EROSION CONTROL & STORMWATER REPORT & CALCULATIONS

For

Harris Creek Farms

Town of Rolesville, Wake County, NC

99. Provide rip rap calculations for all stormwater outfalls.

Original: 30 May 2025

100. Provide gutter spread calculations.

Bryan Harris

Digitally signed by Bryan Harris
DN: C=US, E=Bryan@QuantechEng.com, O=Quantech Engineering LLP, CN=Bryan Harris
Reason: I have reviewed this document
Date: 2025.05.30 17:58:12-04'00'

101. Provide culvert calculations for all proposed culverts.

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Narrative:

This project, Harris Creek Farms, is located in the Town of Rolesville, Wake County, North Carolina, directly south of the intersection of Universal Drive and Gideon Drive. The existing site consists of 94.99 acres of mostly wooded areas and open fields. There are two (2) streams within the site, Harris Creek runs from east to west, and an unnamed tributary runs from north to south and feeds into Harris Creek. There are existing FEMA flood plains on this site per FEMA panel 3720175700K, with an effective date of 7/19/2022. The site is located outside of any current High Quality Water (HQW) zones delineated by NCDEQ.

As the site is being developed, the stormwater runoff will be routed through diversion ditches into four (4) sediment basins designed to Wake County standards. Once the site has been stabilized, two (2) of the sediment basins will be converted into permanent wet ponds designed to NCDEQ standards, and will receive stormwater runoff through a series of stormwater pipes and inlets.

The peak flow analysis for the site was performed by analyzing the on-site area that drains to a downstream analysis point on Harris Creek. The results from this analysis are shown in the table below:

Peak Flow Analysis

Site Condition	Storm Event (cfs)			
	1-year (cfs)	2-year (cfs)	10-year (cfs)	100-year (cfs)
Total Pre-Development	97.19	140.47	268.72	485.73
Post-Development Pond Inflow (to SCM 1)	29.62	40.98	73.59	126.80
Post-Development Pond Inflow (to SCM 2)	18.20	25.18	45.22	77.92
Post-Development Pond Outflow (SCM 1)	0.50	0.59	14.27	89.74
Post-Development Pond Outflow (SCM 2)	2.40	10.91	40.00	75.92
Post-Development Untreated (Bypass)	85.43	121.90	229.22	408.08
Total Post-Development	85.93	132.88	264.21	553.73

Conclusion:

The results of the analysis shows that the proposed development decreases the peak stormwater flows for the 1-year, 2-year, and 10-year storm events. Based on the results, the development is not anticipated to have any adverse downstream impacts.

RAINFALL DATA

NOAA Atlas 14, Volume 2, Version 3
Location name: Wake Forest, North Carolina, USA*
Latitude: 35.8857°, Longitude: -78.4794°
Elevation: 234 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)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.403** (0.369-0.442)	**0.469** (0.430-0.513)	**0.535** (0.490-0.584)	**0.600** (0.549-0.655)	**0.666** (0.606-0.726)	**0.718** (0.651-0.782)	**0.764** (0.689-0.832)	**0.805** (0.721-0.878)	**0.850** (0.756-0.928)	**0.890** (0.785-0.974)
10-min	**0.644** (0.590-0.705)	**0.750** (0.688-0.820)	**0.857** (0.785-0.935)	**0.960** (0.878-1.05)	**1.06** (0.966-1.16)	**1.14** (1.04-1.25)	**1.21** (1.09-1.32)	**1.28** (1.14-1.39)	**1.34** (1.20-1.47)	**1.40** (1.24-1.53)
15-min	**0.806** (0.738-0.882)	**0.943** (0.864-1.03)	**1.08** (0.993-1.18)	**1.21** (1.11-1.32)	**1.34** (1.22-1.47)	**1.45** (1.31-1.58)	**1.53** (1.38-1.67)	**1.61** (1.44-1.76)	**1.69** (1.50-1.85)	**1.76** (1.55-1.92)
30-min	**1.10** (1.01-1.21)	**1.30** (1.19-1.42)	**1.54** (1.41-1.68)	**1.76** (1.61-1.92)	**1.99** (1.81-2.17)	**2.18** (1.98-2.38)	**2.35** (2.12-2.56)	**2.51** (2.25-2.73)	**2.69** (2.39-2.94)	**2.85** (2.51-3.12)
60-min	**1.38** (1.26-1.51)	**1.63** (1.50-1.79)	**1.97** (1.81-2.15)	**2.29** (2.10-2.50)	**2.65** (2.42-2.89)	**2.95** (2.68-3.22)	**3.24** (2.92-3.53)	**3.52** (3.15-3.83)	**3.86** (3.44-4.22)	**4.16** (3.67-4.55)
2-hr	**1.61** (1.46-1.78)	**1.92** (1.75-2.10)	**2.34** (2.13-2.57)	**2.75** (2.49-3.01)	**3.23** (2.91-3.54)	**3.65** (3.28-3.99)	**4.05** (3.61-4.43)	**4.47** (3.96-4.88)	**5.00** (4.39-5.47)	**5.48** (4.76-6.00)
3-hr	**1.71** (1.55-1.89)	**2.03** (1.86-2.24)	**2.49** (2.27-2.75)	**2.94** (2.67-3.24)	**3.50** (3.15-3.84)	**3.98** (3.57-4.37)	**4.47** (3.97-4.90)	**4.98** (4.39-5.45)	**5.65** (4.93-6.20)	**6.27** (5.41-6.88)
6-hr	**2.05** (1.87-2.26)	**2.44** (2.23-2.68)	**2.99** (2.73-3.29)	**3.54** (3.22-3.88)	**4.22** (3.82-4.62)	**4.83** (4.34-5.28)	**5.44** (4.85-5.94)	**6.09** (5.37-6.64)	**6.96** (6.06-7.58)	**7.76** (6.67-8.47)
12-hr	**2.41** (2.21-2.66)	**2.88** (2.64-3.16)	**3.54** (3.25-3.89)	**4.22** (3.84-4.62)	**5.06** (4.59-5.53)	**5.84** (5.24-6.35)	**6.62** (5.89-7.19)	**7.46** (6.56-8.10)	**8.61** (7.46-9.35)	**9.68** (8.25-10.5)
24-hr	**2.87** (2.66-3.09)	**3.46** (3.22-3.73)	**4.35** (4.05-4.69)	**5.06** (4.69-5.45)	**6.02** (5.57-6.49)	**6.80** (6.26-7.32)	**7.59** (6.97-8.17)	**8.41** (7.70-9.06)	**9.54** (8.69-10.3)	**10.4** (9.47-11.3)
2-day	**3.32** (3.09-3.57)	**4.00** (3.72-4.30)	**4.99** (4.64-5.37)	**5.77** (5.36-6.21)	**6.83** (6.32-7.36)	**7.68** (7.08-8.27)	**8.55** (7.86-9.21)	**9.44** (8.65-10.2)	**10.7** (9.73-11.5)	**11.6** (10.6-12.6)
3-day	**3.52** (3.28-3.78)	**4.23** (3.95-4.54)	**5.25** (4.90-5.63)	**6.06** (5.64-6.50)	**7.16** (6.64-7.68)	**8.04** (7.44-8.63)	**8.94** (8.24-9.60)	**9.87** (9.06-10.6)	**11.2** (10.2-12.0)	**12.2** (11.1-13.1)
4-day	**3.72** (3.48-3.98)	**4.46** (4.17-4.77)	**5.52** (5.15-5.90)	**6.35** (5.92-6.78)	**7.50** (6.96-8.01)	**8.41** (7.79-8.99)	**9.34** (8.62-10.0)	**10.3** (9.48-11.0)	**11.6** (10.6-12.5)	**12.7** (11.5-13.6)
7-day	**4.32** (4.04-4.61)	**5.15** (4.82-5.50)	**6.29** (5.88-6.71)	**7.19** (6.72-7.67)	**8.43** (7.85-9.00)	**9.42** (8.74-10.1)	**10.4** (9.65-11.1)	**11.5** (10.6-12.3)	**12.9** (11.8-13.8)	**14.0** (12.8-15.1)
10-day	**4.91** (4.61-5.24)	**5.85** (5.49-6.23)	**7.05** (6.60-7.50)	**7.99** (7.47-8.50)	**9.25** (8.64-9.86)	**10.3** (9.55-10.9)	**11.3** (10.5-12.0)	**12.3** (11.4-13.1)	**13.7** (12.6-14.7)	**14.8** (13.6-15.8)
20-day	**6.59** (6.20-7.02)	**7.79** (7.32-8.29)	**9.22** (8.67-9.81)	**10.4** (9.72-11.0)	**11.9** (11.1-12.7)	**13.1** (12.2-13.9)	**14.3** (13.3-15.3)	**15.6** (14.4-16.6)	**17.2** (15.9-18.4)	**18.5** (17.1-19.9)
30-day	**8.18** (7.72-8.69)	**9.63** (9.08-10.2)	**11.2** (10.6-11.9)	**12.5** (11.7-13.2)	**14.1** (13.2-15.0)	**15.3** (14.4-16.3)	**16.6** (15.5-17.7)	**17.8** (16.6-19.0)	**19.5** (18.1-20.8)	**20.8** (19.2-22.2)
45-day	**10.4** (9.89-11.0)	**12.2** (11.6-12.9)	**14.0** (13.3-14.8)	**15.4** (14.6-16.2)	**17.2** (16.2-18.1)	**18.5** (17.5-19.6)	**19.9** (18.7-21.0)	**21.2** (19.9-22.4)	**22.9** (21.5-24.3)	**24.2** (22.6-25.7)
60-day	**12.5** (11.9-13.1)	**14.6** (13.9-15.4)	**16.6** (15.7-17.4)	**18.1** (17.1-19.0)	**20.0** (18.9-21.0)	**21.4** (20.3-22.6)	**22.8** (21.6-24.1)	**24.2** (22.8-25.6)	**26.0** (24.4-27.5)	**27.3** (25.6-28.9)

[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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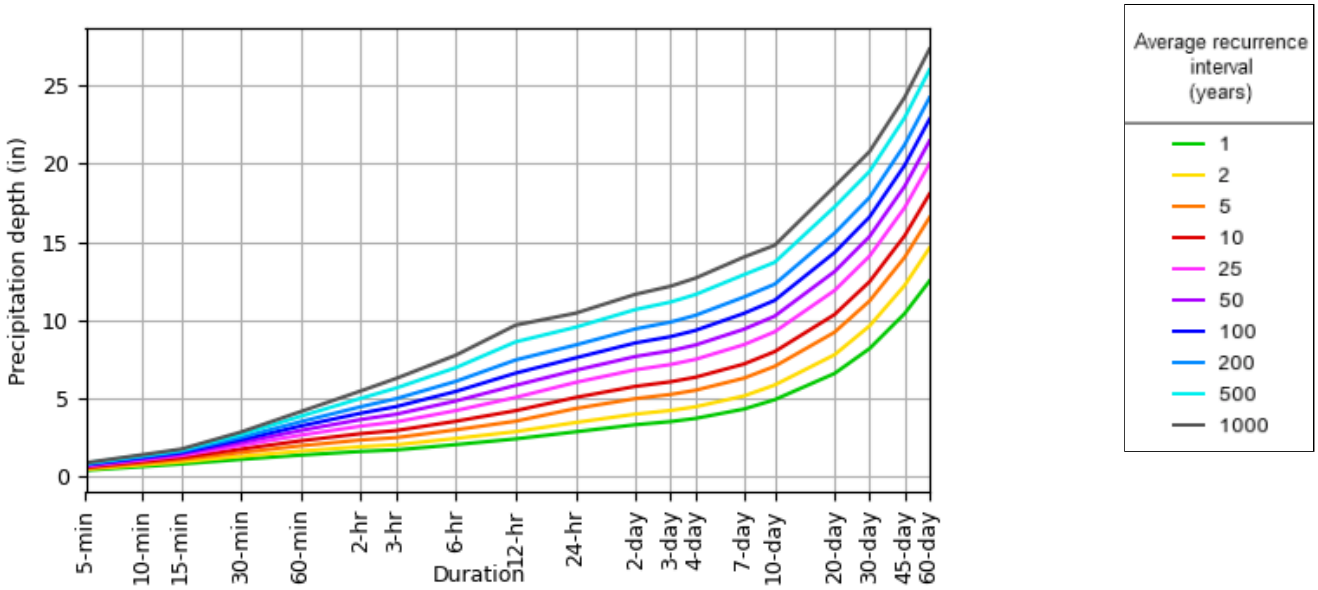
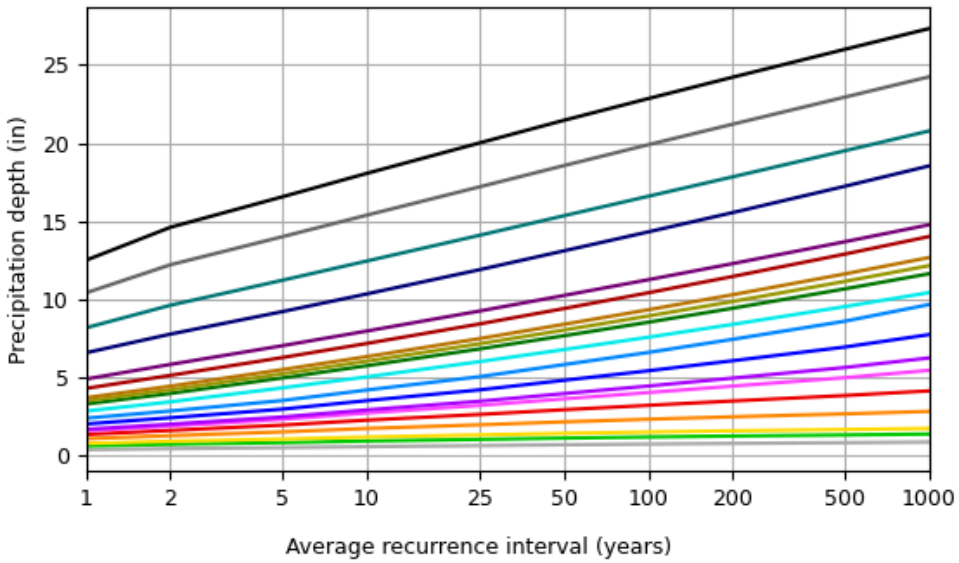
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 35.8857°, Longitude: -78.4794°





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Created (GMT): Tue Feb 25 13:19:14 2025

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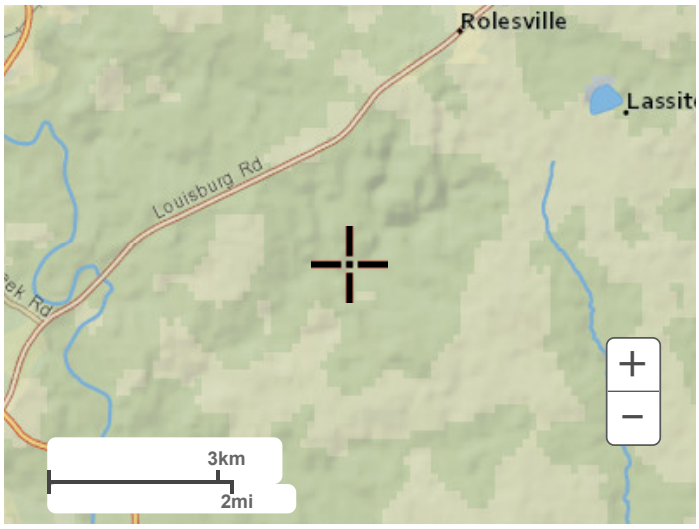
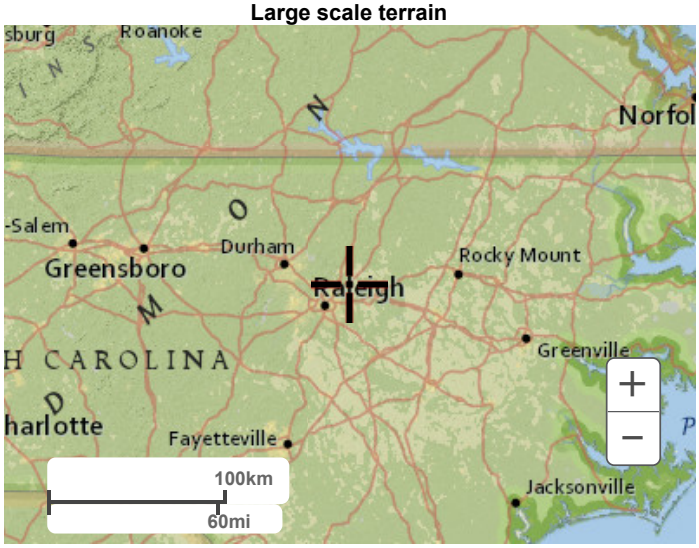
Maps & aerials

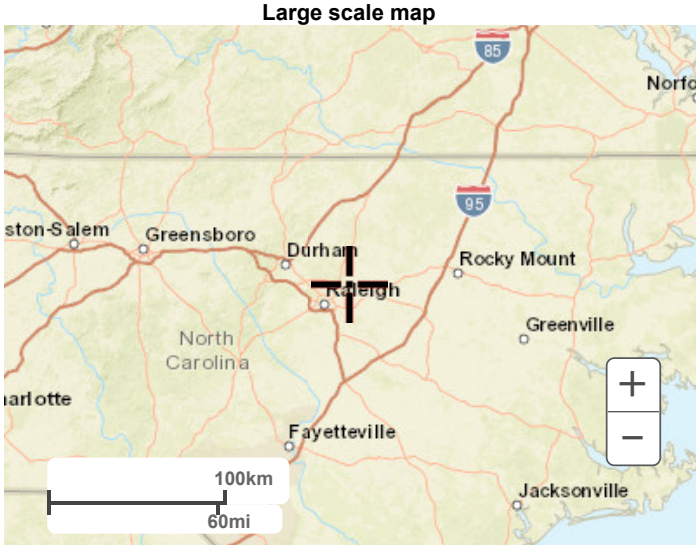
Small scale terrain



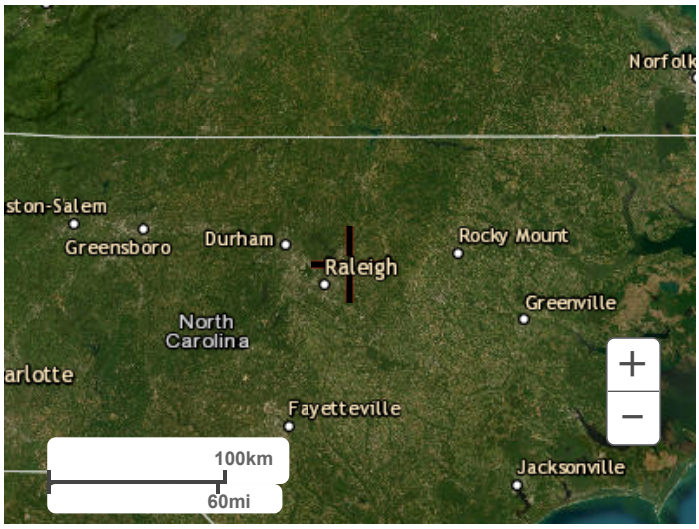
Large scale terrain



Large scale map



Large scale aerial



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1325 East West Highway
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Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 2, Version 3
Location name: Wake Forest, North Carolina, USA*
Latitude: 35.8857°, Longitude: -78.4794°
Elevation: 234 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	**4.84** (4.43-5.30)	**5.63** (5.16-6.16)	**6.42** (5.88-7.01)	**7.20** (6.59-7.86)	**7.99** (7.27-8.71)	**8.62** (7.81-9.38)	**9.17** (8.27-9.98)	**9.66** (8.65-10.5)	**10.2** (9.07-11.1)	**10.7** (9.42-11.7)
10-min	**3.86** (3.54-4.23)	**4.50** (4.13-4.92)	**5.14** (4.71-5.61)	**5.76** (5.27-6.28)	**6.37** (5.80-6.94)	**6.86** (6.22-7.48)	**7.28** (6.56-7.93)	**7.66** (6.86-8.35)	**8.07** (7.17-8.81)	**8.41** (7.42-9.20)
15-min	**3.22** (2.95-3.53)	**3.77** (3.46-4.12)	**4.34** (3.97-4.73)	**4.86** (4.44-5.30)	**5.38** (4.90-5.86)	**5.79** (5.25-6.31)	**6.14** (5.53-6.68)	**6.44** (5.77-7.02)	**6.77** (6.02-7.39)	**7.04** (6.21-7.70)
30-min	**2.21** (2.02-2.42)	**2.60** (2.39-2.85)	**3.08** (2.82-3.36)	**3.52** (3.22-3.84)	**3.98** (3.63-4.34)	**4.36** (3.95-4.75)	**4.70** (4.24-5.12)	**5.01** (4.49-5.47)	**5.39** (4.79-5.88)	**5.70** (5.03-6.24)
60-min	**1.38** (1.26-1.51)	**1.63** (1.50-1.79)	**1.97** (1.81-2.15)	**2.29** (2.10-2.50)	**2.65** (2.42-2.89)	**2.95** (2.68-3.22)	**3.24** (2.92-3.53)	**3.52** (3.15-3.83)	**3.86** (3.44-4.22)	**4.16** (3.67-4.55)
2-hr	**0.805** (0.731-0.889)	**0.958** (0.875-1.05)	**1.17** (1.06-1.28)	**1.37** (1.25-1.51)	**1.61** (1.46-1.77)	**1.82** (1.64-2.00)	**2.03** (1.81-2.22)	**2.23** (1.98-2.44)	**2.50** (2.20-2.74)	**2.74** (2.38-3.00)
3-hr	**0.568** (0.516-0.629)	**0.676** (0.618-0.746)	**0.829** (0.754-0.915)	**0.980** (0.889-1.08)	**1.16** (1.05-1.28)	**1.33** (1.19-1.46)	**1.49** (1.32-1.63)	**1.66** (1.46-1.82)	**1.88** (1.64-2.06)	**2.09** (1.80-2.29)
6-hr	**0.341** (0.312-0.377)	**0.407** (0.373-0.448)	**0.499** (0.456-0.549)	**0.591** (0.538-0.648)	**0.704** (0.637-0.771)	**0.807** (0.724-0.881)	**0.909** (0.809-0.992)	**1.02** (0.896-1.11)	**1.16** (1.01-1.27)	**1.30** (1.11-1.41)
12-hr	**0.200** (0.183-0.220)	**0.238** (0.219-0.261)	**0.294** (0.269-0.322)	**0.349** (0.319-0.383)	**0.420** (0.380-0.458)	**0.484** (0.435-0.526)	**0.549** (0.488-0.596)	**0.618** (0.544-0.671)	**0.714** (0.618-0.775)	**0.803** (0.685-0.872)
24-hr	**0.119** (0.111-0.128)	**0.144** (0.134-0.155)	**0.181** (0.168-0.195)	**0.210** (0.195-0.226)	**0.250** (0.232-0.270)	**0.283** (0.261-0.304)	**0.316** (0.290-0.340)	**0.350** (0.320-0.377)	**0.397** (0.362-0.429)	**0.435** (0.394-0.470)
2-day	**0.069** (0.064-0.074)	**0.083** (0.077-0.089)	**0.103** (0.096-0.111)	**0.120** (0.111-0.129)	**0.142** (0.131-0.153)	**0.159** (0.147-0.172)	**0.178** (0.163-0.191)	**0.196** (0.180-0.212)	**0.222** (0.202-0.240)	**0.242** (0.220-0.262)
3-day	**0.048** (0.045-0.052)	**0.058** (0.054-0.063)	**0.072** (0.068-0.078)	**0.084** (0.078-0.090)	**0.099** (0.092-0.106)	**0.111** (0.103-0.119)	**0.124** (0.114-0.133)	**0.137** (0.125-0.147)	**0.154** (0.141-0.166)	**0.168** (0.153-0.182)
4-day	**0.038** (0.036-0.041)	**0.046** (0.043-0.049)	**0.057** (0.053-0.061)	**0.066** (0.061-0.070)	**0.078** (0.072-0.083)	**0.087** (0.081-0.093)	**0.097** (0.089-0.104)	**0.107** (0.098-0.115)	**0.121** (0.110-0.130)	**0.132** (0.120-0.142)
7-day	**0.025** (0.024-0.027)	**0.030** (0.028-0.032)	**0.037** (0.035-0.039)	**0.042** (0.039-0.045)	**0.050** (0.046-0.053)	**0.056** (0.052-0.059)	**0.062** (0.057-0.066)	**0.068** (0.062-0.073)	**0.076** (0.070-0.082)	**0.083** (0.076-0.089)
10-day	**0.020** (0.019-0.021)	**0.024** (0.022-0.025)	**0.029** (0.027-0.031)	**0.033** (0.031-0.035)	**0.038** (0.035-0.041)	**0.042** (0.039-0.045)	**0.046** (0.043-0.050)	**0.051** (0.047-0.054)	**0.057** (0.052-0.061)	**0.061** (0.056-0.066)
20-day	**0.013** (0.012-0.014)	**0.016** (0.015-0.017)	**0.019** (0.018-0.020)	**0.021** (0.020-0.022)	**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** (0.010-0.012)	**0.013** (0.012-0.014)	**0.015** (0.014-0.016)	**0.017** (0.016-0.018)	**0.019** (0.018-0.020)	**0.021** (0.019-0.022)	**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	**0.009** (0.009-0.010)	**0.011** (0.010-0.011)	**0.012** (0.012-0.013)	**0.014** (0.013-0.015)	**0.015** (0.015-0.016)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)	**0.019** (0.018-0.020)	**0.021** (0.019-0.022)	**0.022** (0.020-0.023)
60-day	**0.008** (0.008-0.009)	**0.010** (0.009-0.010)	**0.011** (0.010-0.012)	**0.012** (0.011-0.013)	**0.013** (0.013-0.014)	**0.014** (0.014-0.015)	**0.015** (0.014-0.016)	**0.016** (0.015-0.017)	**0.018** (0.016-0.019)	**0.018** (0.017-0.020)

[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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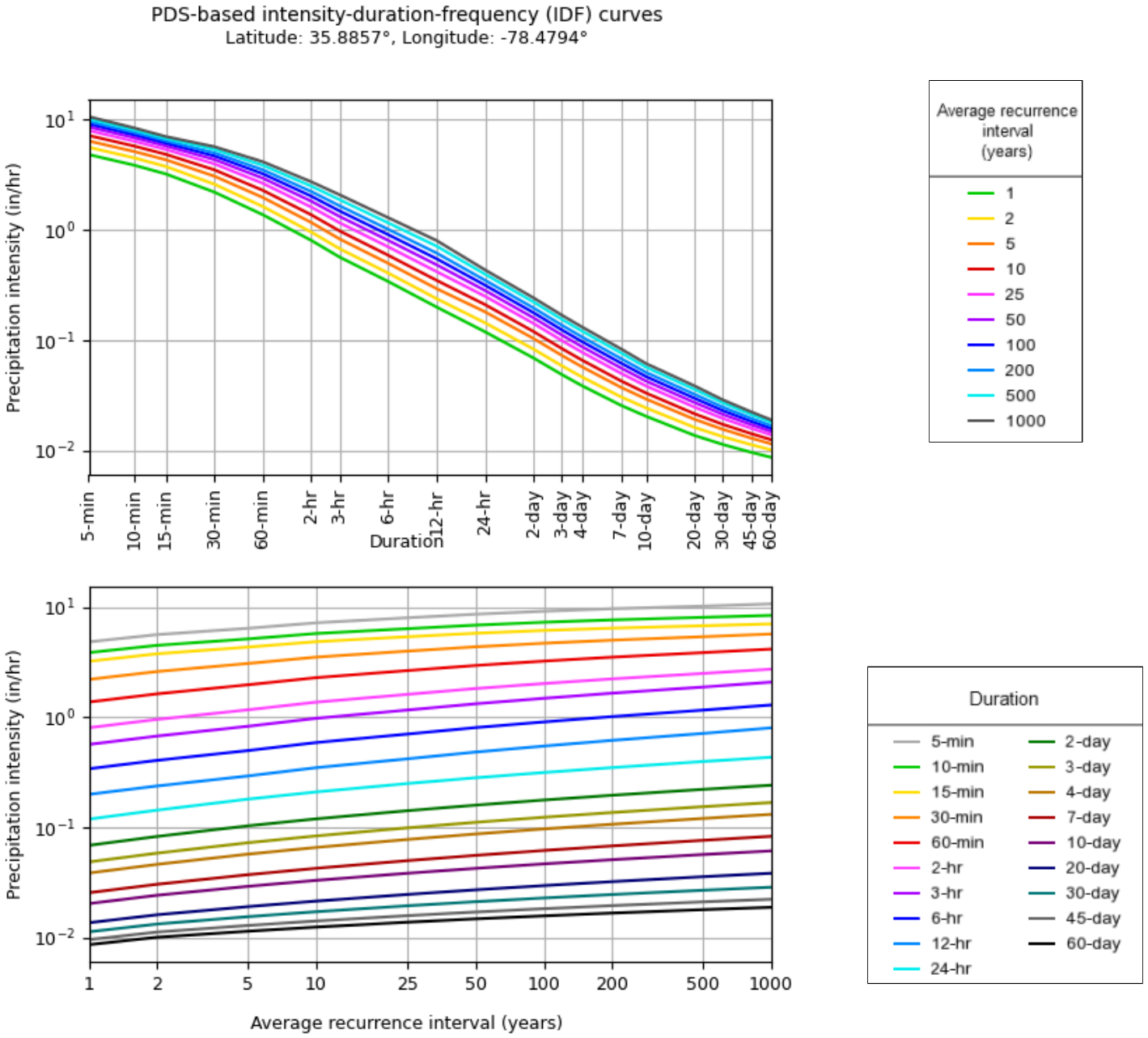
PF graphical



NOAA Atlas 14, Volume 2, Version 3 Created (GMT): Wed May 21 14:15:04 2025

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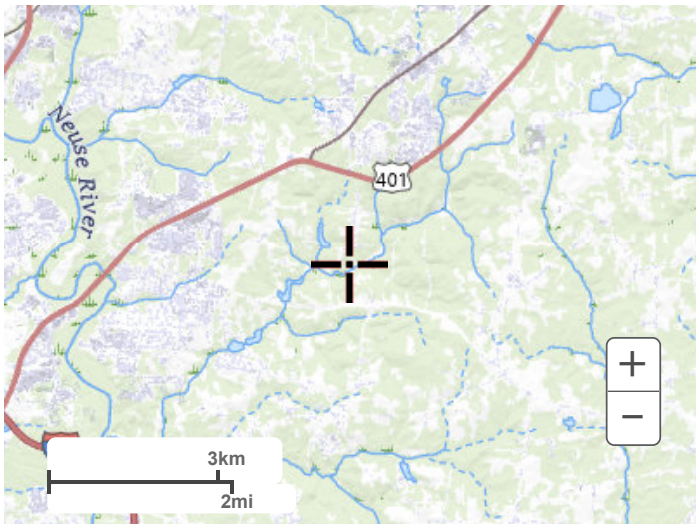
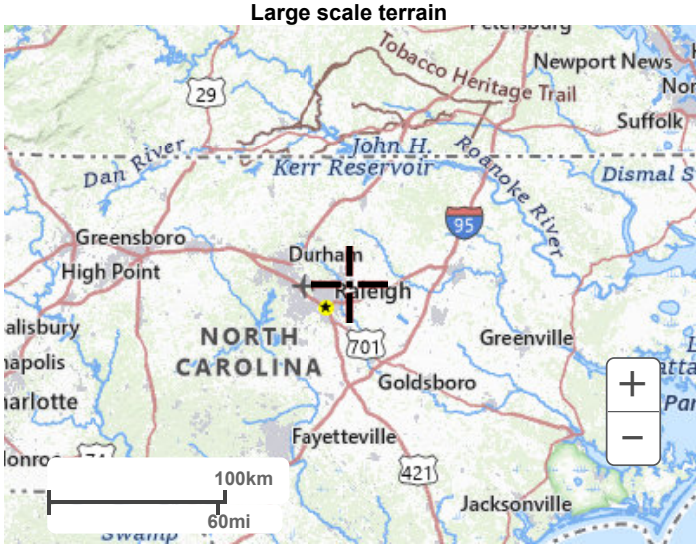
Maps & aerials

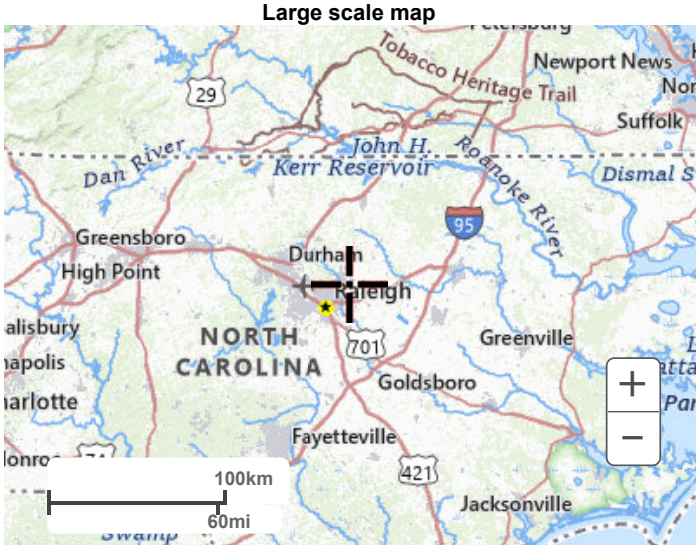
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

Back to Top

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

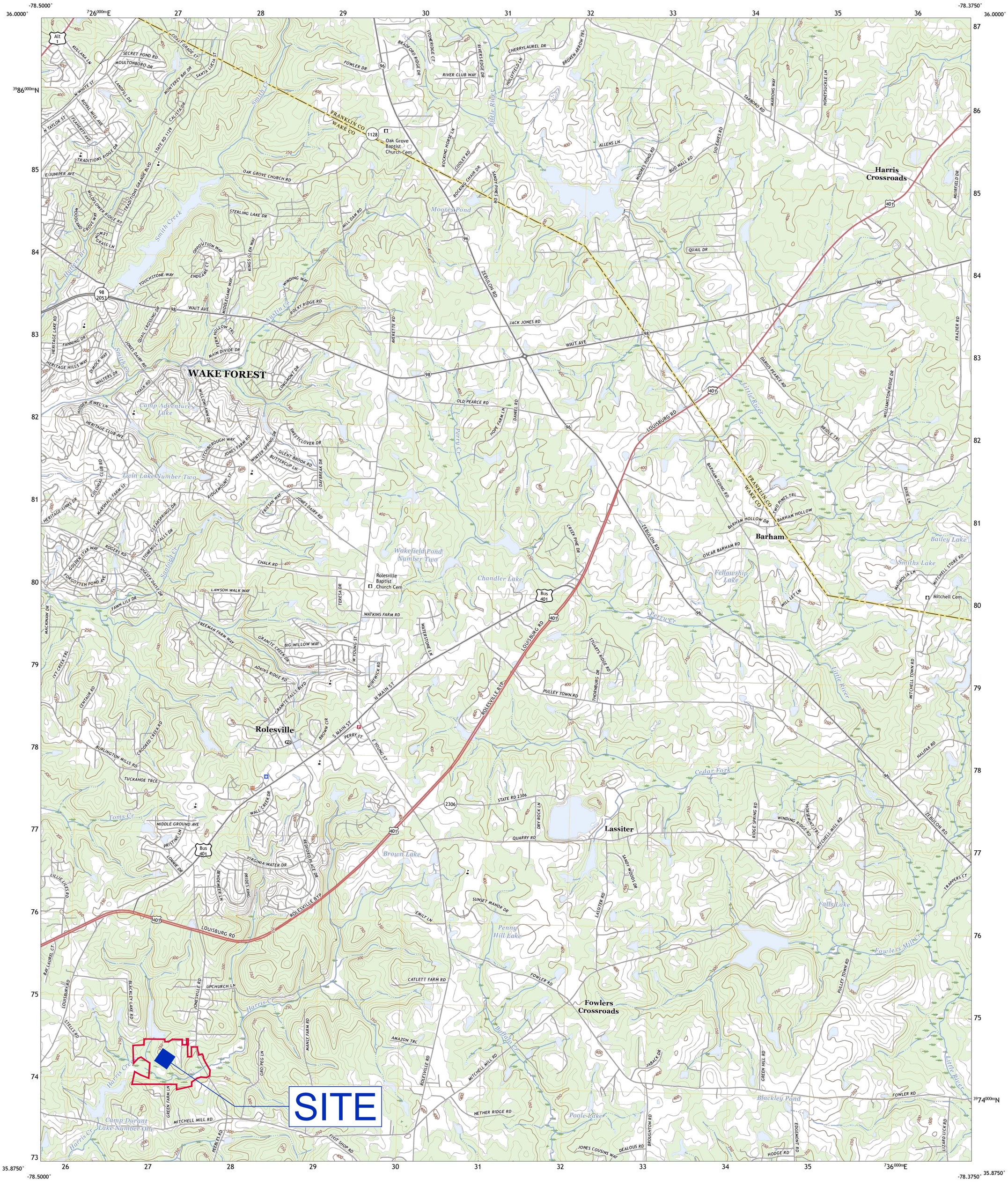
Disclaimer

USGS MAP

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

ROLESVILLE QUADRANGLE
NORTH CAROLINA
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid:Universal Transverse Mercator, Zone 17S

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, July 2020 - July 2020
Roads.....U.S. Census Bureau, 2016
Names.....GNIS, 1980 - 2022
Hydrography.....National Hydrography Dataset, 2001 - 2021
Contours.....National Elevation Dataset, 2008
Boundaries.....Multiple sources; see metadata file 2019 - 2021

Wetlands.....FWS National Wetlands Inventory Not Available

MN
GN
9°23'
167 MILS
1½°
27 MILS
UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
QV

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

NORTH CAROLINA
QUADRANGLE LOCATION

1 Grissom
2 Franklinton
3 Louisburg
4 Wake Forest
5 Bunn West
6 Raleigh East

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

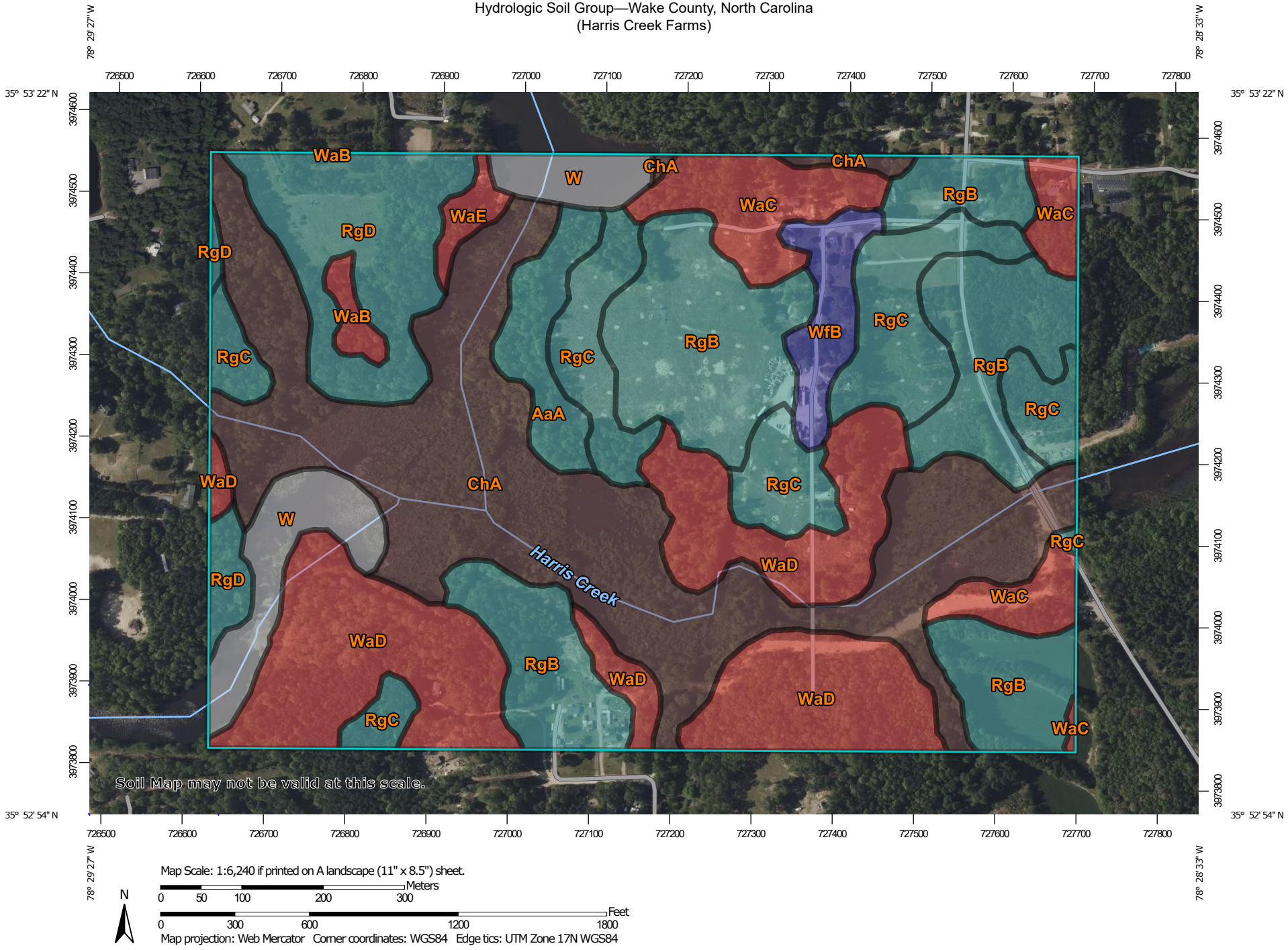
N. 76 43 01 16 37 91 70
A REF NO. USGSX24K384453

WAKE COUNTY SOILS MAP

WAKE COUNTY, NORTH CAROLINA — SHEET NUMBER 31

NRCS SOILS MAP

Hydrologic Soil Group—Wake County, North Carolina
(Harris Creek Farms)



Map Scale: 1:6,240 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wake County, North Carolina
Survey Area Data: Version 26, Sep 9, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 24, 2022—May 9, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AaA	Altavista fine sandy loam, 0 to 4 percent slopes, rarely flooded	C	5.1	2.6%
ChA	Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded	B/D	49.9	25.8%
RgB	Rawlings-Rion complex, 2 to 6 percent slopes	C	38.2	19.7%
RgC	Rawlings-Rion complex, 6 to 10 percent slopes	C	21.8	11.3%
RgD	Rawlings-Rion complex, 10 to 15 percent slopes	C	15.1	7.8%
W	Water		8.9	4.6%
WaB	Wake-Rolesville complex, 2 to 6 percent slopes, very rocky	D	1.2	0.6%
WaC	Wake-Rolesville complex, 6 to 10 percent slopes, very rocky	D	11.6	6.0%
WaD	Wake-Rolesville complex, 10 to 15 percent slopes, very rocky	D	35.8	18.5%
WaE	Wake-Rolesville complex, 15 to 25 percent slopes, very rocky	D	1.4	0.7%
WfB	Wedowee-Saw complex, 2 to 6 percent slopes	B	4.4	2.3%
Totals for Area of Interest			**193.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

FEMA FLOOD MAP

This digital Flood Insurance Rate Map (FIRM) was produced through a unique cooperative partnership between the State of North Carolina and the Federal Emergency Management Agency (FEMA). The State of North Carolina has implemented a long term approach to floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map flood hazard areas at the local level. As a part of this effort, the State of North Carolina has joined in a Cooperating Technical State agreement with FEMA to produce and maintain this digital FIRM.

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://FRIS.NC.GOV/FRIS
HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A,V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% Annual Chance Flood with Average Depth Less Than One Foot or With Drainage Areas of Less Than One Square Mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*

OTHER AREAS

- Areas Determined to be Outside the 0.2% Annual Chance Floodplain *Zone X*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall
- 012 — 18.2 — Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
- 8 — Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

OTHER FEATURES

- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at https://msc.fema.gov. An accompanying Flood Insurance Study report, Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA) revising portions of this panel, and digital versions of this FIRM may be available. Visit the North Carolina Floodplain Mapping Program website at https://flood.nc.gov/ncflood, or contact the FEMA Map Service Center.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Flood Insurance Study (FIS) means an examination, evaluation, and determination of flood hazards, corresponding water surface elevations, flood hazard risk zones, and other flood data in a community issued by the North Carolina Floodplain Mapping Program (NCFMP). The Flood Insurance Study (FIS) is comprised of the following products used together: the Digital Flood Hazard Database, the Water Surface Elevation Rasters, the digitally derived, autogenerated Flood Insurance Rate Map and the Flood Insurance Survey Report. A Flood Insurance Survey is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. This report contains detailed flood elevation data, data tables and FIRM indices. When a flood study is completed for the NFIP, the digital information, reports and maps are assembled into an FIS. Information shown on this FIRM is provided in digital format by the NCFMP. Base map information shown on this FIRM was provided in digital format by the NCFMP. The source of this information can be determined from the metadata available in the digital FLOOD database and in the Technical Support Data Notebook (TSDN).

ACCREDITED LEVEE NOTES TO USERS: If an accredited levee note appears on this panel check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

PROVISIONALLY ACCREDITED LEVEE NOTES TO USERS: If a Provisionally Accredited Levee (PAL) note appears on this panel, check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

LIMIT OF MODERATE WAVE ACTION NOTES TO USERS: For some coastal flooding zones the AE Zone category has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

- Limit of Moderate Wave Action (LiMWA)

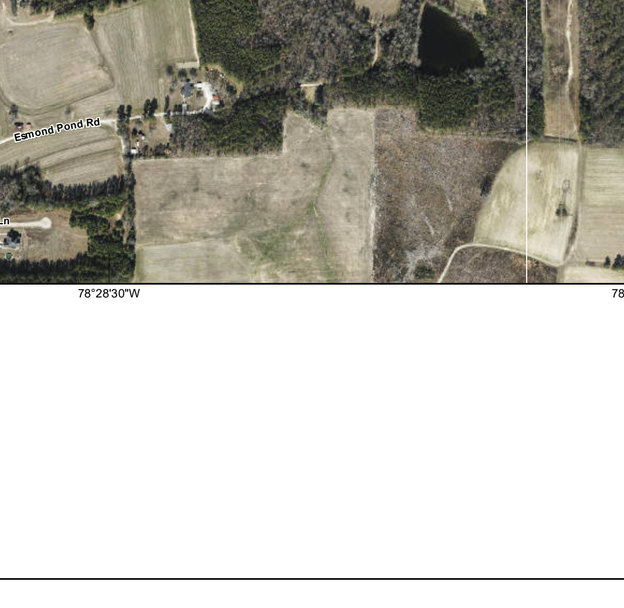
SCALE

Map Projection:
North Carolina State Plane Projection Feet (Zone 3200)
Datum: NAD 1983 (Horizontal), NAVD 1988 (Vertical)

1 inch = 500 feet 1:6,000

0 250 500 1,000 Feet
0 75 150 300 Meters

PANEL LOCATOR



FEMA
National Flood Insurance Program

NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 1757

FEMA

Panel Contains:

COMMUNITY	CID	PANEL	SUFFIX
RALEIGH, CITY OF	370243	1757	K
ROLESVILLE, TOWN OF	370468	1757	K
WAKE COUNTY	370368	1757	K

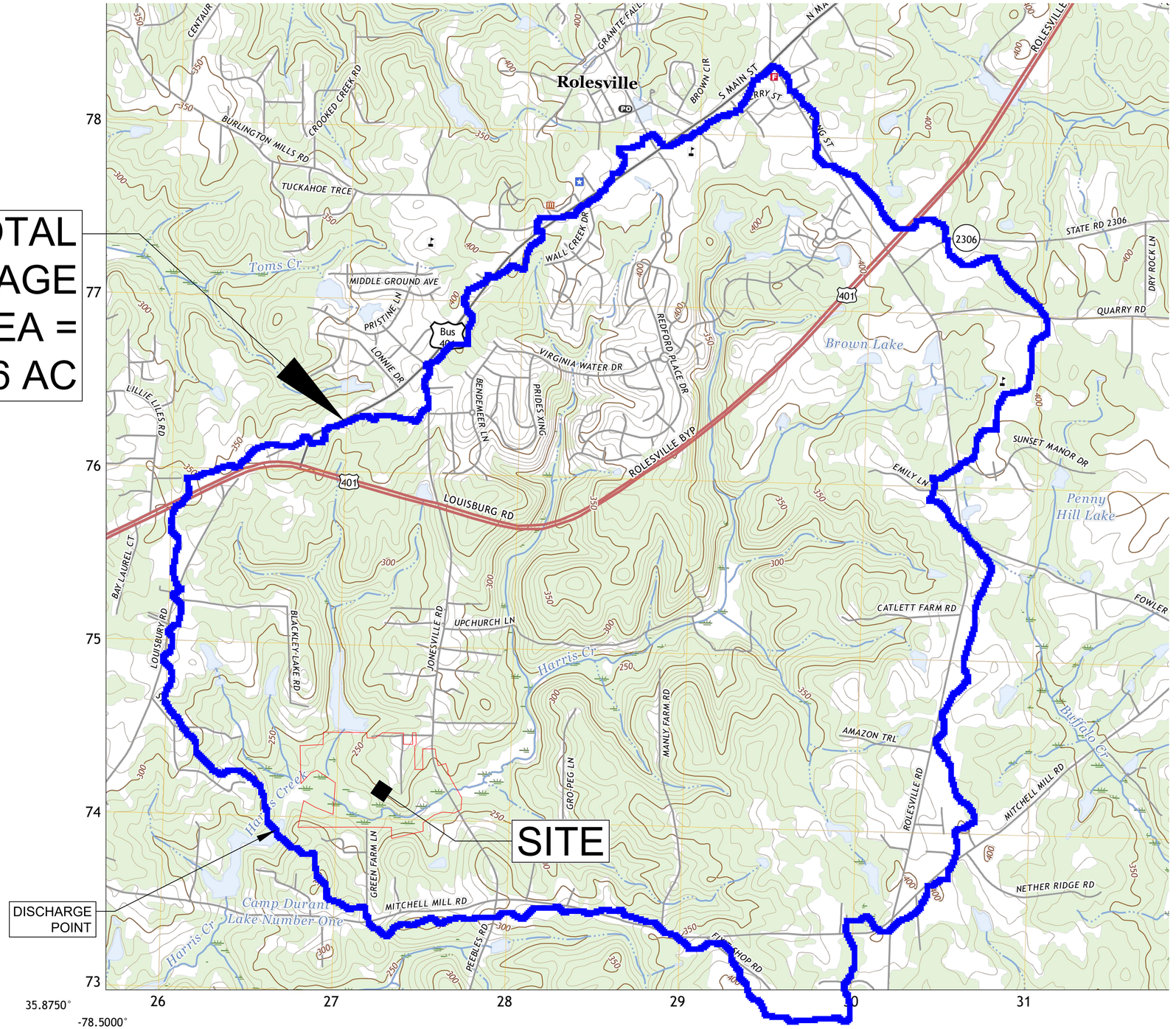
VERSION NUMBER
2.3.3.2

MAP NUMBER
3720175700K

MAP REVISED
July 19, 2022

DRAINAGE AREA MAPS

TOTAL DRAINAGE AREA = 4,207.36 AC



GRAPHIC SCALE

1,000 0 500 1,000 2,000 4,000

(IN FEET)
1 inch =1,000 ft

N.C. UNDERGROUND UTILITIES
811 3 DAYS BEFORE DIGGING CALL TOLL FREE 811 or (800)632-4949
A ONE CALL SYSTEM FOR COMMUNITY AND JOB SAFETY

File Location: C:\Users\Jason Cato\Quantech\Quantech Engineering - Documents\Harris Creek Farm - Jonesville\Engineering_DWG\Base Files\References\Pond Calcs\Drainage Area Maps.dwg

Developer
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Cary, N.C. 27513
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Bateman Civil Survey Company
2524 Reliance Avenue
Apex, NC 27539
919-557-1080 ext 109
www.batemancivilsurvey.com

Jurisdiction / Municipality
Rolesville
Town of Rolesville
502 Southtown Cir
Rolesville, NC 27571
Phone: 919-554-6517
PSP-24-05

Other Consultants

Sheet map:

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Last Saved by: Jason Cato
Drawn by: TAN

Project:

HARRIS CREEK FARMS

CID-25-??

