Meeting Agenda

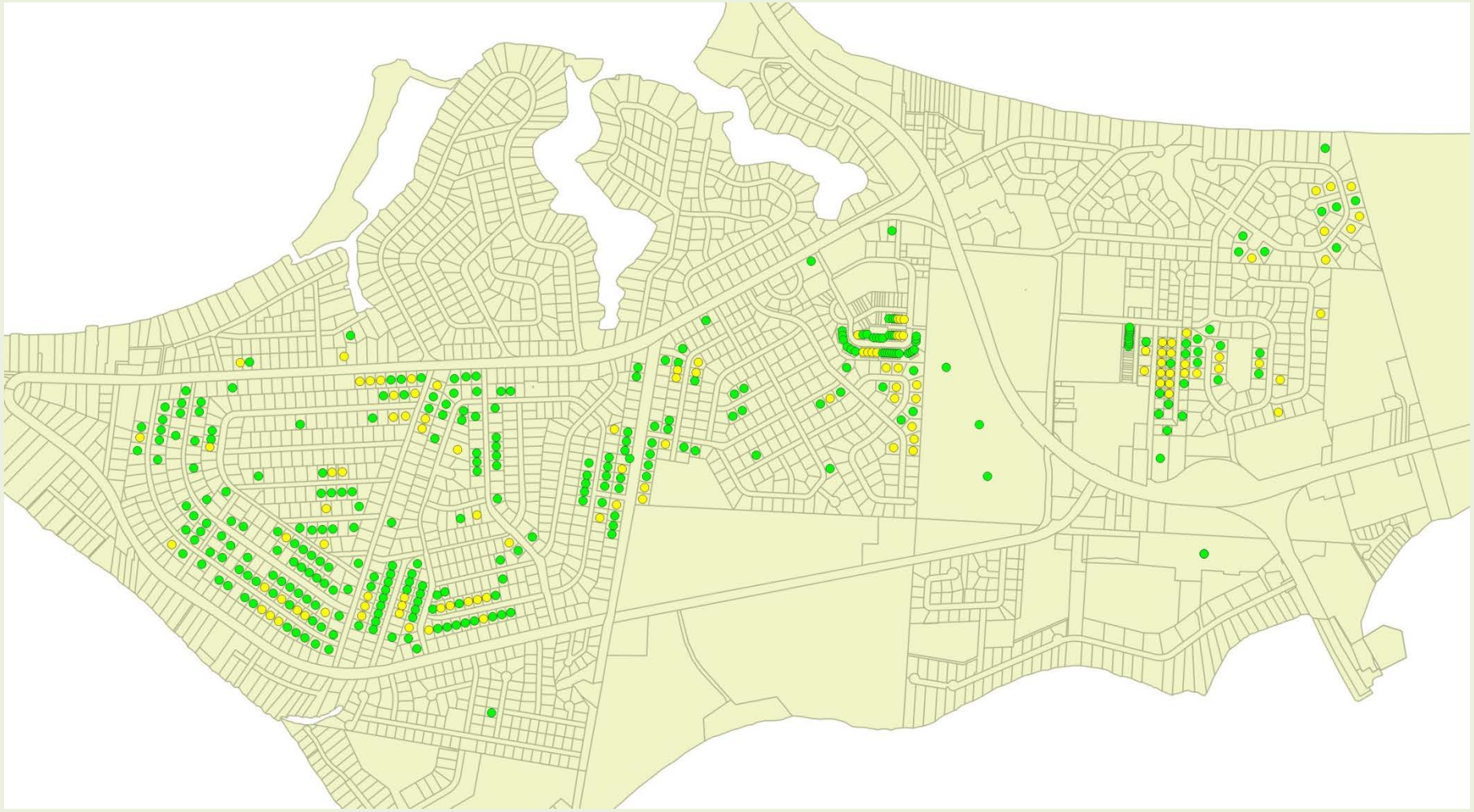
City of Gulf Breeze Storm Water and Drainage Task Force
Meeting Date: May 19, 2016 5:30 PM
Gulf Breeze City Hall

1. Call to order and determination of quorum
2. Open Forum
3. Two Years Later. Presentation by Staff
    A. West – Gilmore, Gravity Feasibility Study, Mott-MacDonald
    B. Central – Shoreline Park, Gravity Feasibility, Baskerville-Donovan, Inc
    C. East – McClure & Shirley, Plantation Hill, Gravity Feasibility Jhele-Halstead, Inc
4. Task Force Discussion

    New Business

    1. McClure & Shirley Drainage
5. Open Forum
6. Next Meeting
7. Adjournment

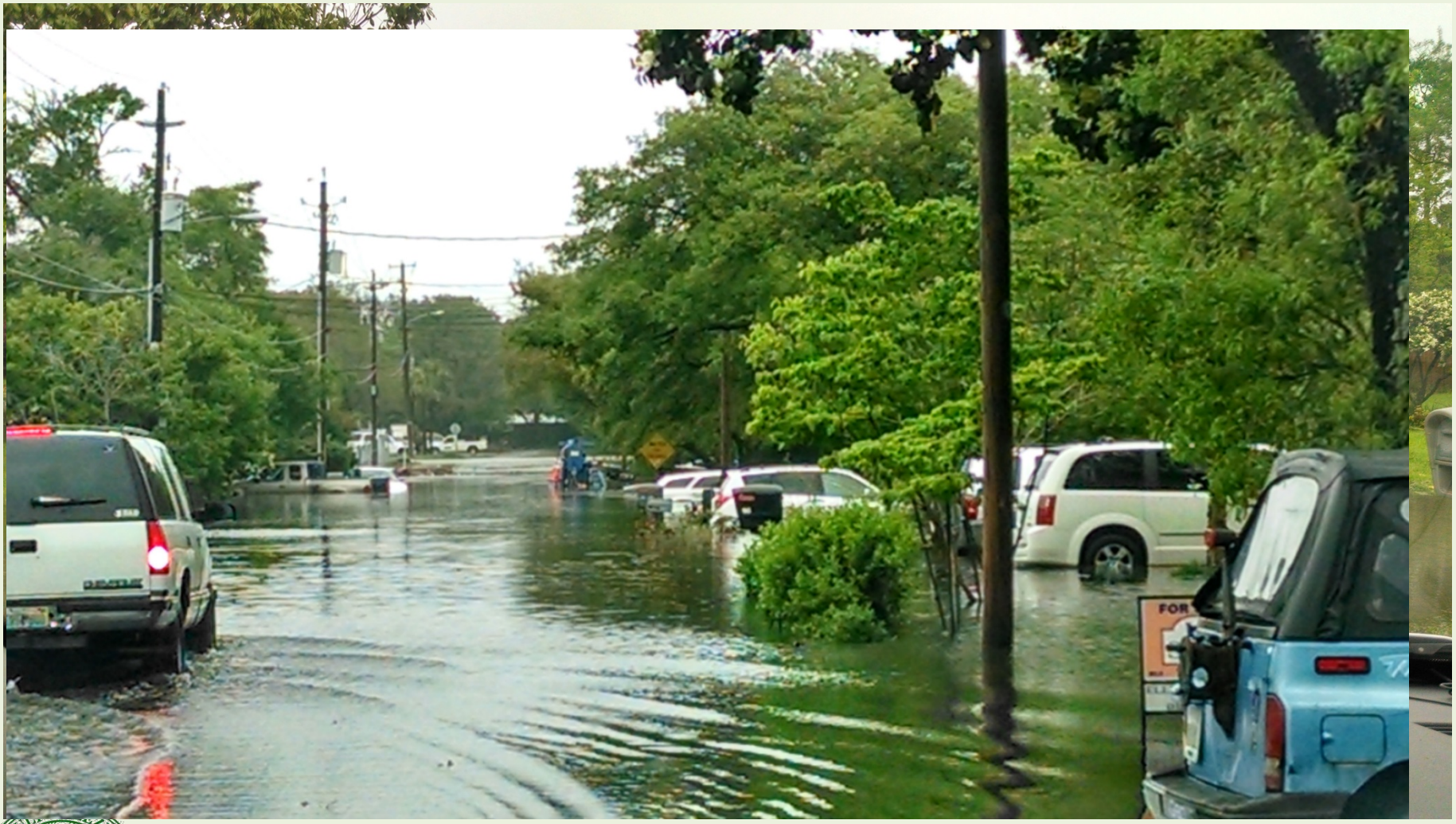
GULF BREEZE STORMWATER TASK FORCE
APRIL 28, 2015



GULF BREEZE STORMWATER TASK FORCE

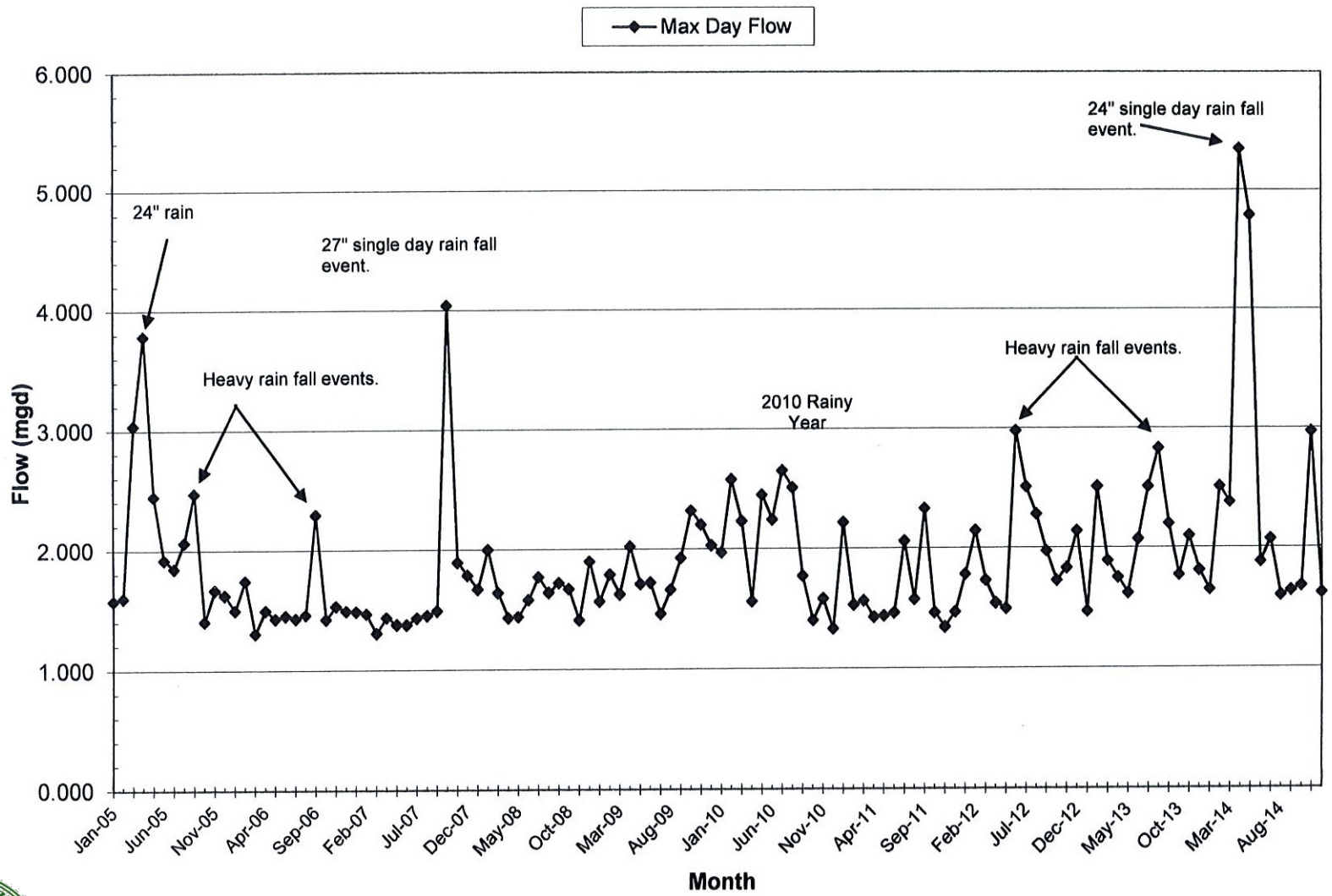
APRIL 28, 2015

TWO YEARS AGO



GULF BREEZE STORMWATER TASK FORCE APRIL 28, 2015

Figure 2. Historical Flow Data – Monthly Maximum Daily Flow (MGD)



BAY CLIFFS

GULF BREEZE STORMWATER TASK FORCE APRIL 28, 2015

BAY CLIFFS

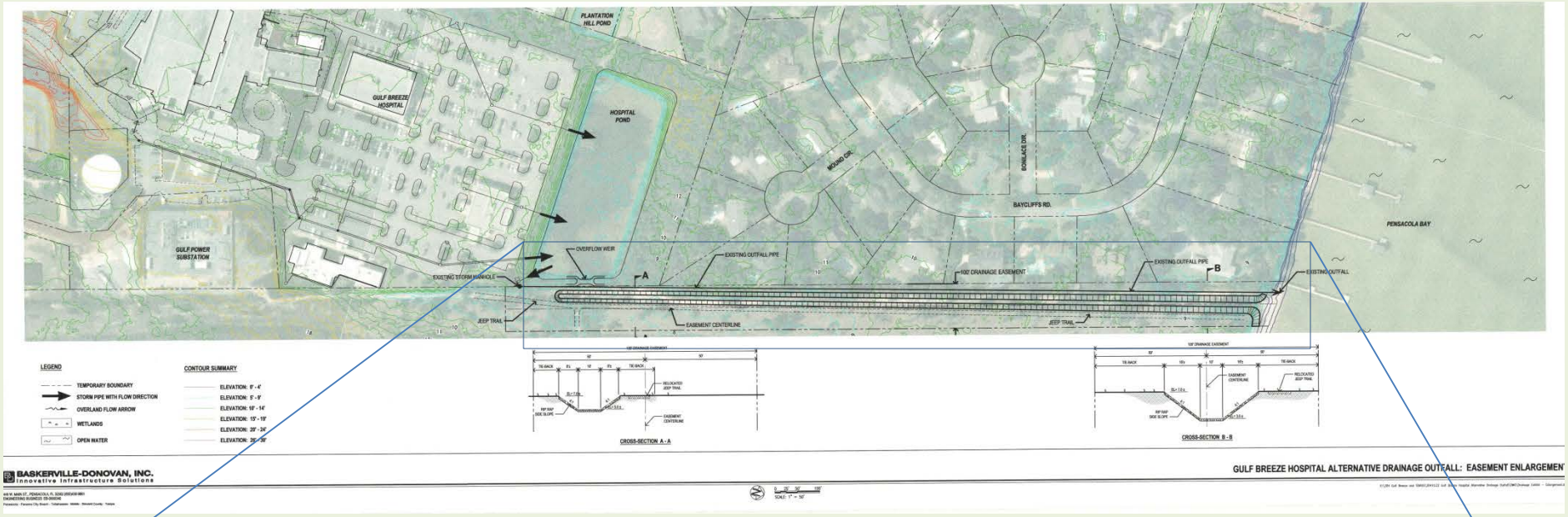
700 Bay Cliffs Rd
24" concrete line
24" PVC line
Completed Connection

