

Drainage Report

2023 Street and Utility Improvements

City of Montgomery, MN
May 31, 2022



Submitted by:

Bolton & Menk, Inc.
1960 Premier Drive
Mankato, MN 56001-5900
P: 507-625-4171
F: 507-625-4177
BMI No. 0M1.126823



Real People. Real Solutions.

Certification

Drainage Report

For


2023 Street & Utility Improvement Project

City of Montgomery, MN
OM1.126823

May 31, 2022

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

By:


Matthew Simon, P.E.
License No. 57832

Date: May 31, 2022

Table of Contents

I.	Introduction	1
II.	Previous Studies.....	1
III.	Analysis	1
IV.	Existing Conditions.....	1
V.	Proposed Design	2
	A. Railroad Detention Basin	2
	B. Model Results	3
VI.	Summary	4

Tables

Table 1 – Impervious Calculation	2
Table 2 – Discharge Rates (CFS) to County Ditch 22	3
Table 3 – Ponding Elevation (FT) at Lexington Avenue Low Point.....	3
Table 4 – Ponding Elevation (FT) at MN Valley Gain Co	3
Table 5 – Railroad Detention Basin.....	3

Appendix

Appendix A: Figures

Appendix B: Televising

Appendix C: Supporting Materials

I. Introduction

The City of Montgomery will be reconstructing or repaving the streets in the Columbia Heights neighborhood as part of their capital improvement plan for 2023. The 2023 Street & Utility Improvement project is bounded by Boulevard Avenue on the west, Hickory Avenue on the east, 4th Street to the south and 1st Street to the north. Streets in this section were given a road condition score of 1.5-2.5 (out of 5) as part of the City of Montgomery 2015-2035 Comprehensive Plan. There will be utility improvements along with the street improvements, including replacing the aging storm sewer system. The existing storm sewer infrastructure is in poor condition and insufficient to manage the more frequent and higher intensity rainfalls of today. This drainage report serves to provide some background on the project area and outline the proposed stormwater management design for the 2023 Street & Utility Improvement project.

II. Previous Studies

In 2020, the City of Montgomery contracted SEH to provide hydrologic and hydraulic modeling of the storm sewer system along Hickory Avenue to the outfall on Lexington Avenue west of Welco Drive. The purpose of the analysis was to identify how proposed improvements to the storm sewer system would affect localized flooding along the system. Existing and proposed conditions models were developed in Innovyze's XPSWMM. The study provided some recommendations on proposed ponding locations and storm sewer sizing.

III. Analysis

To understand the drainage conditions of the project area and guide the proposed stormwater management design, a hydrologic and hydraulic model was developed using Autodesk's Storm & Sanitary Analysis (SSA). SSA uses the Soil Conservation Service (SCS) Technical Release (TR-20) methodology to route watershed runoff through the system using a rainfall hydrograph. The Atlas 14 rainfall depths were used along with the NRCS's MSE 3, 24-hour rainfall distribution. The rainfall depths used for the 2-, 10-, and 100-Year rainfall events were 2.85", 4.23" and 7.18", respectively. Time of concentrations were calculated using the NRCS's TR-55 methodology. Drainage areas were delineated using a combination of LiDAR data and survey data where available. Soil types within the project area are dominated by clay loams characterized by the hydrological soil group type D.

IV. Existing Conditions

The existing land use within the project area is predominantly residential, specifically ¼ acre residential lots, with some industrial land use at the top of the watershed coming from the USP site. Runoff generated within the watershed is managed today by an aging storm sewer system that is undersized and has insufficient inlet capacity to properly capture runoff. During large rainfall events the storm sewer system is overwhelmed, and the streets convey the excess runoff down to the major low points on the Minnesota Valley Grain Co site near the railroad tracks and on Lexington Avenue. When the low point on MN Valley Grain Co site fills up, excess runoff overtops the railroad tracks and runs out onto Lexington Avenue. The ultimate discharge point for this storm sewer system is County Ditch 22 on the western side of the city, which drains to Lake Pepin to the north. Televising of the storm sewer system performed in March of 2022 (See Appendix B for report), identified a number of problematic conditions including pipes filled with dirt and roots, fractured pipes and offset joints. One benefit to the existing drainage conditions of this area is that the neighborhood sits right on top of a hill with the ground falling away more than

10 feet in elevation in all directions. This means that there are no major low points or flooding areas within the streets that are being reconstructed. There are no existing stormwater detention basins serving this area.

Figure 1: Existing Drainage Conditions can be found in Appendix A and shows the existing storm sewer layout, drainage areas, flow directions and ponding extents at the low point on Lexington Avenue and the MN Valley Grain Co site.

V. Proposed Design

As outlined in the 2015-2035 Comprehensive Plan, the City of Montgomery does not have a stormwater management plan or a capital improvement plan with proposed stormwater management improvements to guide proposed development projects within the City. For the 2023 Street & Utility Improvement project, the proposed stormwater management system has been designed to meet the MPCA's NPDES Construction Stormwater Permit requirements and follow the best and most widely accepted engineering design standards. The design is centered on three principles of stormwater management: inlet capacity, conveyance capacity, and detention. Catch basins inlets have been designed with modern high-capacity inlets and have been located at key areas to limit significant ponding within the streets and keep spreads below the centerlines of the roads for up to the 5-Year rainfall event. Storm sewer has been sized to convey collected runoff up to the 5-Year rainfall event. Lastly, a detention basin is proposed to mitigate any impacts the improved proposed storm sewer system would have on the existing downstream storm sewer.

The proposed street and trail improvements will reduce the overall impervious surfaces. Therefore, per the MPCA NPDES Construction Stormwater Permit, a permanent stormwater treatment basin is not required.

Table 1 – Impervious Calculation	
	AREA (ACRES)
Existing	9.6
Proposed	8.7
Difference	-0.9

A. Railroad Detention Basin

The proposed project's outfall is the existing 30" storm sewer pipe running down Lexington Avenue. The low points in this street and on the MN Valley Grain Co site experience significant ponding today (refer to Figure 1 in Appendix A for ponding extents). Improving the upstream stormwater management system will only exacerbate this problem unless collected runoff is slowed down in a detention basin before discharging to the existing storm sewer. A stormwater detention basin is proposed on the empty City parcel located east of the Union Pacific railroad and north of Mill Avenue. This detention basin has been designed to provide 2.5 acre-feet of storage and will reduce both proposed discharge rates to the downstream system and ponding at the low points of concern compared to the existing conditions. The proposed detention basin will allow for the upstream storm sewer system to be upsized while maintaining a reduced outlet size. Additionally, the detention basin will intercept excess runoff that today flows overland down 1st Street NE and spills down Mill Avenue NE reducing ponding on the MN Valley Grain Co site. As part of the railroad detention basin, a new storm sewer pipe crossing under the railroad tracks will be constructed and connect back into the existing storm sewer line on Lexington Avenue. This railroad crossing will require coordination and permitting through Union Pacific. Union Pacific's engineering designing requirements have been included in Appendix C for reference.

B. Model Results

Table 2 below shows that the proposed design will reduce discharge rates to the existing downstream storm sewer system.

Table 2 – Discharge Rates (CFS) To County Ditch 22			
	2-YEAR (2.85")	5-YEAR (3.58")	100-YEAR (7.18")
Existing	47.8	76.2	229.3
Proposed	45.6	47.5	203.5
Difference	-2.2	-28.7	-25.8

*Note: discharge rates include pipe and overland flow leaving
Lexington avenue low point

Table 3 below shows that the proposed design will reduce ponding levels in the low point on Lexington Avenue.

Table 3 – Ponding Elevation (FT) At Lexington Avenue Low Point			
	2-YEAR (2.85")	5-YEAR (3.58")	100-YEAR (7.18")
Existing	1055.1	1055.5	1056.1
Proposed	1054.3	1055.0	1056.1
Difference	0.8	0.5	0.0

*Note: overflow elevation @ 1055.3'

Table 4 below shows that the proposed design will reduce ponding levels in the low point on the MN Valley Grain Co property, east of the railroad tracks and Lexington Ave.

Table 4 – Ponding Elevation (FT) At Mn Valley Gain Co			
	2-YEAR (2.85")	5-YEAR (3.58")	100-YEAR (7.18")
Existing	1064.6	1064.7	1065.1
Proposed	1063.6	1063.8	1065.0
Difference	-1.0	-0.9	-0.1

*Note: railroad overtops @ 1064.3'

Table 5 below shows the high-water levels and stored runoff volume in the proposed railroad detention basin for the 2-, 10- and 100-Year rainfall events.

Table 5 – Railroad Detention Basin								
BASIN CHARACTERISTICS			2-YEAR (2.85")		5-YEAR (3.58")		100-YEAR (7.18")	
BOTTOM	NWL	EOF	HWL (FT)	VOL. STORED (CF)	HWL (FT)	VOL. STORED (CF)	HWL (FT)	VOL. STORED (CF)
1053.0	1057.0	1067.0	1064.7	80,853	1067.0	114,597	1067.7	132,533

For rainfall events larger than the 5-Year, the proposed railroad detention basin will overtop and runoff will flow down to the low point on the MN Valley Grain Co site like it does today. Modeling results indicate that even with this case the proposed project is still an improvement with reducing ponding and overland flow rates. The size of the proposed basin is maxed out on the available land. In order to contain larger rainfall events a combination of increased outlet pipe and/or additional storage needs to be provided. The City owns the parcels (P.I.D. 22.999.1030 & 22.999.1040) immediately west of the railroad tracks. A second detention basin on this property could be constructed to contain larger rainfall events and improve further flooding conditions on Lexington Avenue and the MN Valley

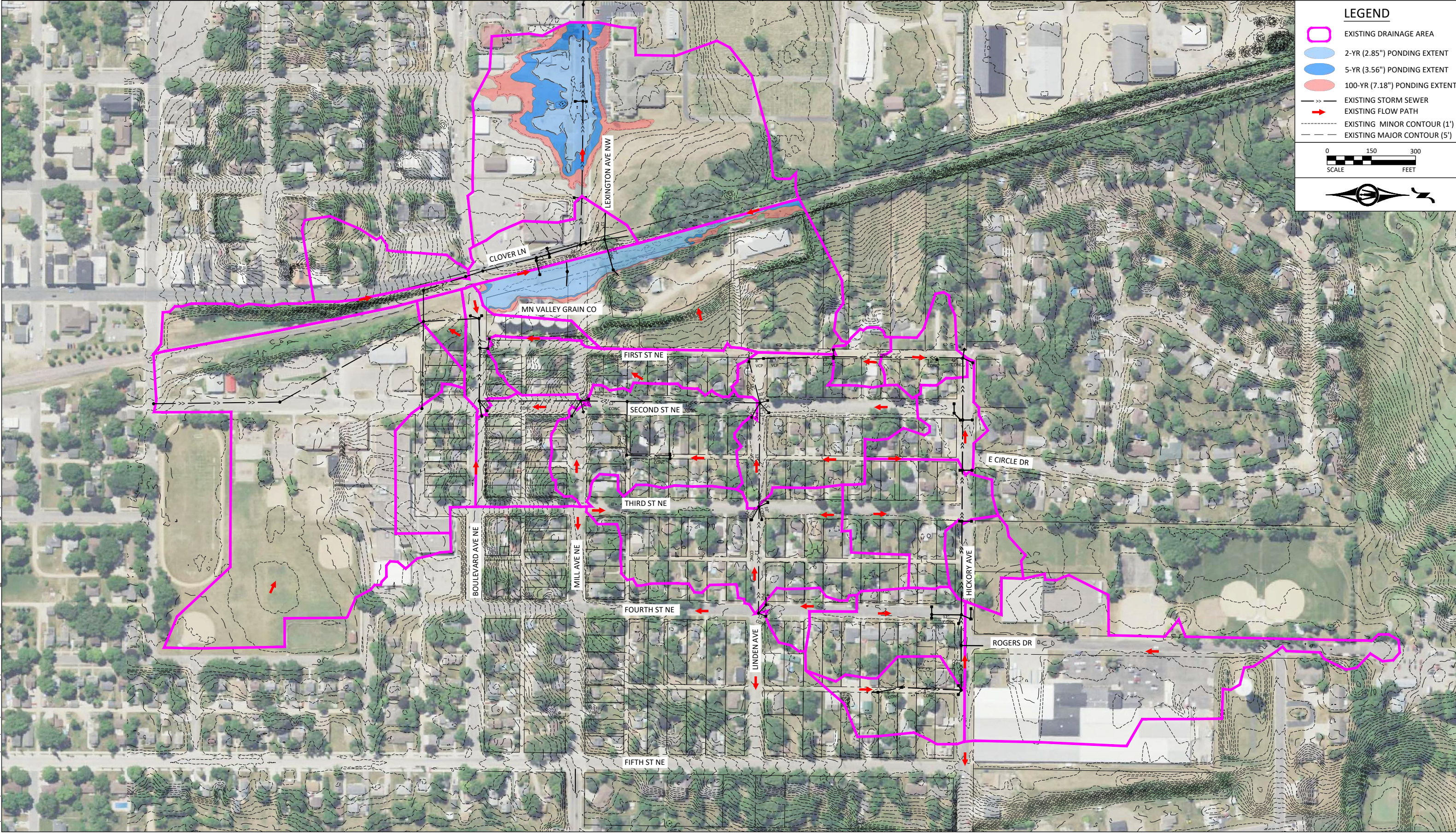
Grain Co site. To contain the 100-Year rainfall event would require ~48" outlet pipe from the proposed railroad detention basin and a second detention basin with ~16 ac-ft of storage, a volume which would take nearly all of P.I.D. 22.999.1030.

