FINAL REPORT | AUGUST 2024

Sanitary Sewer System
Preliminary Engineer's Report

PREPARED FOR

Graton Community Services District

GRATON
community services district

PREPARED BY

WEST YOST
Water. Engineered.

Sanitary Sewer System
Preliminary Engineer's Report

Prepared for

Graton Community Services District

Project No. 1088-40-24-03

Prepared by: Kelly Snyder, PE — Date: 8/13/2024

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1.0 INTRODUCTION

Graton Community Services District (District) is undertaking a project to assess the condition and plan for rehabilitation and repair of its sanitary sewer collection system, including gravity pipelines, manholes, force mains, and lift stations.

The District is located west of Santa Rosa, bounded by the Cities of Sebastopol to the south, Occidental to the west, and Forestville to the north. The District provides sanitary sewer collection, treatment, and disposal to a population of approximately 1,600 (2018) over a service area of approximately 43.1 acres. The sanitary sewer facilities are owned and operated by the District.

Field condition assessment was performed in late 2023 and a technical memorandum, *Graton Community Services District Sanitary Sewer System Condition Assessment,* was delivered in March 2024 (Condition Assessment TM) summarizing the condition assessment results and presenting preliminary rehabilitation and repair alternatives.

This Preliminary Engineer's Report (PER) reviews the alternatives presented in the Condition Assessment TM and recommends preferred alternatives to address identified deficiencies in the collection system. Cost estimates are developed for the proposed recommendations. The report also identifies permitting and constructability requirements that will need consideration during later design phases. The intent of the report it to provide the basis for development of detailed plans and specifications in support of a 50 percent level design.

1.1 Structure of this Report

The following sections of this report include:

2.0 Summary of Existing Information
3.0 Pipeline Rehabilitation Alternatives
4.0 Manhole Rehabilitation Alternatives
5.0 Hydraulic Confirmation
6.0 Preliminary Design Recommendations
7.0 Geotechnical Investigation
8.0 Environmental and Permitting Requirements
9.0 Construction Considerations
10.0 Engineer's Opinion of Probable Construction Cost
11.0 Next Steps

2.0 SUMMARY OF EXISTING INFORMATION

This section provides a summary of the existing data and field investigation information that was used in development of the PER and proposed recommendations. Existing information included the following items, which are described in detail in the following sections:

- Existing Drawings
- Existing Utilities
- Pipeline Zones
- Sewer Gravity Pipeline CCTV Inspection
- Manhole Inspection
- Lift Station and Force Main Condition Assessment

2.1 Existing Drawings

Two sets of drawings were received from District staff, including:

- Graton Community Services District Collection System Grid Maps (Lescure Engineers, Inc; 2010) –21-page set of grid maps showing the District sewer service boundary and plan view location of existing pipelines and manholes.
- Improvement Plans of Graton Sewerage Facilities, County Service Area 2 (Brelje and Race Consulting Civil Engineers; 1976) – design drawings for the wastewater treatment plant (WWTP), two pump stations, and collection system (plan/profile drawings).

2.2 Existing Utilities

Identifying buried utilities near any excavation work is imperative to avoid damage and accidents during construction. This process typically occurs in stages, with the final engineering design providing the as-built estimated positions of any known buried lines. The construction contractor would be responsible for physically locating any utilities that are close enough to potentially be affected by the work.

At this stage, West Yost has made a preliminary information request to identify all known utilities that may exist in the project area. These are shown in Table 2-1. Mapping received from utility companies will be reviewed in later design phases.

Table 2-1. Utility Agencies Identified in Project Area

Name	Type of Facility
AT&T	Media/Communication
Comcast	Media/Communication
PG&E	Gas/Electric Distribution
Sonic Telecom	Media/Communication

2.3 Pipeline Zones

The Graton collection system includes several areas/neighborhoods which have been given names, as shown in Figure 1. This is primarily for the purpose of organizing the pipeline inspection results and recommendations. Pipeline diameter and manhole IDs are also shown on Figure 1.

2.4 Sewer Gravity Pipeline CCTV Inspection

All accessible Graton sanitary sewer gravity pipelines were inspected using CCTV camera equipment during the 2023 condition assessment effort. Six percent of the lines were inaccessible, primarily smaller diameter pipelines where only cleanouts were installed, not manholes. The condition of these lines will be assessed during construction when access is made available through installation of new manhole(s). Uninspected pipelines are smaller diameter and do not service multiple customers, so inspections are not expected to result in major disruptions. The sewer laterals were inspected only at their connection points to the mains.

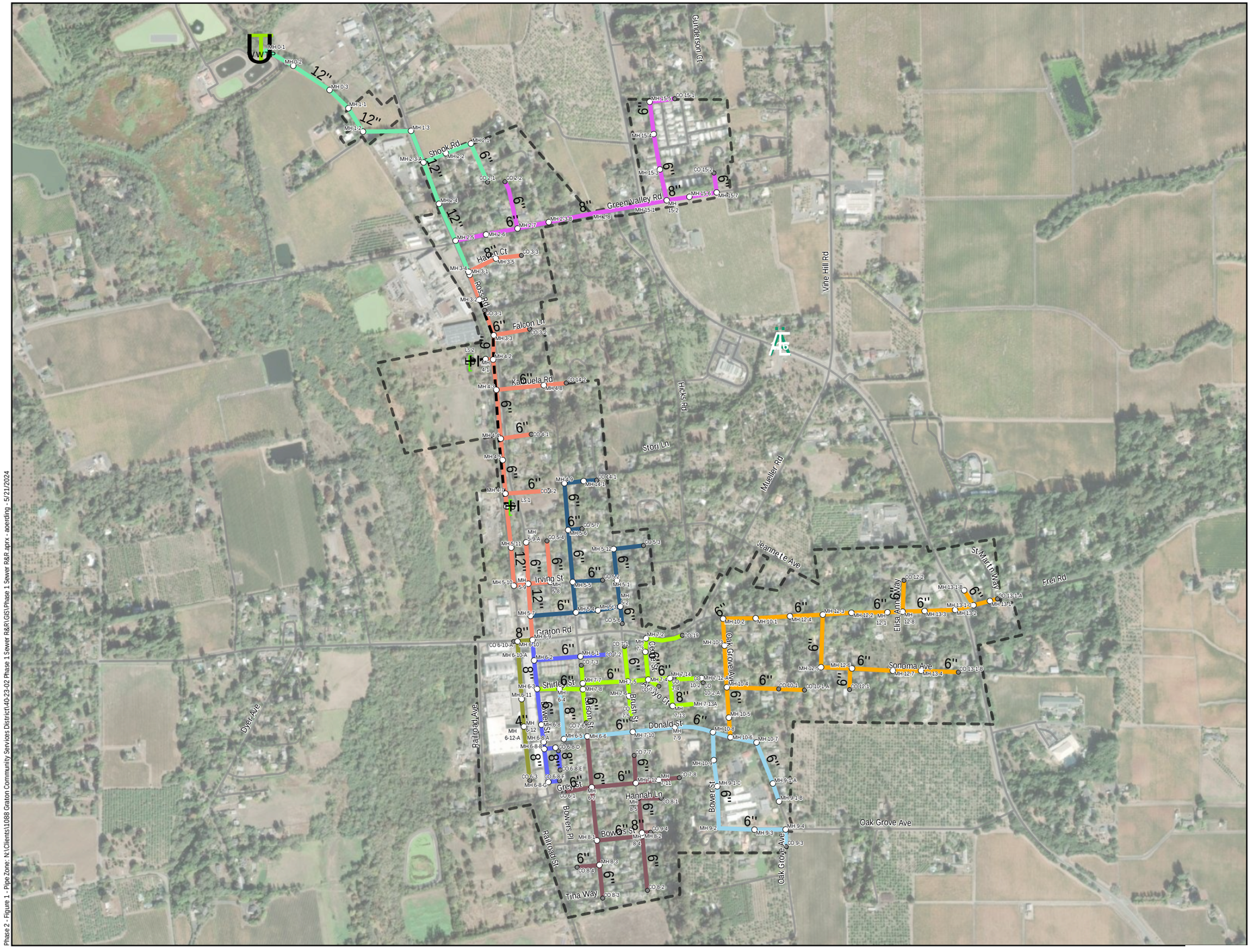
Most of the sanitary sewer piping is asbestos cement (AC) pipe that was installed circa 1976. At the time, this was one of the preferred piping types, as it was more resistant to corrosion and sulfide attack than either cast iron or concrete. Plastic pipes, such as PVC, were available at this time but had not been fully proven in service. Although AC pipe is resistant to sulfide attack, it is not completely immune to it and there are signs that some of the sections of pipe furthest downstream, near the WWTP have decayed significantly as the Portland cement binder has disintegrated, leaving only the spun asbestos matrix, which is beginning to spall off and disintegrate.

The rigidity and strength of the AC pipe segments (the fixed-lengths of pipe supplied by the factory) is apparent in the line surveys. Apart from the very northernmost sections, the AC pipe is still structurally sound. The system defects are almost entirely based on a variety of problems associated with the joints between the pipe segments. A large number of the original joints have separated, resulting in significant risks of both infiltration and exfiltration of fluid. In some extreme cases, soil is visible at the separated joints.

Another issue that can result from the rigidity of the AC pipe is that differential settlement can break the joints and allow for the sewer piping to come out of vertical alignment. In addition to the issues caused by the joint separation itself, a joint offset results in a reduction in the effective cross section of the piping and usually results in a major risk of blockage at the step change where flow is obstructed. Joint separations alone are enough for soil and tree roots to enter the system, but joint offsets expose significantly more soil and result in much higher risks.

The Condition Assessment TM presents the detailed findings from the CCTV line inspections. A summary of the results are provided in Table 2-2, which details each gravity pipeline segment, starting at the most downstream end of the system (at the WWTP), and generally working south and upstream; the table is also organized up by Pipeline Zone. The severity of each observation is graded from Grade 5 (severe) down to Grade 1 (minor), according to the NASSCO PACP[1] condition assessment standard. Each observation is recorded using standard PACP defect codes.

[1] NASSCO Pipeline Assessment Certification Program (PACP) is the industry standard for condition assessment.