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No.	Date	Description

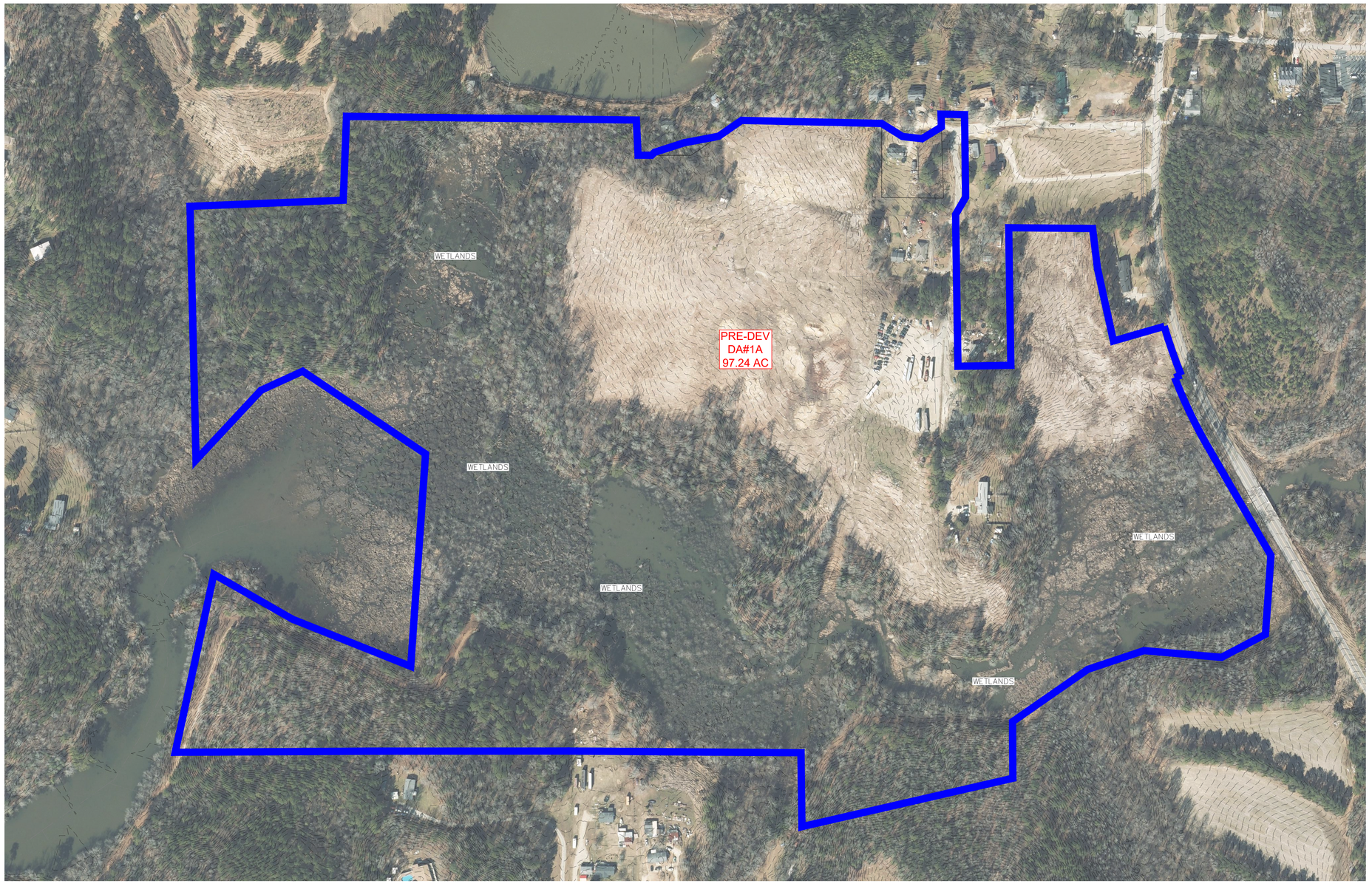
Sheet Title:

OVERALL DRAINAGE BASIN

Sheet #:

POST

DRAINAGE AREA



GRAPHIC SCALE

150 0 75 150 300 600

(IN FEET)
1 inch = 150 ft

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502 Southtown Cir
Rolesville, NC 27571
Phone: 919-554-6517
PSP-24-05

Other Consultants

Sheet map:
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S

Seal:

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PRE-DEVELOPMENT DA MAP

Sheet #:

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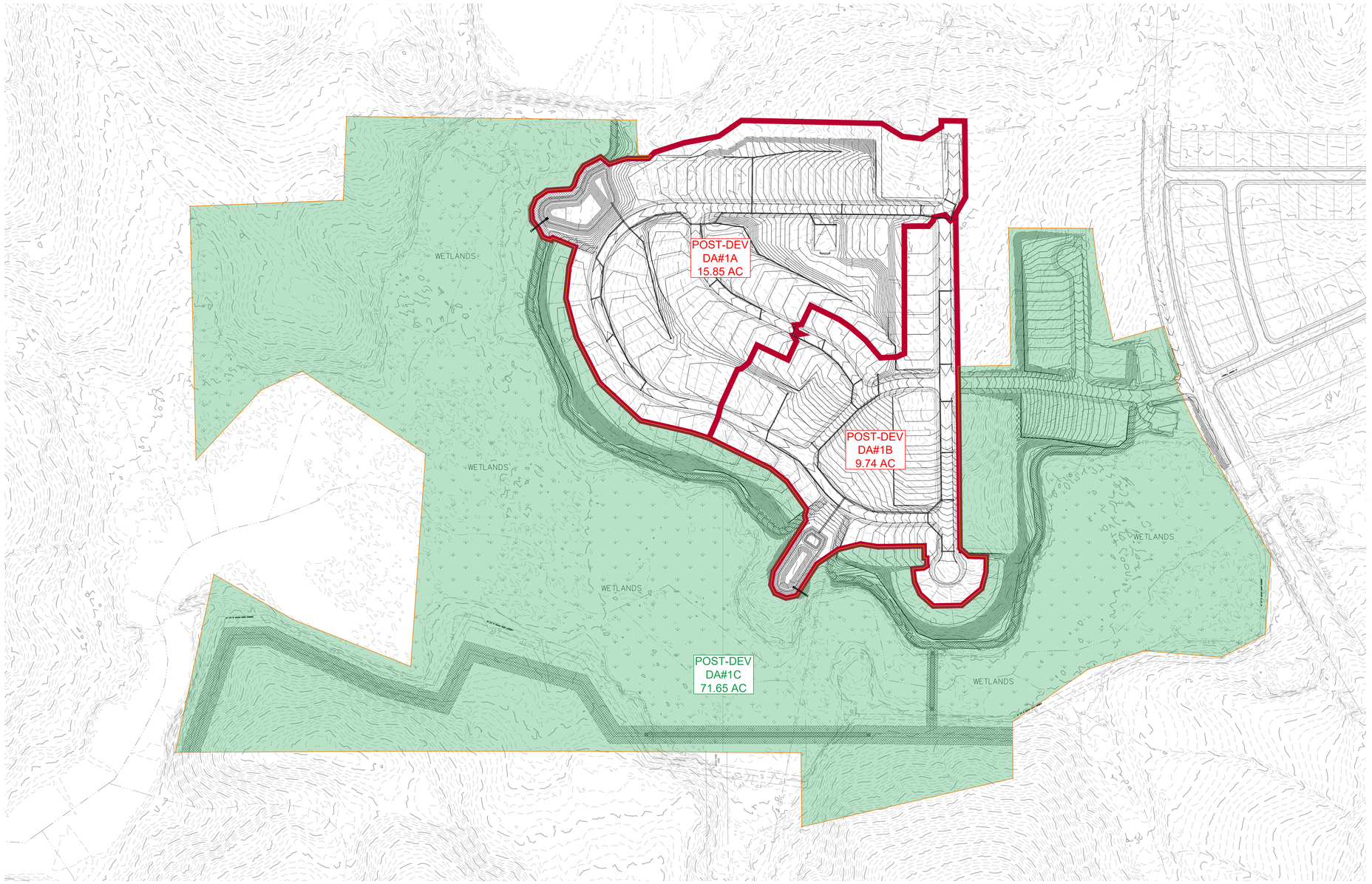
TREATED DRAINAGE AREA

UNTREATED DRAINAGE AREA



N.C. UNDERGROUND UTILITIES

811 3 DAYS BEFORE DIGGING CALL TOLL FREE 811 or (800)632-4949

A ONE CALL SYSTEM FOR COMMUNITY AND JOB SAFETY

GRAPHIC SCALE

150 0 75 150 300 600

(IN FEET)

1 inch = 150 ft

File Location: C:\Users\Jason Cato\Quantech\Quantech Engineering - Documents\Harris Creek Farm - Jonesville\Engineering_DWG\Base Files\Reference\Pond Calcs\Drainage Area Maps.dwg

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Sheet map:

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S

Seal:

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Drawn by: TAN

Project:

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CID-25-??

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PRELIMINARY PLANS
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REVISIONS

No.	Date	Description

Sheet Title:

POST-DEVELOPMENT DA MAP

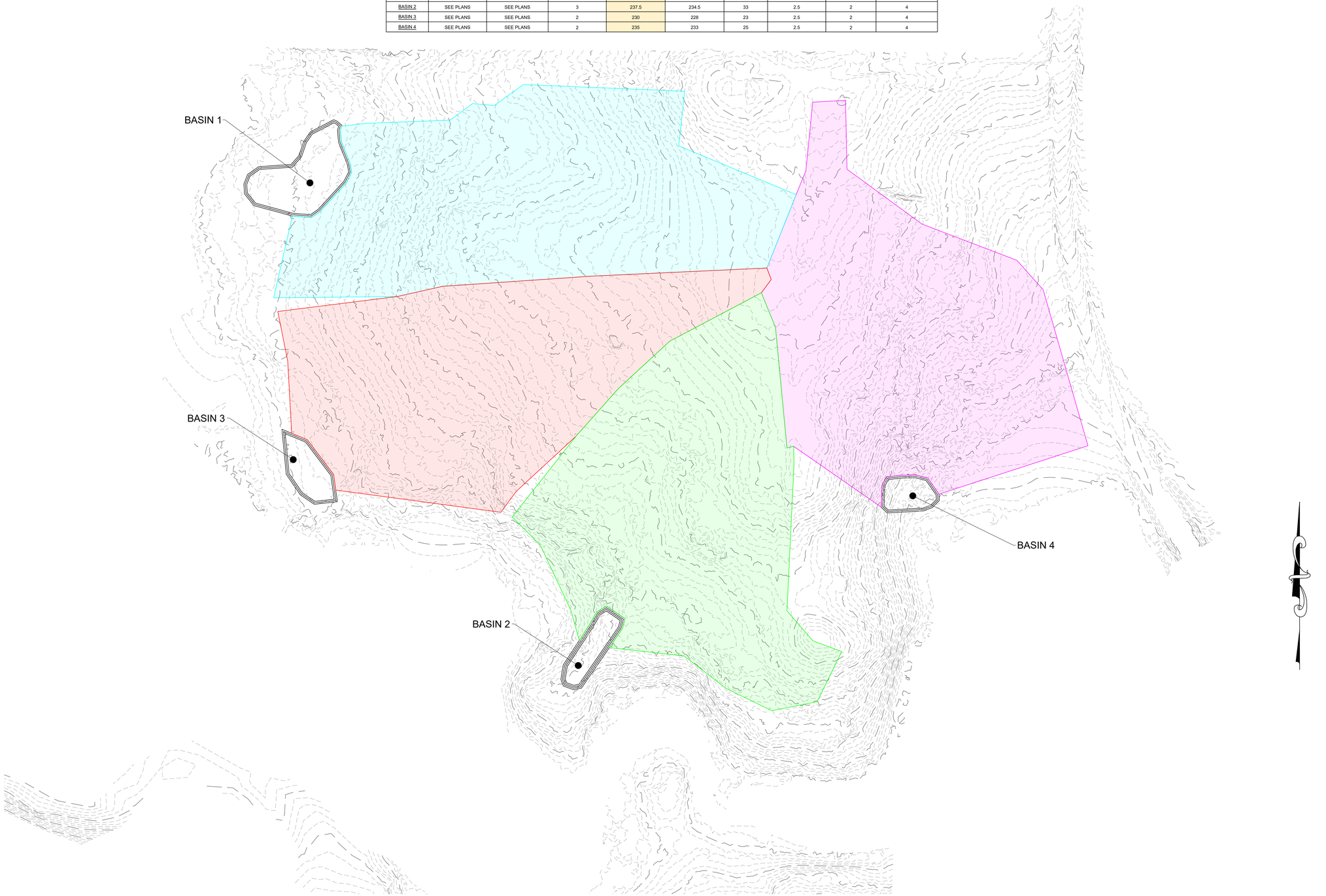
Sheet #:

POST

HARRIS CREEK

SKIMMER BASIN TABLE

Skimmer Basin #	Width (ft)	Length (ft)	Depth (ft)	Top Elevation	Outlet Elevation	Weir (ft)	Skimmer (in)	Orifice (in)	Dewatering Time (days)
BASIN 1	SEE PLANS	SEE PLANS	2	237	235	50	2.5	2.5	4
BASIN 2	SEE PLANS	SEE PLANS	3	237.5	234.5	33	2.5	2	4
BASIN 3	SEE PLANS	SEE PLANS	2	230	228	23	2.5	2	4
BASIN 4	SEE PLANS	SEE PLANS	2	235	233	25	2.5	2	4



GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)

1 inch = 100 ft

File Location: C:\Users\jthodge\Quantech\Quantech Engineering - Documents\Harris Creek Farm - Jonesville\Engineering_DWG\Base Files\X-Refs\Harris Creek DAs.dwg

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Est. 1837

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PSP-24-05

Other Consultants

Sheet map:

N
W E
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Seal:

NORTH CAROLINA PROFESSIONAL SEAL 53676 ENGINEER BRYAN A. HARRIS

FINAL DRAWING - FOR REVIEW PURPOSES ONLY

Issued / Print Date: 2025-May-29 (11:42)
File Name: Harris Creek DAs.dwg

Last Saved by: Jthodge
Drawn by: TAN

Project:

HARRIS CREEK FARMS

CID-25-??

Issued for:

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

REVISIONS

No.	Date	Description

Sheet Title:

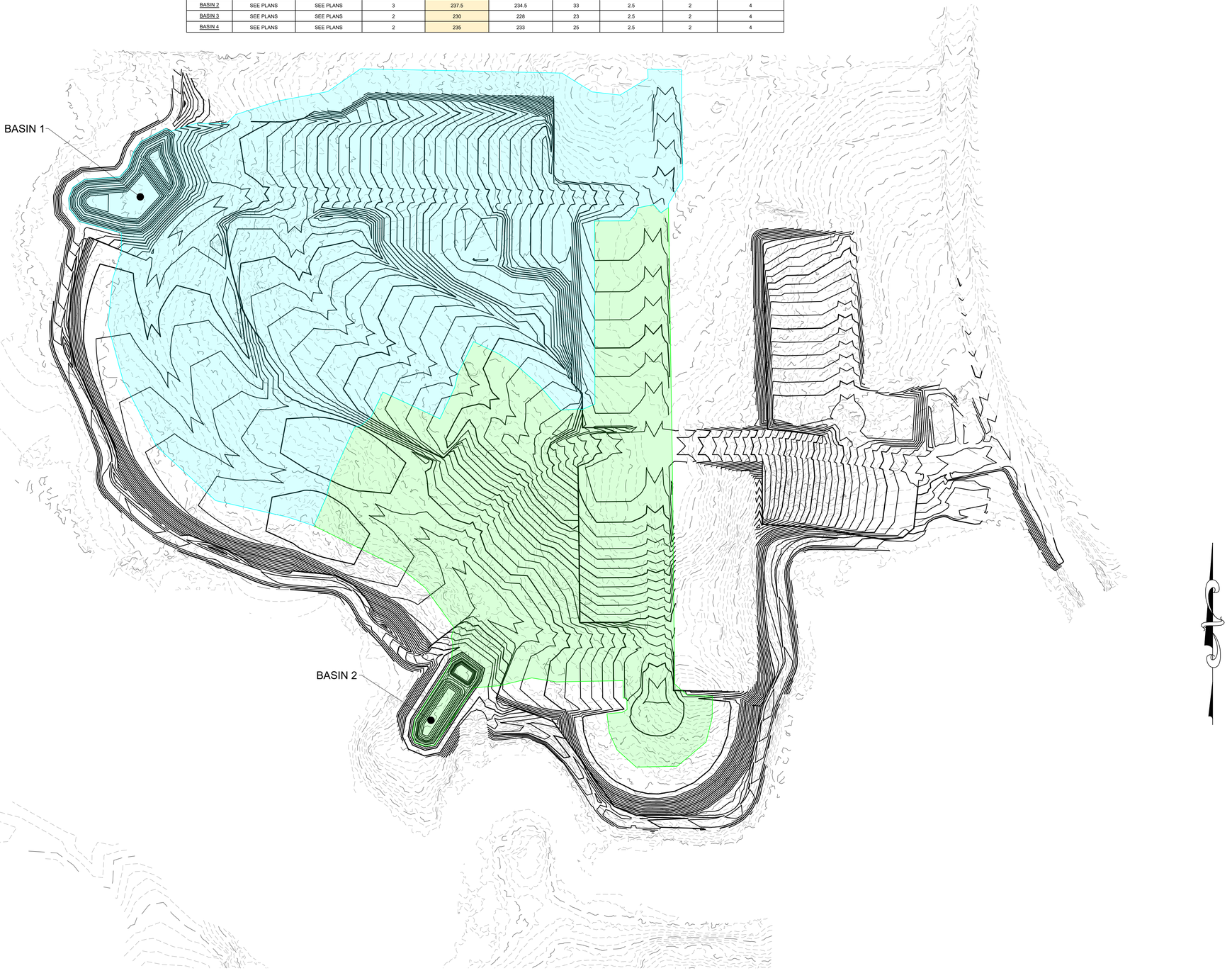
BASIN STAGE 1 DRAINAGE AREA

Sheet #:

HARRIS CREEK

SKIMMER BASIN TABLE

Skimmer Basin #	Width (ft)	Length (ft)	Depth (ft)	Top Elevation	Outlet Elevation	Weir (ft)	Skimmer (in)	Orifice (in)	Dewatering Time (days)
BASIN 1	SEE PLANS	SEE PLANS	2	237	235	50	2.5	2.5	4
BASIN 2	SEE PLANS	SEE PLANS	3	237.5	234.5	33	2.5	2	4
BASIN 3	SEE PLANS	SEE PLANS	2	230	228	23	2.5	2	4
BASIN 4	SEE PLANS	SEE PLANS	2	235	233	25	2.5	2	4



GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)

1 inch = 100 ft

File Location: C:\Users\jthodge\Quantech\Quantech Engineering - Documents\Harris Creek Farm - Jonesville\Engineering_DWG\Base Files\X-Refs\Harris Creek DAs.dwg

Developer

THE CSC GROUP
CONTRIBUTE TO THE SUCCESS OF LOCAL COMMUNITY

10030 Green Level Church Rd, Suite 802 #149: Cary, NC 27519

Engineer

QUANTECH ENGINEERING
INNOVATIVE SOLUTIONS | ENGINEERING THE FUTURE

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15000 Weston Parkway
Cary, N.C. 27513
(919) 996-9455

Surveyor

BCSC

Bateman Civil Survey Company
2524 Reliance Avenue
Apex, NC 27539
919-557-1080 ext 109
www.batemancivilsurvey.com

Jurisdiction / Municipality

Rolesville
Genuine Community • Capital Connection
Est. 1837

Town of Rolesville
502 Southtown Cir
Rolesville, NC 27571
Phone: 919-554-6517

PSP-24-05

Other Consultants

Sheet map:

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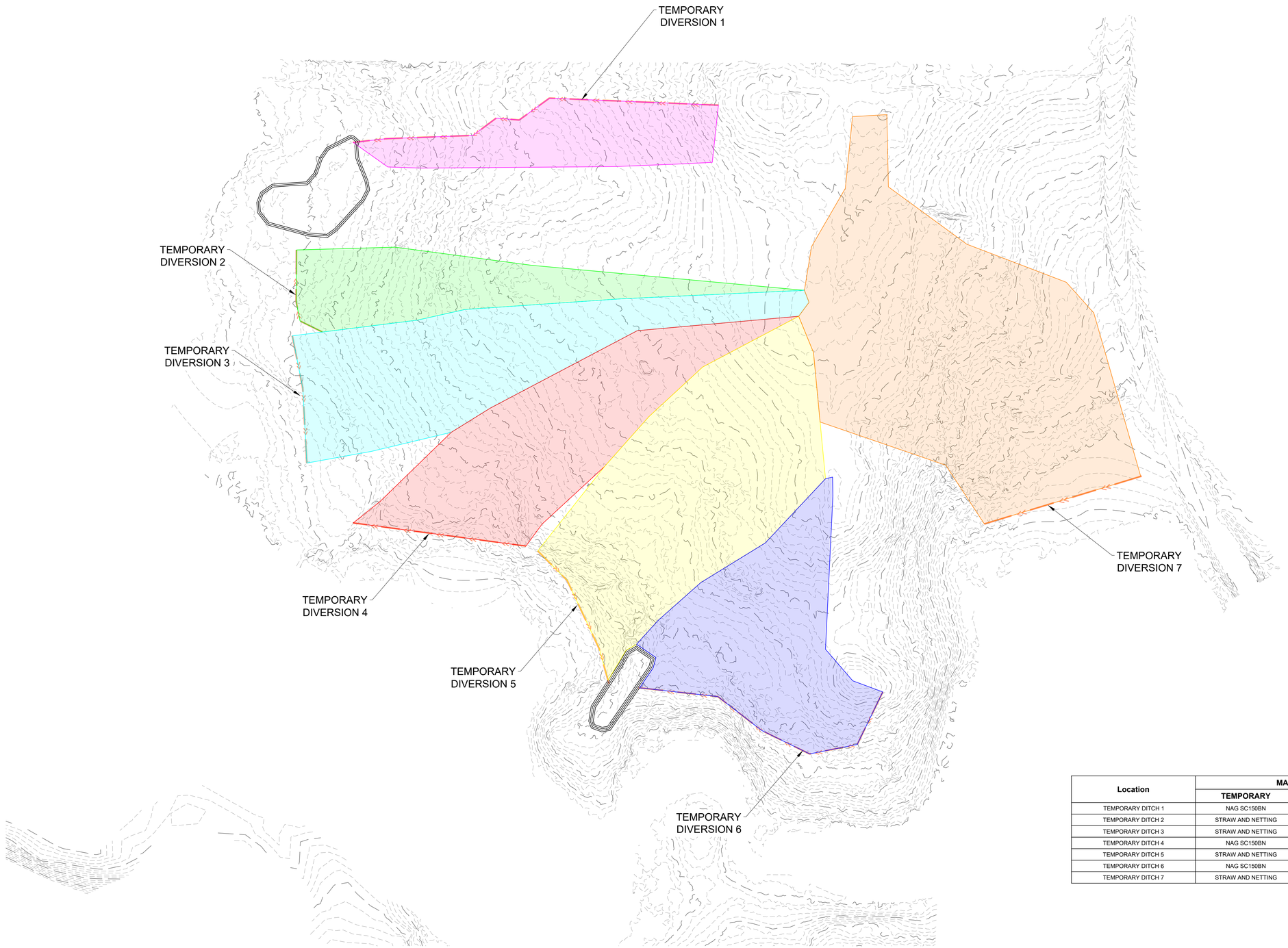
BASIN STAGE 2 DRAINAGE AREA

Sheet #:



Location	MATERIAL	
	TEMPORARY	PERMANENT
TEMPORARY DITCH 1	NAG SC150BN	NAG SC150BN
TEMPORARY DITCH 2	STRAW AND NETTING	STRAW AND NETTING
TEMPORARY DITCH 3	STRAW AND NETTING	STRAW AND NETTING
TEMPORARY DITCH 4	NAG SC150BN	NAG SC150BN
TEMPORARY DITCH 5	STRAW AND NETTING	STRAW AND NETTING
TEMPORARY DITCH 6	NAG SC150BN	NAG SC150BN
TEMPORARY DITCH 7	STRAW AND NETTING	STRAW AND NETTING

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)

1 inch = 100 ft

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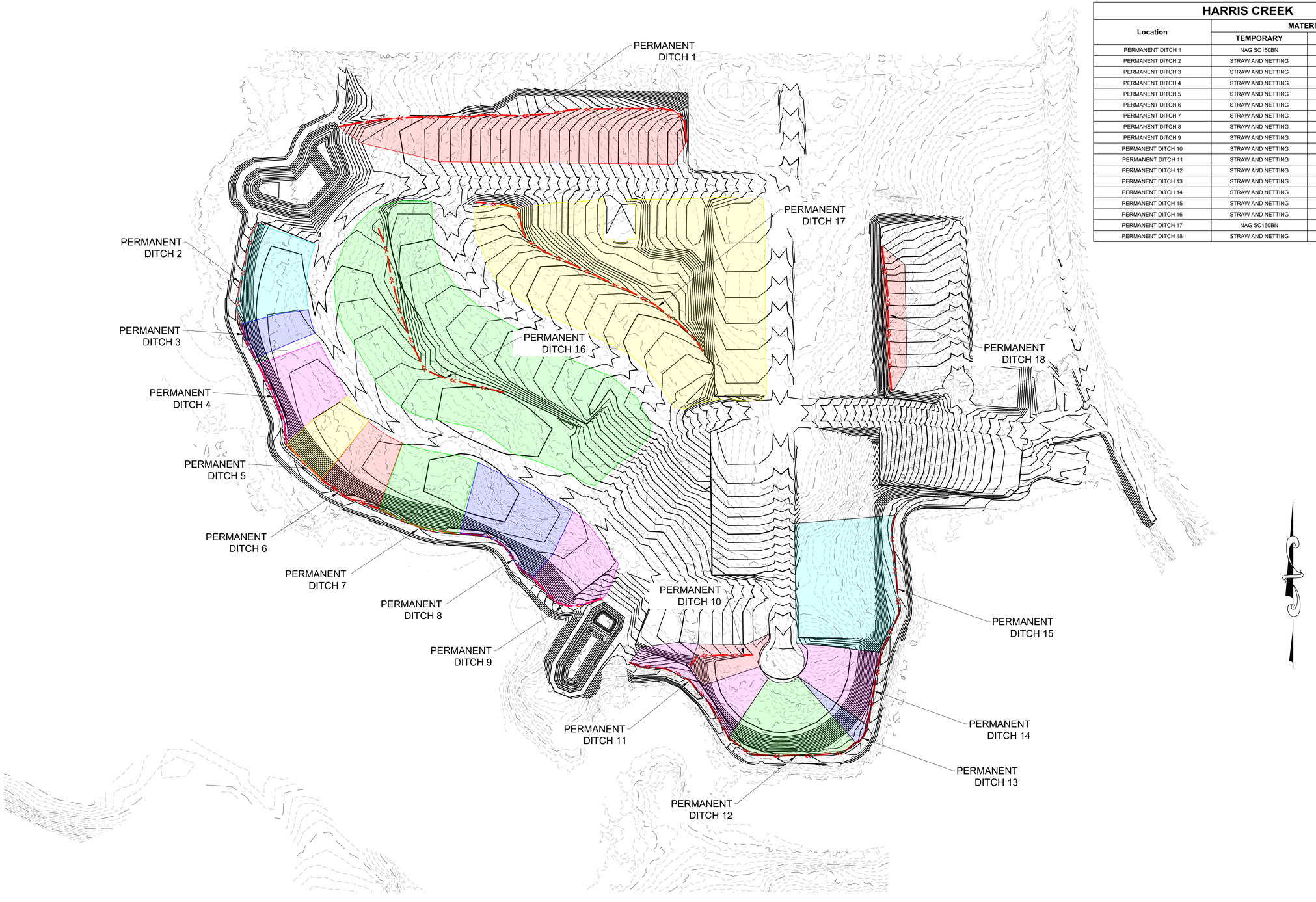
Sheet Title:

TEMPORARY DITCH DRAINAGE AREA

Sheet #:



HARRIS CREEK

Location	MATERIAL	
	TEMPORARY	PERMANENT
PERMANENT DITCH 1	NAG SC150BN	NAG SC150BN
PERMANENT DITCH 2	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 3	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 4	STRAW AND NETTING	GRASS
PERMANENT DITCH 5	STRAW AND NETTING	GRASS
PERMANENT DITCH 6	STRAW AND NETTING	GRASS
PERMANENT DITCH 7	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 8	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 9	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 10	STRAW AND NETTING	NAG SC150BN
PERMANENT DITCH 11	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 12	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 13	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 14	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 15	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 16	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 17	NAG SC150BN	NAG SC150BN
PERMANENT DITCH 18	STRAW AND NETTING	STRAW AND NETTING

GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
1 inch = 100 ft

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PERMANENT DITCH DRAINAGE AREA

Sheet #:

File Location: C:\Users\Jthodge\Quantech\Quantech Engineering - Documents\Harris Creek Farm - Jonesville\Engineering_DWG\Base Files\X-Refs\Harris Creek DAs.dwg

EROSION CONTROL CALCULATIONS

SEDIMENT BASIN CALCULATIONS

HARRIS CREEK

SKIMMER BASIN TABLE

Skimmer Basin #	Width (ft)	Length (ft)	Depth (ft)	Top Elevation	Outlet Elevation	Weir (ft)	Skimmer (in)	Orifice (in)	Dewatering Time (days)
BASIN 1	SEE PLANS	SEE PLANS	2	237	235	55	2.5	2.5	4
BASIN 2	SEE PLANS	SEE PLANS	3	237.5	234.5	55	2.5	2	4
BASIN 3	SEE PLANS	SEE PLANS	2	230	228	55	2.5	2	4
BASIN 4	SEE PLANS	SEE PLANS	2	235	233	55	2.5	2	4

5/30/2025

Selection of Sediment Control Measure

PROJECT NAME : HARRIS CREEK
STREET:
STATION:

		Do Not Use	Temporary Sediment Trap
15.96	Total Drainage Area	Do Not Use	Rock Dam,
15.96	Disturbed Area (Acres)	Do Not Use	Skimmer Sediment Basin
57.46	Peak Flow from 10-year Storm (cfs)	Okay	Temporary Sediment Basin
A_d =	15.96 Disturbed Area (Acres)		
A_u =	0.00 AC [AREA UNDISTURBED]		
A_t =	15.96 Total Drainage Area		
C =	0.50 RUNOFF COEFFECIENT		
I_2 =	5.63 2-YR RAINFALL INTENSITY		
Q_2 =	44.93 Peak Flow from 2-year Storm (cfs)		
I_{10} =	7.2 10-YR RAINFALL INTENSITY		
Q_{10} =	57.46 Peak Flow from 10-year Storm (cfs)		

	Area in sqft	Area in acres (A)	"C" value for area	A*C
	695,257	15.96	0.50	7.98
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
Total	695,257	15.96		7.98
Composite "C" value:				**0.50**

Sediment Basin

ID

BASIN 1

28728	Required Volume ft^3		
24995	Required Surface Area ft^2		
111.8	Suggested Width ft		
223.6	Suggested Length ft		
	Trial Top Width at Spillway Invert ft		
	Trial Top Length at Spillway Invert ft		
3	Trial Side Slope Ratio Z:1		
2	Trial Depth ft (2 to 3.5 feet above grade)		
N/A	Bottom Width ft		
N/A	Bottom Length ft		
23,105	Bottom Area ft^2		
50,232	Actual Volume ft^3	**Okay**	
27,156	Actual Surface Area ft^2	**Okay**	
55	Trial Weir Length ft (min 4')		
0.5	Trial Depth of Flow ft (max. 1/2')		
58.3	Spillway Capacity cfs	**Okay**	
2.5	Skimmer Size (inches)		
0.208	Head on Skimmer (feet)		
2.5	Orifice Size (0.1" increments)		
4.36	Dewatering Time (days)	**Okay**	
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

OVERALL BASIN 1 VOLUME

ELEV	AREA (sf)	AVERAGE AREA (sf)	VOLUME (cf)	ACC. VOLUME (cf) STORAGE (S)	STAGE (ft) Z	AREA (ac)	ELEV	ELEV STEP (ft) ΔZ
235.00	23,105	0	0	0	0	0.530	235.00	1
236.00	25,101	24,103	24,103	24,103	1	0.576	236.00	1
237.00	27,156	26,129	26,129	50,232	2	0.623	237.00	1
238.00		0	0	Overtopped	3	0.000	238.00	1
239.00		0	0	Overtopped	4	0.000	239.00	1
240.00		0	0	Overtopped	5	0.000	240.00	1
241.00		0	0	Overtopped	6	0.000	241.00	1
242.00		0	0	Overtopped	7	0.000	242.00	1
243.00		0	0	Overtopped	8	0.000	243.00	1
244.00		0	0	Overtopped	9	0.000	244.00	1
245.00		0	0	Overtopped	10	0.000	245.00	1
246.00		0	0	Overtopped	11	0.000	246.00	1
247.00		0	0	Overtopped	12	0.000	247.00	1
248.00		0	0	Overtopped	13	0.000	248.00	1
249.00		0	0	Overtopped	14	0.500	249.00	1
250.00		0	0	Overtopped	15	0.000	250.00	1
251.00		0	0	Overtopped	16	0.000	251.00	1
252.00		0	0	Overtopped	17	0.000	252.00	1
				50,232				

Selection of Sediment Control Measure

PROJECT NAME : HARRIS CREEK
STREET:
STATION:

		Do Not Us	Temporary Sediment Trap
9.76	Total Drainage Area	Okay	Rock Dam,
7.86	Disturbed Area (Acres)	Okay	Skimmer Sediment Basin
37.08	Peak Flow from 10-year Storm (cfs)	Okay	Temporary Sediment Basin

A_d =	7.86	Disturbed Area (Acres)
A_u =	1.90	AC [AREA UNDISTURBED]
A_t =	9.76	Total Drainage Area
C =	0.50	RUNOFF COEFFECIENT
I_2 =	5.93	2-YR RAINFALL INTENSITY
Q_2 =	28.93	Peak Flow from 2-year Storm (cfs)
I_{10} =	7.6	10-YR RAINFALL INTENSITY
Q_{10} =	37.08	Peak Flow from 10-year Storm (cfs)

	Area in sqft	Area in acres (A)	"C" value for area	A*C
	425,003	9.76	0.50	4.88
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
Total	425,003	9.76		4.88
Composite "C" value:				**0.50**

Skimmer Basin

ID: BASIN 2

14148	Required Volume ft^3	
16128	Required Surface Area ft^2	
89.8	Suggested Width ft	
179.6	Suggested Length ft	
	Trial Top Width at Spillway Invert ft	
	Trial Top Length at Spillway Invert ft	
3	Trial Side Slope Ratio Z:1	
3	Trial Depth ft	(2 to 3.5 feet above grade)
N/A	Bottom Width ft	
N/A	Bottom Length ft	
7,283	Bottom Area ft^2	
32,985	Actual Volume ft^3	**Okay**
16,143	Actual Surface Area ft^2	**Okay**
55	Trial Weir Length ft (min 4')	
0.5	Trial Depth of Flow ft (max. 1/2')	
58.3	Spillway Capacity cfs	**Okay**
2	Skimmer Size (inches)	
0.167	Head on Skimmer (feet)	
2	Orifice Size (0.1" increments)	
3.75	Dewatering Time (days)	**Okay**
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

OVERALL BASIN 2 VOLUME

ELEV	AREA (sf)	AVERAGE AREA (sf)	VOLUME (cf)	ACC. VOLUME (cf) STORAGE (S)	STAGE (ft) Z	AREA (ac)	ELEV	ELEV STEP (ft) ΔZ
234.50	7,283	0	0	0	0	0.167	234.50	1
235.50	9,540	8,412	8,412	8,412	1	0.219	235.50	1
236.50	11,732	10,636	10,636	19,048	2	0.269	236.50	1
237.50	16,143	13,938	13,938	32,985	3	0.371	237.50	1
238.50		0	0	Overtopped	4	0.000	238.50	1
239.50		0	0	Overtopped	5	0.000	239.50	1
240.50		0	0	Overtopped	6	0.000	240.50	1
241.50		0	0	Overtopped	7	0.000	241.50	1
242.50		0	0	Overtopped	8	0.000	242.50	1
243.50		0	0	Overtopped	9	0.000	243.50	1
244.50		0	0	Overtopped	10	0.000	244.50	1
245.50		0	0	Overtopped	11	0.000	245.50	1
246.50		0	0	Overtopped	12	0.000	246.50	1
247.50		0	0	Overtopped	13	0.000	247.50	1
248.50		0	0	Overtopped	14	0.500	248.50	1
249.50		0	0	Overtopped	15	0.000	249.50	1
250.50		0	0	Overtopped	16	0.000	250.50	1
251.50		0	0		17	0.000	251.50	1
				32,985				

Selection of Sediment Control Measure

PROJECT NAME : HARRIS CREEK
STREET:
STATION:

		Do Not Us	Temporary Sediment Trap
7.47	Total Drainage Area	Okay	Rock Dam,
7.47	Disturbed Area (Acres)	Okay	Skimmer Sediment Basin
26.90	Peak Flow from 10-year Storm (cfs)	Okay	Temporary Sediment Basin

A_d =	7.47	Disturbed Area (Acres)
A_u =	0.00	AC [AREA UNDISTURBED]
A_t =	7.47	Total Drainage Area
C =	0.50	RUNOFF COEFFECIENT
I_2 =	5.63	2-YR RAINFALL INTENSITY
Q_2 =	21.03	Peak Flow from 2-year Storm (cfs)
I_{10} =	7.2	10-YR RAINFALL INTENSITY
Q_{10} =	26.90	Peak Flow from 10-year Storm (cfs)

	Area in sqft	Area in acres (A)	"C" value for area	A*C
	325,468	7.47	0.50	3.74
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
Total	325,468	7.47		3.74
Composite "C" value:				**0.50**

Skimmer Basin

ID: BASIN 3

13446	Required Volume ft^3	
11701	Required Surface Area ft^2	
76.5	Suggested Width ft	
153.0	Suggested Length ft	
	Trial Top Width at Spillway Invert ft	
	Trial Top Length at Spillway Invert ft	
3	Trial Side Slope Ratio Z:1	
2	Trial Depth ft	(2 to 3.5 feet above grade)
N/A	Bottom Width ft	
N/A	Bottom Length ft	
8,764	Bottom Area ft^2	
33,726	Actual Volume ft^3	**Okay**
16,143	Actual Surface Area ft^2	**Okay**
55	Trial Weir Length ft (min 4')	
0.5	Trial Depth of Flow ft (max. 1/2')	
58.3	Spillway Capacity cfs	**Okay**
2	Skimmer Size (inches)	
0.167	Head on Skimmer (feet)	
2	Orifice Size (0.1" increments)	
3.56	Dewatering Time (days)	**Okay**
	Suggest about 3 days	

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

OVERALL BASIN 3 VOLUME

ELEV	AREA (sf)	AVERAGE AREA (sf)	VOLUME (cf)	ACC. VOLUME (cf) STORAGE (S)	STAGE (ft) Z	AREA (ac)	ELEV	ELEV STEP (ft) ΔZ
228.00	8,764	0	0	0	0	0.201	228.00	1
229.00	9,540	9,152	9,152	9,152	1	0.219	229.00	1
230.00	11,732	10,636	10,636	19,788	2	0.269	230.00	1
231.00	16,143	13,938	13,938	33,726	3	0.371	231.00	1
232.00		0	0	Overtopped	4	0.000	232.00	1
233.00		0	0	Overtopped	5	0.000	233.00	1
234.00		0	0	Overtopped	6	0.000	234.00	1
235.00		0	0	Overtopped	7	0.000	235.00	1
236.00		0	0	Overtopped	8	0.000	236.00	1
237.00		0	0	Overtopped	9	0.000	237.00	1
238.00		0	0	Overtopped	10	0.000	238.00	1
239.00		0	0	Overtopped	11	0.000	239.00	1
240.00		0	0	Overtopped	12	0.000	240.00	1
241.00		0	0	Overtopped	13	0.000	241.00	1
242.00		0	0	Overtopped	14	0.500	242.00	1
243.00		0	0	Overtopped	15	0.000	243.00	1
244.00		0	0	Overtopped	16	0.000	244.00	1
245.00		0	0	Overtopped	17	0.000	245.00	1
				33,726				

Selection of Sediment Control Measure

PROJECT NAME : HARRIS CREEK
STREET:
STATION:

		Do Not Us	Temporary Sediment Trap
7.99	Total Drainage Area	Okay	Rock Dam,
7.99	Disturbed Area (Acres)	Okay	Skimmer Sediment Basin
28.75	Peak Flow from 10-year Storm (cfs)	Okay	Temporary Sediment Basin

A_d =	7.99	Disturbed Area (Acres)
A_u =	0.00	AC [AREA UNDISTURBED]
A_t =	7.99	Total Drainage Area
C =	0.50	RUNOFF COEFFECIENT
I_2 =	5.63	2-YR RAINFALL INTENSITY
Q_2 =	22.48	Peak Flow from 2-year Storm (cfs)
I_{10} =	7.2	10-YR RAINFALL INTENSITY
Q_{10} =	28.75	Peak Flow from 10-year Storm (cfs)

	Area in sqft	Area in acres (A)	"C" value for area	A*C
	347,909	7.99	0.50	3.99
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
Total	347,909	7.99		3.99
Composite "C" value:				**0.50**

Skimmer Basin

ID

BASIN 4

14382	Required Volume ft^3		
12507	Required Surface Area ft^2		
79.1	Suggested Width ft		
158.2	Suggested Length ft		
	Trial Top Width at Spillway Invert ft		
	Trial Top Length at Spillway Invert ft		
3	Trial Side Slope Ratio Z:1		
2	Trial Depth ft	(2 to 3.5 feet above grade)	
N/A	Bottom Width ft		
N/A	Bottom Length ft		
6,451	Bottom Area ft^2		
32,569	Actual Volume ft^3	**Okay**	
16,143	Actual Surface Area ft^2	**Okay**	
55	Trial Weir Length ft (min 4')		
0.5	Trial Depth of Flow ft (max. 1/2')		
58.3	Spillway Capacity cfs	**Okay**	
2	Skimmer Size (inches)		
0.167	Head on Skimmer (feet)		
2	Orifice Size (0.1" increments)		
3.81	Dewatering Time (days)	**Okay**	
	Suggest about 3 days		

Skimmer Size (Inches)
1.5
2
2.5
3
4
5
6
8

OVERALL BASIN 4 VOLUME

ELEV	AREA (sf)	AVERAGE AREA (sf)	VOLUME (cf)	ACC. VOLUME (cf) STORAGE (S)	STAGE (ft) Z	AREA (ac)	ELEV	ELEV STEP (ft) ΔZ
233.00	6,451	0	0	0	0	0.148	233.00	1
234.00	9,540	7,996	7,996	7,996	1	0.219	234.00	1
235.00	11,732	10,636	10,636	18,632	2	0.269	235.00	1
236.00	16,143	13,938	13,938	32,569	3	0.371	236.00	1
237.00		0	0	Overtopped	4	0.000	237.00	1
238.00		0	0	Overtopped	5	0.000	238.00	1
239.00		0	0	Overtopped	6	0.000	239.00	1
240.00		0	0	Overtopped	7	0.000	240.00	1
241.00		0	0	Overtopped	8	0.000	241.00	1
242.00		0	0	Overtopped	9	0.000	242.00	1
243.00		0	0	Overtopped	10	0.000	243.00	1
244.00		0	0	Overtopped	11	0.000	244.00	1
245.00		0	0	Overtopped	12	0.000	245.00	1
246.00		0	0	Overtopped	13	0.000	246.00	1
247.00		0	0	Overtopped	14	0.500	247.00	1
248.00		0	0	Overtopped	15	0.000	248.00	1
249.00		0	0	Overtopped	16	0.000	249.00	1
250.00		0	0	Overtopped	17	0.000	250.00	1
				32,569				

DITCH LINER CALCULATIONS

HARRIS CREEK

Location	MATERIAL	
	TEMPORARY	PERMANENT
TEMPORARY DITCH 1	NAG SC150BN	NAG SC150BN
TEMPORARY DITCH 2	STRAW AND NETTING	STRAW AND NETTING
TEMPORARY DITCH 3	STRAW AND NETTING	STRAW AND NETTING
TEMPORARY DITCH 4	NAG SC150BN	NAG SC150BN
TEMPORARY DITCH 5	STRAW AND NETTING	STRAW AND NETTING
TEMPORARY DITCH 6	NAG SC150BN	NAG SC150BN
TEMPORARY DITCH 7	STRAW AND NETTING	STRAW AND NETTING

HARRIS CREEK

LOCATION TEMPORARY DITCH 1 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	1.68	Drainage Area
C =	0.45	Runoff Coefficient
I2=	5.63	in/hr
Q2 =	4.2	Design Discharge [cfs]
n =	0.022	Manning Roughness Coefficient
s =	5.69%	Longitudinal Channel Slope
M =	3 3	Horizontal Component of Side Slope
B =	0.00	Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.479	0.69	3.03	0.23	0.26	0.26	GOOD

VELOCITY IN CHANNEL	6.2 FPS
SHEAR STRESS	1.7 LB/SF

USE: NAG SC150BN

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr
Q10 =	5.43	Design Discharge [cfs]
n =	0.038	Manning Roughness Coefficient
s =	5.69%	Longitudinal Channel Slope [ft/ft]
M =	3 3	Horizontal Component of Side Slope
B =	0.00	Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.652	1.28	4.13	0.31	0.58	0.58	GOOD

VELOCITY IN CHANNEL	4.3 FPS
SHEAR STRESS	2.3 LB/SF

USE: NAG SC150BN

HARRIS CREEK

LOCATION TEMPORARY DITCH 2 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	2.03		Drainage Area
C =	0.45		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	5.1		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	0.85%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.740	1.64	4.68	0.35	0.82	0.82	GOOD

VELOCITY IN CHANNEL	3.1 FPS
SHEAR STRESS	0.4 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	6.58		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	0.85%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.998	2.99	6.31	0.47	1.82	1.82	GOOD

VELOCITY IN CHANNEL	2.2 FPS
SHEAR STRESS	0.5 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION TEMPORARY DITCH 3 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	3.60		Drainage Area
C =	0.45		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	9.1		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	1.98%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.786	1.85	4.97	0.37	0.96	0.96	GOOD

VELOCITY IN CHANNEL	4.9 FPS
SHEAR STRESS	1.0 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	11.65		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	1.98%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
1.057	3.35	6.68	0.50	2.11	2.11	GOOD

VELOCITY IN CHANNEL	3.5 FPS
SHEAR STRESS	1.3 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION TEMPORARY DITCH 4 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	3.39		Drainage Area
C =	0.45		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	8.6		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	3.17%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.701	1.47	4.43	0.33	0.71	0.71	GOOD

VELOCITY IN CHANNEL	5.8 FPS
SHEAR STRESS	1.4 LB/SF

USE: NAG SC150BN

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	10.99		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	3.17%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.945	2.68	5.98	0.45	1.57	1.57	GOOD

VELOCITY IN CHANNEL	4.1 FPS
SHEAR STRESS	1.9 LB/SF

USE: NAG SC150BN

HARRIS CREEK

LOCATION TEMPORARY DITCH 5 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	4.78		Drainage Area
C =	0.45		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	12.1		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	1.20%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.958	2.75	6.06	0.45	1.63	1.63	GOOD

VELOCITY IN CHANNEL	4.4 FPS
SHEAR STRESS	0.7 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	15.49		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	1.20%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
1.292	5.01	8.17	0.61	3.61	3.61	GOOD

VELOCITY IN CHANNEL	3.1 FPS
SHEAR STRESS	1.0 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION TEMPORARY DITCH 6 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	3.08	Drainage Area
C =	0.45	Runoff Coefficient
I2=	5.63	in/hr
Q2 =	7.8	Design Discharge [cfs]
n =	0.022	Manning Roughness Coefficient
s =	3.96%	Longitudinal Channel Slope
M =	3 3	Horizontal Component of Side Slope
B =	0.00	Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.651	1.27	4.12	0.31	0.58	0.58	GOOD

VELOCITY IN CHANNEL	6.2 FPS
SHEAR STRESS	1.6 LB/SF

USE: NAG SC150BN

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr
Q10 =	9.99	Design Discharge [cfs]
n =	0.038	Manning Roughness Coefficient
s =	3.96%	Longitudinal Channel Slope [ft/ft]
M =	3 3	Horizontal Component of Side Slope
B =	0.00	Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.875	2.30	5.53	0.41	1.28	1.28	GOOD

VELOCITY IN CHANNEL	4.4 FPS
SHEAR STRESS	2.2 LB/SF

USE: NAG SC150BN

HARRIS CREEK

LOCATION TEMPORARY DITCH 7 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	7.12		Drainage Area
C =	0.45		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	18.0		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	1.00%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
1.152	3.98	7.29	0.55	2.66	2.66	GOOD

VELOCITY IN CHANNEL	4.5 FPS
SHEAR STRESS	0.7 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	23.05		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	1.00%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
1.550	7.21	9.81	0.74	5.88	5.88	GOOD

VELOCITY IN CHANNEL	3.2 FPS
SHEAR STRESS	1.0 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

Location	MATERIAL	
	TEMPORARY	PERMANENT
PERMANENT DITCH 1	NAG SC150BN	NAG SC150BN
PERMANENT DITCH 2	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 3	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 4	STRAW AND NETTING	GRASS
PERMANENT DITCH 5	STRAW AND NETTING	GRASS
PERMANENT DITCH 6	STRAW AND NETTING	GRASS
PERMANENT DITCH 7	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 8	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 9	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 10	STRAW AND NETTING	NAG SC150BN
PERMANENT DITCH 11	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 12	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 13	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 14	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 15	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 16	STRAW AND NETTING	STRAW AND NETTING
PERMANENT DITCH 17	NAG SC150BN	NAG SC150BN
PERMANENT DITCH 18	STRAW AND NETTING	STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 1 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	1.61		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	5.4		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	4.16%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.561	0.94	3.55	0.27	0.39	0.39	GOOD

VELOCITY IN CHANNEL	5.8 FPS
SHEAR STRESS	1.5 LB/SF

USE: NAG SC150BN

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	6.95		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	4.16%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.759	1.73	4.80	0.36	0.87	0.87	GOOD

VELOCITY IN CHANNEL	4.0 FPS
SHEAR STRESS	2.0 LB/SF

USE: NAG SC150BN

HARRIS CREEK

LOCATION PERMANENT DITCH 2 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.58	Drainage Area
C =	0.60	Runoff Coefficient
I2=	5.63	in/hr
Q2 =	2.0	Design Discharge [cfs]
n =	0.022	Manning Roughness Coefficient
s =	3.46%	Longitudinal Channel Slope
M =	3 3	Horizontal Component of Side Slope
B =	0.00	Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.405	0.49	2.56	0.19	0.16	0.16	GOOD

VELOCITY IN CHANNEL	4.0 FPS
SHEAR STRESS	0.9 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr
Q10 =	2.52	Design Discharge [cfs]
n =	0.038	Manning Roughness Coefficient
s =	3.46%	Longitudinal Channel Slope [ft/ft]
M =	3 3	Horizontal Component of Side Slope
B =	0.00	Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.539	0.87	3.41	0.26	0.35	0.35	GOOD

VELOCITY IN CHANNEL	2.9 FPS
SHEAR STRESS	1.2 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 3 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.22		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	0.8		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	3.38%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.273	0.22	1.72	0.13	0.06	0.06	GOOD

VELOCITY IN CHANNEL	3.4 FPS
SHEAR STRESS	0.6 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	0.97		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	3.38%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.369	0.41	2.33	0.17	0.13	0.13	GOOD

VELOCITY IN CHANNEL	2.4 FPS
SHEAR STRESS	0.8 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 4 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.50		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	1.7		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	1.00%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.474	0.68	3.00	0.23	0.25	0.25	GOOD

VELOCITY IN CHANNEL	2.5 FPS
SHEAR STRESS	0.3 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	2.16		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	1.00%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.638	1.22	4.04	0.30	0.55	0.55	GOOD

VELOCITY IN CHANNEL	1.8 FPS
SHEAR STRESS	0.4 LB/SF

USE: GRASS

HARRIS CREEK

LOCATION PERMANENT DITCH 5 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.34		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	1.1		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	1.71%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.368	0.41	2.33	0.17	0.13	0.13	GOOD

VELOCITY IN CHANNEL	2.8 FPS
SHEAR STRESS	0.4 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	1.45		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	1.71%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.494	0.73	3.12	0.23	0.28	0.28	GOOD

VELOCITY IN CHANNEL	2.0 FPS
SHEAR STRESS	0.5 LB/SF

USE: GRASS

HARRIS CREEK

LOCATION PERMANENT DITCH 6 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.40		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	1.4		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	1.45%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.410	0.50	2.59	0.19	0.17	0.17	GOOD

VELOCITY IN CHANNEL	2.7 FPS
SHEAR STRESS	0.4 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	1.74		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	1.45%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.550	0.91	3.48	0.26	0.37	0.37	GOOD

VELOCITY IN CHANNEL	1.9 FPS
SHEAR STRESS	0.5 LB/SF

USE: GRASS

HARRIS CREEK

LOCATION PERMANENT DITCH 7 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.63		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	2.1		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	1.49%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.479	0.69	3.03	0.23	0.26	0.26	GOOD

VELOCITY IN CHANNEL	3.1 FPS
SHEAR STRESS	0.4 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	2.72		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	1.49%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.646	1.25	4.09	0.31	0.57	0.57	GOOD

VELOCITY IN CHANNEL	2.2 FPS
SHEAR STRESS	0.6 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 8 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.72		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	2.4		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	1.24%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	1.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.382	0.82	3.42	0.24	0.32	0.32	GOOD

VELOCITY IN CHANNEL	3.0 FPS
SHEAR STRESS	0.3 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	3.10		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	1.24%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	1.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.557	1.49	4.52	0.33	0.71	0.71	GOOD

VELOCITY IN CHANNEL	2.1 FPS
SHEAR STRESS	0.4 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 9 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.49		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	1.7		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	5.91%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	1.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.217	0.36	2.37	0.15	0.10	0.10	GOOD

VELOCITY IN CHANNEL	4.6 FPS
SHEAR STRESS	0.8 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	2.13		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	5.91%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	1.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.323	0.64	3.04	0.21	0.22	0.22	GOOD

VELOCITY IN CHANNEL	3.4 FPS
SHEAR STRESS	1.2 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 10 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.24	Drainage Area
C =	0.60	Runoff Coefficient
I2=	5.63	in/hr
Q2 =	0.8	Design Discharge [cfs]
n =	0.022	Manning Roughness Coefficient
s =	8.76%	Longitudinal Channel Slope
M =	3 3	Horizontal Component of Side Slope
B =	0.00	Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.234	0.16	1.48	0.11	0.04	0.04	GOOD

VELOCITY IN CHANNEL	5.0 FPS
SHEAR STRESS	1.3 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr
Q10 =	1.05	Design Discharge [cfs]
n =	0.038	Manning Roughness Coefficient
s =	8.76%	Longitudinal Channel Slope [ft/ft]
M =	3 3	Horizontal Component of Side Slope
B =	0.00	Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.321	0.31	2.03	0.15	0.09	0.09	GOOD

VELOCITY IN CHANNEL	3.4 FPS
SHEAR STRESS	1.8 LB/SF

USE: NAG SC150BN

HARRIS CREEK

LOCATION PERMANENT DITCH 11 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.67		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	2.3		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	2.62%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.448	0.60	2.83	0.21	0.21	0.21	GOOD

VELOCITY IN CHANNEL	3.7 FPS
SHEAR STRESS	0.7 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	2.88		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	2.62%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.590	1.04	3.73	0.28	0.45	0.45	GOOD

VELOCITY IN CHANNEL	2.8 FPS
SHEAR STRESS	1.0 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 12 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.67		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	2.3		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	1.98%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.467	0.66	2.96	0.22	0.24	0.24	GOOD

VELOCITY IN CHANNEL	3.5 FPS
SHEAR STRESS	0.6 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	2.91		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	1.98%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.630	1.19	3.98	0.30	0.53	0.53	GOOD

VELOCITY IN CHANNEL	2.4 FPS
SHEAR STRESS	0.8 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 13 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.10		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	0.3		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	4.48%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.196	0.12	1.24	0.09	0.02	0.02	GOOD

VELOCITY IN CHANNEL	2.8 FPS
SHEAR STRESS	0.5 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	0.42		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	4.48%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.251	0.19	1.58	0.12	0.05	0.05	GOOD

VELOCITY IN CHANNEL	2.2 FPS
SHEAR STRESS	0.7 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 14 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.43		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	1.5		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	2.06%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.390	0.46	2.46	0.18	0.15	0.15	GOOD

VELOCITY IN CHANNEL	3.2 FPS
SHEAR STRESS	0.5 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	1.87		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	2.06%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.527	0.83	3.33	0.25	0.33	0.33	GOOD

VELOCITY IN CHANNEL	2.2 FPS
SHEAR STRESS	0.7 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 15 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	1.35	Drainage Area
C =	0.60	Runoff Coefficient
I2=	5.63	in/hr
Q2 =	4.6	Design Discharge [cfs]
n =	0.022	Manning Roughness Coefficient
s =	1.00%	Longitudinal Channel Slope
M =	3 3	Horizontal Component of Side Slope
B =	0.00	Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.688	1.42	4.35	0.33	0.67	0.67	GOOD

VELOCITY IN CHANNEL	3.2 FPS
SHEAR STRESS	0.4 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr
Q10 =	5.82	Design Discharge [cfs]
n =	0.038	Manning Roughness Coefficient
s =	1.00%	Longitudinal Channel Slope [ft/ft]
M =	3 3	Horizontal Component of Side Slope
B =	0.00	Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.925	2.57	5.85	0.44	1.48	1.48	GOOD

VELOCITY IN CHANNEL	2.3 FPS
SHEAR STRESS	0.6 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 16 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	4.32		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63		in/hr
Q2 =	14.6		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	1.50%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

There are 4 Drop inlets spread out evenly along the ditch so no one section is more than 4 acres

y	A	P	R	Zav	Zreq	REMARK
0.987	2.92	6.24	0.47	1.76	1.76	GOOD

VELOCITY IN CHANNEL	5.0 FPS
SHEAR STRESS	0.9 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20		in/hr
Q10 =	18.67		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	1.50%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
1.328	5.29	8.40	0.63	3.89	3.89	GOOD

VELOCITY IN CHANNEL	3.5 FPS
SHEAR STRESS	1.2 LB/SF

USE: STRAW AND NETTING

HARRIS CREEK

LOCATION PERMANENT DITCH 17 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	4.45		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63		in/hr
Q2 =	15.0		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	2.50%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

There are 4 Drop inlets spread out evenly along the ditch so no one section is more than 4 acres

y	A	P	R	Zav	Zreq	REMARK
0.906	2.46	5.73	0.43	1.40	1.40	GOOD

VELOCITY IN CHANNEL	6.1 FPS
SHEAR STRESS	1.4 LB/SF

USE: NAG SC150BN

PERMANENT CHANNEL LININGS

I10=	7.20		in/hr
Q10 =	19.22		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	2.50%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
1.219	4.46	7.71	0.58	3.10	3.10	GOOD

VELOCITY IN CHANNEL	4.3 FPS
SHEAR STRESS	1.9 LB/SF

USE: NAG SC150BN

HARRIS CREEK

LOCATION PERMANENT DITCH 18 Street Side
FROM STATION TO

TEMPORARY CHANNEL LININGS

DA =	0.30		Drainage Area
C =	0.60		Runoff Coefficient
I2=	5.63	in/hr	
Q2 =	1.0		Design Discharge [cfs]
n =	0.022		Manning Roughness Coefficient
s =	4.47%		Longitudinal Channel Slope
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.296	0.26	1.87	0.14	0.07	0.07	GOOD

VELOCITY IN CHANNEL	3.8 FPS
SHEAR STRESS	0.8 LB/SF

USE: STRAW AND NETTING

PERMANENT CHANNEL LININGS

I10=	7.20	in/hr	
Q10 =	1.30		Design Discharge [cfs]
n =	0.038		Manning Roughness Coefficient
s =	4.47%		Longitudinal Channel Slope [ft/ft]
M =	3	3	Horizontal Component of Side Slope
B =	0.00		Bottom Width of Channel [ft]

y	A	P	R	Zav	Zreq	REMARK
0.403	0.49	2.55	0.19	0.16	0.16	GOOD

VELOCITY IN CHANNEL	2.7 FPS
SHEAR STRESS	1.1 LB/SF

USE: STRAW AND NETTING

RIP RAP CALCULATIONS

STORM 100 OUTFALL

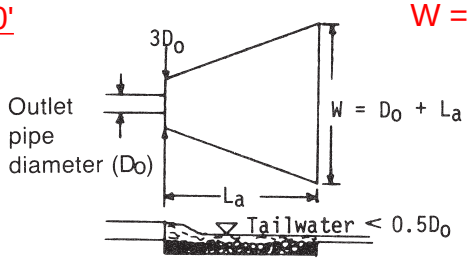
36" RCP

Q = 39.05 cfs

D_O =36" = 3.0'

$3D_O$ = 9.0'

W = D_O + L_A = 23.0'



L_A =20'

D_{50} = 0.60'
= 7.2"

Q = 39.05 cfs

Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition (T_w < 0.5 diameter).

