICT

The Amended Plan of Reclamation as set forth in the report which was adopted May 17, 1920, includes 6,639.68 acres to which is added under the authority of the decree of the date February 9th, 1921, two tracts of land hereinafter described containing 18.86 acres making a total of 6,658.54 acres. The boundary of the district as amended is shown on the maps which accompany this report is described as follows:

Cover from 1921 Engineer's Report

The present day conditions are far more developed resulting in additional runoff to the ditches. The City expects the drainage system to handle a much larger event. However, the system is basically unchanged since it was first constructed.



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 4.1

MAJOR TRIBUTARIES

4.2 Review of Previous Drainage Studies

The Nova Canal Watershed in which Holly Hill is located has been the subject of several studies in the past. Reports prepared in 1977, 1986 and 1992 identified numerous drainage deficiencies and the worst local flooding problems apparent at the time of the report.

4.2.1 Nova Canal System Watershed Management

Due to the tremendous amount of flooding from Tropical Storm Gordon in 1994, Volusia County retained the services of Marshall Provost Associates (MPA) to again study the Nova Canal Watershed and produce a report recommending improvements. MPA produced the report in 1996 which recommended, in essence, four methods to improve drainage:

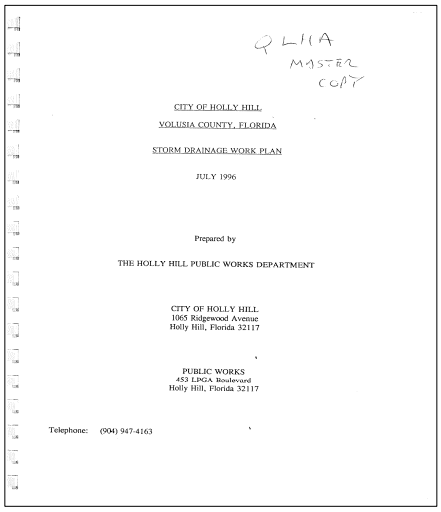
1. Establish a regular maintenance period for removal of accumulated sediment in the canals and culverts throughout the system.

2. Construct structural improvements for source reduction in higher elevations to capture runoff and retain to all to infiltrate into the ground.

3. Construct offline wet detention areas along the canals to provide water quality and quantity benefits.

4. Construct additional outfalls for flood protection where feasible.

4.2.2 Holly Hill Storm Drainage Work Plan


QLHA
MASTER
COPY

CITY OF HOLLY HILL,

VOLUSIA COUNTY, FLORIDA

STORM DRAINAGE WORK PLAN

JULY 1996

Prepared by

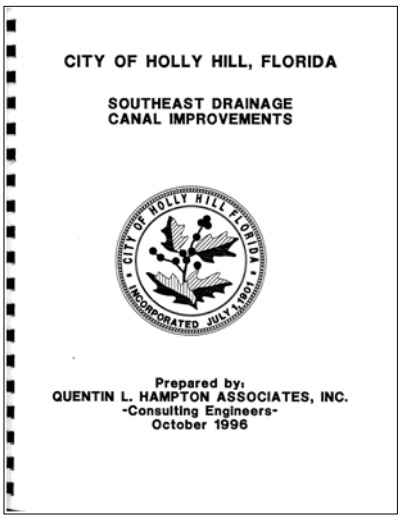
THE HOLLY HILL PUBLIC WORKS DEPARTMENT

CITY OF HOLLY HILL
1065 Ridgewood Avenue
Holly Hill, Florida 32117

PUBLIC WORKS
452 LPGA Boulevard
Holly Hill, Florida 32117

Telephone: (904) 947-4163

Following the production of MPA's report, the City of Holly Hill Public Works Department produced a Storm Drainage Work Plan, 1996, which identified several local flooding problems and recommended structural improvements to correct. A cost estimate was produced for each project area. Included in the Work Plan was a list of previous maintenance items and projects implemented including:


CITY OF HOLLY HILL, FLORIDA

SOUTHEAST DRAINAGE
CANAL IMPROVEMENTS

Prepared by:
QUENTIN L. HAMPTON ASSOCIATES, INC.
-Consulting Engineers-
October 1996

1. The City's Public Works staff cleaned all the vegetation, trees and tree limbs obstructing the flow in the LPGA Blvd. (11th Street) Canal between U.S. 1 and the outfall at the Halifax River.

2. The Volusia County Road and Bridge Division cleaned the silt in the LPGA (11th) Canal between U.S. 1 and the FDOT box culvert on Nova Road.

3. The Mosquito Control District has worked on the N.E. Canal, S.E. Canal and N.W. Canal.

4. The City's Public Works staff cleaned all the vegetation, trees and tree limbs obstructing the flow in the LPGA Blvd. (11th Street) Canal between U.S. 1 and the outfall of the Halifax River.

5. The Volusia County Road and Bridge Division cleaned the silt in the LPGA (11th) Canal between U.S. 1 and the FDOT box culvert on Nova Road.

6. The Mosquito Control District has worked on the N.E. Canal, S.E. Canal and N.W. Canal.

7. The City's Public Works staff connected the two retention basins for Holly Forest located on Unabelle Street to the new drainage system installed by the Public Works staff along Unabelle Street and Walker Street to the Northwest Canal.

8. The City Council and Public Works Department contracted with Quentin Hampton & Associates to design improvements for the S.E. Canal and structures at 6th and S.E. Canal and 3rd and S.E. Canal.

9. The FDOT cleaned the Nova Canal that cuts diagonal across Nova Road (5A) between 9th and 10th Streets.

10. The FDOT has been requested by our staff, Mosquito Control and Volusia County Road and Bridge to clean Nova Road Canal between 10th Street and 3rd Street. The vegetation is dense between these streets. FDOT has cleaned the banks but not the silt and growth in the canal.

4.2.3 Stormwater System Facility Plan

In an attempt to implement the projects identified in the work plan, the City requested QLH produce a Stormwater Facility Plan for submittal to FDEP for a State Revolving Fund loan.

The Facility Plan reiterated the projects identified by the Public Works Department and updated cost estimates. The plan was submitted to FDEP in 6/6/2001 and approved on 8/20/2001. Once the loan was approved, the City requested design efforts begin on the drainage improvements.

Included in the Facility Plan were eight (8) project areas including:

- Flomich Street at State Avenue
- State Avenue/Carswell Avenue at 3rd Street
- 8th Street west of Ronnie Circle
- Marlene Drive, Orange Avenue and Grove Street
- Daytona Avenue and 10th Street
- Bender Avenue and Powers Avenue
- State Avenue and LPGA Boulevard
- Clifton Road, Hopkins Road, Dorothy and Elsie Avenues

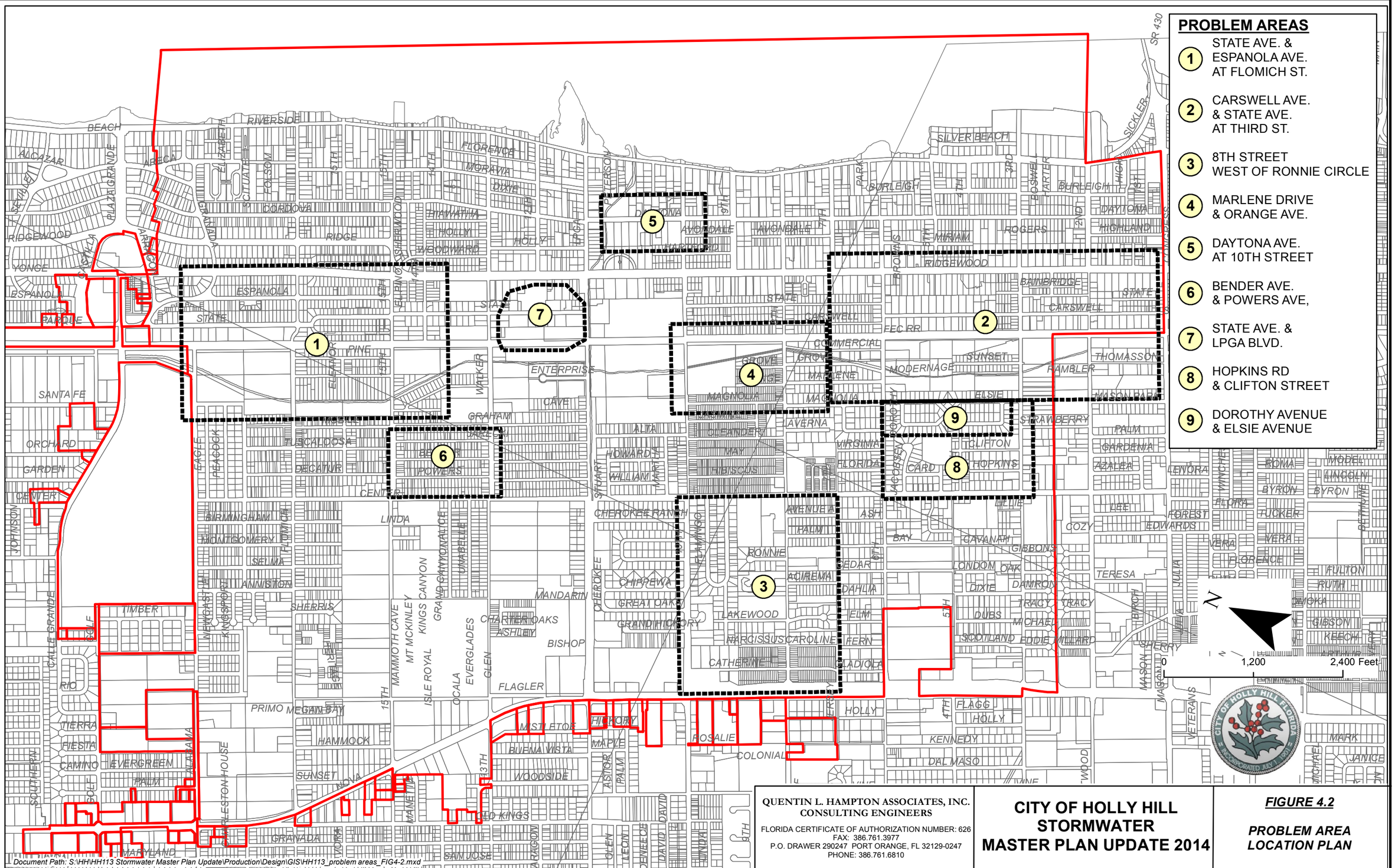
Figure 4.2 depicts the location and items constructed for each project which was completed over a period of years between 2003 and 2005. All eight (8) projects listed above were completed by January 2005 at a cost of approximately $6 million.

4.2.4 Nova Canal Flood Control & Integrated Water Resources Program

In May of 2009, the East Volusia County area experienced a historical rainfall event that deposited approximately 30 inches of rainfall in five (5) days. Sources determined an estimated rainfall recurrence interval of 310 years for this extreme event. Several coastal cities including Holly Hill endured several days of standing water in residential and commercial developments.

The public outcry from the flooding again spurred government to study the drainage system to produce improvements. A Joint Project Agreement (JPA) was developed, led by the East Volusia Regional Water Authority (EVRWA), between Volusia County, FDOT and the cities from Ormond Beach south to Port Orange.

The EVRWA obtained the services of Camp Dresser-McKee (CDM) and Quentin L. Hampton Associates (QLH) to evaluate potential flood control improvements along the LPGA Canal, Reed Canal, and Halifax Canal, all tributaries of the Nova Canal System. The evaluation included an update to the Nova Canal System stormwater model originated by CDM and updated over the years by several consultants. The study included proposed pump stations and tidal gates at each of the three canal outfalls. However, modeling results showed minimal effects in reducing the peak flood stages for a 100-year rainfall event.



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 4.2

PROBLEM AREA LOCATION PLAN

Cost analysis for the projects performed by the consultants determined that the projects were beyond the means of most agencies and benefits did not match the costs. However, it was noted that although the pumping systems would not significantly reduce the peak stages, the duration of flooding seen during the May 2009 event could be reduced significantly.

Since this report was produced, only Daytona Beach and Ormond Beach have moved forward in implementing portions of the projects recommended. Funding and other priorities is the hindrance for other cities in proceeding with projects.

4.2.5 Drainage Study of Carswell Avenue and State Avenue

As stated, the May 2009 storm resulted in several days of flooding in areas throughout Holly Hill. One hard hit area was the commercial district of Carswell Avenue and State Avenue. The City of Holly Hill retained QLH to study the drainage system in this area and provide possible improvements. The results of the study concluded that there were several deficiencies in pipe sizes that, if corrected, would benefit the area only if there was a "no tidal surge" condition. With a tidal surge, which this area is subject to, the pipe size increases would have no effect. The report stated that due to the fact that this area is within the 100-year floodplain (7 feet) total correction of the flooding would not be possible without a tide control gate and pump station near the LPGA Canal. Cost estimates were produced for correcting the pipe size deficiencies totaling $2,757,000. The City has not taken action on these recommendations as they have discussed implementation of the aforementioned tide gate and pump station.

4.3 Existing Drainage Problem Areas

This section discusses the still existing drainage problem areas within the City of Holly Hill. The most recent extreme storm event in May of 2009 brought to light that there are significant challenges the City faces. Although that event was a 100-year plus storm event and drainage systems are not sized to handle up to a 25-year storm event.

A more recent rain event at the end of September 2014 dropped 8-10 inches of rainfall on eastern Volusia County. Holly Hill had several areas that had standing water and a few structures that flooded.

4.3.1 Carswell Avenue – State Avenue Area

Carswell Avenue and State Avenue are home to numerous commercial/industrial businesses, constructed in the very early years of the City. The drainage system has been updated in many areas to include inlets and pipe that were sized for the standards of the day. The topographic features of the study area are generally flat with a minor slope from Ridgewood Avenue to the Southeast Canal. The F.E.C. railroad track that parallels Ridgewood Avenue to the west creates a berm effect to any flow that is directed to the west from Ridgewood Avenue. Several pipe crossings under the railroad tracks convey the runoff to the canal. Runoff is collected all along Carswell and State Avenue and conveyed in various pipe sizes and materials to the major east-west streets (3rd, 6th, 8th and 10th Streets).

From the connection to the Southeast Canal, runoff is directed to the north where the canal connects to the LPGA Canal. Peak Stages are very much affected by the changing tides in the Halifax River. The tailwater effect in the City's Canal system caused by an above normal tide is a major contributor to the flooding during extreme events. A major portion of the

study area is within the elevation 5.0 NAVD 100-year floodplain as depicted in **Figure 3.5**. Many roads are below this elevation.

The existing drainage pipe sizes and inlet locations are shown in **Figure 4.3**. The material of each pipe was not obtained but it is known that there is a mix of concrete, corrugated metal, and some plastic in the smaller sizes (under 15 inches).

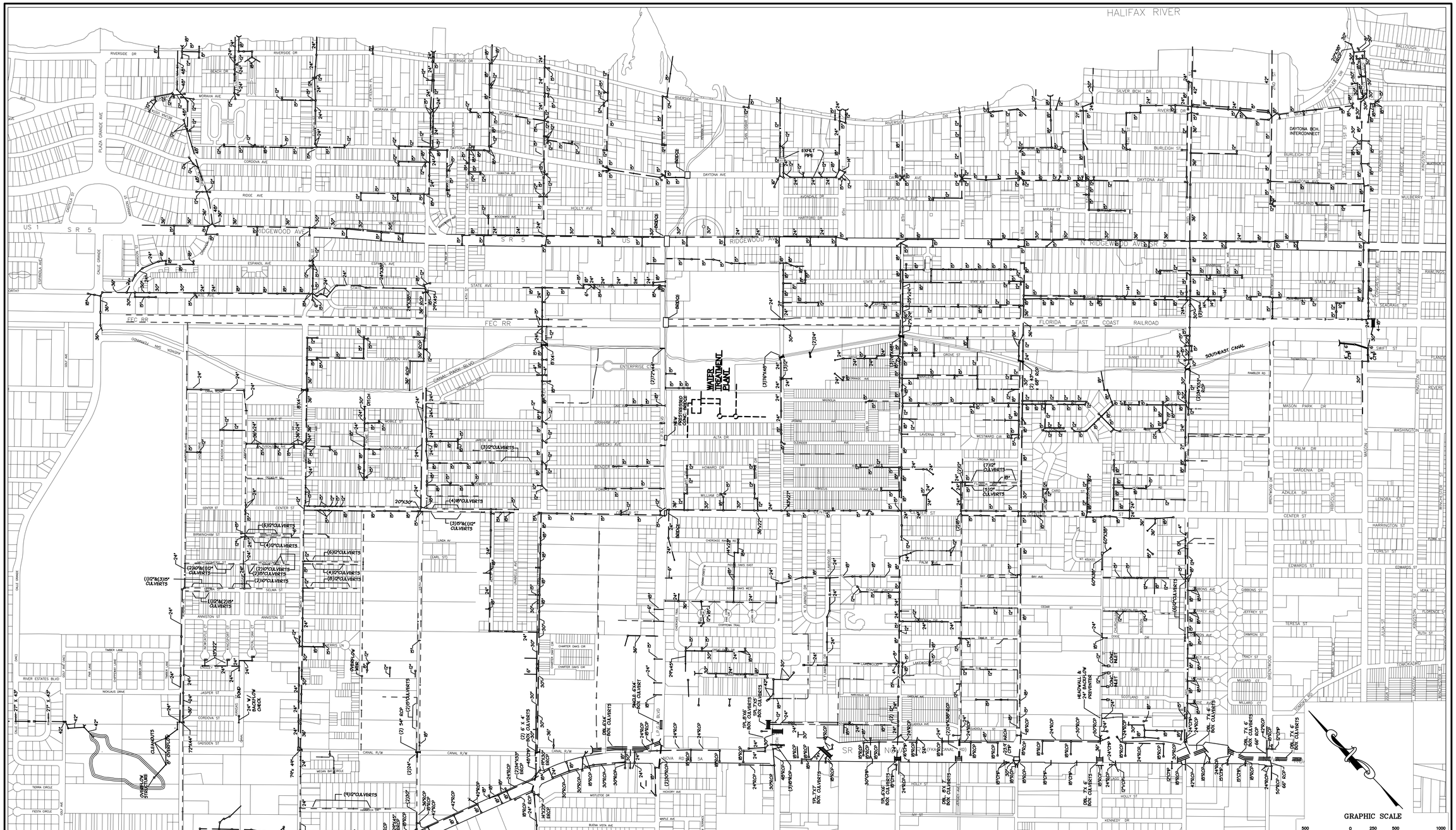
4.3.2 State Avenue North

The area north of Flomich Street between Ridgewood Avenue and the railroad tracks has flooded several times over the years. A substantial amount of work was performed with the Master Plan improvements in 2003 which assisted greatly with minor storms.

However, since this area is at very low elevations (5-6 feet NAVD) it is subject to influence from tidal waters backing into the Northeast Canal.

4.3.3 Ridgewood Avenue and Riverside Drive Between 2nd and 6th Street

Elevations being under three (3) feet NAVD along Riverside Drive between 2nd and 6th Street are the reason this Riverside Drive floods frequently. When the Halifax River is at an above normal tide, rainfall cannot flow to the river and ends up filling up the road causing hazardous driving conditions. Ridgewood Avenue at 2nd, 3rd and 6th Street also has flood issues during these conditions due to the tidal effects. Only a pumping system will overcome the high tide flooding.



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CITY OF HOLLY HILL
STORMWATER
MASTER PLAN UPDATE
2014

FIGURE 4.3

EXISTING DRAINAGE SYSTEM

S:\HH\HH113 Stormwater Master Plan Update\Production\Design\CAD\DWGS\HH113 EXISTING DRAINAGE SYSTEM_FIG4-3.dwg, Layout1, 12/12/2014 11:20:48 AM, PJ

4.4 Existing Conditions Evaluation

This section of the report discusses the procedure for evaluating the existing conditions of the City's drainage system. The steps include data gathering, verification of existing major drainage structures within the canals, creating a stormwater model of the existing system, and calibration of the results.

4.4.1 Data Gathered for Evaluation

QLH utilized previously prepared studies and model data as a starting point in preparing a stormwater model. Volusia County's LiDar mapping was utilized for the overall topographic mapping as it provides one foot contours at reasonable accuracies for master planning. This mapping is adjusted to NAVD 1988 Vertical datum. The Vertical datum used in previous studies used is NGVD 1929 which is 1.1 feet above NAVD 1988.

Additionally, survey data of the major conveyance structures in the canal was collected to verify inverts and sizes. Several structures were found to be inaccurate in previous stormwater models. QLH utilized calibration data collected by CDM for the most recent "Nova Canal Flood Control and Integrated Water Resource Program" in 2010 for the East Volusia Regional Water Authority.

Myers Surveying of Holly Hill assisted with collection of culvert dimensions and inverts. Their product is attached in Appendix C.

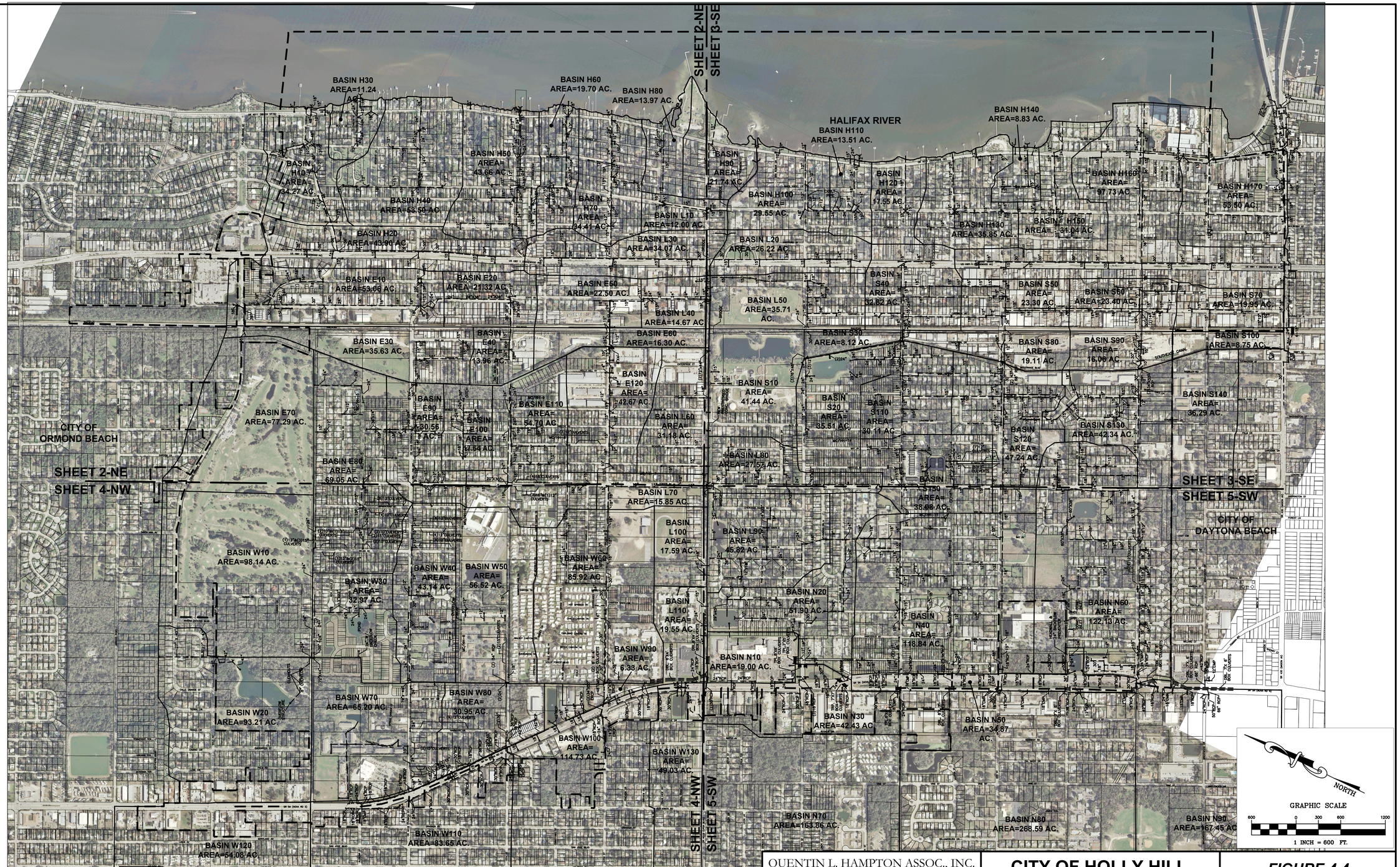
4.4.2 Existing Drainage System Modeling

The drainage system model was organized with nomenclature related to the basin names given in the basin delineation sheet, ***Figure 4.4***. Basin names are related to the tributary or water body they discharge into. For instance, basins flowing into the LPGA Canal are labeled starting with 'L' and those discharging to the Halifax River are labeled with an 'H'.

The primary drainage system (canals and culverts) utilize codes starting with the same letter also, as is seen on the model diagram in Appendix A.

The following designation letters were applied to each drainage system tributary:

- "H" for Halifax River
- "L" for LPGA Canal
- "N" for Nova Canal
- "S" for Southeast Canal
- "E" for Northeast Canal
- "W" for Northwest Canal



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 4.4

OVERALL DRAINAGE PLAN

S:\HHH113 Stormwater Master Plan Update\Production\Design\CAD\DWG\HH113 OVERALL DRAINAGE PLAN_FIG4.4.dwg, SHT 1 OVERALL PLAN 1:600, 10/12/2014 11:18:03 AM, PJ

Figure 4.1 identifies the location of each of the tributaries. Within the model each tributary's canal sections and culverts are given codes based on the order starting at connection to where it discharges.

Examples:

L001-010
L = LPGA Canal
001 = Main Tributary
010 = Sequence Number

S020-020
S = Southeast Canal
020 = Secondary Tributary
020 = Sequence Number

It should be noted that the sequence number was assigned in the upstream direction of the drainage system and uses a non-consecutive interval to allow for additional links or nodes without having to renumber the sequence.

4.4.3 Hydrologic Modeling

The total study area is 3,476 acres which includes areas outside the City limits to the west of Nova Road. This is added because this land mass drains to the Nova Canal and eventually flows to the LPGA Canal. Each basin is assigned an area (acres), a curve number, a time of concentration and a unit hydrograph factor to determine the amount of runoff discharging form the basin. Rainfall is dictated by the storm interval as follows:

Mean Annual Storm	=	5.5 inches/24 hours
25 Year/24 Hour Storm	=	9 inches/24 hours
100 Year/24 Hour Storm	=	13 inches/24 hours

Each basin area is determined using the topography and a judgment of the basin divider. Many times basins are separated due to roads or other dividing feature. The curve numbers are calculated using the land use for the basin area. ***Table 4.1*** shows the number assigned for each type of land use. A summation of the area times the curve number divided by the total area determines the curve number for each basin.

To determine the time it takes for the runoff to start discharging from the basin a time of concentration or Tc is calculated using land slope and land characteristics. The Tc has been calculated for each basin and is shown in ***Table 4.2***.

4.4.4 Results of Existing System Modeling

This section will discuss the adICPR modeling results of the existing drainage system and compare it to results from the Nova Canal Watershed SWMM model produced by CDM for the EVRWA which was validated to the May 2009 storm event.

Table 4.1
SCS Runoff Curve Numbers for Selected
Agricultural, Suburban And Urban Land Use

Land Use Description					
Cultivated Land[b]		A	B	C	D
Without conservation treatment		72	81	88	91
With conservation treatment		62	71	78	81
Pasture or range land:					
Poor condition		68	79	86	89
Good condition		39	61	74	80
Meadow: good condition		30	58	71	78
Wood or Forest Land:					
Thin stand, poor cover, no mulch		45	66	77	83
Good cover		25	55	70	77
Open Spaces, Lawns, Parks, Golf Courses, Cemeteries:					
Good condition: grass cover on 75% or more of the area		39	61	74	80
Fair condition: grass cover on 50% to 75% of the area		49	69	79	84
Poor condition: grass cover on 50% or less of the area		68	79	86	89
Commercial and Business Areas (85% impervious)		89	92	94	95
Industrial Districts (72% impervious)		81	88	91	93
Residential[c]					
Average lot size	Average % Impervious[d]				
1/8 acre or less	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
Paved Parking Lots, Roofs, Driveways[e]:		98	98	98	98
Streets and Roads:					
Paved with curbs and storm sewers[e]		98	98	98	98
Gravel		76	85	89	91
Dirt		72	82	87	89
Paved with open ditches		83	89	92	93
Newly graded area (no vegetation established)		77	86	91	94

[b] Good cover is protected from grazing and litter and brush cover soil.

[c] Curve numbers are computed assuming the runoff from the house and driveway is directed toward the street with a minimum of roof water directed to lawns where additional infiltration could occur, which depends on the depth and degree of the permeability of the underlying strata.

[d] The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

[e] In some warmer climates of the country, a curve number of 96 may be used.

