MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT AMENDMENT FOR COTTAGES AT DRY CREEK

April 2024

Prepared for:

BCC Management, LLC
Attn: Brian Schumann
150 Wuthering Heights Drive
Colorado Springs, CO 80921

Prepared By:

CATAMOUNT ENGINEERING
PO BOX 221
Woodland Park, CO 80866
719-426-2124

JOB NUMBER:20-270

MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT AMENDMENT FOR COTTAGES AT DRY CREEK

Engineer's Statement:

This report and plan for the drainage design of COTTAGES AT DRY CREEK was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

COLORADO LICENSED DAVID L. MIJARES 40510 PROFESSIONAL ENGINEER

4/28/24

David L. Mijares, Colorado PE #40510 Date
For and on behalf of Catamount Engineering

Developer's Statement:

BCC MANAGEMENT LLC hereby certifies that the drainage facilities for COTTAGES AT DRY CREEK shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.4.701 of the City Code; and cannot, on behalf of COTTAGES AT DRY CREEK guarantee that final drainage design review will absolve BCC MANAGEMENT, LLC and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

Schumann Communications Profit Sharing Plan
Name of Developer

5-1-24
Authorized Signature Date

BRIAN SCHUMANN
Printed Name

TRUSTEE
Title

150 Wuthering Heights Dr
Colorado Springs, CO 80921
Address

City of Colorado Springs Only:

Filed in accordance with Section 7.4.701 of the Code of the City of Colorado Springs, 2023, as amended.

05/06/2024
For City Engineer Dana Davison Date

CONDITIONS:

MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT AMENDMENT FOR COTTAGES AT DRY CREEK

PURPOSE

The purpose of this drainage report amendment is to update the hydraulic grade line calculations for storm system 08. Storm system 08 collects developed runoff from Basin C1 of Q_5=2.4 cfs, Q_{100}=4.4 cfs in a 5' private Type R sump inlet. Runoff is conveyed in a private 18" HDPE storm sewer to outfall into proposed private extended detention basin 'C' in the southerly portion of the site. No changes in site layout or impervious area are proposed from the approved final drainage report "MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT AMENDMENT FOR COTTAGES AT DRY CREEK", prepared by Catamount Engineering, approved February 27, 2024.

Hydrologic modeling was not revised in this amendment. Hydraulic modeling of upstream pipe system will not affect modeling of approved Pond 'C'.

STORM SEWER-08

Revised hydraulic grade line calculations were developed utilizing UDSEWER 2009 Version 1.4.0.25. Rational method peak flows for the initial and major storm events as developed in the final drainage report were used for hydraulic analysis.

Storm Sewer 08 was modeled with multiple tailwater assumptions for both minor and major storm events at the discharge into proposed extended detention basin C utilizing respective water surface elevation (WSE) of each event. Tailwater was modeled in both the pond full and pond empty condition.

Peak flows from the major event do not exceed 1.0' below finished ground surface elevation in either modeled condition. Peak flows from the minor event do not exceed 80% of pipe capacity in the pond empty condition.

The analysis in the report appendix provides more detailed calculations for the system in accordance with the requirements of the City of Colorado Springs Drainage Criteria Manual Vol. I. The storm sewer plan and profile drawings have been submitted concurrently with this analysis.

See calculations in the report appendix.

SUMMARY

This Drainage Report Amendment is in conformance with the City of Colorado Springs Drainage Criteria Manual, Volumes 1&2, May 2014 editions(Volume 1 as revised January 2021 and Volume 2 as revised December 2020). Site runoff and storm drain and appurtenances will not adversely affect the downstream and surrounding developments. This report is in general conformance with all previously approved reports which included this site. Private storm facilities will be owned or maintained by the Homeowner's Association.

REFERENCES:

City of Colorado Springs Engineering Division Drainage Criteria Manual Volume 1 as revised January 2021 and Volume 2 as revised December 2020

"Study of the Dry Creek Drainage Basin", prepared by KKBNA, dated February 1985

Urban Storm Drainage Criteria Manual, Volumes I-III, Mile High Flood District (MHFD)

