4.5 Sugar Creek

4.5.1 Introduction

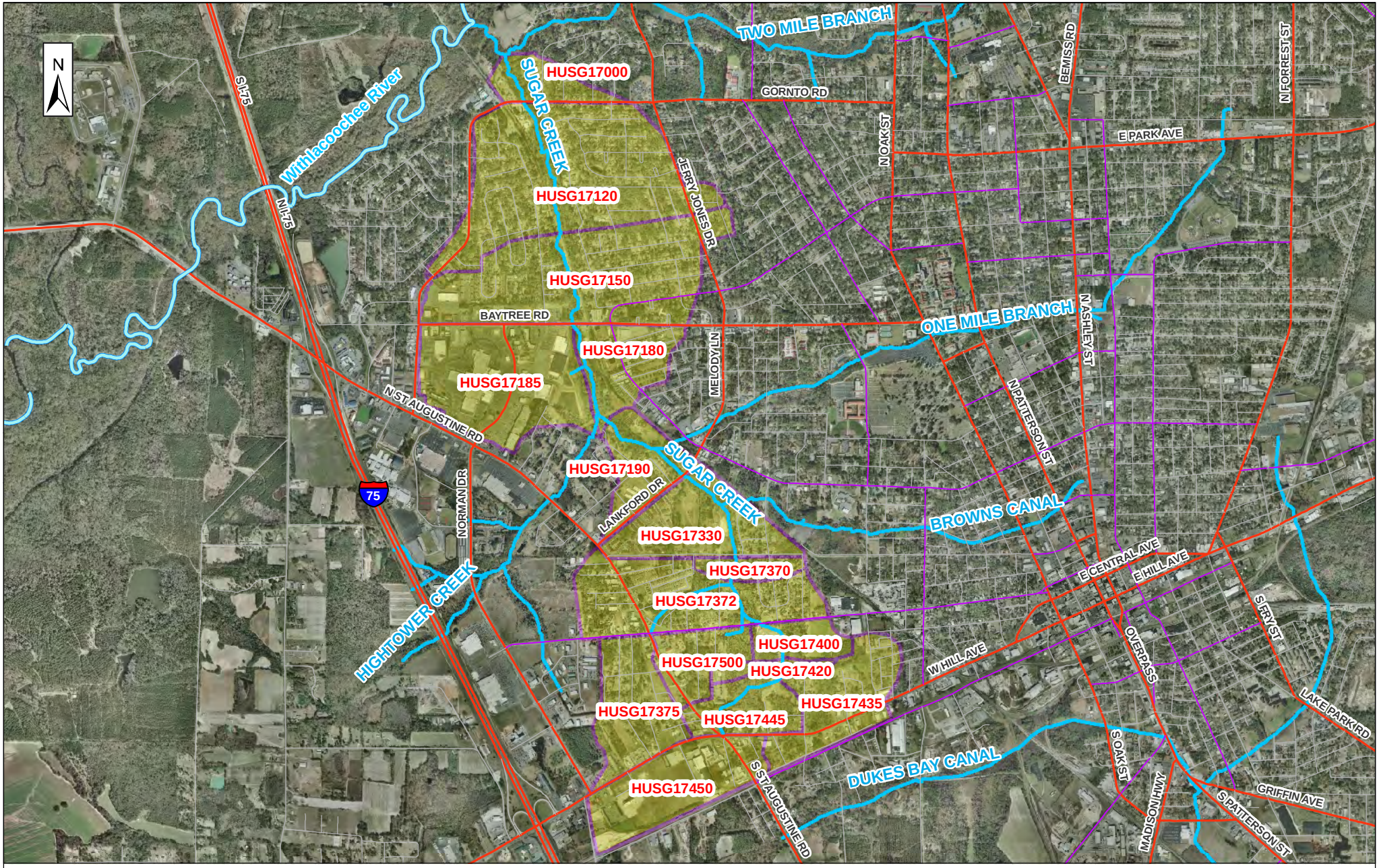
The information presented in this sub-basin plan for Sugar Creek is intended to provide the reader with information necessary to understand the physical setting, methodology used, water quantity problems, results, alternatives evaluation, and recommendations. Section 2 of this study describes in greater details the general methodology, including data collection, engineering methods, and regional analysis. In general the Sugar Creek basin consists of the following sub-basins: One Mile Branch, Hightower Creek, Browns Canal and Sugar Creek. In this section we are focused on the Sugar Creek sub-basin and not the entire Sugar Creek basin.