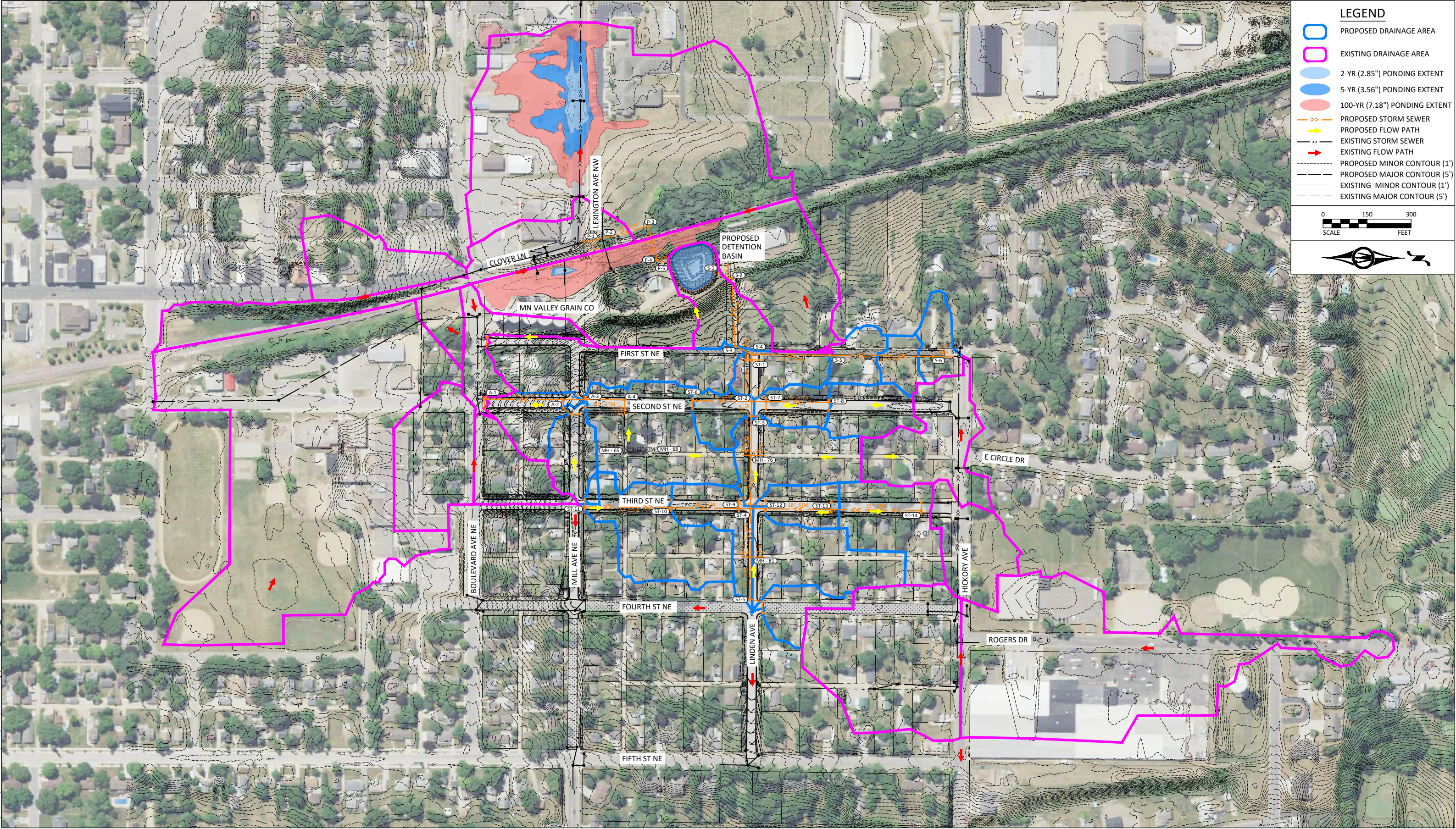
Figure 2: Proposed Drainage Conditions can be found in Appendix A and shows the proposed storm sewer layout and sizing, drainage areas, flow directions and ponding extents at the low point on Lexington Avenue and the MN Valley Grain Co site.

VI. Summary

The 2023 Street & Utility Improvement Project will significantly improve the livability of Columbia Heights neighborhood through street, trail and utility improvements. The proposed stormwater management design presented in this report has been designed to meet all the necessary permitting and design requirements and improve drainage conditions compared to the present-day.

Appendix A: Figures





Appendix B: Televising

Montgomery

**TV/Clean Storm
March 2022**



16281 Baseline Ave. • Shakopee, MN 55379
Phone: 952.445.3173 • Fax: 952.496.9117
Website: www.pipe-services.com

Montgomery

TV/Clean Storm

March 2022

**Montgomery MN
Significant Findings
TV Storm
March 2022**

[illegible]

PipeTech View Search Results

Search Criteria:

Criteria	And/Or
City = 'Montgomery'	

Data Totals:

Field	Total
Total Length:	2528.5
Length Surveyed:	1606

20 Matching Pipe Segments:

#	Pipe Segment Reference	Upstream MH	Downstream MH	Height (Diameter)	Total Length	Length Survey
1	01-02	01	02	12	99	99
2	03-01	03	01	12	12.5	12.5
3	04-01	04	01	12	25	25
4	05-06	05	06	10	130	129.4
5	09-10	09	10	12	350	61.7
6	09-10	09	10	12	350	350
7	11-09	11	09	12	36	36
8	12-09	12	09	12	26	26
9	16-17	16	17	12	329	329
10	18-16	18	16	12	25	25
11	19-16	19	16	12	40	40
12	20-19	20	19	12	54	54
13	30-30A	30	30A	8	0	0
14	30-31	30	31	12	111	44.2
15	30-31R	30	31	12	111	41.2
16	31-32	31	32	12	69	8.2
17	31-32R	31	32	12	69	2
18	35-36	35	36	12	52	12.8
19	37-38	37	38	18	320	220
20	37-38R	37	38	18	320	90



16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

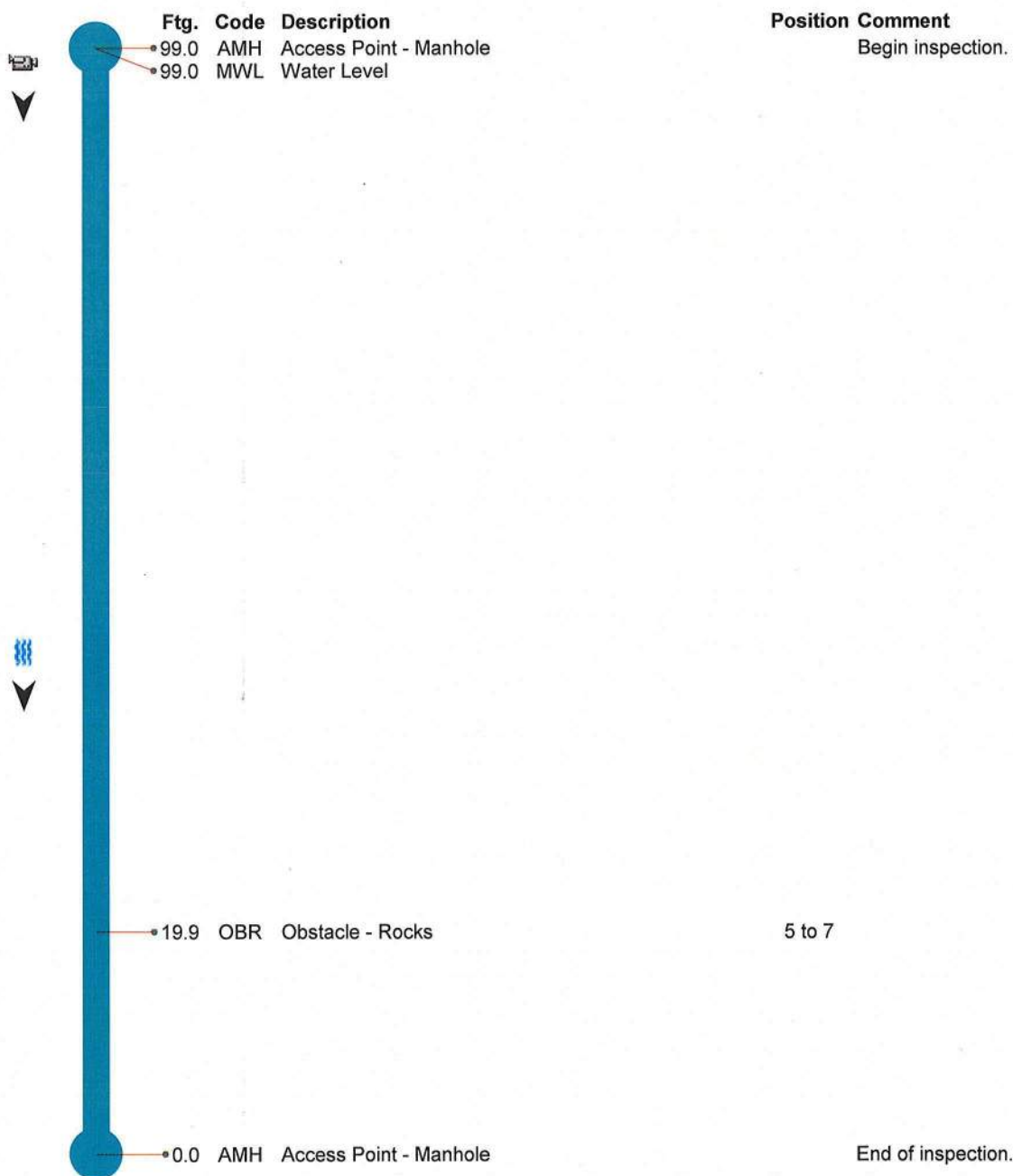
[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 01-02	Upstream MH 01	Downstream MH 02	Size 12	Material Concrete Pipe (non-reinforced)	Total Length 99
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address 4th St	Location Details			
Direction Downstream	Purpose Routine Assessment	Weather Dry	Date 03/14/2022	Sewer Use Stormwater	Length Surveyed 99	

Additional Information

Montgomery sanitary 2022





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

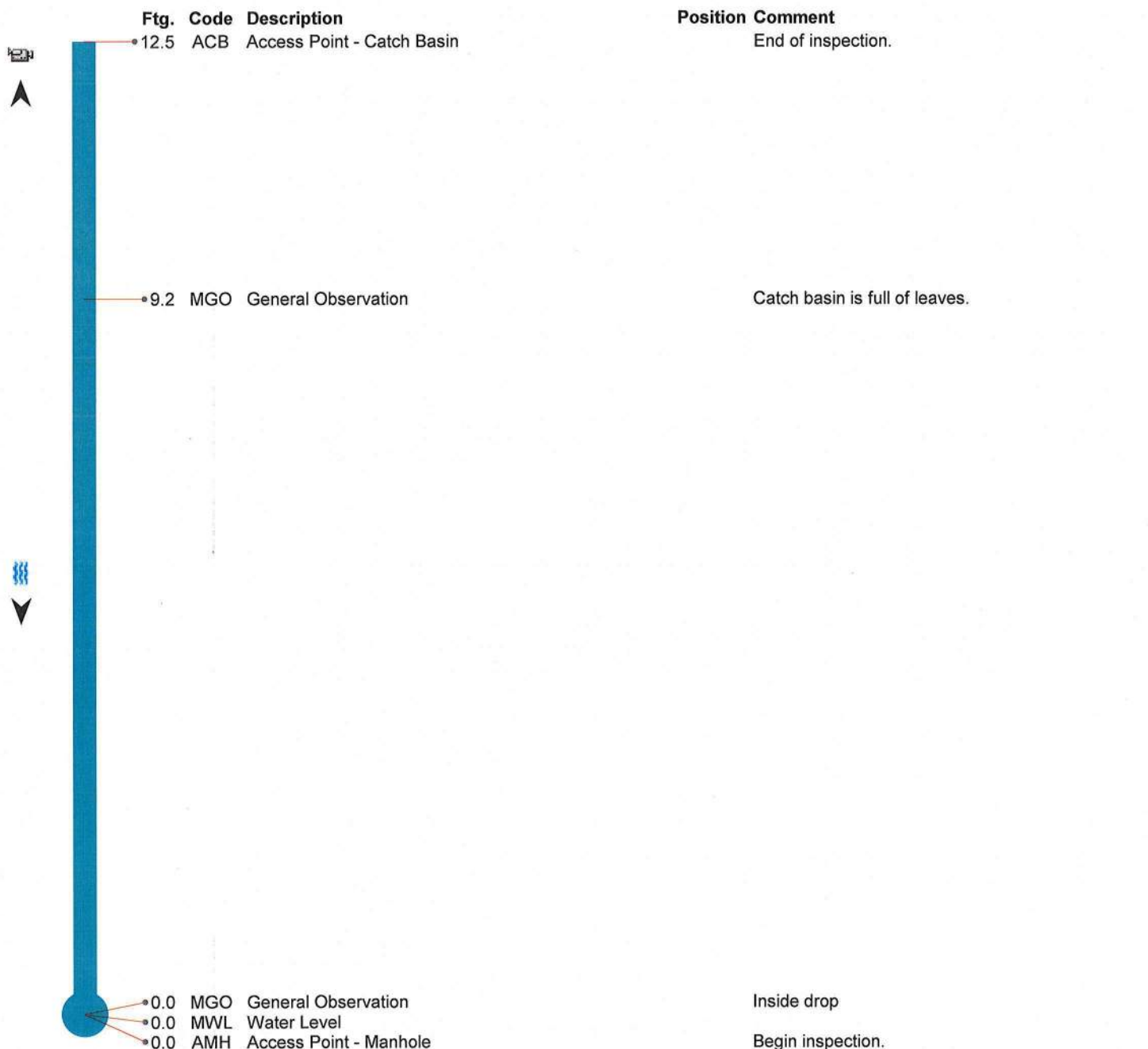
^Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 03-01	Upstream MH 03	Downstream MH 01	Size 12	Material Concrete Pipe (non-reinforced)	Total Length 12.5
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address 4th St	Location Details			
Direction Upstream	Purpose Routine Assessment	Weather Dry	Date 03/14/2022	Sewer Use Stormwater	Length Surveyed 12.5	

Additional Information

Montgomery sanitary 2022





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

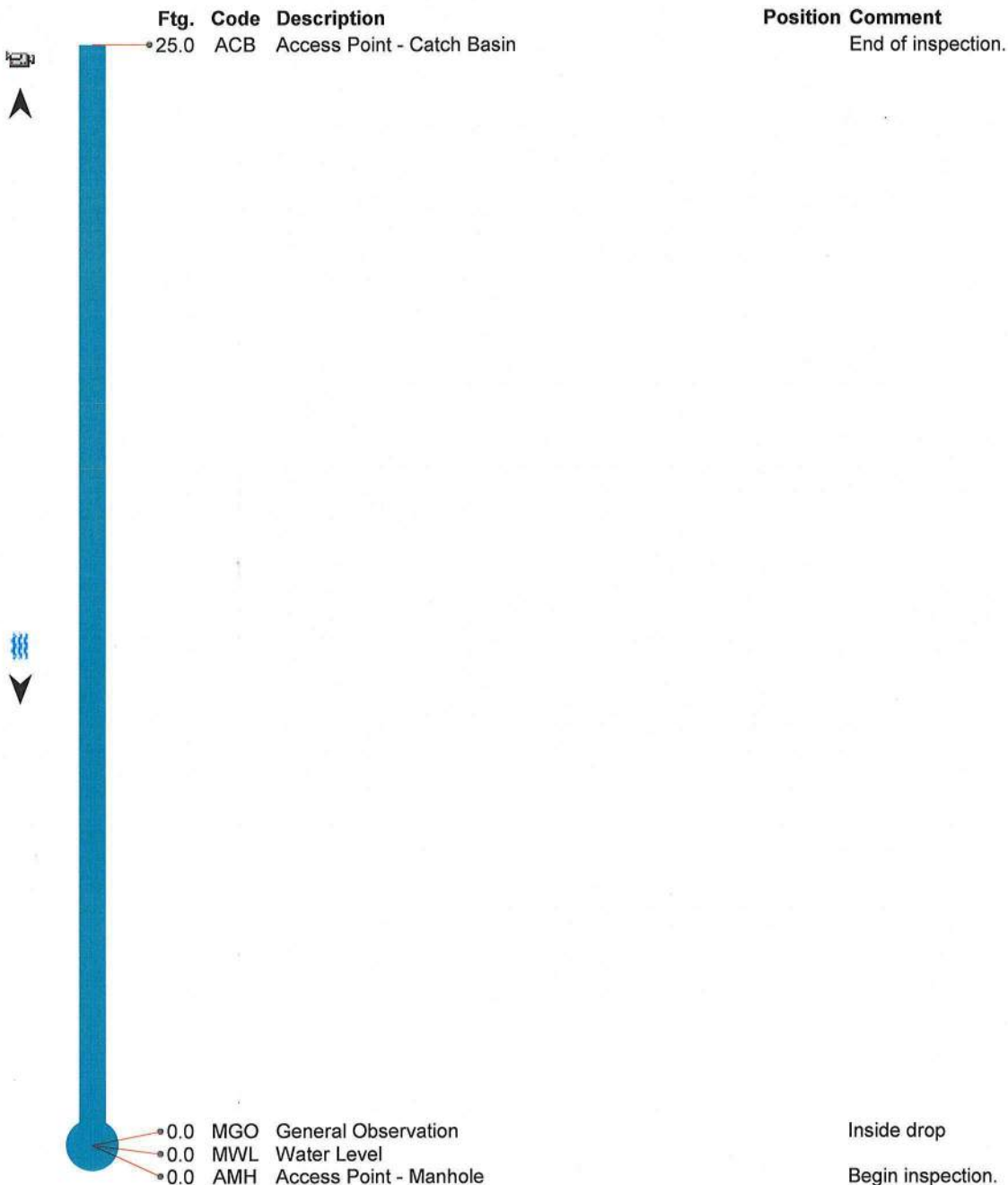
[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 04-01	Upstream MH 04	Downstream MH 01	Size 12	Material Concrete Pipe (non-reinforced)	Total Length 25
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address 4th St	Location Details			
Direction Upstream	Purpose Routine Assessment	Weather Dry	Date 03/14/2022	Sewer Use Stormwater	Length Surveyed 25	

