

**HYDRAULIC REPORT**  
**FOR**  
*Wilshire Hills III*  
*Lee's Summit, Missouri*

*PREPARED FOR:*  
WILSHIRE HILLS III L.P.  
206 PEACH WAY  
COLUMBIA, MO 54202

JUNE 30, 2023  
REVISED FEBRUARY 23, 2024

*PREPARED BY:*  
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## TABLE OF CONTENTS

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TABLE OF CONTENTS.....	2
1 Introduction .....	1
2 Design.....	1
2.1 Erosion & Sediment Control Design.....	1
2.2 Stormwater Detention Design .....	1
2.3 Storm Sewer Design.....	2
3 Conclusion.....	2
Appendix A: Storm Sewer Calculations.....	A
Appendix B: Storm Sewer Map .....	B



# 1 INTRODUCTION

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The project consists of the construction of a 50-unit, three-story, senior living building and associated parking lots, sewer, and utility systems. Offsite work will be completed before the site work in a public improvement phase. This included the extension of Wilshire Drive as well as a large regional detention basin for future development and Phase III. Soil disturbing activities will include clearing and grubbing, installing erosion and sediment controls, grading, installation of underground utilities, building foundations, parking lot construction, and preparation for final seeding, mulching, and landscaping. The stormwater design follows Lee's Summits stormwater requirements.

# 2 DESIGN

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## 2.1 Erosion & Sediment Control Design

*Design Standard(s):*

- *Missouri Department of Natural Resources (MDNR) Protecting Water Quality Field Guide, 2011*

The Civil Site Plans and project Storm Water Pollution and Prevention Plan (SWPPP) indicate erosion and sediment control Best Management Practices (BMPs) to be utilized throughout construction activities. The Preliminary Erosion Control requires the installation of 4 stormwater inlets before mass grading of the site. Th diversion dikes separate this onsite flow to less than 0.5 acres per inlet. With the delineated inlet sediment control, this provides an adequate BMP for the site.

## 2.2 Stormwater Detention Design

*Design Standard(s):*

- *Lee's Summit, Missouri Stormwater Discharge Control Regulations (Code of Ordinance Chapter 34 Article 3)*
- *APWA Section 5300*
- *LS Section 5600 – Storm Drainage Systems and Facilities (revised July 2020)*

The regional detention basin was adequately sized to provide detention for the Phase III site, including its offsite bypass. The Stormwater Report for the regional detention basin dated February 16, 2024, outlines the allotted impervious area for each site. The regional detention report allowed for 1.25 acres of impervious area in the designed space, this is outlined in Table 1.



Table 1: Future Land Development

Wilshire Hills	Total Area (acres)	Designed Imperious (acres)	Designed CN	Current Impervious (acres)	Remaining Impervious (acres)
<b>Lot 5 (Wilshire Hills III + Bypass)</b>	2.54	1.25	87	1.18	0.07
<b>Northeast Area (includes Lot 6)</b>	5.39	4	92		4
<b>West Area</b>	3.2	2.5	92	0.82	1.68
<b>Southwest Area</b>	1.6	1.2	92	0.2	1
<b>Southeast Area</b>	6.27	4.9	93	0.09	4.81
<b>Total</b>	<b>19</b>	<b>13.85</b>	<b>91</b>	<b>2.29</b>	<b>11.56</b>

The shared detention basin is sized to serve each of these sites. Wilshire Hills Phase III will use 1.25 of the allowed impervious area. The basin meets the APWA water quality standards for the site area. The basin is also sized to bypass the offsite area coming through the site.

## 2.3 Storm Sewer Design

### *Design Standard(s):*

- *Lee's Summit, Missouri Stormwater Discharge Control Regulations (Code of Ordinance Chapter 34 Article 3)*
- *APWA Section 5300*
- *LS Section 5600 – Storm Drainage Systems and Facilities (revised July 2020)*

All onsite storm sewers for this project will be private and have been designed for the 25-year storm event. The culvert pipe with FES 40 and 41 will be located in the City right-of-way and will be public. Appendix C includes HydraFlow storm sewer calculations. The calculations are based on the Storm Sewer Drainage Area Map in Appendix D.

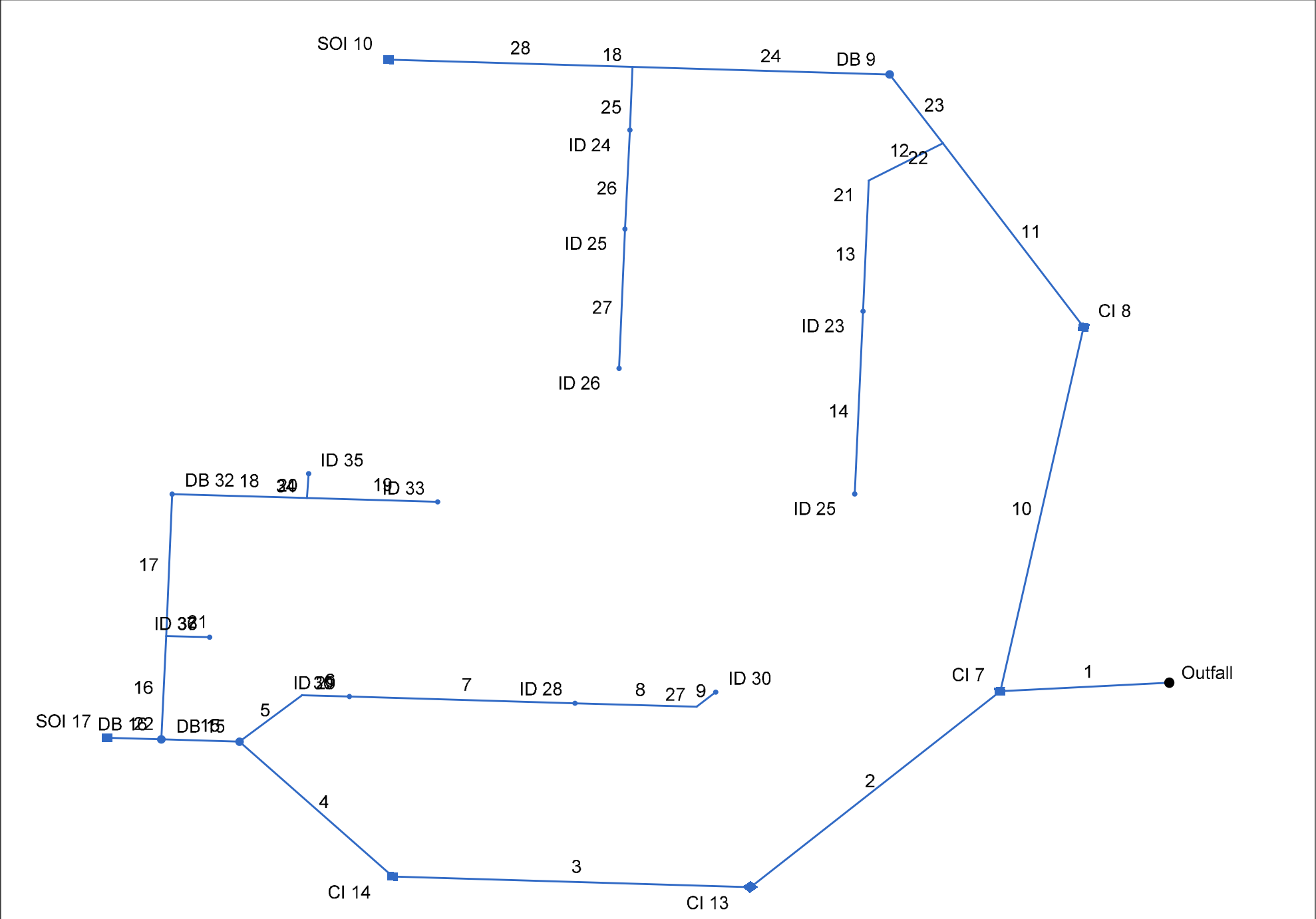
## 3 CONCLUSION

Erosion and sediment control has been designed per requirements. The site meets storm water detention requirements for developments within the City of Lee's Summit. The storm sewers have been designed to convey the 25-year design storm. All of the City of Lee's Summit stormwater requirements have been met.



## APPENDIX A: STORM SEWER CALCULATIONS

# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Storm Sewers- SITE ONLY- 25 Year Storm.stm	Number of lines: 28	Date: 6/29/2023
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# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	7	10.91	24	Cir	50.767	923.93	924.18	0.492	925.24	925.36	n/a	925.36 j	End	Combination
2	13	8.72	24	Cir	104.692	927.20	928.25	1.003	928.02	929.30	0.48	929.30	1	Combination
3	14	8.23	18	Cir	107.573	928.45	929.53	1.004	929.39	930.64	n/a	930.64	2	Combination
4	15	7.66	18	Cir	68.017	929.73	930.41	1.000	930.64	931.48	0.85	931.48	3	DropGrate
5	28	0.77	8	Cir	25.460	932.48	932.73	0.982	932.85	933.15	n/a	933.15	4	None
6	28A	0.77	8	Cir	14.228	932.73	932.88	1.054	933.15	933.30	n/a	933.30	5	DropGrate
7	29	0.53	8	Cir	68.000	932.88	933.56	1.000	933.30	933.90	n/a	933.90 j	6	DropGrate
8	30	0.30	8	Cir	36.408	933.56	933.92	0.989	933.90	934.17	n/a	934.17 j	7	None
9	30A	0.30	8	Cir	7.959	933.92	934.00	1.005	934.17	934.25	0.09	934.25	8	DropGrate
10	8	2.03	15	Cir	137.771	924.88	925.57	0.501	925.44	926.14	n/a	926.14	1	Combination
11	9	2.03	10	Cir	80.481	925.88	926.28	0.497	926.71*	927.30*	0.22	927.52	10	None
12	20	0.31	8	Cir	26.198	926.58	932.39	22.177	927.52	932.65	n/a	932.65 j	11	None
13	20A	0.31	8	Cir	48.719	932.39	932.88	1.006	932.65	933.14	0.05	933.14	12	DropGrate
14	21	0.31	8	Cir	68.041	932.88	933.56	0.999	933.14	933.82	0.10	933.82	13	DropGrate
15	16	7.00	18	Cir	23.547	930.41	930.65	1.019	931.48	931.67	n/a	931.67 j	4	DropGrate
16	32	0.84	10	Cir	38.493	930.65	931.03	0.987	931.67	931.71	0.05	931.76	15	None
17	32A	0.75	10	Cir	52.854	931.04	931.56	0.984	931.76	931.94	n/a	931.94 j	16	DropGrate
18	33	0.54	8	Cir	40.521	931.56	931.97	1.012	931.94	932.31	n/a	932.31 j	17	None
19	33A	0.48	8	Cir	39.195	931.97	932.36	0.995	932.31	932.68	n/a	932.68 j	18	DropGrate
20	35	0.07	8	Cir	9.078	931.97	932.06	0.992	932.31	932.18	n/a	932.18	18	DropGrate
21	37	0.09	8	Cir	13.065	931.04	932.00	7.348	931.76	932.14	n/a	932.14 j	16	DropGrate
22	17	6.30	15	Cir	16.220	930.65	930.81	0.986	931.67	931.82	n/a	931.82 j	15	DropCurb
23	9A	1.81	10	Cir	30.034	926.28	926.43	0.499	927.52*	927.69*	0.22	927.92	11	DropGrate
24	10	1.76	10	Cir	77.344	926.43	926.82	0.504	927.92*	928.34*	0.16	928.50	23	None