4.5.2 Sub-basin Information

This section outlines information on the Sugar Creek Sub-basin infrastructure, and its ability to meet level of service requirements. The Sugar Creek Branch sub-basin extends from its confluence with Withlacoochee River in the north to Savannah Avenue in the south. The area of the sub-basin is approximately 2.5 sq mi (1,622 acres), which was divided into 16 hydrologic units ranging from 16 to 280 acres in size. The hydrologic unit boundaries and the In-stream PSWMS are shown on **Figure 4.5.1**. The HU delineation along with the areas and the loading node for each HU is shown in **Table 4.5.1**.

Table 4.5.1. Hydrologic Units: Area

Hydrologic Unit ID	Area (Acres)	Loading Node
HUSG17000	40.7	SG70050
HUSG17120	282.3	SG70120S
HUSG17150	242.6	SG70150S
HUSG17180	73.1	SG70180S
HUSG17185	175.4	SG70800APS
HUSG17190	62.8	SG70190
HUSG17330	106.2	SG70340
HUSG17370	23.7	SG70370S
HUSG17372	152.0	SG70375
HUSG17375	91.5	SG70700AP
HUSG17400	35.5	SG70400S
HUSG17420	16.7	SG70420AP
HUSG17435	97.1	SG70435AP
HUSG17445	57.6	SG70445AP
HUSG17450	112.7	SG70450AP
HUSG17500	51.4	SG70550
Total	**1,621.5**	



Legend

Hydrologic Units
HUSG17150
Streams

Arterial Roads
Collector Roads
Local Roads

0 0.5 1 2 Miles

Figure 4.5.1
City of Valdosta, GA
Sugar Creek Sub-Basin
Hydrologic Unit Boundaries

CDM

The predominant land use in the sub-basin is Medium Density Residential, which accounts for little over 35 percent of the total land use, followed by Light Industrial, Commercial & Institutional. The land use categories along with their respective associated area and percentage for all of Sugar Creek sub-basin are shown in **Table 4.5.2**. The predominant soil within the sub-basin, almost 50 percent, is B. **Table 4.5.3** shows the soils breakdown based on HSG. The soil coverage, infiltration and storage capacity was based on the available data from the NRCS Lowndes County soil survey. Detailed discussion on the Soils and Land Use is available in the Methodology Section of the report.

