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Engineers & Surveyors NCBELS License No. P-1199

MEMORANDUM

Date: March 3, 2025

To: Town of Rolesville, NC

From: Timothy G. Nifong, PE

Subject: Public and Private Storm Sewer Pipe Network Design – Hall of Fame Car Wash – Rolesville, Wake County, NC

Project Summary

The purpose of this memorandum is to present the design calculations for the public and private storm sewer pipe network for the Hall of Fame Car Wash site located on Lot 8 of the Wallbrook Development. The total development consists of approximately 7.04 acres. The site is located on the South side of Main Street (US 401) and East side of Wall Creek Drive in Rolesville, NC. (Reference Wallbrook Preliminary Plat PR21-04 REV, Wallbrook Lot 8 Preliminary Plat PSP24-06, and Hall of Fame Car Wash – Lot 8 SDP25-01).

Line 11 (504-DI) represents the future drainage from lot 8B as shown on PSP 24-06, totaling 1.67 acres to the proposed storm sewer system. Line 15 to 12 represents the outfall from the proposed underground stormwater detention system with a known flow (cfs) entered into Line 15.

Calculation Methodology & Constants

- A minimum time of concentration of 5 minutes was utilized
- A minimum rational C value of 0.60 was utilized for open space areas
- A minimum rational C value of 0.95 was utilized for built-upon areas
- All pipes are RCP using a Manning's n value of 0.013
- The minimum pipe size used is 15"
- Rainfall data was taken from NOAA Atlas 14 at the Neuse 2 NE station

Analysis

The pipe networks were modeled using Autodesk Civil 3D and the model data was exported to Hydraflow Storm Sewer software for analysis. The attached results show that the drainage network meets Wake County and Town of Rolesville regulations and standards as follows:

- The gutter spread for the 1-year, approximately 4 in/hr storm, does not encroach more than 10' into the adjacent driving lane for the public storm sewer system (101-CB, 102-CB, 502-CB, & 503-CB).
- The total flow (cfs) within the storm sewer system does not exceed the flow capacity (cfs) in the pipe network in the 10-year rain event for storm sewer system.
- The 10-yr rain event HGL is contained within the storm sewer system.

