Section 1.0
Ortega River Basin

1.1 Introduction

Stormwater management as an element of the restoration and protection of the lower St. Johns River within Duval County is a major challenge confronting the City of Jacksonville. In 2009 a Basin management Action Plan (BMAP) was adopted for the Lower St. Johns River Basin documenting how stakeholders within the basin would meet Pollutant Load Reduction Goals (PLRGs) for the marine and freshwater portions of the St Johns River. Additionally, the Environmental Protection Agency (EPA) is currently evaluating a Numeric Nutrient Criteria (NNC) for streams and lakes which could impact regulations for discharges to the river. Control of urban stormwater runoff in the City of Jacksonville is necessary to reduce non-point source pollution of the river. Update and maintenance of the City's Master Stormwater Management Plan (MSMP) is a critical element in these restoration efforts.

The objectives of the MSMP are to:

1. Resolve the City's current flooding problems and properly manage new development;

2. Address the complex water quality issues of non-point source (urban runoff) pollutant loading to the Lower St. Johns River Basin including its tributaries; and

3. Establish an equitable means of prioritizing recommended stormwater improvements county-wide.

The original MSMP (CDM 1992) studied nine major basins. Since that time, additional development within Duval County and plans for future development have increased the need for detailed stormwater modeling in the western and northern portions of the county. In this update of the MSMP, eleven major basins were identified for detailed study in the MSMP:

- Cecil Field (CECIL)
- Arlington River (ARL)
- Lower St. Johns River Upstream of Trout River (LSJRU)
- Thomas Creek (THO)
- Lower St. Johns River Downstream of Trout River (LSJRD)
- Intracoastal Waterway (ICW)

- Broward River (BROW)
- Dunn Creek (DUN)
- Ortega River (ORT)
- Trout River (TROUT)
- Julington Creek (JUL)

This volume presents the updated MSMP for the five sub-basins in the Ortega River Basin.

1.2 Basin Physical Description

The Ortega River Basin is located in western portion of Duval County. It is bordered approximately by Commonwealth Avenue to the north, the St. Johns River to the east, Kingsley Avenue to the south, and Brannon Field Road to the west, as shown on **Figure 1.1**. The basin contains five sub-basins comprised of seven major watercourses, which are referred to as Primary Stormwater Management Systems (PSWMS).

- Ortega River (includes McGirts Creek) (OR)
- Fishing Creek (FI)
- Butcher Pen Creek (BU)
- Cedar River / Wills Branch (CW)
- Williamson Creek (WL)

Ortega River and McGirts Creek were combined as one sub-basin due to their interconnected nature. This system will be referenced as Ortega River in this MSMP. **Figure 1.1** shows the PSWMSs and the respective sub-basin codes.

The area of the basin is approximately 83 sq mi. The most prevalent land uses in the basin are water/wetlands, medium density residential development, low density residential, and open space. As shown in **Table 1.1**, these 4 land uses account for over 79 percent of the total land use. Future development is projected primarily as conversion of forest/open land into medium density and high density residential and commercial development.

The soils within the sub-basin are a primarily class D and dual hydrologic classes, with smaller amounts of hydrologic classes A and C soils. Overall infiltration characteristics for the hydrologic units are typically similar to a class D soil. Hydrologic parameters for each hydrologic unit are presented in sections for each individual sub-basin.

Table 1.1 Land Uses in Basin

Land Use Name	Acres	Percent of Total Acreage
Ag/Golf	1,240	2%
High Density Residential (HDR)	2,404	5%
Heavy Industrial/Road	3,684	7%
Low Density Residential (LDR)	7,146	13%
Light Industrial/Commercial	2,628	5%
Medium Density Residential (MDR)	9,529	18%
Open	13,867	26%
Pasture	1,277	2%
Water	1,186	2%
Wetlands	10,021	19%
Grand Total	52,984	

1.3 Problem Areas

In the past, ditching and draining to convey stormwater away from development coupled with the filling of floodplains and wetlands was the accepted practice. Over the years, flood damage along with adverse impacts to water quality, fisheries, scenic areas, recharge areas, and wildlife habitats have encouraged the development of accepted approaches to manage stormwater. Stormwater management now involves storage, conveyance, recharge, and treatment aspects along with the proper timing, duration, levels of flooding, and nutrient releases for natural areas or wetlands to ensure a comprehensive management approach to what has become a local, state, and national concern.

1.3.1 Water Quantity

The City of Jacksonville is similar in characteristics to other coastal communities regarding stormwater service. Many of the city's older stormwater management systems provide inadequate flood protection for streets and provide little or no treatment of the runoff prior to release. This study focuses on implementation of regional stormwater facilities intended to address the quantity and timing of floodwaters to mitigate roadway and structural flooding.

Within the Ortega River Basin, most water quantity issues are focused in urban areas where development has occurred up to the stream banks, within the historical floodplain. This is particularly true in the Cedar River/Wills Branch sub basin. Additionally, given the city's generally flat topography and the tidal nature of the St Johns River, tailwater elevations present a large factor governing riverine flooding throughout the county. A detailed discussion of desired levels of service and means of assessing LOS violations is contained in Volume 1 Section 6.0.

For each sub-basin CDM has identified a recommended plan based on a cost-benefit analysis. For those sub-basins which do not exhibit serious LOS violations, CDM has provided suggestions for non-structural or programmatic action to address potential stormwater management issues.

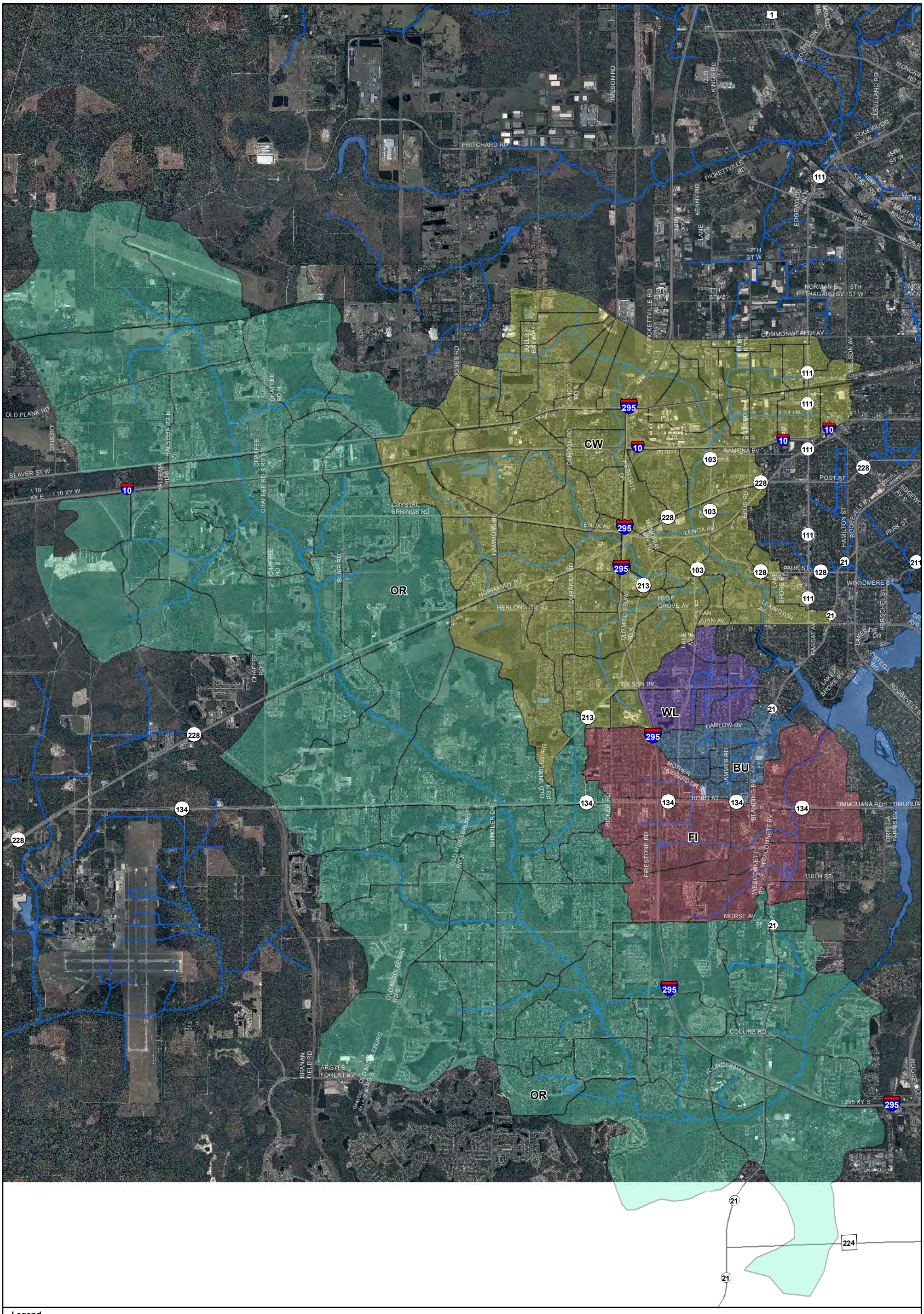
1.3.2 Water Quality

In June 2008 the Florida Department of Environmental Protection (FDEP) and the EPA established a Total maximum Daily Load (TMDL) for the Lower St Johns River (LSJR). Within the TMDL, the LSJR was identified as impaired for dissolved oxygen (DO) due to an overabundance of nutrients, specifically total nitrogen in the marine portion of the rover and both total nitrogen and total phosphorus in the freshwater portion of the river. In October 2008 the FDEP in consultation with the LSJR Basin stakeholders established a BMAP to document the specific actions that would be undertaken within the basin to reduce nutrient loading to the LSJR. Within the BMAP, the City of Jacksonville committed to nutrient reductions of 116 MT/yr through a toolbox approach employing public education, septic tank phase-out, stormwater best management practices (BMPs), and implementation of ordinances to encourage nutrient reduction practices.

Within the Ortega River basin, there is a mixture of old and new development. In areas of older development (Cedar/Wills, Fishing, Williamson, and Butcher Pen Creek) CDM evaluated the potential for retrofitting developed areas with regional stormwater facilities (RSFs) to provide water quality treatment where none currently exists. In rural areas (portions of Ortega River) where there was sufficient available land, RSFs were evaluated to treat large portions of the basin to meet nutrient reduction requirements set forth in the BMAP. In newly developed areas, CDM provided suggestions for non-structural or programmatic action geared to source reduction of both runoff and pollutants.

In all sub-basins opportunities for septic tank phase-out were identified. Septic tank phase-out projects were not included in the cost benefit analysis for the sub-basin, but potential nutrient reduction benefits were estimated based on the FDEPs currently approved methodology for septic tank phase-out. This information should be considered in conjunction with the other scoring criteria being developed by the City to evaluate priority septic tank phase-out areas. **Figure 1.2** provides a depiction of the currently identified Department of Health septic tank failure areas, which are the basis for the proposed septic tank phase-outs.

Throughout the master plan it is encouraged that the City implement a programmatic approach to stormwater reuse including irrigation of public facilities such as parks, schools, and athletic fields. Based on BMPs contained in the current draft of FDEP's Stormwater Applicant Handbook, stormwater reuse can qualify for nutrient reduction credit dependent on the application rate.



Legend

Sub Basins

- Butcher Pen Creek
- Cedar River and Wills Branch
- Fishing Creek
- Ortega River
- Williamson Creek

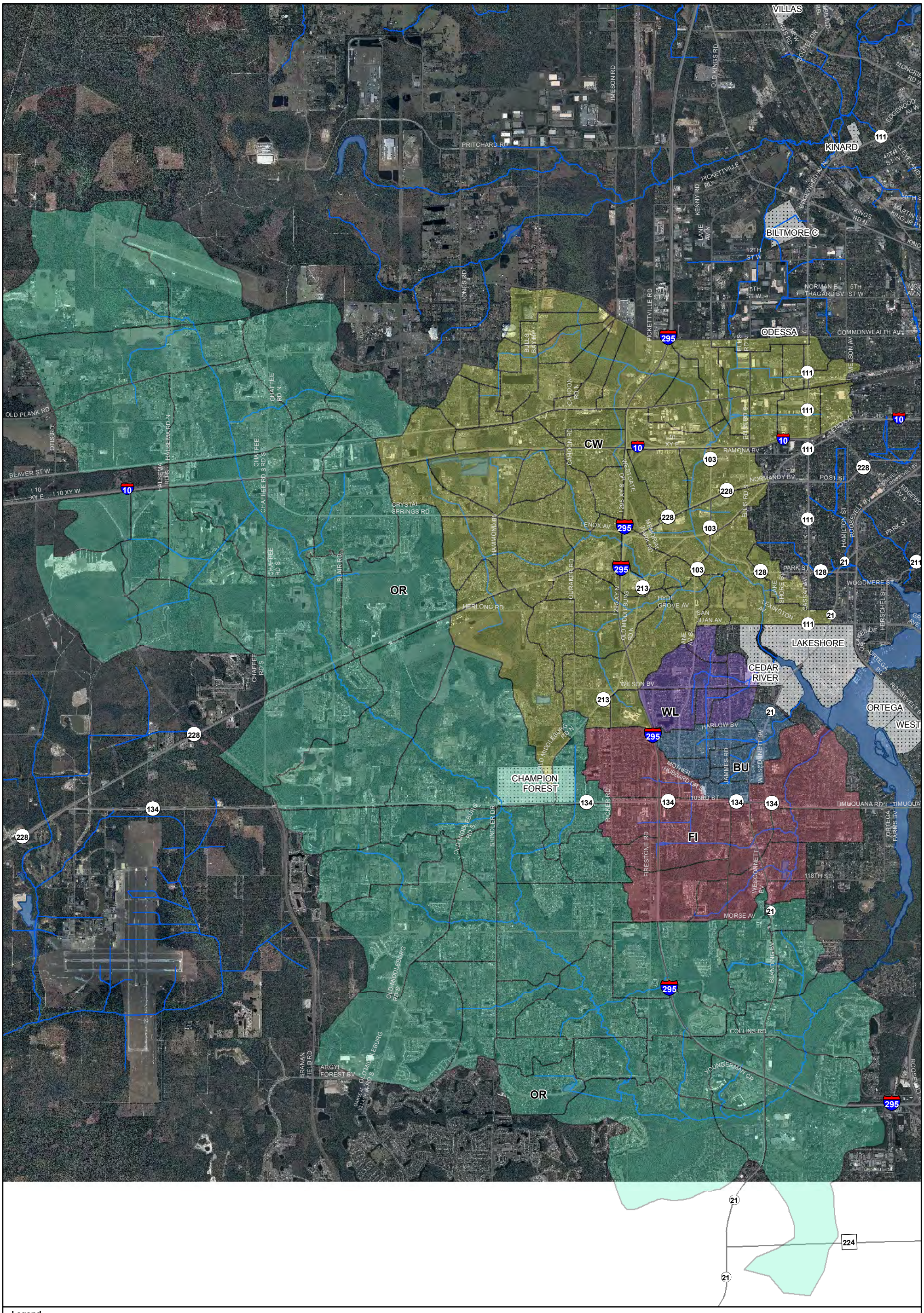
- Streams
- Major Roads
- Water Body

N

0 2 4 Miles

Figure 1.1
Ortega River Basin
Sub-Basins

CDM



Legend

Sub Basins

- Butcher Pen Creek
- Cedar River and Wills Branch
- Fishing Creek
- Ortega River
- Williamson Creek

- Streams
- Major Roads
- Water Body
- Septic Tank Failure Areas

N

0 2 4 Miles

Figure 1.2
Ortega River Basin
Septic Tank Failure Areas

CDM

Section 2.0
Ortega River

2.1 Introduction

This is an update of the 1992 MSMP; it reflects changes occurred in the basins since then based on updated land use, and additional survey and data collection. The following sections describe in greater detail the results of the analysis for Ortega River. The 1992 MSMP for this sub-basin is located in Appendix A.

This is a planning level investigation to be used for capital improvement analysis. The MSMP provides a model framework for documenting Level of Service (LOS), proposing alternatives, and identifying water quality opportunities.

2.2 Sub-basin Information

This section outlines information on the Ortega River sub-basin infrastructure, floodplain, and ability to meet LOS requirements. Schematics of the sub-basin hydrology and hydraulics are shown on **Figures 2.1 and 2.2**, respectively. Hydrologic unit parameters are summarized in **Table 2.1**.

2.2.1 Existing Condition

Ortega River has experienced major development since the 1992 MSMP including the development of Oak Leaf Plantation. The City has implemented several Capital Improvement Projects (CIPs) in the Ortega River sub-basin, such as:

- Better Jacksonville Plan (BJP) Roadway Improvements

    1. Schindler Road - Old Middleburg Road to Collins Road
    2. Collins Road - From Schindler Dr to Rampart Rd
    3. Rampart Road - Park City to Argyle Forest
    4. Ricker Road- Morse to 118th Street
    5. Collins Road - Rampart Dr to I-295
    6. Parramore Road - Collins Rd to Youngerman Circle
    7. Collins Road - Blanding Blvd to Ortega Bluff
    8. Collins Road - Bridge over Ortega River

- 103rd Street McGirts Creek Regional Stormwater Facility (RSF). Two stormwater ponds located in McGirts Creek Park were expanded to treat runoff from 615 acres of untreated residential and commercial land use.
    - New diversion weir structure located across an unnamed ditch that flows through McGirts Creek Park from east to west
    - Bank stabilization for approximately 300 linear feet adjacent to the diversion structure to prevent additional bank erosion
    - Two RSF: 5.1-acre South Pond and 2.8-acre North Pond
    - A pump station with a peak capacity of 2,300 gpm to pump water from the South pond to the North pond

These improvements and developments have been incorporated in the model for the Ortega River sub-basin.

2.2.2 FEMA Related Documents

As part of this project, the City developed updated FEMA flood maps, which include stream profiles and discharge tables that are available to the public. The Flood Insurance Study (FIS) summarizes the results of the analysis that can be retrieved electronically at the following location: http://www.mappingtherisk.com/. This website can also be reached through the City's www.coj.net homepage.

2.2.3 Level of Service Summary

Under the present land use conditions, the Mean Annual, 5-, 10-, 25-, 50-, 100–year design storms were simulated to determine the problem areas as defined below.

In the Ortega River area the following locations do not meet the City's LOS as described in Volume 1 Section 6.0.

- Water Quantity
    - Six local roads (Taylor Field Road, Caprice Dr, Anglia Dr, Steamboat Springs Dr, Blair Rd, 103rd AP) do not meet the defined LOS i.e., >3 inches of flooding for a 5-year storm event. All arterial roads meet the LOS.
    - There are approximately 255 potential structures at risk (PSAR) in the Ortega River area including residential and commercial establishments. These structures lie within the special flood hazard area (SFHA). Structure finished floor elevations may exceed the base flood elevations (BFE) established for these areas. Additional survey is recommended during detailed design for projects in this area.

The peak stages for the various 24-hr design storms under existing conditions are presented in **Table 2.2**.

- Water Quality
    - Number of septic tanks in the Department of Health defined failing septic tank areas in the Ortega River sub-basin: 607.
    - There are 100 septic tanks in these failing areas in the 200-meter Ortega River buffer.
    - The BMAP goal for total nitrogen (TN) reduction in the Ortega River basin is set at 4.6 MT TN/yr.
- Erosion
    - Total length of channel experiencing high velocities (greater than 3 ft/sec): 29,500 feet.
    - The reaches experiencing such high velocities are shown on **Figure 2.3** and presented here.

Channel between:	Node OR13050 to Node OR13001
	Node OR62005 to Node OR62004AP
	Node OR64015APS to Node OR64008AP
	Node OR64006AP to Node OR64005APS
	Node OR14015 to Node OR14013
	Node OR10063L5 to Node OR10063L4
	Node OR10430AP to Node OR10425AP
	Node OR10060S to Node OR10056
	Node OR16020S to Node OR16007
	Node OR17014AP to Node OR17010S
	Node OR11032APS to Node OR11006APS

2.3 Alternatives Evaluation

This section describes the alternatives evaluated for the Ortega River sub-basin. Based on the screening process for the alternatives evaluation, the following alternatives representing different LOS were developed. Detailed public safety options and standards should be considered and implemented as appropriate during final design.

- Alternative 1: 40-acre RSF

ALTERNATIVE 1 – 40-ACRE RSF

Alternative 1 addresses water quality and flood control within the Ortega River sub-basin. This alternative involves construction of a 40 acre wet-detention facility as shown on **Figure 2.4**. The RSF was evaluated as an off-line pond with a retention period of 21 days, a maximum depth of 12 feet, a permanent pool volume of 391 ac-ft, and a total surface area (including maintenance buffer) of approximately 47 acres. For cost-benefit analysis, two scales were identified for this alternative:

- Alternative 1A: 40-acre RSF
- Alternative 1B: 40-acre RSF with Managed Aquatic Plant Systems (MAPS)

MAPS are a supplement to existing or new RSF to increase nutrient uptake and removal in the facilities through vegetative growth. The MAPS act as a littoral zone planted with aquatic vegetation managed to optimize uptake of nutrients. Unlike a traditional littoral zone, which dies back in winter releasing the nutrients through its detritus, MAPS are harvested annually to permanently remove nutrients from the system. Additionally, the MAPS are typically implemented as floating islands that remain in contact with nutrients in the water even during periods when traditional littoral zones would be left dry.

Water quality analysis was performed using the Watershed Management Model (WMM) to measure the effectiveness of this pond to reduce the various NPDES water quality parameters for annual loads. Results are tabulated in **Table 2.3** comparing the existing and with-project conditions for the Ortega River sub-basin. For MAPS, a removal efficiency of 40 percent of the remaining pond load was assumed (i.e., after traditional wet detention). The City and FDEP are in the process of several MAPS trial studies to further define this removal efficiency.

Alternative 1 provides two benefits: reducing stages downstream and addressing nutrient reduction for the Ortega River basin. The proposed alternative results in 5 PSAR being removed from the SFHA and nutrient reduction ranging from 0.6 MT TN/yr (Alternative 1A) to 1.62 MT TN/yr (Alternative 1B). The peak stages under Alternative 1 are presented in **Table 2.4**.

The capital and O&M costs associated with these alternatives are presented in **Tables 2.5 and 2.6**.

Table 2.3 Water Quality Analysis Results for Alternative 1 for Ortega River

Parameter	Units	Existing Conditions	Alternative	Reduction	% Reduction
Flow	(ac-ft/yr)	54,162	54,162	-	0.0%
BOD	lbs/yr	663,622	655,573	8,049	1.2%
Cd	lbs/yr	109	107	2	2.2%
COD	lbs/yr	4,119,029	4,070,716	48,313	1.2%
Cu	lbs/yr	727	719	8	1.1%
DP	lbs/yr	12,435	12,262	173	1.4%
F-Coli	counts/yr	4.87E+15	4.71E+15	1.60E+14	3.3%
NO23	lbs/yr	42,225	41,753	472	1.1%
Pb	lbs/yr	857	846	11	1.3%
TDS	lbs/yr	17,634,811	17,532,811	102,000	0.6%
TKN	lbs/yr	140,045	139,175	870	0.6%
TP	lbs/yr	22,394	22,110	284	1.3%
TSS	lbs/yr	2,326,719	2,286,129	40,590	1.7%
Zn	lbs/yr	4,290	4,254	36	0.8%
TN	lbs/yr	182,270	180,928	1,342	0.7%

Values do not include MAPS nutrient removal

2.4 Cost Benefit Analysis

To facilitate the selection of the most cost effective project alternatives, a cost-benefit analysis was performed for all identified combinations of alternatives. The detailed methodology used for the cost-benefit analysis can be found in Volume 1 Section 7.0.

2.4.1 Alternative Relationships

To maximize the effectiveness of the cost-benefit analysis, any interdependencies among alternatives must be identified. The following relationships were identified for the Ortega River sub-basin:

- All alternatives can be implemented as standalone projects.
- No alternative is dependent upon the implementation of another alternative.

2.4.2 Cost Effectiveness Analysis

Figure 2.5 shows all the possible combinations of alternatives and their corresponding benefit scores. The cost effective frontier identified the alternatives that are the most cost effective, i.e., no other combination of alternatives provides more benefit for lower cost, and the "best buys," i.e., the combinations of alternatives with the lowest cost/benefit ratio. The best buy plans for the sub-basin are identified in **Table 2.7**.

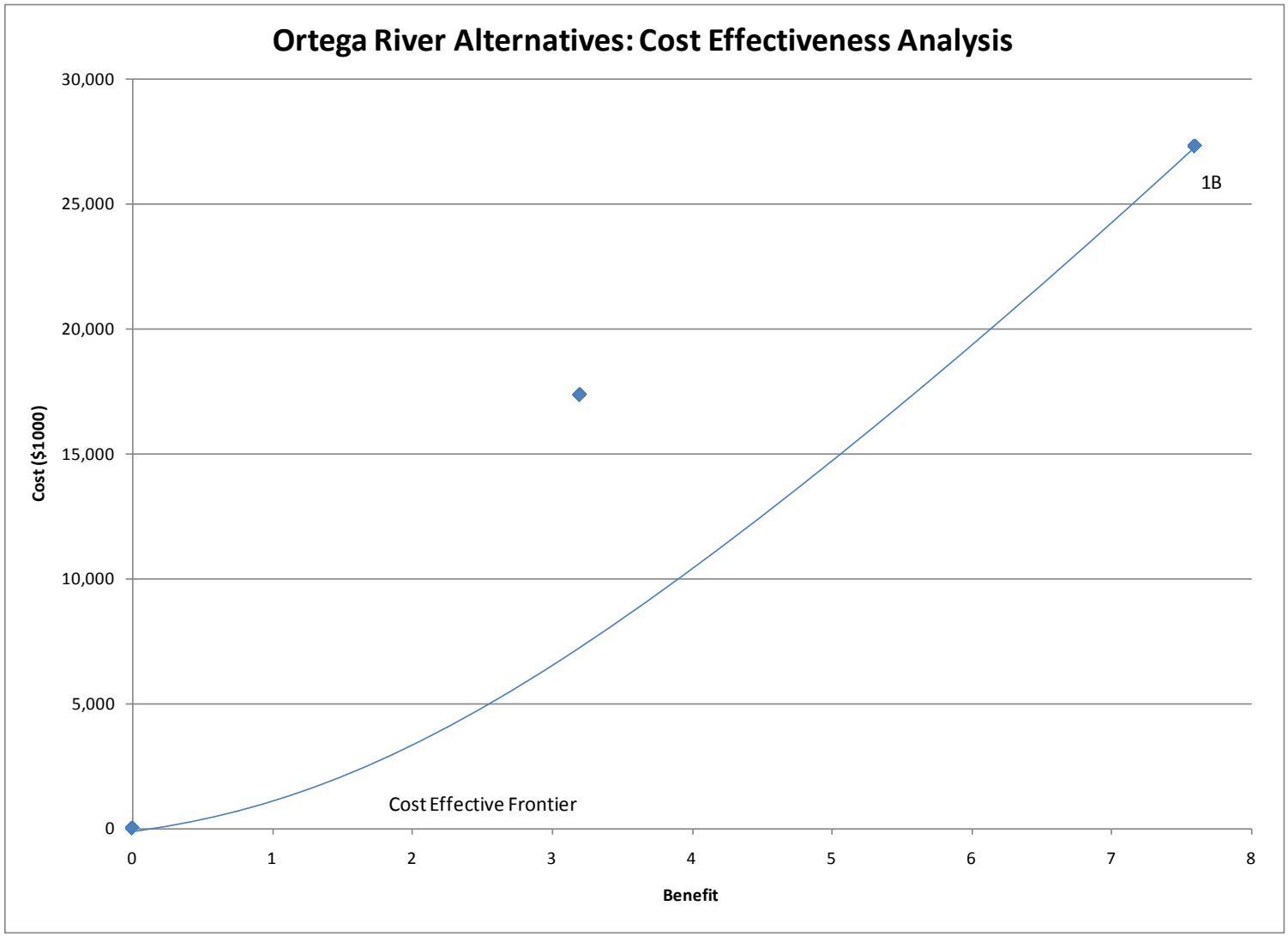


Figure 2.5 Results of Ortega River Cost Effectiveness Analysis

Table 2.7 Best Buy Plans Identified for Ortega River Sub-basin Cost Effectiveness Analysis

Plan Alternative	Project Description	Total Benefit (Output) (%)	Cost ($1000)	Average Cost ($1000 / %)
No Action Plan		0	0	
1B	40ac RSF w/ MAPS	7.6	27,332	3,596

2.4.3 Incremental Cost Analysis

The best buy plans identified during cost effectiveness analysis were next reviewed for incremental cost. The results of the incremental cost analysis are presented on **Figure 2.6 and in Table 2.8**.

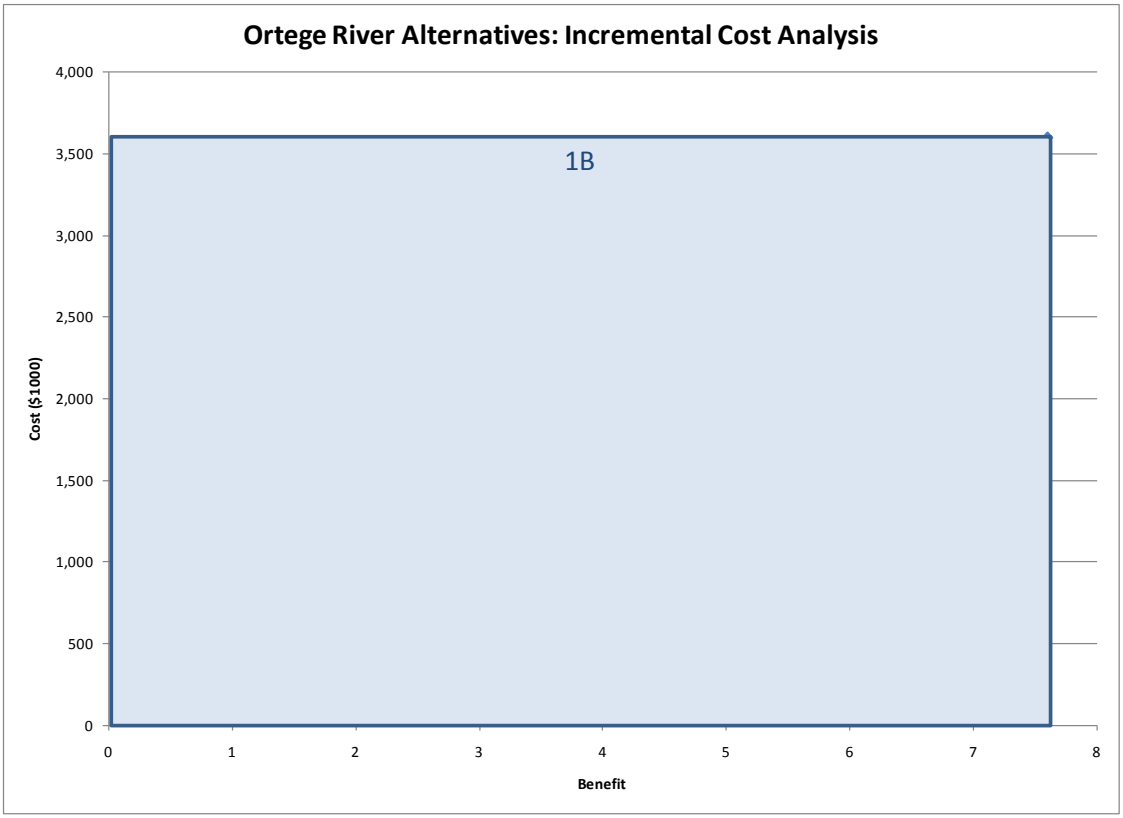


Figure 2.6 Results of Ortega River Incremental Cost Analysis

Table 2.8 Incremental Cost Information for Best Buy Plans

Plan Alternative	Total Benefit (Output) (%)	Cost ($1000)	Average Cost ($1000/%)	Incremental Cost ($1000)	Inc. Output (%)	Inc. Cost Per Output ($1000)
No Action	0	0				
1B	7.6	27,332	3,596	27,332	7.6	3,596

2.4.4 Plan Selection

There is only one best but alternative identified for the Ortega River Basin. It is recommended that the City implement Plan 1B, 40-acre RSF with MAPS. Due the extremely large cost associated with a project of this size, it is recommended that this project be considered in the context of county-wide benefits to determine its prioritization for implementation.

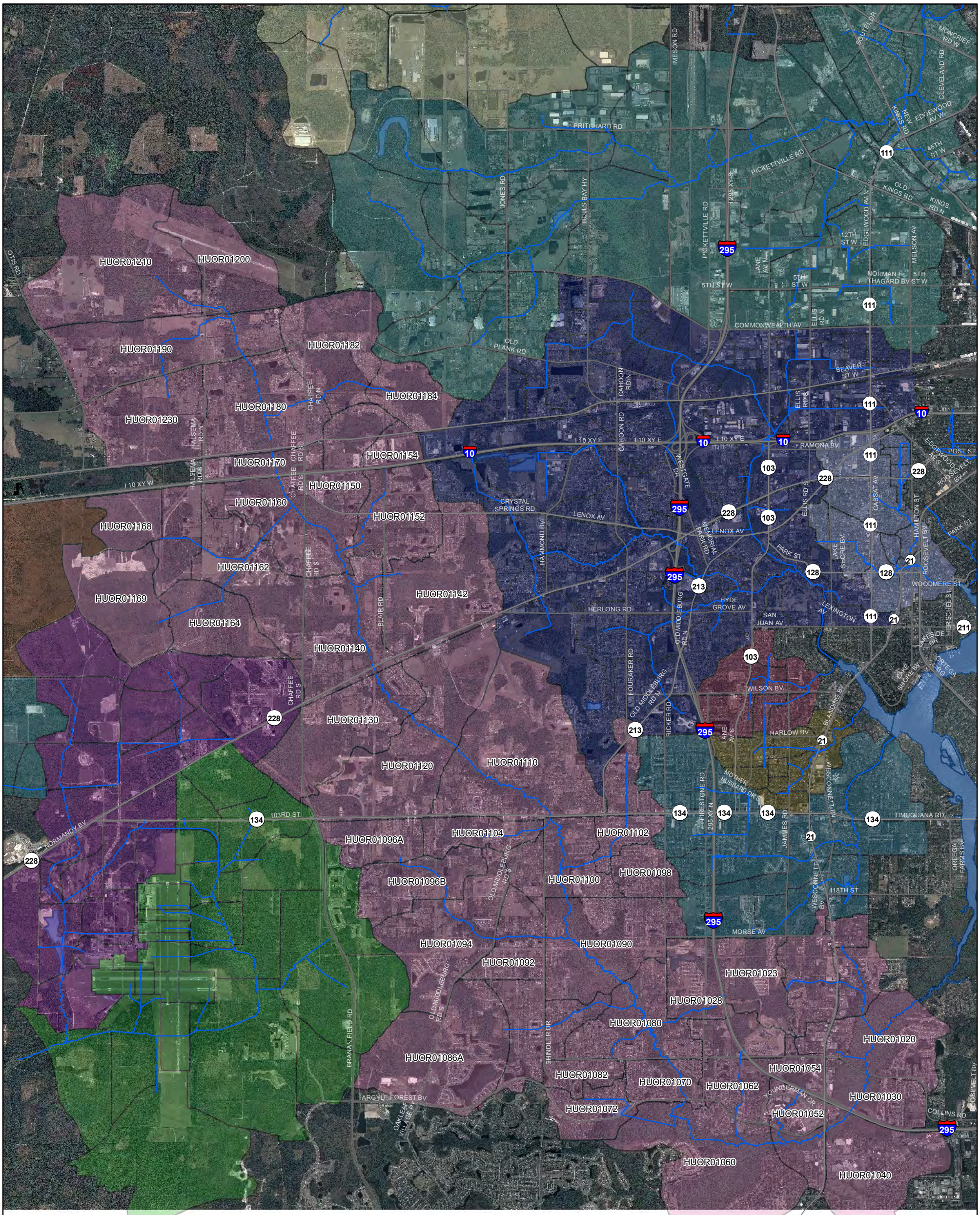
2.5 Recommendations

CDM recommends that the City implement the following components as part of the Ortega River sub-basin Stormwater Improvements. The benefits associated with this plan are outlined in **Table 2.9**.

- 40-acre RSF with MAPS

Table 2.9 Projected Benefits for Recommended Plan

Strategic Program Goals	Water Quantity						WQ	O&M
Performance Measurement Metrics	Local Road	Arterial Road			Structure		WQ	Erosion
Design Storm	5	10	25	100	25	100	MT TN/yr	velocity > 3fps (ft)
Depth Criteria	>3in	>3in	>6in	>9in	>0ft	> 0 ft		
Project Benefits	-	-	-	-	-	5	1.6	-



For detailed information, including model nodes, stream profiles, roadway crossings and floodplain delineation refer to FIS/FIRM.

Legend

- MSMP Conduits
- Major Roads
- Water Body

Hydrologic Unit

- Ortega River
- Big Fishweir Creek
- Caldwell Branch
- St. Mary's River
- Rowell Creek
- Sal Taylor Creek
- Trout River
- Ribault River
- Williamson Creek
- Fishing Creek
- Cedar River and Wills Branch
- Butcher Pen Creek

N

0 2 4 Miles

Figure 2.1
Ortega River Subbasin
Hydrology

CDM

For detailed information, including
model nodes, stream profiles, roadway
crossings and floodplain delineation refer to FIS/FIRM.

Legend

- MSMP Nodes
- MSMP Conduits
- Major Roads
- Water Body

Hydrologic Unit

- Ortega River
- Big Fishweir Creek
- Caldwell Branch
- St. Mary's River
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- Ribault River
- Williamson Creek
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- Cedar River and Wills Branch
- Butcher Pen Creek

N

0 2 4 Miles

Figure 2.2
Ortega River Subbasin
Hydraulics

CDM

Table 2.1
COJ MSMP Update
Ortega River - Hydrologic Unit Parameters

HUC Name	Outlet	Area (Acres)	Imperviousness %	Width	Slope %	N-Imperv	N-Perv	Max. Infil. Rate	Min. Infil. Rate
HUOR01020	OR10015	779.1	67.0	8829	0.56	0.079	0.248	5.36	0.25
HUOR01021	OR11005	290.8	39.2	8223	1.31	0.048	0.291	6.14	0.29
HUOR01022	OR11020S	488.1	27.8	6017	0.70	0.042	0.293	5.76	0.26
HUOR01023	OR11040S	526.4	38.8	3886	0.16	0.087	0.327	5.88	0.26
HUOR01025	OR18005AP	89.1	43.7	3702	0.69	0.015	0.222	4.73	0.20
HUOR01026	OR11110APS	121.5	26.8	1819	0.44	0.040	0.250	5.47	0.23
HUOR01028	OR15035AP	423.2	47.4	3013	0.56	0.066	0.278	6.26	0.30
HUOR01030	OR10035	473.1	56.6	5585	0.70	0.069	0.240	5.00	0.21
HUOR01040	OR10045	1536	43.5	4198	0.43	0.035	0.242	5.89	0.33
HUOR01050	OR10052	227.6	65.5	2638	1.73	0.062	0.217	5.48	0.32
HUOR01052	OR17010S	233.5	52.4	5376	0.63	0.020	0.297	4.41	0.16
HUOR01054	OR17040S	228	58.9	3888	0.42	0.033	0.281	4.89	0.20
HUOR01060	OR10054	1577.3	59.2	14314	1.01	0.085	0.256	5.52	0.30
HUOR01062	OR16015	354.7	24.2	8842	0.68	0.018	0.275	4.90	0.19
HUOR01063	OR16035	161.8	39.0	2985	0.19	0.069	0.281	4.95	0.19
HUOR01066	OR16040S	194.3	30.1	2549	0.18	0.071	0.300	6.46	0.31
HUOR01070	OR10060S	329.6	36.4	4890	1.25	0.061	0.256	5.89	0.30
HUOR01072	OR10056	392.7	35.1	4428	0.96	0.051	0.242	6.27	0.31
HUOR01080	OR10062	785	41.1	9683	0.86	0.077	0.255	6.32	0.31
HUOR01082	OR10430AP	226.5	18.2	1773	0.43	0.016	0.245	7.36	0.39
HUOR01084	OR10505AP	221.8	28.1	3703	0.78	0.071	0.255	5.94	0.27
HUOR01086A	OR10590	1357	36.9	13801	0.33	0.069	0.309	7.08	0.36
HUOR01086B	OR10540	442	36.9	4503	0.33	0.069	0.309	3.00	0.50
HUOR01090	OR10064	1125.4	40.5	8191	0.93	0.081	0.287	7.06	0.37
HUOR01092	OR14013	447.5	21.4	5060	1.09	0.057	0.259	7.19	0.38
HUOR01094	OR14020APS	1051	24.2	8468	0.61	0.071	0.309	7.85	0.43
HUOR01096a	OR14090AP	402	30.4	7716	0.45	0.079	0.298	7.63	0.41
HUOR01096b	OR14050	583	30.4	11196	0.45	0.079	0.298	3.00	0.50
HUOR01098	OR13032	304.9	29.5	9932	2.02	0.020	0.221	6.23	0.31
HUOR01100	OR10066	466.1	42.7	9547	1.80	0.077	0.272	8.44	0.52
HUOR01102	OR13040S	239.9	29.8	5371	0.89	0.015	0.226	7.34	0.40
HUOR01103	OR13085	321.8	31.2	9564	0.91	0.030	0.249	7.31	0.39
HUOR01104	OR19070AP	355.9	30.1	6037	0.42	0.070	0.294	6.99	0.36
HUOR01106	OR10065L4	205	9.2	2164	0.73	0.043	0.265	7.66	0.41
HUOR01110	OR10072	1827.6	29.7	11044	0.85	0.065	0.296	7.59	0.42
HUOR01120	OR10074	1588.8	31.3	10693	0.69	0.072	0.322	7.80	0.43

Table 2.1
COJ MSMP Update
Ortega River - Hydrologic Unit Parameters

HUC Name	Outlet	Area (Acres)	Imperviousness %	Width	Slope %	N-Imperv	N-Perv	Max. Infil. Rate	Min. Infil. Rate
HUOR01130	OR10075	1073.8	45.1	11231	0.98	0.086	0.307	7.24	0.39
HUOR01140	OR60003S	986.4	25.2	11929	1.13	0.069	0.311	8.56	0.51
HUOR01142	OR65015AP	1216.2	33.1	6260	0.31	0.075	0.332	7.73	0.42
HUOR01150	OR60008	890.4	42.3	7411	0.61	0.072	0.294	7.30	0.38
HUOR01152	OR64015APS	697	29.3	6361	0.46	0.055	0.263	7.39	0.39
HUOR01154	OR64030AP	200.5	35.4	2049	0.40	0.033	0.347	7.11	0.37
HUOR01160	OR60013	581.8	45.8	6587	0.69	0.084	0.334	6.96	0.35
HUOR01162	OR61017	856	34.9	6234	0.33	0.091	0.316	7.87	0.42
HUOR01164	OR61050AP	627.2	29.6	5578	0.38	0.098	0.374	7.75	0.41
HUOR01166	OR63020AP	395.6	18.2	4088	0.27	0.089	0.361	7.16	0.36
HUOR01168	OR63040	354.9	22.2	2340	0.08	0.097	0.384	7.81	0.41
HUOR01169	OR61100AP	875.5	32.3	5239	0.04	0.098	0.384	3.00	0.50
HUOR01170	OR60025	316.7	60.5	3120	0.74	0.055	0.299	6.00	0.29
HUOR01180	OR60045	1055.2	25.7	12670	0.76	0.076	0.295	7.29	0.38
HUOR01182	OR62033AP	902.7	35.7	7298	0.31	0.087	0.307	7.15	0.37
HUOR01184	OR62036AP	434.6	49.7	4820	0.29	0.088	0.293	7.18	0.37
HUOR01190	OR60053	1245.8	23.7	7892	0.75	0.087	0.307	6.72	0.33
HUOR01200	OR60057S	775.5	26.2	6098	0.35	0.073	0.320	7.38	0.39
HUOR01210	OR60070AP	1803.1	23.6	13083	0.23	0.091	0.358	6.63	0.32
HUOR01230	OR66050AP	933.1	26.6	7706	0.26	0.087	0.310	7.13	0.36

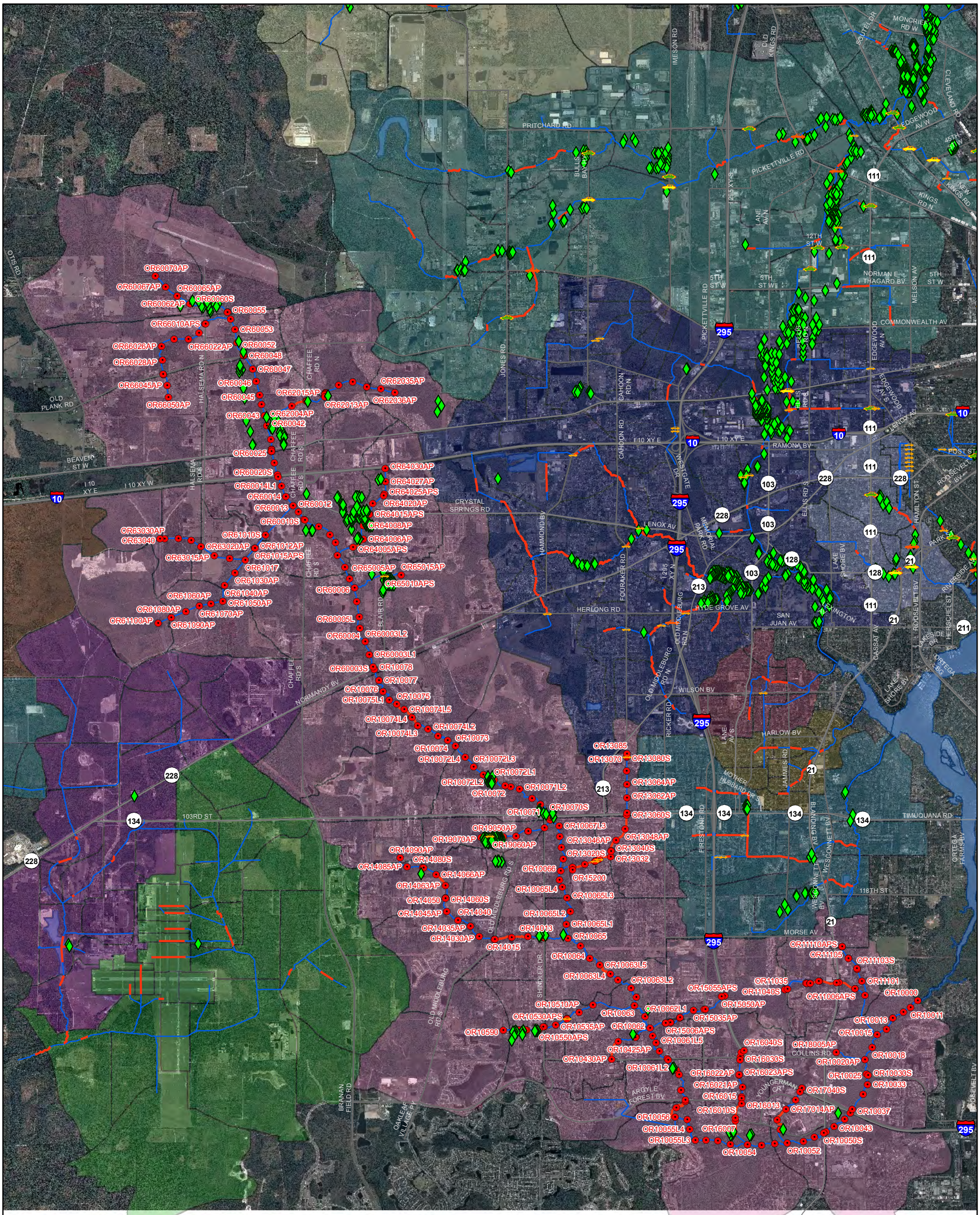

Figure 2.3
Ortega River Subbasin
Level of Service

CDM

Table 2.2
COJ MSMP Update
Ortega River - Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
OR10011				S	1.8		1.9		2.1		2.4		2.7		2.9	
OR10012				S	2.0		2.2		2.5		2.9		3.2		3.5	
OR10013				S	2.0		2.2		2.5		3.0		3.3		3.6	
OR10014				S	2.0		2.3		2.6		3.1		3.4		3.8	
OR10015				S	2.0		2.3		2.6		3.2		3.5		3.9	
OR10018				S	2.1		2.4		2.8		3.4		3.8		4.2	
OR10020AP				AP	2.1		2.4		2.8		3.4		3.8		4.2	
OR10025				S	2.1		2.4		2.9		3.4		3.9		4.3	
OR10030S	COLLINS ROAD	LOCAL	9.0	S	2.1		2.5		3.0		3.7		4.3		4.8	
OR10033				S	2.2		2.5		3.1		3.8		4.4		4.9	
OR10035				S	2.2		2.6		3.2		3.9		4.5		5.0	
OR10037				S	2.2		2.7		3.3		4.1		4.7		5.3	
OR10040S	I 295 EXPRESSWAY	ARTERIAL	11.0	S	2.3		2.8		3.5		4.5		5.3		6.1	
OR10042				S	2.3		2.9		3.6		4.6		5.4		6.2	
OR10043				S	2.4		3.0		3.8		4.9		5.7		6.4	
OR10045				S	2.5		3.2		4.0		5.1		5.9		6.7	
OR10050S	BLANDING BOULEVARD	ARTERIAL	39.0	S	2.5		3.3		4.2		5.5		6.4		7.3	
OR10051				S	2.5		3.4		4.4		5.6		6.5		7.4	
OR10051L1				S	2.6		3.5		4.5		5.7		6.6		7.5	
OR10052				S	2.8		3.7		4.7		5.9		6.8		7.7	
OR10053				S	2.8		3.8		4.8		6.1		7.0		7.8	
OR10053L1				S	2.9		3.9		4.9		6.2		7.1		8.0	
OR10055				S	3.4		4.4		5.4		6.6		7.5		8.4	
OR10055L1				S	3.8		4.8		5.8		7.0		7.9		8.7	
OR10055L2				S	4.4		5.3		6.3		7.5		8.3		9.1	
OR10055L3				S	4.8		5.7		6.6		7.8		8.6		9.4	
OR10055L4				S	6.0		6.7		7.5		8.6		9.3		10.0	
OR10055L5				S	6.5		7.3		8.0		9.0		9.7		10.4	
OR10057				S	8.0		8.6		9.3		10.1		10.7		11.3	
OR10058				S	10.0		10.6		11.2		11.8		12.3		12.6	
OR10060L1				S	10.4		11.2		12.1		13.0		13.7		14.2	
OR10060S	ARGYLE FOREST BOULEVARD	LOCAL	21.8	S	10.0		10.7		11.3		12.0		12.5		13.0	
OR10061				S	12.6		13.5		14.4		15.4		16.1		16.7	
OR10061L1				S	12.9		13.8		14.7		15.8		16.5		17.1	
OR10061L2				S	13.6		14.7		15.8		17.0		17.8		18.4	
OR10061L3				S	13.6		14.7		15.8		17.1		17.9		18.6	
OR10061L4				S	14.1		15.2		16.3		17.6		18.5		19.2	