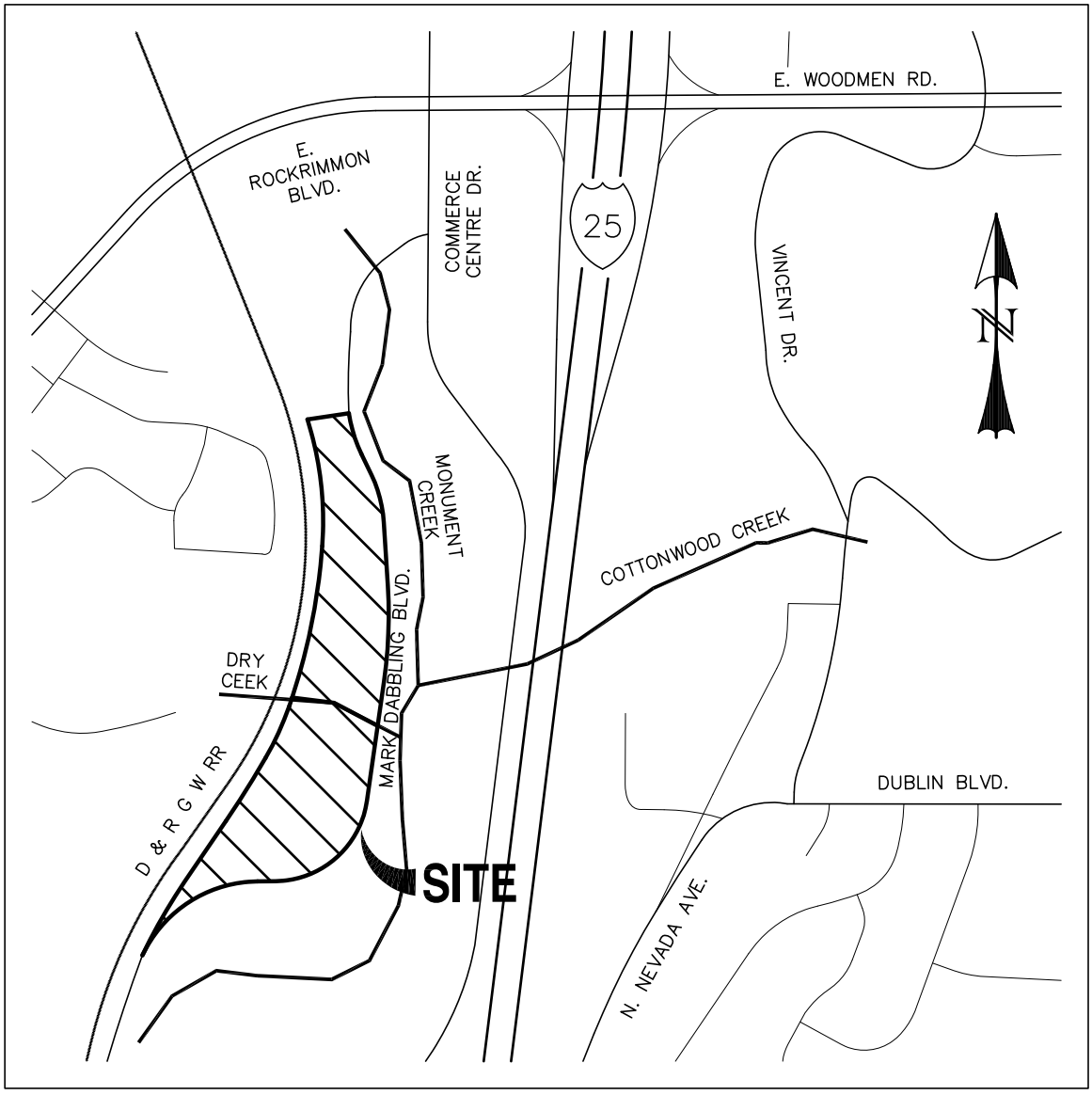
FEMA Flood Insurance Rate Map Number 08041C0512 G, effective December 7, 2018

Natural Resources Conservation Service Web Soil Survey

"MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT FOR COTTAGES AT DRY CREEK", prepared by Catamount Engineering, approved April 2023.

"MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT AMENDMENT FOR COTTAGES AT DRY CREEK", prepared by Catamount Engineering, approved February 27, 2024.

