STORMWATER MANAGEMENT

Prepared By:

GPD Group
520 S. Main Street, Suite 2531
Akron, OH 44311

Prepared For:
Hudson Engineering Department
1140 Terex Road
Hudson, Ohio 44236

CENTRAL CAMPUS SITE IMPROVEMENTS

N. Oviatt Drive Widening

Property Owners:
North Canton Board of Education

Civil Designer:
Kendra Sanelli

Project Manager:
Michael Cefaratti, P.E.

Design Date:
April 2025

Revision Date
-

GPD Project Number:
2024128.01

Leonardo Sferra, P.E. — 04/14/25 Date

The Hudson City School District is proposing to widen the entrance off North Oviatt Street to better serve the Middle school during pick up and drop off times. The District looks to add one additional queuing lane south of the current drive with new site lighting, landscaping, accessible ramp and walk connection to the public R/W, and new pavement markings. There is approximately 0.69 acres of disturbance anticipated for this improvement including the demolition and abatement of a home, site grading and utility improvements.

The subject parcel encompasses various school and school-related facilities over 91.94 acres. The site sits north of SR 303, east of Oviatt Street, south of Franklin and Aurora Street, and west of N. Hayden Parkway in the City of Hudson, Summit County, Ohio. The proposed work will affect the western exit of the site off North Oviatt Street. The total disturbance for this improvement makes up 0.8% of the total campus.

A multitude of projects have occurred on this property over the years as the needs of the District have evolved. Since the last stormwater design was completed for the New Middle School, a 1927 portion of the old Middle School was demolished along with its associated walks directly south of the proposed project. Additionally, a surface lot behind the was converted back to green space near the school's entrance off North Oviatt. Neither of these two demolition activities were accounted for in the most-recent Middle School Campus stormwater calculations. The removal of these two items resulted in a significant net reduction in impervious surface area.

Existing conditions, including these two impervious areas were modeled in the existing condition to fully understand the hydraulic impact removing nearly 0.75 acres of impervious had on the system. For this model, NOAA rainfall and intensity data was used.

Attached herein, two maps of the overall western entrance (1.99 acres) are shown. These maps indicate that with the existing home, surface lot and 1927 Middle School in tact in the pre-developed conditions, there is a total of 1.14 acres of impervious. However, with the demolition of these items and all lane widening proposed work, there is only 0.47 acres of impervious. The included hydrographs model proves that outflow rates are controlled to less-than the pre-existing conditions, therefore, detention requirements have been waived. GPD used the rational method to analyze the local watershed as described herein. Please see Summary Table below summarizing the results of the hydrograph analysis.

	PRE (CFS)	POST (CFS)
1 YR	4.253	2.995
2 YR	5.091	3.585
5 YR	6.164	4.341
10 YR	6.975	4.912
25 YR	8.023	5.650
50 YR	8.791	6.191
100 YR	9.569	6.739

Table 1: Hydrograph Summary

Per the requirements of the *City of Hudson Stormwater Ordinance* and the *Ohio Environmental Protection Agency (OEPA)*, sites disturbing over one acre of land are required to provide post construction BMPs to treat runoff before it leaves the site. With a total disturbance of approximately 0.69 acres, post-construction water quality BMP's will not be required for this site. The true disturbance limit of work is shown on the maps herein.