Project File: Storm Sewers- SITE ONLY- 25 Year Storm.stm

Number of lines: 28

Run Date: 2/23/2024

NOTES: Return period = 25 Yrs. ; \*Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	24	0.85	8	Cir	23.493	927.00	930.45	14.685	928.50	930.89	n/a	930.89 j	24	DropGrate
26	25	0.85	8	Cir	36.839	930.45	930.82	1.004	930.89	931.26	0.10	931.26	25	DropGrate
27	26	0.46	8	Cir	51.897	930.82	931.34	1.002	931.26	931.66	n/a	931.66 j	26	DropGrate
28	10A	1.17	10	Cir	73.277	926.82	927.19	0.505	928.50*	928.68*	0.07	928.75	24	DropCurb
Project File: Storm Sewers- SITE ONLY- 25 Year Storm.stm									Number of lines: 28			Run Date: 2/23/2024		
NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.														



# Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	50.767	0.03	3.63	0.90	0.03	1.89	5.0	16.6	5.8	10.91	17.19	5.32	24	0.49	923.93	924.18	925.24	925.36	929.66	934.90	7
2	1	104.692	0.15	2.45	0.57	0.09	1.51	5.0	16.6	5.8	8.72	24.54	6.17	24	1.00	927.20	928.25	928.02	929.30	934.90	934.90	13
3	2	107.573	0.21	2.30	0.47	0.10	1.42	5.0	16.6	5.8	8.23	11.40	6.45	18	1.00	928.45	929.53	929.39	930.64	934.90	934.90	14
4	3	68.017	0.06	2.09	0.32	0.02	1.32	5.0	16.6	5.8	7.66	11.37	6.25	18	1.00	929.73	930.41	930.64	931.48	934.90	935.50	15
5	4	25.460	0.00	0.12	0.00	0.00	0.09	0.0	5.0	8.2	0.77	1.30	3.63	8	0.98	932.48	932.73	932.85	933.15	935.50	936.50	28
6	5	14.228	0.04	0.12	0.72	0.03	0.09	5.0	5.0	8.2	0.77	1.34	3.38	8	1.05	932.73	932.88	933.15	933.30	936.50	936.50	28A
7	6	68.000	0.04	0.08	0.72	0.03	0.06	5.0	5.0	8.2	0.53	1.31	2.65	8	1.00	932.88	933.56	933.30	933.90	936.50	936.50	29
8	7	36.408	0.00	0.04	0.00	0.00	0.04	0.0	5.0	8.2	0.30	1.30	2.05	8	0.99	933.56	933.92	933.90	934.17	936.50	936.40	30
9	8	7.959	0.04	0.04	0.90	0.04	0.04	5.0	5.0	8.2	0.30	1.31	2.46	8	1.01	933.92	934.00	934.17	934.25	936.40	936.50	30A
10	1	137.771	0.00	1.15	0.00	0.00	0.35	5.0	16.6	5.8	2.03	4.95	3.79	15	0.50	924.88	925.57	925.44	926.14	934.90	933.75	8
11	10	80.481	0.00	1.15	0.00	0.00	0.35	0.0	16.6	5.8	2.03	1.67	3.73	10	0.50	925.88	926.28	926.71	927.30	933.75	934.00	9
12	11	26.198	0.00	0.05	0.00	0.00	0.04	0.0	5.0	8.2	0.31	6.16	1.70	8	22.18	926.58	932.39	927.52	932.65	934.00	936.50	20
13	12	48.719	0.00	0.05	0.00	0.00	0.04	0.0	5.0	8.2	0.31	1.31	2.50	8	1.01	932.39	932.88	932.65	933.14	936.50	936.50	20A
14	13	68.041	0.05	0.05	0.76	0.04	0.04	5.0	5.0	8.2	0.31	1.31	2.50	8	1.00	932.88	933.56	933.14	933.82	936.50	936.50	21
15	4	23.547	0.06	1.91	0.32	0.02	1.21	5.0	16.6	5.8	7.00	11.49	5.32	18	1.02	930.41	930.65	931.48	931.67	935.50	934.90	16
16	15	38.493	0.00	0.20	0.00	0.00	0.10	0.0	5.0	8.2	0.84	2.36	1.66	10	0.99	930.65	931.03	931.67	931.71	934.90	936.00	32
17	16	52.854	0.06	0.18	0.43	0.03	0.09	5.0	5.0	8.2	0.75	2.35	2.29	10	0.98	931.04	931.56	931.76	931.94	936.00	935.90	32A
18	17	40.521	0.00	0.12	0.00	0.00	0.07	0.0	5.0	8.2	0.54	1.32	2.79	8	1.01	931.56	931.97	931.94	932.31	935.90	935.40	33
19	18	39.195	0.08	0.08	0.72	0.06	0.06	5.0	5.0	8.2	0.48	1.31	2.73	8	1.00	931.97	932.36	932.31	932.68	935.40	936.30	33A
20	18	9.078	0.04	0.04	0.20	0.01	0.01	5.0	5.0	8.2	0.07	1.30	0.99	8	0.99	931.97	932.06	932.31	932.18	935.40	935.40	35
21	16	13.065	0.02	0.02	0.55	0.01	0.01	5.0	5.0	8.2	0.09	3.55	1.01	8	7.35	931.04	932.00	931.76	932.14	936.00	936.50	37
22	15	16.220	1.65	1.65	0.66	1.09	1.09	16.6	16.6	5.8	6.30	6.95	5.89	15	0.99	930.65	930.81	931.67	931.82	934.90	952.50	17
Project File: Storm Sewers- SITE ONLY- 25 Year Storm.stm																Number of lines: 28				Run Date: 2/23/2024		
NOTES:Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82; Return period =Yrs. 25 ; Pipe travel time suppressed. ; c = cir e = ellip b = box																						

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
23	11	30.034	0.01	1.10	0.90	0.01	0.31	5.0	16.6	5.8	1.81	1.68	3.32	10	0.50	926.28	926.43	927.52	927.69	934.00	934.00	9A
24	23	77.344	0.00	1.09	0.00	0.00	0.30	0.0	16.6	5.8	1.76	1.68	3.23	10	0.50	926.43	926.82	927.92	928.34	934.00	934.00	10
25	24	23.493	0.00	0.13	0.00	0.00	0.10	5.0	5.0	8.2	0.85	5.01	2.97	8	14.69	927.00	930.45	928.50	930.89	934.00	936.30	24
26	25	36.839	0.06	0.13	0.78	0.05	0.10	5.0	5.0	8.2	0.85	1.31	3.51	8	1.00	930.45	930.82	930.89	931.26	936.30	936.30	25
27	26	51.897	0.07	0.07	0.80	0.06	0.06	5.0	5.0	8.2	0.46	1.31	2.36	8	1.00	930.82	931.34	931.26	931.66	936.30	936.30	26
28	24	73.277	0.96	0.96	0.21	0.20	0.20	16.6	16.6	5.8	1.17	1.69	2.14	10	0.50	926.82	927.19	928.50	928.68	934.00	930.50	10A
Project File: Storm Sewers- SITE ONLY- 25 Year Storm.stm																Number of lines: 28				Run Date: 2/23/2024		
NOTES:Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82; Return period =Yrs. 25 ; Pipe travel time suppressed. ; c = cir e = ellip b = box																						

# Inlet Report

Line No	Inlet ID	Q = CIA	Q carry	Q capt	Q Byp	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
		(cfs)	(cfs)	(cfs)	(cfs)		Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CI 7	0.22	0.00	0.22	0.00	Comb	6.0	2.93	1.60	2.76	1.46	Sag	1.50	0.020	0.020	0.013	0.07	3.45	0.07	3.45	0.0	Off
2	CI 13	0.71	0.00	0.71	0.00	Comb	6.0	2.93	1.60	2.76	1.46	Sag	1.50	0.020	0.020	0.013	0.13	6.60	0.13	6.60	0.0	Off
3	CI 14	0.81	0.00	0.81	0.00	Comb	6.0	2.93	1.60	2.76	1.46	Sag	1.50	0.020	0.020	0.013	0.14	7.19	0.14	7.19	0.0	Off
4	DB 15	0.16	0.00	0.16	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.06	6.58	0.06	6.58	0.0	Off
5	30	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
6	ID 29	0.24	0.00	0.24	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.07	8.31	0.07	8.31	0.0	Off
7	ID 28	0.24	0.00	0.24	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.07	8.31	0.07	8.31	0.0	Off
8	27	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
9	ID 30	0.30	0.00	0.30	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.08	9.48	0.08	9.48	0.0	Off
10	CI 8	0.00	0.00	0.00	0.00	Comb	6.0	2.93	1.60	2.76	1.46	Sag	1.50	0.020	0.020	0.013	0.00	0.01	0.00	0.01	0.0	Off
11	22	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
12	21	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
13	ID 23	0.00	0.00	0.00	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.00	1.00	0.00	1.00	0.0	Off
14	ID 25	0.31	0.00	0.31	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.09	9.79	0.09	9.79	0.0	Off
15	DB 16	0.16	0.00	0.16	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.06	6.58	0.06	6.58	0.0	Off
16	36	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
17	DB 32	0.21	0.00	0.21	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.07	7.79	0.07	7.79	0.0	Off
18	34	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
19	ID 33	0.48	0.00	0.48	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.12	12.60	0.12	12.60	0.0	Off
20	ID 35	0.07	0.00	0.07	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.03	4.11	0.03	4.11	0.0	Off
21	ID 37	0.09	0.00	0.09	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.04	4.85	0.04	4.85	0.0	Off
22	SOI 17	6.30	0.00	6.30	0.00	DrCrb	11.0	12.00	0.00	0.00	0.00	Sag	0.00	0.020	0.020	0.013	0.31	15.63	0.31	15.63	0.0	Off
23	DB 9	0.07	0.00	0.07	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	2.00	0.020	0.020	0.013	0.03	5.36	0.03	5.36	0.0	Off

Project File: Storm Sewers- SITE ONLY- 25 Year Storm.stm

Number of lines: 28

Run Date: 2/23/2024

NOTES: Inlet N-Values = 0.016; Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82; Return period = 25 Yrs. ; \* Indicates Known Q added. All curb inlets are Horiz throat.