D_{max} = 1.5 * D_{50} = 10.8" => USE CLASS 'B' RIP RAP (D_{max} = 12")

Apron Thickness = 1.5 * D_{max} = 18"

TABLE 1042-1
ACCEPTANCE CRITERIA FOR RIP RAP AND STONE FOR EROSION CONTROL

Class	Required Stone Sizes, inches		
	Minimum	Midrange	Maximum
A	2	4	6
B	5	8	12
1	5	10	17
2	9	14	23

STORM 200 OUTFALL

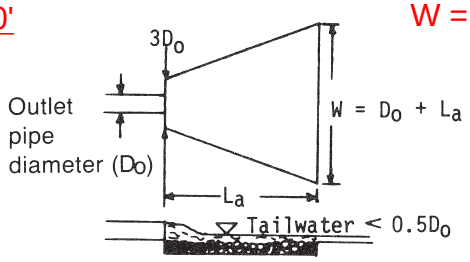
36" RCP

Q = 31.42 cfs

D_O =36" = 3.0'

$3D_O$ = 9.0'

W = D_O + L_A = 23.0'



L_A =20'

D_{50} = 0.60'
= 7.2"

Q = 31.42 cfs

Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition (T_w < 0.5 diameter).

D_{max} = 1.5 * D_{50} = 10.8" => USE CLASS 'B' RIP RAP (D_{max} = 12")

Apron Thickness = 1.5 * D_{max} = 18"

TABLE 1042-1
ACCEPTANCE CRITERIA FOR RIP RAP AND STONE FOR EROSION CONTROL

Class	Required Stone Sizes, inches		
	Minimum	Midrange	Maximum
A	2	4	6
B	5	8	12
1	5	10	17
2	9	14	23

STORM 300 OUTFALL

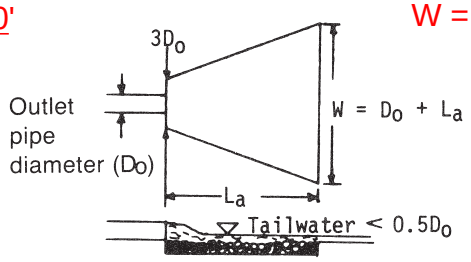
24" RCP

Q = 15.46 cfs

D_O =24" = 2.0'

$3D_O$ = 6.0'

$W = D_O + L_A$ = 15.0'



L_A =13'

Q = 15.46 cfs

D_{50} = 0.45' = 5.4"

Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition (T_w < 0.5 diameter).

$D_{max} = 1.5 * D_{50}$ = 8.1" => USE CLASS 'B' RIP RAP (D_{max} = 12")

Apron Thickness = 1.5 * D_{max} = 18"

TABLE 1042-1
ACCEPTANCE CRITERIA FOR RIP RAP AND STONE FOR EROSION CONTROL

Class	Required Stone Sizes, inches		
	Minimum	Midrange	Maximum
A	2	4	6
B	5	8	12
1	5	10	17
2	9	14	23

102. Is this supposed to be "Storm 400 Outfall"?

STORM 300 OUTFALL

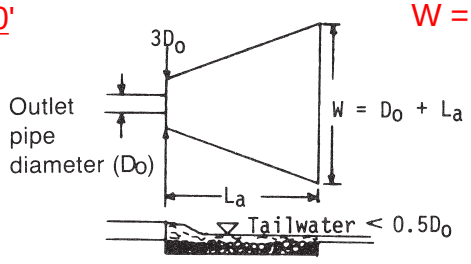
24" RCP

Q = 11.30 cfs

D_O = 24" = 2.0'

$3D_O$ = 6.0'

$W = D_O + L_A$ = 15.0'



L_A = 13'

Q = 11.30 cfs

D_{50} = 0.45' = 5.4"

Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition (T_w < 0.5 diameter).

$D_{max} = 1.5 * D_{50}$ = 8.1" => USE CLASS 'B' RIP RAP (D_{max} = 12")

Apron Thickness = 1.5 * D_{max} = 18"

TABLE 1042-1
ACCEPTANCE CRITERIA FOR RIP RAP AND STONE FOR EROSION CONTROL

Class	Required Stone Sizes, inches		
	Minimum	Midrange	Maximum
A	2	4	6
B	5	8	12
1	5	10	17
2	9	14	23

DESIGN OF RIPRAP OUTLET PROTECTION

New York DOT Dissipator Method For Use in Defined Channels

(Source: "Bank and channel lining procedures", New York Department of Transportation, Division of Design and Construction, 1971.)

Guide to Color Key:	User Input Data	Calculated Value	Reference Data

Project Name:	**Bourdan Woods**	**Company:**	**Quantech Eng, LLP**
Site Location (City/Town):	**Durham**	**Designed By:**	**JAC**
Date:	**29-May-2025**	**Culvert Id.**	**SCM 2 Outfall**

Estimation of Stone Size and Dimensions For Culvert Aprons

Step 1) Compute flow velocity V_o at culvert or paved channel outlet.

Step 2) For pipe culverts D_o is diameter.
For pipe arch, arch and box culverts, and paved channel outlets,
$D_o = A_o$ where A. = cross-sectional area of flow at outlet.

For multiple culverts, use $D_o = 1.25 \times D_o$ of single culvert.

Velocity (ft/s)	8.15
Opening type	Pipe Culvert
Single or multiple openings?	Single
Outlet pipe diameter, D_o (ft)	2.5

NOTE 1: If opening type is anything other than "Pipe Culvert", $D_o=A_o$ (Cross-sectional area of flow at outlet).

NOTE 2: If multiple openings, $D_o=1.25 \times D_o$ of single culvert.

Step 3) For apron grades of 10% or steeper, use recommendations
For next higher zone. (Zones 1 through 6).

Zone	2	Figure 8.06c
Will apron have >/=10% grade?	No	

NOTE: For apron slopes equal to or greater than 10%, use next higher Zone in Figure 8.06d to determine apron length.

Apron length (ft)	7.5 min 15 max	Figure 8.06d
Say apron length (ft)	10	
Minimum Apron width (ft)	7.5	
Use Rip Rap	Class B	

Max. stone size (in.)	12	Figure 8.06e
D_{50} of Stone size (in.)	8	
Minimum Stone size (in.)	5	
Min. depth of Dissipator (in.)	18	

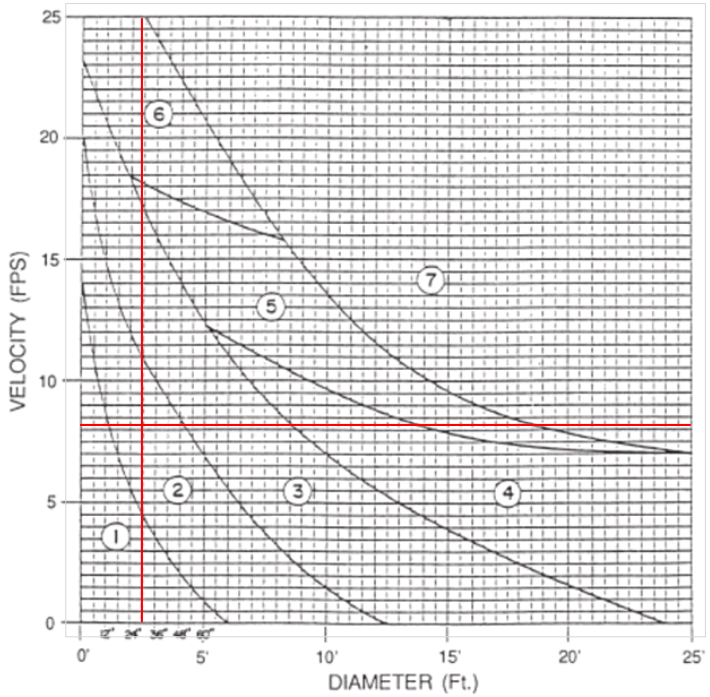
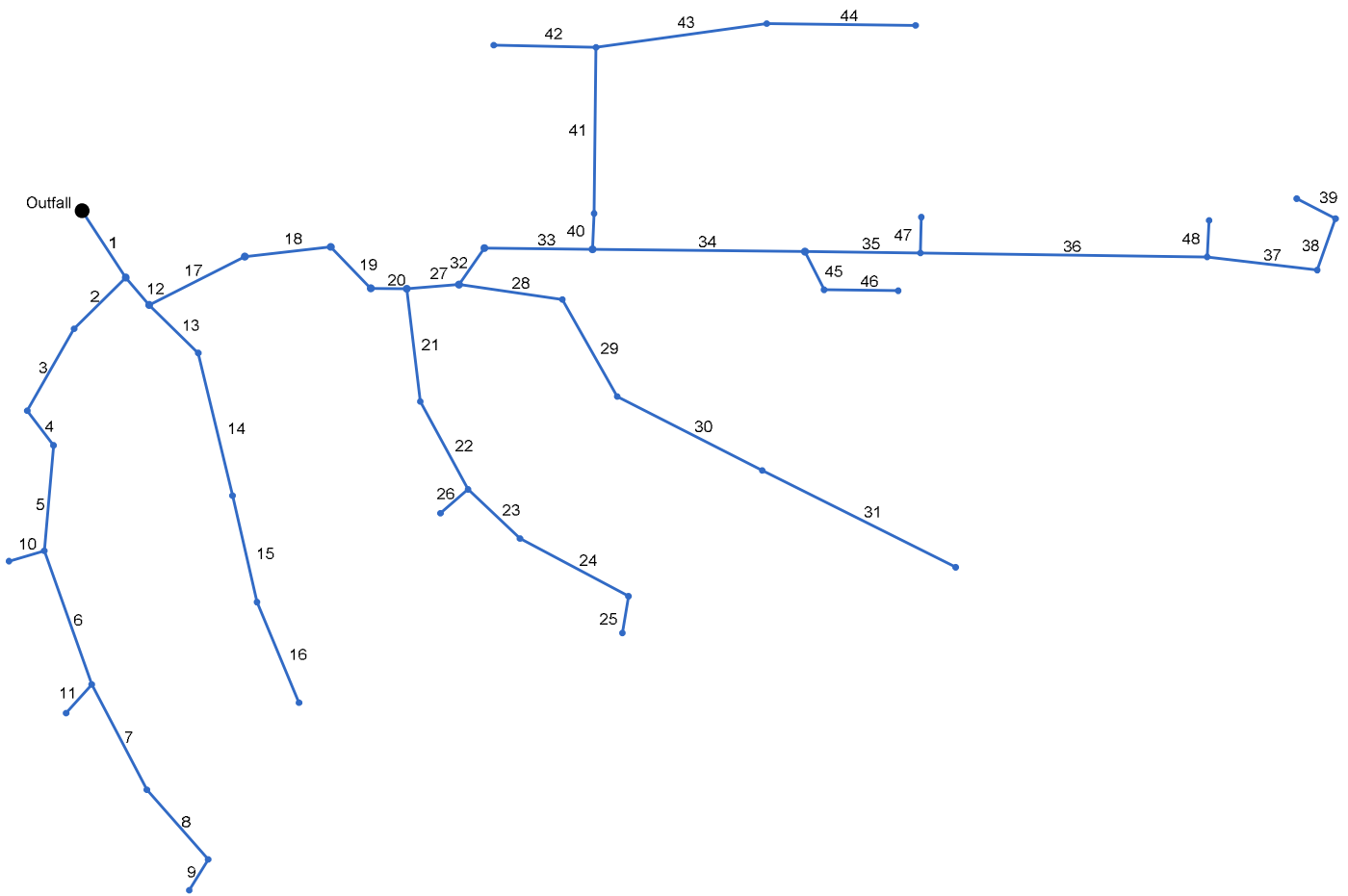


Figure 8.06c

STORM DRAINAGE CALCULATIONS

STORM SYSTEM 100

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



Project File: Storm 100.stm	Number of lines: 48	Date: 5/30/2025

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	62.363	0.69	13.57	0.70	0.48	8.05	5.0	16.0	4.8	39.05	151.1	6.91	36	5.13	233.00	236.20	235.52	238.23	236.52	242.81	101
2	1	56.823	0.08	2.33	0.70	0.05	1.63	5.0	7.8	6.4	10.38	42.14	4.21	30	1.06	236.70	237.30	238.23	238.38	242.81	243.19	102
3	2	73.788	0.24	2.25	0.70	0.17	1.58	5.0	7.4	6.5	10.19	23.55	6.36	24	1.08	237.80	238.60	238.72	239.74	243.19	243.88	103
4	3	33.985	0.13	2.01	0.70	0.09	1.41	5.0	7.3	6.5	9.18	24.54	5.12	24	1.18	238.60	239.00	239.74	240.08	243.88	243.79	104
5	4	82.819	0.19	1.88	0.70	0.13	1.32	5.0	7.0	6.6	8.68	10.95	6.45	18	1.09	239.50	240.40	240.51	241.54	243.79	244.96	105
6	5	111.027	0.16	1.43	0.70	0.11	1.00	5.0	6.5	6.7	6.73	10.92	5.02	18	1.08	240.40	241.60	241.54	242.60	244.96	246.12	106
7	6	92.859	0.12	0.94	0.70	0.08	0.66	5.0	5.9	6.9	4.53	10.90	4.11	18	1.08	241.60	242.60	242.60	243.42	246.12	247.07	107
8	7	72.589	0.39	0.82	0.70	0.27	0.57	5.0	5.4	7.1	4.05	11.02	4.28	18	1.10	242.60	243.40	243.42	244.17	247.07	247.58	108
9	8	28.308	0.43	0.43	0.70	0.30	0.30	5.0	5.0	7.2	2.18	15.29	3.02	18	2.12	243.40	244.00	244.17	244.56	247.58	247.61	109
10	5	28.579	0.26	0.26	0.70	0.18	0.18	5.0	5.0	7.2	1.32	15.22	2.14	18	2.10	240.60	241.20	241.54	241.63	244.96	245.02	110
11	6	30.107	0.34	0.34	0.70	0.23	0.23	5.0	5.0	7.2	1.69	16.01	2.36	18	2.33	241.60	242.30	242.60	242.79	246.12	245.96	111
12	1	28.138	0.30	10.56	0.70	0.21	5.94	5.0	16.0	4.9	28.86	41.01	8.27	30	1.00	237.28	237.57	238.83	239.40	242.81	242.69	112
13	12	53.597	0.20	1.85	0.50	0.10	0.92	5.0	7.1	6.6	6.06	10.51	4.40	18	1.00	238.07	238.60	239.40	239.55	242.69	242.05	113
14	13	114.868	0.53	1.65	0.50	0.26	0.83	5.0	6.5	6.7	5.55	10.50	4.84	18	1.00	238.60	239.75	239.55	240.66	242.05	243.02	114
15	14	85.346	0.32	1.12	0.50	0.16	0.56	5.0	5.9	6.9	3.88	10.50	3.92	18	1.00	239.75	240.60	240.66	241.36	243.02	244.12	115
16	15	85.356	0.80	0.80	0.50	0.40	0.40	5.0	5.0	7.2	2.87	10.54	3.59	18	1.01	240.60	241.46	241.36	242.10	244.12	246.25	116
17	12	83.692	0.09	8.41	0.70	0.06	4.80	5.0	15.8	4.9	23.44	22.62	8.17	24	1.00	238.57	239.40	240.28	241.12	242.69	243.59	117
18	17	67.426	0.06	8.32	0.70	0.04	4.74	5.0	15.7	4.9	23.24	22.66	8.10	24	1.00	239.40	240.08	241.12	241.79	243.59	245.46	118
19	18	45.039	0.38	8.26	0.70	0.27	4.70	5.0	15.6	4.9	23.11	22.56	8.08	24	0.99	240.08	240.53	241.79	242.24	245.46	247.71	119
20	19	28.077	0.20	7.88	0.70	0.14	4.44	5.0	15.5	4.9	21.83	22.62	7.72	24	1.00	240.53	240.81	242.24	242.48	247.71	247.71	120
21	20	88.873	0.13	1.11	0.70	0.09	0.77	5.0	8.3	6.2	4.84	15.75	4.35	18	2.25	241.50	243.50	242.48	244.34	247.71	249.66	121
22	21	78.221	0.09	0.97	0.70	0.06	0.68	5.0	7.8	6.4	4.34	14.54	4.39	18	1.92	243.50	245.00	244.34	245.80	249.66	251.49	122

Project File: Storm 100.stm

Number of lines: 48

Run Date: 5/30/2025

NOTES:Intensity = 72.00 / (Inlet time + 12.50) ^ 0.80; Return period =Yrs. 10 ; c = cir e = ellip b = box

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)	
23	22	55.737	0.16	0.56	0.70	0.11	0.39	5.0	7.2	6.5	2.57	14.07	3.26	18	1.79	245.00	246.00	245.80	246.61	251.49	252.79	123
24	23	95.963	0.19	0.40	0.70	0.14	0.28	5.0	5.8	6.9	1.94	20.05	3.21	18	3.65	246.00	249.50	246.61	250.02	252.79	254.69	124
25	24	29.230	0.21	0.21	0.70	0.14	0.14	5.0	5.0	7.2	1.04	23.79	2.42	18	5.13	249.50	251.00	250.02	251.38	254.69	254.86	125
26	22	28.632	0.32	0.32	0.70	0.22	0.22	5.0	5.0	7.2	1.61	16.42	4.62	18	2.44	246.80	247.50	247.12	247.98	251.49	251.25	126
27	20	40.676	0.13	6.57	0.50	0.06	3.52	5.0	15.4	4.9	17.38	22.62	6.54	24	1.00	240.81	241.21	242.48	242.72	247.71	245.60	127
28	27	81.330	0.24	2.33	0.50	0.12	1.17	5.0	7.4	6.5	7.56	16.47	7.36	18	2.46	242.00	244.00	242.72	245.06	245.60	248.03	128
29	28	87.167	0.47	2.09	0.50	0.24	1.05	5.0	7.0	6.6	6.90	16.87	5.28	18	2.58	244.00	246.25	245.06	247.27	248.03	250.41	129
30	29	126.986	0.59	1.62	0.50	0.29	0.81	5.0	6.3	6.8	5.50	18.05	4.63	18	2.95	246.25	250.00	247.27	250.90	250.41	254.36	130
31	30	168.905	1.03	1.03	0.50	0.52	0.52	5.0	5.0	7.2	3.72	16.16	3.83	18	2.37	250.00	254.00	250.90	254.74	254.36	258.04	131
32	27	34.806	0.05	4.11	0.70	0.03	2.29	5.0	15.3	5.0	11.35	22.62	5.11	24	1.00	241.22	241.57	242.72	242.77	245.60	250.68	132
33	32	84.061	0.27	4.07	0.70	0.19	2.26	5.0	14.9	5.0	11.30	22.67	5.69	24	1.00	241.56	242.40	242.77	243.61	250.68	254.31	133
34	33	165.576	0.01	1.99	0.70	0.01	1.21	5.0	11.9	5.5	6.68	53.60	8.19	24	5.62	245.70	255.00	246.18	255.92	254.31	262.40	134
35	34	90.085	0.35	1.64	0.70	0.24	0.94	5.0	11.4	5.6	5.25	28.64	8.60	18	7.44	255.50	262.20	255.94	263.08	262.40	266.41	135
36	35	223.580	0.03	0.66	0.70	0.02	0.41	5.0	8.9	6.1	2.50	22.54	3.06	18	4.61	262.20	272.50	263.08	273.10	266.41	277.11	136
37	36	86.367	0.03	0.42	0.70	0.02	0.29	5.0	6.6	6.7	1.95	17.51	3.25	18	2.78	272.50	274.90	273.10	275.43	277.11	278.99	137
38	37	42.695	0.17	0.38	0.70	0.12	0.27	5.0	6.0	6.9	1.85	11.36	3.41	18	1.17	274.90	275.40	275.43	275.91	278.99	279.77	138
39	38	34.160	0.21	0.21	0.70	0.15	0.15	5.0	5.0	7.2	1.05	11.36	2.47	18	1.17	275.40	275.80	275.91	276.18	279.77	279.77	139
40	33	28.083	0.45	1.81	0.70	0.32	0.86	5.0	14.7	5.0	4.33	22.62	3.18	24	1.00	242.40	242.69	243.61	243.42	254.31	254.36	140
41	40	130.001	0.35	1.35	0.40	0.14	0.54	5.0	12.6	5.4	2.91	32.08	5.03	24	2.01	243.69	246.30	244.09	246.89	254.36	253.51	141
42	41	79.807	0.25	0.25	0.40	0.10	0.10	5.0	5.0	7.2	0.71	7.92	1.99	15	1.50	246.30	247.50	246.89	247.83	253.51	249.75	142
43	41	134.295	0.32	0.76	0.40	0.13	0.30	5.0	10.5	5.8	1.75	19.22	5.09	18	3.35	250.50	255.00	250.81	255.50	253.51	258.50	143
44	43	115.991	0.44	0.44	0.40	0.18	0.18	7.5	7.5	6.5	1.13	22.87	2.62	18	4.74	255.00	260.50	255.50	260.90	258.50	263.54	144

Project File: Storm 100.stm | Number of lines: 48 | Run Date: 5/30/2025

NOTES:Intensity = 72.00 / (Inlet time + 12.50) ^ 0.80; Return period =Yrs. 10 ; c = cir e = ellip b = box

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)	
45	34	33.380	0.13	0.34	0.90	0.12	0.27	5.0	6.6	6.7	1.78	11.50	4.08	18	1.20	257.90	258.30	258.30	258.80	262.40	262.43	145
46	45	57.800	0.21	0.21	0.70	0.14	0.14	5.0	5.0	7.2	1.04	10.70	2.48	18	1.04	258.30	258.90	258.80	259.28	262.43	262.50	146
47	35	28.068	0.64	0.64	0.45	0.29	0.29	7.5	7.5	6.5	1.85	10.86	3.20	18	1.07	262.50	262.80	263.08	263.31	266.41	266.42	147
48	36	28.605	0.21	0.21	0.45	0.09	0.09	7.5	7.5	6.5	0.60	10.75	2.48	18	1.05	272.80	273.10	273.10	273.39	277.11	277.12	148

Project File: Storm 100.stm

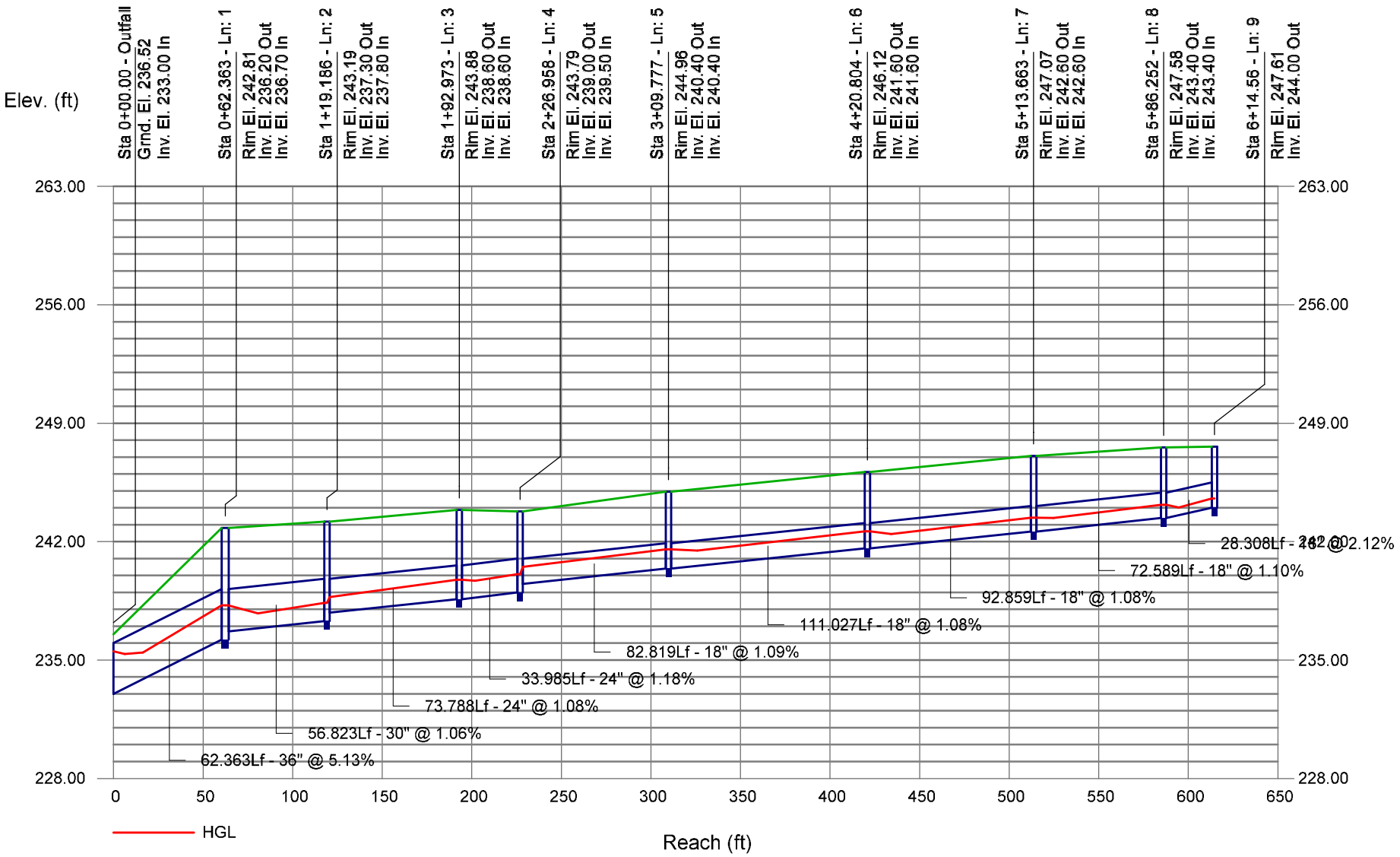
Number of lines: 48

Run Date: 5/30/2025

NOTES:Intensity = 72.00 / (Inlet time + 12.50) ^ 0.80; Return period =Yrs. 10 ; c = cir e = ellip b = box

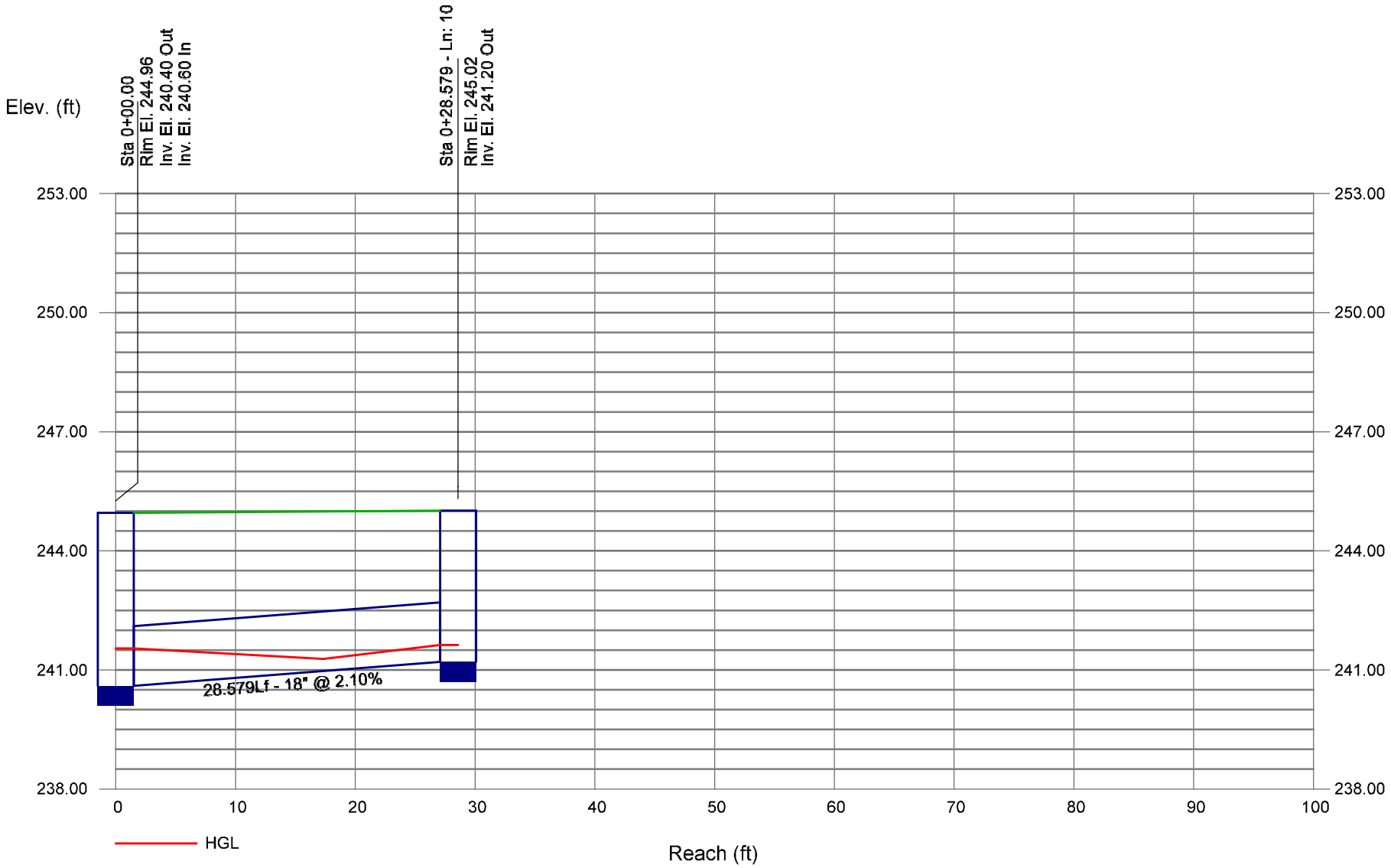
Storm Sewer Profile

Proj. file: Storm 100.stm



Storm Sewer Profile

Proj. file: Storm 100.stm



Storm Sewer Profile

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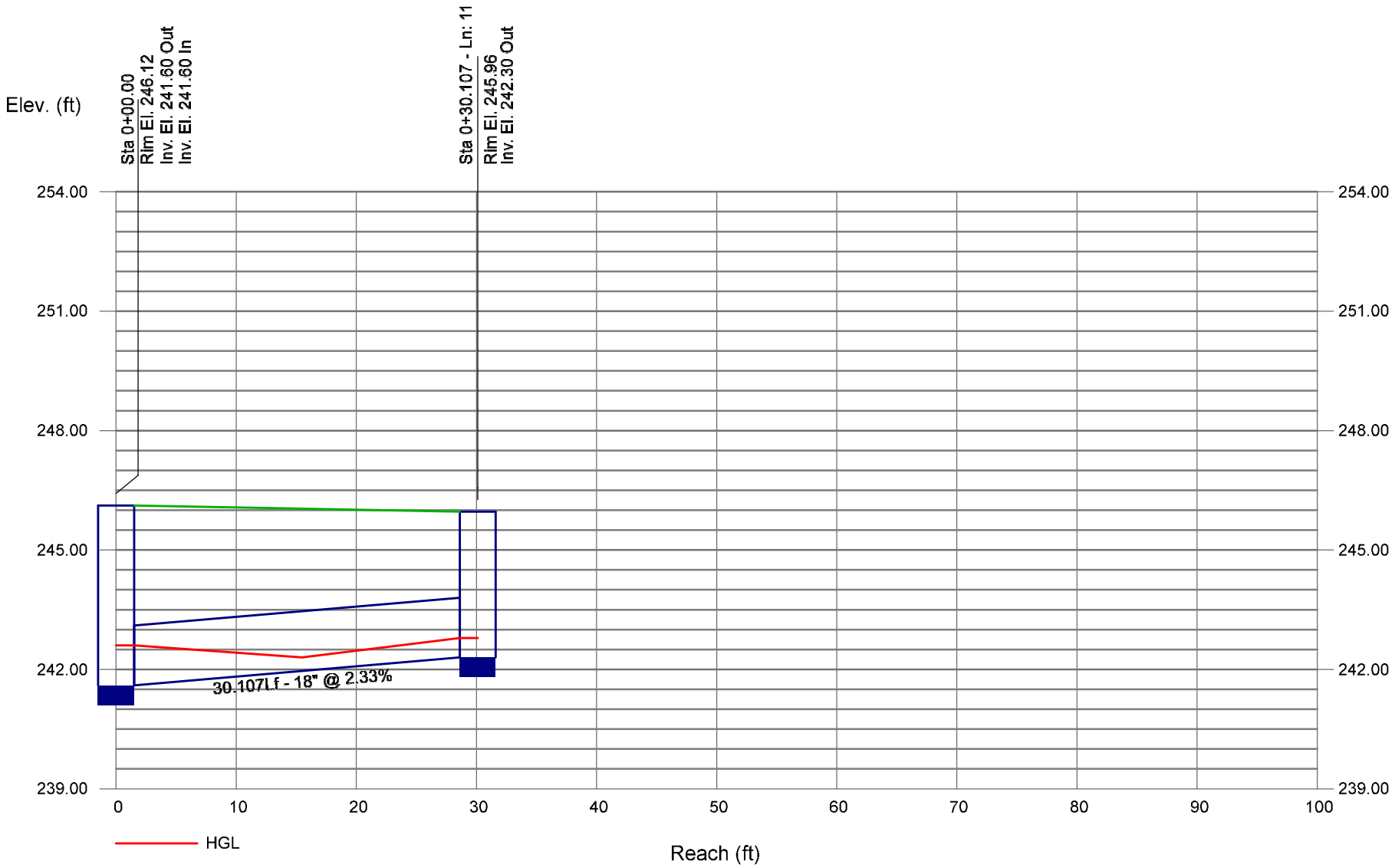

Storm Sewer Profile

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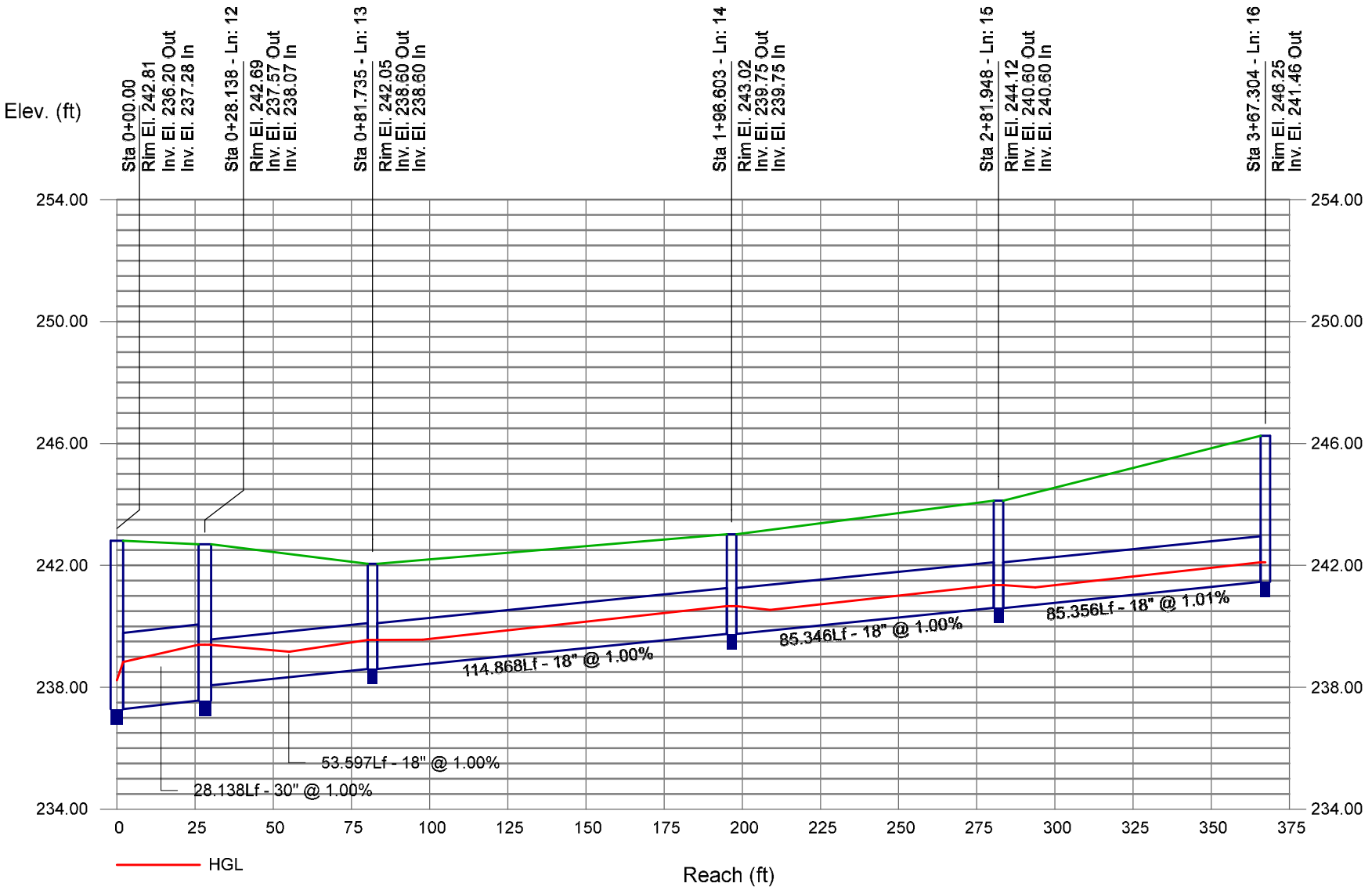

Storm Sewer Profile

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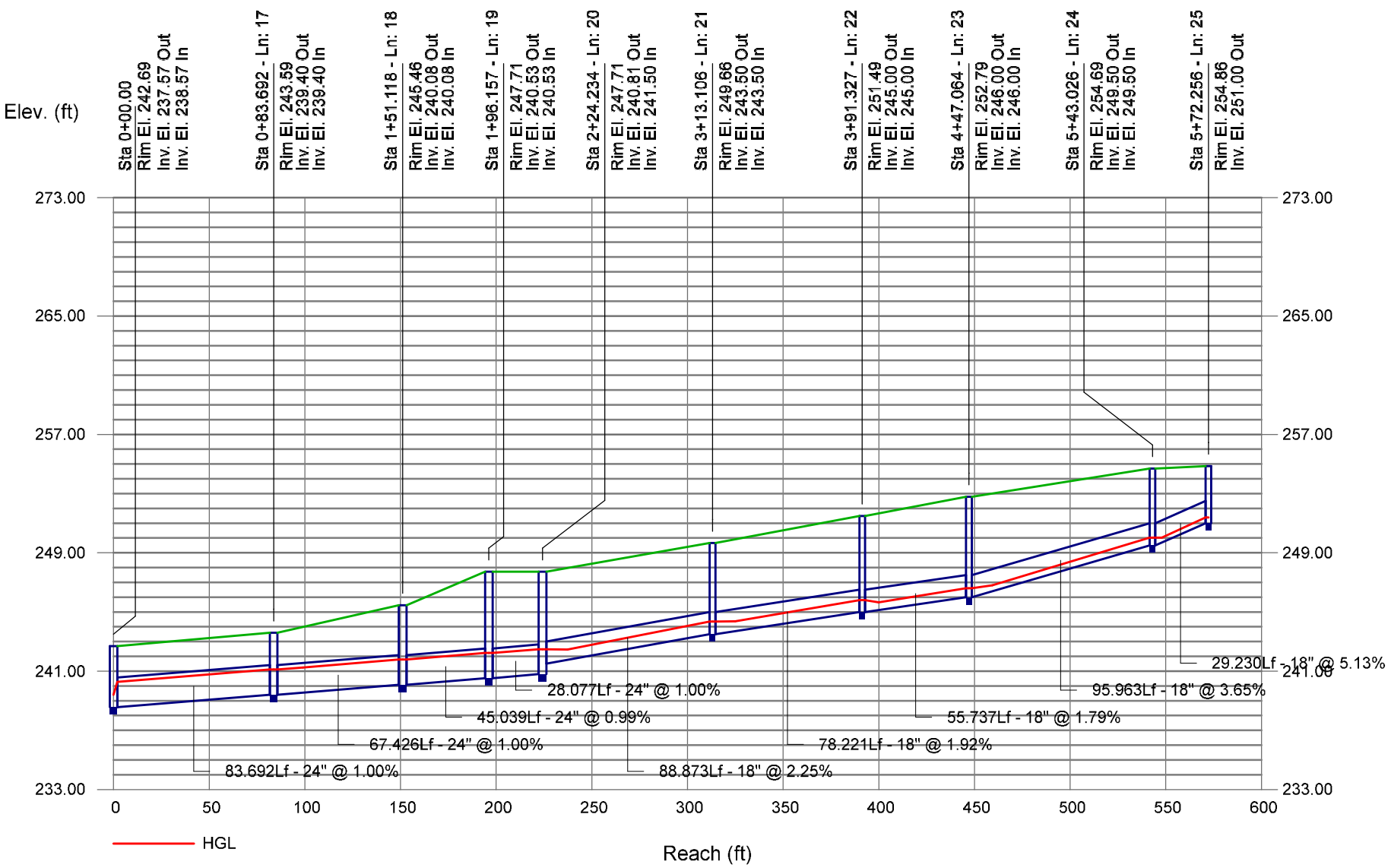

Storm Sewer Profile

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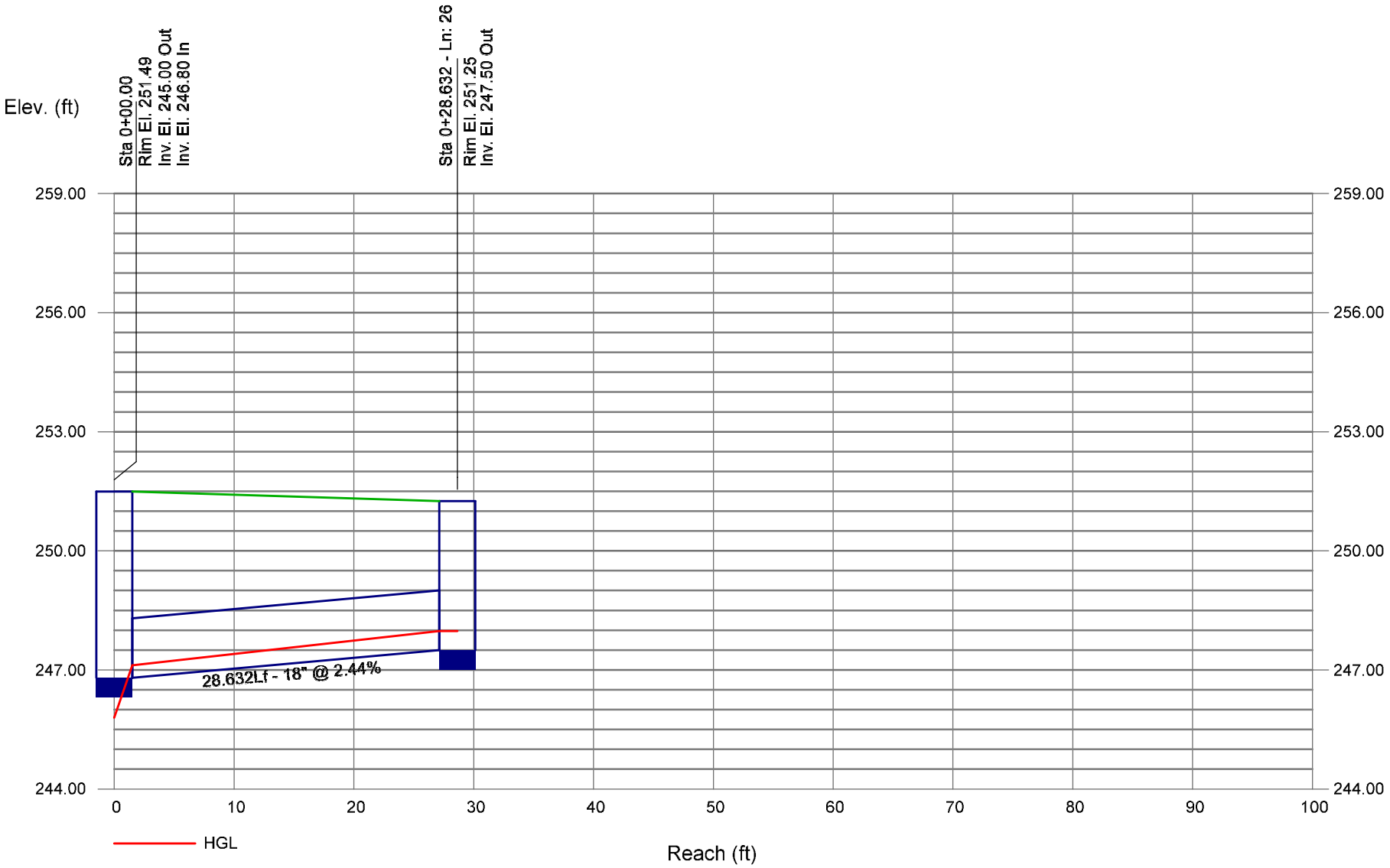

Storm Sewer Profile

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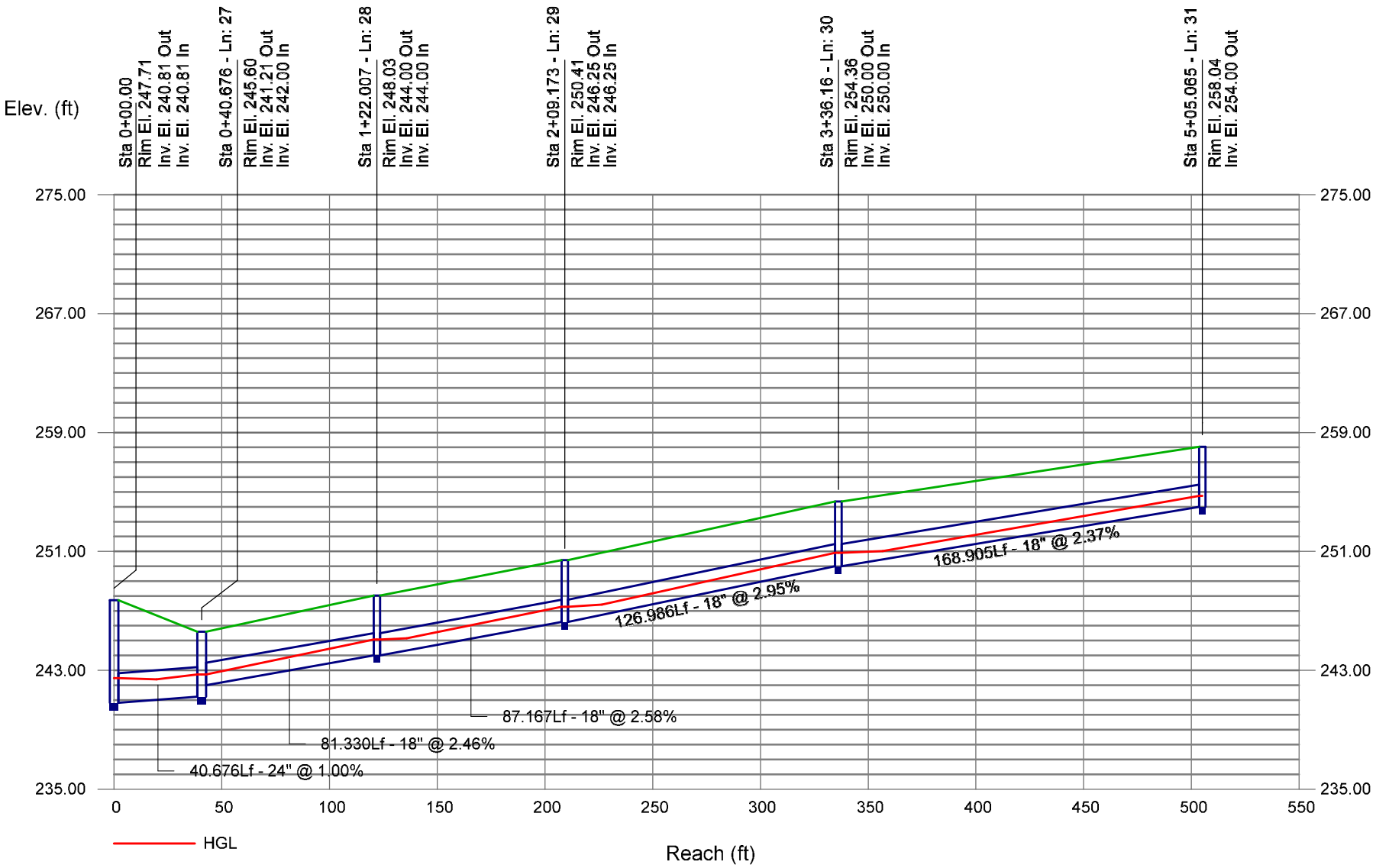

Storm Sewer Profile

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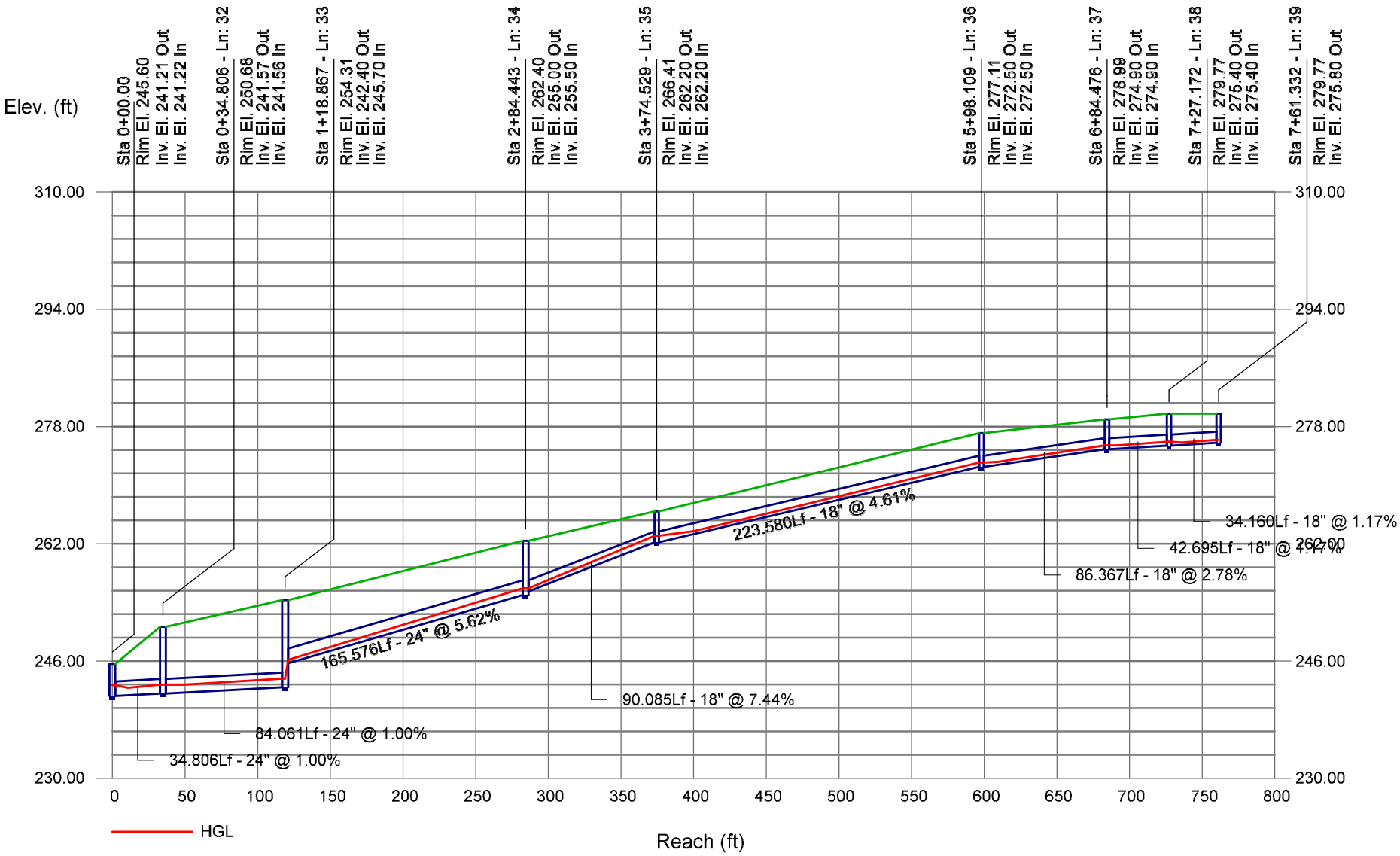

Storm Sewer Profile

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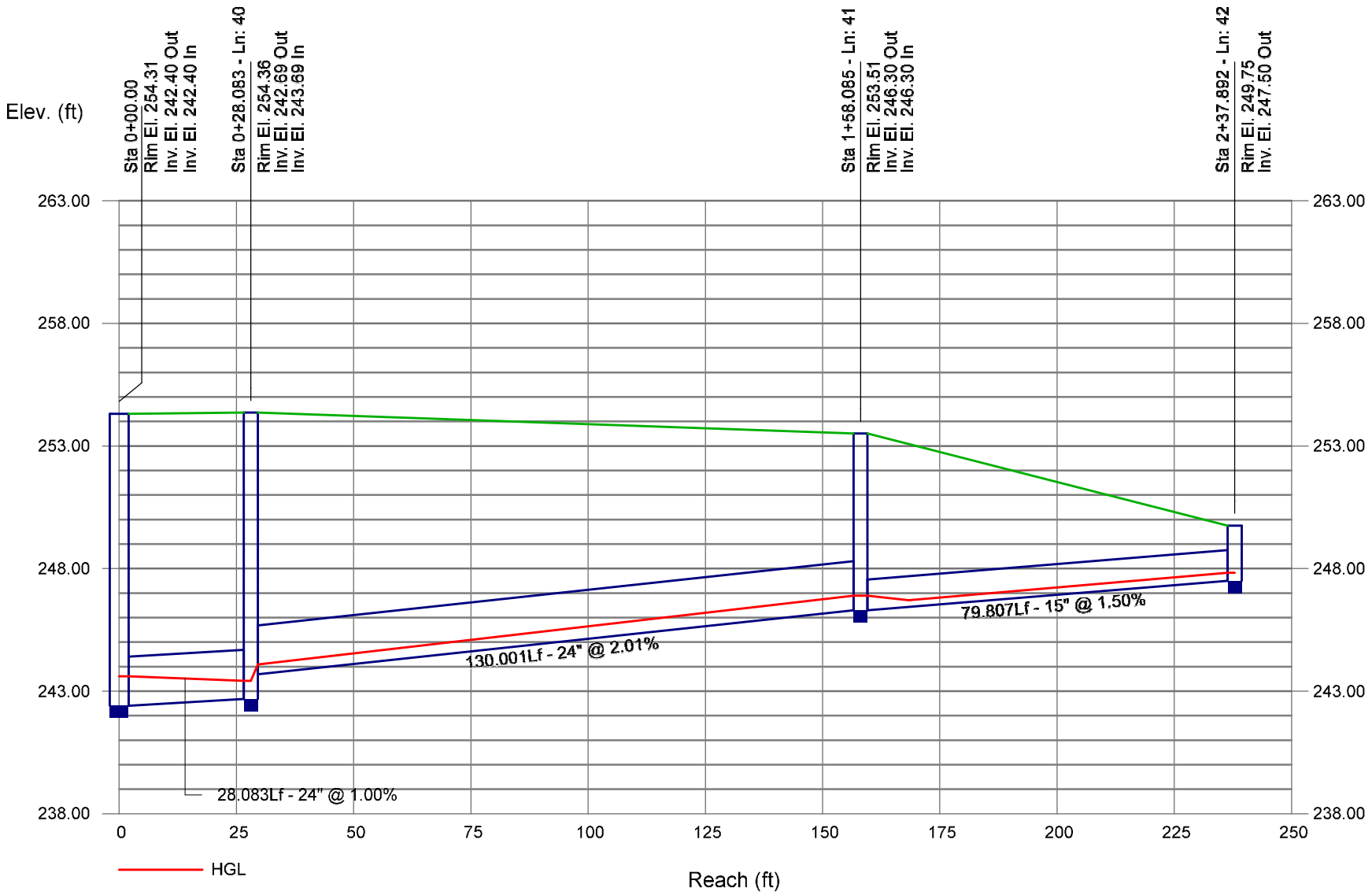