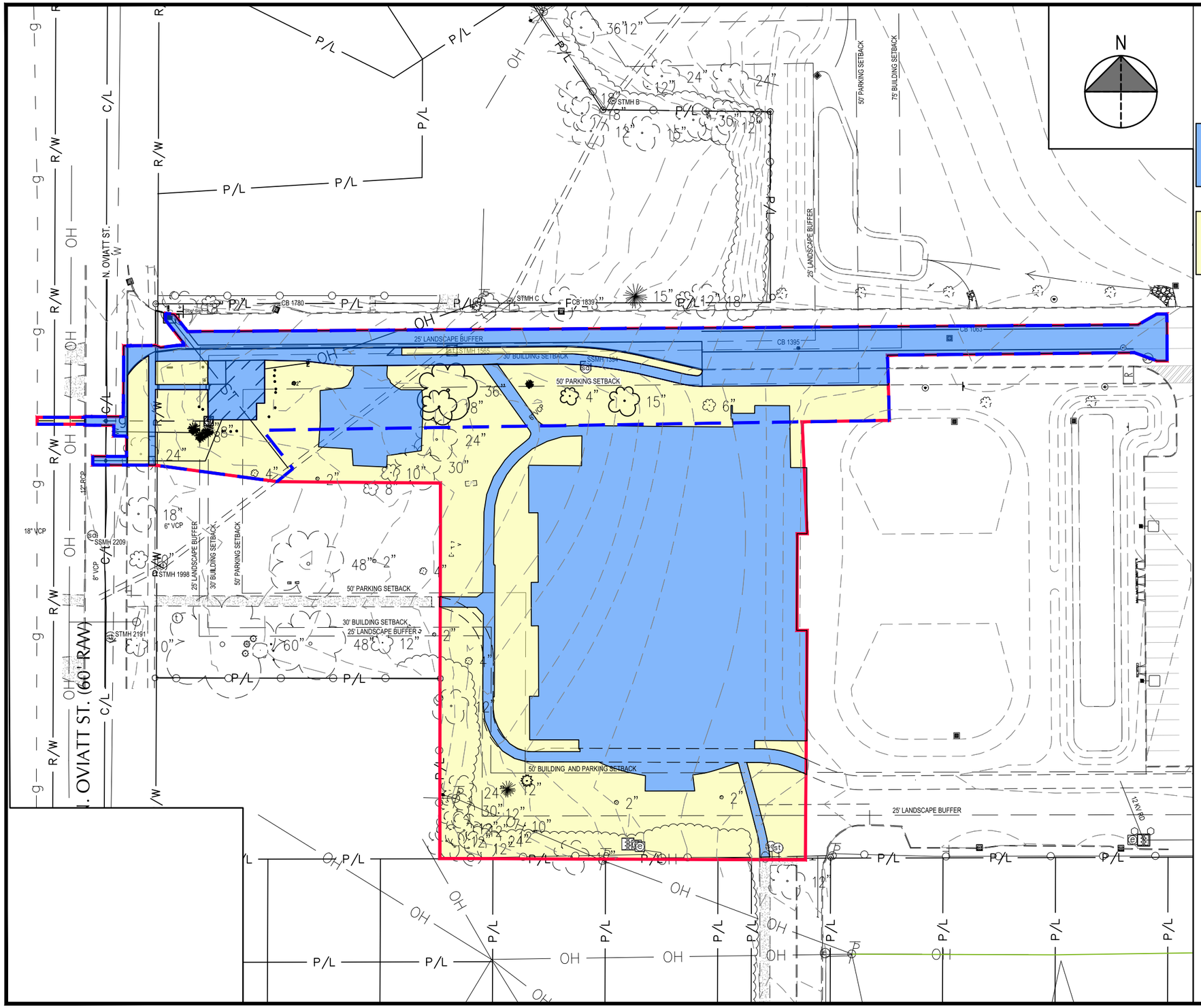
In the proposed work area, rainfall currently sheet flows to 1 of 3 on-grade inlets on the north side of the drive before they tie into the City 3'x3' box culvert. Although redundant, a new inlet with 12" HDPE pipe is proposed downstream to collect any water that may have bypassed the upstream structures. Additionally, in the event that the upstream pipes are to become clogged, the new structure is designed to convey all these flows to the box culvert. Calculations can be found herein with map depicting tributary catchment.

Attachments:

1. Pre Development and Post Development Watershed Map (Overall) with disturbance limits
2. Storm Sewer Catchment Map and Calculations
3. Hydrographs
4. NOAA Intensity and Rainfall
5. Soil Mapping