Drainage Area Map and Supporting Documents

NOAA Atlas 14, Volume 2, Version 3
Location name: Raleigh, North Carolina, USA*
Latitude: 35.9167°, Longitude: -78.5667°
Elevation: 243.35 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.82** (4.42-5.28)	**5.62** (5.15-6.13)	**6.42** (5.89-7.01)	**7.18** (6.56-7.82)	**7.94** (7.24-8.66)	**8.53** (7.74-9.30)	**9.06** (8.16-9.86)	**9.50** (8.53-10.4)	**10.0** (8.90-10.9)	**10.4** (9.20-11.4)
10-min	**3.85** (3.53-4.21)	**4.49** (4.12-4.91)	**5.15** (4.72-5.62)	**5.74** (5.25-6.26)	**6.33** (5.77-6.90)	**6.79** (6.16-7.40)	**7.19** (6.49-7.84)	**7.54** (6.76-8.23)	**7.92** (7.04-8.64)	**8.22** (7.25-8.99)
15-min	**3.21** (2.94-3.51)	**3.76** (3.45-4.11)	**4.34** (3.98-4.74)	**4.84** (4.43-5.28)	**5.35** (4.87-5.83)	**5.74** (5.20-6.25)	**6.06** (5.47-6.60)	**6.34** (5.68-6.92)	**6.64** (5.91-7.25)	**6.88** (6.06-7.52)
30-min	**2.20** (2.02-2.41)	**2.60** (2.38-2.84)	**3.08** (2.83-3.36)	**3.51** (3.21-3.82)	**3.96** (3.61-4.32)	**4.32** (3.92-4.71)	**4.64** (4.19-5.06)	**4.93** (4.42-5.38)	**5.29** (4.70-5.77)	**5.57** (4.91-6.09)
60-min	**1.37** (1.26-1.50)	**1.63** (1.50-1.78)	**1.98** (1.81-2.16)	**2.28** (2.09-2.49)	**2.64** (2.40-2.88)	**2.93** (2.65-3.19)	**3.20** (2.88-3.48)	**3.46** (3.10-3.78)	**3.79** (3.37-4.14)	**4.07** (3.59-4.44)
2-hr	**0.800** (0.728-0.883)	**0.956** (0.872-1.05)	**1.17** (1.06-1.28)	**1.36** (1.24-1.50)	**1.60** (1.44-1.75)	**1.80** (1.61-1.97)	**1.99** (1.77-2.17)	**2.18** (1.93-2.38)	**2.43** (2.13-2.65)	**2.64** (2.30-2.89)
3-hr	**0.565** (0.514-0.625)	**0.675** (0.616-0.744)	**0.829** (0.755-0.913)	**0.974** (0.884-1.07)	**1.15** (1.04-1.26)	**1.31** (1.17-1.43)	**1.46** (1.30-1.60)	**1.62** (1.43-1.77)	**1.83** (1.60-2.00)	**2.01** (1.74-2.21)
6-hr	**0.340** (0.311-0.375)	**0.407** (0.373-0.447)	**0.500** (0.457-0.549)	**0.588** (0.536-0.644)	**0.699** (0.632-0.764)	**0.796** (0.716-0.869)	**0.893** (0.796-0.973)	**0.994** (0.877-1.08)	**1.13** (0.985-1.23)	**1.25** (1.08-1.37)
12-hr	**0.200** (0.183-0.220)	**0.239** (0.220-0.261)	**0.295** (0.270-0.323)	**0.349** (0.318-0.381)	**0.417** (0.378-0.455)	**0.478** (0.431-0.519)	**0.540** (0.481-0.586)	**0.606** (0.534-0.657)	**0.697** (0.604-0.754)	**0.778** (0.664-0.843)
24-hr	**0.119** (0.111-0.128)	**0.144** (0.134-0.154)	**0.180** (0.168-0.193)	**0.209** (0.194-0.224)	**0.248** (0.230-0.266)	**0.279** (0.258-0.299)	**0.310** (0.286-0.333)	**0.343** (0.315-0.368)	**0.387** (0.355-0.415)	**0.422** (0.385-0.454)