Reference: USDA, SCS, TR-55 (1984).

Table 4.2
City Of Holly Hill, Florida
Tc Values Per Basin

Northeast Canal Basins

Basin Number	Acres	Tc (min)
E10	53.06	52
E20	21.32	18
E30	35.63	32
E40	13.96	12
E50	22.50	20
E60	16.30	20
E70	77.29	85
E80	69.05	65
E90	30.56	28
E100	17.64	21
E110	54.70	50
E120	42.67	38

Northwest Canal Basins

Basin Number	Acres	Tc (min)
W10	98.14	75
W20	93.21	85
W30	32.97	25
W40	43.14	38
W50	56.52	51
W60	85.92	70
W70	65.20	58
W80	30.95	28
W90	6.33	10
W100	93.86	80
W110	69.34	65
W120	52.41	60
W130	46.00	52

LPGA Canal Basins

Basin Number	Acres	Tc (min)
L10	12.00	10
L20	26.22	18
L30	34.07	20
L40	14.67	10
L50	35.71	25
L60	31.18	20
L70	15.85	9
L80	27.57	25
L90	45.82	45
L100	17.59	20
L110	19.55	18

Nova Canal Basins

Basin Number	Acres	Tc (min)
N10	19.00	16
N20	51.90	50
N30	42.43	50
N40	118.84	85
N50	34.87	30
N60	122.13	95
N70	163.86	125
N80	268.59	160
N90	167.45	130

Table 4.2
City Of Holly Hill, Florida
Tc Values Per Basin – Continued

Southeast Canal Basins

Basin Number	Acres	Tc (min)
S10	41.44	35
S20	35.51	25
S30	8.12	10
S40	32.82	20
S50	23.30	12
S60	23.40	14
S70	19.95	15
S80	19.11	12
S90	16.06	15
S100	8.75	8
S110	30.11	25
S120	47.24	40
S130	42.34	35
S140	36.29	25
S150	38.08	33

Halifax River Basins

Basin Number	Acres	Tc (min)
H10	34.27	11
H20	43.90	12
H30	11.24	15
H40	53.50	13
H50	43.66	15
H60	19.70	17
H70	34.41	9
H80	13.97	6
H90	21.74	21
H100	29.55	12
H110	13.51	14
H120	17.55	7
H130	35.85	9
H140	8.83	6
H150	31.04	14
H160	97.73	11
H170	53.50	13

The existing system was modeled using three storm events – Mean Annual (five inches in 24 hours), 25-year/24 hour (nine inches) and 100-year/24 hours (13 inches) with two tidal conditions per storm - one year and 100 year tidal Stillwater conditions. Additionally, the May 2009 unnamed storm event was modeled and results presented herein.

4.4.4.1 Boundary Conditions

The model utilizes several boundary conditions. They include the discharge point at the Halifax River, at Mason Avenue and the Southeast Canal, at Calle Grande Avenue and the Northeast Canal, and at 2nd Street and the Nova Canal. The boundary conditions have been derived from the Nova Canal SWMM model by CDM for the various storm events. The time-stage information is contained in the report titled "E.V.R.W.A. Nova Canal Flood Control and Integrated Water Resource Program", July 2010. The information is not repeated in this report but the data is present in the model output in the Appendix.

4.4.4.2 Model Validation

Model validation refers to the process where results produced by the model are compared to measure/observed parameters to demonstrate that predicted values (flows and stages) match within a reasonable tolerance. The May 2009 storm event which delivered approximately 25 inches of rain to the study area over a five-day period was utilized for the comparison to the model results along with data generated by the CDM model for the 25 year and 100 year events. Measured data from the USGS station (ID 02247509) at LPGA Canal and Ridgewood Avenue displayed within the CDM Nova Canal Flood Control Report, 2010, is presented in ***Figures 4.5*** and ***4.6.*** The USGS station is located upstream of the culvert under US-1 (Ridgewood Avenue). Stage measurements were available for the entire event, but flow data was sporadic at times as can be seen on the graphs. The stage data has been converted to NAVD '88 vertical datum from NGVD '29 as downloaded from USGS.

The graphs shown in ***Figure 4.7*** and ***4.8*** show the model is closely related to the CDM model storms for the 25 year and 100 year events, while ***Figure 4.9*** compares the model to the CDM model for the May 2009 event.

To further validate the results, the City of Holly Hill had given a high water mark of 7.0 feet NGVD at the Public Works Building near LPGA Canal and Alta Road during the May 2009 event. The model results show a peak stage of 5.8 feet NAVD (6.9 NGVD) for the node upstream of Alta Road Bridge.

Figure 4.10 includes a photo taken on May 20, 2009 at the Public Works Administration Building along with a site view of the building with spot elevations. It shows the flood waters reached an elevation of approximately 6.3 feet NAVD '88.

4.4.4.3 Design Storm Model Results

Once the model was validated, the design storms mentioned previously were evaluated for stated frequencies. Each design storm was also evaluated for two Halifax River tidal conditions, the one-year and 100-year Stillwater elevation. The results of these model runs for the LPGA Canal are summarized in ***Figures 4.11*** and ***4.12***.

Figure 4.5
City Of Holly Hill, Florida
May 2009 Stage Data At LPGA Canal

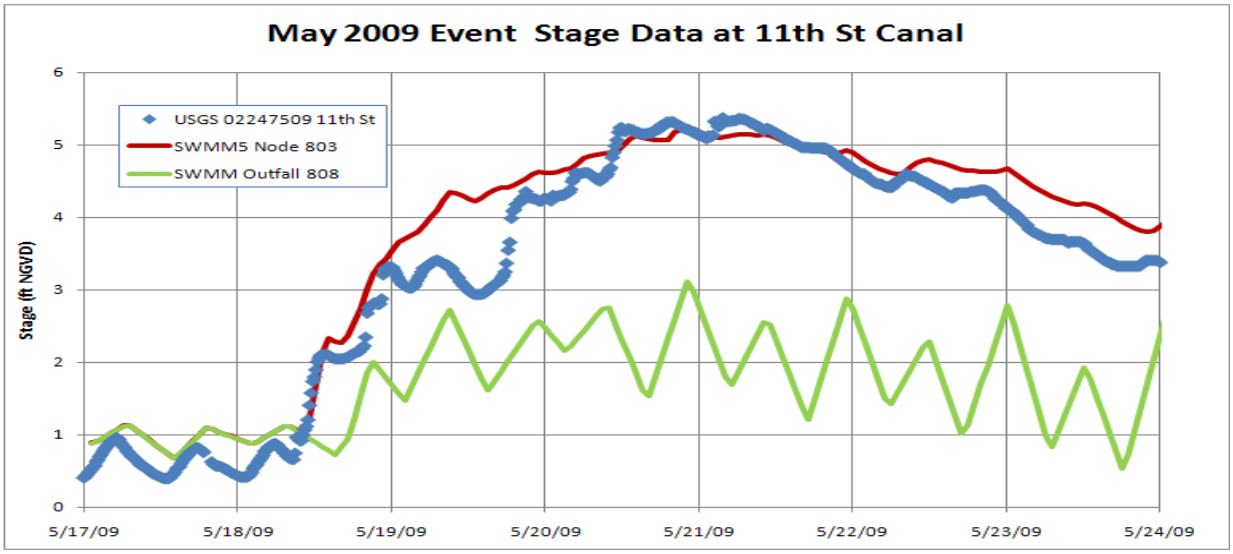


Figure 4.6
City Of Holly Hill, Florida
May 2009 Flow Data At LPGA Canal

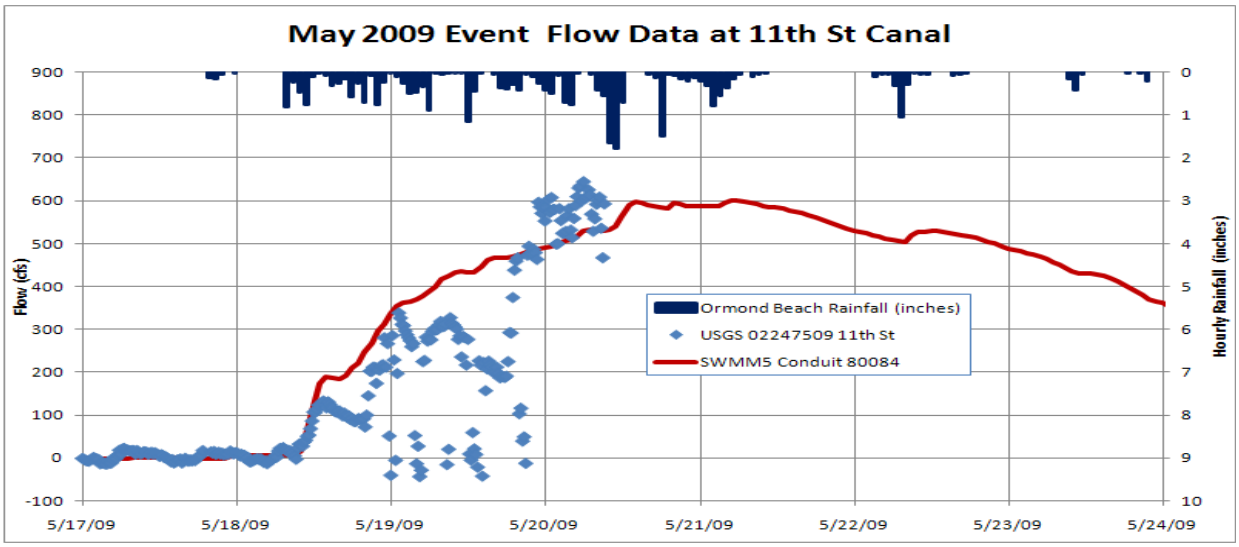
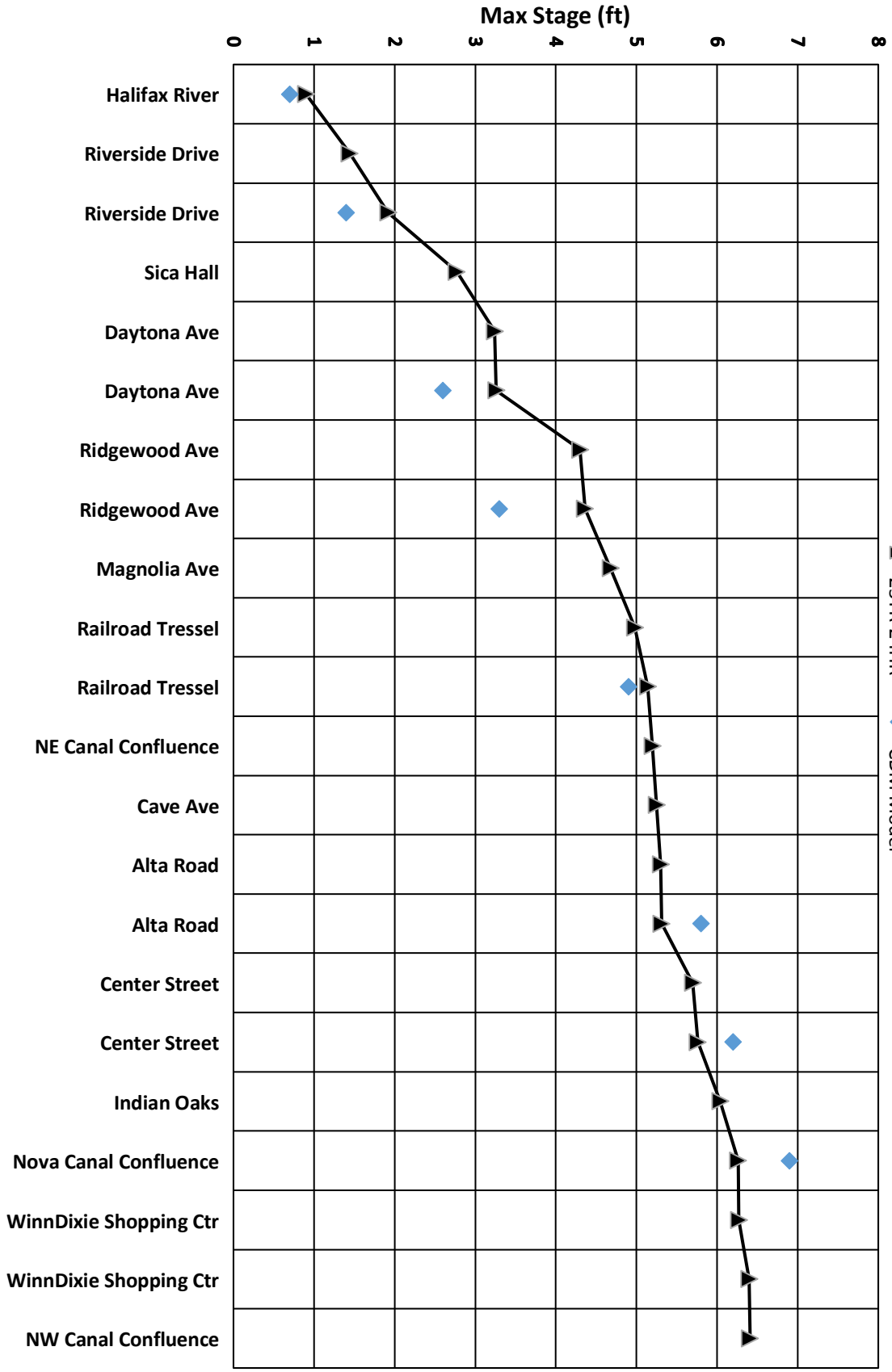


FIGURE 4.7
CITY OF HOLLY HILL, FLORIDA
LPGA CANAL EXISTING CONDITIONS - 25 YEAR EVENT COMPARISON



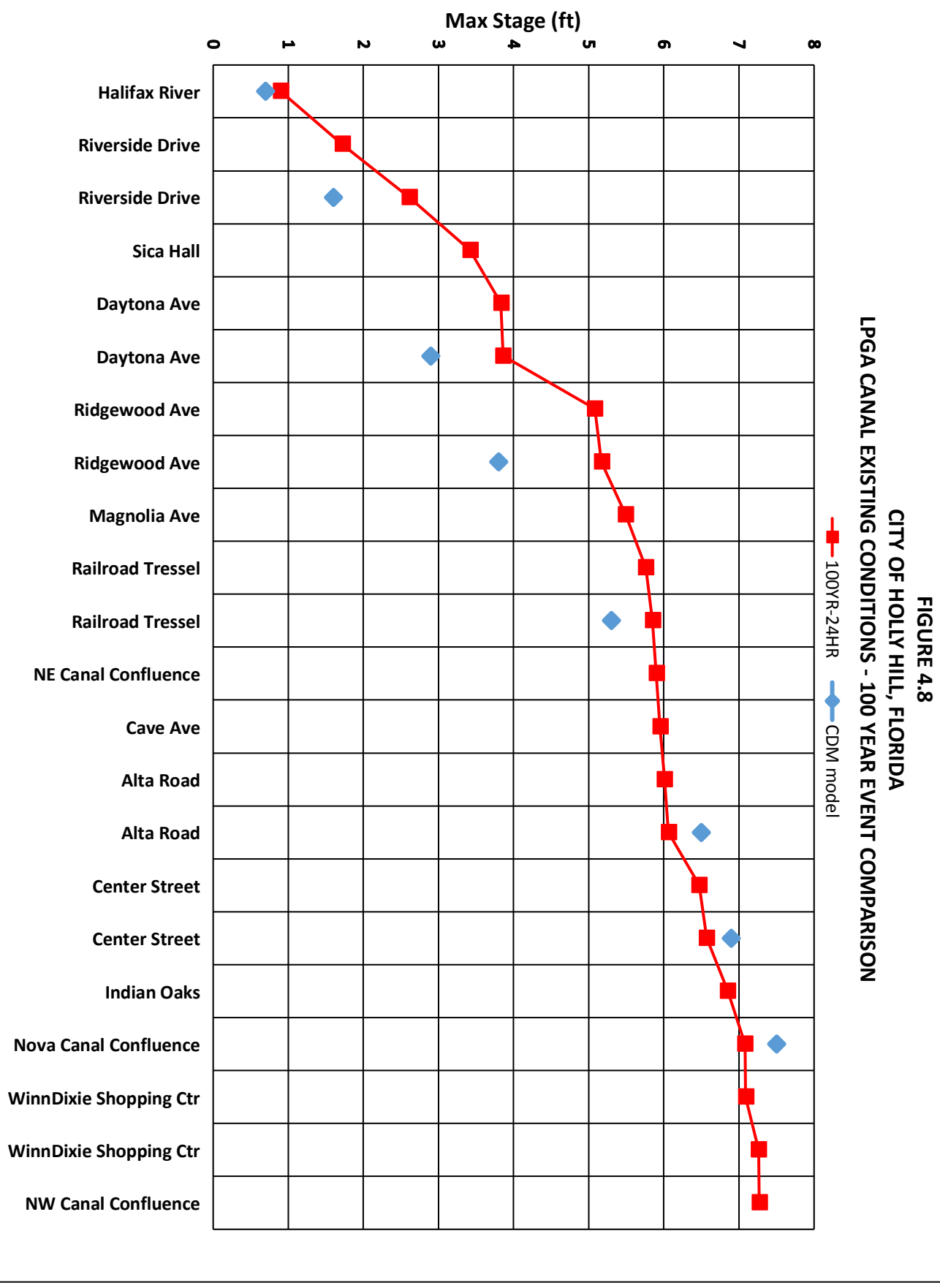
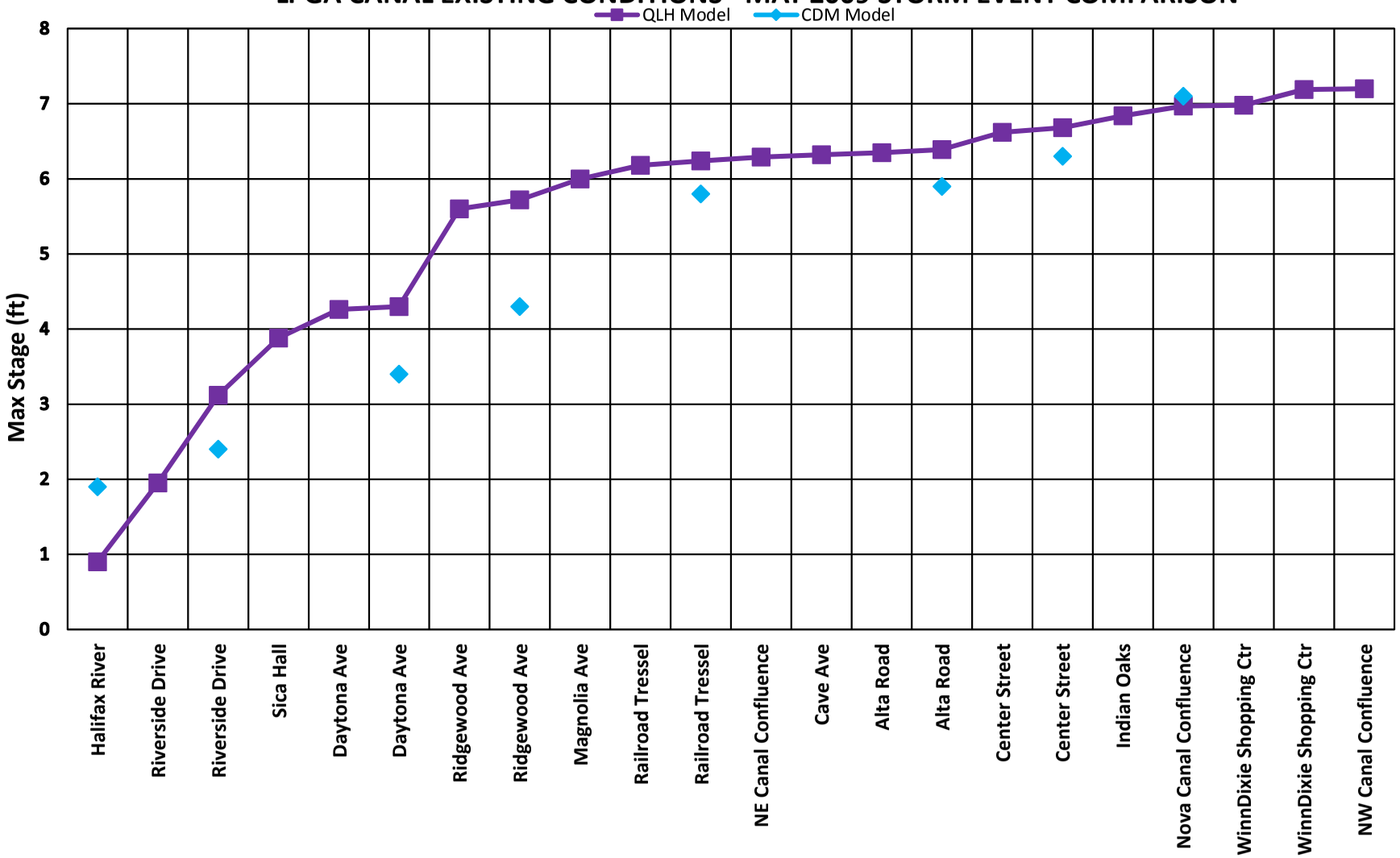


FIGURE 4.8
CITY OF HOLLY HILL, FLORIDA
LPGA CANAL EXISTING CONDITIONS - 100 YEAR EVENT COMPARISON
100YR-24HR
CDM model
Max Stage (ft)
0
1
2
3
4
5
6
7
8
Halifax River
Riverside Drive
Riverside Drive
Sica Hall
Daytona Ave
Daytona Ave
Ridgewood Ave
Ridgewood Ave
Magnolia Ave
Railroad Tressel
Railroad Tressel
NE Canal Confluence
Cave Ave
Alta Road
Alta Road
Center Street
Center Street
Indian Oaks
Nova Canal Confluence
WinnDixie Shopping Ctr
WinnDixie Shopping Ctr
NW Canal Confluence

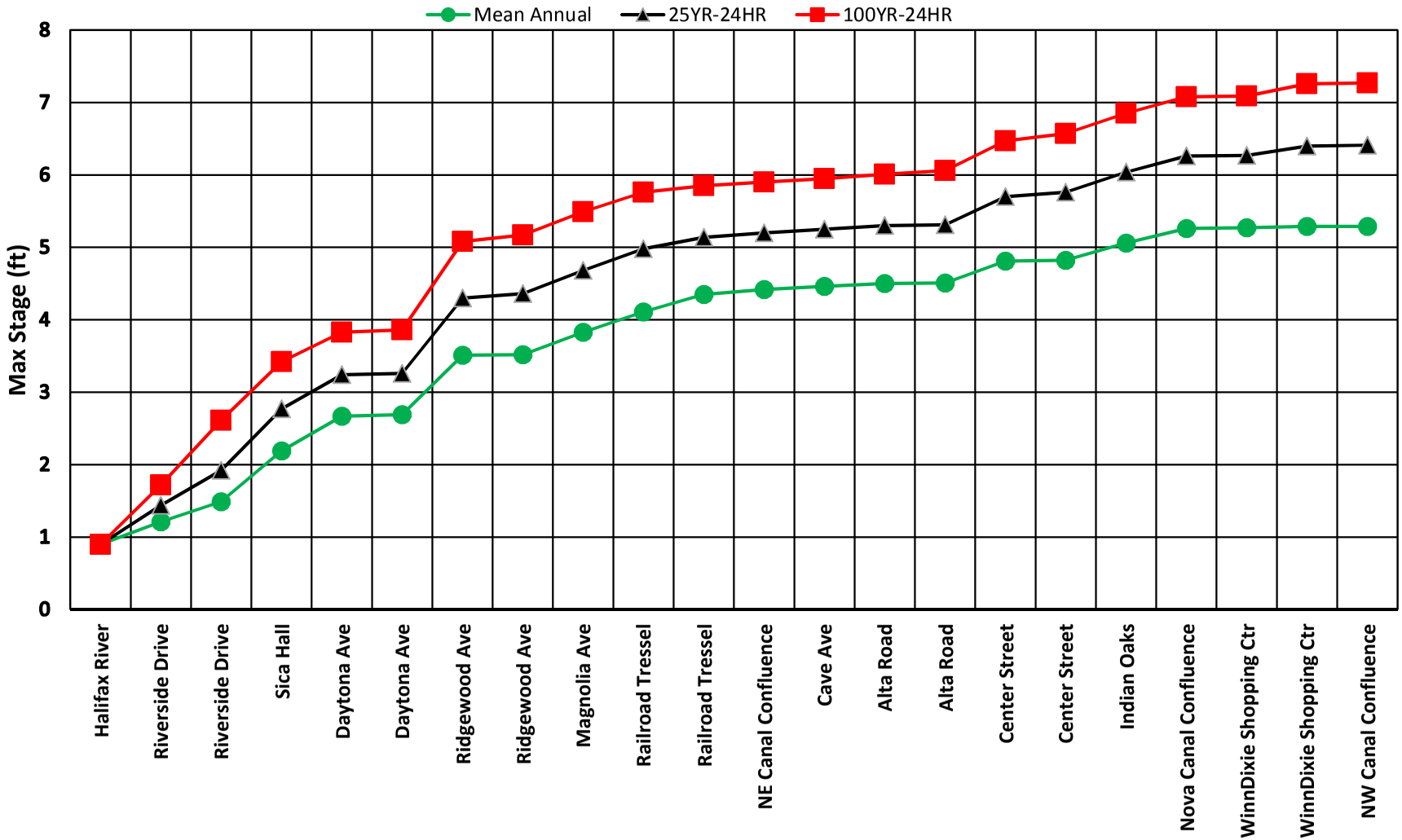
FIGURE 4.9
CITY OF HOLLY HILL, FLORIDA
LPGA CANAL EXISTING CONDITIONS - MAY 2009 STORM EVENT COMPARISON



QLH model	0.9	1.95	3.12	3.88	4.26	4.3	5.6	5.72	6	6.18	6.24	6.29	6.32	6.35	6.39	6.62	6.68	6.84	6.97	6.98	7.19	7.2
CDM model	1.9		2.4			3.4		4.3			5.8				5.9		6.3		7.1			

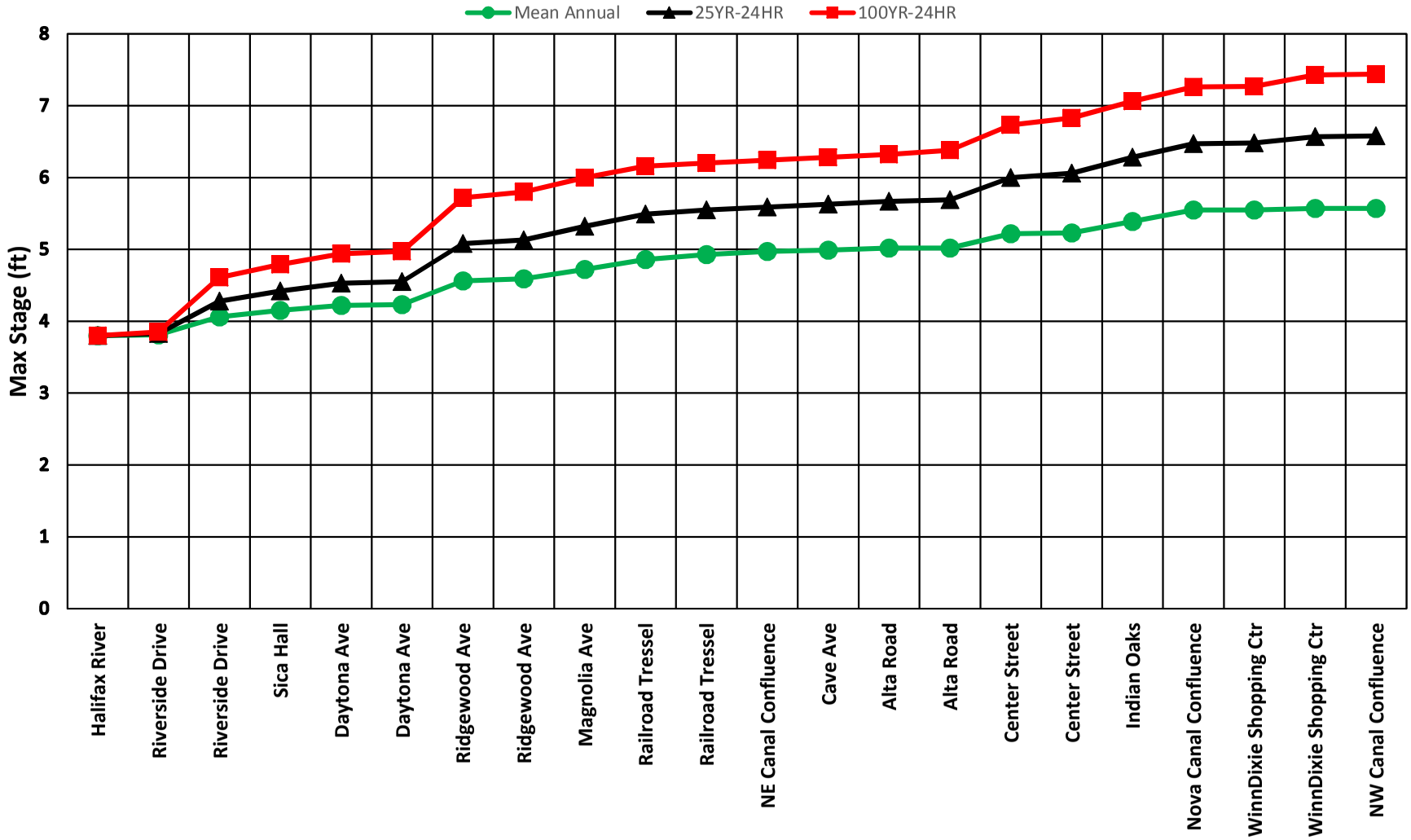
Figure 4.10
City Of Holly Hill, Florida
Public Works Administration Building Photograph

FIGURE 4.11
CITY OF HOLLY HILL, FLORIDA
LPGA CANAL EXISTING CONDITIONS WITH 1 YEAR STILLWATER



	Halifax River	Riverside Drive	Riverside Drive	Sica Hall	Daytona Ave	Daytona Ave	Ridgewood Ave	Ridgewood Ave	Magnolia Ave	Railroad Tressel	Railroad Tressel	NE Canal Confluence	Cave Ave	Alta Road	Alta Road	Center Street	Center Street	Indian Oaks	Nova Canal Confluence	WinnDixie Shopping Ctr	WinnDixie Shopping Ctr	NW Canal Confluence
Mean Annual	0.9	1.21	1.49	2.19	2.67	2.69	3.51	3.52	3.83	4.11	4.35	4.42	4.46	4.5	4.51	4.81	4.82	5.06	5.26	5.27	5.29	5.29
25YR-24HR	0.9	1.44	1.92	2.77	3.24	3.26	4.3	4.36	4.68	4.98	5.14	5.2	5.25	5.3	5.31	5.7	5.76	6.04	6.26	6.27	6.4	6.41
100YR-24HR	0.9	1.72	2.61	3.42	3.83	3.87	5.08	5.17	5.49	5.76	5.84	5.9	5.95	6	6.06	6.47	6.57	6.84	7.07	7.08	7.31	7.32

FIGURE 4.12
CITY OF HOLLY HILL, FLORIDA
LPGA CANAL EXISTING CONDITIONS WITH 100 YEAR STILLWATER



	Halifax River	Riverside Drive	Riverside Drive	Sica Hall	Daytona Ave	Daytona Ave	Ridgewood Ave	Ridgewood Ave	Magnolia Ave	Railroad Tressel	Railroad Tressel	NE Canal Confluence	Cave Ave	Alta Road	Alta Road	Center Street	Center Street	Indian Oaks	Nova Canal Confluence	WinnDixie Shopping Ctr	WinnDixie Shopping Ctr	NW Canal Confluence
Mean Annual	3.8	3.81	4.06	4.15	4.22	4.23	4.56	4.59	4.72	4.86	4.93	4.97	4.99	5.02	5.02	5.22	5.23	5.39	5.55	5.55	5.57	5.57
25YR-24HR	3.8	3.83	4.28	4.42	4.53	4.55	5.08	5.13	5.32	5.49	5.55	5.59	5.63	5.67	5.69	6	6.06	6.28	6.47	6.48	6.57	6.58
100YR-24HR	3.8	3.85	4.61	4.79	4.94	4.97	5.72	5.8	6	6.16	6.2	6.24	6.28	6.32	6.38	6.73	6.83	7.06	7.26	7.27	7.43	7.44

5.0 PROPOSED DRAINAGE SYSTEM IMPROVEMENTS

5.1 General Discussion

Upon completion of the existing system model and validation, several projects were considered to improve the drainage system for both water quantity and quality improvements. The water quantity discharged to the Halifax River must be considered for both flood protection and pollutant load reduction. Increases in the stormwater discharges to the Halifax River can benefit the City in providing reduced flood stages but harm the Halifax River estuary by increasing pollutant loadings. Therefore, the City is bound by regulations to show there is a positive effect to the estuary when implementing projects that increase volume discharges. The combination of projects to be implemented must include water quality improvements along with the flood protection aspects.