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					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
OR10061L5				S	14.4		15.4		16.6		17.9		18.8		19.5	
OR10061L6				S	14.8		15.8		16.9		18.2		19.1		19.8	
OR10062				S	15.4		16.3		17.3		18.6		19.4		20.2	
OR10062L1				S	16.3		17.1		18.1		19.3		20.1		20.8	
OR10063				S	17.3		18.2		19.2		20.5		21.4		22.1	
OR10063L1				S	17.6		18.4		19.5		20.8		21.7		22.4	
OR10063L2				S	18.9		19.5		20.3		21.4		22.3		22.9	
OR10063L3				S	19.2		19.8		20.7		21.9		22.7		23.4	
OR10063L4				S	19.5		20.1		21.0		22.1		23.0		23.7	
OR10063L5				S	21.0		21.6		22.2		23.1		23.9		24.5	
OR10064				S	22.4		23.0		23.8		24.7		25.4		25.9	
OR10064L1				S	23.2		23.9		24.8		25.7		26.4		26.8	
OR10065				S	24.2		24.9		25.8		26.8		27.5		28.0	
OR10065L1				S	25.2		25.8		26.7		27.6		28.3		28.7	
OR10065L2				S	26.8		27.5		28.2		29.1		29.7		30.1	
OR10065L3				S	27.7		28.4		29.2		30.2		30.8		31.2	
OR10065L4				S	28.5		29.2		30.0		31.1		31.8		32.3	
OR10065L5				S	29.5		30.2		31.0		32.1		32.8		33.2	
OR10066				S	30.5		31.3		32.1		33.1		33.8		34.2	
OR10067				S	30.9		31.7		32.5		33.6		34.3		34.8	
OR10067L1	ASH STREET	LOCAL	39.0	S	31.6		32.3		33.2		34.6		35.4		35.9	
OR10067L2				S	32.6		33.2		34.0		35.4		36.2		36.8	
OR10067L3				S	33.6		34.3		35.2		36.5		37.3		37.8	
OR10067L4				S	35.6		36.1		37.0		38.2		38.9		39.4	
OR10068				S	35.7		36.3		37.1		38.4		39.1		39.6	
OR10070S	103RD STREET	LOCAL	41.0	S	36.0		36.8		37.8		39.5		40.8		41.7	0.6
OR10071				S	38.0		39.0		40.1		41.3		42.1		42.8	
OR10071L1				S	38.3		39.2		40.3		41.5		42.3		43.0	
OR10071L2				S	38.6		39.5		40.6		41.8		42.7		43.4	
OR10071L3				S	38.9		39.8		40.9		42.2		43.0		43.8	
OR10072				S	39.5		40.4		41.5		42.7		43.5		44.3	
OR10072L1				S	39.7		40.6		41.6		42.9		43.7		44.5	
OR10072L2				S	40.1		41.0		42.0		43.3		44.2		44.9	
OR10072L3				S	40.4		41.3		42.3		43.6		44.5		45.3	
OR10072L4				S	40.7		41.6		42.6		43.8		44.8		45.6	
OR10073				S	41.2		42.1		43.1		44.2		45.2		46.1	
OR10074				S	41.7		42.5		43.4		44.5		45.5		46.4	

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COJ MSMP Update
Ortega River - Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
OR10074L1				S	43.5		44.2		45.1		46.1		46.8		47.5	
OR10074L2				S	43.7		44.6		45.6		46.6		47.2		47.9	
OR10074L3				S	44.1		44.9		46.0		47.1		47.8		48.4	
OR10074L4				S	44.5		45.4		46.6		47.8		48.5		49.2	
OR10074L5				S	45.1		46.0		47.3		48.5		49.2		50.0	
OR10075				S	47.5		48.3		49.1		50.1		50.9		51.6	
OR10075L1				S	47.5		48.4		49.6		50.7		51.4		52.2	
OR10076				S	48.9		49.6		50.5		51.5		52.2		53.0	
OR10077				S	49.8		50.7		51.7		52.6		53.3		54.0	
OR10078				S	50.4		51.5		52.5		53.5		54.2		54.9	
OR10410AP				AP	22.4		22.6		22.8		22.9		23.1		23.3	
OR10420APS	INVERMERE BOULEVARD	LOCAL	26.0	AP	23.4		23.9		24.5		25.1		25.7		26.2	0.2
OR10425AP				AP	30.3		30.4		30.6		30.7		30.9		30.9	
OR10430AP				AP	37.9		38.2		38.7		39.0		39.4		39.5	
OR10505AP				AP	27.9		28.1		28.3		28.4		28.5		28.6	
OR10510AP				AP	35.5		35.8		36.0		36.1		36.2		36.3	
OR10520				AP	43.5		44.1		44.8		45.2		45.6		45.7	
OR10530APS	TAYLOR FIELD ROAD	LOCAL	46.0	AP	46.6	0.6	46.8	0.8	47.0	1.0	47.1	1.1	47.2	1.2	47.3	1.3
OR10535AP				AP	48.7		49.3		49.9		50.3		50.6		50.8	
OR10540				AP	53.5		54.3		55.1		55.6		56.0		56.1	
OR10545APS	SHINDLER DRIVE	LOCAL	57.0	AP	53.5		54.3		55.1		55.6		56.0		56.1	
OR10550APS	PISCES CIRCLE	LOCAL	57.0	AP	53.5		54.3		55.2		56.8		58.1	1.1	58.9	1.9
OR10560				S	56.2		57.7		58.6		59.5		59.7		60.0	
OR10565				S	57.6		58.9		59.9		60.8		61.1		61.4	
OR10575S	PETRELL DRIVE	LOCAL	60.3	S	56.3		57.8		59.0		60.6	0.3	60.8	0.5	61.0	0.7
OR10580S	BRETT FOREST DRIVE	LOCAL	61.3	S	57.6		59.2		61.4	0.1	61.6	0.3	61.6	0.3	61.7	0.4
OR11005				S	2.0		2.3		2.6		3.2		3.5		3.9	
OR11006APS	5900-1 TOWNSEND AP	LOCAL	11.0	AP	5.0		5.6		6.5		7.2		7.9		8.3	
OR11007				S	7.6		8.4		9.1		9.5		9.9		10.0	
OR11010S	BLANDING BOULEVARD	ARTERIAL	15.0	S	8.0		9.0		10.1		10.9		11.6		11.9	
OR11015				S	12.3		12.9		13.5		13.9		14.3		14.5	
OR11020S	ARMADILLO CIRCLE	LOCAL	17.0	S	12.5		13.2		14.2		14.9		15.5		15.9	
OR11025AP				AP	14.3		14.4		14.8		15.3		15.6		15.9	
OR11027APS	CYPRESS COVE ROAD	LOCAL	20.5	AP	14.3		14.5		14.9		15.5		15.9		16.2	
OR11030AP				AP	15.7		15.9		16.3		16.8		17.0		17.3	
OR11032APS				AP	15.8		16.0		16.4		17.2		17.7		18.0	
OR11035				S	15.8		16.0		16.4		17.2		17.7		18.0	

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					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
OR11101				S	2.2		2.6		3.1		3.5		3.9		4.2	
OR11102				S	2.3		2.7		3.2		3.6		3.9		4.2	
OR11103S	ORTEGA PARK BOULEVARD	LOCAL	7.0	S	2.5		3.4		3.6		4.1		4.4		4.7	
OR11104				S	5.7		6.4		6.5		6.6		6.8		6.9	
OR11105				S	8.6		9.1		9.6		9.9		10.2		10.4	
OR11110APS	OVELLA ROAD	LOCAL	10.0	AP	8.8		9.7		11.0	1.0	11.2	1.2	11.2	1.2	11.3	1.3
OR13001				S	33.9		35.0		36.3		37.1		37.8		38.2	
OR13002				S	44.2		45.1		46.0		46.4		46.8		47.0	
OR13003				S	56.0		56.9		57.8		58.3		58.8		59.0	
OR13029				S	60.5		61.6		62.2		62.4		62.7		63.0	
OR13030S	ANGLIA DRIVE	LOCAL	63.0	S	63.6	0.6	63.9	0.9	64.4	1.4	64.5	1.5	64.6	1.6	64.7	1.7
OR13032				S	64.5		65.3		66.5		67.2		67.9		68.3	
OR13033				S	64.9		65.7		66.8		67.5		68.2		68.6	
OR13046AP				AP	68.3		68.8		69.5		70.2		70.6		71.0	
OR13048AP				AP	69.3		69.8		70.5		71.4		72.1		72.6	
OR13050				S	75.8		76.1		76.6		77.1		77.5		77.8	
OR13060S	103RD STREET	LOCAL	80.0	S	75.8		76.1		76.7		77.2		77.7		78.1	
OR13062AP				AP	75.8		76.2		76.7		77.2		77.7		78.1	
OR13064AP				AP	79.8		80.4		80.9		81.4		81.8		82.1	
OR13066AP				AP	80.7		81.7		82.3		82.7		82.9		83.1	
OR13070				S	84.0		84.5		84.8		85.0		85.2		85.3	
OR13080S	STEAMBOAT SPRINGS DRIVE	LOCAL	83.9	S	84.6	0.6	85.0	1.1	85.1	1.2	85.1	1.2	85.2	1.3	85.3	1.4
OR13085				S	85.2		85.3		85.3		85.3		85.3		85.3	
OR14003				S	32.5		33.3		34.0		34.6		35.1		35.5	
OR14010S	SHINDLER DRIVE	LOCAL	36.0	S	32.5		33.4		34.1		34.8		35.5		36.1	0.1
OR14014AP				AP	34.3		35.8		37.0		38.0		38.9		39.5	
OR14015				AP	40.9		42.5		43.6		44.4		45.2		45.7	
OR14030AP				AP	44.5		44.8		45.4		46.3		46.8		47.0	
OR14035AP				AP	47.4		47.9		48.5		48.9		49.2		49.3	
OR14040				AP	53.7		54.5		55.2		55.6		55.9		56.1	
OR14045AP				AP	54.8		55.2		55.6		55.9		56.3		56.4	
OR14050				S	59.3		60.0		60.7		61.2		61.5		61.7	
OR14060S	SANDLER ROAD	LOCAL	65.1	S	59.3		60.0		60.7		61.2		61.5		61.7	
OR14063AP				AP	60.9		61.3		61.8		62.4		62.7		63.1	
OR14066AP				AP	65.9		66.4		67.0		67.4		67.6		67.9	
OR14070				S	67.1		67.4		67.7		68.0		68.1		68.4	
OR14080S	CONNIE JEAN ROAD	LOCAL	71.0	S	68.3		68.8		69.5		70.4		71.0	0.0	71.2	0.2

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					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
OR14085AP				AP	68.7		68.9		69.5		70.4		71.0		71.2	
OR14090AP				AP	74.0		74.2		74.5		74.7		74.8		74.9	
OR15005				AP	18.9		18.9		18.9		19.0		19.4		20.2	
OR15006APS				AP	19.7		20.5		20.8		21.0		21.1		21.2	
OR15008				S	20.5		20.7		20.8		21.0		21.1		21.2	
OR15025				S	20.7		21.3		21.7		22.1		22.4		22.7	
OR16007				S	9.7		10.2		11.0		11.3		11.5		11.7	
OR16010S	ARGYLE FOREST BOULEVARD	LOCAL	14.7	S	9.8		10.5		11.7		12.6		13.5		14.1	
OR16013				S	11.9		13.0		13.7		14.0		14.3		14.6	
OR16015				S	13.1		13.7		14.4		14.9		15.3		15.6	
OR16020S	CANDLEWOOD DRIVE	LOCAL	17.0	S	13.1		13.8		14.4		14.9		15.4		15.7	
OR16021AP				AP	13.6		14.0		14.5		15.0		15.5		15.8	
OR16022AP				AP	15.6		16.0		16.5		16.9		17.2		17.4	
OR16023APS				AP	15.8		16.3		16.8		17.2		17.6		17.9	
OR16025				S	17.7		18.1		18.5		18.9		19.2		19.5	
OR16030S	COLLINS ROAD	LOCAL	24.0	S	17.8		18.3		18.8		19.2		19.6		19.9	
OR17010S	ARGYLE FOREST BOULEVARD	LOCAL	11.0	S	5.1		6.3		7.0		7.3		7.6		7.7	
OR17013AP				AP	8.5		8.8		9.2		9.5		9.7		9.7	
OR17014AP				S	11.4		12.1		12.4		12.7		12.9		13.0	
OR17015				S	12.6		13.0		13.2		13.4		13.6		13.7	
OR17035S	YOUNGERMAN CIRCLE	LOCAL	16.0	S	12.7		13.3		13.6		14.5		14.9		15.2	
OR18005AP				AP	4.5		4.7		4.8		5.0		5.1		5.2	
OR19025APS	SHINDLER DRIVE	LOCAL	43.0	AP	40.2		40.2		43.6	0.6	44.0	1.0	44.1	1.1	44.3	1.3
OR19030AP				AP	55.3		55.3		56.8		57.7		58.0		58.3	
OR19040APS	OLD MIDDLEBURG ROAD	LOCAL	61.0	AP	56.6		56.6		61.5	0.5	61.9	0.9	62.0	1.0	62.2	1.2
OR19050AP				AP	62.6		62.6		65.2		66.6		67.1		67.5	
OR19060AP				AP	69.7		70.7		71.1		71.2		71.3		71.4	
OR19067AP				AP	69.7		70.7		71.1		71.2		71.3		71.4	
OR19069APS	9380-1 103ROAD AP	LOCAL	70.0	AP	69.7		70.7	0.7	71.1	1.1	71.2	1.2	71.3	1.3	71.4	1.4
OR19070AP				AP	69.7		70.7		71.1		71.2		71.3		71.5	
OR60003L1				S	50.7		51.9		53.0		54.2		55.0		55.9	
OR60003L2				S	51.1		52.2		53.4		54.6		55.4		56.2	
OR60003S	NORMANDY BOULEVARD	LOCAL	57.0	S	50.4		51.5		52.6		53.8		54.5		55.4	
OR60004				S	51.5		52.6		53.7		54.9		55.7		56.5	
OR60005L				S	52.3		53.4		54.5		55.6		56.3		57.1	
OR60005L1				S	52.7		53.9		55.1		56.2		57.0		57.7	
OR60006				S	53.0		54.2		55.4		56.6		57.4		58.1	

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COJ MSMP Update
Ortega River - Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
OR60006L1				S	53.2		54.5		55.7		56.8		57.6		58.4	
OR60006L2				S	53.9		55.3		56.6		57.6		58.4		59.1	
OR60007				S	54.3		55.7		56.9		58.0		58.8		59.5	
OR60007L1				S	54.5		55.8		57.1		58.2		58.9		59.6	
OR60008				S	54.6		55.9		57.1		58.2		58.9		59.6	
OR60008L1				S	54.7		55.9		57.2		58.2		59.0		59.7	
OR60009				S	54.9		56.0		57.2		58.3		59.0		59.7	
OR60010S	CHAFFEE ROAD	LOCAL	62.0	S	55.0		56.1		57.3		58.3		59.1		59.8	
OR60012				S	55.7		56.5		57.5		58.5		59.2		59.9	
OR60013				S	55.9		56.7		57.6		58.6		59.3		59.9	
OR60014				S	56.3		57.0		57.8		58.7		59.4		60.0	
OR60014L1				S	57.3		57.7		58.3		59.1		59.7		60.3	
OR60015				S	57.4		57.9		58.6		59.3		59.8		60.4	
OR60020S	I 10 EXPRESSWAY	ARTERIAL	64.5	S	57.4		58.0		58.6		59.4		60.0		60.6	
OR60023				S	57.5		58.1		58.8		59.5		60.2		60.7	
OR60025				S	58.7		59.0		59.6		60.2		60.7		61.2	
OR60038				S	58.8		59.2		59.9		60.6		61.2		61.8	
OR60040S	BEAVER STREET	ARTERIAL	65.0	S	58.8		59.3		60.1		61.0		61.8		62.6	
OR60041				S	58.8		59.4		60.2		61.1		61.9		62.7	
OR60042				S	59.7		60.1		60.9		61.7		62.4		63.1	
OR60043				S	60.5		61.0		61.6		62.3		62.8		63.4	
OR60044				S	60.8		61.3		61.9		62.5		63.1		63.7	
OR60045				S	61.6		61.9		62.4		63.0		63.5		64.1	
OR60046				S	62.0		62.4		62.9		63.6		64.1		64.6	
OR60047				S	64.2		64.7		65.2		66.0		66.5		67.0	
OR60048				S	64.9		65.4		66.1		67.1		67.6		68.1	
OR60050S	OLD PLANK ROAD	LOCAL	70.3	S	65.2		65.8		66.5		67.7		68.5		69.3	
OR60052				S	67.8		68.3		68.8		69.9		70.6		71.2	
OR60053				S	68.1		68.8		69.4		70.6		71.4		72.0	
OR60054				S	68.2		68.8		69.7		70.9		71.6		72.2	
OR60055				S	68.3		69.0		69.8		70.9		71.7		72.3	
OR60059				S	69.5		70.7		71.7		72.6		73.1		73.7	
OR60062AP				AP	72.5		73.0		73.5		74.2		74.6		74.9	
OR60065AP				AP	74.0		74.4		75.0		75.6		76.0		76.3	
OR60067AP				AP	75.2		75.6		76.2		76.8		77.1		77.3	
OR61010S				AP	61.8		62.1		62.2		62.2		62.2		62.2	
OR61012AP				AP	64.2		64.8		65.3		65.7		65.9		66.1	

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Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
OR61015APS				AP	65.7		67.3		69.3		71.3		72.5		73.5	
OR61030AP				AP	68.4		69.0		70.1		71.6		72.6		73.5	
OR61040AP				AP	68.6		69.1		70.1		71.6		72.6		73.5	
OR61050AP				AP	71.5		71.9		72.2		72.4		72.7		73.6	
OR61060AP				AP	71.8		71.7		71.9		72.1		72.7		73.6	
OR61070AP				AP	79.3		79.3		79.4		79.5		79.5		79.6	
OR61080AP				AP	82.2		82.5		82.7		82.9		83.1		83.2	
OR61090AP				AP	82.7		82.8		83.0		83.1		83.2		83.3	
OR62004AP				AP	66.1		66.6		67.5		68.5		69.2		69.7	
OR62005				S	69.5		70.0		70.9		71.8		72.6		73.1	
OR62010S	CHAFFEE ROAD	LOCAL	77.0	S	69.6		70.1		71.3		72.7		73.8		74.5	
OR62013AP				AP	75.8		76.2		77.0		77.9		78.5		78.8	
OR62015AP				AP	77.4		77.8		78.7		79.3		79.5		79.6	
OR62026AP				AP	77.8		78.6		79.3		79.5		79.7		79.8	
OR62030S				AP	78.1		79.1		79.3		79.5		79.7		79.8	
OR62032AP				AP	78.6		79.1		79.3		79.6		79.7		79.8	
OR62033AP				AP	79.6		79.9		80.2		80.3		80.5		80.6	
OR62035AP				AP	84.2		84.6		85.0		85.3		85.5		85.6	
OR63010AP				AP	68.4		69.0		70.0		71.6		72.6		73.5	
OR63015AP				AP	73.3		74.1		74.8		75.4		75.9		76.1	
OR63022AP				AP	76.5		77.2		77.8		78.3		78.8		79.1	
OR63027AP				AP	77.0		77.3		77.7		78.1		78.5		78.9	
OR64005APS	WILD AZALEA DRIVE	LOCAL	60.0	AP	58.3		59.1		60.2	0.2	60.5	0.5	60.6	0.6	60.7	0.7
OR64006AP				AP	58.3		59.1		60.2		60.5		60.6		60.7	
OR64010AP				AP	65.8		66.1		67.1		68.2		68.7		69.0	
OR64017AP				AP	73.5		73.8		74.2		74.5		74.8		75.0	
OR64020AP				AP	75.1		75.6		76.2		76.7		77.2		77.4	
OR64025APS	JOES ROAD	LOCAL	79.0	AP	75.2		75.8		76.4		77.3		78.1		78.6	
OR64027AP				AP	76.4		76.8		77.2		77.8		78.5		78.9	
OR65005AP				AP	57.4		57.8		58.2		58.5		58.8		58.9	
OR65010APS	BLAIR ROAD	LOCAL	58.0	AP	58.0		58.5	0.5	58.7	0.7	58.9	0.9	59.0	1.0	59.1	1.1
OR65015AP				AP	59.5		60.0		60.5		60.9		61.2		61.3	
OR66005AP				AP	74.7		75.2		75.6		76.0		76.2		76.5	
OR66010APS	HALSEMA ROAD	LOCAL	77.0	AP	75.1		76.9		77.4	0.4	77.5	0.5	77.6	0.6	77.7	0.7
OR66020AP				AP	77.1		77.8		78.1		78.4		78.7		78.9	
OR66022AP				AP	79.2		79.8		80.1		80.3		80.5		80.6	
OR66024AP				AP	79.2		79.8		80.2		80.5		80.7		80.9	

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Ortega River - Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
OR66026AP				AP	79.2		79.9		80.2		80.6		80.8		81.1	
OR66028AP				AP	79.7		80.2		80.8		81.3		81.5		81.8	
OR66030AP				AP	81.5		82.3		83.1		83.6		84.0		84.3	
OR66035APS	OLD PLANK ROAD	LOCAL	83.0	AP	81.7		82.9		83.2	0.2	83.6	0.6	84.0	1.0	84.3	1.3
OR66045AP				AP	82.5		83.5		84.2		84.7		85.1		85.4	
OR10000				S	1.7		1.7		1.7		1.7		1.7		1.7	
OR10054				S	3.1		4.1		5.1		6.4		7.3		8.2	
OR10056				S	7.0		7.8		8.6		9.6		10.2		10.8	
OR10590				S	60.4		61.6		62.5		63.7		64.5		65.3	
OR11040S	JUBAL LANE	LOCAL	19.6	S	18.2		18.8		19.3		19.5		19.5		19.6	0.0
OR13020S	CAPRICE DRIVE	LOCAL	61.0	S	60.4		61.5	0.5	61.8	0.8	61.9	0.9	62.1	1.1	62.2	1.2
OR13040S	CARAVELLE DRIVE	LOCAL	70.0	S	65.2		66.0		67.1		67.8		68.6		69.0	
OR15010S	SONIA DRIVE	LOCAL	24.0	S	20.7		21.3		21.7		22.1		22.4		22.7	
OR15030S	PARK CITY DRIVE	LOCAL	24.0	S	21.0		21.6		22.1		22.7		23.0		23.3	
OR15035AP				S	22.3		22.8		23.2		23.7		24.0		24.1	
OR15200				AP	33.1		33.6		34.1		34.5		34.8		35.0	
OR16035				S	18.4		18.8		19.3		19.7		20.0		20.3	
OR16040S	I 295 EXPRESSWAY	ARTERIAL	26.0	S	18.4		19.2		19.8		20.5		21.0		21.4	
OR17040S	I 295 EXPRESSWAY	ARTERIAL	18.0	S	14.7		15.3		16.3		17.0		17.6		18.0	0.0
OR20010APS				AP	99.0		99.0		99.0		99.0		99.0		99.0	
OR60030S				S	58.7		59.2		59.8		60.5		61.1		61.8	
OR60057S				S	68.3		69.0		69.9		71.0		71.9		72.7	
OR60060S	HALSEMA ROAD	LOCAL	73.6	S	69.5		70.7		71.8		72.7		73.4		73.9	0.3
OR61017				S	68.4		69.0		70.0		71.6		72.6		73.5	
OR61100AP				AP	83.3		83.5		83.7		83.8		83.9		84.0	
OR62020S	WILLIAMS AVENUE	LOCAL	79.0	S	77.7		78.6		79.3	0.3	79.5	0.5	79.6	0.6	79.7	0.7
OR62034AP				AP	81.2		81.3		81.5		81.7		81.8		81.9	
OR62036AP				AP	85.4		85.7		85.9		86.2		86.4		86.5	
OR63020AP				AP	76.5		77.2		77.9		78.5		79.0		79.3	
OR63030AP				AP	79.8		79.9		80.0		80.1		80.1		80.2	
OR63040				S	80.9		81.3		81.6		82.1		82.4		82.7	
OR64030AP				AP	76.9		77.4		77.9		78.5		79.1		79.4	
OR64015APS	CRYSTAL SPRINGS ROAD	LOCAL	70.0	AP	66.5		67.3		70.3	0.3	70.6	0.6	70.8	0.8	70.9	0.8
OR64008AP				AP	61.3		61.5		61.8		62.1		62.3		62.4	
OR60070AP				AP	77.0		77.4		77.8		78.1		78.3		78.5	
OR66050AP				AP	84.6		86.8		87.8		88.5		88.9		89.2	
OR14020APS	OLD MIDDLEBURG ROAD	LOCAL	45.0	AP	41.6		43.0		44.3		45.8	0.8	46.3	1.3	46.4	1.4

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Ortega River - Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
OR14013				S	32.8		33.8		34.6		35.5		36.3		36.9	

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Legend

- ! MSMP Nodes
- MSMP Conduits
- Major Roads
- Alternative 1

N

0 2,000 4,000 Feet

Figure 2.4
Ortega River Subbasin
Alternative 1

CDM

Table 2.4
COJ MSMP Update
Ortega River-Alternative 1 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
OR10011				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10012				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10013				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10014				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10015				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10018				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10020AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR10025				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10030S	COLLINS ROAD	LOCAL	9.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10033				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10035				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10037				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10040S	I 295 EXPRESSWAY	ARTERIAL	11.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10042				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10043				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10045				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10050S	BLANDING BOULEVARD	ARTERIAL	39.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10051				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10051L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10052				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10053				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10053L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10055				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10055L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10055L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10055L3				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10055L4				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10055L5				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10057				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10058				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10060L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10060S	ARGYLE FOREST BOULEVARD	LOCAL	21.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10061				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10061L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10061L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10061L3				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10061L4				S	0.0		0.0		0.0		0.0		0.0		0.0	

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Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
OR10061L5				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10061L6				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10062				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10062L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10063				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10063L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10063L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10063L3				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10063L4				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10063L5				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10064				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10064L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10065				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10065L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10065L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10065L3				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10065L4				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10065L5				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10066				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10067				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10067L1	ASH STREET	LOCAL	39.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10067L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10067L3				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10067L4				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10068				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10070S	103RD STREET	LOCAL	41.0	S	0.0		0.0		0.0		0.0		0.0		0.0	0.6
OR10071				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10071L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10071L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10071L3				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10072				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10072L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10072L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10072L3				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10072L4				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10073				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10074				S	0.0		0.0		0.0		0.0		0.0		0.0	

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Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
OR10074L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10074L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10074L3				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10074L4				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10074L5				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10075				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10075L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10076				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10077				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10078				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10410AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR10420APS	INVERMERE BOULEVARD	LOCAL	26.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	0.2
OR10425AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR10430AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR10505AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR10510AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR10520				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR10530APS	TAYLOR FIELD ROAD	LOCAL	46.0	AP	0.0	0.6	0.0	0.8	0.0	1.0	0.0	1.1	0.0	1.2	0.0	1.3
OR10535AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR10540				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR10545APS	SHINDLER DRIVE	LOCAL	57.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR10550APS	PISCES CIRCLE	LOCAL	57.0	AP	0.0		0.0		0.0		0.0		0.0	1.1	0.0	1.9
OR10560				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10565				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10575S	PETRELL DRIVE	LOCAL	60.3	S	0.0		0.0		0.0		0.0	0.3	0.0	0.5	0.0	0.7
OR10580S	BRETT FOREST DRIVE	LOCAL	61.3	S	0.0		0.0		0.0	0.1	0.0	0.3	0.0	0.3	0.0	0.4
OR11005				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR11006APS	5900-1 TOWNSEND AP	LOCAL	11.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR11007				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR11010S	BLANDING BOULEVARD	ARTERIAL	15.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR11015				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR11020S	ARMADILLO CIRCLE	LOCAL	17.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR11025AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR11027APS	CYPRESS COVE ROAD	LOCAL	20.5	AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR11030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR11032APS				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR11035				S	0.0		0.0		0.0		0.0		0.0		0.0	

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Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
OR11101				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR11102				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR11103S	ORTEGA PARK BOULEVARD	LOCAL	7.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR11104				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR11105				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR11110APS	OVELLA ROAD	LOCAL	10.0	AP	0.0		0.0		0.0	1.0	0.0	1.2	0.0	1.2	0.0	1.3
OR13001				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR13002				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR13003				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR13029				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR13030S	ANGLIA DRIVE	LOCAL	63.0	S	0.0	0.6	0.0	0.9	0.0	1.4	0.0	1.5	0.0	1.6	0.0	1.7
OR13032				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR13033				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR13046AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR13048AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR13050				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR13060S	103RD STREET	LOCAL	80.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR13062AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR13064AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR13066AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR13070				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR13080S	STEAMBOAT SPRINGS DRIVE	LOCAL	83.9	S	0.0	0.6	0.0	1.1	0.0	1.2	0.0	1.2	0.0	1.3	0.0	1.4
OR13085				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR14003				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR14010S	SHINDLER DRIVE	LOCAL	36.0	S	0.0		0.0		0.0		0.0		0.0		0.0	0.1
OR14014AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR14015				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR14030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR14035AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR14040				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR14045AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR14050				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR14060S	SANDLER ROAD	LOCAL	65.1	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR14063AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR14066AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR14070				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR14080S	CONNIE JEAN ROAD	LOCAL	71.0	S	0.0		0.0		0.0		0.0		0.0	0.0	0.0	0.2

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OR14085AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR14090AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR15005				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR15006APS				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR15008				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR15025				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR16007				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR16010S	ARGYLE FOREST BOULEVARD	LOCAL	14.7	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR16013				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR16015				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR16020S	CANDLEWOOD DRIVE	LOCAL	17.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR16021AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR16022AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR16023APS				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR16025				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR16030S	COLLINS ROAD	LOCAL	24.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR17010S	ARGYLE FOREST BOULEVARD	LOCAL	11.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR17013AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR17014AP				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR17015				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR17035S	YOUNGERMAN CIRCLE	LOCAL	16.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR18005AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR19025APS	SHINDLER DRIVE	LOCAL	43.0	AP	0.0		0.0		0.0	0.6	0.0	1.0	0.0	1.1	0.0	1.3
OR19030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR19040APS	OLD MIDDLEBURG ROAD	LOCAL	61.0	AP	0.0		0.0		0.0	0.5	0.0	0.9	0.0	1.0	0.0	1.2
OR19050AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR19060AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR19067AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR19069APS	9380-1 103ROAD AP	LOCAL	70.0	AP	0.0		0.0	0.7	0.0	1.1	0.0	1.2	0.0	1.3	0.0	1.4
OR19070AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR60003L1				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60003L2				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60003S	NORMANDY BOULEVARD	LOCAL	57.0	S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60004				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60005L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60005L1				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60006				S	0.0		0.0		0.0		0.0		-0.1		-0.1	

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					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
OR60006L1				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60006L2				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60007				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60007L1				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60008				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60008L1				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60009				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60010S	CHAFFEE ROAD	LOCAL	62.0	S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60012				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60013				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60014				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60014L1				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60015				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60020S	I 10 EXPRESSWAY	ARTERIAL	64.5	S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60023				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60025				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60038				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60040S	BEAVER STREET	ARTERIAL	65.0	S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60041				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60042				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60043				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60044				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60045				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
OR60046				S	0.0		0.0		0.0		-0.1		-0.1		-0.2	
OR60047				S	-0.1		0.0		0.0		-0.2		-0.2		-0.4	
OR60048				S	-0.1		-0.1		-0.1		-0.2		-0.3		-0.3	
OR60050S	OLD PLANK ROAD	LOCAL	70.3	S	-0.3		-0.4		-0.5		-0.8		-1.1		-1.5	
OR60052				S	0.1		0.1		0.1		-0.2		-0.3		-0.2	
OR60053				S	0.0		0.0		0.0		-0.2		-0.3		-0.3	
OR60054				S	0.0		0.0		-0.1		-0.3		-0.3		-0.3	
OR60055				S	0.0		0.0		-0.1		-0.3		-0.3		-0.3	
OR60059				S	0.0		0.0		-0.1		-0.1		-0.1		-0.1	
OR60062AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR60065AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR60067AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR61010S				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR61012AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 2.4
COJ MSMP Update
Ortega River-Alternative 1 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
OR61015APS				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR61030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR61040AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR61050AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR61060AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR61070AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR61080AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR61090AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR62004AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR62005				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR62010S	CHAFFEE ROAD	LOCAL	77.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR62013AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR62015AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR62026AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR62030S				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR62032AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR62033AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR62035AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR63010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR63015AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR63022AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR63027AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR64005APS	WILD AZALEA DRIVE	LOCAL	60.0	AP	0.0		0.0		0.0	0.2	0.0	0.5	0.0	0.6	0.0	0.7
OR64006AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR64010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR64017AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR64020AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR64025APS	JOES ROAD	LOCAL	79.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR64027AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR65005AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR65010APS	BLAIR ROAD	LOCAL	58.0	AP	0.0		0.0	0.5	0.0	0.7	0.0	0.9	0.0	1.0	0.0	1.1
OR65015AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR66005AP				AP	-0.1		-0.6		-1.0		-0.4		-0.2		-0.2	
OR66010APS	HALSEMA ROAD	LOCAL	77.0	AP	-0.3		-2.1		-2.6		-0.1	0.4	-0.1	0.5	-0.1	0.6
OR66020AP				AP	-0.1		-0.8		-1.1		-0.3		-0.2		-0.2	
OR66022AP				AP	-0.7		-1.3		-1.6		-0.1		-0.1		0.0	
OR66024AP				AP	-0.7		0.0		0.4		0.2		0.1		-0.1	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 2.4
COJ MSMP Update
Ortega River-Alternative 1 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
OR66026AP				AP	-0.2		-0.1		0.4		0.2		0.0		-0.1	
OR66028AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR66030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR66035APS	OLD PLANK ROAD	LOCAL	83.0	AP	0.0		0.0		0.0	0.2	0.0	0.6	0.0	1.0	0.0	1.3
OR66045AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR10000				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10054				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10056				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR10590				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR11040S	JUBAL LANE	LOCAL	19.6	S	0.0		0.0		0.0		0.0		0.0		0.0	0.0
OR13020S	CAPRICE DRIVE	LOCAL	61.0	S	0.0		0.0	0.5	0.0	0.8	0.0	0.9	0.0	1.1	0.0	1.2
OR13040S	CARAVELLE DRIVE	LOCAL	70.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR15010S	SONIA DRIVE	LOCAL	24.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR15030S	PARK CITY DRIVE	LOCAL	24.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR15035AP				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR15200				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR16035				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR16040S	I 295 EXPRESSWAY	ARTERIAL	26.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
OR17040S	I 295 EXPRESSWAY	ARTERIAL	18.0	S	0.0		0.0		0.0		0.0		0.0		0.0	0.0
OR20010APS				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR60030S				S	0.0		0.0		0.0		0.0		0.0		-0.1	
OR60060S	HALSEMA ROAD	LOCAL	73.6	S	0.0		-0.1		-0.1		-0.1		-0.2		-0.2	0.1
OR61017				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR61100AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR62020S	WILLIAMS AVENUE	LOCAL	79.0	S	0.0		0.0		0.0	0.3	0.0	0.5	0.0	0.6	0.0	0.7
OR62034AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR62036AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR63020AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR63030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR63040				S	0.0		0.0		0.0		0.0		0.0		0.0	
OR64030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR64015APS	CRYSTAL SPRINGS ROAD	LOCAL	70.0	AP	0.0		0.0		0.0	0.3	0.0	0.6	0.0	0.8	0.0	0.8
OR64008AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR60070AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR66050AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
OR14020APS	OLD MIDDLEBURG ROAD	LOCAL	45.0	AP	0.0		0.0		0.0		0.0	0.8	0.0	1.3	0.0	1.4
OR14013				S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 2.5
COJ MSMP Update
Ortega River-Alternative Conceptual Cost Evaluation

ALTERNATIVE 1A

Item	Units	Unit Cost	Quantity	Total Cost
Captial Costs				
1. Culverts/Bridges	LF	$ 3,000	0	$ -
2. Weirs/Outlet Structures	LS	$ 50,000	1	$ 50,000
3. Pump Station	LS	$ -	0	$ -
4. Channel Lining (1)	LF	$ 200	0	$ -
5. Excavation/Earth Work	CY	$ 8	990,000	$ 7,920,000
6. Land Acquisition	ACRE	$ 50,000	0	$ -
7. Wetlands Creation (2)	ACRE	$ 50,000	10	$ 1,500,000
8. Sod at Pond Sites/Channel Banks	SY	$ 3	34,000	$ 102,000
9. Baffle Box	LS	$ 100,000	0	$ -
10. Managed Aquatic Plant Systems	SF	$ 8	0	$ -
Subtotal 1 - Capital Costs (3)				$ 9,572,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$ 1,435,800
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$ 11,007,800
Contingency (30% of Subtotal 2)				$ 3,302,340
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$ 14,310,140
Operations & Maintenance (4)				
11. Crossing Upgrade	LS	$ 14,000	0	$ -
12. Pump Station	LS	$ -	0	$ -
13. Channel Lining	LF/YR	$ 30	0	$ -
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	48	$ 62,400
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	48	$ 19,200
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	48	$ 2,976,000
17. Baffle Box	LS	$ 2,000	0	$ -
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	0	$ -
Subtotal 4 - Total Operations & Maintenance Cost				$ 3,057,600
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)				**$ 17,368,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Table 2.6
COJ MSMP Update
Ortega River -Alternative Conceptual Cost Evaluation

ALTERNATIVE 1B					
Item	**Units**	**Unit Cost**	**Quantity**	**Total Cost**	
Captial Costs					
1. Culverts/Bridges	LF	$ 3,000	0	$	-
2. Weirs/Outlet Structures	LS	$ 50,000	1	$	50,000
3. Pump Station	LS	$ -	0	$	-
4. Channel Lining (1)	LF	$ 200	0	$	-
5. Excavation/Earth Work	CY	$ 8	990,000	$	7,920,000
6. Land Acquisition	ACRE	$ 50,000	0	$	-
7. Wetlands Creation (2)	ACRE	$ 50,000	10	$	1,500,000
8. Sod at Pond Sites/Channel Banks	SY	$ 3	34,000	$	102,000
9. Baffle Box	LS	$ 100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$ 8	89,000	$	712,000
Subtotal 1 - Capital Costs (3)				$	10,284,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$	1,542,600
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$	11,826,600
Contingency (30% of Subtotal 2)				$	3,547,980
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$	15,374,580
Operations & Maintenance (4)					
11. Crossing Upgrade	LS	$ 14,000	0	$	-
12. Pump Station	LS	$ -	0	$	-
13. Channel Lining	LF/YR	$ 30	0	$	-
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	48	$	62,400
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	48	$	19,200
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	48	$	2,976,000
17. Baffle Box	LS	$ 2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	89,000	$	8,900,000
Subtotal 4 - Total Operations & Maintenance Cost				$	11,957,600
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)				**$**	**27,332,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Section 3.0
Fishing Creek

3.1 Introduction

This is an update of the 1992 MSMP; it reflects changes occurred in the basins since then based on updated land use, and additional survey and data collection. The following sections describe in greater detail the results of the analysis for Fishing Creek. The following sections describe in greater detail the results of the analysis for Hogan's Creek. The 1992 MSMP for this sub-basin is located in Appendix A.

This is a planning level investigation to be used for capital improvement analysis. The MSMP provides a model framework for documenting Level of Service (LOS), proposing alternatives, and identifying water quality opportunities.

3.2 Sub-basin Information

This section outlines information on the Fishing Creek Sub-basin infrastructure, floodplain, and ability to meet level of service requirements. Schematics of the sub-basin hydrology and hydraulics are shown on **Figures 3.1 and 3.2**, respectively. Hydrologic unit parameters are summarized in **Table 3.1**.

3.3.1 Existing Condition

Fishing Creek has not experienced any major development since the 1992 MSMP. All development that has taken place has incorporated stormwater BMPs as required by local permitting regulations. These developments have been incorporated in the model for the Fishing Creek sub-basin.

3.3.2 FEMA Related Documents

As part of this project, the City developed updated FEMA flood maps which include stream profiles and discharge tables that are available to the public. The Flood Insurance Study (FIS) summarizes the results of the analysis that can be retrieved electronically at the following location: http://www.mappingtherisk.com/. This website can also be reached through the City's www.coj.net homepage.

3.3.3 Level of Service Summary

Under the present land use conditions, the Mean Annual, 5-, 10-, 25-, 50-, 100–year design storms were simulated to determine the problem areas as defined below.

In the Fishing Creek area the following locations do not meet the City's LOS as described in Volume 1 Section 6.0.

- Water Quantity
    - All local and arterial roads meet the defined LOS.
    - There are approximately 24 potential structures at risk (PSAR) in the Fishing Creek area including residential and commercial establishments. These structures lie within the special flood hazard area (SFHA). Structure finished floor elevations may exceed the base flood elevations (BFE) established for these areas. Additional survey is recommended during detailed design for projects in this area.

The peak stages for the various 24-hr design storms under existing conditions are presented in **Table 3.2**.

- Water Quality
    - Number of septic tanks in the Department of Health defined failing septic tank areas in the Fishing Creek sub-basin: 0.
    - There are no septic tanks in these failing areas in the 200-meter Fishing Creek buffer.
    - The BMAP goal for total nitrogen (TN) reduction in the Ortega River basin is set at 4.6 MT TN/yr.
- Erosion
    - Total length of channel experiencing high velocities (greater than 3 ft/sec): 15,100 feet.
    - The reaches experiencing such high velocities are shown on **Figure 3.3** and presented here.

Channel between:	Node FI21120AP to Node FI21060
	Node FI21090AP to Node FI21085AP
	Node FI21010 to Node FI20008
	Node FI20025 to Node FI20015

3.3 Alternatives Evaluation

This section describes the alternatives evaluated for the Fishing Creek sub-basin. Based on the screening process for the alternatives evaluation, the following alternatives representing different levels of service were developed. Detailed public safety options and standards should be considered and implemented as appropriate during final design.

- Alternative 1: 6-Acre RSF
- Alternative 2: Channel Lining (FI21078 to FI21074 and FI23014AP to FI2301APS)

ALTERNATIVE 1

Alternative 1 addresses water quality and flood control within the Fishing Creek sub-basin. This alternative involves construction of a 6 acre wet-detention facility as shown on **Figure 3.4**.The RSF was evaluated as an off-line pond with a retention period of less than 2 days, a maximum depth of 10 feet, a permanent pool volume of 30.5 ac-ft, and a total surface area (including maintenance buffer) of approximately 7 acres. For cost-benefit analysis, two scales were identified for this alternative:

- Alternative 1A: 6-Acre RSF
- Alternative 1B: 6-Acre RSF with Managed Aquatic Plant Systems (MAPS)

MAPS are a supplement to existing or new RSF to increase nutrient uptake and removal in the facilities through vegetative growth. The MAPS act as a littoral zone planted with aquatic vegetation managed to optimize uptake of nutrients. Unlike a traditional littoral zone, which dies back in winter releasing the nutrients through its detritus, MAPS are harvested annually to permanently remove nutrients from the system. Additionally, the MAPS are typically implemented as floating islands that remain in contact with nutrients in the water even during periods when traditional littoral zones would be left dry.

Water quality analysis was performed using the Watershed Management Model (WMM) to measure the effectiveness of this pond to reduce the various NPDES water quality parameters for annual loads. Results are tabulated in **Table 3.3** comparing the existing and with-project conditions for the Fishing Creek sub-basin. For MAPS, a removal efficiency of 40 percent of the remaining pond load was assumed (i.e., after traditional wet detention). The City and FDEP are in the process of several MAPS trial studies to further define this removal efficiency.

Alternative 1 provides two benefits: reducing stages downstream and addressing nutrient reduction for the Broward River basin. The proposed alternative results in 1 PSAR being removed from the SFHA, one PSAR being removed from the 25 year floodplain, 1,000 ft of channel with velocities under 3 ft/sec, and nutrient reduction ranging from 0.2 MT TN/yr (Alternative 1A) to 0.6 MT TN/yr (Alternative 1B). The peak stages under Alternative 1 are presented in **Table 3.4**.

The capital and O&M costs associated with these alternatives are presented in **Tables 3.5 and 3.6**.

Table 3.3 Water Quality Analysis Results for Alternative 1 for Fishing Creek

Parameter	Units	Existing Conditions	Alternative	Reduction	% Reduction
Flow	(ac-ft/yr)	7,108	7,108	-	0.0%
BOD	lbs/yr	118,645	115,644	3,001	2.5%
Cd	lbs/yr	30	29	1	3.5%
COD	lbs/yr	751,279	732,629	18,650	2.5%
Cu	lbs/yr	192	187	5	2.8%
DP	lbs/yr	2,305	2,235	70	3.0%
F-Coli	counts/yr	1.03E+15	9.73E+14	5.54E+13	5.4%
NO23	lbs/yr	8,655	8,484	171	2.0%
Pb	lbs/yr	244	237	7	3.1%
TDS	lbs/yr	2,364,471	2,324,362	40,109	1.7%
TKN	lbs/yr	20,433	20,151	282	1.4%
TP	lbs/yr	4,181	4,065	116	2.8%
TSS	lbs/yr	563,907	543,272	20,635	3.7%
Zn	lbs/yr	1,123	1,093	30	2.7%
TN	lbs/yr	29,088	28,635	453	1.6%

Values do not include MAPS nutrient removal

ALTERNATIVE 2

Alternative 2 is a maintenance alternative to correct erosion from Node FI21078 to Node FI21074 and Node FI23014AP to NodeFI2301APS as shown on **Figure 3.5**. This alternative proposes lining approximately 1,800 ft of channel to prevent erosion for velocities greater than 3 ft/ sec. The capital and O&M costs associated with this alternative are presented in **Table 3.7**.

3.4 Cost Benefit Analysis

To facilitate the selection of the most cost effective project alternatives, a cost-benefit analysis was performed for all identified combinations of alternatives. The detailed methodology used for the cost-benefit analysis can be found in Volume 1 Section 7.0.

3.4.1 Alternative Relationships

To maximize the effectiveness of the cost-benefit analysis, any interdependencies among alternatives must be identified. The following relationships were identified for the Fishing Creek sub-basin:

- All alternatives can be implemented as standalone projects.
- No alternative is dependent upon the implementation of another alternative.

3.4.2 Cost Effectiveness Analysis

Figure 3.6 shows all the possible combinations of alternatives and their corresponding benefit scores. The cost effective frontier identified the alternatives that are the most cost effective, i.e., no other combination of alternatives provides more benefit for lower cost, and the "best buys," i.e., the combinations of alternatives with the lowest cost/benefit ratio. The best buy plans for the sub-basin are identified in **Table 3.8**.

Table 3.8 Best Buy Plans Identified for Fishing Creek Sub-basin Cost Effectiveness Analysis

Plan Alternative	Project Description	Total Benefit (Output) (%)	Cost ($1000)	Average Cost ($1000 / %)
No Action Plan		0	0	
2A	Channel Lining	2.4	592	247
1B2A	6ac RSF w/ MAPS + Channel Lining	7.4	3,327	450

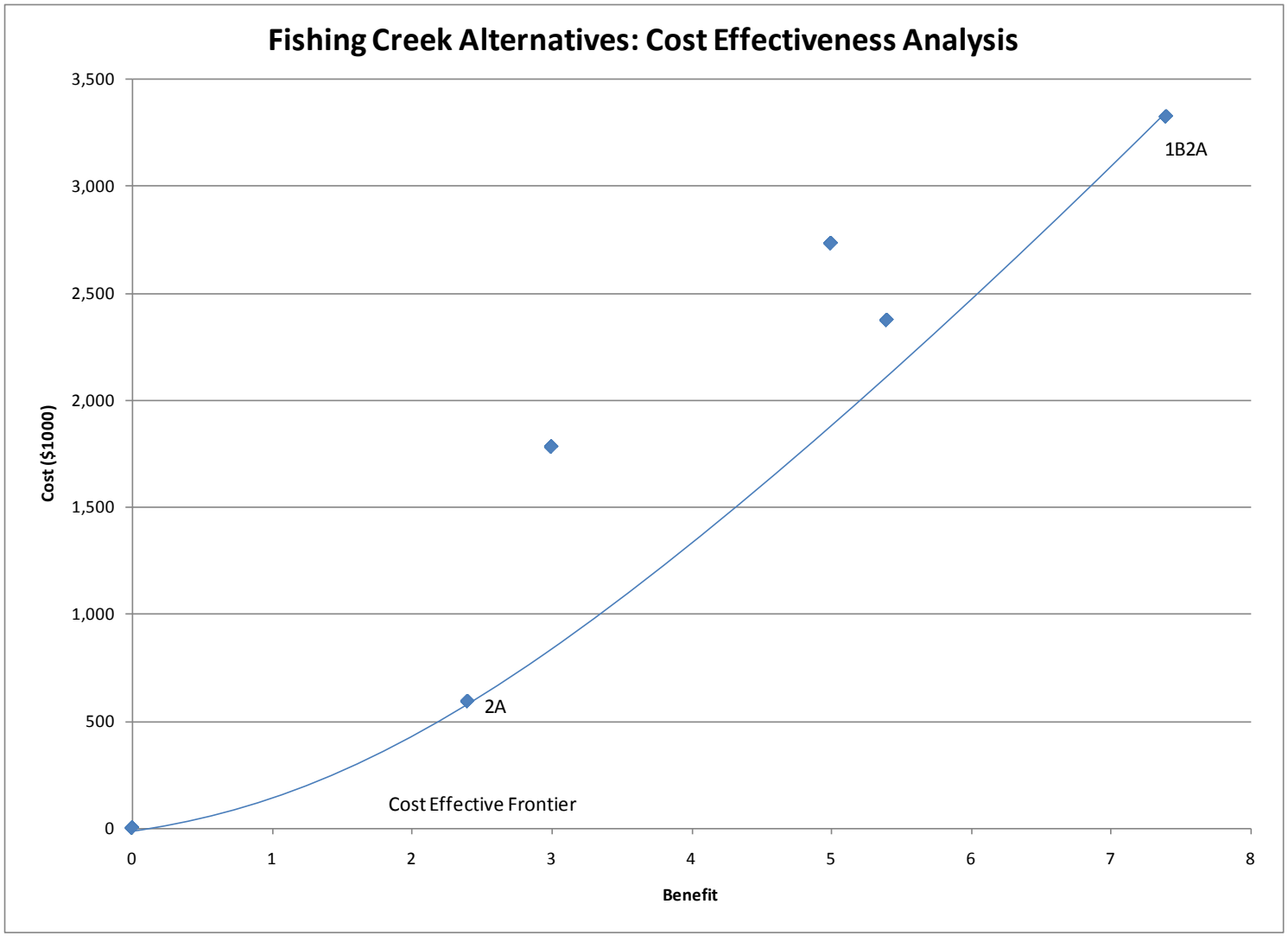


Figure 3.6 Results of Fishing Creek Cost Effectiveness Analysis

3.4.3 Incremental Cost Analysis

The best buy plans identified during cost effectiveness analysis were next reviewed for incremental cost. The results of the incremental cost analysis are presented on **Figure 3.7 and in Table 3.9**.

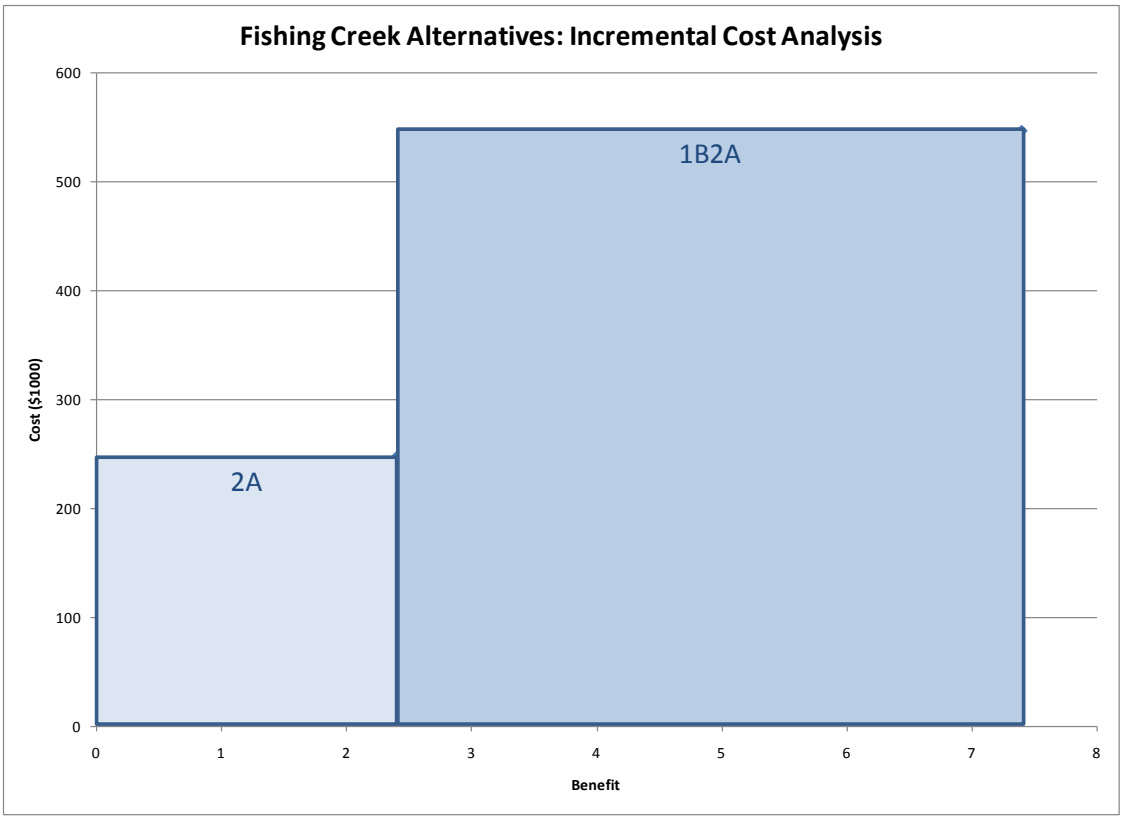


Figure 3.7 Results of Fishing Creek Incremental Cost Analysis

Table 3.9 Incremental Cost Information for Best Buy Plans

Plan Alternative	Total Benefit (Output) (%)	Cost ($1000)	Average Cost ($1000/%)	Incremental Cost ($1000)	Inc. Output (%)	Inc. Cost Per Output ($1000)
No Action	0	0				
2A	2.4	592	247	592	2.4	247
1B2A	7.4	3,327	450	2,735	5.0	547

3.4.4 Plan Selection

Due to the small water quantity benefits associated with alternative 1B it is recommended that Plan 2A be implemented. If during the course of county-wide project implementation it becomes necessary to provide additional water quality treatment, Plan 1B2A should be considered further for implementation.