Additional Information

Montgomery storm 2022





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

^Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 05-06	Upstream MH 05	Downstream MH 06	Size 10	Material Vitrified Clay Pipe	Total Length 130
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address Hickory Ave	Location Details Alley-easement			
Direction Upstream	Purpose Routine Assessment	Weather Dry	Date 03/14/2022	Sewer Use Stormwater	Length Surveyed 129.4	

Additional Information

Montgomery sanitary 2022

	Ftg.	Code	Description	Position	Comment
	129.4	MSA	Survey Abandoned		Cannot proceed pass the roots, pipe needs to be root cut.
	127.3	RMJ	Roots, Medium, Joint	5 to 7	10% roots at joint.
	126.6	RMJ	Roots, Medium, Joint	4 to 6	10% roots at joint.
	122.7	JOM	Joint Offset (displaced): Medium		Offset about 1 inch.
	110.1	JOM	Joint Offset (displaced): Medium		Offset about 1 inch.
	98.2	JOM	Joint Offset (displaced): Medium		Offset about 1 inch.
	95.6	JOM	Joint Offset (displaced): Medium		Offset about 1 inch.
	93.5	JOM	Joint Offset (displaced): Medium		Offset about 1 inch.
	90.8	JOM	Joint Offset (displaced): Medium		Offset about 1 inch.
	86.4	JOM	Joint Offset (displaced): Medium		Offset about 1 inch.
	64.3	MWLS	Water Level: Sag		Sag about 2 inch's of water.
	59.3	DAE	Deposits Attached: Encrustation	7 to 11	5% deposits at joint.
	12.9	JOM	Joint Offset (displaced): Medium		Offset about 1 inch.
	7.9	JOM	Joint Offset (displaced): Medium		Offset about 1 inch.
	0.0	MWL	Water Level		
	0.0	AMH	Access Point - Manhole		Begin inspection.



16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

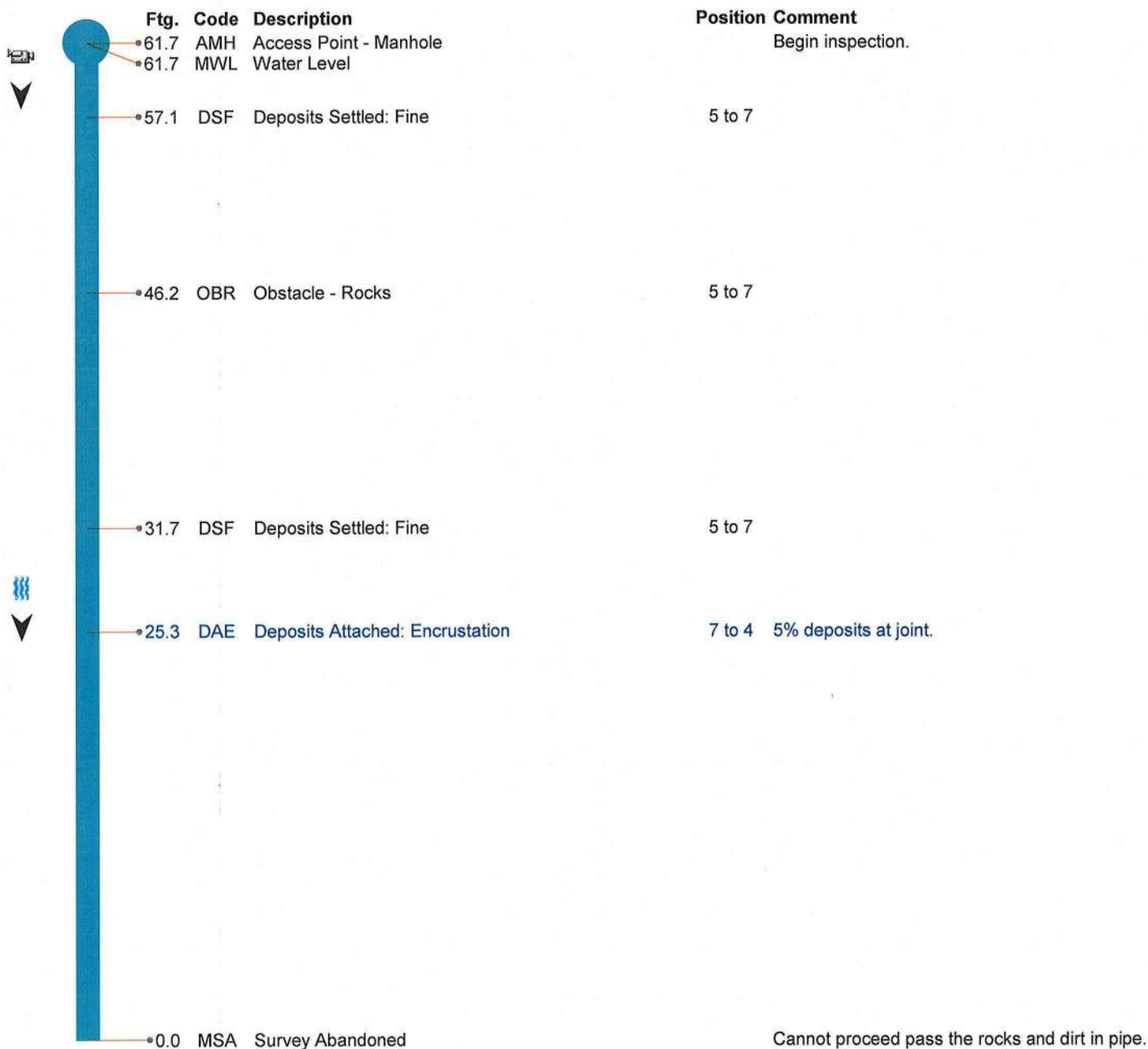
Customer	Pipe Segment Ref.	Upstream MH	Downstream MH	Size	Material	Total Length
City of Montgomery	09-10	09	10	12	Concrete Pipe (non-reinforced)	350

Surveyor's Name	Certificate Number	Street Address	Location Details
Shawn Blake	U-314-06020629	Linden Ave	

Direction	Purpose	Weather	Date	Sewer Use	Length Surveyed
Upstream	Routine Assessment	Dry	03/14/2022	Stormwater	61.7

Additional Information

Montgomery sanitary 2022





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

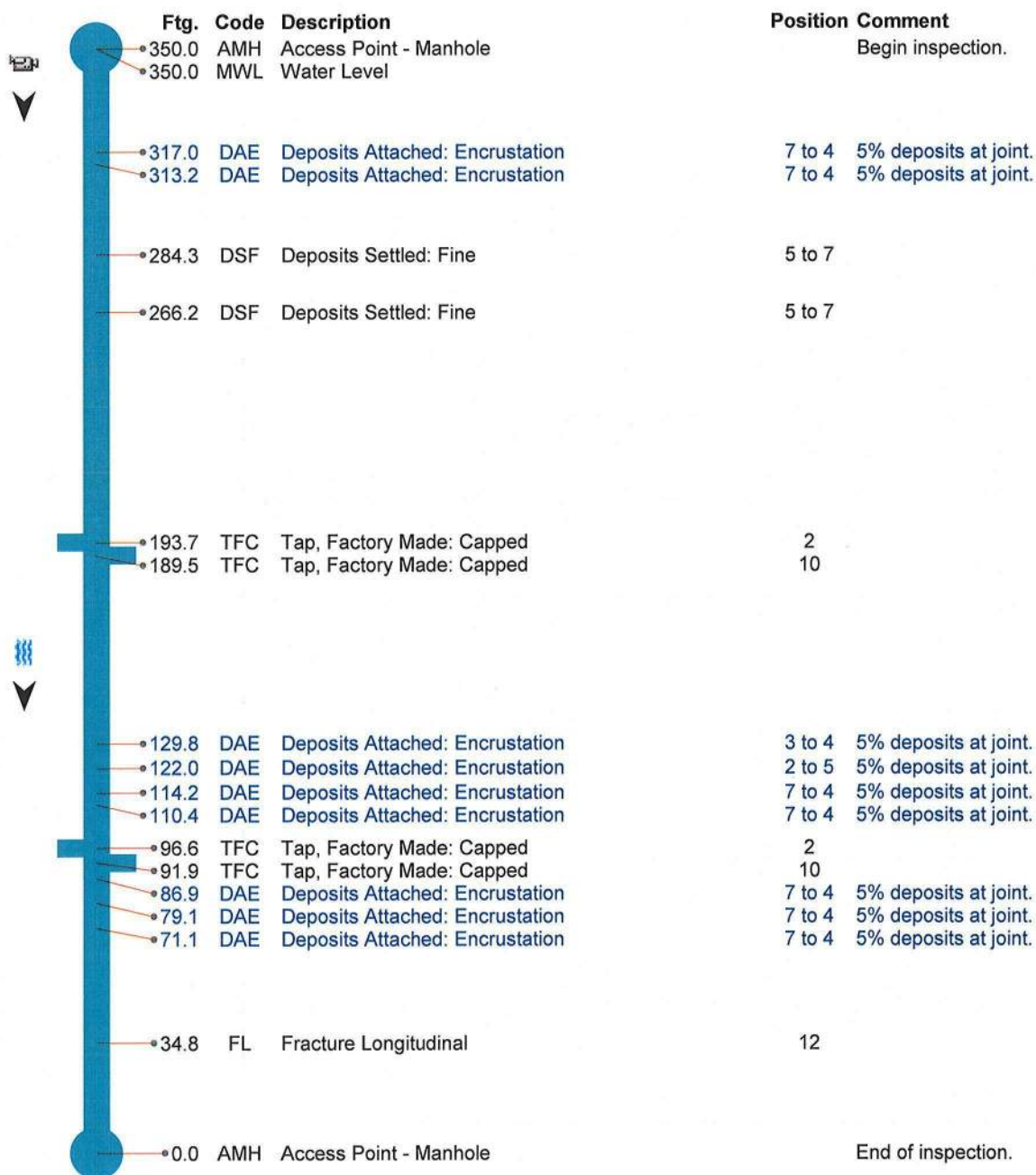
[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 09-10	Upstream MH 09	Downstream MH 10	Size 12	Material Concrete Pipe (non-reinforced)	Total Length 350
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address Linden Ave	Location Details			
Direction Downstream	Purpose Routine Assessment	Weather Dry	Date 03/15/2022	Sewer Use Stormwater	Length Surveyed 350	

Additional Information

Montgomery sanitary 2022





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

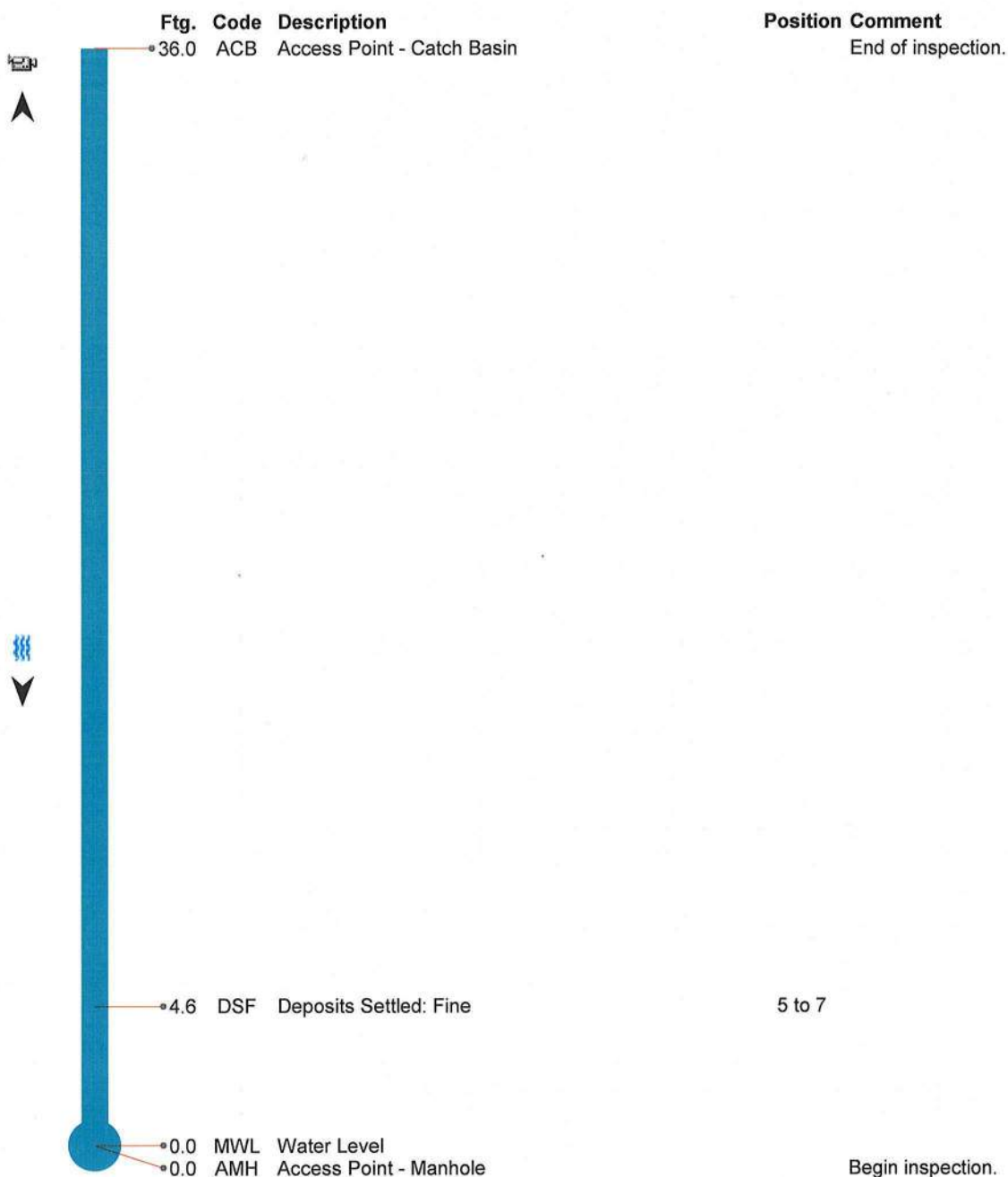
Customer	Pipe Segment Ref.	Upstream MH	Downstream MH	Size	Material	Total Length
City of Montgomery	11-09	11	09	12	Concrete Pipe (non-reinforced)	36