With that, we have broken the project into two categories, 1) Flood Protection/(reduction of peak stages) and 2) Water Quality Improvement. Several projects proposed have both flood protection and water quality improvement aspects such as those recommending detention ponds. The ponds provide volume attenuation and pollution treatment aspects.

The following sections identify the projects proposed with descriptions, conceptual level designs and cost estimates.

5.2 Recommended Flood Reduction Projects

5.2.1 Project 1 – LPGA Canal Pump Station and Backflow Gate

To assist with reducing flooding and recover from extreme storm events, three projects are recommended that include pumping and backflow prevention to reduce the tidal effect on the drainage system.

Project 1 includes a pump station capable of moving 500 cubic feet per second (cfs) or 225,000 gpm. The proposed configuration includes three (3) diesel engine driven propeller pumps rated at 75,000 gpm each and a backflow preventing tide gate that would be closed during high tides and pumping.

Figure 5.1 shows the plan view and section of the pump station proposed to be located behind Sica Hall. The cost for this project is presented below and includes several hundred feet of canal bank armoring to control erosion from the velocities produced by the pumps.

The protocol for operation of this system would be at the discretion of City Staff. It is possible for the City to utilize the pumps and tide gate to pump the drainage system out prior to a major predicted storm to provide valuable storage in the canals and adjacent ponds. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.1.***

Table 5.1
City Of Holly Hill, Florida
Project 1 – LPGA Canal Pump Station

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
L001-020U	Riverside Drive Culvert	1.49	1.80	1.92	2.13
L001-040U	Daytona Ave Culvert	2.69	2.08	3.26	2.57
L001-060U	Ridgewood Culvert	3.52	3.20	4.36	4.08
L001-090U	Upstream of Railroad Tracks	4.35	4.24	5.14	5.04

Although the results do not show much improvement in stages, the benefit of evacuating flood waters after the storm peak is a benefit.

5.2.2 Project 2 – Granada Street Pump Structure and Canal Connection

Project 2 is the Granada Street pump and baffle box to be located on the 48" RCP termination at the Halifax River. This project includes a 30-inch pipe connection from State Avenue to the east side of Ridgewood Avenue (US-1) along Calle Grande Avenue. This pipe connection and the pump would in essence create an additional outfall to the Northeast Canal drainage system from the west side of the F.E.C. Railroad which is very much needed to help reduce flooding.

The proposed configuration of the pump and baffle box system at the Granada Street and Riverside Drive is shown in ***Figures 5.3*** and ***5.4***. A motor-operated sluice gate is included to provide tidal backflow prevention when operating the pump during extreme tides. The pump is proposed to be fixed diesel engine driven or a portable pump option, whichever the City desires. The portable pump option would require manpower to mobilize the pump for operation which may be impractical due to staff availability prior to or during a storm event. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.2***.

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 1

Item	Deficiency Description or Location	Proposed Retrofit Improvements				
	LPGA Canal Pump Station and Backflow Gate	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$200,000.00	$200,000.00
	- Site preparation	Demo and remove existing structures	1	LS	$80,000.00	$80,000.00
	- Site preparation	Dewatering and flow diversion	1	LS	$150,000.00	$150,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	$50,000.00	$50,000.00
	- Canal Bank Armoring	Retaining Wall	2,000	LF	$500.00	$1,000,000.00
	- Pump Station incl structure	500 cfs pump station -eng drivn	1	LS	$3,500,000.00	$3,500,000.00
	- Tide Gate	Tide Gate	1	LS	$750,000.00	$750,000.00
	- Erosion control countermeasures	Stone rubble rip rap	200	TN	$70.00	$14,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$80,000.00	$80,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$5,824,000.00
- Mobilization @	5%	$291,200.00
- Contingencies @	10%	$582,400.00
SUB-TOTAL OF CONSTRUCTION COST		$6,697,600.00
- Eng Design & Permitting @	5.5%	$368,368.00
- Subconsultants @	2%	$133,952.00
- Constr Admin and Insp @	6%	$401,856.00
TOTAL PROJECT COST		**$7,601,776**

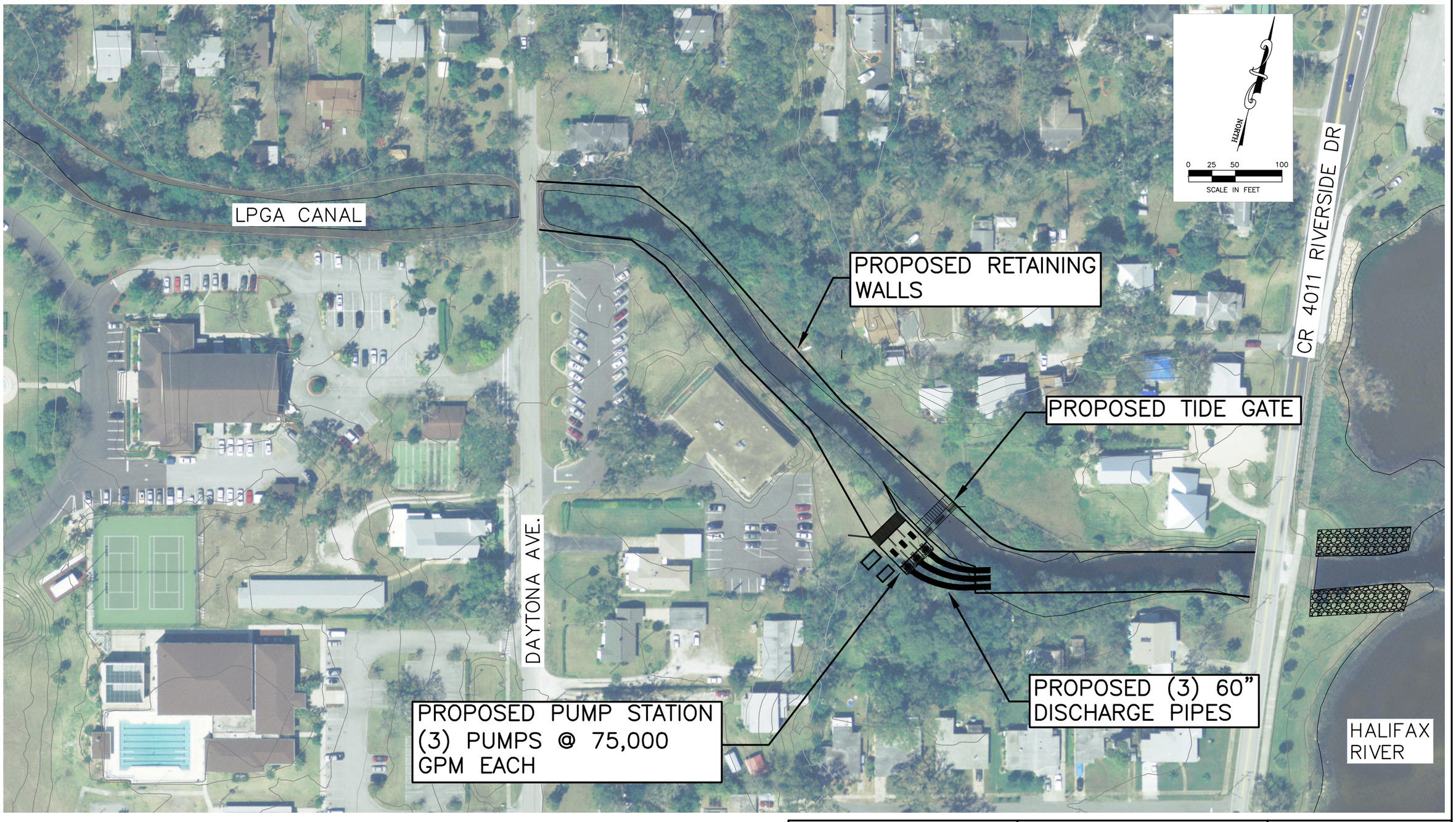


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FIGURE 5.1
PROJECT #1
LPGA ALTERNATE
PUMP AROUND

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Table 5.2
City Of Holly Hill, Florida
Project 2 – Granada Street Pump Station

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
H010-010	Granada St	7.54	4.13	9.33	8.56
H020-010	Ridgewood at Granada St	8.65	4.59	9.74	9.02
E010-010	State Ave at Aragon St	4.72	4.28	5.39	5.37
E010-030	State Ave at Flomich St	4.75	4.72	5.72	5.38

5.2.3 Projects 3 & 4 – 2nd Street and 3rd Street Pump Structure and Canal Connection

Projects 3 and 4 are similar in nature to the Granada Street project in that they provide an additional outlet from the canal system which flows through the Southeast Canal to LPGA Canal. Again, additional outlets are needed due to the LPGA Canal system being undersized for the watershed it serves.

The proposed pump station and baffle box configuration is shown in ***Figure 5.4.*** The plan for the location of the stations is shown in ***Figure 5.3.*** A 36" pipe connection from Carswell Avenue to the east side of Ridgewood along 3rd Street is required to make the connection from the Southeast Canal. Similar to the Granada Street pump, these stations can utilize a portable pump in place of a fixed diesel engine driven pump. A conceptual level cost estimate follows for each of these projects. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.3***. ***Figure 5.5*** is a location map showing where projects 2, 3 and 4 are proposed.

Stormwater Master Plan Update
Preliminary Cost Estimate

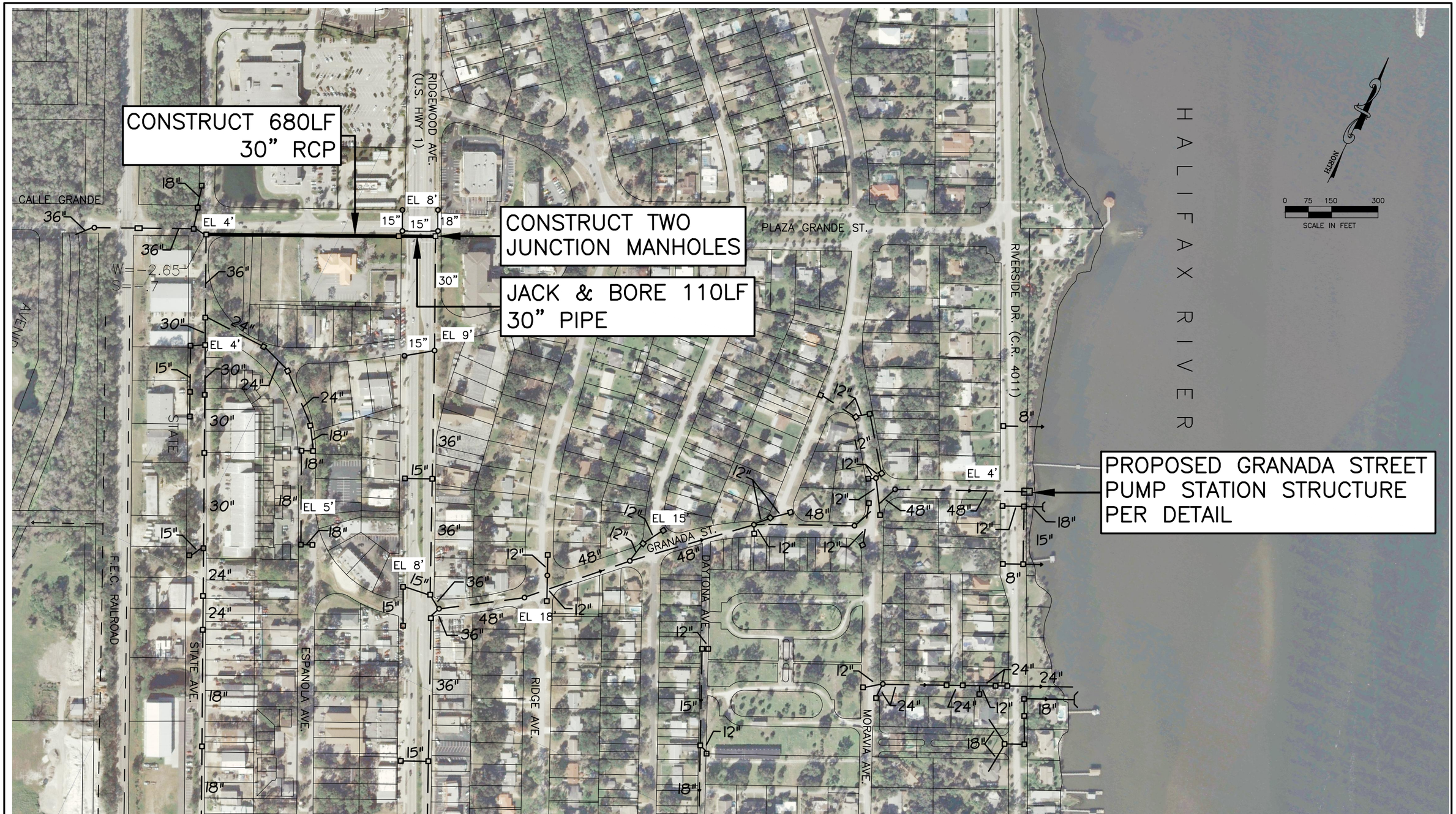
Project 2

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Granada Street Pump Structure & Canal Connection	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$50,000.00	$50,000.00
	- Site preparation	Demo and remove existing structures	1	LS	$40,000.00	$40,000.00
	- Site preparation	Dewatering and flow diversion	1	LS	$30,000.00	$30,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	$25,000.00	$25,000.00
	- Storm Pipe	30" RCP	680	LF	$85.00	$57,800.00
	- Storm Pipe Jack and Bore	30" Steel Pipe in Carrier	100	LF	$300.00	$30,000.00
	- Pump	12,000 gpm pump -eng drivn	1	LS	$150,000.00	$150,000.00
	- Pump Structure	30' x 10' Conc. Struct w/Sluice Gate	1	LS	$120,000.00	$120,000.00
	- Erosion control countermeasures	Stone rubble rip rap	50	TN	$70.00	$3,500.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$80,000.00	$80,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$586,300.00
- Mobilization @	5%	$29,315.00
- Contingencies @	10%	$58,630.00
SUB-TOTAL OF CONSTRUCTION COST		$674,245.00
- Eng Design & Permitting @	5.5%	$37,083.48
- Subconsultants @	2%	$13,484.90
- Constr Admin and Insp @	6%	$40,454.70
TOTAL PROJECT COST		**$765,268**



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CITY OF HOLLY HILL
STORMWATER
MASTER PLAN UPDATE
2014

FIGURE 5.2
PROJECT #2
GRANADA STREET
PUMP STATION

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Table 5.3
City Of Holly Hill, Florida
Project 3 & 4 – 2nd Street and 3rd Street Pump Stations

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
H160-040	Riverside Drive at 3rd St	2.32	1.44	2.55	1.62
H160-030	Burleigh St at 3rd St	3.70	2.92	4.17	3.35
H160-020	Daytona Ave at 3rd St	4.94	4.23	5.68	4.88
H210-010	Riverside Drive at 4th St	2.76	2.64	3.15	3.02
H220-040	Mason Ave at Riverside Drive	2.78	2.77	3.45	3.43
H160-010	Ridgewood Ave at 3rd St	7.14	6.55	8.38	7.69

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 3

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	3rd Street Pump Structure and Canal Connection	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$50,000.00	$50,000.00
	- Site preparation	Demo and remove existing structures	1	LS	$40,000.00	$40,000.00
	- Site preparation	Dewatering and flow diversion	1	LS	$30,000.00	$30,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	$25,000.00	$25,000.00
	- Storm Pipe	36" RCP	600	LF	$95.00	$57,000.00
	- Storm Pipe Jack and Bore	36" Steel Pipe in Casing	100	LF	$350.00	$35,000.00
	- Pump	12,000 gpm pump -eng drivn	1	LS	$150,000.00	$150,000.00
	- Pump Structure	30' x 10' Conc. Struct w/Sluice Gate	1	LS	$120,000.00	$120,000.00
	- Erosion control countermeasures	Stone rubble rip rap	50	TN	$70.00	$3,500.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$80,000.00	$80,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$590,500.00
- Mobilization @	5%	$29,525.00
- Contingencies @	10%	$59,050.00
SUB-TOTAL OF CONSTRUCTION COST		$679,075.00
- Eng Design & Permitting @	5.5%	$37,349.13
- Subconsultants @	2%	$13,581.50
- Constr Admin and Insp @	6%	$40,744.50
TOTAL PROJECT COST		**$770,750**

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

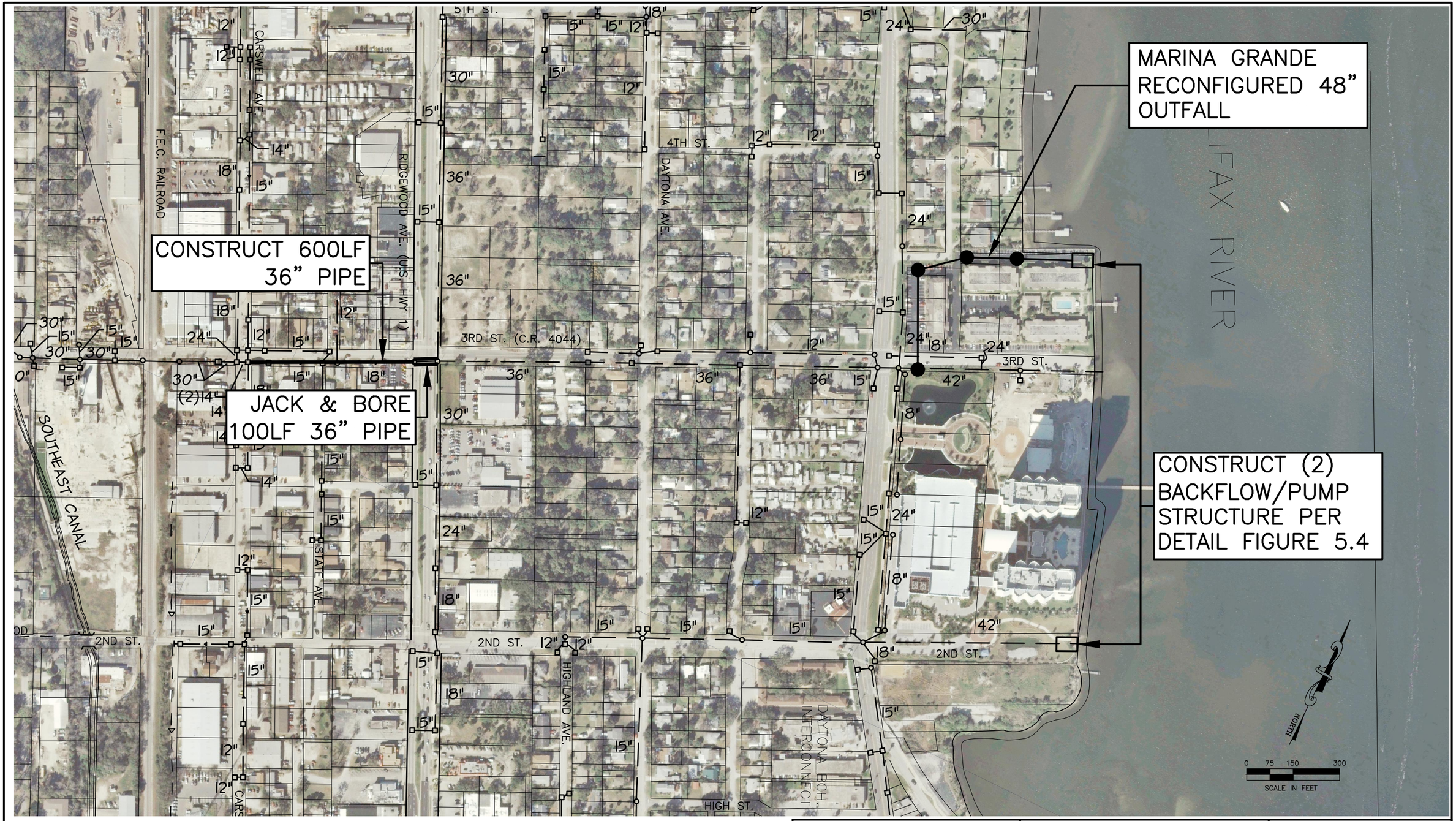
Project 4

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	2nd Street Pump Structure	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$20,000.00	$20,000.00
	- Site preparation	Demo and remove existing structures	1	LS	$5,000.00	$5,000.00
	- Site preparation	Dewatering and flow diversion	1	LS	$20,000.00	$20,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	$10,000.00	$10,000.00
	- Pump	12,000 gpm pump -eng drivn	1	LS	$150,000.00	$150,000.00
	- Pump Structure	30' x 10' Conc. Struct w/Sluice Gate	1	LS	$120,000.00	$120,000.00
	- Erosion control countermeasures	Stone rubble rip rap	50	TN	$70.00	$3,500.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$80,000.00	$80,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$408,500.00
- Mobilization @	5%	$20,425.00
- Contingencies @	10%	$40,850.00
SUB-TOTAL OF CONSTRUCTION COST		$469,775.00
- Eng Design & Permitting @	5.5%	$25,837.63
- Subconsultants @	2%	$9,395.50
- Constr Admin and Insp @	6%	$28,186.50
TOTAL PROJECT COST		**$533,195**



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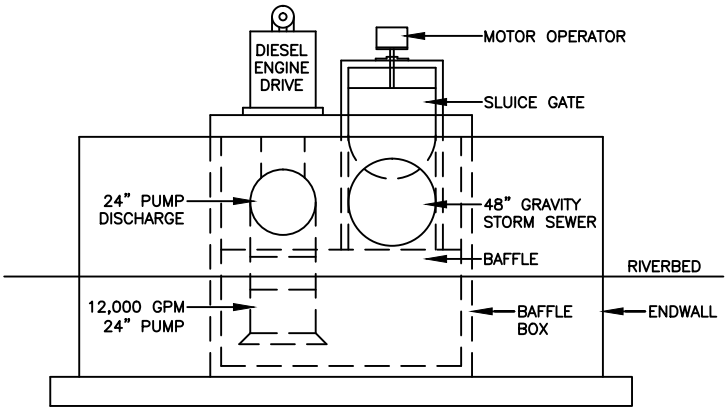
CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.3
PROJECTS 3 & 4
2ND & 3RD STREET PUMP STATIONS

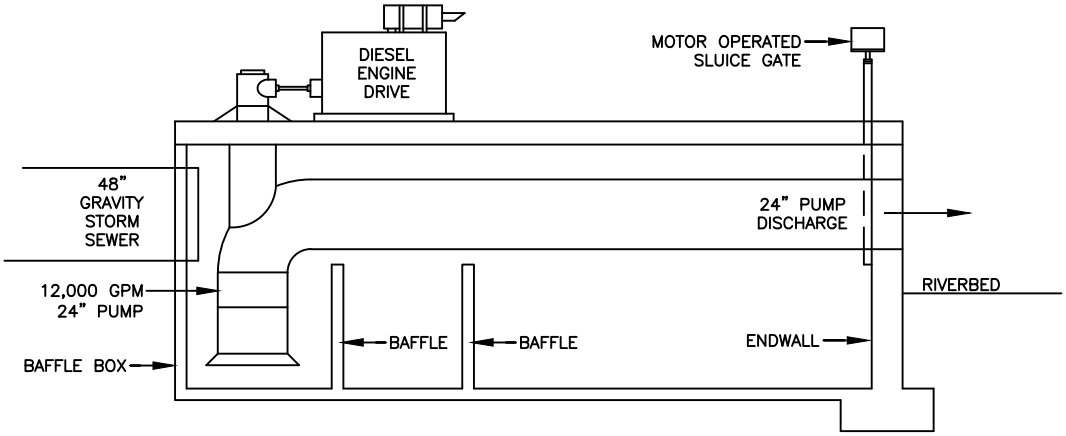
S:\HH\HH113 Stormwater Master Plan Update\Production\Design\CAD\DWGS\HH113 2nd & 3rd St Pump Station_FIG5-3.dwg, HH113_1 2nd & 3rd Pmp Sta_REVISED, 12/12/2014 11:09:13 AM, PJ

NOTE: THE DIESEL ENGINE DRIVEN PUMP MAY BE SUBSTITUTED FOR A PORTABLE PUMP TO BE MOBILIZED PRE-STORM.