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
24	18	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
25	ID 24	0.00	0.00	0.00	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.00	1.00	0.00	1.00	0.0	Off
26	ID 25	0.39	0.00	0.39	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.10	11.10	0.10	11.10	0.0	Off
27	ID 26	0.46	0.00	0.46	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.11	12.39	0.11	12.39	0.0	Off
28	SOI 10	1.17	0.00	1.17	0.00	DrCrb	4.0	1.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.59	inf.00	0.59	inf.00	0.0	Off
Project File: Storm Sewers- SITE ONLY- 25 Year Storm.stm														Number of lines: 28				Run Date: 2/23/2024				
NOTES: Inlet N-Values = 0.016; Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.																						

# Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	Travel Time (min)
1	7	User																		5.00
2	13	User																		5.00
3	14	User																		5.00
4	15	User																		5.00
5	28	User																		0.00
6	28A	User																		5.00
7	29	User																		5.00
8	30	User																		0.00
9	30A	User																		5.00
10	8	User																		5.00
11	9	User																		0.00
12	20	User																		0.00
13	20A	User																		0.00
14	21	User																		5.00
15	16	User																		5.00
16	32	User																		0.00
17	32A	User																		5.00
18	33	User																		0.00
19	33A	User																		5.00
20	35	User																		5.00
21	37	User																		5.00
22	17	User																		16.60
23	9A	User																		5.00
24	10	User																		0.00
Project File: Storm Sewers- SITE ONLY- 25 Year Storm.stm					Min. Tc used for intensity calculations = 5 min							Number of lines: 28				Date: 2/23/2024				

# Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	Travel Time (min)
25	24	User																		5.00
26	25	User																		5.00
27	26	User																		5.00
28	10A	User																		16.60
Project File: Storm Sewers- SITE ONLY- 25 Year Storm.stm					Min. Tc used for intensity calculations = 5 min							Number of lines: 28				Date: 2/23/2024				

# Hydraulic Grade Line Computations

Line	Size  (in)	Q  (cfs)	Downstream								Len  (ft)	Upstream								Check		JL coeff  (K)	Minor loss  (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
1	24	10.91	923.93	925.24	1.31	1.93	5.00	0.49	925.73	0.000	50.767	924.18	925.36 j	1.18**	1.93	5.64	0.49	925.86	0.000	0.000	n/a	1.50	n/a
2	24	8.72	927.20	928.02	0.82*	1.22	7.14	0.42	928.45	0.000	104.692	928.25	929.30	1.05**	1.68	5.20	0.42	929.72	0.000	0.000	n/a	1.15	0.48
3	18	8.23	928.45	929.39	0.94*	1.17	7.02	0.54	929.93	0.000	107.573	929.53	930.64	1.11**	1.40	5.87	0.54	931.18	0.000	0.000	n/a	1.13	n/a
4	18	7.66	929.73	930.64	0.91	1.12	6.83	0.50	931.14	0.000	68.017	930.41	931.48	1.07**	1.35	5.67	0.50	931.98	0.000	0.000	n/a	1.70	0.85
5	8	0.77	932.48	932.85	0.37*	0.20	3.87	0.18	933.03	0.000	25.460	932.73	933.15	0.42**	0.23	3.38	0.18	933.32	0.000	0.000	n/a	0.75	n/a
6	8	0.77	932.73	933.15	0.42*	0.23	3.38	0.18	933.32	0.000	14.228	932.88	933.30	0.42**	0.23	3.38	0.18	933.47	0.000	0.000	n/a	0.50	n/a
7	8	0.53	932.88	933.30	0.42	0.18	2.34	0.14	933.43	0.000	68.000	933.56	933.90 j	0.34**	0.18	2.96	0.14	934.04	0.000	0.000	n/a	0.50	n/a
8	8	0.30	933.56	933.90	0.34	0.12	1.64	0.09	934.00	0.000	36.408	933.92	934.17 j	0.25**	0.12	2.46	0.09	934.27	0.000	0.000	n/a	0.75	0.07
9	8	0.30	933.92	934.17	0.25*	0.12	2.46	0.09	934.27	0.000	7.959	934.00	934.25	0.25**	0.12	2.46	0.09	934.35	0.000	0.000	n/a	1.00	0.09
10	15	2.03	924.88	925.44	0.56*	0.53	3.84	0.22	925.66	0.000	137.771	925.57	926.14	0.57**	0.54	3.75	0.22	926.36	0.000	0.000	n/a	1.08	n/a
11	10	2.03	925.88	926.71	0.83*	0.55	3.73	0.22	926.93	0.731	80.481	926.28	927.30	0.83	0.55	3.73	0.22	927.52	0.734	0.733	0.590	1.00	0.22
12	8	0.31	926.58	927.52	0.67	0.13	0.90	0.01	927.53	0.057	26.198	932.39	932.65 j	0.26**	0.13	2.50	0.10	932.75	0.561	0.309	n/a	0.86	0.08
13	8	0.31	932.39	932.65	0.26*	0.13	2.50	0.10	932.75	0.000	48.719	932.88	933.14	0.26**	0.13	2.50	0.10	933.24	0.000	0.000	n/a	0.50	0.05
14	8	0.31	932.88	933.14	0.26*	0.13	2.50	0.10	933.24	0.000	68.041	933.56	933.82	0.26**	0.13	2.50	0.10	933.92	0.000	0.000	n/a	1.00	0.10
15	18	7.00	930.41	931.48	1.07	1.28	5.19	0.46	931.94	0.000	23.547	930.65	931.67 j	1.02**	1.28	5.45	0.46	932.14	0.000	0.000	n/a	1.50	n/a
16	10	0.84	930.65	931.67	0.83	0.55	1.55	0.04	931.71	0.127	38.493	931.03	931.71	0.68	0.48	1.77	0.05	931.76	0.127	0.127	0.049	1.00	0.05
17	10	0.75	931.04	931.76	0.72	0.24	1.50	0.15	931.91	0.000	52.854	931.56	931.94 j	0.38**	0.24	3.08	0.15	932.09	0.000	0.000	n/a	1.50	n/a
18	8	0.54	931.56	931.94	0.38	0.18	2.61	0.14	932.08	0.000	40.521	931.97	932.31 j	0.34**	0.18	2.97	0.14	932.45	0.000	0.000	n/a	1.00	0.14
19	8	0.48	931.97	932.31	0.34	0.17	2.61	0.13	932.44	0.000	39.195	932.36	932.68 j	0.32**	0.17	2.84	0.13	932.81	0.000	0.000	n/a	1.00	0.13
20	8	0.07	931.97	932.31	0.34	0.04	0.36	0.04	932.36	0.000	9.078	932.06	932.18	0.12**	0.04	1.61	0.04	932.22	0.000	0.000	n/a	1.00	n/a
21	8	0.09	931.04	931.76	0.67	0.05	0.26	0.00	931.76	0.005	13.065	932.00	932.14 j	0.14**	0.05	1.76	0.05	932.18	0.564	0.284	n/a	1.00	0.05
22	15	6.30	930.65	931.67	1.02	1.06	5.86	0.54	932.22	0.000	16.220	930.81	931.82 j	1.01**	1.06	5.92	0.54	932.37	0.000	0.000	n/a	1.00	0.54

Project File: Storm Sewers- SITE ONLY- 25 Year Storm.stm

Number of lines: 28

Run Date: 2/23/2024

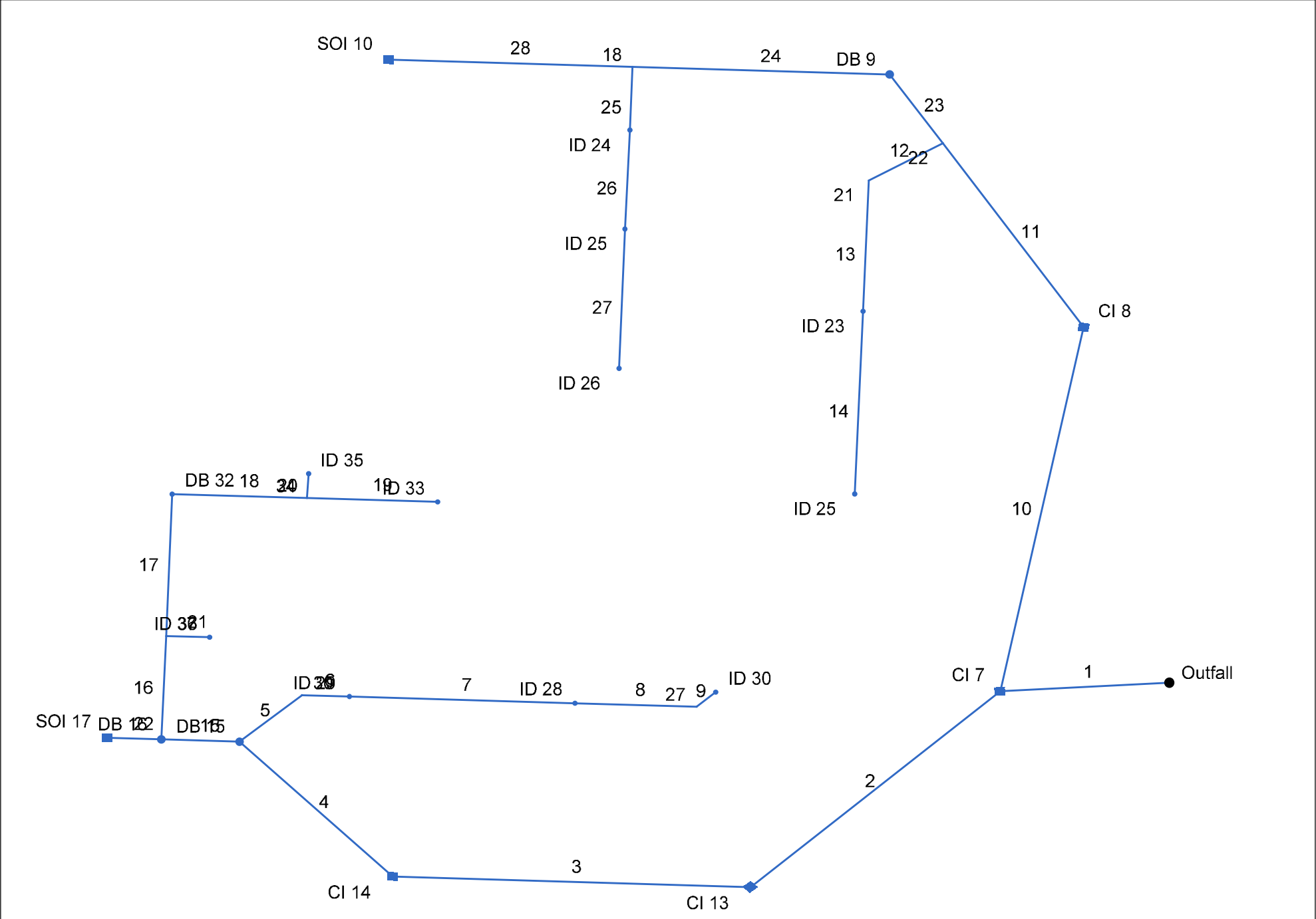
Notes: \* Normal depth assumed; \*\* Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

# Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream									Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)			
	(in)	(cfs)									(ft)											(K)	(ft)	
23	10	1.81	926.28	927.52	0.83	0.55	3.32	0.17	927.69	0.584	30.034	926.43	927.69	0.83	0.55	3.32	0.17	927.87	0.584	0.584	0.175	1.29	0.22	
24	10	1.76	926.43	927.92	0.83	0.55	3.23	0.16	928.08	0.551	77.344	926.82	928.34	0.83	0.55	3.23	0.16	928.50	0.551	0.551	0.426	1.00	0.16	
25	8	0.85	927.00	928.50	0.67	0.24	2.43	0.09	928.60	0.420	23.493	930.45	930.89 j	0.44**	0.24	3.51	0.19	931.08	0.723	0.571	n/a	0.50	0.10	
26	8	0.85	930.45	930.89	0.44*	0.24	3.51	0.19	931.08	0.000	36.839	930.82	931.26	0.44**	0.24	3.51	0.19	931.45	0.000	0.000	n/a	0.50	0.10	
27	8	0.46	930.82	931.26	0.44	0.16	1.91	0.12	931.38	0.000	51.897	931.34	931.66 j	0.32**	0.16	2.82	0.12	931.78	0.000	0.000	n/a	1.00	0.12	
28	10	1.17	926.82	928.50	0.83	0.55	2.14	0.07	928.58	0.242	73.277	927.19	928.68	0.83	0.55	2.14	0.07	928.75	0.242	0.242	0.177	1.00	0.07	
Project File: Storm Sewers- SITE ONLY- 25 Year Storm.stm														Number of lines: 28					Run Date: 2/23/2024					
Notes: * Normal depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box																								



# Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Storm Sewers- SITE ONLY- 100 Year Storm.stm	Number of lines: 28	Date: 6/29/2023
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# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	24	1.01	8	Cir	23.493	927.00	930.45	14.685	929.35	930.93	n/a	930.93 j	24	DropGrate
26	25	1.01	8	Cir	36.839	930.45	930.82	1.004	930.93	931.30	n/a	931.30	25	DropGrate
27	26	0.55	8	Cir	51.897	930.82	931.34	1.002	931.30	931.69	n/a	931.69 j	26	DropGrate
28	10A	1.42	10	Cir	73.277	926.82	927.19	0.505	929.35*	929.61*	0.10	929.72	24	DropCurb
Project File: Storm Sewers- SITE ONLY- 100 Year Storm.stm									Number of lines: 28			Run Date: 2/23/2024		
NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.														

# Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	50.767	0.03	3.63	0.90	0.03	1.89	5.0	16.6	7.0	13.24	17.19	6.04	24	0.49	923.93	924.18	925.24	925.50	929.66	934.90	7
2	1	104.692	0.15	2.45	0.57	0.09	1.51	5.0	16.6	7.0	10.59	24.54	6.55	24	1.00	927.20	928.25	928.12	929.41	934.90	934.90	13
3	2	107.573	0.21	2.30	0.47	0.10	1.42	5.0	16.6	7.0	9.99	11.40	6.89	18	1.00	928.45	929.53	929.54	930.75	934.90	934.90	14
4	3	68.017	0.06	2.09	0.32	0.02	1.32	5.0	16.6	7.0	9.29	11.37	6.71	18	1.00	929.73	930.41	930.76	931.59	934.90	935.50	15
5	4	25.460	0.00	0.12	0.00	0.00	0.09	0.0	5.0	9.8	0.92	1.30	3.83	8	0.98	932.48	932.73	932.89	933.18	935.50	936.50	28
6	5	14.228	0.04	0.12	0.72	0.03	0.09	5.0	5.0	9.8	0.92	1.34	3.63	8	1.05	932.73	932.88	933.18	933.33	936.50	936.50	28A
7	6	68.000	0.04	0.08	0.72	0.03	0.06	5.0	5.0	9.8	0.64	1.31	2.83	8	1.00	932.88	933.56	933.33	933.94	936.50	936.50	29
8	7	36.408	0.00	0.04	0.00	0.00	0.04	0.0	5.0	9.8	0.35	1.30	2.17	8	0.99	933.56	933.92	933.94	934.20	936.50	936.40	30
9	8	7.959	0.04	0.04	0.90	0.04	0.04	5.0	5.0	9.8	0.35	1.31	2.59	8	1.01	933.92	934.00	934.20	934.28	936.40	936.50	30A
10	1	137.771	0.00	1.15	0.00	0.00	0.35	5.0	16.6	7.0	2.47	4.95	2.27	15	0.50	924.88	925.57	926.34	926.50	934.90	933.75	8
11	10	80.481	0.00	1.15	0.00	0.00	0.35	0.0	16.6	7.0	2.47	1.67	4.52	10	0.50	925.88	926.28	926.71	927.58	933.75	934.00	9
12	11	26.198	0.00	0.05	0.00	0.00	0.04	0.0	5.0	9.8	0.37	6.16	1.85	8	22.18	926.58	932.39	927.90	932.67	934.00	936.50	20
13	12	48.719	0.00	0.05	0.00	0.00	0.04	0.0	5.0	9.8	0.37	1.31	2.63	8	1.01	932.39	932.88	932.67	933.16	936.50	936.50	20A
14	13	68.041	0.05	0.05	0.76	0.04	0.04	5.0	5.0	9.8	0.37	1.31	2.63	8	1.00	932.88	933.56	933.16	933.84	936.50	936.50	21
15	4	23.547	0.06	1.91	0.32	0.02	1.21	5.0	16.6	7.0	8.50	11.49	5.84	18	1.02	930.41	930.65	931.59	931.78	935.50	934.90	16
16	15	38.493	0.00	0.20	0.00	0.00	0.10	0.0	5.0	9.8	1.01	2.36	1.85	10	0.99	930.65	931.03	931.78	931.84	934.90	936.00	32
17	16	52.854	0.06	0.18	0.43	0.03	0.09	5.0	5.0	9.8	0.90	2.35	2.45	10	0.98	931.04	931.56	931.90	931.98	936.00	935.90	32A
18	17	40.521	0.00	0.12	0.00	0.00	0.07	0.0	5.0	9.8	0.65	1.32	2.50	8	1.01	931.56	931.97	932.23	932.35	935.90	935.40	33
19	18	39.195	0.08	0.08	0.72	0.06	0.06	5.0	5.0	9.8	0.57	1.31	2.46	8	1.00	931.97	932.36	932.50	932.71	935.40	936.30	33A
20	18	9.078	0.04	0.04	0.20	0.01	0.01	5.0	5.0	9.8	0.08	1.30	0.98	8	0.99	931.97	932.06	932.50	932.19	935.40	935.40	35
21	16	13.065	0.02	0.02	0.55	0.01	0.01	5.0	5.0	9.8	0.11	3.55	1.08	8	7.35	931.04	932.00	931.90	932.15	936.00	936.50	37
22	15	16.220	1.65	1.65	0.66	1.09	1.09	16.6	16.6	7.0	7.65	6.95	6.23	15	0.99	930.65	930.81	931.90	932.06	934.90	952.50	17
Project File: Storm Sewers- SITE ONLY- 100 Year Storm.stm																Number of lines: 28				Run Date: 2/23/2024		
NOTES:Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period =Yrs. 100 ; Pipe travel time suppressed. ; c = cir e = ellip b = box																						

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
23	11	30.034	0.01	1.10	0.90	0.01	0.31	5.0	16.6	7.0	2.20	1.68	4.04	10	0.50	926.28	926.43	927.90	928.16	934.00	934.00	9A
24	23	77.344	0.00	1.09	0.00	0.00	0.30	0.0	16.6	7.0	2.14	1.68	3.92	10	0.50	926.43	926.82	928.49	929.11	934.00	934.00	10
25	24	23.493	0.00	0.13	0.00	0.00	0.10	5.0	5.0	9.8	1.01	5.01	3.34	8	14.69	927.00	930.45	929.35	930.93	934.00	936.30	24
26	25	36.839	0.06	0.13	0.78	0.05	0.10	5.0	5.0	9.8	1.01	1.31	3.79	8	1.00	930.45	930.82	930.93	931.30	936.30	936.30	25
27	26	51.897	0.07	0.07	0.80	0.06	0.06	5.0	5.0	9.8	0.55	1.31	2.53	8	1.00	930.82	931.34	931.30	931.69	936.30	936.30	26
28	24	73.277	0.96	0.96	0.21	0.20	0.20	16.6	16.6	7.0	1.42	1.69	2.60	10	0.50	926.82	927.19	929.35	929.61	934.00	930.50	10A
Project File: Storm Sewers- SITE ONLY- 100 Year Storm.stm																Number of lines: 28				Run Date: 2/23/2024		
NOTES:Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period =Yrs. 100 ; Pipe travel time suppressed. ; c = cir e = ellip b = box																						