2-day	**0.069** (0.064-0.074)	**0.083** (0.078-0.089)	**0.103** (0.096-0.111)	**0.119** (0.111-0.128)	**0.141** (0.131-0.151)	**0.158** (0.146-0.169)	**0.175** (0.162-0.188)	**0.192** (0.177-0.207)	**0.217** (0.199-0.233)	**0.235** (0.215-0.254)
3-day	**0.049** (0.046-0.052)	**0.059** (0.055-0.063)	**0.073** (0.068-0.078)	**0.083** (0.078-0.089)	**0.098** (0.092-0.105)	**0.110** (0.102-0.118)	**0.122** (0.113-0.131)	**0.134** (0.124-0.144)	**0.151** (0.139-0.162)	**0.165** (0.150-0.177)
4-day	**0.039** (0.036-0.041)	**0.046** (0.043-0.049)	**0.057** (0.054-0.061)	**0.066** (0.061-0.070)	**0.077** (0.072-0.082)	**0.086** (0.080-0.092)	**0.096** (0.089-0.102)	**0.105** (0.097-0.113)	**0.119** (0.109-0.127)	**0.129** (0.118-0.138)
7-day	**0.026** (0.024-0.027)	**0.031** (0.029-0.032)	**0.037** (0.035-0.040)	**0.042** (0.040-0.045)	**0.050** (0.046-0.053)	**0.055** (0.052-0.059)	**0.061** (0.057-0.065)	**0.067** (0.062-0.072)	**0.075** (0.069-0.080)	**0.082** (0.075-0.087)
10-day	**0.020** (0.019-0.022)	**0.024** (0.023-0.026)	**0.029** (0.027-0.031)	**0.033** (0.031-0.035)	**0.038** (0.036-0.041)	**0.042** (0.039-0.045)	**0.046** (0.043-0.049)	**0.050** (0.047-0.054)	**0.056** (0.052-0.060)	**0.060** (0.056-0.065)
20-day	**0.014** (0.013-0.015)	**0.016** (0.015-0.017)	**0.019** (0.018-0.020)	**0.021** (0.020-0.023)	**0.024** (0.023-0.026)	**0.027** (0.025-0.029)	**0.029** (0.027-0.031)	**0.032** (0.030-0.034)	**0.035** (0.033-0.038)	**0.038** (0.035-0.041)
30-day	**0.011** (0.011-0.012)	**0.013** (0.013-0.014)	**0.015** (0.015-0.016)	**0.017** (0.016-0.018)	**0.019** (0.018-0.021)	**0.021** (0.020-0.022)	**0.023** (0.021-0.024)	**0.024** (0.023-0.026)	**0.027** (0.025-0.028)	**0.028** (0.026-0.030)
45-day	**0.010** (0.009-0.010)	**0.011** (0.011-0.012)	**0.013** (0.012-0.014)	**0.014** (0.013-0.015)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)	**0.019** (0.018-0.020)	**0.021** (0.020-0.022)	**0.022** (0.021-0.023)
60-day	**0.009** (0.008-0.009)	**0.010** (0.010-0.011)	**0.011** (0.011-0.012)	**0.012** (0.012-0.013)	**0.014** (0.013-0.014)	**0.015** (0.014-0.015)	**0.016** (0.015-0.016)	**0.017** (0.016-0.017)	**0.018** (0.017-0.019)	**0.019** (0.018-0.020)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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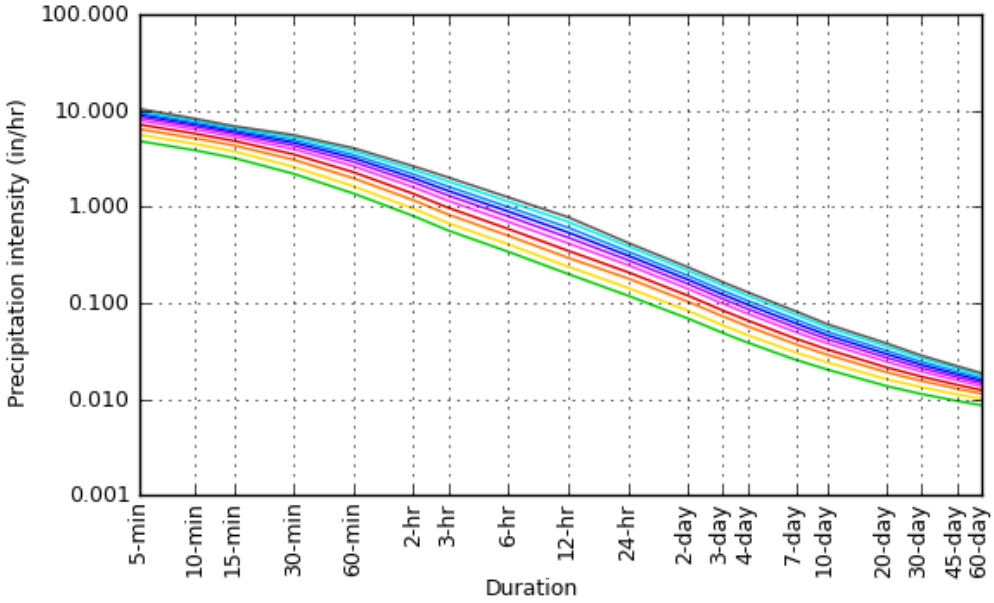
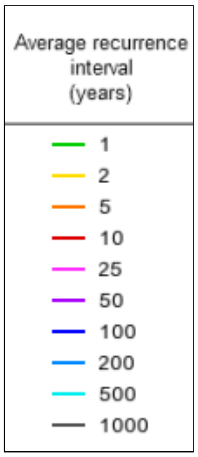
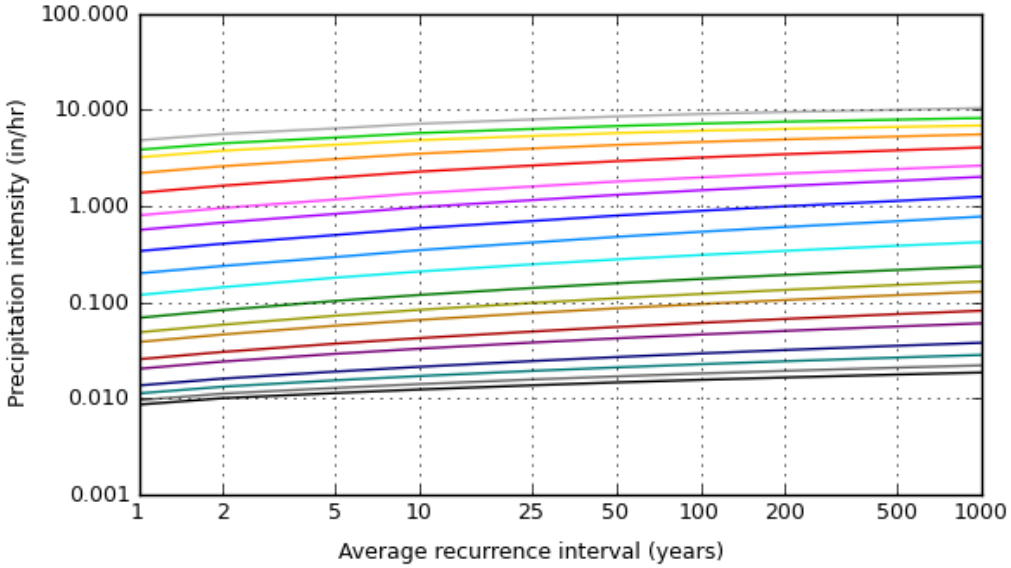
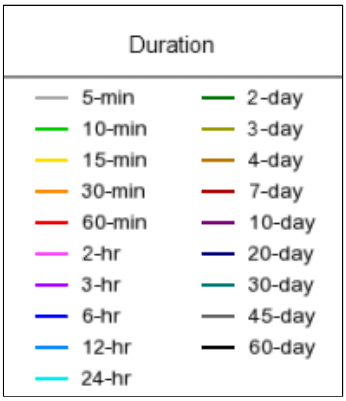
PF graphical