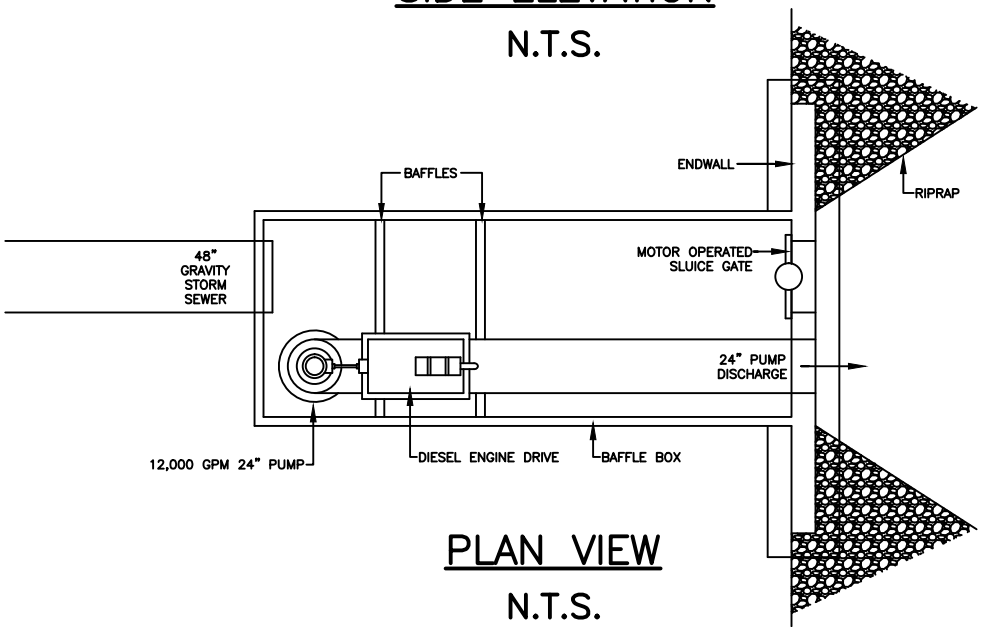
FRONT ELEVATION

N.T.S.



SIDE ELEVATION

N.T.S.



PLAN VIEW

N.T.S.

QUENTIN L. HAMPTON ASSOC., INC. CONSULTING ENGINEERS FLORIDA CERTIFICATE OF AUTHORIZATION NUMBER: 626 FAX: 386.761.3977 P.O. DRAWER 290247 PORT ORANGE, FL 32129-0247 PHONE: 386.761.6810	**CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014**	***FIGURE 5.4*** ***GRANADA STREET PUMP STATION - 2ND & 3RD STREET BAFFLE BOX STRUCTURES***

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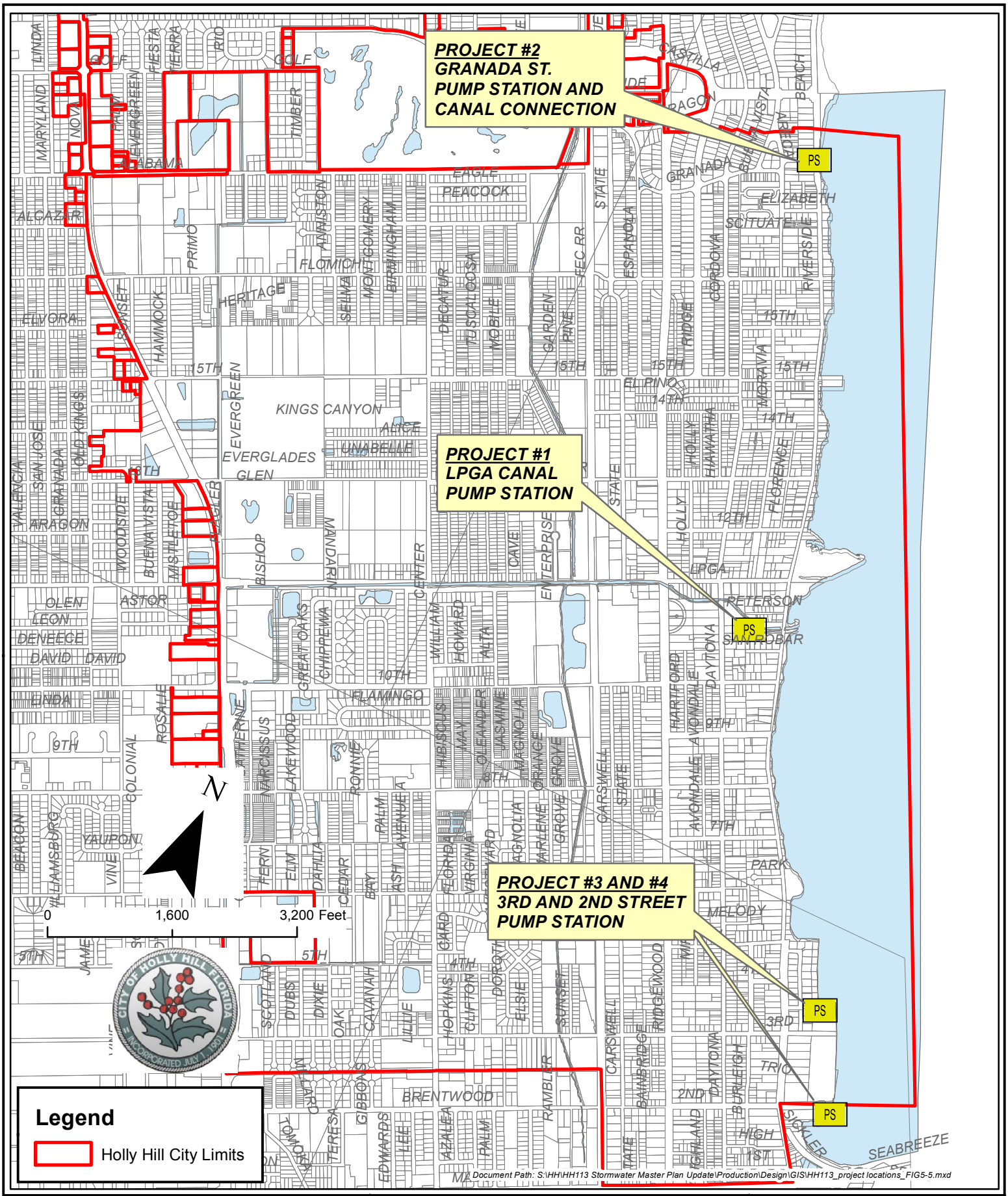

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CITY OF HOLLY HILL STORMWATER MASTER PLAN

FIGURE 5.5

PROJECTS 1, 2, 3, 4 LOCATIONS

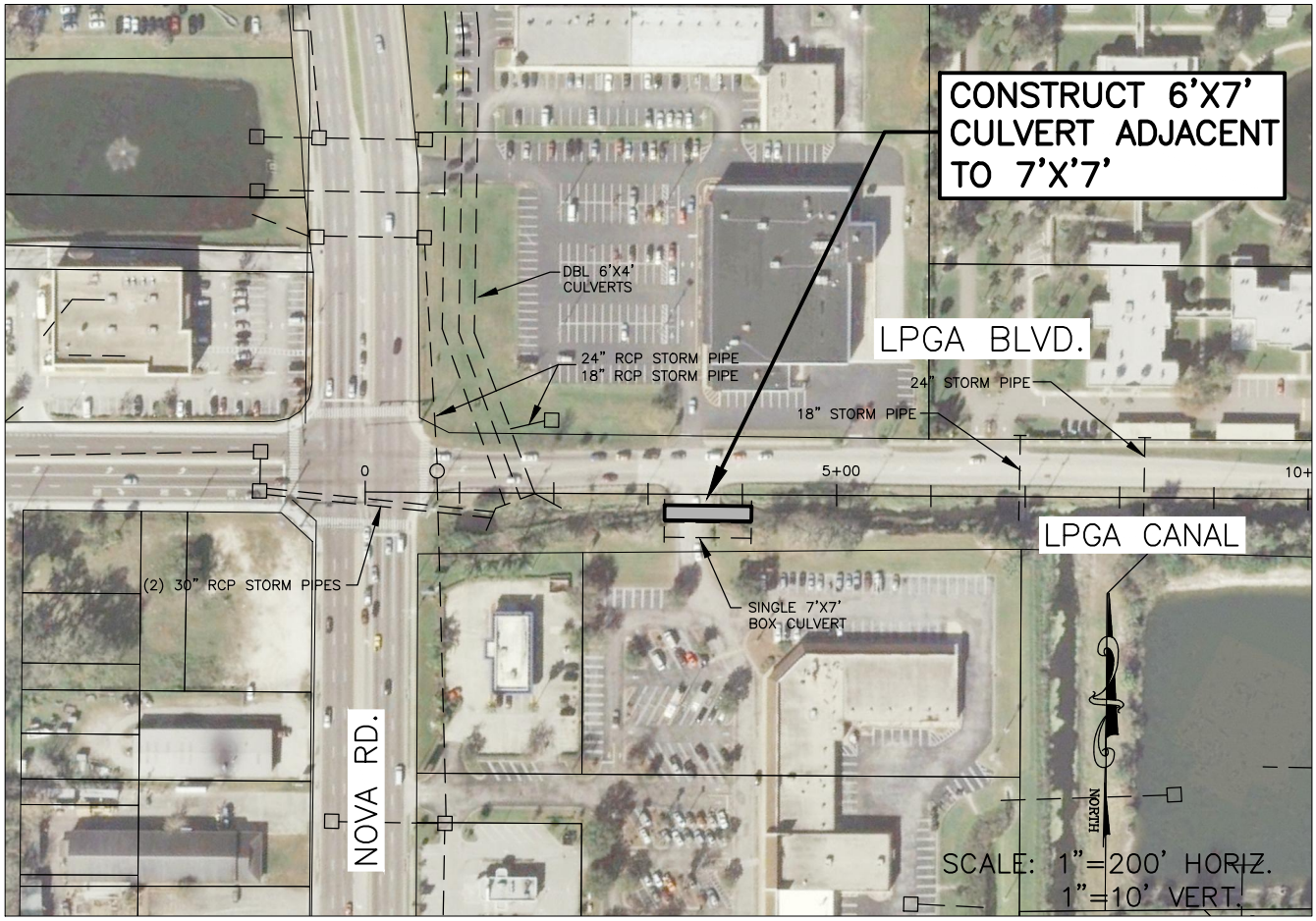
5.2.4 Project 5 – Holly Hill Plaza Culvert Replacement

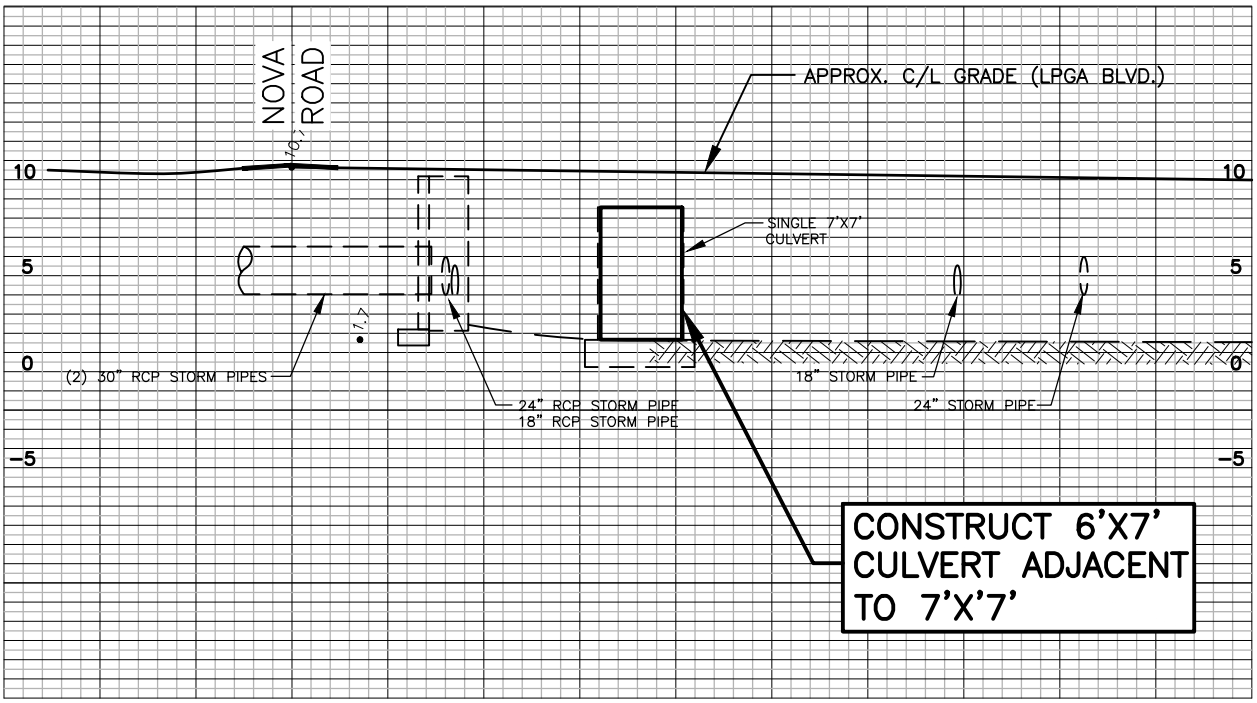
The existing culvert in the LPGA Canal under the Holly Hill Plaza entrance is a single 7-ft. x 7-ft. (49 SF) box culvert. The culverts upstream, connecting the Nova Canal to the Northwest Canal, are double 6-ft. x 6-ft. culverts (72 SF). The culvert downstream of the plaza is at Center Street which is a 33.5-ft. x 7-ft. bridge (234 SF). Modeling results show there is approximately a one (1) foot headloss caused from the reduced size of the plaza culvert.

It is recommended the culvert be replaced with a size equal to the upstream or double the size it is now. A plan view of the culvert location is shown in ***Figure 5.6.*** A conceptual level cost estimate follows. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.4.***

Table 5.4
City Of Holly Hill, Florida
Project 5 – Holly Hill Plaza Culvert Replacement

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
L001-200D	Holly Hill Plaza Culvert Downstream	5.27	5.02	6.27	6.12
L001-200U	Holly Hill Plaza Culvert Upstream	5.29	5.02	6.4	6.21
W001-030D	Walker Street Culvert	5.4	5.05	6.77	6.55





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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.6
PROJECT #5
ADDITIONAL CULVERT AT HOLLY HILL PLAZA & LPGA CANAL

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Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 5

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	LPGA Canal and Holly Hill Plaza Culvert Replacement	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$20,000.00	$20,000.00
	- Site preparation	Demo and remove existing structures	1	LS	$5,000.00	$5,000.00
	- Site preparation	Dewatering and flow diversion	1	LS	$20,000.00	$20,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	$10,000.00	$10,000.00
	- Culvert Replacement	Install 6' x 7' Culvert	1	LS	$150,000.00	$150,000.00
	- Culvert Replacement	Endwalls	1	LS	$80,000.00	$80,000.00
	- Erosion control countermeasures	Stone rubble rip rap	50	TN	$70.00	$3,500.00
	- Right-of-way restoration	Pavement, Sodding, landscaping, etc.	1	LS	$30,000.00	$30,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$318,500.00
- Mobilization @	5%	$15,925.00
- Contingencies @	10%	$31,850.00
SUB-TOTAL OF CONSTRUCTION COST		$366,275.00
- Eng Design & Permitting @	5.5%	$20,145.13
- Subconsultants @	2%	$7,325.50
- Constr Admin and Insp @	6%	$21,976.50
TOTAL PROJECT COST		**$415,722**

5.2.5 Project 6 – Riviera Country Club Pond Interconnects and Diversion

This project area is located within the northern part of Holly Hill and will serve to improve the Riviera Country club with a basin area greater than 80 acres. The project consists of installing RCP pipes between several ponds, installing a weir, and regrading the ditch currently existing on the southern edge of the Country Club to flow west. ***Figure 5.7*** is a conceptual plan of the improvements which includes the locations for the proposed connecting pipes, and the existing ditch needing to be regraded.

This project will require an agreement/easements from the Riviera Country Club owner. The project would allow stormwater to be diverted into the golf club's ponds for treatment prior to discharge. The available storage in the ponds will attenuate peak storm discharge rates from the north region of the City.

Conceptual level cost estimates follow this page. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.5.***

Table 5.5
City Of Holly Hill, Florida
Project 6 – Riviera Country Club Pond Interconnect and Diversion

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
E070-010	East Side of Riviera Country Club	3.98	3.84	5.02	5.12
E080-010	Flomich Street at Center Ave	6.95	6.97	7.5	7.51
E080-020	South side of Riviera Country Club	4.33	4.42	5.19	5.12
W010-010	West Side of Riviera Country Club	5.39	4.48	6.45	5.90
W030-020	Mirage Pond	6.05	2.26	6.82	4.57

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

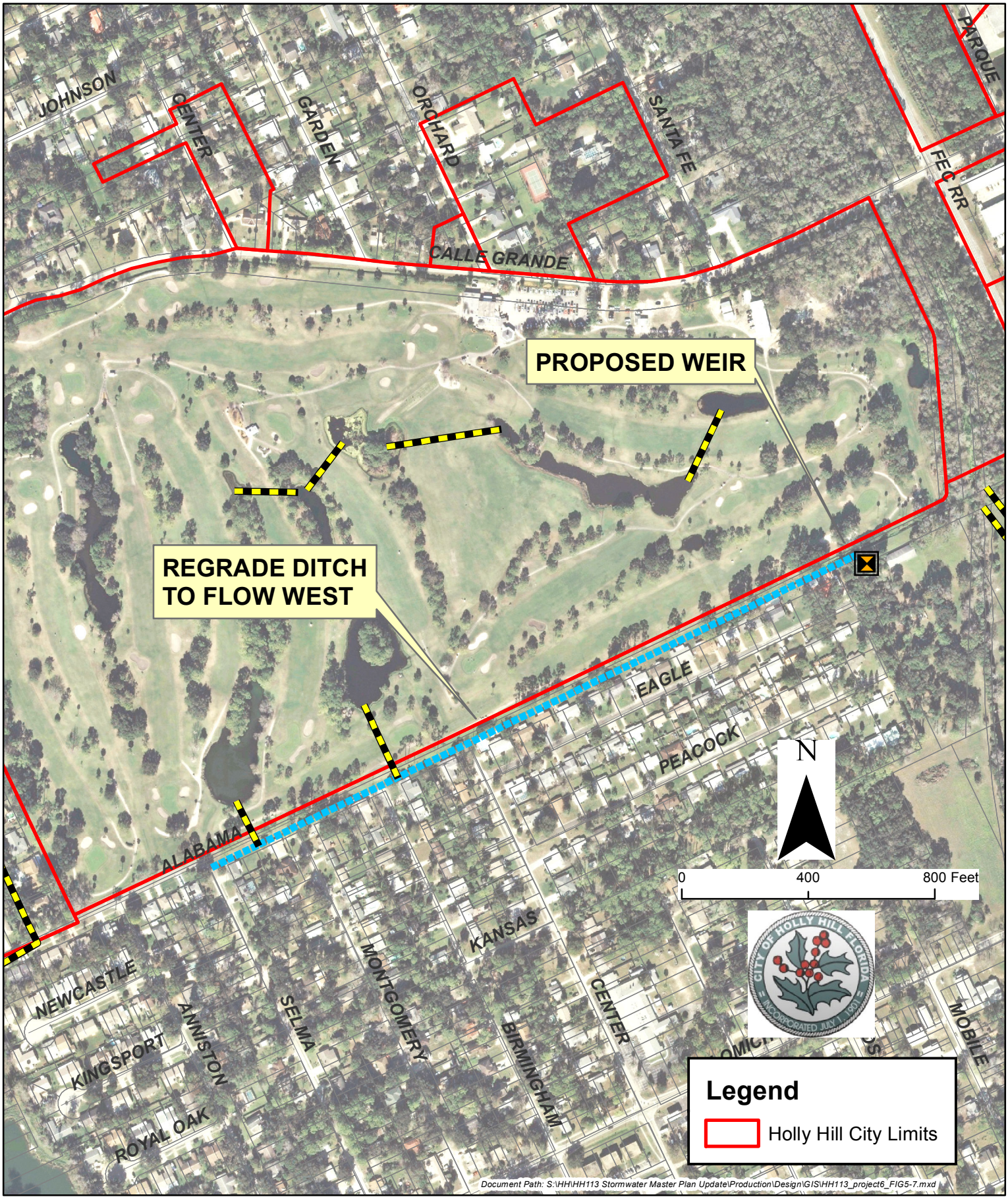
Project 6

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Riviera Country Club	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$22,500.00	$22,500.00
	- Site preparation	Dewatering	1	LS	$11,250.00	$11,250.00
	- Construction management	Maintenance of traffic, signage	1	LS	$11,250.00	$11,250.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$4,500.00	$4,500.00
	- Storm pipe	15" RCP	1,500	LF	$40.00	$60,000.00
	- Grading Work	Regrade ditch west	1,500	LF	$30.00	$45,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	3	EA	$2,400.00	$7,200.00
	- Proposed Weir	Weir Installation	1	EA	$4,000.00	$4,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$75,000.00	$75,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$240,700.00
- Mobilization @	5%	$12,035.00
- Contingencies @	10%	$24,070.00
SUB-TOTAL OF CONSTRUCTION COST		$276,805.00
- Eng Design & Permitting @	5.5%	$15,224.28
- Subconsultants @	2%	$5,536.10
- Constr Admin and Insp @	6%	$16,608.30
TOTAL PROJECT COST		**$314,174**



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.7
PROJECT #6
RIVIERA COUNTRY CLUB IMPROVEMENTS

5.2.6 Project 7 – Bishop's Farm Detention Pond

This project area is located north on Flomich Street adjacent to the Northeast Canal in the northern part of the City and will serve a drainage area of 30 acres. The project consists of purchasing Bishop's Farm property, constructing a wet detention pond and installing two control structures to reroute the northeast canal through the proposed detention pond. The wet detention pond will provide help attenuation peak stages while also reducing the amount of pollutant discharged downstream. ***Figure 5.8*** is a conceptual plan of the improvements which includes construction of the detention pond, installation of two control structures, and installation of connecting pipe.

Any excess runoff will be discharged into the Northeast Canal where it currently discharges. However with this project, the system will provide treatment year round, thereby reducing the amount of pollutants being sent to the Halifax River.

Conceptual level cost estimates follow this page. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.6.*** The annual pollutant removal quantities anticipated with the implementation of this project is contained in Section 6.

Table 5.6
City Of Holly Hill, Florida
Project 7 – Bishop's Farm Detention Pond

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
E001-150D	Calle Grande Culvert	4.32	4.26	5.19	5.15
E001-090U	Flomich St. Culvert	4.33	4.27	5.19	5.15
E001-105	Proposed Pond		4.26		5.15

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 7

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Bishop's Farm Detention Pond	Item Description	Quantity	Unit	Unit Cost	Amount
1	Land Acquisition	Obtain Property	1	LS	$750,000.00	$750,000.00
2	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$5,000.00	$5,000.00
	- Pond Construction	Excavation, control struc, exc.	1	LS	$115,000.00	$115,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	$1,500.00	$1,500.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$1,500.00	$1,500.00
	- Storm pipe	42" RCP	200	LF	$120.00	$24,000.00
	- Control Structure	Flow control structure	2	EA	$4,000.00	$8,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$10,000.00	$10,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$915,000.00
- Mobilization @	5%	$45,750.00
- Contingencies @	10%	$91,500.00
SUB-TOTAL OF CONSTRUCTION COST		$1,052,250.00
- Eng Design & Permitting @	5.50%	$57,873.75
- Subconsultant @	2%	$21,045.00
- Constr Admin and Insp @	6%	$63,135.00
TOTAL PROJECT COST		**$1,194,304**

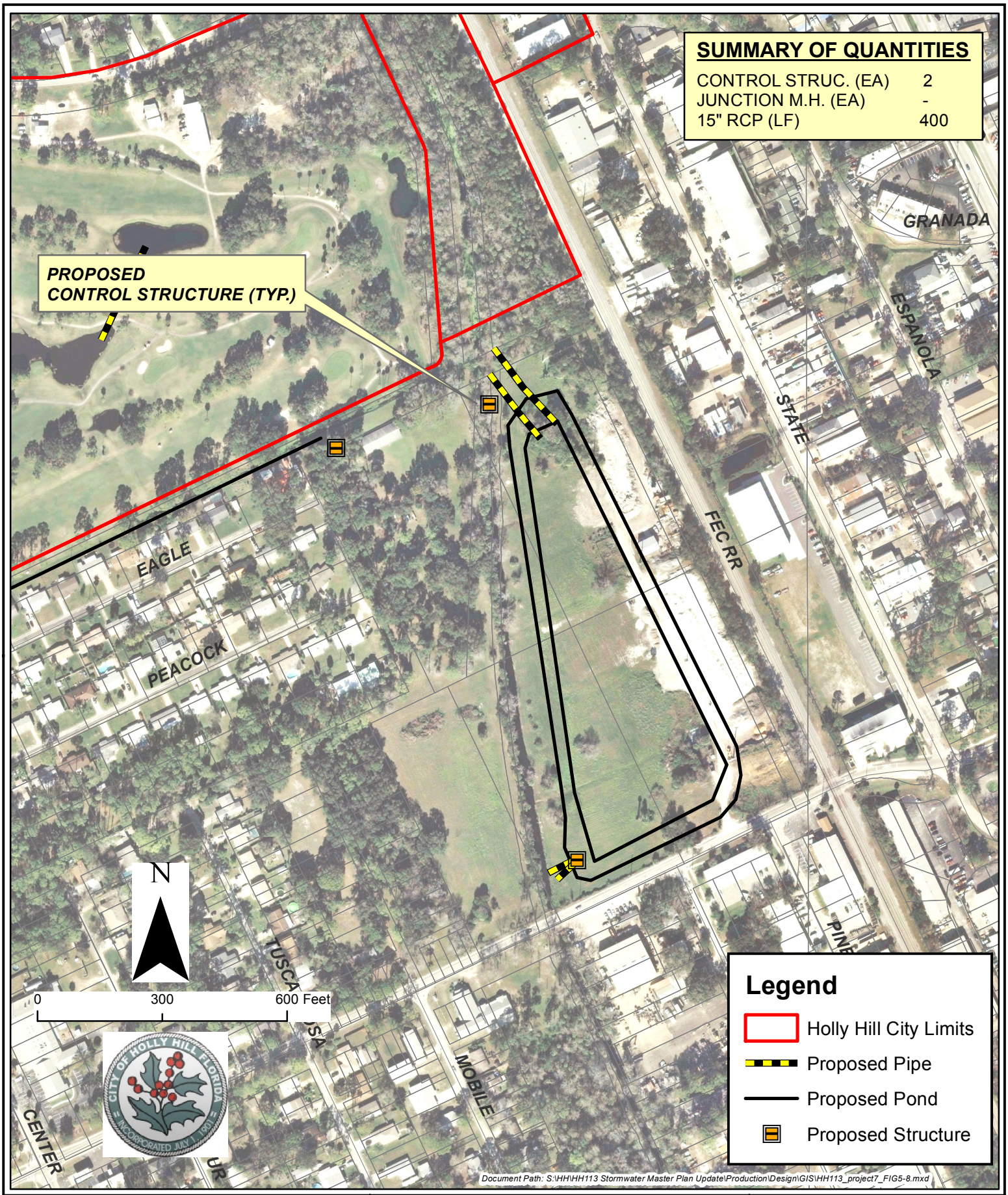

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FIGURE 5.8
PROJECT 7
BISHOP'S FARM
PROPOSED
DETENTION POND

5.2.7 Project 8 – 6th Street Detention Pond

This project area is located west of Center Street and south of 6th Street and will serve a drainage basin area of 70 acres. The project consists of purchasing the vineyard property and constructing a wet detention pond along with structures and connecting pipe. The wet detention pond will provide flood attenuation while also reducing the amount of pollutant discharge from the surrounding area. ***Figure 5.9*** is a conceptual plan of the improvements which includes construction of the detention pond, installation of a control structure, and installing connecting pipe with inlets.

Any excess runoff will be discharged into the Nova Canal where it currently discharges. With this project the system will provide treatment year round, thereby reducing the amount of pollutants being sent to the Halifax River.

Conceptual level cost estimates follow this page. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.7.*** The annual pollutant removal quantities anticipated with the implementation of this project is contained in Section 6.