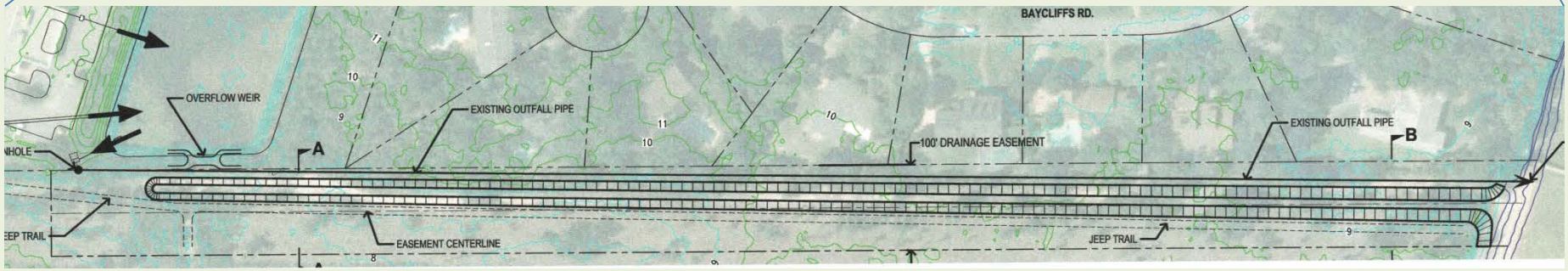
BAY CLIFFS

GULF BREEZE STORMWATER TASK FORCE APRIL 28, 2015

BAY CLIFFS

DRAINAGE CANAL ALONG BAY CLIFFS/GINS





GULF BREEZE STORMWATER TASK FORCE APRIL 28, 2015

BAHAMA BAY

GULF BREEZE STORMWATER TASK FORCE APRIL 28, 2015

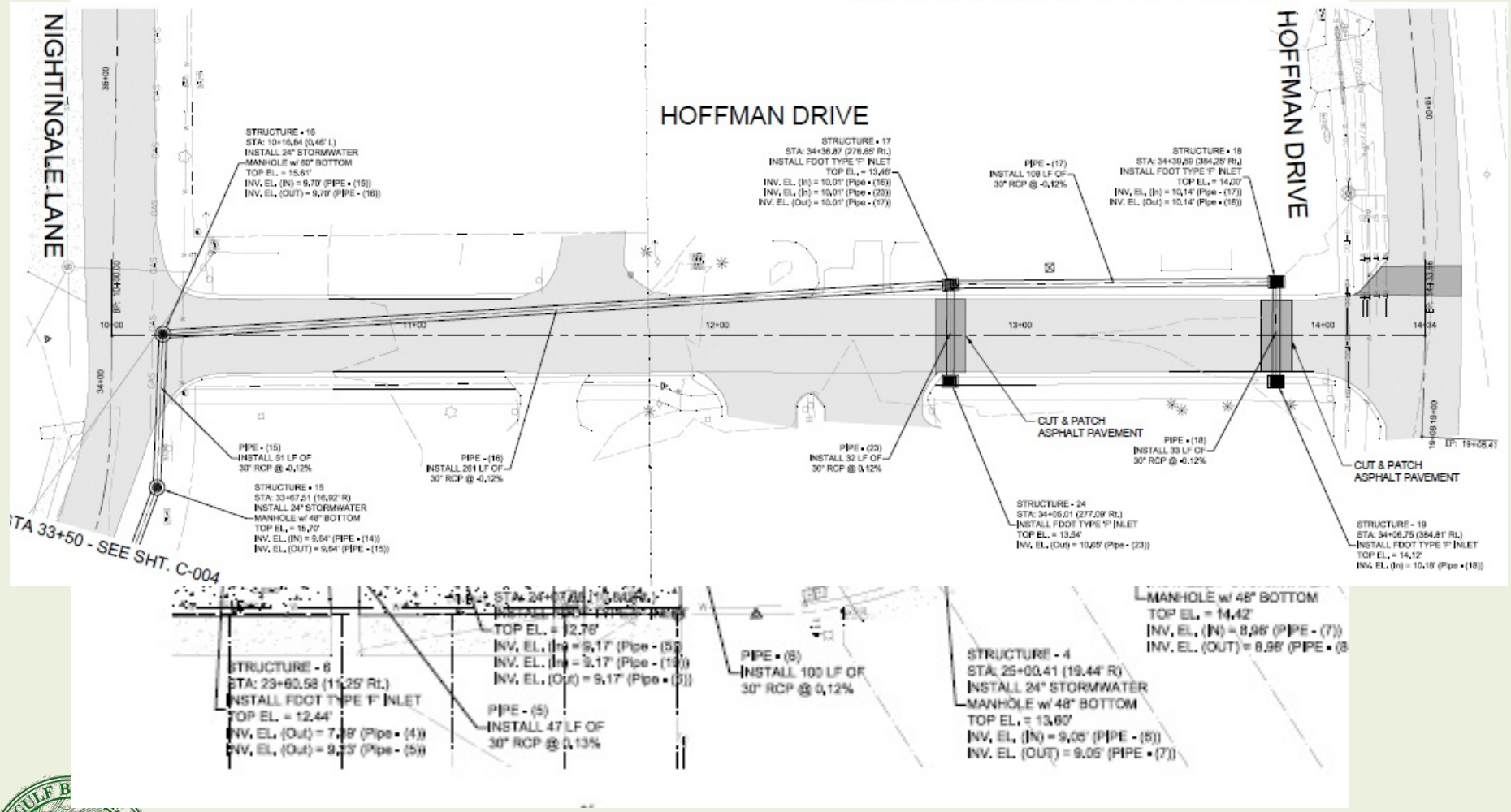
RUSS/DRACENA REDESIGN

GULF BREEZE STORMWATER TASK FORCE APRIL 28, 2015

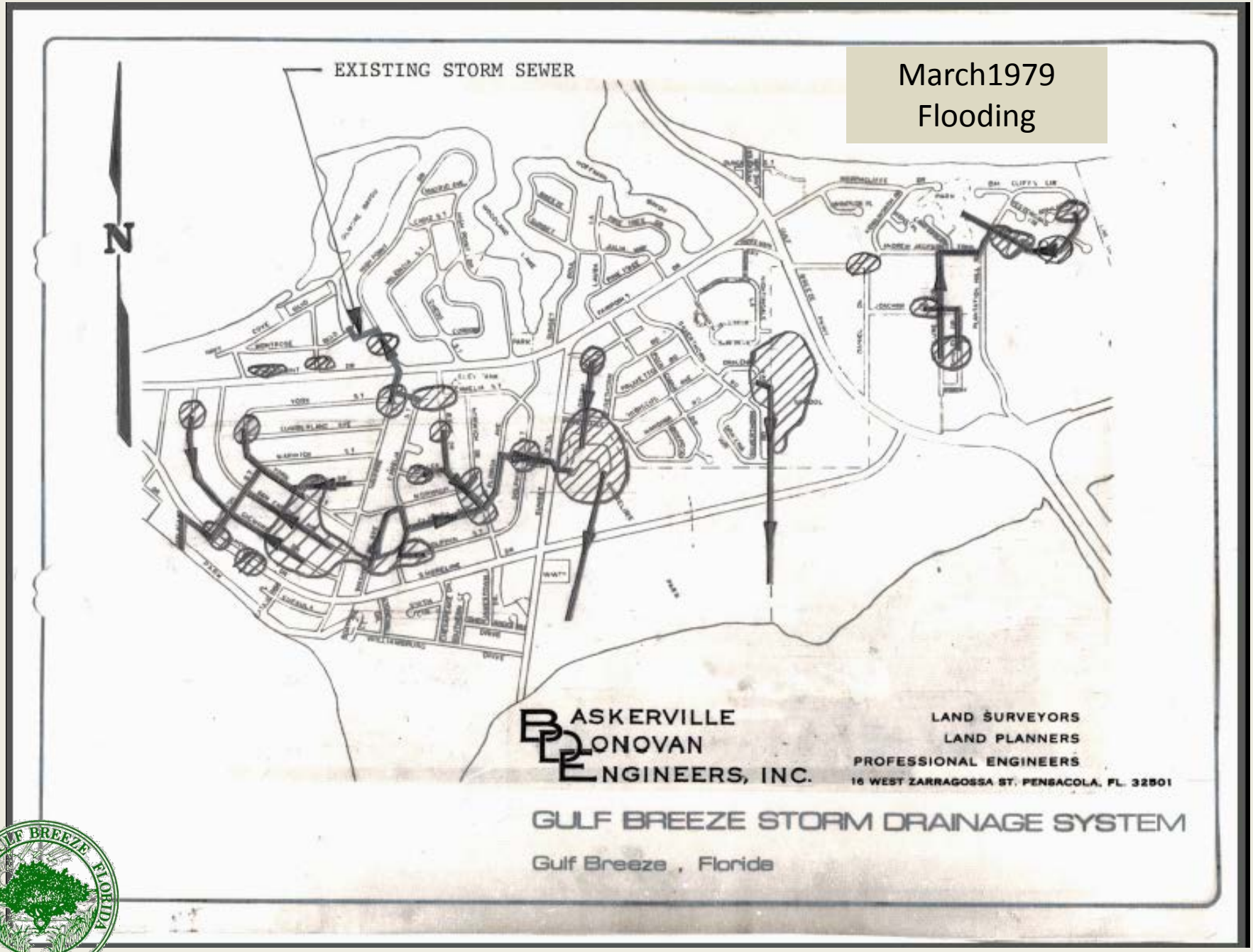
RUSS/DRACENA REDESIGN

GULF BREEZE STORMWATER TASK FORCE APRIL 28, 2015

RUSS/DRACENA REDESIGN



GULF BREEZE STORMWATER TASK FORCE APRIL 28, 2015



GULF BREEZE STORMWATER TASK FORCE MAY 19, 2016

GULF BREEZE STORMWATER TASK FORCE
MAY 19, 2016

Camelia Street Improvements

Control Box

Drainage Basins

GULF BREEZE STORMWATER TASK FORCE MAY 19, 2016

Washington Ave Improvements

Drainage Basins & Swales

Control Box

GULF BREEZE STORMWATER TASK FORCE MAY 19, 2016

South Sunset Blvd Swales

Shoreline & Daniel Junction Box

GULF BREEZE STORMWATER TASK FORCE MAY 19, 2016

Dracena Way Connection

Center Street Basins

Russ Drive Improvements

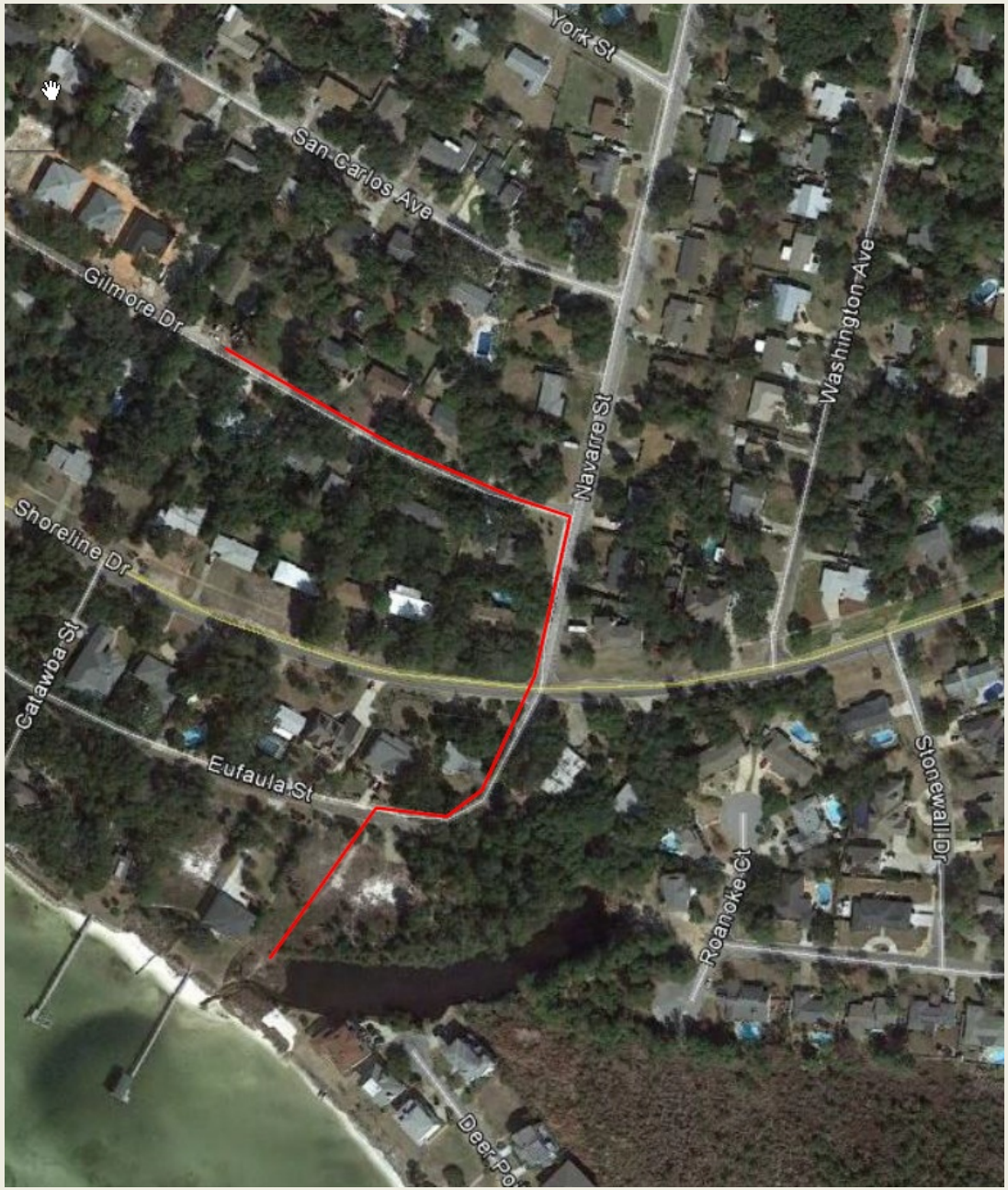
GULF BREEZE STORMWATER TASK FORCE MAY 19, 2016

288 Plantation Hill Road on 4/29/14

Finished floor elevation 13.35’

- Frequency
- Severity
- Duration

GILMORE, NAVARRE, SAN CARLOS GRAVITY CONNECTION FEASIBILITY



GULF BREEZE STORMWATER TASK FORCE APRIL 28, 2015

PARK GRAVITY DISCHARGE ACROSS SHORELINE DR.

GULF BREEZE STORMWATER TASK FORCE APRIL 28, 2015

McClure/Shirley Gravity Connection Feasibility

GULF BREEZE STORMWATER TASK FORCE MAY 19, 2016

Gilmore Drive Gravity Storm Water Outfall Feasibility Report

Hatch Mott MacDonald

CITY OF GULF BREEZE FLORIDA 1961

Project Purpose and Location

- Feasibility to construct positive outfall to convey 100 year design storm
  - Gilmore Drive to Regina Canal
  - Alternate: San Carlos Ave. drain inlet to York St. drain inlet
- Outfall size based on entire watershed

Existing Conditions Summary

- 2007 LIDAR topographic data from NWFWMD
- Storm Water basin is approximately 87 acres
  - Basin is closed and naturally slopes to the south towards Gilmore Dr.
  - Higher elevations along Shoreline Dr. prevent a positive outfall of surface flows to the south
  - Single family residential
  - Peak flow for 100 year design storm: 163 cfs or 73,000 gpm

Functional Feasibility – Minimum Slopes

- Minimum slope requirements for varying sized pipe materials

Pipe Diameter (in.)	Roughness Coefficient	Full Flow Discharge (ft^3/s)	Full Flow Slope (ft/ft)	Velocity (ft/s)
CONCRETE				
48	0.013	163.0	0.01288	12.97
54	0.013	163.0	0.00687	10.25
60	0.013	163.0	0.00392	8.30
66	0.013	163.0	0.00236	6.86
72	0.013	163.0	0.00148	5.76
DUCTILE IRON				
48	0.012	163.0	0.01097	12.97
54	0.012	163.0	0.00585	10.25
60	0.012	163.0	0.00334	8.30
66	0.012	163.0	0.00201	6.86
72	0.012	163.0	0.00126	5.76
SOLID WALL HDPE				
48	0.011	163.0	0.00922	12.97
54	0.011	163.0	0.00492	10.25
60	0.011	163.0	0.00280	8.30
66	0.011	163.0	0.00169	6.86
72	0.011	163.0	0.00106	5.76

Functional Feasibility – Maximum Slopes

- Maximum slope limits for varying sized pipes

Pipe Diameter (in)	Upstream Surface Elevation (ft)	Upstream Minimum Cover Requirement (ft)	Upstream Pipe Invert (ft)*	Approximate Route length (ft)	Downstream Pipe Invert Constraint (ft)	Maximum Allowable Pipe Slope (ft/ft)
Route Option 1						
48	9.00	2.00	3.00	1642.00	-3.00	0.00365
54	9.00	2.00	2.50	1642.00	-3.00	0.00335
60	9.00	2.00	2.00	1642.00	-3.00	0.00305
66	9.00	2.00	1.50	1642.00	-3.00	0.00274
72	9.00	2.00	1.00	1642.00	-3.00	0.00244

Construction Feasibility

- Generally, direct bury via open trench is most cost effective
- Crossing Shoreline Dr. will require alternate installation method
  - Elevation of 29.00’ at intersection with Navarre St.
  - Would require deep installation with 30’ of cover
  - Likely have an excavation 50’ or wider
  - Entire right-of-way of Navarre St.