PDS-based intensity-duration-frequency (IDF) curves
Latitude: 35.9167°, Longitude: -78.5667°









NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Fri Jan 6 13:04:06 2023

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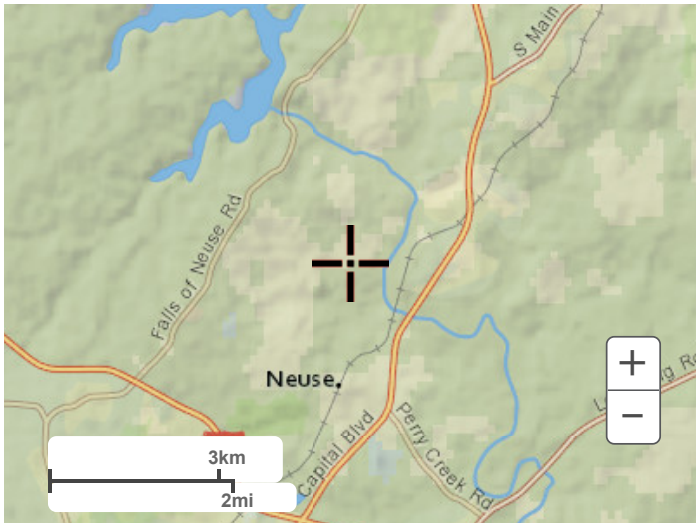
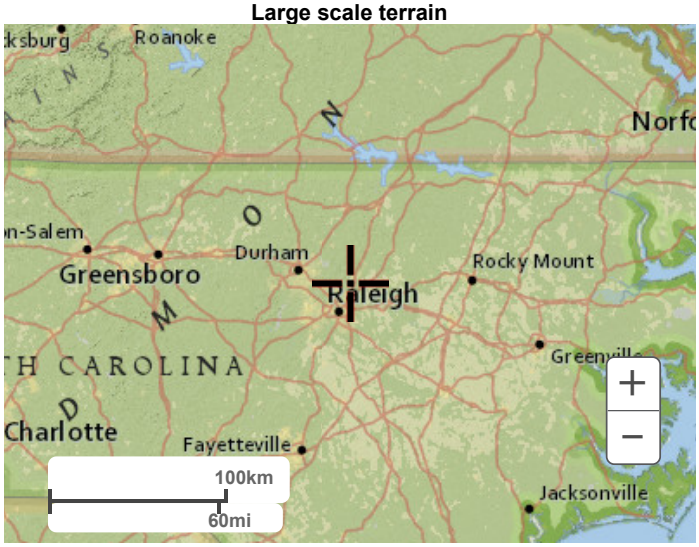
Maps & aerials