3.5 Recommendations

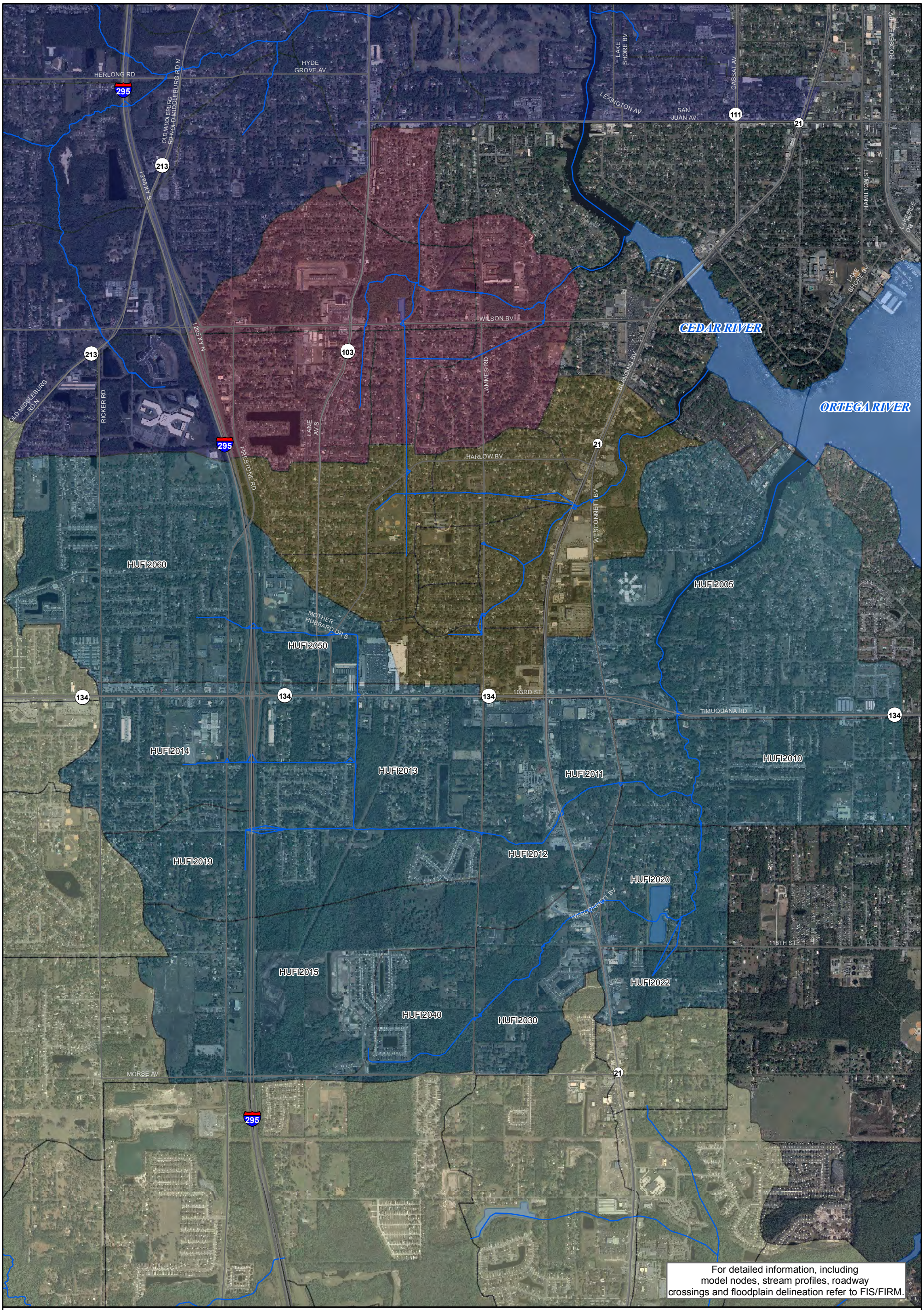
CDM recommends that the City implement the following components as part of the Fishing Creek Sub-basin Stormwater Improvements. The benefits associated with this plan are outlined in **Table 3.10**.

- Channel lining (FI21078 to FI21074 and FI23014AP to FI2301APS)

Table 3.10 Projected Benefits for Recommended Plan

Strategic Program Goals	Water Quantity						WQ	O&M
Performance Measurement Metrics	Local Road	Arterial Road			Structure		WQ	Erosion
Design Storm	5	10	25	100	25	100	MT TN/yr	velocity > 3fps (ft)
Depth Criteria	>3in	>3in	>6in	>9in	>0ft	> 0 ft		
Project Benefits	-	-	-	-	-	-	-	1,800

Additionally, due to the extremely large number of septic tanks in the sub-basin the City should consider potential septic tank phase-outs. While there are no septic tank failure areas directly within the Fishing Creek sub-basin, there are several candidate locations in close proximity including Ortega and Westfield. Two subdivisions within the failure areas: Ortega Forest and Westfield comprise 300 septic tanks in close proximity to waterways. Using the currently accepted BMAP methodology for estimating nutrient reduction, phase-out of these septic tanks would result in approximately 0.93 MT TN/yr.



Legend

- MSMP Conduits
- Major Roads
- Water Body

Hydrologic Unit

- Fishing Creek
- Ortega River
- Williamson Creek
- Cedar River and Wills Branch
- Butcher Pen Creek

N

0 0.5 1 Mile

Figure 3.1
Fishing Creek Subbasin
Hydrology

CDM

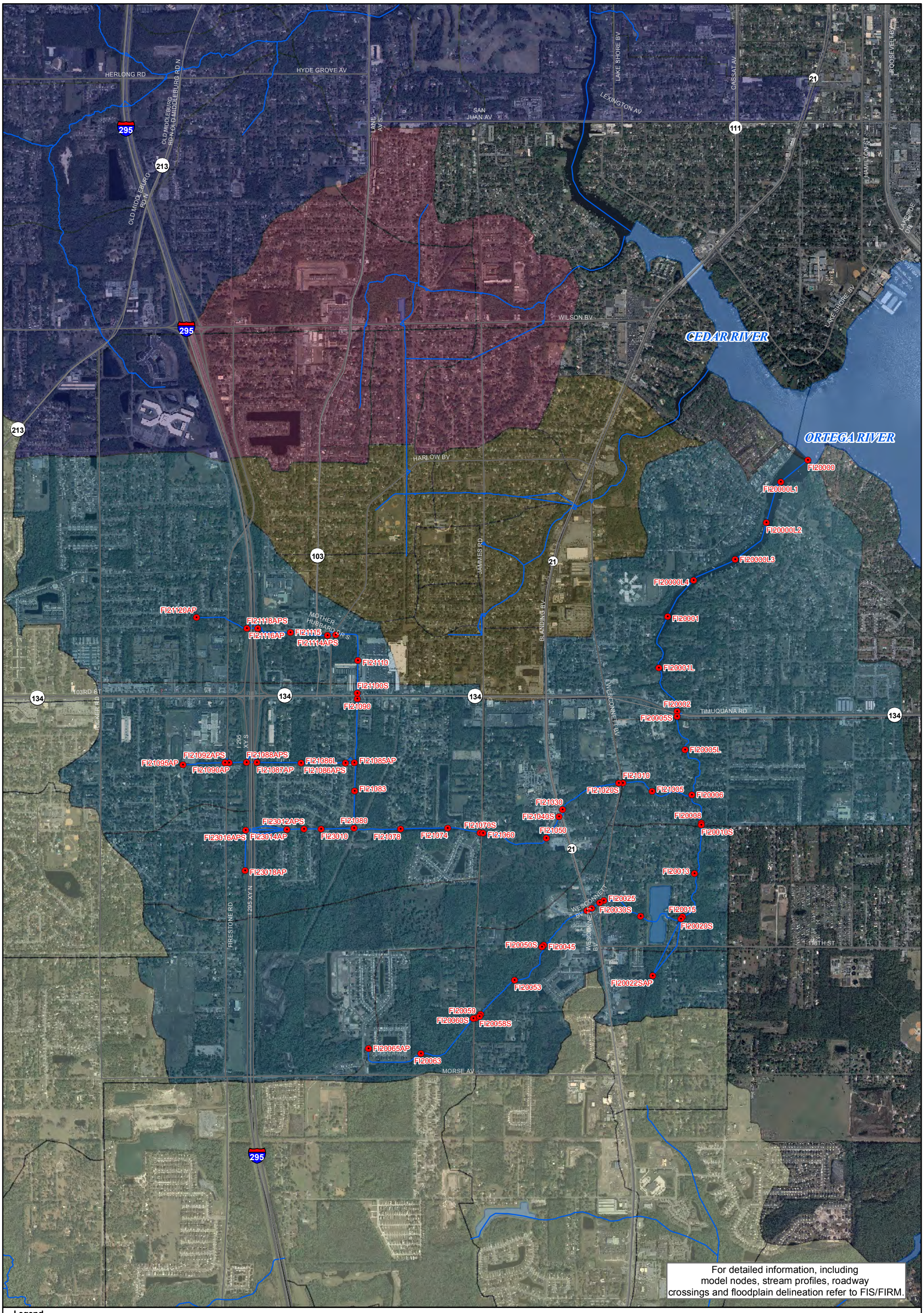


Figure 3.2
Fishing Creek Subbasin
Hydraulics

CDM

Table 3.1
COJ MSMP Update
Fishing Creek - Hydrologic Unit Parameters

HUC Name	Outlet	Area (Acres)	Imperviousness %	Width	Slope %	N-Imperv	N-Perv	Max. Infil. Rate	Min. Infil. Rate
HUFI2005	FI20001	712.6	34.9	10292	0.73	0.029	0.232	5.93	0.30
HUFI2010	FI20006	324.2	27.9	6794	0.51	0.032	0.237	5.71	0.26
HUFI2011	FI21020S	97.1	50.5	2005	0.73	0.031	0.247	6.15	0.31
HUFI2012	FI21040S	177	37.6	3118	0.31	0.034	0.295	5.45	0.23
HUFI2013	FI21070S	508.2	37.2	4379	0.41	0.039	0.270	5.32	0.23
HUFI2014	FI21095AP	239.4	45.0	3558	0.98	0.015	0.213	6.40	0.33
HUFI2015	FI20065AP	465.6	37.1	5978	1.00	0.086	0.314	6.23	0.29
HUFI2019	FI23018AP	122.8	15.1	3249	1.60	0.015	0.241	6.90	0.35
HUFI2020	FI20020S	177.3	21.0	3404	0.59	0.050	0.268	5.95	0.27
HUFI2022	FI20022APS	79	41.0	4209	1.10	0.054	0.271	5.96	0.27
HUFI2030	FI20050S	186.5	33.9	3605	0.39	0.059	0.318	6.60	0.32
HUFI2040	FI20060S	138.8	21.7	2945	0.36	0.084	0.351	5.13	0.20
HUFI2050	FI21110	141.6	53.1	2979	0.95	0.015	0.225	5.82	0.29
HUFI2060	FI21120AP	523.9	32.4	6799	0.46	0.028	0.237	7.16	0.38

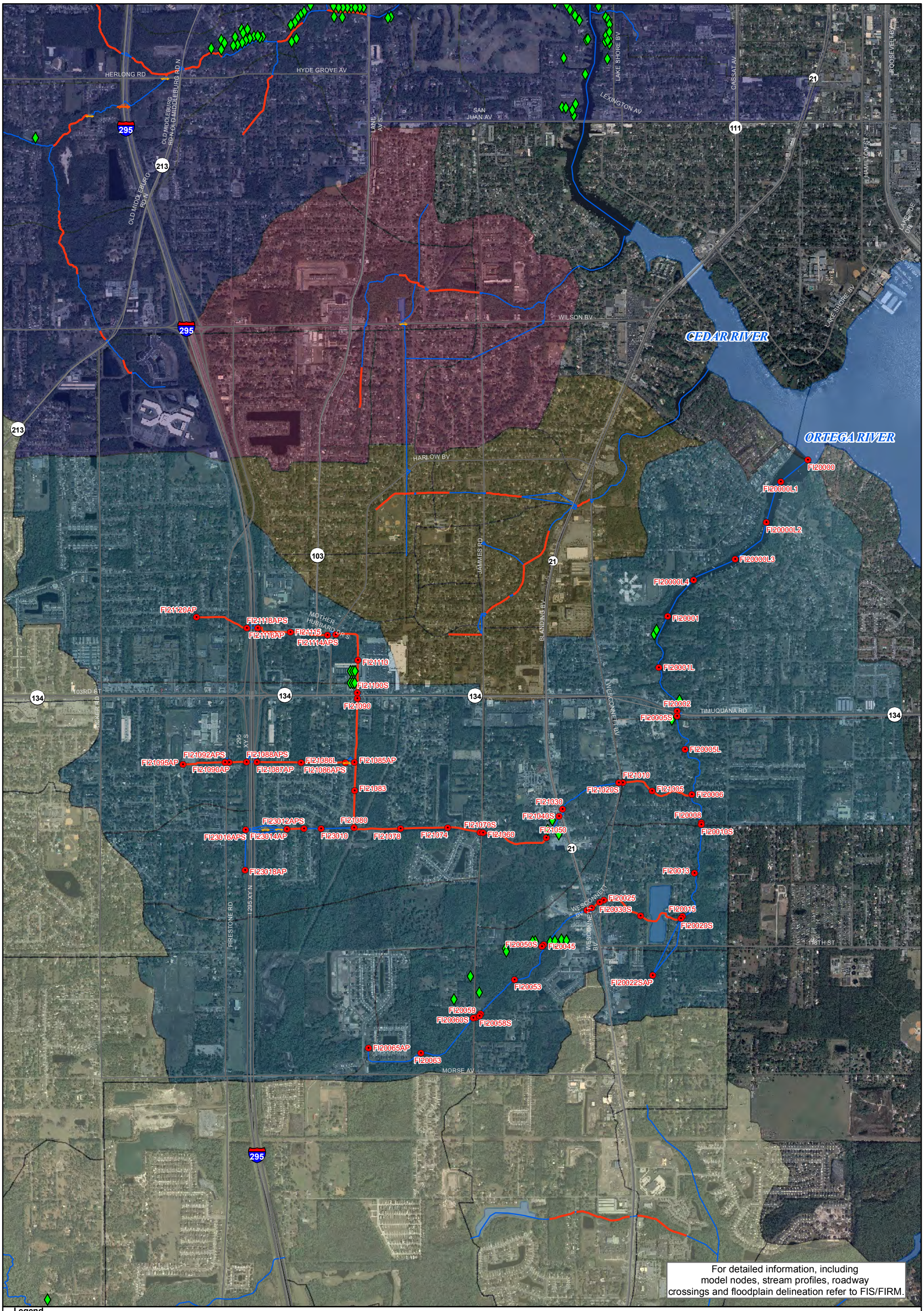


Figure 3.3
Fishing Creek Subbasin
Level of Service

CDM

Table 3.2
COJ MSMP Update
Fishing Creek -Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

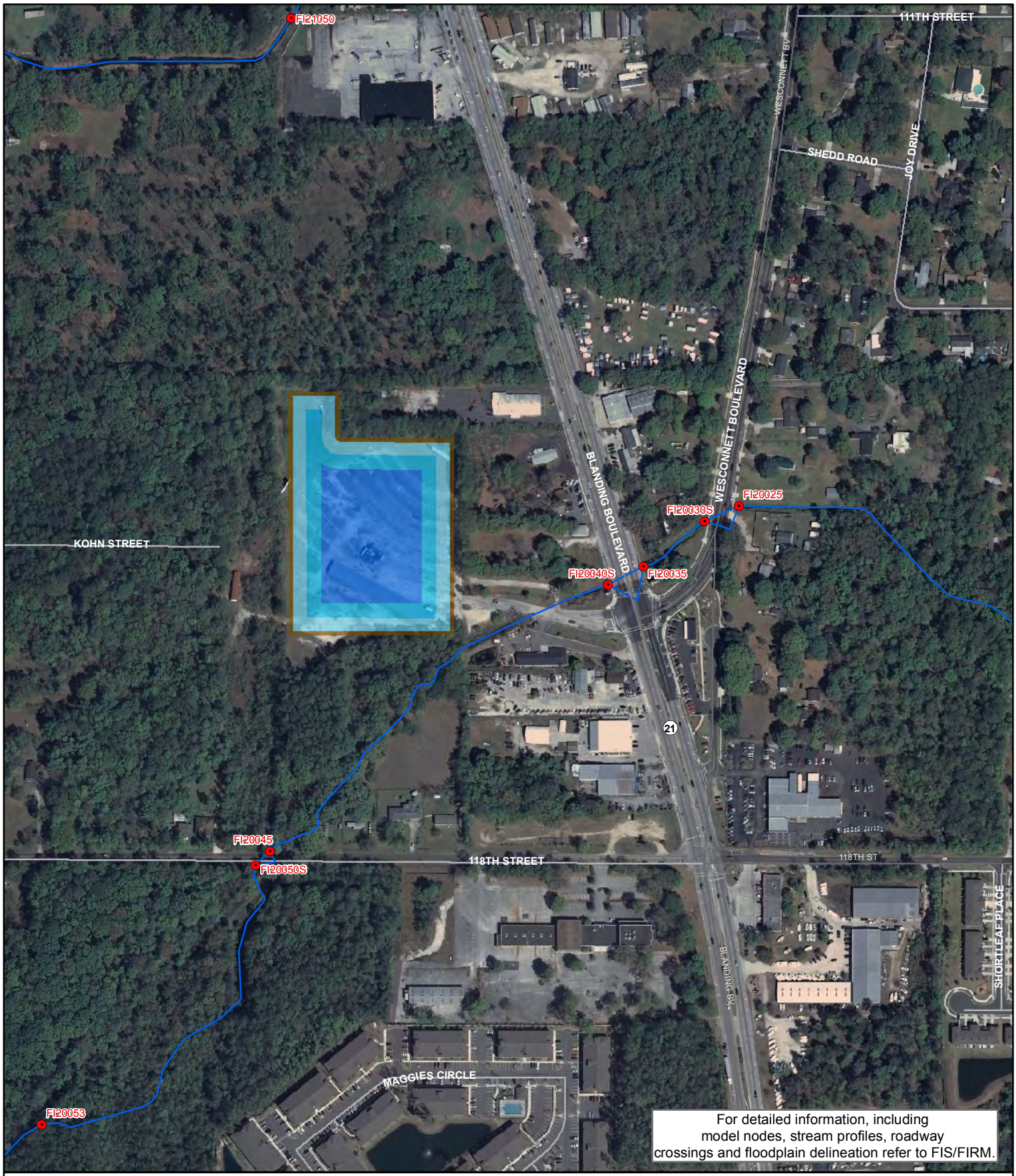
					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
FI20000				S	1.7		1.7		1.7		1.7		1.7		1.7	
FI20000L1				S	1.7		1.7		1.7		1.7		1.7		1.7	
FI20000L2				S	1.7		1.7		1.8		1.8		1.9		1.9	
FI20000L3				S	2.8		3.4		4.1		4.8		5.2		5.5	
FI20000L4				S	2.8		3.4		4.2		4.8		5.2		5.5	
FI20001				S	3.3		4.1		4.9		5.6		6.0		6.4	
FI20001L				S	3.4		4.2		5.0		5.7		6.1		6.5	
FI20002				S	3.5		4.3		5.2		5.9		6.4		6.7	
FI20005L				S	3.8		4.7		5.6		6.3		6.8		7.2	
FI20005S	TIMUQUANA ROAD	ARTERIAL	12.0	S	3.5		4.3		5.2		5.9		6.4		6.8	
FI20006				S	4.6		5.5		6.4		7.2		7.7		8.1	
FI20008				S	4.6		5.6		6.5		7.3		7.8		8.2	
FI20010S	110TH STREET	LOCAL	10.0	S	4.6		5.6		6.6		7.4		8.0		8.5	
FI20013				S	5.7		6.4		6.9		7.7		8.3		8.7	
FI20015				S	7.7		8.4		8.9		9.3		9.6		9.9	
FI20020S	NANCY DRIVE	LOCAL	10.0	S	7.7		8.5		9.1		9.6		10.1	0.1	10.5	0.5
FI20022APS	JOHNNIE CIRCLE	LOCAL	12.0	AP	7.8		8.7		9.4		10.2		10.5		10.7	
FI20023				S	10.8		10.7		10.9		11.3		11.5		11.7	
FI20025				S	14.5		14.7		14.8		15.2		15.4		15.7	
FI20030S	WESCONNETT BOULEVARD	LOCAL	21.0	S	14.7		14.9		15.1		15.7		16.3		16.8	
FI20035				S	15.8		16.0		16.2		16.8		17.2		17.6	
FI20040S	BLANDING BOULEVARD	ARTERIAL	21.0	S	15.9		16.2		16.5		17.4		18.3		19.1	
FI20045				S	17.8		18.1		18.3		18.9		19.5		20.0	
FI20050S	118TH STREET	LOCAL	19.1	S	17.8		18.2		18.5		19.2	0.1	19.8	0.6	20.2	1.1
FI20053				S	17.8		18.2		18.5		19.3		19.8		20.2	
FI20055				S	17.9		18.2		18.7		19.5		19.9		20.3	
FI20058S				S	17.9		18.5		19.2		19.6		20.0		20.3	
FI20059				S	18.0		18.5		19.2		19.6		20.0		20.3	
FI20060S	JAMMES ROAD	LOCAL	20.1	S	18.1		18.9		20.0		20.7	0.6	20.9	0.8	21.1	1.0
FI20063				S	18.2		19.0		20.0		20.7		21.0		21.2	
FI20065AP				AP	19.9		20.4		20.8		21.2		21.5		21.7	
FI21005				S	6.8		7.6		8.3		8.9		9.3		9.6	
FI21010				S	11.4		12.3		13.1		13.6		13.9		14.1	
FI21020S	WESCONNETT BOULEVARD	LOCAL	15.6	S	12.2		13.5		14.7		15.6	0.0	16.2	0.6	16.6	1.0
FI21030				S	12.5		13.8		15.0		15.9		16.5		16.9	
FI21040S	BLANDING BOULEVARD	ARTERIAL	17.3	S	12.7		14.1		15.5		16.6		17.4	0.1	17.9	0.6
FI21050				S	12.7		14.2		15.6		16.6		17.4		17.9	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 3.2
COJ MSMP Update
Fishing Creek -Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
FI21060				S	13.6		14.5		15.7		16.9		17.7		18.2	
FI21070S	JAMMES ROAD	LOCAL	23.4	S	14.0		15.1		16.3		17.5		18.3		18.9	
FI21074				S	15.5		16.4		17.3		18.2		18.9		19.3	
FI21078				S	17.4		18.3		19.3		19.8		20.3		20.6	
FI21080				S	20.1		21.1		22.1		22.7		23.2		23.5	
FI21083				S	20.6		21.5		22.4		23.0		23.4		23.6	
FI21085AP				AP	22.8		23.3		23.9		24.3		24.6		24.7	
FI21086APS	TAMPICO ROAD	LOCAL	23.0	AP	24.6	1.6	25.4	2.4	26.0	3.0	26.3	3.3	26.5	3.5	26.6	3.6
FI21086L				S	31.0		31.3		31.5		31.7		31.8		31.9	
FI21087AP				AP	40.9		41.2		41.3		41.5		41.8		41.9	
FI21088APS	I 295 EXPRESSWAY	ARTERIAL	53.0	AP	46.3		47.6		48.5		49.5		50.7		51.4	
FI21090				S	24.1		25.0		25.9		26.4		26.6		26.7	
FI21090AP				AP	52.1		52.2		52.2		52.2		52.2		52.2	
FI21092APS	FIRESTONE ROAD	LOCAL	56.0	AP	52.8		53.4		54.7		55.9		56.7	0.6	57.0	1.0
FI21095AP				AP	64.1		64.8		65.7		66.3		66.8		67.1	
FI21100S	103RD STREET	LOCAL	29.5	S	24.5		26.0		27.7		28.9		29.4		29.8	0.3
FI21110				S	25.4		26.7		28.0		28.9		29.6		30.0	
FI21112AP				AP	29.2		29.7		30.2		30.4		30.5		30.6	
FI21114APS	HARLOW BOULEVARD	LOCAL	36.5	AP	32.3		33.6		35.0		35.7		36.2		36.5	
FI21115				AP	42.8		42.8		42.8		43.0		43.1		43.2	
FI21116AP	OAK HILL ELEM AC	LOCAL	55.0	AP	52.3		52.8		53.2		53.4		53.5		53.6	
FI21118APS	I 295 EXPRESSWAY	ARTERIAL	68.0	AP	56.9		58.9		61.6		62.9		63.7		64.2	
FI21120AP	FIRESTONE ROAD	LOCAL	64.0	AP	63.3		64.0	0.0	64.9	0.9	65.2	1.2	65.5	1.5	65.5	1.5
FI23010				S	20.2		21.2		22.1		22.7		23.2		23.5	
FI23012APS	GEORGE WOOD LANE	LOCAL	28.0	AP	26.6		27.4		29.5	1.5	32.4	4.4	33.7	5.7	34.7	6.7
FI23014AP				AP	31.8		31.8		31.9		32.4		33.7		34.7	
FI23016APS				AP	47.6		48.6		50.1		50.3		50.4		50.5	
FI23018AP	WHEAT ROAD	LOCAL	50.0	AP	47.8		48.7		50.2	0.2	50.4	0.4	50.6	0.6	50.8	0.8

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.



Legend

- MSMP Nodes
- MSMP Conduits
- Major Roads
- Alternative 1

N

0 500 1,000 Feet

Figure 3.4
Fishing Creek Subbasin
Alternative 1

CDM

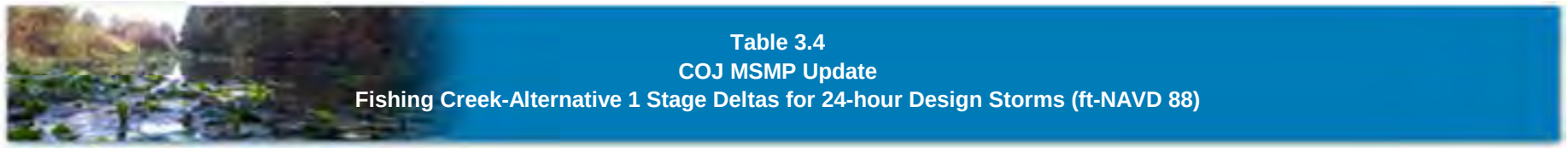


Table 3.4
COJ MSMP Update
Fishing Creek-Alternative 1 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
FI20000L1				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI20000				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI20000L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI20000L3				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI20000L4				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI20001				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI20001L				S	0.0		-0.1		0.0		0.0		0.0		0.0	
FI20002				S	0.0		0.0		-0.1		0.0		0.0		0.0	
FI20005L				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI20005S	TIMUQUANA ROAD	ARTERIAL	12.0	S	0.0		0.0		-0.1		0.0		0.0		0.0	
FI20006				S	0.0		-0.1		-0.1		0.0		0.0		0.0	
FI20008				S	0.0		-0.1		-0.1		-0.1		0.0		0.0	
FI20010S	110TH STREET	LOCAL	10.0	S	0.0		-0.1		-0.1		-0.1		-0.1		-0.1	
FI20013				S	-0.1		0.0		-0.2		-0.1		-0.1		-0.1	
FI20015				S	-0.1		0.0		0.0		-0.1		-0.1		-0.1	
FI20020S	NANCY DRIVE	LOCAL	10.0	S	-0.1		0.0		-0.1		-0.1		-0.1	0.0	-0.1	0.4
FI20022APS	JOHNNIE CIRCLE	LOCAL	12.0	AP	-0.1		-0.1		-0.1		-0.1		0.0		0.0	
FI20023				S	-0.7		-0.1		0.0		0.0		0.0		-0.1	
FI20025				S	-0.4		-0.1		0.0		0.0		0.0		-0.1	
FI20030S	WESCONNETT BOULEVARD	LOCAL	21.0	S	-0.5		-0.1		0.0		-0.1		-0.1		-0.1	
FI20035				S	-0.6		-0.1		0.0		0.0		-0.1		-0.1	
FI20040S	BLANDING BOULEVARD	ARTERIAL	21.0	S	-0.6		-0.2		0.0		-0.1		-0.2		-0.2	
FI20045				S	-1.3		-0.8		-0.4		-0.3		-0.3		-0.3	
FI20050S	118TH STREET	LOCAL	19.1	S	-1.2		-0.9		-0.4		-0.4		-0.2	0.4	-0.2	0.9
FI20053				S	-1.1		-0.7		-0.4		-0.3		-0.2		-0.2	
FI20055				S	-1.0		-0.6		-0.3		-0.2		-0.2		-0.2	
FI20058S				S	-0.9		-0.5		-0.2		-0.1		-0.1		-0.1	
FI20059				S	-0.9		-0.4		-0.2		-0.1		-0.1		-0.1	
FI20060S	JAMMES ROAD	LOCAL	20.1	S	-0.8		-0.4		-0.2		0.0	0.5	0.0	0.8	0.0	1.0
FI20063				S	0.0		-0.3		-0.2		0.0		0.0		0.0	
FI20065AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI21005				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21010				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21020S	WESCONNETT BOULEVARD	LOCAL	15.6	S	0.0		0.0		0.0		0.0	0.0	0.0	0.6	0.0	1.0
FI21030				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21040S	BLANDING BOULEVARD	ARTERIAL	17.3	S	0.0		0.0		0.0		0.0		0.0	0.1	0.0	0.6
FI21050				S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

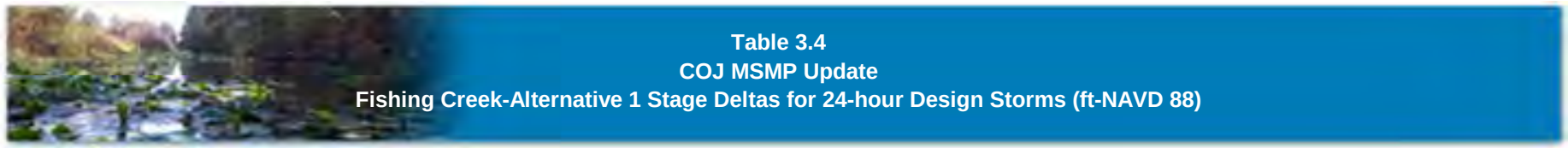


Table 3.4
COJ MSMP Update
Fishing Creek-Alternative 1 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
FI21060				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21070S	JAMMES ROAD	LOCAL	23.4	S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21074				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21078				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21080				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21083				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21085AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI21086APS	TAMPICO ROAD	LOCAL	23.0	AP	0.0	1.6	0.0	2.4	0.0	3.0	0.0	3.3	0.0	3.5	0.0	3.6
FI21086L				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21087AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI21088APS	I 295 EXPRESSWAY	ARTERIAL	53.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI21090				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21090AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI21092APS	FIRESTONE ROAD	LOCAL	56.0	AP	0.0		0.0		0.0		0.0		0.0	0.6	0.0	1.0
FI21095AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI21100S	103RD STREET	LOCAL	29.5	S	0.0		0.0		0.0		0.0		0.0		0.0	0.3
FI21110				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21112AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI21114APS	HARLOW BOULEVARD	LOCAL	36.5	AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI21115				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI21116AP	OAK HILL ELEM AC	LOCAL	55.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI21118APS	I 295 EXPRESSWAY	ARTERIAL	68.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI21120AP	FIRESTONE ROAD	LOCAL	64.0	AP	0.0		0.0	0.0	0.0	0.9	0.0	1.2	0.0	1.5	0.0	1.5
FI23010				S	0.0		0.0		0.0		0.0		0.0		0.0	
FI23012APS	GEORGE WOOD LANE	LOCAL	28.0	AP	0.0		0.0		0.0	1.5	0.0	4.4	0.0	5.7	0.0	6.7
FI23014AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI23016APS				AP	0.0		0.0		0.0		0.0		0.0		0.0	
FI23018AP	WHEAT ROAD	LOCAL	50.0	AP	0.0		0.0		0.0	0.2	0.0	0.4	0.0	0.6	0.0	0.8

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
   S = Survey.

Table 3.5
COJ MSMP Update
Fishing Creek-Alternative Conceptual Cost Evaluation

ALTERNATIVE 1A

Item	Units	Unit Cost	Quantity	Total Cost
Captial Costs				
1. Culverts/Bridges	LF	$ 283,000	0	$ -
2. Weirs/Outlet Structures	LS	$ 50,000	2	$ 100,000
3. Pump Station	LS	$ -	0	$ -
4. Channel Lining [1]	LF	$ 200	0	$ -
5. Excavation/Earth Work	CY	$ 8	63,000	$ 504,000
6. Land Acquisition	ACRE	$ 50,000	6	$ 300,000
7. Wetlands Creation [2]	ACRE	$ 50,000	0	$ -
8. Sod at Pond Sites/Channel Banks	SY	$ 3	11,000	$ 33,000
9. Baffle Box	LS	$ 100,000	0	$ -
10. Managed Aquatic Plant Systems	SF	$ 8	0	$ -
Subtotal 1 - Capital Costs [3]				$ 937,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$ 140,550
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$ 1,077,550
Contingency (30% of Subtotal 2)				$ 323,265
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$ 1,400,815
Operations & Maintenance [4]				
11. Crossing Upgrade	LS	$ 14,000	0	$ -
12. Pump Station	LS	$ -	0	$ -
13. Channel Lining	LF/YR	$ 30	0	$ -
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	6	$ 7,800
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	6	$ 2,400
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	6	$ 372,000
17. Baffle Box	LS	$ 2,000	0	$ -
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	0	$ -
Subtotal 4 - Total Operations & Maintenance Cost				$ 382,200
Total Cost (Subtotal 3 + Subtotal 4) [5] [6]				**$ 1,783,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Table 3.6
COJ MSMP Update
Fishing Creek-Alternative Conceptual Cost Evaluation

ALTERNATIVE 1B

Item	Units	Unit Cost	Quantity	Total Cost
Captial Costs				
1. Culverts/Bridges	LF	$ 3,000	0	$ -
2. Weirs/Outlet Structures	LS	$ 50,000	2	$ 100,000
3. Pump Station	LS	$ -	0	$ -
4. Channel Lining [1]	LF	$ 200	0	$ -
5. Excavation/Earth Work	CY	$ 8	63,000	$ 504,000
6. Land Acquisition	ACRE	$ 50,000	6	$ 300,000
7. Wetlands Creation [2]	ACRE	$ 50,000	0	$ -
8. Sod at Pond Sites/Channel Banks	SY	$ 3	11,000	$ 33,000
9. Baffle Box	LS	$ 100,000	0	$ -
10. Managed Aquatic Plant Systems	SF	$ 8	8,500	$ 68,000
Subtotal 1 - Capital Costs [3]				$ 1,005,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$ 150,750
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$ 1,155,750
Contingency (30% of Subtotal 2)				$ 346,725
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$ 1,502,475
Operations & Maintenance [4]				
11. Crossing Upgrade	LS	$ 14,000	0	$ -
12. Pump Station	LS	$ -	0	$ -
13. Channel Lining	LF/YR	$ 30	0	$ -
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	6	$ 7,800
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	6	$ 2,400
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	6	$ 372,000
17. Baffle Box	LS	$ 2,000	0	$ -
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	8,500	$ 850,000
Subtotal 4 - Total Operations & Maintenance Cost				$ 1,232,200
Total Cost (Subtotal 3 + Subtotal 4) [5] [6]				**$ 2,735,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

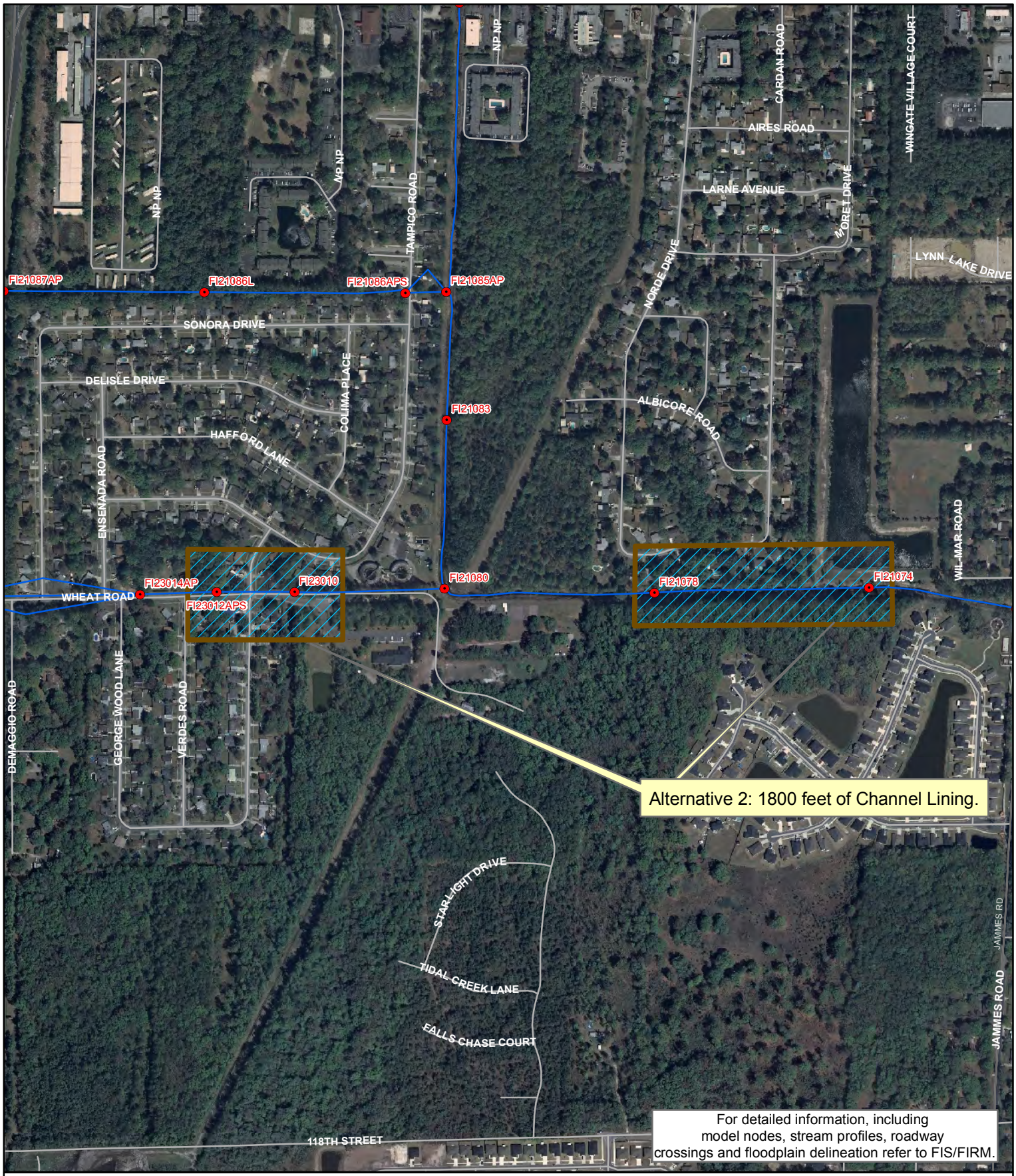


Figure 3.5
Fishing Creek Subbasin
Alternative 2

Table 3.7
COJ MSMP Update
Fishing Creek-Alternative Conceptual Cost Evaluation

ALTERNATIVE 2

Item	Units		Unit Cost	Quantity		Total Cost
Captial Costs						
1. Culverts/Bridges	LF	$	3,000	0	$	-
2. Weirs/Outlet Structures	LS	$	50,000	0	$	-
3. Pump Station	LS	$	-	0	$	-
4. Channel Lining [1]	LF	$	200	1,800	$	360,000
5. Excavation/Earth Work	CY	$	8	0	$	-
6. Land Acquisition	ACRE	$	50,000	0	$	-
7. Wetlands Creation [2]	ACRE	$	50,000	0	$	-
8. Sod at Pond Sites/Channel Banks	SY	$	3	0	$	-
9. Baffle Box	LS	$	100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$	8	0	$	-
Subtotal 1 - Capital Costs [3]					$	360,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)					$	54,000
Subtotal 2 (Subtotal 1 + 15% Design Fees)					$	414,000
Contingency (30% of Subtotal 2)					$	124,200
Subtotal 3 - (Subtotal 2 + 30% Contingency)					$	538,200
Operations & Maintenance [4]						
11. Crossing Upgrade	LS	$	14,000	0	$	-
12. Pump Station	LS	$	-	0	$	-
13. Channel Lining	LF/YR	$	30	1,800	$	54,000
14. Stormwater Facility - Mowing	ACRE/YR	$	1,300	0	$	-
15. Stormwater Facility - Spraying	ACRE/YR	$	400	0	$	-
16. Stormwater Facility - Dredging and Structure Repair	LS	$	62,000	0	$	-
17. Baffle Box	LS	$	2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$	100	0	$	-
Subtotal 4 - Total Operations & Maintenance Cost					$	54,000
Total Cost (Subtotal 3 + Subtotal 4) [5] [6]					**$**	**592,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Section 4.0
Butcher Pen Creek

4.1 Introduction

This is an update of the 1992 MSMP; it reflects changes occurred in the basins since then based on updated land use, and additional survey and data collection. The following sections describe in greater detail the results of the analysis for Butcher Pen Creek. The 1992 MSMP for this sub-basin is located in Appendix A.

This is a planning level investigation to be used for capital improvement analysis. The MSMP provides a model framework for documenting Level of Service (LOS), proposing alternatives, and identifying water quality opportunities.

4.2 Sub-basin Information

This section outlines information on the Butcher Pen Creek sub-basin infrastructure, floodplain, and ability to meet level of service requirements. Schematics of the sub-basin hydrology and hydraulics are shown on **Figures 4.1 and 4.2**, respectively. Hydrologic Unit Code (HUC) parameters are summarized in **Table 4.1**.

4.2.1 Existing Condition

Butcher Pen Creek has not experienced any major development since the 1992 MSMP.

4.2.2 FEMA Related Documents

As part of this project, the City developed updated FEMA flood maps, which include stream profiles and discharge tables that are available to the public. The Flood Insurance Study (FIS) summarizes the results of the analysis that can be retrieved electronically at the following location: http://www.mappingtherisk.com/. This website can also be reached through the City's www.coj.net homepage.

4.2.3 Level of Service Summary

Under the present land use conditions, the Mean Annual, 5-, 10-, 25-, 50-, 100–year design storms were simulated to determine the problem areas as defined below.

In the Butcher Pen Creek area the following locations do not meet the City's LOS as described in Volume 1 Section 6.0. Violations in LOS are shown on **Figure 4.3**.

- Water Quantity
    - All local roads meet the defined LOS, i.e., >3 inches of flooding for a 5-year storm event.
    - All arterial roads meet the LOS.

- There are no potential structures at risk (PSAR) in the Butcher Pen Creek area including residential and commercial establishments.

The peak stages for the various 24-hr design storms under existing conditions are presented in **Table 4.2**.

- Water Quality
  - Number of septic tanks in the Department of Health defined failing septic tank areas in the Butcher Pen Creek sub-basin: 133.
  - There are approximately 115 septic tanks in these failing areas in the 200-meter Butcher Pen Creek buffer.
  - The BMAP goal for total nitrogen (TN) reduction in the Ortega River basin is set at 4.6 MT TN/yr.
- Erosion
  - Total length of channel experiencing high velocities (greater than 3 ft/sec): 5,700 feet.
  - Channel between: Node BU31060AP and Node BU31035
    Node BU31020 and Node BU31010S
    Node BU30055AP and Node BU30050APS
    Node BU30035 and Node BU30022
    Node BU30011 and Node BU30010S

4.3 Alternatives Evaluation

This section describes the alternatives evaluated for the Butcher Pen Creek sub-basin. Based on the screening process for the alternatives evaluation, the following alternatives representing different LOS were developed. Detailed public safety options and standards should be considered and implemented as appropriate during final design.

- Alternative 1: 2.5-acre RSF
- Alternative 2: Baffle Boxes

ALTERNATIVE 1

Alternative 1 addresses water quality within the Butcher Pen Creek sub-basin. This alternative involves construction of a 2.5-acre wet-detention facility. The proposed site for this wet-detention facility is shown on **Figure 4.4**. Due to the configuration of Buther Pen Creek and the topography surrounding the available pond site, Alternative 1 provided no nutrient reduction benefit and was not evaluated in the sub-basin cost benefit analysis.

ALTERNATIVE 2

Alternative 2 addresses water quality within the Butcher Pen Creek sub-basin. This alternative involves installation of baffle boxes at two major NPDES outfalls: Jammes Road and Blanding Blvd. The target areas for baffle box installation are pre-1984 developed areas that typically lack any type of stormwater controls. Butcher Pen Creek sub-basin has about 380 acres of pre-1984 development associated with these two outfalls. Baffle boxes can be designed to capture 85 percent of the average annual flow. Water quantity calculations were performed using an average annual rainfall of 50 in/yr, TN event mean concentration (EMC) of 1.2 mg/l, and 10 percent TN removal efficiency. Water quality benefits for Alternative 2 are 0.2 MT TN/yr. Structure finished floor elevations may exceed the base flood elevations (BFE) established for these areas. Additional survey is recommended during detailed design for projects in this area.

The capital and O&M costs associated with this alternative are presented in **Table 4.3**.

4.4 Cost Benefit Analysis

Based on the benefits provided by each alternative, it was determined that while Alternative 2 could provide some water quality benefit, neither would provide cost effective solutions to water quality issues at the watershed and county-wide levels. It is in the City's best interest to dedicate its resources to alternate projects within the Ortega River watershed that address water quality and water quantity issues in a more cost effective manner.

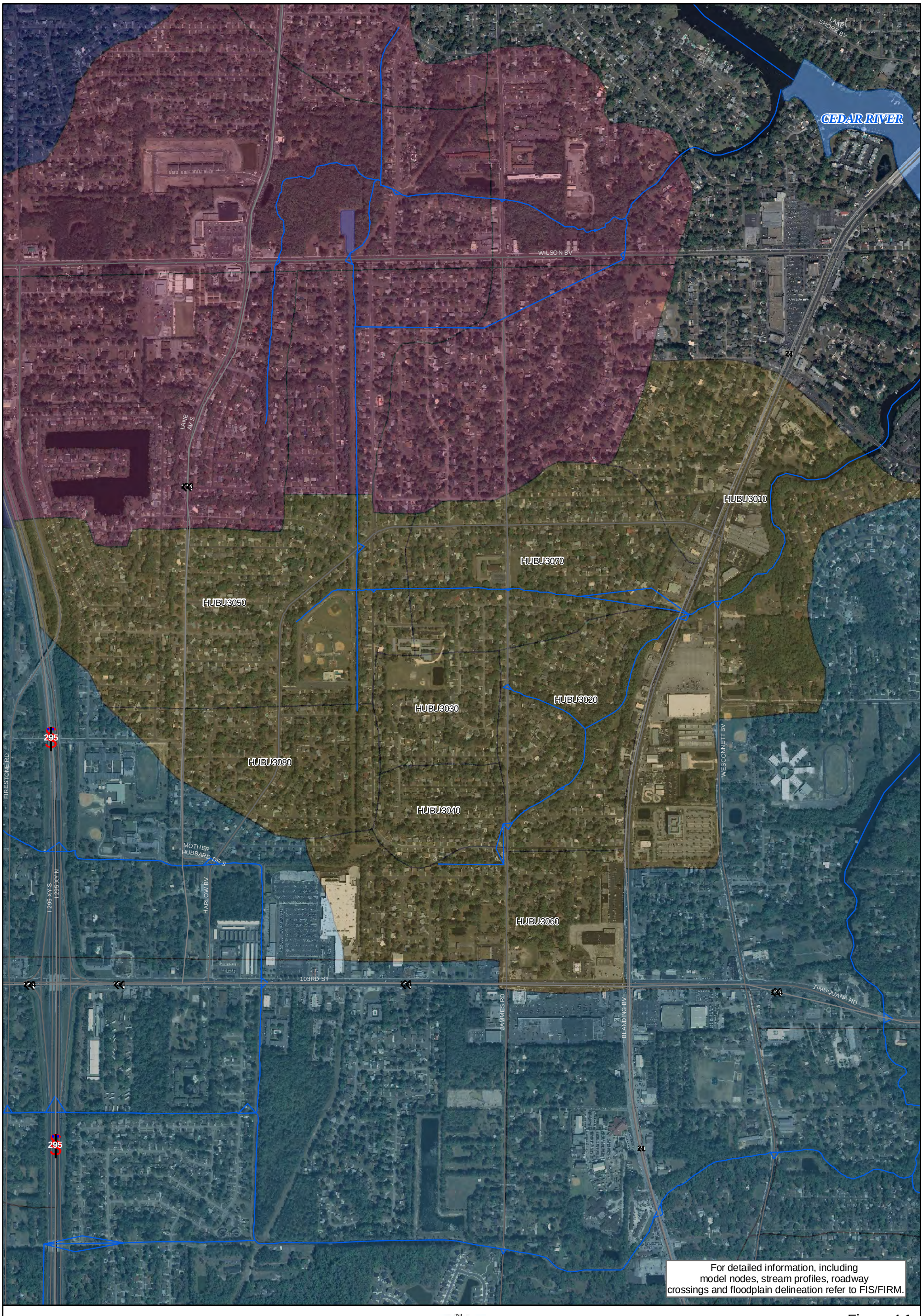
4.5 Recommendations

CDM recommends that the City implement the following components as part of the Butcher Pen Creek Sub-basin Stormwater Improvements:

- The Cedar River septic tank failure area occurs in close proximity to the Butcher Pen Creek tributary area. This failure area should be evaluated for septic tank phase-out based on the ranking system currently being developed by the City. Five subdivisions within the failure area: Cedar Forest, Cedar Park, Lakeshore Manor, and Ortega Farms comprise 115 septic tanks in close proximity to waterways. Using the currently accepted BMAP methodology for estimating

nutrient reduction, phase-out of these septic tanks would result in approximately 0.36 MT TN/yr.

- The City should implement volumetric controls in this sub-basin to prevent further flooding from new development, or redevelopment.
- Low Impact Development (LID) practices should be encouraged to improve infiltration rates.
- Development of property in the 100-yr floodplain should be compensated for in accordance with the City's Floodplain Management Ordinance.
- Stormwater facilities can be enhanced with features such as Managed Aquatic Plant Systems (MAPS) to improve efficiency.
- The City should provide routine maintenance on all City-owned facilities.
- The City should obtain finished floor survey of the individual PSARs to confirm the flooding risk. For homes remaining below the nearest BFE it is recommended that the City purchase the home or flood proof the home using one of the recommended FEMA methods.