Table 5.7
City Of Holly Hill, Florida
Project 8 – 6th Street Detention Pond

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
N060-010	3rd and Center St.	8.05	8.04	8.34	8.33
N060-070	Proposed Pond		6.77		7.74

Stormwater Master Plan Update

Preliminary Construction Cost Estimate

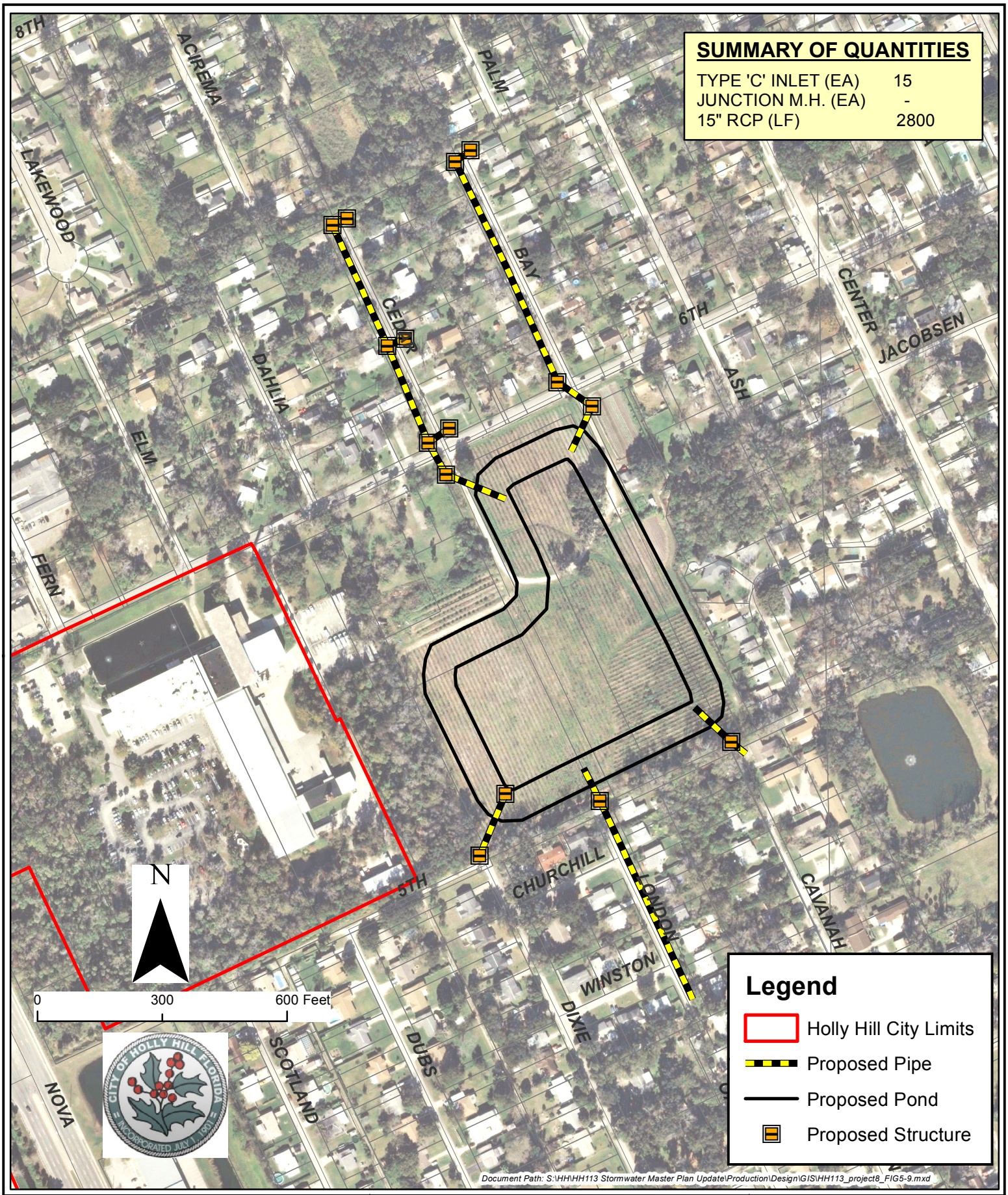
Project 8

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	6th St Detention Pond	Item Description	Quantity	Unit	Unit Cost	Amount
1	Land Acquisition	Obtain Property	1	LS	$126,000.00	$126,000.00
2	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$50,000.00	$50,000.00
	- Pond Construction	Excavation, control struc, exc.	1	LS	$118,000.00	$118,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	$1,500.00	$1,500.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$1,500.00	$1,500.00
	- Storm pipe	15" RCP	2,800	LF	$60.00	$168,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	15	EA	$2,400.00	$36,000.00
	Roadway open cut and restoration (40' pavement)	Asphalt, base and subgrade	200	SY	$40.00	$8,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$140,000.00	$140,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$649,000.00
- Mobilization @	5%	$32,450.00
- Contingencies @	10%	$64,900.00
SUB-TOTAL OF CONSTRUCTION COST		$746,350.00
- Eng Design & Permitting @	5.5%	$41,049.25
- Subconsultants @	2%	$14,927.00
- Constr Admin and Insp @	6%	$44,781.00
TOTAL PROJECT COST		**$847,107**



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.9
PROJECT 8
6TH ST.
PROPOSED
DETENTION POND

5.2.8 Project 9 – The Mirage Property Detention Pond

This project area is located between Flomich Street and Alabama Avenue, and west of Selma Avenue, in the northwest part of the City. It will serve a drainage basin area of 50 acres. The project consists of purchasing the Mirage development property and constructing a wet detention pond. The wet detention pond will provide flood attenuation while also reducing the amount of pollutant discharge from the surrounding area. ***Figure 5.10*** is a conceptual plan of the improvements which includes construction of the detention pond, installation of a control structure, and installing connecting pipe with inlets. .

The untreated streets east of the pond including Timber Trail, Montgomery Avenue, Selma Avenue, Anniston Avenue and Flomich Street are also to be directed to the pond with a few diversion structures and pipes. A control structure located in the southwest corner of the pond would allow discharge into the Northwest Canal after treatment and flow through.

Any excess runoff will be discharged into the Nova Canal where it currently discharges. With this project the system will provide treatment year round, thereby reducing the amount of pollutants being sent to the Halifax River.

Conceptual level cost estimates follow this page. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.8.*** The annual pollutant removal quantities anticipated with the implementation of this project is contained in Section 6.

Table 5.8
City Of Holly Hill, Florida
Project 9 – Mirage Property Detention Pond

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
W010-010	West side of Riviera CC	5.39	4.95	6.45	6.18
W030-010	Anniston Avenue	6.32	6.26	6.82	6.51
W040-010	Flomich St near Selma Ave	5.48	5.12	6.92	6.69
W001-090	South of Alabama Culvert	5.5	5.26	6.82	6.52
W030-020	Proposed Pond		3.88		5.73

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

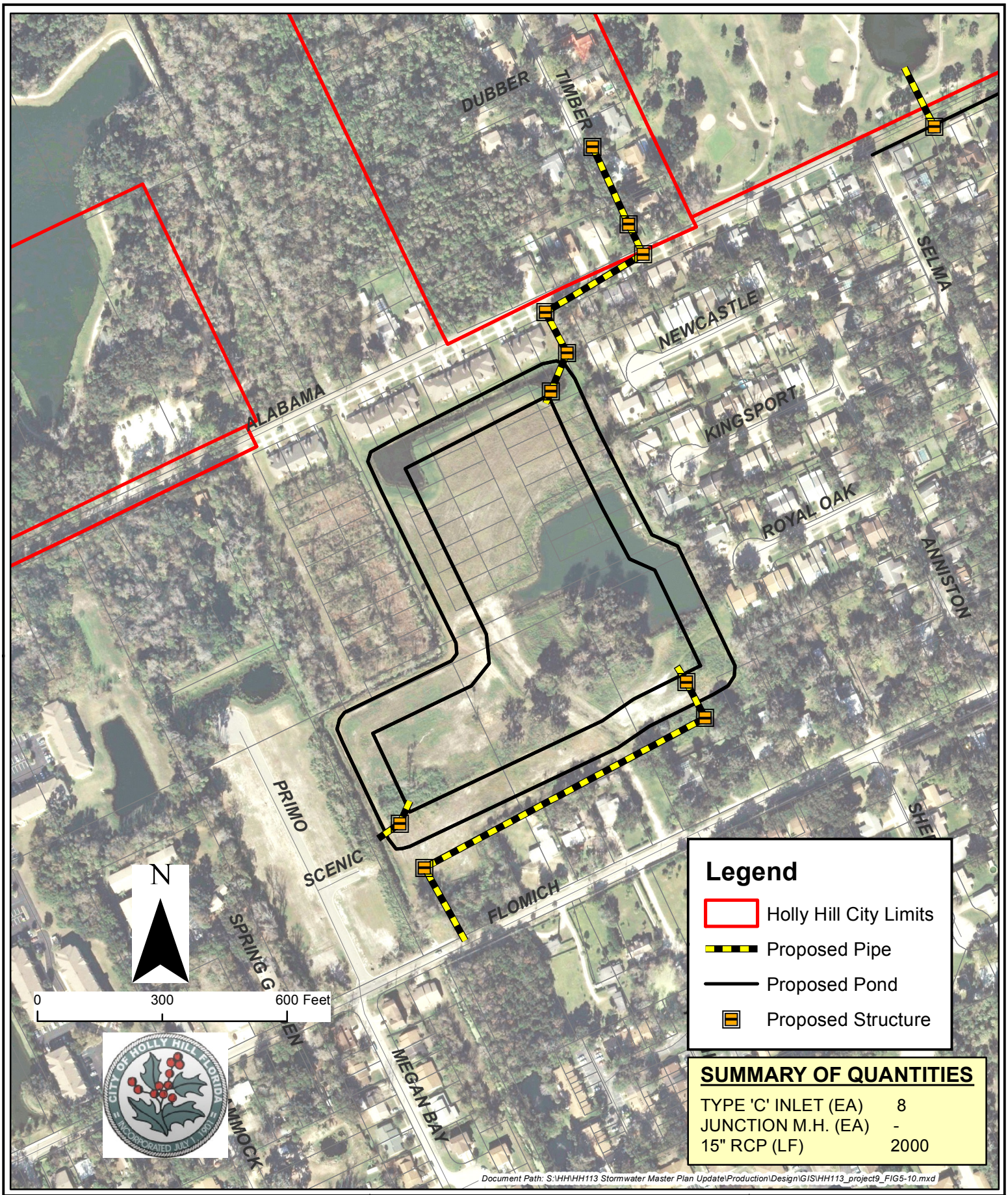
Project 9

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Mirage Site Detention Pond	Item Description	Quantity	Unit	Unit Cost	Amount
1	Land Acquisition	Obtain Property	1	LS	$395,000.00	$395,000.00
2	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$2,000.00	$2,000.00
	- Pond Construction	Excavation, control struc, exc.	1	LS	$160,000.00	$160,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	$1,500.00	$1,500.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$1,500.00	$1,500.00
	- Storm pipe	15" RCP	2,000	LF	$60.00	$120,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	8	EA	$2,400.00	$19,200.00
	Roadway open cut and restoration (20' pavement)	Asphalt, base and subgrade	100	SY	$40.00	$4,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$100,000.00	$100,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$803,200.00
- Mobilization @	5%	$40,160.00
- Contingencies @	10%	$80,320.00
SUB-TOTAL OF CONSTRUCTION COST		$923,680.00
- Eng Design & Permitting @	5.5%	$50,802.40
- Subconsultants @	2%	$18,473.60
- Constr Admin and Insp @	6%	$55,420.80
TOTAL PROJECT COST		**$1,048,377**



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.10
PROJECT 9
MIRAGE
PROPOSED
DETENTION POND

5.2.9 Project 10 – Old King's Road Detention Pond

This project area is located west of the city limits of Holly Hill but it will attenuate peak discharges to the Nova Canal. The project serves a drainage basin area of 45 acres. The project consists of constructing a wet detention pond along Old King's Rd, north of 13th St. The wet detention pond will provide flood attenuation while also reducing the amount of pollutant discharge from the surrounding area. ***Figure 5.11*** is a conceptual plan of the improvements which include construction of the detention pond, installation of a control structure, inlets, and installing connecting pipe.

Any excess runoff will be discharged into the Northwest Canal where it currently discharges. However with this project the system will provide treatment year round, thereby reducing the amount of pollutants being sent to the Halifax River.

Conceptual level cost estimates follow this page. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.9.*** The annual pollutant removal quantities anticipated with the implementation of this project is contained in Section 6.

Table 5.9
City Of Holly Hill, Florida
Project 10 – Old King's Road Detention Pond

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
W100-010	Nova Rd and 13th Street	9.39	9.31	9.85	9.83
W130-010	Nova Rd and LPGA	5.78	5.7	7.25	7.08
W100-040	Proposed Pond		3.63		4.13

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

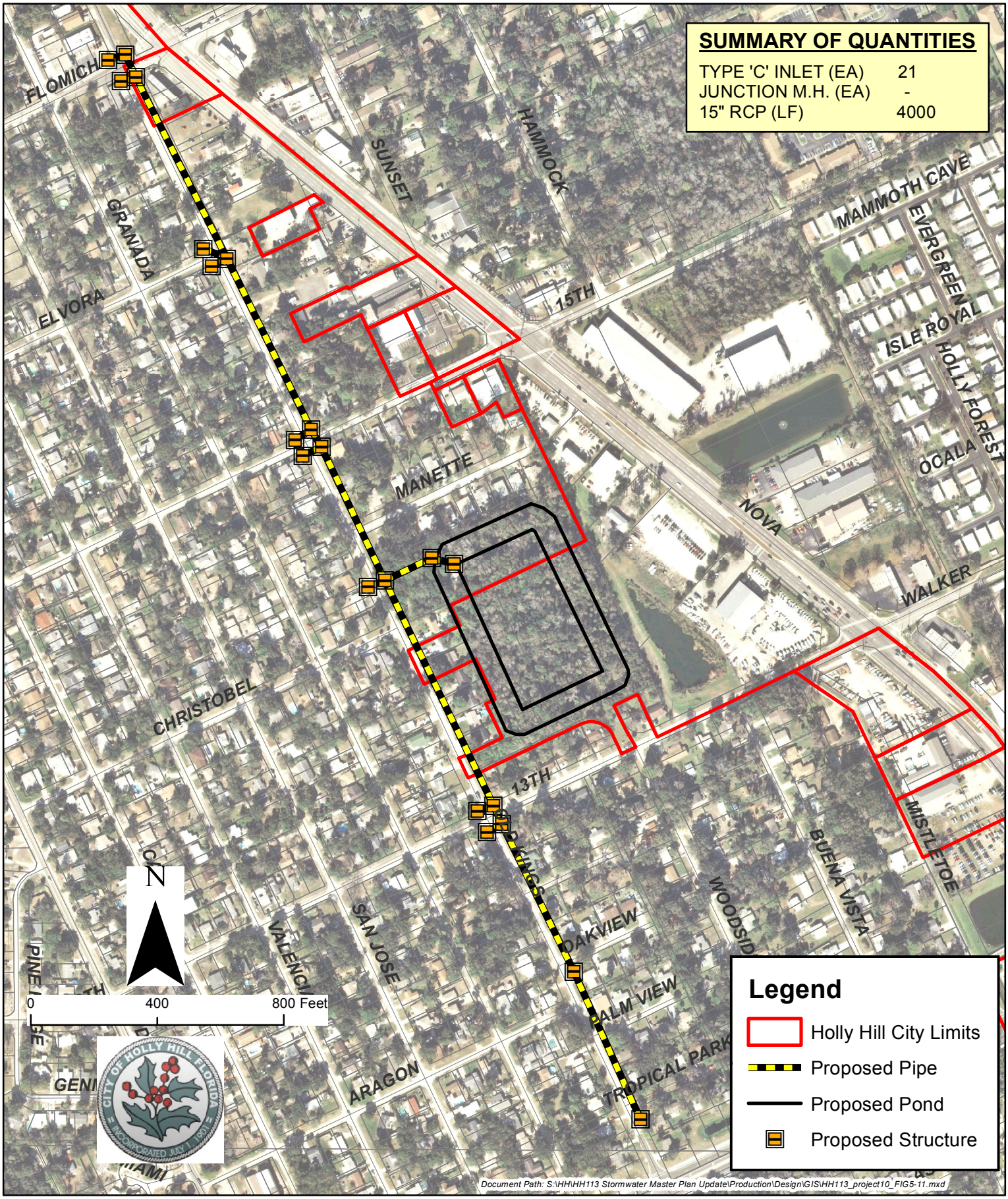
Project 10

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Old Kings Rd Detention Pond	Item Description	Quantity	Unit	Unit Cost	Amount
1	Land Acquisition	Obtain Property	1	LS	$240,000.00	$240,000.00
2	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$50,000.00	$50,000.00
	- Pond Construction	Excavation, control struc, exc.	1	LS	$90,000.00	$90,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	$1,500.00	$1,500.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$1,500.00	$1,500.00
	- Storm pipe	15" RCP	4,000	LF	$60.00	$240,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	21	EA	$2,400.00	$50,400.00
	Roadway open cut and restoration (20' pavement)	Asphalt, base and subgrade	500	SY	$40.00	$20,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$200,000.00	$200,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$893,400.00
- Mobilization @	5%	$44,670.00
- Contingencies @	10%	$89,340.00
SUB-TOTAL OF CONSTRUCTION COST		$1,027,410.00
- Eng Design & Permitting @	5.5%	$56,507.55
- Subconsultants @	2%	$20,548.20
- Constr Admin and Inspection @	6%	$61,644.60
TOTAL PROJECT COST		**$1,166,110**



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.11
PROJECT 10
OLD KINGS RD.
PROPOSED
DETENTION POND

5.3 Recommended Water Quality Projects

5.3.1 Projects 11 and 12 – Cordova Avenue and Ridge Avenue

This project area is located within the north east part of Holly Hill and will serve a drainage basin area of 29 acres. The projects consist of retrofitting Cordova Avenue and Ridge Avenue with stormwater collection and treatment where currently none exists. ***Figure 5.12*** is a conceptual plan of the improvements which include storm inlets, connecting pipe, and exfiltration trenches for treatment.

The excess runoff will be discharged into each street's right-of-way where it currently discharges. However with this project the system will treat the first flush of runoff instead of sending it to the Halifax River.

Cordova Avenue

Ridge Avenue

For planning and budgetary purposes, this project area is divided into two projects, one project pertaining to each street.

Conceptual level cost estimates follow this page. An estimate of annual pollutant removal quantities anticipated with the implementation of these projects is contained in Section 6.

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 11

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Cordova Avenue	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$42,000.00	$42,000.00
	- Site preparation	Dewatering	1	LS	$21,000.00	$21,000.00
	- Construction management	Maintenance of traffic, signage	1	LS	$21,000.00	$21,000.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$8,400.00	$8,400.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	2,800	LF	$100.00	$280,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	8	EA	$4,000.00	$32,000.00
	- Roadway open cut and restoration (40' pavement)	Asphalt, base and subgrade	560	SY	$50.00	$28,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$140,000.00	$140,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$572,400.00
- Mobilization @	5%	$28,620.00
- Contingencies @	10%	$57,240.00
SUB-TOTAL OF CONSTRUCTION COST		$658,260.00
- Eng Design & Permitting @	5.5%	$36,204.30
- Subconsultants @	2%	$13,165.20
- Constr Admin and Insp @	6%	$39,495.60
TOTAL PROJECT COST		**$747,125**

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

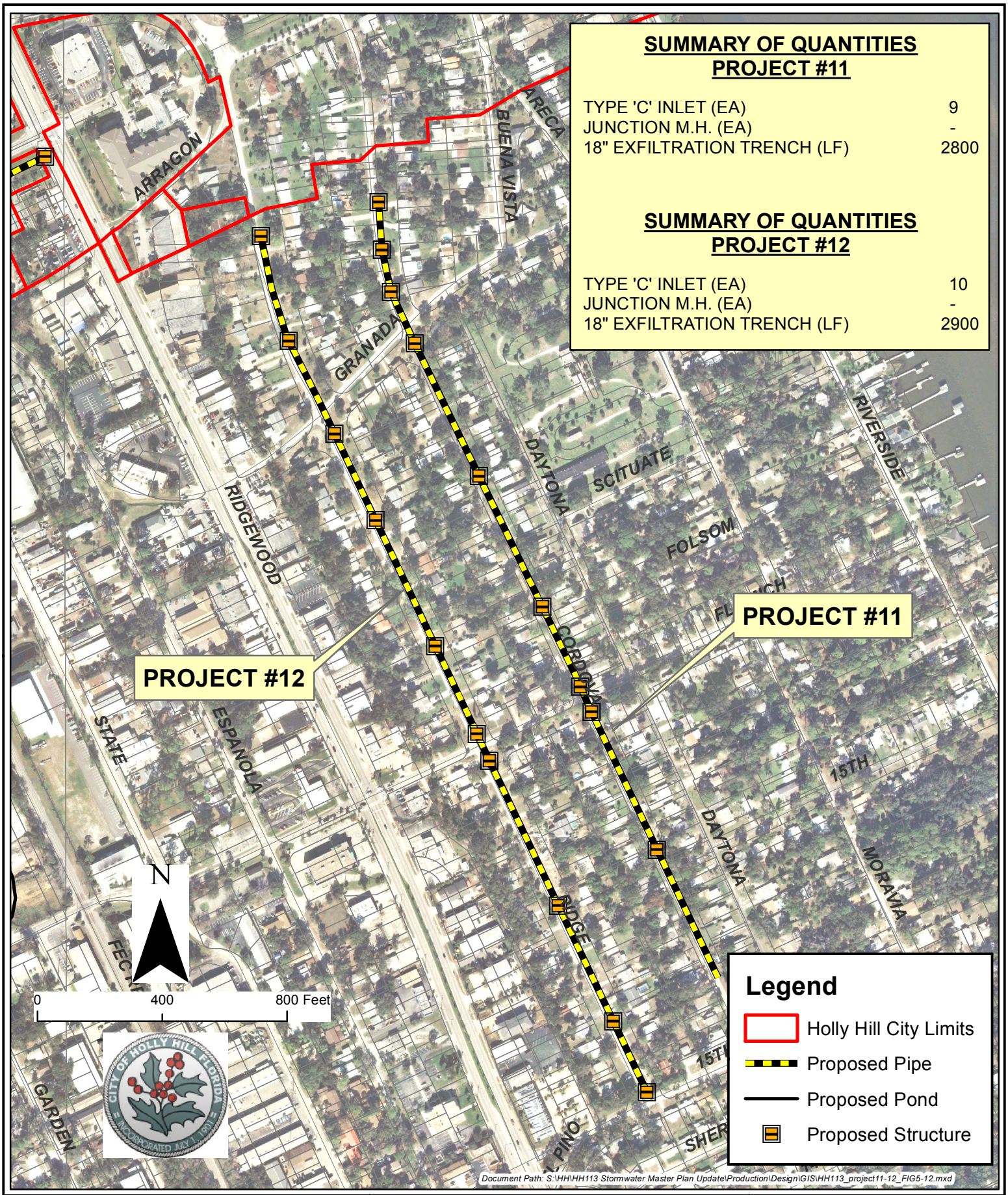
Project 12

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Ridge Avenue	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$43,500.00	$43,500.00
	- Site preparation	Dewatering	1	LS	$21,750.00	$21,750.00
	- Construction management	Maintenance of traffic, signage	1	LS	$21,750.00	$21,750.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$8,700.00	$8,700.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	2,900	LF	$100.00	$290,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	10	EA	$4,000.00	$40,000.00
	- Roadway open cut and restoration (40' pavement)	Asphalt, base and subgrade	580	SY	$50.00	$29,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$145,000.00	$145,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$599,700.00
- Mobilization @	5%	$29,985.00
- Contingencies @	10%	$59,970.00
SUB-TOTAL OF CONSTRUCTION COST		$689,655.00
- Eng Design & Permitting @	5.5%	$37,931.03
- Subconsultants @	2%	$13,793.10
- Constr Admin and Insp @	6%	$41,379.30
TOTAL PROJECT COST		**$782,758**



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.12

PROJECTS #11 AND #12

5.3.2 Projects 13, 14, 15, 16, 17, & 18 - Moravia Avenue, Daytona Avenue, Hiawatha Avenue, Holly Avenue, and Woodward Avenue

This project area is located within the northeast part of Holly Hill and will serve a drainage basin area of 33 acres. The project consists of retrofitting Moravia Avenue, Daytona Avenue, Hiawatha Avenue, Holly Avenue, and Woodward Avenue with stormwater collection and treatment where currently little or none exists. ***Figure 5.13*** is a conceptual plan of the improvements which include storm inlets, connecting pipe, and exfiltration trenches for treatment.

The excess runoff will be discharged into each street's right-of-way where it currently discharges. However with this project the system will treat the first flush of runoff instead of sending it to the Halifax River.

Moravia Avenue

Daytona Avenue

Hiawatha Avenue

Holly Avenue Part A

Holly Avenue Part B

Woodward Avenue

For planning and budgetary purposes, this project area is divided into multiple projects, one project pertaining to each street or phase.

Conceptual level cost estimates follow this page. An estimate of annual pollutant removal quantities anticipated with the implementation of these projects is contained in Section 6.

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 13

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Moravia Avenue	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$9,750.00	$9,750.00
	- Site preparation	Dewatering	1	LS	$4,875.00	$4,875.00
	- Construction management	Maintenance of traffic, signage	1	LS	$4,875.00	$4,875.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$1,950.00	$1,950.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	650	LF	$100.00	$65,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	3	EA	$4,000.00	$12,000.00
	- Roadway open cut and restoration (20' pavement)	Asphalt, base and subgrade	130	SY	$50.00	$6,500.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$32,500.00	$32,500.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$137,450.00
- Mobilization @	5%	$6,872.50
- Contingencies @	10%	$13,745.00
SUB-TOTAL OF CONSTRUCTION COST		$158,067.50
- Eng Design & Permitting @	5.5%	$8,693.71
- Subconsultants @	2%	$3,161.35
- Constr Admin and Insp @	6%	$9,484.05
TOTAL PROJECT COST		**$179,407**

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 14

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Daytona Avenue Part A	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$18,600.00	$18,600.00
	- Site preparation	Dewatering	1	LS	$9,300.00	$9,300.00
	- Construction management	Maintenance of traffic, signage	1	LS	$9,300.00	$9,300.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$3,720.00	$3,720.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	1,240	LF	$100.00	$124,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	4	EA	$4,000.00	$16,000.00
	- Roadway open cut and restoration (20' pavement)	Asphalt, base and subgrade	248	SY	$50.00	$12,400.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$62,000.00	$62,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$255,320.00
- Mobilization @	5%	$12,766.00
- Contingencies @	10%	$25,532.00
SUB-TOTAL OF CONSTRUCTION COST		$293,618.00
- Eng Design & Permitting @	5.5%	$16,148.99
- Subconsultants @	2%	$5,872.36
- Constr Admin and Insp @	6%	$17,617.08
TOTAL PROJECT COST		**$333,256**

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 15

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Hiawatha Avenue	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction Activities					
	- Site preparation	Clearing and grubbing	1	LS	$9,000.00	$9,000.00
	- Site preparation	Dewatering	1	LS	$4,500.00	$4,500.00
	- Construction management	Maintenance of traffic, signage	1	LS	$4,500.00	$4,500.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$1,800.00	$1,800.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	600	LF	$100.00	$60,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	3	EA	$4,000.00	$12,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	120	LS	$50.00	$6,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$97,800.00
- Mobilization @	5%	$4,890.00
- Contingencies @	10%	$9,780.00
SUB-TOTAL OF CONSTRUCTION COST		$112,470.00
- Eng Design & Permitting @	5.5%	$6,185.85
- Subconsultants @	2%	$2,249.40
- Constr Admin and Insp @	6%	$6,748.20
TOTAL PROJECT COST		**$127,653**

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 16

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Holly Avenue Part A	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction Activities					
	- Site preparation	Clearing and grubbing	1	LS	$12,300.00	$12,300.00
	- Site preparation	Dewatering	1	LS	$6,150.00	$6,150.00
	- Construction management	Maintenance of traffic, signage	1	LS	$6,150.00	$6,150.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$2,460.00	$2,460.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	820	LF	$100.00	$82,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	3	EA	$4,000.00	$12,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	164	LS	$50.00	$8,200.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$129,260.00
- Mobilization @	5%	$6,463.00
- Contingencies @	10%	$12,926.00
SUB-TOTAL OF CONSTRUCTION COST		$148,649.00
- Eng Design & Permitting @	5.5%	$8,175.70
- Subconsultants @	2%	$2,972.98
- Constr Admin and Insp @	6%	$8,918.94
TOTAL PROJECT COST		**$168,717**

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 17

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Holly Avenue Part B	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction Activities					
	- Site preparation	Clearing and grubbing	1	LS	$24,750.00	$24,750.00
	- Site preparation	Dewatering	1	LS	$12,375.00	$12,375.00
	- Construction management	Maintenance of traffic, signage	1	LS	$12,375.00	$12,375.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$4,950.00	$4,950.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	1,650	LF	$100.00	$165,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	7	EA	$4,000.00	$28,000.00
	- Roadway open cut and restoration (20' pavement)	Asphalt, base and subgrade	330	SY	$50.00	$16,500.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$82,500.00	$82,500.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$346,450.00
- Mobilization @	5%	$17,322.50
- Contingencies @	10%	$34,645.00
SUB-TOTAL OF CONSTRUCTION COST		$398,417.50
- Eng Design & Permitting @	5.5%	$21,912.96
- Subconsultants @	2%	$7,968.35
- Constr Admin and Insp @	6%	$23,905.05
TOTAL PROJECT COST		**$452,204**