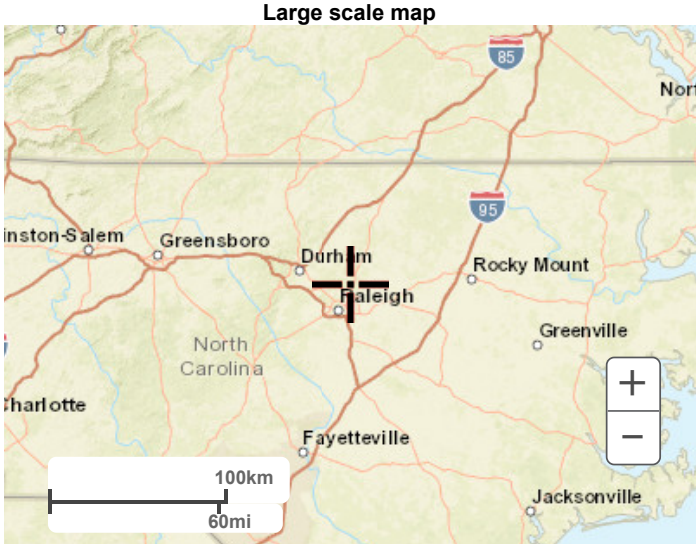
Small scale terrain



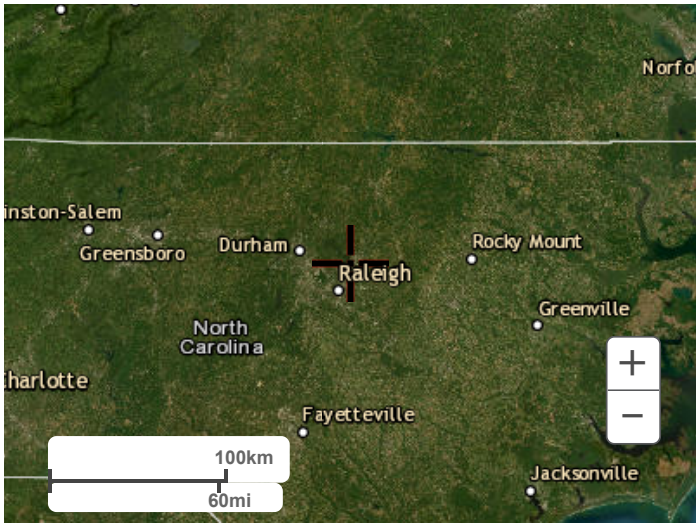
Large scale terrain



Large scale map



Large scale aerial



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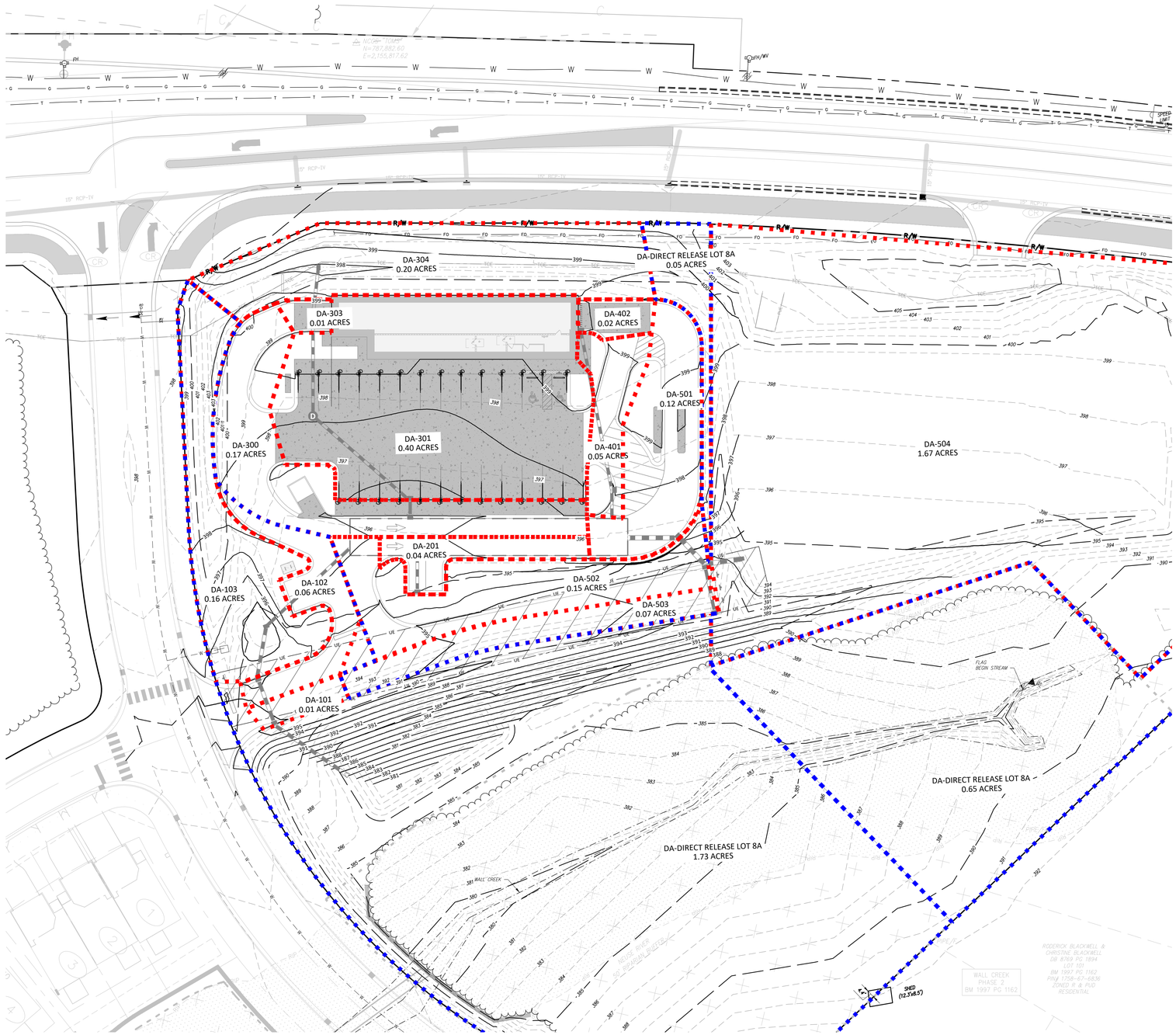
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov



30' 0 15' 30'

SCALE 1 inch = 30 ft

DRAINAGE AREA MAP

HALL OF FAME CAR WASH

WALLBROOK - LOT 8

Town of Rolesville Project No. SDP 25-01
US 401 Business / S. Main Street & Wall Creek Drive
Wake Forest Township, Town of Rolesville, Wake County, North Carolina

REVISIONS:

#	DATE	DESCRIPTION
3	2-JAN-25	INITIAL SUBMITTAL FOR REVIEW
2	3-MAR-25	REVISED PER TRC REVIEW COMMENTS

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PRELIMINARY
Not to be used for construction