Phase 2 - Figure 1 - Pipe Zone: N:\Clients\1088 Graton Community Services District\40-23-02 Phase 1 Sewer R&R\GIS\Phase 1 Sewer R&R.aprx - aperdino - 5/21/2024

Wastewater Treatment Plant
Lift Station
Manhole
Cleanout
Service Area

Pipeline Zones

- WWTP Area (North Ross Road)
- Green Valley Corridor
- Ross Road Corridor (Excluding Force Mains)
- Edison North of Graton Area
- Dreyer Feeder Line
- Bowen Street Corridor
- Shirley Street Area
- Donald Street Area
- Grey Street to Tina Way Area
- Oak Grove and Graton Road East Area
- Force Main

Prepared by:

WEST YOST

0 1,200 Feet

N

Prepared for:

Graton Community Services District
Sewer Rehab and Replacement Phase 2

GRATON community services district

Collection System Pipeline Diameter and Zones

Figure 1

Table 2-2. Gravity Pipeline CCTV Inspection Results

Start Structure	End Structure	PACP Code[a]				
		Grade 5	Grade 4	Grade 3	Grade 2	Grade 1
WWTP Area (North Ross Road)						
MH 0-1	WWTP					
MH 0-2	MH 0-1	SMW				
MH 0-3	MH 0-2	SMW				
MH 1-1	MH 0-3	SMW				
MH 1-2	MH 1-1	SMW				
MH 1-3	MH 1-2	SMW				
MH 2-3-A	MH 1-3	SMW				
MH 2-4	MH 2-3-A	HSV, SMW			OBZ, SSS	ISSR
MH 2-5	MH 2-4				DAE, SSS	
MH 3-4	MH 2-5			MWLS 50%	DAE, MWLS 20%	
MH 2-2	MH 2-3-A	HSV				
MH 2-1	MH 2-2					
CO 2-1	MH 2-1					
Green Valley Road Corridor						
MH 2-6	MH 2-5					
MH 2-7	MH 2-6			JOM		
CO 2-2	MH 2-7		JSL	JSM		
MH 2-3-B	MH 2-7		RBL			
MH 2-8	MH 2-3-B					
MH 15-1	MH 2-8			JSM		
MH 15-2	MH 15-1					MWL 5%
MH 15-6	MH 15-2					
MH 15-7	MH 15-6					
CO 15-2	MH 15-7					
MH 15-3	MH 15-2			MWLS 30%	MWLS 25%	MWL 5%
MH 15-4	MH 15-3			JOM, JSM	MWLS 20%	MWL 5%
MH 15-5	MH 15-4					
CO 15-1	MH 15-5			JSM, MWLS 35-70%		MWL 35-70%, MCU
Ross Road Corridor (Excluding Force Mains)						
CO 3-3	MH 3-5			JSM		
MH 3-5	MH 3-4					
MH 3-1	MH 3-4					
MH 3-2	MH 3-1					MWL 20%
CO 3-1	MH 3-3			JOM		
CO 3-2	MH 3-3			JOM, JSM		
MH 3-3	MH 4-2			JSM	MWLS 20%	
MH 4-1	MH 4-2					
MH 4-2	MH 4-3					
MH 4-8	MH 4-3					
CO 14-2	MH 4-8					
MH 4-3	MH 4-4			JOM		
CO 4-1	MH 4-4			JOM, JSM		MWL 5%
MH 4-4	MH 4-5				MWLS 15%	
MH 4-5	MH 4-7					
MH 4-7	MH 5-11-A			JSM		
CO 4-2	MH 4-7	NOT INSPECTED				
MH 5-11-A	LS-1					
MH 5-11	MH 5-11-A			RMJ		MWL 25%
MH 5-10	MH 5-11					MWL 10%
MH 5-9	MH 5-10				MWLS 25%	
MH 5-9-A	MH 5-9					MWL
MH 5-8	MH 5-9		B			
CO 5-4	MH 5-8		B		RTJ	RFL
MH 5-7	MH 5-9					
MH 6-9	MH 5-7					MWL 10%
Edison North of Graton Area						
MH 5-4	MH 5-7			JOM	CL	
MH 5-3	MH 5-4					
MH 5-2	MH 5-3			JOM		
CO 5-6	MH 5-2					
MH 5-1	MH 5-2			JOM	OBZ	MWL 5%
MH 5-12	MH 5-1		JSL	JSM, JOM	RFJ, JOM, RFJ, RTJ	RFJ
CO 5-3	MH 5-12					
MH 5-5	MH 5-4			JOM, JSM		
CO 5-2	MH 5-5		RBJ			
MH 5-6	MH 5-5		DAZ	JSM		

Table 2-2. Gravity Pipeline CCTV Inspection Results

Start Structure	End Structure	PACP Code[a]				
		Grade 5	Grade 4	Grade 3	Grade 2	Grade 1
CO 5-7	MH 5-6		RBL			MWL 5%
MH 4-9	MH 5-6	NOT INSPECTED				
MH 14-1	MH 4-9	NOT INSPECTED				
CO 14-1	MH 14-1	NOT INSPECTED				
Dreyer Feeder Line						
MH 6-10	MH 6-9					MWL 10%
CO 6-10-A	MH 6-10		SCP			
MH 6-10-A	Blind Tee					
MH 6-11	MH 6-10				MWLS 25%	
MH 6-12	MH 6-11				MWLS 15%, JOS, SSS	
MH 6-12-A	Blind Tee					
CO 6-3	MH 6-12					
Bowen Street Corridor						
MH 6-2	MH 6-9					
MH 6-1	MH 6-2	DSGV 35%		JSM, JOM		
CO 7-2	MH 6-1	RMB		JSM, RML, JOM		RFJ
MH 6-3	MH 6-2				MWLS 25%	MWL 10%
MH 6-8	MH 6-3					
MH 6-8-A	MH 6-8					
MH 6-8-B	MH 6-8-A					
MH 6-8-G	MH 6-8-B					
CO 6-8-F	MH 6-8-G					
MH 6-8-C	MH 6-8-B					
CO 6-8-D	MH 6-8-C					
CO 6-8-E	CO 6-8-D	NOT INSPECTED				
Shirley Street Area						
MH 6-4	MH 6-3					
MH 7-8	MH 6-4					
CO 7-6	MH 7-8					
MH 7-7	MH 7-8			JSM		
CO 7-3	MH 7-7			JOM		
MH 7-5	MH 7-7			JOM	CC, IS	
CO 7-1	MH 7-5	HSV		JOM		
MH 7-6	MH 7-5					MWL
CO 7-5	MH 7-6		JSL	JOM, JSM		
MH 7-4	MH 7-5	JOL	JOM	JSM		
MH 7-3	MH 7-4				FC	
MH 7-2	MH 7-3					
CO 19	MH 7-2					
CO 7-9	MH 7-4			JOM		MWL 5%
MH 7-14	MH 7-4					
CO 7-4	MH 7-14	NOT INSPECTED				
MH 7-13	MH 7-14	NOT INSPECTED				
MH 7-13-A	MH 7-13	NOT INSPECTED				
MH 7-12-A	MH 7-14	NOT INSPECTED				
CO 10-2	MH 7-12-A	NOT INSPECTED				
CO 10-2-A	MH 7-12-A	NOT INSPECTED				
Donald Street Area						
MH 6-5	MH 6-4			JSM		
MH 6-6	MH 6-5					MWL
MH 7-10	MH 6-6			JOM, JSM		
MH 7-9	MH 7-10					RPL
MH 10-8	MH 7-9					
MH 10-6	MH 10-8					
MH 10-7	MH 10-6					RPL
MH 9-1-A	MH 10-7		JOL		FC	
MH 9-1-B	MH 9-1-A					
MH 10-9	MH 10-8					RFJ
MH 9-1-C	MH 10-9					
MH 9-2	MH 9-1-C					
MH 9-3	MH 9-2		JOL			
MH 9-4	MH 9-3			JOM		RFJ, DAGS
CO 9-3	MH 9-4					
Grey Street to Tina Way Area						
MH 6-7	MH 6-6			DSZ		MWL
CO 6-1	MH 6-7		B		MWLS	
MH 7-12	MH 6-7		B	JSM, JOM		

Table 2-2. Gravity Pipeline CCTV Inspection Results

Start Structure	End Structure	PACP Code[a]				
		Grade 5	Grade 4	Grade 3	Grade 2	Grade 1
CO 7-7	MH 7-12			JOM		
MH 7-11	MH 7-12					
CO 7-8	MH 7-11		B	JOM, JSM		RFJ
MH 8-1	MH 6-7	MWLS 50-75%	B, JSL	OBM 15%, JOM, JSM		MWLS 25%
MH 8-3	MH 8-1		JOL	JSM, JOM	MWLS	SRI
CO 8-3	MH 8-3	Combined inspection with MH 8-3 to MH 8-1 (CO 8-3 to MH 8-1)				
CO 8-4	MH 8-3			SSS, DAZ		
MH 8-2	MH 8-1			JSM		
CO 8-2	MH 8-2		JOL	JOM		
MH 8-4	MH 8-2		JOL			MWL 5%
CO 9-4	MH 8-4				JSS	
MH 8-5	MH 8-4		JOL			MWL 5%
CO 8-1	MH 8-5					
Oak Grove and Graton Road East Area						
MH 10-5	MH 10-6		DAGS	JOM, MWLS	DAGS	
MH 10-4	MH 10-5		B	JSM, JOM		
CO 10-1	MH 10-4	NOT INSPECTED				
CO 10-1-A	CO 10-1	NOT INSPECTED				
MH 10-3	MH 10-4			DAZ		
MH 10-2	MH 10-3		B			
MH 10-1	MH 10-2			JOM	MWLS 30%	
MH 12-4	MH 10-1					
MH 12-3	MH 12-4		B	MWLS	OBZ	MWL
MH 12-5	MH 12-3		B	JOM		
MH 12-6	MH 12-5			JOM		
CO 12-1	MH 12-6			JOM	MWLS 15%	MWL 5%
MH 12-7	MH 12-6			JOM		RFJ
MH 13-4	MH 12-7	DAR		JOM, RMJ	MWLS 10%, RTJ	RFJ
CO 13-1-B	MH 13-4			JOM, DSZ		RFJ
MH 12-2	MH 12-3		JOL	JOM, MWLS 50%		VZ Worm
MH 12-1	MH 12-2			JOM	RF	
MH 12-8	MH 12-1					
CO 12-2	MH 12-8			JOM	MWLS 15%	MWL 15%, RFJ
MH 13-3	MH 12-8					SSC
MH 13-2	MH 13-3					
MH 13-1-C	MH 13-2		MCU		MWLS 20%	
MH 13-1-B	MH 13-1-C					
MH 13-1	MH 13-1-C					MWL 5%
CO 13-1-A	MH 13-1					