# Inlet Report

Line No	Inlet ID	Q = CIA	Q carry	Q capt	Q Byp	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
		(cfs)	(cfs)	(cfs)	(cfs)		Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CI 7	0.27	0.00	0.27	0.00	Comb	6.0	2.93	1.60	2.76	1.46	Sag	1.50	0.020	0.020	0.013	0.08	3.79	0.08	3.79	0.0	Off
2	CI 13	0.84	0.00	0.84	0.00	Comb	6.0	2.93	1.60	2.76	1.46	Sag	1.50	0.020	0.020	0.013	0.15	7.33	0.15	7.33	0.0	Off
3	CI 14	0.97	0.00	0.97	0.00	Comb	6.0	2.93	1.60	2.76	1.46	Sag	1.50	0.020	0.020	0.013	0.16	7.99	0.16	7.99	0.0	Off
4	DB 15	0.19	0.00	0.19	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.06	7.27	0.06	7.27	0.0	Off
5	30	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
6	ID 29	0.28	0.00	0.28	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.08	9.22	0.08	9.22	0.0	Off
7	ID 28	0.28	0.00	0.28	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.08	9.22	0.08	9.22	0.0	Off
8	27	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
9	ID 30	0.35	0.00	0.35	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.10	10.54	0.10	10.54	0.0	Off
10	CI 8	0.00	0.00	0.00	0.00	Comb	6.0	2.93	1.60	2.76	1.46	Sag	1.50	0.020	0.020	0.013	0.00	0.01	0.00	0.01	0.0	Off
11	22	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
12	21	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
13	ID 23	0.00	0.00	0.00	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.00	1.00	0.00	1.00	0.0	Off
14	ID 25	0.37	0.00	0.37	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.10	10.89	0.10	10.89	0.0	Off
15	DB 16	0.19	0.00	0.19	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.06	7.27	0.06	7.27	0.0	Off
16	36	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
17	DB 32	0.25	0.00	0.25	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.08	8.64	0.08	8.64	0.0	Off
18	34	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
19	ID 33	0.57	0.00	0.57	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.13	14.05	0.13	14.05	0.0	Off
20	ID 35	0.08	0.00	0.08	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.03	4.50	0.03	4.50	0.0	Off
21	ID 37	0.11	0.00	0.11	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.04	5.32	0.04	5.32	0.0	Off
22	SOI 17	7.65	0.00	7.65	0.00	DrCrb	11.0	12.00	0.00	0.00	0.00	Sag	0.00	0.020	0.020	0.013	0.36	17.79	0.36	17.79	0.0	Off
23	DB 9	0.09	0.00	0.09	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	2.00	0.020	0.020	0.013	0.04	5.78	0.04	5.78	0.0	Off

Project File: Storm Sewers- SITE ONLY- 100 Year Storm.stm

Number of lines: 28

Run Date: 2/23/2024

NOTES: Inlet N-Values = 0.016; Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = 100 Yrs. ; \* Indicates Known Q added. All curb inlets are Horiz throat.

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
24	18	0.00	0.00	0.00	0.00	None	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
25	ID 24	0.00	0.00	0.00	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.00	1.00	0.00	1.00	0.0	Off
26	ID 25	0.46	0.00	0.46	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.11	12.36	0.11	12.36	0.0	Off
27	ID 26	0.55	0.00	0.55	0.00	DrGrt	0.0	0.00	0.58	1.00	1.00	Sag	1.00	0.020	0.020	0.013	0.13	13.80	0.13	13.80	0.0	Off
28	SOI 10	1.42	0.00	1.42	0.00	DrCrb	4.0	1.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.79	inf.00	0.79	inf.00	0.0	Off
Project File: Storm Sewers- SITE ONLY- 100 Year Storm.stm														Number of lines: 28					Run Date: 2/23/2024			
NOTES: Inlet N-Values = 0.016; Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = 100 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.																						

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	Travel Time (min)
1	7	User																		5.00
2	13	User																		5.00
3	14	User																		5.00
4	15	User																		5.00
5	28	User																		0.00
6	28A	User																		5.00
7	29	User																		5.00
8	30	User																		0.00
9	30A	User																		5.00
10	8	User																		5.00
11	9	User																		0.00
12	20	User																		0.00
13	20A	User																		0.00
14	21	User																		5.00
15	16	User																		5.00
16	32	User																		0.00
17	32A	User																		5.00
18	33	User																		0.00
19	33A	User																		5.00
20	35	User																		5.00
21	37	User																		5.00
22	17	User																		16.60
23	9A	User																		5.00
24	10	User																		0.00
Project File: Storm Sewers- SITE ONLY- 100 Year Storm					stm Min. Tc used for intensity calculations = 5 min							Number of lines: 28				Date: 2/23/2024				

# Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	Travel Time (min)
25	24	User																		5.00
26	25	User																		5.00
27	26	User																		5.00
28	10A	User																		16.60
Project File: Storm Sewers- SITE ONLY- 100 Year Storm					stm Min. Tc used for intensity calculations = 5 min							Number of lines: 28				Date: 2/23/2024				



# Hydraulic Grade Line Computations

Line	Size  (in)	Q  (cfs)	Downstream								Len  (ft)	Upstream								Check		JL coeff  (K)	Minor loss  (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
1	24	13.24	923.93	925.24	1.31	2.18	6.08	0.57	925.81	0.501	50.767	924.18	925.50	1.32	2.20	6.01	0.56	926.06	0.486	0.494	0.251	1.50	0.84
2	24	10.59	927.20	928.12	0.92*	1.41	7.52	0.48	928.60	0.000	104.692	928.25	929.41	1.16**	1.90	5.57	0.48	929.90	0.000	0.000	n/a	1.15	0.56
3	18	9.99	928.45	929.54	1.09*	1.37	7.27	0.66	930.20	0.000	107.573	929.53	930.75	1.22**	1.54	6.50	0.66	931.40	0.000	0.000	n/a	1.13	n/a
4	18	9.29	929.73	930.76	1.03*	1.29	7.18	0.61	931.37	0.000	68.017	930.41	931.59	1.18**	1.49	6.25	0.61	932.19	0.000	0.000	n/a	1.70	n/a
5	8	0.92	932.48	932.89	0.41*	0.23	4.03	0.20	933.10	0.000	25.460	932.73	933.18	0.45**	0.25	3.63	0.20	933.39	0.000	0.000	n/a	0.75	n/a
6	8	0.92	932.73	933.18	0.45*	0.25	3.63	0.20	933.39	0.000	14.228	932.88	933.33	0.45**	0.25	3.63	0.20	933.54	0.000	0.000	n/a	0.50	n/a
7	8	0.64	932.88	933.33	0.45	0.20	2.51	0.15	933.49	0.000	68.000	933.56	933.94 j	0.38**	0.20	3.15	0.15	934.09	0.000	0.000	n/a	0.50	n/a
8	8	0.35	933.56	933.94	0.38	0.14	1.75	0.10	934.04	0.000	36.408	933.92	934.20 j	0.28**	0.14	2.59	0.10	934.30	0.000	0.000	n/a	0.75	0.08
9	8	0.35	933.92	934.20	0.28*	0.14	2.59	0.10	934.30	0.000	7.959	934.00	934.28	0.28**	0.14	2.59	0.10	934.38	0.000	0.000	n/a	1.00	0.10
10	15	2.47	924.88	926.34	1.25	1.23	2.01	0.06	926.41	0.124	137.771	925.57	926.50	0.93	0.98	2.52	0.10	926.60	0.152	0.138	0.191	1.08	0.11
11	10	2.47	925.88	926.71	0.83*	0.55	4.52	0.32	927.03	1.077	80.481	926.28	927.58	0.83	0.55	4.52	0.32	927.90	1.082	1.080	0.869	1.00	0.32
12	8	0.37	926.58	927.90	0.67	0.14	1.07	0.02	927.92	0.082	26.198	932.39	932.67 j	0.28**	0.14	2.63	0.11	932.78	0.571	0.326	n/a	0.86	n/a
13	8	0.37	932.39	932.67	0.28*	0.14	2.63	0.11	932.78	0.000	48.719	932.88	933.16	0.28**	0.14	2.63	0.11	933.27	0.000	0.000	n/a	0.50	n/a
14	8	0.37	932.88	933.16	0.28*	0.14	2.63	0.11	933.27	0.000	68.041	933.56	933.84	0.28**	0.14	2.63	0.11	933.95	0.000	0.000	n/a	1.00	n/a
15	18	8.50	930.41	931.59	1.18	1.43	5.71	0.55	932.14	0.000	23.547	930.65	931.78 j	1.13**	1.43	5.96	0.55	932.33	0.000	0.000	n/a	1.50	n/a
16	10	1.01	930.65	931.78	0.83	0.55	1.85	0.05	931.83	0.180	38.493	931.03	931.84	0.81	0.54	1.86	0.05	931.90	0.160	0.170	0.065	1.00	0.05
17	10	0.90	931.04	931.90	0.83	0.28	1.65	0.04	931.94	0.144	52.854	931.56	931.98 j	0.42**	0.28	3.25	0.16	932.15	0.551	0.347	0.184	1.50	0.25
18	8	0.65	931.56	932.23	0.67	0.20	1.85	0.05	932.28	0.243	40.521	931.97	932.35 j	0.38**	0.21	3.14	0.15	932.50	0.634	0.439	0.178	1.00	0.15
19	8	0.57	931.97	932.50	0.53	0.19	1.89	0.14	932.64	0.000	39.195	932.36	932.71 j	0.35**	0.19	3.02	0.14	932.85	0.000	0.000	n/a	1.00	n/a
20	8	0.08	931.97	932.50	0.53	0.05	0.26	0.04	932.55	0.000	9.078	932.06	932.19	0.13**	0.05	1.69	0.04	932.23	0.000	0.000	n/a	1.00	0.04
21	8	0.11	931.04	931.90	0.67	0.06	0.31	0.00	931.90	0.007	13.065	932.00	932.15 j	0.15**	0.06	1.84	0.05	932.20	0.558	0.283	n/a	1.00	n/a
22	15	7.65	930.65	931.90	1.25*	1.23	6.23	0.60	932.50	1.195	16.220	930.81	932.06	1.25	1.23	6.23	0.60	932.66	1.157	1.176	0.191	1.00	0.60