Legend

- MSMP Conduits
- Major Roads
- Water Body

Hydrologic Unit

- Williamson Creek
- Fishing Creek
- Cedar River and Wills Branch
- Butcher Pen Creek

N

0 0.25 0.5 Miles

Figure 4.1
Butcher Pen Creek Subbasin Hydrology

CDM

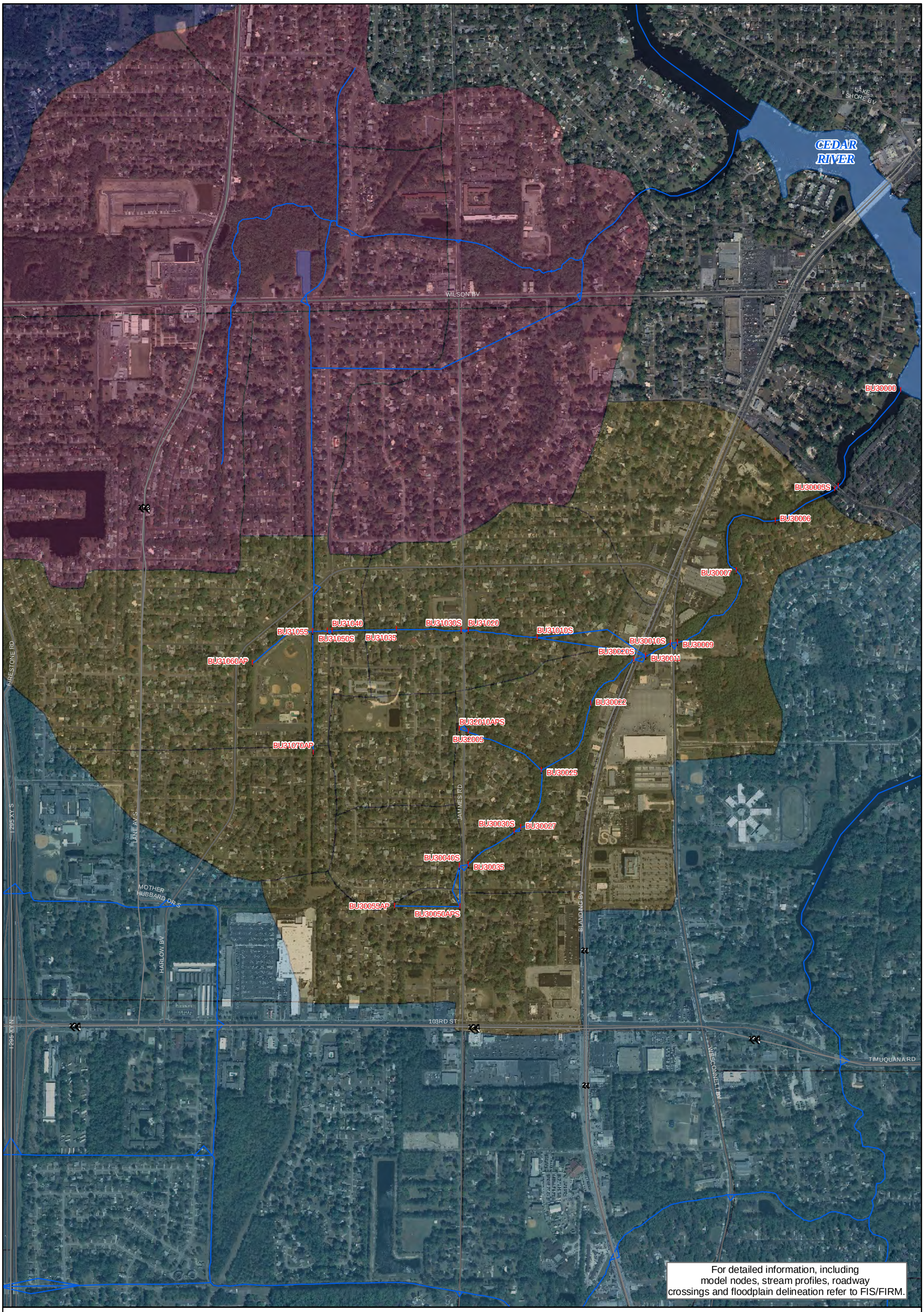


Figure 4.2
Butcher Pen Creek Subbasin Hydraulics

CDM

Table 4.1
COJ MSMP Update
Butcher Pen Creek - Hydrologic Unit Parameters

HUC Name	Outlet	Area (Acres)	Imperviousness %	Width	Slope %	N-Imperv	N-Perv	Max. Infil. Rate	Min. Infil. Rate
HUBU3010	BU30009	207.8	54.5	3882	0.64	0.024	0.225	4.76	0.23
HUBU3020	BU30025	86	37.8	2384	1.08	0.044	0.212	4.09	0.14
HUBU3030	BU32010APS	37.9	34.0	1359	0.38	0.015	0.210	4.30	0.16
HUBU3040	BU30040S	31.2	23.0	1169	0.40	0.015	0.213	5.06	0.21
HUBU3050	BU31060AP	180.6	25.0	2640	1.08	0.015	0.231	6.20	0.31
HUBU3060	BU30055AP	102.3	46.9	2953	0.44	0.015	0.203	4.19	0.15
HUBU3070	BU31010S	110.1	29.3	3327	0.33	0.015	0.211	3.57	0.10
HUBU3080	BU31070AP	69.6	23.8	1646	0.84	0.015	0.213	6.70	0.35
HUWL5012	WL51010S	98.1	36.3	3195	1.25	0.045	0.236	5.89	0.33
HUWL5014	WL52005S	139.1	27.5	3001	1.01	0.027	0.214	4.91	0.24
HUWL5016	WL51035AP	273.9	24.9	4599	1.05	0.029	0.271	5.89	0.27
HUWL5017	WL51033	94.7	32.2	3535	0.38	0.015	0.210	5.12	0.22
HUWL5018	WL54015	223.8	39.6	5197	1.31	0.017	0.209	6.61	0.35
HUWL5019	WL51060	78.3	23.0	2557	0.39	0.015	0.213	3.64	0.10

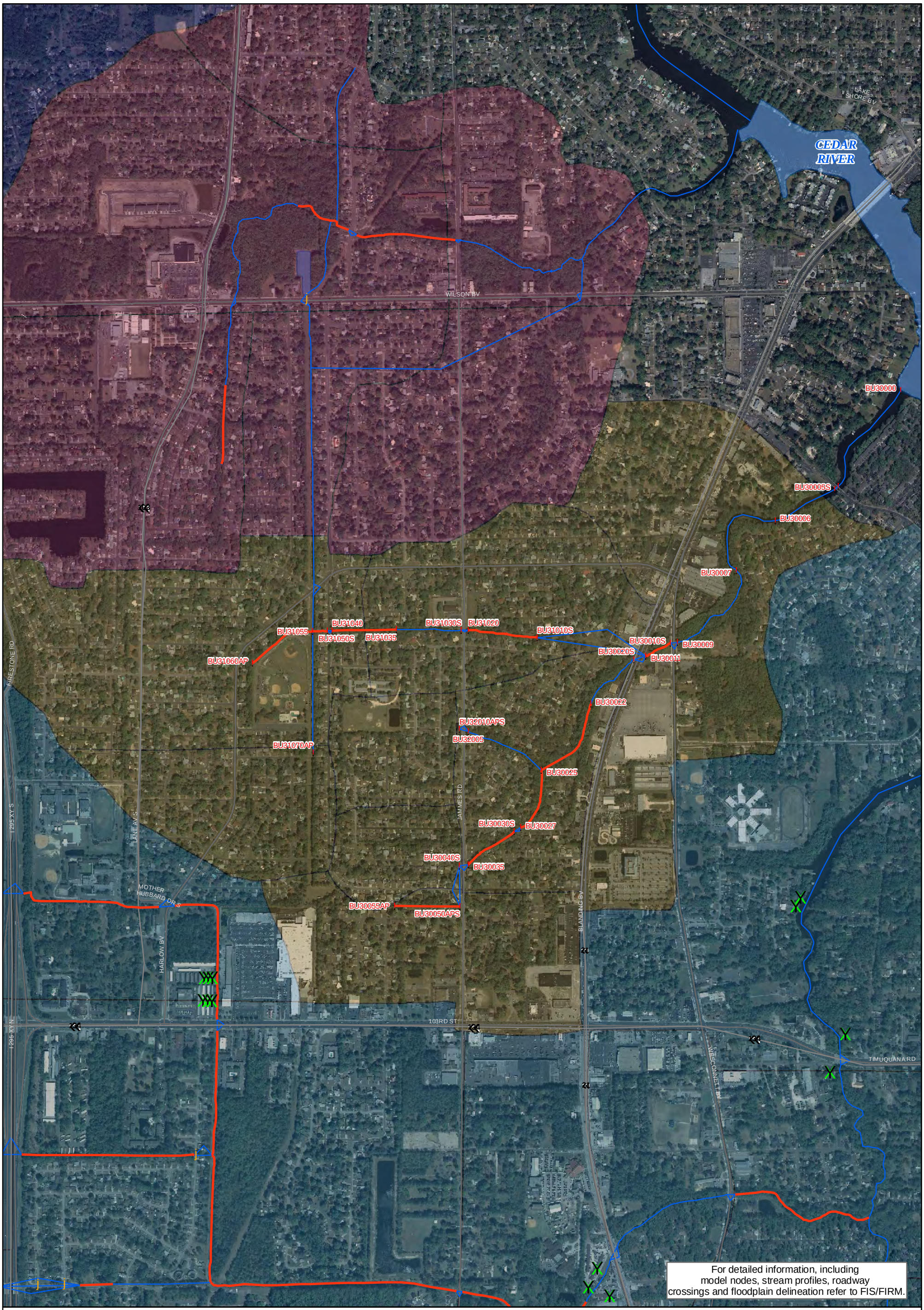


Figure 4.3
Butcher Pen Creek Subbasin
Level of Service

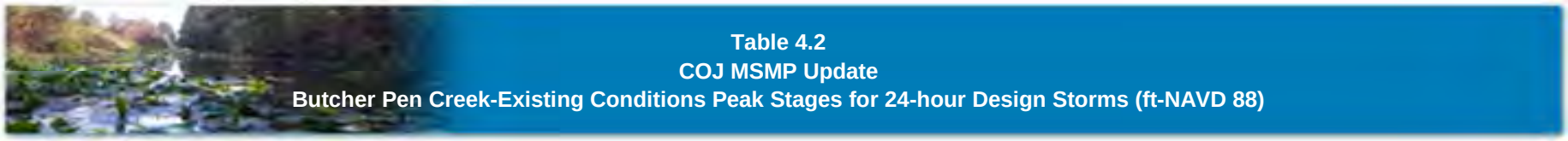
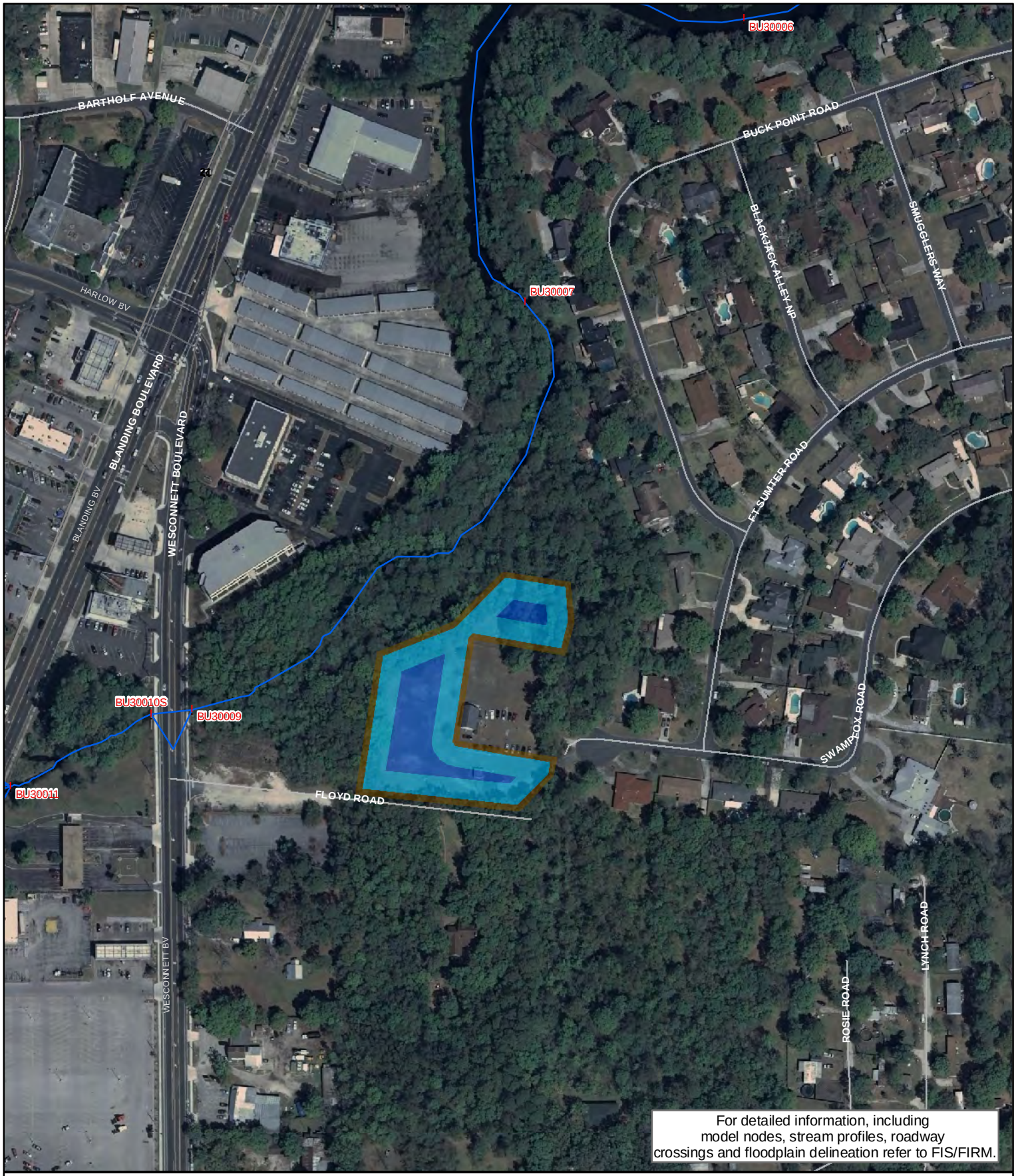


Table 4.2
COJ MSMP Update
Butcher Pen Creek-Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
BU30000				S	1.7		1.7		1.7		1.7		1.7		1.7	
BU30004				S	1.8		1.9		2.1		2.2		2.3		2.5	
BU30005S	CONFEDERATE POINT ROAD	LOCAL	12.0	S	1.8		1.9		2.1		2.3		2.4		2.5	
BU30006				S	2.1		2.4		2.8		3.1		3.3		3.5	
BU30007				S	2.2		2.7		3.1		3.5		3.8		4.0	
BU30009				S	2.9		3.5		4.0		4.5		4.8		5.0	
BU30010S	WESCONNETT BOULEVARD	LOCAL	10.4	S	3.4		4.5		5.6		6.4		7.2		7.7	
BU30011				S	3.8		4.8		5.8		6.7		7.4		7.9	
BU30020S	BLANDING BOULEVARD	ARTERIAL	9.0	S	3.9		4.9		6.0		6.8		7.6		8.2	
BU30022				S	4.0		4.9		6.0		6.9		7.7		8.2	
BU30025				S	9.1		9.6		10.2		10.5		10.8		10.8	
BU30027				S	12.9		13.3		13.5		13.7		14.1		14.4	
BU30030S	RANDIA DRIVE	LOCAL	15.6	S	13.8		14.6		15.2		16.0	0.4	16.4	0.8	16.6	1.0
BU30035				S	14.7		15.0		15.5		16.1		16.6		16.8	
BU30040S	JAMMES ROAD	LOCAL	20.0	S	18.0		19.3		19.9		20.1	0.1	20.5	0.4	20.6	0.6
BU30050APS	ANVERS BOULEVARD	LOCAL	22.0	AP	18.8		21.2		22.0	0.0	22.5	0.5	22.9	0.9	23.0	1.0
BU30055AP				AP	20.8		21.3		21.8		22.9		22.9		23.1	
BU31010S	BLANDING BOULEVARD	ARTERIAL	20.0	S	13.9		14.0		14.1		14.2		14.3		14.3	
BU31020				S	21.2		21.5		22.0		22.3		22.6		22.8	
BU31030S	JAMMES ROAD	LOCAL	23.6	S	21.7		22.2		23.0		23.7	0.1	24.2	0.6	24.6	1.0
BU31035				S	22.0		22.5		23.2		23.9		24.4		24.8	
BU31040				S	23.3		24.0		24.4		24.8		25.2		25.5	
BU31050S	ANVERS BOULEVARD	LOCAL	26.4	S	23.7		24.4		25.1		25.7		26.3		26.7	0.3
BU31055				S	23.8		24.5		25.2		25.8		26.3		26.8	
BU31060AP				AP	24.9		25.4		25.8		26.0		26.4		26.8	
BU31070AP				AP	24.1		24.6		25.2		25.8		26.3		26.8	
BU32005				S	12.7		13.1		13.5		13.9		14.2		14.3	
BU32010APS	JAMMES ROAD	LOCAL	19.0	AP	14.2		15.1		16.6		18.0		19.6	0.6	20.0	1.0

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.



Legend

- ! MSMP Nodes
- MSMP Conduits
- Major Roads
- Alternative 1

N

0 250 500 Feet

Figure 4.4
Butcher Pen Creek Subbasin
Alternative 1

CDM

Table 4.4
COJ MSMP Update
Butcher Pen Creek -Alternative Conceptual Cost Evaluation

ALTERNATIVE 2

Item	Units	Unit Cost	Quantity	Total Cost
Captial Costs				
1. Culverts/Bridges	LF	$ 3,000	0	$ -
2. Weirs/Outlet Structures	LS	$ 50,000	0	$ -
3. Pump Station	LS	$ -	0	$ -
4. Channel Lining (1)	LF	$ 200	0	$ -
5. Excavation/Earth Work	CY	$ 8	0	$ -
6. Land Acquisition	ACRE	$ 50,000	0	$ -
7. Wetlands Creation (2)	ACRE	$ 50,000	0	$ -
8. Sod at Pond Sites/Channel Banks	SY	$ 3	0	$ -
9. Baffle Box	LS	$ 100,000	2	$ 200,000
10. Managed Aquatic Plant Systems	SF	$ 8	0	$ -
Subtotal 1 - Capital Costs (3)				$ 200,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$ 30,000
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$ 230,000
Contingency (30% of Subtotal 2)				$ 69,000
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$ 299,000
Operations & Maintenance (4)				
11. Crossing Upgrade	LS	$ 14,000	0	$ -
12. Pump Station	LS	$ -	0	$ -
13. Channel Lining	LF/YR	$ 30	0	$ -
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	0	$ -
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	0	$ -
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	0	$ -
17. Baffle Box	LS	$ 2,000	2	$ 4,000
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	0	$ -
Subtotal 4 - Total Operations & Maintenance Cost				$ 4,000
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)				**$ 303,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Section 5.0
Cedar River/Wills Branch Creek

5.1 Introduction

This is an update of the 1992 MSMP; it reflects changes occurred in the basins since then based on updated land use, and additional survey and data collection. The following sections describe in greater detail the results of the analysis for Cedar River/Wills Branch Creek. The 1992 MSMP for this sub-basin is located in Appendix A.

This is a planning level investigation to be used for capital improvement analysis. The MSMP provides a model framework for documenting Level of Service (LOS), proposing alternatives, and identifying water quality opportunities.

5.2 Sub-basin Information

This section outlines information on the Cedar River/Wills Branch Creek Sub-basin infrastructure, floodplain, and ability to meet LOS requirements. Schematics of the sub-basin hydrology and hydraulics are shown on **Figures 5.1 and 5.2**, respectively. Hydrologic unit parameters are summarized in **Table 5.1**.

5.2.1 Existing Condition

Cedar River/Wills Branch Creek has not experienced any major development since the 1992 MSMP. The City has implemented several Capital Improvement Projects (CIPs) in the Cedar River/Wills Branch Creek sub-basin, such as:

- Cedar River Outfall Improvements Regional Stormwater Facility (RSF). This project consists of a wet detention pond near the intersection of Highway Avenue and Cynthia Street. The pond provides a permanent pool volume of about 45.9 ac-ft and a residence time of 3 days. The pond is able to provide retrofit treatment of the entire 1,452-acre tributary area.

These improvements and developments have been incorporated in the model for the Cedar River/Wills Branch Creek sub-basin.

5.2.2 FEMA Related Documents

As part of this project, the City developed updated FEMA flood maps, which include stream profiles and discharge tables that are available to the public. The Flood Insurance Study (FIS) summarizes the results of the analysis that can be retrieved electronically at the following location: http://www.mappingtherisk.com/. This website can also be reached through the City's www.coj.net homepage.

5.2.3 Level of Service Summary

Under the present land use conditions, the Mean Annual, 5-, 10-, 25-, 50-, 100–year design storms were simulated to determine the problem areas as defined below.

In the Cedar River/Wills Branch Creek area the following locations do not meet the City's LOS as described in Volume 1 Section 6.0. LOS violations are shown on **Figure 5.3**.

- Water Quantity
    - Sixteen local roads do not meet the defined LOS, i.e., >3 inches of flooding for a 5-year storm event.

      Lenox Ave
      Hammond Blvd
      Valley Crossing Dr
      Grace Lane
      Ocala Ave
      Wasson Ave
      Highway Ave
      Edgewood Ave
      Ryan Ave
      Chase Blvd
      Stuart Ave
      Grace Terrace
      Fouraker Rd at Hogan Cove Dr
      Fouraker Rd at Joffre Dr
      Herlong Rd at Old Middleburg Rd
      Herlong Rd west of Bilodeau Ct

    - One arterial road (Cassat Ave.) is not able to meet the LOS, i.e., >3 inches of flooding for a 10-year storm event.
    - Two arterial roads (Cassat Ave. and Beaver St.) are not able to meet the LOS, i.e., >6 inches of flooding for a 25-year storm event.
    - Two arterial roads (Cassat Ave., Beaver St.) are not able to meet the LOS, i.e., >9 inches of flooding for a 100-year storm event.
    - There are approximately 318 potential structures at risk (PSAR) in the Cedar River/Wills Branch Creek area including residential and commercial establishments. These structures lie within the special flood hazard area (SFHA). Structure finished floor elevations may exceed the base flood elevations (BFE) established for these areas. Additional survey is recommended during detailed design for projects in this area.

The peak stages for the various 24-hr design storms under existing conditions are presented in **Table 5.2**.

- Water Quality
    - Number of septic tanks in the Department of Health defined failing septic tank areas in the Cedar River/Wills Branch Creek sub-basin: 4,300.
    - There are 1,600 septic tanks in these failing areas in the 200-meter Cedar River/Wills Branch Creek buffer.
    - The BMAP goal for total nitrogen (TN) reduction in the Ortega River basin is set at 4.6 MT TN/yr.
- Erosion
    - Total length of channel experiencing high velocities (greater than 3 ft/sec): 52,000 feet.
    - The reaches experiencing such high velocities are shown on Figure 5.1 and presented here.

Channel between:	Node CW40098 to Node CW40097L
	Node CW40090S to Node CW40065
	Node CW40055 to Node CW40046
	Node CW40045 to Node CW40008
	Node CW40007 to Node CW40007L
	Node CW40006 to Node CW40005S
	Node CW41057 to Node CW41055
	Node CW41047 to Node CW41040S
	Node CW41037 to Node CW 41037L
	Node CW41035 to Node CW41031
	Node CW41015 to Node CW41007
	Node CW41004 to Node CW41002
	Node CW42007 to Node CW42006
	Node CW43065 to Node CW43063

Node CW43056 to Node CW43033

Node CW43027 to Node CW43007

Node CW43003 to Node CW43002

Node CW44020S to Node CW44002S

Node CW45030 to Node CW45010

Node CW46030 to Node CW41015

Node CW50142 to Node CW50120S

Node CW52010 to Node CW50045

Node CW54015 to Node CW54010S

Node CW55013AP to Node CW54010S

Node CW57040S to Node CW57020S

5.3 Alternatives Evaluation

This section describes the alternatives evaluated for the Cedar River/Wills Branch Creek Sub-basin. Based on the screening process for the alternatives evaluation, the following alternatives representing different LOS were developed. Detailed public safety options and standards should be considered and implemented as appropriate during final design.

- Alternative 1 – 0.4-Acre RSF
- Alternative 2 – 5-Acre RSF
- Alternative 3 – Supplement Cedar River Outfall Water Quality Treatment
- Alternative 4 – Valley Crossing Improvements
- Alternative 5 – 8.5-Acre RSF
- Alternative 6 – 41-Acre RSF
- Alternative 7 – Country Creek Drainage Improvements
- Alternative 8 – Channel Improvements
- Alternative 9 – Channel Lining

ALTERNATIVE 1

Alternative 1 addresses water quality within the Cedar River/Wills Branch sub-basin. This alternative involves construction of a 0.5-acre wet-detention facility, as shown on **Figure 5.4**. The RSF was evaluated as an off-line pond with a retention period of 6 days, a maximum depth of 10 feet, a permanent pool volume of 2.4 ac-ft, and a total surface area (including maintenance buffer) of approximately 1 acre. For cost-benefit analysis, two scales were identified for this alternative:

- Alternative 1A: 0.5-Acre RSF
- Alternative 1B: 0.5-Acre RSF with Managed Aquatic Plant Systems (MAPS)

MAPS are a supplement to existing or new RSF to increase nutrient uptake and removal in the facilities through vegetative growth. The MAPS act as a littoral zone planted with aquatic vegetation managed to optimize uptake of nutrients. Unlike a traditional littoral zone, which dies back in winter releasing the nutrients through its detritus, MAPS are harvested annually to permanently remove nutrients from the system. Additionally, the MAPS are typically implemented as floating islands that remain in contact with nutrients in the water even during periods when traditional littoral zones would be left dry.

Water quality analysis was performed using the Watershed Management Model (WMM) to measure the effectiveness of this pond to reduce the various NPDES water quality parameters for annual loads. Results are tabulated in **Table 5.3** comparing the existing and with-project conditions for the Cedar River/ Wills Branch sub-basin. For MAPS, a removal efficiency of 40 percent of the remaining pond load was assumed (i.e., after traditional wet detention). The City and FDEP are in the process of several MAPS trial studies to further define this removal efficiency.

Alternative 1 provides nutrient reduction ranging from 0.02 MT TN/yr (Alternative 1A) to 0.07 MT TN/yr (Alternative 1B). The capital and O&M costs associated with these alternatives are presented in **Tables 5.4 and 5.5**.

Table 5.3 Water Quality Analysis Results for Alternative 1 for Cedar River/Wills Branch

Parameter	Units	Existing Conditions	Alternative	Reduction	% Reduction
Flow	(ac-ft/yr)	26820	26,820	-	0.0%
BOD	lbs/yr	452409	452,210	199	0.0%
Cd	lbs/yr	115.40	114	1	0.9%
COD	lbs/yr	2904873	2,903,504	1,369	0.0%
Cu	lbs/yr	749	748	1	0.1%
DP	lbs/yr	7857	7,851	6	0.1%
F-Coli	counts/yr	3.26E+15	3.26E+15	2.90E+12	0.1%
NO23	lbs/yr	31617	31,599	18	0.1%
Pb	lbs/yr	1010	1,008	2	0.2%

Table 5.3 Water Quality Analysis Results for Alternative 1 for Cedar River/Wills Branch

Parameter	Units	Existing Conditions	Alternative	Reduction	% Reduction
TDS	lbs/yr	8748869	8,746,869	2,000	0.0%
TKN	lbs/yr	75165	75,145	20	0.0%
TP	lbs/yr	15080	15,071	9	0.1%
TSS	lbs/yr	2195743	2,192,893	2,850	0.1%
Zn	lbs/yr	4813	4,808	5	0.1%
TN	lbs/yr	106782	106,744	38	0.0%

Values do not include MAPS nutrient removal

ALTERNATIVE 2

Alternative 2 addresses water quality and flood control within the Cedar River/Wills Branch sub-basin. This alternative involves construction of a 5-acre wet-detention facility as shown on **Figure 5.5**.The RSF was evaluated as an off-line pond with a retention period of 5 days, a maximum depth of 10 feet, a permanent pool volume of 40.7 ac-ft, and a total surface area (including maintenance buffer) of approximately 9 acres. For cost-benefit analysis, two scales were identified for this alternative:

- Alternative 2A: 5-Acre RSF
- Alternative 2B: 5-Acre RSF with MAPS

Water quality analysis was performed using the Watershed Management Model (WMM) to measure the effectiveness of this pond to reduce the various NPDES water quality parameters for annual loads. Results are tabulated in **Table 5.6** comparing the existing and with-project conditions for the Cedar River/Wills Branch sub-basin. For MAPS, a removal efficiency of 40 percent of the remaining pond load was assumed (i.e., after traditional wet detention). The City and FDEP are in the process of several MAPS trial studies to further define this removal efficiency.

Alternative 2 provides two benefits: reducing stages downstream and addressing nutrient reduction for the Ortega River basin. The proposed alternative results in 12 PSAR being removed from the SFHA, 11 PSAR being removed from the 25-year floodplain, one arterial road able to meet the desired LOS, one local road able to meet the desired LOS, and nutrient reduction ranging from 0.33 MT TN/yr (Alternative 2A) to 2.2 MT TN/yr (Alternative2B). The peak stages under Alternative 2 are presented in **Table 5.7**

The capital and O&M costs associated with these alternatives are presented in **Tables 5.8 and 5.9**.

Table 5.6 Water Quality Analysis Results for Alternative 2 for Cedar River/Wills Branch

Parameter	Units	Existing Conditions	Alternative	Reduction	% Reduction
Flow	(ac-ft/yr)	26,820	26,820	-	0.0%
BOD	lbs/yr	452,409	435,576	16,833	3.7%
Cd	lbs/yr	115	104	12	10.2%
COD	lbs/yr	2,904,873	2,793,367	111,506	3.8%
Cu	lbs/yr	749	685	64	8.5%
DP	lbs/yr	7,857	7,361	496	6.3%
F-Coli	counts/yr	3.26E+15	3.04E+15	2.25E+14	6.9%
NO23	lbs/yr	31,617	30,514	1,103	3.5%
Pb	lbs/yr	1,010	898	112	11.1%
TDS	lbs/yr	8,748,869	8,515,111	233,758	2.7%
TKN	lbs/yr	75,165	73,677	1,488	2.0%
TP	lbs/yr	15,080	14,205	875	5.8%
TSS	lbs/yr	2,195,743	1,978,557	217,186	9.9%
Zn	lbs/yr	4,813	4,374	439	9.1%
TN	lbs/yr	106,782	104,191	2,591	2.4%

Values do not include MAPS nutrient removal

ALTERNATIVE 3

Alternative 3 is a water quality alternative for the Cedar River/Wills Branch Sub-basin. It involves supplementing the existing 14-acre pond located downstream of the Highway Ave. Bridge to improve water quality benefit, as shown on **Figure 5.6**. Alternative 3 evaluates the addition of MAPS to the existing facility.

Water quality analysis was performed using the Watershed Management Model (WMM) to estimate the effectiveness of the existing pond to reduce the various NPDES water quality parameters for annual loads. Results are tabulated in **Table 5.10**. For MAPS, a removal efficiency of 40 percent of the remaining pond load was assumed (i.e., after traditional wet detention). The City and FDEP are in the process of several MAPS trial studies to further define this removal efficiency. Alternative 3 provides nutrient reduction of 0.77 MT TN/yr.

The capital and O&M costs associated with this alternative are presented in **Table 5.11**.

Table 5.10 Water Quality Analysis Results for Existing 14 Acre RSF for Cedar River

Parameter	Units	Existing Conditions	Alternative	Reduction	% Reduction
Flow	(ac-ft/yr)	26,820	26,820	-	0.0%
BOD	lbs/yr	452,409	439,068	13,341	2.9%
Cd	lbs/yr	115	107	9	7.6%
COD	lbs/yr	2,904,873	2,816,435	88,438	3.0%
Cu	lbs/yr	749	699	50	6.7%
DP	lbs/yr	7,857	7,437	420	5.3%
F-Coli	counts/yr	3.26E+15	3.09E+15	1.76E+14	5.4%
NO23	lbs/yr	31,617	30,828	789	2.5%
Pb	lbs/yr	1,010	921	89	8.8%
TDS	lbs/yr	8,748,869	8,563,786	185,083	2.1%
TKN	lbs/yr	75,165	74,074	1,091	1.5%
TP	lbs/yr	15,080	14,341	739	4.9%
TSS	lbs/yr	2,195,743	2,025,865	169,878	7.7%
Zn	lbs/yr	4,813	4,470	343	7.1%
TN	lbs/yr	106,782	104,902	1,880	1.8%

Values do not include MAPS nutrient removal

ALTERNATIVE 4

Alternative 4 addresses water quality and flood control within the Cedar River/Wills Branch sub-basin. This alternative addresses improvements that could be implemented near the intersection of Valley Crossing and Herlong Rd. (CW41033), as shown on **Figure 5.7**. Two scales were identified for further investigation:

- Alternative 4A – 20-Acre RSF
- Alternative 4B - Upgrade Crossing at node CW41033S

In the 1992 MSMP this area was identified as a potential site for a retrofit water quality pond. The water quality pond was proposed in 1992 with a permanent pool of approximately 117 ac-ft and a total surface area of approximately 20 acres. Since the 1992 MSMP, the area proposed for the wet detention facility was developed into a medium density residential neighborhood. This alternative was not investigated further.

Alternative 4B evaluated the replacement of the existing 4-ft x 7-ft box culvert at Valley Crossing drive with a 6-ft x 6-ft box culvert to improve conveyance at node CW41033S. These conveyance improvements resulted in stage reductions up to 0.1 ft for the 100-year design storm, and 3 PSAR were removed from the SFHA. The peak stages under Alternative 4 are presented in **Table 5.12**.

The capital and O&M costs associated with this alternative are presented in **Table 5.13**.

ALTERNATIVE 5

Alternative 5 addresses water quality and flood control within the Cedar River/Wills Branch sub-basin. This alternative involves construction of an 8.5-acre wet-detention facility as shown on **Figure 5.8**. The RSF was evaluated as an off-line pond with a retention period of 21 days, a maximum depth of 10 feet, a permanent pool volume of 60.3 ac-ft, and a total surface area (including maintenance buffer) of approximately 10 acres. For cost-benefit analysis, three scales were identified for this alternative:

- Alternative 5A: 8.5-Acre RSF
- Alternative 5B: 8.5-Acre RSF with Conveyance Improvements
- Alternative 5C: 8.5-Acre RSF with Conveyance Improvements with MAPS

Water quality analysis was performed for all three alternatives using the Watershed Management Model (WMM) to measure the effectiveness of this pond to reduce the various NPDES water quality parameters for annual loads. Results are tabulated in **Table 5.14** comparing the existing and with-project conditions for the Cedar River/Wills Branch sub-basin. For MAPS, a removal efficiency of 40 percent of the remaining pond load was assumed (i.e., after traditional wet detention). The City and FDEP are in the process of several MAPS trial studies to further define this removal efficiency.

With the additional storage provided by the 8.5-acre RSF, additional conveyance was evaluated to try and alleviate structure flooding upstream of Country Creek Blvd. For Alternative 5B, a 7-ft x 12-ft box culvert was evaluated at Country Creek Blvd. (Node CW43010S). While it was able to lower upstream stages by 0.3 ft, it was not able to remove any additional PSAR from the SFHA. This alternative was not evaluated further for the cost benefit analysis.

Alternatives 5A and 5C provide two benefits: reducing stages downstream and addressing nutrient reduction for the Ortega River basin. The proposed alternative results in 5 PSAR being removed from the SFHA, 4 PSAR being removed from the 25 year floodplain, and nutrient reduction ranging from 0.0.05 MT TN/yr (Alternative 5A) to 0.25 MT TN/yr (Alternative 5C). The peak stages under Alternative 5 are presented in **Table 5.15**.

The capital and O&M costs associated with these alternatives are presented in **Tables 5.16 and 5.17**.

Table 5.14 Water Quality Analysis Results for Alternative 5 for Cedar River/Wills Branch

Parameter	Units	Existing Conditions	Alternative	Reduction	% Reduction
Flow	(ac-ft/yr)	26,820	26,820	-	0.0%
BOD	lbs/yr	452,409	451,771	638	0.1%
Cd	lbs/yr	115	114	1	0.9%
COD	lbs/yr	2,904,873	2,900,861	4,012	0.1%
Cu	lbs/yr	749	747	2	0.3%
DP	lbs/yr	7,857	7,838	19	0.2%
F-Coli	counts/yr	3.26E+15	3.25E+15	1.40E+13	0.4%
NO23	lbs/yr	31,617	31,570	47	0.1%
Pb	lbs/yr	1,010	1,008	2	0.2%
TDS	lbs/yr	8,748,869	8,739,869	9,000	0.1%
TKN	lbs/yr	75,165	75,100	65	0.1%
TP	lbs/yr	15,080	15,049	31	0.2%
TSS	lbs/yr	2,195,743	2,189,614	6,129	0.3%
Zn	lbs/yr	4,813	4,803	10	0.2%
TN	lbs/yr	106,782	106,670	112	0.1%

Values do not include MAPS nutrient removal

ALTERNATIVE 6

In the 1992 MSMP the area upstream of Herlong Recreational Airport was identified as a potential site for a retrofit water quality pond, as shown on **Figure 5.9**. The water quality pond was proposed in 1992 with approximately 325 ac-ft of live storage, a permanent pool of 126 ac-ft, and a total surface area of approximately 41 acres. Due to FAA safety concerns with wildlife attractants it is not feasible to construct a wet detention facility in such close proximity to Herlong Recreational Airport. This alternative was not evaluated in the cost benefit analysis.

ALTERNATIVE 7

Country Creek Drainage Study is being conducted through a separate City contract. Channel improvements including channel widening are being evaluated; however, no project details have been finalized to date. Once additional project details have been finalized and benefits quantified, the cost benefit analysis in Section 5.4 can be updated.

ALTERNATIVE 8

Alternative 8 is a water quantity alternative to improve conveyance from Grace Lane to Lane Ave. (Node CW50050S to Node CW50120S), as shown on **Figure 5.10**. For cost-benefit analysis, four scales were identified for this alternative:

- Alternative 8A: Conveyance Improvements – Grace Lane to Normandy Blvd.
- Alternative 8B: Conveyance Improvements – I-10 to Ramona Blvd.
- Alternative 8C: Conveyance Improvements – Grace Lane to Ramona Blvd.

- Alternative 8D: Conveyance Improvements – Grace Lane to Lane Avenue

Each component of the proposed conveyance improvements is described in detail below.

Grace Lane to Normandy Blvd. Under this alternative the channel bottom will be widened to 115 ft and regraded with 3:1 sideslopes.

I-10 to Ramona Blvd. Under this alternative the channel bottom will be widened to 45 ft, regraded with 1:1 sideslopes and armored.

Lane Avenue. Under this alternative the three existing 9-ft x 8-ft box culverts under Lane Ave. will be replaced by two 9-ft x 10-ft box culverts.

For Alternative 8A, upstream stages are reduced up to 0.9 ft for the 100-year design storm, resulting in 9 PSAR being removed from the SFHA and 2 PSAR being removed from the 25-year floodplain. The peak stages under Alternative 8A are presented in **Table 5.18**.

For Alternative 8B, upstream stages are reduced by up to 0.3 ft for the 100-year design storm resulting in 10 PSAR being removed from the SFHA, 11 PSAR being removed from the 25-year floodplain, and approximately 1,200 ft of channel being protected from velocities greater than 3 ft/sec. The peak stages under Alternative 8B are presented in **Table 5.19**.

For Alternative 8C, upstream stages are reduced up to 0.8 ft for the 100-year design storm, resulting in 14 PSAR being removed from the SFHA, 1 PSAR being removed from the 25-year floodplain, and approximately 1,200 ft of channel will be protected from velocities greater than 3 ft/sec. The peak stages under Alternative 8C are presented in **Table 5.20**.

For Alternative 8D, upstream stages are reduced up to 0.8 ft for the 100-year design storm, resulting in 16 PSAR being removed from the SFHA, 3 PSAR being removed from the 25-year floodplain, and approximately 1,200 ft of channel will be protected from velocities greater than 3 ft/sec. The peak stages under Alternative 8D are presented in **Table 5.21**.

The capital and O&M costs associated with these alternatives are presented in **Tables 5.22 through 5.25**.

ALTERNATIVE 9

Alternative 9 is a maintenance alternative to correct erosion from Node CW40055 to Node CW40046, as shown on **Figure 5.11**. This alternative proposes lining approximately 4,600 ft of channel to prevent erosion for velocities greater than 3 ft/sec. The capital and O&M costs associated with this alternative are presented in **Table 5.26**.

5.4 Cost Benefit Analysis

To facilitate the selection of the most cost effective project alternatives, a cost-benefit analysis was performed for all identified combinations of alternatives. The detailed methodology used for the cost-benefit analysis can be found in Volume 1 Section 7.0.

5.4.1 Alternative Relationships

To maximize the effectiveness of the cost-benefit analysis, any interdependencies among alternatives must be identified. The following relationships were identified for the Cedar River/Wills Branch Creek sub-basin:

- All alternatives can be implemented as standalone projects.
- No alternative is dependent upon the implementation of another alternative.

5.4.2 Cost Effectiveness Analysis

Figure 5.12 shows all of the possible combinations of alternatives and their corresponding benefit scores. The cost effective frontier identified the alternatives that are the most cost effective, i.e., no other combination of alternatives provides more benefit for lower cost, and the "best buys," i.e., the combinations of alternatives with the lowest cost/benefit ratio. The best buy plans for the sub-basin are identified in **Table 5.27**.

Table 5.27 Best Buy Plans Identified for Cedar River/Wills Branch Creek Sub-basin Cost Effectiveness Analysis

Plan Alternative	Project Description	Total Benefit (Output) (%)	Cost ($1000)	Average Cost ($1000 / %)
No Action Plan		0	0	
8B	Conveyance I-10 to Ramona	1.2	383	330
2B8B	Conveyance I-10 to Ramona + 5 Ac RSF	13.2	5,602	426
2B3A8B	Conveyance I-10 to Ramona + 5 Ac RSF w/MAPS+ Cedar MAPS	16.4	7,673	469
2B3A8B9A	Conveyance I-10 to Ramona + 5 Ac RSF w/MAPS + Cedar MAPS + Channel Lining	18.2	9,186	506
2B3A5C8B9A	Conveyance I-10 to Ramona + 5 Ac RSF w/MAPS + Cedar MAPS + Channel Lining + 8.5 Ac RSF w/MAPS	18.5	9,865	534
1B2B3A5C8B9A	Conveyance I-10 to Ramona + 5 Ac RSF w/MAPS + Cedar MAPS + Channel Lining +8.5 Ac RSF w/MAPS + 0.4 Ac RSF w/MAPS	20.1	15,779	786
1B2B3A5C8D9A	Conveyance Grace to Lane + 8.5 Ac RSF w/MAPS + Cedar MAPS + Channel Lining +8.5 Ac RSF w/MAPS + 0.4 Ac RSF w/MAPS	20.3	19,329	951

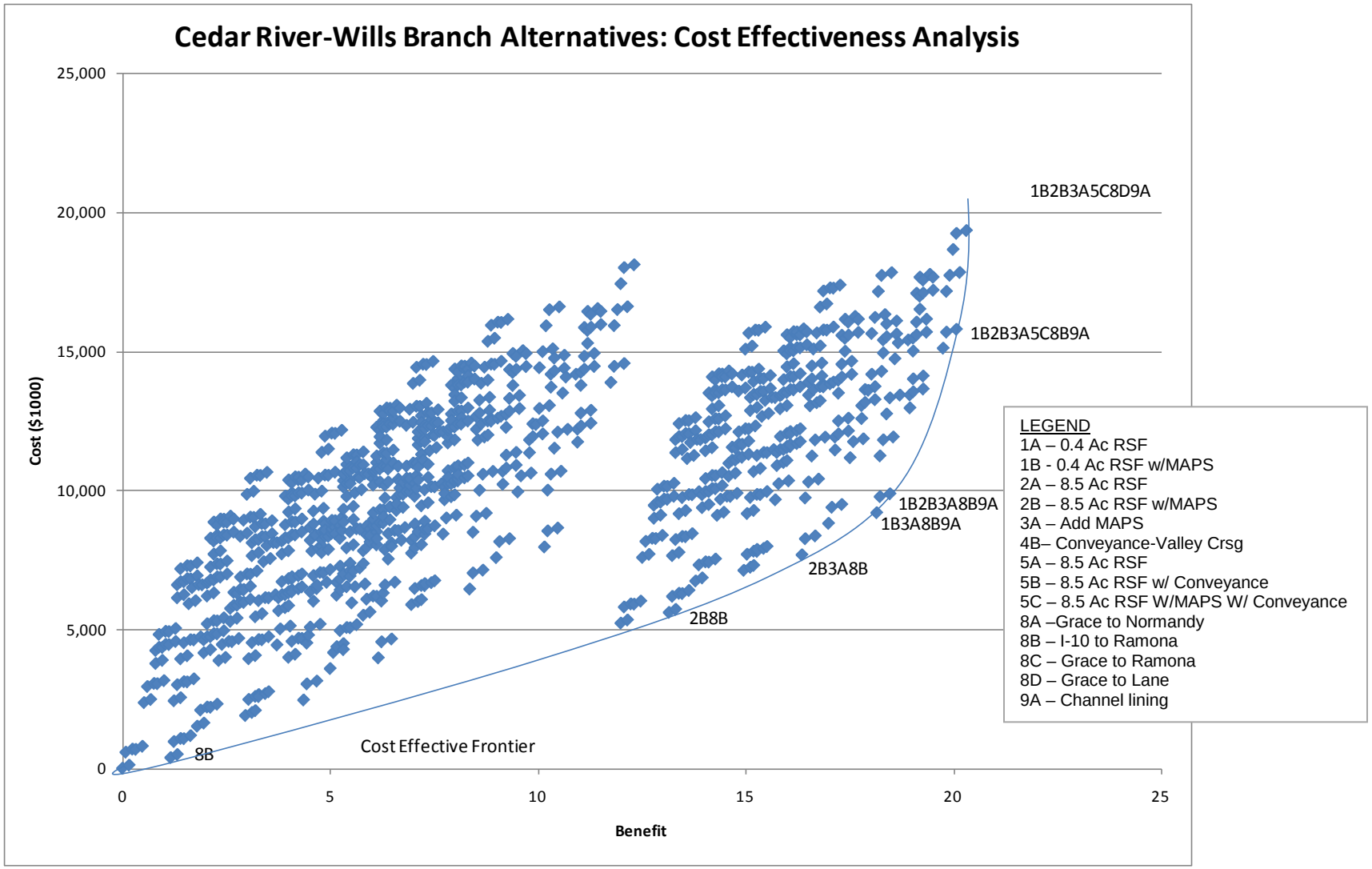


Figure 5.12 Results of Cedar River/Wills Branch Creek Cost Effectiveness Analysis

5.4.3 Incremental Cost Analysis

The best buy plans identified during cost effectiveness analysis were next reviewed for incremental cost. The results of the incremental cost analysis are presented on **Figure 5.13 and in Table 5.28**.

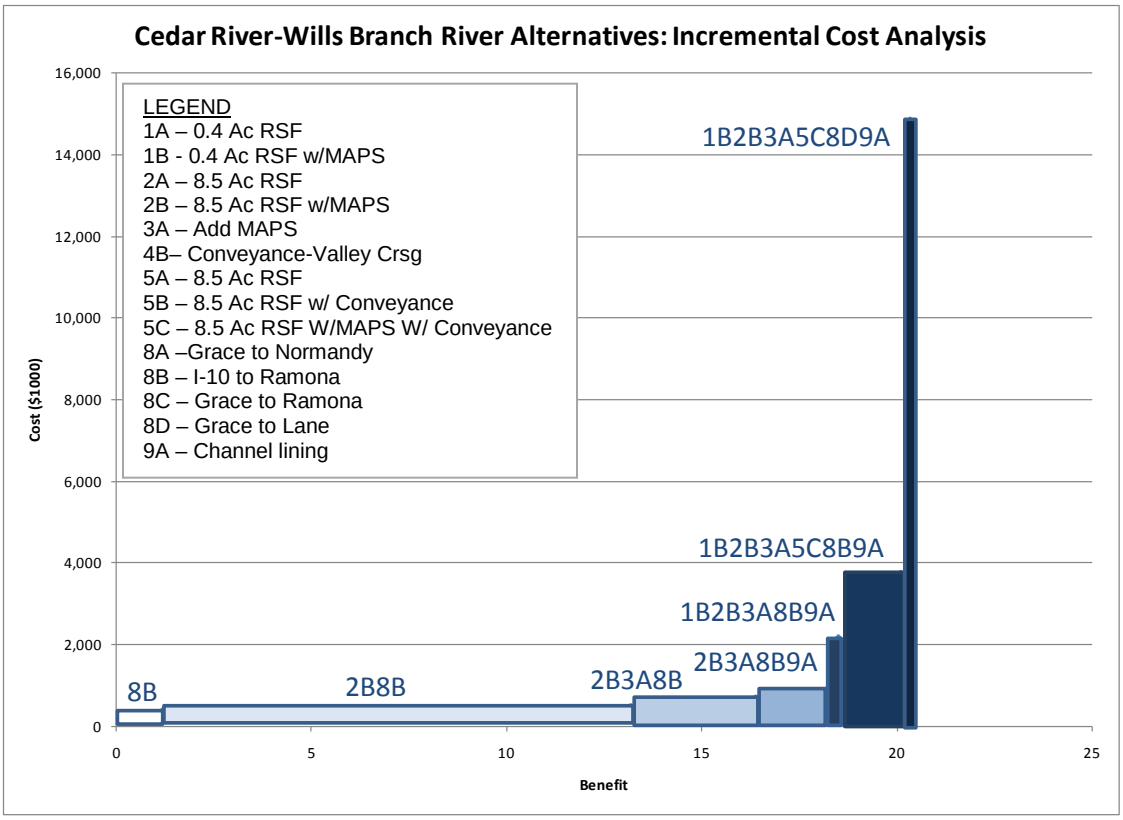


Figure 5.13 Results of Cedar River/Wills Branch Creek Incremental Cost Analysis

Table 5.28 Incremental Cost Information for Best Buy Plans

Plan Alternative	Total Benefit (Output) (%)	Cost ($1000)	Average Cost ($1000/%)	Incremental Cost ($1000)	Inc. Output (%)	Inc. Cost Per Output ($1000)
No Action	0	0				
8B	1.2	383	330	383	1.2	330
2B8B	13.2	5,602	426	5,219	12.0	435
2B3A8B	16.4	7,673	469	2,071	3.2	647
2B3A8B9A	18.2	9,186	506	1,513	1.8	841
2B3A5C8B9A	18.5	9,865	534	679	0.3	2,122
1B2B3A5C8B9A	20.1	15,779	786	5,914	1.6	3,696
1B2B3A5C8D9A	20.3	19,329	951	3,550	0.2	14,792

5.4.4 Plan Selection

All Best Buy plans are implementable. Based on the incremental cost analysis there is a large range of cost per benefit unit. There is a large increase in incremental cost following Plan 2B3A8B9A. These plans provide additional benefit but the higher incremental cost indicates that these Plans are not a good fit as the recommended plan for this basin. Of the remaining plans, all contain both water quality and water quantity benefits. Only Plan 2B3A8B9A addresses all three of the City's strategic goals: water quality, water quantity, and maintenance. For this reason, Plan 2B3A8B9A is the recommended plan for the Cedar River/Wills Branch Sub-basin. Because this Plan includes so many components, a phased implementation is recommended for this project and discussed in further detail in Section 5.5.

5.5 Recommendations

CDM recommends that the City implement the following components as part of the Cedar River/Wills Branch Creek Sub-basin Stormwater Improvements. The benefits associated with this plan are outlined in **Table 5.29**.

- Phase 1: 5-Acre RSF with MAPS and MAPS implementation at Cedar Creek Outfall
- Phase 2: Conveyance Improvements I-10 to Ramona Blvd. and Approximately 4,600 ft Channel Lining (Node CW40055 to Node CW40046)

Table 5.29 Projected Benefits for Recommended Plan

Strategic Program Goals	Water Quantity						WQ	O&M
Performance Measurement Metrics	Local Road	Arterial Road			Structure		WQ	Erosion
Design Storm	5	10	25	100	25	100	MT TN/yr	velocity > 3fps (ft)
Depth Criteria	>3in	>3in	>6in	>9in	>0ft	> 0 ft		
Phase I	1	-	1	-	11	12	2.97	-
Phase II	-	-	-	-	11	10	-	5,800

For detailed information, including model nodes, stream profiles, roadway crossings and floodplain delineation refer to FIS/FIRM.