Storm Sewer Profile

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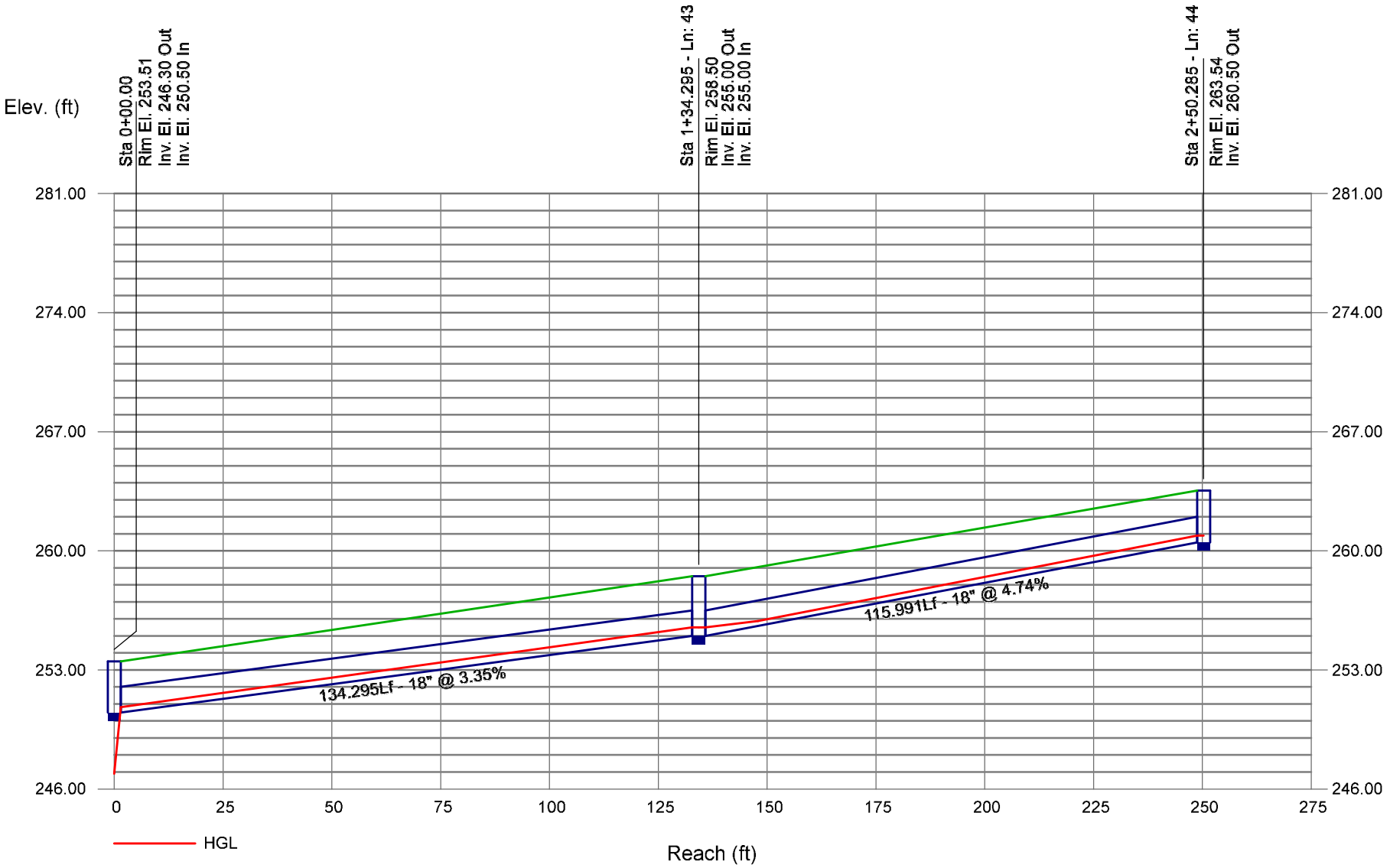

Storm Sewer Profile

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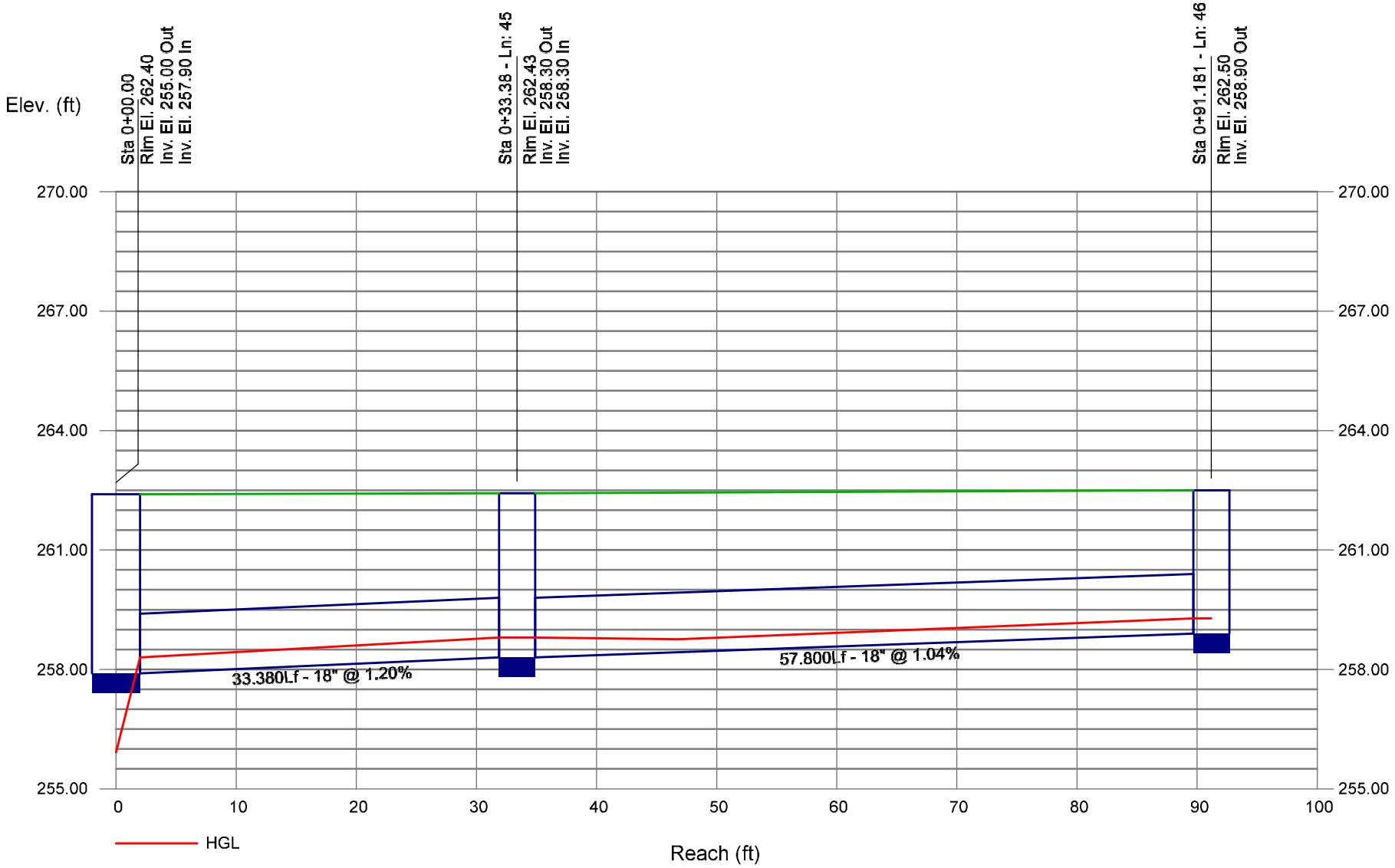

Storm Sewer Profile

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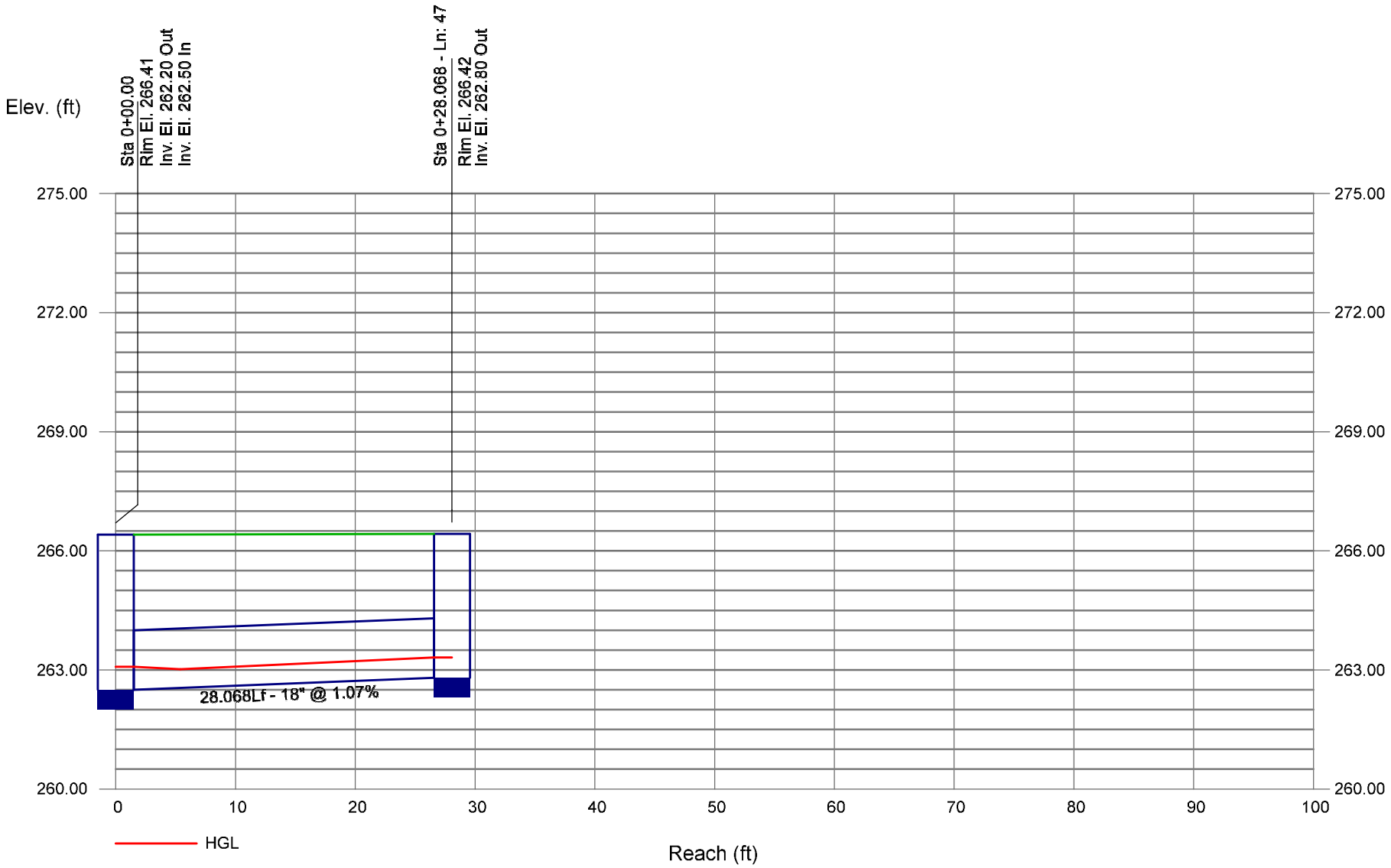

Storm Sewer Profile

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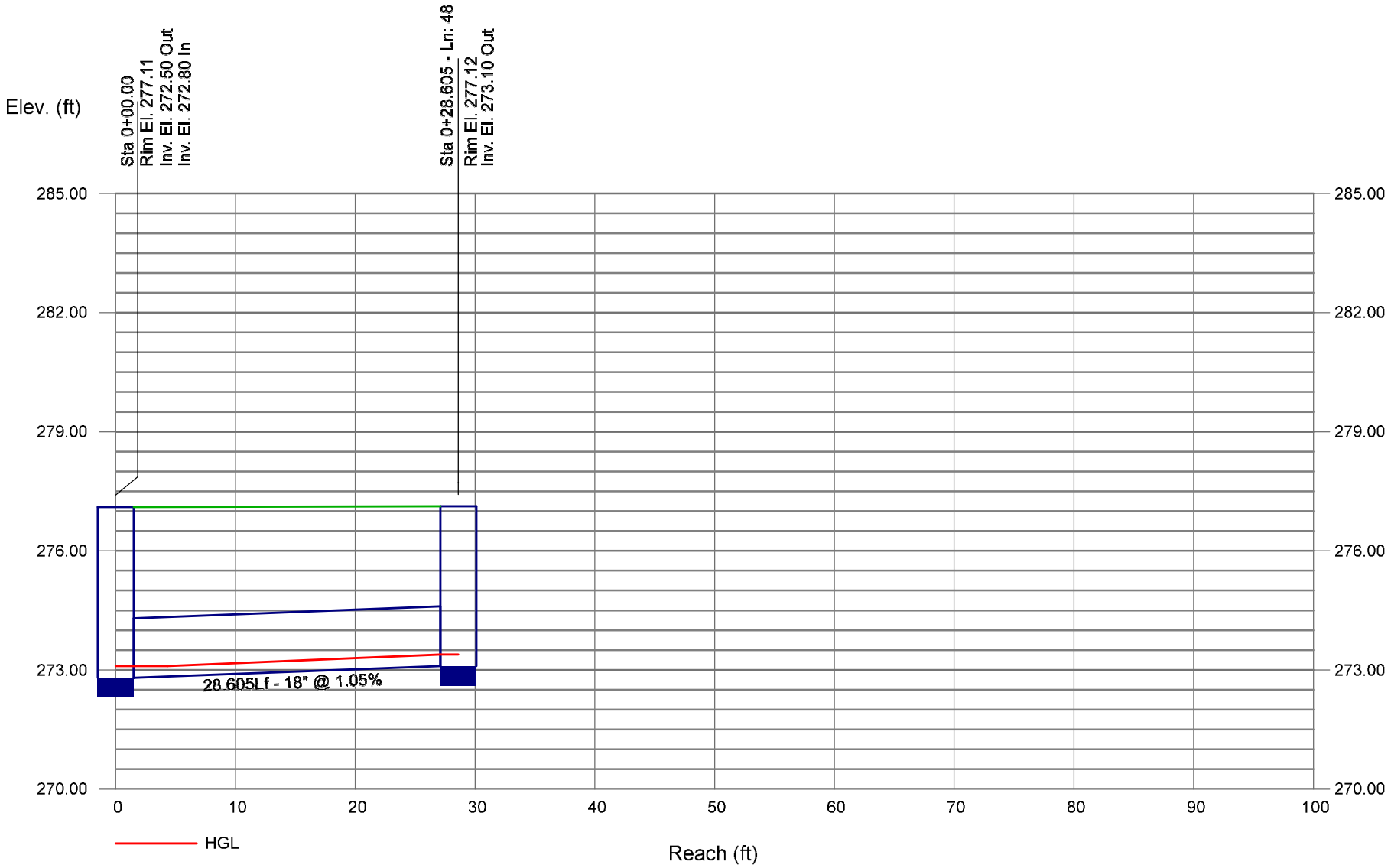
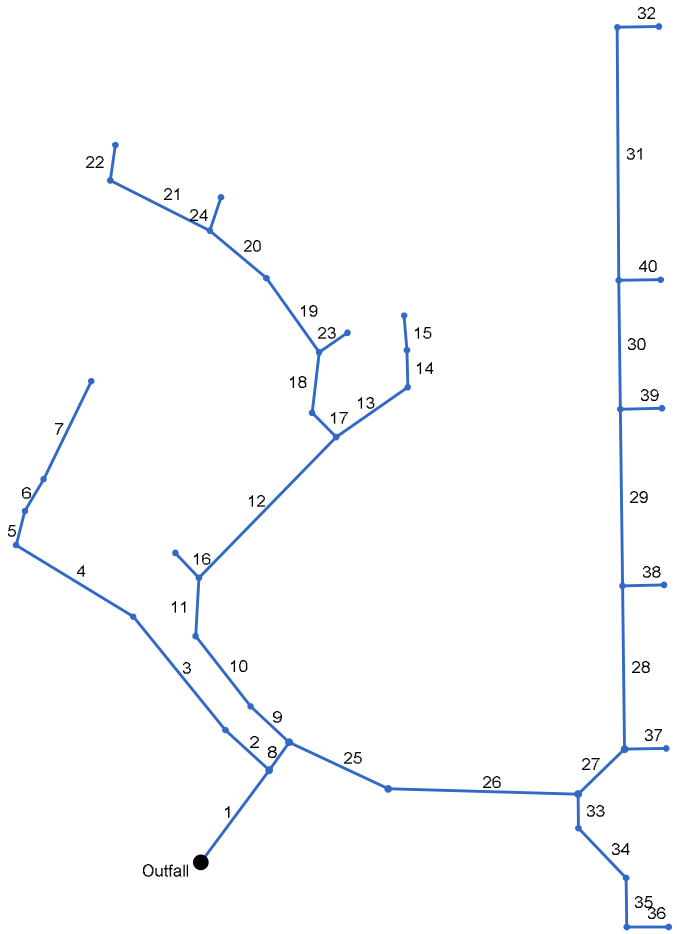


STORM SYSTEM 200

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



Project File: Storm 200.stm	Number of lines: 40	Date: 5/30/2025

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	94.194	0.46	9.15	0.70	0.32	5.88	5.0	12.8	5.3	31.42	117.0	6.10	36	3.08	237.50	240.40	239.91	242.22	241.02	246.99	201
2	1	48.721	0.27	1.93	0.70	0.19	1.16	5.0	7.4	6.5	7.52	12.59	5.26	18	1.44	241.00	241.70	242.22	242.76	246.99	246.66	202
3	2	119.808	0.18	1.66	0.70	0.13	0.97	5.0	6.9	6.6	6.45	10.51	5.04	18	1.00	241.70	242.90	242.76	243.88	246.66	247.50	203
4	3	112.287	0.26	1.48	0.70	0.18	0.85	5.0	6.3	6.8	5.74	10.86	4.85	18	1.07	242.90	244.10	243.88	245.02	247.50	249.04	204
5	4	28.808	0.26	1.22	0.70	0.19	0.66	5.0	6.1	6.8	4.52	10.72	4.28	18	1.04	244.10	244.40	245.02	245.22	249.04	249.34	205
6	5	30.294	0.09	0.95	0.50	0.04	0.48	5.0	5.8	6.9	3.29	12.07	3.75	18	1.32	244.40	244.80	245.22	245.49	249.34	249.62	206
7	6	89.398	0.87	0.87	0.50	0.43	0.43	5.0	5.0	7.2	3.11	11.11	3.99	18	1.12	244.80	245.80	245.49	246.47	249.62	248.80	207
8	1	28.140	0.25	6.77	0.50	0.13	4.41	5.0	12.7	5.4	23.59	42.35	7.85	30	1.07	240.90	241.20	242.23	242.85	246.99	246.96	208
9	8	43.069	0.54	2.79	0.50	0.27	1.80	5.0	12.5	5.4	9.68	24.37	4.84	24	1.16	241.50	242.00	242.85	243.11	246.96	246.67	209
10	9	73.220	0.23	2.25	0.70	0.16	1.53	5.0	12.1	5.5	8.34	25.08	4.89	24	1.23	242.00	242.90	243.11	243.93	246.67	247.22	210
11	10	47.888	0.29	2.02	0.70	0.21	1.37	5.0	11.9	5.5	7.53	37.27	4.79	24	2.71	242.90	244.20	243.93	245.17	247.22	248.98	211
12	11	161.146	0.10	1.43	0.70	0.07	0.95	5.0	10.5	5.8	5.50	37.80	6.53	24	2.79	244.70	249.20	245.22	250.03	248.98	260.22	212
13	12	71.363	0.19	0.56	0.70	0.13	0.34	5.0	6.3	6.8	2.34	14.71	4.91	18	1.96	256.50	257.90	256.90	258.48	260.22	265.98	213
14	13	30.459	0.14	0.37	0.70	0.10	0.21	5.0	5.7	7.0	1.47	12.03	2.80	18	1.31	257.90	258.30	258.48	258.75	265.98	266.70	214
15	14	28.453	0.23	0.23	0.50	0.12	0.12	5.0	5.0	7.2	0.83	6.63	3.28	15	1.05	258.60	258.90	258.90	259.26	266.70	262.22	215
16	11	28.110	0.29	0.29	0.70	0.21	0.21	5.0	5.0	7.2	1.48	23.37	2.03	24	1.07	244.20	244.50	245.17	244.92	248.98	249.03	216
17	12	28.063	0.02	0.77	0.70	0.02	0.54	5.0	10.3	5.8	3.14	10.86	4.70	18	1.07	249.70	250.00	250.25	250.67	260.22	260.22	217
18	17	50.070	0.02	0.75	0.70	0.01	0.53	5.0	9.9	5.9	3.10	10.49	4.04	18	1.00	250.00	250.50	250.67	251.17	260.22	262.56	218
19	18	74.603	0.04	0.70	0.70	0.03	0.49	5.0	8.0	6.3	3.09	10.87	4.06	18	1.07	250.50	251.30	251.17	251.97	262.56	261.12	219
20	19	60.462	0.03	0.66	0.70	0.02	0.46	5.0	7.5	6.5	2.97	11.30	3.96	18	1.16	251.30	252.00	251.97	252.65	261.12	259.61	220
21	20	91.300	0.15	0.34	0.70	0.10	0.24	5.0	5.9	6.9	1.66	10.99	2.80	18	1.10	252.00	253.00	252.65	253.48	259.61	257.90	221
22	21	29.454	0.20	0.20	0.70	0.14	0.14	5.0	5.0	7.2	0.99	12.24	2.46	18	1.36	253.00	253.40	253.48	253.77	257.90	257.71	222

Project File: Storm 200.stm | Number of lines: 40 | Run Date: 5/30/2025

NOTES:Intensity = 72.00 / (Inlet time + 12.50) ^ 0.80; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Tabulation

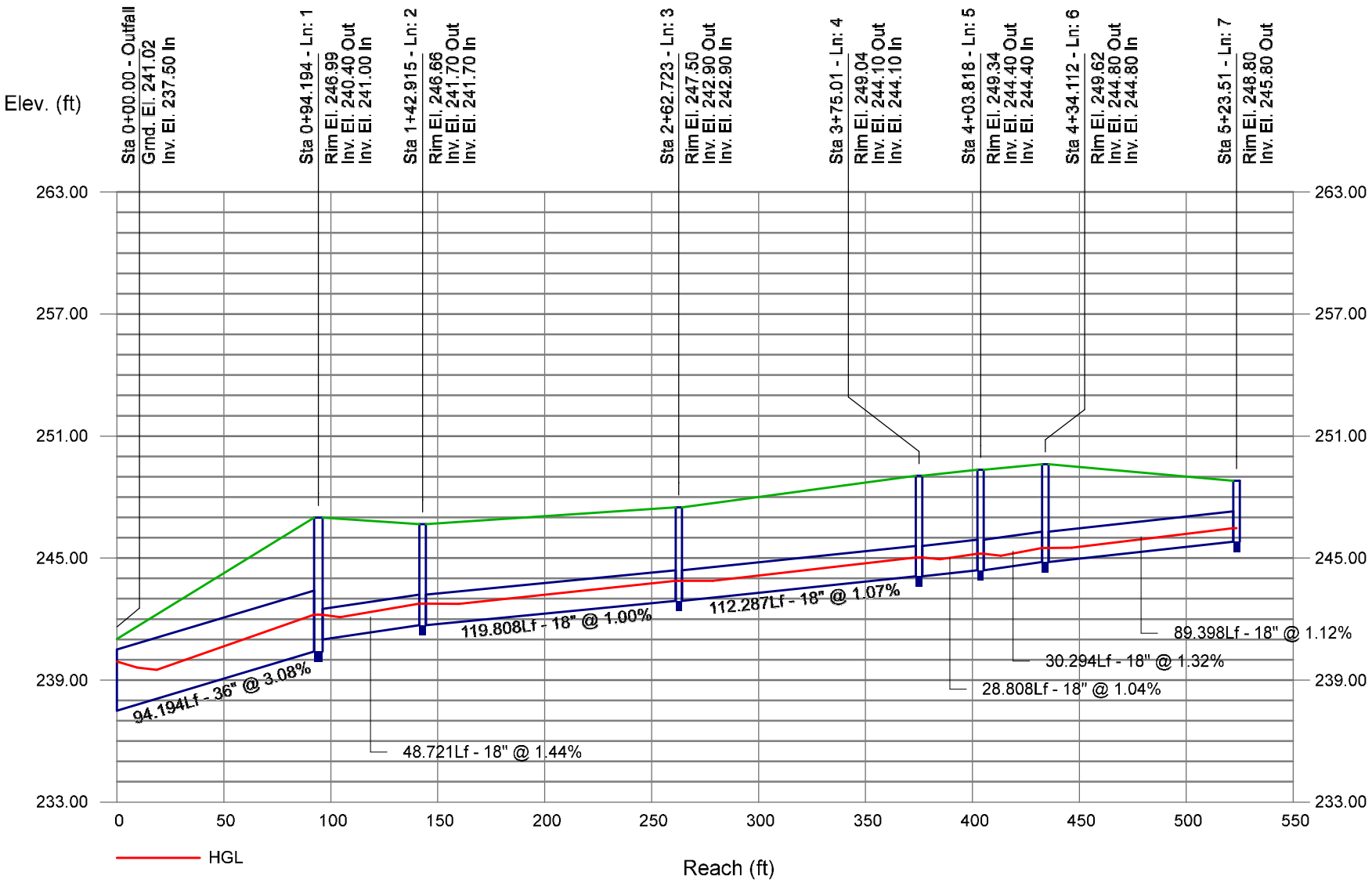
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	18	28.095	0.03	0.03	0.70	0.02	0.02	5.0	5.0	7.2	0.17	10.85	2.04	18	1.07	258.70	259.00	258.83	259.15	262.56	262.56	223
24	20	28.837	0.28	0.28	0.70	0.20	0.20	5.0	5.0	7.2	1.41	10.71	3.71	18	1.04	255.20	255.50	255.57	255.94	259.61	259.48	224
25	8	89.490	0.63	3.73	0.50	0.32	2.48	5.0	12.0	5.5	13.60	68.55	5.31	30	2.79	241.50	244.00	242.85	245.24	246.96	248.63	225
26	25	155.352	0.11	3.09	0.70	0.08	2.17	5.0	11.1	5.7	12.24	70.57	5.23	30	2.96	244.00	248.60	245.24	249.77	248.63	255.76	226
27	26	52.848	0.22	2.15	0.70	0.15	1.51	5.0	10.8	5.7	8.60	59.85	9.36	24	7.00	251.20	254.90	251.71	255.94	255.76	260.61	227
28	27	134.046	0.26	1.83	0.70	0.18	1.28	5.0	9.9	5.9	7.54	52.05	8.38	24	5.30	256.30	263.40	256.81	264.37	260.61	267.80	228
29	28	144.964	0.05	1.46	0.70	0.04	1.02	5.0	8.8	6.1	6.28	35.14	4.40	24	2.41	263.40	266.90	264.37	267.79	267.80	271.38	229
30	29	105.821	0.54	1.32	0.70	0.38	0.93	5.0	8.3	6.3	5.79	10.71	5.61	18	1.04	267.00	268.10	267.79	269.03	271.38	272.53	230
31	30	207.695	0.48	0.62	0.70	0.33	0.44	5.0	6.4	6.8	2.95	11.97	4.81	18	1.30	268.70	271.40	269.21	272.05	272.53	275.88	231
32	31	34.039	0.15	0.15	0.70	0.10	0.10	5.0	5.0	7.2	0.74	11.38	1.85	18	1.18	271.40	271.80	272.05	272.12	275.88	275.88	232
33	26	28.066	0.02	0.83	0.70	0.02	0.58	5.0	6.0	6.9	4.01	12.54	3.56	18	1.43	248.60	249.00	249.77	249.77	255.76	255.76	233
34	33	56.318	0.04	0.81	0.70	0.03	0.57	5.0	5.6	7.0	3.97	12.52	4.39	18	1.42	249.00	249.80	249.77	250.56	255.76	255.08	234
35	34	40.365	0.32	0.77	0.70	0.22	0.54	5.0	5.3	7.1	3.85	12.80	4.31	18	1.49	249.80	250.40	250.56	251.15	255.08	254.15	235
36	35	34.101	0.46	0.46	0.70	0.32	0.32	5.0	5.0	7.2	2.30	8.57	3.45	15	1.76	250.40	251.00	251.15	251.61	254.15	254.15	236
37	27	34.089	0.10	0.10	0.70	0.07	0.07	5.0	5.0	7.2	0.51	11.38	2.84	18	1.17	256.20	256.60	256.42	256.87	260.61	260.61	237
38	28	34.090	0.11	0.11	0.70	0.08	0.08	5.0	5.0	7.2	0.55	11.38	1.47	18	1.17	263.40	263.80	264.37	264.07	267.80	267.82	238
39	29	34.070	0.09	0.09	0.70	0.06	0.06	5.0	5.0	7.2	0.44	7.00	1.60	15	1.17	267.20	267.60	267.79	267.86	271.38	271.38	239
40	30	34.092	0.16	0.16	0.70	0.11	0.11	5.0	5.0	7.2	0.81	11.37	1.73	18	1.17	268.10	268.50	269.03	268.84	272.53	272.53	240

Project File: Storm 200.stm | Number of lines: 40 | Run Date: 5/30/2025

NOTES:Intensity = 72.00 / (Inlet time + 12.50) ^ 0.80; Return period =Yrs. 10 ; c = cir e = ellip b = box