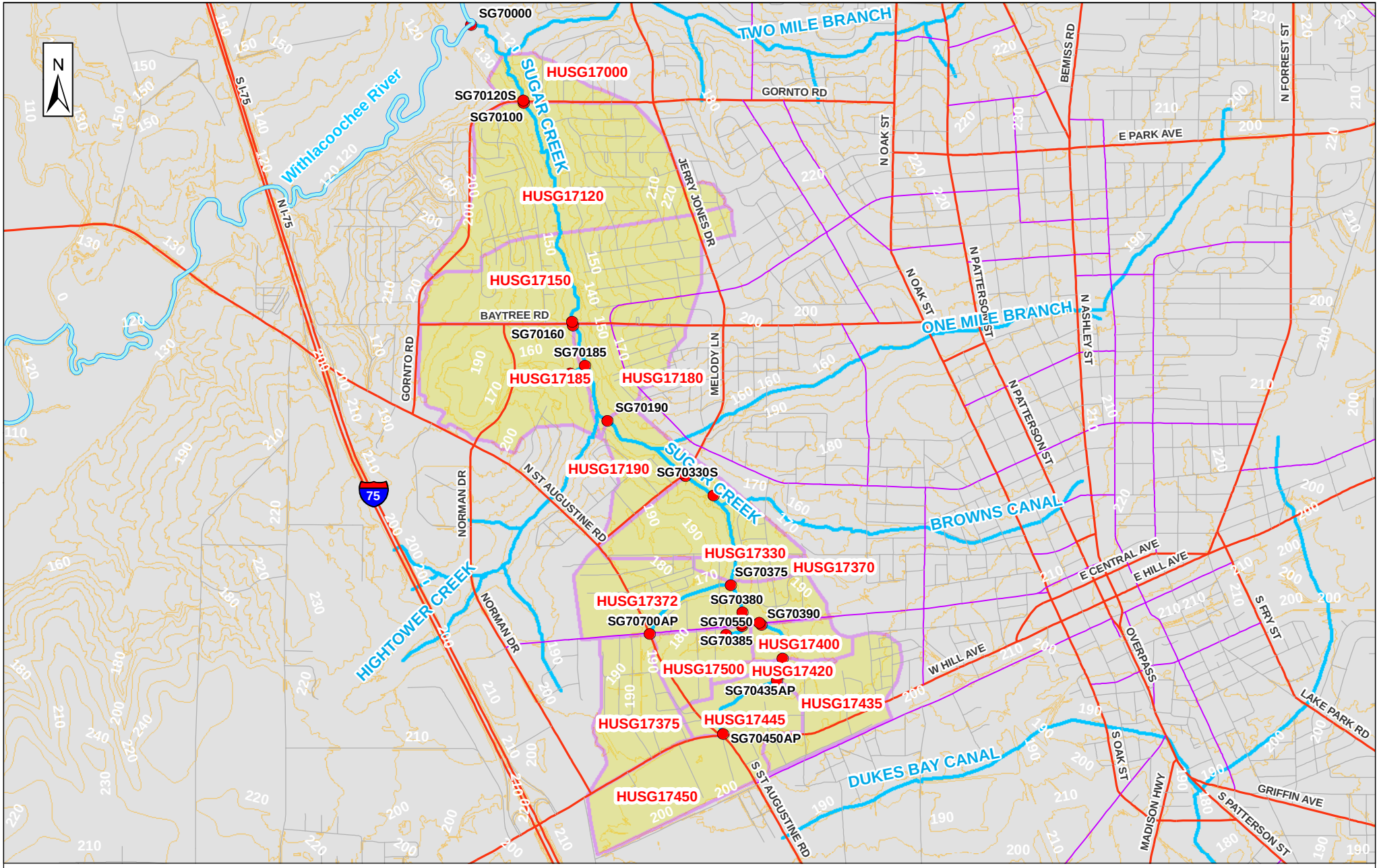
The In-stream PSWMS consists of a main stem channel, which at its most downstream section confluences with the Withlacoochee River. Browns Canal, Hightower Creek, One Mile Branch and Two Mile Branch all confluence into Sugar Creek in that order, from upstream to downstream of Sugar Creek. A schematic showing the model representation (hydraulic network along with nodes) of the sub-basin is presented on **Figure 4.5.2.1.**

Table 4.5.2. Land Use

Land Use Category	Area (Acres)	Area (Percent)
Forest, Open & Park	272.7	16.8
Pasture	0.0	0.0
Agricultural	0.0	0.0
Low Density Residential	69.8	4.3
Medium Density Residential	594.9	36.7
High Density Residential	21.2	1.3
Light Industrial, Commercial & Institutional	393.9	24.3
Heavy Industrial & Roadways	255.1	15.7
Wetlands	0.0	0.0
Watercourses & Water bodies	13.8	0.9
Total	**1,621.5**	**100.0**

Table 4.5.3. Soils Breakdown

Hydrologic Soil Group	Area (Acres)	Area (Percent)
A	20.4	1.3
B	780.6	48.1
C	417.2	25.7
D	403.3	24.9
Total	**1,621.5**	**100.0**



Legend

Hydrologic Units
HUSG17150
Streams

Model Nodes
SG70130

Arterial Roads
Collector Roads
Local Roads
Topographic Contours (ft)*

** Elevations shown are based on NGVD datum. Refer to Section 2.2.1 for conversion to NAVD datum.*

0 0.5 1 2 Miles

Figure 4.5.2.1
City of Valdosta, GA
Sugar Creek Sub-Basin
Hydraulic Network

CDM

4.5.3 Existing Conditions

Sugar Creek has experienced several developments and improvements since the 1996 MSMP. Several projects in the Sugar Creek sub-basin have been implemented as per the recommendations of the previous master plan, such as:

- Valdosta Mall regional detention facility - A detention pond at the Mall outfall was constructed.

Another significant feature in Sugar Creek sub-basin that affects hydrology and hydraulics of the system is the Mall. This Mall has a huge impervious area. The retention ponds at the Mall outfall do provide some treatment and detention for the runoff.