(a) Notation for findings are based on NASSCO's standard pipeline assessment codes

B = Broken	ISSR = Intruding Sealing Ring	RBL = Roots (Ball) at Lateral
CC = Crack, Circumferential	JOL = Joint Offset, Large	RF = Roots (Fine)
CL = Crack, Longitudinal	JOM = Joint Offset, Medium	RFJ = Roots (Fine) at Joint
DAE = Deposits (Attached), Encrustation	JSL = Joint Separation, Large	RMB = Roots (Medium) at Barrel
DAGS = Deposits (Attached), Grease	JSM = Joint Separation, Medium	RMJ = Roots (Medium) at Joint
DAR = Deposits (Attached), Ragging	JSS = Joint Separation, Small	RPL = Point Repair, Liner
DAZ = Deposits (Other)	MCU = (Miscellaneous), Camera Underwater	RTJ = Roots (Tap) at Joint
DSGV = Deposits (Settled), Gravel	MWL = (Miscellaneous), Water Level	SCP = Surface Damage, Corrosion
DSZ = Deposits (Settled), Other	MWLS = (Miscellaneous), Water Level Sag	SMW = Surface Damage, Missing Wall
FC = Fracture, Circumferential	OBM = Obstruction, Pipe Material in Invert	SRI = Surface Roughness Increase
HSV = Hole, Soil Visible	OBZ = Obstruction, (Other)	SSC = Surface Spalling of Coating
IS = Infiltration Stain	RBJ = Roots (Ball) at Joint	SSS = Surface Spalling

2.5 Manhole Inspection

Manholes (also referred to as maintenance holes) are buried structural vaults that are often used for merging flows and changing flow direction. Manholes provide venting but are intended to minimize inflows as much as possible.

Manholes consist primarily of an underground structure that is designed to resist static earth loads and the dynamic vehicular loads that are applied to it. This chamber is attached to a riser/reducer that allows for the placement of a cover-frame and cover that is matched with the surface level of the street, sidewalk, or ground.

Many of the Graton manholes are only a few feet deep, which greatly facilitated their inspection. At this time, all the accessible Graton manholes have been inspected by removing their covers and visually assessed for the structural integrity, signs of cracks and infiltration, surface condition of the concrete, and for cover/frame corrosion. This is considered a NASSCO MACP[2] Level 1 inspection. MACP Level 2 inspections are significantly more thorough, typically requiring personnel entry and detailed measurements taken from each manhole. A summary of the inspection results are provided in Table 2-3, starting at the most downstream end of the system (at the WWTP), and generally working south and upstream; the table is also organized by Pipeline Zone.

[2] NASSCO Manhole Assessment Certification Program (MACP) is the industry standard for condition assessment.

Table 2-3. Manhole Inspection Results

Structure ID	Main Findings				
	Not Inspected	Frame/Cover Corroded	Inside Surface Damage	Infiltration Staining	Sound (No Defects)
WWTP Area (North Ross Road)					
MH 0-1	X				
MH 0-2	X				
MH 0-3			X		
MH 1-1	X				
MH 1-2	X				
MH 1-3			X	X	
MH 2-3-A			X	X	
MH 2-4		X	X	X	
MH 2-5			X	X	
MH 3-4			X	X	
MH 2-2					X
MH 2-1				X	
Green Valley Road Corridor					
MH 2-6			X		
MH 2-7			X		
MH 2-3-B			X		
MH 2-8			X		
MH 15-1	X				
MH 15-2					X
MH 15-6					X
MH 15-7					X
MH 15-3	X				
MH 15-4					X
MH 15-5	X				
Ross Road Corridor					
MH 3-5					X
MH 3-1		X	X	X	
MH 3-2		X	X	X	
MH 3-3				X	
MH 4-1					X
MH 4-2		X			
MH 4-8				X	
MH 4-3					X
MH 4-4		X			
MH 4-5		X		X	
MH 4-7	X				
MH 5-11-A		X		X	
MH 5-11	X				
MH 5-10		X			
MH 5-9		X	X		
MH 5-9-A					X
MH 5-8					X
MH 5-7					X
MH 6-9			X	X	
Edison North of Graton Area					
MH 5-4					X
MH 5-3	X				
MH 5-2			X		
MH 5-1				X	
MH 5-12				X	
MH 5-5		X			
MH 5-6			X	X	
MH 4-9	X				
MH 14-1	X				
Dreyer Feeder Line					
MH 6-10	X				
MH-6-10-A		X			
MH 6-11					X
MH 6-12					X
MH-6-12-A					X
Bowen Street Corridor					
MH 6-2					X
MH 6-1				X	
MH 6-3					X

Table 2-3. Manhole Inspection Results

Structure ID	Main Findings				
	Not Inspected	Frame/Cover Corroded	Inside Surface Damage	Infiltration Staining	Sound (No Defects)
MH 6-8					X
MH 6-8-A					X
MH 6-8-B					X
MH 6-8-G					X
MH 6-8-C					X
Shirley Street Area					
MH 6-4					X
MH 7-8					X
MH 7-7					X
MH 7-5					X
MH 7-6					X
MH 7-4				X	
MH 7-3				X	
MH 7-2					X
MH 7-14	X				
MH 7-13	X				
MH 7-13-A	X				
MH 7-12-A	X				
Donald Street Area					
MH 6-5				X	
MH 6-6					X
MH 7-10					X
MH 7-9					X
MH 10-8				X	
MH 10-6				X	
MH 10-7				X	
MH 9-1-A				X	
MH 10-9				X	
MH 9-1-C				X	
MH 9-2	X				
MH 9-3				X	
MH 9-4	X				
Grey Street to Tina Way Area					
MH 6-7			X		
MH 7-12				X	
MH 7-11					X
MH 8-1					X
MH 8-3					X
MH 8-2				X	
MH 8-4				X	
MH 8-5	X				
Oak Grove and Graton Road East Area					
MH 10-5				X	
MH 10-4				X	
MH 10-3				X	
MH 10-2				X	
MH 10-1					X
MH 12-4			X	X	
MH 12-3					X
MH 12-5				X	
MH 12-6				X	
MH 12-7				X	
MH 13-4				X	
MH 12-2				X	
MH 12-1				X	
MH 12-8					X
MH 13-3				X	
MH 13-2					X
MH 13-1-C				X	
MH 13-1-B	X				
MH 13-1			X	X	

2.6 Lift Station Condition and Force Main Assessment

The project includes two independent lift stations, each connected to a force main.

2.6.1 Lift Station 1

The service area for the District is located well above the elevation of the wastewater treatment plant. However, the main wastewater trunk line (under Ross Road) has a high point just north of Falcon Lane. Lift Station 1 is required to overcome this high point, using an 8-inch force main to pump wastewater from Lift Station 1 to the gravity pipeline on Ross Road. The 1976 design drawings indicate that this force main was originally installed with Asbestos Cement (AC) pipe. CCTV inspection was attempted in coordination with shutoff of the lift station pumps but was not possible due to water level encountered approximately 2 feet into the force main from its discharge manhole. Video inspection of this pipe would likely require that the entire pumping system to be stopped and subsequently drained via pumping. This process would require bypass pumping to maintain service to the roughly three-quarters of the District service area that the lift station receives flow from.

Lift Station 1 is a submersible pump station (two pumps) with a wet well and a single room electrical/generator building. The lift station itself was visited on August 21, 2023. For the most part, the facility matches the original design drawings from 1976. This includes the plug valves, check valves, and the original flanged (bolted) cast iron pipe fittings, many of which are installed underground, so their current condition is not known. At the time of the visit, one of the two pumps was out of service and some concerns were expressed regarding the adequacy of the installed pumps. In February 2024, District staff notified West Yost that the second pump had failed. Underperformance of the pumps could be related to a number of factors, including pump wear, pipe roughness, or an inability to accurately measure the flow. There is a single generator for the station, which appears to be what was originally installed. It was reported that servicing the generator is difficult because both parts and experienced servicepeople are difficult to find.

2.6.2 Lift Station 2

Lift Station 2 is comprised of a cylindrical wet well, two submersible grinder pumps, and an electrical cabinet. The lift station services two residential lots that are located below the level of the trunk line under Ross Road. Discharge from Lift Station 2 ultimately arrives at Lift Station 1 through the gravity main on Ross Road. The force main is 1.5 inches in diameter and 125 feet long. The material for the buried force main is not specified in the 1976 design drawings. Based on the symbology of the fittings and the age of the installation, it is likely galvanized steel – although other materials such as PVC are possible.

3.0 PIPELINE REHABILITIATION ALTERNATIVES

The primary goal of rehabilitation and repair is to support collection system performance to meet State and Regional Water Board regulatory compliance requirements. As such, the rehabilitation strategy targets reduction of sanitary sewer overflows (SSOs), inflow and infiltration, and exfiltration. Pipeline defects or characteristics that increase the likelihood of these regulated events occurring will be addressed with an appropriate rehabilitation method.

Gravity pipeline rehabilitation typically aims to select the best method of repairing defects at the least cost. There are many methods of repairing damaged pipes that require less cost, effort, and disruption than a full excavation and replacement of the defective section. In fact, several options are available that do not require any earth movement whatsoever and can be completed entirely via the available manhole access points. This section reviews the available technologies that could potentially be applicable to the Graton sewer system.

3.1 Applicable Rehabilitation/Replacement Options

There exists a vast array of technically and commercially proven pipeline replacement and rehabilitation options. However, many of these intended for applications other than the relatively short pipeline spans between manholes. Sliplining, for example, involves pulling or pushing a new pipe of smaller diameter into an existing pipe and grouting the annular area between the pipes to prevent leakage and provide structural integrity. The sliplining process typically requires a substantial horizontal span along the length of the pipeline, well in excess of the few feet that is available in a manhole. Destructive pipe replacement methods, such as pipe bursting, are very effective at breaking apart an existing pipeline and replacing it with a new pipe along the same alignment, but this would need to be conducted with caution to avoid damaging the manholes at either end of the operation.