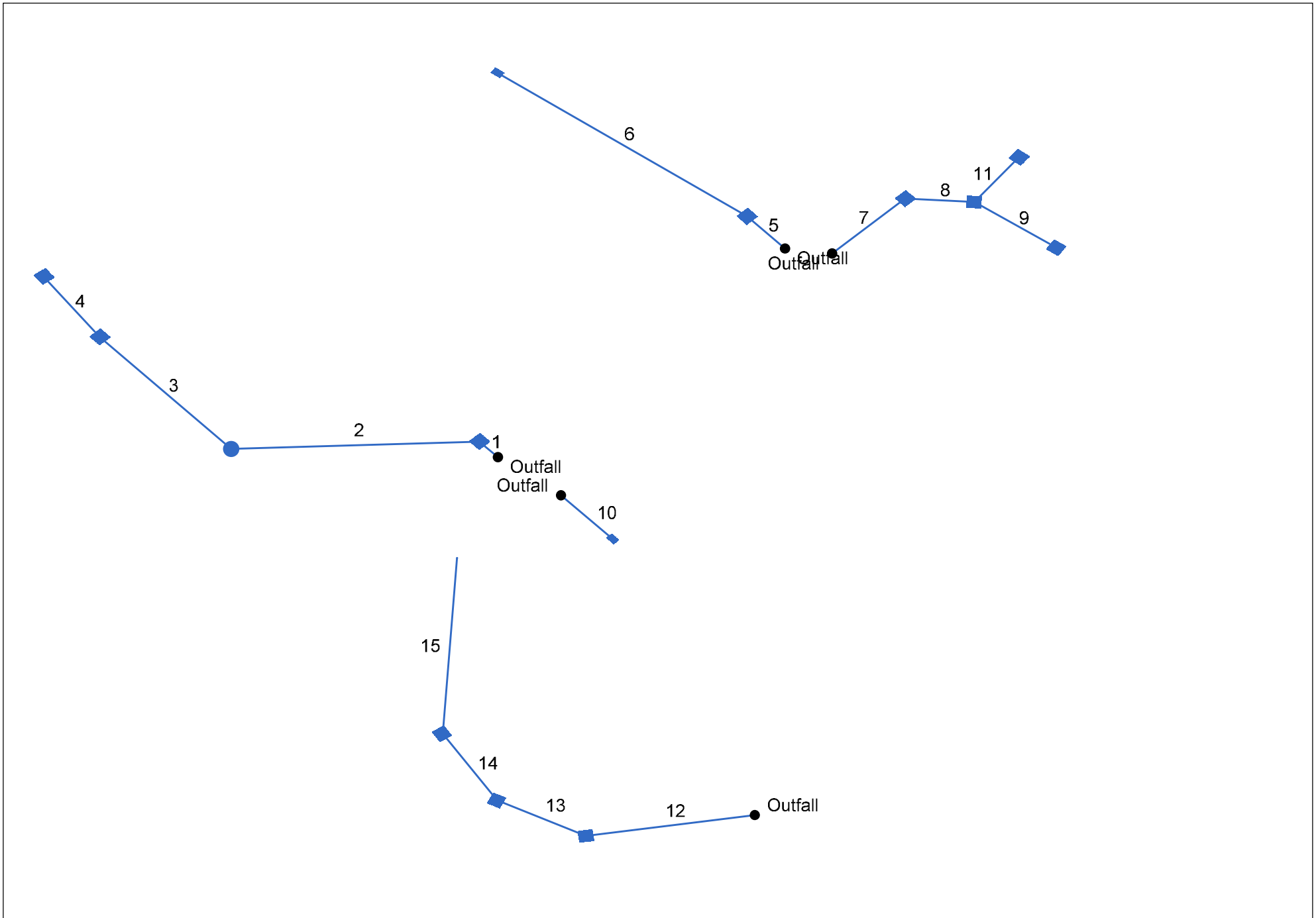
2/3/2025

Project Manager:	BCF
Drawn By:	DLC
Checked By:	TGN
Project Number:	24137
Drawing Number:	D-1525

DA

Date: January 2, 2025

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



Project File: 2025-03-03 - Lot 8A HoF.stm	Number of lines: 15	Date: 3/3/2025

1-Year Rain Event Results for Gutter Spread

Inlets

Line No.	Inlet ID	Drng Area (ac)	Inlet Time (min)	i Inlet (in/hr)	Runoff Coeff (C)	Flow Rate (cfs)	Line Type	Grate Area (sqft)	Cross Sl, Sw (ft/ft)	Cross Sl, Sx (ft/ft)	Local Depr (in)	Gutter Spread (ft)	Gutter Depth (ft)
15	104-UGO	0.00	0.0	0.00	0.00	4.67	Cir	....	....	....	....	....	....
14	103-DI	0.16	5.0	4.82	0.60	5.13	Cir	3.10	0.056	0.020	2.0	1.13	-0.01
13	102-CB	0.06	5.0	4.82	0.95	5.40	Cir	....	0.056	0.020	2.0	2.44	0.12
12	101-CB	0.01	5.0	4.82	0.95	5.44	Cir	....	0.056	0.020	2.0	1.10	0.06
11	504-DI	1.67	5.0	4.82	0.90	7.24	Cir	3.10	0.056	0.020	2.0	19.61	0.46
10	201-CB	0.04	5.0	4.82	0.95	0.18	Cir	3.10	0.056	0.020	2.0	0.90	-0.04
9	503-CB	0.07	5.0	4.82	0.95	0.32	Cir	3.10	0.056	0.020	2.0	1.23	0.01
8	502-CB	0.15	5.0	4.82	0.95	7.57	Cir	3.10	0.056	0.020	2.0	1.87	0.09
7	501-CB	0.12	5.0	4.82	0.95	8.03	Cir	3.10	0.056	0.020	2.0	1.66	0.06
6	402-CB	0.02	5.0	4.82	0.95	0.09	Cir	3.10	0.056	0.020	2.0	0.60	-0.08
5	401-CB	0.05	5.0	4.82	0.95	0.17	Cir	3.10	0.056	0.020	2.0	1.02	-0.02
4	304-DI	0.20	5.0	4.82	0.60	0.58	Cir	3.10	0.056	0.020	2.0	1.31	0.02
3	303-DI	0.01	5.0	4.82	0.95	0.60	Cir	3.10	0.056	0.020	2.0	0.24	-0.13
2	302-JB	0.00	5.0	0.00	0.00	0.55	Cir	....	....	....	....	....	....
1	301-CB	0.40	5.0	4.82	0.95	1.96	Cir	3.10	0.056	0.020	2.0	4.03	0.15

Project File: 2025-03-03 - Lot 8A HoF.stm | Number of lines: 15 | Date: 3/3/2025

NOTES: Intensity = 62.18 / (Inlet time + 12.70) ^ 0.89 -- Return period = 1 Yrs. ; ** Critical depth