One Mile Branch, Hightower Creek and Browns Canal all confluence with Sugar Creek and bring significant sediment loads. Sugar Creek has its outfall in Withlacoochee River. This area of Sugar Creek is controlled by the Withlacoochee River stage elevations.

4.5.4 Water Quantity Problem Areas

1. Browns Canal, One Mile Branch and Hightower Creek all confluence into Sugar Creek and deliver significant sediment loads. A geomorphic assessment of Sugar Creek was performed as part of this project. Refer to Section 3 for the Geomorphologic Assessment report giving a detailed discussion on problem identification and its causes for the entire stretch of Sugar Creek. Other water quantity problem areas in Sugar Creek sub-basin are listed below:

2. Gornto Road: The storm event of April 2009 caused widespread flooding at several locations within the city. Gornto Road was flooded during this event.

3. South of Baytree Road: Widespread channel erosion and fallen trees were observed in about 2000 ft of stream section downstream of Baytree Road. Refer to Appendix I for Baytree Road Culvert for a proposed design for a trash collection device near Sugar Creek.

4. Upper reaches of Sugar Creek: The upper reaches of Sugar Creek near River Street show a lot of channel erosion and sediment deposition downstream.

5. Withlacoochee River: Near the confluence of Sugar Creek with Withlacoochee River, several flooding instances in addition to the April 2009 flooding have been reported. Houses and buildings on Meadowbrook Drive have been severely impacted by flooding caused due to Withlacoochee flooding.

6. North of Gornto Road: Stream bank erosion about 500 feet North of Gornto Road, is threatening sewer manholes running parallel to Sugar Creek. Refer to Appendix E

for a Conceptual Project Documentation on Creekside Emergency Restoration provided by CDM for this section of Sugar Creek.

4.5.5 Results

The following paragraphs discuss the water quantity model results, the existing level of service in terms of roads flooding, and sediment loads due to erosion.

4.5.5.1 Water Quantity Results

The stages for the 1.2-in, 5-, 25-, 50-, and 100–year design storms model runs are presented in **Table 4.5.4**. Road crown elevation, road names, and road classification (local, collector, arterial) are also shown in the table. The roads not meeting the City's defined Level of Service are highlighted in the model result tables. Due to lack of data in terms of finished floor elevations of houses and other structures, available topographic data were utilized to estimate potential flooding of structures for each storm event and tabulated. The model results table indicates the nearest node to the structures flooding location.

4.5.5.2 Total Suspended Solids (TSS) and Channel Bank Evaluation

Significant sediment loads resulting from erosion of stream banks has been observed in the whole Sugar Creek basin and in One Mile Branch. As per the findings of the Geomorphologic assessment report (Section 3 of this report) of the Sugar Creek, this increase in sediment loads is generated by down cutting of the channel bed (incision), scour of the stream banks or both. Yearly TSS loads were calculated based on standard EMC of TSS, yearly rainfall, tributary area; land use characteristics like percent imperviousness for Valdosta. Yearly TSS loads from various hydrologic units for each sub-basin were computed in lbs/year units. The total TSS loads for the Sugar Creek sub-basin was estimated to be about 363,000 lbs/year.

The Georgia Stormwater Manual states the sizing criteria for any stormwater control/mitigation system to treat the runoff from 85 percent of the storms that occur in an average year. For Georgia, this equates to providing water quality treatment for the runoff resulting from a rainfall depth of 1.2 inches. This runoff is also termed as the Water Quality treatment volume (WQ_V). Please refer to Georgia Stormwater Manual Volume 2 (technical handbook) Section 1.3 for a detailed discussion on WQ_V and the unified stormwater sizing criteria. This method and the 1.2 inch storm event were used for evaluation of potential TSS water quality benefits in the alternatives.

Channel Bank Erosion: Almost 14,500 linear feet of Sugar Creek show velocities greater than 3 ft/sec. The threshold velocity for erosive velocity in Sugar Creek sub-basin is 3 ft/sec. Several locations were verified in field and showed signs of channel bank erosion.