Surveyor's Name	Certificate Number	Street Address	Location Details
Shawn Blake	U-314-06020629	Linden Ave	

Direction	Purpose	Weather	Date	Sewer Use	Length Surveyed
Upstream	Routine Assessment	Dry	03/14/2022	Stormwater	36

Additional Information

Montgomery sanitary 2022





^Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

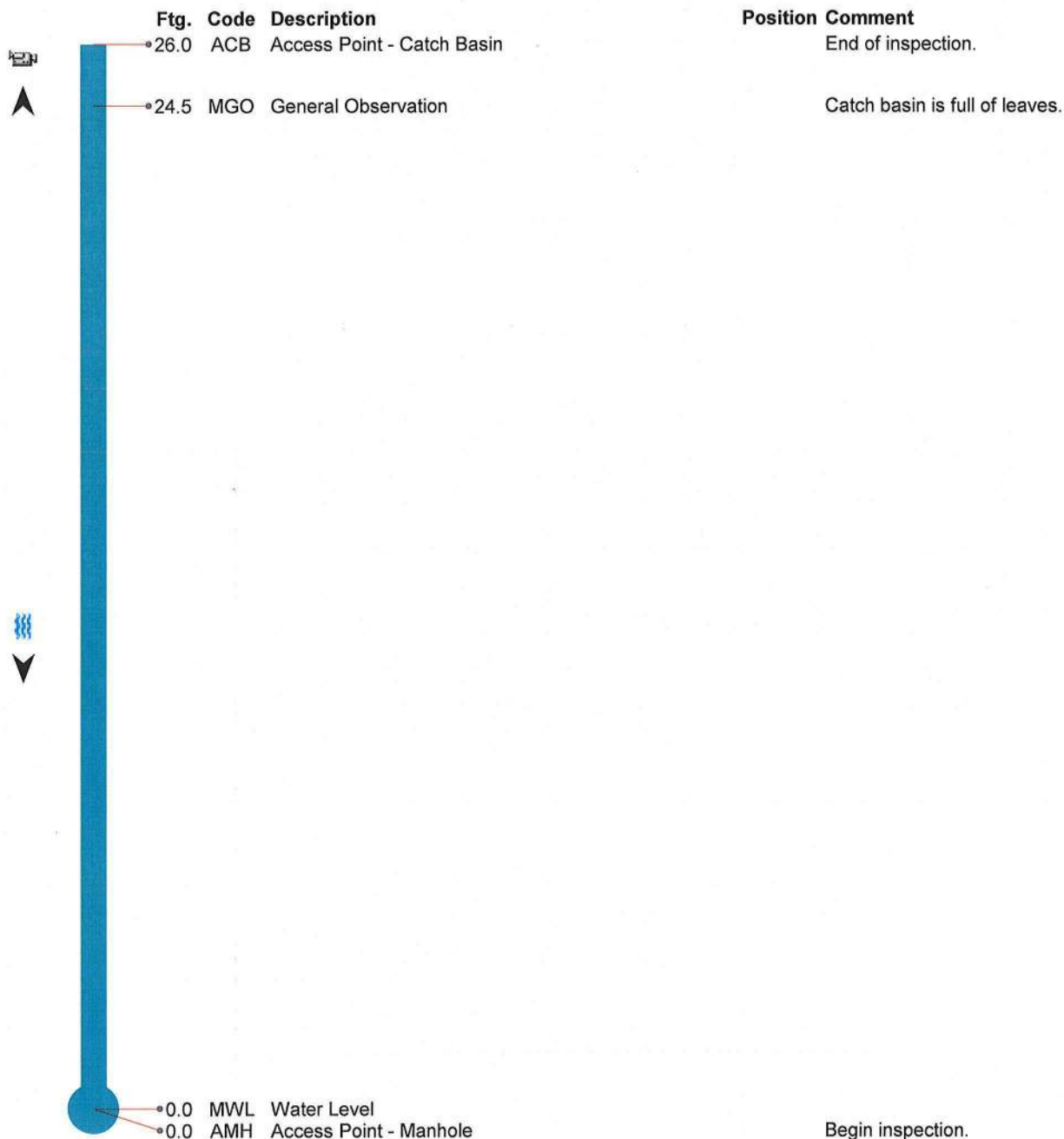
Customer	Pipe Segment Ref.	Upstream MH	Downstream MH	Size	Material	Total Length
City of Montgomery	12-09	12	09	12	Concrete Pipe (non-reinforced)	26

Surveyor's Name	Certificate Number	Street Address	Location Details
Shawn Blake	U-314-06020629	Linden Ave	

Direction	Purpose	Weather	Date	Sewer Use	Length Surveyed
Upstream	Routine Assessment	Dry	03/14/2022	Stormwater	26

Additional Information

Montgomery sanitary 2022





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

^ANote: Distances are indicated from the Downstream MH.

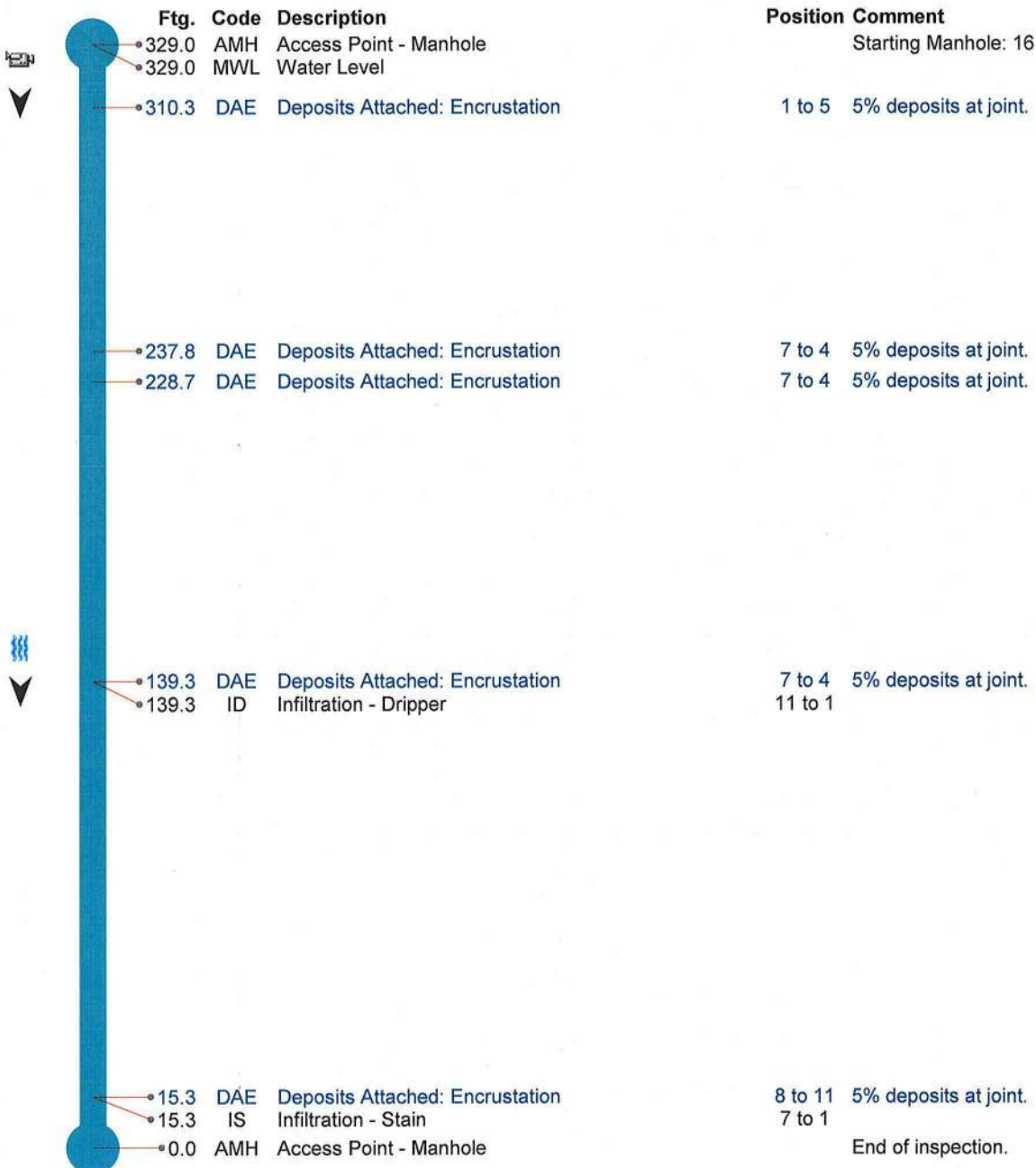
Closed Circuit Television Inspection

Customer	Pipe Segment Ref.	Upstream MH	Downstream MH	Size	Material	Total Length
City of Montgomery	16-17	16	17	12	Concrete Pipe (non-reinforced)	329

Surveyor's Name	Certificate Number	Street Address	Location Details
Shawn Blake	U-314-06020629	4th St	

Direction	Purpose	Weather	Date	Sewer Use	Length Surveyed
Downstream	Routine Assessment	Dry	03/14/2022	Stormwater	329

Additional Information
Montgomery sanitary 2022



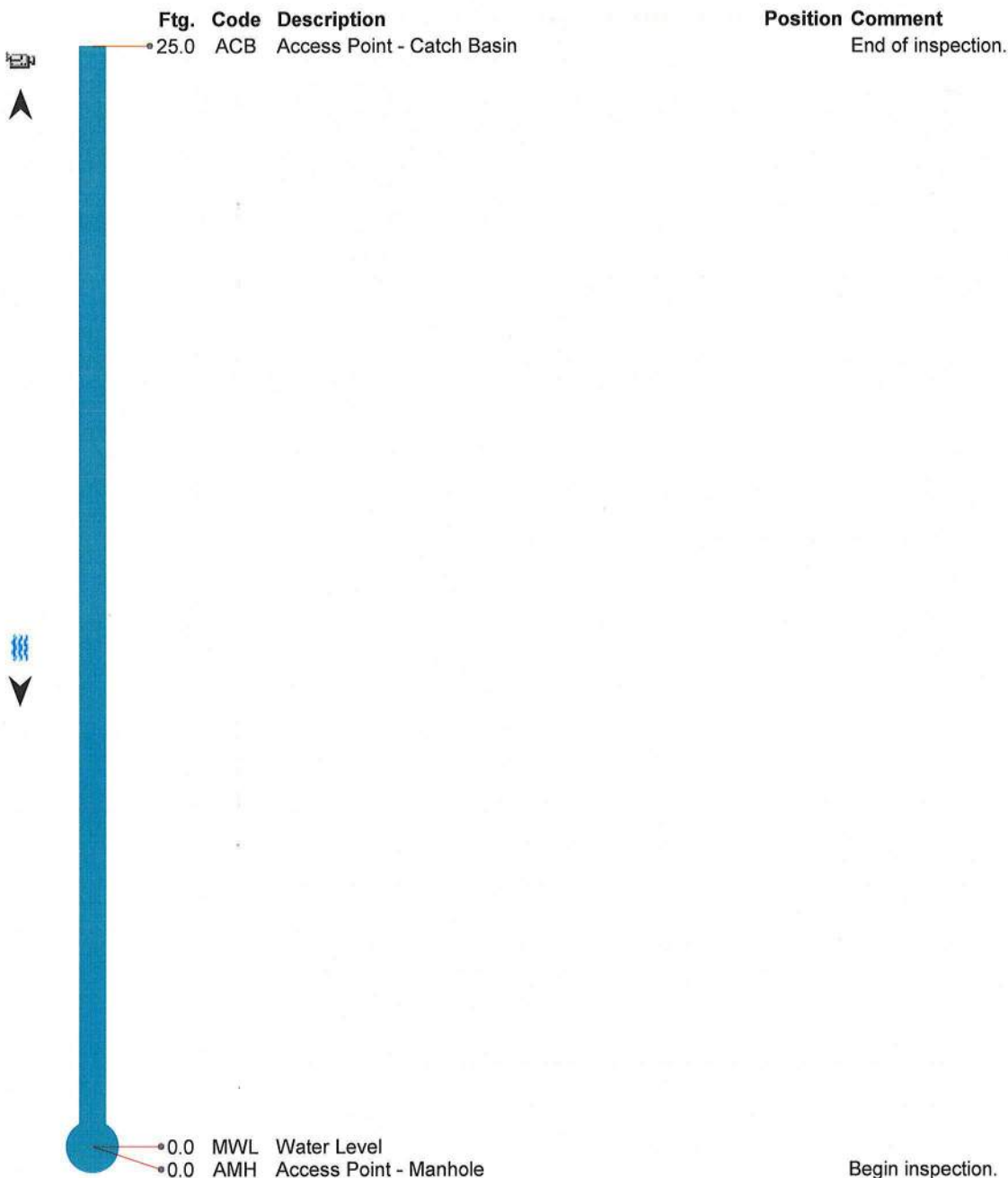


16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 18-16	Upstream MH 18	Downstream MH 16	Size 12	Material Concrete Pipe (non-reinforced)	Total Length 25
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address 4th St	Location Details			
Direction Upstream	Purpose Routine Assessment	Weather Dry	Date 03/14/2022	Sewer Use Stormwater	Length Surveyed 25	
Additional Information Montgomery sanitary 2022						