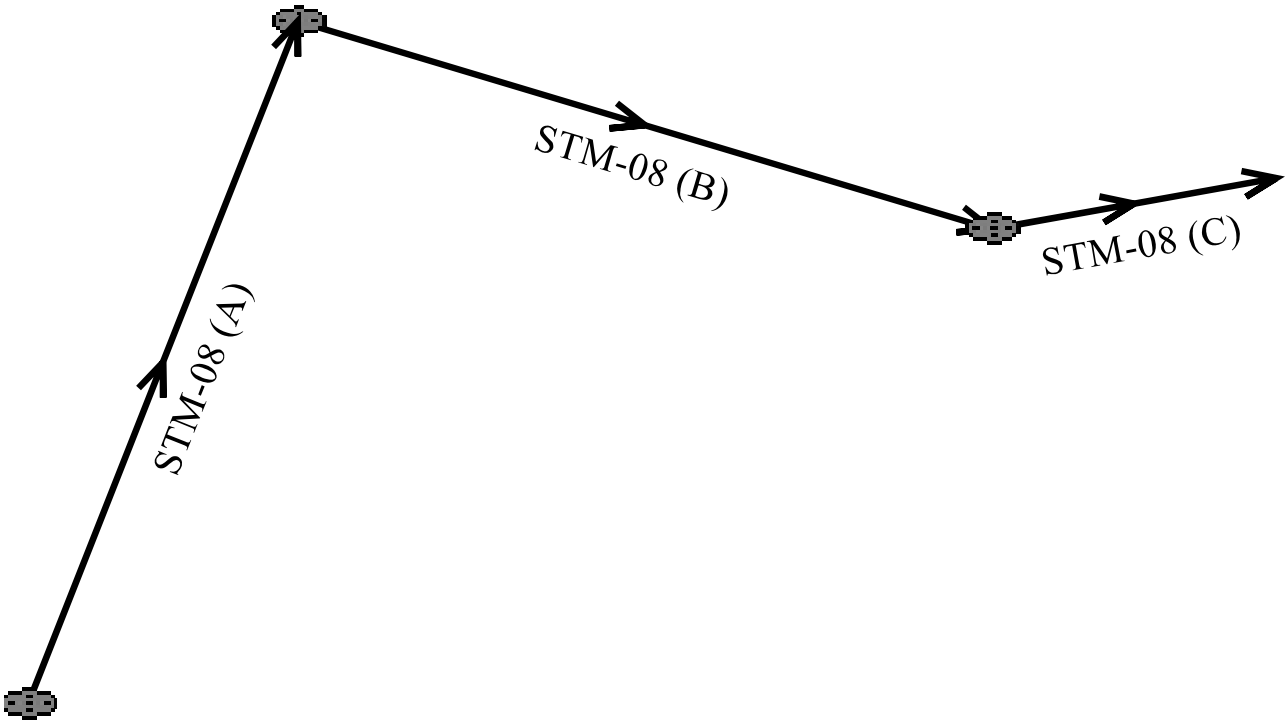
APPENDIX



VICINITY MAP

SCALE: N.T.S.

CALCULATIONS


STM-08 (A)
STM-08 (B)
STM-08 (C)

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 4/29/2024 3:59:22 PM	**UDSewer Results Summary** **Project Title:** 20-270 Mark Dabbling Storm 8 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6254.68

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6256.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (C)	6257.20	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (B)	6260.03	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (A)	6258.15	2.40	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-08 (C)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	
STM-08 (B)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	
STM-08 (A)	0.00	0.00	0.00	0.00	2.40	0.00	0.00	0.00	2.40	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-08 (C)	26.41	6252.26	0.6	6252.42	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (B)	139.75	6252.67	0.5	6253.37	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (A)	138.94	6253.62	0.5	6254.31	0.013	0.38	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
STM-08 (C)	8.20	4.64	7.03	3.75	6.67	4.03	1.11	Pressurized	2.40	26.41	
STM-08 (B)	7.46	4.22	7.03	3.75	7.02	3.76	1.00	Supercritical Jump	2.40	116.97	
STM-08 (A)	7.42	4.20	7.03	3.75	7.04	3.75	1.00	Subcritical	2.40	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
STM-08 (C)	2.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (B)	2.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (A)	2.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6254.68

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-08 (C)	6252.26	6252.42	0.00	0.00	6254.68	6254.69	6254.71	0.01	6254.72
STM-08 (B)	6252.67	6253.37	0.00	0.00	6254.70	6254.75	6254.72	0.06	6254.78
STM-08 (A)	6253.62	6254.31	0.01	0.00	6254.76	6254.94	6254.81	0.31	6255.12

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

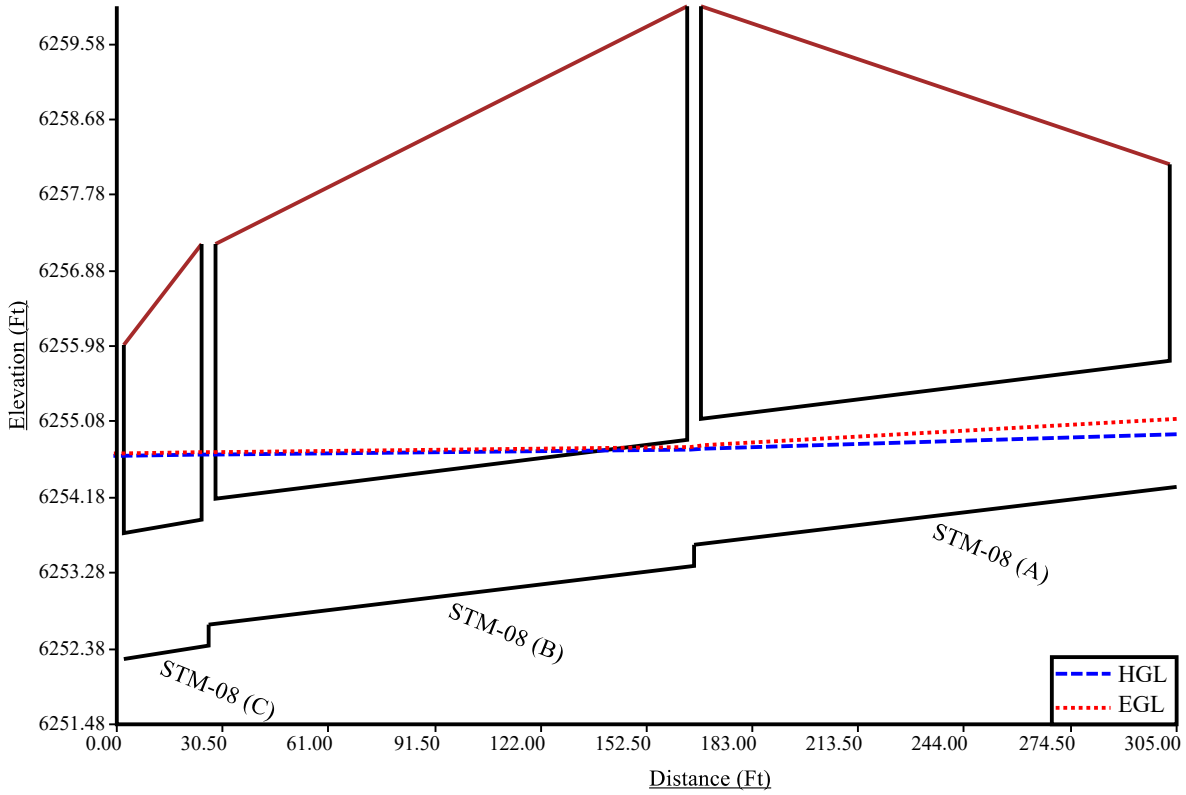
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
STM-08 (C)	26.41	2.50	4.00	4.92	6.98	4.28	2.03	9.06	5.32	3.07	25.71	
STM-08 (B)	139.75	2.50	4.00	4.92	8.56	5.07	2.82	12.82	7.20	4.95	205.17	
STM-08 (A)	138.94	2.50	4.00	4.92	12.32	6.95	4.70	7.18	4.38	2.13	181.92	