Trenchless Installation Comparison Anticipated Conditions

- Estimated minimum length: 520 LF
- Elevations between 15.0’ and 17.0’ at the jacking and receiving pits
  - Corresponding pipe inverts: 0.0’ to -2.5’
- Installation Below water table

Trenchless Installation Comparison: Jack and Bore

- Requires an entry pit and a receiving pit
- Uses a rotating cutting head attached to the auger
- Limited support to the excavation face
- Carrier pipe within a steel casing
- Not suited for installation below the water table

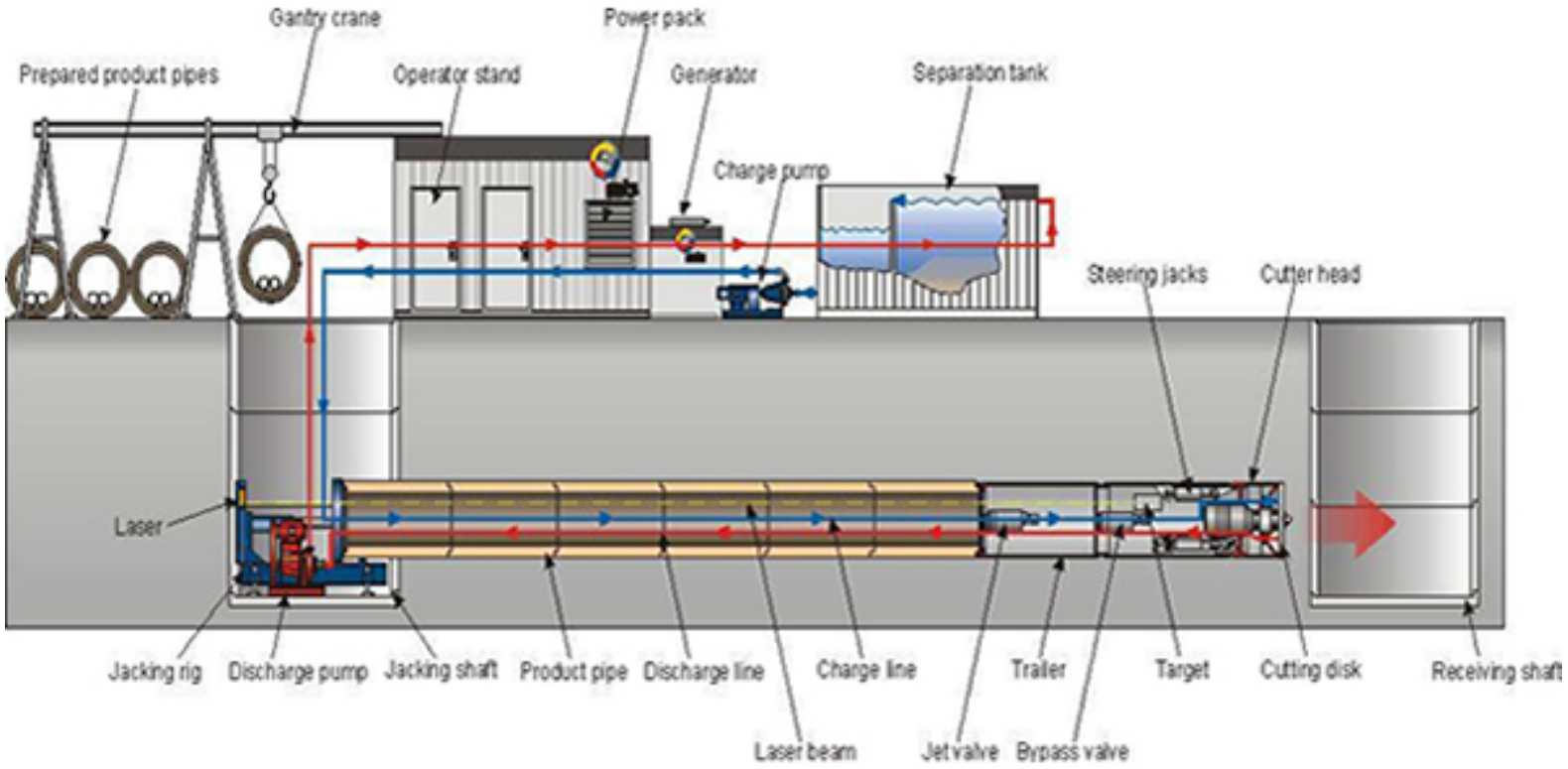
Trenchless Installation Comparison: Horizontal Directional Drilling (HDD)

- Drills then enlarges a pilot hole along centerline
- Prefabricated pipe is pulled behind the reamer
- Requires HDPE or fusible PVC which is not available in necessary diameters in the USA.

Trenchless Installation Comparison: Micro-Tunneling

- Uses a remotely controlled Micro-Tunneling Machine
- Most accurate and precise option
- Allows for installation in a single pass in poor soil below the water table
- Capable of installing required size pipe
- Requires a launch shaft and a receiving shaft
- Would need to verify soil conditions through geotechnical exploration

Micro-Tunneling



Project Cost – Site Work

Item No.	Description	Quantity	Unit	Unit Price	Amount
	SITEWORK				
	Mobilization @ 5% of Total Cost	1	LS	$ 173,122.50	$ 173,122.50
	2" SP-12.5 Asphalt	250	TN	$ 91.00	$ 22,750.00
	6"Graded Aggregate Base	2220	SY	$ 15.00	$ 33,300.00
	12" Type B Stabilization	2500	SY	$ 3.06	$ 7,650.00
	Sod	2,500	SY	$ 4.00	$ 10,000.00
	Cut and Patch Concrete Driveways	300	SY	$ 50.00	$ 15,000.00

Project Cost – Storm Water

Item No.	Description	Quantity	Unit	Unit Price	Amount
	STORMWATER				
	66" RCP	1,150	LF	$ 375.00	$ 431,250.00
	7'x4' Type J Bottom	5	LF	$ 15,000.00	$ 75,000.00
	7'x7' Type J Bottom	2	LF	$ 20,000.00	$ 40,000.00
	66" RCP Mircotunnel	550	LF	$ 4,500.00	$ 2,475,000.00
	Launch Shaft (15'x40'x20') Complete	1	LS	$ 150,000.00	$ 150,000.00
	Receiving Shaft (10'x10'x20') Complete	1	LS	$ 100,000.00	$ 100,000.00
	66" U Type Endwall w/ baffle	1	LS	$ 52,500.00	$ 52,500.00
	Dewatering	1	LS	$ 50,000.00	$ 50,000.00

Project Cost - Summary

Subtotal Costs:	$	3,635,572.50
25% Contingency:	$	908,893.13
Total Probable Project Construction Costs	$	4,544,465.63
Probable Topopgraphic Survey Fees	$	10,000.00
Probable Engineering Design Fees	$	350,000.00
Permitting	$	10,000.00
Total Probable Project Costs:	$	4,914,465.63

Alternate Route

- Along Navarre Street from San Carlos to York Street
- Interconnection of existing systems approximately 2,175 ft
- 0.05% slope towards the north between existing structures
- Further investigation is recommended to ensure outfall conditions

Gilmore Drive Gravity Stormwater Outfall Feasibility Study

For

City of Gulf Breeze, Florida
1070 Shoreline Drive
Gulf Breeze, FL 32561

Report of Findings

HMM Project No. 358048
April 2016

HATCH MOTT MACDONALD FLORIDA, LLC
220 W. Garden Street, Suite 700
Pensacola, Florida 32502
AAC000035 EB0000155 LB00006783

Steven D. White, PE
FLPE No. 58809

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Gilmore Drive Gravity Stormwater Outfall Feasibility Study

Report of Findings
HMM Project Number 358048

PROJECT PURPOSE

Following the historic rainfall which occurred in April 2014, and at the recommendation of the Gulf Breeze stormwater task force, the City of Gulf Breeze (City) has engaged Hatch Mott MacDonald (HMM) to investigate the feasibility of constructing a gravity stormwater outfall capable of conveying the runoff from a 100 year design storm event from Gilmore Drive to Regina Canal. The study will review the feasibility of such a gravity outfall from the perspective of functionality, different methods of construction and comparative opinions of probable costs associated with each.

While the size of the outfall will be based upon the peak runoff generated by the entire watershed which could contribute to surface flows to Gilmore Drive, the feasibility of constructing such an outfall will be reviewed only from the planned point of discharge into Regina Canal to the approximate low point along Gilmore Drive. To be conservative, the peak runoff rate used to size the proposed outfall for this study will be calculated based upon the assumption that existing stormwater collection/transmission facilities in the overall basin contributing flow to Gilmore Drive will be expanded such that the time of concentration from any point in the basin to the nearest inlet is limited to 56 minutes. However, the feasibility of installing and/or expanding such facilities in the overall contributing basin is considered outside the current scope of services and has therefore not been reviewed.

PROJECT LOCATION

The proposed project would be located within a portion of Section 6, Township 3S, Range 29W in the City of Gulf Breeze, Florida. The project would extend from the approximate low point along Gilmore Drive, between Hampton Street and Navarre Street to Regina Canal at the southerly end of the unopened Eufaula Street right-of-way. The route extends easterly along Gilmore Drive to Navarre Street, turning southward along Navarre Street passing beneath Shoreline Drive and continuing southerly along Eufaula Street to Regina Canal. ***Figure 1 – Gilmore Drive Gravity Stormwater Outfall Route*** depicts this general route. With the exception of areas in very near proximity to Regina Canal all portions of the proposed outfall route and contributing stormwater basin are located within Flood Zone X, areas outside the 0.20% annual chance (500 Year) flood as indicated by FEMA Flood Insurance Rate Maps, 12113C0602G and 12113C0606G, effective December 19, 2006. See ***Figure 2 - FEMA Flood Maps***. Although, the current flood insurance rate maps do not place Gilmore Drive within a special flood hazard area, this area is the low point of a localized depression within a closed basin and has historically been subject to intermittent flooding.

DATA GATHERING

Hatch Mott MacDonald personnel acquired available LIDAR topographic data circa 2007. Previous survey establishes the elevation of the low point along Washington Avenue at approximately 10.00' in the vicinity of the proposed Washington Avenue Lift Station (WALS). As a check, the LIDAR data in this area was reviewed and also found to indicate an elevation of approximately 10.00' at this same location. It is therefore believed that use of the LIDAR data for determining the feasibility of the proposed gravity stormwater outfall is reasonable. Although somewhat dated, the use of this LIDAR data is considered appropriate due to the built-out nature of the area with low potential for recent modification of area contours. HMM personnel subsequently utilized the LIDAR topographic data to delineate the extents of the watershed which currently contributes stormwater runoff to Gilmore Drive and to estimate ground surface elevations along the potential stormwater outfall piping routes to determine potential cover depths over the proposed piping system.

EXISTING CONDITIONS ANALYSIS

Using the LIDAR topographic data, an overall contributing stormwater basin of approximately 86.87 acres was delineated as depicted in ***Figure 3 – Gilmore Drive Contributing Watershed***. The watershed is characterized by a gentle southerly slope toward Gilmore Drive but lacks a positive outfall due to the significantly higher elevations present along Shoreline Drive to the south. The watershed is comprised entirely of single family residential development essentially at build-out conditions with a typical lot size of approximately 0.33 acres. Peak runoff rates were calculated using the rational equation:

$Q = CiA$, where
Q = Runoff rate (cfs)
C = Runoff coefficient
i = Rainfall intensity (in/hr)
A = Basin area, (acres)

The published runoff coefficient for single family residential developments, in sandy soils and flat topography, with typical lot sizes less than ½ acres is approximately 0.40 when considering a 100 year return frequency storm event. The runoff rate from a basin is maximized for any particular design storm when the storm duration is set equal to the basin time of concentration. For the purposes of calculating peak runoff rates, it was conservatively assumed that stormwater collection/transmission facilities would be expanded throughout the contributing basin. As such, the time of concentration for the basin is estimated to be approximately 56 minutes. The rainfall intensity for a 100 year return frequency design storm, from the FDOT Zone 1 IDF curve, for a 56 minute duration storm is 4.68 in/hr. Using these parameters, the peak runoff from the Gilmore Drive basin during a 100 year storm event was calculated as follows:

$$Q_{100} = (0.40)*(4.68 \text{ in/hr})*(86.87 \text{ ac.}) = 162.62 \text{ cfs}$$

Geotechnical explorations previously conducted along Washington Avenue to the east of this site encountered groundwater at approximate elevations ranging between 4.0' and 5.5'. Seasonal

high groundwater was estimated to be near an elevation of approximately 6.5'. Due to the near proximity to Gilmore Road and Navarre Street it is believed that these groundwater elevations are reasonable estimations for groundwater elevations for this study.

FUNCTIONAL FEASIBILITY REVIEW

Review of the functional feasibility of construction a gravity outfall, focused on the topographic conditions along the proposed route and the size requirements for the gravity outfall piping to determine if sufficient elevation differential existed such that a viable outfall could be achieved while maintaining cover over the system.

For this purpose an analysis was performed to determine the minimum slope required for pipes of varying sizes and materials to convey 163 cfs at full flow conditions.

The results of this analysis are as indicated in the below Table:

Table 1 – Pipe Full Flow Slope Analysis

Pipe Diameter (in.)	Roughness Coefficient	Full Flow Discharge (ft^3/s)	Full Flow Slope (ft/ft)	Velocity (ft/s)
CONCRETE				
48	0.013	163.0	0.01288	12.97
54	0.013	163.0	0.00687	10.25
60	0.013	163.0	0.00392	8.30
66	0.013	163.0	0.00236	6.86
72	0.013	163.0	0.00148	5.76
DUCTILE IRON				
48	0.012	163.0	0.01097	12.97
54	0.012	163.0	0.00585	10.25
60	0.012	163.0	0.00334	8.30
66	0.012	163.0	0.00201	6.86
72	0.012	163.0	0.00126	5.76
SOLID WALL HDPE				
48	0.011	163.0	0.00922	12.97
54	0.011	163.0	0.00492	10.25
60	0.011	163.0	0.00280	8.30
66	0.011	163.0	0.00169	6.86
72	0.011	163.0	0.00106	5.76

Next, the LIDAR topographic data was reviewed to determine elevation constraints at Gilmore Drive. LIDAR data estimates the low elevation along Gilmore Drive to be approximately at

elevation 9.00'. As bathymetric survey data at the proposed outfall into Regina Canal is not available, a constraint of elevation -3.00' was applied at the discharge location. Based upon a starting minimum cover requirement of 2' at Gilmore Drive and the length of the proposed Routes maximum pipe slope limits were determined for the various size pipes as indicated in the below Table:

Table 2 – Maximum Allowable Pipe Slope vs. Pipe Diameter

Pipe Diameter (in)	Upstream Surface Elevation (ft)	Upstream Minimum Cover Requirement (ft)	Upstream Pipe Invert (ft)*	Approximate Route length (ft)	Downstream Pipe Invert Constraint (ft)	Maximum Allowable Pipe Slope (ft/ft)
Route Option 1						
48	9.00	2.00	3.00	1642.00	-3.00	0.00365
54	9.00	2.00	2.50	1642.00	-3.00	0.00335
60	9.00	2.00	2.00	1642.00	-3.00	0.00305
66	9.00	2.00	1.50	1642.00	-3.00	0.00274
72	9.00	2.00	1.00	1642.00	-3.00	0.00244

*Pipe cover and upstream invert calculations do not consider wall thickness.

Based upon a comparison of the full flow slope data contained in Table 1 versus the maximum allowable pipe slope date in Table 2, it can be determined that installation of a single barrel gravity stormwater outfall from the approximate low point of Gilmore Drive to Regina Canal is functionally feasible using a 66" or 72" RCP diameter piping system provided that a discharge elevation within Regina Canal of -3.00' is attainable.

CONSTRUCTION OPTIONS FEASIBILITY

The foregoing functional feasibility assessment focused upon the physical ability to provide the minimum slope required for the proposed piping system to convey the necessary peak discharge rates while maintaining a minimal cover requirement at the upstream end of the system and providing a positive outfall into Regina Canal. However, this assessment did not address the constructability of such a system. Therefore this section of the report is intended to provide a discussion of various construction options which might be specified/necessary in order to install the necessary infrastructure.

Generally speaking, the most cost effective method of installation is direct bury via open trench. As such, it is anticipated that this method of installation would be pursued whenever practical. There is one aspect of the installation of such a proposed system, however, that would likely require the specification of alternate installation methods. Specifically, the elevation along Shoreline Drive is shown at an approximate elevation of 29.00' at its intersections with Navarre Street. Given that the likely invert of any proposed gravity outfall piping at this crossing location would be between elevation -1.00'and 0.00' the depth of the installation would be approximate 30'. An excavation of this depth which was not shored would likely have a width at

the surface at or in excess of 50'. The Navarre Street right-of-way is approximately 50' wide with private residences with their sole/main means of access in the location where the installation would occur. The width, depth and nature of such an excavation would not allow ingress/egress to residents' homes to be maintained as required. Shoring of such an excavation may limit the width but would likely prevent the closure of the excavation each night and still result in denial of access to some residents. Hence, trenchless installation methods would likely be required to cross Shoreline Drive. The following discussion of installation methodologies is limited to these potential crossings sites and it is anticipated that other areas of the proposed outfall piping would be installed via conventional trench methods.