The fact that many of the pipelines being rehabilitated/replaced contain asbestos introduces further complexity into the decision-making process. Asbestos is a hazardous material that is most harmful when it is allowed to become airborne as a dry powdery dust (friable). Although the Graton sanitary sewer includes some heavily deteriorated sections, the asbestos remains relatively benign while it is moist and underground. Excavation and replacement of this pipe will require special handling techniques to avoid disturbing the friable material, along with double-bagging and disposition as hazardous waste. Current environmental regulations seriously discourage destructive pipe replacement methods that would allow AC pipe to be fragmented and abandoned in the subsoil.

Based on the above considerations, the available options for pipeline rehabilitation are limited to the following:

3.1.1 Spray Applied Pipe Lining

Spray Applied Pipe Lining (SAPL) uses a spray head that is inserted into the pipeline to apply a monolithic layer of protective coating. Although this coating can supply a minimal amount of structural support to resist infiltration, for example, it is not able to resist significant external forces. This type of coating requires careful surface preparation to assure adhesion and it will not bond to extraneous materials, such as exposed soil or the elastomeric sealing ring that can be exposed at separated AC joints.

This type of coating is primarily used to inhibit corrosion in metallic pipes. Very few of the defects that were found during the line inspection could be corrected using this method, so it is not being recommended as a solution. Note however that a similar technique can be useful for manhole

rehabilitation, as the defects observed there are much different than those found in the sewer mains themselves.

3.1.2 Lining Options

Pipeline linings can range from very thin, non-structural liners up to the installation of new, smaller-diameter pipe inside of the existing pipe. Applying a liner of this type has the advantage that the outer pipe does not need to be completely clean and dry. However, in most cases the lining must be pushed or pulled into place from a pit excavated to the depth of the pipe. This would require many large excavations, at least one for each pipe alignment.

3.1.3 Cured-In-Place Pipe

There is a very wide variety of pipe materials available on the market. Most modern pipes are either metallic (e.g., ductile iron) or polymeric (e.g., PVC). One of the less common pipe types is fiber-reinforced plastic (aka glass-reinforced plastic). This type of pipe uses a composite of a fiber mesh and a hard resin, similar to fiberglass. The resin is cured in the pipe-forming process, which causes it to convert from a liquid to a hard, inert solid.

Cured-In-Place Pipe (CIPP) uses a similar process to form a structural pipe *inside* of an existing pipe that needs to be rehabilitated. A cloth matrix embedded with liquid resin, along with a protective foil backing, is placed into the existing pipe and inflated with air to form a pipe shape. The uncured pipe is flexible enough that it can be positioned between manholes, without any additional excavation. Once in place, the resin is cured to form a solid around the fiber core. The curing process is accomplished using UV light or steam.

CIPP has become an industry standard for sewer rehabilitation and pipeline contractors are familiar with this technology. There are well-developed industry standards for sealing the liner at the manhole and cutting the openings in the liner for the lateral inlets. One of the biggest advantages that CIPP has over some of the other rehabilitation options is that it forms a structural barrier that can be capable of handling both hydrostatic and earth loads.

One of the only drawbacks of this method is that the existing pipe needs to be cleaned and dried prior to insertion of the CIPP. This means that the sewer line needs to be taken out of service with a full bypass while the contractor is making the installation.

3.1.4 Excavate and Repair

The large majority of the Graton pipeline defects are associated with failures at the joints, such as offsets and separations, while the remainder of the pipeline is fully intact and structurally sound. It is entirely practical and feasible to excavate down to each of these defects and perform an isolated repair. The final excavation will need to be done with extreme care, possibly by hand, to avoid damaging the AC pipe.

Joint separations can be repaired by sealing the gap from the outside, either by sealing over the collar or by removing the collar and installing a repair collar.

In the case of joint offsets, where the pipe segments are no longer aligned, localized excavation and repair would involve excavating one or more of the exposed pipe segments to allow for realignment. The procedure would need to include proper replacement of the pipe bedding and backfill to avoid further settlement after the repair (refer to Section 9.1).

3.1.5 Full Pipeline Replacement

Some of the Graton sewer pipes have degraded to a point where they are no longer structurally intact or where the interior surface is no longer round, due to deposits/encrustations/deterioration. It is not advisable to attempt to repair this pipe – any significant cleaning or handling of the pipe poses a significant risk of damage. CIPP is also not recommended because a clean, circular pipe interior is required for that process. Any pipe spalling or distortion could interfere with the CIPP integrity.

In locations where the AC pipe has degraded to the point that the interior is out-of-round, full removal of the AC pipe and replacement with PVC is advised.

3.2 Recommendations

At this stage of engineering, the strategy for rehabilitating defects found in the Graton gravity pipelines is be based on the following recommendations. It may be that some exceptions will be made for specific sections at a later stage, based on practical considerations or based on local priorities that have not yet been considered.

3.2.1 Water Level Sag

The CCTV inspection of the collection system identified a number of sections that no longer have adequate downhill slope and now have apparent low points, or sags, which is evident by liquid pooling in these locations. Structural sags in sanitary sewer pipelines refer to sections of the pipeline that have settled or deformed, resulting in a dip or low point along the pipeline vertical grade. These sags can occur due to various reasons, including inadequate initial installation, soil settlement, ground movement, or improper bedding and backfilling practices. Over time, these factors can cause portions of the pipeline to sink below the intended grade, creating areas where wastewater flow is impeded. There is almost always a structural or O&M defect associated with a sag. The major points of water level sag in the Graton system seem to be associated with joint offsets (see Section 3.2.3).

Addressing sags in sanitary sewer pipelines is recommended for several reasons. First, sags can lead to the accumulation of wastewater and solids, which can cause blockages and reduce the overall capacity and efficiency of the sewer system. This can result in increased maintenance costs and the potential for SSOs, posing environmental and public health risks. Second, standing water in sagged areas can promote the growth of biofilms and the accumulation of sediments, which can accelerate pipe corrosion and decrease the lifespan of the sewer infrastructure. Finally, sags can hinder the proper inspection and maintenance of sewer lines, complicating the identification and repair of other potential issues. Therefore, early detection and repair of structural sags are essential to maintaining the functionality and reliability of the sanitary sewer system.

Most sags identified in the Graton system were associated with joint offsets or other defects that will be recommended for action. It is recommended structural sags equal or greater than 30 percent are repaired (e.g., for a 10-inch pipe, this is equivalent to 3 inches of vertical deflection).

3.2.2 Joint Separation

The CCTV inspection of the Graton sewer lines revealed a large number of joint separations. Most of these are minor separations that may have been present during the initial construction of the lines, caused by not fully seating the two pipe segments together. Repair of these defects may help with infiltration and

exfiltration but should be considered a lower priority than defects that show a clear pipe failure, such as offsets and pipe damage.

3.2.3 Joint Offsets

Large offsets, which obstruct flow, will need to be excavated and repaired. This process should include replacement of any out-of-alignment AC pipe with PVC. Joint offsets should be considered a medium priority for repair because they can allow for further deterioration, such as soil and root infiltration, blockages, and further settlement (due to the interaction of the exposed soil with the fluid in the line).

3.2.4 Surface Spalling and Major Structural Defects

Most of the original Graton gravity pipelines remain fully structurally intact, but there are some sections that show signs of serious degradation. Specifically, the pipe from the intersection of Ross and Green Valley Roads all the way to the WWTP exhibits spalling, deformation, holes, and a variety of joint failures. This pipe will need to be fully excavated, removed, and replaced.

4.0 MANHOLE REHABILITATION ALTERNATIVES

This section presents the methods and available for manhole rehabilitation. Similar to gravity pipelines, the manhole rehabilitation strategy targets reduction of sanitary sewer overflows (SSOs), inflow and infiltration, and exfiltration. Manhole defects or characteristics that increase the likelihood of these regulated events occurring will be addressed with an appropriate rehabilitation method.

Effective manhole rehabilitation methods have been established over recent years. In most cases, if the manhole walls are structurally intact then it is more cost effective to rehabilitate the manhole, rather than to perform a full excavation and replacement. Based on the Level 1 inspections, none of the accessible manholes appeared to require full replacement – although several of them will require extensive work, including repairing the cementitious lining (due to cracking and spalling), full replacement of the cover and cover frame (due to corrosion), and the addition of internal lining (to seal cracks against infiltration).

For some applications, having a completely water-tight manhole is crucial. Areas that are subject to flooding, for example, can have issues with leakage through the manhole cover vent holes and at the adjusting rings directly below the cover frame (which are subjected to large cyclical traffic loads that wear away the seals). The Graton community is located 10-20 feet above the adjacent Atascadero Creek, meaning that water should tend to drain away from the roadways, rather than accumulating over manhole covers where large-scale inflows to the sewer system would be a risk. Accordingly, this report does not make any system-wide recommendations for upgrading or sealing the manhole covers and frames. Recommendations will be made for rehabilitation of manholes back to their original condition at the time of installation.

Based on the observed manhole defects, rehabilitation efforts will be focused on the following areas:

4.1 Cover/Frame Replacement

Several of the manhole inspections reported that the cover and frame were corroded. In some of the more severe cases, the corrosion is beginning to affect the concrete bond at the frame, resulting in surface damage and cracking. Replacement of the cover/frame assembly is a straightforward process that can be carried out from street level. The old frame is cut out and removed and a new frame is embedded in

poured concrete. The current recommendation is to replace all frames that were noted as "corroded" during the field inspection.

4.2 Grouting

Manholes that are subjected to hydrostatic pressure can allow water to infiltrate into the sewer system. Over time, these flows can allow soil to slowly migrate through cracks and holes in the concrete. Eventually this will result in voids forming around the outside of the manhole, as the fissures in the manhole wall continue to grow. Grouting is a method for simultaneously filling in cracks/holes in the concrete as well as any empty space around the outside surface of the manhole. If holes are introduced deliberately and the grout is applied with an even spacing, the process can also be used to seal the outside surface of the manholes against moisture.

None of the Graton manholes appeared to have significant moisture intrusions that would justify a grouting operation. The cracks that were found are small enough to be sealed with a surface treatment on the inside of the manhole.

4.3 Cementitious Lining

Many of the Graton manholes are suffering from non-structural failures of the interior concrete surface. Cracking and spalling of small pieces of concrete is common. Some of manholes have a roughened surface texture that is indicative of incrustation or an overall degradation of the concrete surface. To address these problems, water cleaning and abrasive blasting can be used to remove the defective material and expose a clean substrate. This is followed by a fresh layer of cementitious material, which is often a spray-applied Portland cement-based mix that is then troweled smooth and finished. To prevent a recurrence of the surface damage, it is recommended that a polymeric coating be applied on top of the new finished cementitious lining.