Project File: Storm Sewers- SITE ONLY- 100 Year Storm.stm

Number of lines: 28

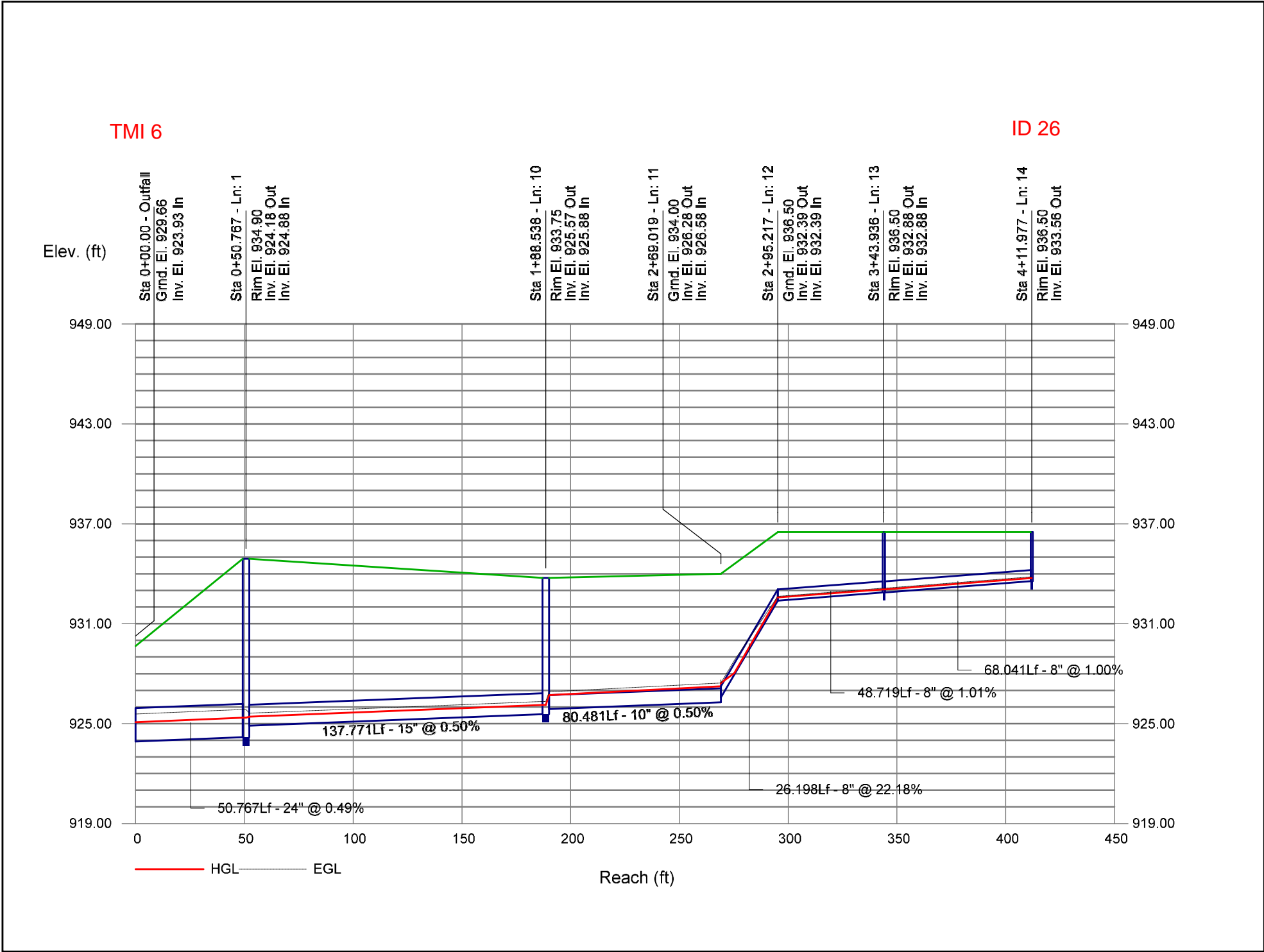
Run Date: 2/23/2024

Notes: \* Normal depth assumed; \*\* Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

# Hydraulic Grade Line Computations

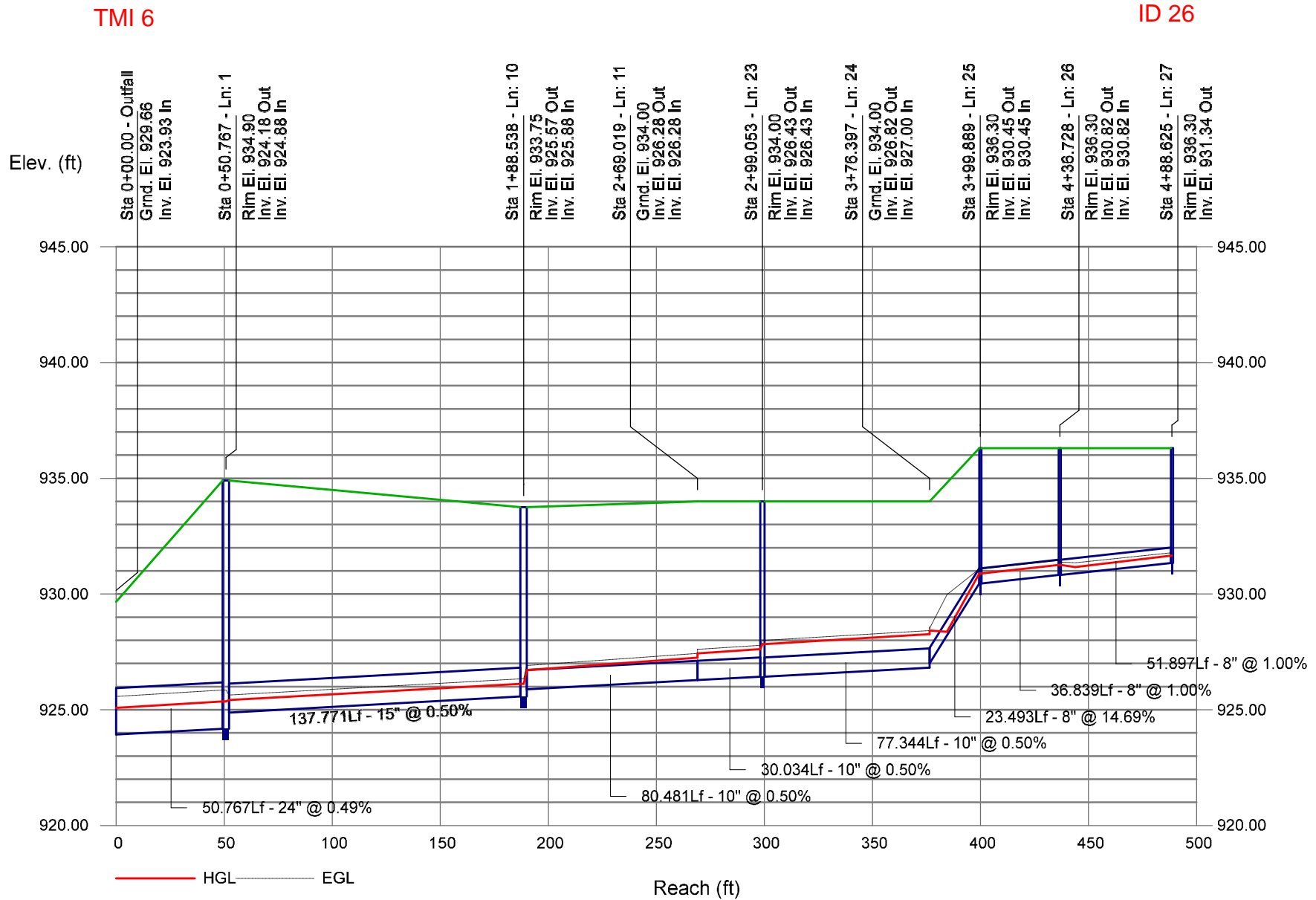
Line	Size  (in)	Q  (cfs)	Downstream								Len  (ft)	Upstream								Check		JL coeff  (K)	Minor loss  (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
23	10	2.20	926.28	927.90	0.83	0.55	4.04	0.25	928.15	0.861	30.034	926.43	928.16	0.83	0.55	4.03	0.25	928.41	0.860	0.861	0.258	1.29	0.33
24	10	2.14	926.43	928.49	0.83	0.55	3.92	0.24	928.72	0.812	77.344	926.82	929.11	0.83	0.55	3.92	0.24	929.35	0.812	0.812	0.628	1.00	0.24
25	8	1.01	927.00	929.35	0.67	0.27	2.90	0.13	929.48	0.597	23.493	930.45	930.93 j	0.48**	0.27	3.79	0.22	931.15	0.807	0.702	n/a	0.50	n/a
26	8	1.01	930.45	930.93	0.48*	0.27	3.79	0.22	931.15	0.000	36.839	930.82	931.30	0.48**	0.27	3.79	0.22	931.52	0.000	0.000	n/a	0.50	n/a
27	8	0.55	930.82	931.30	0.48	0.18	2.06	0.14	931.44	0.000	51.897	931.34	931.69 j	0.35**	0.18	2.99	0.14	931.83	0.000	0.000	n/a	1.00	0.14
28	10	1.42	926.82	929.35	0.83	0.55	2.60	0.10	929.46	0.356	73.277	927.19	929.61	0.83	0.55	2.60	0.10	929.72	0.356	0.356	0.261	1.00	0.10
Project File: Storm Sewers- SITE ONLY- 100 Year Storm.stm														Number of lines: 28					Run Date: 2/23/2024				
Notes: * Normal depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box																							