Legend

- MSMP Conduits
- Major Roads
- Water Body

Hydrologic Unit

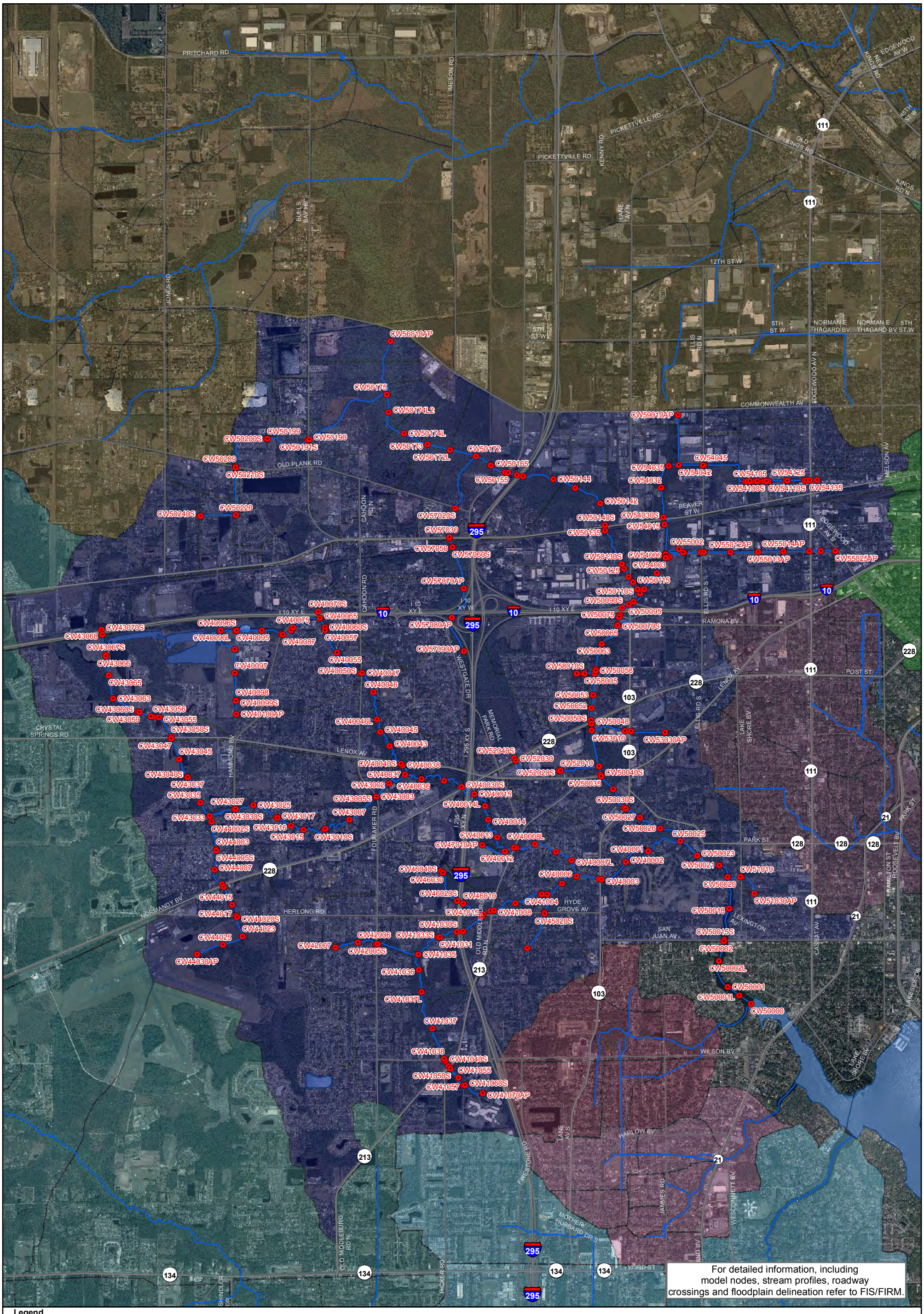
- Cedar River and Wills Branch
- Fishing Creek
- Butcher Pen Creek
- McCoy Creek
- Big Fishweir Creek
- Ortega River
- Ribault River
- Williamson Creek

N

0 1 2 Miles

Figure 5.1
Cedar River and Wills Branch Subbasin Hydrology

CDM



For detailed information, including model nodes, stream profiles, roadway crossings and floodplain delineation refer to FIS/FIRM.

Legend

- MSMP Nodes
- MSMP Conduits
- Major Roads
- Water Body

Hydrologic Unit

- Cedar River and Wills Branch
- Fishing Creek
- Butcher Pen Creek
- McCoy Creek
- Big Fishweir Creek
- Ortega River
- Ribault River
- Williamson Creek

N

0 1 2 Miles

Figure 5.2
Cedar River and Wills Branch Subbasin Hydraulics

CDM

Table 5.1
COJ MSMP Update
Cedar River / Wills Branch - Hydrologic Unit Parameters

HUC Name	Outlet	Area (Acres)	Imperviousness %	Width	Slope %	N-Imperv	N-Perv	Max. Infil. Rate	Min. Infil. Rate
HUCW4010	CW40001	118.3	20.5	2047	0.99	0.017	0.268	4.47	0.15
HUCW4015	CW40006	152.5	35.5	2891	0.96	0.023	0.228	4.44	0.16
HUCW4017	CW40007	76.2	23.7	2914	0.18	0.017	0.237	3.88	0.12
HUCW4020	CW40013	198.2	39.2	8346	2.11	0.046	0.289	4.87	0.22
HUCW4021	CW47010AP	71.1	61.4	2093	2.36	0.018	0.258	3.86	0.13
HUCW4030	CW40035	289.3	55.6	5978	2.29	0.041	0.229	3.84	0.12
HUCW4040	CW40045	353.9	27.8	4145	1.68	0.033	0.236	3.84	0.11
HUCW4050	CW40055	235.7	24.4	4375	1.35	0.038	0.232	3.60	0.10
HUCW4052	CW40100AP	440.7	38.4	6955	0.43	0.034	0.320	3.88	0.11
HUCW4060	CW40070S	288.6	51.8	2544	0.61	0.029	0.266	3.65	0.10
HUCW4070	CW43015	532.4	29.7	6566	1.50	0.034	0.262	3.69	0.10
HUCW4080	CW43035	324.8	28.3	4804	1.09	0.047	0.292	3.77	0.10
HUCW4082	CW44030AP	968.9	43.3	5232	0.12	0.045	0.287	3.67	0.10
HUCW4086	CW44003	151.7	31.2	2183	0.83	0.026	0.221	3.46	0.09
HUCW4090	CW43065	324.1	36.5	5607	0.60	0.058	0.286	3.76	0.10
HUCW4100	CW43070S	328.1	51.1	4932	0.31	0.039	0.285	3.56	0.09
HUCW4110	CW41007	158.8	32.9	4825	1.95	0.052	0.282	4.27	0.14
HUCW4112	CW46040S	239.3	38.4	2538	0.73	0.029	0.239	3.85	0.13
HUCW4114	CW45030	310.6	26.8	2604	1.02	0.020	0.238	4.14	0.14
HUCW4120	CW41035	217.6	38.3	5608	2.90	0.062	0.265	3.78	0.11
HUCW4122	CW42007	285.8	23.4	5203	1.46	0.023	0.232	3.61	0.10
HUCW4130	CW41037	426.6	34.5	7229	1.37	0.038	0.268	3.57	0.09
HUCW4140	CW41060S	133	45.8	2159	0.07	0.023	0.344	3.58	0.09
HUCW5020	CW50025	626.9	33.1	11901	0.99	0.034	0.245	4.41	0.16
HUCW5021	CW51030AP	180	40.7	3281	0.66	0.032	0.283	4.44	0.17
HUCW5030	CW50035	299.5	44.3	7912	1.16	0.032	0.265	3.96	0.13
HUCW5032	CW53020S	155.3	46.7	2812	0.46	0.022	0.244	3.73	0.11
HUCW5034	CW52040S	206.8	65.1	3624	0.08	0.074	0.291	3.87	0.12
HUCW5040	CW58010S	289.6	41.7	4903	0.35	0.030	0.229	3.36	0.08
HUCW5042	CW50060S	383	52.1	4961	0.30	0.023	0.283	3.80	0.12
HUCW5050	CW50105	326.8	67.4	3588	0.45	0.019	0.260	3.42	0.11
HUCW5055	CW50125	191.7	60.2	3515	0.54	0.032	0.250	3.97	0.14
HUCW5060	CW50142	171.3	71.4	4056	0.38	0.061	0.293	3.72	0.11
HUCW5062	CW50144	151.5	72.8	4932	0.93	0.047	0.226	3.44	0.11
HUCW5070	CW50172	336.6	51.7	6800	0.35	0.070	0.335	4.43	0.15
HUCW5072	CW50173	212.1	46.8	1995	0.99	0.083	0.330	4.22	0.13

Table 5.1
COJ MSMP Update
Cedar River / Wills Branch - Hydrologic Unit Parameters

HUC Name	Outlet	Area (Acres)	Imperviousness %	Width	Slope %	N-Imperv	N-Perv	Max. Infil. Rate	Min. Infil. Rate
HUCW5074	CW50174L	314.1	51.4	3591	1.23	0.073	0.281	4.22	0.13
HUCW5080	CW50174L2	184.2	49.7	5399	1.53	0.095	0.311	4.31	0.13
HUCW5082	CW50191S	190.6	32.2	1967	0.47	0.035	0.248	3.85	0.11
HUCW5090	CW54010S	103.2	54.7	3877	0.78	0.024	0.323	4.23	0.15
HUCW5100	CW54030S	185.3	73.0	2518	0.16	0.019	0.239	2.94	0.08
HUCW5110	CW54035	122.4	73.5	4973	1.40	0.044	0.278	3.44	0.10
HUCW5114	CW57060S	198	46.7	2488	1.15	0.059	0.276	4.02	0.12
HUCW5116	CW57070AP	121.6	38.0	1903	1.51	0.069	0.228	4.09	0.13
HUCW5118	CW57080AP	142	49.4	2892	1.92	0.030	0.224	4.08	0.14
HUCW5120	CW55010S	163.7	65.4	6038	0.13	0.016	0.217	3.10	0.09
HUCW5122	CW55025AP	140.4	62.3	3078	0.35	0.023	0.259	3.21	0.08
HUCW5130	CW55015AP	224.4	64.8	5295	0.17	0.016	0.203	3.10	0.09
HUCW5140	CW54140S	101.8	33.4	1895	0.17	0.015	0.261	3.43	0.09
HUCW5145	CW54130S	81.1	45.3	1729	0.29	0.015	0.203	3.21	0.08
HUCW5150	CW54115	99	59.1	2969	0.29	0.015	0.208	3.23	0.09
HUCW5160	CW54060	161.7	71.0	8155	0.36	0.032	0.247	3.49	0.11
HUCW5170	CW59010AP	104.3	57.1	1715	0.26	0.019	0.229	3.79	0.13
HUCW5180	CW50175	175	62.3	2409	0.82	0.071	0.274	3.74	0.10
HUCW5190	CW56010AP	255.1	55.5	3842	0.80	0.074	0.286	4.02	0.11
HUCW5200	CW57090AP	154.2	27.7	2141	0.96	0.025	0.214	3.43	0.09
HUCW5210	CW50210S	71.7	13.2	993	0.16	0.060	0.249	3.94	0.11
HUCW5220	CW50220	101.4	13.3	1739	0.12	0.024	0.308	3.71	0.09
HUCW5230	CW50240S	181.2	30.8	3509	0.49	0.037	0.254	3.69	0.10
HUCW5250	CW50200S	77.8	5.8	3455	0.51	0.016	0.291	3.79	0.10

For detailed information, including model nodes, stream profiles, roadway crossings and floodplain delineation refer to FIS/FIRM.

Legend

- Arterial & Local Roads - 5 yr > 3 in
- Arterial & Local Roads - 10 yr > 3 in
- Arterial & Local Roads - 25 yr > 6 in
- Arterial & Local Roads - 100 yr > 9 in
- PSARs
- Velocity >= 3fps
- MSMP Conduits
- Major Roads

Hydrologic Unit

- Cedar River and Wills Branch
- Fishing Creek
- Butcher Pen Creek
- McCoy Creek
- Big Fishweir Creek
- Ortega River
- Ribault River
- Williamson Creek

N

0 1 2 Miles

Figure 5.3
Cedar River and Wills Branch Subbasin Level of Service

CDM

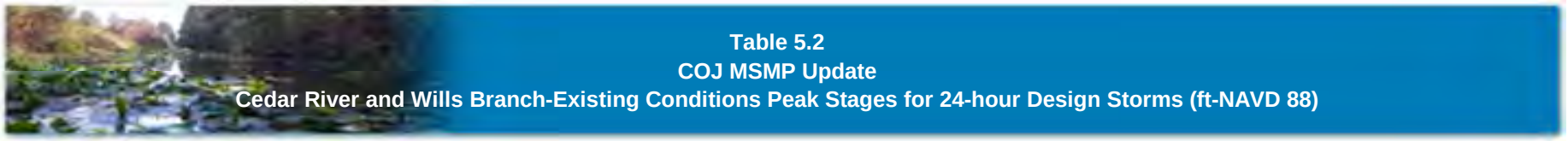


Table 5.2
COJ MSMP Update
Cedar River and Wills Branch-Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
CW40001				S	2.6		3.4		4.5		5.5		6.2		6.7	
CW40002				S	3.1		4.2		5.3		6.3		7.0		7.5	
CW40003				S	3.4		4.7		5.9		6.9		7.6		8.1	
CW40005S	LANE AVENUE	LOCAL	12.8	S	3.5		4.7		6.0		7.1		7.9		8.5	
CW40006				S	4.1		5.7		6.8		7.8		8.6		9.2	
CW40007				S	5.0		6.5		7.6		8.6		9.4		9.9	
CW40007L				S	4.4		5.9		7.1		8.1		8.8		9.4	
CW40008				S	6.2		7.9		9.2		10.3		11.0		11.6	
CW40008L				S	5.6		7.3		8.6		9.6		10.4		11.0	
CW40010S	OLD MIDDLEBURG ROAD	LOCAL	18.7	S	6.2		8.0		9.3		10.4		11.1		11.7	
CW40012				S	6.5		8.3		9.5		10.6		11.3		11.9	
CW40013				S	7.9		9.3		10.5		11.5		12.2		12.8	
CW40014				S	11.1		12.6		13.6		14.4		15.0		15.4	
CW40014L				S	12.4		13.7		14.8		15.7		16.2		16.7	
CW40015				S	13.7		15.1		16.2		17.0		17.6		18.0	
CW40030S	N I295EXIT NORM RP	LOCAL	23.4	S	13.9		15.5		16.9		18.1		19.0		19.9	
CW40035				S	15.8		16.7		17.9		18.9		19.7		20.4	
CW40036				S	16.8		18.4		19.6		20.7		21.4		22.0	
CW40037				S	18.5		19.8		20.9		21.9		22.6		23.1	
CW40038				S	20.8		22.1		22.7		23.0		23.3		23.8	
CW40040S	LENOX AVENUE	LOCAL	22.5	S	21.1		22.8	0.3	23.7	1.2	24.2	1.7	24.5	2.0	24.7	2.2
CW40043				S	23.8		24.6		25.2		25.6		25.9		26.1	
CW40045				S	28.7		29.5		30.1		30.5		30.9		31.0	
CW40046				S	31.9		32.4		32.9		33.2		33.5		33.6	
CW40046L				AP	30.2		30.9		31.4		31.7		31.9		32.0	
CW40047				AP	35.1		35.8		36.3		36.7		36.9		37.1	
CW40050S	CAHOON ROAD	LOCAL	43.7	S	35.3		36.2		36.9		37.4		37.8		38.1	
CW40055				S	42.0		42.6		43.0		43.3		43.5		43.6	
CW40057				S	42.8		43.5		44.0		44.3		44.5		44.6	
CW40060S	RAMONA BOULEVARD	LOCAL	53.9	S	43.5		45.0		46.6		47.9		48.7		50.1	
CW40065				S	43.6		45.1		46.7		47.9		48.7		50.1	
CW40070S	I 10 EXPRESSWAY	ARTERIAL	59.0	S	46.4		48.8		52.9		56.0		58.4		59.3	0.3
CW40075				S	51.5		52.5		53.1		53.7		54.1		54.5	
CW40080S	RAMONA BOULEVARD	LOCAL	60.8	S	53.3		55.6		57.0		59.6		61.4	0.6	61.7	0.9
CW40087				S	58.3		59.1		59.5		59.9		61.2		61.9	
CW40090S	HAMMOND BOULEVARD	LOCAL	63.6	S	64.0	0.4	64.3	0.7	64.5	0.9	64.6	1.0	64.7	1.1	64.8	1.2
CW40093				S	64.0		64.5		64.7		64.9		65.1		65.2	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

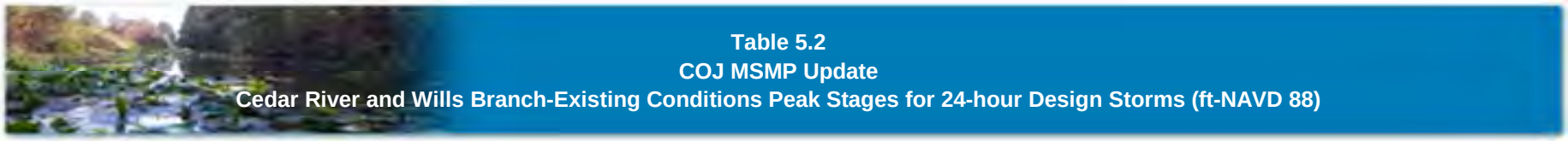


Table 5.2
COJ MSMP Update
Cedar River and Wills Branch-Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
CW40095				S	64.5		65.1		65.6		65.9		66.2		66.5	
CW40096L				S	67.2		67.6		67.9		68.3		68.5		68.8	
CW40096S				S	67.0		67.2		67.4		67.5		67.6		67.6	
CW40097				S	69.9		70.4		70.8		71.2		71.5		71.9	
CW40097L				S	67.2		67.6		68.0		68.3		68.6		68.9	
CW40098				S	72.3		73.4		74.5		75.5		76.1		75.8	
CW40099S				S	78.6		78.9		79.1		79.3		79.5		79.5	
CW40100AP				AP	78.6		78.8		79.0		79.7		80.2		80.5	
CW41002				S	4.3		5.9		6.9		7.9		8.7		9.3	
CW41003				S	5.3		6.6		7.4		8.4		9.1		9.6	
CW41004				S	5.4		6.7		7.5		8.5		9.2		9.7	
CW41005S	MT VERNON DRIVE	LOCAL	10.4	S	5.7		7.9		9.9		11.3	0.9	11.8	1.4	12.1	1.7
CW41007				S	6.0		8.1		10.0		11.4		11.9		12.3	
CW41008				S	7.3		9.3		10.6		11.8		12.4		12.8	
CW41010S	OLD MIDDLEBURG ROAD	LOCAL	16.3	S	7.8		10.2		12.3		14.8		16.8	0.4	17.4	1.1
CW41015				S	11.2		12.1		12.7		14.8		16.8		17.4	
CW41020S	HERLONG ROAD	LOCAL	17.5	S	18.6	1.1	19.0	1.5	19.3	1.8	19.5	2.0	19.7	2.2	19.8	2.3
CW41027				S	21.5		22.6		23.4		24.0		24.6		24.9	
CW41030S	I 295 EXPRESSWAY	ARTERIAL	32.0	S	22.4		24.7		27.6		31.0		32.9	0.9	33.3	1.3
CW41031				S	22.9		24.9		27.7		31.0		32.9		33.3	
CW41033S	VALLEY CROSSING DRIVE	LOCAL	30.0	S	31.0	1.0	31.8	1.8	32.4	2.4	32.9	2.9	33.2	3.2	33.5	3.5
CW41035				S	31.0		32.0		32.7		33.4		33.8		34.0	
CW41036				S	31.1		32.1		32.9		33.5		34.1		34.2	
CW41037				S	46.6		47.5		48.2		48.6		48.9		46.6	
CW41037L				S	31.9		32.2		33.0		33.6		34.1		34.3	
CW41038				S	53.6		53.9		54.1		54.5		54.8		54.9	
CW41040S	WILSON BOULEVARD	LOCAL	58.4	S	54.4		54.9		55.5		57.0		58.3		58.7	0.3
CW41047				S	57.2		57.5		57.7		58.2		58.5		58.8	
CW41050S	OLD MIDDLEBURG ROAD	LOCAL	62.3	S	57.5		57.9		58.4		59.2		59.8		60.1	
CW41055				S	59.2		59.4		59.7		60.2		60.6		60.8	
CW41057				S	61.3		61.7		62.2		63.0		63.5		63.7	
CW41060S	FRANK H PETERSON ACADEMY AC	LOCAL	64.0	S	61.7		62.5		63.3		63.6		63.7		63.8	
CW41070AP				AP	62.2		62.5		63.3		63.6		63.7		63.8	
CW42003				S	33.0		33.8		34.4		34.8		35.1		35.2	
CW42005S	FOURAKER ROAD	LOCAL	39.8	S	38.2		40.6	0.8	41.2	1.4	41.5	1.7	41.7	1.9	41.7	1.9
CW42006				S	38.5		40.8		41.5		42.0		42.3		42.4	
CW42007				S	41.7		43.6		45.2		45.8		46.3		46.2	

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Table 5.2
COJ MSMP Update
Cedar River and Wills Branch-Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
CW43002				S	20.7		21.7		22.4		23.0		23.5		24.0	
CW43003				S	22.8		23.6		24.0		24.6		25.1		25.5	
CW43005S	FOURAKER ROAD	LOCAL	27.5	S	27.9	0.4	28.2	0.7	28.4	0.9	28.7	1.2	28.9	1.4	29.0	1.5
CW43007				S	28.0		28.3		28.5		28.8		29.1		29.3	
CW43008				S	30.0		30.8		31.4		31.9		32.3		32.6	
CW43010S	COUNTRY CREEK BOULEVARD	LOCAL	33.6	S	30.2		31.0		31.8		32.6		33.3		34.2	0.5
CW43015				S	33.3		34.0		34.7		35.3		35.8		36.3	
CW43016				S	34.6		35.6		36.1		36.7		37.1		37.3	
CW43017				S	35.5		36.4		36.9		37.4		37.8		38.1	
CW43020S	COUNTRY CREEK BOULEVARD	LOCAL	40.7	S	35.5		36.5		37.0		37.6		38.1		38.4	
CW43025				S	40.1		41.0		41.1		41.3		41.6		41.8	
CW43027				S	45.1		46.4		47.9		48.8		49.2		48.3	
CW43030S	HAMMOND BOULEVARD	LOCAL	49.0	S	45.1		46.5		48.0		49.0		49.5	0.5	48.6	
CW43033				S	45.4		46.7		48.1		49.1		49.6		48.9	
CW43035				S	47.2		47.9		48.5		49.4		49.9		49.5	
CW43037				S	60.0		61.2		61.6		61.7		61.7		61.6	
CW43040S				S	61.7		62.2		62.7		63.0		63.3		63.3	
CW43045				S	65.5		65.9		66.1		66.3		66.4		66.4	
CW43047				S	73.5		74.1		74.7		75.2		75.5		75.4	
CW43050S	CRYSTAL SPRINGS ROAD	LOCAL	75.9	S	74.7		76.0	0.0	76.4	0.5	76.5	0.6	76.6	0.7	76.6	0.7
CW43055				S	75.3		76.3		76.7		76.8		76.9		77.0	
CW43056				S	75.6		76.5		76.9		77.1		77.3		77.3	
CW43057S	EVENING STROLL LANE	LOCAL	80.8	S	75.8		76.6		77.1		77.3		77.5		77.6	
CW43059				S	76.4		77.0		77.4		77.6		77.8		78.8	
CW43060S	CHANDLER OAKS DRIVE	LOCAL	79.3	S	76.7		77.5		78.1		78.5		78.8		83.4	4.1
CW43063				S	77.0		77.8		78.2		78.6		78.9		79.1	
CW43065				S	77.0		77.8		78.3		78.7		78.9		79.1	
CW43066				S	77.1		77.9		78.3		78.7		78.9		79.1	
CW43067S	COXWELL ESTATES CT	LOCAL	80.5	S	77.5		78.5		79.1		79.6		79.9		80.2	
CW43068				S	77.6		78.5		79.1		79.6		79.9		80.2	
CW43070S	I 10 EXPRESSWAY	ARTERIAL	82.5	S	78.4		79.5		80.4		81.2		81.7		82.0	
CW44002S	ROCKPOND MEADOWS DRIVE	LOCAL	52.0	S	45.5		47.0		48.6		50.1		51.2		51.3	
CW44003				S	56.3		56.8		57.3		57.6		57.9		58.0	
CW44005S				S	56.3		56.8		57.3		57.7		57.9		58.1	
CW44007				S	61.0		61.3		61.6		61.9		62.0		62.1	
CW44008				S	63.1		63.9		64.5		65.0		65.2		65.2	
CW44010S	NORMANDY BOULEVARD	LOCAL	70.7	S	63.2		64.1		64.7		65.2		65.5		65.4	

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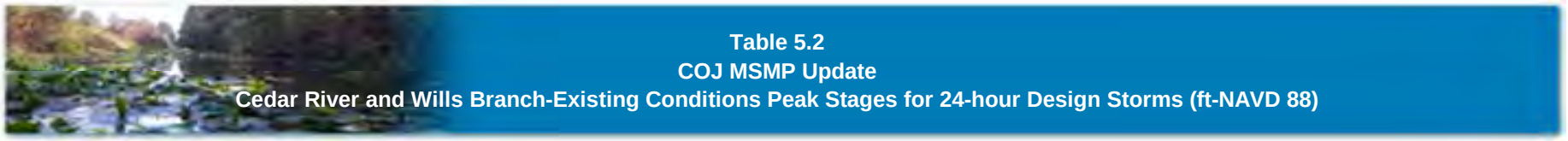

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					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
CW44015				S	67.2		67.6		68.0		68.3		68.5		68.5	
CW44017				S	69.7		70.1		70.5		70.9		71.0		71.0	
CW44020S	HERLONG ROAD	LOCAL	74.2	S	74.7	0.5	74.9	0.7	75.0	0.8	75.1	0.9	75.1	0.9	75.1	0.9
CW44023				S	74.7		74.9		75.0		75.2		75.2		75.3	
CW44025				S	75.2		75.7		76.2		76.6		76.9		77.0	
CW44030AP				AP	76.3		76.9		77.5		78.1		78.5		79.0	
CW45010				S	5.3		6.6		7.4		8.4		9.1		9.6	
CW45020S	HYDE GROVE AVENUE	LOCAL	15.2	S	6.9		7.6		8.3		8.9		9.6		10.3	
CW45030				S	23.0		23.6		24.5		24.8		25.1		25.2	
CW46010				S	22.0		22.9		23.4		23.7		24.0		23.9	
CW46020S	I 295 EXPRESSWAY	ARTERIAL	37.3	S	23.7		25.1		26.6		28.0		29.3		30.1	
CW46030				S	38.8		39.5		40.1		40.5		40.8		40.9	
CW46040S				S	42.9		44.3		46.0		47.6		49.3		49.8	
CW47010AP				AP	10.5		12.0		12.8		13.2		13.5		13.5	
CW50000				S	1.7		1.7		1.7		1.7		1.7		1.7	
CW50001				S	1.8		1.9		2.1		2.4		2.6		2.8	
CW50001L				S	1.8		1.8		1.9		2.1		2.2		2.4	
CW50002				S	1.9		2.1		2.5		2.9		3.2		3.5	
CW50002L				S	1.8		2.0		2.3		2.6		2.9		3.1	
CW50015S	SAN JUAN AVENUE	LOCAL	10.0	S	1.9		2.2		2.7		3.2		3.6		4.0	
CW50018				S	2.1		2.6		3.2		3.9		4.5		4.9	
CW50020				S	2.2		2.8		3.5		4.3		4.9		5.3	
CW50021				S	2.2		2.8		3.6		4.4		5.0		5.4	
CW50023				S	2.5		3.2		4.1		5.0		5.6		6.0	
CW50025				S	2.6		3.5		4.5		5.4		6.0		6.5	
CW50026				S	2.8		3.7		4.6		5.5		6.1		6.6	
CW50027				S	2.9		3.8		4.8		5.7		6.3		6.7	
CW50028				S	3.2		4.0		4.9		5.8		6.4		6.8	
CW50030S	LANE AVENUE	LOCAL	15.6	S	3.3		4.1		5.1		5.9		6.6		7.0	
CW50033				S	3.4		4.3		5.2		6.1		6.7		7.2	
CW50035				S	3.7		4.5		5.5		6.3		6.9		7.3	
CW50040S	LENOX AVENUE	LOCAL	9.5	S	3.8		4.6		5.6		6.4		7.0		7.5	
CW50045				S	3.9		4.7		5.6		6.5		7.1		7.5	
CW50047				S	4.5		5.3		6.1		6.9		7.5		7.9	
CW50048				S	4.7		5.5		6.5		7.2		7.8		8.2	
CW50050S	NORMANDY BOULEVARD	LOCAL	12.0	S	4.8		5.7		6.7		7.5		8.1		8.6	
CW50052				S	5.0		5.9		6.9		7.8		8.4		8.8	

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Cedar River and Wills Branch-Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
CW50053				S	5.4		6.4		7.3		8.1		8.7		9.1	
CW50055				S	5.9		6.9		7.8		8.6		9.2		9.5	
CW50058				S	5.9		6.9		7.8		8.6		9.2		9.5	
CW50060S	GRACE LANE	LOCAL	7.8	S	7.2		8.8	1.0	9.1	1.3	9.5	1.7	9.7	1.9	9.9	2.1
CW50063				S	7.5		9.0		9.3		9.7		9.9		10.1	
CW50065				S	7.7		9.1		9.5		9.8		10.1		10.2	
CW50070S	RAMONA BOULEVARD	LOCAL	9.6	S	7.7		9.3		9.6	0.0	10.1	0.5	10.3	0.7	10.4	0.8
CW50075				S	7.9		9.5		9.9		10.4		10.7		10.9	
CW50080S	E I10EXIT S LANE RP	LOCAL	13.8	S	8.0		9.8		10.2		10.9		11.3		11.6	
CW50090S	I 10 EXPRESSWAY	ARTERIAL	13.0	S	8.2		10.2		10.7		11.6		12.1		12.5	
CW50095				S	8.2		10.2		10.7		11.7		12.2		12.5	
CW50100S	W I10EXIT S LANE RP	LOCAL	13.2	S	8.4		10.7		11.3		12.5		13.1		13.6	0.4
CW50105				S	8.4		10.7		11.3		12.5		13.1		13.6	
CW50110S	STUART AVENUE	LOCAL	10.7	S	8.4		10.8	0.1	11.4	0.7	12.5	1.8	13.1	2.4	13.6	2.9
CW50115				S	8.5		10.8		11.5		12.5		13.2		13.6	
CW50120S	LANE AVENUE	LOCAL	12.0	S	8.6		11.2		11.9		13.0	1.0	13.4	1.4	13.8	1.8
CW50125				S	8.6		11.2		11.9		13.0		13.4		13.8	
CW50130S	HIGHWAY AVENUE	LOCAL	11.8	S	8.7		11.6		12.3	0.5	13.3	1.5	13.6	1.8	14.0	2.2
CW50135				S	9.5		13.1		13.3		13.8		14.4		14.8	
CW50140S	BEAVER STREET	ARTERIAL	15.9	S	10.1		13.7		13.9		14.6		15.3		15.7	
CW50142				S	15.1		15.4		15.1		15.4		15.7		16.0	
CW50143				S	15.1		15.4		15.2		15.5		15.8		16.0	
CW50144				S	15.3		16.0		16.3		16.6		16.9		17.0	
CW50145				S	16.3		16.8		17.2		17.4		17.5		17.6	
CW50150S	I 295 EXPRESSWAY	ARTERIAL	23.5	S	16.5		17.2		17.7		18.0		18.3		18.5	
CW50155				S	16.9		17.5		18.0		18.4		18.6		18.8	
CW50160S	PICKETTVILLE ROAD	LOCAL	24.0	S	17.0		17.8		18.5		19.0		19.4		19.6	
CW50165				S	17.3		18.1		18.7		19.2		19.5		19.7	
CW50170S				S	17.4		18.2		18.9		19.4		19.8		20.1	
CW50172				S	17.6		18.3		18.9		19.5		19.9		20.1	
CW50172L				S	18.1		18.5		19.1		19.6		19.9		20.2	
CW50173				S	18.3		18.8		19.3		19.8		20.1		20.3	
CW50174L				S	18.4		18.9		19.4		19.9		20.2		20.4	
CW50174L2				S	19.0		19.4		19.8		20.2		20.4		20.6	
CW50175				S	19.2		19.6		20.0		20.3		20.5		20.7	
CW50190	WASSON AVENUE	LOCAL	44.0	S	47.8	3.8	48.1	4.1	48.3	4.3	48.5	4.5	48.6	4.6	48.8	4.8
CW50191S	BULLS BAY HIGHWAY	LOCAL	52.6	S	47.8		48.1		48.3		48.6		48.7		49.0	

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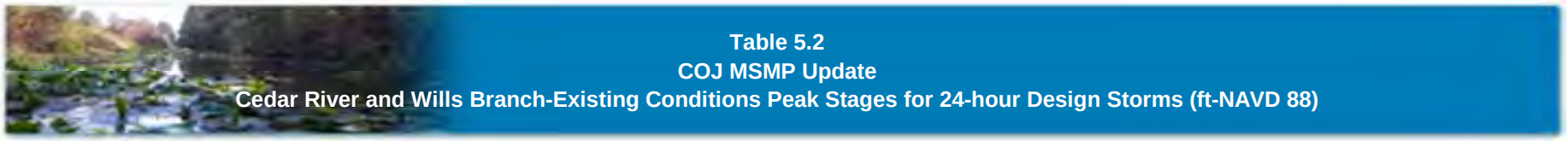

Table 5.2
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Cedar River and Wills Branch-Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
CW50199				S	55.6		56.0		56.3		56.7		56.9		56.9	
CW50200S				S	55.6		56.1		56.4		56.9		57.3		57.5	
CW50209				S	59.5		60.4		61.3		62.9		63.9		64.6	
CW50210S	OLD PLANK ROAD	LOCAL	65.9	S	59.9		60.8		61.8		63.6		65.1		66.0	0.1
CW50220				S	71.0		71.4		71.7		72.1		72.4		72.7	
CW50230				S	72.3		72.7		73.2		73.6		73.8		74.0	
CW50240S				S	72.5		73.1		73.6		73.8		73.9		74.0	
CW51010				S	2.2		2.8		3.5		4.3		4.9		5.3	
CW51020S	LAKE SHORE BOULEVARD	LOCAL	5.1	S	2.3		2.8		3.7		4.7		5.6	0.5	5.9	0.8
CW51030AP	1701-1 LAKE SHORE AP	LOCAL	10.0	AP	7.2		7.7		8.2		8.5		8.7		8.9	
CW52010				S	18.7		19.2		19.7		20.1		20.3		20.5	
CW52020S				S	20.6		21.4		22.1		22.8		23.3		23.7	
CW52030				S	22.6		23.2		23.8		24.3		24.7		24.9	
CW52040S	NORMANDY BOULEVARD	LOCAL	27.9	S	23.0		24.1		25.7		27.6		28.7	0.8	28.9	1.0
CW53010				S	7.3		7.7		8.0		8.2		8.3		8.4	
CW53020S	LANE AVENUE	LOCAL	14.7	S	8.7		9.5		10.2		10.7		11.0		11.2	
CW53030AP				AP	13.0		13.0		13.0		13.0		13.0		13.0	
CW54001S	STUART AVENUE	LOCAL	11.2	S	8.4		10.7		11.3	0.1	12.5	1.3	13.1	1.9	13.6	2.4
CW54002				S	8.5		10.7		11.3		12.5		13.1		13.6	
CW54003				S	8.5		10.7		11.3		12.5		13.1		13.6	
CW54004S				S	10.4		12.5		13.1		14.0		14.4		14.8	
CW54005S				S	13.7		15.1		15.7		16.1		16.4		16.6	
CW54006				S	13.7		15.1		15.7		16.1		16.4		16.6	
CW54007				S	13.7		15.1		15.7		16.1		16.4		16.6	
CW54010S	HIGHWAY AVENUE	LOCAL	14.5	S	13.7		15.1	0.6	15.7	1.2	16.1	1.6	16.4	1.9	16.6	2.1
CW54015				S	13.8		15.1		15.7		16.1		16.4		16.6	
CW54030S	BEAVER STREET	ARTERIAL	15.6	S	13.8		15.1		15.7	0.1	16.1	0.5	16.4	0.8	16.6	1.0
CW54032				S	13.8		15.1		15.7		16.1		16.4		16.6	
CW54035				S	13.8		15.2		15.7		16.1		16.4		16.6	
CW54040S				S	13.8		15.2		15.7		16.2		16.4		16.6	
CW54042				S	14.1		15.2		15.8		16.2		16.5		16.7	
CW54045				S	14.8		15.3		15.8		16.3		16.5		16.7	
CW54050S				S	14.8		15.3		15.9		16.3		16.6		16.8	
CW54060				S	15.9		16.4		16.7		16.9		17.1		17.2	
CW54070S				S	16.2		16.6		17.0		17.8		18.2		18.4	
CW54075				S	16.2		16.6		17.0		18.4		18.4		18.6	
CW54080S				S	16.5		17.0		17.5		18.6		19.0		19.2	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

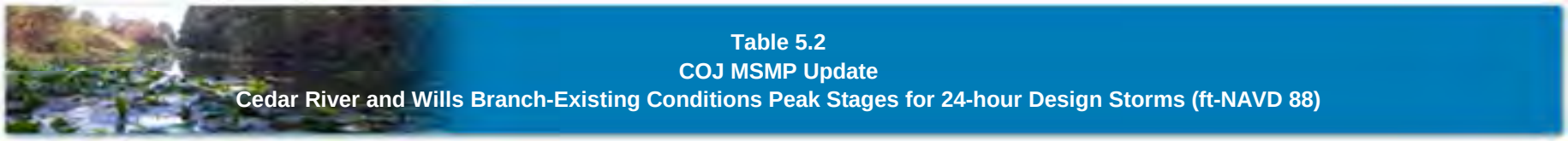

Table 5.2
COJ MSMP Update
Cedar River and Wills Branch-Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
CW54085				S	16.5		17.0		17.5		18.6		19.0		19.2	
CW54090S	SCOTIA ROAD	LOCAL	19.3	S	17.6		18.3		19.5	0.2	20.0	0.7	20.1	0.8	20.2	0.9
CW54095				S	17.6		18.3		19.5		20.0		20.1		20.2	
CW54100S				S	18.8		19.4		19.8		20.1		20.3		20.3	
CW54105				S	18.8		19.4		19.8		20.1		20.3		20.4	
CW54110S				S	19.0		19.5		19.9		20.2		20.3		20.5	
CW54115				S	19.0		19.5		19.9		20.2		20.4		20.5	
CW54120S				S	19.0		19.5		19.9		20.2		20.4		20.5	
CW54125				S	19.0		19.5		19.9		20.2		20.4		20.5	
CW54130S				S	19.0		19.6		19.9		20.2		20.4		20.5	
CW54135				S	19.0		19.6		19.9		20.2		20.4		20.5	
CW54140S	EDGEWOOD AVENUE	LOCAL	19.0	S	19.1	0.1	19.6	0.6	19.9	0.9	20.2	1.2	20.4	1.4	20.5	1.5
CW55002				S	13.7		15.1		15.7		16.1		16.4		16.6	
CW55003				S	13.7		15.1		15.7		16.1		16.4		16.6	
CW55005S				S	14.8		16.6		17.0		17.2		17.3		17.3	
CW55007				S	15.1		16.8		17.3		17.5		17.7		17.7	
CW55010S	ELLIS ROAD	LOCAL	22.9	S	15.4		17.4		18.2		18.8		19.2		19.4	
CW55012AP	STEVENS STREET	LOCAL	25.0	AP	16.0		17.7		18.5		19.1		19.5		19.7	
CW55013AP				AP	18.3		19.1		19.8		20.2		20.5		20.7	
CW55014AP				AP	18.4		19.2		19.9		20.4		20.7		20.9	
CW55015AP				AP	18.9		19.8		20.4		20.9		21.2		21.3	
CW55020APS	CASSAT AVENUE	ARTERIAL	19.0	AP	19.3	0.3	19.9	0.9	20.5	1.5	20.9	1.9	21.2	2.2	21.3	2.3
CW55025AP				AP	19.3		19.9		20.5		20.9		21.2		21.3	
CW56010AP				AP	21.3		21.6		21.9		22.1		22.2		22.3	
CW57005				S	15.0		15.0		15.0		15.0		15.0		15.0	
CW57020S	OLD PLANK ROAD	LOCAL	22.8	S	18.7		19.0		19.1		19.3		19.5		19.7	
CW57030				S	22.0		22.0		21.7		21.7		21.7		21.8	
CW57040S	BEAVER STREET	ARTERIAL	28.4	S	22.4		23.5		23.9		24.3		24.5		24.8	
CW57050				S	22.7		23.5		23.9		24.3		24.5		24.8	
CW57060S				S	23.3		23.7		24.0		24.3		24.6		24.8	
CW57070AP	CHASE BOULEVARD	LOCAL	23.0	AP	23.3	0.3	23.7	0.7	24.0	1.0	24.3	1.3	24.6	1.6	24.8	1.8
CW57080AP	S I295EXIT W I10 RP	LOCAL	32.0	AP	24.1		24.5		24.9		25.3		25.6		25.8	
CW57090AP	E I10EXIT S I295 RP	LOCAL	32.0	AP	25.2		25.6		26.0		26.3		26.6		26.8	
CW58005				S	6.7		7.5		8.8		9.8		10.2		10.1	
CW58010S	GRACE TERRACE	LOCAL	10.2	S	9.2		10.9	0.7	11.5	1.3	11.8	1.6	12.0	1.8	11.9	1.7
CW58015				S	9.2		10.9		11.5		11.8		12.0		11.9	
CW59010AP				AP	14.1		15.2		15.8		16.2		16.5		16.7	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Figure 5.4
Cedar River and Wills Branch Subbasin
Alternative 1

CDM

Table 5.4
COJ MSMP Update
Cedar River and Wills Branch -Alternative Conceptual Cost Evaluation

ALTERNATIVE 1A

Item	Units		Unit Cost	Quantity		Total Cost
Captial Costs						
1. Culverts/Bridges	LF	$	283,000	0	$	-
2. Weirs/Outlet Structures	LS	$	50,000	1	$	50,000
3. Pump Station	LS	$	-	0	$	-
4. Channel Lining [1]	LF	$	200	0	$	-
5. Excavation/Earth Work	CY	$	8	11,000	$	88,000
6. Land Acquisition	ACRE	$	50,000	1	$	50,000
7. Wetlands Creation [2]	ACRE	$	50,000	1	$	150,000
8. Sod at Pond Sites/Channel Banks	SY	$	3	2,000	$	6,000
9. Baffle Box	LS	$	100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$	8	0	$	-
Subtotal 1 - Capital Costs [3]					$	344,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)					$	51,600
Subtotal 2 (Subtotal 1 + 15% Design Fees)					$	395,600
Contingency (30% of Subtotal 2)					$	118,680
Subtotal 3 - (Subtotal 2 + 30% Contingency)					$	514,280
Operations & Maintenance [4]						
11. Crossing Upgrade	LS	$	14,000	0	$	-
12. Pump Station	LS	$	-	0	$	-
13. Channel Lining	LF/YR	$	30	0	$	-
14. Stormwater Facility - Mowing	ACRE/YR	$	1,300	1	$	1,300
15. Stormwater Facility - Spraying	ACRE/YR	$	400	1	$	400
16. Stormwater Facility - Dredging and Structure Repair	LS	$	62,000	1	$	62,000
17. Baffle Box	LS	$	2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$	100	0	$	-
Subtotal 4 - Total Operations & Maintenance Cost					$	63,700
Total Cost (Subtotal 3 + Subtotal 4) [5] [6]					**$**	**578,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Table 5.5
COJ MSMP Update
Cedar River and Wills Branch -Alternative Conceptual Cost Evaluation

ALTERNATIVE 1B

Item	Units	Unit Cost	Quantity	Total Cost
Captial Costs				
1. Culverts/Bridges	LF	$ 3,000	0	$ -
2. Weirs/Outlet Structures	LS	$ 50,000	1	$ 50,000
3. Pump Station	LS	$ -	0	$ -
4. Channel Lining [1]	LF	$ 200	0	$ -
5. Excavation/Earth Work	CY	$ 8	11,000	$ 88,000
6. Land Acquisition	ACRE	$ 50,000	1	$ 50,000
7. Wetlands Creation [2]	ACRE	$ 50,000	1	$ 150,000
8. Sod at Pond Sites/Channel Banks	SY	$ 3	2,000	$ 6,000
9. Baffle Box	LS	$ 100,000	0	$ -
10. Managed Aquatic Plant Systems	SF	$ 8	900	$ 7,200
Subtotal 1 - Capital Costs [3]				$ 351,200
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$ 52,680
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$ 403,880
Contingency (30% of Subtotal 2)				$ 121,164
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$ 525,044
Operations & Maintenance [4]				
11. Crossing Upgrade	LS	$ 14,000	0	$ -
12. Pump Station	LS	$ -	0	$ -
13. Channel Lining	LF/YR	$ 30	0	$ -
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	1	$ 1,300
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	1	$ 400
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	1	$ 62,000
17. Baffle Box	LS	$ 2,000	0	$ -
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	900	$ 90,000
Subtotal 4 - Total Operations & Maintenance Cost				$ 153,700
Total Cost (Subtotal 3 + Subtotal 4) [5] [6]				**$ 679,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Legend

- MSMP Nodes
- MSMP Conduits
- Major Roads
- Alternative 2

N

0 500 1,000 Feet

Figure 5.5
Cedar River and Wills Branch Subbasin
Alternative 2

CDM

Table 5.7
COJ MSMP Update
Cedar River and Wills Branch-Alternative 2 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40005S	LANE AVENUE	LOCAL	12.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40007L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40008				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40008L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40010S	OLD MIDDLEBURG ROAD	LOCAL	18.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40012				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40013				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40030S	N I295EXIT NORM RP	LOCAL	23.4	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40035				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40036				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40037				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40038				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40040S	LENOX AVENUE	LOCAL	22.5	S	0.0		0.0	0.3	0.0	1.2	0.0	1.7	0.0	2.0	0.0	2.2
CW40043				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40045				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40046				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40046L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40050S	CAHOON ROAD	LOCAL	43.7	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40060S	RAMONA BOULEVARD	LOCAL	53.9	S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40065				S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40070S	I 10 EXPRESSWAY	ARTERIAL	59.0	S	0.0		0.0		0.0		0.0		0.0		0.0	0.3
CW40075				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40080S	RAMONA BOULEVARD	LOCAL	60.8	S	0.0		0.0		0.0		0.0		0.0	0.6	0.0	0.9
CW40087				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40090S	HAMMOND BOULEVARD	LOCAL	63.6	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.0	0.0	1.1	0.0	1.2
CW40093				S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.7
COJ MSMP Update
Cedar River and Wills Branch-Alternative 2 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40097				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40097L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40098				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW40099S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40100AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW41002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41004				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41005S	MT VERNON DRIVE	LOCAL	10.4	S	0.0		0.0		0.0		0.0	0.9	0.0	1.4	0.1	1.7
CW41007				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41008				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41010S	OLD MIDDLEBURG ROAD	LOCAL	16.3	S	0.0		0.0		0.0		0.0		0.0	0.4	0.0	1.1
CW41015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41020S	HERLONG ROAD	LOCAL	17.5	S	0.0	1.1	0.0	1.5	0.0	1.8	0.0	2.0	0.0	2.2	0.1	2.4
CW41027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41030S	I 295 EXPRESSWAY	ARTERIAL	32.0	S	0.0		0.0		0.0		0.0		0.0	0.9	0.0	1.3
CW41031				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41033S	VALLEY CROSSING DRIVE	LOCAL	30.0	S	0.0	1.0	0.0	1.8	0.0	2.4	0.0	2.9	0.0	3.2	0.0	3.5
CW41035				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41036				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41037				S	0.0		0.0		0.0		0.0		0.0		2.3	
CW41037L				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41038				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41040S	WILSON BOULEVARD	LOCAL	58.4	S	0.0		0.0		0.0		0.0		0.0		0.0	0.2
CW41047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41050S	OLD MIDDLEBURG ROAD	LOCAL	62.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41060S	FRANK H PETERSON ACADEMY AC	LOCAL	64.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41070AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW42003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42005S	FOURAKER ROAD	LOCAL	39.8	S	0.0		0.0	0.8	0.0	1.4	0.0	1.7	0.0	1.9	0.1	2.0
CW42006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42007				S	0.0		0.0		0.0		0.0		0.0		0.2	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.7
COJ MSMP Update
Cedar River and Wills Branch-Alternative 2 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW43002				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43003				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43005S	FOURAKER ROAD	LOCAL	27.5	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW43007				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43008				S	0.0		0.0		0.0		0.0		0.0		-0.2	
CW43010S	COUNTRY CREEK BOULEVARD	LOCAL	33.6	S	0.0		0.0		0.0		0.0		0.0		-0.3	0.3
CW43015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43016				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43017				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43020S	COUNTRY CREEK BOULEVARD	LOCAL	40.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43027				S	0.0		0.0		0.0		0.0		0.0		1.1	
CW43030S	HAMMOND BOULEVARD	LOCAL	49.0	S	0.0		0.0		0.0		0.0		0.0	0.5	1.1	0.7
CW43033				S	0.0		0.0		0.0		0.0		0.0		1.0	
CW43035				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW43037				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43040S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43047				S	0.0		0.0		0.0		0.0		0.0		0.4	
CW43050S	CRYSTAL SPRINGS ROAD	LOCAL	75.9	S	0.0		0.0	0.0	0.0	0.5	0.0	0.6	0.0	0.7	0.1	0.8
CW43055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43056				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43057S	EVENING STROLL LANE	LOCAL	80.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43059				S	0.0		0.0		0.0		0.0		0.0		-0.9	
CW43060S	CHANDLER OAKS DRIVE	LOCAL	79.3	S	0.0		0.0		0.0		0.0		0.0		-4.4	
CW43063				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43065				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43066				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43067S	COXWELL ESTATES CT	LOCAL	80.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43068				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43070S	I 10 EXPRESSWAY	ARTERIAL	82.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44002S	ROCKPOND MEADOWS DRIVE	LOCAL	52.0	S	0.0		0.0		0.0		0.0		0.0		0.8	0.1
CW44003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44008				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW44010S	NORMANDY BOULEVARD	LOCAL	70.7	S	0.0		0.0		0.0		0.0		0.0		0.1	

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Table 5.7
COJ MSMP Update
Cedar River and Wills Branch-Alternative 2 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW44015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44017				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44020S	HERLONG ROAD	LOCAL	74.2	S	0.0	0.5	0.0	0.7	0.0	0.8	0.0	0.9	0.0	0.9	0.0	0.9
CW44023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW45010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45020S	HYDE GROVE AVENUE	LOCAL	15.2	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46010				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW46020S	I 295 EXPRESSWAY	ARTERIAL	37.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46040S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW47010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW50000				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50015S	SAN JUAN AVENUE	LOCAL	10.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50018				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50020				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50021				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50026				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50028				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50030S	LANE AVENUE	LOCAL	15.6	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50033				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50035				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW50040S	LENOX AVENUE	LOCAL	9.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50047				S	-0.1		-0.1		0.0		0.0		0.0		-0.1	
CW50048				S	-0.1		-0.1		0.0		0.0		0.0		-0.1	
CW50050S	NORMANDY BOULEVARD	LOCAL	12.0	S	-0.1		0.0		-0.1		0.0		0.0		-0.1	
CW50052				S	-0.1		0.0		-0.1		0.0		0.0		-0.1	