The manholes that had inspections indicating a defective surface condition (chimney, cone, wall, bench, or channel) will proceed on the basis of having partial or complete cementitious lining applied.

4.4 Polymeric Lining

Concrete manholes are vulnerable to water intrusion. Even when fully intact, concrete is a porous material, but once cracks begin to form, water seepage can accelerate dramatically. Almost 40% of the Graton manholes were observed to have infiltration staining, which would indicate that water is able to pass into the manhole. This can be prevented using a spray-on polymeric lining. These linings are much thicker than a layer of paint as they are intended to have enough structural strength to resist external forces such as water intrusion.

Polymeric linings have the added benefit that they protect the concrete from exposure to sewer gases and microbial action, which prevents surface deterioration of the concrete. It is recommended that the manholes that require cementitious lining have a polymeric coating applied afterwards, to prevent the situation from recurring. In addition, the manholes that exhibit infiltration staining will have a polymeric lining applied, regardless of whether cementitious lining is required.

5.0 HYDRAULIC CONFIRMATION

A hydraulic capacity evaluation of the existing pipelines was not performed as part of this study. Information received from District staff indicates the existing system is adequately sized and there are no known capacity issues. This is supported based on the California Integrated Water Quality System Project (CIWQS) SSO database, which shows four SSO records since 2008.

The smallest gravity pipeline in the system is 6 inches diameter, which meets Sonoma County Design and Construction Standards for minimum main and side sewers.

6.0 PRELIMINARY DESIGN RECOMMENDATIONS

This section considers the alternatives presented in sections 3.0 and 4.0 and recommends an appropriate action for each gravity pipeline, manhole, force main, and lift station.

6.1 Gravity Pipeline

Gravity pipeline recommendations include full replacement, excavate and repair, cleaning, and CCTV inspection.

6.1.1 Full Replacement

AC pipe material is characteristically long-lasting and inert. However, over time the pipe can deteriorate when exposed to corrosive sewer fluids and gases. It is clear from the CCTV inspection that some sections of the pipe will need to be entirely replaced. These sections are listed in Table 6-1, and shown in Figure 2.

Table 6-1. Gravity Pipelines Recommended for Full Replacement

Start	End	Material[(a)]	Length	Notes
WWTP Area (North Ross Road)				
MH 0-1	WWTP	AC	73	Pipe is no longer structurally sound
MH 0-2	MH 0-1	AC	246	Pipe is no longer structurally sound
MH 0-3	MH 0-2	AC	357	Pipe is no longer structurally sound
MH 1-1	MH 0-3	AC	205	Pipe is no longer structurally sound
MH 1-2	MH 1-1	AC	221	Pipe is no longer structurally sound
MH 1-3	MH 1-2	AC	388	Pipe is no longer structurally sound
MH 2-3-A	MH 1-3	AC	272	Pipe is no longer structurally sound
MH 2-4	MH 2-3-A	AC	347	Pipe is no longer structurally sound
MH 2-5	MH 2-4	AC	331	Surface spalling
MH 3-4	MH 2-5	AC	275	Surface spalling
MH 2-2	MH 2-3-A	AC	212	Pipe is no longer structurally sound
		Total	**2,927**	

(a) Pipe material is listed for reference but should not be considered definitive.
AC = Asbestos Cement

Phase 2 - Figure 2 - Full Replacement: N:\Clients\1088 Graton Community Services District\140-23-02 Phase 1 Sewer R&R\GIS\Phase 1 Sewer R&R aprx - aoerding - 5/24/2024

- Wastewater Treatment Plant
- Lif Staton
- Manhole
- Cleanout
- Service Area
- Gravity Pipeline
- Force Main
- Full Pipe Replacement

Prepared by:

WEST YOST

0 1,200 Feet

N

Prepared for:

Graton Community Services District
Sewer Rehab and Replacement Phase 2

GRATON community services district

Gravity Pipelines Recommended for Full Replacement

Figure 2

6.1.2 Excavate and Repair

The vast majority of the observed defects are related to various misalignments or separations between pipe segments. For separations and small to medium offsets, it might be possible to avoid excavation and use trenchless technology, such as CIPP. Nonetheless, the majority of the sections that need to be remediated have significant offsets and trapped water that are both incompatible with liner application. For simplicity, the misaligned sections are being recommended for spot repair involving excavation, realignment of the pipe sections, the application of a proper backfill, and replacement of the soil and road surface. These are listed in Table 6-2 and shown in Figure 3. Pipes that could be suitable for CIPP are identified in Table 6-2 and will be considered during the next design phase based on costs and District preferences.

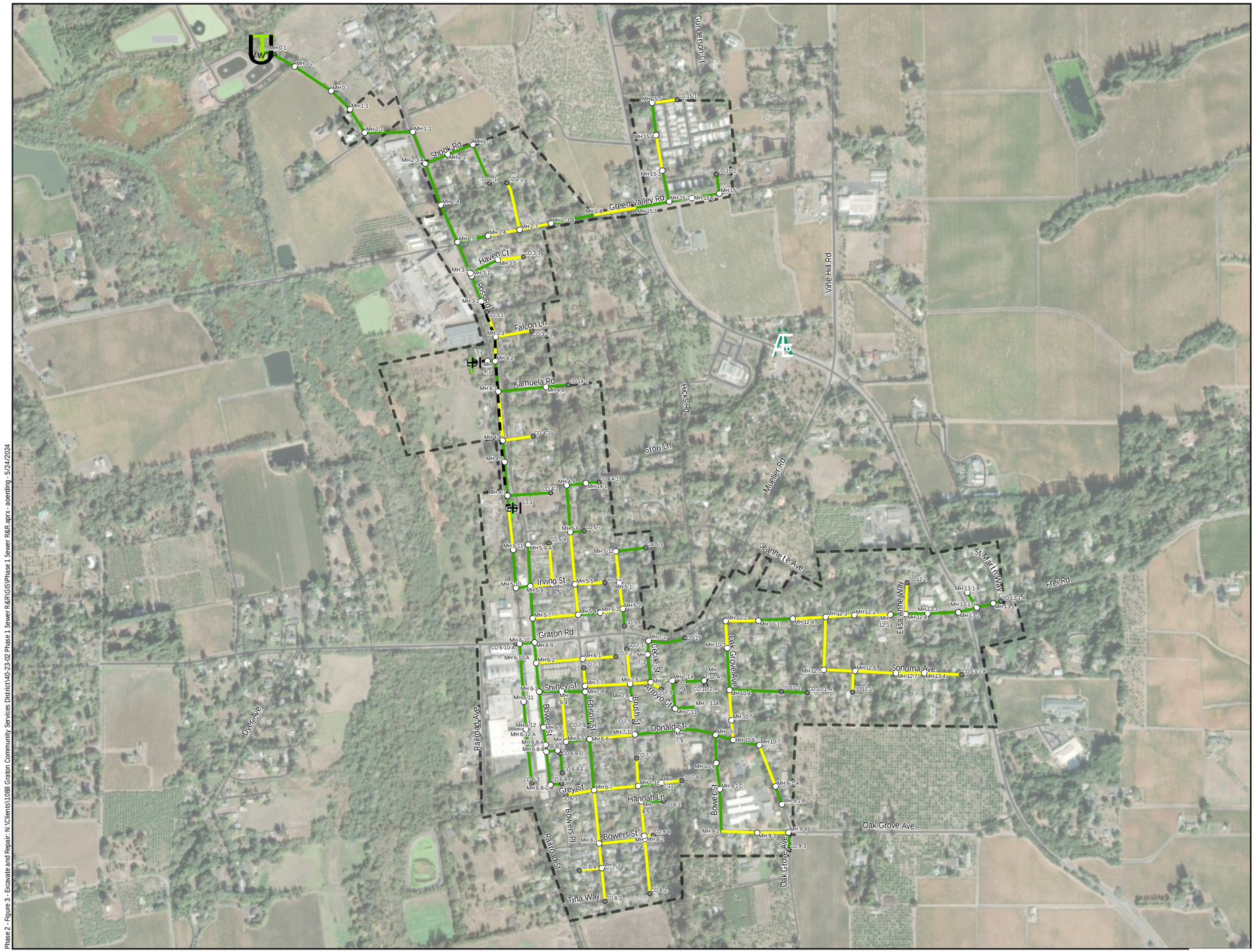
Table 6-2. Gravity Pipelines Recommended for Spot Excavation and Repair