HCSD CENTRAL CAMPUS
SITE IMPROVEMENTS

JOB NO.
2024098.05



PRE-DEVELOPED CONDITIONS

BOUNDARY OF ANALYSIS = 1.99 ACRES

DISTURBANCE LIMITS = 0.69 ACRES

COVER TYPE:	IMPERVIOUS SURFACE COVER
AREA (ACRES):	1.14

COVER TYPE:	PERVIOUS SURFACE COVER
AREA (ACRES):	0.85

HCSD CENTRAL CAMPUS
SITE IMPROVEMENTS

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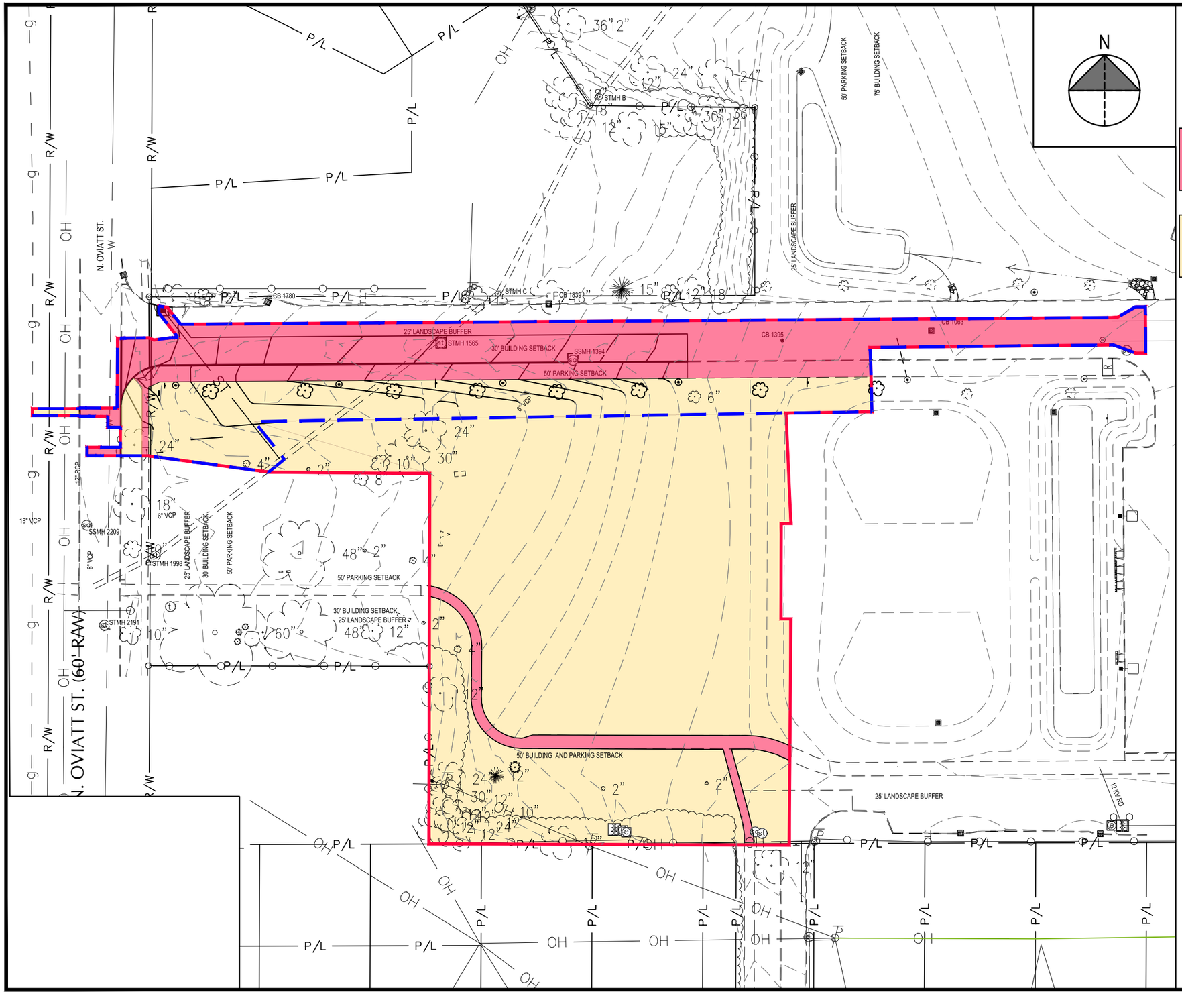
2024098.05