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					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50053				S	-0.1		0.0		-0.1		0.0		0.0		0.0	
CW50055				S	-0.1		0.0		-0.1		0.0		0.0		0.0	
CW50058				S	-0.1		0.0		-0.1		0.0		0.0		0.0	
CW50060S	GRACE LANE	LOCAL	7.8	S	-0.2		0.0	1.0	0.0	1.3	0.0	1.7	0.0	1.9	0.0	2.0
CW50063				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW50065				S	-0.1		0.0		0.0		-0.1		0.0		0.0	
CW50070S	RAMONA BOULEVARD	LOCAL	9.6	S	-0.1		0.0		-0.1		-0.1	0.4	-0.1	0.6	0.0	0.8
CW50075				S	-0.1		0.0		-0.1		-0.1		-0.1		-0.1	
CW50080S	E I10EXIT S LANE RP	LOCAL	13.8	S	-0.1		0.0		-0.1		-0.1		-0.1		-0.1	
CW50090S	I 10 EXPRESSWAY	ARTERIAL	13.0	S	-0.2		0.0		-0.1		-0.2		-0.2		-0.1	
CW50095				S	-0.2		0.0		-0.1		-0.2		-0.2		-0.1	
CW50100S	W I10EXIT S LANE RP	LOCAL	13.2	S	-0.2		0.0		-0.2		-0.2		-0.2		-0.1	0.2
CW50105				S	-0.2		0.0		-0.2		-0.2		-0.2		-0.1	
CW50110S	STUART AVENUE	LOCAL	10.7	S	-0.2		0.0	0.1	-0.2	0.5	-0.2	1.6	-0.2	2.2	-0.1	2.8
CW50115				S	-0.2		0.0		-0.2		-0.2		-0.2		-0.1	
CW50120S	LANE AVENUE	LOCAL	12.0	S	-0.2		0.0		-0.2		-0.1	0.9	-0.1	1.3	-0.1	1.7
CW50125				S	-0.2		0.0		-0.2		-0.1		-0.1		-0.1	
CW50130S	HIGHWAY AVENUE	LOCAL	11.8	S	-0.2		0.1		-0.2	0.3	-0.1	1.4	-0.1	1.7	-0.2	2.1
CW50135				S	-0.1		0.1		-0.1		0.0		-0.1		-0.1	
CW50140S	BEAVER STREET	ARTERIAL	15.9	S	-0.1		0.2		-0.1		0.0		-0.1		-0.1	
CW50142				S	0.0		0.2		0.0		0.0		0.0		0.0	
CW50143				S	0.0		0.1		0.0		0.0		0.0		0.0	
CW50144				S	0.0		0.1		0.0		0.0		0.0		0.0	
CW50145				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50150S	I 295 EXPRESSWAY	ARTERIAL	23.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50155				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50160S	PICKETTVILLE ROAD	LOCAL	24.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50165				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50170S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50173				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50175				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50190	WASSON AVENUE	LOCAL	44.0	S	0.0	3.8	0.0	4.1	0.0	4.3	0.0	4.5	0.0	4.6	0.0	4.8
CW50191S	BULLS BAY HIGHWAY	LOCAL	52.6	S	0.0		0.0		0.0		0.0		0.0		0.0	

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					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50199				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW50200S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW50209				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50210S	OLD PLANK ROAD	LOCAL	65.9	S	0.0		0.0		0.0		0.0		0.0		0.0	0.1
CW50220				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50230				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50240S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51020S	LAKE SHORE BOULEVARD	LOCAL	5.1	S	0.0		0.0		0.0		0.0		0.0	0.5	0.0	0.8
CW51030AP	1701-1 LAKE SHORE AP	LOCAL	10.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW52010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52020S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52040S	NORMANDY BOULEVARD	LOCAL	27.9	S	0.0		0.0		0.0		0.0		0.0	0.8	0.0	1.0
CW53010				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW53020S	LANE AVENUE	LOCAL	14.7	S	0.0		0.0		0.0		0.0		0.0		0.1	
CW53030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW54001S	STUART AVENUE	LOCAL	11.2	S	-0.2		0.0		-0.2		-0.2	1.0	-0.2	1.7	-0.2	2.3
CW54002				S	-0.2		0.0		-0.2		-0.2		-0.2		-0.1	
CW54003				S	-0.2		0.0		-0.2		-0.2		-0.2		-0.1	
CW54004S				S	-0.5		-0.2		-0.2		-0.2		-0.2		-0.1	
CW54005S				S	-0.8		-0.4		-0.2		-0.2		-0.1		-0.1	
CW54006				S	-0.8		-0.4		-0.2		-0.2		-0.1		-0.1	
CW54007				S	-0.8		-0.4		-0.2		-0.2		-0.1		-0.1	
CW54010S	HIGHWAY AVENUE	LOCAL	14.5	S	-0.8		-0.4	0.2	-0.2	1.0	-0.2	1.4	-0.1	1.7	-0.1	1.9
CW54015				S	-0.8		-0.4		-0.2		-0.2		-0.1		-0.1	
CW54030S	BEAVER STREET	ARTERIAL	15.6	S	-0.8		-0.4		-0.2		-0.2	0.4	-0.2	0.6	-0.1	0.9
CW54032				S	-0.8		-0.4		-0.2		-0.2		-0.1		-0.1	
CW54035				S	-0.8		-0.4		-0.2		-0.2		-0.1		-0.1	
CW54040S				S	-0.8		-0.4		-0.2		-0.2		-0.1		-0.1	
CW54042				S	-0.2		-0.4		-0.2		-0.2		-0.1		-0.1	
CW54045				S	0.0		-0.2		-0.2		-0.2		-0.1		-0.1	
CW54050S				S	0.0		-0.1		-0.2		-0.2		-0.2		-0.1	
CW54060				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54070S				S	0.0		0.0		0.0		-0.1		0.0		0.0	
CW54075				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54080S				S	0.0		0.0		-0.1		0.0		0.0		-0.1	

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					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW54085				S	0.0		0.0		-0.1		0.0		0.0		-0.1	
CW54090S	SCOTIA ROAD	LOCAL	19.3	S	0.0		0.0		0.0	0.2	0.0	0.6	0.0	0.8	0.0	0.9
CW54095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54100S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54105				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54110S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54115				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54120S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54125				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54130S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54135				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54140S	EDGEWOOD AVENUE	LOCAL	19.0	S	0.0	0.1	0.0	0.6	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW55002				S	-0.8		-0.4		-0.2		-0.2		-0.1		-0.1	
CW55003				S	-0.8		-0.4		-0.2		-0.2		-0.1		-0.1	
CW55005S				S	0.3		-0.1		-0.1		0.0		0.0		0.0	
CW55007				S	0.3		-0.1		0.0		0.0		0.0		0.0	
CW55010S	ELLIS ROAD	LOCAL	22.9	S	0.3		0.0		0.0		0.0		0.0		0.0	
CW55012AP	STEVENS STREET	LOCAL	25.0	AP	0.1		0.0		0.0		0.0		0.0		0.0	
CW55013AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55014AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55015AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55020APS	CASSAT AVENUE	ARTERIAL	19.0	AP	0.0	0.3	0.0	0.9	0.0	1.5	0.0	1.9	0.0	2.2	0.0	2.3
CW55025AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW56010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57005				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57020S	OLD PLANK ROAD	LOCAL	22.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57030				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW57040S	BEAVER STREET	ARTERIAL	28.4	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57050				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57060S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57070AP	CHASE BOULEVARD	LOCAL	23.0	AP	0.0	0.3	0.0	0.7	0.0	1.0	0.0	1.3	0.0	1.6	0.0	1.8
CW57080AP	S I295EXIT W I10 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57090AP	E I10EXIT S I295 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW58005				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW58010S	GRACE TERRACE	LOCAL	10.2	S	0.0		0.0	0.7	0.0	1.3	0.0	1.6	0.0	1.8	0.1	1.8
CW58015				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW59010AP				AP	-0.2		-0.4		-0.2		-0.2		-0.1		-0.1	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.8
COJ MSMP Update
Cedar River and Wills Branch -Alternative Conceptual Cost Evaluation

ALTERNATIVE 2A					
Item	**Units**	**Unit Cost**	**Quantity**		**Total Cost**
Captial Costs					
1. Culverts/Bridges	LF	$ 3,000	0	$	-
2. Weirs/Outlet Structures	LS	$ 50,000	2	$	100,000
3. Pump Station	LS	$ -	0	$	-
4. Channel Lining [1]	LF	$ 200	0	$	-
5. Excavation/Earth Work	CY	$ 8	135,000	$	1,080,000
6. Land Acquisition	ACRE	$ 50,000	9	$	450,000
7. Wetlands Creation [2]	ACRE	$ 50,000	4	$	600,000
8. Sod at Pond Sites/Channel Banks	SY	$ 3	18,000	$	54,000
9. Baffle Box	LS	$ 100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$ 8	0	$	-
Subtotal 1 - Capital Costs [3]				$	2,284,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$	342,600
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$	2,626,600
Contingency (30% of Subtotal 2)				$	787,980
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$	3,414,580
Operations & Maintenance [4]					
11. Crossing Upgrade	LS	$ 14,000	0	$	-
12. Pump Station	LS	$ -	0	$	-
13. Channel Lining	LF/YR	$ 30	0	$	-
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	9	$	11,700
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	9	$	3,600
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	9	$	558,000
17. Baffle Box	LS	$ 2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	0	$	-
Subtotal 4 - Total Operations & Maintenance Cost				$	573,300
Total Cost (Subtotal 3 + Subtotal 4) [5] [6]				**$**	**3,988,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Table 5.9
COJ MSMP Update
Cedar River and Wills Branch -Alternative Conceptual Cost Evaluation

ALTERNATIVE 2B					
Item	**Units**	**Unit Cost**	**Quantity**		**Total Cost**
Captial Costs					
1. Culverts/Bridges	LF	$ 3,000	0	$	-
2. Weirs/Outlet Structures	LS	$ 50,000	2	$	100,000
3. Pump Station	LS	$ -	0	$	-
4. Channel Lining (1)	LF	$ 200	0	$	-
5. Excavation/Earth Work	CY	$ 8	135,000	$	1,080,000
6. Land Acquisition	ACRE	$ 50,000	9	$	450,000
7. Wetlands Creation (2)	ACRE	$ 50,000	4	$	600,000
8. Sod at Pond Sites/Channel Banks	SY	$ 3	18,000	$	54,000
9. Baffle Box	LS	$ 100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$ 8	11,000	$	88,000
Subtotal 1 - Capital Costs (3)				$	2,372,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$	355,800
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$	2,727,800
Contingency (30% of Subtotal 2)				$	818,340
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$	3,546,140
Operations & Maintenance (4)					
11. Crossing Upgrade	LS	$ 14,000	0	$	-
12. Pump Station	LS	$ -	0	$	-
13. Channel Lining	LF/YR	$ 30	0	$	-
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	9	$	11,700
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	9	$	3,600
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	9	$	558,000
17. Baffle Box	LS	$ 2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	11,000	$	1,100,000
Subtotal 4 - Total Operations & Maintenance Cost				$	1,673,300
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)				**$**	**5,219,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

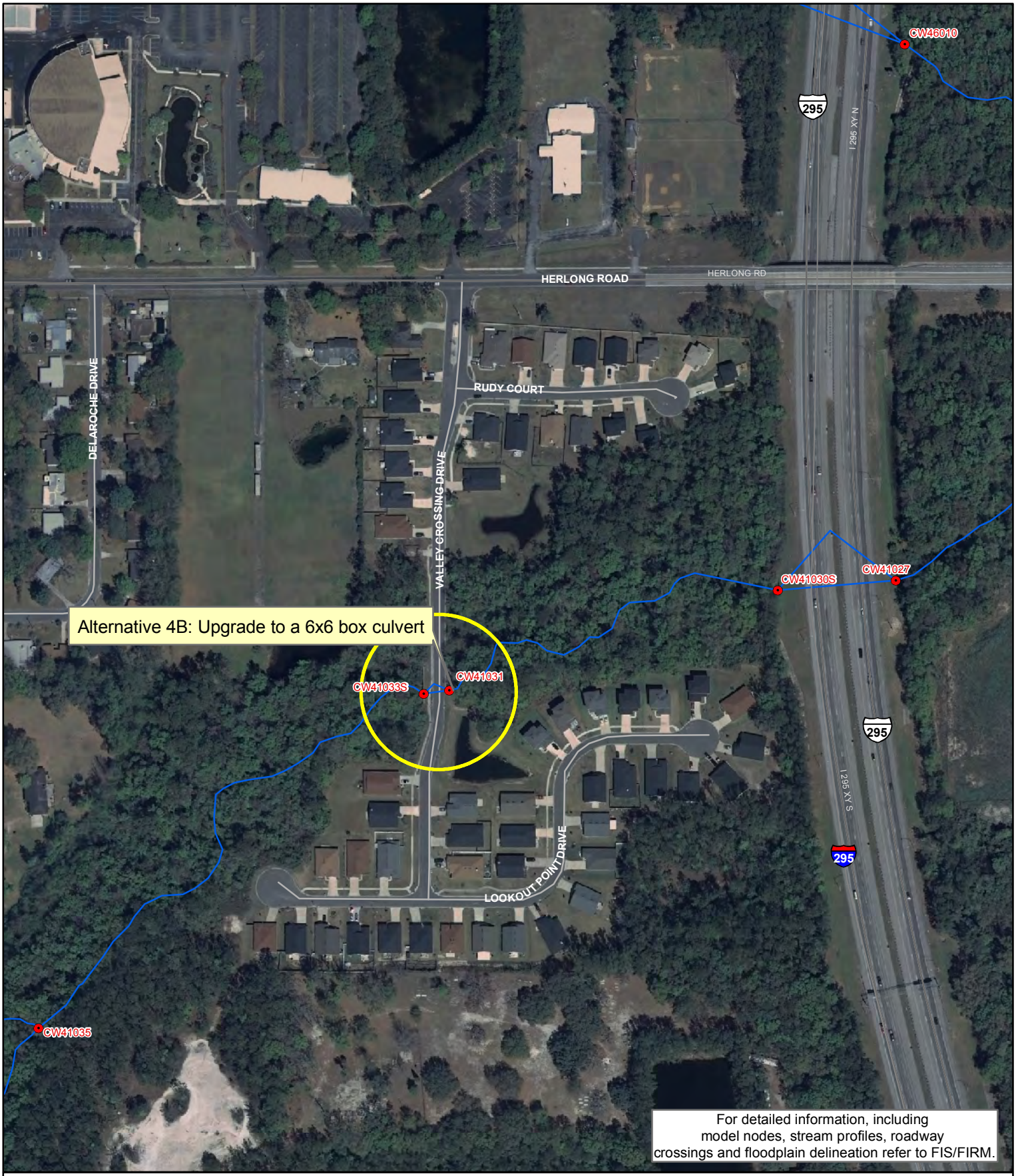
Figure 5.6
Cedar River and Wills Branch Subbasin
Alternative 3

CDM

Table 5.11
COJ MSMP Update
Cedar River and Wills Branch -Alternative Conceptual Cost Evaluation

ALTERNATIVE 3						
Item	**Units**		**Unit Cost**	**Quantity**		**Total Cost**
Captial Costs						
1. Culverts/Bridges	LF	$	3,000	0	$	-
2. Weirs/Outlet Structures	LS	$	50,000	0	$	-
3. Pump Station	LS	$	-	0	$	-
4. Channel Lining (1)	LF	$	200	0	$	-
5. Excavation/Earth Work	CY	$	8	0	$	-
6. Land Acquisition	ACRE	$	50,000	0	$	-
7. Wetlands Creation (2)	ACRE	$	50,000	0	$	-
8. Sod at Pond Sites/Channel Banks	SY	$	3	0	$	-
9. Baffle Box	LS	$	100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$	8	18,500	$	148,000
Subtotal 1 - Capital Costs (3)					$	148,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)					$	22,200
Subtotal 2 (Subtotal 1 + 15% Design Fees)					$	170,200
Contingency (30% of Subtotal 2)					$	51,060
Subtotal 3 - (Subtotal 2 + 30% Contingency)					$	221,260
Operations & Maintenance (4)						
11. Crossing Upgrade	LS	$	14,000	0	$	-
12. Pump Station	LS	$	-	0	$	-
13. Channel Lining	LF/YR	$	30	0	$	-
14. Stormwater Facility - Mowing	ACRE/YR	$	1,300	0	$	-
15. Stormwater Facility - Spraying	ACRE/YR	$	400	0	$	-
16. Stormwater Facility - Dredging and Structure Repair	LS	$	62,000	0	$	-
17. Baffle Box	LS	$	2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$	100	18,500	$	1,850,000
Subtotal 4 - Total Operations & Maintenance Cost					$	1,850,000
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)					**$**	**2,071,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.



Legend

- MSMP Nodes
- MSMP Conduits
- Major Roads

N

0 250 500 Feet

Figure 5.7
Cedar River and Wills Branch Subbasin
Alternative 4

CDM

Table 5.12
COJ MSMP Update
Cedar River and Wills Branch-Alternative 4B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40005S	LANE AVENUE	LOCAL	12.8	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40006				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40007				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40007L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40008				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40008L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40010S	OLD MIDDLEBURG ROAD	LOCAL	18.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40012				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40013				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40030S	N I295EXIT NORM RP	LOCAL	23.4	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40035				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40036				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40037				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40038				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40040S	LENOX AVENUE	LOCAL	22.5	S	0.0		0.0	0.3	0.0	1.2	0.0	1.7	0.0	2.0	0.0	2.2
CW40043				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40045				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40046				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40046L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40050S	CAHOON ROAD	LOCAL	43.7	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40060S	RAMONA BOULEVARD	LOCAL	53.9	S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40065				S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40070S	I 10 EXPRESSWAY	ARTERIAL	59.0	S	0.0		0.0		0.0		0.0		0.0		0.0	0.3
CW40075				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40080S	RAMONA BOULEVARD	LOCAL	60.8	S	0.0		0.0		0.0		0.0		0.0	0.6	0.0	0.9
CW40087				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40090S	HAMMOND BOULEVARD	LOCAL	63.6	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.0	0.0	1.1	0.0	1.2
CW40093				S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.12
COJ MSMP Update
Cedar River and Wills Branch-Alternative 4B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40097				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40097L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40098				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW40099S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40100AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW41002				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW41003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41004				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41005S	MT VERNON DRIVE	LOCAL	10.4	S	0.0		0.1		0.1		0.0	0.9	0.0	1.4	0.0	1.7
CW41007				S	0.0		0.1		0.1		0.0		0.0		0.0	
CW41008				S	0.0		0.1		0.1		0.0		0.0		0.0	
CW41010S	OLD MIDDLEBURG ROAD	LOCAL	16.3	S	0.0		0.2		0.1		0.0		-0.1	0.3	-0.1	1.0
CW41015				S	0.0		0.1		0.0		0.0		-0.1		0.0	
CW41020S	HERLONG ROAD	LOCAL	17.5	S	0.0	1.1	0.0	1.5	0.0	1.8	0.0	2.0	0.0	2.2	0.1	2.3
CW41027				S	0.0		0.1		0.0		0.0		0.0		0.0	
CW41030S	I 295 EXPRESSWAY	ARTERIAL	32.0	S	0.0		0.2		0.1		-0.1		-0.1	0.8	0.0	1.2
CW41031				S	0.0		0.2		0.1		-0.1		-0.1		0.0	
CW41033S	VALLEY CROSSING DRIVE	LOCAL	30.0	S	-0.4	0.6	-0.3	1.6	-0.2	2.2	-0.2	2.7	-0.1	3.1	-0.1	3.4
CW41035				S	-0.4		-0.2		-0.2		-0.1		-0.1		0.0	
CW41036				S	-0.3		-0.2		-0.1		-0.1		-0.1		0.0	
CW41037				S	0.0		0.0		0.0		0.0		0.0		2.4	
CW41037L				S	0.0		0.0		-0.1		-0.1		-0.1		0.0	
CW41038				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41040S	WILSON BOULEVARD	LOCAL	58.4	S	0.0		0.0		0.0		0.0		0.0		0.0	0.2
CW41047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41050S	OLD MIDDLEBURG ROAD	LOCAL	62.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41060S	FRANK H PETERSON ACADEMY AC	LOCAL	64.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41070AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW42003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42005S	FOURAKER ROAD	LOCAL	39.8	S	0.0		0.0	0.8	0.0	1.4	0.0	1.7	0.0	1.9	0.1	2.0
CW42006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42007				S	0.0		0.0		0.0		0.0		0.0		0.2	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.12
COJ MSMP Update
Cedar River and Wills Branch-Alternative 4B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW43002				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43003				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43005S	FOURAKER ROAD	LOCAL	27.5	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW43007				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43008				S	0.0		0.0		0.0		0.0		0.0		-0.2	
CW43010S	COUNTRY CREEK BOULEVARD	LOCAL	33.6	S	0.0		0.0		0.0		0.0		0.0		-0.3	0.3
CW43015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43016				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43017				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43020S	COUNTRY CREEK BOULEVARD	LOCAL	40.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43027				S	0.0		0.0		0.0		0.0		0.0		1.1	
CW43030S	HAMMOND BOULEVARD	LOCAL	49.0	S	0.0		0.0		0.0		0.0		0.0	0.5	1.1	0.7
CW43033				S	0.0		0.0		0.0		0.0		0.0		1.0	
CW43035				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW43037				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43040S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43047				S	0.0		0.0		0.0		0.0		0.0		0.4	
CW43050S	CRYSTAL SPRINGS ROAD	LOCAL	75.9	S	0.0		0.0	0.0	0.0	0.5	0.0	0.6	0.0	0.7	0.1	0.8
CW43055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43056				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43057S	EVENING STROLL LANE	LOCAL	80.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43059				S	0.0		0.0		0.0		0.0		0.0		-0.9	
CW43060S	CHANDLER OAKS DRIVE	LOCAL	79.3	S	0.0		0.0		0.0		0.0		0.0		-4.4	
CW43063				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43065				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43066				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43067S	COXWELL ESTATES CT	LOCAL	80.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43068				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43070S	I 10 EXPRESSWAY	ARTERIAL	82.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44002S	ROCKPOND MEADOWS DRIVE	LOCAL	52.0	S	0.0		0.0		0.0		0.0		0.0		0.8	0.1
CW44003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44008				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW44010S	NORMANDY BOULEVARD	LOCAL	70.7	S	0.0		0.0		0.0		0.0		0.0		0.1	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.12
COJ MSMP Update
Cedar River and Wills Branch-Alternative 4B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW44015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44017				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44020S	HERLONG ROAD	LOCAL	74.2	S	0.0	0.5	0.0	0.7	0.0	0.8	0.0	0.9	0.0	0.9	0.0	0.9
CW44023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW45010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45020S	HYDE GROVE AVENUE	LOCAL	15.2	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46010				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW46020S	I 295 EXPRESSWAY	ARTERIAL	37.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46040S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW47010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW50000				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50015S	SAN JUAN AVENUE	LOCAL	10.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50018				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50020				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50021				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50026				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50028				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50030S	LANE AVENUE	LOCAL	15.6	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50033				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50035				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50040S	LENOX AVENUE	LOCAL	9.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50048				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50050S	NORMANDY BOULEVARD	LOCAL	12.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50052				S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.12
COJ MSMP Update
Cedar River and Wills Branch-Alternative 4B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50053				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50058				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50060S	GRACE LANE	LOCAL	7.8	S	0.0		0.0	1.0	0.0	1.3	0.0	1.7	0.0	1.9	0.0	2.1
CW50063				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50065				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50070S	RAMONA BOULEVARD	LOCAL	9.6	S	0.0		0.0		0.0	0.0	0.0	0.5	0.0	0.7	0.0	0.8
CW50075				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50080S	E I10EXIT S LANE RP	LOCAL	13.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50090S	I 10 EXPRESSWAY	ARTERIAL	13.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50100S	W I10EXIT S LANE RP	LOCAL	13.2	S	0.0		0.0		0.0		0.0		0.0		0.0	0.4
CW50105				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50110S	STUART AVENUE	LOCAL	10.7	S	0.0		0.0	0.1	0.0	0.7	0.0	1.8	0.0	2.4	0.0	2.9
CW50115				S	0.0		0.0		-0.1		0.0		0.0		0.0	
CW50120S	LANE AVENUE	LOCAL	12.0	S	0.0		0.0		0.0		0.0	1.0	0.0	1.4	0.0	1.8
CW50125				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50130S	HIGHWAY AVENUE	LOCAL	11.8	S	0.0		0.0		0.0	0.4	0.0	1.5	0.0	1.8	0.0	2.2
CW50135				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50140S	BEAVER STREET	ARTERIAL	15.9	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50142				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50143				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50144				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50145				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50150S	I 295 EXPRESSWAY	ARTERIAL	23.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50155				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50160S	PICKETTVILLE ROAD	LOCAL	24.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50165				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50170S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50173				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50175				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50190	WASSON AVENUE	LOCAL	44.0	S	0.0	3.8	0.0	4.1	0.0	4.3	0.0	4.5	0.0	4.6	0.0	4.8
CW50191S	BULLS BAY HIGHWAY	LOCAL	52.6	S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.12
COJ MSMP Update
Cedar River and Wills Branch-Alternative 4B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50199				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW50200S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW50209				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50210S	OLD PLANK ROAD	LOCAL	65.9	S	0.0		0.0		0.0		0.0		0.0		0.0	0.1
CW50220				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50230				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50240S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51020S	LAKE SHORE BOULEVARD	LOCAL	5.1	S	0.0		0.0		0.0		0.0		0.0	0.5	0.0	0.8
CW51030AP	1701-1 LAKE SHORE AP	LOCAL	10.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW52010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52020S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52040S	NORMANDY BOULEVARD	LOCAL	27.9	S	0.0		0.0		0.0		0.0		0.0	0.8	0.0	1.0
CW53010				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW53020S	LANE AVENUE	LOCAL	14.7	S	0.0		0.0		0.0		0.0		0.0		0.1	
CW53030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW54001S	STUART AVENUE	LOCAL	11.2	S	0.0		0.0		0.0	0.1	0.0	1.3	0.0	1.9	0.0	2.4
CW54002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54004S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54010S	HIGHWAY AVENUE	LOCAL	14.5	S	0.0		0.0	0.6	0.0	1.2	0.0	1.6	0.0	1.9	0.0	2.1
CW54015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54030S	BEAVER STREET	ARTERIAL	15.6	S	0.0		0.0		0.0	0.1	0.0	0.5	0.0	0.8	0.0	1.0
CW54032				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54035				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54040S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54042				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54050S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54060				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54070S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54075				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54080S				S	0.0		0.0		0.0		0.0		0.0		-0.1	

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S = Survey.

Table 5.12
COJ MSMP Update
Cedar River and Wills Branch-Alternative 4B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

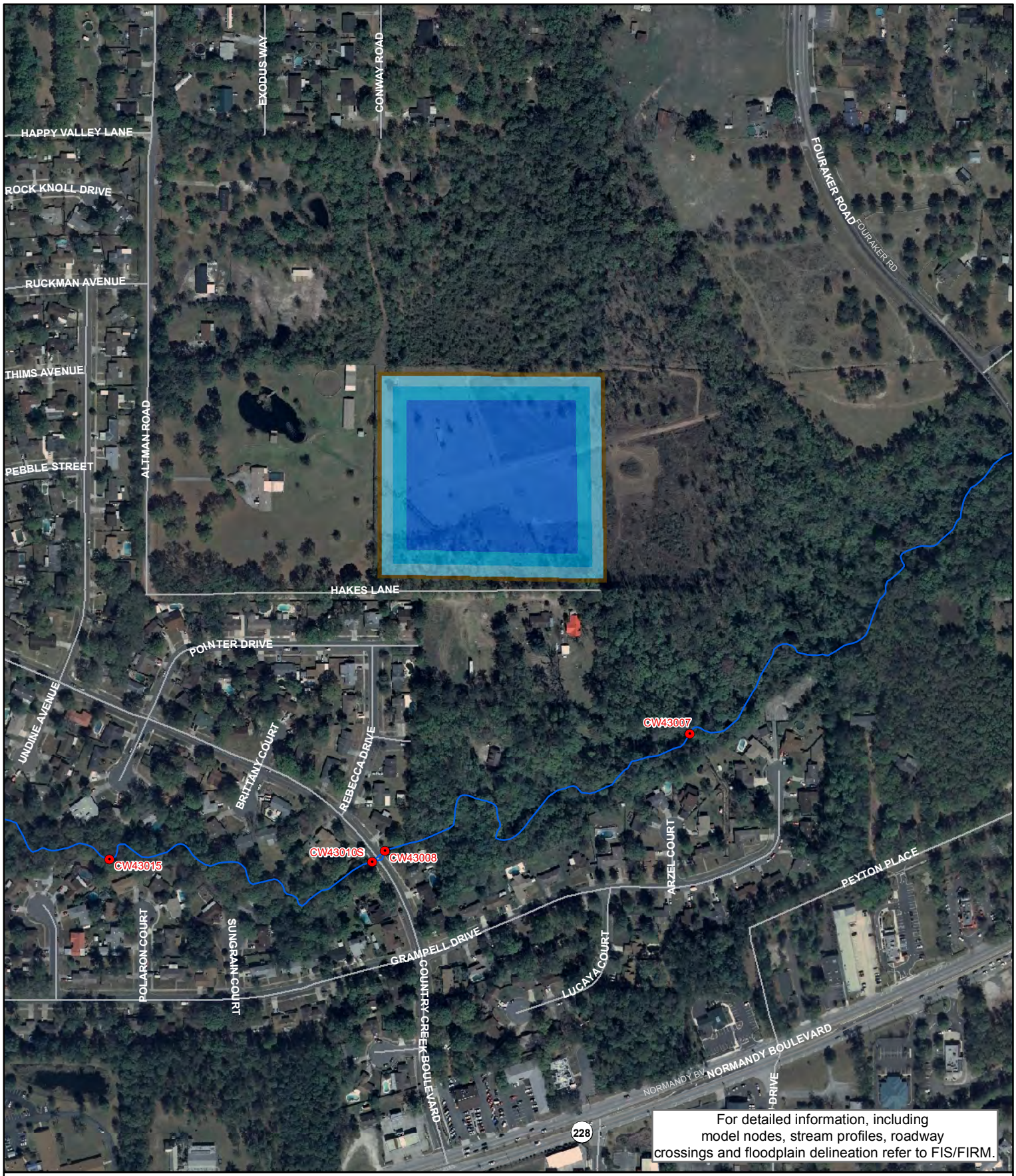
					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW54085				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54090S	SCOTIA ROAD	LOCAL	19.3	S	0.0		0.0		0.0	0.2	0.0	0.7	0.0	0.8	0.0	0.9
CW54095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54100S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54105				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54110S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54115				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54120S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54125				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54130S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54135				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54140S	EDGEWOOD AVENUE	LOCAL	19.0	S	0.0	0.1	0.0	0.6	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW55002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55010S	ELLIS ROAD	LOCAL	22.9	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55012AP	STEVENS STREET	LOCAL	25.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55013AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55014AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55015AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55020APS	CASSAT AVENUE	ARTERIAL	19.0	AP	0.0	0.3	0.0	0.9	0.0	1.5	0.0	1.9	0.0	2.2	0.0	2.3
CW55025AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW56010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57005				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57020S	OLD PLANK ROAD	LOCAL	22.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57030				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW57040S	BEAVER STREET	ARTERIAL	28.4	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57050				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57060S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57070AP	CHASE BOULEVARD	LOCAL	23.0	AP	0.0	0.3	0.0	0.7	0.0	1.0	0.0	1.3	0.0	1.6	0.0	1.8
CW57080AP	S I295EXIT W I10 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57090AP	E I10EXIT S I295 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW58005				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW58010S	GRACE TERRACE	LOCAL	10.2	S	0.0		0.0	0.7	0.0	1.3	0.0	1.6	0.0	1.8	0.1	1.8
CW58015				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW59010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.13
COJ MSMP Update
Cedar River and Wills Branch-Alternative Conceptual Cost Evaluation

ALTERNATIVE 4B						
Item	**Units**		**Unit Cost**	**Quantity**		**Total Cost**
Captial Costs						
1. Culverts/Bridges	LF	$	64,000	1	$	64,000
2. Weirs/Outlet Structures	LS	$	50,000	0	$	-
3. Pump Station	LS	$	-	0	$	-
4. Channel Lining (1)	LF	$	200	0	$	-
5. Excavation/Earth Work	CY	$	8	0	$	-
6. Land Acquisition	ACRE	$	50,000	0	$	-
7. Wetlands Creation (2)	ACRE	$	50,000	0	$	-
8. Sod at Pond Sites/Channel Banks	SY	$	3	0	$	-
9. Baffle Box	LS	$	100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$	8	0	$	-
Subtotal 1 - Capital Costs (3)					$	64,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)					$	9,600
Subtotal 2 (Subtotal 1 + 15% Design Fees)					$	73,600
Contingency (30% of Subtotal 2)					$	22,080
Subtotal 3 - (Subtotal 2 + 30% Contingency)					$	95,680
Operations & Maintenance (4)						
11. Crossing Upgrade	LS	$	14,000	1	$	14,000
12. Pump Station	LS	$	-	0	$	-
13. Channel Lining	LF/YR	$	30	0	$	-
14. Stormwater Facility - Mowing	ACRE/YR	$	1,300	0	$	-
15. Stormwater Facility - Spraying	ACRE/YR	$	400	0	$	-
16. Stormwater Facility - Dredging and Structure Repair	LS	$	62,000	0	$	-
17. Baffle Box	LS	$	2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$	100	0	$	-
Subtotal 4 - Total Operations & Maintenance Cost					$	14,000
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)					**$**	**110,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.



Legend

- MSMP Nodes
- MSMP Conduits
- Major Roads
- Alternative 5

N

0 500 1,000 Feet

Figure 5.8
Cedar River and Wills Branch Subbasin
Alternative 5

CDM

Table 5.15
COJ MSMP Update
Cedar River and Wills Branch-Alternative 5 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40001				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40002				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40003				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40005S	LANE AVENUE	LOCAL	12.8	S	0.0		0.0		0.0		0.0		-0.1		-0.1	
CW40006				S	0.0		0.0		0.0		-0.1		-0.1		-0.1	
CW40007				S	0.0		-0.1		-0.1		-0.1		-0.1		-0.1	
CW40007L				S	0.0		-0.1		0.0		-0.1		-0.1		-0.1	
CW40008				S	0.0		-0.1		-0.1		-0.1		-0.1		-0.1	
CW40008L				S	0.0		-0.1		-0.1		-0.1		-0.1		-0.1	
CW40010S	OLD MIDDLEBURG ROAD	LOCAL	18.7	S	0.0		-0.1		-0.1		-0.1		-0.1		-0.1	
CW40012				S	0.0		-0.1		-0.1		-0.1		-0.1		-0.2	
CW40013				S	0.0		-0.1		-0.1		-0.1		-0.1		-0.1	
CW40014				S	0.0		-0.1		-0.1		-0.1		-0.1		-0.1	
CW40014L				S	0.0		-0.1		-0.1		-0.1		-0.1		-0.1	
CW40015				S	0.0		-0.1		-0.1		-0.1		-0.1		-0.1	
CW40030S	N I295EXIT NORM RP	LOCAL	23.4	S	0.0		-0.1		-0.1		-0.1		-0.1		-0.3	
CW40035				S	0.0		-0.1		-0.1		-0.1		-0.1		-0.3	
CW40036				S	0.0		-0.1		-0.1		-0.1		-0.1		-0.2	
CW40037				S	0.0		-0.1		-0.1		-0.1		-0.1		-0.2	
CW40038				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40040S	LENOX AVENUE	LOCAL	22.5	S	0.0		0.0	0.3	0.0	1.2	0.0	1.7	0.0	2.0	0.0	2.2
CW40043				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40045				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40046				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40046L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40050S	CAHOON ROAD	LOCAL	43.7	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40060S	RAMONA BOULEVARD	LOCAL	53.9	S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40065				S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40070S	I 10 EXPRESSWAY	ARTERIAL	59.0	S	0.0		0.0		0.0		0.0		0.0		0.0	0.3
CW40075				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40080S	RAMONA BOULEVARD	LOCAL	60.8	S	0.0		0.0		0.0		0.0		0.0	0.6	0.0	0.9
CW40087				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40090S	HAMMOND BOULEVARD	LOCAL	63.6	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.0	0.0	1.1	0.0	1.2
CW40093				S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.15
COJ MSMP Update
Cedar River and Wills Branch-Alternative 5 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40097				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40097L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40098				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW40099S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40100AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW41002				S	0.0		0.0		0.0		-0.1		0.0		-0.1	
CW41003				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW41004				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW41005S	MT VERNON DRIVE	LOCAL	10.4	S	0.0		0.0		0.0		0.0	0.9	0.0	1.4	0.1	1.7
CW41007				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41008				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41010S	OLD MIDDLEBURG ROAD	LOCAL	16.3	S	0.0		0.0		0.0		0.0		0.0	0.4	0.0	1.1
CW41015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41020S	HERLONG ROAD	LOCAL	17.5	S	0.0	1.1	0.0	1.5	0.0	1.8	0.0	2.0	0.0	2.2	0.1	2.4
CW41027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41030S	I 295 EXPRESSWAY	ARTERIAL	32.0	S	0.0		0.0		0.0		0.0		0.0	0.9	0.0	1.3
CW41031				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41033S	VALLEY CROSSING DRIVE	LOCAL	30.0	S	0.0	1.0	0.0	1.8	0.0	2.4	0.0	2.9	0.0	3.2	0.0	3.5
CW41035				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41036				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41037				S	0.0		0.0		0.0		0.0		0.0		2.3	
CW41037L				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41038				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41040S	WILSON BOULEVARD	LOCAL	58.4	S	0.0		0.0		0.0		0.0		0.0		0.0	0.2
CW41047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41050S	OLD MIDDLEBURG ROAD	LOCAL	62.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41060S	FRANK H PETERSON ACADEMY AC	LOCAL	64.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41070AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW42003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42005S	FOURAKER ROAD	LOCAL	39.8	S	0.0		0.0	0.8	0.0	1.4	0.0	1.7	0.0	1.9	0.1	2.0
CW42006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42007				S	0.0		0.0		0.0		0.0		0.0		0.2	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.15
COJ MSMP Update
Cedar River and Wills Branch-Alternative 5 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW43002				S	0.0		0.0		-0.1		-0.1		-0.1		-0.2	
CW43003				S	0.0		0.0		-0.1		-0.1		-0.1		-0.2	
CW43005S	FOURAKER ROAD	LOCAL	27.5	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.1	0.0	1.3	-0.1	1.4
CW43007				S	0.0		0.0		0.0		0.0		-0.1		-0.1	
CW43008				S	-0.1		-0.2		-0.2		-0.2		-0.3		-0.4	
CW43010S	COUNTRY CREEK BOULEVARD	LOCAL	33.6	S	-0.2		-0.2		-0.3		-0.3		-0.4		-0.7	
CW43015				S	-0.1		-0.1		-0.2		-0.2		-0.2		-0.3	
CW43016				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43017				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43020S	COUNTRY CREEK BOULEVARD	LOCAL	40.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43027				S	0.0		0.0		0.0		0.0		0.0		1.1	
CW43030S	HAMMOND BOULEVARD	LOCAL	49.0	S	0.0		0.0		0.0		0.0		0.0	0.4	1.1	0.7
CW43033				S	0.0		0.0		0.0		0.0		0.0		1.0	
CW43035				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW43037				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43040S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43047				S	0.0		0.0		0.0		0.0		0.0		0.4	
CW43050S	CRYSTAL SPRINGS ROAD	LOCAL	75.9	S	0.0		0.0	0.0	0.0	0.5	0.0	0.6	0.0	0.7	0.1	0.8
CW43055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43056				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43057S	EVENING STROLL LANE	LOCAL	80.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43059				S	0.0		0.0		0.0		0.0		0.0		-0.9	
CW43060S	CHANDLER OAKS DRIVE	LOCAL	79.3	S	0.0		0.0		0.0		0.0		0.0		-4.4	
CW43063				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43065				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43066				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43067S	COXWELL ESTATES CT	LOCAL	80.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43068				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43070S	I 10 EXPRESSWAY	ARTERIAL	82.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44002S	ROCKPOND MEADOWS DRIVE	LOCAL	52.0	S	0.0		0.0		0.0		0.0		0.0		0.8	0.1
CW44003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44008				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW44010S	NORMANDY BOULEVARD	LOCAL	70.7	S	0.0		0.0		0.0		0.0		0.0		0.1	

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3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.15
COJ MSMP Update
Cedar River and Wills Branch-Alternative 5 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW44015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44017				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44020S	HERLONG ROAD	LOCAL	74.2	S	0.0	0.5	0.0	0.7	0.0	0.8	0.0	0.9	0.0	0.9	0.0	0.9
CW44023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW45010				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW45020S	HYDE GROVE AVENUE	LOCAL	15.2	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46010				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW46020S	I 295 EXPRESSWAY	ARTERIAL	37.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46040S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW47010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW50000				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50015S	SAN JUAN AVENUE	LOCAL	10.0	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW50018				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50020				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50021				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW50023				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW50025				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW50026				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW50027				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW50028				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50030S	LANE AVENUE	LOCAL	15.6	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50033				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50035				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50040S	LENOX AVENUE	LOCAL	9.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50048				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50050S	NORMANDY BOULEVARD	LOCAL	12.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50052				S	0.0		0.0		0.0		0.0		0.0		0.0	

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   S = Survey.

Table 5.15
COJ MSMP Update
Cedar River and Wills Branch-Alternative 5 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50053				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50058				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50060S	GRACE LANE	LOCAL	7.8	S	0.0		0.0	1.0	0.0	1.3	0.0	1.7	0.0	1.9	0.0	2.1
CW50063				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50065				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50070S	RAMONA BOULEVARD	LOCAL	9.6	S	0.0		0.0		0.0	0.0	0.0	0.5	0.0	0.7	0.0	0.8
CW50075				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50080S	E I10EXIT S LANE RP	LOCAL	13.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50090S	I 10 EXPRESSWAY	ARTERIAL	13.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50100S	W I10EXIT S LANE RP	LOCAL	13.2	S	0.0		0.0		0.0		0.0		0.0		0.0	0.4
CW50105				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50110S	STUART AVENUE	LOCAL	10.7	S	0.0		0.0	0.1	0.0	0.7	0.0	1.8	0.0	2.4	0.0	2.9
CW50115				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50120S	LANE AVENUE	LOCAL	12.0	S	0.0		0.0		0.0		0.0	1.0	0.0	1.4	0.0	1.8
CW50125				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50130S	HIGHWAY AVENUE	LOCAL	11.8	S	0.0		0.0		0.0	0.5	0.0	1.5	0.0	1.8	0.0	2.2
CW50135				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50140S	BEAVER STREET	ARTERIAL	15.9	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50142				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50143				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50144				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50145				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50150S	I 295 EXPRESSWAY	ARTERIAL	23.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50155				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50160S	PICKETTVILLE ROAD	LOCAL	24.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50165				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50170S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50173				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50175				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50190	WASSON AVENUE	LOCAL	44.0	S	0.0	3.8	0.0	4.1	0.0	4.3	0.0	4.5	0.0	4.6	0.0	4.8
CW50191S	BULLS BAY HIGHWAY	LOCAL	52.6	S	0.0		0.0		0.0		0.0		0.0		0.0	

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S = Survey.

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COJ MSMP Update
Cedar River and Wills Branch-Alternative 5 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50199				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW50200S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW50209				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50210S	OLD PLANK ROAD	LOCAL	65.9	S	0.0		0.0		0.0		0.0		0.0		0.0	0.1
CW50220				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50230				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50240S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51020S	LAKE SHORE BOULEVARD	LOCAL	5.1	S	0.0		0.0		0.0		0.0		0.0	0.5	0.0	0.8
CW51030AP	1701-1 LAKE SHORE AP	LOCAL	10.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW52010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52020S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52040S	NORMANDY BOULEVARD	LOCAL	27.9	S	0.0		0.0		0.0		0.0		0.0	0.8	0.0	1.0
CW53010				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW53020S	LANE AVENUE	LOCAL	14.7	S	0.0		0.0		0.0		0.0		0.0		0.1	
CW53030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW54001S	STUART AVENUE	LOCAL	11.2	S	0.0		0.0		0.0	0.1	0.0	1.3	0.0	1.9	0.0	2.4
CW54002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54004S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54010S	HIGHWAY AVENUE	LOCAL	14.5	S	0.0		0.0	0.6	0.0	1.2	0.0	1.6	0.0	1.9	0.0	2.1
CW54015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54030S	BEAVER STREET	ARTERIAL	15.6	S	0.0		0.0		0.0	0.1	0.0	0.5	0.0	0.8	0.0	1.0
CW54032				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54035				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54040S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54042				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54050S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54060				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54070S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54075				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54080S				S	0.0		0.0		0.0		0.0		0.0		-0.1	

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					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW54085				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54090S	SCOTIA ROAD	LOCAL	19.3	S	0.0		0.0		0.0	0.2	0.0	0.7	0.0	0.8	0.0	0.9
CW54095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54100S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54105				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54110S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54115				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54120S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54125				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54130S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54135				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54140S	EDGEWOOD AVENUE	LOCAL	19.0	S	0.0	0.1	0.0	0.6	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW55002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55010S	ELLIS ROAD	LOCAL	22.9	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55012AP	STEVENS STREET	LOCAL	25.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55013AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55014AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55015AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55020APS	CASSAT AVENUE	ARTERIAL	19.0	AP	0.0	0.3	0.0	0.9	0.0	1.5	0.0	1.9	0.0	2.2	0.0	2.3
CW55025AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW56010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57005				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57020S	OLD PLANK ROAD	LOCAL	22.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57030				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW57040S	BEAVER STREET	ARTERIAL	28.4	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57050				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57060S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57070AP	CHASE BOULEVARD	LOCAL	23.0	AP	0.0	0.3	0.0	0.7	0.0	1.0	0.0	1.3	0.0	1.6	0.0	1.8
CW57080AP	S I295EXIT W I10 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57090AP	E I10EXIT S I295 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW58005				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW58010S	GRACE TERRACE	LOCAL	10.2	S	0.0		0.0	0.7	0.0	1.3	0.0	1.6	0.0	1.8	0.1	1.8
CW58015				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW59010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	

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S = Survey.

Table 5.16
COJ MSMP Update
Cedar River and Wills Branch-Alternative Conceptual Cost Evaluation

ALTERNATIVE 5A

Item	Units		Unit Cost	Quantity		Total Cost
Captial Costs						
1. Culverts/Bridges	LF	$	3,000	0	$	-
2. Weirs/Outlet Structures	LS	$	50,000	1	$	50,000
3. Pump Station	LS	$	-	0	$	-
4. Channel Lining (1)	LF	$	200	0	$	-
5. Excavation/Earth Work	CY	$	8	200,000	$	1,600,000
6. Land Acquisition	ACRE	$	50,000	9	$	450,000
7. Wetlands Creation (2)	ACRE	$	50,000	0	$	-
8. Sod at Pond Sites/Channel Banks	SY	$	3	12,000	$	36,000
9. Baffle Box	LS	$	100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$	8	0	$	-
Subtotal 1 - Capital Costs (3)					$	2,136,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)					$	320,400
Subtotal 2 (Subtotal 1 + 15% Design Fees)					$	2,456,400
Contingency (30% of Subtotal 2)					$	736,920
Subtotal 3 - (Subtotal 2 + 30% Contingency)					$	3,193,320
Operations & Maintenance (4)						
11. Crossing Upgrade	LS	$	14,000	0	$	-
12. Pump Station	LS	$	-	0	$	-
13. Channel Lining	LF/YR	$	30	0	$	-
14. Stormwater Facility - Mowing	ACRE/YR	$	1,300	9	$	11,700
15. Stormwater Facility - Spraying	ACRE/YR	$	400	9	$	3,600
16. Stormwater Facility - Dredging and Structure Repair	LS	$	62,000	9	$	558,000
17. Baffle Box	LS	$	2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$	100	0	$	-
Subtotal 4 - Total Operations & Maintenance Cost					$	573,300
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)					**$**	**3,767,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Table 5.17
COJ MSMP Update
Cedar River and Wills Branch-Alternative Conceptual Cost Evaluation

ALTERNATIVE 5C						
Item	**Units**		**Unit Cost**	**Quantity**		**Total Cost**
Captial Costs						
1. Culverts/Bridges	LF	$	147,000	2	$	294,000
2. Weirs/Outlet Structures	LS	$	50,000	1	$	50,000
3. Pump Station	LS	$	-	0	$	-
4. Channel Lining (1)	LF	$	200	0	$	-
5. Excavation/Earth Work	CY	$	8	200,000	$	1,600,000
6. Land Acquisition	ACRE	$	50,000	9	$	450,000
7. Wetlands Creation (2)	ACRE	$	50,000	0	$	-
8. Sod at Pond Sites/Channel Banks	SY	$	3	12,000	$	36,000
9. Baffle Box	LS	$	100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$	8	15,000	$	120,000
Subtotal 1 - Capital Costs (3)					$	2,550,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)					$	382,500
Subtotal 2 (Subtotal 1 + 15% Design Fees)					$	2,932,500
Contingency (30% of Subtotal 2)					$	879,750
Subtotal 3 - (Subtotal 2 + 30% Contingency)					$	3,812,250
Operations & Maintenance (4)						
11. Crossing Upgrade	LS	$	14,000	2	$	28,000
12. Pump Station	LS	$	-	0	$	-
13. Channel Lining	LF/YR	$	30	0	$	-
14. Stormwater Facility - Mowing	ACRE/YR	$	1,300	9	$	11,700
15. Stormwater Facility - Spraying	ACRE/YR	$	400	9	$	3,600
16. Stormwater Facility - Dredging and Structure Repair	LS	$	62,000	9	$	558,000
17. Baffle Box	LS	$	2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$	100	15,000	$	1,500,000
Subtotal 4 - Total Operations & Maintenance Cost					$	2,101,300
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)					**$**	**5,914,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Figure 5.9
Cedar River and Wills Branch Subbasin
Alternative 6

CDM


Alternative 8: Locations
BEAVER ST W
CSXT NP
ST ANDREWS STREET
ANNE AVENUE
JULIE AVENUE
CW55002
CW55007
CW55010S
CW55012AP
CW54010S
CW54007
CW54005S
CW55003
CW54003
ARNOLD AVENUE
TYLER AVENUE
HARRIET AVENUE
LEAMING AVENUE
HARROLD AVENUE
CW50130S
HIGHWAY AVENUE
BAHAMA AVENUE
CW50125
CW54002
CW50120S
CW50115
DRAKE STREET
STUART AVENUE
FOX STREET
HENDERSON ROAD
CW54001S
CW50110S
CW50105
CYNTHIA STREET
ERNONA STREET
ELLIS RD S
ELLIS ROAD
W I10EXIT N I295 RAMP NP
STUART LANE
CW50095
CW50100S
CW50090S
I 10 XY W
I 10 XY E
CASSIDY ROAD
CLIFF STREET
STEVENS STREET
CW50080S
CW50075
CW50070S
RAMONA BV
RAMONA BOULEVARD
CW50065
AKRA AVENUE
ATLEE AVENUE
ROBERTS STREET
RAMONA LANE
BENT BAUM ROAD
CW50063
103
BERNAY AVENUE
CW50058
CW50060S
CW58015
CW50055
CW58010S
GRACE LANE
VERNA BOULEVARD
APOLLO ROAD
CLOVIS ROAD
LA MARCHE DRIVE
REVELS ROAD
LOIS AVENUE
ARQUES ROAD
CW50053
KINGSBURY STREET
FOUNTAIN ROAD
CHERBOURG AVENUE
CW50052
BAGNAL ROAD
NORMANDY BOULEVARD
LE BRUN DRIVE
BUSAC AVENUE
LEGAY AVENUE
MANTES AVENUE
CALVADOS AVENUE
ALPHA AVENUE
LAKE SHORE BOULEVARD
CW50050S
CW50048
LANE AVENUE
NORMANDY BV
71-4 LANE AVENUE
CW53020S
CW50047
CW53010
CW53030AP
PLYMOUTH STREET
228
CW52040S
CW52030
LANE AV S
ELLIS ROAD
CW50045
LENOX AVENUE
ORTON STREET
NEVA STREET
PANGOLA DRIVE
MULL STREET
LAKE SHORE BV
CW52020S
CW52010
NP NP
CW50040S
DELMAR PLACE
LENOX AV
CW50035
LACLEDE AVENUE
CEDAR ANNEX ROAD
OTTAWA AVENUE
CW50033
213
WYANDOTTE AVENUE
PARK ST
For detailed information, including model nodes, stream profiles, roadway crossings and floodplain delineation refer to FIS/FIRM.
Legend
MSMP Nodes
MSMP Conduits
Major Roads
N
0
1,000
2,000
Feet
Figure 5.10
Cedar River and Wills Branch Subbasin
Alternative 8
CDM

Table 5.18
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40005S	LANE AVENUE	LOCAL	12.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40007L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40008				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40008L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40010S	OLD MIDDLEBURG ROAD	LOCAL	18.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40012				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40013				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40030S	N I295EXIT NORM RP	LOCAL	23.4	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40035				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40036				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40037				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40038				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40040S	LENOX AVENUE	LOCAL	22.5	S	0.0		0.0	0.3	0.0	1.2	0.0	1.7	0.0	2.0	0.0	2.2
CW40043				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40045				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40046				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40046L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40050S	CAHOON ROAD	LOCAL	43.7	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40060S	RAMONA BOULEVARD	LOCAL	53.9	S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40065				S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40070S	I 10 EXPRESSWAY	ARTERIAL	59.0	S	0.0		0.0		0.0		0.0		0.0		0.0	0.3
CW40075				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40080S	RAMONA BOULEVARD	LOCAL	60.8	S	0.0		0.0		0.0		0.0		0.0	0.6	0.0	0.9
CW40087				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40090S	HAMMOND BOULEVARD	LOCAL	63.6	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.0	0.0	1.1	0.0	1.2
CW40093				S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.18
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40097				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40097L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40098				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW40099S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40100AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW41002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41004				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41005S	MT VERNON DRIVE	LOCAL	10.4	S	0.0		0.0		0.0		0.0	0.9	0.0	1.4	0.1	1.7
CW41007				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41008				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41010S	OLD MIDDLEBURG ROAD	LOCAL	16.3	S	0.0		0.0		0.0		0.0		0.0	0.4	0.0	1.1
CW41015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41020S	HERLONG ROAD	LOCAL	17.5	S	0.0	1.1	0.0	1.5	0.0	1.8	0.0	2.0	0.0	2.2	0.1	2.4
CW41027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41030S	I 295 EXPRESSWAY	ARTERIAL	32.0	S	0.0		0.0		0.0		0.0		0.0	0.9	0.0	1.3
CW41031				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41033S	VALLEY CROSSING DRIVE	LOCAL	30.0	S	0.0	1.0	0.0	1.8	0.0	2.4	0.0	2.9	0.0	3.2	0.0	3.5
CW41035				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41036				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41037				S	0.0		0.0		0.0		0.0		0.0		2.3	
CW41037L				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41038				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41040S	WILSON BOULEVARD	LOCAL	58.4	S	0.0		0.0		0.0		0.0		0.0		0.0	0.2
CW41047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41050S	OLD MIDDLEBURG ROAD	LOCAL	62.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41060S	FRANK H PETERSON ACADEMY AC	LOCAL	64.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41070AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW42003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42005S	FOURAKER ROAD	LOCAL	39.8	S	0.0		0.0	0.8	0.0	1.4	0.0	1.7	0.0	1.9	0.1	2.0
CW42006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42007				S	0.0		0.0		0.0		0.0		0.0		0.2	

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S = Survey.

