
Oconee Joint Regional Sewer Authority

Report of Findings

Summary of Deficiencies and Work Plan



Contact OJRSA to inquire about which of these project(s) may have been completed.

August 24, 2022

Prepared for:
Oconee Joint Regional Sewer Authority
623 Return Church Road
Seneca, South Carolina 29678



Prepared by:
WK Dickson & Co., Inc.
5 Legacy Park Road, Suite A
Greenville, South Carolina 29607
WKD # 20210552.00.GV

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Aug 24 2022 11:56 AM

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1. Introduction

This Report of Findings is in response to Consent Order 21-025-W dated May 14, 2021. It follows the Preliminary Engineering Report (PER) dated March 10, 2022, and approved by SC DHEC on July 25, 2022. The PER details the assessments and analysis completed and the recommended improvements to the Oconee Joint Regional Sewer Authority (OJRSA) system. This Report of Findings includes a summary of priority deficiencies identified in Oconee Joint Regional Sewer Authority's wastewater collection system and provides corrective action plans for each of the deficiencies. It identifies benchmarks and target dates, and a final completion date for each corrective action plan.

Prior assessments in response to this Consent Order have included identification of repetitive or significant spills and a comprehensive review of components and operational procedures that are or may be contributing to repetitive or significant spills. Based on the location of these spills and temporary flow monitoring data, focus areas were identified. The location of these significant spills and focus areas are plotted on a map of the collection system and are included in Figure 1.1, Collection System Overview.

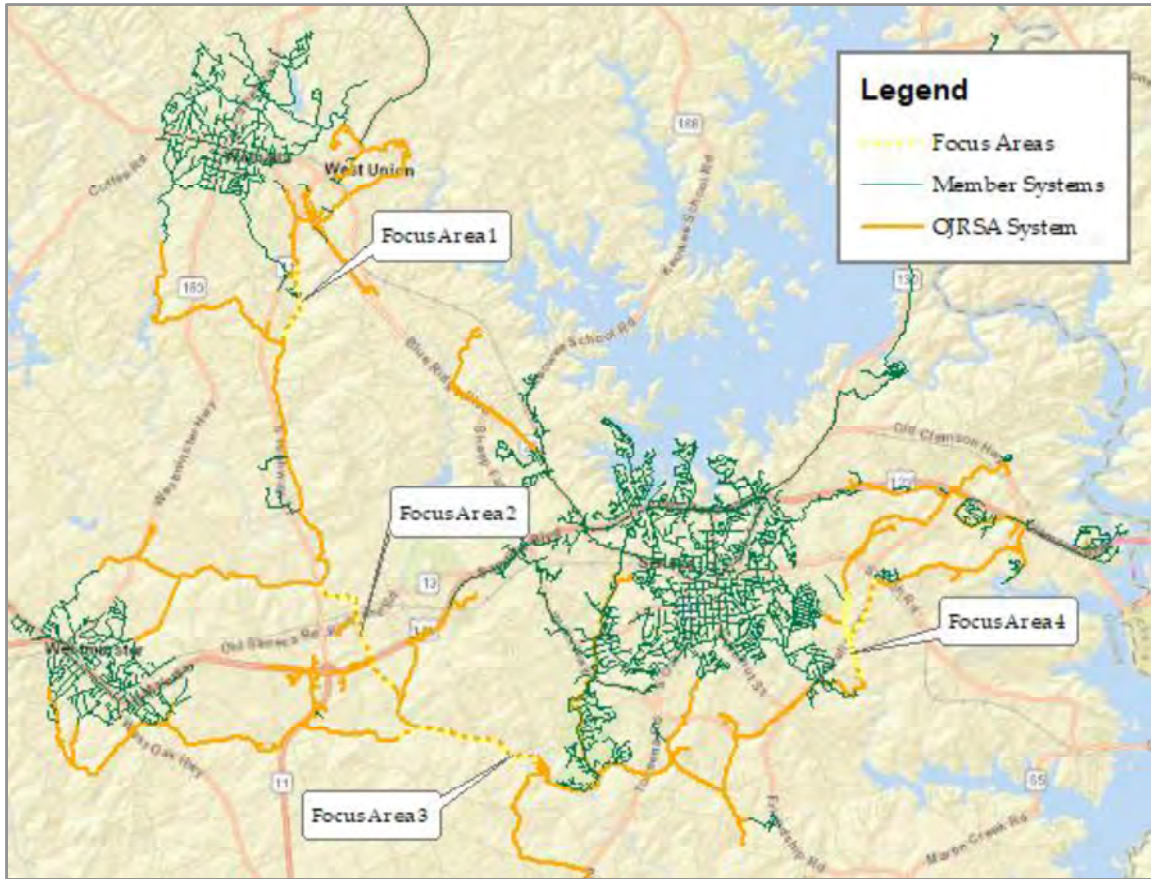


Figure 1 Collection System Overview

Focus areas were further evaluated with CCTV and visual manhole inspections to identify defects. All the identified defects were evaluated for their potential to contribute to repetitive or significant spills. Some of the defects identified have been considered as potentially contributing significant and repetitive overflows and are considered priority defects. These priority defects were assigned necessary corrective actions.

This report summarizes those corrective actions and their formulation into work plans.

End of Section

2. Summary of Findings

2.1 Review of Evaluations

The further evaluation of the assets located in Focus Areas No. 1 – 4 included CCTV and visual manhole inspections. These inspections were necessary to gain more specific information on the condition of these assets and their defects to determine if they may be contributing to significant spills.

The defects identified were compared against system performance criteria to determine if corrective actions are needed. The system performance criteria includes any defect or condition that may contribute to significant spills by:

- ◆ Contributing I/I
- ◆ Reducing Hydraulic Capacity
- ◆ Reducing Structural Integrity

For further details on the findings of the further evaluation of the assets in Focus Areas No. 1- 4 please refer to the Preliminary Engineering Report.

2.2 Review of Findings

Upon further evaluation of the assets in Focus Areas No. 1 – 4 the following defects that are or may be contributing to significant and repetitive spills have been identified and are listed in Table 1 below.

Table 1 Review of Findings			
Segments	Pipe Size & Material	Priority Defects	Findings
MH 157 - MH 156	15" VCP	CM, SMW, JSM, IR, RMJ, CU, SG	This pipe is in poor condition. There are visible cracks, root intrusions at joints, sections of missing wall, signs of groundwater infiltration, signs of pipe sags.
MH 53 – MH 52	30" VCP	SSS, RJF, LFDC, ISJ, LFD, MC, MCU, OBZ, CM, MSA, SG	The segment includes minor liner defects throughout. An obstruction at the bottom of a sag was found during CCTV. The obstruction has since been cleared, but the

			sag is still in need of repair. The pipe at the joints on either end of the sag are broken and cracked and have infiltration staining.
MH 912 – MH 911	10" PVC	DSC, DAR, OBZ, MGD, ID, IG, SG	This line appears to be severely coated in grease and sludge build up, there are defects that are consistent with pipe sag. At the connection to the downstream manhole, water is dripping from the top of the pipe and there is also one instance of an infiltration gusher.
MH 30 – MH 29	30" RCP	LFD, RJF, LFB, IR, OBZ	This line has some minor linear defects throughout this segment, typical grease buildup, and a handful of joints with minor root intrusion. There is one instance of an infiltration runner and one instance of an unknown obstacle.
MH 913 – MH 912	10" PVC	DSC, DAR, SG	This line appears to be severely coated in grease and sludge build up. There is also ragging of grease and debris from the top of the pipe that suggests full stagnant flow at some instances indicating a potential pipe sag.
MH 897 – MH 896	10" PVC	DSC, MCU, OBZ, DAAR, SG	CCTV camera was submerged during inspection indicating two potential pipe sags. There is substantial grease and sludge build up and after instances of sag there is ragging from the top of the pipe.
MH 893 – MH 892	10" PVC and DIP	DSC, MGD, OBZ, DAGS	Several unknown obstacles were found in the flow path, substantial grease and sludge build up. There was also an instance where the pipe appears to drop significantly, but there was no noticeable joint offset. Further investigation could prove useful.

Pump run times for each of the pump stations was also reviewed. It is generally recommended that pumps be designed to run no longer than 8 hour per day in dry weather conditions. It is also a general recommendation that wet weather peaking factors be less than 2. The pump stations that had dry weather pump runtimes higher

than 8 hours per day and wet weather peaking factors great than 2 have been included in the table below. This evaluation has identified several pump stations that have higher than recommended pump runtime or peaking factors. Those pump stations are listed below in Table 2.