Start	End	Material[a]	Length	Notes
Green Valley Road Corridor				
MH 2-7	MH 2-6	AC	262	Offset
CO 2-2[b]	MH 2-7	AC, PVC	389	Separations
MH 2-3-B	MH 2-7	AC, PVC	234	Separation, Roots
MH 15-1[b]	MH 2-8	PVC	272	Separation
MH 15-3	MH 15-2	PVC	285	Sag
MH 15-4	MH 15-3	PVC	255	Offset, Separation
CO 15-1[b]	MH 15-5	PVC	350	Separation
		Subtotal	**2,047**	
Ross Road Corridor (Excluding Force Mains)				
CO 3-3[b]	MH 3-5	PVC	200	Separation
CO 3-1	MH 3-3	AC, PVC	216	Offset
CO 3-2	MH 3-3	AC	290	Offset, Separation
MH 3-3[b]	MH 4-2	AC	200	Separation
MH 4-3	MH 4-4	CP	374	Offset
CO 4-1	MH 4-4	AC	253	Offset, Separation
MH 4-7[b]	MH 5-11-A	CP	133	Separation
MH 5-11	MH 5-11-A	CP, PVC	330	Separation, Roots
MH 5-8[b]	MH 5-9	AC, PVC	175	Break
CO 5-4[b]	MH 5-8	AC, PVC	331	Break, Separation, Roots
		Subtotal	**2,502**	
Edison North of Graton Area				
MH 5-4	MH 5-7	AC, PVC	370	Offset
MH 5-2	MH 5-3	AC, PVC, CP	366	Offset
MH 5-1	MH 5-2	AC, PVC	203	Offset
MH 5-12	MH 5-1	AC, PVC	174	Offsets, Separations, Roots
MH 5-5	MH 5-4	AC, PVC	253	Offset, Separation
CO 5-2	MH 5-5	AC	247	Separation, Roots
MH 5-6[b]	MH 5-5	AC	417	Separation
CO 5-7	MH 5-6	AC	113	Roots at Tap
		Subtotal	**2,143**	
Bowen Street Corridor				
MH 6-1	MH 6-2	AC, PVC	372	Offset, Separation
CO 7-2	MH 6-1	AC	253	Offset, Separation, Roots
		Subtotal	**625**	
Shirley Street Area				
MH 7-7[b]	MH 7-8	AC	50	Separation
CO 7-3	MH 7-7	AC	120	Offset
MH 7-5	MH 7-7	AC	363	Offset, Crack
CO 7-1	MH 7-5	AC	285	Offset, Hole
CO 7-5	MH 7-6	AC, PVC	180	Offset, Separation
MH 7-4	MH 7-5	AC	173	Offsets, Separation
CO 7-9	MH 7-4	AC	94	Offset
		Subtotal	**1,265**	
Donald Street Area				
MH 6-5[b]	MH 6-4	AC, PVC	400	Separation
MH 7-10	MH 6-6	AC	374	Offset, Separation
MH 9-1-A	MH 10-7	AC, PVC	352	Offset, Fracture
MH 9-3	MH 9-2	AC	290	Offset
MH 9-4	MH 9-3	AC	248	Offset, Roots
		Subtotal	**1,664**	
Grey Street to Tina Way Area				
CO 6-1[b]	MH 6-7	AC, PVC	227	Break
MH 7-12	MH 6-7	AC, PVC	365	Break, Offset, Separation
CO 7-7	MH 7-12	AC	218	Offset
CO 7-8	MH 7-11	AC	162	Break, Offset, Separation
MH 8-1	MH 6-7	AC, PVC	440	Break, Offset, Separations
MH 8-3	MH 8-1	AC	431	Offsets, Separation
CO 8-3	MH 8-3	AC		Offsets
CO 8-4	MH 8-3	AC	178	Surface Spalling
MH 8-2[b]	MH 8-1	AC	369	Separation
CO 8-2	MH 8-2	AC	435	Offsets
MH 8-4	MH 8-2	AC	25	Offset
CO 9-4[b]	MH 8-4	PVC	138	Separation
MH 8-5	MH 8-4	AC, PVC	256	Offset
		Subtotal	**3,244**	

Oak Grove and Graton Road East Area				
MH 10-5	MH 10-6	AC	159	Offset
MH 10-4	MH 10-5	AC	243	Break, Offset, Separation
MH 10-2[(b)]	MH 10-3	AC	209	Break
MH 10-1	MH 10-2	AC, PVC	263	Offset
MH 12-3	MH 12-4	AC	255	Break
MH 12-5	MH 12-3	AC, PVC	425	Break, Offset
MH 12-6	MH 12-5	AC	249	Offset
CO 12-1	MH 12-6	PVC	179	Offset
MH 12-7	MH 12-6	AC	326	Offset
MH 13-4	MH 12-7	AC	239	Offset, Roots
CO 13-1-B	MH 13-4	AC	289	Offset
MH 12-2	MH 12-3	AC	228	Offsets
MH 12-1	MH 12-2	AC	297	Offset, Roots
CO 12-2	MH 12-8	PVC, AC	288	Offset
		Subtotal	**3,649**	
		Total	**16,854**	

(a) Pipe material is listed for reference but should not be considered definitive. AC = Asbestos Cement; CP = Concrete Pipe; DIP = Ductile Iron Pipe; PVC = Polyvinyl Chloride

(b) Pipe defects are also suitable for CIPP.



Wastewater Treatment Plant
Lift Station
Manhole
Cleanout
Service Area
Gravity Pipeline
Force Main
Excavate and Repair

Phase 2 - Figure 3 - Excavate and Repair: N:\Clients\1088 Graton Community Services District\40-23-02 Phase 1 Sewer R&R\GIS\Phase 1 Sewer R&R aprx - aoerding - 5/24/2024

Prepared by:

WEST YOST

0 1,200 Feet

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Prepared for:

Graton Community Services District
Sewer Rehab and Replacement Phase 2

GRATON community services district

Gravity Pipelines Recommended for Spot Excavation and Repair

Figure 3

6.1.3 Cured-In-Place Pipe (Lining)

The excavation and repair that is recommended in Section 6.1.2 is very intrusive and requires significant time to complete. CIPP lining can be done without excavation but requires that the pipe be clean and dry prior to application of the lining. Even under best-case installation scenarios, a sewer bypass must be constructed while work is being done on the line. At this time, none of the offset and/or separated pipes are being considered for CIPP. In many cases the sections with small separations that would be suitable for CIPP are located immediately adjacent to other sections with major offsets that will need to be excavated. This negates the potential benefit of CIPP in those areas.

6.1.4 Cleaning

A relatively small number of pipes were found with significant debris. Even in those few cases, the debris was not enough to significantly obstruct the flow. These pipes are recommended for heavy cleaning. Cleaning efforts are assumed to be covered in annual maintenance budget and are not included in the cost estimates provided later in this report.

Table 6-3. Gravity Pipelines Recommended for Heavy Cleaning

Start	End	Material[(a)]	Length	Notes
Edison North of Graton Area				
MH 5-6	MH 5-5	AC	417	Concrete fragments
Bowen Street Corridor				
MH 6-1	MH 6-2	AC, PVC	372	Gravel in lateral
Grey Street to Tina Way Area				
MH 6-7	MH 6-6	AC	409	
Oak Grove and Graton Road East Area				
MH 10-5	MH 10-6	AC	159	
MH 10-3	MH 10-4	AC	340	
MH 12-3	MH 12-4	AC	255	
CO 13-1-B	MH 13-4	AC	289	
		Total	**2,241**	

(a) Pipe material is listed for reference but should not be considered definitive.
AC = Asbestos Cement; PVC = Polyvinyl Chloride

6.1.5 Recommended Future Cleaning

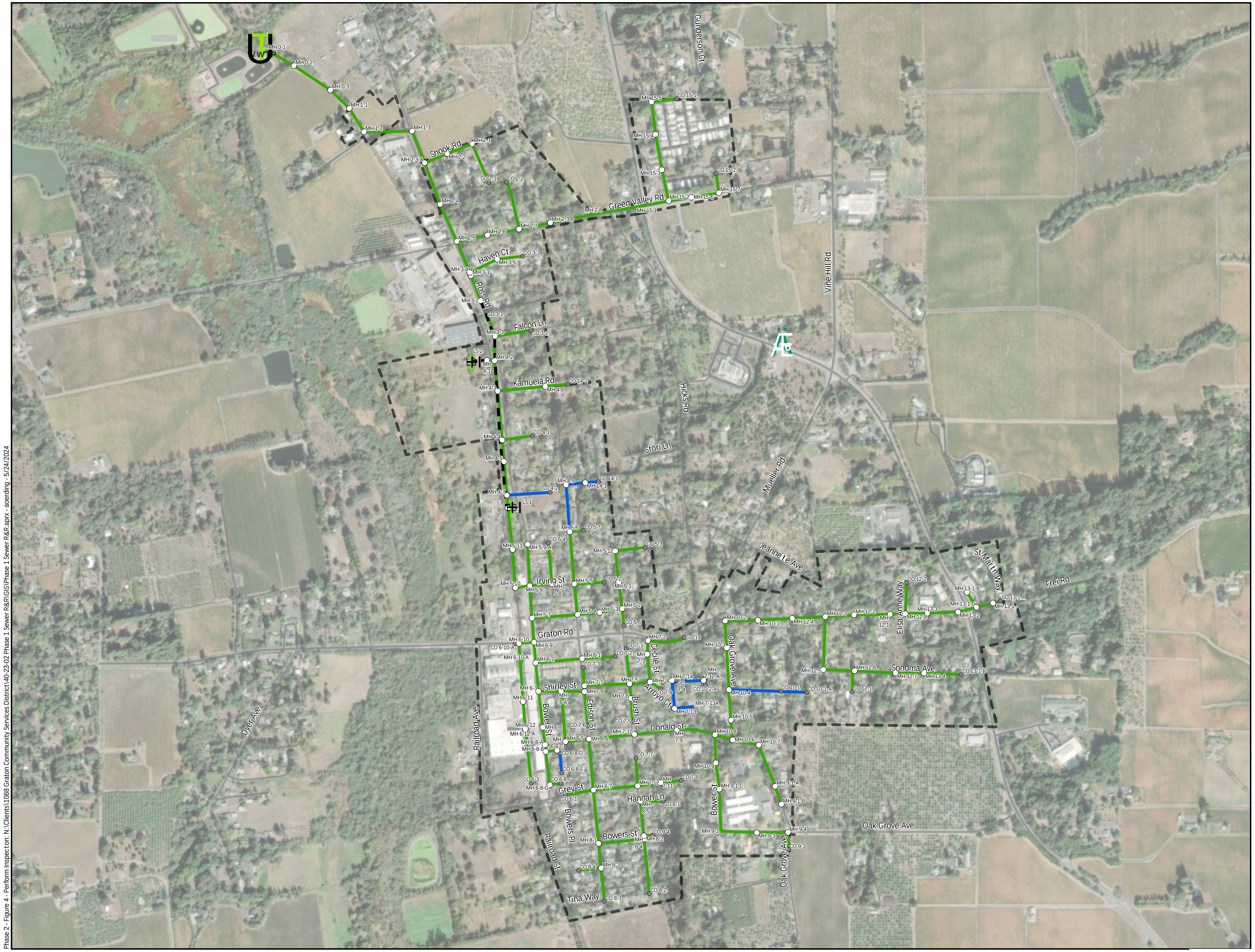
All collection system pipes should be incorporated into a preventative maintenance program including routine cleaning. Regular cleaning should include hydro-jetting and removal of accumulated debris. It is recommended that pipes identified for heavy cleaning within this study should be initially cleaned annually. After the first annual occurrence, the cleaning frequency can be customized to each individual pipe segment based on observed debris. Typical cleaning frequency for pipes that do not require heavy cleaning is approximately once every three years.

6.1.6 CCTV Inspection

Some of the sewer lines could not be CCTV inspected due to access. For the most part, these were branch lines, often with cleanouts or manholes located on private property. In order to complete the system assessment, a plan should be developed for how these lines can be inspected. The missing inspections are listed in Table 6-4 and shown in Figure 4.