4.5.5.3 Level of Service Summary

Under the present land use conditions, the 1.2-in, 5-, 25-, 50-, and 100–year design storms were simulated to determine the problem areas as defined below:

- Roads

In the One Mile Branch sub-basin the following roads do not meet the City's Level of Service as described in Section 2. The One Mile Branch stage Table 4.4.4 highlights all roads not meeting the level of service in red. For a road to be classified as not meeting the level of service, it has more than 6 inches of flooding for the storm event under consideration for that particular road classification (5-year event for a local road and 50-year event for a collector and arterial road).

One collector road (River Street) does not meet the defined level of service (more than 6 inches of flooding for a 50-year storm event). One arterial roads (Lankford Drive) does not meet the defined level of service (more than 6 inches of flooding for a 50-year storm event). Another arterial road (Gornto Road) also floods frequently, but the primary cause of this flooding is staging up of the Withlacoochee River near the confluence with Sugar Creek.

- Structures

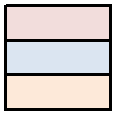
Eight locations, as represented by model nodes, were identified in the Sugar Creek sub-basin for probable structural flooding for the 100-year event.

Please refer to **Figure 4.5.2.2** for a map of Level of Service violations for Sugar Creek sub-basin. Other water quantity problem areas are also shown on this figure.

Table 4.5.4. Sugar Creek Existing Condition Model Results

					Design Event				
					Water Surface Elevation (ft-NAVD)				
Node ID	Road Name	Road Class	Road Crown Elevation (ft-NAVD)	Potential Structure Flooding	1.2 Inch	5 Year	25 Year	50 Year	100 Year
SG70000					113.1	128.0	133.0	137.0	140.0
SG70050				Y	118.0	128.0	133.0	137.0	140.0
SG70100					120.3	128.0	133.0	137.0	140.0
SG70120S	Gornto Road	Arterial	131.8	Y	120.9	128.0	133.0	137.0	140.0
SG70130					127.8	132.9	134.4	137.0	140.0
SG70150S	Railroad	R/R	139.3	Y	130.4	135.0	136.9	137.9	140.0
SG70160					131.6	138.2	140.2	140.9	141.6
SG70180S	Baytree Road	Arterial	145.6		133.4	139.5	141.4	142.0	142.7
SG70185					138.7	144.4	146.1	146.5	147.1
SG70188					140.8	146.7	148.4	148.8	149.4
SG70190					140.8	146.8	148.5	149.0	149.5
SG70200					141.4	147.7	149.5	150.0	150.6
SG70290					145.0	148.6	149.8	150.2	150.7
SG70300				Y	146.9	152.3	154.4	155.0	155.4
SG70330S	Lankford Drive	Arterial	157.1		147.0	153.4	156.5	157.5	158.2
SG70340					148.2	154.1	156.9	157.8	158.5
SG70345					149.5	155.4	157.6	158.4	159.0
SG70350				Y	156.6	160.1	161.1	161.6	162.1
SG70370S	Magnolia Street	Local	165.0	Y	156.7	160.9	162.6	163.5	164.6
SG70375					160.6	163.6	164.5	165.1	165.6
SG70380					166.7	169.1	170.6	171.0	171.4
SG70385					171.3	171.8	171.9	171.9	171.9
SG70390					172.3	174.5	175.9	176.3	176.6
SG70400S	River Street	Collector	177.1	Y	172.7	177.0	177.5	177.6	177.7
SG70420AP				Y	178.6	181.6	182.3	182.5	182.6
SG70435AP					178.6	181.6	182.3	182.5	182.7
SG70445AP					178.6	181.6	182.3	182.5	182.7
SG70450AP					181.2	183.6	184.5	184.8	185.1
SG70500S	River Street	Collector	176.1		172.8	174.3	174.9	175.2	175.4
SG70550					173.6	174.7	175.0	175.2	175.4
SG70700AP					169.6	171.8	172.5	172.7	172.8
SG70800APS					145.1	147.8	149.1	149.5	149.9

Notes:



1. Roads not meeting the City's defined Level of Service.
2. Roads not meeting the City's define Level of Service due to Withlacoochee flooding.
3. Water surface elevations due to Withlacoochee Staging.
3. 'Y' depicts potential structure flooding near the corresponding node location.
4. Potential Stucture flooding estimated by comparing model results with the regional 2 foot contours dataset. Additional finished floor elevations data shall be acquired for further investigation.
5. Potential Stucture flooding estimated by comparing model results with the regional 2 foot contours dataset. Additional finished floor elevations data should be acquired for further investigation.
6. All design storm events are 24 hour duration.