Table 2 Review of Pump Station Findings	
Pump Station	Findings
Coneross Creek	High pump runtimes
Perkins Creek	High pump runtimes
Martin Creek	High pump runtimes
Choestoea	High peaking factor
Flat Rock	High peaking factor

2.2 Review of Recommendations

Based on the priority defects identified the following recommendations and projects, shown in Table 3 below, have been formulated to mitigate their contributions to significant and repetitive spills.

Table 3 Summary of Recommendations				
Project No.	Between Manholes	Recommendations	Priority	Focus Area
1	MH 157 - MH 156	Full replacement of the VCP segment. During replacement, ensure that the area of existing sagging pipe is fully supported by stabilized soils.	1	3
2	MH 53 – MH 52	Point Repair of a sagging segment. During replacement of the existing pipe, soil should be stabilized to prevent another sag.	2	2
3	MH 912 – MH 911	This line should be cleaned, plugged, and reinvestigated to confirm sags within the segment. If sags exist, they should be remedied by a point repair of the segment. The downstream manhole shall be inspected further to determine sources of I/I.	3	4 (10'')

4	MH 30 – MH 29	This line should be cleaned to clear existing grease buildup and remove potential obstructions and eliminate potential sources of I/I.	4	3
5	MH 913 – MH 912	This line should be cleaned, plugged, and re-evaluated to confirm sags in the pipe. If sags are confirmed, they should be eliminated with point repairs.	5	4 (10")
6	MH 897 – MH 896	This line should be cleaned, plugged, and re-evaluated to confirm sags in the pipe. If sags are confirmed, they should be eliminated with point repairs.	6	4 (10")
7	MH 893 – MH 892	This line should be cleaned, plugged, and re-evaluated to confirm presence of defects. After confirmation of defects is made a corrective action work plan can be developed to address them.	7	4 (10")
8	FM 8 – 375 to Westminster	This line should be cleaned, plugged, and re-evaluated to confirm presence of defects. After confirmation of defect is made a corrective action work plan can be developed to address them.	8	3
9	Choestoea PS to Westminster	This line should be cleaned, plugged, and re-evaluated to confirm presence of defects. After confirmation of defect is made a corrective action work plan can be developed to address them.	9	3

Some of the assets within Focus Areas No. 1 -4 could not be fully assessed due to collection system conditions or a need for more information. In these cases, it is recommended to address these collection system conditions in a further evaluation so that priority defects can be identified and addressed. A list of these further evaluations is included in Table 4 below.

Table 4 Recommendation for Further Evaluation and Study	
Focus Area	Recommendation
Study: Additional Gravity Sewer Sections	Conduct further CCTV analysis of sections of the gravity sewer system likely to be in poor condition due to age and pipe material.

Study: Pump Station Evaluation	Conduct complete pump station inspection with drawdown test for each pump station listed in Table 2; Coneross Creek, Perkins Creek, Martin Creek, Choestoea, and Flat Rock.
Study: Force Main Evaluation	Inspect force mains for the Seneca Creek and Speeds Creek Pump Stations for corrosion and air release valves for proper functioning.

During the Pump Station and the Force Main Evaluations additional defects will likely be identified. These defects will be evaluated for their potential to contribute to repetitive significant spills and will be categorized as priority defects. Methods to address each of the priority defects will be evaluated and selected based on the most effective and economical way to eliminate the defect and reduce its potential to contribute to repetitive significant spills. Once a method has been selected it will be formulated into a project and added to this work plan for future implementation.

End of Section

3. Work Plans

3.1. Project 1: MH157 - MH156

This 15" VCP gravity sewer is in poor condition with visible cracks, root intrusions at the joints, section of missing pipe, and signs of groundwater infiltration. A portion of the pipe segment could not be CCTV inspected due to the camera being submerged in wastewater. This is an indication of a sag in the pipe segment.

It is recommended that the pipe be completely replaced from manhole 157 to manhole 156. By replacing the entire segment and not just the portions of the pipe that have defects it ensure a more complete and thorough repair. During the replacement, it should be ensured that the area with the sag is properly backfilled with stabilized soil to eliminate the current sag and prevent future sagging.



Figure 2. Project 1

It is estimated that associated engineering fees for the design of this project will be roughly \$40,000 and the construction costs will be roughly \$150,000. For additional detail on cost estimates for each of the projects, please refer to **Appendix A**, Budget Estimates.

3.2 Project 1.c Additional CCTV

In response to the CCTV results of MH157-MH156, it is recommended that all upstream segments of VCP between MH 157 and Choestoea Creek Pump Station, not including service connections or tributary sewers be CCTV inspected to determine if similar defects are present. These defects could be sources of I/I and should be addressed in future projects.

This is estimated to be roughly 11,000 LF of gravity sewer and will cost \$62,000 to inspect and \$15,000 to evaluate.

Based on evaluation, appropriate repairs and replacement of this section will be determined. If full replacement of this section is needed, the 11,000 LF of gravity sewer may cost approximately \$4,500,000 to replace.

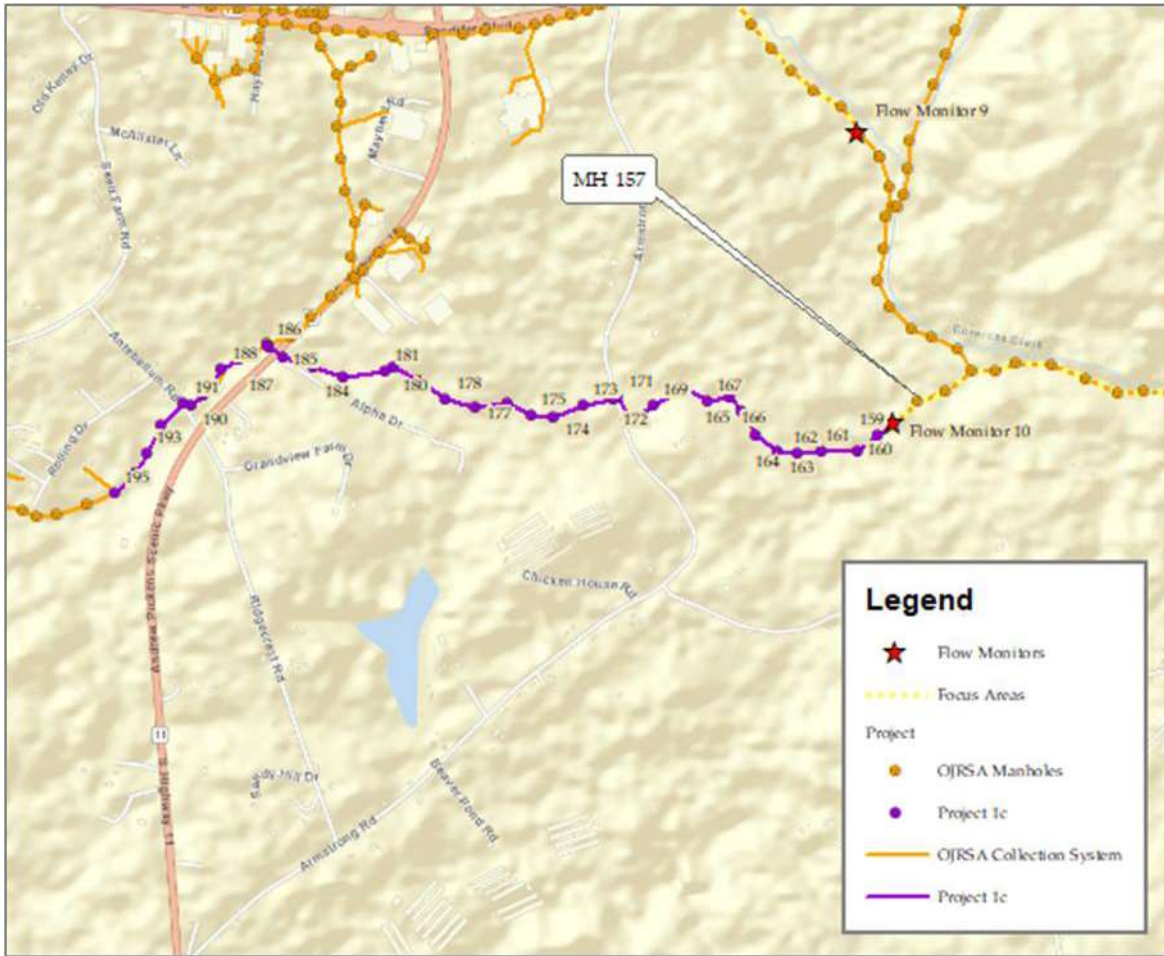


Figure 3. Project 1.c

3.2. Project 2: MH53 - MH52

This 30" VCP segment includes minor liner defects throughout. An obstruction at the bottom of a sag was found during CCTV. The obstruction has since been cleared, but the sag is still in need of repair. The pipe at the joints on either end of the sag are broken and cracked and have infiltration staining.