10-Year Rain Event Results

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	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	7.500	0.40	0.61	0.95	0.38	0.51	5.0	8.4	6.2	3.17	6.67	3.67	15	1.07	390.00	390.08	391.01	390.80	397.01	397.12	301
2	1	69.692	0.00	0.21	0.00	0.00	0.13	5.0	6.8	6.6	0.86	6.43	2.35	15	0.99	390.28	390.97	390.80	391.33	397.12	398.07	302
3	2	54.000	0.01	0.21	0.95	0.01	0.13	5.0	5.6	7.0	0.90	6.46	3.33	15	1.00	391.17	391.71	391.49	392.08	398.07	398.80	303
4	3	26.498	0.20	0.20	0.60	0.12	0.12	5.0	5.0	7.2	0.86	6.52	3.29	15	1.02	391.91	392.18	392.22	392.54	398.80	397.80	304
5	End	15.500	0.05	0.07	0.95	0.05	0.07	5.0	18.0	4.6	0.31	9.13	1.27	15	2.00	390.00	390.31	390.82	390.52	391.80	398.45	401
6	5	86.450	0.02	0.02	0.95	0.02	0.02	5.0	5.0	7.2	0.14	9.13	2.23	15	2.00	390.51	392.24	390.62	392.38	398.45	399.47	402
7	End	28.107	0.12	2.01	0.95	0.11	1.83	5.0	6.3	6.8	12.38	15.96	5.03	24	0.50	388.50	388.64	390.00	390.07	390.88	397.62	501
8	7	19.578	0.15	1.89	0.95	0.14	1.71	5.0	6.2	6.8	11.65	16.17	4.16	24	0.51	388.84	388.94	390.54	390.57	397.62	393.84	502
9	8	28.000	0.07	0.07	0.95	0.07	0.07	5.0	5.0	7.2	0.48	4.57	0.75	15	0.50	390.21	390.35	390.93	390.93	393.84	393.84	503
10	End	21.000	0.04	0.04	0.95	0.04	0.04	5.0	5.0	7.2	0.27	9.13	1.25	15	2.00	389.58	390.00	390.29	390.20	391.10	396.58	201
11	8	20.039	1.67	1.67	0.90	1.50	1.50	5.0	5.0	7.2	10.79	15.98	3.70	24	0.50	389.14	389.24	390.93	390.96	393.84	394.22	504
12	End	47.891	0.01	0.23	0.95	0.01	0.16	5.0	5.3	7.1	5.82	5.68	3.81	18	0.29	384.00	384.14	385.20	385.36	385.79	395.34	101
13	12	28.000	0.06	0.22	0.95	0.06	0.15	5.0	5.2	7.1	5.76	5.95	3.73	18	0.32	384.34	384.43	385.57	385.65	395.34	395.34	102
14	13	27.851	0.16	0.16	0.60	0.10	0.10	5.0	5.0	7.2	5.36	14.85	6.31	18	2.00	386.31	386.86	386.93	387.76	395.34	394.20	103
15	14	61.800	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	4.67	9.15	5.87	15	2.01	387.06	388.30	387.76	389.18	394.20	390.10	105

Project File: 2025-03-03 - Lot 8A HoF.stm

Number of lines: 15

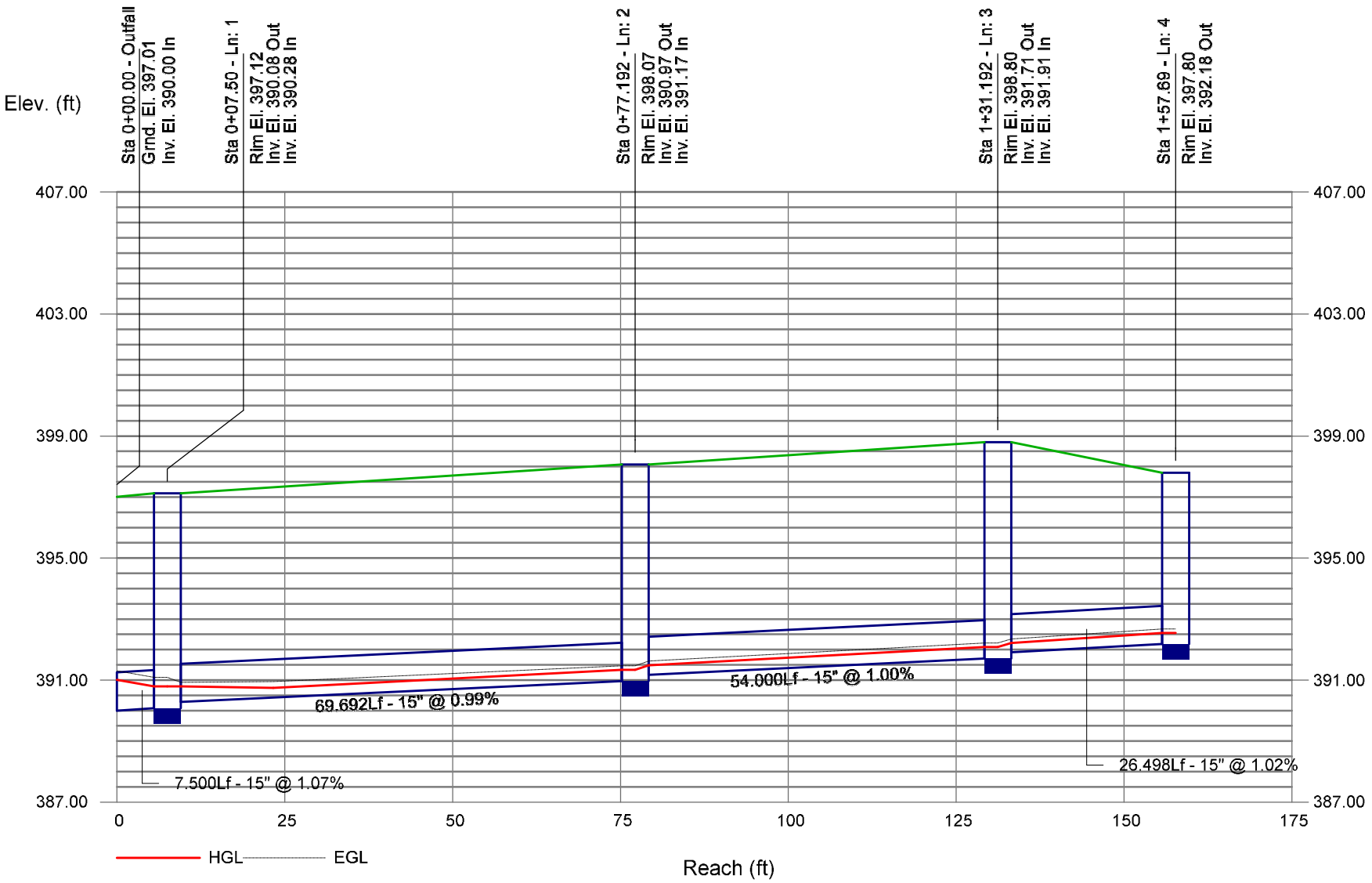
Run Date: 3/3/2025

NOTES:Intensity = 73.11 / (Inlet time + 12.60) ^ 0.81; Return period =Yrs. 10 ; c = cir e = ellip b = box