Storm Sewer Profile



# Storm Sewer Profile

Proj. file: Storm Sewers- SITE ONLY- 25 Year Storm.stm

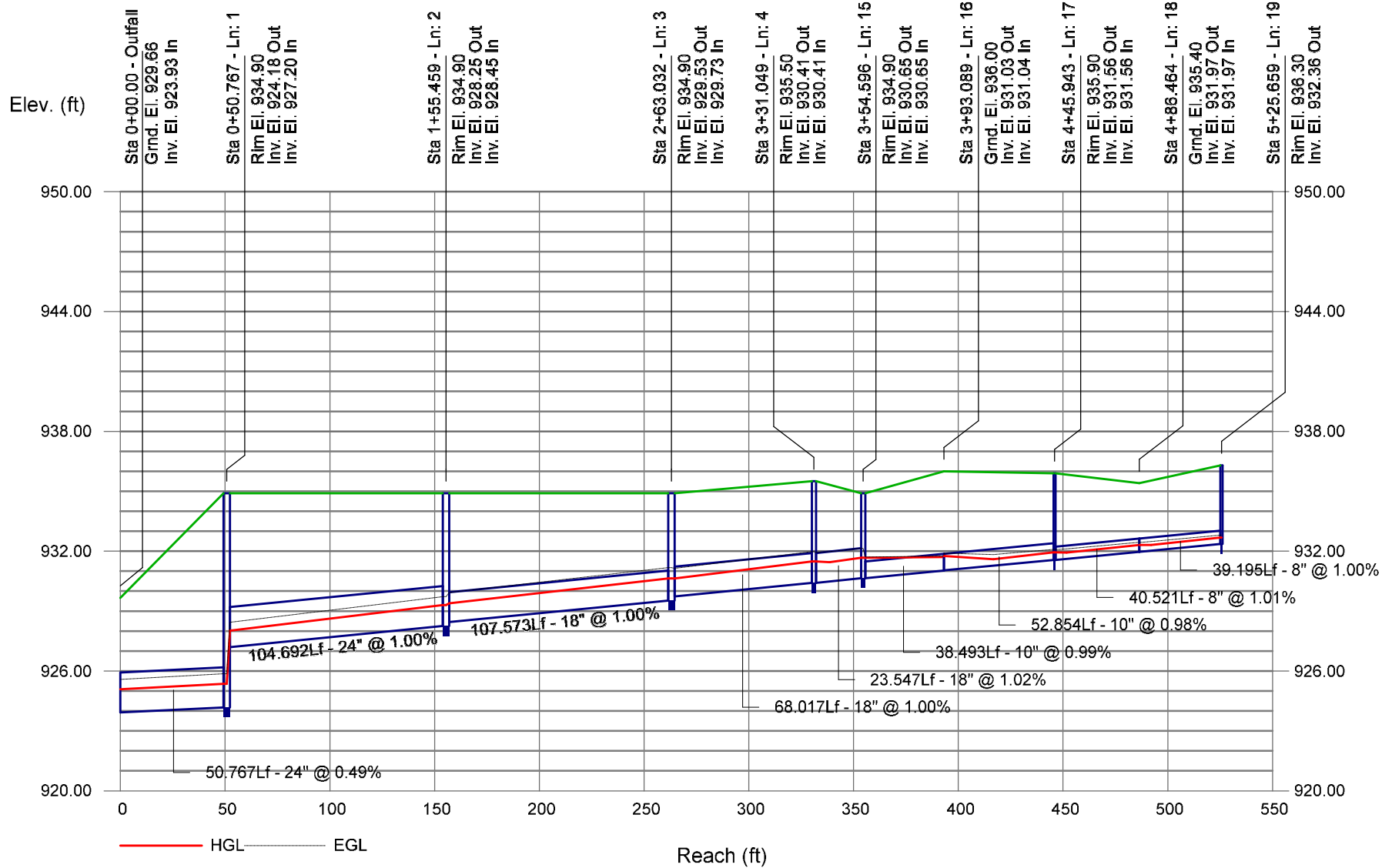


# Storm Sewer Profile

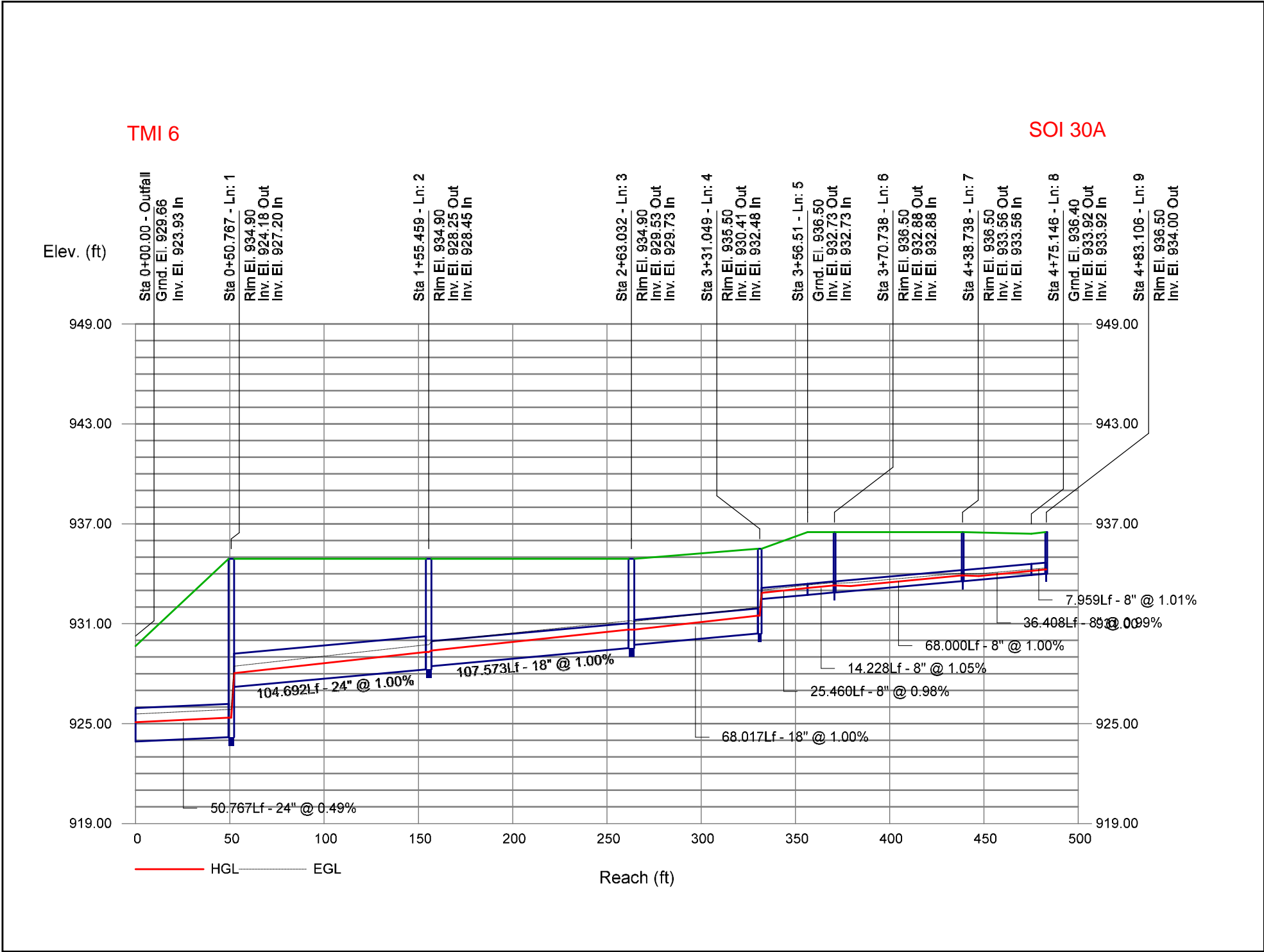
Proj. file: Storm Sewers- SITE ONLY- 25 Year Storm.stm