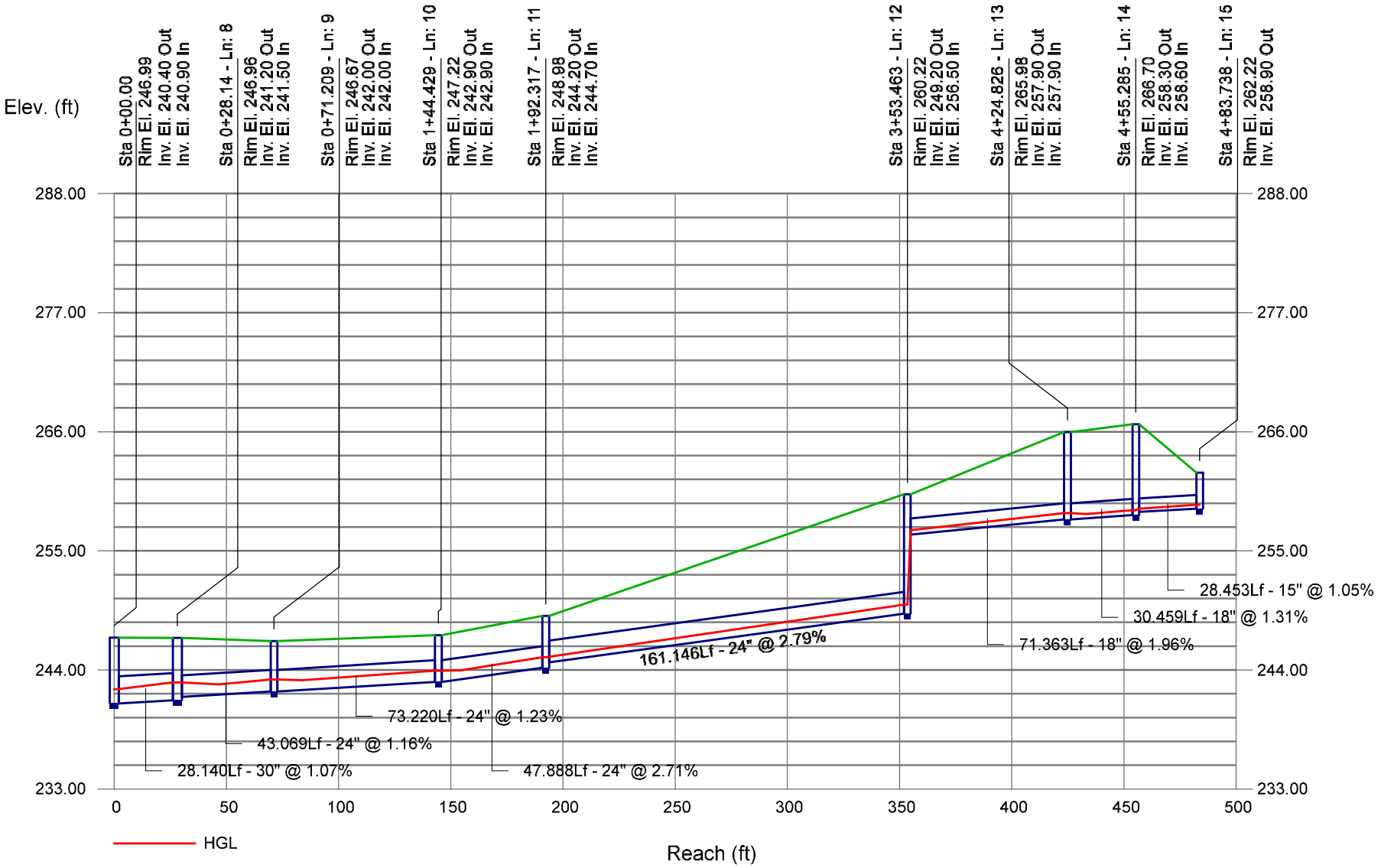
Storm Sewer Profile

Proj. file: Storm 200.stm



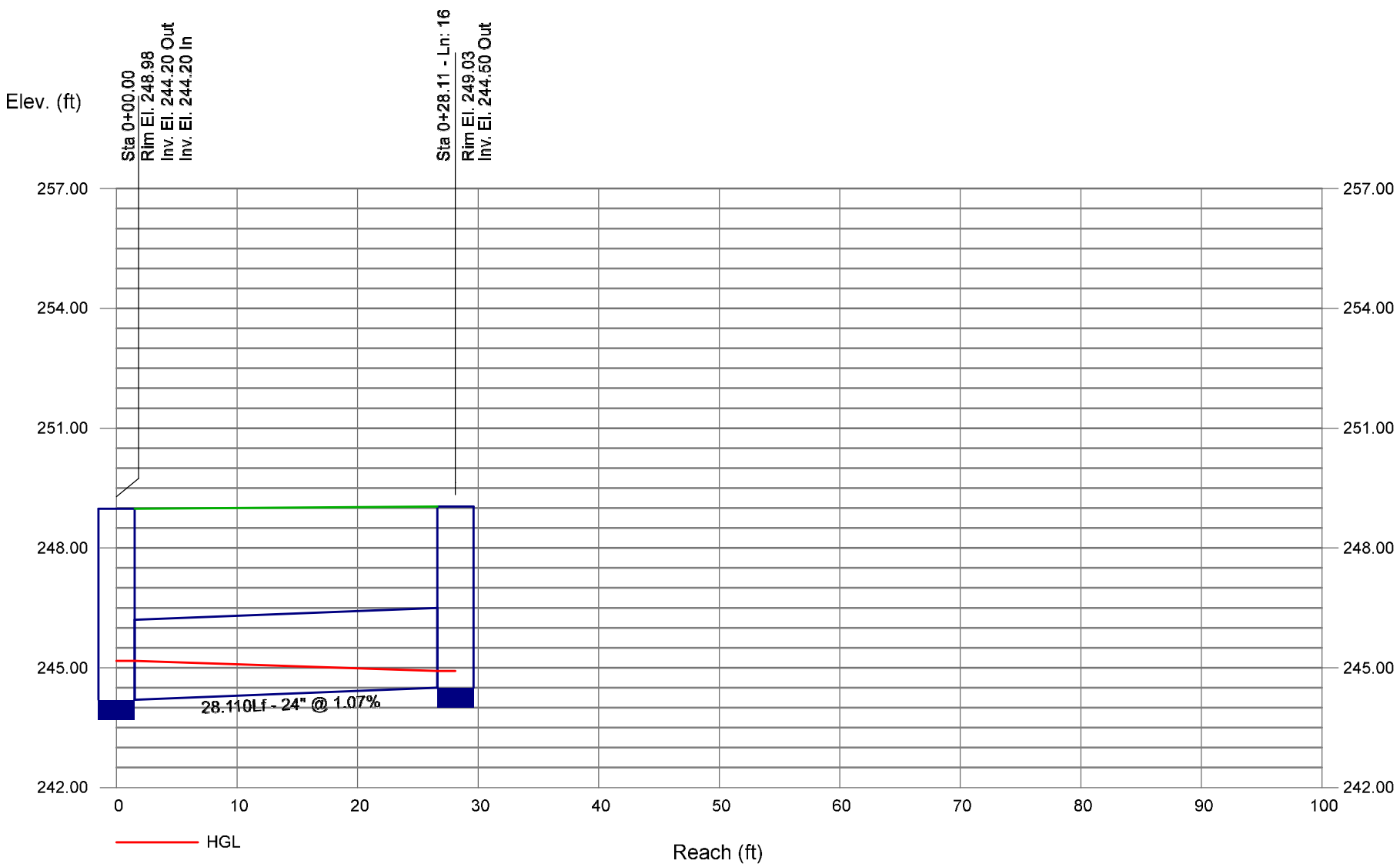
Storm Sewer Profile

Proj. file: Storm 200.stm



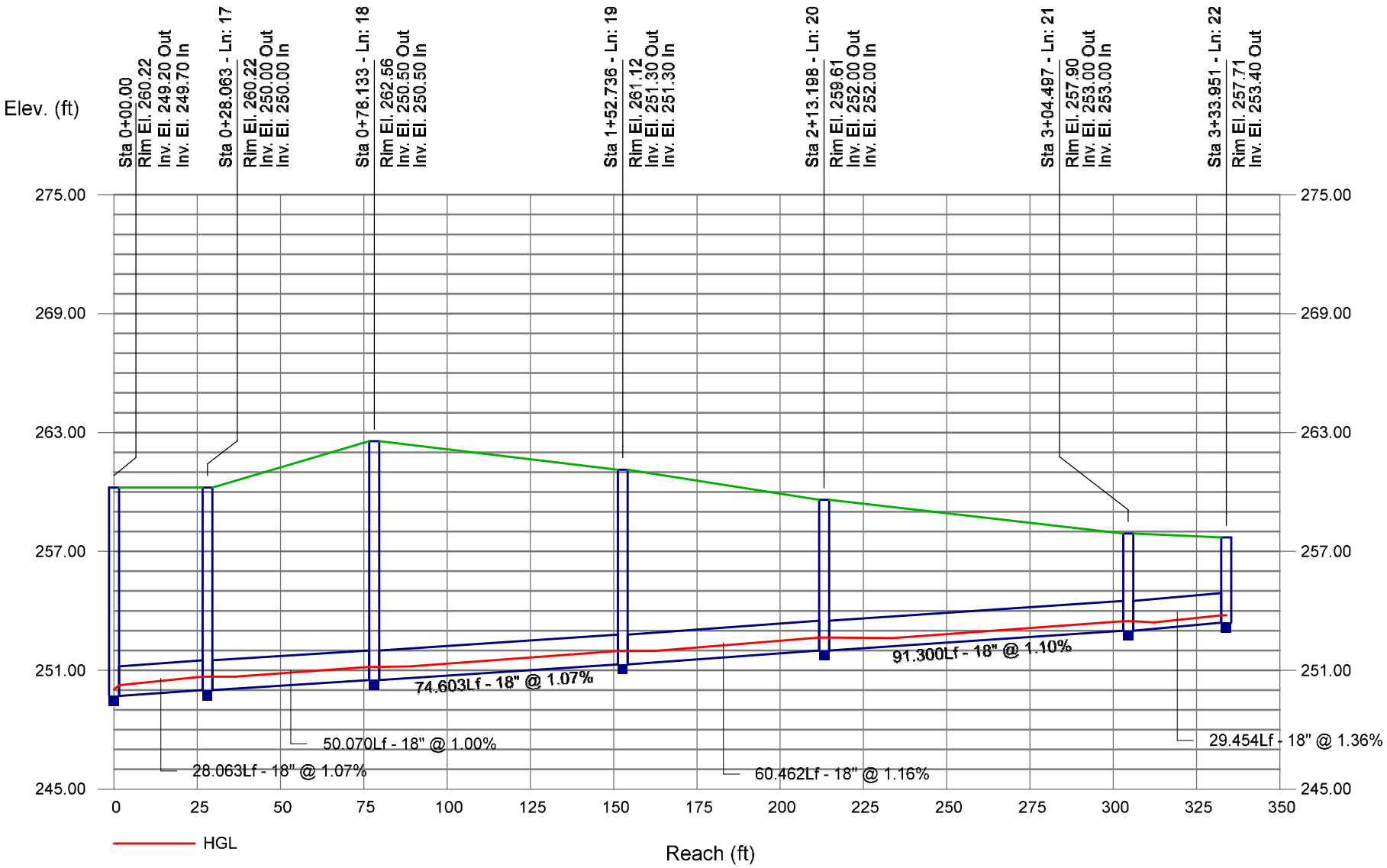
Storm Sewer Profile

Proj. file: Storm 200.stm



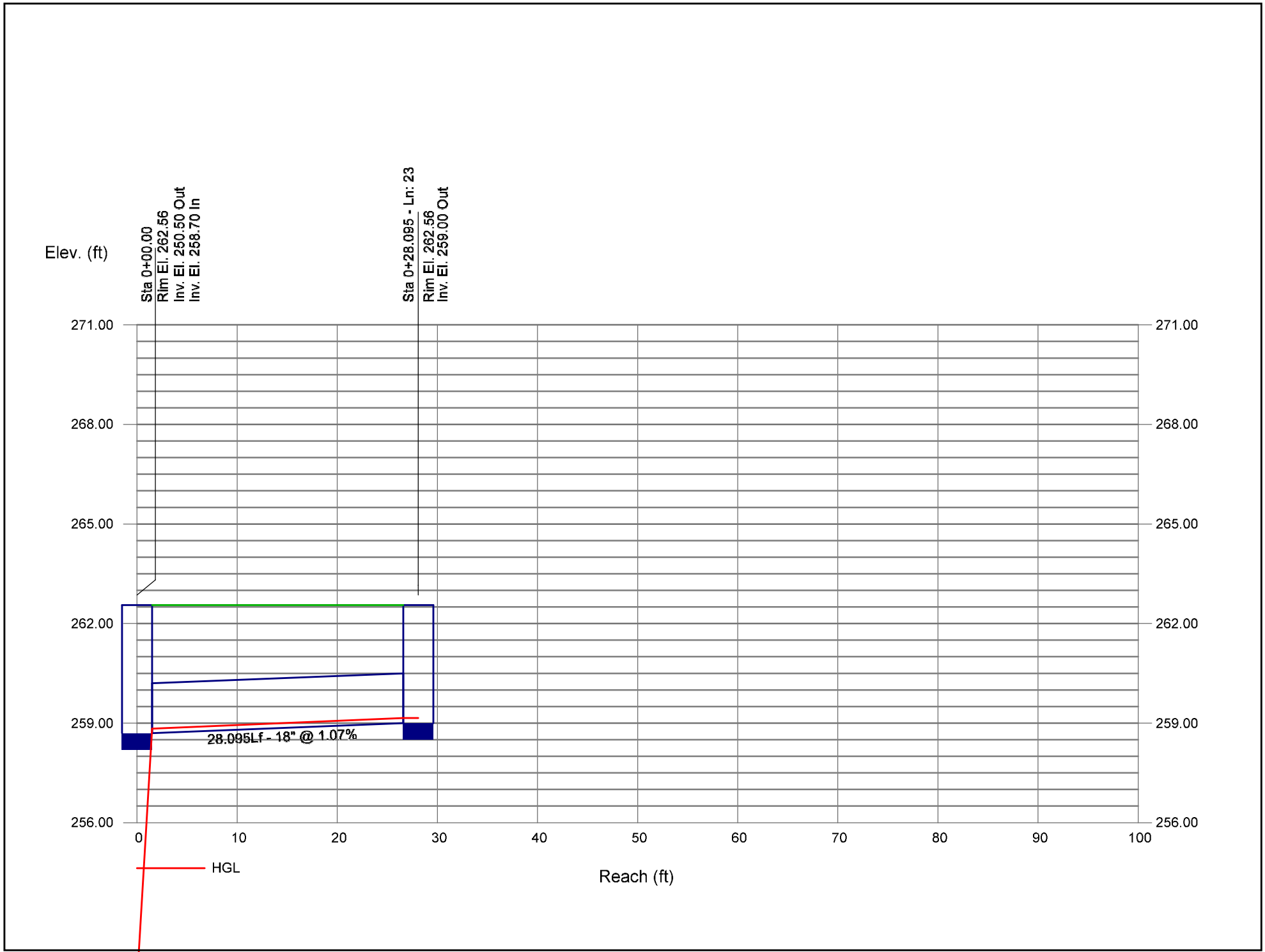
Storm Sewer Profile

Proj. file: Storm 200.stm



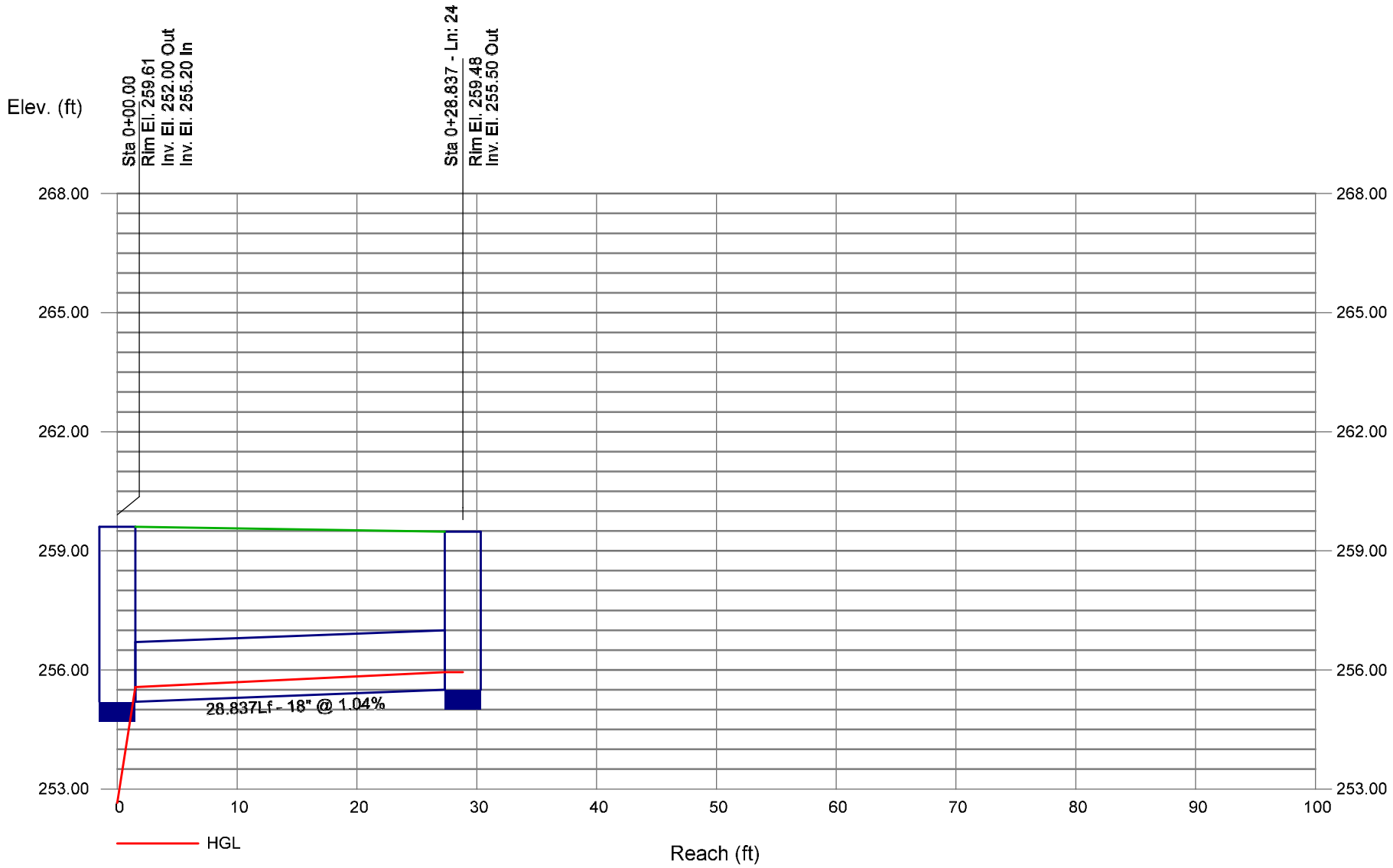
Storm Sewer Profile

Proj. file: Storm 200.stm



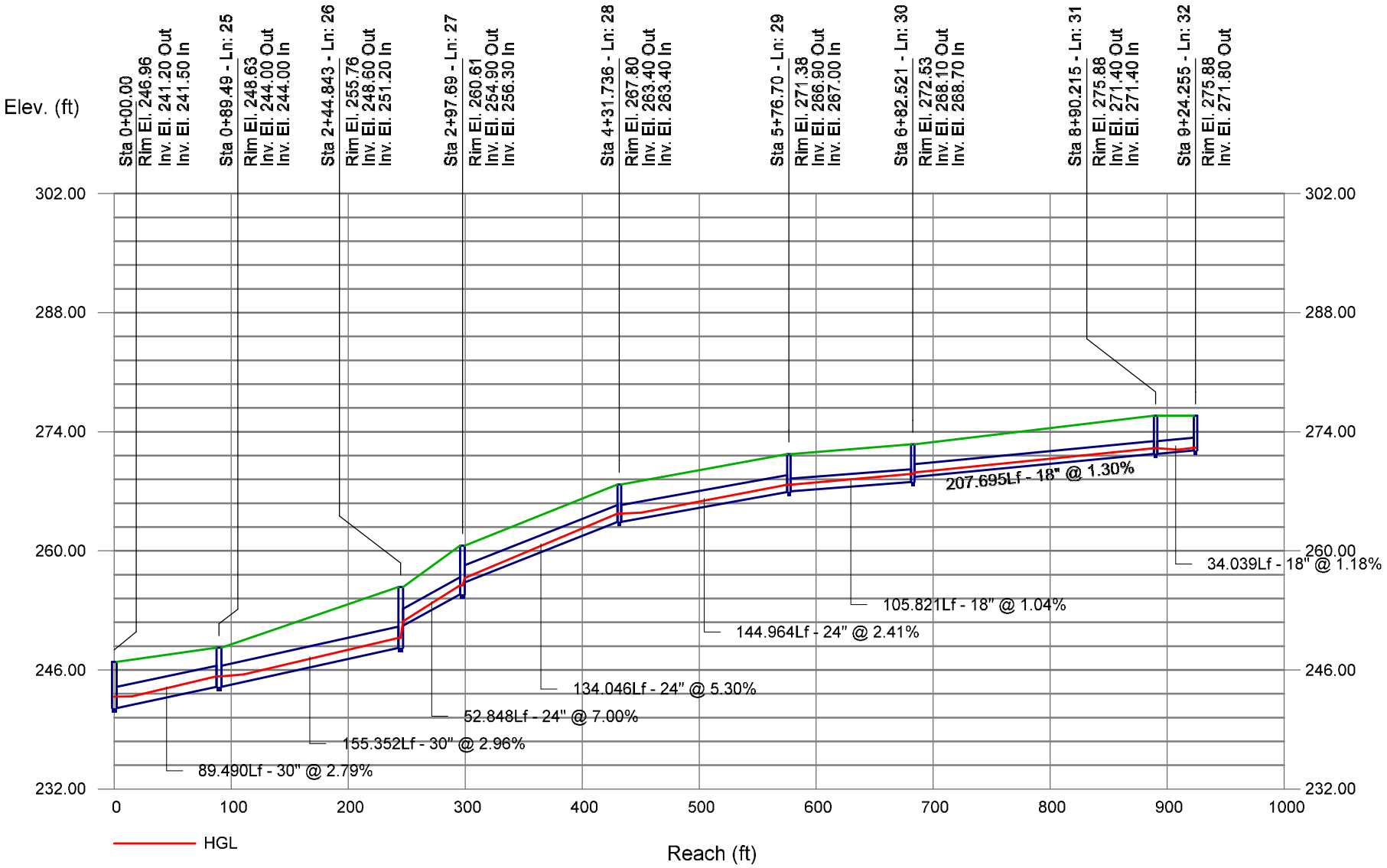
Storm Sewer Profile

Proj. file: Storm 200.stm



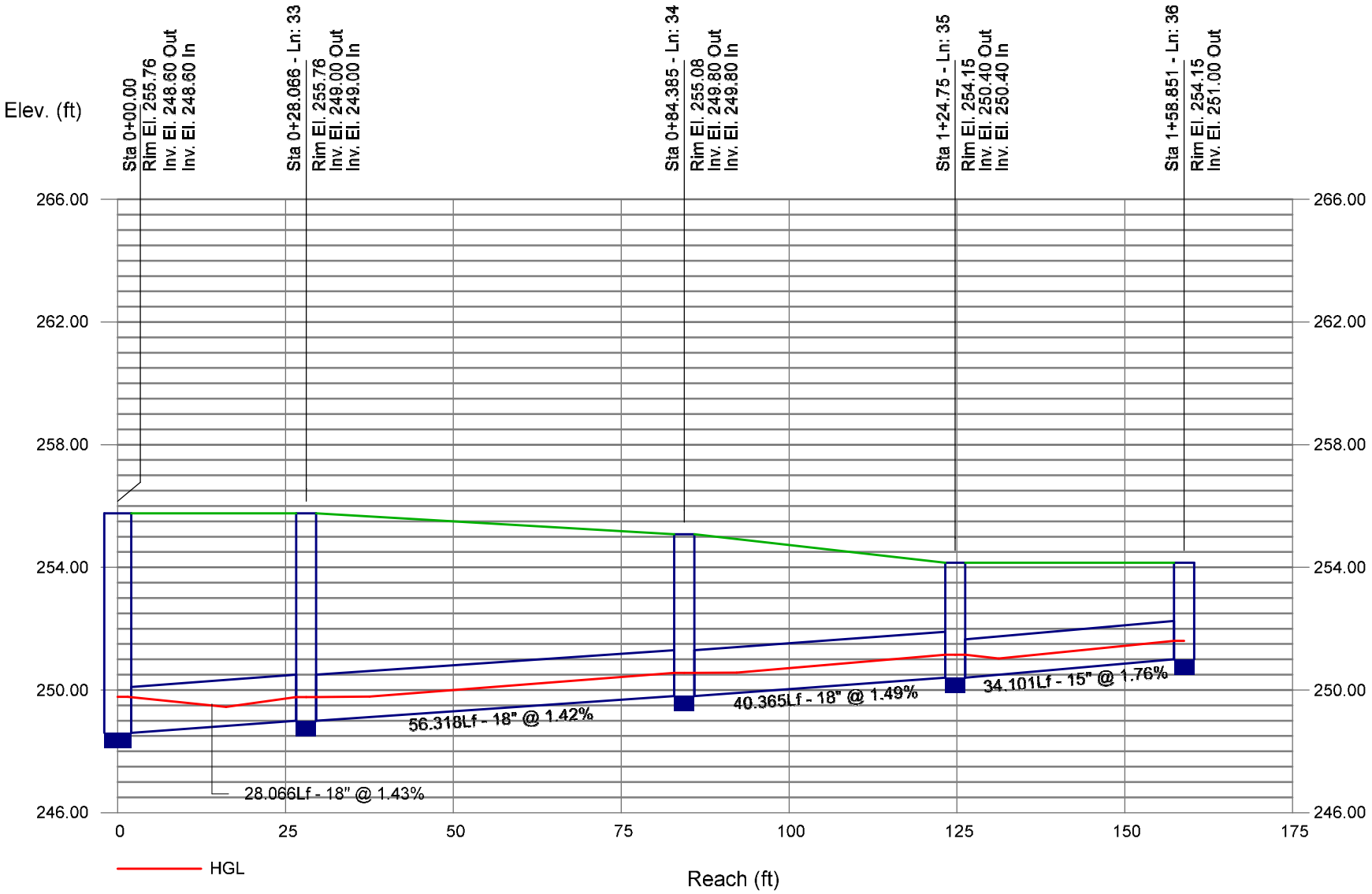
Storm Sewer Profile

Proj. file: Storm 200.stm



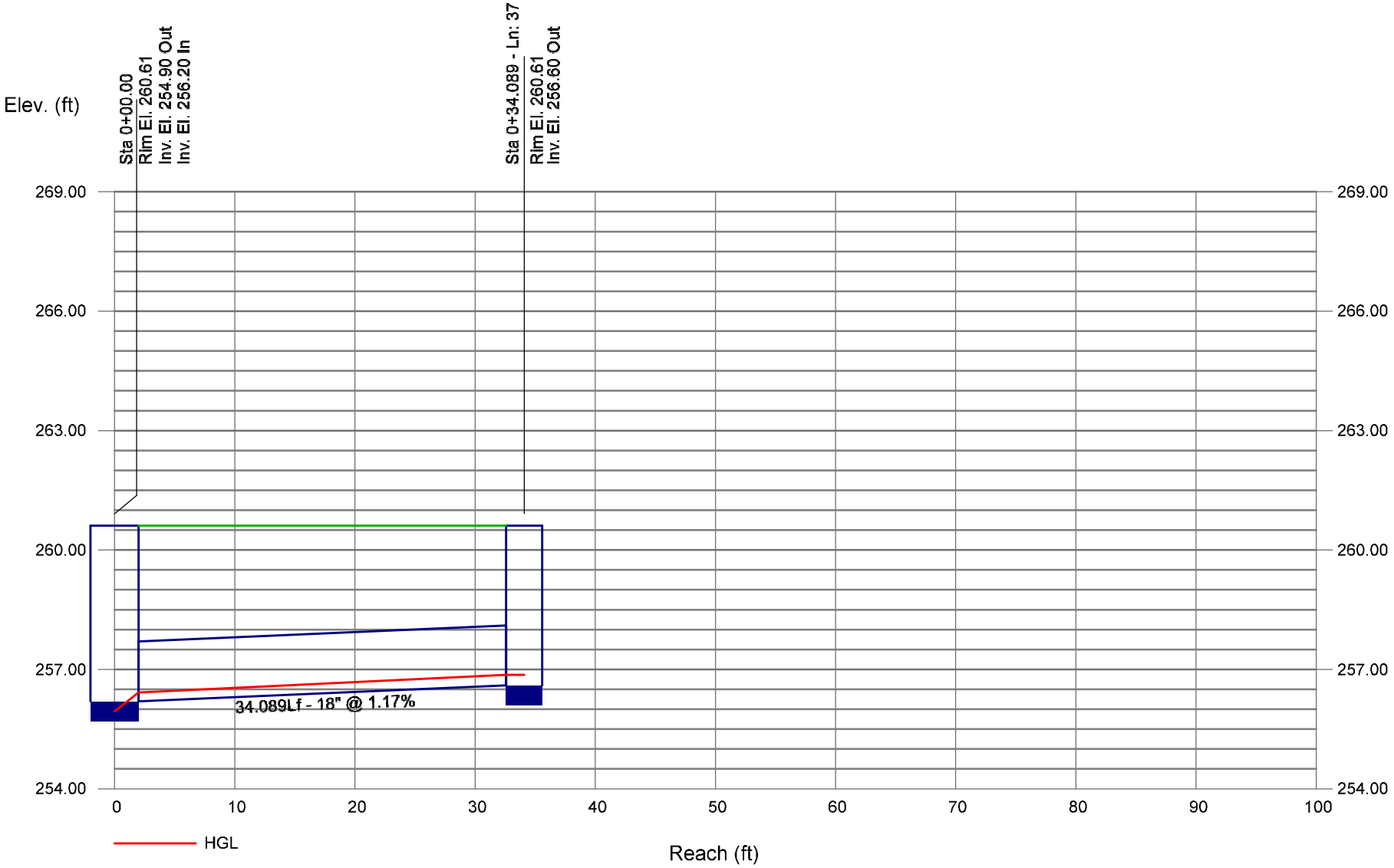
Storm Sewer Profile

Proj. file: Storm 200.stm



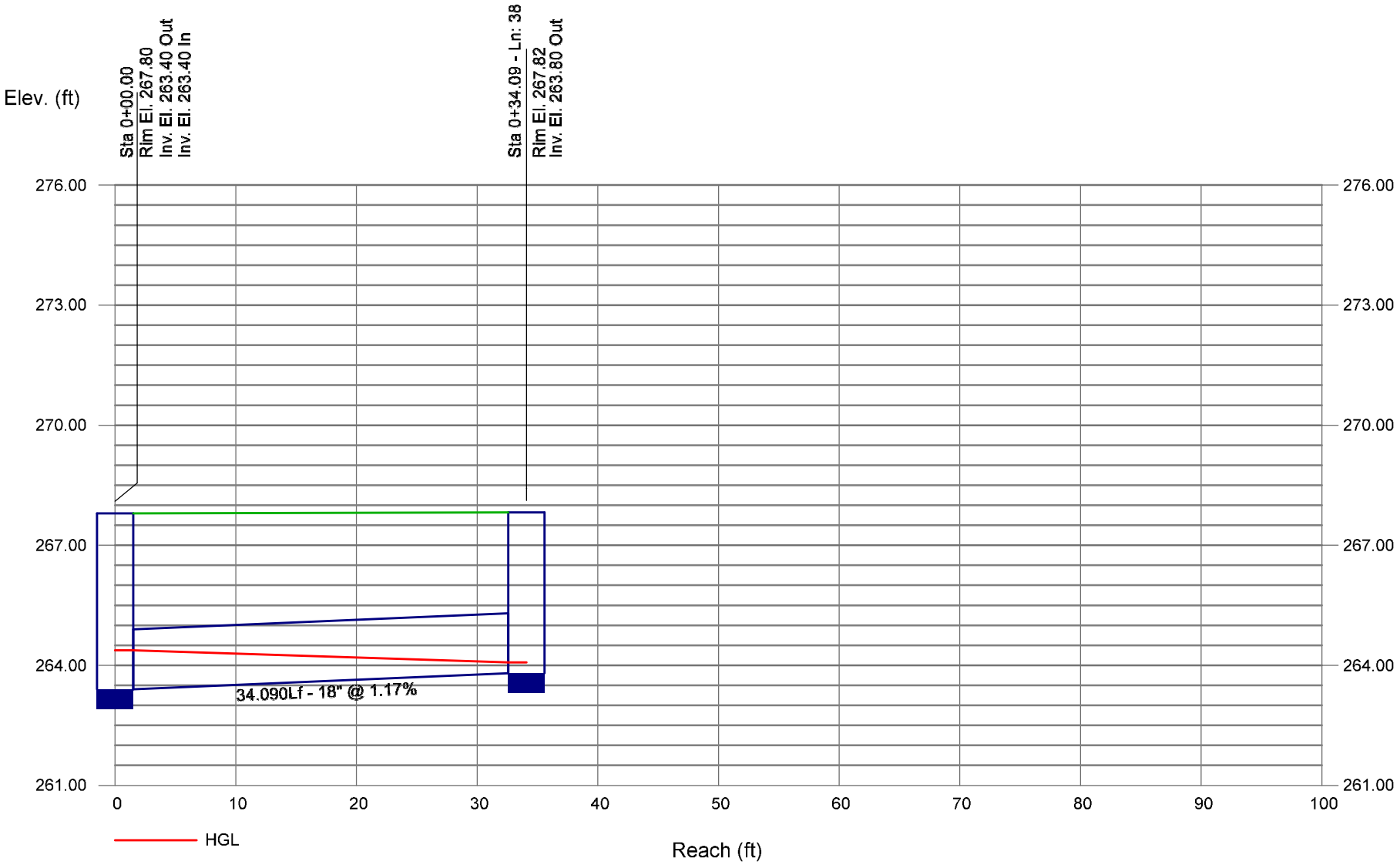
Storm Sewer Profile

Proj. file: Storm 200.stm



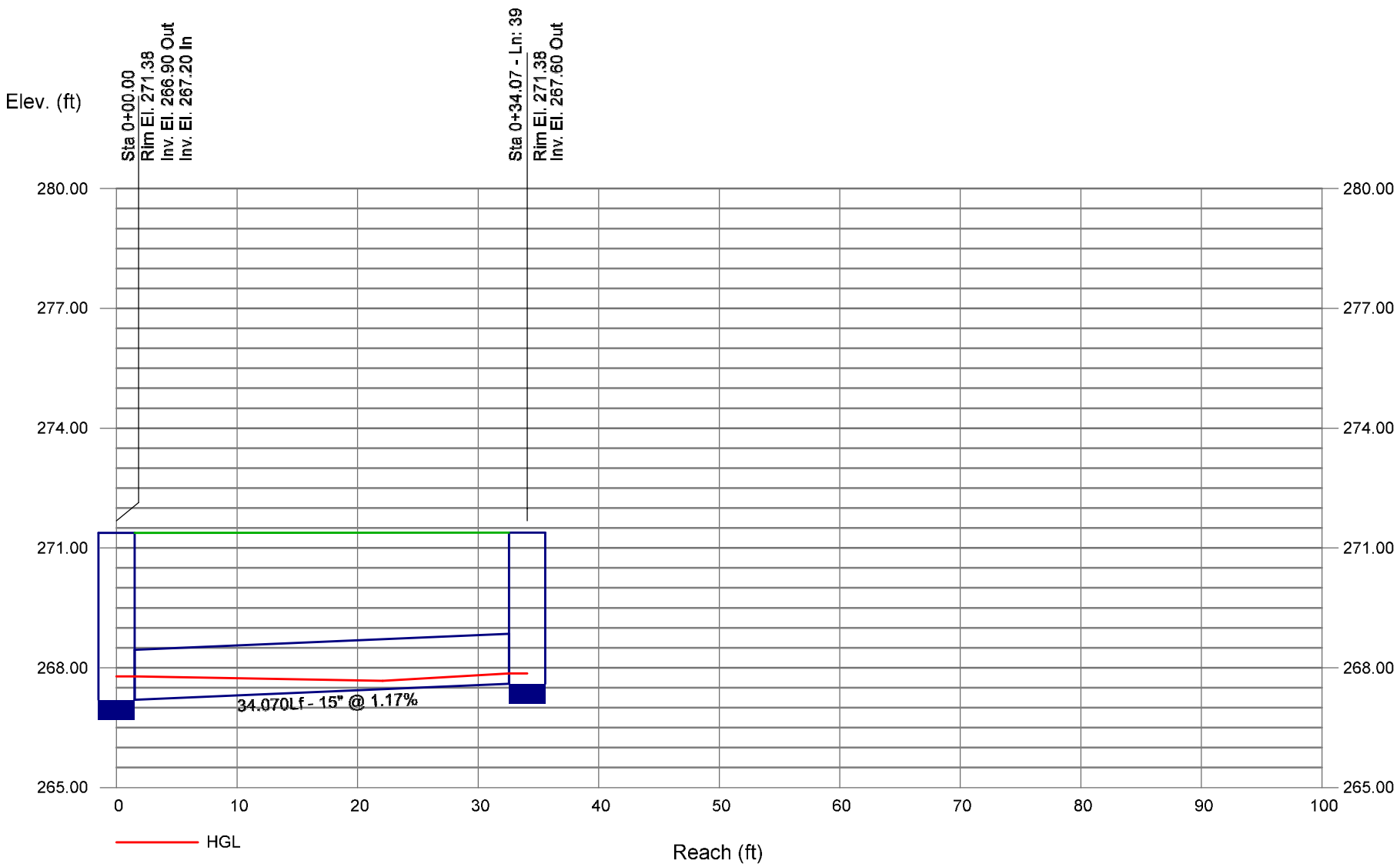
Storm Sewer Profile

Proj. file: Storm 200.stm



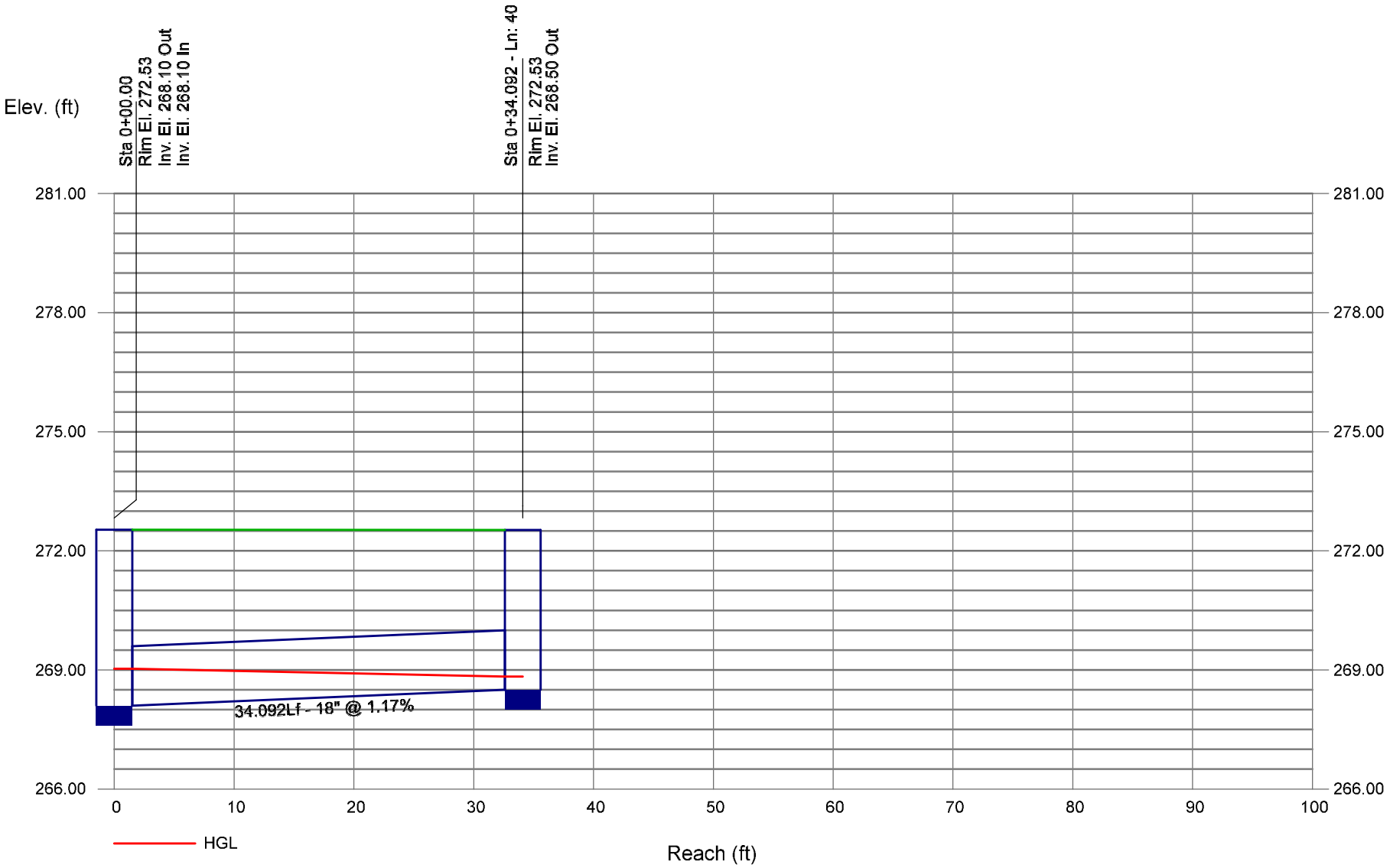
Storm Sewer Profile

Proj. file: Storm 200.stm



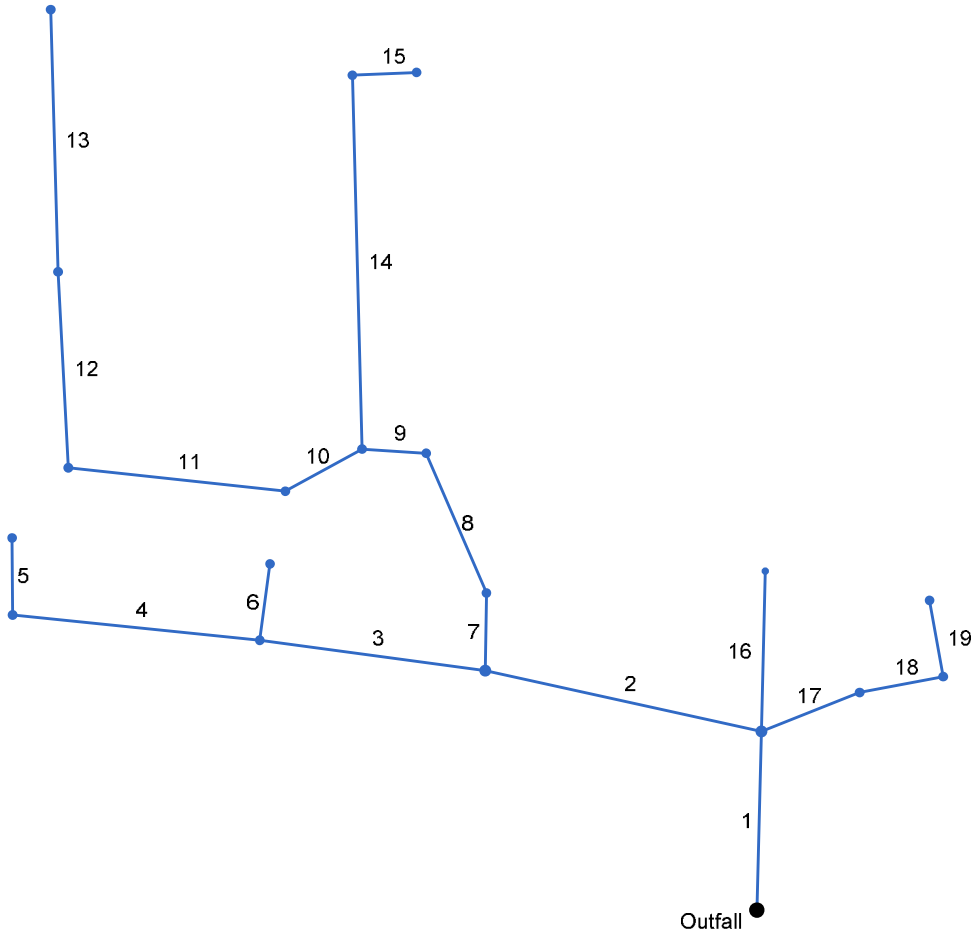
Storm Sewer Profile

Proj. file: Storm 200.stm



STORM SYSTEM 300

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



Project File: Storm 300.stm	Number of lines: 19	Date: 5/30/2025

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	78.940	0.33	5.81	0.70	0.23	3.02	5.0	14.2	5.1	15.46	25.46	5.96	24	1.27	234.40	235.40	236.11	236.82	237.35	241.72	301
2	1	124.578	0.18	4.65	0.70	0.13	2.28	5.0	13.6	5.2	11.88	45.31	5.62	24	4.01	235.50	240.50	236.82	241.74	241.72	246.72	302
3	2	100.182	0.12	0.39	0.70	0.08	0.27	5.0	10.2	5.8	1.59	27.56	5.90	18	6.89	243.00	249.90	243.24	250.37	246.72	254.30	303
4	3	109.337	0.10	0.20	0.70	0.07	0.14	5.0	7.0	6.6	0.93	29.11	5.18	18	7.68	250.60	259.00	250.78	259.36	254.30	263.95	304
5	4	34.067	0.10	0.10	0.70	0.07	0.07	5.0	5.0	7.2	0.51	11.38	2.83	18	1.17	259.50	259.90	259.72	260.16	263.95	263.95	305
6	3	34.049	0.07	0.07	0.70	0.05	0.05	5.0	5.0	7.2	0.37	11.38	1.50	18	1.17	249.90	250.30	250.37	250.52	254.30	254.30	306
7	2	34.271	0.03	4.08	0.70	0.02	1.88	5.0	13.5	5.2	9.85	42.32	5.13	24	3.50	240.50	241.70	241.74	242.82	246.72	247.01	307
8	7	67.270	0.29	4.05	0.70	0.21	1.86	5.0	13.1	5.3	9.85	31.44	5.43	24	1.93	241.70	243.00	242.82	244.12	247.01	248.23	308
9	8	28.207	0.42	3.76	0.70	0.30	1.66	5.0	12.9	5.3	8.80	30.11	5.04	24	1.77	243.00	243.50	244.12	244.56	248.23	248.23	309
10	9	38.633	0.06	2.81	0.50	0.03	0.99	5.0	12.6	5.4	5.35	25.73	3.81	24	1.29	243.50	244.00	244.56	244.82	248.23	247.61	310
11	10	96.002	0.79	2.76	0.35	0.27	0.96	10.0	12.1	5.5	5.28	10.72	5.46	18	1.04	244.50	245.50	245.24	246.38	247.61	249.21	311
12	11	86.703	0.80	1.97	0.35	0.28	0.69	10.0	11.4	5.6	3.86	16.73	3.96	18	2.54	245.50	247.70	246.38	248.45	249.21	251.33	312
13	12	115.891	1.17	1.17	0.35	0.41	0.41	10.0	10.0	5.9	2.41	20.46	3.25	18	3.80	247.70	252.10	248.45	252.69	251.33	255.68	313
14	9	165.242	0.31	0.52	0.70	0.21	0.37	5.0	5.8	6.9	2.54	18.09	5.52	18	2.97	244.20	249.10	244.58	249.70	248.23	253.54	314
15	14	28.156	0.22	0.22	0.70	0.15	0.15	5.0	5.0	7.2	1.09	17.69	2.32	18	2.84	249.10	249.90	249.70	250.29	253.54	253.56	315
16	1	70.901	0.35	0.35	0.50	0.18	0.18	5.0	5.0	7.2	1.27	10.43	3.56	18	0.99	236.50	237.20	236.85	237.62	241.72	240.26	316
17	1	46.520	0.01	0.47	0.70	0.01	0.33	5.0	6.0	6.9	2.27	12.88	2.50	18	1.50	235.40	236.10	236.82	236.67	241.72	241.13	317
18	17	37.444	0.09	0.46	0.70	0.06	0.32	5.0	5.5	7.0	2.25	10.85	3.68	18	1.07	236.10	236.50	236.67	237.07	241.13	240.78	318
19	18	34.196	0.37	0.37	0.70	0.26	0.26	5.0	5.0	7.2	1.87	11.36	3.27	18	1.17	236.50	236.90	237.07	237.41	240.78	240.78	319

Project File: Storm 300.stm

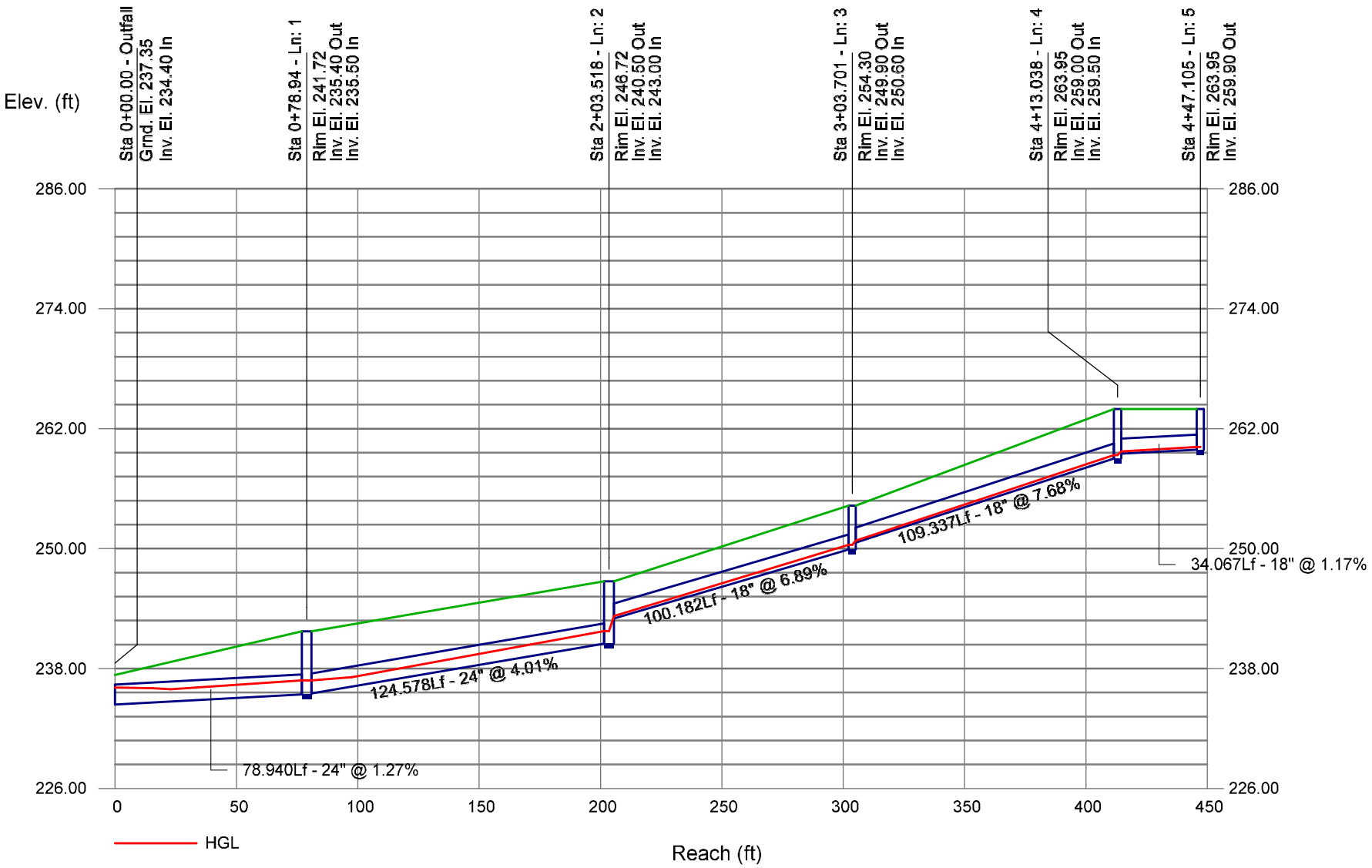
Number of lines: 19

Run Date: 5/30/2025

NOTES:Intensity = 72.00 / (Inlet time + 12.50) ^ 0.80; Return period =Yrs. 10 ; c = cir e = ellip b = box

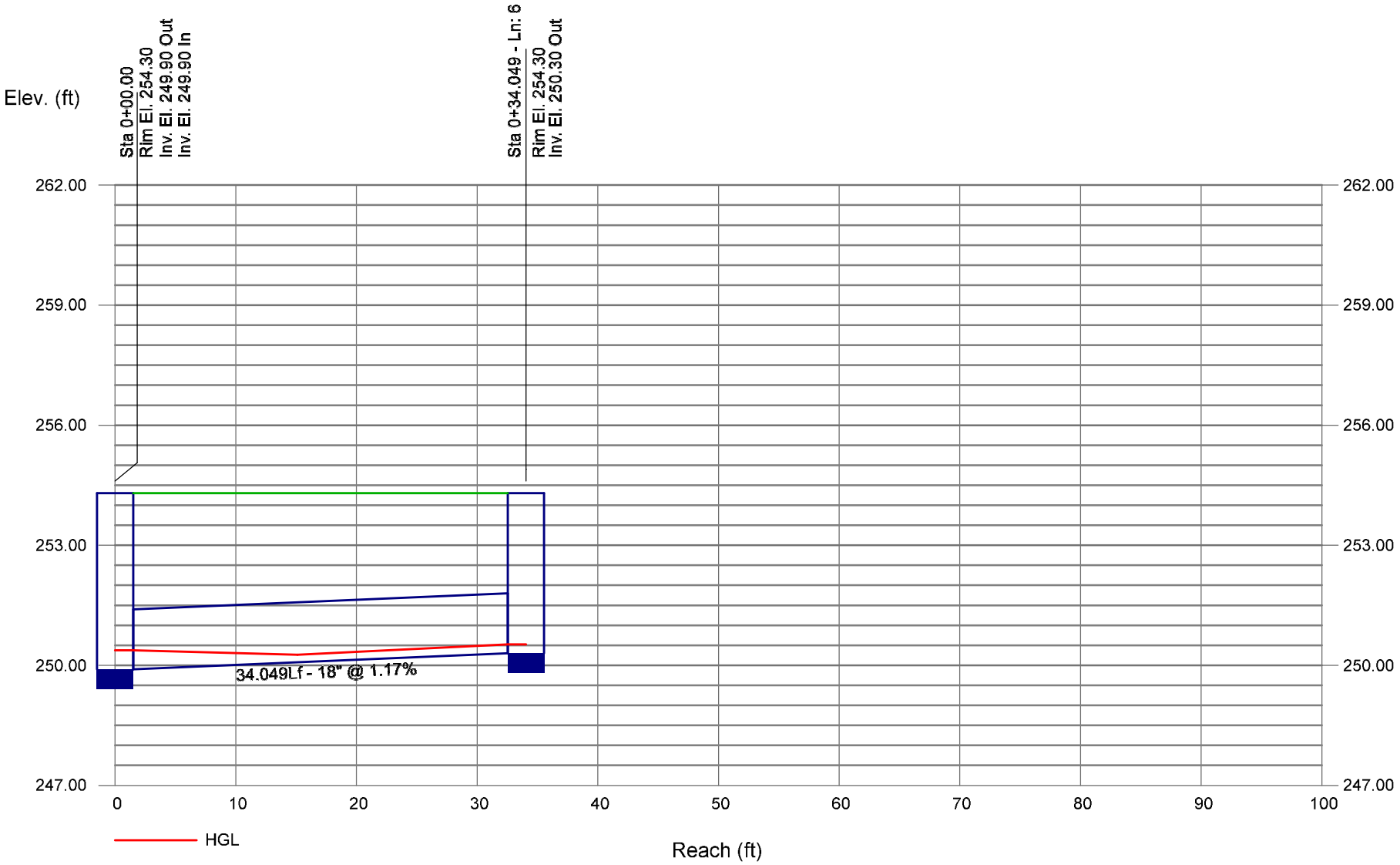
Storm Sewer Profile

Proj. file: Storm 300.stm



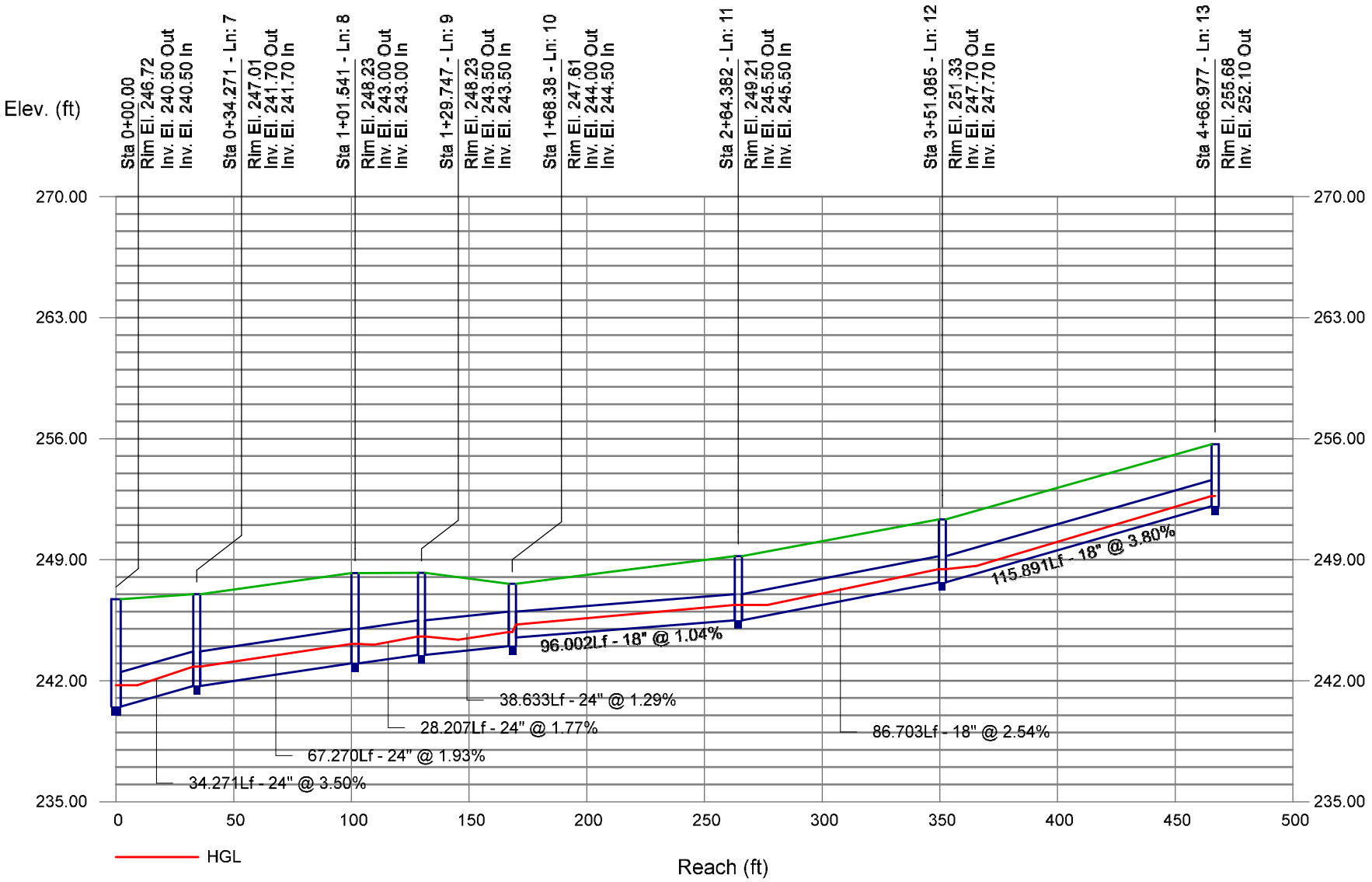
Storm Sewer Profile

Proj. file: Storm 300.stm



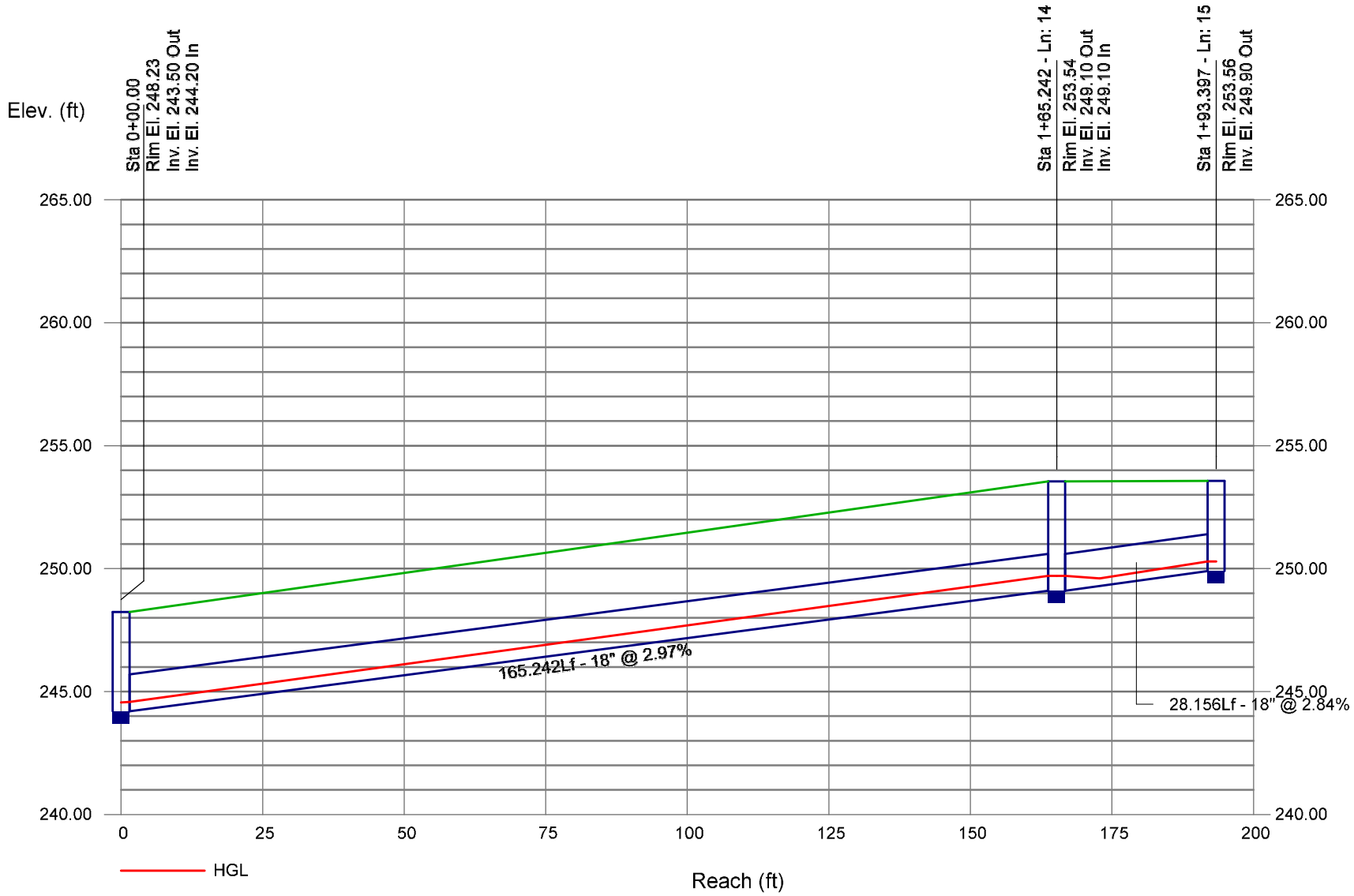
Storm Sewer Profile

Proj. file: Storm 300.stm



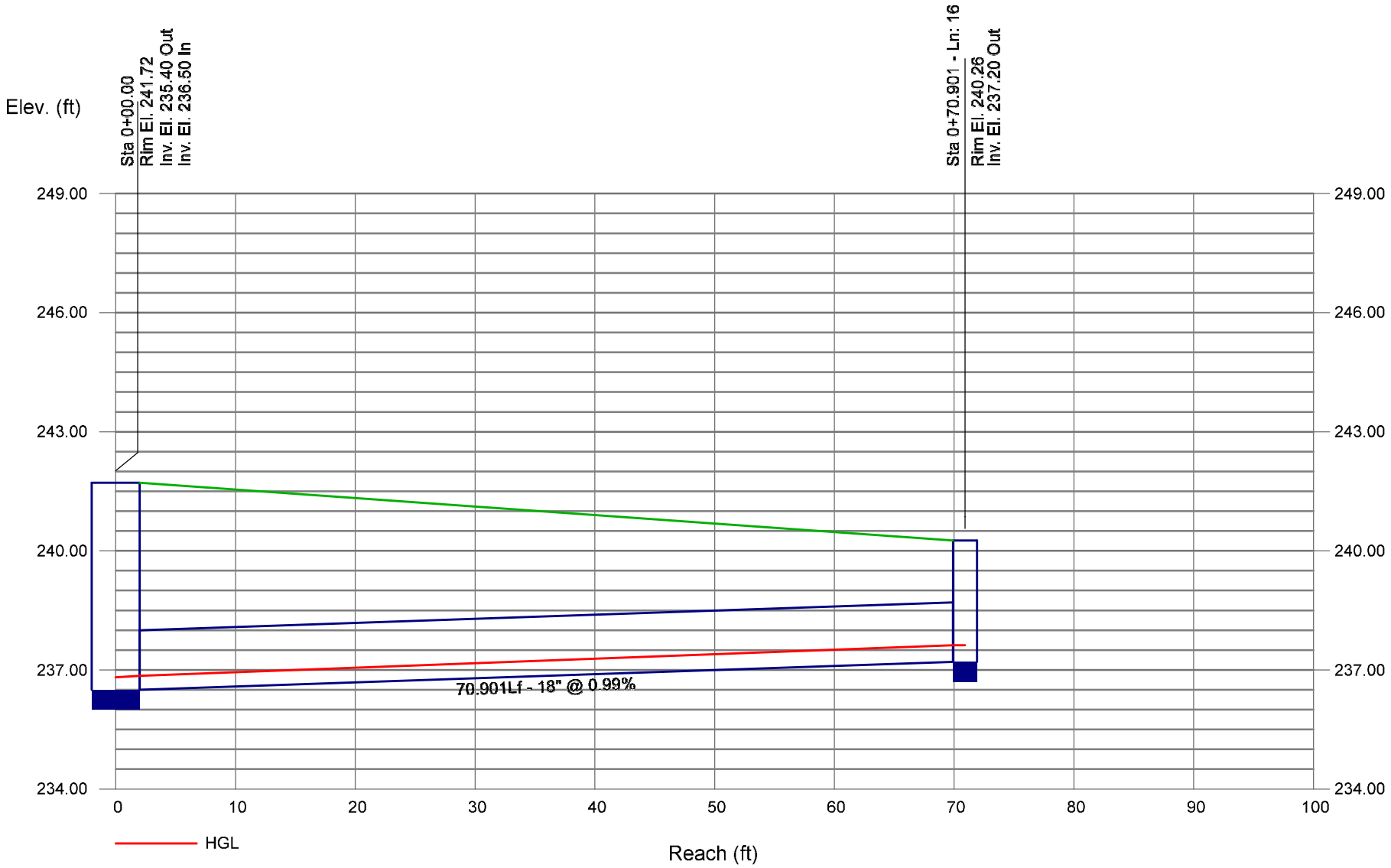
Storm Sewer Profile

Proj. file: Storm 300.stm



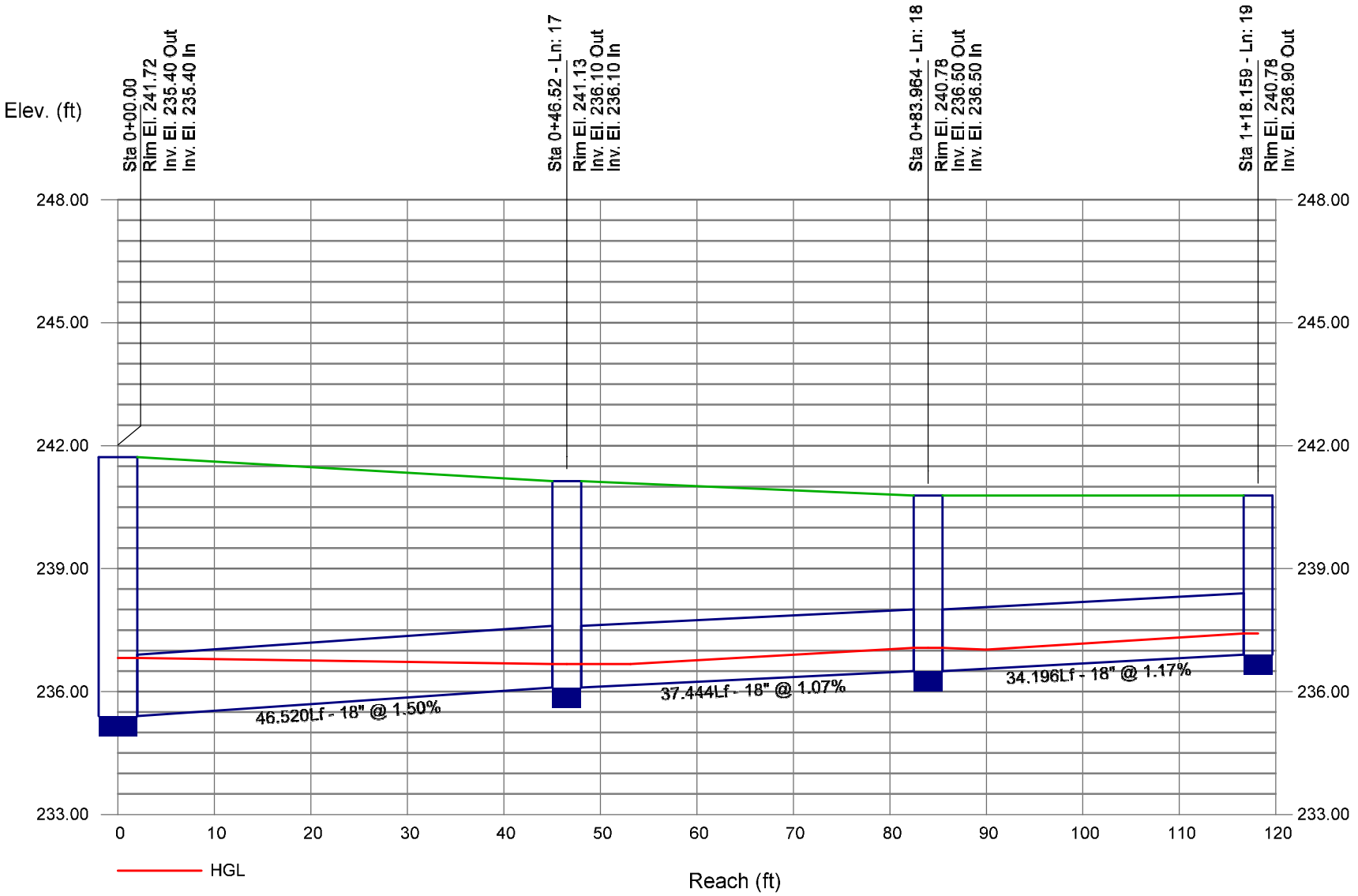
Storm Sewer Profile

Proj. file: Storm 300.stm



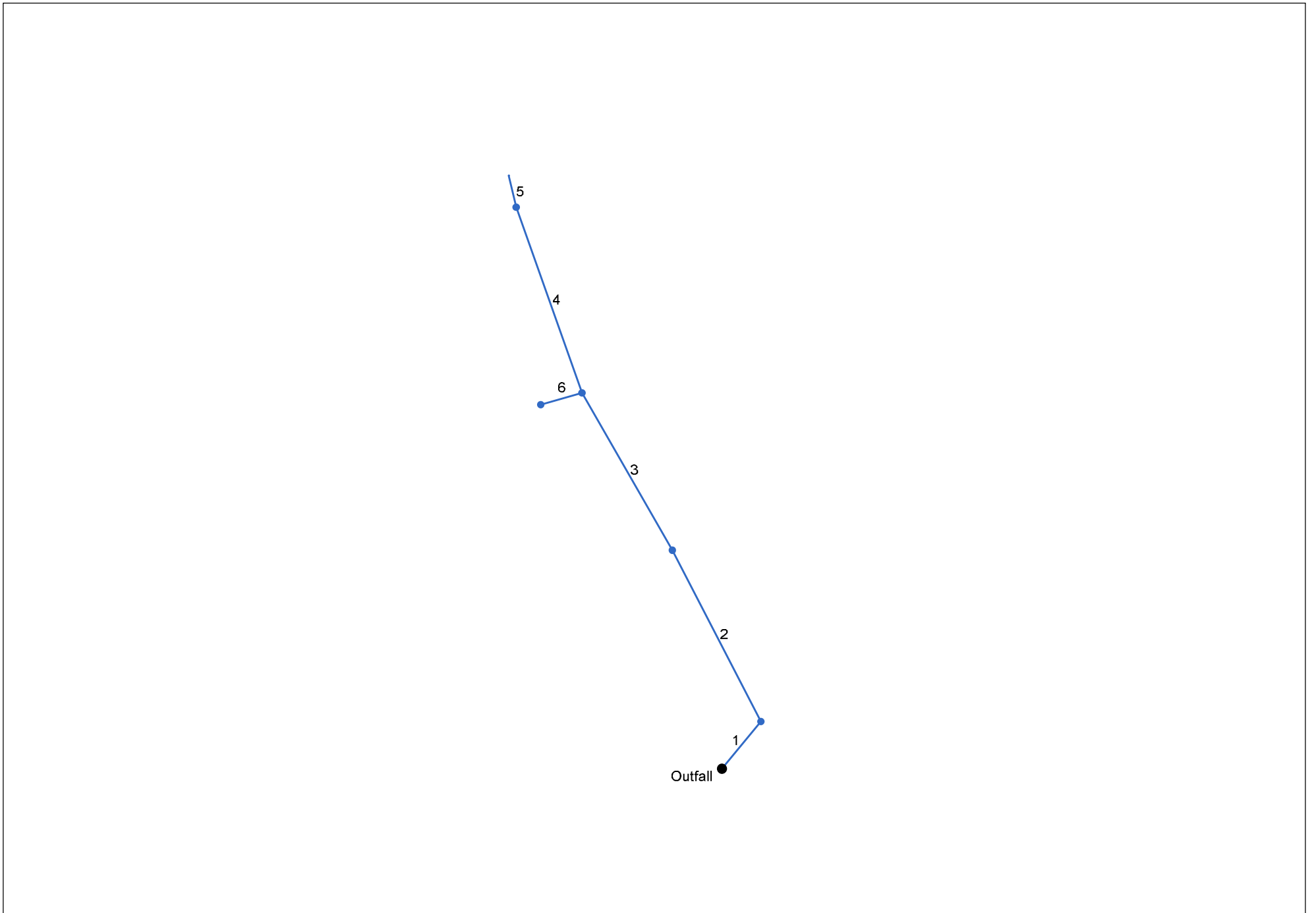
Storm Sewer Profile

Proj. file: Storm 300.stm



STORM SYSTEM 400

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



Project File: Storm 400.stm	Number of lines: 6	Date: 5/30/2025

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	33.016	0.04	5.79	0.70	0.03	2.06	5.0	12.1	5.5	11.30	24.90	4.95	24	1.21	235.20	235.60	236.80	236.81	238.15	240.77	401
2	1	104.363	0.01	5.75	0.70	0.01	2.03	5.0	11.6	5.6	11.32	23.22	5.73	24	1.05	235.60	236.70	236.81	237.91	240.77	241.84	402
3	2	98.269	0.05	5.73	0.70	0.04	2.03	5.0	11.1	5.6	11.43	22.82	5.75	24	1.02	236.70	237.70	237.91	238.91	241.84	243.06	403
4	3	106.686	0.10	5.38	0.35	0.04	1.88	5.0	10.0	5.9	11.05	38.31	5.60	24	2.87	237.70	240.76	238.91	241.95	243.06	244.76	404
5	4	17.633	5.28	5.28	0.35	1.85	1.85	10.0	10.0	5.9	10.85	21.22	9.46	18	4.08	242.00	242.72	242.76	243.98	244.76	244.52	405
6	3	23.320	0.30	0.30	0.35	0.10	0.10	10.0	10.0	5.9	0.61	10.50	1.47	18	1.00	237.70	237.93	238.91	238.22	243.06	240.42	406

Project File: Storm 400.stm

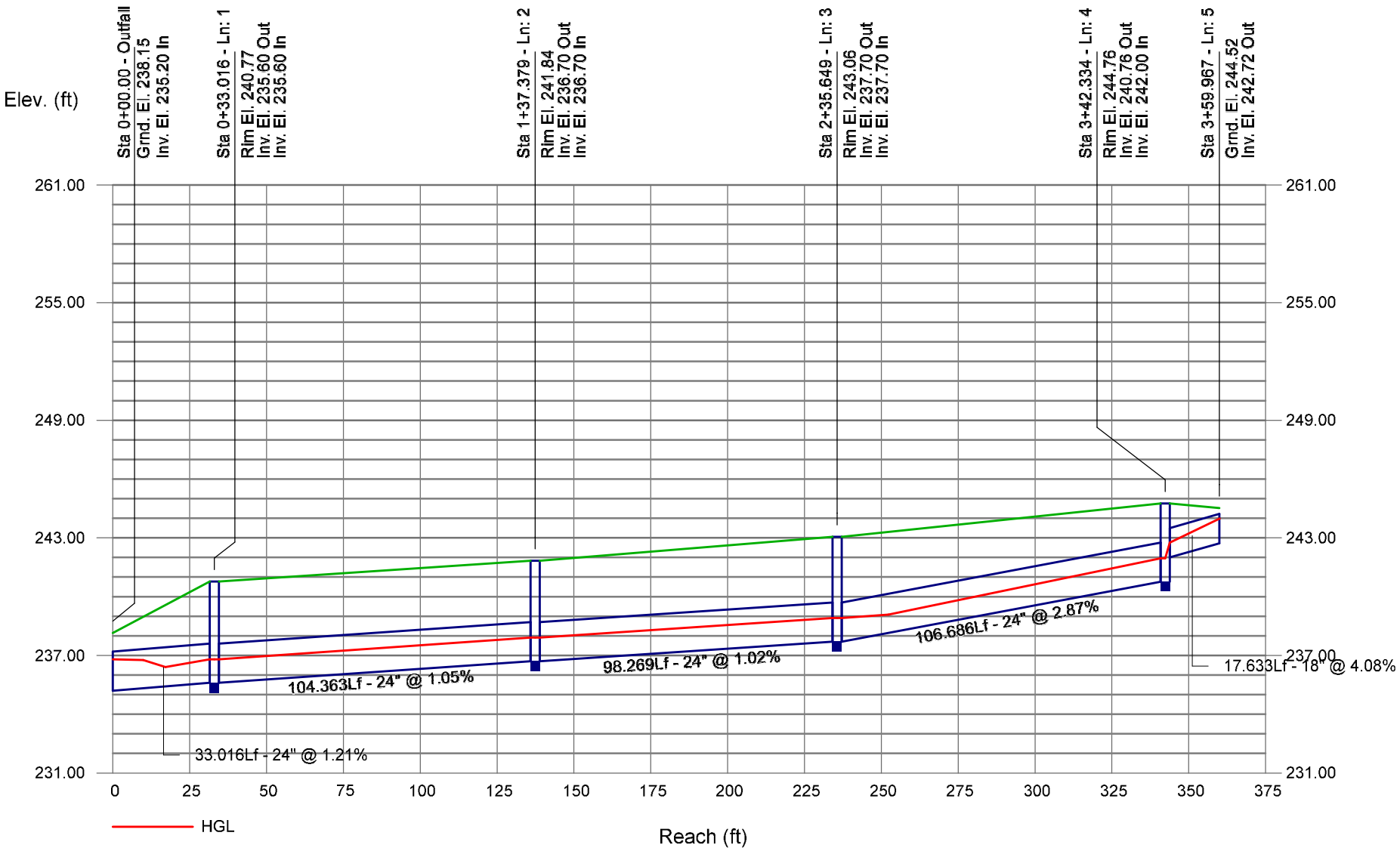
Number of lines: 6

Run Date: 5/30/2025

NOTES:Intensity = 72.00 / (Inlet time + 12.50) ^ 0.80; Return period =Yrs. 10 ; c = cir e = ellip b = box