Total earth volume for sewer trenches = 413 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

STM-08 5 YR


6259.58
6258.68
6257.78
6256.88
6255.98
6255.08
6254.18
6253.28
6252.38
6251.48
Elevation (Ft)
0.00
30.50
61.00
91.50
122.00
152.50
183.00
213.50
244.00
274.50
305.00
Distance (Ft)
STM-08 (A)
STM-08 (B)
STM-08 (C)
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 4/29/2024 4:03:53 PM	**UDSewer Results Summary** **Project Title:** 20-270 Mark Dabbling Storm 8 HGL **Project Description:** NO TAILWATER IN POND

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6252.26

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6256.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (C)	6257.20	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (B)	6260.03	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (A)	6258.15	2.40	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-08 (C)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	
STM-08 (B)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	
STM-08 (A)	0.00	0.00	0.00	0.00	2.40	0.00	0.00	0.00	2.40	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-08 (C)	26.41	6252.26	0.6	6252.42	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (B)	139.75	6252.67	0.5	6253.37	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (A)	138.94	6253.62	0.5	6254.31	0.013	0.38	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
STM-08 (C)	8.20	4.64	7.03	3.75	6.67	4.03	1.11	Supercritical	2.40	0.00	
STM-08 (B)	7.46	4.22	7.03	3.75	7.02	3.76	1.00	Supercritical	2.40	0.00	
STM-08 (A)	7.42	4.20	7.03	3.75	7.04	3.75	1.00	Subcritical	2.40	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
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Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
STM-08 (C)	2.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (B)	2.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (A)	2.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
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Grade Line Summary:

Tailwater Elevation (ft): 6252.26

	Invert Elev.	Downstream Manhole Losses	HGL	EGL

Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-08 (C)	6252.26	6252.42	0.00	0.00	6252.82	6253.01	6253.07	0.16	6253.22
STM-08 (B)	6252.67	6253.37	0.00	0.00	6253.26	6253.96	6253.47	0.70	6254.17
STM-08 (A)	6253.62	6254.31	0.01	0.00	6254.21	6254.90	6254.42	0.69	6255.11