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

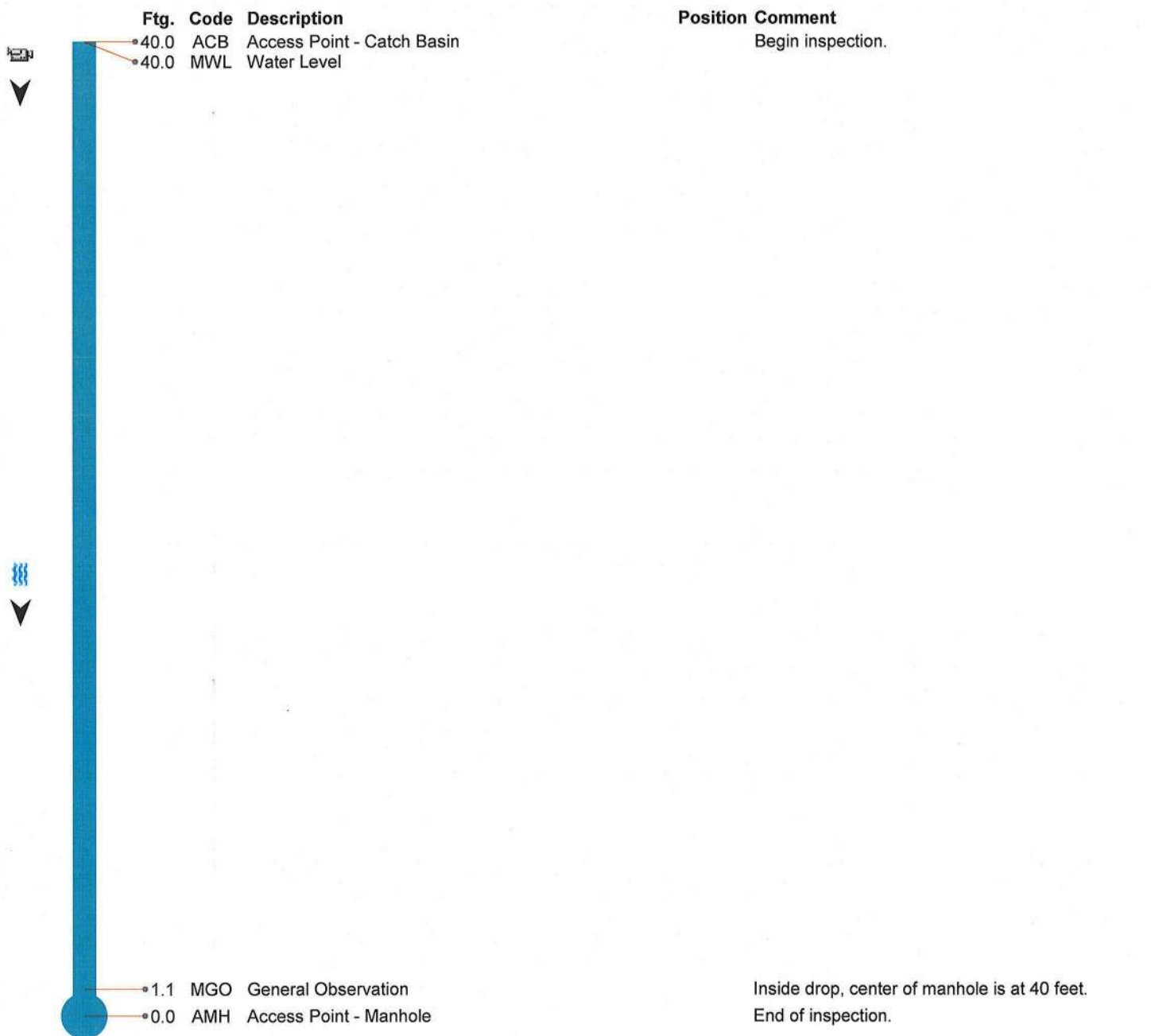
[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 19-16	Upstream MH 19	Downstream MH 16	Size 12	Material Concrete Pipe (non-reinforced)	Total Length 40
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address 4th St	Location Details			
Direction Downstream	Purpose Routine Assessment	Weather Dry	Date 03/14/2022	Sewer Use Stormwater	Length Surveyed 40	

Additional Information

Montgomery sanitary 2022





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

[^]Note: Distances are indicated from the Downstream MH.

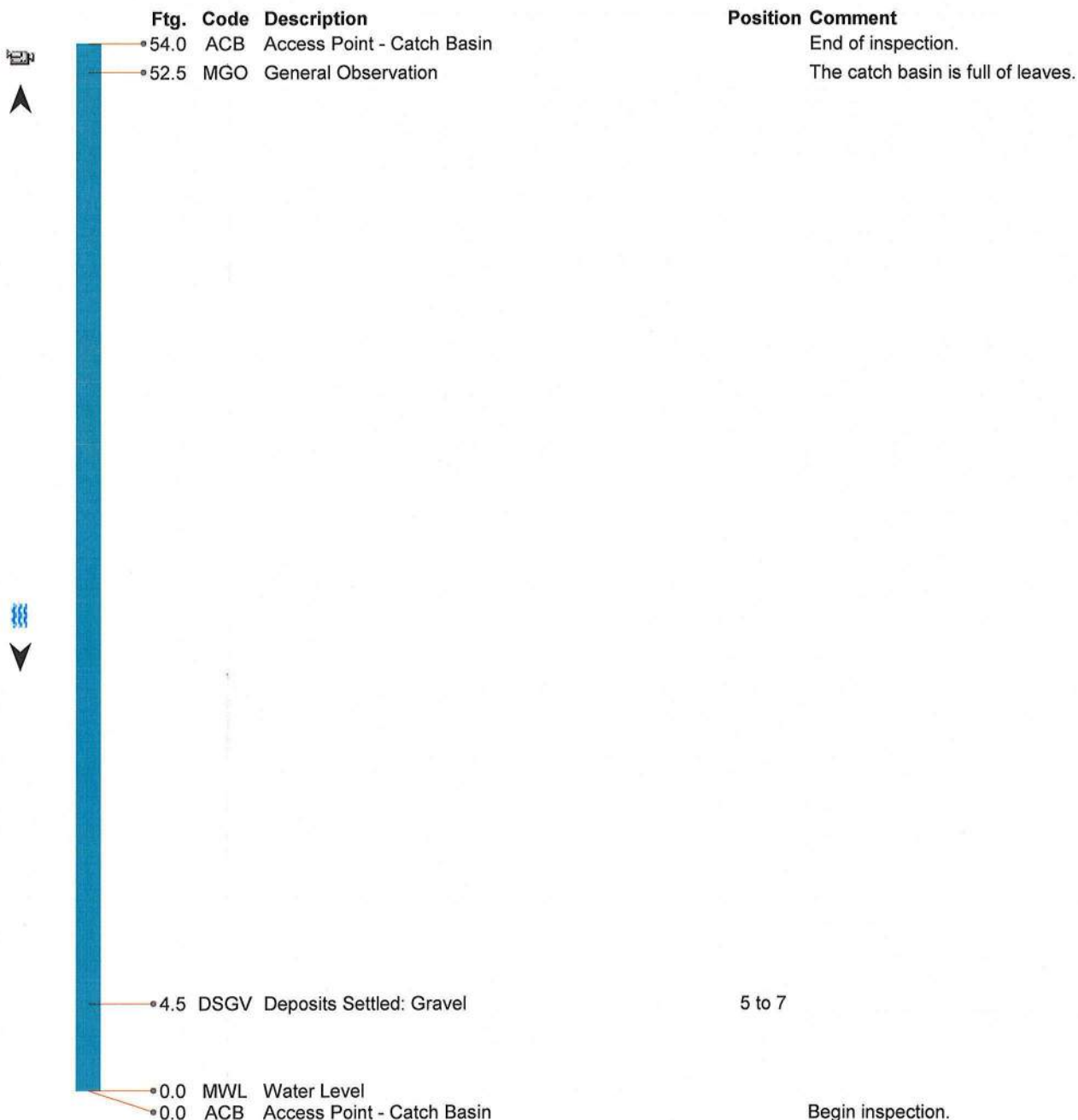
Closed Circuit Television Inspection

Customer	Pipe Segment Ref.	Upstream MH	Downstream MH	Size	Material	Total Length
City of Montgomery	20-19	20	19	12	Concrete Pipe (non-reinforced)	54

Surveyor's Name	Certificate Number	Street Address	Location Details
Shawn Blake	U-314-06020629	4th St	

Direction	Purpose	Weather	Date	Sewer Use	Length Surveyed
Upstream	Routine Assessment	Dry	03/14/2022	Stormwater	54

Additional Information
Montgomery sanitary 2022





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

^ANote: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer	Pipe Segment Ref.	Upstream MH	Downstream MH	Size	Material	Total Length
City of Montgomery	30-30A	30	30A	8	Vitrified Clay Pipe	0

Surveyor's Name	Certificate Number	Street Address	Location Details
Shawn Blake	U-314-06020629	1st St	Easement

Direction	Purpose	Weather	Date	Sewer Use	Length Surveyed
Upstream	Routine Assessment	Dry	03/14/2022	Stormwater	0

Additional Information

Montgomery sanitary 2022

	Ftg.	Code	Description	Position	Comment
	0.0	MSA	Survey Abandoned		Cannot Tv this line.
	0.0	MGO	General Observation		Cannot TV this line, the pipe turns left 2-3 feet in, to sharp to turn.
	0.0	MWL	Water Level		
	0.0	AMH	Access Point - Manhole		Begin inspection.



16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

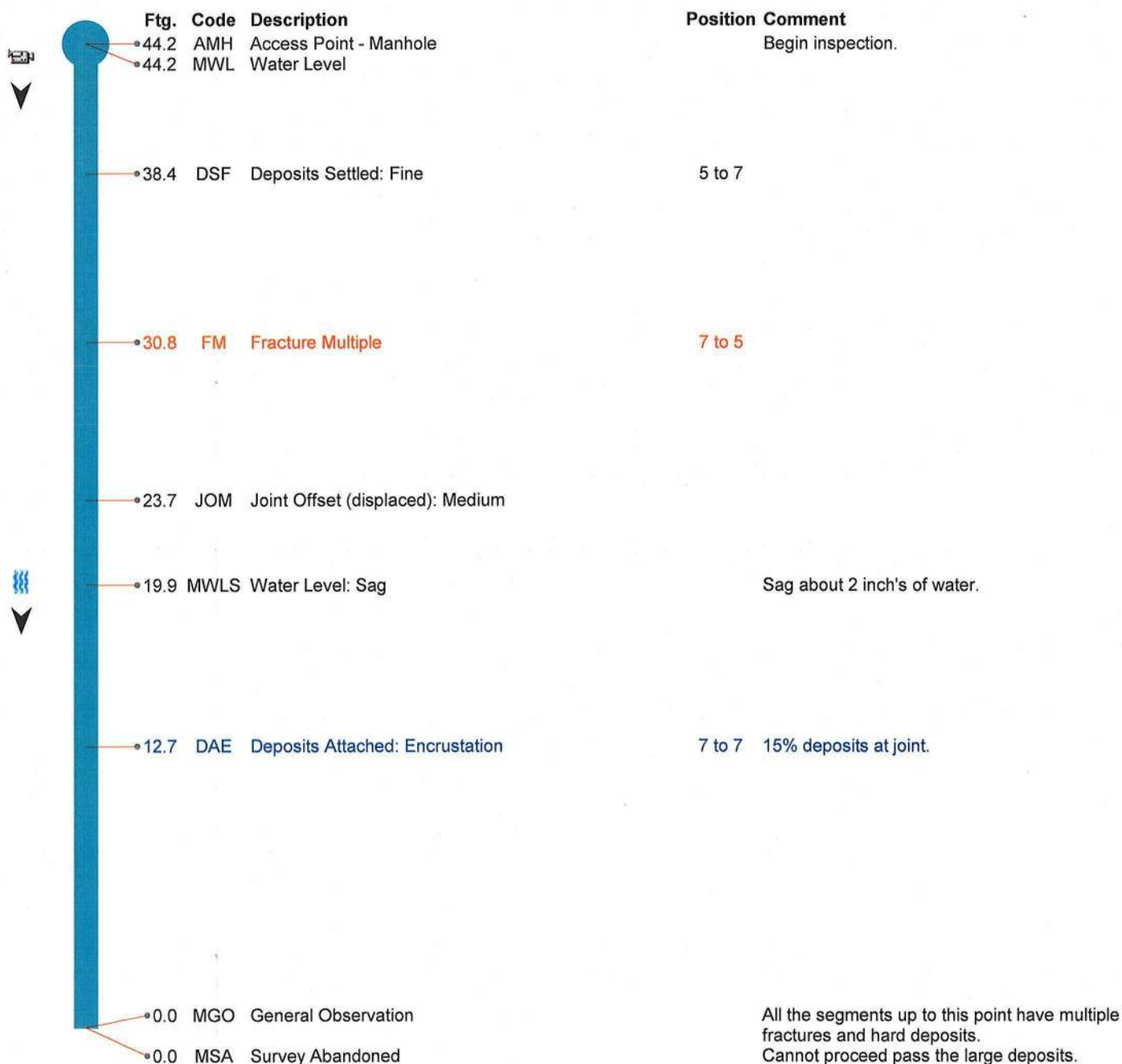
[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 30-31	Upstream MH 30	Downstream MH 31	Size 12	Material Vitrified Clay Pipe	Total Length 111
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address 1st St	Location Details Easement-under RR tracks			
Direction Downstream	Purpose Routine Assessment	Weather Dry	Date 03/14/2022	Sewer Use Stormwater	Length Surveyed 44.2	

Additional Information

Montgomery sanitary 2022





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

^Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer	Pipe Segment Ref.	Upstream MH	Downstream MH	Size	Material	Total Length
City of Montgomery	30-31R	30	31	12	Vitrified Clay Pipe	111

Surveyor's Name	Certificate Number	Street Address	Location Details
Shawn Blake	U-314-06020629	1st St	Easement-under RR tracks

Direction	Purpose	Weather	Date	Sewer Use	Length Surveyed
Upstream	Routine Assessment	Dry	03/14/2022	Stormwater	41.2

Additional Information

Montgomery sanitary 2022

Ftg.	Code	Description	Position	Comment
41.2	MSA	Survey Abandoned		
41.2	MGO	General Observation		
41.2	DAE	Deposits Attached: Encrustation	7 to 4	25% deposits.
36.3	JOM	Joint Offset (displaced): Medium		Offset about 1 inch.
25.8	DAE	Deposits Attached: Encrustation	8 to 10	20% deposits.
18.7	DAE	Deposits Attached: Encrustation	7 to 10	20% deposits
0.0	DSF	Deposits Settled: Fine	5 to 7	
0.0	MWL	Water Level		
0.0	AMH	Access Point - Manhole		Begin inspection.