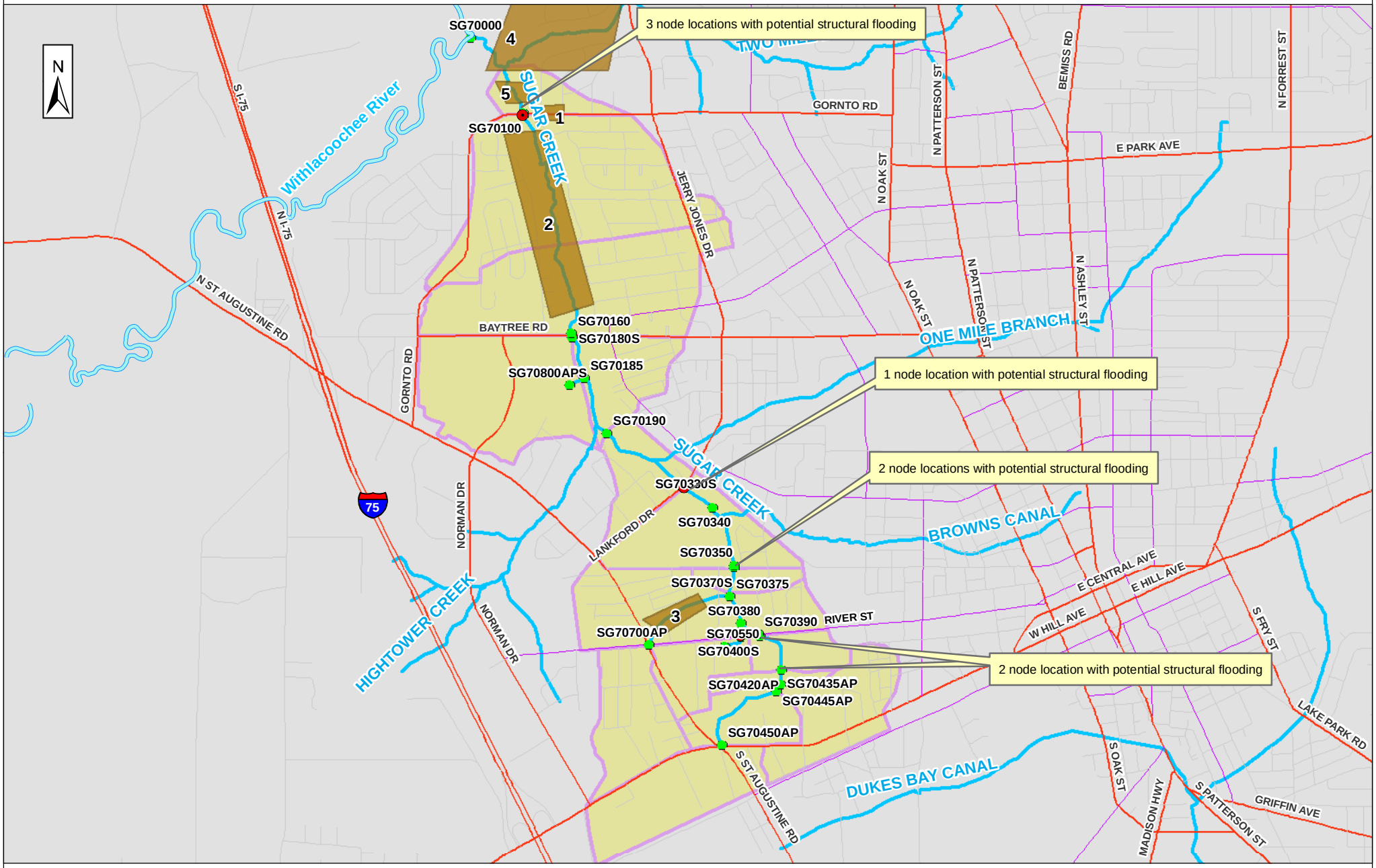


Figure 4.5.2.2
City of Valdosta, GA
Sugar Creek Sub-Basin
Level of Service Violations and Water Quantity Problem Areas

CDM

4.5.6 Alternatives Evaluation

This section describes the alternatives evaluated for the Sugar 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 used during final design.