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
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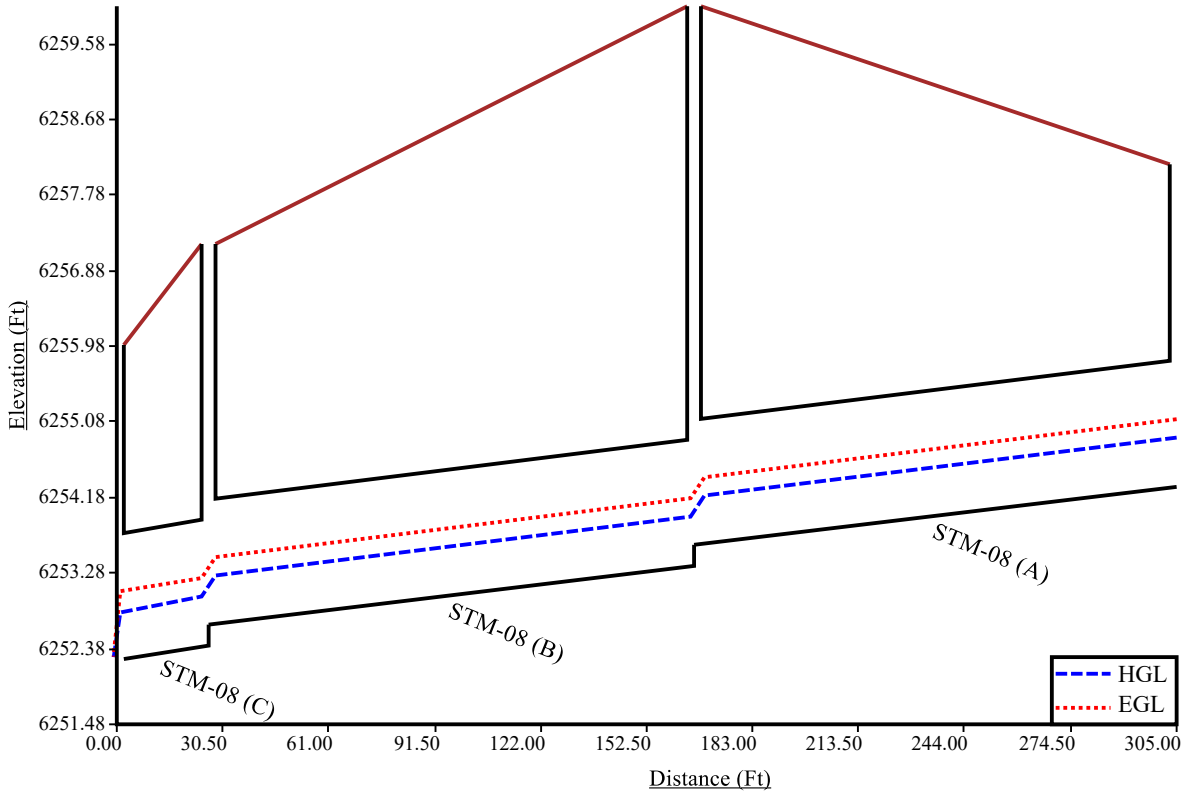
  - Eight inches for all larger sizes.

STM-08 5 YR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122.00
152.50
183.00
213.50
244.00
274.50
305.00
Distance (Ft)
STM-08 (C)
STM-08 (B)
STM-08 (A)
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 4/29/2024 4:34:20 PM	**UDSewer Results Summary** **Project Title:** 20-270 Mark Dabbling Storm 8 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6255.87

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6256.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (C)	6257.20	4.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (B)	6260.03	4.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (A)	6258.15	4.40	4.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-08 (C)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.40	
STM-08 (B)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.40	
STM-08 (A)	0.00	0.00	0.00	0.00	4.40	0.00	0.00	0.00	4.40	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-08 (C)	26.41	6252.26	0.6	6252.42	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (B)	139.75	6252.67	0.5	6253.37	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (A)	138.94	6253.62	0.5	6254.31	0.013	0.38	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
STM-08 (C)	8.20	4.64	9.65	4.56	9.38	4.72	1.06	Pressurized	4.40	26.41	
STM-08 (B)	7.46	4.22	9.65	4.56	9.95	4.39	0.94	Pressurized	4.40	139.75	
STM-08 (A)	7.42	4.20	9.65	4.56	9.97	4.38	0.94	Pressurized	4.40	138.94	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
STM-08 (C)	4.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (B)	4.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (A)	4.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6255.87

	Invert Elev.	Downstream Manhole Losses	HGL	EGL

Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-08 (C)	6252.26	6252.42	0.00	0.00	6255.87	6255.92	6255.97	0.05	6256.01
STM-08 (B)	6252.67	6253.37	0.00	0.00	6255.92	6256.16	6256.02	0.24	6256.26
STM-08 (A)	6253.62	6254.31	0.04	0.00	6256.20	6256.44	6256.30	0.24	6256.54