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

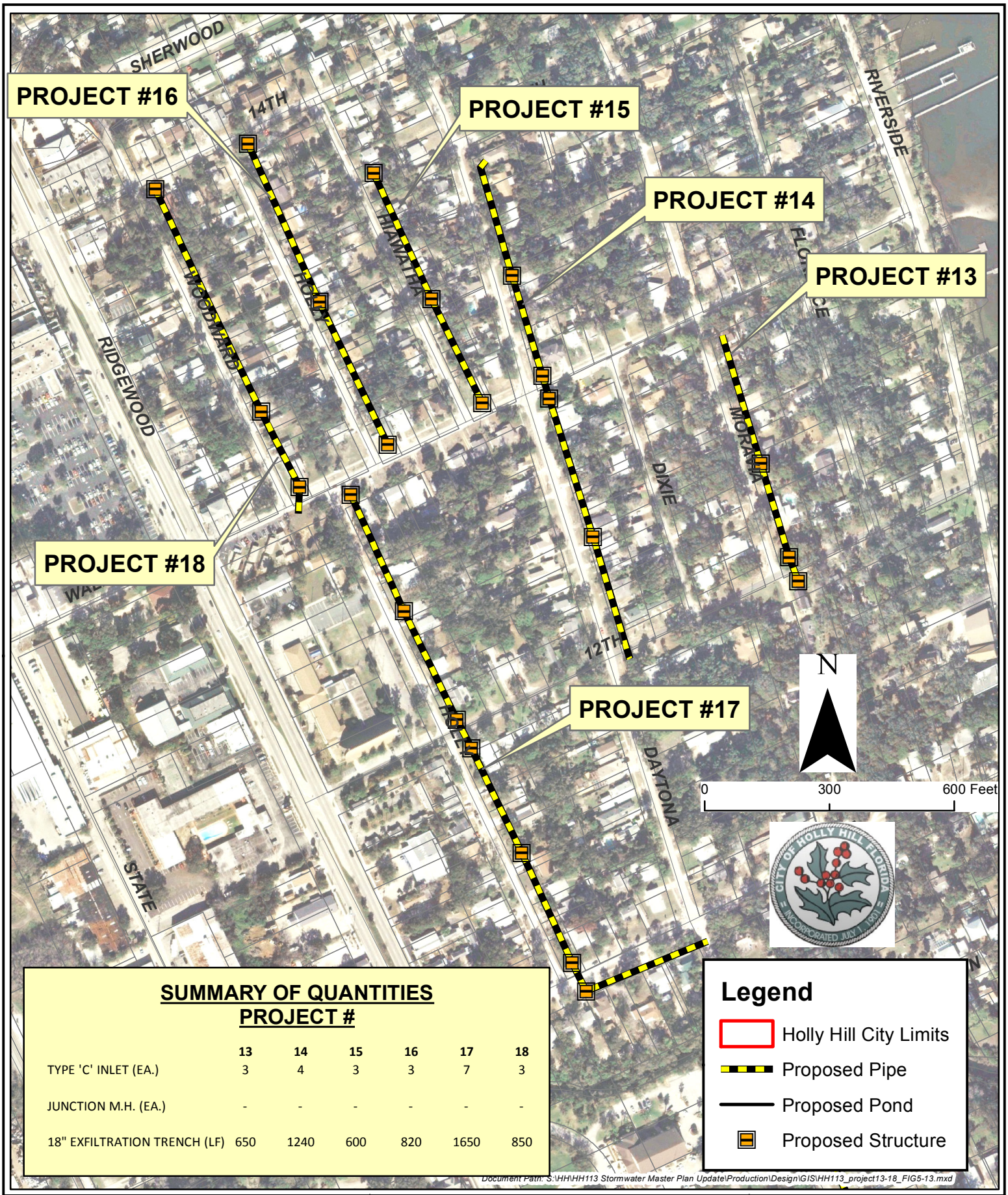
Project 18

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Woodward Avenue	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$12,750.00	$12,750.00
	- Site preparation	Dewatering	1	LS	$6,375.00	$6,375.00
	- Construction management	Maintenance of traffic, signage	1	LS	$6,375.00	$6,375.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$2,550.00	$2,550.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	850	LF	$100.00	$85,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	3	EA	$4,000.00	$12,000.00
	- Roadway open cut and restoration (20' pavement)	Asphalt, base and subgrade	170	SY	$50.00	$8,500.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$42,500.00	$42,500.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$176,050.00
- Mobilization @	5%	$8,802.50
- Contingencies @	10%	$17,605.00
SUB-TOTAL OF CONSTRUCTION COST		$202,457.50
- Eng Design & Permitting @	5.5%	$11,135.16
- Subconsultants @	2%	$4,049.15
- Constr Admin and Insp @	6%	$12,147.45
TOTAL PROJECT COST		**$229,789**



SUMMARY OF QUANTITIES
PROJECT #

	13	14	15	16	17	18
TYPE 'C' INLET (EA.)	3	4	3	3	7	3
JUNCTION M.H. (EA.)	-	-	-	-	-	-
18" EXFILTRATION TRENCH (LF)	650	1240	600	820	1650	850

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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.13

PROJECTS #13 THRU #18

5.3.3 Projects 19 and 20 – Miriam Avenue and Daytona Avenue

This project area is located within the southeast part of Holly Hill and will serve a drainage basin area of 11 acres. The project consists of retrofitting Miriam Avenue and Daytona Avenue with stormwater collection and treatment where currently none exists. ***Figure 5.14*** is a conceptual plan of the improvements which include storm inlets, connecting pipe, and exfiltration trenches for treatment.

The excess runoff will be discharged into each street's right-of-way where it currently discharges. However with this project the system will treat the first flush of runoff instead of sending it to the Halifax River.

Miriam Avenue

Daytona Avenue

For planning and budgetary purposes, this project area is divided into two projects, one project pertaining to each street.

Conceptual level cost estimates follow this page. An estimate of annual pollutant removal quantities anticipated with the implementation of these projects is contained in Section 6.

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 19

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Miriam Avenue	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$11,250.00	$11,250.00
	- Site preparation	Dewatering	1	LS	$5,625.00	$5,625.00
	- Construction management	Maintenance of traffic, signage	1	LS	$5,625.00	$5,625.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$2,250.00	$2,250.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	750	LF	$100.00	$75,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	5	EA	$4,000.00	$20,000.00
	- Roadway open cut and restoration (20' pavement)	Asphalt, base and subgrade	150	SY	$50.00	$7,500.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$37,500.00	$37,500.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$164,750.00
- Mobilization @	5%	$8,237.50
- Contingencies @	10%	$16,475.00
SUB-TOTAL OF CONSTRUCTION COST		$189,462.50
- Eng Design & Permitting @	5.5%	$10,420.44
- Subconsultants @	2%	$3,789.25
- Constr Admin and Insp @	6%	$11,367.75
TOTAL PROJECT COST		**$215,040**

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

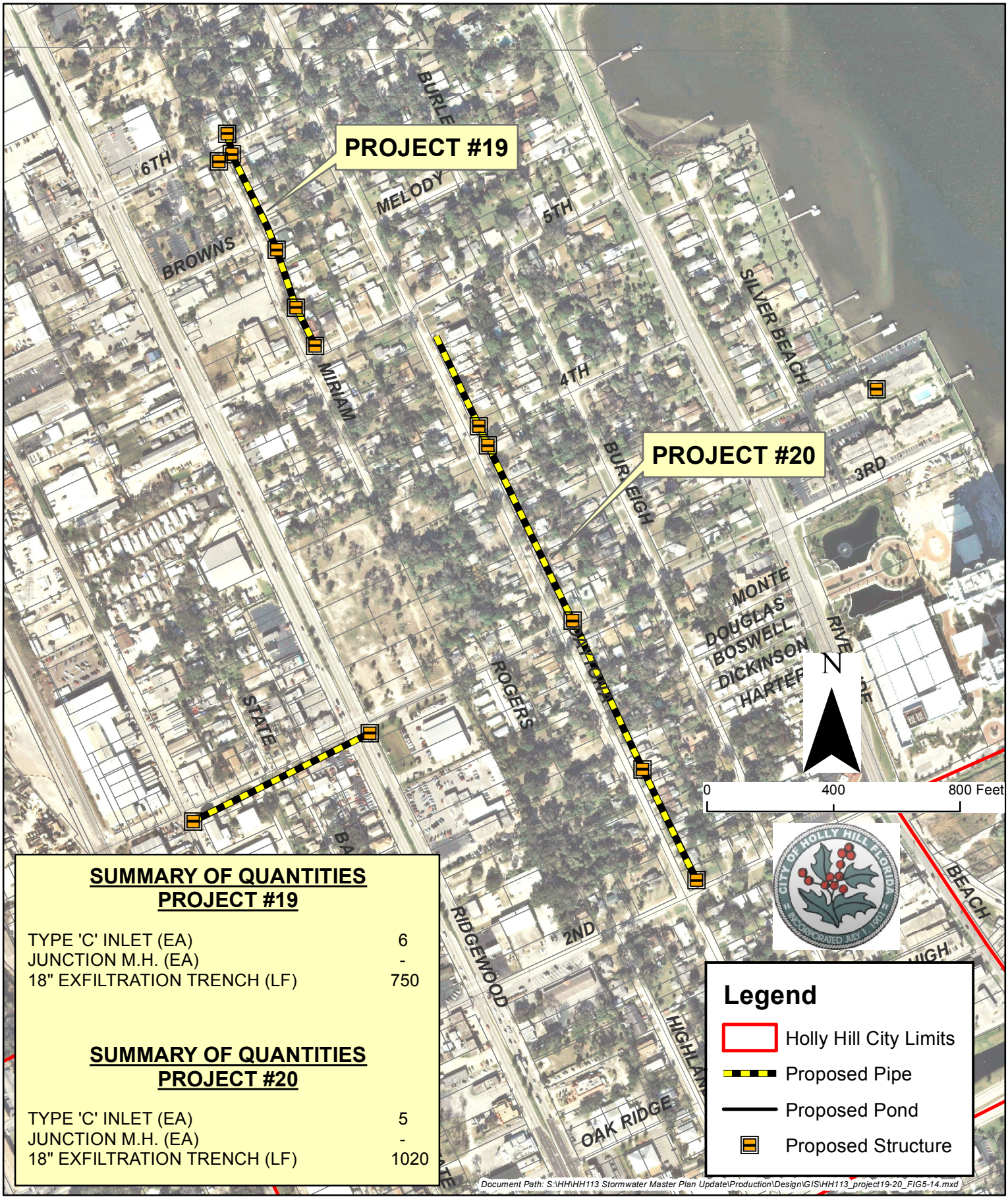
Project 20

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Daytona Avenue Part B	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$15,300.00	$15,300.00
	- Site preparation	Dewatering	1	LS	$7,650.00	$7,650.00
	- Construction management	Maintenance of traffic, signage	1	LS	$7,650.00	$7,650.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$3,060.00	$3,060.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	1,020	LF	$100.00	$102,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	5	EA	$4,000.00	$20,000.00
	- Roadway open cut and restoration (20' pavement)	Asphalt, base and subgrade	204	SY	$50.00	$10,200.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$51,000.00	$51,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$216,860.00
- Mobilization @	5%	$10,843.00
- Contingencies @	10%	$21,686.00
SUB-TOTAL OF CONSTRUCTION COST		$249,389.00
- Eng Design & Permitting @	5.5%	$13,716.40
- Subconsultants @	2%	$4,987.78
- Constr Admin and Insp @	6%	$14,963.34
TOTAL PROJECT COST		**$283,057**



SUMMARY OF QUANTITIES
PROJECT #19

TYPE 'C' INLET (EA)	6
JUNCTION M.H. (EA)	-
18" EXFILTRATION TRENCH (LF)	750

SUMMARY OF QUANTITIES
PROJECT #20

TYPE 'C' INLET (EA)	5
JUNCTION M.H. (EA)	-
18" EXFILTRATION TRENCH (LF)	1020

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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.14

PROJECTS #19 AND #20

5.3.4 Project 21 – Daytona Avenue (Central)

This project area is located within the east central part of Holly Hill and will serve a drainage basin area of 7 acres. The project consists of retrofitting Daytona Avenue, south of LPGA Blvd, with stormwater collection and treatment where currently none exists. ***Figure 5.15*** is a conceptual plan of the improvements which include storm inlets, connecting pipe, and exfiltration trenches for treatment.

The excess runoff will be discharged into each street's right-of-way where it currently discharges. However with this project the system will treat the first flush of runoff instead of sending it to the Halifax River.

Miriam Avenue

Daytona Avenue

Conceptual level cost estimates follow this page. An estimate of annual pollutant removal quantities anticipated with the implementation of this project is contained in Section 6.

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

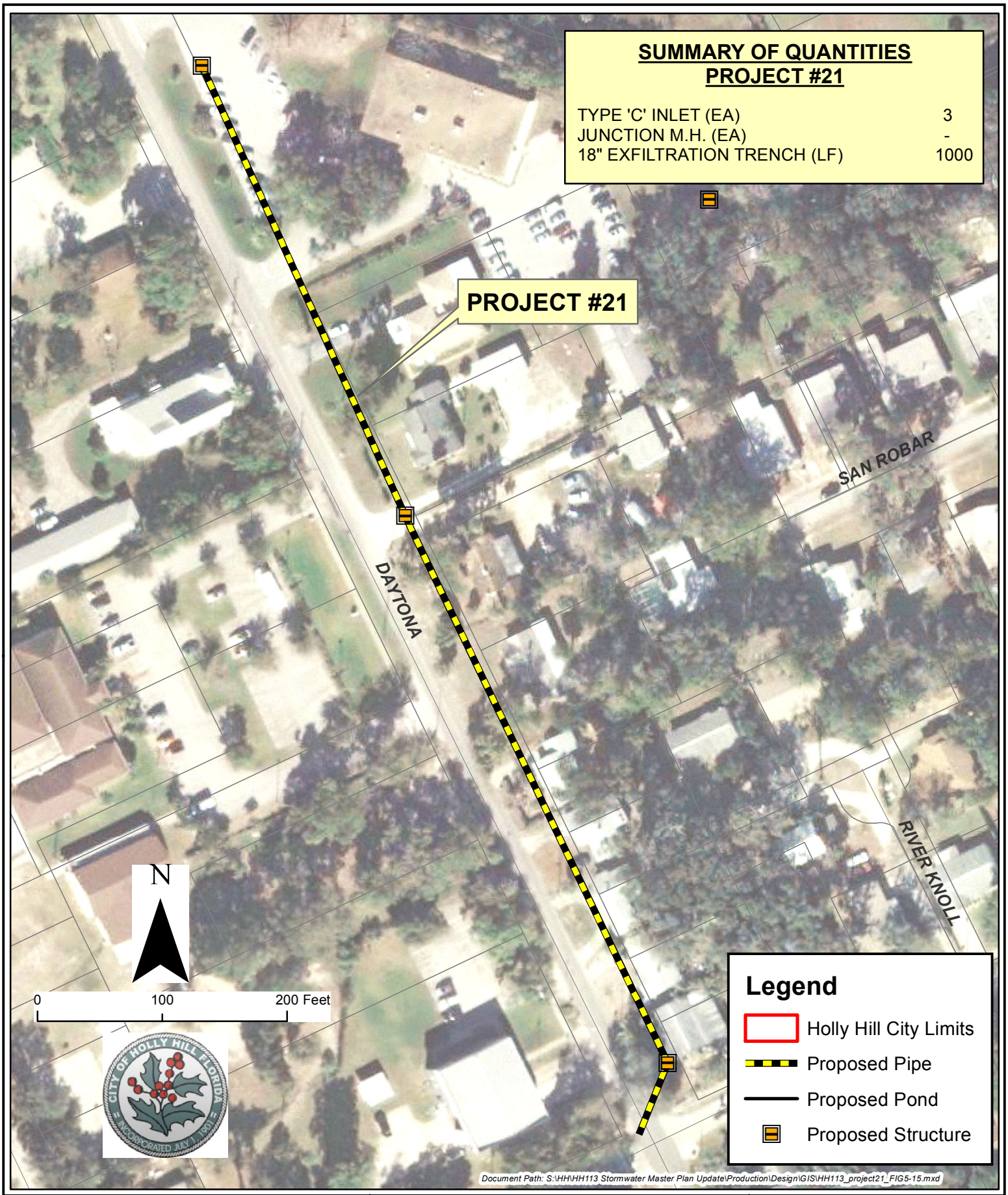
Project 21

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Daytona Avenue Part C	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$15,000.00	$15,000.00
	- Site preparation	Dewatering	1	LS	$7,500.00	$7,500.00
	- Construction management	Maintenance of traffic, signage	1	LS	$7,500.00	$7,500.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$3,000.00	$3,000.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	1,000	LF	$100.00	$100,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	3	EA	$2,400.00	$7,200.00
	Roadway open cut and restoration (20' pavement)	Asphalt, base and subgrade	100	SY	$40.00	$4,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$50,000.00	$50,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$194,200.00
- Mobilization @	5%	$9,710.00
- Contingencies @	10%	$19,420.00
SUB-TOTAL OF CONSTRUCTION COST		$223,330.00
- Eng Design & Permitting @	5.5%	$12,283.15
- Subconsultants @	2%	$4,466.60
- Constr Admin and Insp @	6%	$13,399.80
TOTAL PROJECT COST		**$253,480**



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.15

PROJECT 21

5.4 Localized Stage Height Reduction

5.4.1 Project 22 – 7th Street & Daytona Ave Pipe Replacement

This project area is located in the southeast portion of Holly Hill along 7th Street with a drainage basin area of 35.9 acres. The project consists of installing a 36 inch pipe from the intersection of 7th Street at Daytona Avenue to the Halifax River. The proposed pipe will provide an additional outfall for the basin area and reduce the amount of standing water along 7th Street. ***Figure 5.16*** is a conceptual plan of the improvements for the surrounding area along 7th Street.

Any excess runoff will be discharged into the Halifax River where it currently discharges. This project, however, will provide relief for the roadway as it will provide an additional outfall for the surrounding area.

Conceptual level cost estimates follow this page. An estimate of stage reduction can be seen in ***Table 5.10.***

Table 5.10
City Of Holly Hill, Florida
Project 22 – 7th Street & Daytona Ave. Pipe Installation

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
H130-010	7th St and Daytona Ave	11.16	10.41	11.78	11.36

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 21

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Daytona Avenue Part C	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$15,000.00	$15,000.00
	- Site preparation	Dewatering	1	LS	$7,500.00	$7,500.00
	- Construction management	Maintenance of traffic, signage	1	LS	$7,500.00	$7,500.00
	- Erosion control and pollution abatement	Silt fences, turbidity barriers, etc.	1	LS	$3,000.00	$3,000.00
	- Exfiltration Trench incl pipe, rock and fabric	18" Perf. HDPE w/rock envelope	1,000	LF	$100.00	$100,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	3	EA	$2,400.00	$7,200.00
	Roadway open cut and restoration (20' pavement)	Asphalt, base and subgrade	100	SY	$40.00	$4,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$50,000.00	$50,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$194,200.00
- Mobilization @	5%	$9,710.00
- Contingencies @	10%	$19,420.00
SUB-TOTAL OF CONSTRUCTION COST		$223,330.00
- Eng Design & Permitting @	5.5%	$12,283.15
- Subconsultants @	2%	$4,466.60
- Constr Admin and Insp @	6%	$13,399.80
TOTAL PROJECT COST		**$253,480**

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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.16

PROJECT 22

5.4.2 Carswell Avenue and State Avenue Area

The following three (3) projects are included in this master plan update to reiterate the recommendations proposed in the previously prepared Carswell Avenue and State Avenue Drainage Improvement Study, 2010.

5.4.3 Project 23 – 6th Street at Carswell Avenue Area

The 6th Street area improvements include replacement of pipes and inlets on State Avenue north of 6th Street and at the intersection. A length of 15 inch pipe of State is recommended to be replaced with 24 inch pipe. Between State and Carswell, it is recommended that as additional 24 inch pipe be constructed on the north side of 6th Street. From the intersection of Carswell and 6th Street, it is recommended a 36 inch pipe be constructed to the Southeast canal to supplement the capacity of the existing 36 inch on the south side of 6th Street. A 36 inch jack and bore is required to be constructed under the railroad tracks. ***Figure 5.17*** is a conceptual plan depicting the recommended improvements for the surrounding area along 6th Street to the Southeast Canal.

Any excess runoff will be discharged into the Southeast Canal where it currently discharges. This project will provide relief for the roadway with the addition of the new pipes.

Conceptual level cost estimates follow this page. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.11.***

Table 5.11
City Of Holly Hill, Florida
Project 23 – 6th Street Area

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
S050-010	6th Street at Carswell Ave	5.74	5.7	6.06	6.04
S080-010	6th Street near Railroad Tracks	5.04	4.66	5.68	5.51
S001-060U	6th Street Culvert	4.66	4.37	5.36	5.13

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

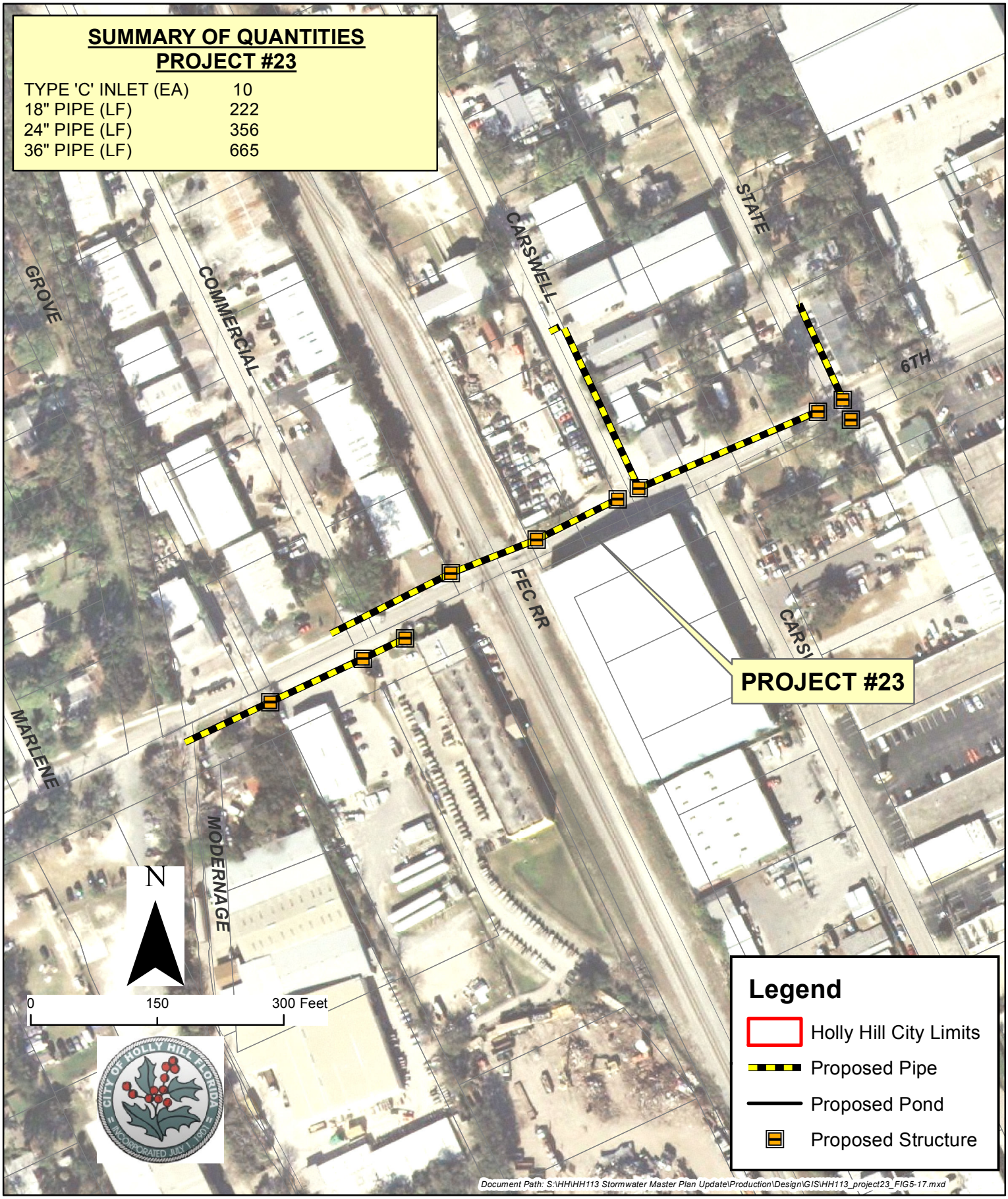
Project 23

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	6th Steet Improvements	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$15,000.00	$15,000.00
	- Site preparation	Dewatering	1	LS	$7,500.00	$7,500.00
	- Construction management	Maintenance of traffic, signage	1	LS	$7,500.00	$7,500.00
	- Storm Pipe	18 inch Pipe	250	LF	$54.00	$13,500.00
	- Storm Pipe	24 inch Pipe	480	LF	$66.00	$31,680.00
	- Storm Pipe	36 inch Pipe	630	LF	$108.00	$68,040.00
	- Jack & Bore	36-inch in 54-inch casing	140	LF	$300.00	$42,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	12	EA	$2,400.00	$28,800.00
	- Utility Adjustments	Estimated Utility Relocation Costs	1	LS	$120,000.00	$120,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$180,000.00	$180,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$514,020.00
- Mobilization @	5%	$25,701.00
- Contingencies @	10%	$51,402.00
SUB-TOTAL OF CONSTRUCTION COST		$591,123.00
- Eng Design & Permitting @	5.5%	$32,511.77
- Subconsultants @	2%	$11,822.46
- Constr Admin and Insp @	6%	$35,467.38
TOTAL PROJECT COST		**$670,925**



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.17

PROJECT 23

5.4.4 Project 24 – 8th Street at Carswell Avenue Area

Additional conveyance capacity is recommended for 8th Street from Ridgewood Avenue to the Southeast canal. A 24 inch pipe is recommended to be constructed from Ridgewood to Carswell Avenue. The existing 18 inch and 24" x 35" pipes should remain in place. From Carswell Avenue, it is recommended that a 36 inch pipe replace the existing 18 inch on the north side of 8th Street. The 36 inch pipe is recommended to continue west under the railroad track to the Southeast canal to supplement the existing pipe on the south side of 8th Street. ***Figure 5.18*** is a conceptual plan depicting the recommended improvements for the surrounding area along 8th Street.

Any excess runoff will be discharged into the Southeast Canal where it currently discharges. This project will provide relief for the roadway with the new pipes.

Conceptual level cost estimates follow this page. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.12.***

Table 5.12
City Of Holly Hill, Florida
Project 24 – 8th Street Area

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
S040-010	8th Street near Railroad Tracks	4.93	4.13	5.5	5.22
S040-020	8th Street at Carswell Ave	4.93	4.13	5.5	5.22
S001-040U	8th Street Culvert	4.53	4.1	5.26	4.96

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

Project 24

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	8th Street Improvements	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$15,000.00	$15,000.00
	- Site preparation	Dewatering	1	LS	$7,500.00	$7,500.00
	- Construction management	Maintenance of traffic, signage	1	LS	$7,500.00	$7,500.00
	- Storm Pipe	18 inch Pipe	320	LF	$54.00	$17,280.00
	- Storm Pipe	24 inch Pipe	630	LF	$66.00	$41,580.00
	- Storm Pipe	36 inch Pipe	290	LF	$108.00	$31,320.00
	- Jack & Bore	36-inch in 54-inch casing	120	LF	$300.00	$36,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	10	EA	$2,400.00	$24,000.00
	- Utility Adjustments	Estimated Utility Relocation Costs	1	LS	$120,000.00	$120,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$165,000.00	$165,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$465,180.00
- Mobilization @	5%	$23,259.00
- Contingencies @	10%	$46,518.00
SUB-TOTAL OF CONSTRUCTION COST		$534,957.00
- Eng Design & Permitting @	5.5%	$29,422.64
- Subconsultants @	2%	$10,699.14
- Constr Admin and Insp @	6%	$32,097.42
TOTAL PROJECT COST		**$607,176**

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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.18

PROJECT 24

5.4.5 Project 25 – 10th Street at Carswell Avenue Area

The 10th Street area between Ridgewood Avenue and the railroad right-of-way consists of piping and inlets which convey the runoff to the east side ditch which runs parallel to the railroad tracks. The ditch is not of sufficient capacity due to the slope and cross sectional area. It is recommended that a 36 inch pipe be constructed from the east side of the tracks at 10th Street to the Southeast canal. Additional improvements, as shown on Figure 12, include an 18 inch pipe from the easternmost inlet on 10th Street to State Avenue. From State Avenue and 10th Street, a 24 inch is recommended be constructed along the north right-of-way line to the railroad tracks. On State Avenue, south of 10th Street, an 18 inch is recommended to replace the existing 8 inch pipe. ***Figure 5.19*** is a conceptual plan of the recommended improvements for the surrounding area along 10th Street.