Table 6-4. Sewer Lines Recommended for Inspection

Start	End	Material	Length	Notes
Ross Road Corridor				
CO 4-2	MH 4-7	TBD	347	Not inspected
Edison North of Graton Area				
MH 4-9	MH 5-6	TBD	382	Not inspected
MH 14-1	MH 4-9	TBD	171	Not inspected
CO 14-1	MH 14-1	TBD	91	Not inspected
Bowen Street Corridor				
CO 6-8-E	CO 6-8-D	TBD	130	Not inspected
Shirley Street Area				
CO 7-4	MH 7-14	TBD	35	Not inspected
MH 7-13	MH 7-14	TBD	237	Not inspected
MH 7-13-A	MH 7-13	TBD	173	Not inspected
MH 7-12-A	MH 7-14	TBD	98	Not inspected
CO 10-2	MH 7-12-A	TBD	4	Not inspected
CO 10-2-A	MH 7-12-A	TBD	15	Not inspected
Oak Grove and Graton Road East Area				
CO 10-1	MH 10-4	TBD	394	Not inspected
CO 10-1-A	CO 10-1	TBD	246	Not inspected
		Total	**2,323**	



Phase 2 - Figure 4 - Perform Inspection: N:\Clients\1088 Graton Community Services District\40-23-02 Phase 1 Sewer R&R\GIS\Phase 1 Sewer R&R.aprx - aoerding - 5/24/2024

- Wastewater Treatment Plant
- Lift Station
- Manhole
- Cleanout
- Service Area
- Gravity Pipeline
- Force Main
- Perform Inspection (CCTV)

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GRATON community services district

Gravity Pipelines
Recommended for CCTV

Figure 4

6.2 Manholes

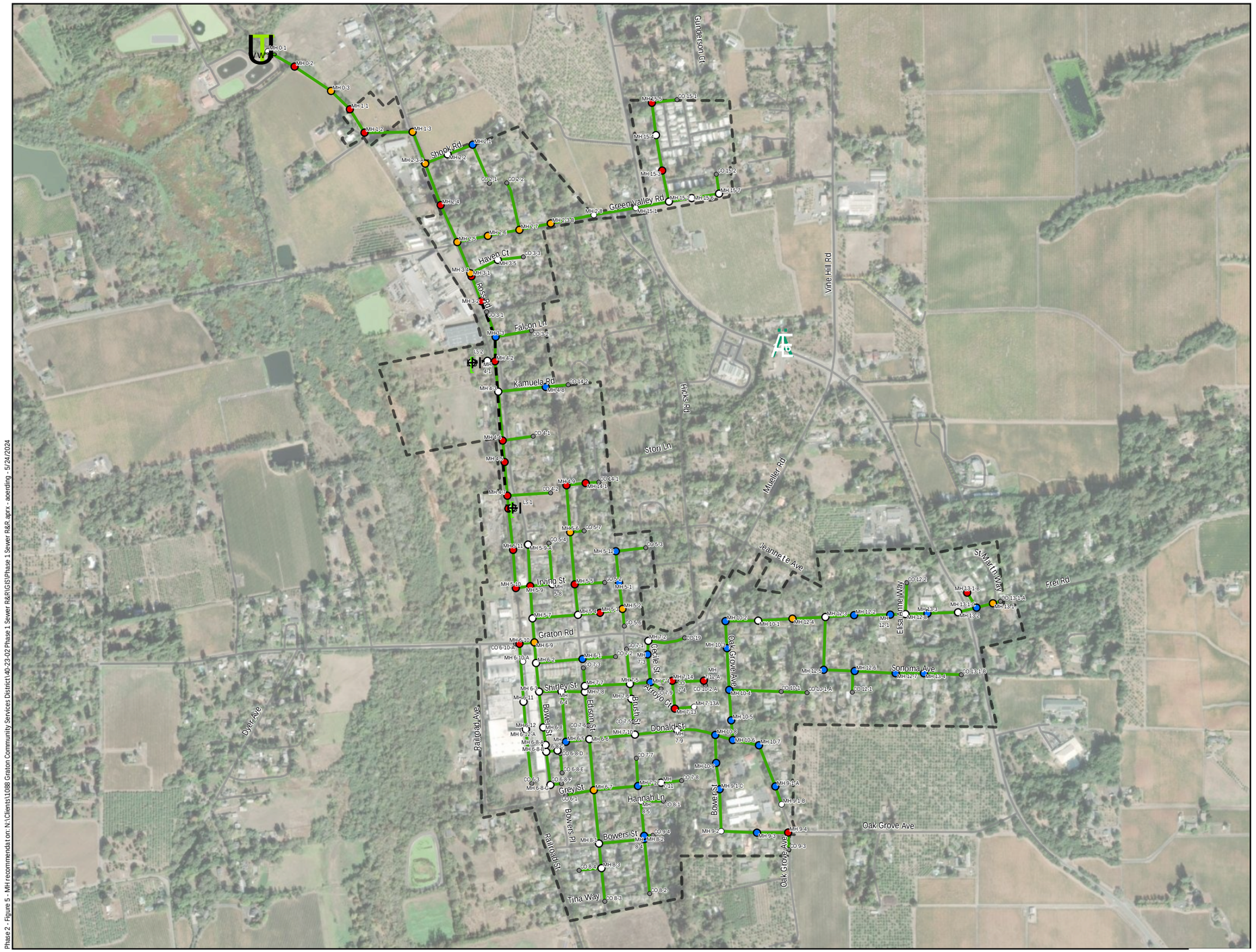
Manhole recommendations include polymeric lining, cementation lining, and frame/cover replacement. Several manholes were unable to be inspected due to access or stuck covers and are recommended to be inspected during construction. Table 6-5 provides a summary of the recommended actions for each manhole. The recommendations are shown in Figure 5.

Table 6-5. Manhole Rehabilitation Recommendations

Manhole ID	Recommended Action			
	Inspect	Replace Frame/Cover	Cementitious Lining	Polymeric Lining
WWTP Area (North Ross Road)				
MH 0-1	X	X		
MH 0-2	X	X		
MH 0-3			X	X
MH 1-1	X	X		
MH 1-2	X	X		
MH 1-3			X	X
MH 2-3-A			X	X
MH 2-4		X	X	X
MH 2-5			X	X
MH 3-4			X	X
MH 2-1				X
Green Valley Road Corridor				
MH 2-6			X	X
MH 2-7			X	X
MH 2-3-B			X	X
MH 2-8			X	X
MH 15-1	X	X		
MH 15-3	X	X		
MH 15-5	X	X		
Ross Road Corridor				
MH 3-1		X	X	X
MH 3-2		X	X	X
MH 3-3				X
MH 4-2		X		
MH 4-8				X
MH 4-4		X		
MH 4-5		X		X
MH 4-7	X	X		
MH 5-11-A		X		X
MH 5-11	X	X		
MH 5-10		X		
MH 5-9		X	X	X
MH 6-9			X	X
Edison North of Graton Area				
MH 5-3	X			
MH 5-2			X	X
MH 5-1				X
MH 5-12				X
MH 5-5		X		
MH 5-6			X	X
MH 4-9	X	X		
MH 14-1	X	X		
Dreyer Feeder Line				
MH 6-10	X	X		
MH-6-10-A		X		
Bowen Street Corridor				
MH 6-1				X
Shirley Street Area				
MH 7-4				X
MH 7-3				X
MH 7-14	X	X		
MH 7-13	X	X		
MH 7-13-A	X	X		
MH 7-12-A	X	X		
Donald Street Area				
MH 6-5				X
MH 10-8				X
MH 10-6				X
MH 10-7				X
MH 9-1-A				X
MH 10-9				X
MH 9-1-C				X
MH 9-2	X	X		
MH 9-3				X
MH 9-4	X	X		

Table 6-5. Manhole Rehabilitation Recommendations

Manhole ID	Recommended Action			
	Inspect	Replace Frame/Cover	Cementitious Lining	Polymeric Lining
Grey Street to Tina Way Area				
MH 6-7			X	X
MH 7-12				X
MH 8-2				X
MH 8-4				X
MH 8-5	X	X		
Oak Grove and Graton Road East Area				
MH 10-5				X
MH 10-4				X
MH 10-3				X
MH 10-2				X
MH 12-4			X	X
MH 12-5				X
MH 12-6				X
MH 12-7				X
MH 13-4				X
MH 12-2				X
MH 12-1				X
MH 13-3				X
MH 13-1-C				X
MH 13-1-B	X	X		
MH 13-1			X	X



Wastewater Treatment Plant

Lift Station

Gravity Main

Force Main

Service Area

Manhole Rehab/Replacement

- Frame/Cover Replacement
- Cementitious Lining
- Polymeric Lining
- No Recommendation
- Cleanout

Phase 2 - Figure 5 - MH recommendations.mxd - N:\Clients\11088 Graton Community Services District\40-23-02 Phase 1 Sewer R&R\GIS\Phase 1 Sewer R&R aprx - aoerding - 5/24/2024

Prepared by:

WEST YOST

0 1,200 Feet

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Prepared for:

Graton Community Services District
Sewer Rehab and Replacement Phase 2

GRATON community services district

Manhole Recommendations

Figure 5

6.3 Lift Station 1 and Force Main

Lift Station 1 and its associated force main represent a potential single point of failure for a large portion of the Graton service area. The lift station has limited redundancy of its systems and cannot be easily maintained and inspected due to the age of the installation. Bringing the station up to a modern standard of service should be a high priority.

6.3.1 Force Main

The condition of the force main has not been assessed to the same level as the Graton gravity sewer line network, but even if the force main had been successfully inspected and found to be in perfect working order, it would still represent a significant operational risk.

Having only a single force main available has the following drawbacks:

- Inability to clean the line
- Inability to survey the integrity of the line
- Inability to repair the line without long service outages

The line was originally installed with AC pipe and some portion of it may have subsequently been replaced with PVC, but there is no clear record of this. The line appears to be operating properly, although there are reports that the pumping system may not be performing optimally. A thorough line cleaning may reduce the friction in the line and improve the pump performance.

It is recommended that a new PVC force main be installed alongside the existing force main. The existing line will not be abandoned but will be kept as a backup line for when the new pipeline needs to be inspected or cleaned. Keeping the old line in place will facilitate construction of the new line, since a temporary bypass will not be required during the removal of the exiting line, and it will provide redundancy moving forward.