It is recommended that a point repair of the sagging segment to restore a uniform slope be completed. During replacement of the existing pipe, soil should be stabilized to prevent future sags.

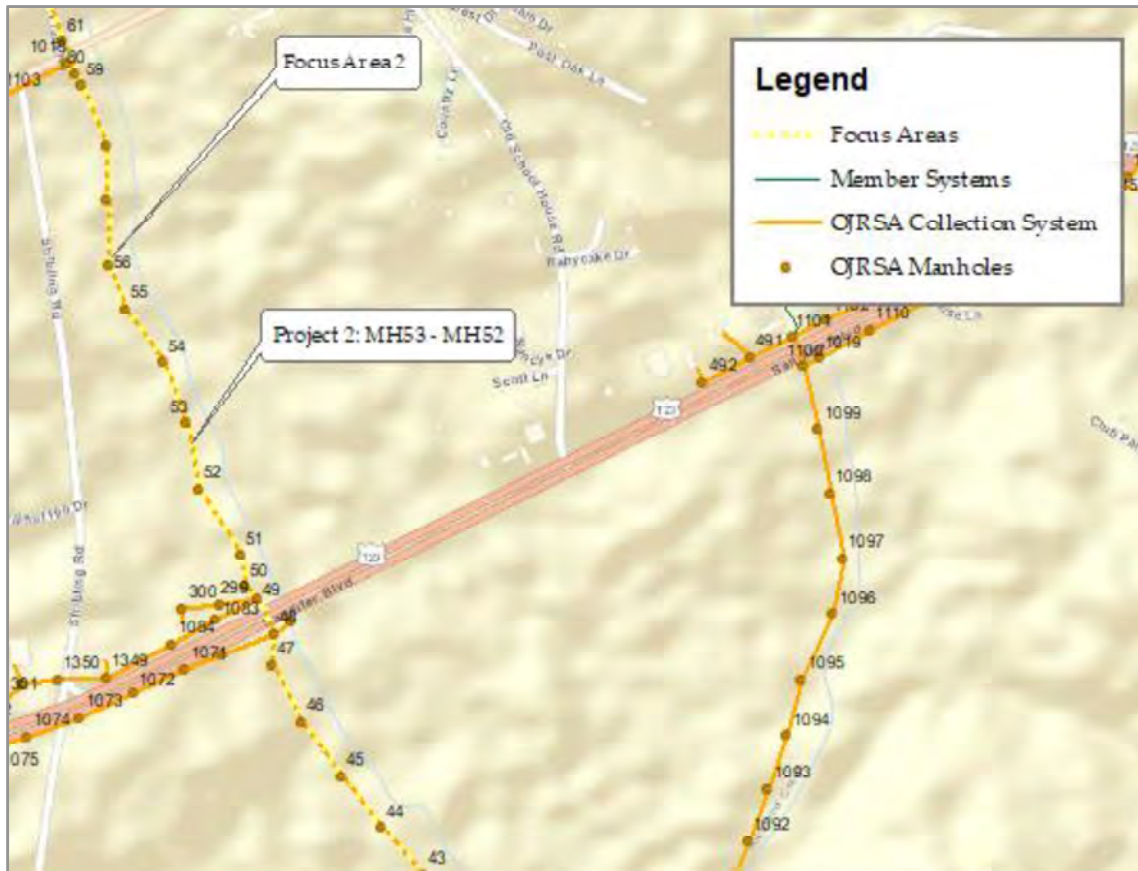


Figure 4. Project 2

It is estimated that associated engineering fees for the design of this project will be roughly \$10,000 and the construction costs will be roughly \$17,000.

3.3. Project 3 MH912 – MH911

This 10" PVC line appears to be severely coated in grease and sludge build up, there are defects that are consistent with a pipe sag. At the connection to the downstream manhole, water is dripping from the top of the pipe and there is also one instance of an infiltration gusher.

It is recommended that this line be cleaned, plugged, and CCTV inspected to confirm sags within the segment. If sags exist, rehabilitative action should be conducted to address the sag. The downstream manhole, MH911, shall be inspected further to determine sources of I/I.



Figure 5. Project 3

It is estimated that associated engineering fees for the design of this project will be roughly \$15,000 and the construction costs will be roughly \$21,500.

3.4 Project 4 MH30 - MH29

This 30" RCP gravity line has some minor linear defects throughout this segment, typical grease buildup, and a handful of joints with minor root intrusion. There is one instance of an infiltration runner and one instance of an unknown obstacle.

It is recommended that this line be cleaned to clear existing grease buildup and remove potential obstructions and eliminate potential sources of I/I with a point repair.



Figure 6. Project 4

It is estimated that associated engineering fees for the design of this project will be roughly \$10,000 and the construction costs will be roughly \$27,800.

3.5 Project 5 MH913 – MH912

This 10" PVC line appears to be severely coated in grease and sludge build up. There is also ragging of grease and debris from the top of the pipe that suggests full stagnant flow at some instances indicating a potential pipe sag.

Segment MH913-MH912 is shown in Figure 6 below conveying wastewater in a southward direction adjacent to a parallel 18" PVC gravity sewer.

It is recommended that this line be cleaned, plugged, and inspected with CCTV to confirm sags in the pipe. If sags are confirmed, rehabilitative action should be taken to address the sags.