TRENCHLESS INSTALLATION COMPARISON

Anticipated conditions along trenchless technology installation route

The minimum installation length of piping via trenchless technology is anticipated to be approximately 520 linear feet. Based upon the LIDAR topographic data ground surface elevations at the jacking and receiving pits are anticipated to be at elevations roughly between 15.0' and 17.0'. Corresponding pipe inverts at these locations are expected to be in the range of 0.0' to -2.5'. As discussed previously groundwater elevations are anticipated to be between elevations 4.0' and 6.5'. Hence, the installation would be conducted within groundwater.

Jack and Bore

Jack and bore is a well-known and established trenchless application. The process requires an entry pit and a receiving pit, and it uses a rotating cutting head attached to the auger to create a bore path that the casing is simultaneously jacked into. This method of installation provides limited tracking and steering along with limited support to the excavation face. The jack and bore method typically involves installation of carrier pipe of the required diameter within a steel casing of larger diameter.

This particular method of installation is not suited for installations below the water table, as would be the case for the currently contemplated project. As such, jack and bore installation is not considered feasible.

Horizontal Directional Drilling (HDD)

HDD is another trenchless method of installing underground pipes. Unlike jack and bore, HDD requires drilling a pilot hole along the proposed design centerline before enlarging the pilot hole to the desired diameter using a back reamer. The prefabricated pipe is then pulled behind the reamer, usually from the side of the crossing opposite the drill rig. HDD allows for the possibility of a deeper and longer installation than jack and bore and is not precluded in installations below the water table. HDD installations are typically performed for pressurized systems along a more or less concave alignment, although can be performed to provide on-grade alignments for gravity flow applications.

HDD is typically accomplished using ductile iron pipe with flex-ring joints, fusible solid wall HDPE or fusible PVC pipe. However, fusible PVC is not available in the necessary diameter to

convey the design flows. Furthermore, while ductile iron pipe is available in the require diameter the necessary flex-ring coupler needed to allow use of ductile iron pipe in an HDD application is only available in sizes up to 54", thereby eliminating ductile iron as a potential material. Solid wall fusible HDPE pipe is available in the US in sizes up to 65" outside diameter with inside diameters up to 60.76".

However, performing an at grade directional drill for pipe with an outside diameter of 65" over a length somewhere between 500 feet to 1000 feet, depending on entry/exit method, is not considered feasible. Even if a double barrel crossing is considered the required pipe size (54" outside diameter) and length of the crossing in additional to barrel separation considerations prevent HDD from being a feasible option

Microtunneling

Microtunneling is a trenchless method that uses a remotely controlled Microtunnel Boring Machine (MTBM) to install gravity flow pipelines. This method is the most accurate and precise of the options discussed and allows product pipe to be installed directly in a single pass in poor soil below the water table. A variety of pipe materials can be used for microtunneling as well, including steel, reinforced concrete, vitrified clayware, glass fiber/resin-based pipes, and plastic. This method is capable of installing the size pipe proposed in this report and larger. Microtunneling has been used successfully in Florida (most prevalently south Florida) and there are a number of contractors in Florida who provide this service. It is therefore considered a feasible option for this project.

Microtunneling does require a launch shaft and a reception shaft in addition to room for equipment on the launch side. It is anticipated that the launch shaft for a pipe of this diameter would likely be approximately 15' wide and 40' in length while the reception shaft would be approximately 10' long by 10' wide. It appears likely that the launch shaft could be placed at the bend in Eufala Street and the receiving pit could be installed at the intersection of Gilmore Drive and Navarre Street without interrupting access to any of the area residents.

It should be noted that final determination of the suitability for use of this technology would necessarily need to be predicated on verification of anticipated soil conditions through geotechnical exploration

PROJECT COSTS

HMM has prepared an opinion of probable project costs for the project based upon the above findings.

Gilmore Drive Gravity Stormwater Outfall
Figure 4 - Opinion of Probable Project Costs
February 3,2016

HMM Project No. 358048

Basis: Conceptual Alignmnet - Microtunnel

Hatch Mott MacDonald

Item No.	Description	Quantity	Unit	Unit Price	Amount
	SITEWORK				
	Mobilization @ 5% of Total Cost	1	LS	$ 173,122.50	$ 173,122.50
	2" SP-12.5 Asphalt	250	TN	$ 91.00	$ 22,750.00
	6"Graded Aggregate Base	2220	SY	$ 15.00	$ 33,300.00
	12" Type B Stabilization	2500	SY	$ 3.06	$ 7,650.00
	Sod	2,500	SY	$ 4.00	$ 10,000.00
	Cut and Patch Concrete Driveways	300	SY	$ 50.00	$ 15,000.00
	STORMWATER				
	66" RCP	1,150	LF	$ 375.00	$ 431,250.00
	7'x4' Type J Bottom	5	LF	$ 15,000.00	$ 75,000.00
	7'x7' Type J Bottom	2	LF	$ 20,000.00	$ 40,000.00
	66" RCP Mircotunnel	550	LF	$ 4,500.00	$ 2,475,000.00
	Launch Shaft (15'x40'x20') Complete	1	LS	$ 150,000.00	$ 150,000.00
	Receiving Shaft (10'x10'x20') Complete	1	LS	$ 100,000.00	$ 100,000.00
	66" U Type Endwall w/ baffle	1	LS	$ 52,500.00	$ 52,500.00
	Dewatering	1	LS	$ 50,000.00	$ 50,000.00
	Subtotal Costs:				**$ 3,635,572.50**
	25% Contingency:				**$ 908,893.13**
	Total Probable Project Construction Costs				**$ 4,544,465.63**
	Probable Topopgraphic Survey Fees				**$ 10,000.00**
	Probable Engineering Design Fees				**$ 350,000.00**
	Permitting				**$ 10,000.00**
	Total Probable Project Costs:				**$ 4,914,465.63**

Hatch Mott MacDonald
Hatch Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
220 West Garden Street, Suite 700
Pensacola, Florida (32502)
Telephone: (850) 484-8011 ¤ Fax: (850) 484-8199

GULF BREEZE GILMORE DRAINAGE IMPROVEMENTS
SANTA ROSA COUNTY, FLORIDA

REV.	DATE	REVISION DESCRIPTION

DATE: OCTOBER 2015
DESIGNED BY: B. CANNON
DRAWN BY: T. MITCHELL
PROJECT ENGINEER: B. CANNON
PROJECT MANAGER: S. WHITE
H.M.M. PROJECT NUMBER: 359048

THIS DRAWING IS NOT FOR CONSTRUCTION

SHEET TITLE:
GRAVITY STORMWATER OUTFALL ROUTE

SHEET NUMBER:
FIGURE 1

This drawing is the property of Hatch Mott MacDonald Florida, LLC, and may not be reproduced without written permission.

NOTES TO USERS

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Coastal Base Flood Elevations shown on this map appy only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study reportfor this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain nanagement purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements ofthe National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report or information on flood contro structures for this jurisdiction.

The **projection** used in the preparation of this map was Florida State Plane North zone. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differenes in map features across jurisdiction boundaries. These differences do not affect he accuracy of this FIRM.

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Spatial Reference System Divison
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

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If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

COASTAL BARRIER LEGEND

11/16/1990 Coastal Barrier

FLOOD INSURANCE NOT AVAILABLE FOR NEW CONSTRUCTION OR SUBSTANTIALLY IMPROVED STRUCTURES ON OR AFTER NOVEMBER 16, 1990, IN DESIGNATED COASTALBARRIERS.

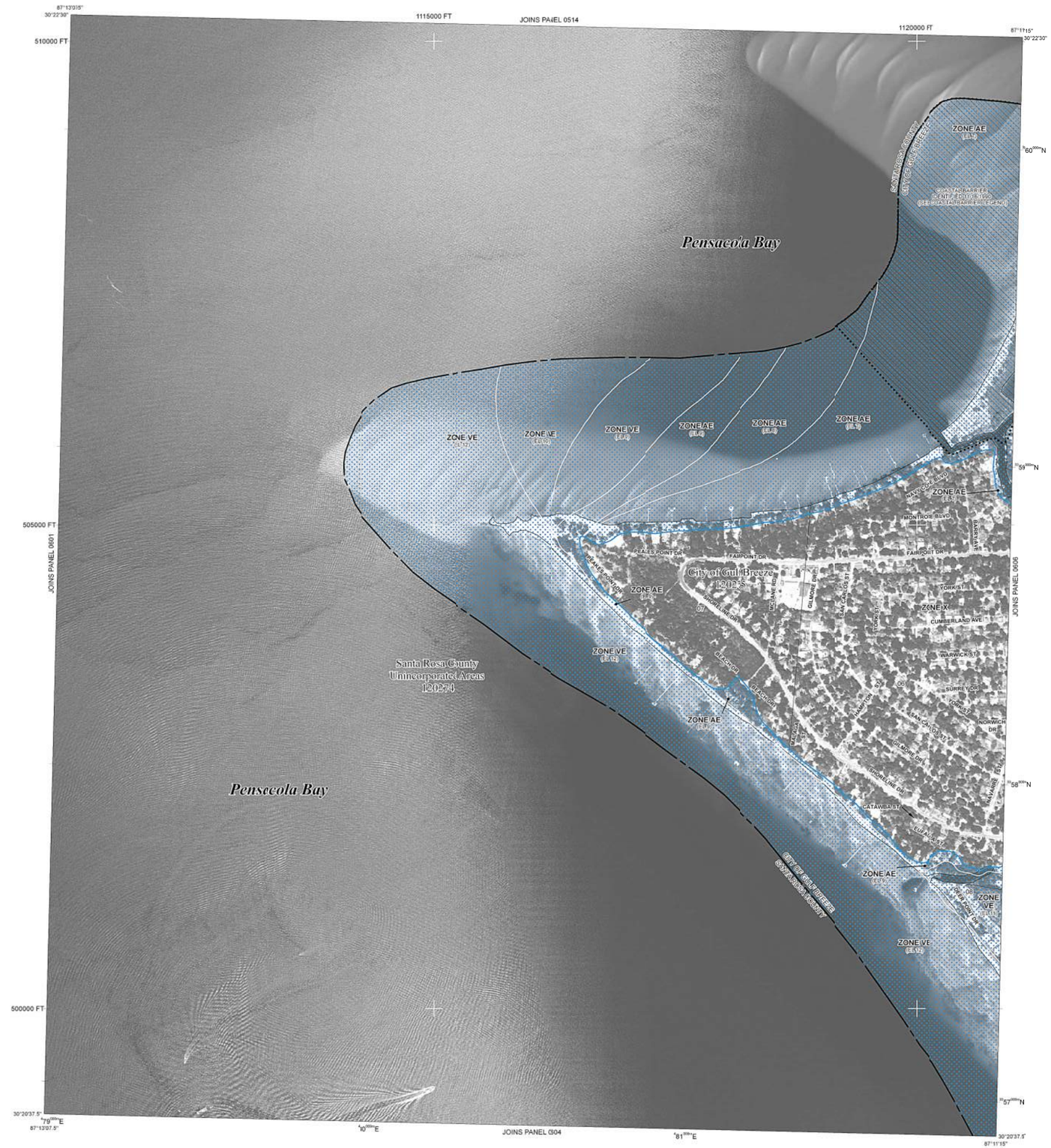
11/16/1991 Otherwise Protected Area

FLOOD INSURANCE NOT AVAILABLE FOR STRUCTURES - NEWLY BUILT OR SUBSTANTIALLY IMPROVED ON OR AFTER NOVEMBER 16,1991- NOT USED IN A MANNER CONSISTENT WITH THE PURPOSE OF THE OTHERWISE PROTECTED AREAS.

02/24/1997 Coastal Barrier

FLOOD INSURANCE NOT AVAILABLE FOR NEW CONSTRUCTION OR SUBSTANTIALLY IMPROVED STRUCTURES ON OR AFTER FEBRUARY 24, 1997, IN DESIGNATED COASTAL BARRIERS.

Comments or concerns regarding the Coastal Barrier Resources System or Otherwise Protected Areas should be directed to the Coastal Barrier Coordinator at the U.S. Fish and Wildlife Service; (404) 679-7106.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross section line
(23)- - - - -(23)	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
3°76000mN	1000-meter Universal Transverse Mercator grid values, zone 16
600000 FT	5000-foot grid ticks: Florida State Plane coordinate system, North zone (FIPSZONE 0903), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
●M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
DECEMBER 19, 2006

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Food Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0602G

FIRM

FLOOD INSURANCE RATE MAP

SANTA ROSA COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 602 OF 657

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
GULF BREEZE, CITY OF	120275	0602	G
SANTA ROSA COUNTY	120274	0602	G

- NOTE -

THIS MAP INCLUDES COASTAL BARRIER RESOURCES SYSTEM BOUNDARIES ESTABLISHED UNDER THE COASTAL BARRIER RESOURCE ACT OF 1982 AND/OR SUBSEQUENT LEGISLATION.

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
12113C0602G

EFFECTIVE DATE
DECEMBER 19, 2006

Federal Emergency Management Agency

FIGURE 2a

NOTES TO USERS

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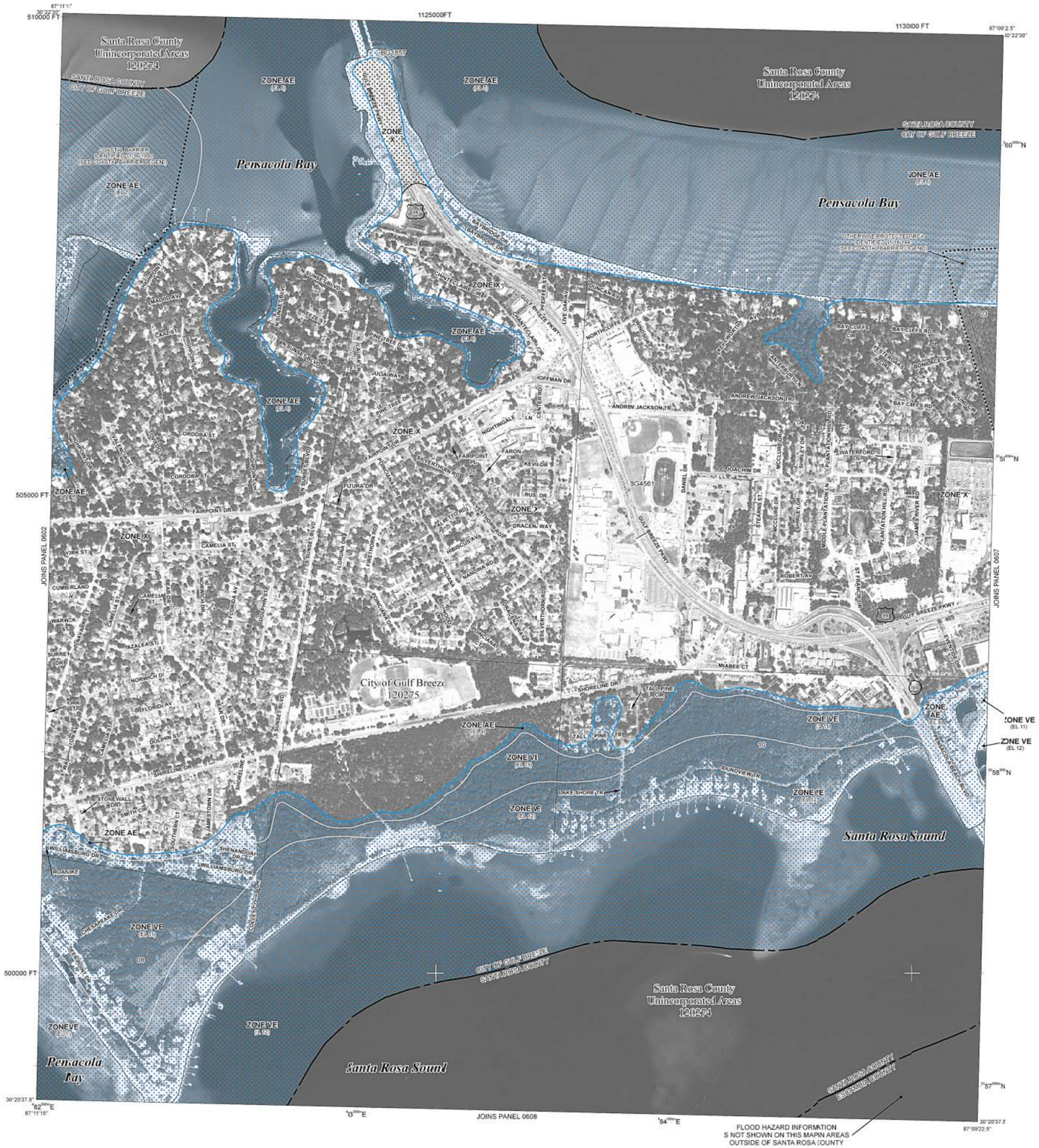

LEGEND

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	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

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MAP REPOSITORY
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EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
DECEMBER 19, 2006

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0601G

FIRM

FLOOD INSURANCE RATE MAP

SANTA ROSA COUNTY, FLORIDA
AND INCORPORATED AREAS

PANEL 606 OF 657

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GULF BREEZE, CITY OF	120275	0606	G
SANTA ROSA COUNTY	120274	0606	G

- NOTE -

THIS MAP INCLUDES COASTAL BARRIER RESOURCES SYSTEM BOUNDARIES ESTABLISHED UNDER THE COASTAL BARRIER RESOURCES ACT OF 1982 AND/OR SUBSEQUENT LEGISLATION.