6.3.2 Pumps

Pumps are mechanical devices that rotate at high speed and are prone to wear as well as intermittent unplanned stoppages. The goal should be to keep both pumps in operational order at all times, with one operating and one in standby. It is understood that one pump may be taken out of service during maintenance periods.

There are reports from the station operator that the pumps may be inadequately sized or that they have some other difficulties in sustaining the required flows. It may be necessary to upgrade the pumps at some point in the future, but the pump problems may be related to the condition of the force main. It is recommended that the new force main (see Section 6.3.1) be installed prior to attempting to definitively diagnose the pumping issues.

6.3.3 Backup Generator

The existing backup generator should be replaced. The generator is old, beyond its expected service life, and requires unnecessary additional maintenance to keep it in service. A newer generator would be more reliable and more fuel efficient.

6.3.4 Station Piping and Valves

The station appears to have all of its original piping, valves, and instruments. It is recommended the station piping and valves (2 plug valves and 2 check valves) be replaced due to age and visible condition when the pumps are replaced.

6.3.5 Other

The Condition Assessment TM included several recommendations for improving the lift station, most of them with relatively low cost. These items are listed below and will be considered as the work on the system moves forward.

- Replace pump guide rails with standard width rails
- Replace or modify wet well hatch to add safety grate and spring-assist opening mechanism
- Replace all electrical, instrumentation, and controls components

6.4 Lift Station 2 and Force Main

Lift Station 2 serves as a small branch line, connecting two properties to the gravity pipeline under Ross Road. The District has expressed interest in handing over this facility to others for ownership and management. If this option is desired, the District should initiate conversations with the homeowners and other stakeholders as soon as possible. The recommendations below assume the station will continue to be owned and operated by the District.

6.4.1 Force Main

If the force main uses galvanized steel pipe (assumed based on age of the station) then it is almost certainly nearing the end of its design life and should be replaced with PVC. It is also possible that this line is already constructed with PVC, in which case what is needed is a cleaning and an assessment of the line condition. The line is only 1.5 inches diameter, so it may be more practical to visually assess the line condition during the cleaning operation.

In any case, the first step should be to pothole the force main in several points along its length to confirm the pipe material and to assess the condition of the outside surface of the pipe.

6.4.2 Pumps

The two pumps for the station should both be kept in working order to provide redundancy in the case of an unexpected equipment failure. No immediate actions are recommended.

6.4.3 Backup Generator

The lift station does not include a generator or any other backup power supply for use when utility power is offline. It is recommended that a more thorough assessment be completed on this lift station with respect to protecting the two connected properties from excess fluid levels the sump – especially the risk of cross-connection between the properties. It may be necessary to protect the properties with backflow preventers and/or sewer relief valves. It may be simpler and better to install a backup power supply in the form of a generator or battery to provide the lift station with enough autonomy to avoid issues during power outages.

6.4.4 Other

The Condition Assessment TM provided a list of recommended improvements to the lift station. These items are listed below and will be considered as the work on the system moves forward.

- Install pulley system for pump accessibility
- Replace all electrical, instrumentation, and controls components
- Improve site to allow for easier servicing and equipment access

The TM also suggested that it could be advantageous to replace the existing equipment with a new self-contained lift station package. Doing so would provide better confidence in the long-term reliability of the station and may be preferred if the District plans on handing over this facility to others for ownership and management.

7.0 GEOTECHNICAL INVESTIGATION

A geotechnical investigation was not performed for this project, and no known geotechnical information is available for the site. To support the next phase of design, it is recommended that a comprehensive geotechnical investigation be conducted including field testing. This investigation should provide detailed information on subsurface soils, groundwater conditions and dewatering requirements, the potential for liquefaction, and other critical design considerations.

8.0 ENVIRONMENTAL AND PERMITTING REQUIREMENTS

8.1 Hazardous Materials

Asbestos Cement (AC) pipe exists in the project area and will require special handling and disposal when cut, sawed, or broken. The contract documents will include specifications for AC pipe handling.

8.2 9.2 CEQA and NEPA Compliance

The project consists of replacement or reconstruction of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced.

In May 2024, the District initiated the California Environmental Quality Act (CEQA) studies required to confirm the exemption status of the project, based on the rehabilitation recommended herein. Based on CEQA assessments completed as of August 2024, it is anticipated that the project will be Categorically Exempt (CE) per CEQA Guidelines Section 15302, Class 2 (c).

Regarding National Environmental Policy Act (NEPA) compliance, at this time, the ultimate source(s) of construction funding are not known, and hence a federal lead agency is not known. Should National NEPA clearance be required, it will be provided in a separate scope and budget.

8.3 California Division of Drinking Water

If sewer pipelines are within 10 feet of existing potable water mains, it is suggested that the 90% design be submitted to the California Department of Health's Division of Drinking Water (DDW) for their concurrence on pipe locations and pipe materials, relative to potable pipelines. The need for a DDW submittal will be further evaluated during design development.

9.0 CONSTRUCTION CONSIDERATIONS

This section discusses the potential construction considerations that will be addressed or mitigated during detailed design.

9.1 Bedding and Backfill Procedures

Roughly half of the pipeline deficiencies in the Graton sewer system are offsets and separations at locations that have previously been repaired. This is indicative of inadequate procedures for pipe bedding and backfill. The old, damaged pipe was excavated and removed; new pipe bedding was placed into the trench, and new PVC pipe was connected to the AC pipe at either end. Subsequent to installation, the PVC pipe gradually settled and is now out of alignment with the AC pipe.

To prevent this, spot repairs will use a controlled density backfill for bedding of the repair pipe. This technique is also known as flowable fill or, more descriptively, as soil-cement slurry. Rather than using dry soil for filling the trench, a mortar-like mix is poured into the trench to secure the pipe in position. The goal of the mix is to prevent settlement while still being friable (soft) enough to be easily excavated later, if necessary. A soil-cement slurry bedding and backfill specification will be provided as part of the contract documents.

9.2 Sewer Flow Control

Sewer flow control will be required for the system during construction of the spot repairs, replacements, and manhole rehabilitation operations. This typically involves temporary bypassing of sewer flow between manholes using temporary pumping facilities and/or flow-through plugs. The contractor will be required to submit sewer bypass pumping plans for review and approval. Sewer flow control and bypass pumping requirements will be provided as part of the contract documents.

10.0 ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Table 10-1 presents an AACE Class 3[3] opinion of probable construction cost for rehabilitating the Graton sanitary sewer collection system as recommended in this report. A Class 3 estimate represents a 10 to 40 percent project maturity with an expected accuracy range of -20 percent to +30 percent and is typically used for budget authorization or funding purposes. The tasks are broken down into costs per unit (linear feet or cost per repair, for example). Unit costs include allowances for contractor requirements for mobilization, shoring, traffic control, etc.

Several project contingencies and other allowances have also been included:

- *Estimating Contingency – 35%:* Contingency to allow for construction uncertainties associated with the conceptual planning of the project. Factors such as unexpected construction conditions, the need for unforeseen items, and variations in final quantities. This percentage will be further refined as the detailed design progresses.
- *Engineering Services including Design – 15% and Construction Management – 10%:* Engineering services associated with new facilities including investigations (geotechnical, etc.), preparation of drawings and specifications for construction, construction management, and inspection during construction. Applied to be 25% of the construction cost estimate after Construction Contingency.
- *Program Implementation Costs – 10%:* Items such as legal fees, environmental/CEQA compliance requirements, financing expenses, and administrative costs. Applied to be 10% of the construction cost estimate after Construction Contingency.

Costs presented are based on a programmatic design and construction effort as opposed to implementation in multiple smaller projects.

[3] Association for Advancement of Cost Engineering (AACE) International.

Table 10-1. Engineer's Opinion of Probable Construction Cost for Graton Sanitary Sewer System Rehabilitation (2024 Dollars)

Description	Quantity	Unit	Unit Cost, dollars	Total, dollars
Sanitary Sewers				
Pipeline Replacement of 12-inch AC pipe with PVC	2,927	L.F.	1,150	3,366,050
Pipeline Spot Repair (Separations and Offsets)	100	Each	7,000	700,000
Complete CCTV Inspections and Condition Assessment	2,323	L.F.	30	69,690
Manholes				
Manhole Frame/Cover Replacement	31	Each	5,000	155,000
Manhole Cementitious Lining (with Polymeric Coating)	19	Each	10,000	190,000
Manhole Sealing (Polymeric Coating)	33	Each	3,000	99,000
Lift Stations and Force Mains				
Lift Station 1 Force Main – Install New 8-inch Force Main Parallel to Existing Main	1,700	L.F.	400	680,000
Lift Station 1 Piping and Valves Replacement	1	Lump Sum	300,000	300,000
Lift Station 1 Generator Replacement	1	Each	30,000	30,000
Lift Station 1 Pump Replacement	2	Each	30,000	60,000
Lift Station 1 Electrical, Instrumentation, and Controls Replacement	1	Lump Sum	150,000	150,000
Lift Station 1 Bypass Pumping	1	Lump Sum	50,000	50,000
Lift Station 2 Force Main Replacement	130	L.F.	50	6,500
Lift Station 1 Electrical, Instrumentation, and Controls Replacement	1	Lump Sum	90,000	90,000
			Sub Total	**$5,946,240**
			Estimating Contingency (35%)	$2,081,184
			Sub Total with Estimating Contingency	**$8,027,424**
			Engineering Services (25%)	$2,006,856
			Program Implementation Costs (10%)	$802,742
			Total (Rounded)	**$10,840,000**

11.0 NEXT STEPS

The Graton sanitary sewer system has been assessed and recommendations for identified deficiencies have been presented. Environmental and permitting work is being conducted in parallel with this study. Additional investigations will be required, particularly with respect to geotechnical conditions.

This report will serve as the basis for development of detailed design. Expected detailed design phases include:

- 50 percent design including plans, template specifications, and associated cost estimate. It will focus on further engineering relating to large budget and schedule items.
- 90 percent design including plans, project-specific specifications, and associated cost estimate. This phase will address any remaining engineering questions, often related to construction issues (such as tie-ins or bypasses) and finalizing equipment selection.
- 100 percent design including plans, project-specific specification package, and associated cost estimate which will form a bid set that can be used by the District to be advertised for competitive bid.