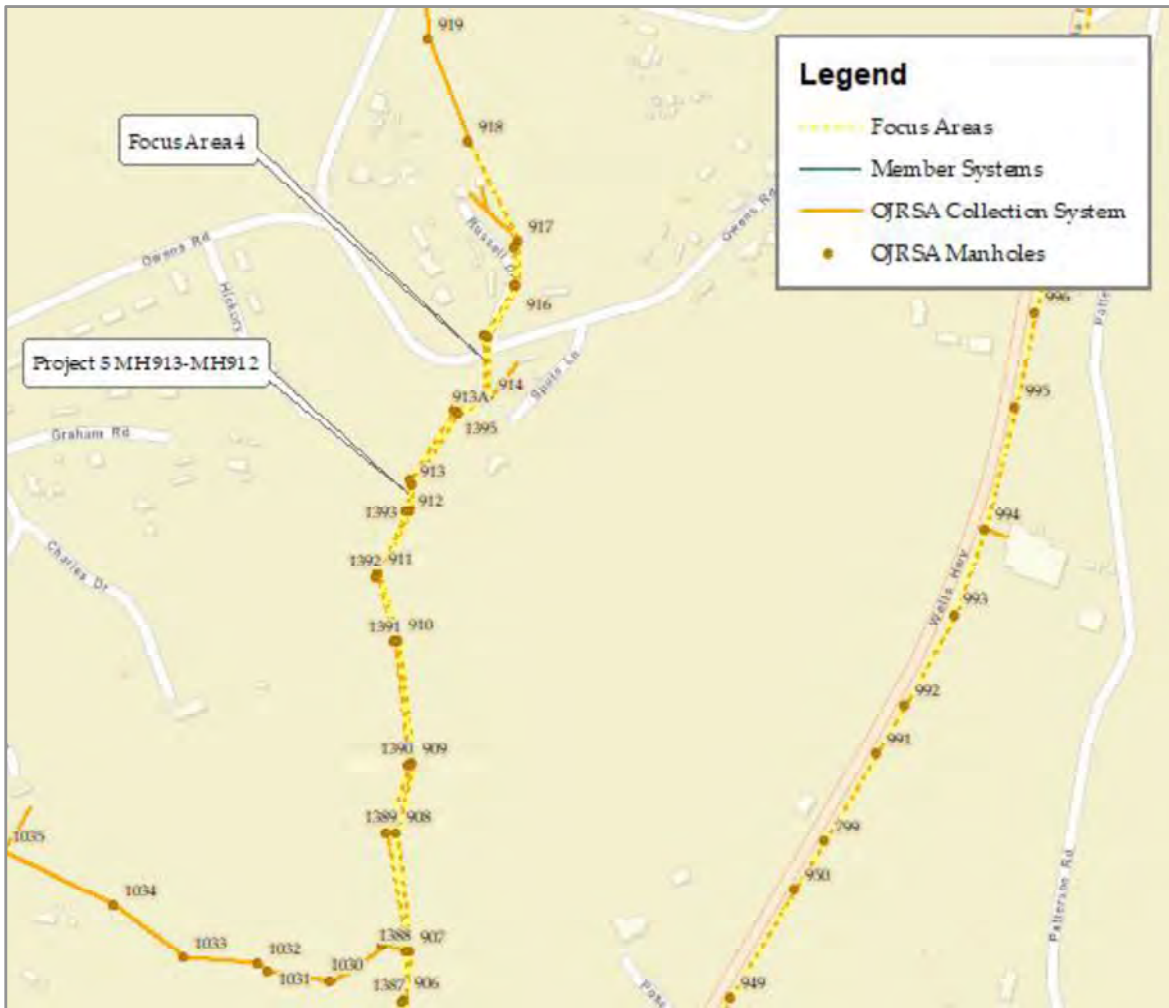


Figure 7. Project 5

It is estimated that associated engineering fees for the design of this project will be roughly \$12,000 and the construction costs will be roughly \$15,900.

3.6 Project 6 MH897 – MH896

During inspection of the 10" PVC line the CCTV camera was submerged indicating two potential pipe sags. There is substantial grease and sludge build up and after instances of sag there is ragging from the top of the pipe.

Segment MH897-MH896 is shown in Figure 7 below conveying wastewater in a southward direction adjacent to a parallel 18" PVC gravity sewer.

It is recommended that this line be cleaned, plugged, and re-evaluated to confirm sags in the pipe. If sags are confirmed, rehabilitative action should be taken to address the sags.

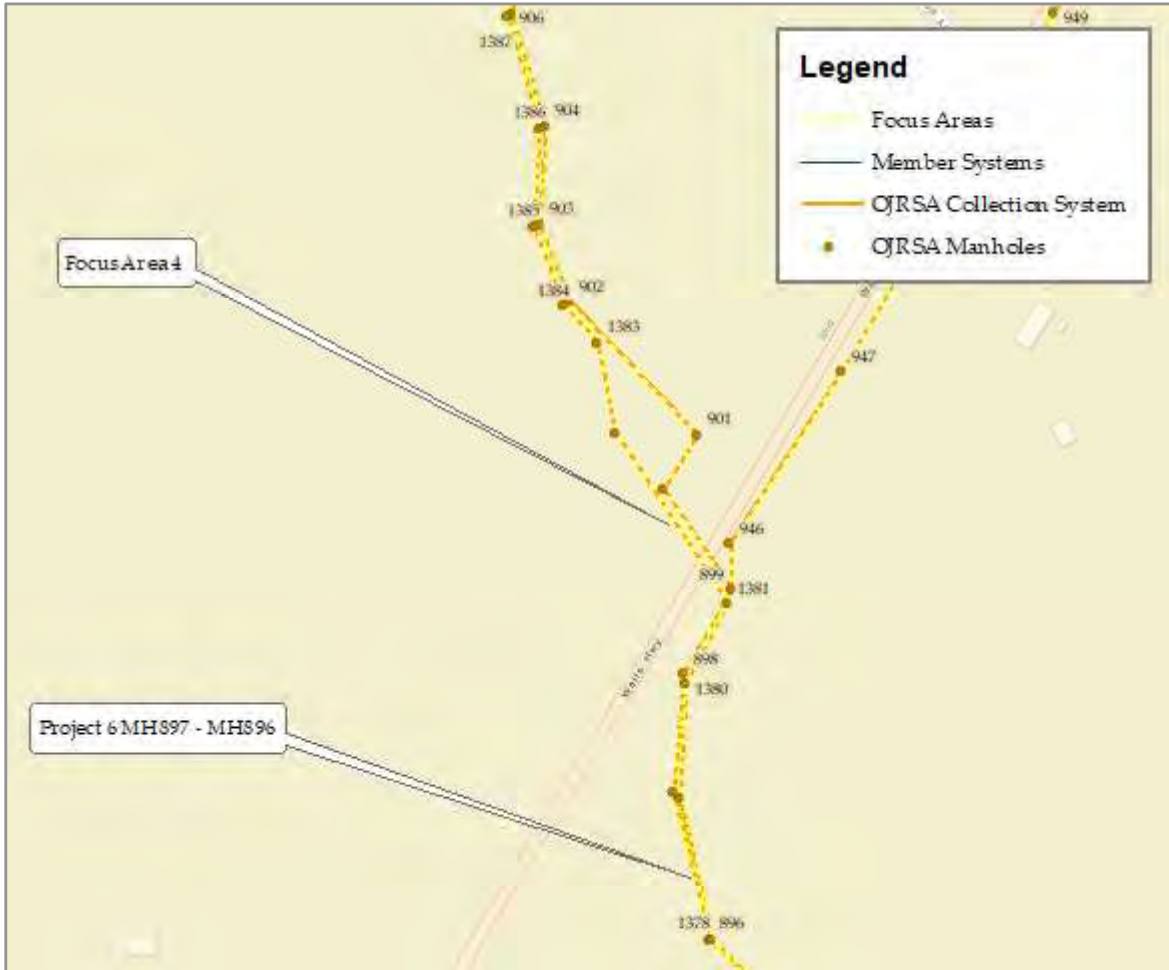


Figure 8. Project 6

It is estimated that associated engineering fees for the design of this project will be roughly \$15,000 and the construction costs will be roughly \$24,200.

3.7 Project 7 MH893 – MH892

During the inspection of this 10" PVC and DIP line, several unknown obstacles were found in the flow path, additionally substantial grease and sludge build up. There was also an instance where the pipe appears to drop significantly, but there was no noticeable joint offset. Further investigation could confirm the presence and extent of any defects.

It is recommended that this line be cleaned, plugged, and re-evaluated to confirm presence of defects. After confirmation of defects is made a corrective action work plan can be developed to address them.

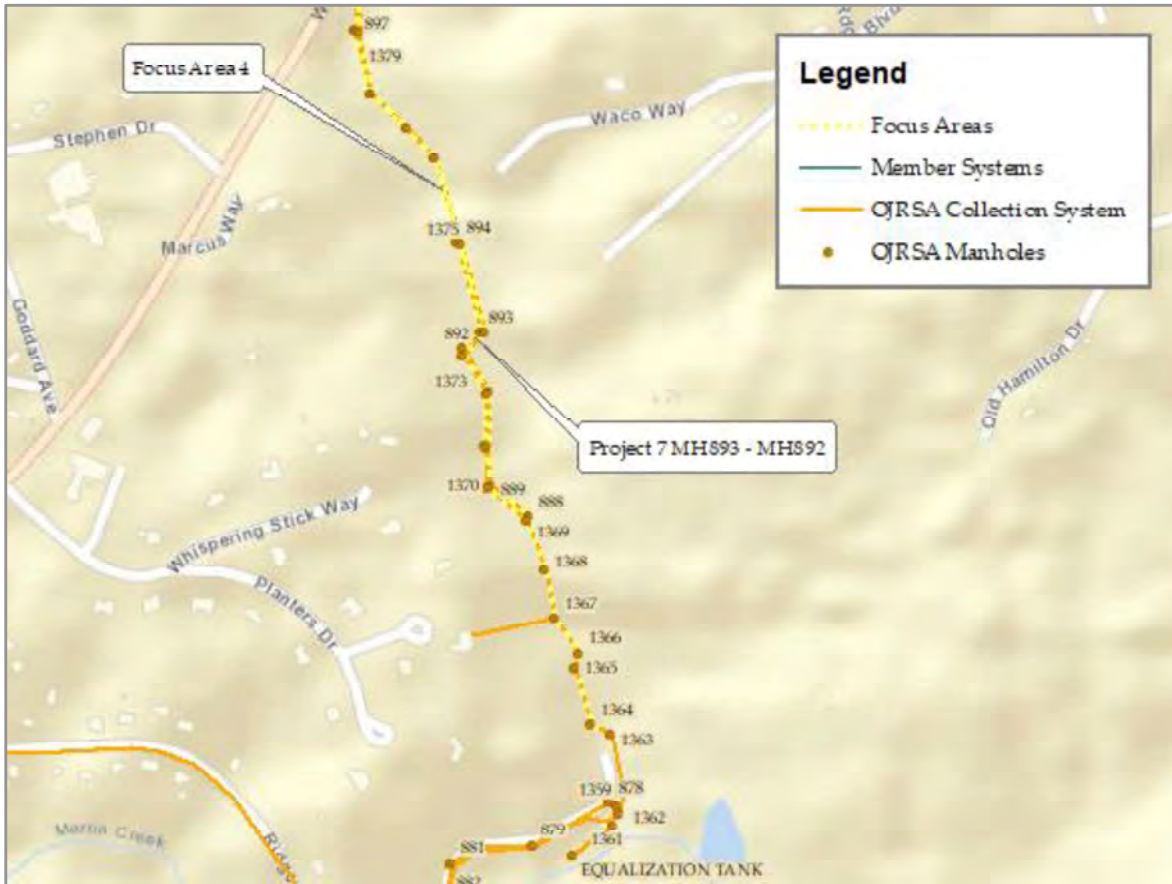


Figure 9. Project 7

It is estimated that associated engineering fees for the design of this project will be roughly \$12,500 and the construction costs will be roughly \$17,000.