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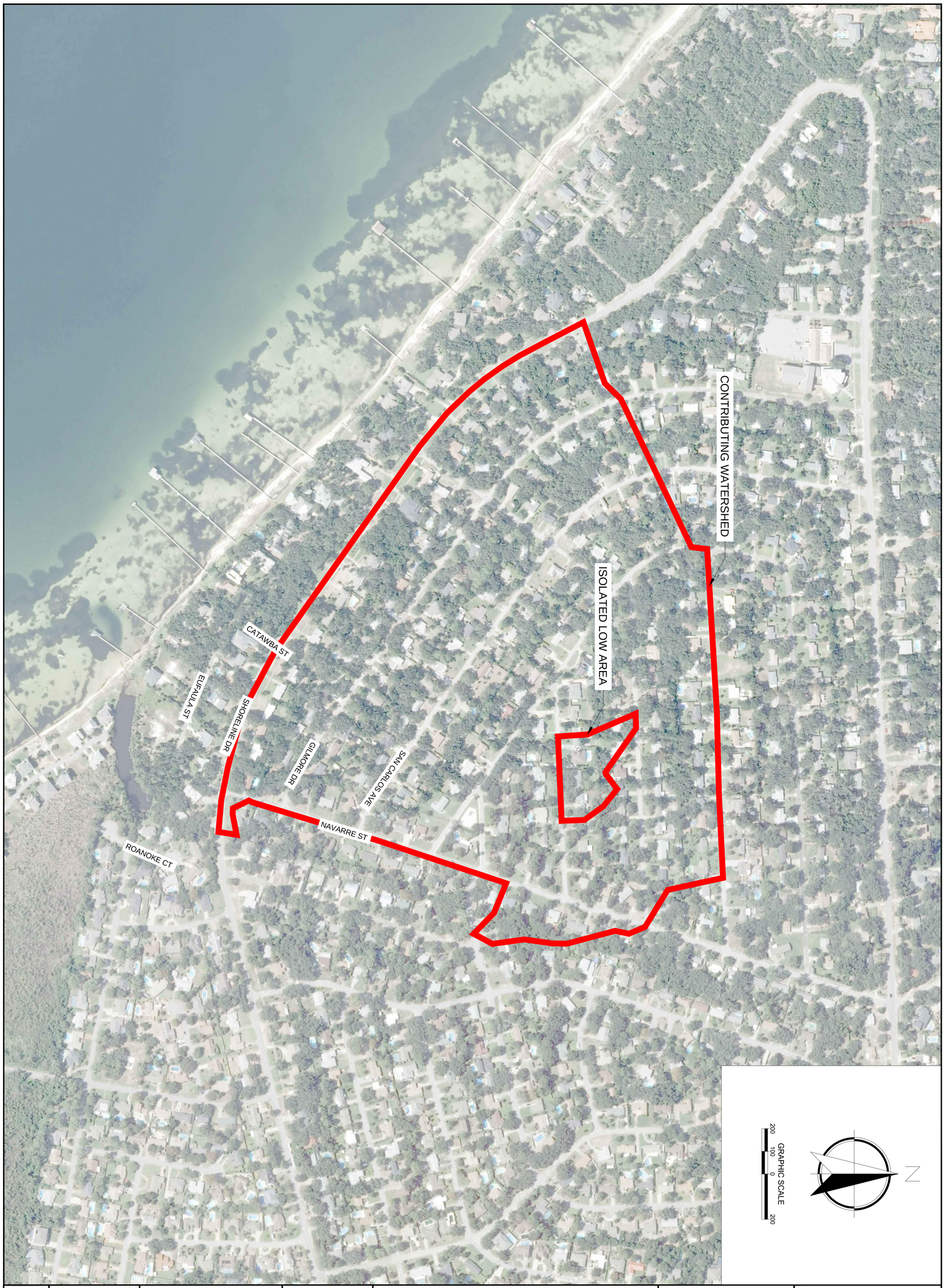
MAP NUMBER
12113C0606G

EFFECTIVE DATE
DECEMBER 19, 2006

Federal Emergency Management Agency

FIGURE 2b



SHEET NUMBER: FIGURE 3

SHEET TITLE: GILMORE DRIVE CONTRIBUTING WATERSHED

THIS DRAWING IS NOT FOR CONSTRUCTION

DATE:	OCTOBER 2015
DESIGNED BY:	B. CANNON
DRAWN BY:	T. MITCHELL
PROJECT ENGINEER	B. CANNON
PROJECT MANAGER:	S. WHITE
H.M.M. PROJECT NUMBER:	358048

DATE	REV.	REVISION DESCRIPTION

GULF BREEZE GILMORE DRAINAGE IMPROVEMENTS
SANTA ROSA COUNTY, FLORIDA

Hatch Mott MacDonald
Hatch Mott MacDonald Florida, LLC
Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
220 West Garden Street, Suite 700
Pensacola, Florida (32502)
Telephone: (850) 484-6011 ■ Fax: (850) 484-8199

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jhi jehle-halstead, inc.
Civil Engineering and Surveying

January 29, 2016

Mr. Vernon Prather
City of Gulf Breeze
1010 Shoreline Drive
Gulf Breeze, FL 32561

RE: McClure/Shirley Preliminary Drainage and Feasibility Study

Dear Mr. Prather,

The intent of this report is to outline our findings of the requested drainage study and associated feasibility study for the construction of a drainage system to help alleviate drainage concerns within the referenced area of the City of Gulf Breeze. The subject of the referenced studies is an approximately 31 acre watershed located northeast of Gulf Breeze Parkway with the low lying areas centered around McClure Drive and Shirley Drive. To allow the City to review options in regards to potential piping systems we have looked at, what we consider to be, a minimum and maximum pipe size installation for a gravity flow system as well as the corresponding force main systems that would be required to achieve the same flows.

System Description

The referenced gravity flow piping system initially consists of two separate systems to be installed within the right's-of-way of both McClure Drive and Shirley Drive and will have inlets installed in multiple locations along their length. These systems will flow north to Joachim Drive where the separate systems will be combined, then flow east along Joachim Drive to Plantation Hill Road, then flow north to Baycliffs Road, and finally flow northwest along Baycliffs Road to its outfall in a wetland area which flows north to Pensacola Bay.

Option 1

The first two options considered were for the minimum sized piping system to be installed based on our understanding of the needs of the City from our prior discussions.

The first option considered was for the installation of 2,780' of 24" diameter reinforced concrete pipe (RCP) which would discharge at an elevation of 5' at the wetland. Based on the elevations in the low areas along McClure Dr. and Shirley Dr. the starting elevation of this system would be approximately 7.5' which results in an approximately 0.1% slope on the pipe. The resulting modeled flow rate capacity of this piping system is shown to be approximately 7.5 cfs. Based on the watershed model this is equivalent to less than a 2-year storm event which is approximately 45 cfs.

To achieve the equivalent flow rate of 7.5 cfs, or 3,365 gpm, a 15 horsepower pump would be required with 2,320' of 18"pvc forcemain.

5414 Highway 90 • Milton, Florida 32571 • (850) 994-9503 • Fax (850) 994-9504
www.jehle-halstead.com

Our opinion of probable cost (OPC) for the gravity flow system is approximately $695,000 or $250 per foot of pipe. This price includes pipes, structures, inlets, pipe trenching/bedding, demolition and rebuilding of some of the roadways, some utility coordination, end treatment at the discharge location, a Vortechs separator, design, and construction contingency.

Our OPC for the equivalent pump system is approximately $690,000 or $297 per foot of pipe. This price includes the same items described in the gravity system but also includes the costs associated with the pump. However, keep in mind that for a singular pump system there would not be two separate systems with inlets in each right-of-way of McClure Drive and Shirley Drive; there would only be one system with one inlet. To provide pumping in both locations it is reasonable to assume an increase of approximately $75,000.

Option 2

In the next option the discharge elevation at the wetland was dropped to 0' with all other parameters from option 1 remaining constant. This change in discharge elevation resulted in an increased slope to approximately 0.3% and increased the modeled flow rate capacity to approximately 12.9 cfs which still results in a less than 2-year storm capacity.

To achieve the equivalent flow rate of 12.9 cfs, or 5,790 gpm, a 25 horsepower pump would be required with 2,320' of 20" pvc forcemain.

Our opinion of probable cost (OPC) for the gravity flow system is approximately $710,000 or $255 per foot of pipe. This price includes pipes, structures, inlets, pipe trenching/bedding, demolition and rebuilding of some of the roadways, some utility coordination, end treatment at the discharge location, a Vortechs separator, design, and construction contingency.

Our OPC for the equivalent pump system is approximately $715,000 or $308 per foot of pipe. This price includes the same items described in the gravity system but also includes the costs associated with the pump. However, as with option 1, this price is for a singular pump system so there would not be two separate systems with inlets in each right-of-way of McClure Drive and Shirley Drive; there would only be one system with one inlet. To provide pumping in both locations it is reasonable to assume an increase of approximately $75,000.

Option 3

With the last two options a piping system was designed to maximize the drainage capacity by increasing the pipe diameters to a maximum size allowable by the available cover. Although larger pipes may be able to be installed in some locations we limited the maximum size to 60" for the purpose of this study.

The third option considered had the same discharge elevation of 5' as option 1 but, as previously described, the pipes were increased to the maximum size achievable as dictated by cover limitations. This option includes the installation of 3,170' of RCP consisting of 390' of double barreled 24" RCP (total 24" diameter length of 780') located in the most cover restricted areas of Mclure Dr. and Shirley Dr. along with 290' of 36" RCP, 80' of 48" RCP, and 2,020' of 60" RCP. The slope of this system will be the

same as option 1 at approximately 0.1% with a resulting modeled flow rate capacity shown to be approximately 85 cfs. Based on the watershed model this is equivalent to slightly more than a 5-year storm event which is approximately 80 cfs.

To achieve the equivalent flow rate of 85 cfs, or 38,150 gpm, a 200 horsepower pump would be required with 1,230' of 36" pvc forcemain and 1,090' of 60" RCP.

Our OPC for this gravity flow system is approximately $1,570,000 or $495 per foot of pipe. This price includes pipes, structures, inlets, pipe trenching/bedding, demolition and rebuilding of some of the roadways, some utility coordination, end treatment at the discharge location, a Vortechs separator system, design, and construction contingency. We would like to note that a significant portion of the cost for this option is required for the Vortechs system which would require multiple units to handle these flows. However, if a unit similar to options 1 and 2 were used to only treat the first flush this price could be reduced by approximately $500,000.

Our OPC for the equivalent pump system is approximately $1,520,000 or $655 per foot of pipe. Along with the price associated with the pump, this price includes pipes, structures, inlet, pipe trenching/bedding, demolition and rebuilding of some of the roadways, some utility coordination, end treatment at the discharge location, a Vortechs separator system, design, and construction contingency. As previously stated, a significant portion of the cost for this option is required for the Vortechs system and the overall cost could be reduced by approximately $500,000 if a smaller unit was used to treat the first flush only. Also, this price is for a singular pump system so there would not be two separate systems with inlets in each right-of-way of McClure Drive and Shirley Drive; there would only be one system with one inlet. To provide pumping in both locations it is reasonable to assume an increase of approximately $125,000 to the overall cost.

Option 4

The final option considered was essentially the same as option 3 except that the discharge elevation was lowered to 0' as in option 2 and some of the pipe diameters were able to be increased due to the additional cover. This change in discharge elevation and increased pipe size resulted in an increased slope to approximately 0.3% and increased the modeled flow rate capacity to approximately 145 cfs. This increased flow rate is slightly more than a 25-year storm event which is approximately 140 cfs.

To achieve the equivalent flow rate of 145 cfs, or 65,080 gpm, a 400 horsepower pump would be required with 1,230' of 42" pvc forcemain and 1,090' of 60" RCP.

Our opinion of probable cost (OPC) for the gravity flow system is approximately $1,790,000 or $565 per foot of pipe. This price includes pipes, structures, inlets, pipe trenching/bedding, demolition and rebuilding of some of the roadways, some utility coordination, end treatment at the discharge location, a Vortechs separator system, design, and construction contingency. As stated earlier, we would like to note that a significant portion of the cost for this option is required for the Vortechs system which would require multiple units to handle these flows. However, if a unit similar to options 1 and 2 were used to only treat the first flush this price could be reduced by approximately $650,000.

Our OPC for the equivalent pump system is approximately $1,800,000 or $776 per foot of pipe. This price includes the same items described in the gravity system but also includes the costs associated with the pump. As previously stated, if a Vortechs unit similar to option 1 were used to only treat the first flush this price could be reduced by approximately $650,000. Also, as discussed, there would not be two separate systems with inlets in each right-of-way of McClure Drive and Shirley Drive; there would only be one system with one inlet. To provide pumping in both locations it is reasonable to assume an increase of approximately $150,000 to the overall cost.

Additional Comments

Several pipe layouts/routes have been discussed; therefore, "per foot" pricing has been given above so as to be able to approximate costs for revised pipe layouts. This information is intended to provide insight to the City for further decisions regarding final pipe layout and sizing and should be considered as a document from which to continue discussions between Jehle-Halstead, Inc. and the City as we assist you in making these decisions.

Attachments provided within this report for reference include:

- Original pipe layout provided by the City
- Revised pipe layout provided by the City
- Sample CAD layout exhibit of 24" system discharging at elev. 5'
    - Additional layouts have not been generated but can be upon request.
- Sample CAD profile exhibit of 24" system discharging at elev. 5'
    - Additional profiles have not been generated but can be upon request.

Limitations

The basis for the opinion of probable cost is conceptual in nature and represents a potentially feasible concept based on the limited information available at this stage of the project. The concepts provided do not represent the results of a detailed analysis. The prepared estimate is a "snapshot in time" and the reliability of this OPC will degrade over time. The engineer has no control over costs of labor, materials, competitive bidding environments and procedures, unknown field conditions, financial and/or market conditions or other factors affecting construction costs. Jehle-Halstead, Inc. does not make any warranty, promise, guarantee, or represent, either expressed or implied, that proposals, bids, and project construction costs will not vary substantially from the OPC. This analysis has been prepared for the exclusive use of The City of Gulf Breeze and other members of the design/construction team for the specific project discussed within this document.

This analysis has been prepared in accordance with generally accepted local engineering practices; no other warranty is expressed or implied.

As the project progresses and more detailed information is obtained, project cost projections will be further refined.

Please let me know if you have any questions.