16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer	Pipe Segment Ref.	Upstream MH	Downstream MH	Size	Material	Total Length
City of Montgomery	31-32	31	32	12	Vitrified Clay Pipe	69

Surveyor's Name	Certificate Number	Street Address	Location Details
Shawn Blake	U-314-06020629	1st St	Easement

Direction	Purpose	Weather	Date	Sewer Use	Length Surveyed
Downstream	Routine Assessment	Dry	03/14/2022	Stormwater	8.2

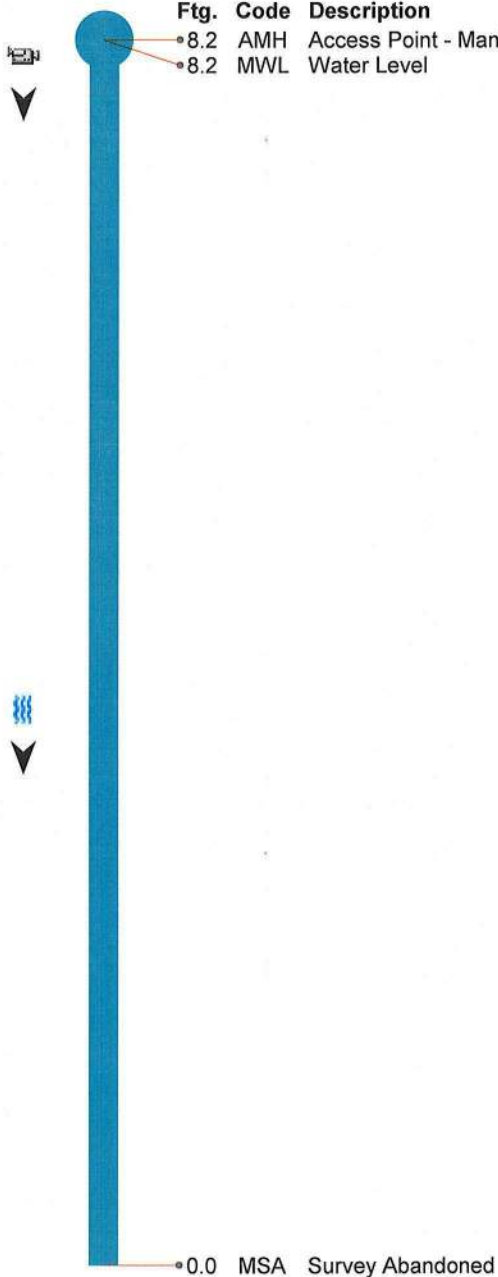
Additional Information

Montgomery sanitary 2022

Ftg.	Code	Description
8.2	AMH	Access Point - Manhole
8.2	MWL	Water Level

Position Comment

Begin inspection.



Cannot proceed pass the large amount of dirt in pipe.



16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

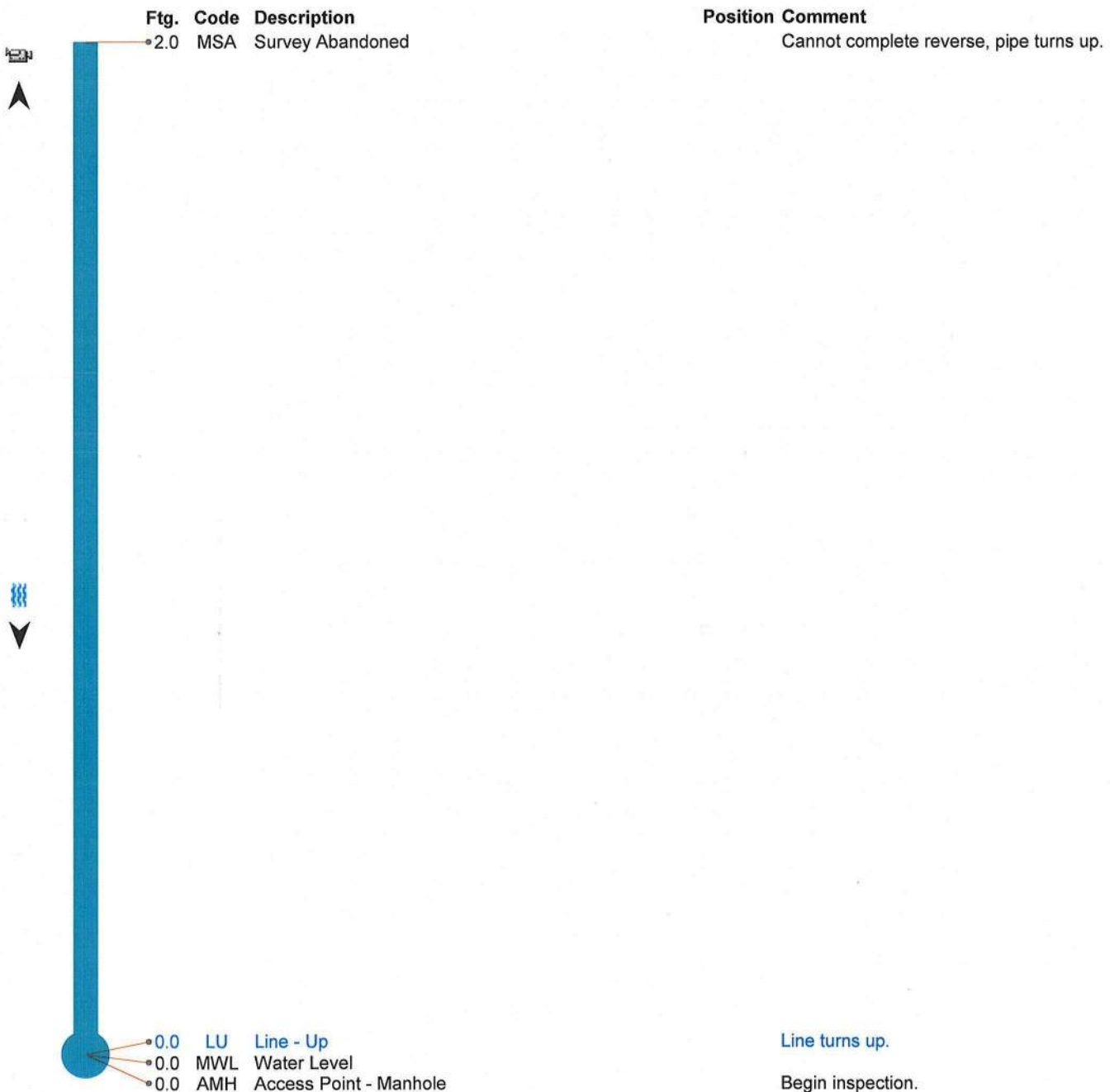
[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 31-32R	Upstream MH 31	Downstream MH 32	Size 12	Material Vitrified Clay Pipe	Total Length 69
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address 1st St	Location Details Easement			
Direction Upstream	Purpose Routine Assessment	Weather Dry	Date 03/14/2022	Sewer Use Stormwater	Length Surveyed 2	

Additional Information

Montgomery sanitary 2022





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

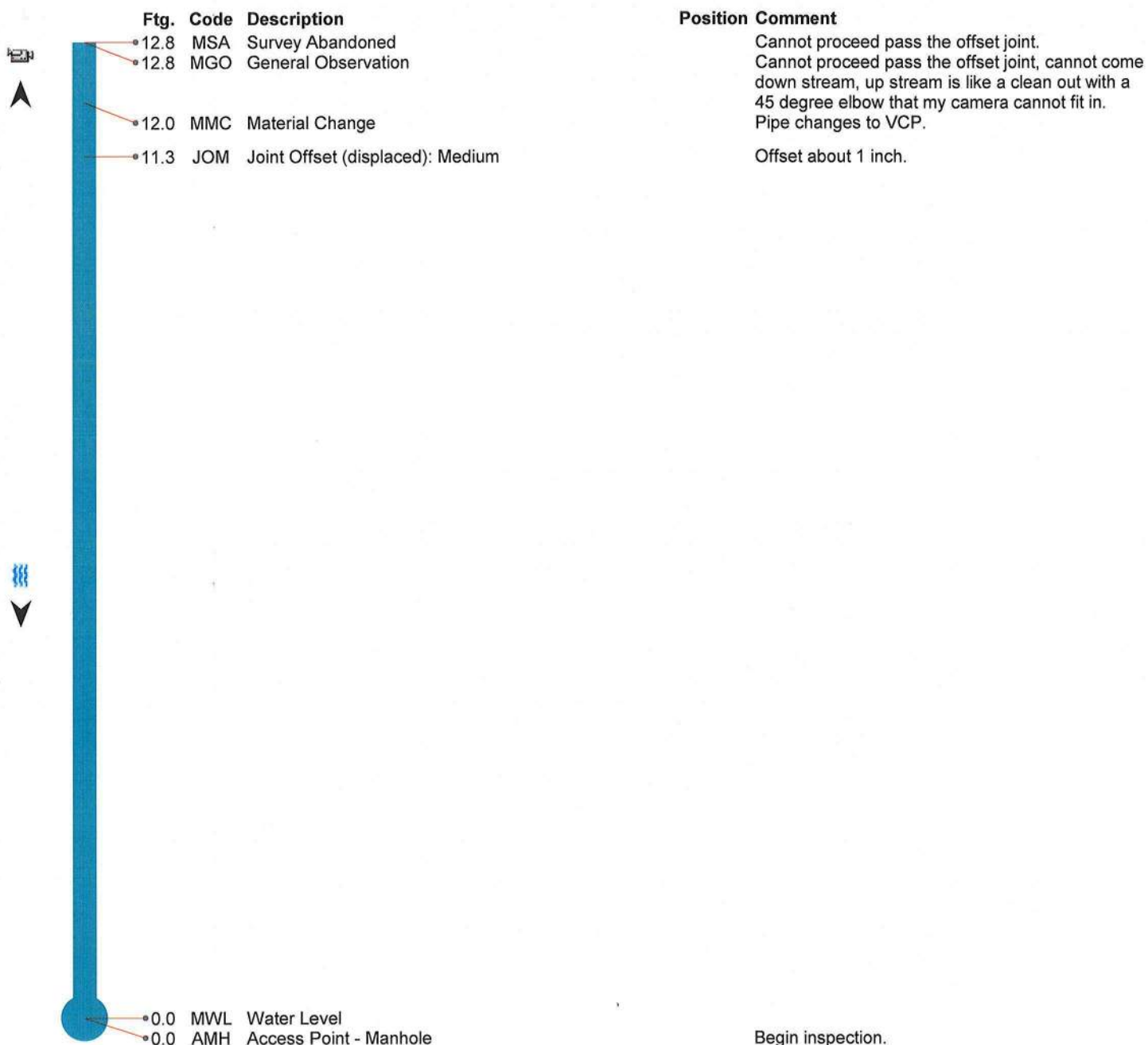
[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 35-36	Upstream MH 35	Downstream MH 36	Size 12	Material Polyvinyl Chloride	Total Length 52
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address 1st St	Location Details Easement-under RR tracks			
Direction Upstream	Purpose Routine Assessment	Weather Dry	Date 03/14/2022	Sewer Use Stormwater	Length Surveyed 12.8	

Additional Information

Montgomery sanitary 2022





16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

[^]Note: Distances are indicated from the Downstream MH.

Closed Circuit Television Inspection

Customer	Pipe Segment Ref.	Upstream MH	Downstream MH	Size	Material	Total Length
City of Montgomery	37-38	37	38	18	Reinforced Concrete Pipe	320
Surveyor's Name	Certificate Number	Street Address	Location Details			
Shawn Blake	U-314-06020629	Oak Ave				
Direction	Purpose	Weather	Date	Sewer Use	Length Surveyed	
Downstream	Routine Assessment	Light Rain	03/22/2022	Stormwater	220	

Additional Information

Montgomery storm 2022

Ftg.	Code	Description	Position	Comment
220.0	AMH	Access Point - Manhole		Begin inspection.
220.0	MWL	Water Level		
217.0	TFC	Tap, Factory Made: Capped	12	
215.0	TFC	Tap, Factory Made: Capped	12	
211.7	TFC	Tap, Factory Made: Capped	12	
209.2	TFC	Tap, Factory Made: Capped	12	
206.7	TFC	Tap, Factory Made: Capped	12	
204.3	TFC	Tap, Factory Made: Capped	12	
201.7	TFC	Tap, Factory Made: Capped	11	
201.5	DAE	Deposits Attached: Encrustation	7 to 4	5% deposits at joint.
199.4	TFC	Tap, Factory Made: Capped	12	
196.8	TFC	Tap, Factory Made: Capped	12	
196.3	DSF	Deposits Settled: Fine	5 to 7	
196.3	OBR	Obstacle - Rocks	5 to 7	
194.1	TFC	Tap, Factory Made: Capped	12	
191.8	TFC	Tap, Factory Made: Capped	12	
189.2	TFC	Tap, Factory Made: Capped	12	
186.7	TFC	Tap, Factory Made: Capped	12	
184.1	TFC	Tap, Factory Made: Capped	12	
183.7	DAE	Deposits Attached: Encrustation	4 to 5	5% deposits at joint.
181.5	TFC	Tap, Factory Made: Capped	12	
179.1	TFC	Tap, Factory Made: Capped	12	
176.4	TFC	Tap, Factory Made: Capped	12	
173.8	TFC	Tap, Factory Made: Capped	12	
171.3	TFC	Tap, Factory Made: Capped	12	
170.2	DAE	Deposits Attached: Encrustation	7 to 4	5% deposits at joint.
168.7	TFC	Tap, Factory Made: Capped	12	
168.0	OBR	Obstacle - Rocks	4 to 6	
168.0	DAE	Deposits Attached: Encrustation	7 to 4	5% deposits at joint.
166.0	TFC	Tap, Factory Made: Capped	11	
163.5	TFC	Tap, Factory Made: Capped	1	
163.3	DAE	Deposits Attached: Encrustation	7 to 4	5% deposits at joint.
161.1	TFC	Tap, Factory Made: Capped	1	
158.5	TFC	Tap, Factory Made: Capped	11	
155.9	TFC	Tap, Factory Made: Capped	11	
155.4	DAE	Deposits Attached: Encrustation	7 to 8	5% deposits at joint.
153.3	TFC	Tap, Factory Made: Capped	11	
153.1	DAE	Deposits Attached: Encrustation	7 to 4	5% deposits at joint.
150.8	TFC	Tap, Factory Made: Capped	12	
150.8	OBR	Obstacle - Rocks	5 to 7	
147.9	TFC	Tap, Factory Made: Capped	11	
147.9	DAE	Deposits Attached: Encrustation	7 to 4	5% deposits at joint.
145.9	TFC	Tap, Factory Made: Capped	11	
143.2	TFC	Tap, Factory Made: Capped	11	
140.7	TFC	Tap, Factory Made: Capped	11	
137.9	TFC	Tap, Factory Made: Capped	11	
130.1	TFC	Tap, Factory Made: Capped	11	Hole in cap
130.1	DAE	Deposits Attached: Encrustation	7 to 4	5% deposits at joint.
127.5	TFC	Tap, Factory Made: Capped	11	Cap is cracked.
127.0	DAE	Deposits Attached: Encrustation	4 to 5	5% deposits at joint.
106.9	DAE	Deposits Attached: Encrustation	7 to 8	5% deposits at joint.
97.3	DAE	Deposits Attached: Encrustation	3 to 5	5% deposits at joint.



Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 37-38	Upstream MH 37	Downstream MH 38	Size 18	Material Reinforced Concrete Pipe	Total Length 320
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address Oak Ave		Location Details		
Direction Downstream	Purpose Routine Assessment	Weather Light Rain	Date 03/22/2022	Sewer Use Stormwater	Length Surveyed 220	

Additional Information
Montgomery storm 2022

	Ftg.	Code	Description	Position	Comment
	92.4	TFC	Tap, Factory Made: Capped	11	Cap is fractured.
	92.0	DAE	Deposits Attached: Encrustation	6 to 8	5% deposits at joint.
	82.2	TFC	Tap, Factory Made: Capped	11	Cap is fractured.
	80.1	TFC	Tap, Factory Made: Capped	12	Cap is fractured.
	42.2	TFC	Tap, Factory Made: Capped	12	Hole in cap.
	13.7	TFC	Tap, Factory Made: Capped	12	Hole in cap.
	1.0	OBP	Obstacle - External Pimper or Cable in Sewer	9 to 3	Pipe going through pipe.
	0.0	MSA	Survey Abandoned		Cannot proceed pass pipe.

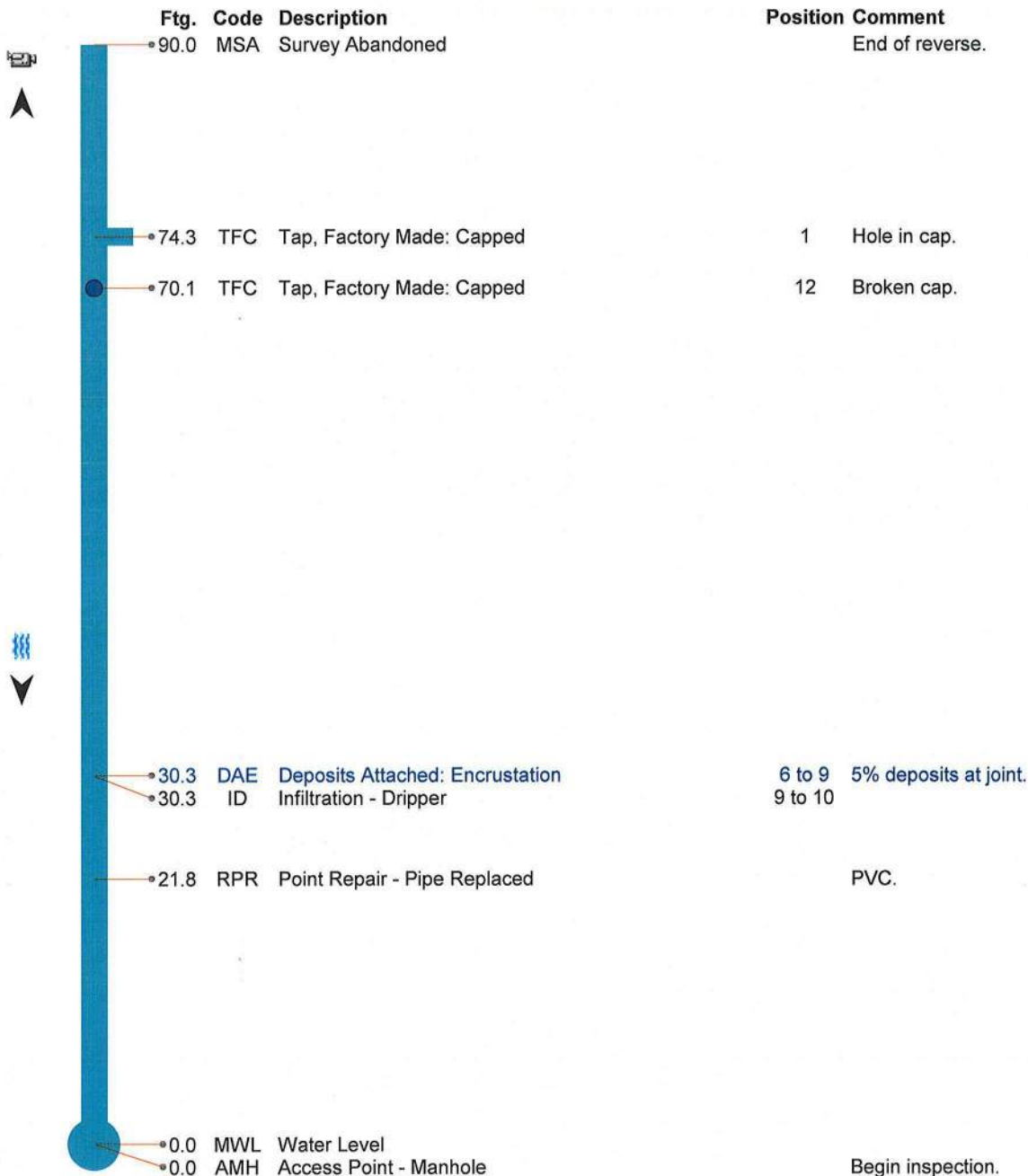


16281 Baseline Ave.
Shakopee, MN 55379
952.445.3173

[^]Note: Distances are indicated from the Downstream MH.

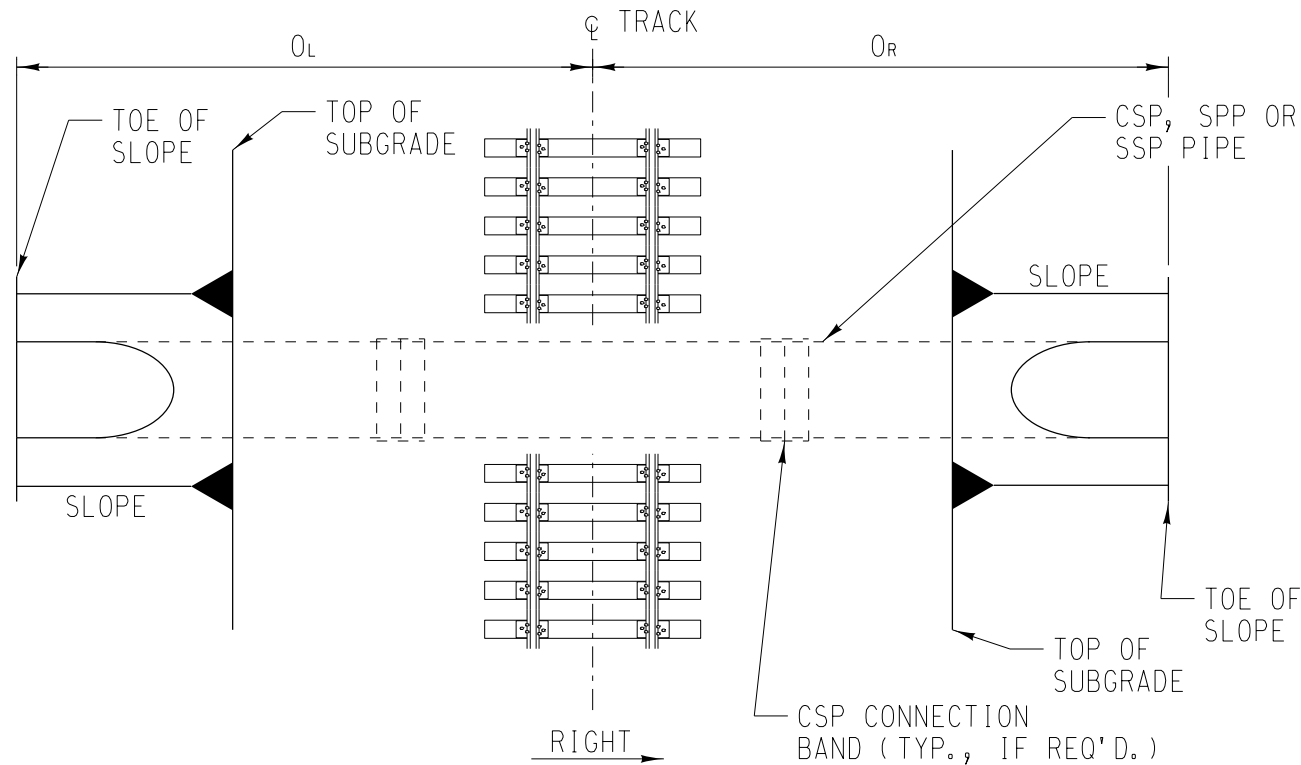
Closed Circuit Television Inspection

Customer City of Montgomery	Pipe Segment Ref. 37-38R	Upstream MH 37	Downstream MH 38	Size 18	Material Reinforced Concrete Pipe	Total Length 320
Surveyor's Name Shawn Blake	Certificate Number U-314-06020629	Street Address Oak Ave	Location Details			
Direction Upstream	Purpose Routine Assessment	Weather Light Rain	Date 03/24/2022	Sewer Use Stormwater	Length Surveyed 90	
Additional Information Montgomery storm 2022						



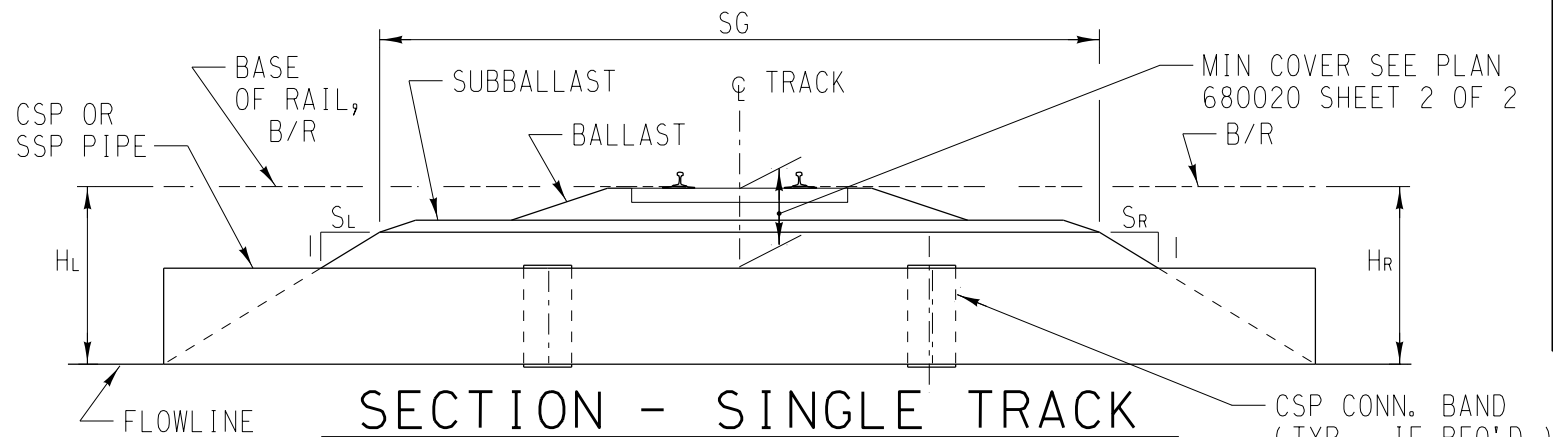
Appendix C: Supporting Materials

FILE NAME: P:\dgn\standards\Culverts (Pipe)\steel\pip_std.dgn



PLAN - SINGLE TRACK

SCALE: NONE



SECTION - SINGLE TRACK

SCALE: NONE

CULVERT LENGTH EQUATION:

$$PL = O_L + O_R = SG + (H_L - 2.0')S_L + (H_R - 2.0')S_R$$

(THIS EQUATION CALCULATES LENGTH OF CULVERT AT NEW EMBANKMENT)

KEY:

- H = AVERAGE HEIGHT - BASE OF RAIL TO FLOWLINE
H_L = HEIGHT - BASE OF RAIL TO FLOWLINE LEFT OF TRACK
H_R = HEIGHT - BASE OF RAIL TO FLOWLINE RIGHT OF TRACK
SG = WIDTH OF SUBGRADE = 2 SHOULDER + TRACK CENTER SPACING
S_L = SLOPE LEFT OF TRACK
S_R = SLOPE RIGHT OF TRACK
PL = PIPE LENGTH
O_L = OFFSET LEFT
O_R = OFFSET RIGHT

Assume SG = 30'

CULVERT PIPE LENGTH (PL) FOR STANDARD CROSS SECTIONS

H - B/R TO FLOWLINE (FT.)	SINGLE TRACK			13' TRACK CENTERS			20' TRACK CENTERS		
	SLOPE			SLOPE			SLOPE		
	1.5:1	2:1	3:1	1.5:1	2:1	3:1	1.5:1	2:1	3:1
4	36	38	42	50	52	56	58	60	64
5	40	42	48	52	56	62	60	64	70
6	42	46	54	56	60	68	64	68	76
7	46	50	60	58	64	74	66	72	82
8	48	54	66	62	68	80	70	76	88
9	52	58	72	64	72	86	72	80	94
10	54	62	78	68	76	92	76	84	100
11	58	66	84	70	80	98	78	88	106
12	60	70	90	74	84	104	82	92	112
13	64	74	96	76	88	110	84	96	118
14	66	78	102	80	92	116	88	100	124
15	70	82	108	82	96	122	90	104	130
16	72	86	114	86	100	128	94	108	136
17	76	90	120	88	104	134	96	112	142
18	78	94	126	92	108	140	100	116	148
19	82	98	132	94	112	146	102	120	154
20	84	102	138	98	116	152	106	124	160
21	88	106	144	100	120	158	108	128	166
22	90	110	150	104	124	164	112	132	172
23	94	114	156	106	128	170	114	136	178
24	96	118	162	110	132	176	118	140	184
25	100	122	168	112	136	182	120	144	190
26	102	126	174	116	140	188	124	148	196

LENGTHS ARE ROUNDED TO THE NEAREST EVEN NUMBER OF FEET
TABLE ASSUMES 15'-0" SHOULDER FOR SINGLE TRACK AND 13' CENTERS,
15'-6" SHOULDER FOR 20' TRACK CENTERS,
ADD 10' FOR EACH ACCESS ROAD,
LENGTHS SHOWN ARE FOR STANDARD CROSS SECTIONS FOR TANGENT TRACK,
ADD 2' TO PIPE LENGTH (TO OUTSIDE OF CURVE) IF SUPER ELEVATION IS 2" OR GREATER.