10-Year Hydraulic Grade Profiles

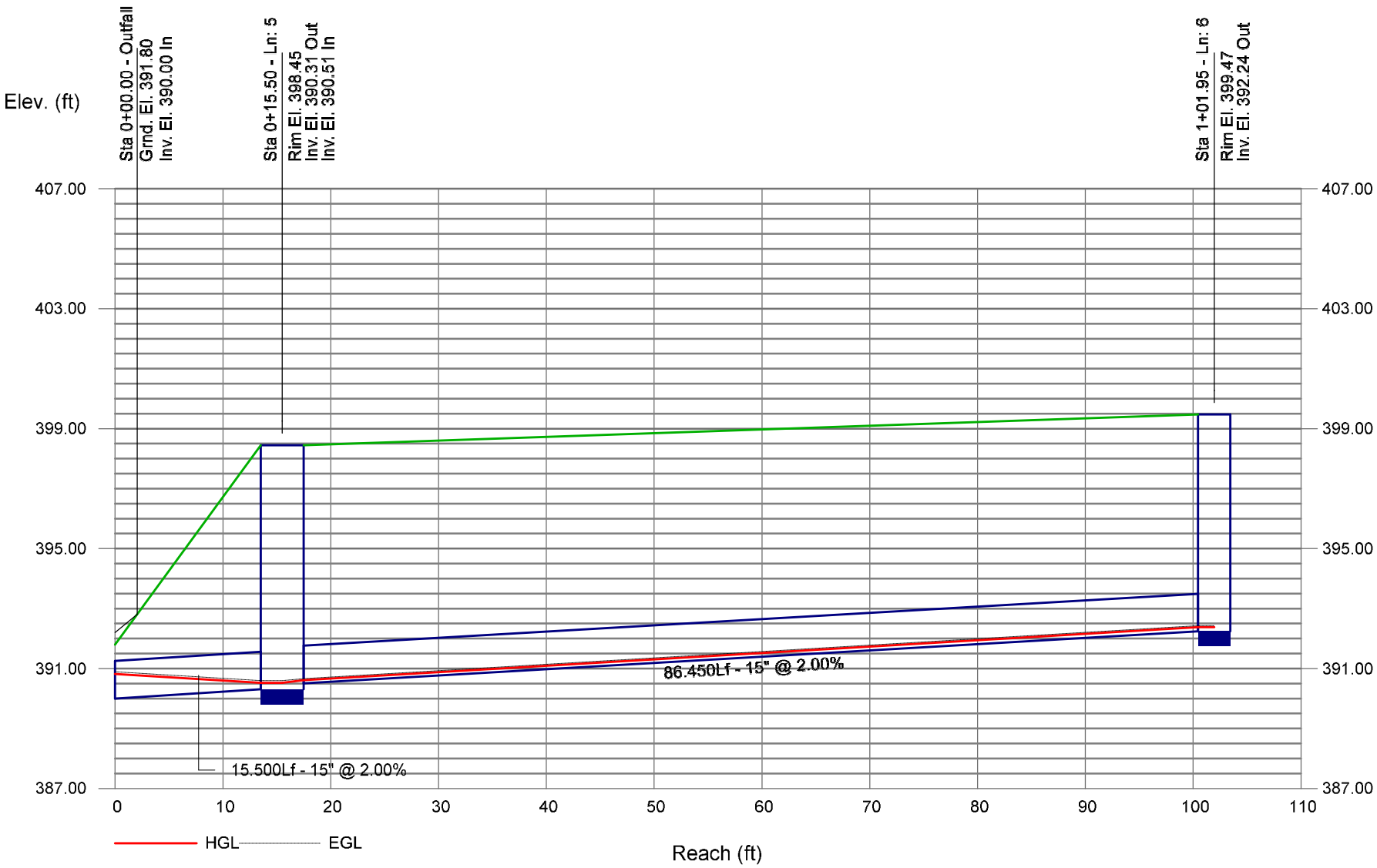
Storm Sewer Profile

Proj. file: 2025-03-03 - Lot 8A HoF.stm



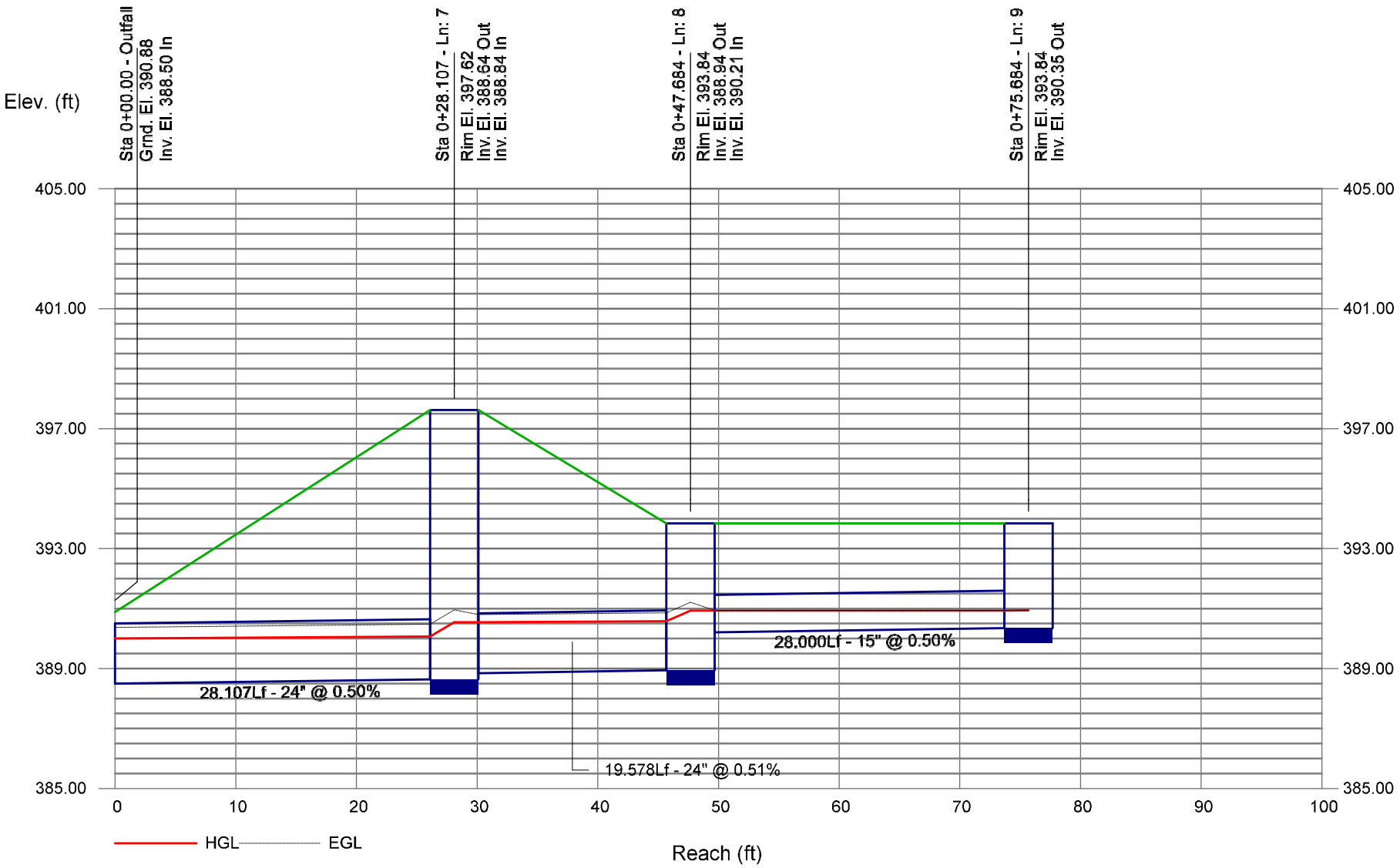
Storm Sewer Profile

Proj. file: 2025-03-03 - Lot 8A HoF.stm



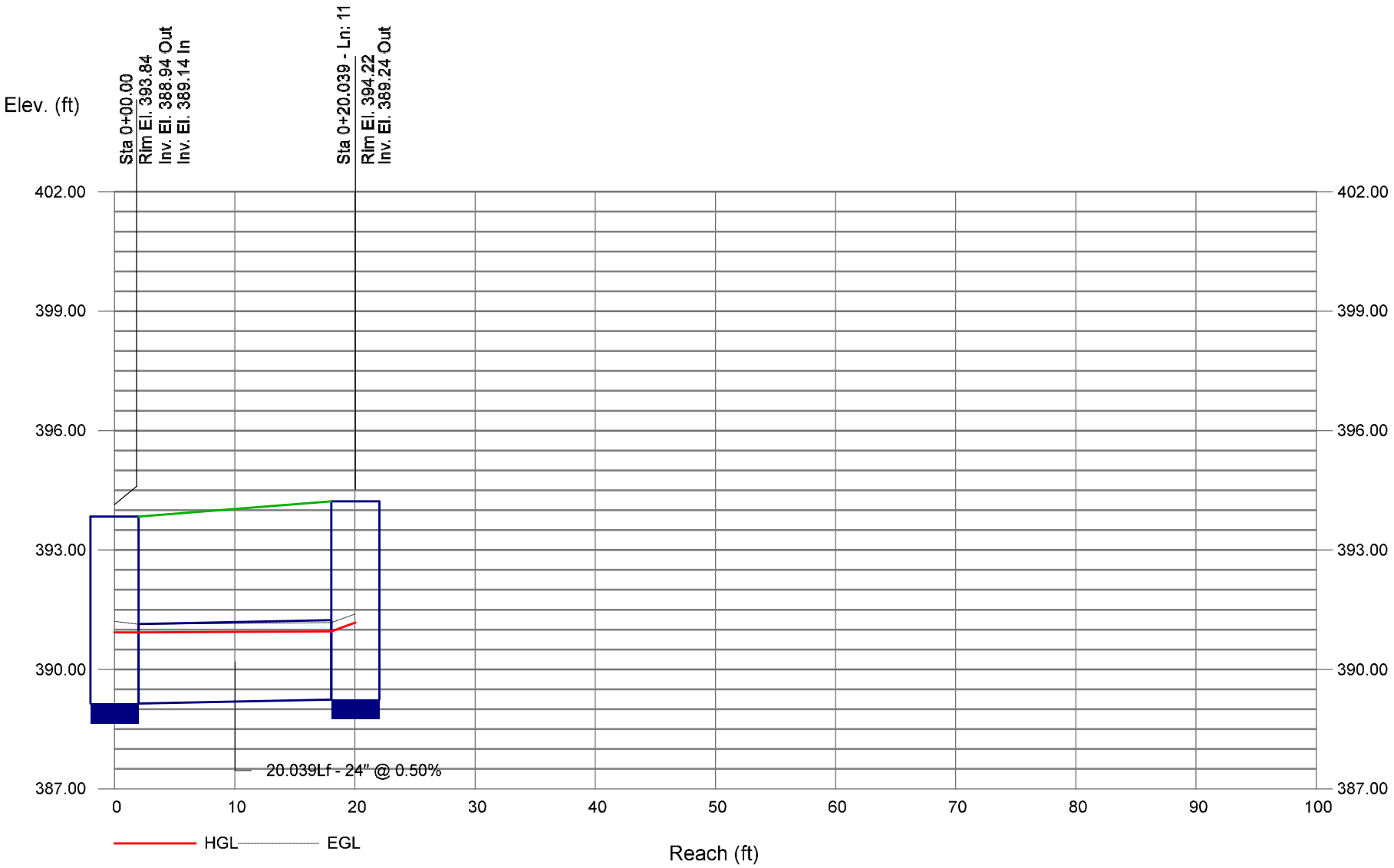
Storm Sewer Profile

Proj. file: 2025-03-03 - Lot 8A HoF.stm



Storm Sewer Profile

Proj. file: 2025-03-03 - Lot 8A HoF.stm



Storm Sewer Profile

Proj. file: 2025-03-03 - Lot 8A HoF.stm