Sincerely,

Michael Lynch, P.E.
Project Manager

Original Pipe Routing

Revised Pipe Routing

McCLURE/SHIRLEY BASIN MAP

0' 50' 100' 200'
SCALE IN FEET

N

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Certificate of Authorization No. 0000469
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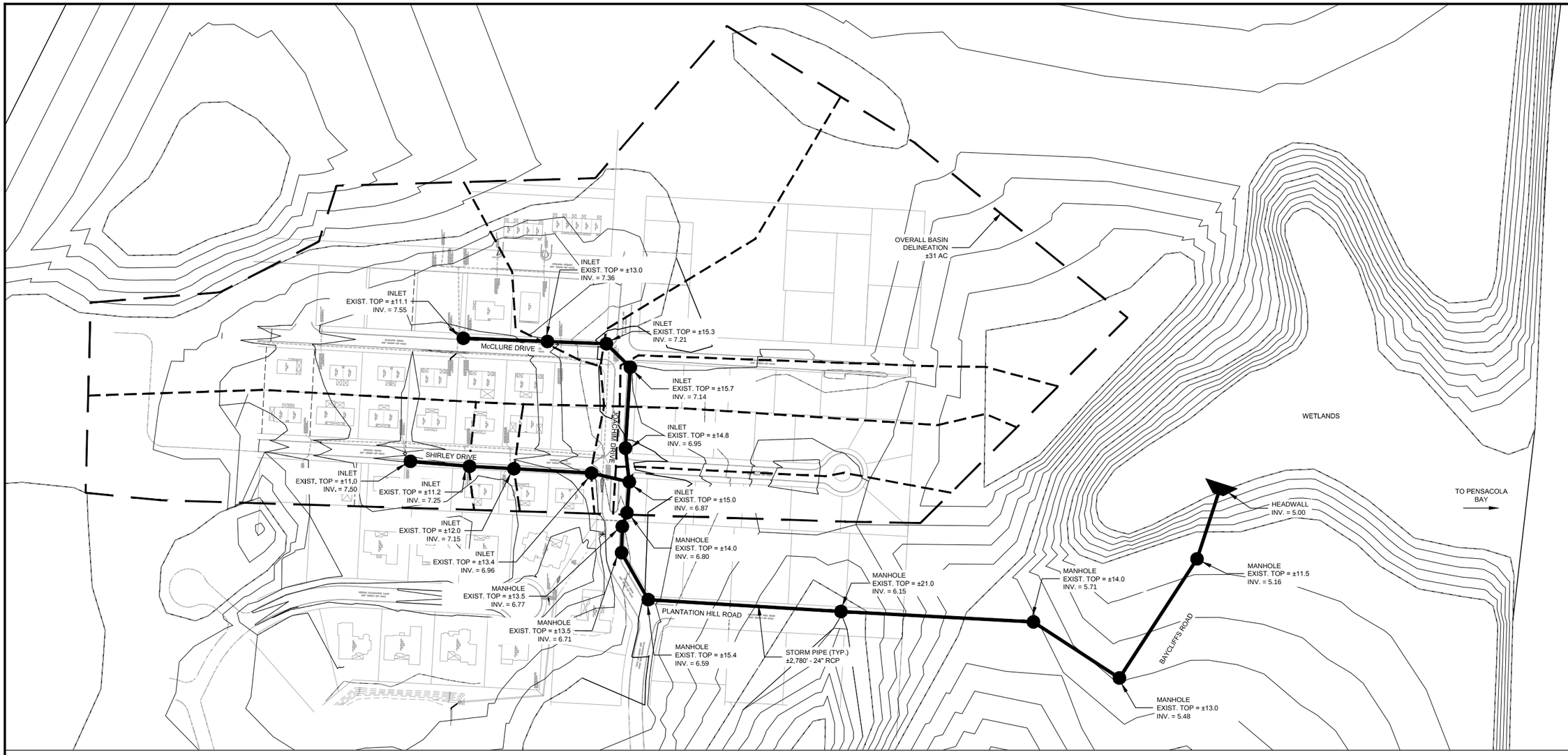
McCLURE/SHIRLEY BASIN MAP

Revisions	
Date	Description

Designed By: MDL
Drawn By: MDL
Checked By: DPJJ
Job No.: 150067
Date: 1-28-2016
Scale: AS SHOWN
Sheet No.: EX-100



McCLURE/SHIRLEY DRAINAGE EXHIBIT

0' 50' 100' 200'
SCALE IN FEET

N

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McCLURE/SHIRLEY
DRAINAGE EXHIBIT

Revisions	
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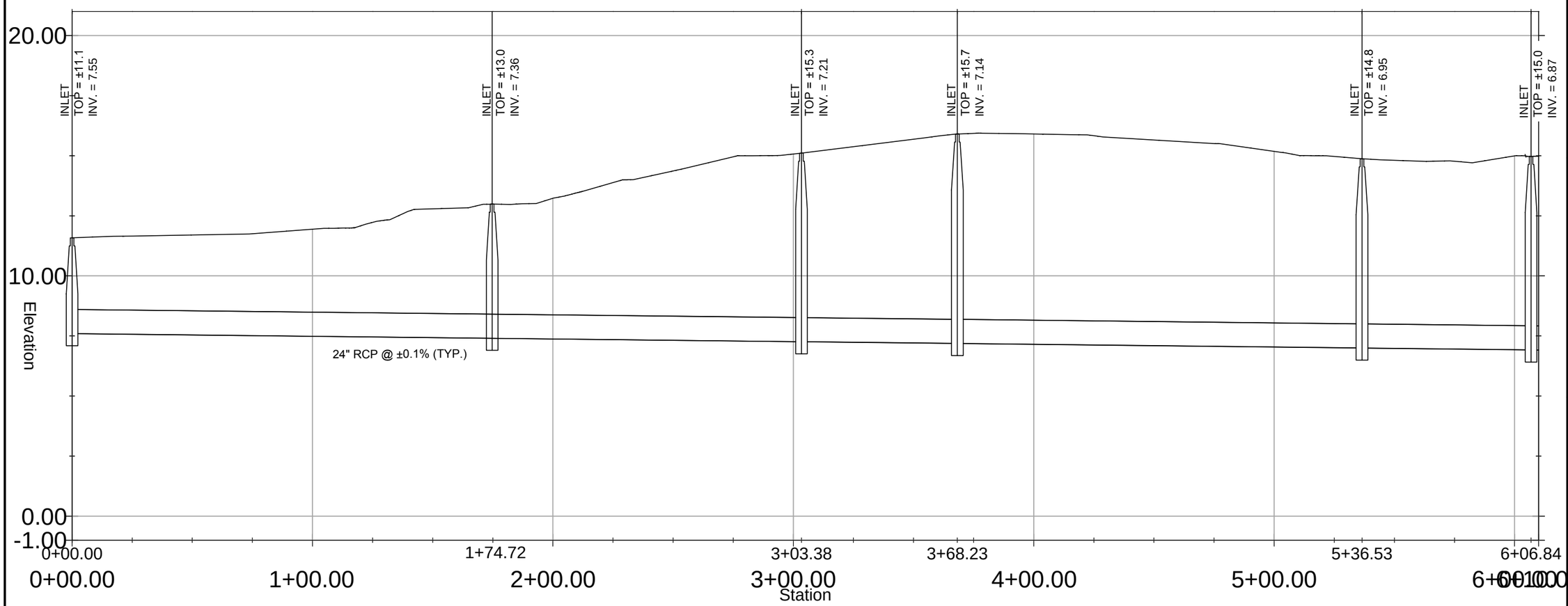

McCLURE DR./JOACHIM DR.

SCALE
H: 1" = 20'
V: 1" = 2'

McCLURE/SHIRLEY PIPE PROFILES

N

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McCLURE/SHIRLEY
DRAINAGE EXHIBIT

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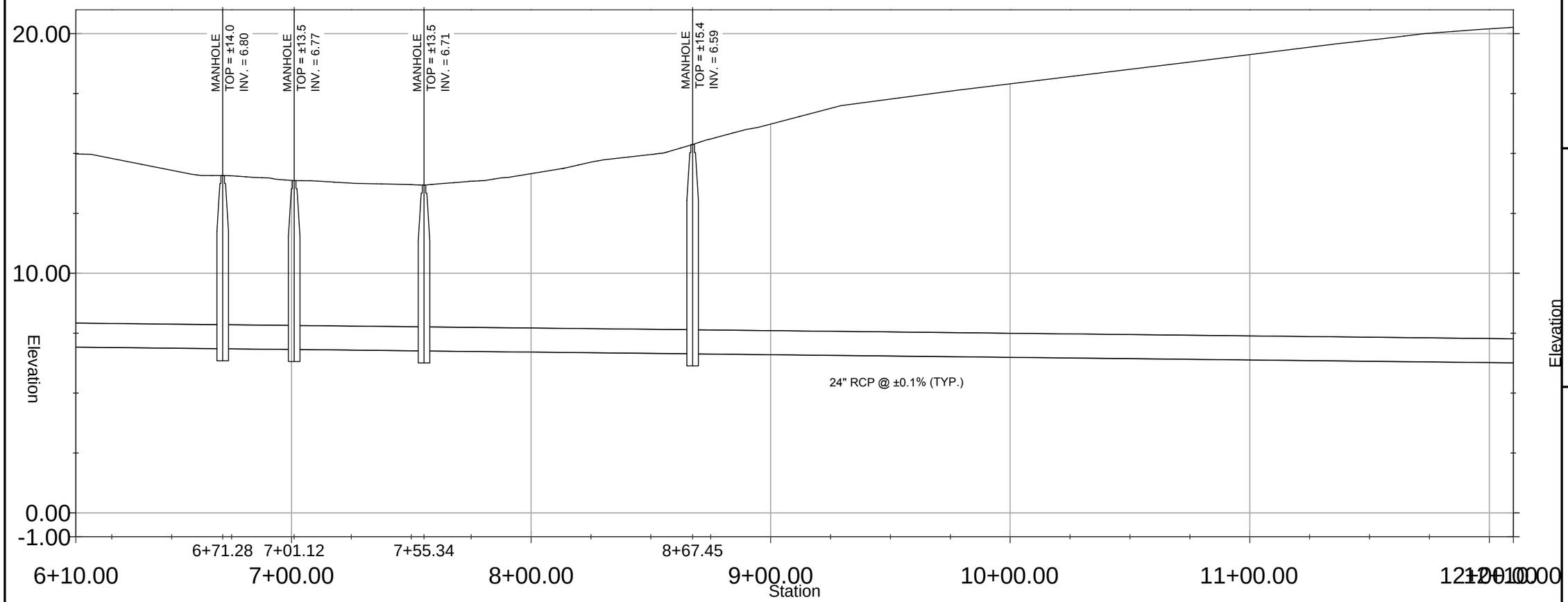

JOACHIM DR./PLANTATION HILL RD.

SCALE
H: 1" = 20'
V: 1" = 2'

N

McCLURE/SHIRLEY PIPE PROFILES

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Elevation

SANTA ROSA COUNTY ~ FLORIDA

McCLURE/SHIRLEY
DRAINAGE EXHIBIT

Revisions	
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Job No.: 150067
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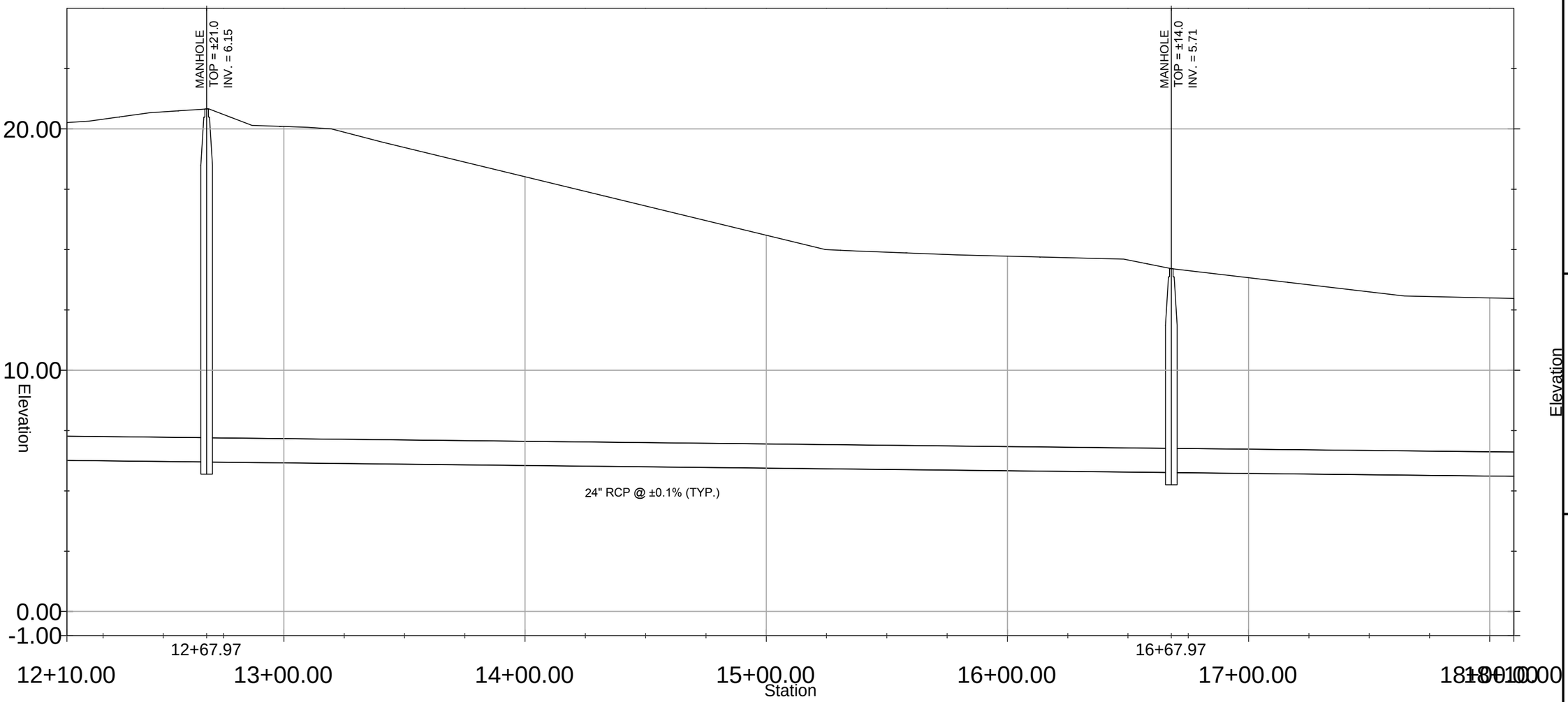
Sheet No.: EX-103



PLANTATION HILL RD.

SCALE
H: 1" = 20'
V: 1" = 2'

N

McCLURE/SHIRLEY PIPE PROFILES

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Elevation

SANTA ROSA COUNTY ~ FLORIDA

McCLURE/SHIRLEY
DRAINAGE EXHIBIT

Revisions	
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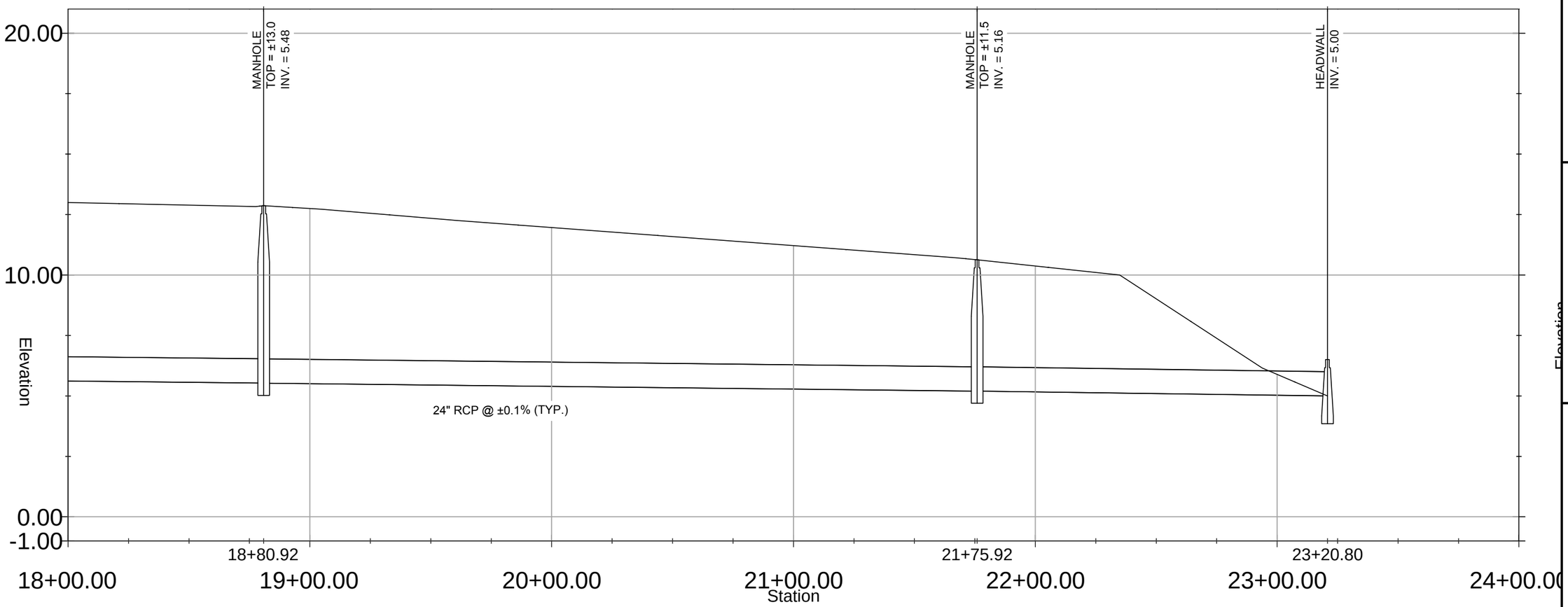

PLANTATION HILL RD./BAYCLIFFS RD.