Table 5.18
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW43002				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43003				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43005S	FOURAKER ROAD	LOCAL	27.5	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW43007				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43008				S	0.0		0.0		0.0		0.0		0.0		-0.2	
CW43010S	COUNTRY CREEK BOULEVARD	LOCAL	33.6	S	0.0		0.0		0.0		0.0		0.0		-0.3	0.3
CW43015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43016				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43017				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43020S	COUNTRY CREEK BOULEVARD	LOCAL	40.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43027				S	0.0		0.0		0.0		0.0		0.0		1.1	
CW43030S	HAMMOND BOULEVARD	LOCAL	49.0	S	0.0		0.0		0.0		0.0		0.0	0.5	1.1	0.7
CW43033				S	0.0		0.0		0.0		0.0		0.0		1.0	
CW43035				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW43037				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43040S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43047				S	0.0		0.0		0.0		0.0		0.0		0.4	
CW43050S	CRYSTAL SPRINGS ROAD	LOCAL	75.9	S	0.0		0.0	0.0	0.0	0.5	0.0	0.6	0.0	0.7	0.1	0.8
CW43055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43056				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43057S	EVENING STROLL LANE	LOCAL	80.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43059				S	0.0		0.0		0.0		0.0		0.0		-0.9	
CW43060S	CHANDLER OAKS DRIVE	LOCAL	79.3	S	0.0		0.0		0.0		0.0		0.0		-4.4	
CW43063				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43065				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43066				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43067S	COXWELL ESTATES CT	LOCAL	80.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43068				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43070S	I 10 EXPRESSWAY	ARTERIAL	82.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44002S	ROCKPOND MEADOWS DRIVE	LOCAL	52.0	S	0.0		0.0		0.0		0.0		0.0		0.8	0.1
CW44003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44008				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW44010S	NORMANDY BOULEVARD	LOCAL	70.7	S	0.0		0.0		0.0		0.0		0.0		0.1	

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3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.18
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW44015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44017				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44020S	HERLONG ROAD	LOCAL	74.2	S	0.0	0.5	0.0	0.7	0.0	0.8	0.0	0.9	0.0	0.9	0.0	0.9
CW44023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW45010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45020S	HYDE GROVE AVENUE	LOCAL	15.2	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46010				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW46020S	I 295 EXPRESSWAY	ARTERIAL	37.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46040S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW47010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW50000				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50015S	SAN JUAN AVENUE	LOCAL	10.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50018				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50020				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50021				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50026				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50028				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50030S	LANE AVENUE	LOCAL	15.6	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50033				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50035				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50040S	LENOX AVENUE	LOCAL	9.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50048				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50050S	NORMANDY BOULEVARD	LOCAL	12.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50052				S	-0.2		-0.2		-0.3		-0.3		-0.3		-0.2	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.18
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50053				S	-0.5		-0.6		-0.6		-0.6		-0.5		-0.5	
CW50055				S	-1.0		-1.1		-1.1		-1.0		-0.9		-0.9	
CW50058				S	-1.0		-1.2		-1.1		-1.0		-0.9		-0.9	
CW50060S	GRACE LANE	LOCAL	7.8	S	-0.5		-0.2	0.8	-0.2	1.1	-0.2	1.5	-0.2	1.7	-0.2	1.9
CW50063				S	-0.3		-0.2		-0.2		-0.2		-0.1		-0.2	
CW50065				S	-0.3		-0.2		-0.2		-0.1		-0.1		-0.1	
CW50070S	RAMONA BOULEVARD	LOCAL	9.6	S	-0.3		-0.1		-0.2		-0.1	0.4	-0.1	0.6	-0.1	0.8
CW50075				S	-0.2		-0.1		-0.1		-0.1		-0.1		-0.1	
CW50080S	E I10EXIT S LANE RP	LOCAL	13.8	S	-0.2		-0.1		-0.1		-0.1		-0.1		-0.1	
CW50090S	I 10 EXPRESSWAY	ARTERIAL	13.0	S	-0.2		0.0		-0.1		-0.1		-0.1		-0.1	
CW50095				S	-0.2		0.0		-0.1		-0.1		-0.1		0.0	
CW50100S	W I10EXIT S LANE RP	LOCAL	13.2	S	-0.2		0.0		-0.1		-0.1		-0.1		0.0	0.3
CW50105				S	-0.2		0.0		-0.1		-0.1		-0.1		0.0	
CW50110S	STUART AVENUE	LOCAL	10.7	S	-0.2		0.0	0.1	-0.1	0.6	-0.1	1.7	-0.1	2.4	0.0	2.9
CW50115				S	-0.2		0.0		-0.2		-0.1		-0.1		0.0	
CW50120S	LANE AVENUE	LOCAL	12.0	S	-0.2		0.1		-0.1		-0.1	0.9	0.0	1.4	0.0	1.8
CW50125				S	-0.2		0.1		-0.1		0.0		0.0		0.0	
CW50130S	HIGHWAY AVENUE	LOCAL	11.8	S	-0.2		0.2		-0.1	0.4	0.0	1.5	0.0	1.8	-0.1	2.2
CW50135				S	-0.1		0.4		0.0		0.0		0.0		0.0	
CW50140S	BEAVER STREET	ARTERIAL	15.9	S	-0.1		0.5		0.0		0.0		0.0		0.0	
CW50142				S	0.0		0.4		0.0		0.0		0.0		0.0	
CW50143				S	0.0		0.4		0.0		0.0		0.0		0.0	
CW50144				S	0.0		0.2		0.0		0.0		0.0		0.0	
CW50145				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50150S	I 295 EXPRESSWAY	ARTERIAL	23.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50155				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50160S	PICKETTVILLE ROAD	LOCAL	24.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50165				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50170S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50173				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50175				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50190	WASSON AVENUE	LOCAL	44.0	S	0.0	3.8	0.0	4.1	0.0	4.3	0.0	4.5	0.0	4.6	0.0	4.8
CW50191S	BULLS BAY HIGHWAY	LOCAL	52.6	S	0.0		0.0		0.0		0.0		0.0		0.0	

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3) Road flooding stage is referenced to road crown elevation.
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S = Survey.

Table 5.18
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50199				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW50200S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW50209				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50210S	OLD PLANK ROAD	LOCAL	65.9	S	0.0		0.0		0.0		0.0		0.0		0.0	0.1
CW50220				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50230				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50240S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51020S	LAKE SHORE BOULEVARD	LOCAL	5.1	S	0.0		0.0		0.0		0.0		0.0	0.5	0.0	0.8
CW51030AP	1701-1 LAKE SHORE AP	LOCAL	10.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW52010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52020S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52040S	NORMANDY BOULEVARD	LOCAL	27.9	S	0.0		0.0		0.0		0.0		0.0	0.8	0.0	1.0
CW53010				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW53020S	LANE AVENUE	LOCAL	14.7	S	0.0		0.0		0.0		0.0		0.0		0.1	
CW53030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW54001S	STUART AVENUE	LOCAL	11.2	S	-0.2		0.0		-0.1		-0.1	1.2	-0.1	1.8	0.0	2.4
CW54002				S	-0.2		0.0		-0.1		-0.1		-0.1		0.0	
CW54003				S	-0.2		0.0		-0.1		-0.1		-0.1		0.0	
CW54004S				S	-0.1		0.0		-0.1		0.0		0.0		0.0	
CW54005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54010S	HIGHWAY AVENUE	LOCAL	14.5	S	0.0		0.0	0.6	0.0	1.2	0.0	1.6	0.0	1.9	0.0	2.1
CW54015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54030S	BEAVER STREET	ARTERIAL	15.6	S	0.0		0.0		0.0	0.1	0.0	0.5	0.0	0.8	0.0	1.0
CW54032				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54035				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54040S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54042				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54050S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54060				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54070S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54075				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54080S				S	0.0		0.0		0.0		0.0		0.0		-0.1	

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S = Survey.

Table 5.18
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW54085				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54090S	SCOTIA ROAD	LOCAL	19.3	S	0.0		0.0		0.0	0.2	0.0	0.7	0.0	0.8	0.0	0.9
CW54095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54100S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54105				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54110S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54115				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54120S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54125				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54130S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54135				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54140S	EDGEWOOD AVENUE	LOCAL	19.0	S	0.0	0.1	0.0	0.6	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW55002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55010S	ELLIS ROAD	LOCAL	22.9	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55012AP	STEVENS STREET	LOCAL	25.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55013AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55014AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55015AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55020APS	CASSAT AVENUE	ARTERIAL	19.0	AP	0.0	0.3	0.0	0.9	0.0	1.5	0.0	1.9	0.0	2.2	0.0	2.3
CW55025AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW56010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57005				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57020S	OLD PLANK ROAD	LOCAL	22.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57030				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW57040S	BEAVER STREET	ARTERIAL	28.4	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57050				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57060S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57070AP	CHASE BOULEVARD	LOCAL	23.0	AP	0.0	0.3	0.0	0.7	0.0	1.0	0.0	1.3	0.0	1.6	0.0	1.8
CW57080AP	S I295EXIT W I10 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57090AP	E I10EXIT S I295 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW58005				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW58010S	GRACE TERRACE	LOCAL	10.2	S	0.0		0.0	0.7	0.0	1.3	0.0	1.6	0.0	1.8	0.1	1.8
CW58015				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW59010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	

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2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.19
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40005S	LANE AVENUE	LOCAL	12.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40007L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40008				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40008L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40010S	OLD MIDDLEBURG ROAD	LOCAL	18.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40012				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40013				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40030S	N I295EXIT NORM RP	LOCAL	23.4	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40035				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40036				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40037				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40038				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40040S	LENOX AVENUE	LOCAL	22.5	S	0.0		0.0	0.3	0.0	1.2	0.0	1.7	0.0	2.0	0.0	2.2
CW40043				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40045				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40046				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40046L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40050S	CAHOON ROAD	LOCAL	43.7	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40060S	RAMONA BOULEVARD	LOCAL	53.9	S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40065				S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40070S	I 10 EXPRESSWAY	ARTERIAL	59.0	S	0.0		0.0		0.0		0.0		0.0		0.0	0.3
CW40075				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40080S	RAMONA BOULEVARD	LOCAL	60.8	S	0.0		0.0		0.0		0.0		0.0	0.6	0.0	0.9
CW40087				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40090S	HAMMOND BOULEVARD	LOCAL	63.6	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.0	0.0	1.1	0.0	1.2
CW40093				S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.19
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40097				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40097L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40098				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW40099S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40100AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW41002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41004				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41005S	MT VERNON DRIVE	LOCAL	10.4	S	0.0		0.0		0.0		0.0	0.9	0.0	1.4	0.1	1.7
CW41007				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41008				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41010S	OLD MIDDLEBURG ROAD	LOCAL	16.3	S	0.0		0.0		0.0		0.0		0.0	0.4	0.0	1.1
CW41015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41020S	HERLONG ROAD	LOCAL	17.5	S	0.0	1.1	0.0	1.5	0.0	1.8	0.0	2.0	0.0	2.2	0.1	2.4
CW41027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41030S	I 295 EXPRESSWAY	ARTERIAL	32.0	S	0.0		0.0		0.0		0.0		0.0	0.9	0.0	1.3
CW41031				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41033S	VALLEY CROSSING DRIVE	LOCAL	30.0	S	0.0	1.0	0.0	1.8	0.0	2.4	0.0	2.9	0.0	3.2	0.0	3.5
CW41035				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41036				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41037				S	0.0		0.0		0.0		0.0		0.0		2.3	
CW41037L				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41038				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41040S	WILSON BOULEVARD	LOCAL	58.4	S	0.0		0.0		0.0		0.0		0.0		0.0	0.2
CW41047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41050S	OLD MIDDLEBURG ROAD	LOCAL	62.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41060S	FRANK H PETERSON ACADEMY AC	LOCAL	64.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41070AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW42003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42005S	FOURAKER ROAD	LOCAL	39.8	S	0.0		0.0	0.8	0.0	1.4	0.0	1.7	0.0	1.9	0.1	2.0
CW42006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42007				S	0.0		0.0		0.0		0.0		0.0		0.2	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.19
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW43002				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43003				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43005S	FOURAKER ROAD	LOCAL	27.5	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW43007				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43008				S	0.0		0.0		0.0		0.0		0.0		-0.2	
CW43010S	COUNTRY CREEK BOULEVARD	LOCAL	33.6	S	0.0		0.0		0.0		0.0		0.0		-0.3	0.3
CW43015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43016				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43017				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43020S	COUNTRY CREEK BOULEVARD	LOCAL	40.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43027				S	0.0		0.0		0.0		0.0		0.0		1.1	
CW43030S	HAMMOND BOULEVARD	LOCAL	49.0	S	0.0		0.0		0.0		0.0		0.0	0.5	1.1	0.7
CW43033				S	0.0		0.0		0.0		0.0		0.0		1.0	
CW43035				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW43037				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43040S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43047				S	0.0		0.0		0.0		0.0		0.0		0.4	
CW43050S	CRYSTAL SPRINGS ROAD	LOCAL	75.9	S	0.0		0.0	0.0	0.0	0.5	0.0	0.6	0.0	0.7	0.1	0.8
CW43055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43056				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43057S	EVENING STROLL LANE	LOCAL	80.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43059				S	0.0		0.0		0.0		0.0		0.0		-0.9	
CW43060S	CHANDLER OAKS DRIVE	LOCAL	79.3	S	0.0		0.0		0.0		0.0		0.0		-4.4	
CW43063				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43065				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43066				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43067S	COXWELL ESTATES CT	LOCAL	80.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43068				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43070S	I 10 EXPRESSWAY	ARTERIAL	82.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44002S	ROCKPOND MEADOWS DRIVE	LOCAL	52.0	S	0.0		0.0		0.0		0.0		0.0		0.8	0.1
CW44003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44008				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW44010S	NORMANDY BOULEVARD	LOCAL	70.7	S	0.0		0.0		0.0		0.0		0.0		0.1	

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S = Survey.

Table 5.19
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW44015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44017				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44020S	HERLONG ROAD	LOCAL	74.2	S	0.0	0.5	0.0	0.7	0.0	0.8	0.0	0.9	0.0	0.9	0.0	0.9
CW44023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW45010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45020S	HYDE GROVE AVENUE	LOCAL	15.2	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46010				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW46020S	I 295 EXPRESSWAY	ARTERIAL	37.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46040S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW47010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW50000				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50015S	SAN JUAN AVENUE	LOCAL	10.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50018				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50020				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50021				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50026				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50028				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50030S	LANE AVENUE	LOCAL	15.6	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50033				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50035				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50040S	LENOX AVENUE	LOCAL	9.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50048				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50050S	NORMANDY BOULEVARD	LOCAL	12.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50052				S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.19
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50053				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50058				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50060S	GRACE LANE	LOCAL	7.8	S	0.0		0.0	1.0	0.0	1.3	0.0	1.7	0.0	1.9	0.0	2.1
CW50063				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50065				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50070S	RAMONA BOULEVARD	LOCAL	9.6	S	0.0		0.1		0.0	0.0	0.0	0.5	0.0	0.7	0.0	0.9
CW50075				S	-0.1		-0.1		-0.2		-0.2		-0.2		-0.3	
CW50080S	E I10EXIT S LANE RP	LOCAL	13.8	S	-0.1		-0.1		-0.2		-0.2		-0.2		-0.3	
CW50090S	I 10 EXPRESSWAY	ARTERIAL	13.0	S	-0.1		-0.1		-0.2		-0.2		-0.2		-0.2	
CW50095				S	-0.2		-0.1		-0.1		-0.2		-0.2		-0.2	
CW50100S	W I10EXIT S LANE RP	LOCAL	13.2	S	-0.1		-0.1		-0.1		-0.2		-0.2		-0.2	0.2
CW50105				S	-0.1		-0.1		-0.1		-0.2		-0.2		-0.2	
CW50110S	STUART AVENUE	LOCAL	10.7	S	-0.1		-0.1	0.0	-0.1	0.6	-0.2	1.7	-0.2	2.3	-0.2	2.7
CW50115				S	-0.1		-0.1		-0.1		-0.2		-0.1		-0.2	
CW50120S	LANE AVENUE	LOCAL	12.0	S	-0.1		0.0		-0.1		-0.1	0.9	-0.1	1.3	-0.1	1.7
CW50125				S	-0.1		0.0		-0.1		-0.1		-0.1		-0.1	
CW50130S	HIGHWAY AVENUE	LOCAL	11.8	S	-0.1		0.0		-0.1	0.4	-0.1	1.4	-0.1	1.8	-0.2	2.0
CW50135				S	-0.1		0.1		0.0		0.0		-0.1		-0.1	
CW50140S	BEAVER STREET	ARTERIAL	15.9	S	0.0		0.2		0.0		0.0		0.0		-0.1	
CW50142				S	0.0		0.2		0.0		0.0		0.0		0.0	
CW50143				S	0.0		0.2		0.0		0.0		0.0		0.0	
CW50144				S	0.0		0.1		0.0		0.0		0.0		0.0	
CW50145				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50150S	I 295 EXPRESSWAY	ARTERIAL	23.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50155				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50160S	PICKETTVILLE ROAD	LOCAL	24.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50165				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50170S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50173				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50175				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50190	WASSON AVENUE	LOCAL	44.0	S	0.0	3.8	0.0	4.1	0.0	4.3	0.0	4.5	0.0	4.6	0.0	4.8
CW50191S	BULLS BAY HIGHWAY	LOCAL	52.6	S	0.0		0.0		0.0		0.0		0.0		0.0	

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S = Survey.

Table 5.19
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50199				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW50200S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW50209				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50210S	OLD PLANK ROAD	LOCAL	65.9	S	0.0		0.0		0.0		0.0		0.0		0.0	0.1
CW50220				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50230				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50240S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51020S	LAKE SHORE BOULEVARD	LOCAL	5.1	S	0.0		0.0		0.0		0.0		0.0	0.5	0.0	0.8
CW51030AP	1701-1 LAKE SHORE AP	LOCAL	10.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW52010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52020S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52040S	NORMANDY BOULEVARD	LOCAL	27.9	S	0.0		0.0		0.0		0.0		0.0	0.8	0.0	1.0
CW53010				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW53020S	LANE AVENUE	LOCAL	14.7	S	0.0		0.0		0.0		0.0		0.0		0.1	
CW53030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW54001S	STUART AVENUE	LOCAL	11.2	S	-0.1		-0.1		-0.1		-0.2	1.1	-0.2	1.7	-0.2	2.2
CW54002				S	-0.1		-0.1		-0.1		-0.2		-0.2		-0.2	
CW54003				S	-0.1		-0.1		-0.1		-0.2		-0.2		-0.2	
CW54004S				S	-0.1		0.0		-0.1		-0.1		-0.1		-0.1	
CW54005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54010S	HIGHWAY AVENUE	LOCAL	14.5	S	0.0		0.0	0.6	0.0	1.2	0.0	1.6	0.0	1.9	0.0	2.1
CW54015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54030S	BEAVER STREET	ARTERIAL	15.6	S	0.0		0.0		0.0	0.1	0.0	0.5	0.0	0.8	0.0	1.0
CW54032				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54035				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54040S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54042				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54050S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54060				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54070S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54075				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54080S				S	0.0		0.0		0.0		0.0		0.0		-0.1	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.19
COJ MSMP Update
Cedar River and Wills Branch-Alternative 8 B Stage Deltas for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW54085				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54090S	SCOTIA ROAD	LOCAL	19.3	S	0.0		0.0		0.0	0.2	0.0	0.7	0.0	0.8	0.0	0.9
CW54095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54100S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54105				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54110S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54115				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54120S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54125				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54130S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54135				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54140S	EDGEWOOD AVENUE	LOCAL	19.0	S	0.0	0.1	0.0	0.6	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW55002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55010S	ELLIS ROAD	LOCAL	22.9	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55012AP	STEVENS STREET	LOCAL	25.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55013AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55014AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55015AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55020APS	CASSAT AVENUE	ARTERIAL	19.0	AP	0.0	0.3	0.0	0.9	0.0	1.5	0.0	1.9	0.0	2.2	0.0	2.3
CW55025AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW56010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57005				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57020S	OLD PLANK ROAD	LOCAL	22.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57030				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW57040S	BEAVER STREET	ARTERIAL	28.4	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57050				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57060S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57070AP	CHASE BOULEVARD	LOCAL	23.0	AP	0.0	0.3	0.0	0.7	0.0	1.0	0.0	1.3	0.0	1.6	0.0	1.8
CW57080AP	S I295EXIT W I10 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57090AP	E I10EXIT S I295 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW58005				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW58010S	GRACE TERRACE	LOCAL	10.2	S	0.0		0.0	0.7	0.0	1.3	0.0	1.6	0.0	1.8	0.1	1.8
CW58015				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW59010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.20
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8C Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40005S	LANE AVENUE	LOCAL	12.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40007L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40008				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40008L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40010S	OLD MIDDLEBURG ROAD	LOCAL	18.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40012				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40013				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40030S	N I295EXIT NORM RP	LOCAL	23.4	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40035				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40036				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40037				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40038				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40040S	LENOX AVENUE	LOCAL	22.5	S	0.0		0.0	0.3	0.0	1.2	0.0	1.7	0.0	2.0	0.0	2.2
CW40043				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40045				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40046				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40046L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40050S	CAHOON ROAD	LOCAL	43.7	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40060S	RAMONA BOULEVARD	LOCAL	53.9	S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40065				S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40070S	I 10 EXPRESSWAY	ARTERIAL	59.0	S	0.0		0.0		0.0		0.0		0.0		0.0	0.3
CW40075				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40080S	RAMONA BOULEVARD	LOCAL	60.8	S	0.0		0.0		0.0		0.0		0.0	0.6	0.0	0.9
CW40087				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40090S	HAMMOND BOULEVARD	LOCAL	63.6	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.0	0.0	1.1	0.0	1.2
CW40093				S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.20
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 c Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40097				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40097L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40098				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW40099S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40100AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW41002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41004				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41005S	MT VERNON DRIVE	LOCAL	10.4	S	0.0		0.0		0.0		0.0	0.9	0.0	1.4	0.1	1.7
CW41007				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41008				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41010S	OLD MIDDLEBURG ROAD	LOCAL	16.3	S	0.0		0.0		0.0		0.0		0.0	0.4	0.0	1.1
CW41015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41020S	HERLONG ROAD	LOCAL	17.5	S	0.0	1.1	0.0	1.5	0.0	1.8	0.0	2.0	0.0	2.2	0.1	2.4
CW41027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41030S	I 295 EXPRESSWAY	ARTERIAL	32.0	S	0.0		0.0		0.0		0.0		0.0	0.9	0.0	1.3
CW41031				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41033S	VALLEY CROSSING DRIVE	LOCAL	30.0	S	0.0	1.0	0.0	1.8	0.0	2.4	0.0	2.9	0.0	3.2	0.0	3.5
CW41035				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41036				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41037				S	0.0		0.0		0.0		0.0		0.0		2.3	
CW41037L				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41038				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41040S	WILSON BOULEVARD	LOCAL	58.4	S	0.0		0.0		0.0		0.0		0.0		0.0	0.2
CW41047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41050S	OLD MIDDLEBURG ROAD	LOCAL	62.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41060S	FRANK H PETERSON ACADEMY AC	LOCAL	64.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41070AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW42003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42005S	FOURAKER ROAD	LOCAL	39.8	S	0.0		0.0	0.8	0.0	1.4	0.0	1.7	0.0	1.9	0.1	2.0
CW42006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42007				S	0.0		0.0		0.0		0.0		0.0		0.2	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.20
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 c Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW43002				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43003				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43005S	FOURAKER ROAD	LOCAL	27.5	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW43007				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43008				S	0.0		0.0		0.0		0.0		0.0		-0.2	
CW43010S	COUNTRY CREEK BOULEVARD	LOCAL	33.6	S	0.0		0.0		0.0		0.0		0.0		-0.3	0.3
CW43015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43016				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43017				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43020S	COUNTRY CREEK BOULEVARD	LOCAL	40.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43027				S	0.0		0.0		0.0		0.0		0.0		1.1	
CW43030S	HAMMOND BOULEVARD	LOCAL	49.0	S	0.0		0.0		0.0		0.0		0.0	0.5	1.1	0.7
CW43033				S	0.0		0.0		0.0		0.0		0.0		1.0	
CW43035				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW43037				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43040S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43047				S	0.0		0.0		0.0		0.0		0.0		0.4	
CW43050S	CRYSTAL SPRINGS ROAD	LOCAL	75.9	S	0.0		0.0	0.0	0.0	0.5	0.0	0.6	0.0	0.7	0.1	0.8
CW43055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43056				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43057S	EVENING STROLL LANE	LOCAL	80.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43059				S	0.0		0.0		0.0		0.0		0.0		-0.9	
CW43060S	CHANDLER OAKS DRIVE	LOCAL	79.3	S	0.0		0.0		0.0		0.0		0.0		-4.4	
CW43063				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43065				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43066				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43067S	COXWELL ESTATES CT	LOCAL	80.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43068				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43070S	I 10 EXPRESSWAY	ARTERIAL	82.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44002S	ROCKPOND MEADOWS DRIVE	LOCAL	52.0	S	0.0		0.0		0.0		0.0		0.0		0.8	0.1
CW44003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44008				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW44010S	NORMANDY BOULEVARD	LOCAL	70.7	S	0.0		0.0		0.0		0.0		0.0		0.1	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.20
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 c Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW44015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44017				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44020S	HERLONG ROAD	LOCAL	74.2	S	0.0	0.5	0.0	0.7	0.0	0.8	0.0	0.9	0.0	0.9	0.0	0.9
CW44023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW45010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45020S	HYDE GROVE AVENUE	LOCAL	15.2	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46010				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW46020S	I 295 EXPRESSWAY	ARTERIAL	37.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46040S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW47010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW50000				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50015S	SAN JUAN AVENUE	LOCAL	10.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50018				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50020				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50021				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50026				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50028				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50030S	LANE AVENUE	LOCAL	15.6	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50033				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50035				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50040S	LENOX AVENUE	LOCAL	9.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50048				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50050S	NORMANDY BOULEVARD	LOCAL	12.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50052				S	-0.2		-0.2		-0.3		-0.3		-0.2		-0.2	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.20
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 c Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50053				S	-0.5		-0.6		-0.6		-0.5		-0.5		-0.4	
CW50055				S	-1.0		-1.1		-1.1		-1.0		-0.9		-0.8	
CW50058				S	-1.0		-1.1		-1.1		-1.0		-0.9		-0.8	
CW50060S	GRACE LANE	LOCAL	7.8	S	-0.5		-0.2	0.8	-0.2	1.1	-0.2	1.5	-0.2	1.7	-0.2	1.9
CW50063				S	-0.3		-0.2		-0.2		-0.1		-0.1		-0.1	
CW50065				S	-0.3		-0.1		-0.1		-0.1		-0.1		-0.1	
CW50070S	RAMONA BOULEVARD	LOCAL	9.6	S	-0.3		-0.1		-0.1		-0.1	0.4	-0.1	0.6	0.0	0.8
CW50075				S	-0.4		-0.3		-0.3		-0.3		-0.3		-0.4	
CW50080S	E I10EXIT S LANE RP	LOCAL	13.8	S	-0.4		-0.2		-0.3		-0.3		-0.3		-0.3	
CW50090S	I 10 EXPRESSWAY	ARTERIAL	13.0	S	-0.4		-0.2		-0.3		-0.3		-0.3		-0.3	
CW50095				S	-0.4		-0.2		-0.3		-0.3		-0.3		-0.3	
CW50100S	W I10EXIT S LANE RP	LOCAL	13.2	S	-0.4		-0.1		-0.3		-0.3		-0.2		-0.2	0.1
CW50105				S	-0.4		-0.1		-0.3		-0.3		-0.2		-0.2	
CW50110S	STUART AVENUE	LOCAL	10.7	S	-0.4		-0.1		-0.3	0.4	-0.3	1.6	-0.2	2.2	-0.2	2.7
CW50115				S	-0.4		-0.1		-0.3		-0.2		-0.2		-0.2	
CW50120S	LANE AVENUE	LOCAL	12.0	S	-0.3		0.0		-0.2		-0.2	0.8	-0.1	1.3	-0.2	1.6
CW50125				S	-0.3		0.0		-0.3		-0.2		-0.1		-0.2	
CW50130S	HIGHWAY AVENUE	LOCAL	11.8	S	-0.3		0.1		-0.2	0.3	-0.1	1.4	-0.1	1.7	-0.2	2.0
CW50135				S	-0.1		0.4		-0.1		0.0		-0.1		-0.1	
CW50140S	BEAVER STREET	ARTERIAL	15.9	S	-0.1		0.6		-0.1		0.0		-0.1		-0.1	
CW50142				S	0.0		0.5		0.0		0.0		0.0		-0.1	
CW50143				S	0.0		0.4		0.0		0.0		0.0		-0.1	
CW50144				S	0.0		0.2		0.0		0.0		0.0		0.0	
CW50145				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50150S	I 295 EXPRESSWAY	ARTERIAL	23.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50155				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50160S	PICKETTVILLE ROAD	LOCAL	24.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50165				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50170S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50173				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50175				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50190	WASSON AVENUE	LOCAL	44.0	S	0.0	3.8	0.0	4.1	0.0	4.3	0.0	4.5	0.0	4.6	0.0	4.8
CW50191S	BULLS BAY HIGHWAY	LOCAL	52.6	S	0.0		0.0		0.0		0.0		0.0		0.0	

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2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
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S = Survey.

Table 5.20
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 c Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50199				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW50200S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW50209				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50210S	OLD PLANK ROAD	LOCAL	65.9	S	0.0		0.0		0.0		0.0		0.0		0.0	0.1
CW50220				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50230				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50240S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51020S	LAKE SHORE BOULEVARD	LOCAL	5.1	S	0.0		0.0		0.0		0.0		0.0	0.5	0.0	0.8
CW51030AP	1701-1 LAKE SHORE AP	LOCAL	10.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW52010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52020S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52040S	NORMANDY BOULEVARD	LOCAL	27.9	S	0.0		0.0		0.0		0.0		0.0	0.8	0.0	1.0
CW53010				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW53020S	LANE AVENUE	LOCAL	14.7	S	0.0		0.0		0.0		0.0		0.0		0.1	
CW53030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW54001S	STUART AVENUE	LOCAL	11.2	S	-0.4		-0.1		-0.3		-0.3	1.0	-0.2	1.7	-0.2	2.2
CW54002				S	-0.4		-0.1		-0.2		-0.3		-0.2		-0.2	
CW54003				S	-0.3		-0.1		-0.2		-0.3		-0.2		-0.2	
CW54004S				S	-0.2		-0.1		-0.2		-0.2		-0.1		-0.1	
CW54005S				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54006				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54007				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54010S	HIGHWAY AVENUE	LOCAL	14.5	S	-0.1		0.0	0.6	0.0	1.2	0.0	1.6	0.0	1.9	0.0	2.1
CW54015				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54030S	BEAVER STREET	ARTERIAL	15.6	S	0.0		0.0		0.0	0.1	0.0	0.5	0.0	0.8	0.0	1.0
CW54032				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54035				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54040S				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54042				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54050S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54060				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54070S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54075				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54080S				S	0.0		0.0		0.0		0.0		0.0		-0.1	

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S = Survey.

Table 5.20
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 c Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW54085				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54090S	SCOTIA ROAD	LOCAL	19.3	S	0.0		0.0		0.0	0.2	0.0	0.7	0.0	0.8	0.0	0.9
CW54095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54100S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54105				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54110S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54115				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54120S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54125				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54130S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54135				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54140S	EDGEWOOD AVENUE	LOCAL	19.0	S	0.0	0.1	0.0	0.6	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW55002				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW55003				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW55005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55010S	ELLIS ROAD	LOCAL	22.9	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55012AP	STEVENS STREET	LOCAL	25.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55013AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55014AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55015AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55020APS	CASSAT AVENUE	ARTERIAL	19.0	AP	0.0	0.3	0.0	0.9	0.0	1.5	0.0	1.9	0.0	2.2	0.0	2.3
CW55025AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW56010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57005				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57020S	OLD PLANK ROAD	LOCAL	22.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57030				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW57040S	BEAVER STREET	ARTERIAL	28.4	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57050				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57060S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57070AP	CHASE BOULEVARD	LOCAL	23.0	AP	0.0	0.3	0.0	0.7	0.0	1.0	0.0	1.3	0.0	1.6	0.0	1.8
CW57080AP	S I295EXIT W I10 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57090AP	E I10EXIT S I295 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW58005				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW58010S	GRACE TERRACE	LOCAL	10.2	S	0.0		0.0	0.7	0.0	1.3	0.0	1.6	0.0	1.8	0.1	1.8
CW58015				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW59010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

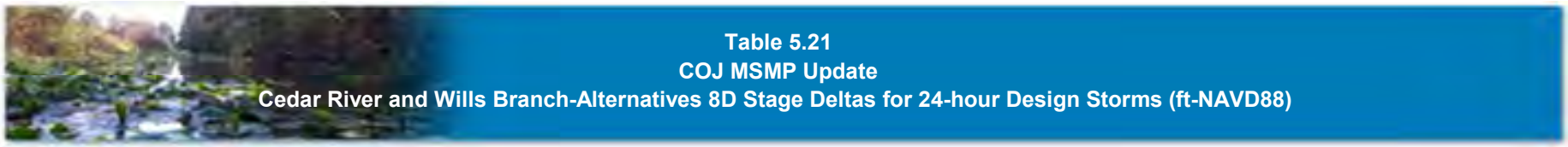

Table 5.21
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8D Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40005S	LANE AVENUE	LOCAL	12.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40007L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40008				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40008L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40010S	OLD MIDDLEBURG ROAD	LOCAL	18.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40012				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40013				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40014L				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40030S	N I295EXIT NORM RP	LOCAL	23.4	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40035				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40036				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40037				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40038				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40040S	LENOX AVENUE	LOCAL	22.5	S	0.0		0.0	0.3	0.0	1.2	0.0	1.7	0.0	2.0	0.0	2.2
CW40043				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40045				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40046				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40046L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40050S	CAHOON ROAD	LOCAL	43.7	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40060S	RAMONA BOULEVARD	LOCAL	53.9	S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40065				S	0.0		0.0		0.0		0.0		0.0		-0.6	
CW40070S	I 10 EXPRESSWAY	ARTERIAL	59.0	S	0.0		0.0		0.0		0.0		0.0		0.0	0.3
CW40075				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40080S	RAMONA BOULEVARD	LOCAL	60.8	S	0.0		0.0		0.0		0.0		0.0	0.6	0.0	0.9
CW40087				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40090S	HAMMOND BOULEVARD	LOCAL	63.6	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.0	0.0	1.1	0.0	1.2
CW40093				S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.21
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 D Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW40095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40096S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40097				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW40097L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW40098				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW40099S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW40100AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW41002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41004				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41005S	MT VERNON DRIVE	LOCAL	10.4	S	0.0		0.0		0.0		0.0	0.9	0.0	1.4	0.1	1.7
CW41007				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41008				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41010S	OLD MIDDLEBURG ROAD	LOCAL	16.3	S	0.0		0.0		0.0		0.0		0.0	0.4	0.0	1.1
CW41015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41020S	HERLONG ROAD	LOCAL	17.5	S	0.0	1.1	0.0	1.5	0.0	1.8	0.0	2.0	0.0	2.2	0.1	2.4
CW41027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41030S	I 295 EXPRESSWAY	ARTERIAL	32.0	S	0.0		0.0		0.0		0.0		0.0	0.9	0.0	1.3
CW41031				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41033S	VALLEY CROSSING DRIVE	LOCAL	30.0	S	0.0	1.0	0.0	1.8	0.0	2.4	0.0	2.9	0.0	3.2	0.0	3.5
CW41035				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41036				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41037				S	0.0		0.0		0.0		0.0		0.0		2.3	
CW41037L				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW41038				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41040S	WILSON BOULEVARD	LOCAL	58.4	S	0.0		0.0		0.0		0.0		0.0		0.0	0.2
CW41047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41050S	OLD MIDDLEBURG ROAD	LOCAL	62.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41057				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41060S	FRANK H PETERSON ACADEMY AC	LOCAL	64.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW41070AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW42003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42005S	FOURAKER ROAD	LOCAL	39.8	S	0.0		0.0	0.8	0.0	1.4	0.0	1.7	0.0	1.9	0.1	2.0
CW42006				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW42007				S	0.0		0.0		0.0		0.0		0.0		0.2	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.21
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 D Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW43002				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43003				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43005S	FOURAKER ROAD	LOCAL	27.5	S	0.0	0.4	0.0	0.7	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW43007				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43008				S	0.0		0.0		0.0		0.0		0.0		-0.2	
CW43010S	COUNTRY CREEK BOULEVARD	LOCAL	33.6	S	0.0		0.0		0.0		0.0		0.0		-0.3	0.3
CW43015				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43016				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43017				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43020S	COUNTRY CREEK BOULEVARD	LOCAL	40.7	S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW43025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43027				S	0.0		0.0		0.0		0.0		0.0		1.1	
CW43030S	HAMMOND BOULEVARD	LOCAL	49.0	S	0.0		0.0		0.0		0.0		0.0	0.5	1.1	0.7
CW43033				S	0.0		0.0		0.0		0.0		0.0		1.0	
CW43035				S	0.0		0.0		0.0		0.0		0.0		0.6	
CW43037				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43040S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW43045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43047				S	0.0		0.0		0.0		0.0		0.0		0.4	
CW43050S	CRYSTAL SPRINGS ROAD	LOCAL	75.9	S	0.0		0.0	0.0	0.0	0.5	0.0	0.6	0.0	0.7	0.1	0.8
CW43055				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43056				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43057S	EVENING STROLL LANE	LOCAL	80.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43059				S	0.0		0.0		0.0		0.0		0.0		-0.9	
CW43060S	CHANDLER OAKS DRIVE	LOCAL	79.3	S	0.0		0.0		0.0		0.0		0.0		-4.4	
CW43063				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43065				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43066				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43067S	COXWELL ESTATES CT	LOCAL	80.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43068				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW43070S	I 10 EXPRESSWAY	ARTERIAL	82.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44002S	ROCKPOND MEADOWS DRIVE	LOCAL	52.0	S	0.0		0.0		0.0		0.0		0.0		0.8	0.1
CW44003				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44008				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW44010S	NORMANDY BOULEVARD	LOCAL	70.7	S	0.0		0.0		0.0		0.0		0.0		0.1	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.21
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 D Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW44015				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44017				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44020S	HERLONG ROAD	LOCAL	74.2	S	0.0	0.5	0.0	0.7	0.0	0.8	0.0	0.9	0.0	0.9	0.0	0.9
CW44023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW44030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW45010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45020S	HYDE GROVE AVENUE	LOCAL	15.2	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW45030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46010				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW46020S	I 295 EXPRESSWAY	ARTERIAL	37.3	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW46040S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW47010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW50000				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50001L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50002L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50015S	SAN JUAN AVENUE	LOCAL	10.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50018				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50020				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50021				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50023				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50025				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50026				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50027				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50028				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50030S	LANE AVENUE	LOCAL	15.6	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50033				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50035				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50040S	LENOX AVENUE	LOCAL	9.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50047				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50048				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50050S	NORMANDY BOULEVARD	LOCAL	12.0	S	0.0		0.0		-0.1		0.0		0.0		0.0	
CW50052				S	-0.2		-0.2		-0.3		-0.2		-0.2		-0.2	

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2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.21
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 D Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50053				S	-0.5		-0.6		-0.7		-0.5		-0.5		-0.4	
CW50055				S	-1.0		-1.1		-1.1		-0.9		-0.9		-0.8	
CW50058				S	-1.0		-1.1		-1.1		-1.0		-0.9		-0.8	
CW50060S	GRACE LANE	LOCAL	7.8	S	-0.5		-0.2	0.8	-0.2	1.1	-0.2	1.5	-0.1	1.8	-0.2	1.9
CW50063				S	-0.3		-0.1		-0.1		-0.1		-0.1		-0.1	
CW50065				S	-0.3		-0.1		-0.1		-0.1		-0.1		-0.1	
CW50070S	RAMONA BOULEVARD	LOCAL	9.6	S	-0.3		-0.1		-0.1		-0.1	0.4	0.0	0.7	0.0	0.8
CW50075				S	-0.4		-0.2		-0.3		-0.3		-0.3		-0.4	
CW50080S	E I10EXIT S LANE RP	LOCAL	13.8	S	-0.4		-0.2		-0.3		-0.3		-0.3		-0.3	
CW50090S	I 10 EXPRESSWAY	ARTERIAL	13.0	S	-0.4		-0.1		-0.3		-0.3		-0.2		-0.3	
CW50095				S	-0.4		-0.1		-0.2		-0.3		-0.2		-0.3	
CW50100S	W I10EXIT S LANE RP	LOCAL	13.2	S	-0.4		-0.1		-0.2		-0.3		-0.2		-0.2	0.2
CW50105				S	-0.4		-0.1		-0.2		-0.3		-0.2		-0.2	
CW50110S	STUART AVENUE	LOCAL	10.7	S	-0.4		0.0	0.0	-0.2	0.5	-0.3	1.6	-0.2	2.3	-0.2	2.7
CW50115				S	-0.4		0.0		-0.2		-0.3		-0.2		-0.2	
CW50120S	LANE AVENUE	LOCAL	12.0	S	-0.4		-0.3		-0.5		-0.5	0.5	-0.3	1.1	-0.3	1.5
CW50125				S	-0.4		-0.3		-0.5		-0.5		-0.3		-0.3	
CW50130S	HIGHWAY AVENUE	LOCAL	11.8	S	-0.4		-0.2		-0.5		-0.4	1.1	-0.2	1.6	-0.3	1.9
CW50135				S	-0.1		0.4		-0.2		0.0		-0.2		-0.2	
CW50140S	BEAVER STREET	ARTERIAL	15.9	S	-0.1		0.6		-0.1		0.0		-0.2		-0.1	
CW50142				S	0.0		0.5		0.0		0.0		-0.1		-0.1	
CW50143				S	0.0		0.4		0.0		0.0		-0.1		-0.1	
CW50144				S	0.0		0.2		0.0		0.0		0.0		0.0	
CW50145				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50150S	I 295 EXPRESSWAY	ARTERIAL	23.5	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50155				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50160S	PICKETTVILLE ROAD	LOCAL	24.0	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50165				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50170S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50172L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50173				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50174L2				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50175				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50190	WASSON AVENUE	LOCAL	44.0	S	0.0	3.8	0.0	4.1	0.0	4.3	0.0	4.5	0.0	4.6	0.0	4.8
CW50191S	BULLS BAY HIGHWAY	LOCAL	52.6	S	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.21
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 D Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW50199				S	0.0		0.0		0.0		0.0		0.0		0.2	
CW50200S				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW50209				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50210S	OLD PLANK ROAD	LOCAL	65.9	S	0.0		0.0		0.0		0.0		0.0		0.0	0.1
CW50220				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50230				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW50240S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW51020S	LAKE SHORE BOULEVARD	LOCAL	5.1	S	0.0		0.0		0.0		0.0		0.0	0.5	0.0	0.8
CW51030AP	1701-1 LAKE SHORE AP	LOCAL	10.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW52010				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52020S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52030				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW52040S	NORMANDY BOULEVARD	LOCAL	27.9	S	0.0		0.0		0.0		0.0		0.0	0.8	0.0	1.0
CW53010				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW53020S	LANE AVENUE	LOCAL	14.7	S	0.0		0.0		0.0		0.0		0.0		0.1	
CW53030AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW54001S	STUART AVENUE	LOCAL	11.2	S	-0.4		0.0		-0.2		-0.3	1.0	-0.2	1.7	-0.2	2.2
CW54002				S	-0.4		0.0		-0.2		-0.3		-0.2		-0.2	
CW54003				S	-0.3		0.0		-0.2		-0.3		-0.2		-0.2	
CW54004S				S	-0.2		0.0		-0.1		-0.1		-0.1		-0.1	
CW54005S				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54006				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54007				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54010S	HIGHWAY AVENUE	LOCAL	14.5	S	-0.1		0.0	0.6	0.0	1.2	0.0	1.6	0.0	1.9	0.0	2.1
CW54015				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54030S	BEAVER STREET	ARTERIAL	15.6	S	0.0		0.0		0.0	0.1	0.0	0.5	0.0	0.8	0.0	1.0
CW54032				S	0.0		-0.1		0.0		0.0		0.0		0.0	
CW54035				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54040S				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW54042				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54045				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54050S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54060				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54070S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54075				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54080S				S	0.0		0.0		0.0		0.0		0.0		-0.1	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.21
COJ MSMP Update
Cedar River and Wills Branch-Alternatives 8 D Stage Deltas for 24-hour Design Storms (ft-NAVD88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth	Δ (ft)	Flood Depth
CW54085				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW54090S	SCOTIA ROAD	LOCAL	19.3	S	0.0		0.0		0.0	0.2	0.0	0.7	0.0	0.8	0.0	0.9
CW54095				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54100S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54105				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54110S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54115				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54120S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54125				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54130S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54135				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW54140S	EDGEWOOD AVENUE	LOCAL	19.0	S	0.0	0.1	0.0	0.6	0.0	0.9	0.0	1.2	0.0	1.4	0.0	1.5
CW55002				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW55003				S	-0.1		0.0		0.0		0.0		0.0		0.0	
CW55005S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55007				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55010S	ELLIS ROAD	LOCAL	22.9	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW55012AP	STEVENS STREET	LOCAL	25.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55013AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55014AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55015AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW55020APS	CASSAT AVENUE	ARTERIAL	19.0	AP	0.0	0.3	0.0	0.9	0.0	1.5	0.0	1.9	0.0	2.2	0.0	2.3
CW55025AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW56010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57005				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57020S	OLD PLANK ROAD	LOCAL	22.8	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57030				S	0.0		0.0		0.0		0.0		0.0		-0.1	
CW57040S	BEAVER STREET	ARTERIAL	28.4	S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57050				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57060S				S	0.0		0.0		0.0		0.0		0.0		0.0	
CW57070AP	CHASE BOULEVARD	LOCAL	23.0	AP	0.0	0.3	0.0	0.7	0.0	1.0	0.0	1.3	0.0	1.6	0.0	1.8
CW57080AP	S I295EXIT W I10 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW57090AP	E I10EXIT S I295 RP	LOCAL	32.0	AP	0.0		0.0		0.0		0.0		0.0		0.0	
CW58005				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW58010S	GRACE TERRACE	LOCAL	10.2	S	0.0		0.0	0.7	0.0	1.3	0.0	1.6	0.0	1.8	0.1	1.8
CW58015				S	0.0		0.0		0.0		0.0		0.0		0.1	
CW59010AP				AP	0.0		0.0		0.0		0.0		0.0		0.0	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.