Any excess runoff will be discharged into the Southeast Canal where it currently discharges. This project, however, will provide relief for the roadway as it will provide an additional outfall for the surrounding area.

Conceptual level cost estimates follow this page. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.13.***

Table 5.13
City Of Holly Hill, Florida
Project 25 – 10th Street Area

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
L050-010	10th Street and State Ave	4.35	3.94	4.98	4.71
S030-010	10th Street near Railroad Tracks	4.48	4.03	5.23	4.91
S001-020U	10th Street Culvert	4.48	4.02	5.23	4.91

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

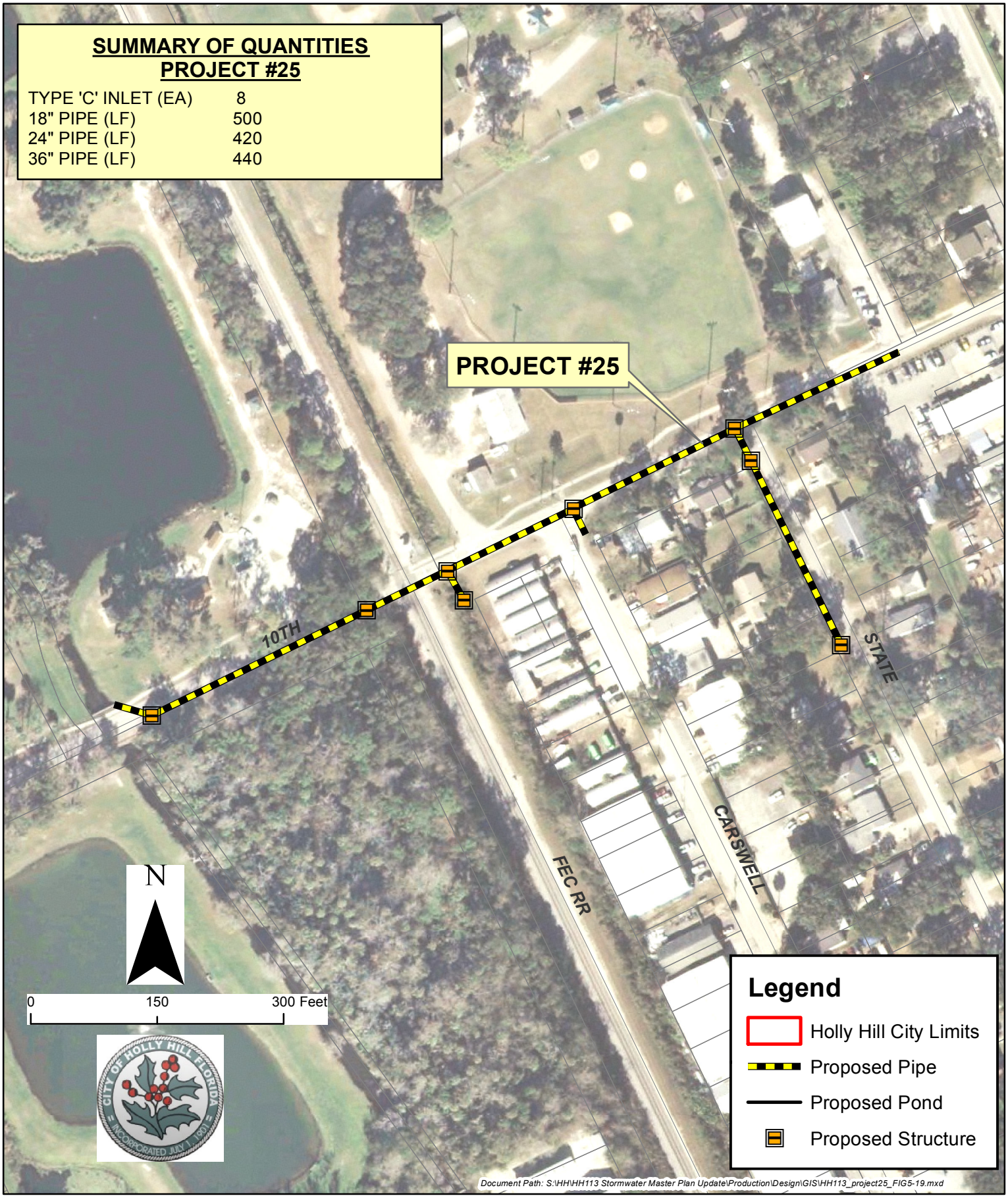
Project 25

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	10th Street Improvements	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$15,000.00	$15,000.00
	- Site preparation	Dewatering	1	LS	$7,500.00	$7,500.00
	- Construction management	Maintenance of traffic, signage	1	LS	$7,500.00	$7,500.00
	- Storm Pipe	18 inch Pipe	500	LF	$54.00	$27,000.00
	- Storm Pipe	24 inch Pipe	380	LF	$66.00	$25,080.00
	- Storm Pipe	36 inch Pipe	360	LF	$108.00	$38,880.00
	- Jack & Bore	36-inch in 54-inch casing	120	LF	$300.00	$36,000.00
	- Drainage Structure	Type "C" with grate (<10' deep)	9	EA	$2,400.00	$21,600.00
	- Utility Adjustments	Estimated Utility Relocation Costs	1	LS	$120,000.00	$120,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$165,000.00	$165,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$463,560.00
- Mobilization @	5%	$23,178.00
- Contingencies @	10%	$46,356.00
SUB-TOTAL OF CONSTRUCTION COST		$533,094.00
- Eng Design & Permitting @	5.5%	$29,320.17
- Subconsultants @	2%	$10,661.88
- Constr Admin and Insp @	6%	$31,985.64
TOTAL PROJECT COST		**$605,062**



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.19

PROJECT 25

5.4.6 Project 26 – Reclaimed Water Augmentation Project

Following the completion of the Nova Canal Flood Control and Water Resources Study by the East Volusia Regional Water Authority (EVRWA), the previous city manager of Holly Hill spearheaded an effort to implement a program to transfer stormwater west to be stored near the city's wellfields. QLH has been successful with other cities in treating stormwater to augment the reclaimed water capacity during times of low reuse supply and high demand of irrigation water. The proposed project would create additional reuse supply to meet demand or for transferring into storage ponds. Although the volumes proposed to be transferred is not sufficient to relieve flooding, the transfer of 1 million gallons per day (MGD) provides a valuable mitigation to permit the increased peak discharges of the proposed pumped drainage improvement projects.

In order to construct this project, it is proposed to site a pump station to transfer 1 MGD (800 gpm) from the Centennial Park Pond to the City's wastewater treatment plant (WWTP) for treatment to reclaimed water standards. It has been documented with the City's permit renewal effort that the WWTP has approximately 0.9 to 1 MGD excess capacity through the year 2032 based on population projections. ***Figure 5.20*** shows the location of the proposed transfer pump at Centennial Park with a 12-inch pipe constructed to the plant for filtering and disinfection to reclaimed water standards.

The 12-inch pipe from the transfer pump would be connected to a new 12' x 24' coagulation and flocculation treatment basin. Coagulation chemicals can be added to the stormwater to promote chemical and physical floc building. This treatment basin is designed to help filters remove algae present in the stormwater ponds. After flocculation, the stormwater will mix with the wastewater effluent and be filtered by the disc filters and then go to the chlorine contact chamber for disinfection. Once treated this augmentation water will be sent into the reclaimed water system for reuse.

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

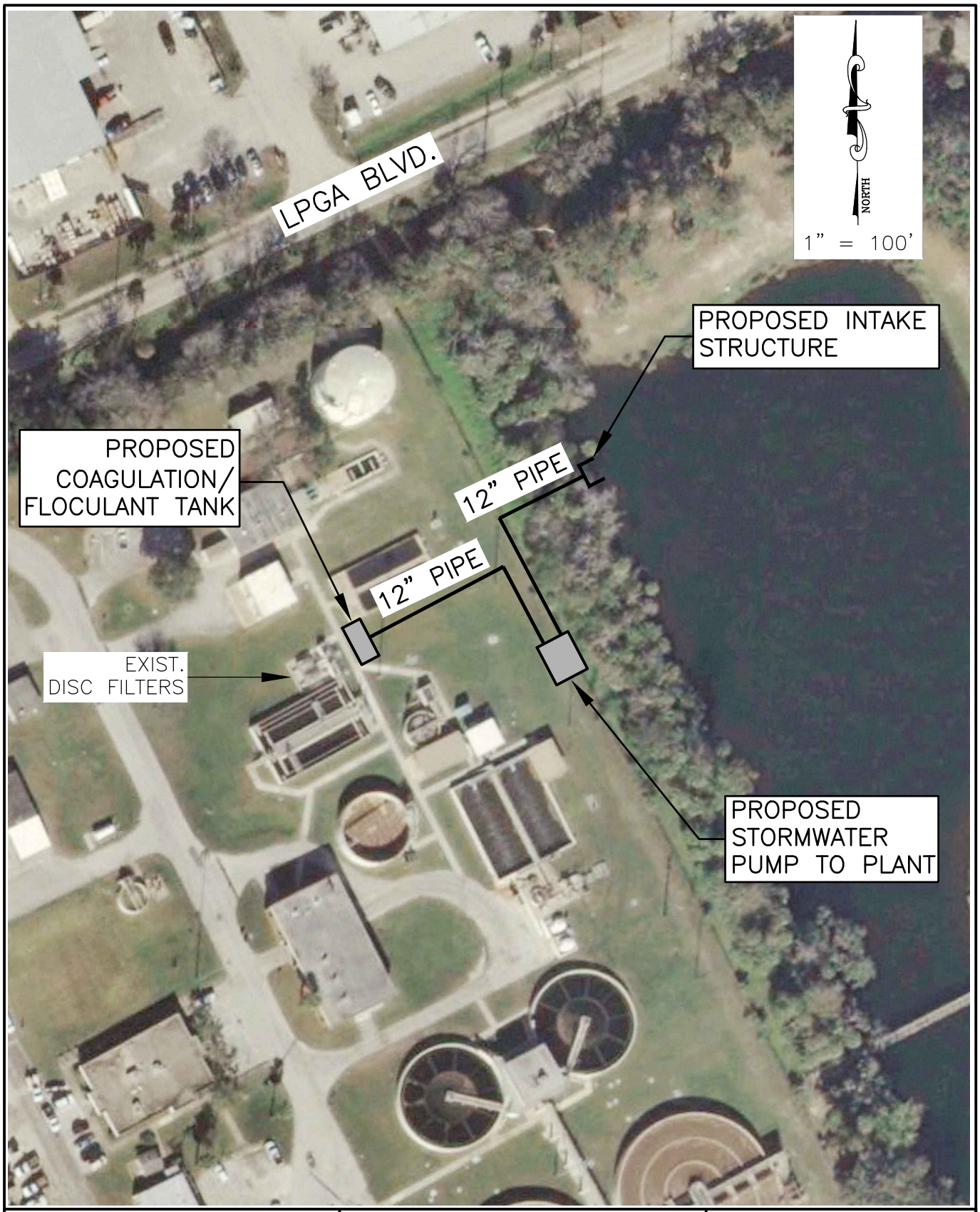
Project 26

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Reclaimed Water Augmentation Project	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$50,000.00	$50,000.00
	- Structure	Coagulation/Flocculation Treatment Train	1	LS	$360,000.00	$360,000.00
	- Equipment	Packaged Pumping System	1	LS	$150,000.00	$150,000.00
	- Pressure Main	12" Reclaimed Main	28,000	LF	$50.00	$1,400,000.00
	- Structure/Equipment	Disc Filter	1	LS	$60,000.00	$60,000.00
	- Piping	Yard Piping and Site Work	1	LS	$45,000.00	$45,000.00
	- Miscellaneous	Electrical/Instrumentation/Telemetry	1	LS	$250,000.00	$250,000.00
	- Flow Control	Automatic Valve and Vault	1	LS	$80,000.00	$80,000.00
	- Erosion control countermeasures	Silt Fence, turbidity barrier, NPDES	1	LS	$50,000.00	$50,000.00
	- Construction Administration	Maintenance of traffic, signage	1	LS	$40,000.00	$40,000.00
	- Right-of-way restoration	Sodding, landscaping, etc.	1	LS	$250,000.00	$250,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$2,735,000.00
- Mobilization @	5%	$136,750.00
- Contingencies @	10%	$273,500.00
SUB-TOTAL OF CONSTRUCTION COST		$3,145,250.00
- Eng Design & Permitting @	5.5%	$172,988.75
- Subconsultants @	2%	$62,905.00
- Constr Admin and Insp @	6%	$188,715.00
TOTAL PROJECT COST		**$3,569,859**



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CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.20
PROJECT 26
****WWTP SITE****
STORMWATER TO REUSE PROJECT

S:\HH\HH113 Stormwater Master Plan Update\Production\Design\CAD\DWGS\HH113 PROJECT 26_FIG5-20.dwg, HH113_Fig-5.20, 12/23/2014 5:17:51 PM, PJ

The project would also include a reuse transmission pipe from the plant to the city's wellfield site that would become part of the city reclaimed water distribution system for areas the city might want to provide reclaimed water to such as the old middle school site. Approximately 22,000 feet of 12-inch pipe is proposed to connect the WWTP to the wellfield site. An automatic valve would be constructed at the termination point at the wellfield to discharge the reuse water into constructed ponds or other system to allow recharge into the aquifer. ***Figure 5.21*** shows the route of the pipe and location of the project components. The City of Holly Hill previously proposed a connection to the City of Daytona Beach's reuse system to allow transfer of reuse water to the City of Holly Hill's wellfield site. After numerous discussions with Daytona Beach officials, they declined to consider the connection. A connection to Daytona Beach's system would save Holly Hill significant funds to implement this project.

The combination of the flood control projects and this project would reduce the flooding levels, frequency, and reduce the pollutant levels that are discharged into the Halifax River. The increased storage volume and the capture of stormwater to augment the City's reuse system would significantly reduce freshwater discharge and pollution to the receiving water body. The cost of the project is detailed in the following cost estimate.

1. HOLLY HILL WWTP
2. REUSE AUGMENTATION PUMPING STATION
3. 12" FORCEMAIN FROM POND TO WWTP FILTER
4. PROPOSED 12" REUSE WATER MAIN CONNECTION TO CITY'S WELLFIELD SITE
5. AUTOMATIC CONTROL VALVE AND VAULT

Legend

Holly Hill Reuse

Diameter

- Unknown
- 2"
- 4"
- 6"
- 8"
- 12"
- Daytona Beach Reuse

EXISTING INTERCONNECT WITH CITY OF ORMOND BEACH

LIMITS OF H.H. REUSE SYSTEM

LIMITS OF D.B. REUSE SYSTEM

CITY OF HOLLY HILL

PROPOSED POND OR EXFILTRATION AREA

HOLLY HILL WESTERN WELLFIELD

CITY OF DAYTONA BEACH

N

0 2,500 5,000 Feet

Path: S:\HH\HH113 Stormwater Master Plan Update\Production\Design\GIS\HH113_project 26_FIG5-21.mxd

NO	BY	DATE	REVISION

MARK A. HAMPTON, P.E. 27391
BRADLEY T. BLAIS, P.E. 47130
DAVID A. KING, P.E. 53669
DAVID A. CLAYTON, P.E. 46601
KEVIN A. LEE, P.E. 71501

PROJECT 26

STORMWATER MASTER PLAN UPDATE 2014

CITY OF HOLLY HILL
VOLUSIA COUNTY, FLORIDA

QUENTIN L. HAMPTON ASSOCIATES, INC.
CONSULTING ENGINEERS
FLA CERTIFICATE OF AUTHORIZATION NO. 626
P.O. BOX 2026
PORT ORANGE, FLORIDA 32129-0247
386.761.6810

DESIGNED BY: BB
DRAWN BY: PEJ
DATE: 12/2014
SCALE: AS SHOWN
SHEET NO.

FIGURE 5.21

5.4.7 Project 27 – 8th Street and Walker Street Outfalls

As discussed in Section 4, the LPGA Canal/Nova Canal system is vastly undersized for present day land utilization. The system was originally sized for a mean annual storm (5" in 24 hours) and so sections are undersized and not capable of removing the volume of water from the Canal system required to prevent flooding during the 25 year event.

The construction of additional outfalls to the Halifax River from upstream of the confluence of the LPGA Canal and the railroad canals (NE and SE) would reduce the peak stage height and improve the rate of recovery for the entire Canal System. The additional outfalls are proposed to be constructed within the 8th Street and Walker Street right-of-ways and would include the construction of two (2) 60 inch pipes from the NE and SE canals to the Halifax River. These streets were chosen due to the lack of available space to expand the LPGA Canal from the railroad tracks to the river. Each 60-inch pipe would terminate at the river with a pump station capable of moving 60 cubic feet per second (cfs). The pumps are needed to overcome the tidal effects on the low areas of the city. ***Figure 5.22*** depicts a conceptual level plan of the recommended improvements for this project.

Conceptual level cost estimates follow this page. An estimate of stage reduction with the implementation of this project can be seen in ***Table 5.14.***

Table 5.14
City Of Holly Hill
Project 27 – 8th Street and Walker Street Outfalls

Local Node Peak Stages		Mean Annual		25 Year	
Node	Location	PRE	POST	PRE	POST
S001-040U	8th Street Culvert	4.53	4.10	5.26	4.96
L001-100U	NE and SE Canal Confluence	4.42	3.94	5.2	4.85
E001-030U	Walker Street Culvert	4.39	3.99	5.2	4.91

Stormwater Master Plan Update
Preliminary Construction Cost Estimate

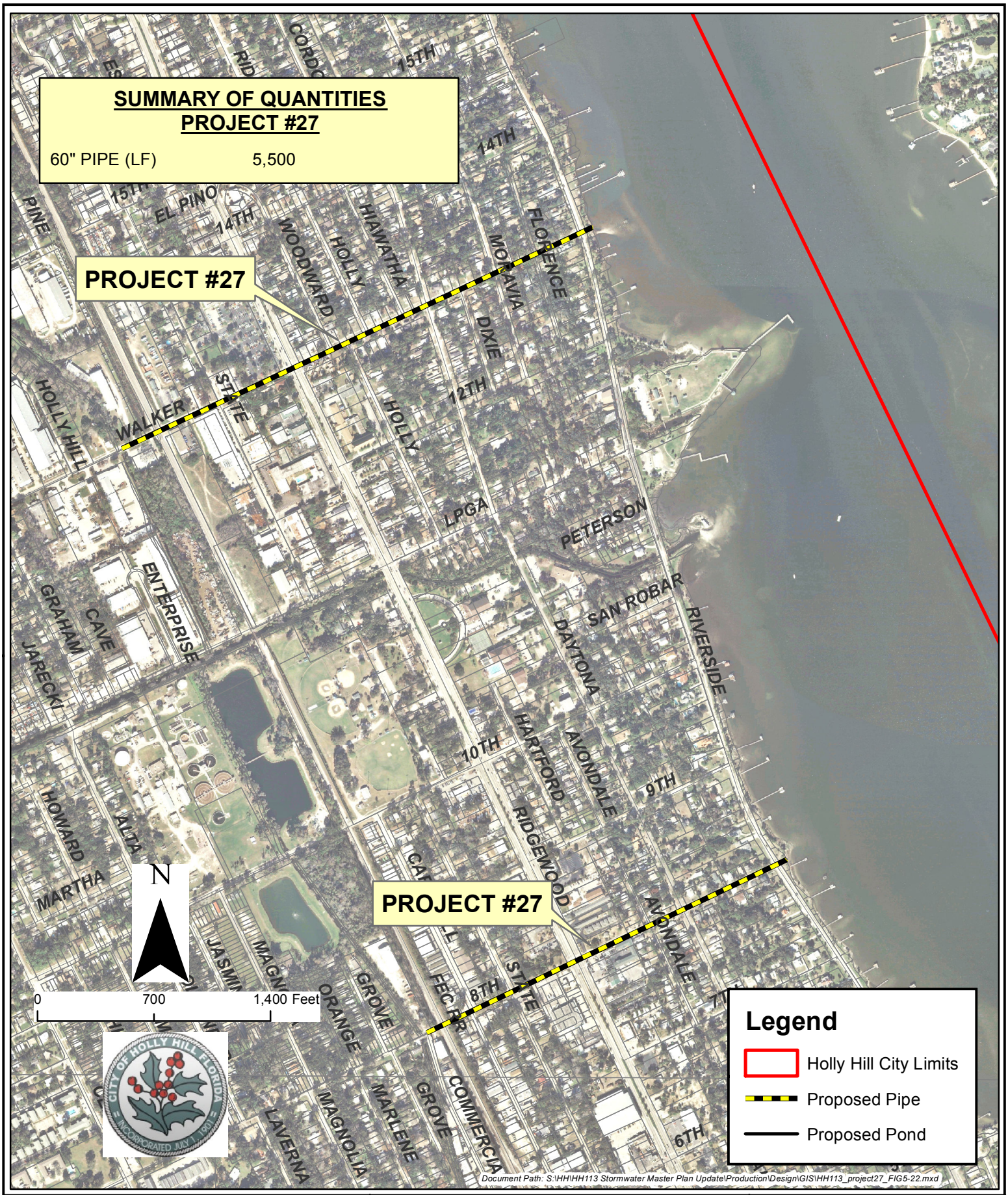
Project 27

Item Number	Deficiency Description or Location	Proposed Retrofit Improvements				
	Jack and Bore Piping	Item Description	Quantity	Unit	Unit Cost	Amount
1	Construction activities					
	- Site preparation	Clearing and grubbing	1	LS	$50,000.00	$50,000.00
	- Excavation	Tunneling Preperations	1	LS	$50,000.00	$50,000.00
	- Storm Pipe	Open Cut - 60 inch	5,300	LF	$200.00	$1,060,000.00
	- Storm Pipe	60 inch Pipe for Jack and Bore	200	LF	$600.00	$120,000.00
	- Pump	60 cfs pump - eng drivn	2	EA	$300,000.00	$600,000.00
	- Pump Structure	30' x 10' Conc. Struct w/Sluice Gate	2	EA	$150,000.00	$300,000.00
	- Material Removal	Material removed from tunneling	1	LS	$80,000.00	$80,000.00
	- Miscellaneous	Electrical/Instrumentation/Telemetry	1	LS	$100,000.00	$100,000.00
	- Dewatering	Dewatering	1	LS	$100,000.00	$100,000.00
	- Erosion control countermeasures	Silt Fence, turbidity barrier, NPDES	1	LS	$50,000.00	$50,000.00
	- Construction Administration	Maintenance of traffic, signage	1	LS	$40,000.00	$40,000.00
	- Right-of-way restoration	Asphalt, Sodding, landscaping, etc.	1	LS	$500,000.00	$500,000.00

Qualifications (if applicable)

1. Utility relocations are not included.
2. Costs of drainage easement acquisition (if required) are not included.

SUB-TOTAL		$3,050,000.00
- Mobilization @	5%	$152,500.00
- Contingencies @	10%	$305,000.00
SUB-TOTAL OF CONSTRUCTION COST		$3,507,500.00
- Eng Design & Permitting @	5.5%	$192,912.50
- Subconsultants @	2%	$70,150.00
- Constr Admin and Insp @	6%	$210,450.00
TOTAL PROJECT COST		**$3,981,013**



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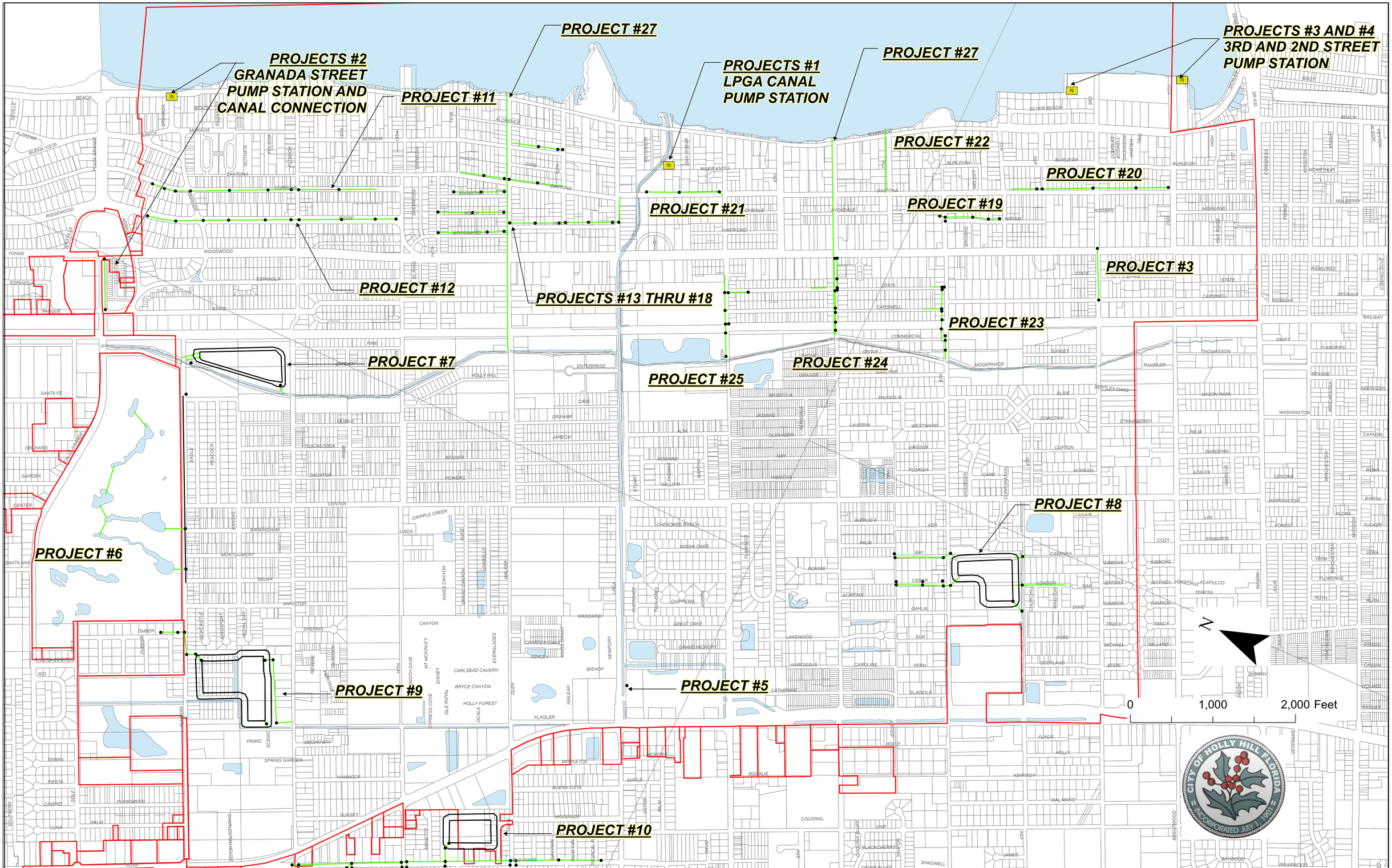
CITY OF HOLLY HILL STORMWATER MASTER PLAN UPDATE 2014

FIGURE 5.22

PROJECT 27



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CITY OF HOLLY HILL
STORMWATER
MASTER PLAN UPDATE 2014

FIGURE 5.23
OVERALL PROJECT LOCATIONS

6.0 STORMWATER POLLUTANT REMOVAL

6.1 General

Municipalities use a variety of practices of structural and non-structural control in the management of stormwater. The removal of sediment and other substances associated with stormwater runoff is essential to maintaining the stormwater conveyance systems. This section will focus on methods developed to reduce water quality degradation and improve sediment removal. Specific locations for placement of devices are shown in the previous section.

6.2 Exfiltration Systems

Stormwater exfiltration systems capture and temporarily store the "first flush" or most polluted volume of stormwater to allow it to infiltrate into the soil. Exfiltration systems applied to up gradient areas of a basin can greatly reduce peak discharge rates into receiving water bodies.

6.2.1 Examples of Exfiltration Systems Include:

- **Exfiltration Trench**

  An exfiltration trench is described as a perforated pipe or chamber surrounded by a non-calcareous rock and filter fabric. These systems can be applied in highly impervious areas where no space is available for open ponds. The groundwater table must be a minimum of one (1) foot below the bottom of the

trench or 4 to 5 feet below grade. Where applied the soils should be highly permeable. A cross section of an exfiltration trench is shown in ***Figure 6.1***.

- **Dry Detention Ponds**

  Dry retention ponds are the most favored system of infiltration due to the ease of maintenance. However, where vacant land is scarce and the water table is high, dry retention is not an option. The City should be vigilant in obtaining land for dry retention ponds in areas up gradient from basins that flood. However, the majority of uplands are developed within Holly Hill.

- **Swale Systems**

  If there is sufficient space in rights-of-ways, the City should consider the placement of swales to capture the first flush of rainfall runoff. Again, this is a system that helps reduce peak discharge rates during a minor storm event. In addition, swales are easily maintained. The drawback is most residents dislike a swale in their front yards. However, if the slopes are mild enough, this can be overcome.