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

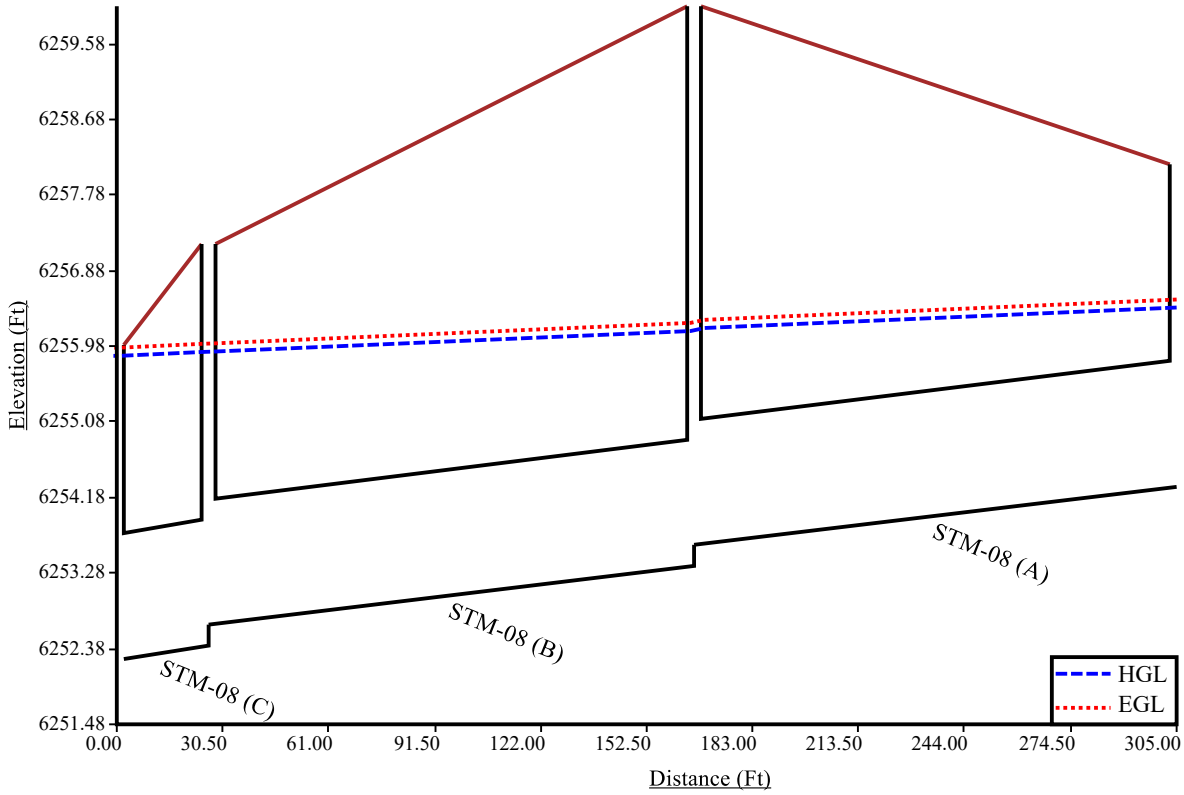
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
STM-08 (C)	26.41	2.50	4.00	4.92	6.98	4.28	2.03	9.06	5.32	3.07	25.71	
STM-08 (B)	139.75	2.50	4.00	4.92	8.56	5.07	2.82	12.82	7.20	4.95	205.17	
STM-08 (A)	138.94	2.50	4.00	4.92	12.32	6.95	4.70	7.18	4.38	2.13	181.92	

Total earth volume for sewer trenches = 413 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

STM-08 100 YR


6259.58
6258.68
6257.78
6256.88
6255.98
6255.08
6254.18
6253.28
6252.38
6251.48
Elevation (Ft)
0.00
30.50
61.00
91.50
122.00
152.50
183.00
213.50
244.00
274.50
305.00
Distance (Ft)
STM-08 (C)
STM-08 (B)
STM-08 (A)
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 4/29/2024 4:09:03 PM	**UDSewer Results Summary** **Project Title:** 20-270 Mark Dabbling Storm 8 HGL **Project Description:** NO TAILWATER IN POND

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6252.26

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6256.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (C)	6257.20	4.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (B)	6260.03	4.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (A)	6258.15	4.40	4.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-08 (C)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.40	
STM-08 (B)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.40	
STM-08 (A)	0.00	0.00	0.00	0.00	4.40	0.00	0.00	0.00	4.40	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-08 (C)	26.41	6252.26	0.6	6252.42	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (B)	139.75	6252.67	0.5	6253.37	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (A)	138.94	6253.62	0.5	6254.31	0.013	0.38	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
STM-08 (C)	8.20	4.64	9.65	4.56	9.38	4.72	1.06	Supercritical	4.40	0.00	
STM-08 (B)	7.46	4.22	9.65	4.56	9.95	4.39	0.94	Subcritical	4.40	0.00	
STM-08 (A)	7.42	4.20	9.65	4.56	9.97	4.38	0.94	Subcritical	4.40	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
STM-08 (C)	4.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (B)	4.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (A)	4.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6252.26

	Invert Elev.	Downstream Manhole Losses	HGL	EGL

Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-08 (C)	6252.26	6252.42	0.00	0.00	6253.04	6253.22	6253.39	0.16	6253.55
STM-08 (B)	6252.67	6253.37	0.00	0.00	6253.47	6254.22	6253.80	0.71	6254.50
STM-08 (A)	6253.62	6254.31	0.04	0.00	6254.42	6255.17	6254.75	0.70	6255.44

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
STM-08 (C)	26.41	2.50	4.00	4.92	6.98	4.28	2.03	9.06	5.32	3.07	25.71	
STM-08 (B)	139.75	2.50	4.00	4.92	8.56	5.07	2.82	12.82	7.20	4.95	205.17	
STM-08 (A)	138.94	2.50	4.00	4.92	12.32	6.95	4.70	7.18	4.38	2.13	181.92	

Total earth volume for sewer trenches = 413 cubic yards.