SCALE
H: 1" = 20'
V: 1" = 2'

N

McCLURE/SHIRLEY PIPE PROFILES

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Elevation

SANTA ROSA COUNTY ~ FLORIDA

McCLURE/SHIRLEY
DRAINAGE EXHIBIT

Revisions	
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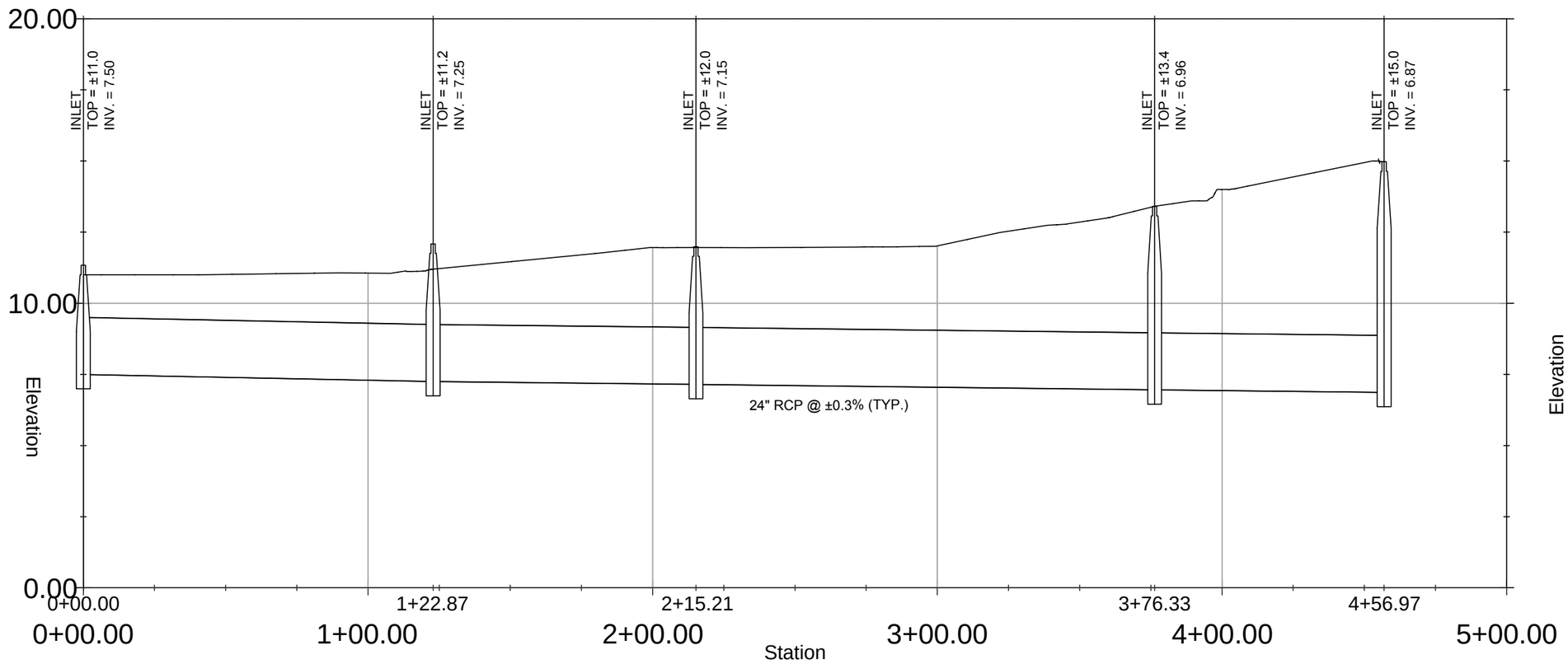

SHIRLEY DR.

SCALE
H: 1" = 20'
V: 1" = 2'

N

McCLURE/SHIRLEY PIPE PROFILES

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SANTA ROSA COUNTY ~ FLORIDA

McCLURE/SHIRLEY
DRAINAGE EXHIBIT

Revisions	
Date	Description

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Checked By: DPJJ
Job No.: 150067
Date: 1-28-2016
Scale: AS SHOWN
Sheet No.: EX-106

jhi jehle–halstead, inc.
Civil Engineering and Surveying

May 17, 2016

Mr. Vernon Prather
City of Gulf Breeze
1010 Shoreline Drive
Gulf Breeze, FL 32561

RE: Plantation Hill Overflow Analysis and Feasibility Study

Dear Mr. Prather,

The intent of this report is to outline our findings and opinion of feasibility for the construction of an overflow discharge system and the expansion of the Plantation Hill stormwater management facility which serves the adjacent ±45-acre watershed. This report is supplemental to our previously submitted "McClure/Shirley Preliminary Drainage and Feasibility Study" which is referenced herein.

Existing Plantation Hill Stormwater Management System Description

Per the "As-Built" survey by Ruben Surveying and Mapping dated September 25, 2014 the existing stormwater management facility contains approximately 340,000 ft^3 of storage capacity. Storage within this facility is provided from pond bottom elevation of 6' up to edge of bank at approximately 12'. Per survey, at elevation 9.14' there is a 15" pipe that provides overflow drainage from the pond. This overflow is connected to a piping system that generally flows northeast towards another stormwater management facility located on the east side of James River Road. It was communicated to jhi by the City of Gulf Breeze staff that in periods of intense and/or sustained rainfall this facility can overtop its banks and, as such, has asked that we evaluate the feasibility of providing another overflow pipe to further aid in the drainage of this facility. In addition, the City has also asked jhi to evaluate the impacts of increasing the stormwater management facility size to provide greater storage capacity and attenuation.

Increased Stormwater Management Facility Volume

Based on the approximate area for the increased stormwater management facility per a sketch provided by the City of Gulf Breeze along with the CAD file previously provided for the McClure/Shirley project we have determined that it may be possible to increase the existing facilities storage capacity by approximately 142,000 ft^3 or approximately 42%. Based on discussions with the City regarding the condition of the proposed area of expansion it appears that impacts to the surrounding area would be minimal. Cost considerations for grading operations, material haul off, and final stabilization could be expected to range up to approximately $200,000.

Additional Discharge Pipe

This piping system would consist of approximately 500' of reinforced concrete pipe (RCP) draining from the northwest corner of the expanded stormwater management facility at an invert elevation of ±8.4'. It should be noted that this discharge elevation is only accurate if the facility is expanded and additional

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volume is provided. This elevation provides a minimum of 1" of runoff treatment for the ±45-acre basin but would need to be raised if the pond expansion is not performed. The pipe would flow west towards Middle Plantation Lane, within an existing drainage easement, and then northwest to Joachim Drive where it would connect to the proposed system considered in the McClure/Shirley report at either elevation ±6.8' or ±5.3' depending on the configuration utilized for the McClure/Shirley system.

Several options of differing pipe sizes were considered for the new Plantation Hill overflow pipe. For each option a hydraulic model was created to review the capacity of the pipes in relation to the corresponding McClure/Shirley option. Those results are outlined as follows:

Option 1

The first option considered in the McClure/Shirley report was for the installation of a 24" piping system which discharged at elevation 5' at the downstream wetland area. Since this option was limited to 24" pipe the Plantation Hill pipe would also be limited to this size. Based on a tie-in elevation of ± 6.8', the capacity of the 24" pipe discharging from the Plantation Hill facility is ± 13 cfs; however, in this scenario the McClure/Shirley system has a maximum discharge capacity of ±7.5 cfs which would limit the flow of the Plantation Hill pipe. For comparison, a 2-year storm discharges approximately 100 cfs for the 45-acre basin.

Our opinion of probable cost (OPC) for this drainage system would be approximately $125,000 or $250 per foot of pipe. This price includes pipes, structures, trenching/bedding, demolition and rebuilding of roadway, some utility coordination, design and construction contingency. This price does not include the ± $200,000 for the stormwater management facility expansion previously discussed.

Option 2

The second option considered in the McClure/Shirley report was for the installation of a 24" piping system which discharged at elevation 0' at the downstream wetland area. Since this option was limited to 24" pipe the Plantation Hill pipe would also be limited to this size. The only difference with this option from Option 1 is that the tie-in elevation is lowered to approximately 5.3' which in turn increases the Plantation Hill pipes slope and capacity. The capacity of the 24" Plantation Hill pipe is approximately 18 cfs; however, in this scenario the McClure/Shirley system has a maximum discharge of ±13 cfs which would limit the flow. Again, for comparison, a 2-year storm discharges approximately 100 cfs for the 45-acre basin.

Our OPC for this drainage system would be approximately the same as in Option 1 at $125,000 or $250 per foot of pipe. This price also includes pipes, structures, trenching/bedding, demolition and rebuilding of roadway, some utility coordination, design and construction contingency. This price does not include the ± $200,000 for the stormwater management facility expansion previously discussed.

Option 3

The third option considered in the McClure/Shirley report was to maximize the drainage capacity by increasing the pipe diameters to a maximum size allowable by the available cover while also being

limited to a 60” pipe size. As in Option 1, this piping system discharged at elevation 5’ at the downstream wetland area. Although the downstream pipe sizes were much larger, due to cover restrictions, the Plantation Hill piping system was limited to 36” pipes. Based on a tie-in elevation of approximately 6.8’, the capacity of the 36” pipe discharging from the Plantation Hill facility is approximately 38 cfs. Again, for comparison, a 2-year storm discharges approximately 100 cfs for the 45-acre basin.

Our OPC for this drainage system would be approximately $160,000 or $330 per foot of pipe. This price includes pipes, structures, trenching/bedding, demolition and rebuilding of roadway, some utility coordination, design and construction contingency. This price does not include the ± $200,000 for the stormwater management facility expansion previously discussed.

Option 4

The fourth and final option considered in the McClure/Shirley report was essentially the same as Option 3 except that the discharge elevation was lowered to 0’. Due to the same cover restrictions as in Option 3 the Plantation Hill piping system was limited to 36” pipes. Based on a tie-in elevation of approximately 5.3’, the capacity of the Plantation Hill system was approximately 50 cfs. Again, for comparison, a 2-year storm discharges approximately 100 cfs for the 45-acre basin.

Our OPC for this drainage system would be approximately the same as in Option 3 at $160,000 or $330 per foot of pipe. This price includes pipes, structures, trenching/bedding, demolition and rebuilding of roadway, some utility coordination, design and construction contingency. This price does not include the ± $200,000 for the stormwater management facility expansion previously discussed.

Additional Comments

Due to the presence of the existing drainage easement in the location where the proposed Plantation Hill piping system would run, it is our opinion that minimal impacts to the surrounding areas should be expected for the pipes installation. However, it should also be understood that connecting the Plantation Hill system to the proposed McClure/Shirley system will reduce the ability of the McClure/Shirley system to provide relief for the focus area in that report. Although capacity of the system remains the same the source of the runoff is from separate systems so an overall negative impact to the McClure/Shirley system should be expected from what was originally reported. Further study, which was outside the scope of this report, would be required to provide greater detail as to these impacts. One possible solution to this issue would be to provide a separate dedicated piping system parallel to the McClure/Shirley system to convey the additional Plantation Hill discharge to the downstream wetland area. Although this would be more costly there would be some “per foot” cost savings attributed to the overlap budget items such as trenching/bedding, excavation, and roadway demo and replacement.

Attachments provided within this report for reference include:

- "As-Built" survey by Ruben Surveying and Mapping provided by the City (2 sheets)
- Plantation Hill stormwater management facility expansion and overflow discharge pipe location sketch provided by the City.
- Plantation Hill Basin Map
- Plantation Hill Drainage Exhibit
- Original "McClure/Shirley Preliminary Drainage and Feasibility Study"

Limitations

The basis for the opinion of probable cost is conceptual in nature and represents a potentially feasible concept based on the limited information available at this stage of the project. The concepts provided do not represent the results of a detailed analysis. The prepared estimate is a "snapshot in time" and the reliability of this OPC will degrade over time. The engineer has no control over costs of labor, materials, competitive bidding environments and procedures, unknown field conditions, financial and/or market conditions or other factors affecting construction costs. Jehle-Halstead, Inc. does not make any warranty, promise, guarantee, or represent, either expressed or implied, that proposals, bids, and project construction costs will not vary substantially from the OPC. This analysis has been prepared for the exclusive use of the City of Gulf Breeze and other members of the design/construction team for the specific project discussed within this document.

This analysis has been prepared in accordance with generally accepted local engineering practices; no other warranty is expressed or implied.

As the project progresses and more detailed information is obtained, project cost projections can be further refined.

Please let me know if you have any questions.

Sincerely,

Michael Lynch, P.E.
Project Manager

AS—BUILT SURVEY

AS—BUILT SURVEY

CITY OF GULF BREEZE – EAST DISTRICT
STORM DRAINAGE STUDY
A PORTION OF SECTION 4,
TOWNSHIP-3-SOUTH, RANGE-29-WEST,
SANTA ROSA COUNTY, FLORIDA

JOB NO.:	FIELD DATE:	FIELD BOOK:	PAGE:
15810-14	9/25/14	484/485/488	78/63-65,68-69/40-43
PROPERTY ADDRESS:		489/491/495	69/1-2,41-44,53-56/25
N/A		493/490/476	36-37,50-55,66/57-78/41-48
SCALE:	DRAWN BY:	PARTY CHIEF:	APPROVED: / ENCROACHMENTS:
1"=20'	JWC/RJM	CAL/ABT/CAB/SPM	RER / N/A

RUBEN SURVEYING & MAPPING
LICENSED BUSINESS NO.: 8004
1179 GULF BREEZE PARKWAY, GULF BREEZE, FLORIDA 32561
PH: (850) 916-7292 FAX: (850) 916-7275

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JOB NO. 15810-14

SHEET 17 OF 25 (H-23)

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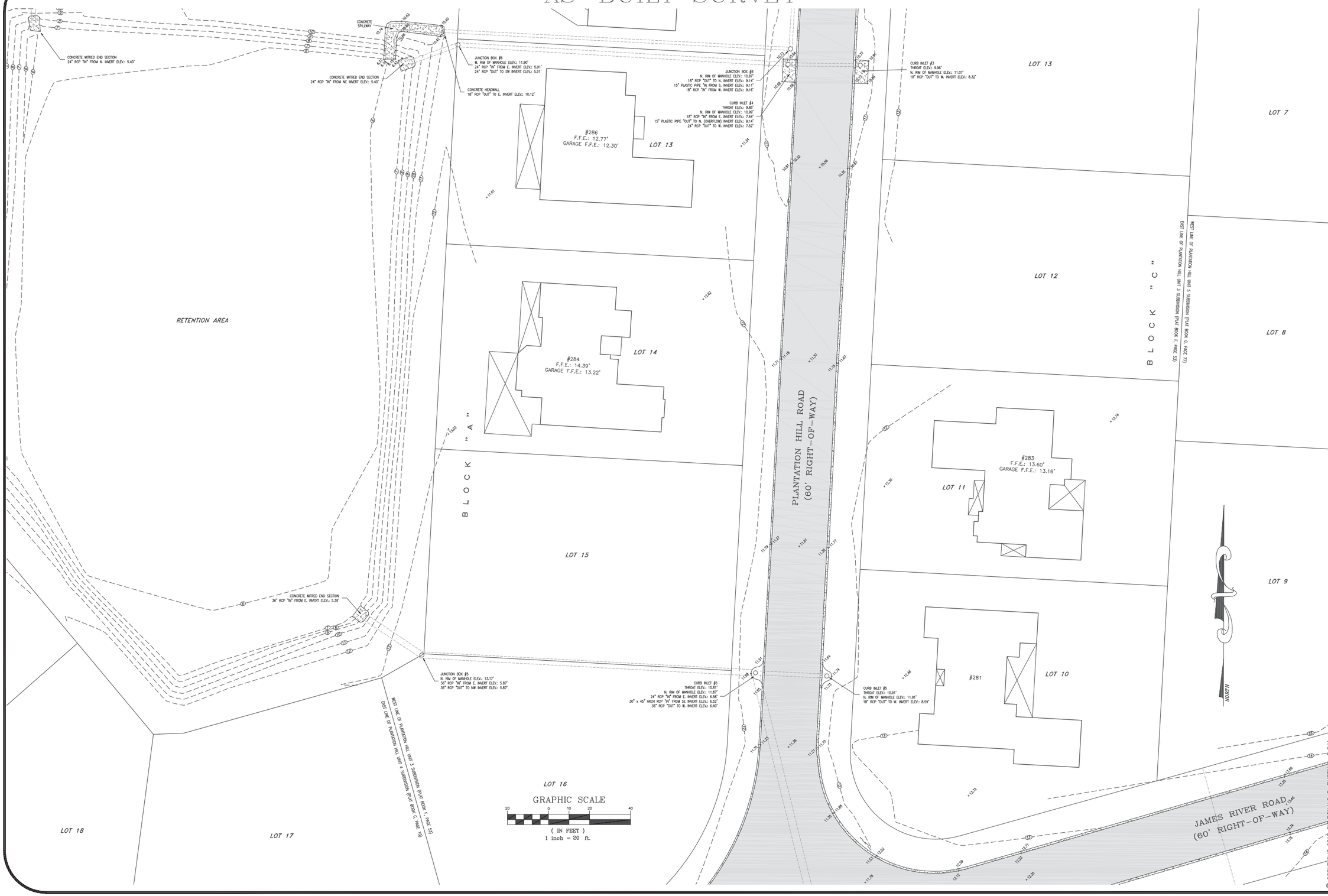
AS–BUILT SURVEY