REVISIONS			DESIGN BY: CLJ	DRAWN BY: KDM	CHECKED BY: CLJ
DATE	LTR.	DESCRIPTION	APPROVED: <i>George J. Moyn</i> 4/4/08 UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN		
02/12	A	ADDED NOTE TO CULV. LENGTH EQ.			
/					
/					
/					
/					

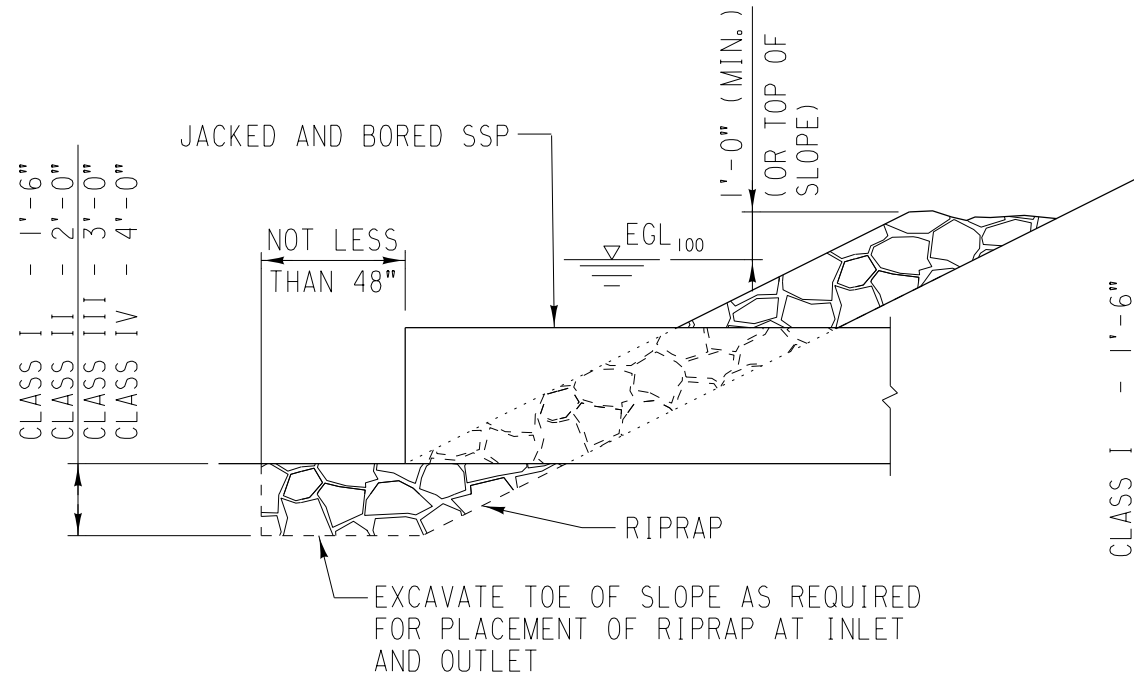


BRIDGE
STANDARDS

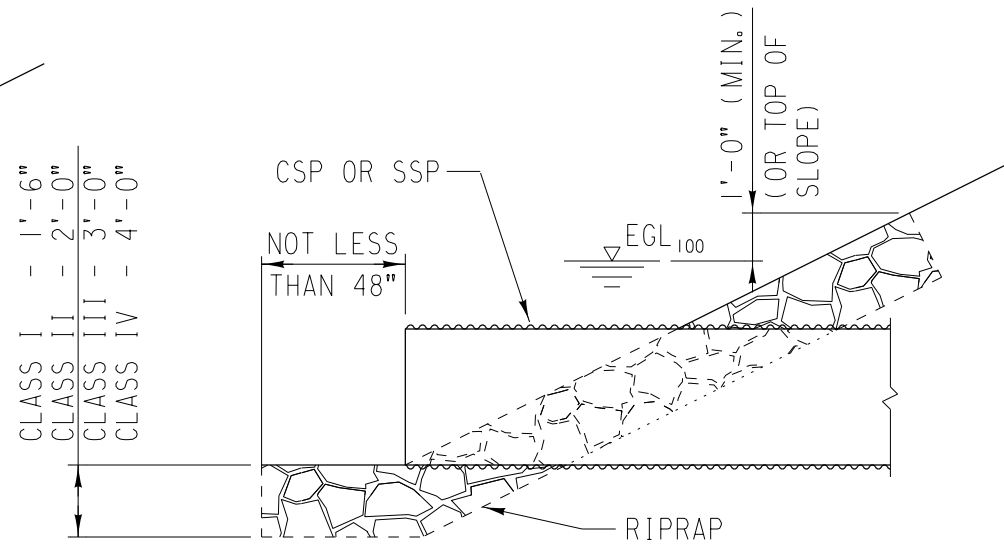
GENERAL NOTES AND
DETAILS FOR ROUND
STEEL PIPE CULVERTS

FILE OWNER: UPRR	DATE:
PLAN NO.: 680000	SHEET: 1 OF 3

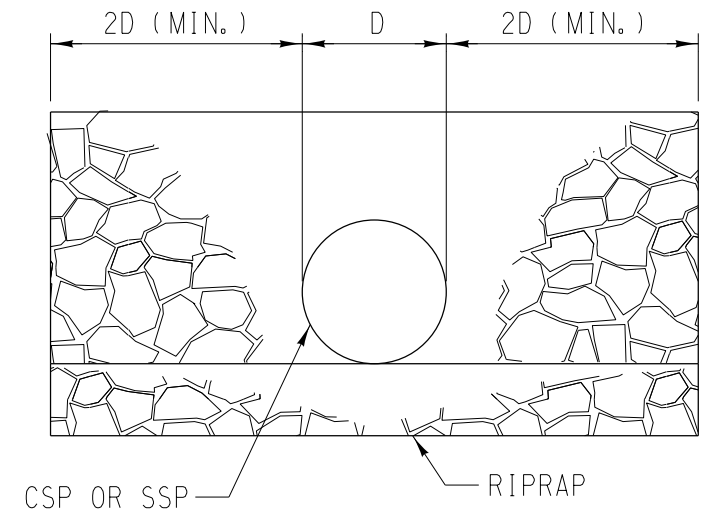
FILE NAME: P:*dgn*standards\Culverts (Pipe)*steel\pip_std.dgn



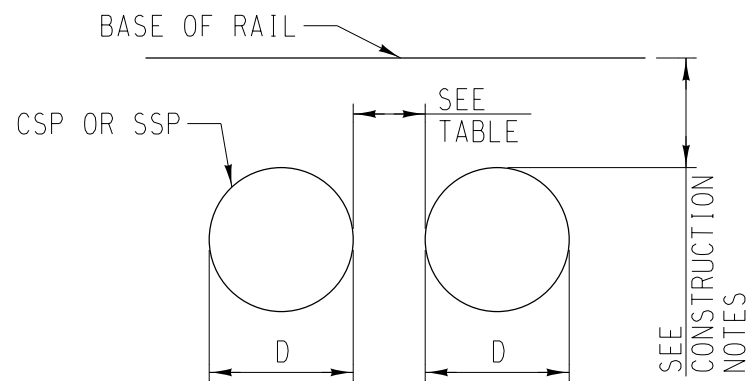
RIPRAP - SECTION
SCALE: (EXISTING EMBANKMENT) NONE



RIPRAP - SECTION
SCALE: (NEW EMBANKMENT) NONE

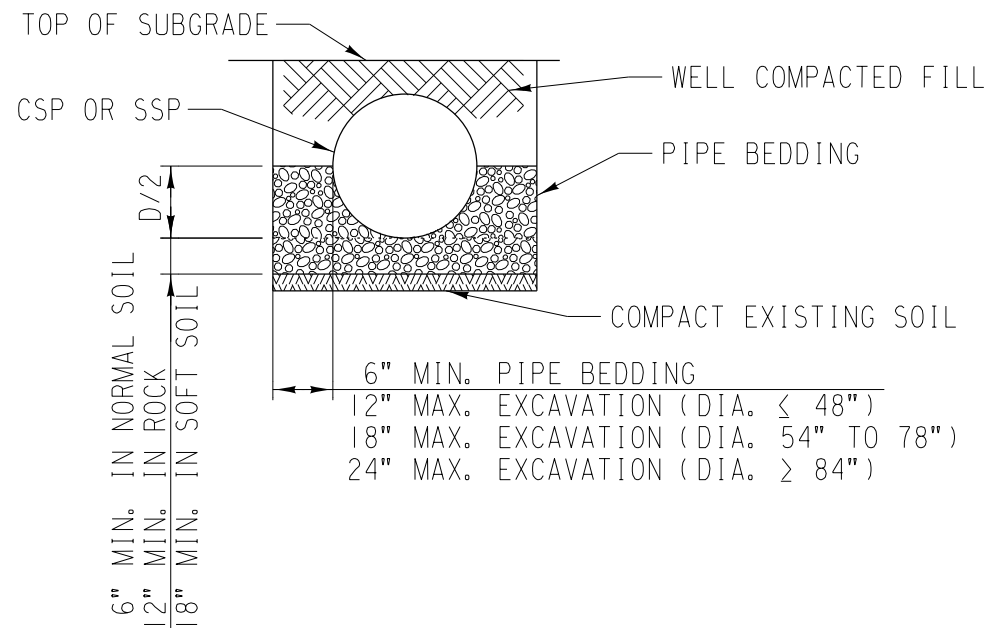


RIPRAP - ELEVATION
SCALE: NONE



MINIMUM PIPE SPACING AND COVER
SCALE: NONE

SPACING CHART	
PIPE DIAMETER	MIN. SPACING BETWEEN PIPES
12" to 24"	12"
24" to 96"	D/2
96" OR MORE	48"



EXCAVATION AND FILL LIMITS
SCALE: NONE

REVISIONS			DESIGN BY: CLJ	DRAWN BY: KDM	CHECKED BY: CLJ
DATE	LTR.	DESCRIPTION	APPROVED: <i>George J. Moyn</i> 4/4/08 UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN		
02/12	A	ADDED RIPRAP SECTION			
/					
/					
/					
/					



BRIDGE STANDARDS

DETAILS FOR ROUND STEEL PIPE CULVERTS

FILE OWNER: UPRR	DATE:
PLAN NO.: 680000	SHEET: 2 OF 3

CORROSION PROTECTION:

If a proposed turnout is located within 500 feet of a bridge, refer to Section 1.30 – Structures. Turnouts shall not be installed within 100' of a rail bridge.

Resources:

- A. UPRR Industrial Track Specifications, Section 4.80 – Track
- B. UPRR Std. Dwg.:
 - i. 0017 – Facing Point Turnout Arrangement
 - ii. 0050 – Design Data for Turnout Layout
 - iii. 0080 – Standard Turnout Applications
 - iv. 5001 – Nomenclature for Most Turnouts
- C. AREMA Manual Chapter 5, Part 3.4 – Speeds of Trains through Level Turnouts

3.30 DERAILS

Derail application, type, and location of proposed derails shall correspond with *UPRR Std. Dwg. 2000*. Power operated derails with special ties and components may be required if a POTO is used.

Resources:

- A. UPRR Industrial Track Specifications, Section 4.80 – Track
- B. UPRR Std. Dwg. 2000 – Permanent Derail Installation Instructions

3.40 DRAINAGE

A comprehensive hydrologic and hydraulic Drainage Study is required when the following occurs:

- A. Additional runoff is discharged towards UPRR's right-of-way.
- B. A UPRR drainage structure is being added, removed, or modified.
- C. A drainage structure is being added, removed, or modified upstream or downstream of a UPRR structure.

The Drainage Study and all drainage improvement designs, plans, drawings, and exhibits shall be submitted through UPRR's EDS system under the "Structures" category.

The Drainage Study for UPRR owned or maintained track must include, but is not limited to:

- A. Top of rail elevations.
- B. The 50-year and 100-year water surface elevations for both the existing and proposed conditions.
- C. Flow rates for both events.
- D. Location map of drainage area(s), including UPRR mileposts and engineering stations.
- E. Size of the drainage area(s).
- F. Location of the water flowing along the right-of-way.
- G. Location where the water leaves the right-of-way.

The following UPRR criteria for sizing bridges and culverts on UPRR owned or maintained track is used to determine the adequacy of existing and proposed structures:

- A. The 50-year flood elevation shall not come into contact with the crown of the culvert or the low chord of the bridge, whichever is applicable.
- B. The 100-year flood elevation shall not exceed the track subgrade elevation at the structure.
- C. Both UPRR's criteria and local criteria shall be evaluated, and the more restrictive shall be adopted in sizing the drainage structure or replacement.
- D. If the existing structure opening more than satisfies the foregoing criteria, a smaller section which satisfies the criteria set forth above may be recommended.

- E. Minimum preferred culvert diameter allowed under UPRR owned or maintained track is 36 inches (36").
- F. The use of any drainage culverts other than helical lockseam corrugated metal pipe (CMP) or smooth steel pipe (SSP) will require prior acceptance by UPRR before installation.
- G. The use of elliptical or arch pipe is strictly prohibited.

If an existing bridge or culvert does not meet design criteria, UPRR will consider and evaluate alternatives such as relief bridges on the overbank floodplain, raising track grades, or other measures. All drainage structures shall be designed, at a minimum, to meet the latest edition of the AREMA Manual. If the drainage structure falls within a FEMA-designated floodplain or floodway, the water surface elevation for a 100-year event shall be determined, regardless of line classification.

The Drainage Study for Industry owned or maintained track must include, but is not limited to:

- A. Top of rail elevations.
- B. The 25-year and 50-year water surface elevations for both the existing and proposed conditions.
- C. Flow rates for both events.
- D. Location map of drainage area(s), including UPRR mileposts and engineering stations.
- E. Size of the drainage area(s).
- F. Location of the water flowing along the right-of-way.
- G. Location where the water leaves the right-of-way.

The following UPRR criteria for sizing bridges and culverts on Industry owned or maintained track is used to determine the adequacy of existing and proposed structures:

- A. The 25-year flood elevation shall not come into contact with the crown of the culvert or the low chord of the bridge, whichever is applicable.
- B. The 50-year flood elevation shall not exceed the track subgrade elevation at the structure.
- C. Both UPRR's criteria and local criteria shall be evaluated, and the more restrictive shall be adopted in sizing the drainage structure or replacement.
- D. If the existing structure opening more than satisfies the foregoing criteria, a smaller section which satisfies the criteria set forth above may be recommended.
- E. Minimum preferred culvert diameter allowed under Industry owned or maintained track is 30 inches (30").
- F. The use of any drainage culverts other than CMP or SSP will require prior acceptance by UPRR before installation.
- G. The use of elliptical or arch pipe is strictly prohibited.

Resources:

- A. UPRR Industrial Track Specifications, Section 4.40 – Shoring
- B. UPRR Bridge Std. Plan:
 - i. 680000 – General Notes and Details for Round Steel Pipe Culverts
 - ii. 680010 – Construction Notes and Table for Smooth Steel Pipe Culverts
 - iii. 680021 – Construction Notes Corrugated Metal Pipe Culverts
 - iv. 680030 – Construction Notes and Table for Structural Plate Pipe Culverts
- C. UPRR General Conditions and Specifications:
 - i. Section 33 42 00 – Culverts
 - ii. Section 33 42 16 – Reinforced Concrete Box Culverts
 - iii. Section 33 42 20 – Smooth Steel Pipe Culverts
 - iv. Section 31 37 00 – Rip Rap
 - v. Section 40 05 39 – Reinforced Concrete Pipe
- D. UPRR Engineering Track Maintenance Field Handbook:
 - i. Section 1.2 – Drainage
 - ii. Section 1.3 – Surface Drainage
 - iii. Section 1.4 – Subsurface Drainage