TMI 6

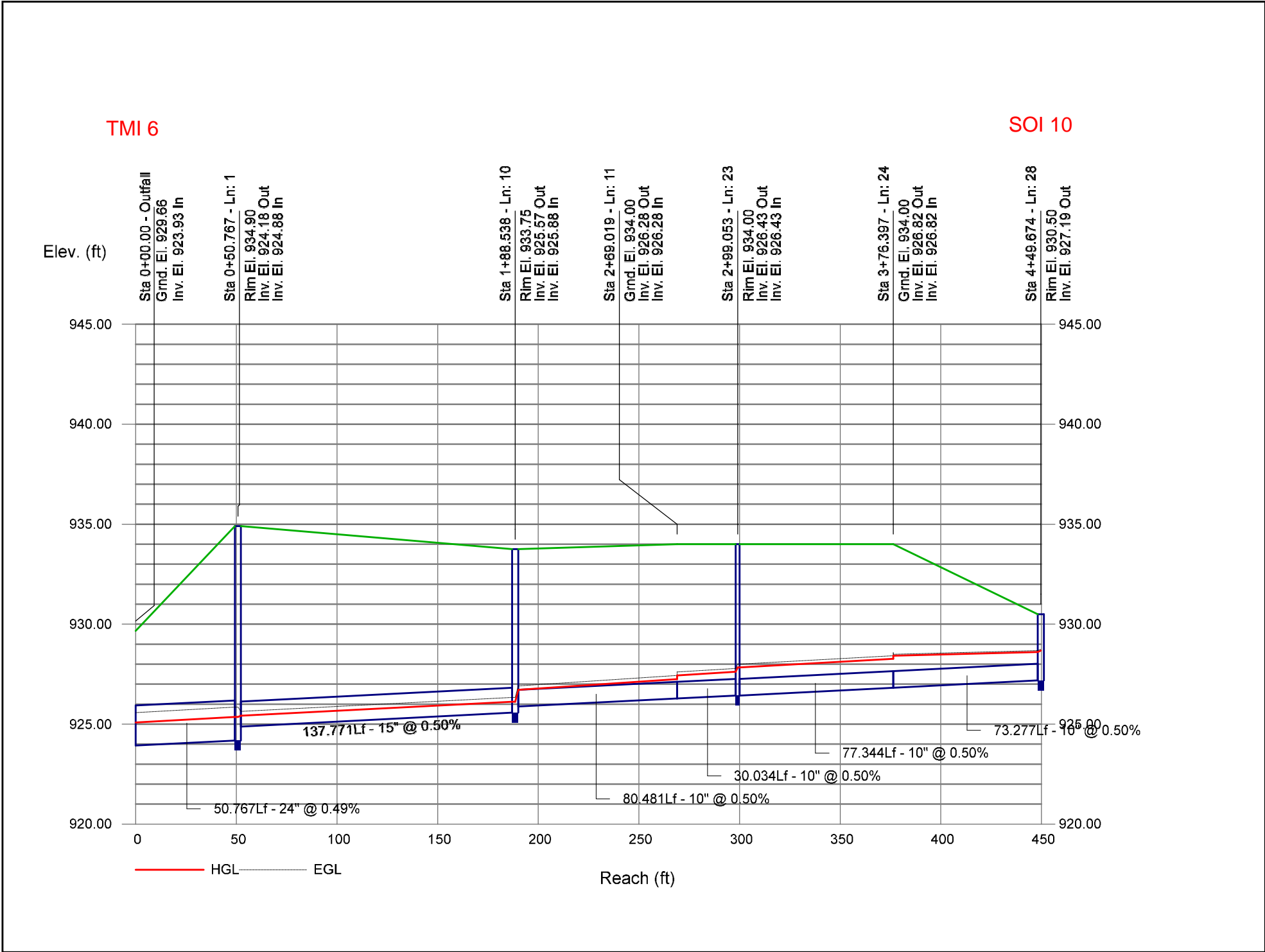
ID 33



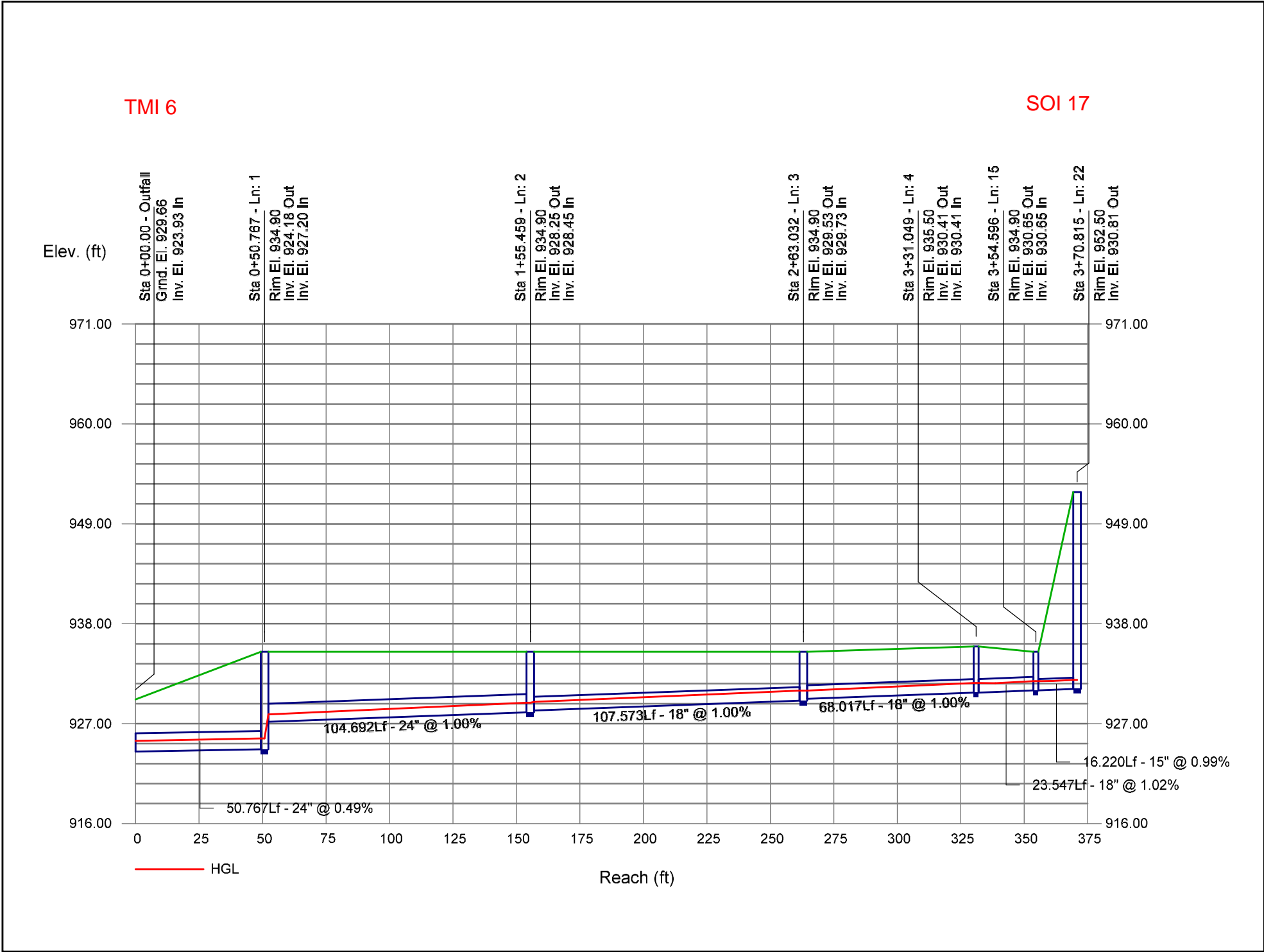
Storm Sewer Profile



# Storm Sewer Profile



Storm Sewer Profile

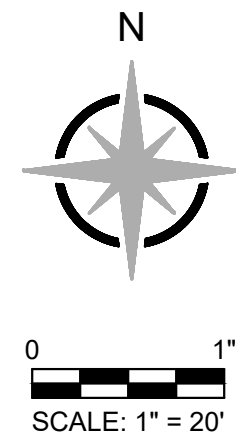
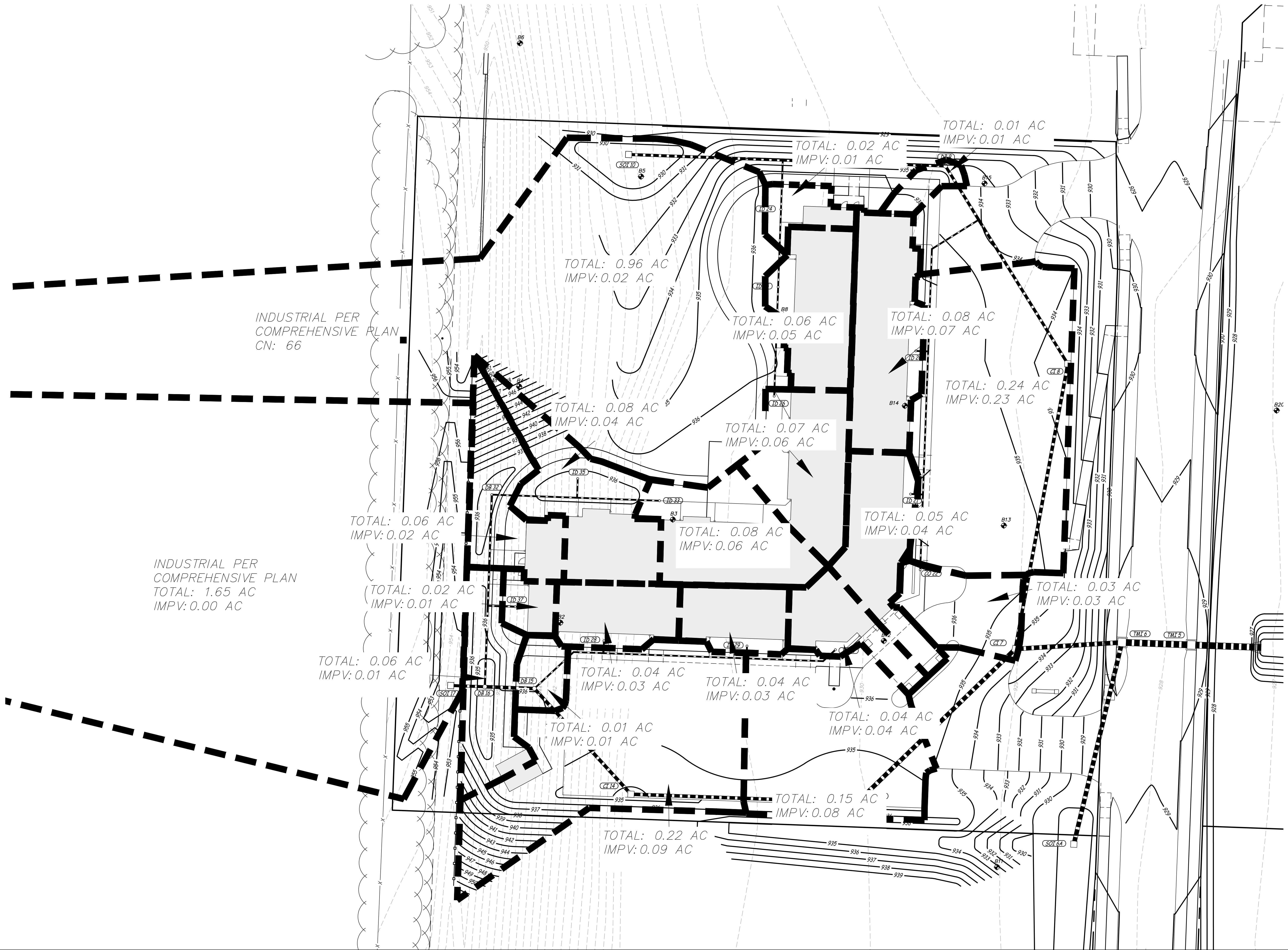




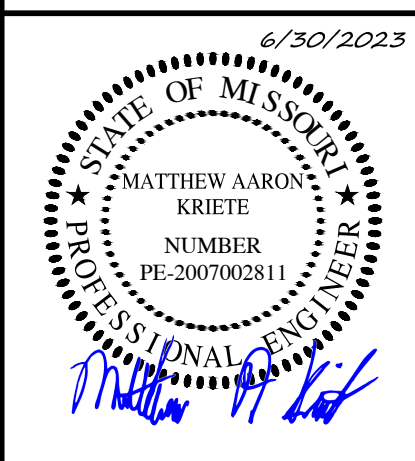


## APPENDIX B: STORM SEWER MAP

P:\GENERAL PROJECTS\15925E-ES-WILSHIRE-HILLS-3-ENG\CAD\15925 DAW (6-14-2023).DWG 6/30/2023



**WILSHIRE HILLS PHASE III**  
STREET ADDRESS  
LEE'S SUMMIT JACKSON COUNTY, MISSOURI



MATTHEW A. KRIETE  
PROFESSIONAL ENGINEER  
PE-2007002811

IF ORIGINAL SIGNATURE OR DIGITAL  
AUTHENTICATION IS NOT PRESENT THIS  
MEDIA SHOULD NOT BE CONSIDERED A  
CERTIFIED DOCUMENT.

Date  
**JUNE 30, 2023**

Revised

Design: ST Drawn: ST

STORM SEWER  
DRAINAGE AREA MAP

Sheet  
**C14.01**

ES&S PROJECT NO. 15925

CONSTRUCTION DOCUMENTS



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