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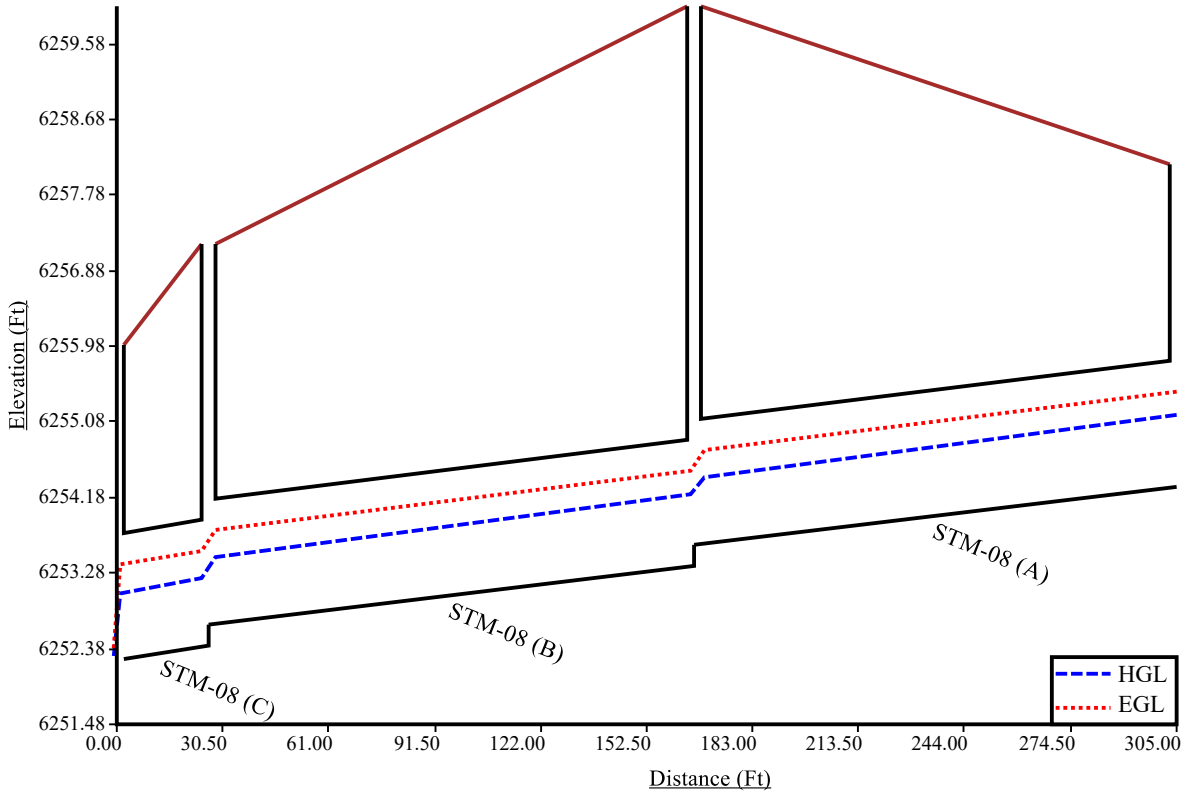
STM-08 100 YR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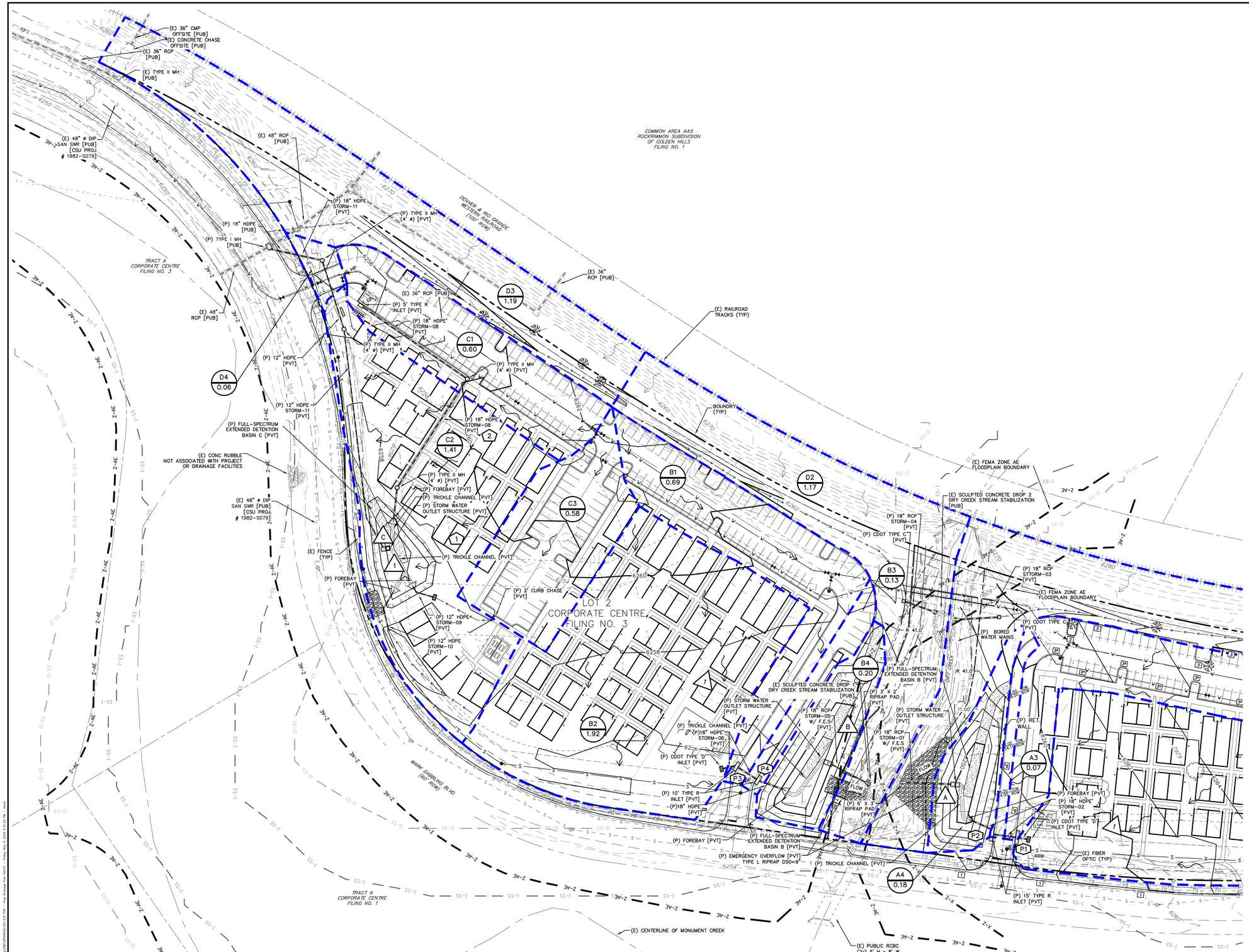
Distance (Ft)
STM-08 (C)
STM-08 (B)
STM-08 (A)
HGL
EGL