3.8 Project 8 Additional CCTV

CCTV Evaluation from flow meter #8-375 to the connection with Westminster. This further investigation covers roughly 5,000 LF of gravity sewer.

This is estimated to be roughly 5,000 LF of gravity sewer and will cost \$30,600 to inspect and \$8,000 to in fees to evaluate.

Based on evaluation, appropriate repairs and replacement of this section will be determined. If full replacement of this section is needed, the 5,000 LF of gravity sewer may cost approximately \$2,250,000 to replace.

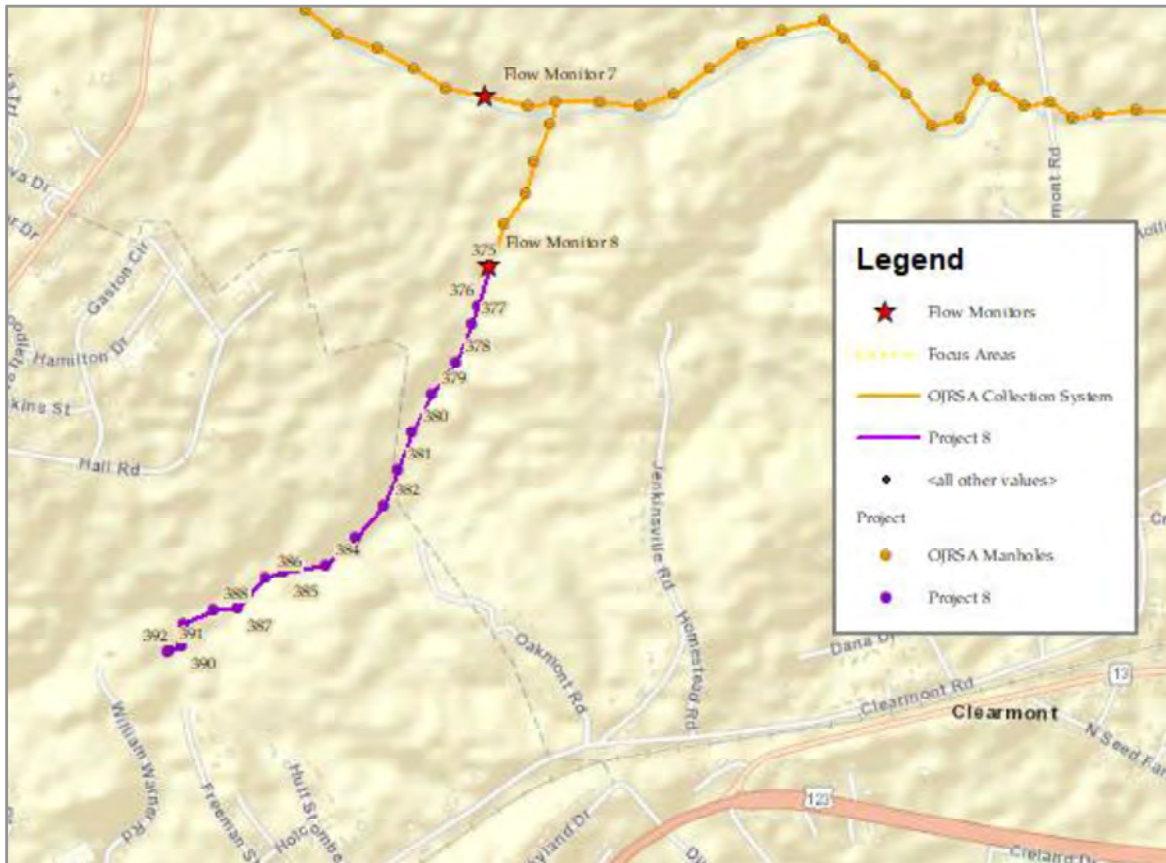


Figure 10. Project 8

3.9 Project 9 Additional CCTV

CCTV Evaluation from Choestoea Pump Station to the connection with Westminster. This is estimated to be roughly 9,000 LF of gravity sewer and will cost \$43,500 to inspect and \$13,000 to in fees to evaluate.

Based on evaluation, appropriate repairs and replacement of this section will be determined. If full replacement of this section is needed, the 9,000 LF of gravity sewer may cost approximately \$4,000,000 to replace.

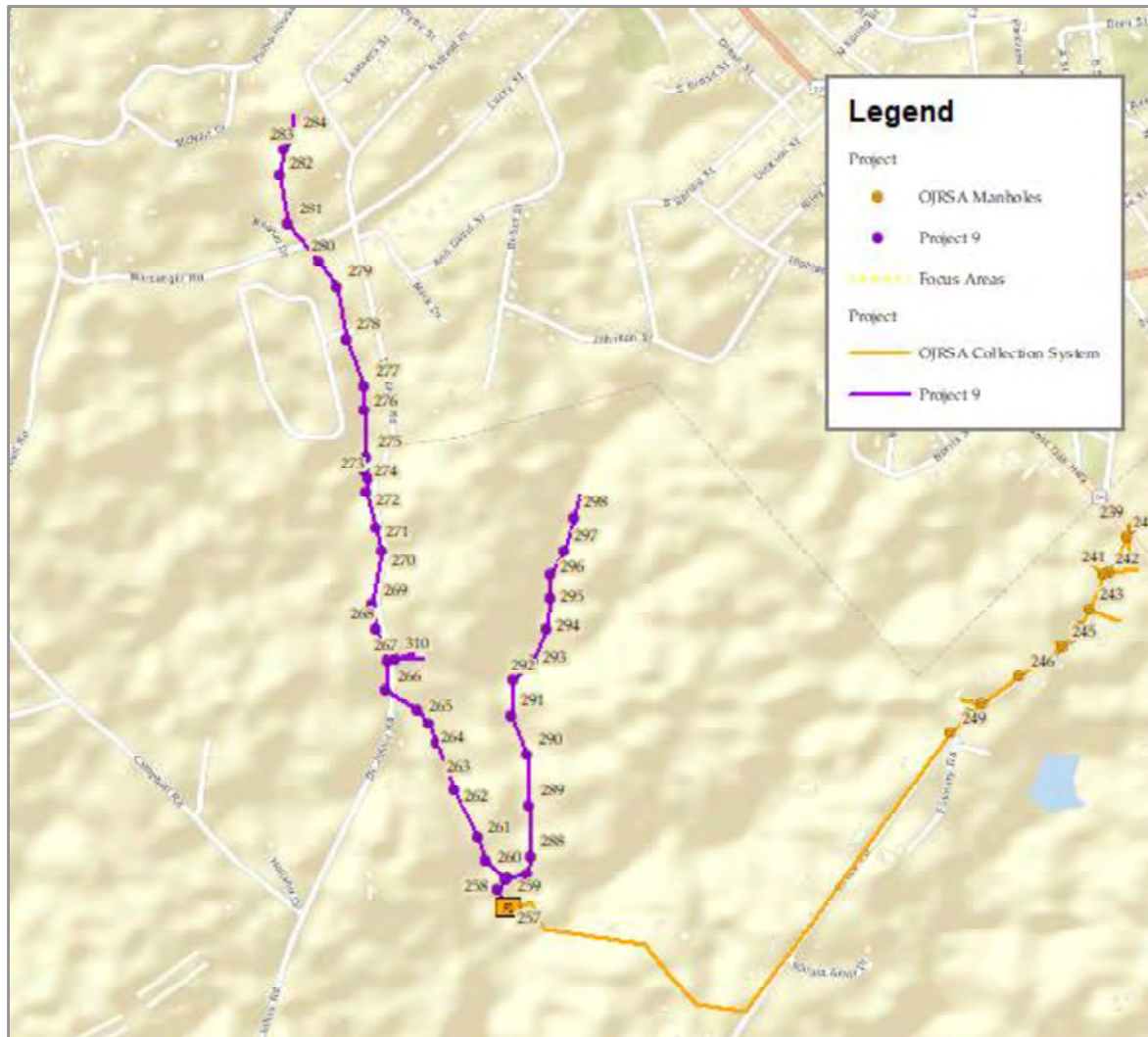


Figure 11. Project 9

3.11 Project 11 Pump Station Evaluation

Conduct pump station evaluations on the following pump stations:

- ◆ Coneross Creek Pump Station
- ◆ Perkins Creek Pump Station
- ◆ Martin Creek Pump Station
- ◆ Choestoea Pump Station
- ◆ Flat Rock Pump Station

These pump stations are also listed in Table 2 and shown in Figure 12 below. It should be noted that Coneross Creek Pump Station is located at the Coneross Creek Wastewater Treatment Facility.

These evaluations should seek to determine the causes of the high pump runtimes and high peaking factors. The estimated cost for this evaluation is \$90,000.

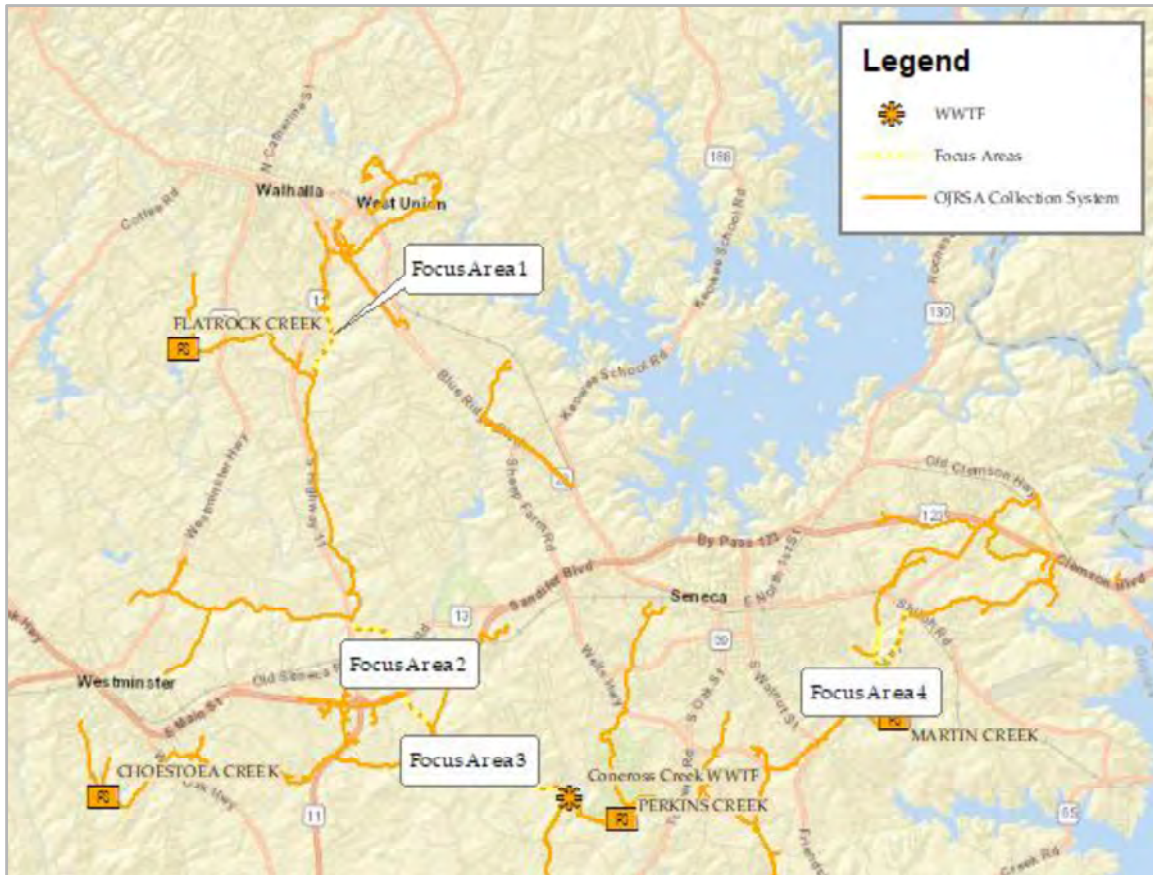


Figure 12. Project 11 Pump Station Evaluation

3.12 Project 12 Force Main Evaluation

Due to failures associated with force mains, Seneca Creek and Speeds Creek force mains were identified for further evaluation.

It is recommended that the force mains be inspected for corrosion and the ARVs be assessed for proper function. Additionally, due to historical, repetitive failures within Speeds Creek force main, an investigation to determine the cause of failures should be

made. Upon determination of the cause of these repeated failures, necessary actions to prevent future failures should be taken as part of the future projects.