Table 5.22
COJ MSMP Update
Cedar River and Wills Branch-Alternative Conceptual Cost Evaluation

ALTERNATIVE 8A						
Item	**Units**		**Unit Cost**	**Quantity**		**Total Cost**
Captial Costs						
1. Culverts/Bridges	LF	$	3,000	0	$	-
2. Weirs/Outlet Structures	LS	$	50,000	0	$	-
3. Pump Station	LS	$	-	0	$	-
4. Channel Lining (1)	LF	$	200	0	$	-
5. Excavation/Earth Work	CY	$	8	41,000	$	328,000
6. Land Acquisition	ACRE	$	50,000	5	$	250,000
7. Wetlands Creation (2)	ACRE	$	50,000	5	$	750,000
8. Sod at Pond Sites/Channel Banks	SY	$	3	12,500	$	37,500
9. Baffle Box	LS	$	100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$	8	0	$	-
Subtotal 1 - Capital Costs (3)					$	1,365,500
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)					$	204,825
Subtotal 2 (Subtotal 1 + 15% Design Fees)					$	1,570,325
Contingency (30% of Subtotal 2)					$	471,098
Subtotal 3 - (Subtotal 2 + 30% Contingency)					$	2,041,423
Operations & Maintenance (4)						
11. Crossing Upgrade	LS	$	14,000	0	$	-
12. Pump Station	LS	$	-	0	$	-
13. Channel Lining	LF/YR	$	30	0	$	-
14. Stormwater Facility - Mowing	ACRE/YR	$	1,300	5	$	6,500
15. Stormwater Facility - Spraying	ACRE/YR	$	400	5	$	2,000
16. Stormwater Facility - Dredging and Structure Repair	LS	$	62,000	5	$	310,000
17. Baffle Box	LS	$	2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$	100	0	$	-
Subtotal 4 - Total Operations & Maintenance Cost					$	318,500
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)					**$**	**2,360,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Table 5.23
COJ MSMP Update
Cedar River and Wills Branch-Alternative Conceptual Cost Evaluation

ALTERNATIVE 8B					
Item	**Units**	**Unit Cost**	**Quantity**		**Total Cost**
Captial Costs					
1. Culverts/Bridges	LF	$ 3,000	0	$	-
2. Weirs/Outlet Structures	LS	$ 50,000	0	$	-
3. Pump Station	LS	$ -	0	$	-
4. Channel Lining [1]	LF	$ 200	220	$	44,000
5. Excavation/Earth Work	CY	$ 8	1,000	$	8,000
6. Land Acquisition	ACRE	$ 50,000	1	$	50,000
7. Wetlands Creation [2]	ACRE	$ 50,000	1	$	150,000
8. Sod at Pond Sites/Channel Banks	SY	$ 3	0	$	-
9. Baffle Box	LS	$ 100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$ 8	0	$	-
Subtotal 1 - Capital Costs [3]				$	252,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$	37,800
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$	289,800
Contingency (30% of Subtotal 2)				$	86,940
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$	376,740
Operations & Maintenance [4]					
11. Crossing Upgrade	LS	$ 14,000	0	$	-
12. Pump Station	LS	$ -	0	$	-
13. Channel Lining	LF/YR	$ 30	220	$	6,600
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	0	$	-
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	0	$	-
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	0	$	-
17. Baffle Box	LS	$ 2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	0	$	-
Subtotal 4 - Total Operations & Maintenance Cost				$	6,600
Total Cost (Subtotal 3 + Subtotal 4) [5] [6]				**$**	**383,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Table 5.24
COJ MSMP Update
Cedar River and Wills Branch-Alternative Conceptual Cost Evaluation

ALTERNATIVE 8C					
Item	**Units**	**Unit Cost**	**Quantity**		**Total Cost**
Captial Costs					
1. Culverts/Bridges	LF	$ 3,000	0	$	-
2. Weirs/Outlet Structures	LS	$ 50,000	0	$	-
3. Pump Station	LS	$ -	0	$	-
4. Channel Lining [1]	LF	$ 200	220	$	44,000
5. Excavation/Earth Work	CY	$ 8	42,000	$	336,000
6. Land Acquisition	ACRE	$ 50,000	6	$	300,000
7. Wetlands Creation [2]	ACRE	$ 50,000	6	$	900,000
8. Sod at Pond Sites/Channel Banks	SY	$ 3	12,500	$	37,500
9. Baffle Box	LS	$ 100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$ 8	0	$	-
Subtotal 1 - Capital Costs [3]				$	1,617,500
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$	242,625
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$	1,860,125
Contingency (30% of Subtotal 2)				$	558,038
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$	2,418,163
Operations & Maintenance [4]					
11. Crossing Upgrade	LS	$ 14,000	0	$	-
12. Pump Station	LS	$ -	0	$	-
13. Channel Lining	LF/YR	$ 30	220	$	6,600
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	0	$	-
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	0	$	-
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	0	$	-
17. Baffle Box	LS	$ 2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	0	$	-
Subtotal 4 - Total Operations & Maintenance Cost				$	6,600
Total Cost (Subtotal 3 + Subtotal 4) [5] [6]				**$**	**2,425,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Table 5.25
COJ MSMP Update
Cedar River and Wills Branch-Alternative Conceptual Cost Evaluation

ALTERNATIVE 8D						
Item	**Units**		**Unit Cost**	**Quantity**		**Total Cost**
Captial Costs						
1. Culverts/Bridges	LF	$	495,000	2	$	990,000
2. Weirs/Outlet Structures	LS	$	50,000	0	$	-
3. Pump Station	LS	$	-	0	$	-
4. Channel Lining (1)	LF	$	200	220	$	44,000
5. Excavation/Earth Work	CY	$	8	42,000	$	336,000
6. Land Acquisition	ACRE	$	50,000	6	$	300,000
7. Wetlands Creation (2)	ACRE	$	50,000	6	$	900,000
8. Sod at Pond Sites/Channel Banks	SY	$	3	12,500	$	37,500
9. Baffle Box	LS	$	100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$	8	0	$	-
Subtotal 1 - Capital Costs (3)					$	2,607,500
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)					$	391,125
Subtotal 2 (Subtotal 1 + 15% Design Fees)					$	2,998,625
Contingency (30% of Subtotal 2)					$	899,588
Subtotal 3 - (Subtotal 2 + 30% Contingency)					$	3,898,213
Operations & Maintenance (4)						
11. Crossing Upgrade	LS	$	14,000	2	$	28,000
12. Pump Station	LS	$	-	0	$	-
13. Channel Lining	LF/YR	$	30	220	$	6,600
14. Stormwater Facility - Mowing	ACRE/YR	$	1,300	0	$	-
15. Stormwater Facility - Spraying	ACRE/YR	$	400	0	$	-
16. Stormwater Facility - Dredging and Structure Repair	LS	$	62,000	0	$	-
17. Baffle Box	LS	$	2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$	100	0	$	-
Subtotal 4 - Total Operations & Maintenance Cost					$	34,600
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)					**$**	**3,933,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

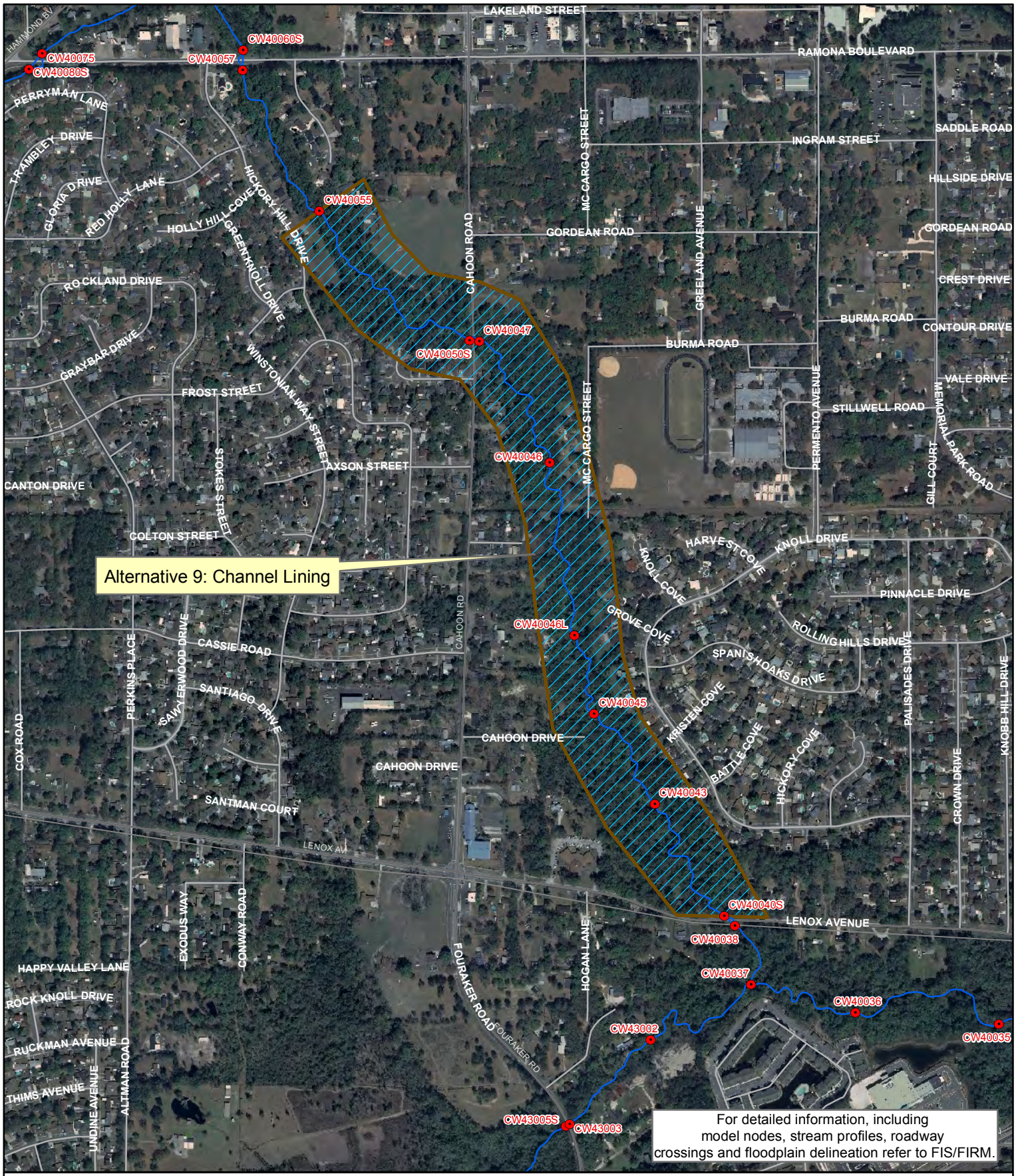


Figure 5.11
Cedar River and Wills Branch Subbasin
Alternative 9

CDM

Table 5.26
COJ MSMP Update
Cedar River and Wills Branch -Alternative Conceptual Cost Evaluation

ALTERNATIVE 9						
Item	**Units**		**Unit Cost**	**Quantity**		**Total Cost**
Captial Costs						
1. Culverts/Bridges	LF	$	3,000	0	$	-
2. Weirs/Outlet Structures	LS	$	50,000	0	$	-
3. Pump Station	LS	$	-	0	$	-
4. Channel Lining (1)	LF	$	200	4,600	$	920,000
5. Excavation/Earth Work	CY	$	8	0	$	-
6. Land Acquisition	ACRE	$	50,000	0	$	-
7. Wetlands Creation (2)	ACRE	$	50,000	0	$	-
8. Sod at Pond Sites/Channel Banks	SY	$	3	0	$	-
9. Baffle Box	LS	$	100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$	8	0	$	-
Subtotal 1 - Capital Costs (3)					$	920,000
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)					$	138,000
Subtotal 2 (Subtotal 1 + 15% Design Fees)					$	1,058,000
Contingency (30% of Subtotal 2)					$	317,400
Subtotal 3 - (Subtotal 2 + 30% Contingency)					$	1,375,400
Operations & Maintenance (4)						
11. Crossing Upgrade	LS	$	14,000	0	$	-
12. Pump Station	LS	$	-	0	$	-
13. Channel Lining	LF/YR	$	30	4,600	$	138,000
14. Stormwater Facility - Mowing	ACRE/YR	$	1,300	0	$	-
15. Stormwater Facility - Spraying	ACRE/YR	$	400	0	$	-
16. Stormwater Facility - Dredging and Structure Repair	LS	$	62,000	0	$	-
17. Baffle Box	LS	$	2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$	100	0	$	-
Subtotal 4 - Total Operations & Maintenance Cost					$	138,000
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)					**$**	**1,513,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Section 6.0
Williamson Creek

6.1 Introduction

This is an update of the 1992 MSMP; it reflects changes occurred in the basins since then based on updated land use, and additional survey and data collection. The following sections describe in greater detail the results of the analysis for Williamson Creek. The 1992 MSMP for this sub-basin is located in Appendix A.

This is a planning level investigation to be used for capital improvement analysis. The MSMP provides a model framework for documenting Level of Service (LOS), proposing alternatives, and identifying water quality opportunities.

6.2 Sub-basin Information

This section outlines information on the Williamson Creek sub-basin infrastructure, floodplain, and ability to meet LOS requirements. Schematics of the sub-basin hydrology and hydraulics are shown on **Figures 6.1 and 6.2**, respectively. Hydrologic Unit Code (HUC) parameters are summarized in **Table 6.1**.

6.2.1 Existing Condition

Williamson Creek has not experienced any major development since the 1992 MSMP.

6.2.2 FEMA Related Documents

As part of this project, the City developed updated FEMA flood maps, which include stream profiles and discharge tables that are available to the public. The Flood Insurance Study (FIS) summarizes the results of the analysis that can be retrieved electronically at the following location: http://www.mappingtherisk.com/. This website can also be reached through the City's www.coj.net homepage.

6.2.3 Level of Service Summary

Under the present land use conditions, the Mean Annual, 5-, 10-, 25-, 50-, 100–year design storms were simulated to determine the problem areas as defined below.

In the Williamson Creek area the following locations do not meet the City's LOS as described in Volume 1 Section 6.0. LOS violations are shown on **Figure 6.3**.

- Water Quantity
    - One local road (Wilson Blvd.) does not meet the defined LOS, i.e., >3 inches of flooding for a 5-year storm event. All arterial roads meet the LOS.

- There are no potential structures at risk (PSAR) in the Williamson Creek area including residential and commercial establishments.

The peak stages for the various 24-hr design storms under existing conditions are presented in **Table 6.2**.

- Water Quality
  - Number of septic tanks in the Department of Health defined failing septic tank areas in the Williamson Creek sub-basin: 291.
  - There are 278 septic tanks in these failing areas in the 200-meter Williamson Creek buffer.
  - The BMAP goal for total nitrogen (TN) reduction in the Ortega River basin is set at 4.6 MT TN/yr.
- Erosion
  - Total length of channel experiencing high velocities (greater than 3 ft/sec): 2600 feet.
  - Channel between: Node WL54015 and Node WL54013AP
    Node WL51035AP and Node WL5015

6.3 Alternatives Evaluation

This section describes the alternatives evaluated for the Williamson Creek sub-basin. Based on the screening process for the alternatives evaluation, the following alternatives representing different LOS were developed. Detailed public safety options and standards should be considered and implemented as appropriate during final design.

- Alternative 1: 0.5-Acre RSF
- Alternative 2: 1.0-Acre RSF

ALTERNATIVE 1

Alternative 1 addresses water quality and flood control within the Williamson Creek sub-basin. This alternative involves construction of a 0.5-acre wet-detention facility as shown on **Figure 6.4**.The RSF was evaluated as an off-line pond with a retention period of 10 days, a maximum depth of 10 feet, a permanent pool volume of 3.6 ac-ft, and a total surface area (including maintenance buffer) of approximately 1.5 acres. For cost-benefit analysis, two scales were identified for this alternative:

- Alternative 1A: 0.5-Acre RSF
- Alternative 1B: 0.5-Acre RSF with Managed Aquatic Plant Systems (MAPS)

MAPS are a supplement to existing or new RSF to increase nutrient uptake and removal in the facilities through vegetative growth. The MAPS act as a littoral zone planted with aquatic vegetation managed to optimize uptake of nutrients. Unlike a traditional littoral zone, which dies back in winter releasing the nutrients through its detritus, MAPS are harvested annually to permanently remove nutrients from the system. Additionally, the MAPS are typically implemented as floating islands that remain in contact with nutrients in the water even during periods when traditional littoral zones would be left dry.

Water quality analysis was performed using the Watershed Management Model (WMM) to measure the effectiveness of this pond to reduce the various NPDES water quality parameters for annual loads. Results are tabulated in **Table 6.3** comparing the existing and with-project conditions for the Williamson Creek sub-basin. For MAPS, a removal efficiency of 40 percent of the remaining pond load was assumed (i.e., after traditional wet detention). The City and FDEP are in the process of several MAPS trial studies to further define this removal efficiency.

Alternative 1 provides nutrient reduction ranging from 0.05 MT TN/yr (Alternative 1A) to 0.70 MT TN/yr (Alternative 1B). The capital and O&M costs associated with these alternatives are presented in **Tables 6.4 and 6.5**.

Table 6.3 Water Quality Analysis Results for Alternative 1 for Williamson Creek

Parameter	Units	Existing Conditions	Alternative	Reduction	%Reduction
Flow	(ac-ft/yr)	3,443	3,443	-	0.0%
BOD	lbs/yr	63,598	62,994	604	0.9%
Cd	lbs/yr	16	16	-	0.0%
COD	lbs/yr	396,783	393,773	3,010	0.8%
Cu	lbs/yr	100	99	1	1.0%
DP	lbs/yr	1,353	1,328	25	1.8%
F-Coli	counts/yr	6.77E+14	6.60E+14	1.67E+13	2.5%
NO23	lbs/yr	4,847	4,796	51	1.1%
Pb	lbs/yr	121	119	2	1.7%
TDS	lbs/yr	1,164,906	1,157,221	7,685	0.7%
TKN	lbs/yr	10,481	10,420	61	0.6%
TP	lbs/yr	2,347	2,311	36	1.5%
TSS	lbs/yr	296,453	290,995	5,458	1.8%
Zn	lbs/yr	536	529	7	1.3%
TN	lbs/yr	15,328	15,216	112	0.7%

Values do not include MAPS nutrient removal

ALTERNATIVE 2

Alternative 2 addresses water quality and flood control within the Williamson Creek sub-basin. This alternative involves construction of a 1.0 acre wet-detention facility as shown on **Figure 6.5**. The RSF was evaluated as an off-line pond with a retention period of 21 days, a maximum depth of 10 feet, a permanent pool volume of 7.5 ac-ft, and a total surface area (including maintenance buffer) of approximately 2.5 acres. For cost-benefit analysis, two scales were identified for this alternative:

- Alternative 2A: 1.0-Acre RSF
- Alternative 2B: 1.0-Acre RSF with MAPS

Water quality analysis was performed using the Watershed Management Model (WMM) to measure the effectiveness of this pond to reduce the various NPDES water quality parameters for annual loads. Results are tabulated in **Table 6.6** comparing the existing and with-project conditions for the Williamson Creek sub-basin. For MAPS, a removal efficiency of 40 percent of the remaining pond load was assumed (i.e., after traditional wet detention). The City and FDEP are in the process of several MAPS trial studies to further define this removal efficiency.

Alternative 2 provides nutrient reduction ranging from 0.04 MT TN/yr (Alternative 2A) to 0.13 MT TN/yr (Alternative 2B). The capital and O&M costs associated with these alternatives are presented in **Tables 6.7 and 6.8**.

Table 6.6 Water Quality Analysis Results for Alternative 2 for Williamson Creek

Parameter	Units	Existing Conditions	Alternative	Reduction	% Reduction
Flow	(ac-ft/yr)	1,721	1,721	-	0.0%
BOD	lbs/yr	31,225	30,840	385	1.2%
Cd	lbs/yr	8	8	0	2.6%
COD	lbs/yr	194,783	192,429	2,354	1.2%
Cu	lbs/yr	50	49	1	2.0%
DP	lbs/yr	688	672	16	2.3%
F-Coli	counts/yr	3.41E+14	3.30E+14	1.12E+13	3.3%
NO23	lbs/yr	2,467	2,432	35	1.4%
Pb	lbs/yr	60	59	1	1.7%
TDS	lbs/yr	577,906	573,377	4,529	0.8%
TKN	lbs/yr	5,269	5,227	42	0.8%
TP	lbs/yr	1,180	1,159	21	1.8%
TSS	lbs/yr	147,453	144,023	3,430	2.3%
Zn	lbs/yr	260	256	4	1.5%
TN	lbs/yr	7,736	7,659	77	1.0%

Values do not include MAPS nutrient removal

6.4 Cost Benefit Analysis

To facilitate the selection of the most cost effective project alternatives, a cost-benefit analysis was performed for all identified combinations of alternatives. The detailed methodology used for the cost-benefit analysis can be found in Volume 1 Section 7.0.

6.4.1 Alternative Relationships

To maximize the effectiveness of the cost-benefit analysis, any interdependencies among alternatives must be identified. The following relationships were identified for the Williamson Creek sub-basin:

- All alternatives can be implemented as standalone projects.
- No alternative is dependent upon the implementation of another alternative.

6.4.2 Cost Effectiveness Analysis

Figure 6.6 shows all the possible combinations of alternatives and their corresponding benefit scores. The cost effective frontier identified the alternatives that are the most cost effective, i.e. no other combination of alternatives provides more benefit for lower cost, and the "best buys", i.e., the combinations of alternatives with the lowest cost/benefit ratio. The best buy plans for the sub-basin are identified in **Table 6.9**.

Table 6.9 Best Buy Plans Identified for Williamson Creek Sub-basin Cost Effectiveness Analysis

Plan Alternative	Project Description	Total Benefit (Output) (%)	Cost ($1000)	Average Cost ($1000 / %)
No Action Plan		0	0	
1B	0.5 Ac RSF w/MAPS	3.0	1,119	368
1B2B	0.5 Ac RSF w/ MAPS + 1.0 Ac RSF w/ MAPS	3.6	2,675	743

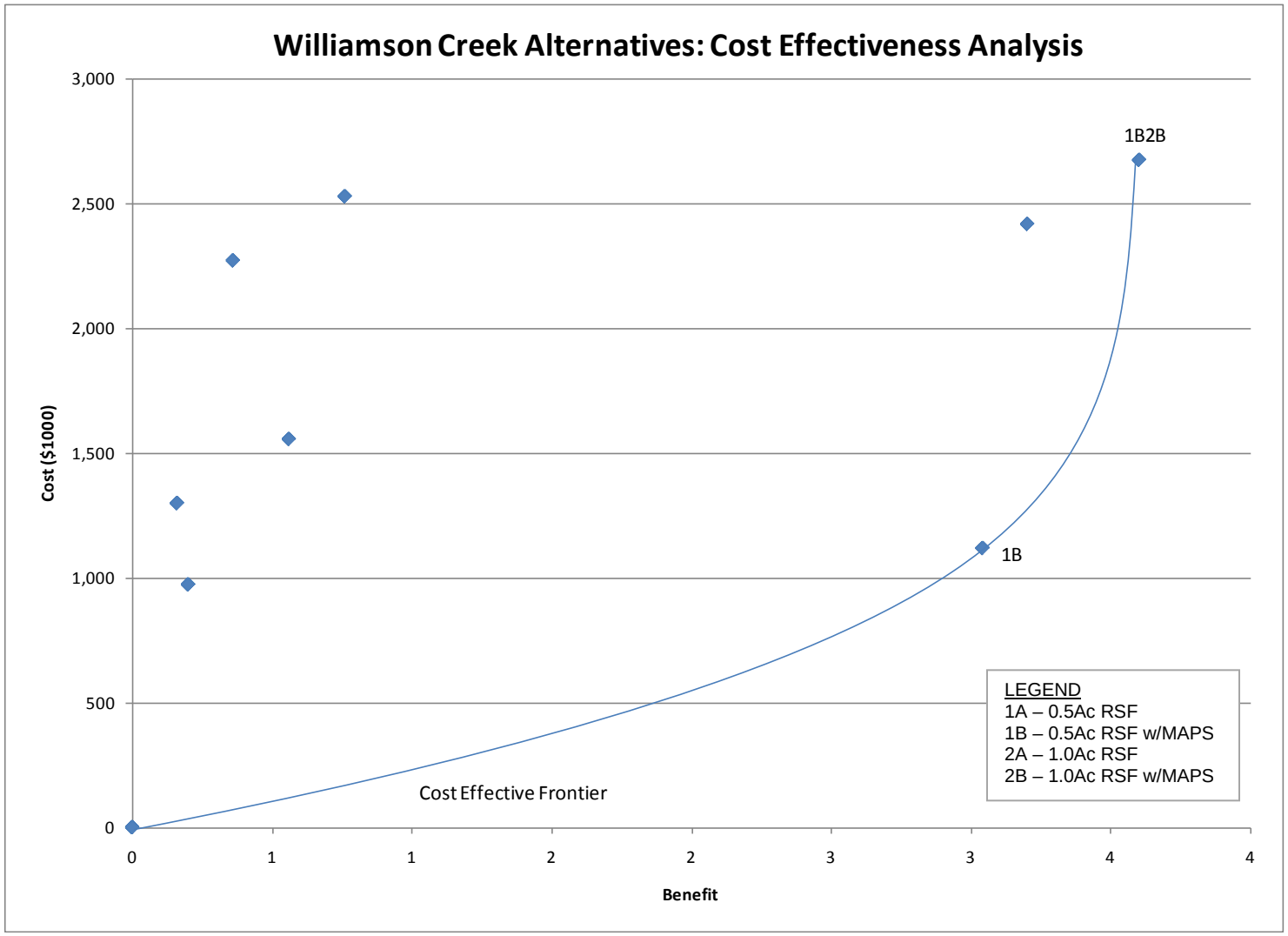


Figure 6.6 Results of Williamson Creek Cost Effectiveness Analysis

6.4.3 Incremental Cost Analysis

The best buy plans identified during cost effectiveness analysis were next reviewed for incremental cost. The results of the incremental cost analysis are presented in **Figure 6.7 and in Table 6.10**.

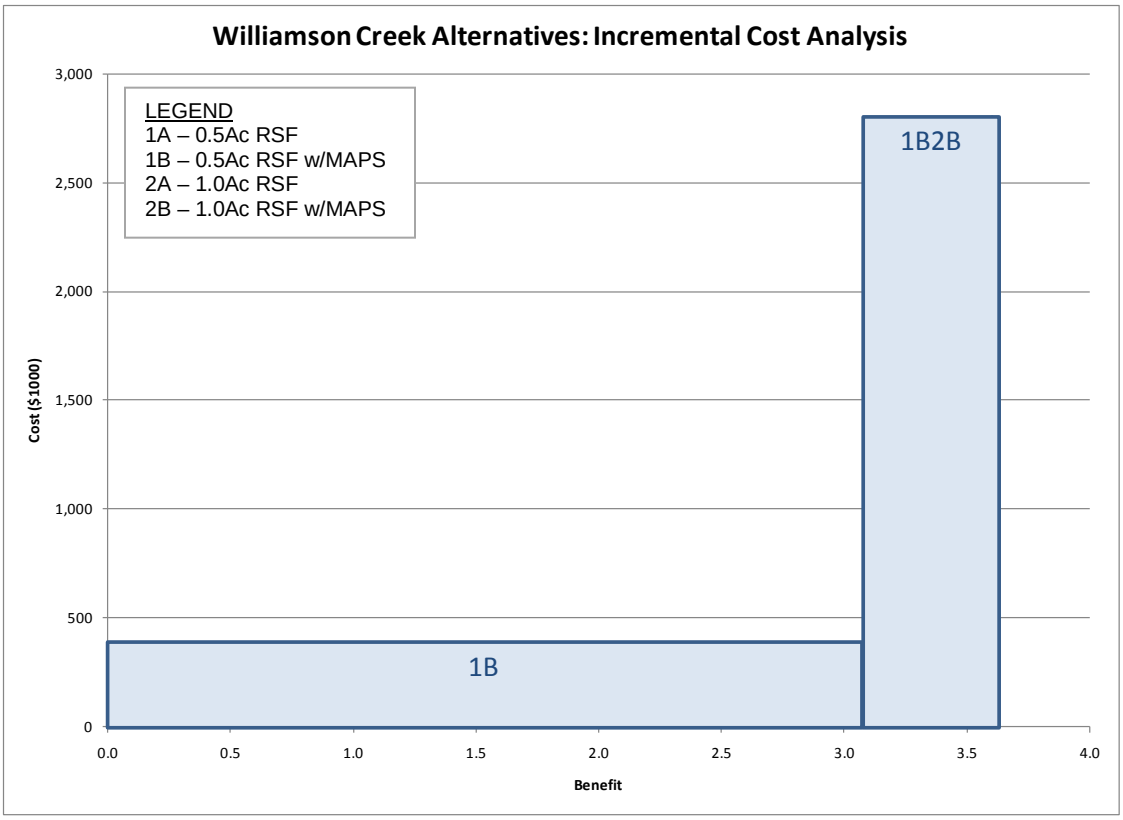


Figure 6.7 Results of Williamson Creek Incremental Cost Analysis

Table 6.10 Incremental Cost Information for Best Buy Plans

Plan Alternative	Total Benefit (Output) (%)	Cost ($1000)	Average Cost ($1000/%)	Incremental Cost ($1000)	Inc. Output (%)	Inc. Cost Per Output ($1000)
No Action	0	0				
1B	3.0	1,119	368	1,119	3.0	368
1B2B	3.6	2,675	743	1,556	0.6	2,779

6.4.4 Plan Selection

Based on the relationships identified in Section 6.4.1, all best buy plans are implementable. There is a steep increase in incremental cost with the addition of the 1.0-acre RSF facility with only marginal water quality benefit. For this reason, it is recommended that the City proceed with Plan 1B, 0.5-Acre RSF with MAPS.

6.5 Recommendations

CDM recommends that the City implement the following components as part of the Williamson Creek Sub-basin Stormwater Improvements. The benefits associated with this plan are outlined in **Table 6.11**.

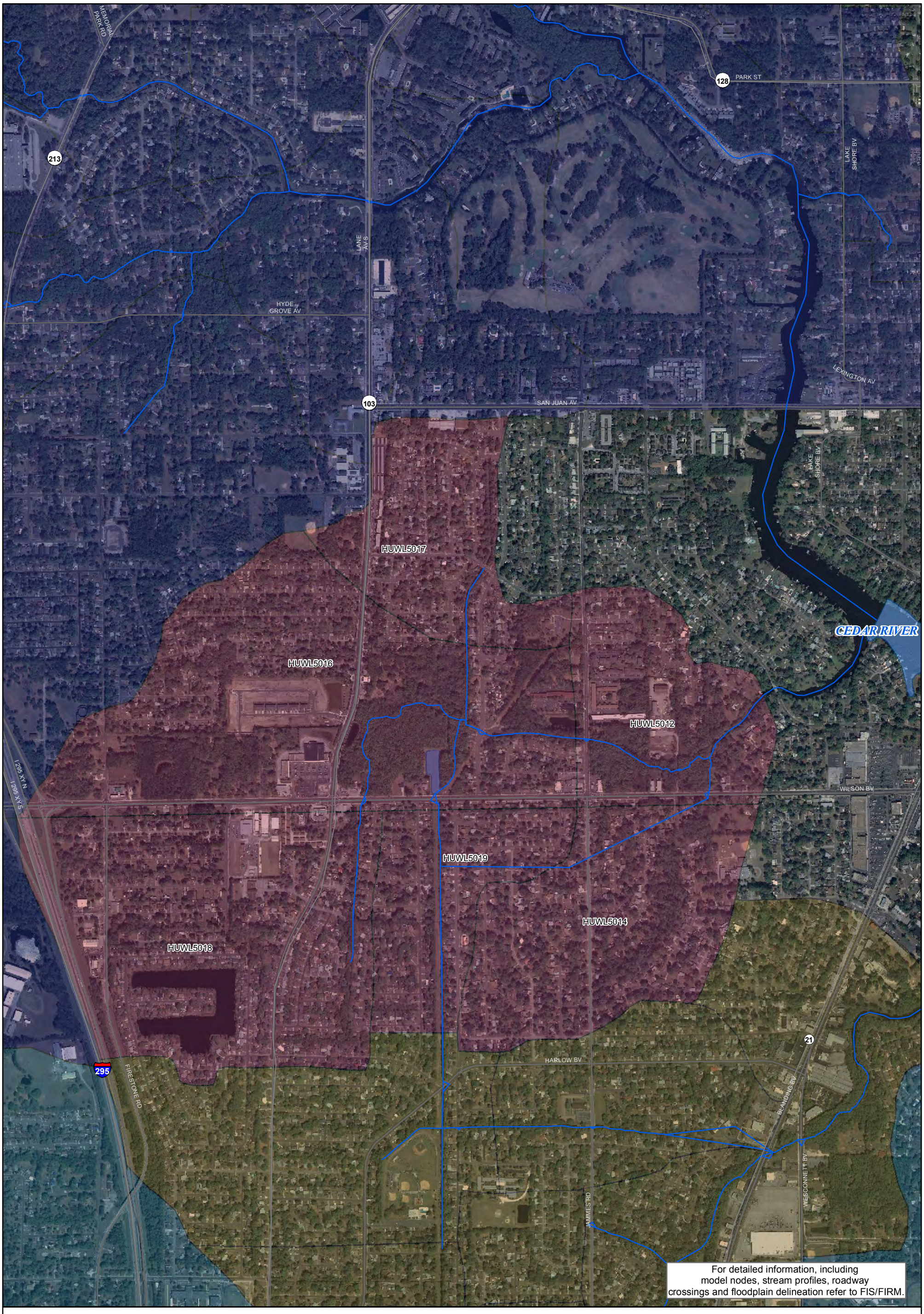
- 0.5-Acre RSF with MAPS

Table 6.11 Projected Benefits for Recommended Plan

Strategic Program Goals	Water Quantity						WQ	O&M
Performance Measurement Metrics	Local Road	Arterial Road			Structure		WQ	Erosion
Design Storm	5	10	25	100	25	100	MT TN/yr	velocity > 3fps (ft)
Depth Criteria	>3in	>3in	>6in	>9in	>0ft	> 0 ft		
Project Benefits	-	-	-	-	-	-	0.70	-

In addition to the wet detention project recommended above, the Williamson Creek Sub-basin includes an opportunity to phase out existing septic tanks. These septic tanks are located in the Cedar River failure area and are in close proximity to Cedar River and Williamson Creek (i.e., within the 200-meter buffer for these waterbodies).

Five subdivisions: Cedar Oaks, Cedar Shores Manor, Cedar Shores Units 1-3, Ellershaw Estates, and Ortega Farms, comprise 278 septic tanks in close proximity to waterways. Using the currently accepted BMAP methodology for estimating nutrient reduction, phase out of these septic tanks would result in approximately 0.86 MT TN/yr.



Legend

- MSMP Conduits
- Major Roads
- Water Body

Hydrologic Unit

- Williamson Creek
- Fishing Creek
- Cedar River and Wills Branch
- Butcher Pen Creek

N

0 0.25 0.5 Miles

Figure 6.1
Williamson Creek Subbasin
Hydrology

CDM

MEMORIAL PARK RD
103
PARK ST
128
213
HYDE GROVE AV
LAKE SHORE BV
LEXINGTON AV
SAN JUAN AV
WL51033
CEDAR RIVER
WL51000
WL51034AP
WL51005S
WL51003
WL51036AP
WL51035AP
WL51006AP
WL51030S
WL51025
WL51023AP
WL51015
WL51020S
WL51013AP
WL51007
WL51010S
WL51009
WL54005
WL51039AP
WILSON BV
WL52005S
WL52003
WL54010S
WL51040S
I 295 XY N
LANE AV S
FIRESTONE RD
WL51050AP
WL54013AP
WL51055AP
WL54015
WL51060
JAMMES RD
HARLOW BV
WL51070S
WL51069
21
I 295 XY S
295
BEANDING BV
WESCONNETT BV
For detailed information, including model nodes, stream profiles, roadway crossings and floodplain delineation refer to FIS/FIRM.

Legend

- MSMP Nodes
- MSMP Conduits
- Major Roads
- Water Body

Hydrologic Unit

- Williamson Creek
- Fishing Creek
- Cedar River and Wills Branch
- Butcher Pen Creek

N

0 0.25 0.5 Miles

Figure 6.2
Williamson Creek Subbasin
Hydraulics

CDM

Table 6.1
COJ MSMP Update
Williamson Creek - Hydrologic Unit Parameters

HUC Name	Outlet	Area (Acres)	Imperviousness %	Width	Slope %	N-Imperv	N-Perv	Max. Infil. Rate	Min. Infil. Rate
HUWL5012	WL51010S	98.1	36.3	3195	1.25	0.045	0.236	5.89	0.33
HUWL5014	WL52005S	139.1	27.5	3001	1.01	0.027	0.214	4.91	0.24
HUWL5016	WL51035AP	273.9	24.9	4599	1.05	0.029	0.271	5.89	0.27
HUWL5017	WL51033	94.7	32.2	3535	0.38	0.015	0.210	5.12	0.22
HUWL5018	WL54015	223.8	39.6	5197	1.31	0.017	0.209	6.61	0.35
HUWL5019	WL51060	78.3	23.0	2557	0.39	0.015	0.213	3.64	0.10

MEMORIAL PARK RD
PARK ST
103
128
213
HYDE GROVE AV
LAKE SHORE BV
LEXINGTON AV
SAN JUAN AV
WL51033
CEDAR RIVER
WL51000
WL51034AP
WL51005S
WL51003
WL51036AP
WL51035AP
WL51025
WL51030S
WL51023AP
WL51015
WL51020S
WL51006AP
WL51013AP
WL51007
WL51010S
WL51009
WL54005
WL51039AP
WILSON BV
WL52003
WL54010S
WL51040S
WL52005S
I 295 XY N
LANE AV S
WL51050AP
WL54013AP
WL51055AP
FIRESTONE RD
WL54015
WL51060
JAMMES RD
HARLOW BV
WL51070S
WL51069
21
I 295 XY S
295
BEAUDING BV
WESCONNETT BV
For detailed information, including model nodes, stream profiles, roadway crossings and floodplain delineation refer to FIS/FIRM.

Legend

- Arterial & Local Roads - 5 yr > 3 in
- Arterial & Local Roads - 10 yr > 3 in
- Arterial & Local Roads - 25 yr > 6 in
- Arterial & Local Roads - 100 yr > 9 in
- PSARs
- Velocity >= 3fps

Hydrologic Unit

- Williamson Creek
- Fishing Creek
- Cedar River and Wills Branch
- Butcher Pen Creek

- MSMP Conduits
- Major Roads

N

0 0.25 0.5 Miles

Figure 6.3
Williamson Creek Subbasin
Level of Service

CDM

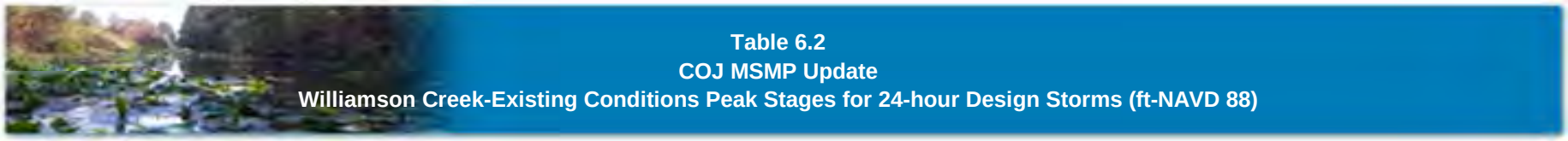
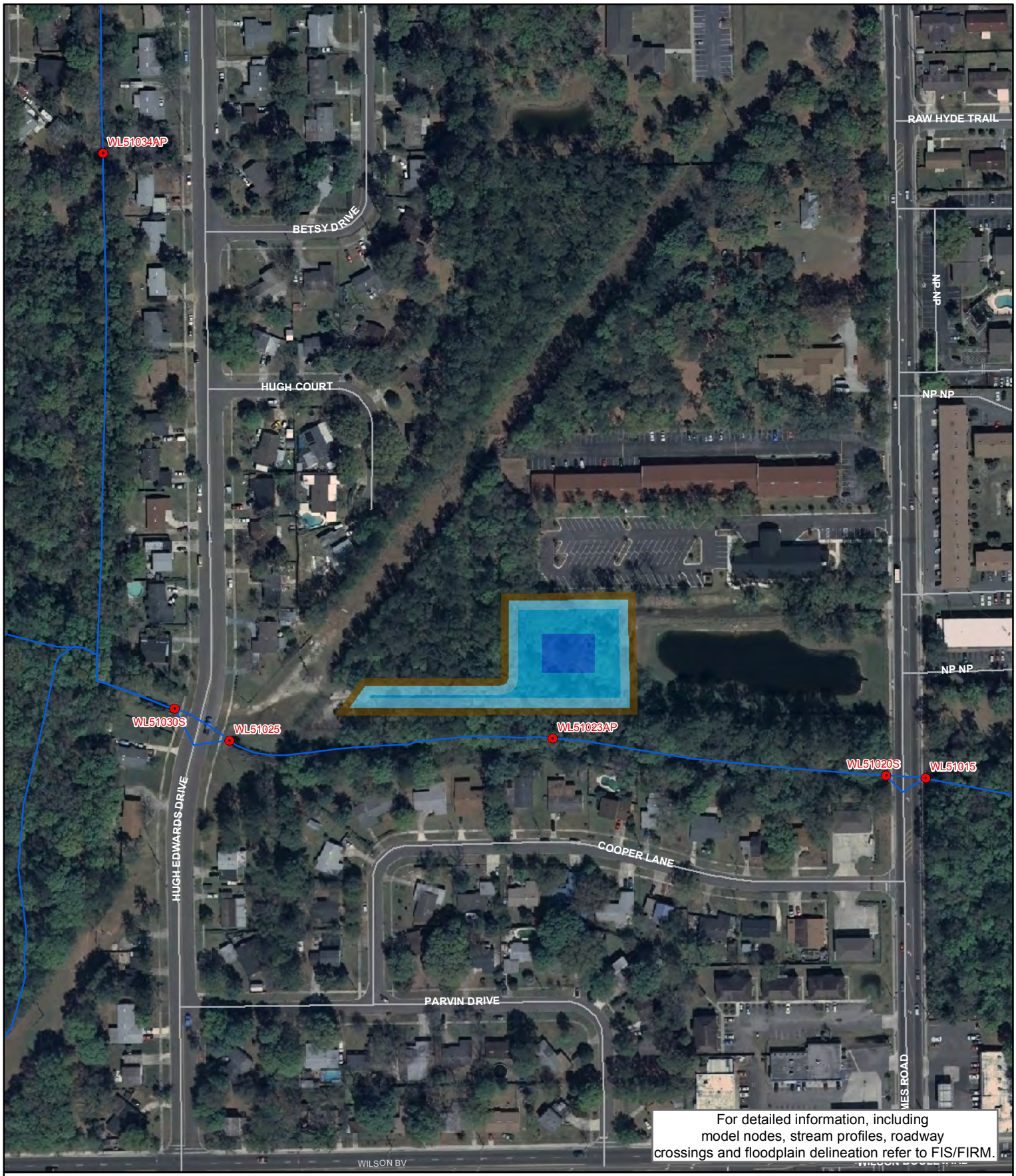


Table 6.2
COJ MSMP Update
Williamson Creek-Existing Conditions Peak Stages for 24-hour Design Storms (ft-NAVD 88)

					Mean Annual		5 - year		10 - year		25 - year		50 - year		100 - year	
Junction	Road Name	Type	Road Elevation	Level of Detail	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth	Flood Stage	Flood Depth
WL51000				S	1.7		1.7		1.7		1.7		1.7		1.7	
WL51003				S	1.7		1.7		1.7		1.8		1.8		1.8	
WL51005S	HYDE PARK ROAD	LOCAL	8.5	S	1.7		1.7		1.8		1.8		1.8		1.8	
WL51006AP				AP	1.8		1.8		1.9		2.0		2.1		2.2	
WL51007				S	1.8		1.9		2.1		2.3		2.5		2.6	
WL51009				S	2.9		2.9		2.9		2.9		2.9		2.9	
WL51010S				S	2.4		2.8		3.7		4.6		5.3		5.8	
WL51013AP				AP	2.5		3.2		4.1		4.9		5.6		6.1	
WL51015				S	3.2		4.0		4.8		5.5		6.1		6.6	
WL51020S	JAMMES ROAD	LOCAL	11.0	S	3.3		4.1		5.0		5.8		6.4		6.9	
WL51023AP				AP	5.6		6.1		6.4		7.0		7.5		7.8	
WL51025				S	6.0		6.6		7.1		7.7		8.2		8.5	
WL51030S	HUGH EDWARDS DRIVE	LOCAL	14.1	S	6.2		6.8		7.4		8.1		8.8		9.3	
WL51033				S	21.0		21.4		21.9		22.2		22.5		22.6	
WL51034AP				AP	6.4		7.1		7.9		8.4		8.9		9.4	
WL51035AP				AP	11.8		12.4		12.8		13.2		13.5		13.8	
WL51036AP				AP	18.3		18.4		18.6		18.7		18.8		18.9	
WL51039AP				AP	20.7		20.8		20.9		21.0		21.1		21.2	
WL51040S	WILSON BOULEVARD	LOCAL	24.0	S	24.0	0.0	24.3	0.3	24.5	0.5	24.6	0.6	24.7	0.7	24.7	0.7
WL51050AP				AP	24.0		24.3		24.5		24.7		24.8		24.9	
WL51055AP				AP	24.1		24.5		25.1		25.6		25.9		26.0	
WL51060				S	24.8		25.3		25.9		26.4		26.8		26.9	
WL51069				S	23.8		24.5		25.2		25.8		26.3		26.8	
WL51070S	HARLOW BOULEVARD	LOCAL	26.5	S	24.0		25.0		25.9		26.4		26.8	0.3	26.9	0.4
WL52003				S	1.9		2.0		2.2		2.4		2.6		2.7	
WL52005S	WILSON BOULEVARD	LOCAL	13.0	S	2.6		3.3		4.3		5.2		6.2		6.9	
WL54005				S	22.8		23.2		23.7		24.1		24.3		24.5	
WL54010S	WILSON BOULEVARD	LOCAL	27.0	S	24.3		26.3		27.4	0.4	27.5	0.5	27.7	0.6	27.7	0.7
WL54013AP				AP	26.2		26.5		27.4		27.7		27.8		28.0	
WL54015				S	30.1		30.4		30.8		31.2		31.5		31.7	

1) All storm durations are 24 hour SJRWMD rainfall distributions.
2) All stages and elevations referenced to the National American Vertical Datum of 1988 (ft-NAVD).
3) Road flooding stage is referenced to road crown elevation.
4) Level of detail descriptions are as follows: AP = approximated from LiDAR.
S = Survey.



Legend

- MSMP Nodes
- MSMP Conduits
- Major Roads
- Alternative 1

N

0 250 500 Feet

Figure 6.4
Williamson Creek Subbasin
Alternative 1

CDM

Table 6.4
COJ MSMP Update
Williamson Creek-Alternative Conceptual Cost Evaluation

ALTERNATIVE 1A

Item	Units	Unit Cost	Quantity	Total Cost
Captial Costs				
1. Culverts/Bridges	LF	$ 283,000	0	$ -
2. Weirs/Outlet Structures	LS	$ 50,000	1	$ 50,000
3. Pump Station	LS	$ -	0	$ -
4. Channel Lining (1)	LF	$ 200	0	$ -
5. Excavation/Earth Work	CY	$ 8	13,000	$ 104,000
6. Land Acquisition	ACRE	$ 50,000	2	$ 100,000
7. Wetlands Creation (2)	ACRE	$ 50,000	2	$ 300,000
8. Sod at Pond Sites/Channel Banks	SY	$ 3	3,900	$ 11,700
9. Baffle Box	LS	$ 100,000	0	$ -
10. Managed Aquatic Plant Systems	SF	$ 8	0	$ -
Subtotal 1 - Capital Costs (3)				$ 565,700
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$ 84,855
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$ 650,555
Contingency (30% of Subtotal 2)				$ 195,167
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$ 845,722
Operations & Maintenance (4)				
11. Crossing Upgrade	LS	$ 14,000	0	$ -
12. Pump Station	LS	$ -	0	$ -
13. Channel Lining	LF/YR	$ 30	0	$ -
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	2	$ 2,600
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	2	$ 800
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	2	$ 124,000
17. Baffle Box	LS	$ 2,000	0	$ -
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	0	$ -
Subtotal 4 - Total Operations & Maintenance Cost				$ 127,400
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)				**$ 973,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Table 6.5
COJ MSMP Update
Williamson Creek-Alternative Conceptual Cost Evaluation

ALTERNATIVE 1B					
Item	**Units**	**Unit Cost**	**Quantity**	**Total Cost**	
Captial Costs					
1. Culverts/Bridges	LF	$ 3,000	0	$	-
2. Weirs/Outlet Structures	LS	$ 50,000	1	$	50,000
3. Pump Station	LS	$ -	0	$	-
4. Channel Lining [1]	LF	$ 200	0	$	-
5. Excavation/Earth Work	CY	$ 8	13,000	$	104,000
6. Land Acquisition	ACRE	$ 50,000	2	$	100,000
7. Wetlands Creation [2]	ACRE	$ 50,000	2	$	300,000
8. Sod at Pond Sites/Channel Banks	SY	$ 3	3,900	$	11,700
9. Baffle Box	LS	$ 100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$ 8	1,300	$	10,400
Subtotal 1 - Capital Costs [3]				$	576,100
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$	86,415
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$	662,515
Contingency (30% of Subtotal 2)				$	198,755
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$	861,270
Operations & Maintenance [4]					
11. Crossing Upgrade	LS	$ 14,000	0	$	-
12. Pump Station	LS	$ -	0	$	-
13. Channel Lining	LF/YR	$ 30	0	$	-
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	2	$	2,600
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	2	$	800
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	2	$	124,000
17. Baffle Box	LS	$ 2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	1,300	$	130,000
Subtotal 4 - Total Operations & Maintenance Cost				$	257,400
Total Cost (Subtotal 3 + Subtotal 4) [5] [6]				**$**	**1,119,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Legend

- MSMP Nodes
- MSMP Conduits
- Major Roads
- Alternative 2

N

0 250 500 Feet

Figure 6.5
Williamson Creek Subbasin
Alternative 2

CDM

Table 6.7
COJ MSMP Update
Williamson Creek-Alternative Conceptual Cost Evaluation

ALTERNATIVE 2A

Item	Units	Unit Cost	Quantity	Total Cost
Captial Costs				
1. Culverts/Bridges	LF	$ 3,000	0	$ -
2. Weirs/Outlet Structures	LS	$ 50,000	1	$ 50,000
3. Pump Station	LS	$ -	0	$ -
4. Channel Lining (1)	LF	$ 200	0	$ -
5. Excavation/Earth Work	CY	$ 8	40,000	$ 320,000
6. Land Acquisition	ACRE	$ 50,000	2	$ 100,000
7. Wetlands Creation (2)	ACRE	$ 50,000	2	$ 300,000
8. Sod at Pond Sites/Channel Banks	SY	$ 3	4,500	$ 13,500
9. Baffle Box	LS	$ 100,000	0	$ -
10. Managed Aquatic Plant Systems	SF	$ 8	0	$ -
Subtotal 1 - Capital Costs (3)				$ 783,500
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$ 117,525
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$ 901,025
Contingency (30% of Subtotal 2)				$ 270,308
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$ 1,171,333
Operations & Maintenance (4)				
11. Crossing Upgrade	LS	$ 14,000	0	$ -
12. Pump Station	LS	$ -	0	$ -
13. Channel Lining	LF/YR	$ 30	0	$ -
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	2	$ 2,600
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	2	$ 800
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	2	$ 124,000
17. Baffle Box	LS	$ 2,000	0	$ -
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	0	$ -
Subtotal 4 - Total Operations & Maintenance Cost				$ 127,400
Total Cost (Subtotal 3 + Subtotal 4) (5) (6)				**$ 1,299,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.

Table 6.8
COJ MSMP Update
Williamson Creek-Alternative Conceptual Cost Evaluation

ALTERNATIVE 2B					
Item	**Units**	**Unit Cost**	**Quantity**		**Total Cost**
Captial Costs					
1. Culverts/Bridges	LF	$ 3,000	0	$	-
2. Weirs/Outlet Structures	LS	$ 50,000	1	$	50,000
3. Pump Station	LS	$ -	0	$	-
4. Channel Lining [1]	LF	$ 200	0	$	-
5. Excavation/Earth Work	CY	$ 8	40,000	$	320,000
6. Land Acquisition	ACRE	$ 50,000	2	$	100,000
7. Wetlands Creation [2]	ACRE	$ 50,000	2	$	300,000
8. Sod at Pond Sites/Channel Banks	SY	$ 3	4,500	$	13,500
9. Baffle Box	LS	$ 100,000	0	$	-
10. Managed Aquatic Plant Systems	SF	$ 8	2,300	$	18,400
Subtotal 1 - Capital Costs [3]				$	801,900
Engineering, Survey, & Permitting Costs (15% of Subtotal 1)				$	120,285
Subtotal 2 (Subtotal 1 + 15% Design Fees)				$	922,185
Contingency (30% of Subtotal 2)				$	276,656
Subtotal 3 - (Subtotal 2 + 30% Contingency)				$	1,198,841
Operations & Maintenance [4]					
11. Crossing Upgrade	LS	$ 14,000	0	$	-
12. Pump Station	LS	$ -	0	$	-
13. Channel Lining	LF/YR	$ 30	0	$	-
14. Stormwater Facility - Mowing	ACRE/YR	$ 1,300	2	$	2,600
15. Stormwater Facility - Spraying	ACRE/YR	$ 400	2	$	800
16. Stormwater Facility - Dredging and Structure Repair	LS	$ 62,000	2	$	124,000
17. Baffle Box	LS	$ 2,000	0	$	-
18. Managed Aquatic Plant Systems - Harvesting & Replanting	SF	$ 100	2,300	$	230,000
Subtotal 4 - Total Operations & Maintenance Cost				$	357,400
Total Cost (Subtotal 3 + Subtotal 4) [5] [6]				**$**	**1,556,000**

(1) Armoform or equivalent.
(2) Does not include wetlands survival maintenance. Fee is from 2010 wetland mitigation cost multiplied by 3:1 credit ratio.
(3) This does not include contingencies for land aquistion or relocation of utilities.
This does include contractor's overhead and profit as well as standard mobilization and contingencies.
(4) The costs were projected for a 30 year design life.
(5) The cost estimates are shown in 2010 dollars.
(6) Does not include potential hazardous waste, remediation, nor potential water or wastewater facility improvements.