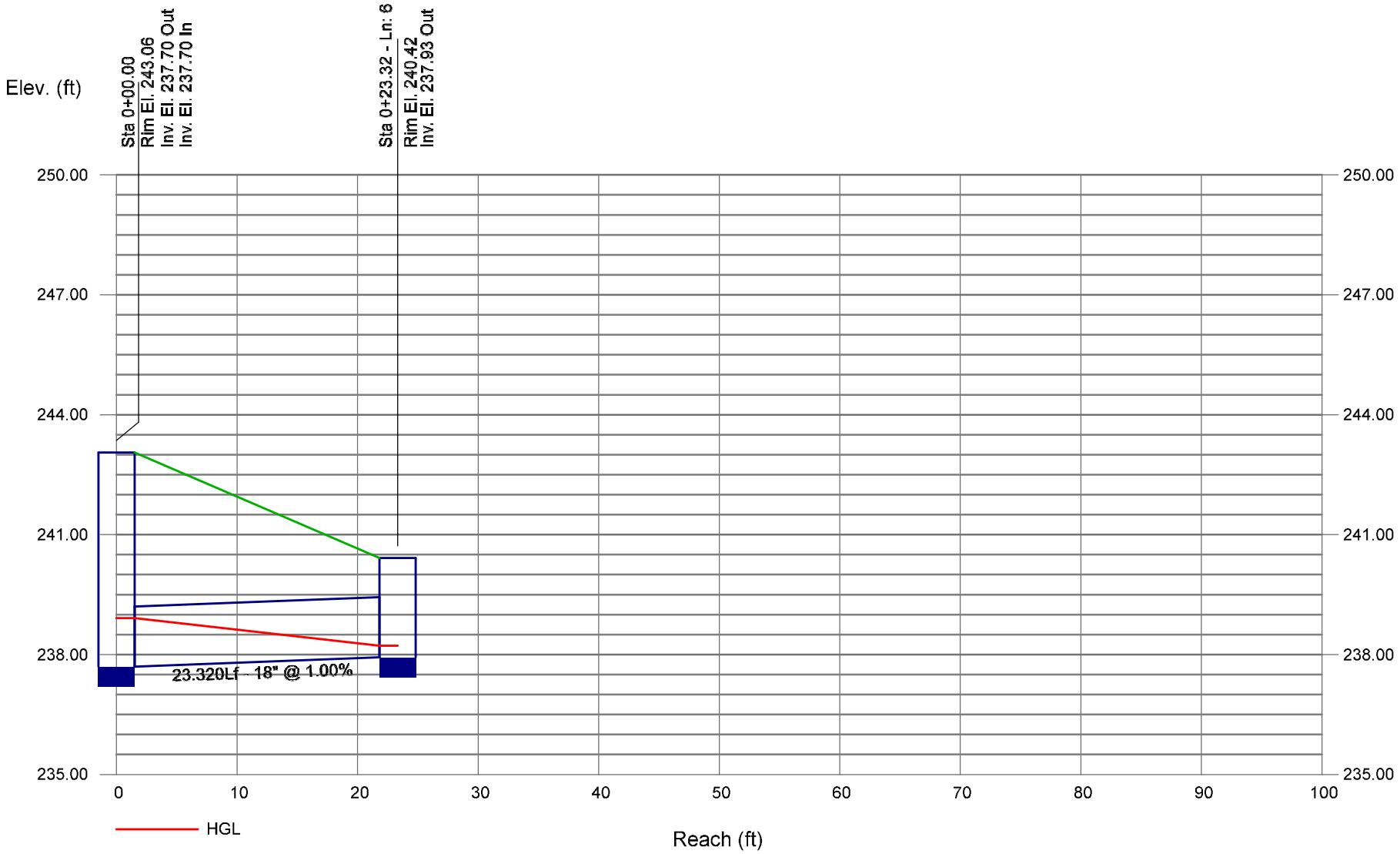
Storm Sewer Profile

Proj. file: Storm 400.stm

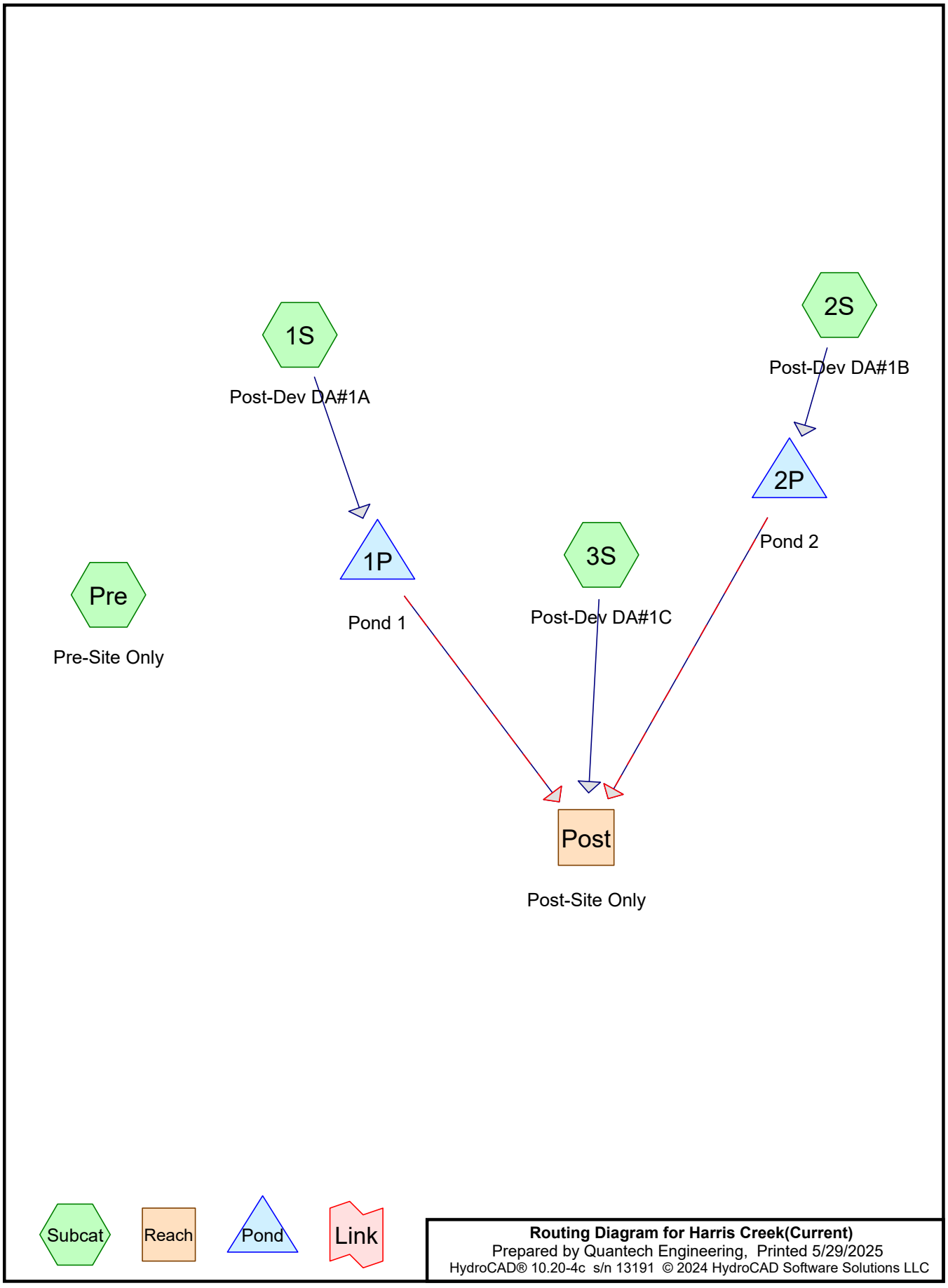


Storm Sewer Profile

Proj. file: Storm 400.stm



PEAK FLOW ANALYSIS
Routing Diagram



Routing Diagram for Harris Creek(Current)
Prepared by Quantech Engineering, Printed 5/29/2025

PEAK FLOW ANALYSIS
Pre-Development Flows

Summary for Subcatchment Pre: Pre-Site Only

[47] Hint: Peak is 259% of capacity of segment #3

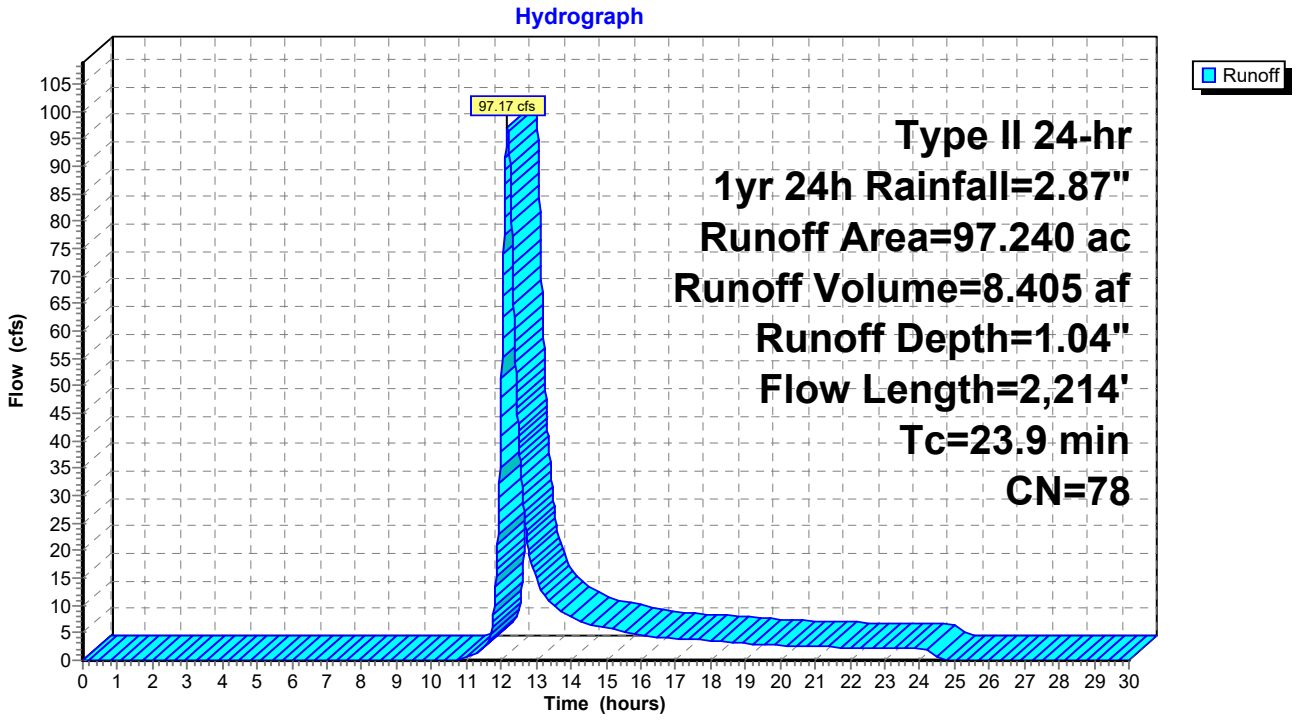
Runoff = 97.17 cfs @ 12.19 hrs, Volume= 8.405 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1yr 24h Rainfall=2.87"

	Area (ac)	CN	Description
*	97.240	78	Pre-Dev CN Value (see Stormwater Tool)
	97.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.1040	0.23		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.46"
5.2	1,023	0.0420	3.30		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
11.6	1,091	0.0070	1.57	37.50	**Channel Flow, Channel Flow** Area= 23.9 sf Perim= 81.4' r= 0.29' n= 0.035
23.9	2,214	Total			

Subcatchment Pre: Pre-Site Only



Summary for Subcatchment Pre: Pre-Site Only

[47] Hint: Peak is 375% of capacity of segment #3

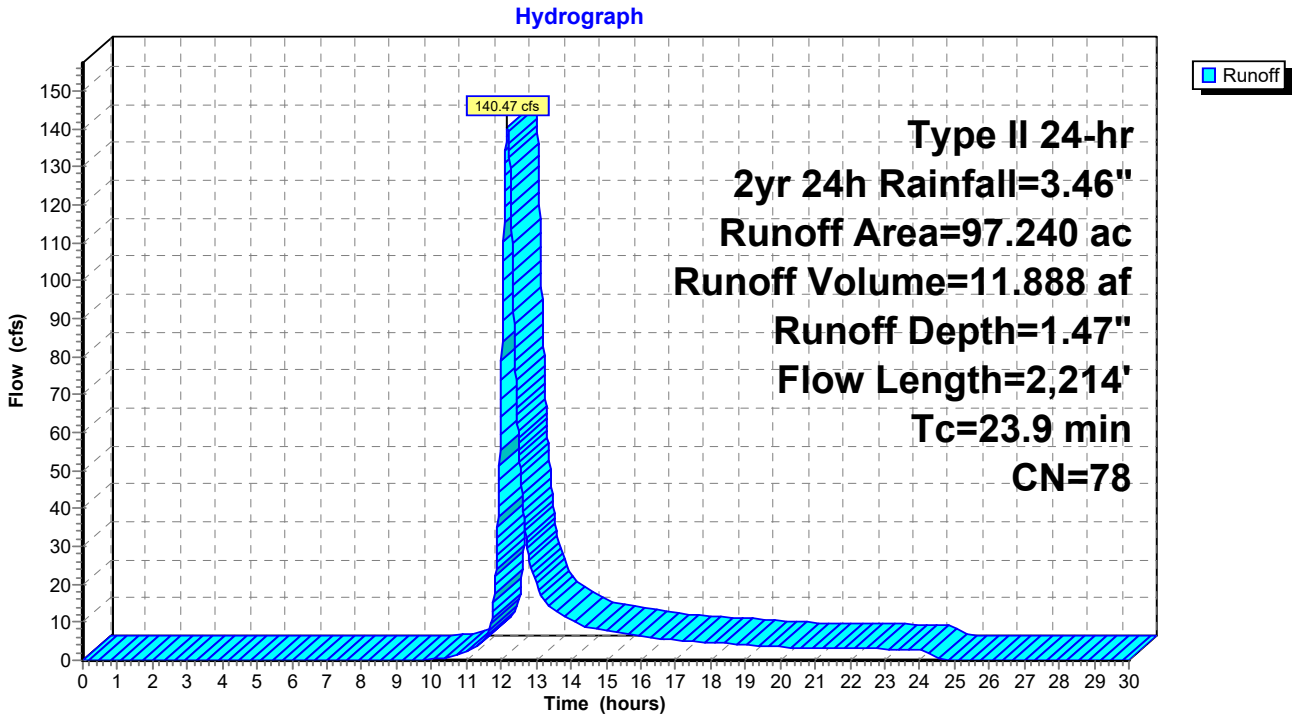
Runoff = 140.47 cfs @ 12.19 hrs, Volume= 11.888 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 2yr 24h Rainfall=3.46"

	Area (ac)	CN	Description
*	97.240	78	Pre-Dev CN Value (see Stormwater Tool)
	97.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.1040	0.23		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.46"
5.2	1,023	0.0420	3.30		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
11.6	1,091	0.0070	1.57	37.50	**Channel Flow, Channel Flow** Area= 23.9 sf Perim= 81.4' r= 0.29' n= 0.035
23.9	2,214	Total			

Subcatchment Pre: Pre-Site Only



Summary for Subcatchment Pre: Pre-Site Only

[47] Hint: Peak is 717% of capacity of segment #3

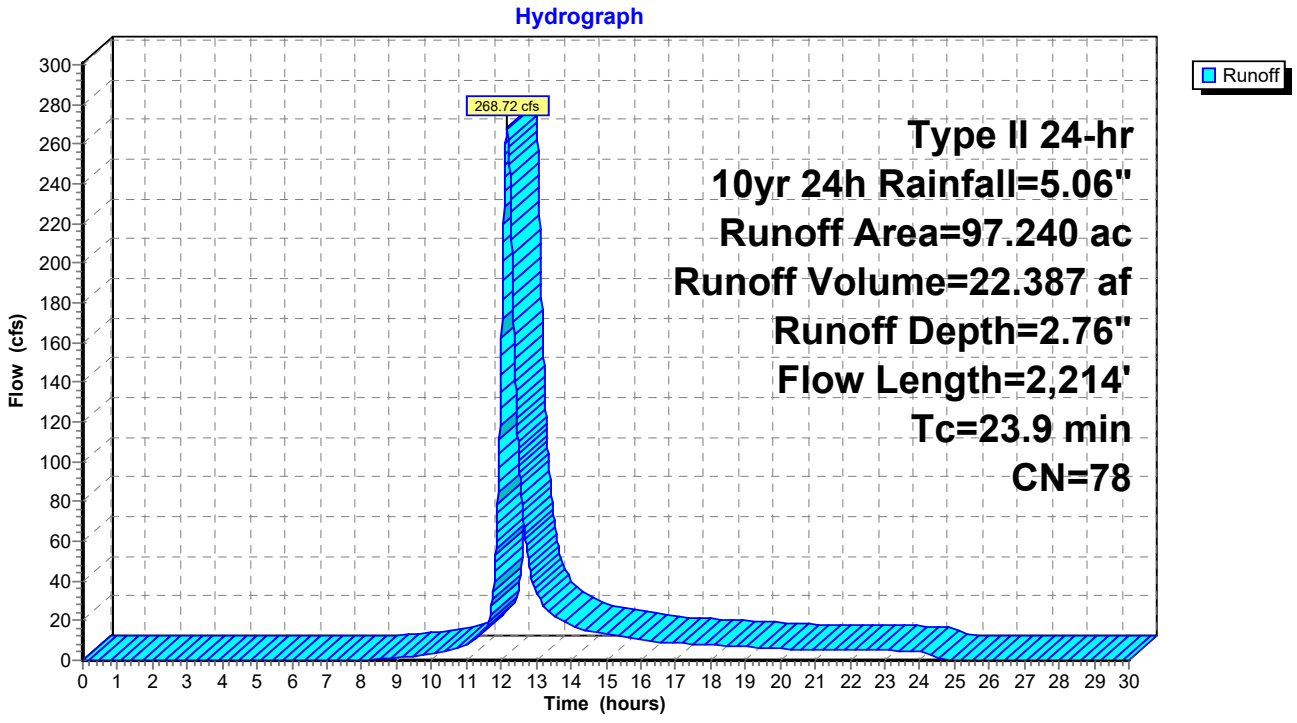
Runoff = 268.72 cfs @ 12.17 hrs, Volume= 22.387 af, Depth= 2.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10yr 24h Rainfall=5.06"

	Area (ac)	CN	Description
*	97.240	78	Pre-Dev CN Value (see Stormwater Tool)
	97.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.1040	0.23		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.46"
5.2	1,023	0.0420	3.30		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
11.6	1,091	0.0070	1.57	37.50	**Channel Flow, Channel Flow** Area= 23.9 sf Perim= 81.4' r= 0.29' n= 0.035
23.9	2,214	Total			

Subcatchment Pre: Pre-Site Only



Summary for Subcatchment Pre: Pre-Site Only

[47] Hint: Peak is 1295% of capacity of segment #3

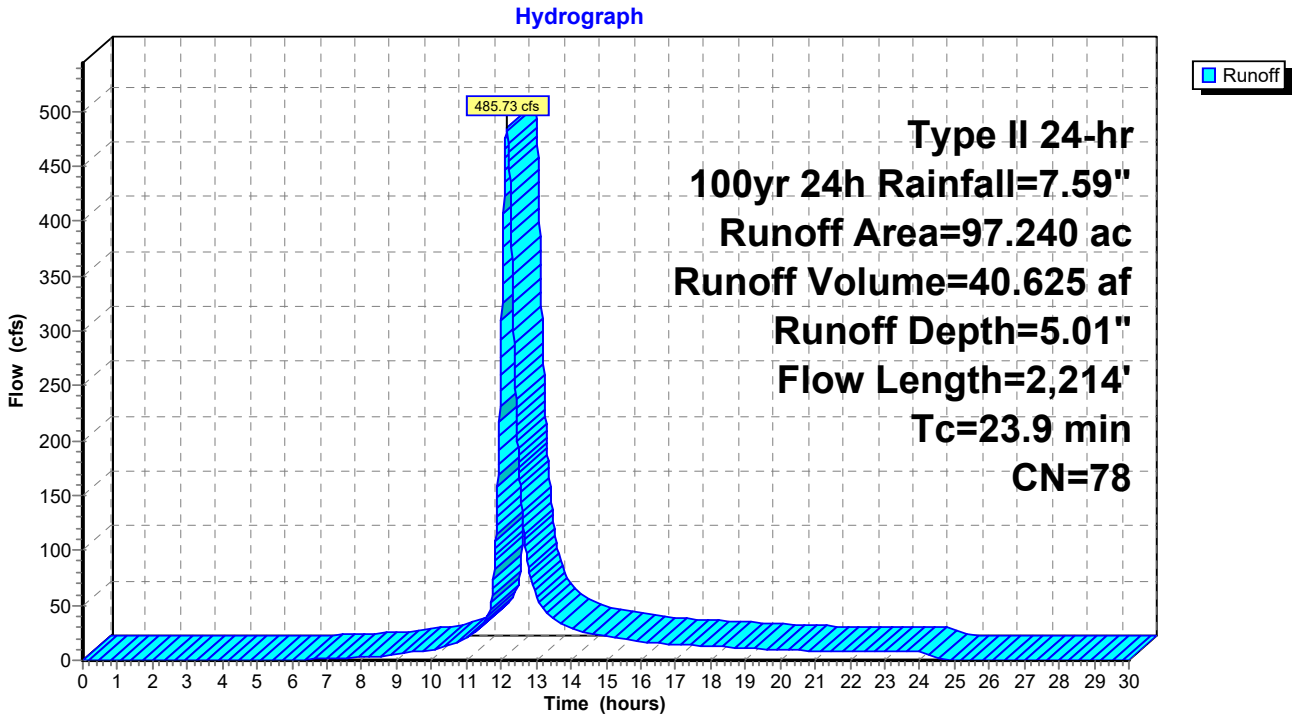
Runoff = 485.73 cfs @ 12.16 hrs, Volume= 40.625 af, Depth= 5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100yr 24h Rainfall=7.59"

	Area (ac)	CN	Description
*	97.240	78	Pre-Dev CN Value (see Stormwater Tool)
	97.240		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.1040	0.23		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.46"
5.2	1,023	0.0420	3.30		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
11.6	1,091	0.0070	1.57	37.50	**Channel Flow, Channel Flow** Area= 23.9 sf Perim= 81.4' r= 0.29' n= 0.035
23.9	2,214	Total			

Subcatchment Pre: Pre-Site Only



PEAK FLOW ANALYSIS
Post-Development DA#1A

Summary for Subcatchment 1S: Post-Dev DA#1A

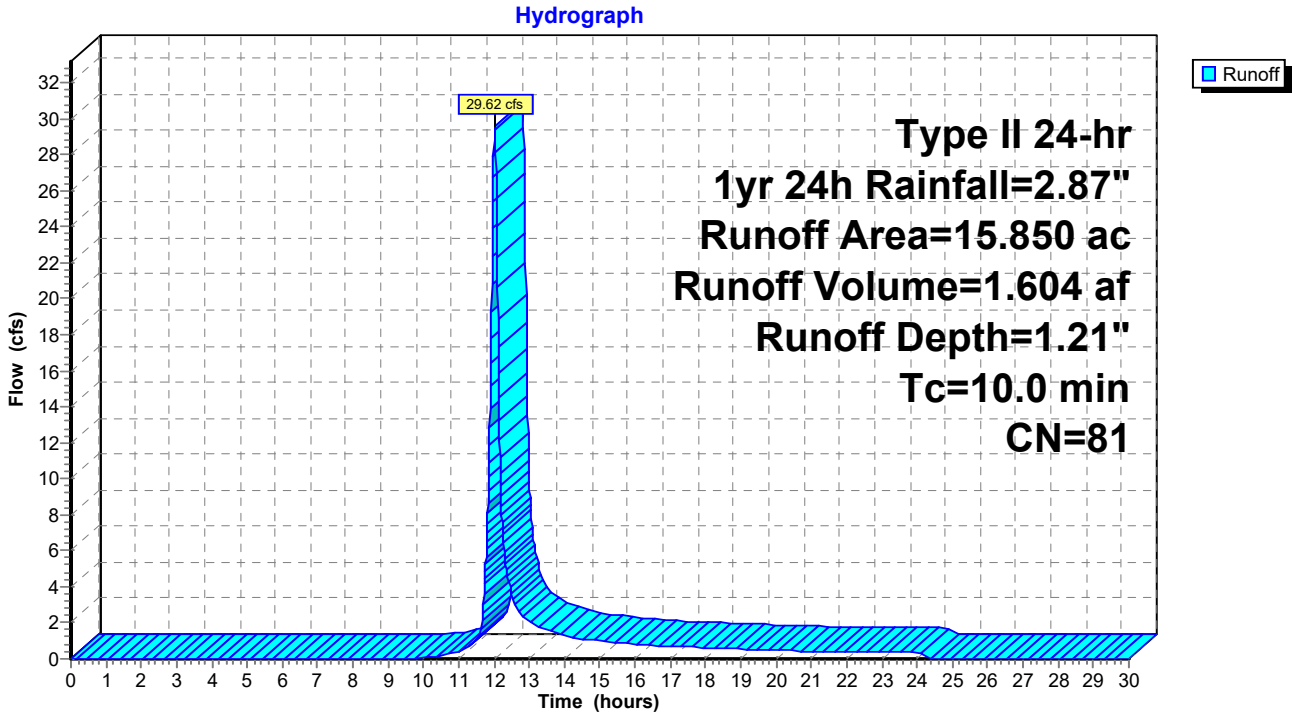
Runoff = 29.62 cfs @ 12.02 hrs, Volume= 1.604 af, Depth= 1.21"
Routed to Pond 1P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1yr 24h Rainfall=2.87"

	Area (ac)	CN	Description
*	15.850	81	Post-Dev CN Value (see Stormwater Tool)
	15.850		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1S: Post-Dev DA#1A



Summary for Subcatchment 1S: Post-Dev DA#1A

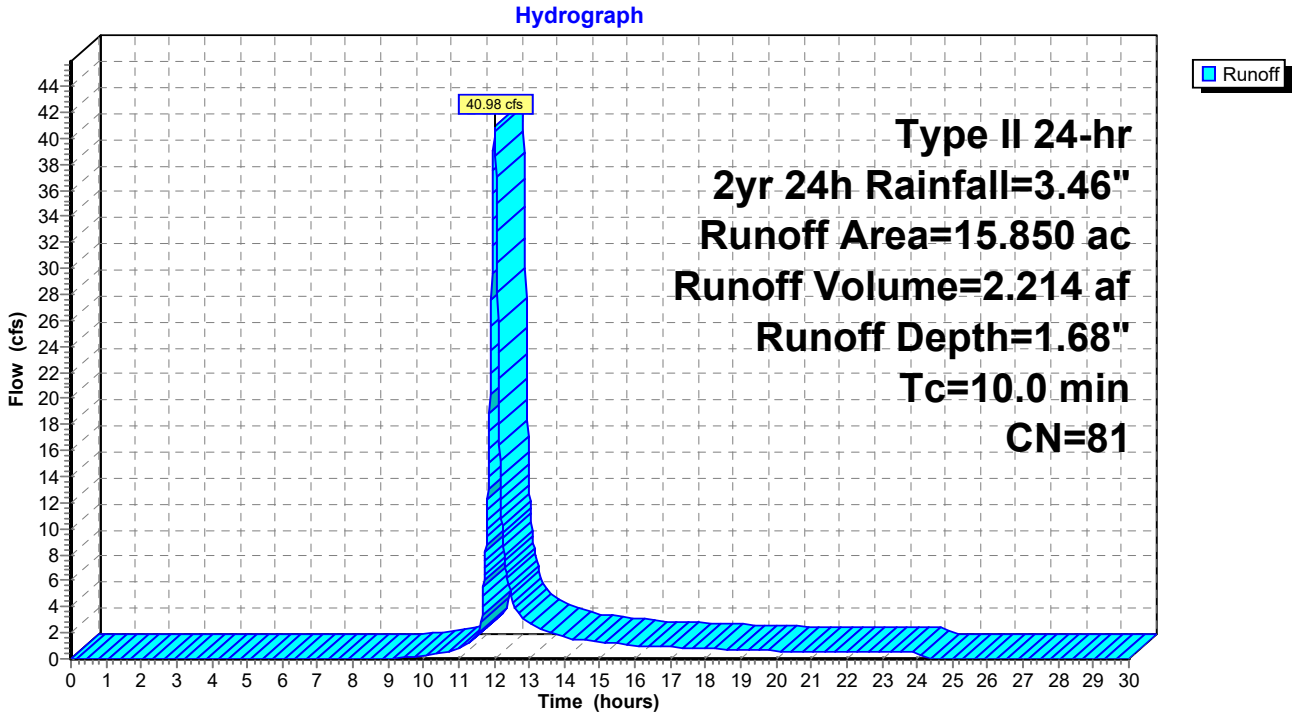
Runoff = 40.98 cfs @ 12.02 hrs, Volume= 2.214 af, Depth= 1.68"
Routed to Pond 1P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 2yr 24h Rainfall=3.46"

	Area (ac)	CN	Description
*	15.850	81	Post-Dev CN Value (see Stormwater Tool)
	15.850		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1S: Post-Dev DA#1A



Summary for Subcatchment 1S: Post-Dev DA#1A

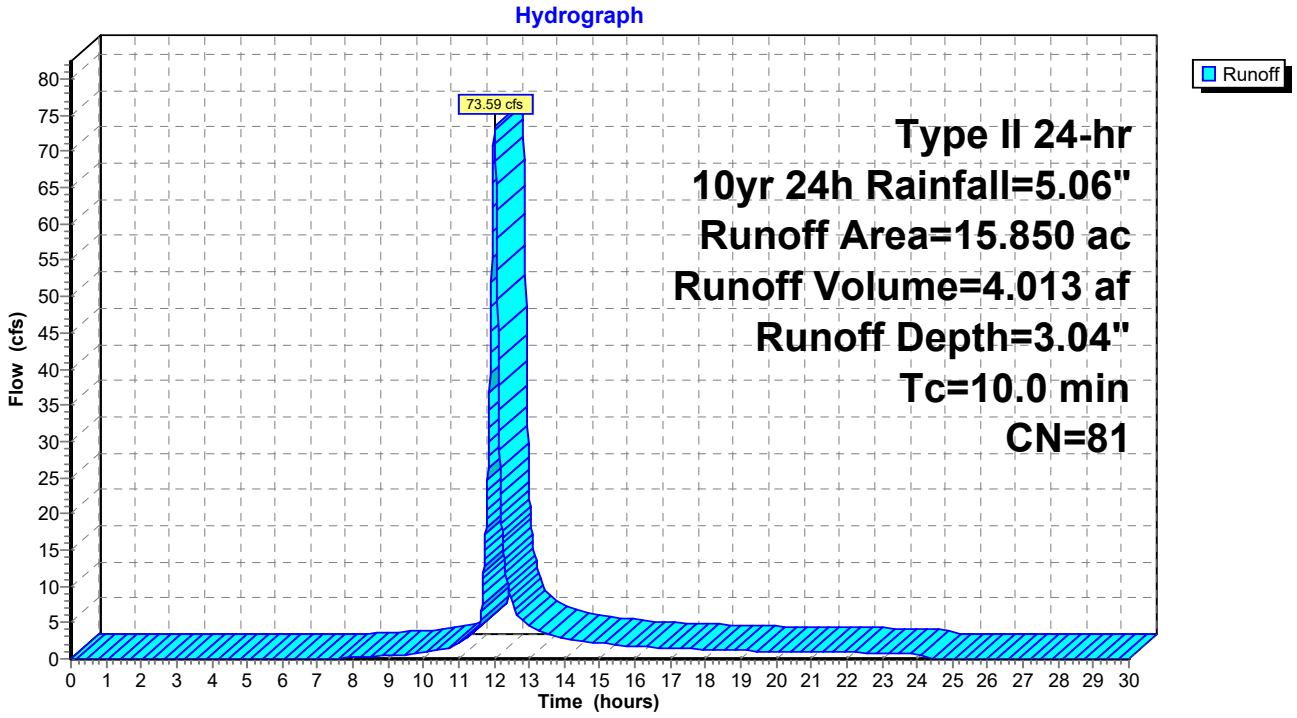
Runoff = 73.59 cfs @ 12.01 hrs, Volume= 4.013 af, Depth= 3.04"
Routed to Pond 1P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10yr 24h Rainfall=5.06"

	Area (ac)	CN	Description
*	15.850	81	Post-Dev CN Value (see Stormwater Tool)
	15.850		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1S: Post-Dev DA#1A



Summary for Subcatchment 1S: Post-Dev DA#1A

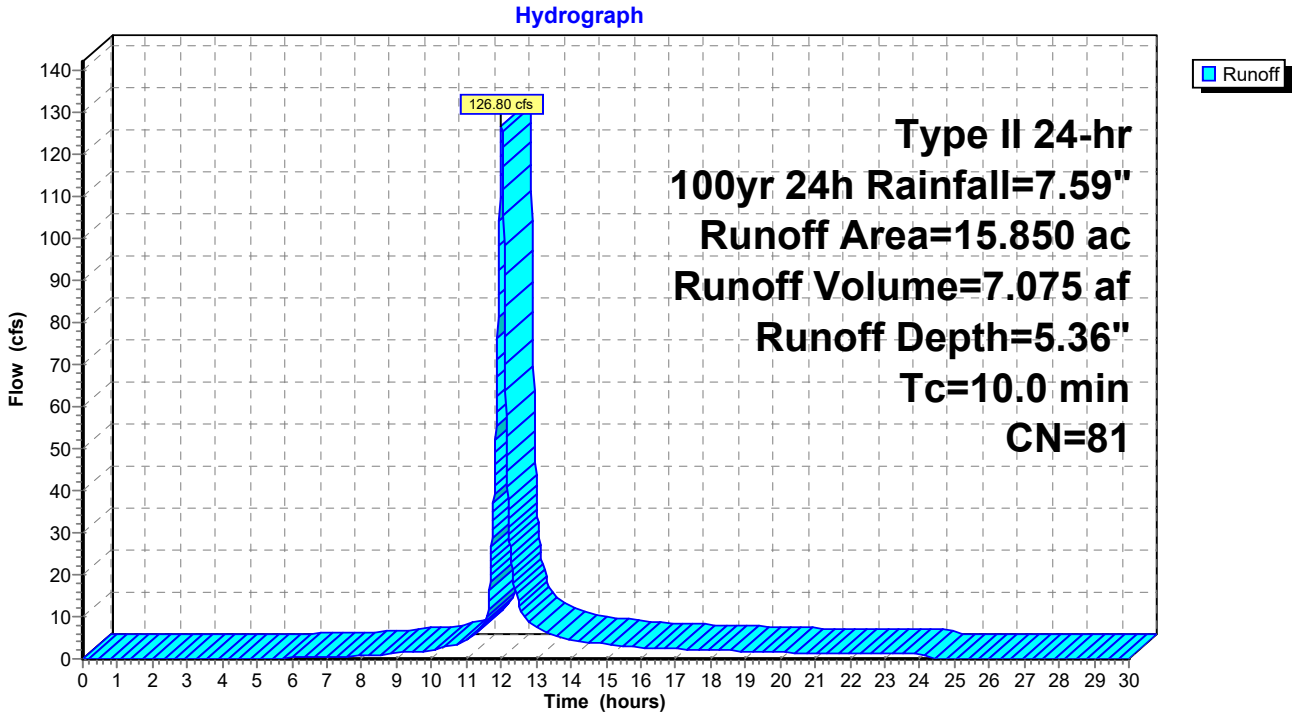
Runoff = 126.80 cfs @ 12.01 hrs, Volume= 7.075 af, Depth= 5.36"
Routed to Pond 1P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100yr 24h Rainfall=7.59"

	Area (ac)	CN	Description
*	15.850	81	Post-Dev CN Value (see Stormwater Tool)
	15.850		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1S: Post-Dev DA#1A



PEAK FLOW ANALYSIS
Wet Pond #1 Routing

Summary for Pond 1P: Pond 1

Inflow Area = 15.850 ac, 0.00% Impervious, Inflow Depth = 1.21" for 1yr 24h event
Inflow = 29.62 cfs @ 12.02 hrs, Volume= 1.604 af
Outflow = 0.50 cfs @ 19.48 hrs, Volume= 0.715 af, Atten= 98%, Lag= 447.7 min
Primary = 0.50 cfs @ 19.48 hrs, Volume= 0.715 af
Routed to Reach Post : Post-Site Only
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach Post : Post-Site Only

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 234.53' @ 19.48 hrs Surf.Area= 22,196 sf Storage= 49,772 cf

Plug-Flow detention time= 540.5 min calculated for 0.715 af (45% of inflow)
Center-of-Mass det. time= 410.3 min (1,255.8 - 845.5)

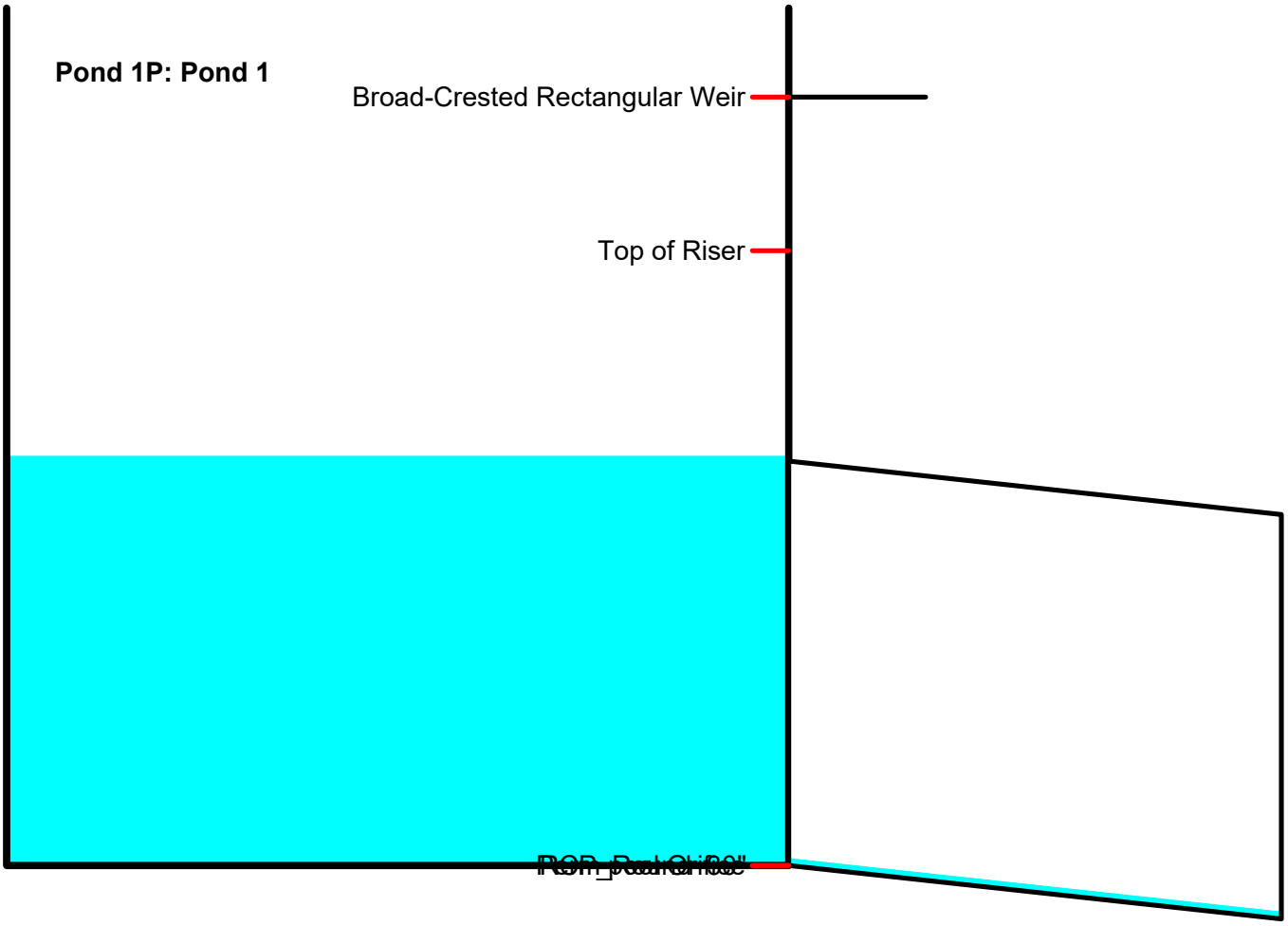
Volume	Invert	Avail.Storage	Storage Description
#1	232.00'	118,842 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
232.00	16,160	0	0
232.50	18,354	8,629	8,629
233.00	19,290	9,411	18,040
234.00	21,168	20,229	38,269
235.00	23,105	22,137	60,405
236.00	25,101	24,103	84,508
237.00	27,156	26,129	110,637
237.30	27,550	8,206	118,842

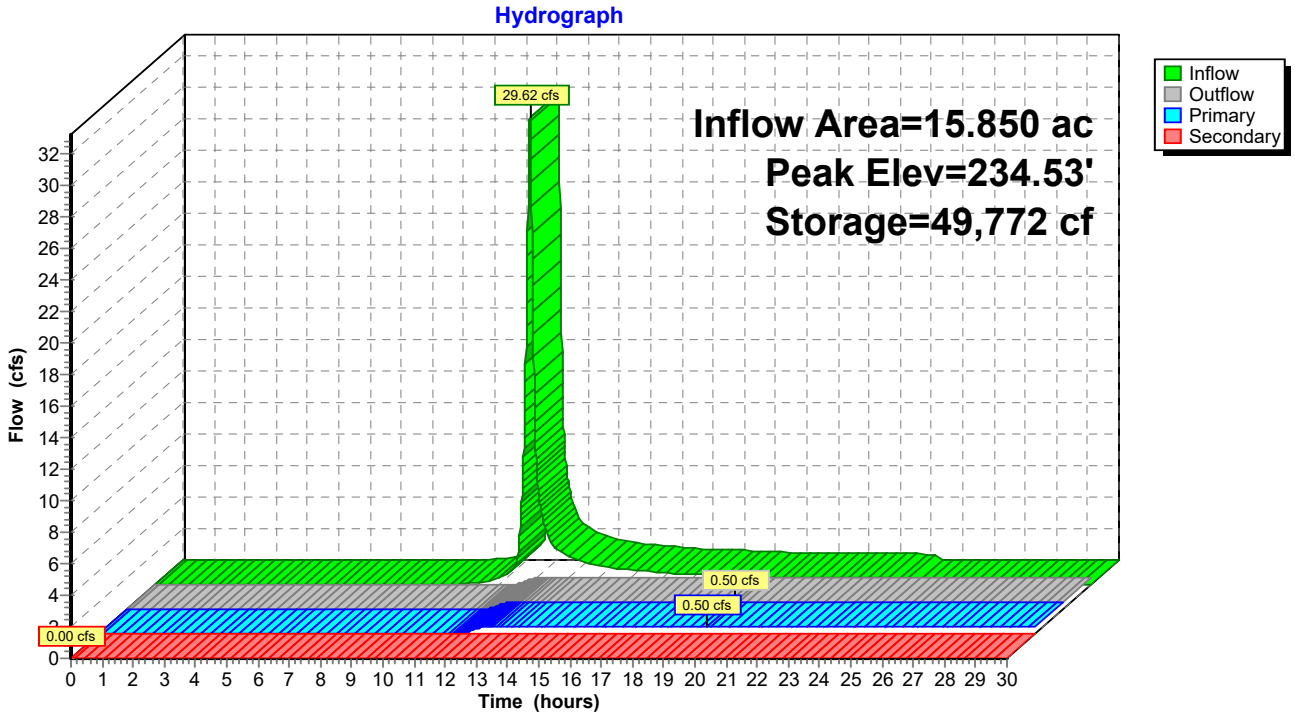
Device	Routing	Invert	Outlet Devices
#1	Primary	232.00'	**30.0" Round RCP_Round 30"** L= 59.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 232.00' / 231.67' S= 0.0056 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	232.00'	**3.5" Vert. Perm pool Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	235.80'	**60.0" x 60.0" Horiz. Top of Riser** C= 0.600 Limited to weir flow at low heads
#4	Secondary	236.75'	**40.0' long + 10.0 '/' SideZ x 16.4' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.50 cfs @ 19.48 hrs HW=234.53' (Free Discharge)
└**1=RCP_Round 30"** (Passes 0.50 cfs of 23.08 cfs potential flow)
└**2=Perm pool Orifice** (Orifice Controls 0.50 cfs @ 7.44 fps)
└**3=Top of Riser** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=232.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)


Pond 1P: Pond 1
Broad-Crested Rectangular Weir
Top of Riser

Pond 1P: Pond 1



Summary for Pond 1P: Pond 1

Inflow Area = 15.850 ac, 0.00% Impervious, Inflow Depth = 1.68" for 2yr 24h event
Inflow = 40.98 cfs @ 12.02 hrs, Volume= 2.214 af
Outflow = 0.59 cfs @ 20.00 hrs, Volume= 0.857 af, Atten= 99%, Lag= 478.9 min
Primary = 0.59 cfs @ 20.00 hrs, Volume= 0.857 af
Routed to Reach Post : Post-Site Only
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach Post : Post-Site Only

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 235.48' @ 20.00 hrs Surf.Area= 24,065 sf Storage= 71,744 cf

Plug-Flow detention time= 546.2 min calculated for 0.857 af (39% of inflow)
Center-of-Mass det. time= 418.6 min (1,254.8 - 836.2)

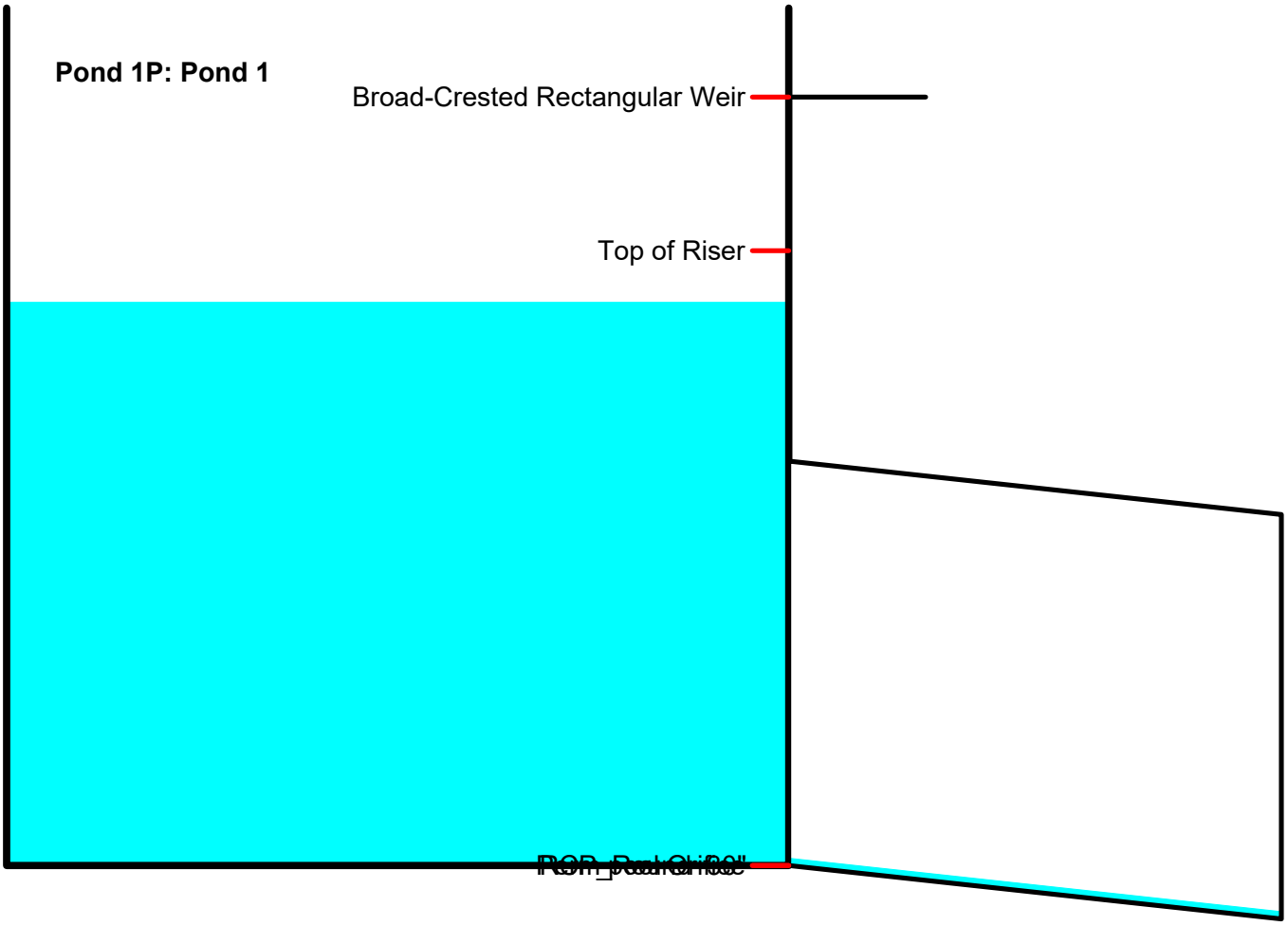
Volume	Invert	Avail.Storage	Storage Description
#1	232.00'	118,842 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
232.00	16,160	0	0
232.50	18,354	8,629	8,629
233.00	19,290	9,411	18,040
234.00	21,168	20,229	38,269
235.00	23,105	22,137	60,405
236.00	25,101	24,103	84,508
237.00	27,156	26,129	110,637
237.30	27,550	8,206	118,842

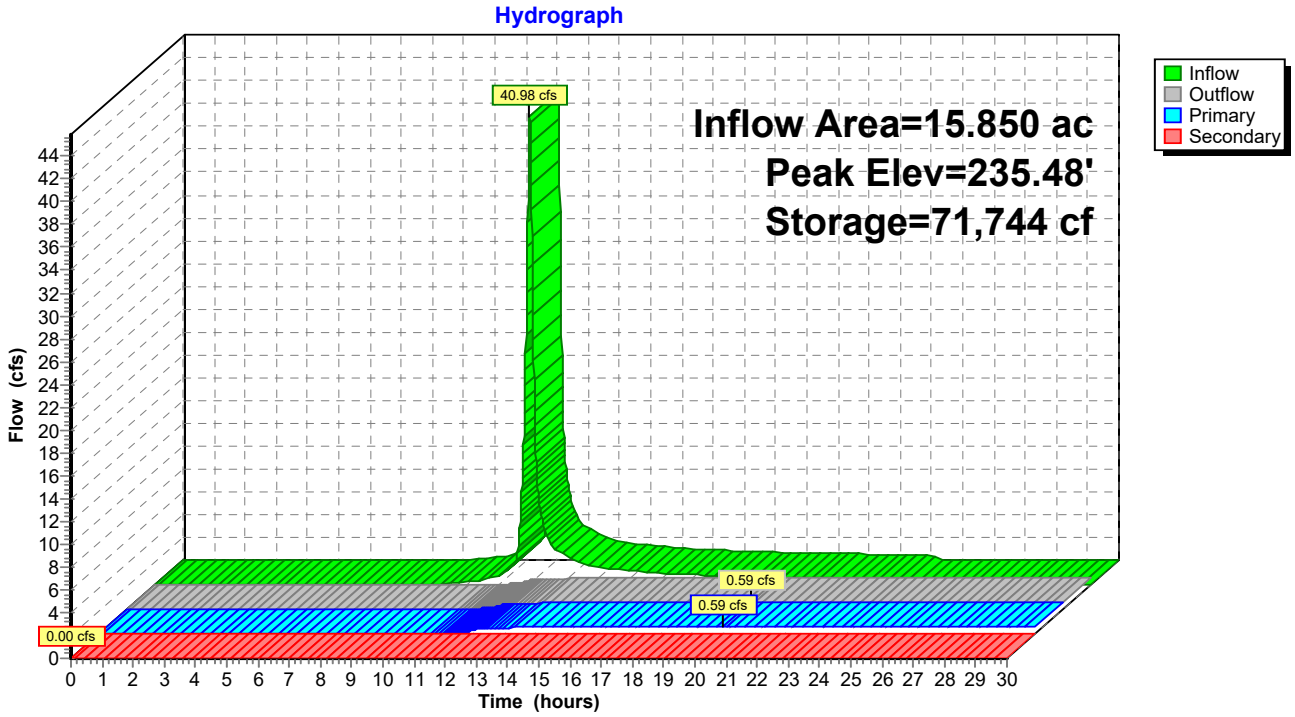
Device	Routing	Invert	Outlet Devices
#1	Primary	232.00'	**30.0" Round RCP_Round 30"** L= 59.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 232.00' / 231.67' S= 0.0056 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	232.00'	**3.5" Vert. Perm pool Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	235.80'	**60.0" x 60.0" Horiz. Top of Riser** C= 0.600 Limited to weir flow at low heads
#4	Secondary	236.75'	**40.0' long + 10.0 '/' SideZ x 16.4' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.59 cfs @ 20.00 hrs HW=235.48' (Free Discharge)
└**1=RCP_Round 30"** (Passes 0.59 cfs of 32.17 cfs potential flow)
└**2=Perm pool Orifice** (Orifice Controls 0.59 cfs @ 8.79 fps)
└**3=Top of Riser** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=232.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)


Pond 1P: Pond 1
Broad-Crested Rectangular Weir
Top of Riser

Pond 1P: Pond 1



Summary for Pond 1P: Pond 1

Inflow Area = 15.850 ac, 0.00% Impervious, Inflow Depth = 3.04" for 10yr 24h event
Inflow = 73.59 cfs @ 12.01 hrs, Volume= 4.013 af
Outflow = 14.27 cfs @ 12.27 hrs, Volume= 2.465 af, Atten= 81%, Lag= 15.6 min
Primary = 14.27 cfs @ 12.27 hrs, Volume= 2.465 af
Routed to Reach Post : Post-Site Only
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach Post : Post-Site Only

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 236.15' @ 12.27 hrs Surf.Area= 25,411 sf Storage= 88,323 cf

Plug-Flow detention time= 298.7 min calculated for 2.465 af (61% of inflow)
Center-of-Mass det. time= 189.3 min (1,008.5 - 819.2)