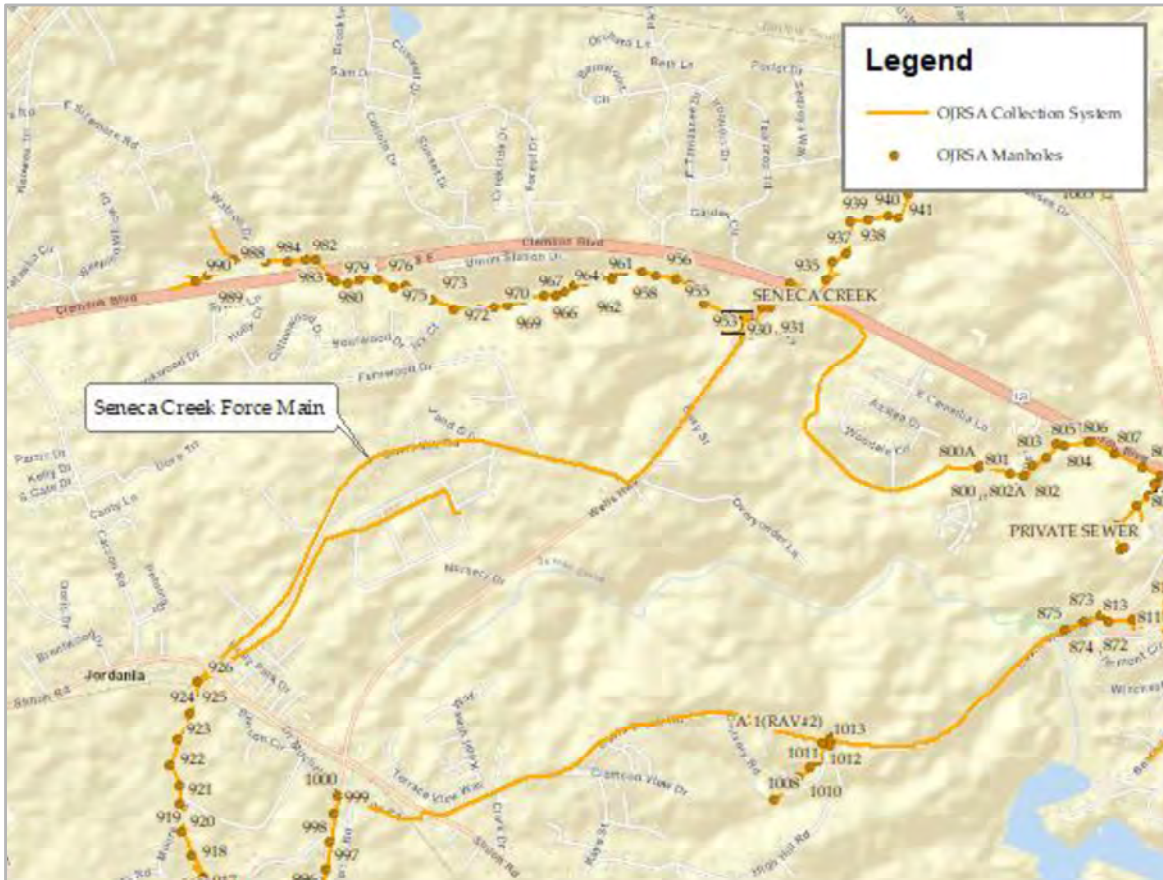


Figure 13. Project 12 Seneca Creek Force Main Evaluations

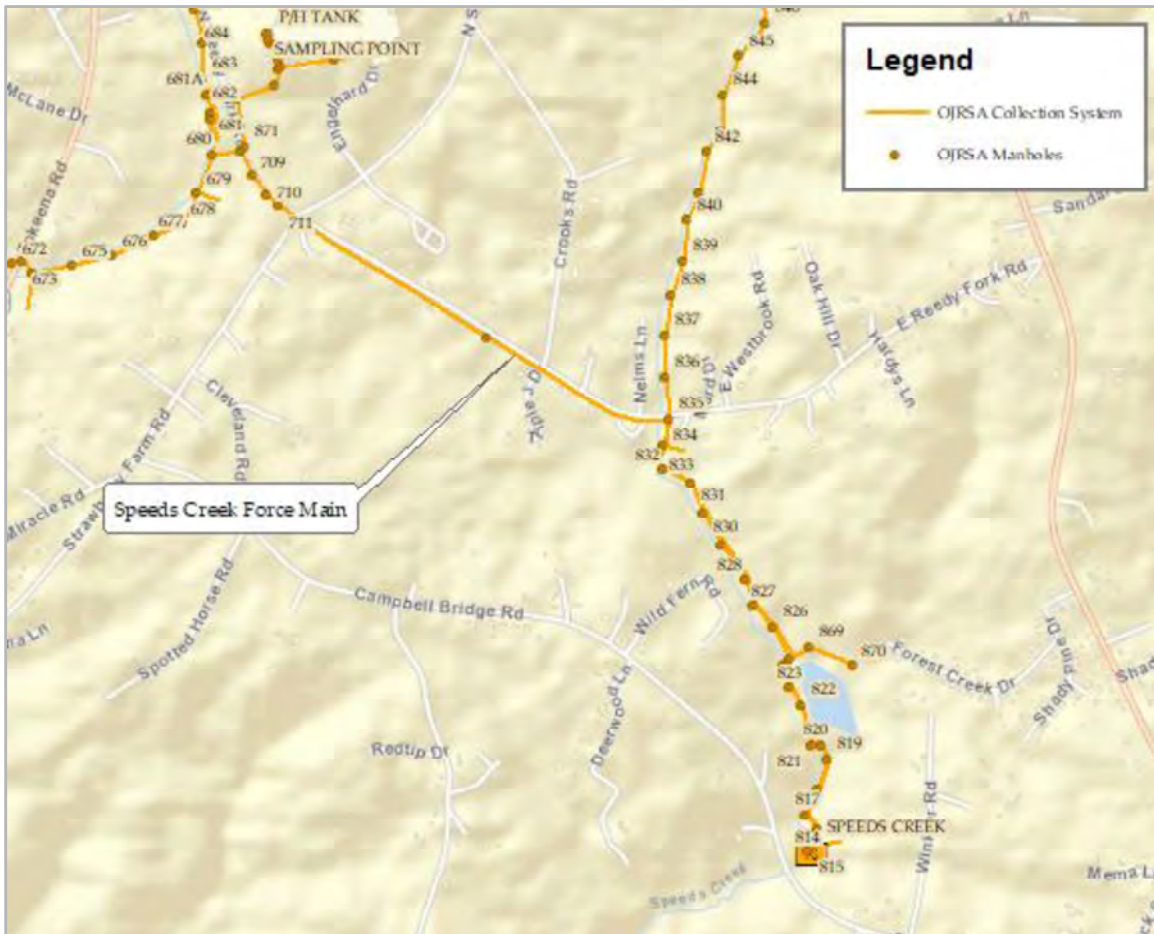


Figure 14. Project 13 Speeds Creek Force Main Evaluation

3.13 Project 13 Flat Rock Pump Station Rehabilitation

The Flat Rock Pump Station serves an area southwest of Walhalla and the Oconee County Detention Center. Recent drawdown tests indicate that the existing pumps are performing below the original design flow rate of 250 gpm. OJRSA plans to increase the capacity of this pump station to 300 gpm to relieve the stress on the sewer system in the area. Additionally, a large amount of debris enters the waste stream interfering with downstream wastewater operations including ragging and blockages at the pump station. By upgrading the pump station, the debris can be removed at the pump station prior to causing blockages in the waste stream.

The Flat Rock Pump Station Rehabilitation will include:

- ◆ Installation of a new wetwell
- ◆ Vertical Barscreen, compactor, and dumpster
- ◆ Duplex submersible pumps
- ◆ Permanent standby generator
- ◆ Demolition of existing wetwell, pump station structure, and radio communications towers
- ◆ Site work; including fencing, improved vehicle access, and water service

Flat Rock Pump Station Rehabilitation is expected to cost \$1,410,000 with engineering fees of \$130,000.

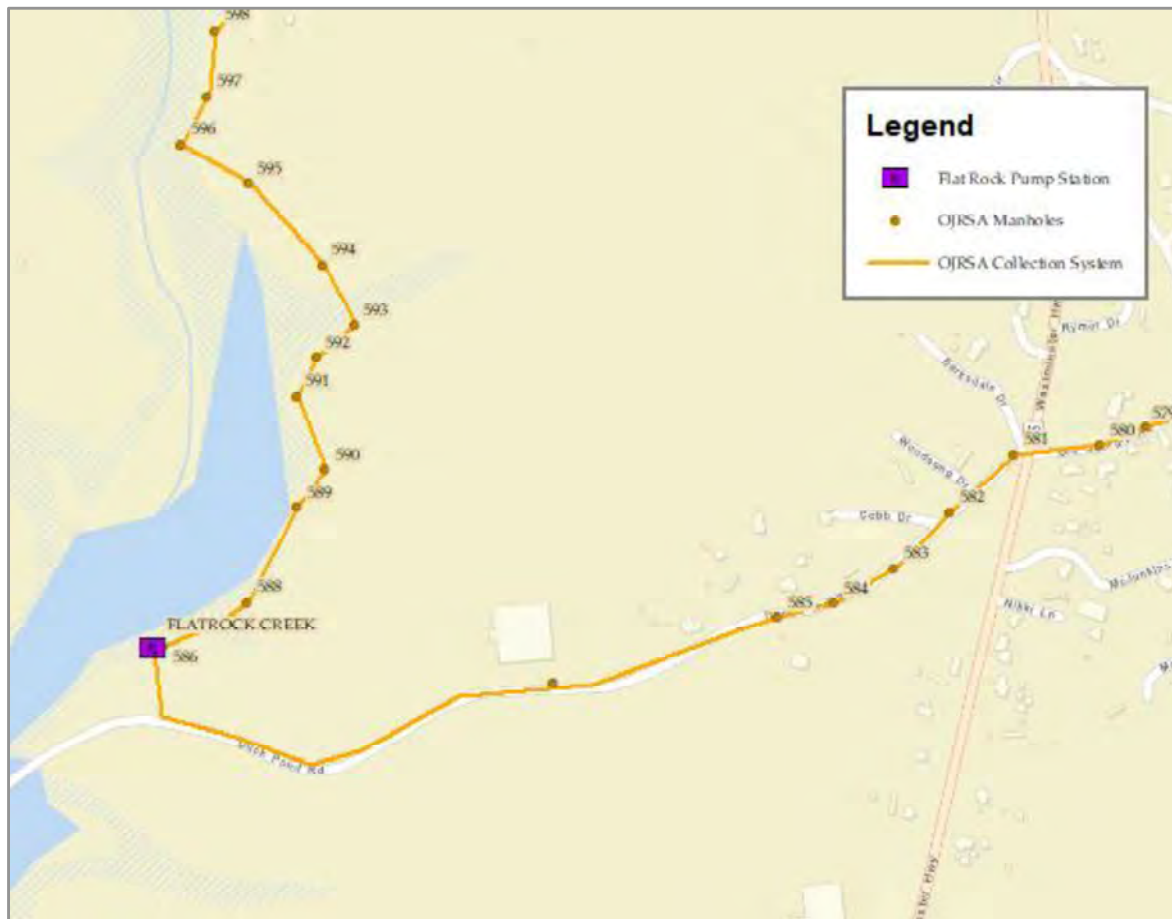


Figure 15. Project 13 Flat Rock Creek Pump Station

End of Section

4. Recommended Rehabilitation and Proposed Schedule

In summary, Table 5 includes a list of all the projects, the type of project, their expected costs, and their expected schedule.