DRAINAGE MAP



0 50 100

SCALE: 1" = 50'

REVISED PER 11/05/24 DP AMENDMENT

PROPOSED DRAINAGE BASINS

BASIN	AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
A1	1.80	5.9	11.1
A2	3.20	2.8	7.3
A3	0.07	0.3	0.5
A4	0.18	0.2	0.7
B1	0.69	2.5	4.7
B2	1.92	2.5	6.0
B3	0.13	0.5	0.9
B4	0.20	0.1	0.7
C1	0.60	2.4	4.4
C2	1.42	1.8	4.7
C3	0.58	2.0	3.7
D1	1.91	0.6	3.4
D2	1.17	0.5	2.5
D3	1.19	0.5	2.7
D4	0.06	0.1	0.3

PROPOSED DESIGN POINTS

BASIN	Q5 (CFS)	Q100 (CFS)
1	3.4	7.6
P1	6.2	13.8
P2	6.4	14.1
P3	4.2	9.2
P4	4.5	9.8
POND A	6.5	14.4
POND B	4.6	10.2
POND C	5.1	10.8

DRAINAGE LEGEND

BASIN IDENTIFIER / BASIN AREA [AC] — F / 0.36
DESIGN POINT IDENTIFIERS — 3
PIPE DESIGN POINT — P2
EXISTING — (E)
PROPOSED — (P)
CURB AND GUTTER — C&G
TYPE 1
TYPE 3 SPILL
TYPE 3 CARRY
EASEMENT — ESMT
PUBLIC — PUB
PRIVATE — PVT
FUTURE — (F)
SLOPE/DIRECTION — 1.00%
SURFACE SHEET FLOW DIRECTION
PROPERTY BOUNDARY
RIGHT-OF-WAY
LOT LINE
(E) CONTOUR, INDEX — 5960
(E) CONTOUR
(P) CONTOUR, INDEX — 5960
(P) CONTOUR
(E) UG ELECTRIC
(E) FIBER OPTIC
(E) GAS MAIN
(E) UG TELEPHONE
(E) SANITARY MAIN, MH
(E) STORM SEWER, INLET, MH
(E) WATER MAIN, VALVE, FH
(P) STORM SEWER, INLET, MH
DRAINAGE BASIN BOUNDARY
(P) DRAINAGE SWALE
(E) STREAMSIDE OVERLAY OUTER
(E) STREAMSIDE OVERLAY INNER
(E) FLOODPLAIN ZONE – AE
(E) FLOODPLAIN ZONE – X

REV.	DESCRIPTION	DATE
1	DEVELOPMENT PLAN AMENDMENT	1/3/24
2	REVISED STORM-08 HGL CALCULATIONS. NO HYDROLOGIC CHANGE	4/29/24

Know what's below. Call 72 hours before you dig.
For more details visit: www.call811.com

PREPARED FOR:
BCC MANAGEMENT, LLC
150 WUTHERING HEIGHTS DRIVE
COLORADO SPRINGS, CO 80921

CATAMOUNT ENGINEERING
321 W. HENRIETTA AVE WOODLAND PARK, CO 80866
PO BOX 221 (719)426-2124

MARK DRABLING COTTAGES SOUTH PORTION

PROPOSED DRAINAGE PLAN

DESIGNED BY:	DLM	DRAWN BY:	DLM
SCALE:	1" = 100'	DATE:	2/11/21
JOB NUMBER		SHEET	
20-270		1 OF 1	