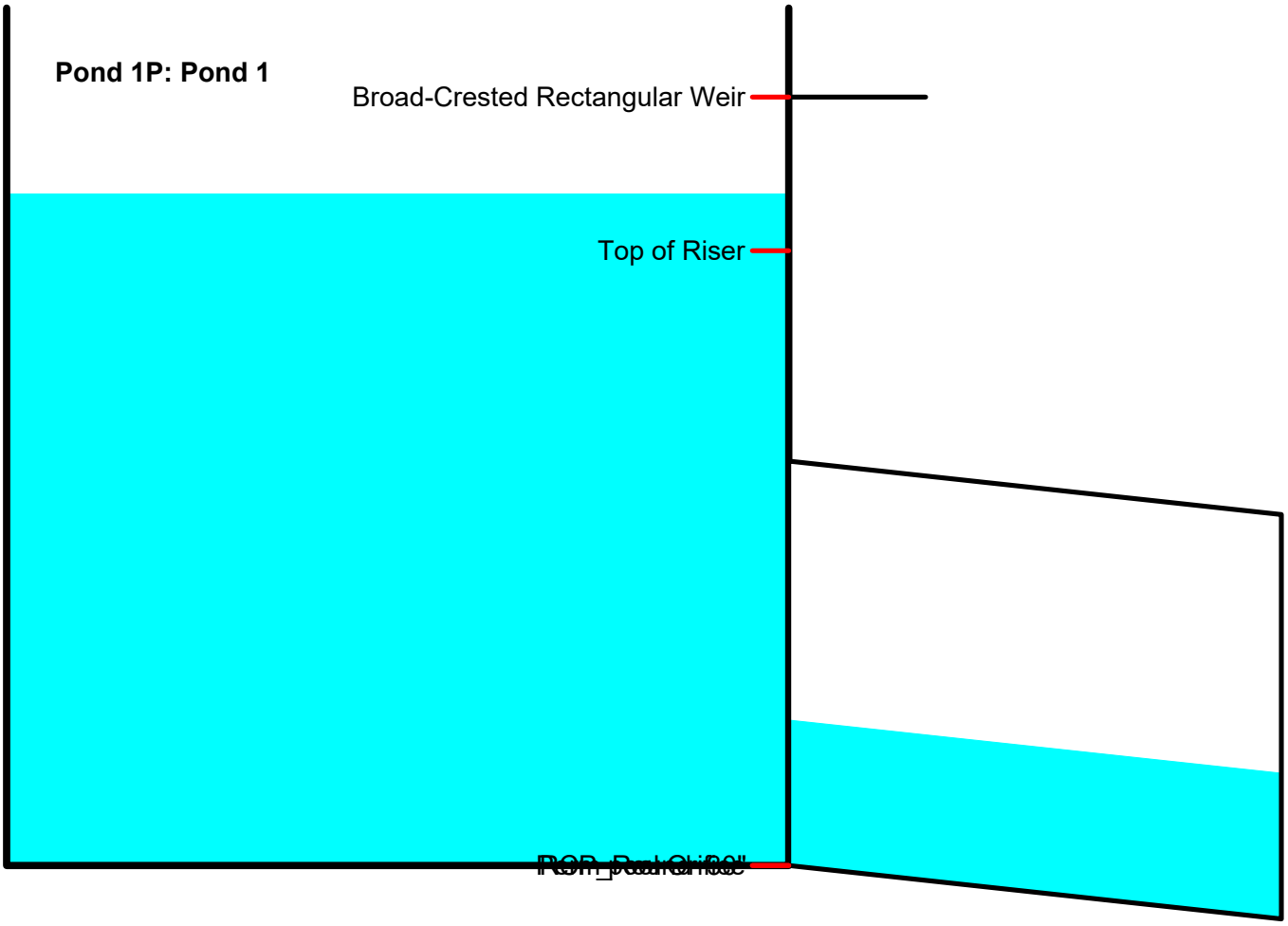
Volume	Invert	Avail.Storage	Storage Description
#1	232.00'	118,842 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
232.00	16,160	0	0
232.50	18,354	8,629	8,629
233.00	19,290	9,411	18,040
234.00	21,168	20,229	38,269
235.00	23,105	22,137	60,405
236.00	25,101	24,103	84,508
237.00	27,156	26,129	110,637
237.30	27,550	8,206	118,842

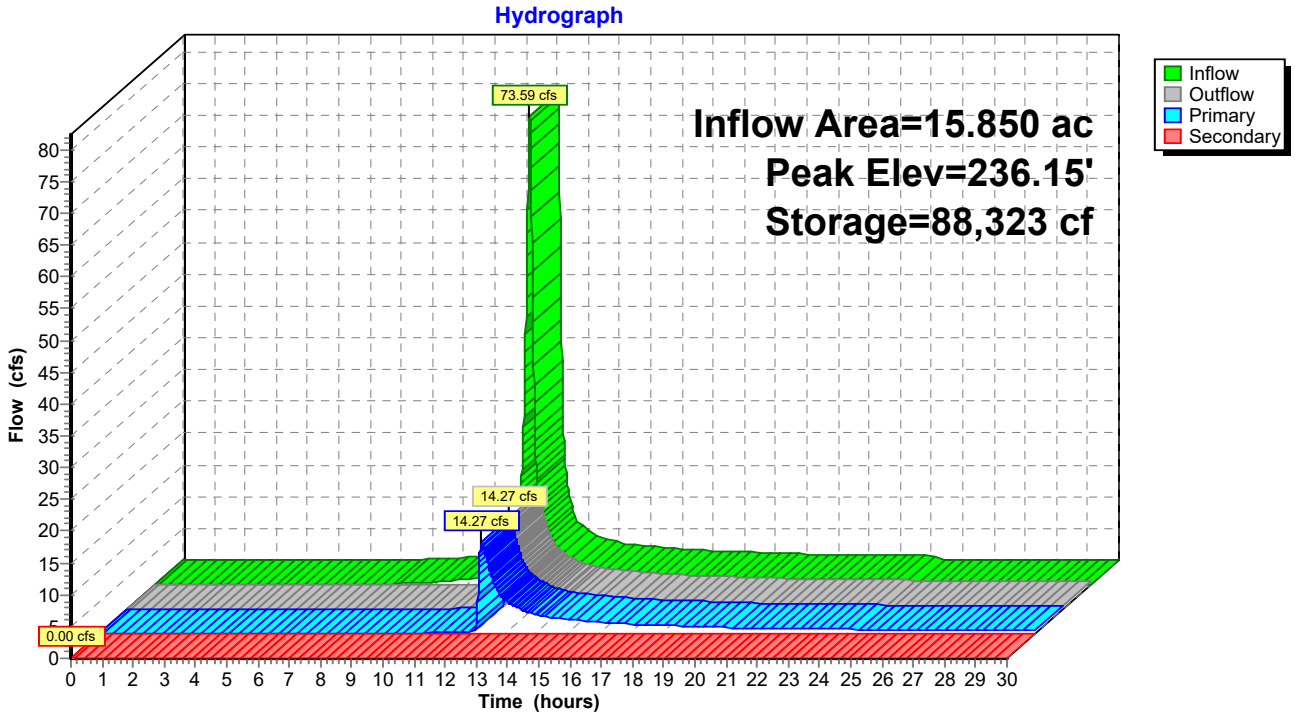
Device	Routing	Invert	Outlet Devices
#1	Primary	232.00'	**30.0" Round RCP_Round 30"** L= 59.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 232.00' / 231.67' S= 0.0056 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	232.00'	**3.5" Vert. Perm pool Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	235.80'	**60.0" x 60.0" Horiz. Top of Riser** C= 0.600 Limited to weir flow at low heads
#4	Secondary	236.75'	**40.0' long + 10.0 '/' SideZ x 16.4' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=14.24 cfs @ 12.27 hrs HW=236.15' (Free Discharge)
└**1=RCP_Round 30"** (Passes 14.24 cfs of 39.55 cfs potential flow)
└**2=Perm pool Orifice** (Orifice Controls 0.64 cfs @ 9.64 fps)
└**3=Top of Riser** (Weir Controls 13.60 cfs @ 1.94 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=232.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)


Pond 1P: Pond 1
Broad-Crested Rectangular Weir
Top of Riser

Pond 1P: Pond 1



Summary for Pond 1P: Pond 1

Inflow Area = 15.850 ac, 0.00% Impervious, Inflow Depth = 5.36" for 100yr 24h event
Inflow = 126.80 cfs @ 12.01 hrs, Volume= 7.075 af
Outflow = 89.74 cfs @ 12.09 hrs, Volume= 5.519 af, Atten= 29%, Lag= 4.8 min
Primary = 47.29 cfs @ 12.09 hrs, Volume= 5.039 af
Routed to Reach Post : Post-Site Only
Secondary = 42.45 cfs @ 12.09 hrs, Volume= 0.481 af
Routed to Reach Post : Post-Site Only

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 237.25' @ 12.09 hrs Surf.Area= 27,488 sf Storage= 117,554 cf

Plug-Flow detention time= 181.8 min calculated for 5.519 af (78% of inflow)
Center-of-Mass det. time= 96.7 min (899.7 - 803.1)

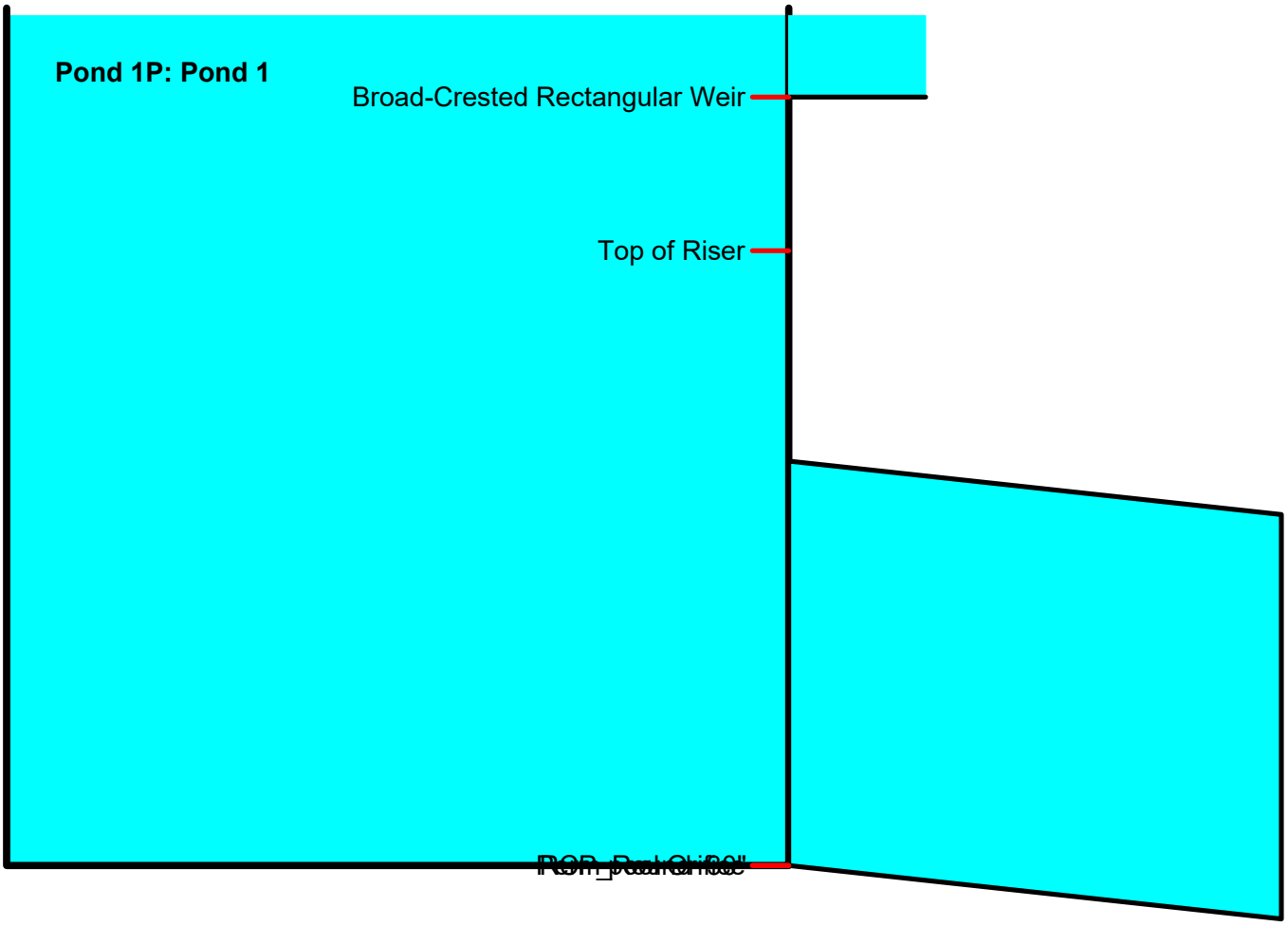
Volume	Invert	Avail.Storage	Storage Description
#1	232.00'	118,842 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
232.00	16,160	0	0
232.50	18,354	8,629	8,629
233.00	19,290	9,411	18,040
234.00	21,168	20,229	38,269
235.00	23,105	22,137	60,405
236.00	25,101	24,103	84,508
237.00	27,156	26,129	110,637
237.30	27,550	8,206	118,842

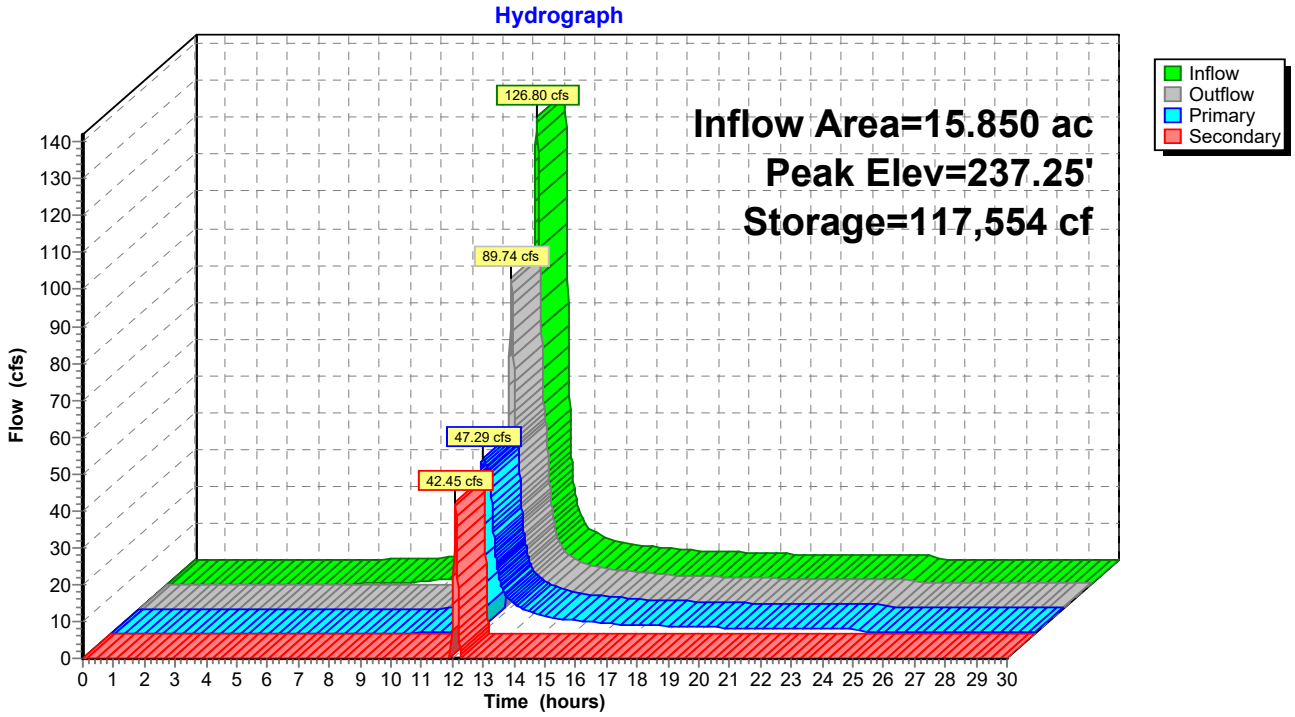
Device	Routing	Invert	Outlet Devices
#1	Primary	232.00'	**30.0" Round RCP_Round 30"** L= 59.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 232.00' / 231.67' S= 0.0056 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	232.00'	**3.5" Vert. Perm pool Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	235.80'	**60.0" x 60.0" Horiz. Top of Riser** C= 0.600 Limited to weir flow at low heads
#4	Secondary	236.75'	**40.0' long + 10.0 '/' SideZ x 16.4' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=47.28 cfs @ 12.09 hrs HW=237.25' (Free Discharge)
└**1=RCP_Round 30"** (Inlet Controls 47.28 cfs @ 9.63 fps)
└**2=Perm pool Orifice** (Passes < 0.73 cfs potential flow)
└**3=Top of Riser** (Passes < 114.46 cfs potential flow)

Secondary OutFlow Max=42.31 cfs @ 12.09 hrs HW=237.25' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Weir Controls 42.31 cfs @ 1.87 fps)


Pond 1P: Pond 1
Broad-Crested Rectangular Weir
Top of Riser

Pond 1P: Pond 1



PEAK FLOW ANALYSIS
Post-Development DA#1B

Summary for Subcatchment 2S: Post-Dev DA#1B

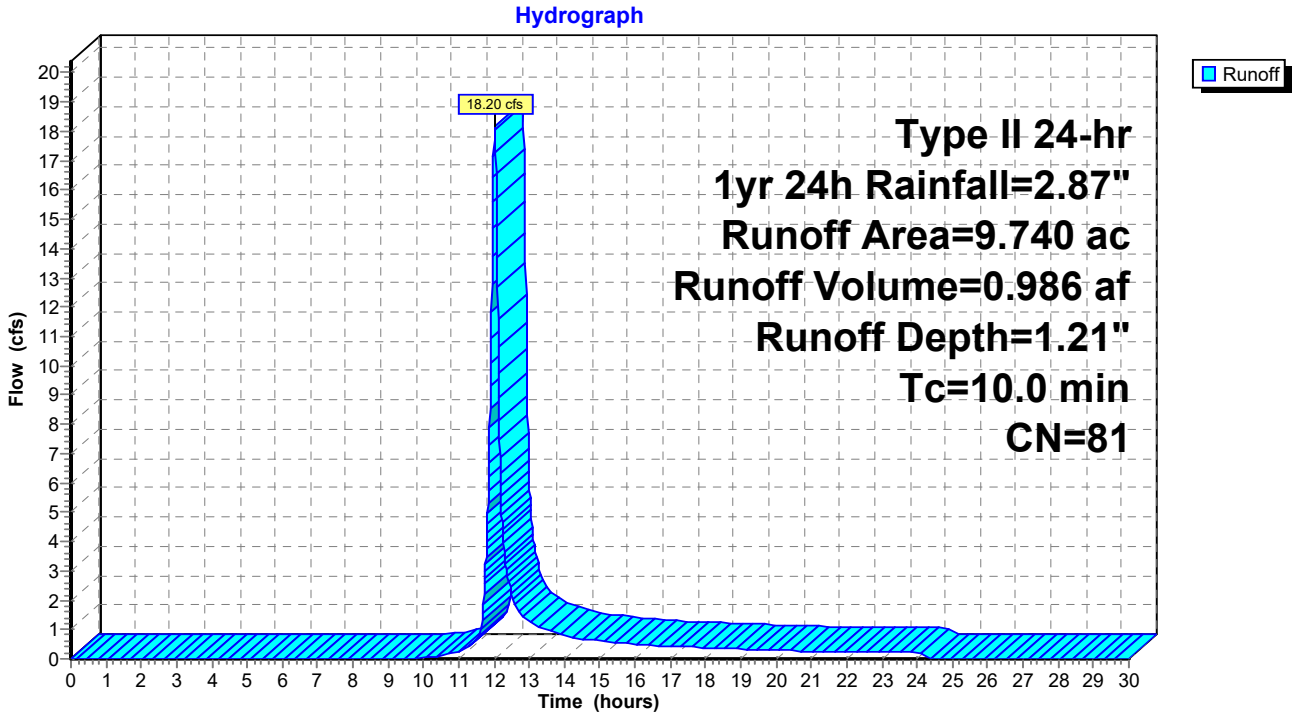
Runoff = 18.20 cfs @ 12.02 hrs, Volume= 0.986 af, Depth= 1.21"
Routed to Pond 2P : Pond 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1yr 24h Rainfall=2.87"

	Area (ac)	CN	Description
*	9.740	81	Post-Dev CN Value (see Stormwater Tool)
	9.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 2S: Post-Dev DA#1B



Summary for Subcatchment 2S: Post-Dev DA#1B

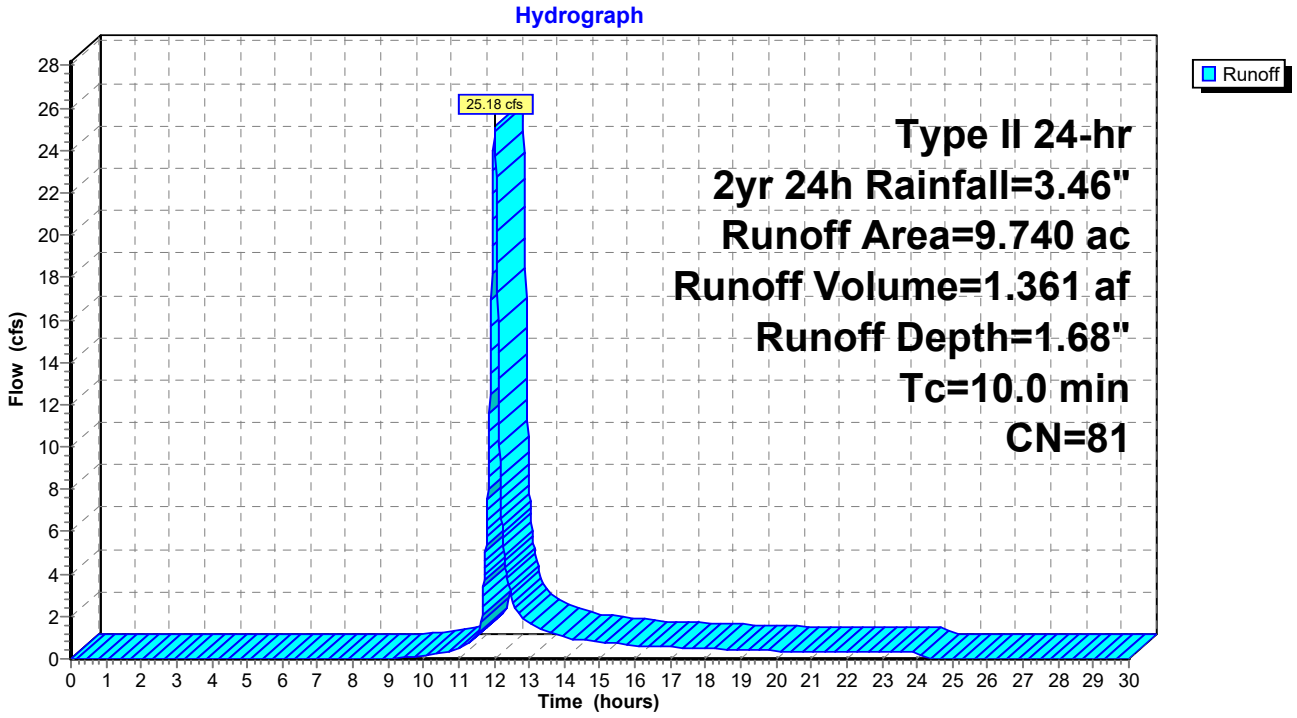
Runoff = 25.18 cfs @ 12.02 hrs, Volume= 1.361 af, Depth= 1.68"
Routed to Pond 2P : Pond 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 2yr 24h Rainfall=3.46"

	Area (ac)	CN	Description
*	9.740	81	Post-Dev CN Value (see Stormwater Tool)
	9.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 2S: Post-Dev DA#1B



Summary for Subcatchment 2S: Post-Dev DA#1B

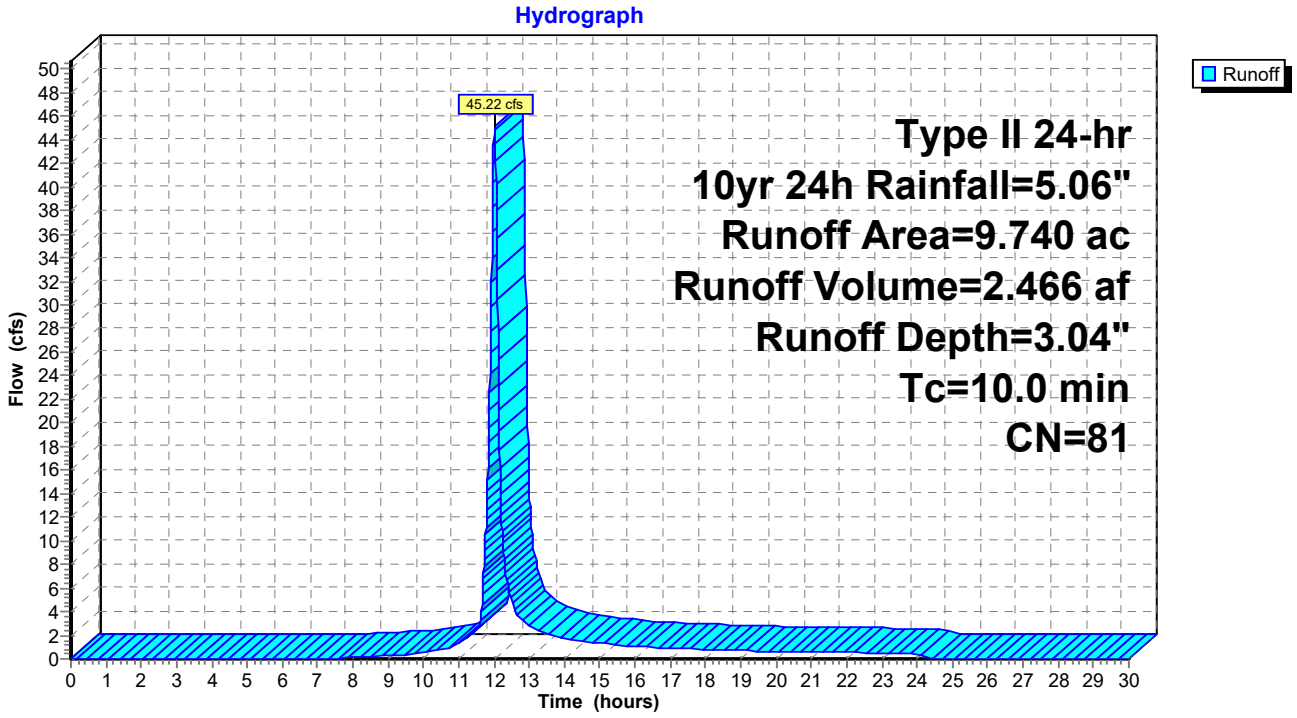
Runoff = 45.22 cfs @ 12.01 hrs, Volume= 2.466 af, Depth= 3.04"
Routed to Pond 2P : Pond 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10yr 24h Rainfall=5.06"

	Area (ac)	CN	Description
*	9.740	81	Post-Dev CN Value (see Stormwater Tool)
	9.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 2S: Post-Dev DA#1B



Summary for Subcatchment 2S: Post-Dev DA#1B

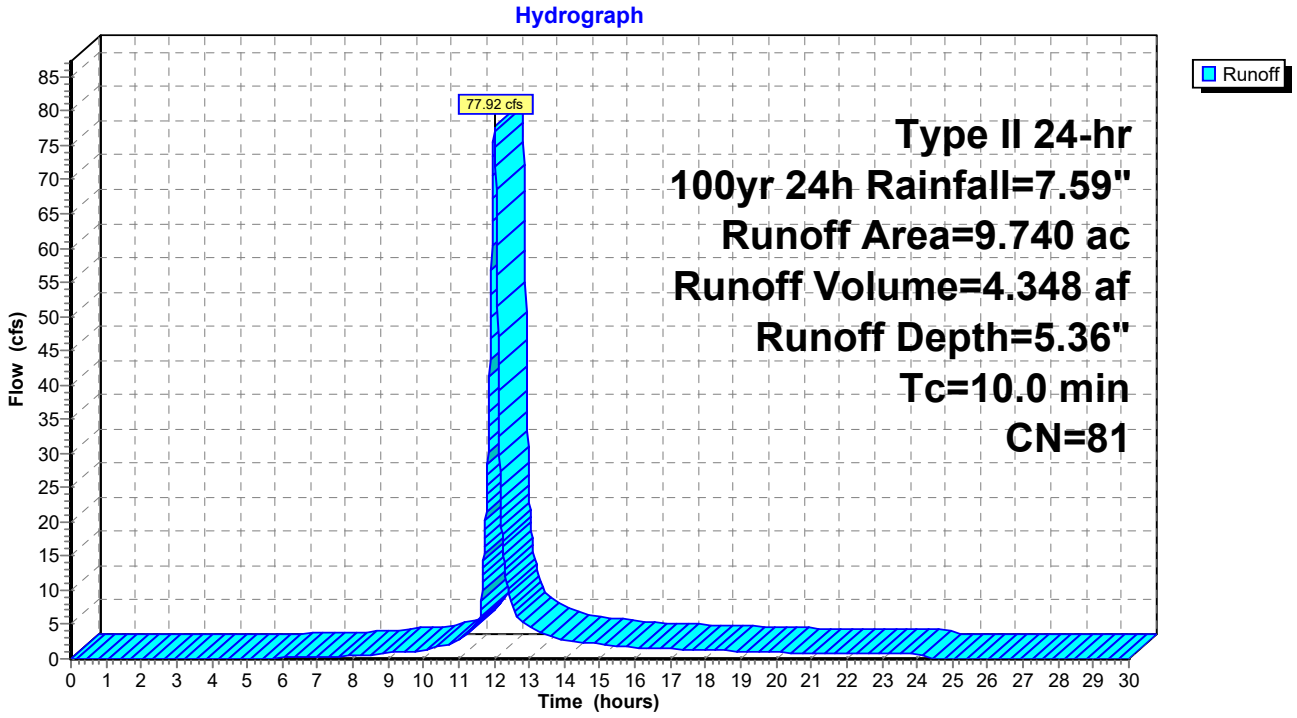
Runoff = 77.92 cfs @ 12.01 hrs, Volume= 4.348 af, Depth= 5.36"
Routed to Pond 2P : Pond 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100yr 24h Rainfall=7.59"

	Area (ac)	CN	Description
*	9.740	81	Post-Dev CN Value (see Stormwater Tool)
	9.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 2S: Post-Dev DA#1B



PEAK FLOW ANALYSIS
Wet Pond #2 Routing

Summary for Pond 2P: Pond 2

Inflow Area = 9.740 ac, 0.00% Impervious, Inflow Depth = 1.21" for 1yr 24h event
Inflow = 18.20 cfs @ 12.02 hrs, Volume= 0.986 af
Outflow = 2.40 cfs @ 12.46 hrs, Volume= 0.605 af, Atten= 87%, Lag= 26.4 min
Primary = 2.40 cfs @ 12.46 hrs, Volume= 0.605 af
Routed to Reach Post : Post-Site Only
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach Post : Post-Site Only

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 238.87' @ 12.46 hrs Surf.Area= 12,546 sf Storage= 20,718 cf

Plug-Flow detention time= 303.9 min calculated for 0.605 af (61% of inflow)
Center-of-Mass det. time= 184.4 min (1,029.9 - 845.5)

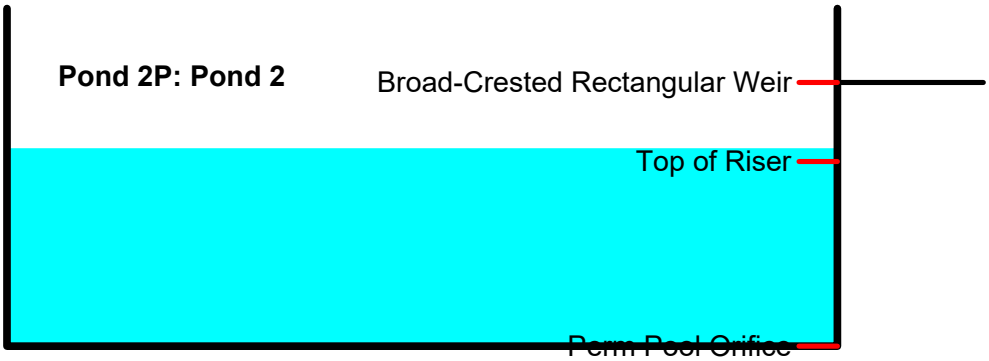
Volume	Invert	Avail.Storage	Storage Description
#1	237.00'	39,111 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

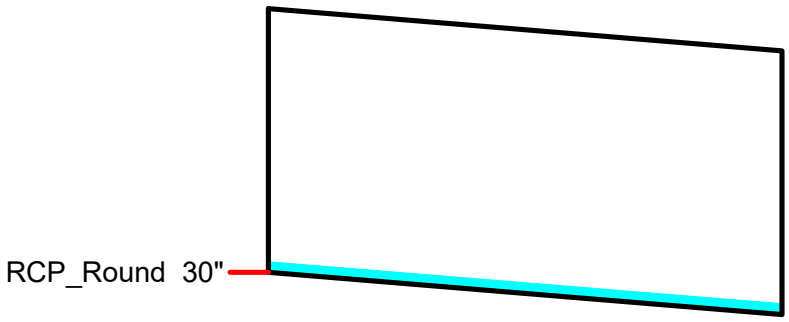
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
237.00	8,846	0	0
237.50	10,581	4,857	4,857
238.00	11,283	5,466	10,323
239.00	12,730	12,007	22,329
240.00	14,237	13,484	35,813
240.20	18,750	3,299	39,111

Device	Routing	Invert	Outlet Devices
#1	Primary	231.50'	**30.0" Round RCP_Round 30"** L= 47.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 231.50' / 231.10' S= 0.0084 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	237.00'	**2.0" Vert. Perm Pool Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	238.75'	**48.0" x 48.0" Horiz. Top of Riser** C= 0.600 Limited to weir flow at low heads
#4	Secondary	239.50'	**40.0' long + 10.0 '/' SideZ x 13.6' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.63 2.66 2.70 2.65 2.64 2.65 2.65 2.63

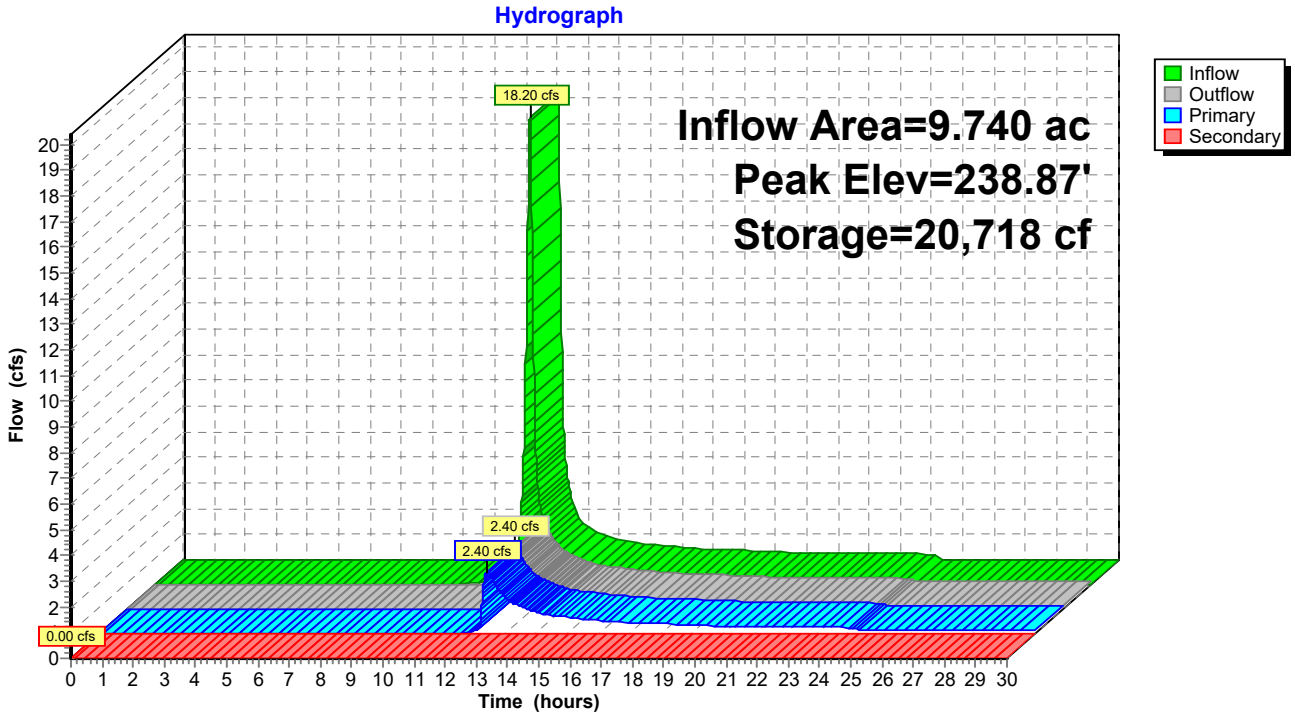
Primary OutFlow Max=2.38 cfs @ 12.46 hrs HW=238.87' (Free Discharge)
└**1=RCP_Round 30"** (Passes 2.38 cfs of 58.48 cfs potential flow)
├**2=Perm Pool Orifice** (Orifice Controls 0.14 cfs @ 6.44 fps)
└**3=Top of Riser** (Weir Controls 2.24 cfs @ 1.14 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=237.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)


Pond 2P: Pond 2
Broad-Crested Rectangular Weir
Top of Riser
Perm Pool Orifice


RCP_Round 30"

Pond 2P: Pond 2



Summary for Pond 2P: Pond 2

Inflow Area = 9.740 ac, 0.00% Impervious, Inflow Depth = 1.68" for 2yr 24h event
Inflow = 25.18 cfs @ 12.02 hrs, Volume= 1.361 af
Outflow = 10.91 cfs @ 12.15 hrs, Volume= 0.979 af, Atten= 57%, Lag= 8.0 min
Primary = 10.91 cfs @ 12.15 hrs, Volume= 0.979 af
Routed to Reach Post : Post-Site Only
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach Post : Post-Site Only

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 239.10' @ 12.15 hrs Surf.Area= 12,878 sf Storage= 23,586 cf

Plug-Flow detention time= 219.4 min calculated for 0.979 af (72% of inflow)
Center-of-Mass det. time= 117.7 min (953.8 - 836.2)

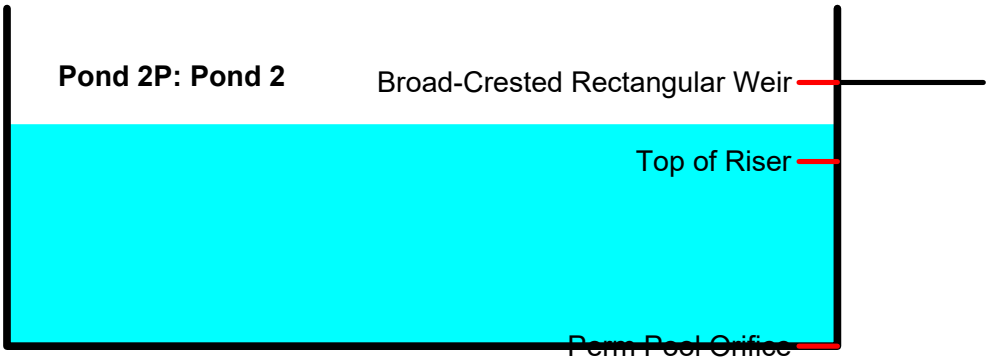
Volume	Invert	Avail.Storage	Storage Description
#1	237.00'	39,111 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

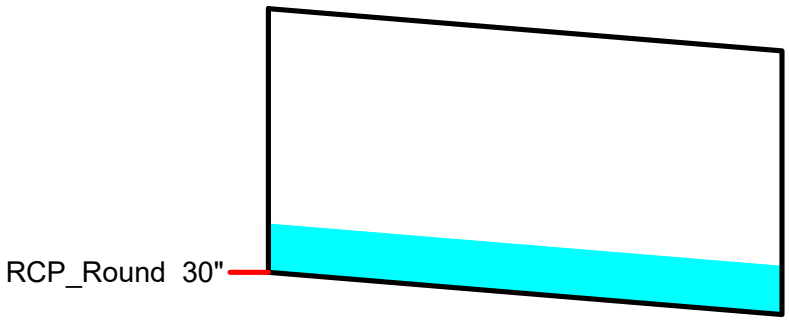
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
237.00	8,846	0	0
237.50	10,581	4,857	4,857
238.00	11,283	5,466	10,323
239.00	12,730	12,007	22,329
240.00	14,237	13,484	35,813
240.20	18,750	3,299	39,111

Device	Routing	Invert	Outlet Devices
#1	Primary	231.50'	**30.0" Round RCP_Round 30"** L= 47.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 231.50' / 231.10' S= 0.0084 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	237.00'	**2.0" Vert. Perm Pool Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	238.75'	**48.0" x 48.0" Horiz. Top of Riser** C= 0.600 Limited to weir flow at low heads
#4	Secondary	239.50'	**40.0' long + 10.0 '/' SideZ x 13.6' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.63 2.66 2.70 2.65 2.64 2.65 2.65 2.63

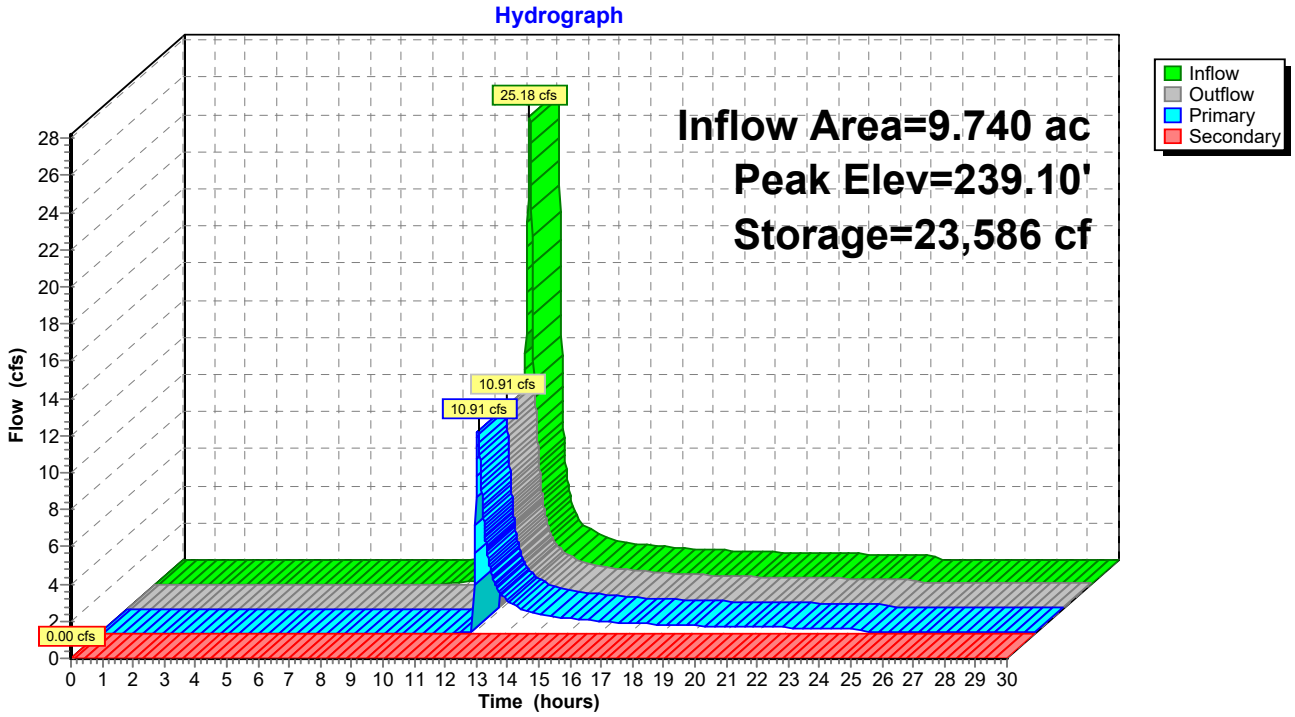
Primary OutFlow Max=10.89 cfs @ 12.15 hrs HW=239.10' (Free Discharge)
└**1=RCP_Round 30"** (Passes 10.89 cfs of 59.55 cfs potential flow)
├**2=Perm Pool Orifice** (Orifice Controls 0.15 cfs @ 6.83 fps)
└**3=Top of Riser** (Weir Controls 10.74 cfs @ 1.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=237.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)


Pond 2P: Pond 2
Broad-Crested Rectangular Weir
Top of Riser
Perm Pool Orifice


RCP_Round 30"

Pond 2P: Pond 2



Summary for Pond 2P: Pond 2

Inflow Area = 9.740 ac, 0.00% Impervious, Inflow Depth = 3.04" for 10yr 24h event
Inflow = 45.22 cfs @ 12.01 hrs, Volume= 2.466 af
Outflow = 40.00 cfs @ 12.06 hrs, Volume= 2.084 af, Atten= 12%, Lag= 2.8 min
Primary = 38.39 cfs @ 12.06 hrs, Volume= 2.076 af
Routed to Reach Post : Post-Site Only
Secondary = 1.61 cfs @ 12.06 hrs, Volume= 0.008 af
Routed to Reach Post : Post-Site Only

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 239.56' @ 12.06 hrs Surf.Area= 13,576 sf Storage= 29,710 cf

Plug-Flow detention time= 132.8 min calculated for 2.084 af (84% of inflow)
Center-of-Mass det. time= 62.4 min (881.6 - 819.2)

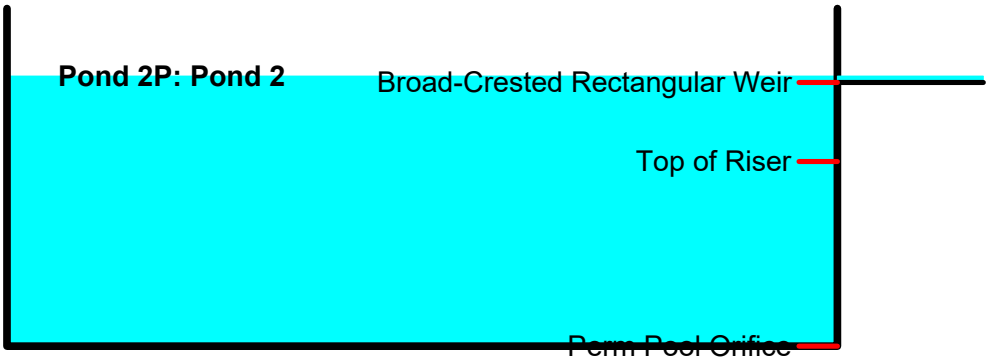
Volume	Invert	Avail.Storage	Storage Description
#1	237.00'	39,111 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

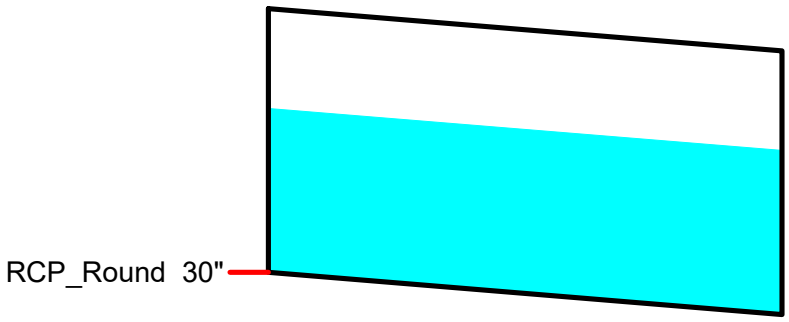
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
237.00	8,846	0	0
237.50	10,581	4,857	4,857
238.00	11,283	5,466	10,323
239.00	12,730	12,007	22,329
240.00	14,237	13,484	35,813
240.20	18,750	3,299	39,111

Device	Routing	Invert	Outlet Devices
#1	Primary	231.50'	**30.0" Round RCP_Round 30"** L= 47.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 231.50' / 231.10' S= 0.0084 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	237.00'	**2.0" Vert. Perm Pool Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	238.75'	**48.0" x 48.0" Horiz. Top of Riser** C= 0.600 Limited to weir flow at low heads
#4	Secondary	239.50'	**40.0' long + 10.0 '/' SideZ x 13.6' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.63 2.66 2.70 2.65 2.64 2.65 2.65 2.63

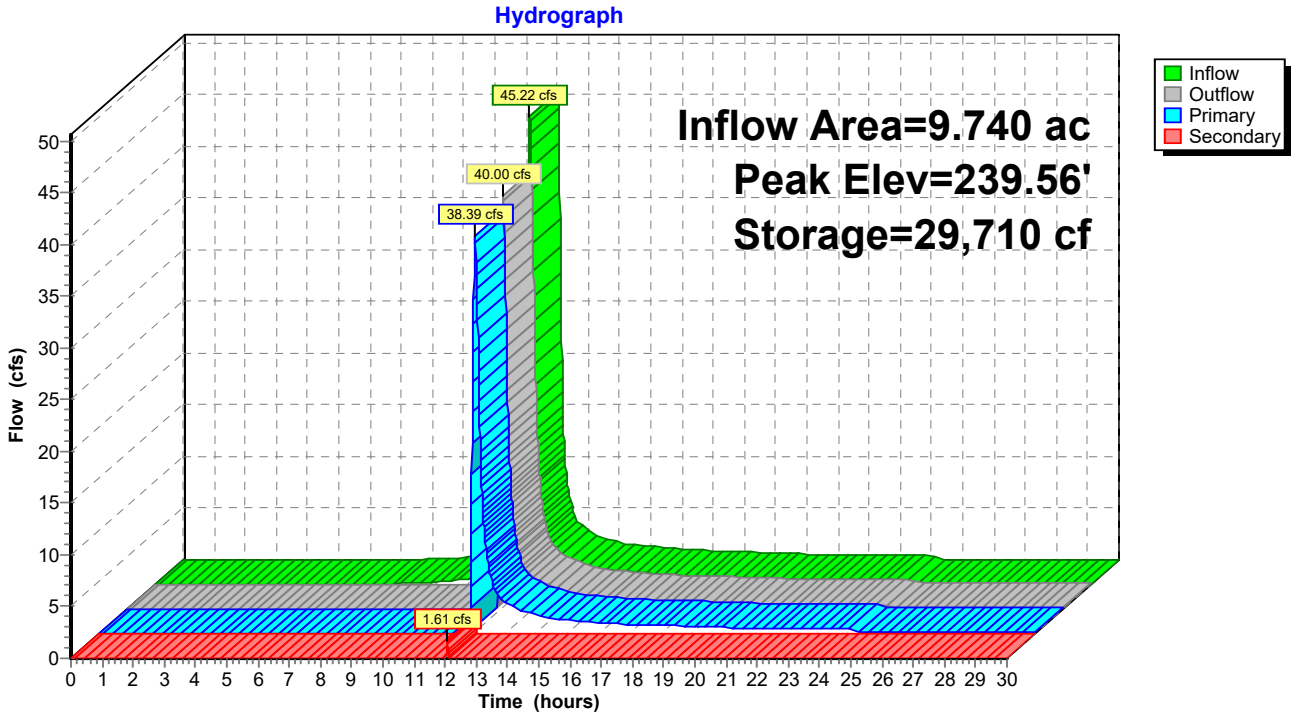
Primary OutFlow Max=38.36 cfs @ 12.06 hrs HW=239.56' (Free Discharge)
└**1=RCP_Round 30"** (Passes 38.36 cfs of 61.68 cfs potential flow)
├**2=Perm Pool Orifice** (Orifice Controls 0.17 cfs @ 7.58 fps)
└**3=Top of Riser** (Weir Controls 38.19 cfs @ 2.94 fps)

Secondary OutFlow Max=1.60 cfs @ 12.06 hrs HW=239.56' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Weir Controls 1.60 cfs @ 0.65 fps)


Pond 2P: Pond 2
Broad-Crested Rectangular Weir
Top of Riser
Perm Pool Orifice


RCP_Round 30"

Pond 2P: Pond 2



Summary for Pond 2P: Pond 2

Inflow Area = 9.740 ac, 0.00% Impervious, Inflow Depth = 5.36" for 100yr 24h event
Inflow = 77.92 cfs @ 12.01 hrs, Volume= 4.348 af
Outflow = 75.92 cfs @ 12.03 hrs, Volume= 3.964 af, Atten= 3%, Lag= 1.3 min
Primary = 56.92 cfs @ 12.03 hrs, Volume= 3.735 af
Routed to Reach Post : Post-Site Only
Secondary = 19.00 cfs @ 12.03 hrs, Volume= 0.229 af
Routed to Reach Post : Post-Site Only

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 239.81' @ 12.03 hrs Surf.Area= 13,944 sf Storage= 33,074 cf

Plug-Flow detention time= 88.5 min calculated for 3.964 af (91% of inflow)
Center-of-Mass det. time= 42.1 min (845.2 - 803.1)

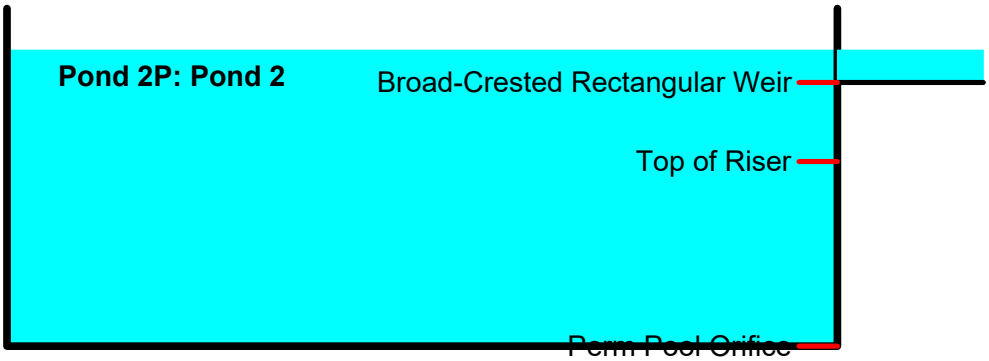
Volume	Invert	Avail.Storage	Storage Description
#1	237.00'	39,111 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

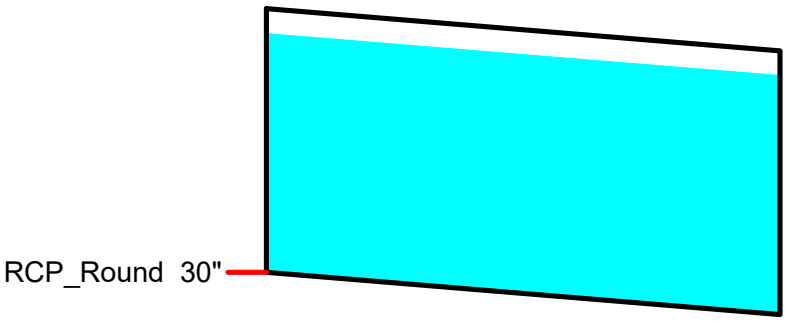
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
237.00	8,846	0	0
237.50	10,581	4,857	4,857
238.00	11,283	5,466	10,323
239.00	12,730	12,007	22,329
240.00	14,237	13,484	35,813
240.20	18,750	3,299	39,111

Device	Routing	Invert	Outlet Devices
#1	Primary	231.50'	**30.0" Round RCP_Round 30"** L= 47.8' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 231.50' / 231.10' S= 0.0084 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 4.91 sf
#2	Device 1	237.00'	**2.0" Vert. Perm Pool Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	238.75'	**48.0" x 48.0" Horiz. Top of Riser** C= 0.600 Limited to weir flow at low heads
#4	Secondary	239.50'	**40.0' long + 10.0 '/' SideZ x 13.6' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.63 2.66 2.70 2.65 2.64 2.65 2.65 2.63

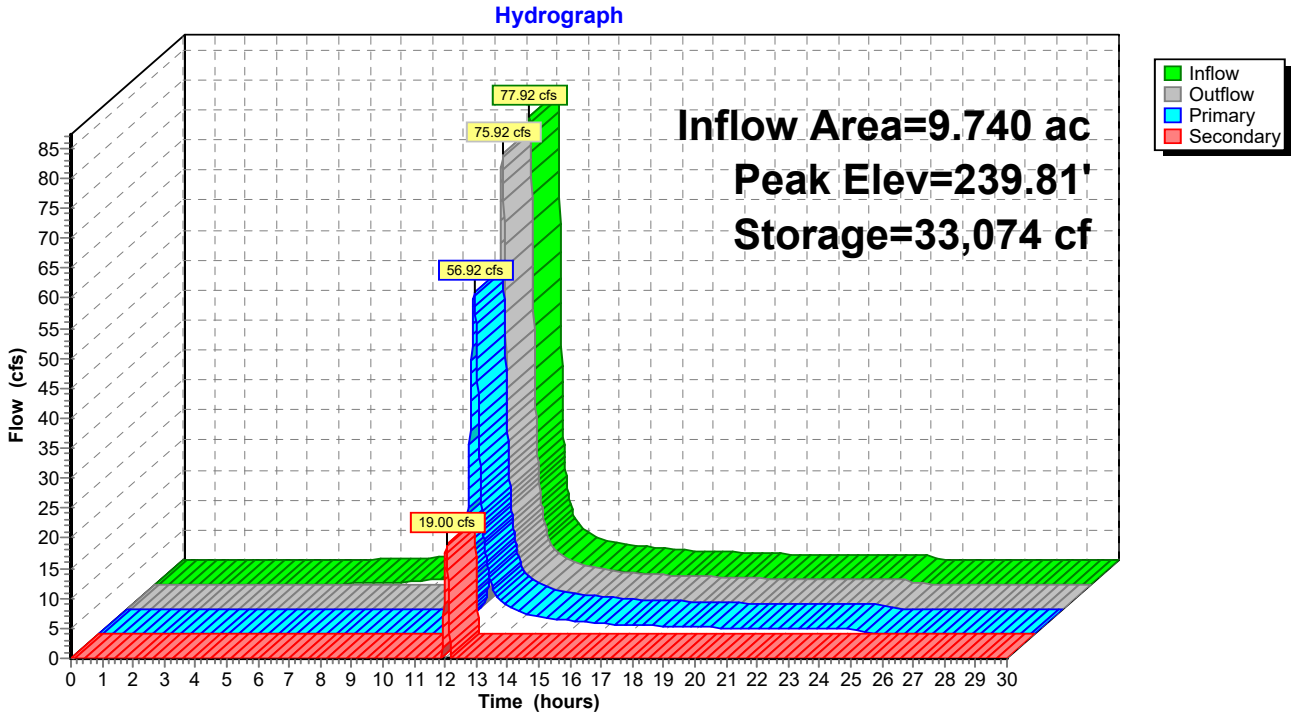
Primary OutFlow Max=56.87 cfs @ 12.03 hrs HW=239.81' (Free Discharge)
└**1=RCP_Round 30"** (Passes 56.87 cfs of 62.78 cfs potential flow)
├**2=Perm Pool Orifice** (Orifice Controls 0.17 cfs @ 7.94 fps)
└**3=Top of Riser** (Weir Controls 56.70 cfs @ 3.36 fps)