Table 5 Summary of Projects				
Project	Project Type	Estimated Engineering Fees	Estimated Construction Costs	Estimated Completion Date
1	Rehabilitation	\$40,000	\$150,000	Summer 2024
1.c	Additional CCTV	\$15,000	\$62,000	Winter 2023
2	Rehabilitation	\$10,000	\$17,000	Summer 2024
3	Rehabilitation	\$15,000	\$21,500	Summer 2024
4	Rehabilitation	\$10,000	\$27,800	Summer 2024
5	Rehabilitation	\$12,000	\$15,900	Summer 2024
6	Rehabilitation	\$15,000	\$24,200	Summer 2024
7	Rehabilitation	\$12,500	\$17,000	Summer 2024
8	Additional CCTV	\$8,000	\$30,600	Winter 2023
9	Additional CCTV	\$13,000	\$43,500	Winter 2023
11	Evaluation	\$90,000	TBD	Winter 2023
12	Evaluation	\$60,000	TBD	Winter 2023
13	Flat Rock Pump Station	\$130,000	\$1,410,000	Winter 2024
		\$430,500	\$1,819,500	

Projects 1-7 are all rehabilitation projects of current known defects that do not require further evaluation. It is expected that these projects will be combined into one rehabilitation project. An extended timeline of 24 months is provided in order to account for funding cycles, supply chain difficulties, and contractor availability. Projects 8-12 and 1.c are for additional inspections and evaluations and will be bid at the same time as Project 1-7. Because this is not a design and construct project, a shorter timeline of 18 months is provided.

End of Section

5. Appendix A Budget Spreadsheets



ID	Item Description	Estimated Engineering Fee		Estimated Construction Costs		Estimated Construction Costs
		Quantity	Unit	Unit Cost	Construction Costs	
CONSTRUCTION PROJECTS						
1	From MH 157 to MH 156 full removal and replacement of the 15" VCP pipe					
1.a.	Full removal and replacement of the 15" VCP pipe. Assuming RCP pipe to replace.	350 Ft		\$400		\$140,000
1.b.	Temporary Bypass of section	5 Days		\$2,000		\$10,000
	Project Totals			\$40,000		\$150,000
1.c.	CCTV inspect VCP pipe segments upstream of MH 157 to determine if there are similar defects.	11,000 Ft		\$6		\$62,000
	Project Totals			\$15,000		\$62,000
2	From MH 53 to MH 52: Point repair, 30" RCP					
2.a.	Point repair should be made on a sag within the line. During replacement, the surrounding soil shall be stabilized and the pipe shall be properly supported to prevent another possible sag.	30 Ft		\$500		\$15,000
2.b.	Temporary Bypass of section	1 Days		\$2,000		\$2,000
	Project Totals			\$10,000		\$17,000



Appendix A: Budget Spreadsheet

ID	Item Description	Estimated Construction Costs		Estimated Construction Costs
		Estimated Engineering Fee	Unit Cost	
3	From MH 912 to MH 911: Point repair, 10"-PVC			
3.a.	Line shall be cleaned and cleared of all obstructions.		200 Ft	\$8,000
3.b.	Subsequently, CCTV should be performed to verify existence of a sag.	\$5,000	200 Ft	\$1,000
3.c.	If the defect does exist, a point repair should be made in the area to remedy the sag.	\$10,000	30 Ft	\$10,500
3.d.	Temporary Bypass of section		1 Days	\$2,000
	Project Totals	\$15,000		\$21,500
4	From MH 30 to MH 29: Point repair, 30" RCP			
4.a.	this line should be cleaned and cleared of all obstructions.		270 Ft	\$10,800
4.b.	Additionally, a point repair should be made at the location of I/I.	\$10,000	30 Ft	\$15,000
4.c.	Temporary Bypass of section		1 Days	\$2,000
	Project Totals	\$10,000		\$27,800



Appendix A: Budget Spreadsheet

ID	Item Description	Estimated Engineering Fee	Estimated Construction Costs		Estimated Construction Costs
			Quantity	Unit	
5	From MH 913 to MH 912: Point repair, 10" PVC				
5.a.	this line should be cleaned and		75 Ft		\$3,000
5.b.	reinvestigated by CCTV to confirm existence of	\$2,000	75 Ft	\$5	\$400
5.c.	If the sag exists, a point repair should be made in the area to remedy the defect.	\$10,000	30 Ft	\$350	\$10,500
5.d.	Temporary Bypass of section		1 Days	\$2,000	\$2,000
	Project Totals	\$12,000			\$15,900
6	From MH 897 to MH 896: Point repair, 10" PVC				
6.a.	this line should be cleaned and		260 Ft	\$40	\$10,400
6.b.	reinvestigated by CCTV to confirm existence of a possible sag.	\$5,000	260 Ft	\$5	\$1,300
6.c.	If the sag exists, a point repair should be made in the area to remedy the defect.	\$10,000	30 Ft	\$350	\$10,500
6.d.	Temporary Bypass of section		1 Days	\$2,000	\$2,000
	Project Totals	\$15,000			\$24,200



ID	Item Description	Estimated Engineering Fee	Estimated Construction Costs		Estimated Construction Costs
			Quantity	Unit Cost	
7	MH 893 to MH 892: 10" PVC Line Cleaned/Reinvestigated by CCTV to Determine the Extent of Defects				
7.a.	this line should be cleaned and		100 Ft	\$40	\$4,000
7.b.	reinvestigated by CCTV to determine the extent of defects within the segment.	\$2,500	100 Ft	\$5	\$500
7.c.	If defects are confirmed within the segment, they shall be rehabilitated in the proper manner.	\$10,000	30 Ft	\$350	\$10,500
7.d.	Temporary Bypass of section		1 Days	\$2,000	\$2,000
Project Totals					\$17,000



ID	Item Description	Estimated Engineering Fee	Estimated Construction Quantity	Unit	Estimated Construction Unit Cost	Estimated Construction Costs
STUDIES						
8	CCTV Evaluation from flow meter #8-375 upstream until the City of Westminster	\$8,000	5,000	Ft	\$6	\$30,600
9	CCTV Evaluation upstream of Choestoea PS until the City of Westminster (included as an area previously recommended by GMC. (#6 and #7))	\$13,000	9,000	Ft	\$5	\$43,500
11	Pump Station Drawdown Tests and Reports Coneross Creek – High PS runtime Perkins Creek – High PS runtime Martin Creek – High PS runtime Choestoea – High peaking factor Flat Rock – High peaking factor	\$90,000				



ID	Item Description	Estimated Engineering Fee	Estimated Construction Costs		Estimated Construction Costs
			Quantity	Unit Cost	
12	<p>Force Main Evaluation</p> <p>Due to failures associated with force mains, two (2) lines were identified for further evaluation. They are listed below:</p> <ul style="list-style-type: none"> · Seneca Creek force main · Speeds Creek force main <p>It is recommended that the force mains be inspected for corrosion and the ARVs be assessed for proper function. Additionally, due to historical, repetitive failures within Speeds Creek force main, investigation of potential causes of failure should be investigated through a thorough assessment. Upon determination of the cause of these repeated failures, necessary actions to prevent future failures should be</p>	\$60,000			



ID	Item Description	Estimated Engineering Fee	Estimated Construction Costs	Estimated Construction Costs
13	Flat Rock Pump Station - Installation of a new wetwell - Vertical Barscreen, compactor, and dumpster - Duplex submersible pumps - Permanent standby generator - Improved vehicular access - Demolition of existing wetwell, pump station structure, and radio communications towers - Site work; including fencing, water service, etc. - Bypass pumping	\$130,000		\$1,410,000

NOTES

- 1 This is for budgetary purposes. Further detailed review will be necessary to finalize these estimates.
- 2 Cost efficiencies will be realized when multiple projects can be designed and bid at the same time.
- 3 Material costs are dynamic in these current market conditions and are our best estimates based on recent bid tabulations.
- 4 Force main analysis of data may conclude that full force main replacement is the best path forward.
- 5 Further discussions on funding these projects also may dictate when how you decide to package these projects, and when to execute them.