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AS–BUILT SURVEY

CITY OF GULF BREEZE – EAST DISTRICT
STORM DRAINAGE STUDY
A PORTION OF SECTION 4,
TOWNSHIP–3–SOUTH, RANGE–29–WEST,
SANTA ROSA COUNTY, FLORIDA

JOB NO.:	FIELD DATE:	FIELD BOOK:	PAGE:
15810–14	9/25/14	484/485/488	78/63–65,68–69/40–43
PROPERTY ADDRESS:		489/491/495	69/1–2,41–44,53–56/25
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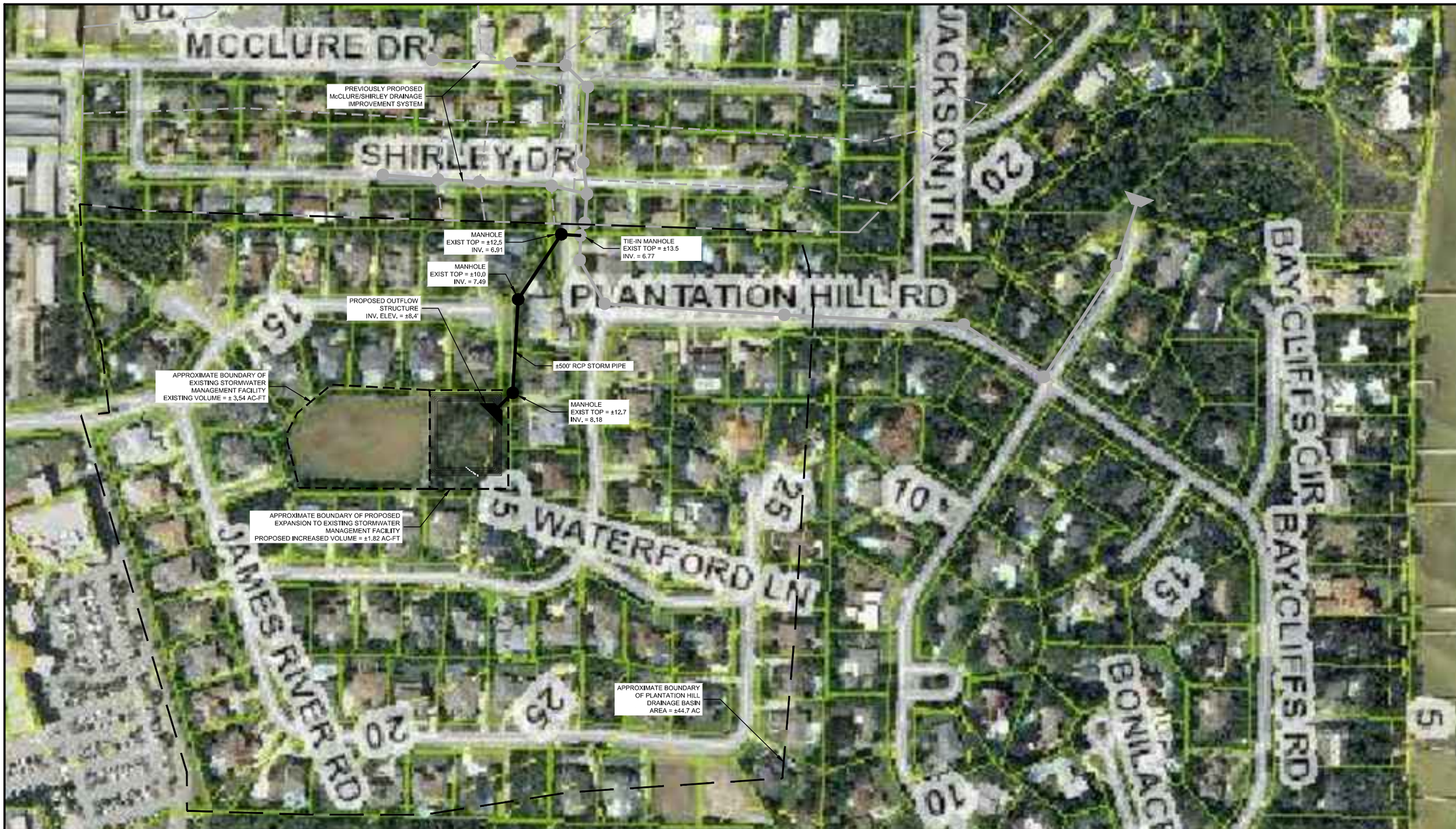
NO.:	DATE:	APPROVED BY:	REVISION:

JOB NO. 15810–14

SHEET 21
OF 25
(1–23)

McClure Shirley Gravity
Stormwater System
Vortex Hydrolic Seperator
24" Gravity Line 2100'
Plantation Hill
Flood Control
Stormwater Pond
Expansion Site
Stearns St
Roberts Ave
Shirley Dr
Bachman Dr
Canterbury Ln
Middle Plantation Ln
Bay Cliffs Cir
2500'



INVERT ELEVATIONS SHOWN REPRESENT OPTIONS 1 AND 3 IN THE CORRESPONDING "PLANTATION HILL OVERFLOW ANALYSIS AND FEASIBILITY STUDY"

0' 50' 100' 200'
SCALE IN FEET

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PLANTATION HILL BASIN MAP

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SANTA ROSA COUNTY ~ FLORIDA

PLANTATION HILL BASIN MAP

Revisions	
Date	Description

Designed By: MDL
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Checked By: DPJJ
Job No.: 150067
Date: 5-16-2016
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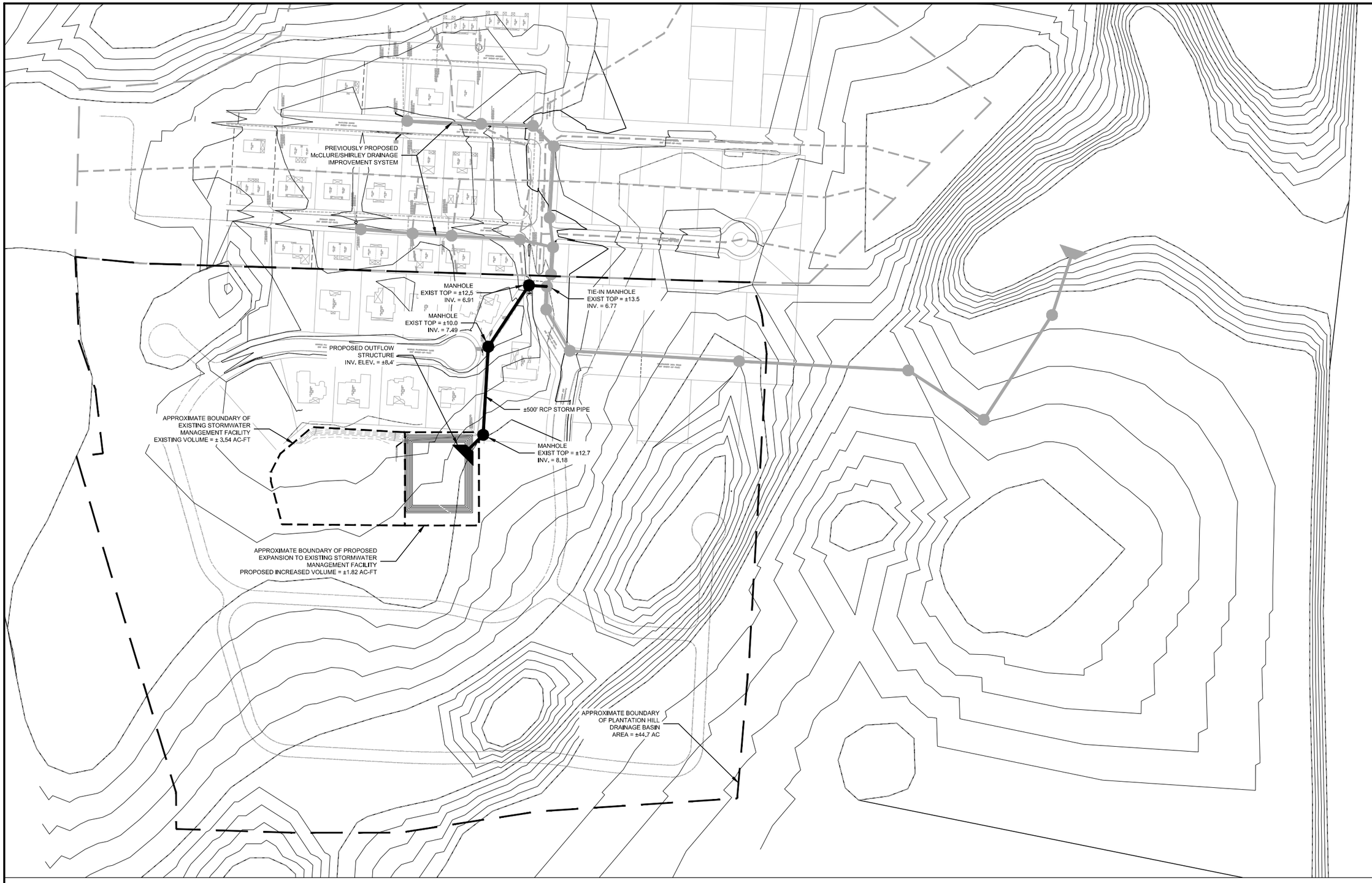
Sheet No.: EX-200



PLANTATION HILL DRAINAGE EXHIBIT

0' 50' 100' 200'
SCALE IN FEET

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INVERT ELEVATIONS SHOWN REPRESENT OPTIONS 1 AND 3 IN THE CORRESPONDING "PLANTATION HILL OVERFLOW ANALYSIS AND FEASIBILITY STUDY"

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PLANTATION HILL
DRAINAGE EXHIBIT

Revisions	
Date	Description

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Job No.: 150067
Date: 5-16-2016
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Sheet No.: EX-201

STORMWATER SHORT TERM AND IMMEDIATE ACTION COST TRACKING **5/19/16**

Completed Portion	**$**	**414,369.08**	
Incomplete Portion	**$**	**3,882,300.00**	
TOTAL COST	**$**	**4,296,669.08**	**(excludes costs covered by grant)**

All amounts shown are City portions and are funded from General Fund Capital Reserve

$ 1,653,869.08 Committed Projects

	PRIORITY	AREA	ITEM	ESTIMATE	ACTUAL	PAID	EST. COMPLETION DATE	Notes
21	**IN PROGRESS**	**CENTRAL**	**Southern Section complete 12/16/15, Northern Section redesigned to eliminate lift station and place 30" pipe drained by gravity - Under construction**	**$ 1,297,000.00**			**11/1/15**	**Total project at $2.867 million, $1.570 by grant**
10	#1	EAST	MCCLURE/SHIRLEY ALT 4: Investigate gravity feasibility.	$ 4,200.00		$ 4,200.00	2016	
	#1A	EAST	MCCLURE/SHIRLEY ALT 4: Pump Station w/Forcemain could be directed to the Bay Cliffs with wetlands discharge.	$ 550,000.00			2016	
	#2	CENTRAL	Replace and enlarge the Bear Drive piping system	$ 320,000.00			2018	Bear Drive scheduled for paving in FY 2017
36	#3	WEST	New Pump Station on north end of Gilmore, pond at Berry and Fairpoint, Gilmore Bayou Discharge	$ 450,000.00			2018	RESTORE Act funding @ 50% match
37	#3A	WEST	Low pressure storm pump stations for suspect lots on Fairpoint	$ 25,000.00			2018	
41	#4	WEST	Investigate gravity pipe under Shoreline @ Park	$ 9,600.00		$ 9,600.00	2015	Received Draft Report
6	#4A	CENTRAL	Gravity pipe under Shoreline @ Park	$ 334,000.00				Received Draft Report
24	#5	CENTRAL	Immediately create a gravity collection point at Loruna and Poinciana, taking the water flow southward to the retention pond existing in Shoreline Park (northern area near Poinciana).	$ 48,000.00			8/1/15	
27	#6	CENTRAL	Install an 18" or greater perf pipe in an area within the Frisbee golf range to act as a groundwater control. Direct flow to the existing pipe that connects to the Community Center lift station. This improvement can be easily constructed on existing city owned property and into existing drainage infrastructure.	$ 210,000.00				
28	#7	CENTRAL	Begin engineering and design of added underground drains for tie in to the Loruna catch basin that will drain areas north of Poinciana.	$ 300,000.00				

c

STORMWATER SHORT TERM AND IMMEDIATE ACTION COST TRACKING **5/19/16**

Completed Portion	**$**	**414,369.08**	
Incomplete Portion	**$**	**3,882,300.00**	
TOTAL COST	**$**	**4,296,669.08**	**(excludes costs covered by grant)**

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	PRIORITY	AREA	ITEM	ESTIMATE	ACTUAL	PAID	EST. COMPLETION DATE	Notes
42	#8	WEST	Investigate gravity pipe under Shoreline @ Navarre	$ 6,000.00	$ -	$ 8,870.00	2015	Received Draft Report
14	#9	WEST	Eufaula (Outfall Treatment)	$ 260,000.00				RESTORE Act funding @ 50% match

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	PRIORITY	AREA	ITEM	ESTIMATE	ACTUAL	PAID	EST. COMPLETION DATE	Notes	
			SMALL PROJECTS						
17		EAST	City to install diversion mechanism at the end of McAbee	$ 3,500.00			8/1/15	Plans under review, Requesting Quotes	
29		CENTRAL	At approximately 113 Bear Dr, the right of way needs a better contour of the existing topography to allow greater flow into existing basins.	$ 2,000.00				Completed at this time	
38		WEST	Larger inlet throats on existing Navarre Street inlets	$ 3,000.00					
40		WEST	Hard pipe emergency crossings						
			COMPLETED PROJECTS						
5		GENERAL	South Sunset , Swale plan/driveway culvert cleanup	$ 60,000.00	$ 57,500.00		8/1/15		
1		GENERAL	A thorough cleaning and general maintenance of the current systems should be conducted in a manner that documents who, when, and where systems have been checked for maximum operating efficiency. No component of the current system should be assumed to be operating properly until inspections are completed.		$ 100,000.00	$ 100,000.00	12/1/14		c
4		GENERAL	Watershed Surveying		$ 135,513.75	$ 135,513.75	9/1/15		c
7		EAST	Install a direct connect of the lower pond (bordering James River Rd.) to the hospital retention pond. This will entail obtaining easements and approvals from Baptist Healthcare.		$ 10,326.33	$ 10,326.33	10/1/15	City's portion is shown, 1/3 of total cost	c
8		EAST	Equalization pipe that will allow quicker flow from the large pond to the small pond.			$ 5,600.00		Install 16" ductile iron connection.	
13		EAST	Obtain an easement to immediately discharge the existing Bay Cliffs collection system to the storm pipe running parallel to the subdivision. Ground water elevations will improve and storm event capacity increased.		$ 55,908.00	$ 55,908.00	3/1/15		c
18		EAST	City will have the stormwater system on McAbee and in Bahama Bay cleaned and video inspected.				4/1/15		c
18		CENTRAL	Replaced defective gravity stormwater pipe from S Sunset to Park Pond		$ 55,121.00	$ 55,121.00	9/30/15		c

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	PRIORITY	AREA	ITEM	ESTIMATE	ACTUAL	PAID	EST. COMPLETION DATE	Notes	
18		WEST	Reshaped City owned lots on Berry Aveto elevation to 8.5'		$ -	$ -	10/30/15		c