6.3 Oil, Sediment, and Trash Separations

Oil, sediment, and trash separating devices come in many forms. There are devices available for retrofitting catch basins to large sediment and trash removal device capable of treating very large flows. The following figures show some examples of the devices. It is recommended the City select a few specific locations of the sediment and trash removal devices based on historical maintenance records.

Wet Detention Ponds

Wet detention ponds are an effective way to battle pollution caused by stormwater runoff. The ponds slow down the fast water flow out of the pipes and allow time for some of the nutrients to settle out of the water. In each pond, there are control structures that control the discharge of cleaner water into the Halifax River once the water level reaches a certain elevation. The ponds also help alleviate flooding.

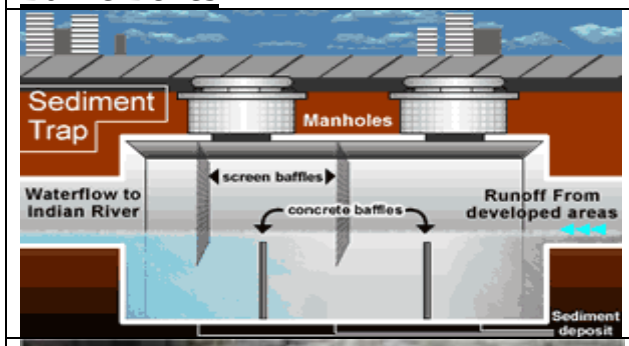
Dry Retention Ponds

Dry retention ponds can be used to both alleviate flooding and treat stormwater runoff. Dry retention ponds temporarily store runoff and allow the water to slowly percolate into the ground over several days, filtering out pollutants before it goes back into our groundwater.

Swales

Swales slow down the rapid flow of stormwater runoff from rural highways and residential streets by ponding the water between its sloping sides. By letting the water pond, it also treats the water before it goes to the lagoon. Swales can found throughout the County.

Baffle Boxes



Baffles boxes are square chambers connected to a storm drain with partitions dividing the box into sections.

Water flows into the first section of the box and allows pollutants to settle out of the water. As water rises above the next partition, it overflows into the second section to allow further reduction of pollutants. Later as the clean water rises, it exits the baffle box into the Halifax. Most baffle boxes are not visible.

Inlet Screens

Inlets are the curbside and grade drains you see in roads. When it rains, water goes down those drains and straight into the river. These two drainage systems do not do much to treat the water but they do help prevent your streets from getting flooded. Inside of the curb and grate inlets, screens or other devices that can filter out some of the dirt, leaves, and trash can be inserted to try and limit the amount of pollution that goes to the river. Although the large pieces are stopped, some nutrients can pass right through the screens and go into the river.

Inlet Basket

Fully Clogged basket

6.4 Existing Stormwater Conditions

The City's stormwater conveyance system relies on the LPGA canal system to move water out of the city and into the Halifax River. With the increase in urban development since the LPGA Canal's initial dredging, the city has been experiencing flooding after severe storm events as the water level rises over the banks of the canal. To reduce the city's dependence on the canal system, several wet detention ponds have been constructed in order to provide flood relief and improve overall water attenuation.

6.5 Existing Soil Hydrographs

The soils in Holly Hill are predominantly Type D or B/D, which are soils classified as having poor drainage characteristics. The developed areas of the City are considered urbanized soil mixtures. There are also areas of well drained Type A soils near the eastern edge of the City, approximately between US1 and Riverside Drive. These classifications were obtained from SJRWMD GIS coverages. Ground water elevations are at about elevation 4.0 near US1, sloping to elevation 0.7 at the Halifax River.

6.6 Annual Rainfall

Most hydrodynamic stormwater models are based upon single rainfall events such as a 10 or 25 year storm, which work well for predicting peak rainfall for sizing of conveyance structures or ponds. However, the perspective for a pollutant model is different. Pollutant loads vary widely with rainfall intensity and duration, making a single event model inappropriate for pollutant load calculations. To normalize the variability of rainfall events, average annual rainfall is used to calculate the pollutants on a mass annual basis.

Based upon a rain gauge station at LPGA Canal and US1, the pollutant calculations used an average annual rainfall of 50 inches for the Holly Hill Area.

6.7 Runoff Coefficients

Runoff coefficients are a major variable in the calculation of stormwater pollutants. A runoff coefficient is typically called a "C" factor for pollutant calculations. A runoff coefficient is a variable that is used to calculate the percentage of rainfall that is not percolated into the ground. Runoff coefficients used in the pollutant calculations are a function of land use and soil type. For example, a runoff coefficient value of 0.60 indicates that 40% of the rainfall for a given area percolates while the other 60% of the rainfall results in runoff.

6.8 Event Mean Concentrations (EMCs)

EMCs were used as an expression of the assumed runoff pollutant concentrations for TN and TP, expressed in mg/L of rainfall runoff. EMCs are selected as a function of land use. See **Table 6.1** for the EMC values used for the pollutant calculations based upon the land use codes.

Table 6.1
City Of Holly Hill, Florida
Emc Values

EVENT MEAN CONCENTRATIONS (mg/L)			
LCCODE	Definition	TN	TP
1100	Residential, Low Density <Less than two dwelling units per acre>	1.850	0.220
1190	-Low Density Under Construction	1.380	0.080
1200	Residential, Medium Density <Twofive dwelling units per acre>	2.230	0.316
1300	Residential, High Density	2.100	0.516
1390	-High Density Under Construction	1.380	0.080
1400	Commercial and Services	1.930	0.497
1460	-Oil and Gas Storage <Except those areas associated with industrial use or m	1.930	0.497
1510	-Food Processing	1.790	0.310
1550	-Other Light Industrial	1.550	0.150
1600	Extractive	1.180	0.150
1700	Institutional	1.800	0.478
1730	-Military	1.800	0.478
1750	-Governmental	1.800	0.478
1800	Recreational	1.250	0.080
1840	-Marinas and Fish Camps	1.580	0.150
1860	-Community Recreational Facilities	1.580	0.100
1890	-Other Recreational	1.580	0.220
2110	-Improved Pastures	2.800	0.576
2200	Tree Crops	1.920	0.506
2210	-Citrus Groves	1.920	0.506
2240	-Abandoned Groves	1.490	0.280
3100	Herbaceous (Dry Prairie)	1.200	0.064
3200	Shrub and Brushland	1.200	0.064
3300	Mixed Rangeland	1.200	0.064
4100	Upland Coniferous Forests	0.700	0.090
4110	-Pine Flatwoods	0.700	0.090
4130	-Sand Pine	0.700	0.090
4200	Upland Hardwood Forests	0.700	0.090
4210	-Xeric Oak	0.700	0.090
4340	-Hardwood - Coniferous Mixed	0.700	0.090
4370	-Australian Pines	0.700	0.090
4430	-Forest Regeneration Areas	0.700	0.090
5100	Streams and Waterways	0.600	0.050
5200	Lakes	0.600	0.110
5300	Reservoirs	0.600	0.135
5340	-Reservoirs less than 10 acres (4 hectares) which are dominant features	0.600	0.135
5400	Bays and Estuaries	0.000	0.000
6120	-Mangrove Swamps	0.000	0.000
6150	-Streams and Lake Swamps (Bottomland)	0.000	0.000
6170	-Mixed Wetland Hardwoods	0.000	0.000
6210	-Cypress	0.000	0.000
6300	Wetland Forested Mixed	0.000	0.000
6410	-Freshwater Marshes	0.000	0.000
6420	-Saltwater Marshes	0.000	0.000
6430	-Wet Prairies	0.000	0.000
6440	-Emergent Aquatic Vegetation	0.000	0.000
6460	-Treeless Hydric Savanna	0.000	0.000
6500	NonVegetated	0.000	0.000
7100	Beaches Other Than Swimming Beaches	1.250	0.053
7200	Sand Other Than Beaches	1.250	0.053
7400	Disturbed Land	1.380	0.109
7410	-Rural land in transition without positive indicators of intended activity	1.510	0.115
7430	-Spoil Areas	1.250	0.202
8110	-Airports	1.150	0.150
8120	-Railroads	1.250	0.053
8140	-Roads and Highways	1.180	0.480
8140	-Roads and Highways	1.200	0.480

6.9 Existing Pollutant Generation

The pollutant loading for each basin was calculated using the predetermined annual rainfall, runoff coefficient, and EMC for the corresponding basin. Table 6.2 summarizes this information and shows the pollutant loading for each basin without considering any treatment options existing or proposed.

Table 6.2
City Of Holly Hill, Florida
Pollutant Loads Generated Per Basin

Basin ID	Basin Area (ac)	Runoff Coefficient	EMC Nitrogen (mg/L)	EMC Phosphorus (mg/L)	TN Generated Annually (lbs)	TP Generated Annually (lbs)
E10	53.06	0.51	1.76	0.29	537	88
E20	21.32	0.75	1.88	0.45	340	82
E30	35.63	0.48	1.55	0.29	301	56
E40	13.96	0.61	1.69	0.37	163	36
E50	22.50	0.64	1.82	0.38	294	61
E60	16.30	0.55	1.62	0.33	163	33
E70	77.29	0.21	1.37	0.13	250	24
E80	69.05	0.52	1.83	0.33	745	136
E90	30.56	0.57	2.00	0.31	393	60
E100	17.64	0.57	1.93	0.36	218	40
E110	54.70	0.64	1.98	0.37	784	149
E120	42.67	0.61	1.86	0.38	548	112
H10	34.27	0.49	1.93	0.27	368	50
H20	43.90	0.69	1.85	0.48	634	164
H30	11.24	0.49	1.93	0.27	121	17
H40	53.50	0.57	1.99	0.35	688	121
H50	43.66	0.63	1.98	0.39	611	120
H60	19.70	0.61	2.03	0.38	276	52
H70	34.41	0.63	2.08	0.39	512	97
H80	13.97	0.50	1.86	0.29	147	23
H90	21.74	0.52	1.84	0.32	233	41
H100	29.55	0.57	1.97	0.35	377	66
H110	13.51	0.56	2.00	0.33	173	28
H120	17.55	0.63	2.08	0.39	260	49

Table 6.2
City Of Holly Hill, Florida
Pollutant Loads Generated Per Basin – Continued

Basin ID	Basin Area (ac)	Runoff Coefficient	EMC Nitrogen (mg/L)	EMC Phosphorus (mg/L)	TN Generated Annually (lbs)	TP Generated Annually (lbs)
H130	35.85	0.63	1.98	0.39	501	99
H140	8.83	0.59	1.98	0.37	116	22
H150	31.04	0.64	2.06	0.41	466	93
H160	97.73	0.63	1.98	0.39	1367	269
H170	53.50	0.66	1.84	0.44	734	175
L10	12.00	0.71	2.05	0.51	198	50
L20	26.22	0.59	1.72	0.39	303	70
L30	34.07	0.72	1.87	0.48	522	134
L40	14.67	0.75	1.79	0.45	221	56
L50	35.71	0.53	1.65	0.33	351	71
L60	31.18	0.70	1.87	0.46	460	114
L70	15.85	0.52	1.64	0.34	152	31
L80	27.57	0.64	1.96	0.39	388	77
L90	45.82	0.58	1.96	0.33	587	98
L100	17.59	0.58	1.74	0.38	201	44
L110	19.55	0.67	1.82	0.44	271	66
N10	19.00	0.71	1.79	0.43	273	66
N20	51.90	0.62	1.99	0.37	719	133
N30	42.43	0.68	1.72	0.41	562	135
N40	118.84	0.58	1.91	0.36	1481	275
N50	34.87	0.58	1.43	0.32	326	74
N60	122.13	0.57	1.92	0.35	1514	272
S10	41.44	0.39	1.46	0.22	265	40
S20	35.51	0.52	1.76	0.35	368	72
S30	8.12	0.42	1.48	0.25	57	9
S40	32.82	0.73	1.95	0.46	526	124
S50	23.30	0.78	1.89	0.50	390	102
S60	23.40	0.78	1.89	0.50	391	103
S70	19.95	0.79	1.89	0.50	336	88
S80	19.11	0.68	1.76	0.41	257	60
S90	16.06	0.68	1.76	0.41	216	51
S100	8.75	0.68	1.76	0.41	118	28
S110	30.11	0.51	1.81	0.32	313	54

Table 6.2
City Of Holly Hill, Florida
Pollutant Loads Generated Per Basin - Continued

Basin ID	Basin Area (ac)	Runoff Coefficient	EMC Nitrogen (mg/L)	EMC Phosphorus (mg/L)	TN Generated Annually (lbs)	TP Generated Annually (lbs)
S120	47.24	0.39	1.64	0.23	343	47
S130	42.34	0.46	1.73	0.24	385	53
S140	36.29	0.57	1.75	0.33	410	78
S150	38.08	0.56	1.87	0.34	447	83
W10	98.14	0.25	1.44	0.15	401	41
W20	93.21	0.46	1.66	0.26	812	129
W30	32.97	0.37	1.64	0.19	225	27
W40	43.14	0.60	1.93	0.37	564	107
W50	56.52	0.58	1.80	0.40	670	150
W60	85.92	0.61	1.84	0.43	1092	253
W70	65.20	0.62	1.85	0.42	847	194
W80	30.95	0.68	1.81	0.44	431	104
W90	6.33	0.64	1.72	0.39	79	18
W100	93.86	0.60	1.76	0.38	1126	242
W110	69.34	0.60	1.79	0.40	848	189
W120	52.41	0.61	1.78	0.40	643	144
W130	46.00	0.60	1.90	0.32	590	101

6.10 Existing Pond Pollutant Removal

The existing ponds in the Holly Hill area are designed to provide peak flow attenuation and improve stormwater quality. Each wet pond will reduce the amount of pollutant leaving the area it serves. ***Table 6.3*** displays the calculated removal of total phosphorus and total nitrogen in lbs/year for each wet pond. The percentage removal used for phosphorus and nitrogen by the wet ponds depends on the volume per acre retained but averages between 40% and 50%, respectively. These percentages are based upon the research article, "Pollutant Removal Efficiencies for Typical Stormwater Management Systems in Florida" written by Harper (1995).

Table 6.3
City Of Holly Hill, Florida
Pollutants Removed Due To Existing Ponds

Basin ID	Wet Pond ID	Estimated Drainage Area(ac)	Runoff C	Annual Pond TN Removal (lbs)	Annual Pond TP Removal (lbs)
E10	E010-020	25	0.51	429.30	65.74
E110	E110-020	30	0.64	169.58	40.31
L90	L090-020	45.82	0.58	231.60	48.50
L100	L100-020	12	0.58	54.03	14.67
L110	L110-020	10	0.67	54.83	16.62
N20	N020-020	25	0.62	136.61	31.79
N20	N020-030	25	0.62	136.61	31.79
N30	N030-020	30	0.68	156.68	47.02
N40	N040-020	15	0.58	73.71	17.10
N40	N040-030	35	0.58	172.00	39.91
N50	N050-020	18	0.58	66.28	18.84
N60	N060-020	45	0.57	220.04	49.37
N60	N060-030	25	0.57	122.25	27.43
S10	S010-020	40	0.39	101.16	18.82
S20	S020-020	30	0.52	122.67	29.99
S150	S150-020	35	0.56	162.13	37.22
W20	W020-020	75	0.46	257.48	51.09
W30	W030-020	30	0.37	80.80	16.38
W50	W050-020	30	0.58	140.34	39.28
W50	W050-030	10	0.58	46.78	13.09
W60	W060-020	20	0.61	100.19	28.98
W60	W060-030	35	0.61	175.33	50.72
W70	W070-020	35	0.62	179.51	51.27
W80	W080-020	10	0.68	54.93	16.64
W100	W100-020	40	0.60	189.39	50.93
W100	W100-030	30	0.60	142.04	38.20
W130	W130-020	40	0.60	202.43	43.04

6.11 Proposed Projects Pollutant Removal

This section documents the quantitative results of the pollutant removal calculations performed. As discussed in previous sections, several of the projects are proposed for water quality improvements to offset the detrimental impacts of increasing peak discharge rates during an extreme storm event. The projects that have water quality benefits include those with detention ponds, exfiltration trenches, and the reclaimed augmentation project.

The calculations for each project are located in Appendix 'F' and are summarized in Table 6.4. The City of Holly Hill can utilize these calculations to apply for grant funds to implement these projects.

Table 6.4
City Of Holly Hill
Stormwater Master Plan Update
Summary of Pollutant Loads Removed With Proposed Projects

Project #	Location	Pollutant Removal Device/System	Generated Loads		Loads Removed by BMP		Loads Remaining	
			TN(lbs/yr)	TP(lbs/yr)	TN(lbs/yr)	TP(lbs/yr)	TN(lbs/yr)	TP(lbs/yr)
7	Bishop's Farm Detention Pond	Detention Pond	441	72	176	36	265	36
8	6th St	Detention Pond	154	25	62	13	93	13
9	The Mirage Site Detention Pond	Detention Pond	348	57	139	28	209	28
10	Old Kings Rd	Detention Pond	253	41	101	21	152	21
11	Cordova Avenue	Exfiltration Trench	157	26	106	18	51	8
12	Ridge Avenue	Exfiltration Trench	193	32	120	20	73	12
13	Moravia Avenue	Exfiltration Trench	61	14	37	8	24	6
14	Daytona Avenue Part A (north part)	Exfiltration Trench	106	24	66	15	40	9
15	Hiawatha Avenue	Exfiltration Trench	61	14	35	8	26	6
16	Holly Avenue Part A (north side)	Exfiltration Trench	76	17	46	10	30	7
17	Holly Avenue Part B (south side)	Exfiltration Trench	121	27	80	18	41	9
18	Woodward Avenue	Exfiltration Trench	76	17	46	10	30	7
19	Miriam Avenue	Exfiltration Trench	60	12	38	8	22	4
20	Daytona Avenue Part B (south part)	Exfiltration Trench	98	20	57	12	41	8
21	Daytona Avenue Part C (central part)	Exfiltration Trench	90	16	51	9	39	7
26	Reclaimed Water Augmentation	Stormwater to Reuse	-	-	3860	1340	-	-

Note: Project 26 Load removed is based on 1 MGD of stormwater pumped to WWTP for reclaimed water augmentation or storage.

7.0 RECOMMENDED PROJECT IMPLEMENTATION SCHEDULE AND FUNDING

This section summarizes the projects proposed in Section 5 and recommends an implementation schedule with priorities. Later in the section funding options are discussed, including the City's current position with regard to their existing State Revolving Fund loan.

7.1 Recommended Project Implementation

The City staff and QLH staff met to discuss the City's desires on project implementation schedule. It is understood the schedule will be contingent on the availability of funds. The City's current budget (FY 14/15) includes approximately $1.3 million for capital drainage projects or land acquisition. This amount would not provide the necessary funds for the projects recommended to be implemented. It is recommended the City partner with neighboring communities in applying for all available grant opportunities and to share costs. Many of the proposed projects would be of benefit to the neighboring jurisdictions. Daytona Beach, Ormond Beach and Volusia County all border the City of Holly Hill and contribute stormwater into the Nova Canal System which eventually drains to the LPGA Canal outfall.

Table 7.1 is a summary of the recommended projects with their associated cost, and a recommended implementation schedule. It is noted that the annual cost required to implement these projects is beyond the means of the City's budget. As mentioned, a concerted effort is recommended to obtain grant funds or utilize State Revolving Fund loans available from FDEP at very low interest rates. A discussion of these grant opportunities follows.

After discussions with City staff, it was decided to forego further discussion of Projects 5 and 6. Project 5 includes the replacement of the culvert under the driveway to the Holly Hill Plaza from LPGA Boulevard. Expanding this culvert would all increase flows to the area downstream which cannot accept increase flows. It is recommended to delete Project 5 as a potential project for this reason.

Project 6 was conceptualized for stormwater quality treatment by diverting runoff to the existing Riviera Golf Club ponds. After discussing this option with City staff, it is unlikely that this project would become a reality due to the private ownership of the golf club. Therefore, it is recommended this project be deleted from consideration.

The remaining projects are recommended as shown with the flood control projects grouped in with the water quality treatment projects for ease of permitting, as discussed.

It should be noted that flooding within the City is not fully eliminated by any of the combinations of projects evaluated. This is due to the physical conditions of the majority of the area being within the floodplain (below 6 feet NAVD) and the limited conveyance outlets to the Halifax River. It must be reiterated that the Nova Canal System was constructed in the early 1920s, designed for a 5-inch in 24 hours storm event. Many of the structures that repeatedly flood were constructed on very low ground, and it may be more cost effective to purchase the structures through FEMA grants than construct a project that may not protect the structure.

The projects included in this plan that require land acquisition are suggested due to them being possible good candidates. There may be additional lands available that are brought to the attention of the City. One possible parcel is at the northwest corner of Center Street and 8th Street. A pond could be sited at this location to treat local untreated areas.

Table 7.1
City of Holly Hill
Stormwater Master Plan Update

Summary of Preliminary Cost and Implementation Schedule

				Suggested Implementation Schedule			
Project #	**Location**	**Improvement**	**Estimated Project Cost ($)**	**Immediate**	**Short Term 1-5 yrs**	**Mid Term 6-10 yrs**	**Long Term >10 yrs**
1	LPGA Canal Pump Station and Backflow Gate	Flood Protection - Pump Station	$7,601,776.00	$7,601,776.00			
2	Granada Street Pump and Baffle Box	Flood Protection - Pump Station	$765,268.08		$765,268.08		
3	3rd Street Pump and Outfall Connection	Flood Protection - Pump Station	$770,750.13		$770,750.13		
4	2nd Street Pump and Outfall Connection	Flood Protection - Pump Station	$533,194.63	$533,194.63			
5	LPGA Canal and Holly Hill Plaza Culvert Replacement	Culvert Replacement	$415,722.13	**NOT RECOMMENDED**			
6	Riviera Country Club	Regrading and Connecting Ponds	$314,173.68	**NOT RECOMMENDED**			
7	Bishop's Farm Detention Pond	Detention Pond Construction	$1,194,303.75			$1,194,303.75	
8	6th St	Detention Pond Construction	$847,107.25				$847,107.25
9	The Mirage Site Detention Pond	Detention Pond Construction	$1,048,376.80		$1,048,376.80		
10	Old Kings Rd	Detention Pond Construction	$1,166,110.35		$1,166,110.35		
11	Cordova Avenue	Exfiltration Trench	$747,125.10	$747,125.10			
12	Ridge Avenue	Exfiltration Trench	$782,758.43		$782,758.43		
13	Moravia Avenue	Exfiltration Trench	$179,406.61		$179,406.61		
14	Daytona Avenue Part A (north part)	Exfiltration Trench	$333,256.43			$333,256.43	
15	Hiawatha Avenue	Exfiltration Trench	$127,653.45			$127,653.45	
16	Holly Avenue Part A(north side)	Exfiltration Trench	$168,716.62				$168,716.62
17	Holly Avenue Part B (south side)	Exfiltration Trench	$452,203.86				$452,203.86
18	Woodward Avenue	Exfiltration Trench	$229,789.26		$229,789.26		
19	Miriam Avenue	Exfiltration Trench	$215,039.94			$215,039.94	
20	Daytona Avenue Part B (south part)	Exfiltration Trench	$283,056.52			$283,056.52	
21	Daytona Avenue Part C (Central part)	Exfiltration Trench	$253,479.55				$253,479.55
22	7th Street Improvements	Pipe installation	$217,872.33		$217,872.33		
23	6th Street Improvements	Pipe Installation and Replacement	$670,924.61			$670,924.61	
24	8th Street Improvements	Pipe Installation and Replacement	$607,176.20			$607,176.20	
25	10th Street Improvements	Pipe Installation and Replacement	$605,061.69				$605,061.69
26	Reclaimed Water Augmentation Project	Pipe Installation	$3,569,858.75			$3,569,858.75	
27	Walker St & 8th St Outfalls/Pump Stations	Pipe Installation	$3,981,012.50				$3,981,012.50
		Projects Total	**$28,081,174.61**	**$8,882,095.73**	**$5,160,331.98**	**$7,001,269.63**	**$6,307,581.47**
28	Annual Repair and Rehabilitation of Existing System	Annual Maintenance	$250,000 per year	$250,000 per year	$250,000 per year	$250,000 per year	$250,000 per year

The pump stations proposed only provide a limited benefit in that they can free up volume in the canals pre-storm and reduce the duration of flooding after a storm. There are no guarantees of eliminating the flooding altogether.

Based on this information, the City must make a policy decision on whether to fund projects with limited benefit or educate their residents of how they can flood proof their homes and businesses in areas where it floods frequently.

The City should be eligible for federal funding if it is shown that a benefit-cost ratio is below 1.0. It may be advantageous to do a combination of purchasing structures and flood prevention projects to meet this ratio. Determining the structures to be purchased is beyond the scope of this plan but can be a task when the City decides to move forward. As decisions are made to purchase properties, designs should proceed with model and further cost estimate refinement. Projects should be advanced to as close to final "shovel-ready" design as possible to increase grant funding eligibility.

7.2 Rehabilitation and Repair

Due to the age of the drainage infrastructure, the City Public Works Department is frequently discovering failing pipe and structures that need immediate repair or replacement. The City is recommended to budget funds annually for these costs. Many of these repairs or replacements are exempt from permitting and can be scheduled as soon as the City can arrange a contractor to perform the work. The City should consider budgeting an amount of $200,000 to $300,000 annually. Also, it may be advantageous to retain the services of several contractors by request for qualification process. These funds are included as Project #28 in ***Table 7.1***.

7.3 Funding Stormwater Management Programs

7.3.1 General

A well-developed and maintained stormwater management program should have reliable financial sources. Sources most commonly used to fund stormwater management programs include:

- General fund budgeting
- Special assessments
- Municipal bonds
- Matching grants
- Stormwater utility
- State Revolving Fund

Prior to 1985, most municipal stormwater programs were funded through the use of general fund revenues. Today it is more common to use a stormwater utility to finance stormwater improvements. It is the choice of each entity to determine an appropriate funding source that is fair and equitable to their constituents. The City of Holly Hill has a stormwater utility which generates approximately $2.6 million annually to fund capital improvement projects, maintenance and rehabilitation, and State Revolving Fund (SRF) loan debt service. The SRF loan debt service is approximately $470,000 annually.

7.3.2 Grant and Loan Funds

There are many sources of grant money available to entities to assist in implementing the various needs of a stormwater program. As an example, the Public Entity Grant program includes an annual program called the "Stormwater Management Cost-Share program

which is offered by SJRWMD. SWIM grants are also available but are typically allocated to projects which emphasize water quality treatment as opposed to flood alleviation. QLH has assisted several municipalities in obtaining funds through both of these programs.

Another grant source available for counties and municipalities is the Florida Forever Grant. These grants are administered by the Department of Community Affairs (DCA). This grant focuses on the preservation of wetland areas. Distressed wetland systems have a higher priority of being purchased by the State. Wetland systems connected to State waters (i.e. Intercoastal Waterway) have even a higher priority in the State's selection process.

The State of Florida offers low interest loans through the State Revolving Fund (SRF) program which this City has participated in with the last round of stormwater projects. Historically, these funds were most often used to build wastewater treatment facilities. Today, the SRF program also provides loans to be used for water quality management and source water protection activities, which constitute the Clean Water State Revolving Fund (CWSRF). The CWSRF provides funds for point source, as well as, nonpoint source projects including: (a) agricultural, silviculture, rural, and urban runoff control: (b) estuary improvement projects: (c) wet weather flow control, including stormwater and sewer outflows: (d) alternative wastewater treatment technologies; (e) landfills closures; (f) habitat restoration; and (g) protection projects in national estuary program areas. Holly Hill projects qualify for this funding source.

The Department of Environmental Protection (DEP) provides funds through the Section 319 NPS Management Implementation Grant Program. DEP receives about $4 million per year in Section 319 grant funds from EPA. These funds are used to implement stormwater retrofitting demonstration projects, to evaluate the effectiveness of stormwater BMPs, and to implement public education programs in the state's NPS priority watersheds. These include SWIM waters, National Estuary Program (NEP) waters, ground waters, and TMDL

listed water bodies. The probability that Holly Hill would be eligible for these funds is very high.

In addition to the sources described above, there are also jointly funded governmental projects where funding is shared for projects that benefit two or more governmental entities. Representative examples of such projects would include City/County participation and City/FDOT participation. Stormwater improvement projects that improve the functional classification of roadways are often funded by joint participation.

Typically, Cities that demonstrate the ability to match contributions of grants or funds from a reliable internal funding source are able to capitalize on joint project funding opportunities. Increasing the stormwater utility fee would create this needed reliable funding source. The City could generate approximately $860,000 annually by raising the stormwater utility fee another $2 per equivalent residential unit (ERU).

Lastly, as discussed previously, the City of Holly Hill should push for local partnering on some of the large pump and conveyance improvement projects since the neighboring entities contribute runoff into the Nova/LPGA Canal system.