Secondary OutFlow Max=18.92 cfs @ 12.03 hrs HW=239.81' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Weir Controls 18.92 cfs @ 1.44 fps)


Pond 2P: Pond 2
Broad-Crested Rectangular Weir
Top of Riser
Perm Pool Orifice


RCP_Round 30"

Pond 2P: Pond 2



PEAK FLOW ANALYSIS
Post-Development DA#1C

Summary for Subcatchment 3S: Post-Dev DA#1C

[47] Hint: Peak is 201% of capacity of segment #3

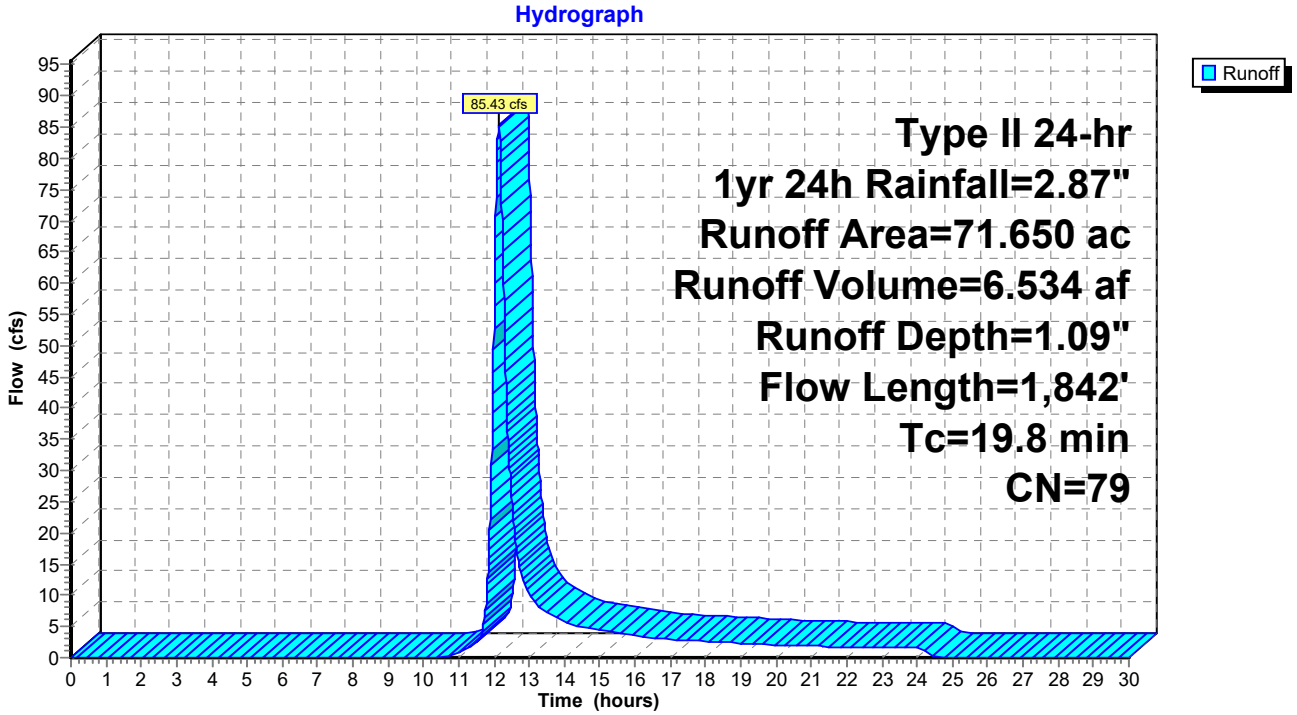
Runoff = 85.43 cfs @ 12.13 hrs, Volume= 6.534 af, Depth= 1.09"
Routed to Reach Post : Post-Site Only

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1yr 24h Rainfall=2.87"

	Area (ac)	CN	Description
*	71.650	79	
	71.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.1040	0.23		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.46"
3.3	738	0.0550	3.78		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
9.4	1,004	0.0090	1.78	42.53	**Channel Flow, Channel Flow** Area= 23.9 sf Perim= 81.4' r= 0.29' n= 0.035
19.8	1,842	Total			

Subcatchment 3S: Post-Dev DA#1C



Summary for Subcatchment 3S: Post-Dev DA#1C

[47] Hint: Peak is 287% of capacity of segment #3

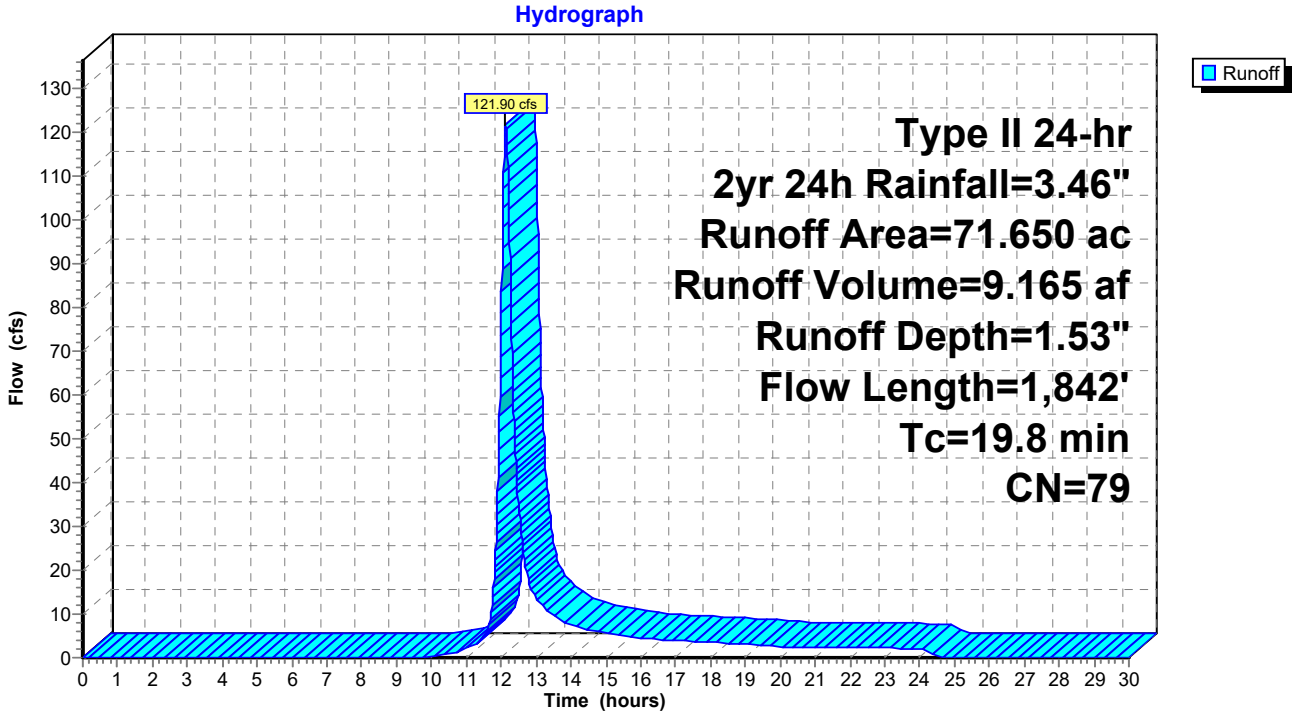
Runoff = 121.90 cfs @ 12.13 hrs, Volume= 9.165 af, Depth= 1.53"
Routed to Reach Post : Post-Site Only

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 2yr 24h Rainfall=3.46"

	Area (ac)	CN	Description
*	71.650	79	
	71.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.1040	0.23		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.46"
3.3	738	0.0550	3.78		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
9.4	1,004	0.0090	1.78	42.53	**Channel Flow, Channel Flow** Area= 23.9 sf Perim= 81.4' r= 0.29' n= 0.035
19.8	1,842	Total			

Subcatchment 3S: Post-Dev DA#1C



Summary for Subcatchment 3S: Post-Dev DA#1C

[47] Hint: Peak is 539% of capacity of segment #3

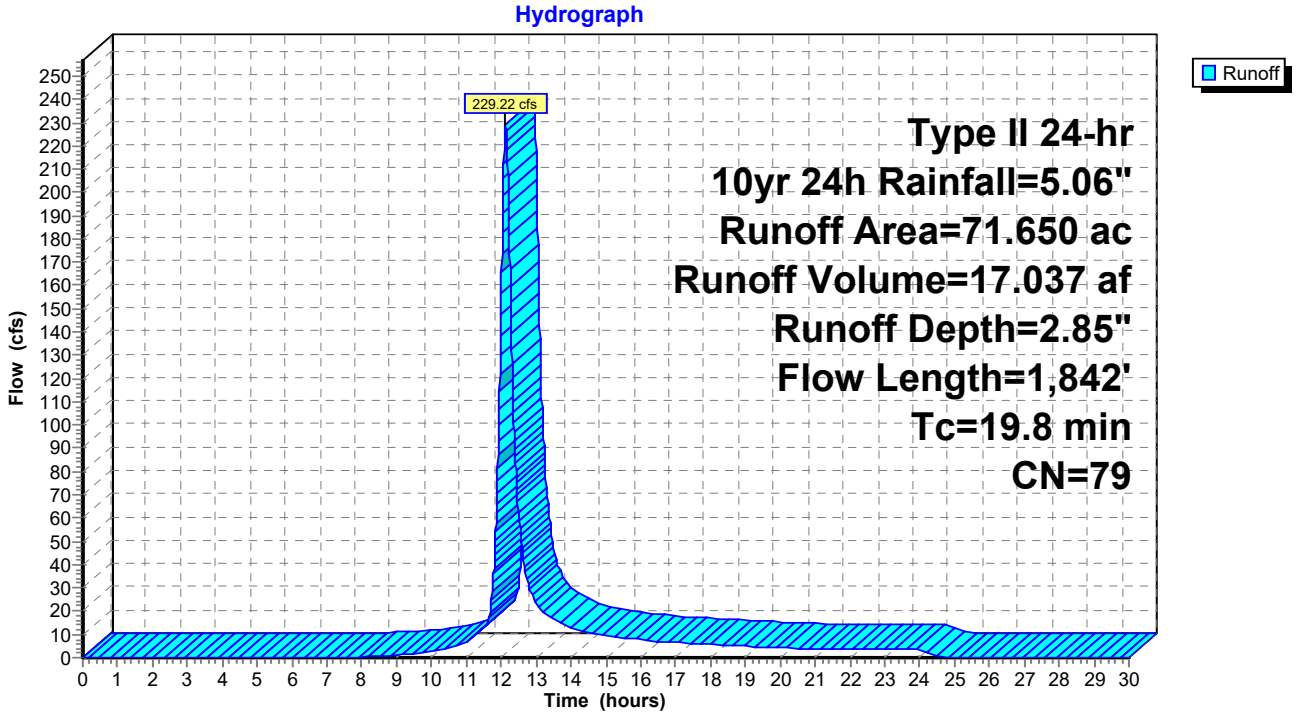
Runoff = 229.22 cfs @ 12.12 hrs, Volume= 17.037 af, Depth= 2.85"
Routed to Reach Post : Post-Site Only

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10yr 24h Rainfall=5.06"

	Area (ac)	CN	Description
*	71.650	79	
	71.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.1040	0.23		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.46"
3.3	738	0.0550	3.78		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
9.4	1,004	0.0090	1.78	42.53	**Channel Flow, Channel Flow** Area= 23.9 sf Perim= 81.4' r= 0.29' n= 0.035
19.8	1,842	Total			

Subcatchment 3S: Post-Dev DA#1C



Summary for Subcatchment 3S: Post-Dev DA#1C

[47] Hint: Peak is 960% of capacity of segment #3

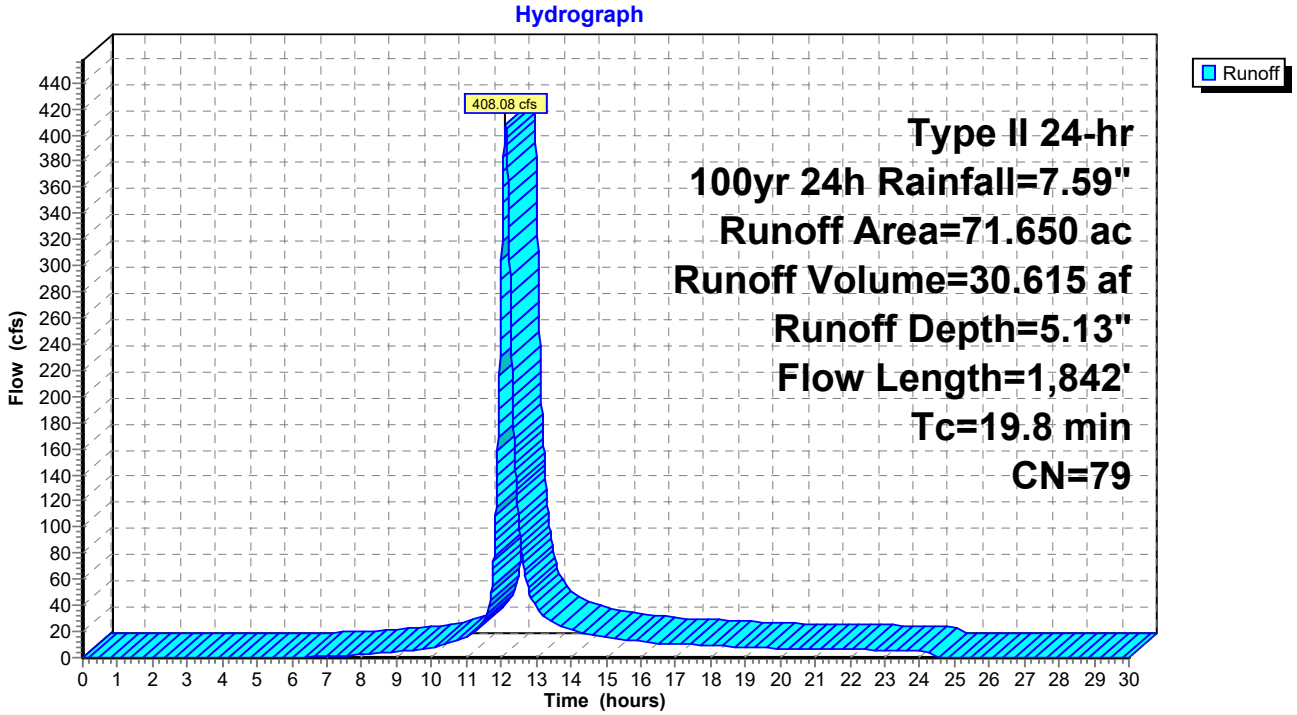
Runoff = 408.08 cfs @ 12.12 hrs, Volume= 30.615 af, Depth= 5.13"
Routed to Reach Post : Post-Site Only

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100yr 24h Rainfall=7.59"

	Area (ac)	CN	Description
*	71.650	79	
	71.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.1040	0.23		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.46"
3.3	738	0.0550	3.78		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
9.4	1,004	0.0090	1.78	42.53	**Channel Flow, Channel Flow** Area= 23.9 sf Perim= 81.4' r= 0.29' n= 0.035
19.8	1,842	Total			

Subcatchment 3S: Post-Dev DA#1C



PEAK FLOW ANALYSIS
Total Post-Development Flows

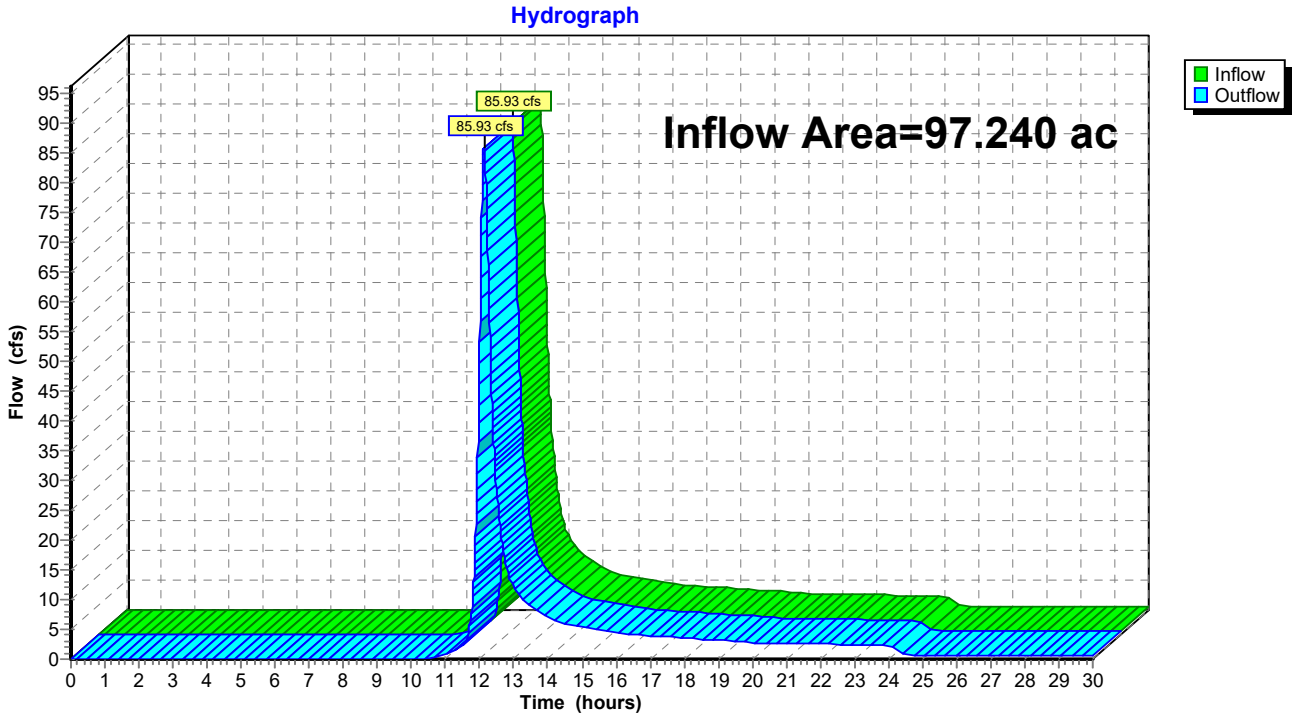
Summary for Reach Post: Post-Site Only

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 97.240 ac, 0.00% Impervious, Inflow Depth > 0.97" for 1yr 24h event
Inflow = 85.93 cfs @ 12.13 hrs, Volume= 7.855 af
Outflow = 85.93 cfs @ 12.13 hrs, Volume= 7.855 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach Post: Post-Site Only



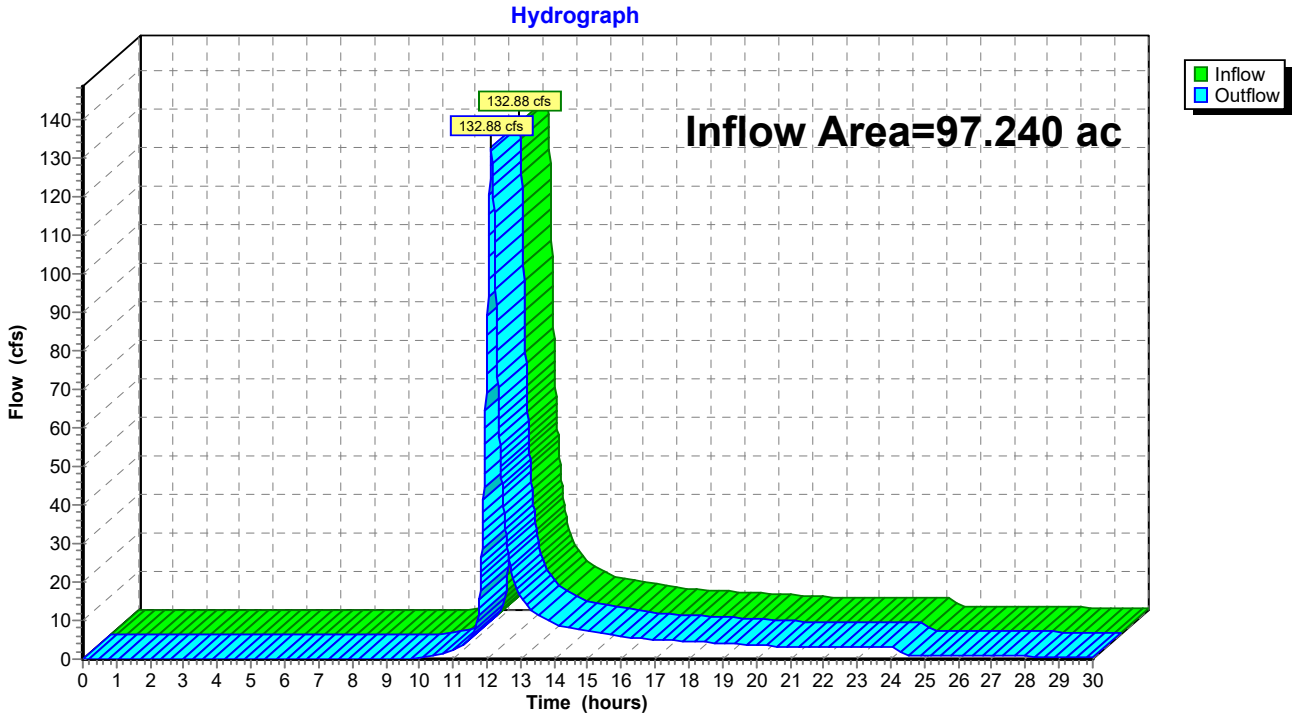
Summary for Reach Post: Post-Site Only

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 97.240 ac, 0.00% Impervious, Inflow Depth > 1.36" for 2yr 24h event
Inflow = 132.88 cfs @ 12.13 hrs, Volume= 11.001 af
Outflow = 132.88 cfs @ 12.13 hrs, Volume= 11.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach Post: Post-Site Only



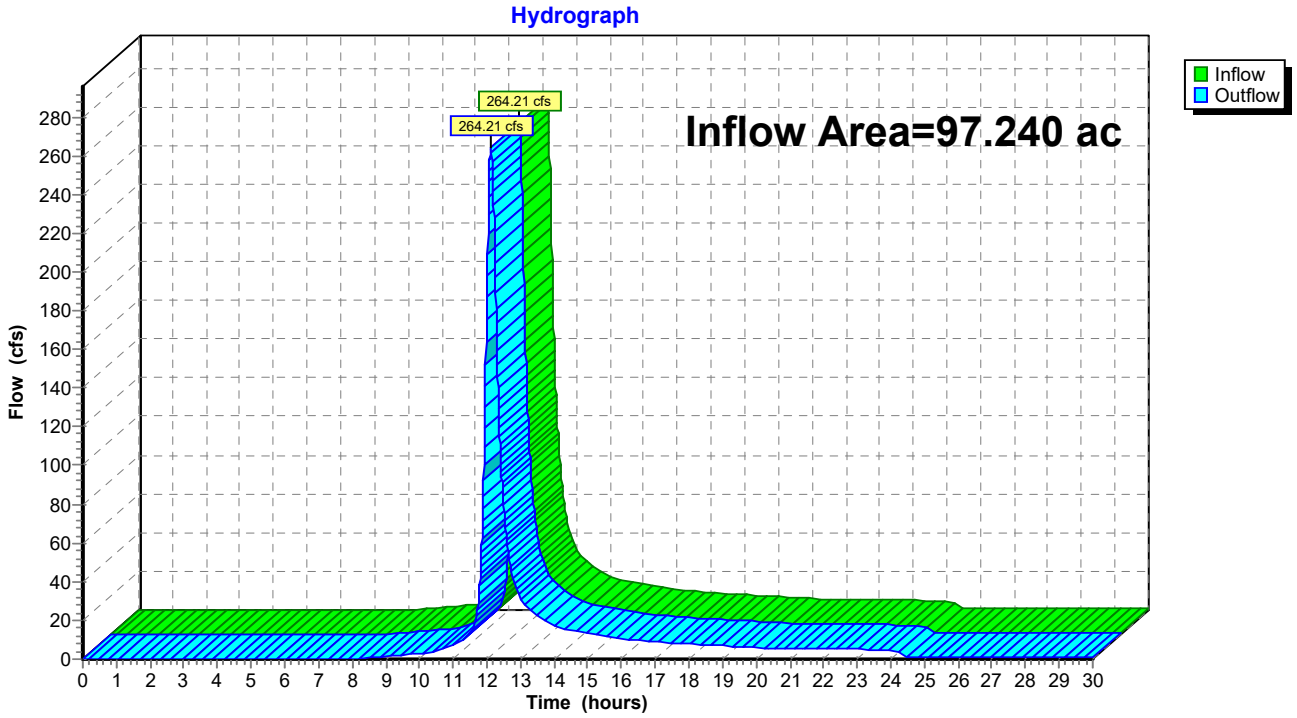
Summary for Reach Post: Post-Site Only

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 97.240 ac, 0.00% Impervious, Inflow Depth > 2.66" for 10yr 24h event
Inflow = 264.21 cfs @ 12.12 hrs, Volume= 21.586 af
Outflow = 264.21 cfs @ 12.12 hrs, Volume= 21.586 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach Post: Post-Site Only



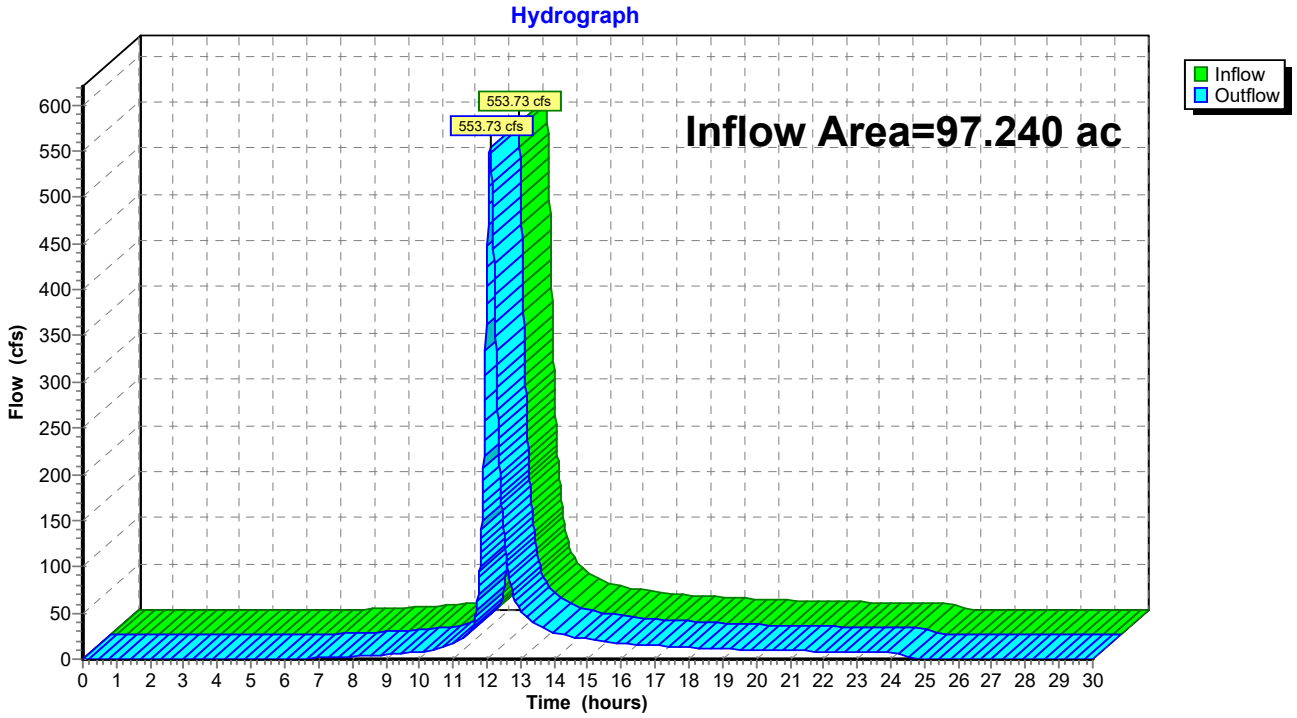
Summary for Reach Post: Post-Site Only

[40] Hint: Not Described (Outflow=Inflow)

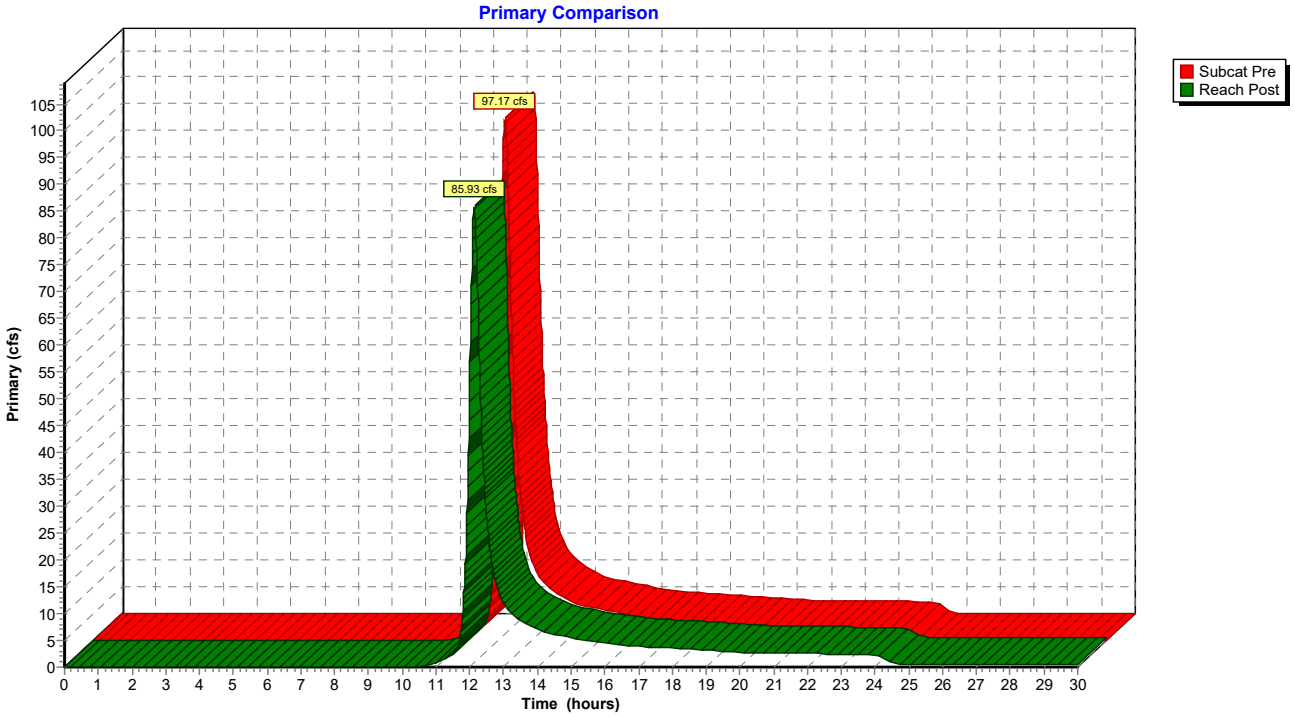
Inflow Area = 97.240 ac, 0.00% Impervious, Inflow Depth > 4.95" for 100yr 24h event
Inflow = 553.73 cfs @ 12.10 hrs, Volume= 40.098 af
Outflow = 553.73 cfs @ 12.10 hrs, Volume= 40.098 af, Atten= 0%, Lag= 0.0 min

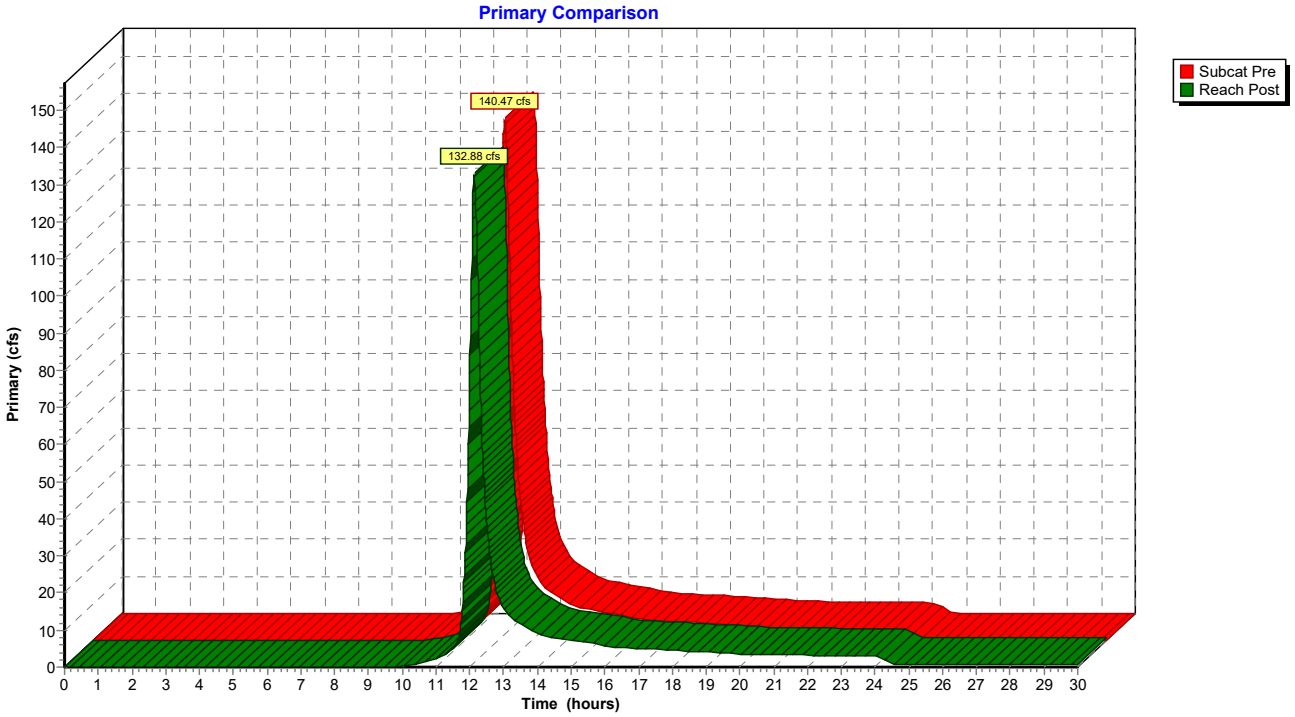
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

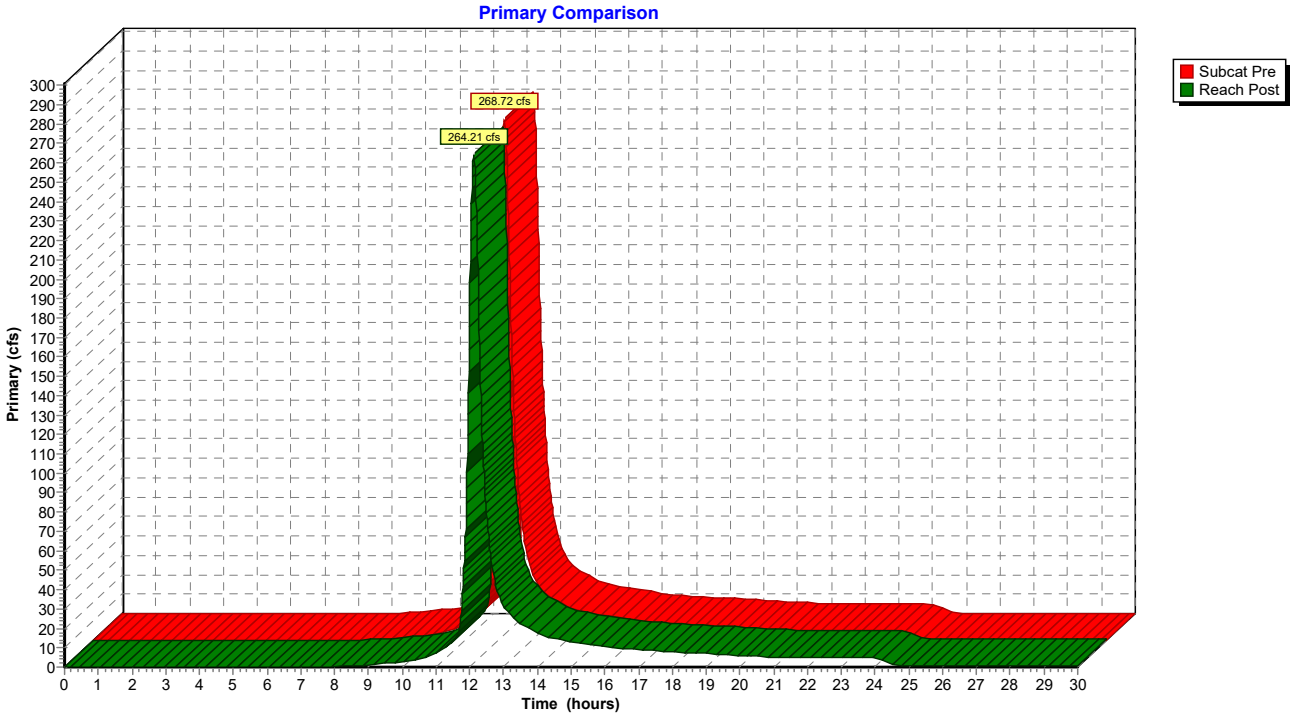
Reach Post: Post-Site Only



PEAK FLOW ANALYSIS
Pre vs Post Comparison


Primary Comparison
Subcat Pre
Reach Post
97.17 cfs
85.93 cfs
Primary (cfs)
Time (hours)
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30


Primary Comparison
Subcat Pre
Reach Post
140.47 cfs
132.88 cfs
Primary (cfs)
Time (hours)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30


Primary Comparison
Subcat Pre
Reach Post
268.72 cfs
264.21 cfs
Primary (cfs)
Time (hours)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

WATER QUALITY CALCULATIONS

WET POND 1

Determine Design Volume and Design Volume Elevation

Simple Method for Runoff Volume

$R_V = 0.05 + 0.9 * I_A$

Where:
- R_V = Runoff coefficient (unitless)
- I_A = Impervious fraction (unitless)

$DV = 3630 * R_D * R_V * A$

Where:
- DV = Design volume (cu ft)
- R_D = Design storm depth (in)
- A = Drainage area (ac)

Drainage Area:	695,257 sf	15.961 AC
Impervious Area:	317,573 sf	7.290 AC
Pervious Area:	377,684 sf	8.670 AC
% Impervious:	45.68%	
Rv:	0.46	
WQV (in)	1.0 in	
WQV (cf)	**26,714.88 cf**	
WQ Elevation	**233.43**	

STORAGE VOLUME ABOVE PERMANENT POOL				
Elev (ft)	Area (sf)	Incremental Volume (cf)	Cumulative Volume (cf)	
232	16,302 sf	0 cf	0 cf	PERM. POOL ELEVATION
232.5	18,354 sf	8,664 cf	8,664 cf	
233	19,290 sf	9,411 cf	18,075 cf	
234	21,168 sf	20,229 cf	38,304 cf	
235	23,105 sf	22,137 cf	60,441 cf	
236	25,101 sf	24,103 cf	84,544 cf	
237	27,156 sf	26,129 cf	110,672 cf	
237.25	27,550 sf	6,838 cf	117,510 cf	

Size Water Quality Orifice

$Q = C_D A (2 g H_o)^{0.5}$

Where:
- Q = Discharge (cfs)
- C_D = Coefficient of discharge per Table 6 (unitless)
- A = Cross-sectional area of orifice entrance (sq ft)
- g = Acceleration of gravity (32.2 ft/sec^2)
- H_o = Driving head from water surface to centroid orifice (ft) **usually use $H_o/3$ to compute drawdown through an orifice to reflect the fact that head is decreasing as drawdown occurs**

Temp. Pool Elev (ft)	235.75	*<= Elev. of first opening above permanent pool orifice (min = 233.43)*
Orifice Diameter (in)	3.5 in	
Temp. Pool Volume (cf)	78,518 cf	
Orifice Coefficient, CD	0.6	
Orifice Area, A (ft^2)	0.067 sf	
Gravity, g (ft/sec^2)	32.2 ft/s/s	
Driving Head, H (ft)	1.250 ft	
Discharge, Q (cfs)	0.360 cfs	
Drawdown Time (hrs)	**60.64 hrs**	GOOD

WET POND 1

Calculate Average Pool Depth

STORAGE VOLUME BELOW PERMANENT POOL							
Elev (ft)	Forebay Area (sf)	Forebay Incremental Volume (cf)	Forebay Cumulative Volume (cf)	Main Bay Area (sf)	Main Bay Incremental Volume (cf)	Main Bay Cumulative Volume (cf)	Total Volume (cf)
227	0 sf	0 cf	0 cf	1,146 sf	0 cf	0 cf	0 cf
228	899 sf	0 cf	0 cf	6,780 sf	3,963 cf	3,963 cf	3,963 cf
229	1,438 sf	1,169 cf	1,169 cf	7,956 sf	7,368 cf	11,331 cf	12,500 cf
230	2,057 sf	1,748 cf	2,916 cf	9,207 sf	8,582 cf	19,913 cf	22,829 cf
231	2,750 sf	2,404 cf	5,320 cf	10,532 sf	9,870 cf	29,782 cf	35,102 cf
231.5	3,124 sf	1,469 cf	6,788 cf	11,223 sf	5,439 cf	35,221 cf	42,009 cf
232	3,783 sf	1,727 cf	8,515 cf	12,519 sf	5,936 cf	41,156 cf	49,671 cf

Forebay %	**17.14%**
	GOOD

Is Littoral Shelf submerged?	=>	YES
Choose Average Depth Equation (Typ. Equation 2 if shelf is **not** submerged, Equation 3 if shelf is submerged)	=>	Equation 3

Equation 3. Average depth when the shelf is partially or fully submerged and the shelf is being excluded from the average depth calculation

$$D_{avg} = \frac{V_{PP} - V_{shelf}}{A_{bottom\ of\ shelf}}$$

Where:
- D_{avg} = Average depth (feet)
- V_{PP} = Main pool volume at permanent pool elevation (feet^3)
- V_{shelf} = Volume over the shelf only (feet^3) – see below
- $A_{bottom\ of\ shelf}$ = Area of main pool at the bottom of the shelf (feet^2)

$$V_{shelf} = 0.5 * Depth_{max\ over\ shelf} * Perimeter_{perm\ pool} * Width_{submerged\ part\ of\ shelf}$$

Where:
- $Depth_{max\ over\ shelf}$ = Depth of water at the deep side of the shelf as measured from the permanent pool (feet)
- $Perimeter_{perm\ pool}$ = Perimeter of main pool at the bottom of the shelf (feet)
- $Width_{submerged\ part\ of\ shelf}$ = Width from the deep side to the dry side of the shelf as measured at permanent pool (feet)

Elev. @ Bottom of Pond (ft)	227.00
Elev. @ Bottom of Littoral Shelf (ft)	231.50
Permanent Pool Elevation (ft)	232.00
Permanent Pool Perimeter (ft)	824.00 ft
$Width_{submerged\ part\ of\ shelf}$	3.00 ft

Main Pool Volume (V_{PP})	41,156 cf	
Surface Area at bottom of shelf (A_{bottom}	11,223 sf	
Depth of water within shelf	0.50 ft	
Volume over the Shelf (V_{shelf})	618 cf	
Average Depth (Using Equation 3)	**3.61 ft**	GOOD

Check Minimum Surface Area

Piedmont or Coastal?			Piedmont
% Impervious	45.68%	=>	50.00%
Average Depth	3.61 ft	=>	4.0 ft
Minimum SA / DA Ratio			1.51
Minimum Permanent Pool Surface Area			10,498 sf
Provided Permanent Pool Surface Area			12,519 sf GOOD

Table 1: Piedmont and Mountain SA/DA Table (Adapted from Driscoll, 1986)

Percent Impervious Cover	Permanent Pool Average Depth (ft)					
	3.0	*4.0*	*5.0*	*6.0*	*7.0*	*≥8.0*
10%	0.51	0.43	0.37	0.30	0.27	0.25
20%	0.84	0.69	0.61	0.51	0.44	0.40
30%	1.17	0.94	0.84	0.72	0.61	0.56
40%	1.51	1.24	1.09	0.91	0.78	0.71
50%	1.79	1.51	1.31	1.13	0.95	0.87
60%	2.09	1.77	1.49	1.31	1.12	1.03
70%	2.51	2.09	1.80	1.56	1.34	1.17
80%	2.92	2.41	2.07	1.82	1.62	1.40
90%	3.25	2.64	2.31	2.04	1.84	1.59
100%	3.55	2.79	2.52	2.34	2.04	1.75

WET POND 2

Determine Design Volume and Design Volume Elevation

Simple Method for Runoff Volume

$R_V = 0.05 + 0.9 * I_A$

Where:
- R_V = Runoff coefficient (unitless)
- I_A = Impervious fraction (unitless)

$DV = 3630 * R_D * R_V * A$

Where:
- DV = Design volume (cu ft)
- R_D = Design storm depth (in)
- A = Drainage area (ac)

Drainage Area:	424,285 sf	9.740 AC
Impervious Area:	190,246 sf	4.367 AC
Pervious Area:	234,039 sf	5.373 AC
% Impervious:	44.84%	
Rv:	0.45	
WQV (in)	1.0 in	
WQV (cf)	**16,036.30 cf**	
WQ Elevation	**238.48**	

STORAGE VOLUME ABOVE PERMANENT POOL				
Elev (ft)	Area (sf)	Incremental Volume (cf)	Cumulative Volume (cf)	
237	8,846 sf	0 cf	0 cf	PERM. POOL ELEVATION
237.5	10,581 sf	4,857 cf	4,857 cf	
238	11,283 sf	5,466 cf	10,323 cf	
239	12,730 sf	12,007 cf	22,329 cf	
240	14,237 sf	13,484 cf	35,813 cf	
240.2	18,750 sf	3,299 cf	39,111 cf	

Size Water Quality Orifice

$Q = C_D A (2 g H_o)^{0.5}$

Where:
- Q = Discharge (cfs)
- C_D = Coefficient of discharge per Table 6 (unitless)
- A = Cross-sectional area of orifice entrance (sq ft)
- g = Acceleration of gravity (32.2 ft/sec^2)
- H_o = Driving head from water surface to centroid orifice (ft) **usually use $H_o/3$ to compute drawdown through an orifice to reflect the fact that head is decreasing as drawdown occurs**

Temp. Pool Elev (ft)	238.75	*<= Elev. of first opening above permanent pool orifice (min = 238.48)*
Orifice Diameter (in)	2.0 in	
Temp. Pool Volume (cf)	19,328 cf	
Orifice Coefficient, CD	0.6	
Orifice Area, A (ft^2)	0.022 sf	
Gravity, g (ft/sec^2)	32.2 ft/s/s	
Driving Head, H (ft)	0.583 ft	
Discharge, Q (cfs)	0.080 cfs	
Drawdown Time (hrs)	**66.92 hrs**	GOOD

WET POND 2

Calculate Average Pool Depth

STORAGE VOLUME BELOW PERMANENT POOL							
Elev (ft)	Forebay Area (sf)	Forebay Incremental Volume (cf)	Forebay Cumulative Volume (cf)	Main Bay Area (sf)	Main Bay Incremental Volume (cf)	Main Bay Cumulative Volume (cf)	Total Volume (cf)
232	0 sf	0 cf	0 cf	1,885 sf	0 cf	0 cf	0 cf
233	0 sf	0 cf	0 cf	2,634 sf	2,260 cf	2,260 cf	2,260 cf
234	950 sf	0 cf	0 cf	3,441 sf	3,038 cf	5,297 cf	5,297 cf
235	1,204 sf	1,077 cf	1,077 cf	4,306 sf	3,874 cf	9,171 cf	10,248 cf
236	1,485 sf	1,345 cf	2,422 cf	5,228 sf	4,767 cf	13,938 cf	16,359 cf
236.5	1,636 sf	780 cf	3,202 cf	5,711 sf	2,735 cf	16,672 cf	19,874 cf
237	2,127 sf	941 cf	4,143 cf	6,719 sf	3,108 cf	19,780 cf	23,922 cf

Forebay %	**17.32%**
	GOOD

Is Littoral Shelf submerged?	=>	YES
Choose Average Depth Equation (Typ. Equation 2 if shelf is **not** submerged, Equation 3 if shelf is submerged)	=>	Equation 3

Equation 3. Average depth when the shelf is partially or fully submerged and the shelf is being excluded from the average depth calculation

$$D_{avg} = \frac{V_{PP} - V_{shelf}}{A_{bottom\ of\ shelf}}$$

Where:
- D_{avg} = Average depth (feet)
- V_{PP} = Main pool volume at permanent pool elevation (feet^3)
- V_{shelf} = Volume over the shelf only (feet^3) – see below
- $A_{bottom\ of\ shelf}$ = Area of main pool at the bottom of the shelf (feet^2)

$$V_{shelf} = 0.5 * Depth_{max\ over\ shelf} * Perimeter_{perm\ pool} * Width_{submerged\ part\ of\ shelf}$$

Where:
- $Depth_{max\ over\ shelf}$ = Depth of water at the deep side of the shelf as measured from the permanent pool (feet)
- $Perimeter_{perm\ pool}$ = Perimeter of main pool at the bottom of the shelf (feet)
- $Width_{submerged\ part\ of\ shelf}$ = Width from the deep side to the dry side of the shelf as measured at permanent pool (feet)

Elev. @ Bottom of Pond (ft)	232.00
Elev. @ Bottom of Littoral Shelf (ft)	236.50
Permanent Pool Elevation (ft)	237.00
Permanent Pool Perimeter (ft)	2482.00 ft
$Width_{submerged\ part\ of\ shelf}$	3.00 ft

Main Pool Volume (V_{PP})	19,780 cf	
Surface Area at bottom of shelf (A_{bottom}	5,711 sf	
Depth of water within shelf	0.50 ft	
Volume over the Shelf (V_{shelf})	1,862 cf	
Average Depth (Using Equation 3)	**3.14 ft**	GOOD

Check Minimum Surface Area

Piedmont or Coastal?			Piedmont
% Impervious	44.84%	=>	40.00%
Average Depth	3.14 ft	=>	3.0 ft
Minimum SA / DA Ratio			1.51
Minimum Permanent Pool Surface Area			6,407 sf
Provided Permanent Pool Surface Area			6,719 sf GOOD

Table 1: Piedmont and Mountain SA/DA Table (Adapted from Driscoll, 1986)

Percent Impervious Cover	Permanent Pool Average Depth (ft)					
	3.0	*4.0*	*5.0*	*6.0*	*7.0*	*≥8.0*
10%	0.51	0.43	0.37	0.30	0.27	0.25
20%	0.84	0.69	0.61	0.51	0.44	0.40
30%	1.17	0.94	0.84	0.72	0.61	0.56
40%	1.51	1.24	1.09	0.91	0.78	0.71
50%	1.79	1.51	1.31	1.13	0.95	0.87
60%	2.09	1.77	1.49	1.31	1.12	1.03
70%	2.51	2.09	1.80	1.56	1.34	1.17
80%	2.92	2.41	2.07	1.82	1.62	1.40
90%	3.25	2.64	2.31	2.04	1.84	1.59
100%	3.55	2.79	2.52	2.34	2.04	1.75

RISER BUOYANCY CALCULATIONS

ANTI FLOATATION COMPUTATIONS

Project Name: Harris Creek Farms
Project Location: Wake County
Job Number:

Date: 5/29/2025
Designer: JAC
Plan Label: SCM No. 1

Riser Top Elevation	235.80
Riser Invert Out	232.00
Riser Bottom Elevation	227.00
Riser Length (ft)	5.0 ft
Riser Width (ft)	5.0 ft
Riser Thickness (ft)	0.5 ft
Riser Base Length (ft)	7.0 ft
Riser Base Width (ft)	7.0 ft
Riser Base Thickness (ft)	2.0 ft

References

Weight of Concrete per CF	=	145 lb
Weight of Water per CF	=	62.4 lb

1. Determine volume of concrete/riser

Concrete Base	Surface Area			Thickness							
	49	Sq Ft	X	2.0 ft	ft	=	98	CF			
Concrete Riser	Surface Area			Height							
	5.25	Sq Ft	X	3.80	ft	=	19.95	CF			
Concrete Fill Inside Riser	Surface Area			Height							
	25	Sq Ft	X	5.00	ft	=	125	CF			
				Total Weight			242.95	CF	X	145 lb	= **35,227.8** lb

2. Determine volume of water displaced

Concrete Base	Surface Area			Thickness							
	49	Sq Ft	X	2.0 ft	ft	=	98	CF			
Concrete Riser	Surface Area			Height							
	30.25	Sq Ft	X	8.80	ft	=	266.2	CF			
				Total Weight			364.2	CF	X	62.4 lb	= **22,726.1** lb

3. Weight comparison

Total Weight of Structure (section 1)	35,227.75 lbs
Total Weight of Displaced Water (section 2)	22,726.08 lbs
Factor of Safety (Min. 1.15)	**1.55**

ANTI FLOATATION COMPUTATIONS

Project Name: Harris Creek Farms
Project Location: Wake County
Job Number:

Date: 5/29/2025
Designer: JAC
Plan Label: SCM No. 2

Riser Top Elevation	238.75
Riser Invert Out	231.50
Riser Bottom Elevation	230.50
Riser Length (ft)	4.0 ft
Riser Width (ft)	4.0 ft
Riser Thickness (ft)	0.5 ft
Riser Base Length (ft)	6.5 ft
Riser Base Width (ft)	6.5 ft
Riser Base Thickness (ft)	2.0 ft

1. Determine volume of concrete/riser

References

Weight of Concrete per CF	=	145	lb
Weight of Water per CF	=	62.4	lb

	Surface Area			Thickness			
Concrete Base	42.25	Sq Ft	X	2.0 ft	ft =	84.5	CF
Concrete Riser	4.25	Sq Ft	X	7.25 ft	ft =	30.8125	CF
Concrete Fill Inside Riser	16	Sq Ft	X	1.00 ft	ft =	16	CF

Total Weight 131.313 CF X 145 lb = **19,040.3** lb

2. Determine volume of water displaced

	Surface Area			Thickness			
Concrete Base	42.25	Sq Ft	X	2.0 ft	ft =	84.5	CF
Concrete Riser	20.25	Sq Ft	X	8.25 ft	ft =	167.063	CF

Total Weight 251.563 CF X 62.4 lb = **15,697.5** lb

3. Weight comparison

Total Weight of Structure (section 1)	19,040.31 lbs
Total Weight of Displaced Water (section 2)	15,697.50 lbs
Factor of Safety (Min. 1.15)	**1.21**