- Alternative SG1: RSF near End Drive
- Alternative SG2: RSF near Lankford Drive
- Alternative SG3: Sugar Creek Stream Restoration North of Baytree Road
- Alternative SG4: Grade Control Structures at four locations throughout the Sugar Creek Sub-basin

Alternative SG1 – RSF near End Drive

This Alternative consists of constructing a 3.3-acre RSF near End Drive. The proposed RSF has a Permanent Pool Volume of 5.6 ac-ft and a Residence Time of more than 2 days. The tributary area to the facility is 267 acres. The implementation of this alternative will reduce some flooding in the neighboring structures along with reducing sediment loads.

The proposed RSF will treat 267 acres of untreated tributary area, and therefore may reduce sediment load. The land on which this facility is proposed is owned by the City. The location of the RSF is shown on **Figure 4.5.3**. **Table 4.5.5** shows the conceptual cost estimates for this alternative.

Alternative SG2 – RSF near Lankford Drive

This Alternative consists of constructing a 4.8-acre RSF upstream of Lankford Drive. The proposed RSF has a Permanent Pool Volume of 12.1 ac-ft and a Residence Time of 2.9 days. The tributary area to the facility is 1,421 acres. The implementation of this alternative will reduce some flooding in the neighboring structures along with reducing sediment loads.

Legend
- Arterial Roads
- Collector Roads
- Local Roads
- Model Nodes
- Streams

0 150 300 600 Feet

Figure 4.5.3
City of Valdosta, GA
Sugar Creek Sub-Basin
Alternative SG1
Regional Stormwater Facility near End Drive

CDM

The proposed RSF will treat 1,421 acres of untreated tributary area, and therefore will reduce sediment load. However, the land on which this facility is proposed is not owned by the City. The location of the RSF is shown on **Figure 4.5.4**. This location has a great potential for creation of a recreational area for citizens next to the RSF. **Table 4.5.6** shows the conceptual cost estimates for this alternative.

Alternative SG3 – Sugar Creek Stream Restoration North of Baytree Road

During the extensive field investigations along with the geomorphologic assessment of Sugar Creek, about 2,000 linear feet of creek north of Baytree Road were found to be in immediate need of attention and restoration. Widespread channel erosion and loss of trees was noticed. Some form of stream restoration/intervention is proposed for this section of Sugar Creek. Spot intervention at specific strategic locations along this section of Sugar Creek can also prove to be beneficial.

Along with the stream restoration structures, a grade control structure just downstream of Baytree Road Bridge is also proposed. This will act as an energy dissipater and also help in reducing the velocities in the stream. The kind of stream restoration structure to be implemented in this stream is subject to more detailed analysis of the stream. The location of this project is shown on **Figure 4.5.5**. **Table 4.5.7** shows the conceptual costs estimates for this alternative.

Alternative SG4 – Grade Control Structures at four locations throughout the Sugar Creek Sub-basin

During the geomorphologic assessment of the Sugar Creek basin, several locations for appropriate stream intervention were identified. Section 3 of this report provides in detail the geomorphologic assessment of the Sugar Creek basin. Based on the velocities, stresses and channel erosion observed in certain sections of Sugar Creek, grade control structures were recommended to be constructed at specific strategic locations. For the Sugar Creek sub-basin, four such locations have been identified. The locations are (two grade control structures north of River Street, one south of confluence with Browns Canal, one south of confluence with One Mile Branch and two south of confluence with Hightower Creek.

In addition to providing reduction in channel erosion and reduction in high velocities in the stream, this intervention is a part of a basin-wide effort to stabilize and restore the stream. The approximate location of the grade control structures is shown on **Figure 4.5.6**. The design of the drop structure is beyond the scope of this planning level analysis. **Table 4.5.8** shows the conceptual costs estimates for this alternative.

CDM recommends detailed geomorphologic assessment is carried out before commencing any design or construction for a grade control project.

Figure 4.5.4
City of Valdosta, GA
Sugar Creek Sub-Basin
Alternative SG2
Regional Stormwater Facility near Lankford Drive

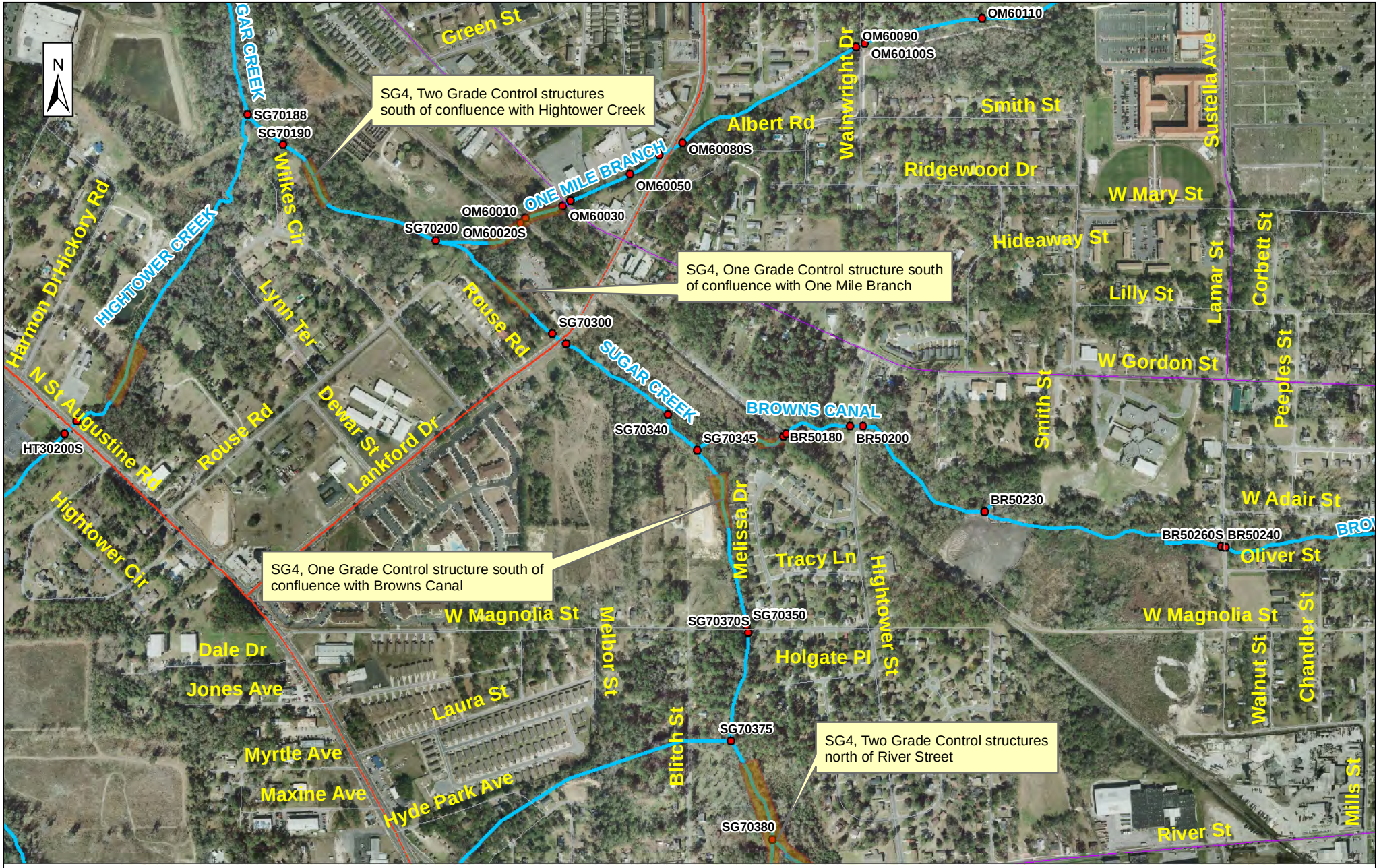
CDM

Legend
- Arterial Roads
- Collector Roads
- Local Roads
- Model Nodes
- Streams

0 375 750 1,500 Feet

Figure 4.5.5
City of Valdosta, GA
Sugar Creek Sub-Basin
Alternative SG3
Sugar Creek Stream Restoration and a Grade Control Structure North of Baytree Rd

CDM



Legend
- Arterial Roads
- Collector Roads
- Local Roads
- Model Nodes
- Streams

0 750 1,500 3,000 Feet

Figure 4.5.6
City of Valdosta, GA
Sugar Creek Sub-Basin
Alternative SG4
Six Grade Control Structures at four locations

CDM