POST-DEVELOPED CONDITIONS

BOUNDARY OF ANALYSIS = 1.99

DISTURBANCE LIMITS = 0.69 ACRES

COVER TYPE:	IMPERVIOUS SURFACE COVER
AREA (ACRES):	0.47

COVER TYPE:	PERVIOUS SURFACE COVER
AREA (ACRES):	1.52

HCSD CENTRAL CAMPUS
SITE IMPROVEMENTS

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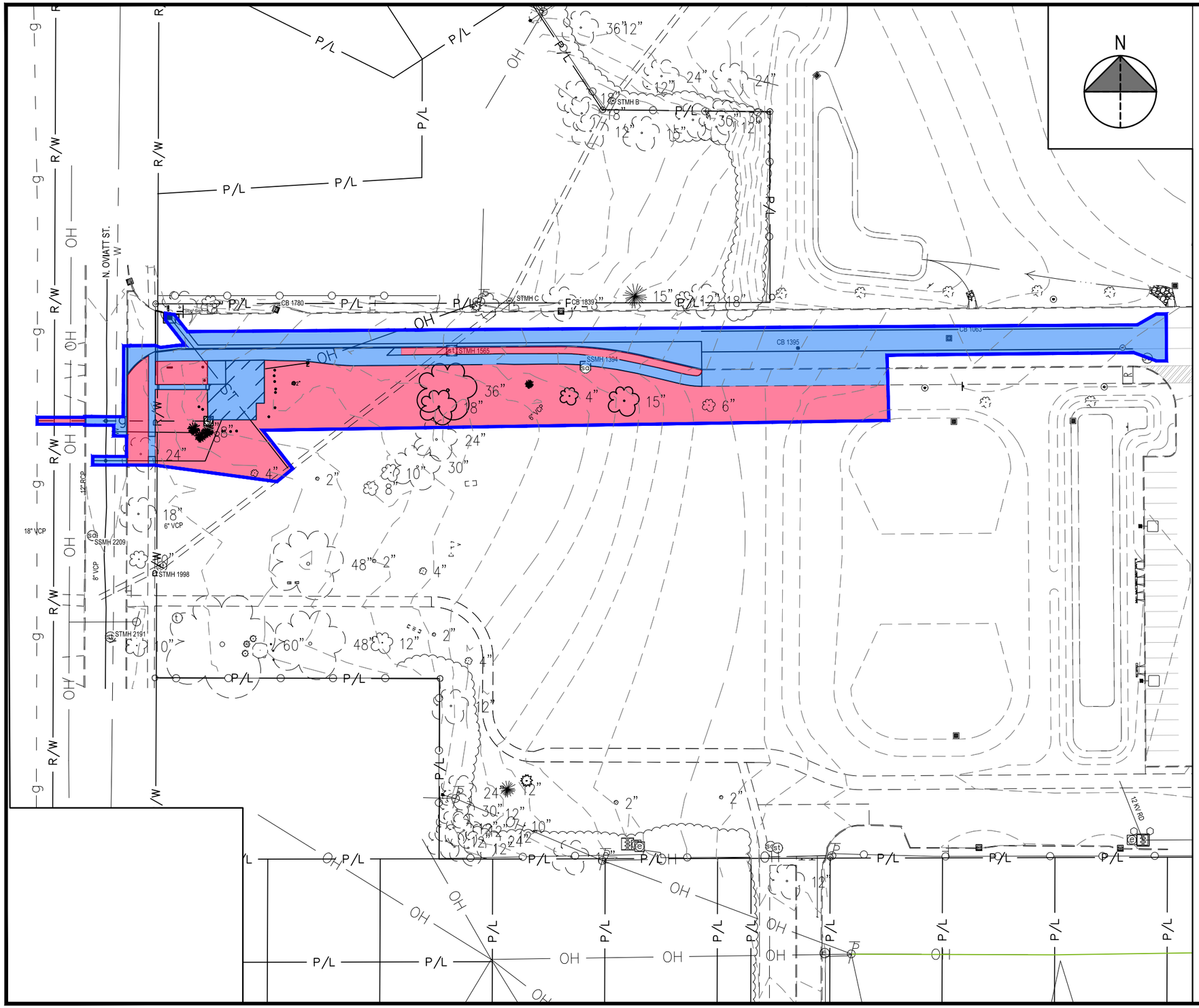
2024098.05



PRE-DEVELOPED CONDITIONS

TOTAL DISTURBED AREA UNDER ANALYSIS = 0.69 ACRES

BOUNDARY OF ANALYSIS

COVER TYPE:	IMPERVIOUS SURFACE COVER
RUNOFF COEFFICIENT	0.98
AREA (ACRES):	0.33

COVER TYPE:	PERVIOUS SURFACE COVER
RUNOFF COEFFICIENT	0.35
AREA (ACRES):	0.36

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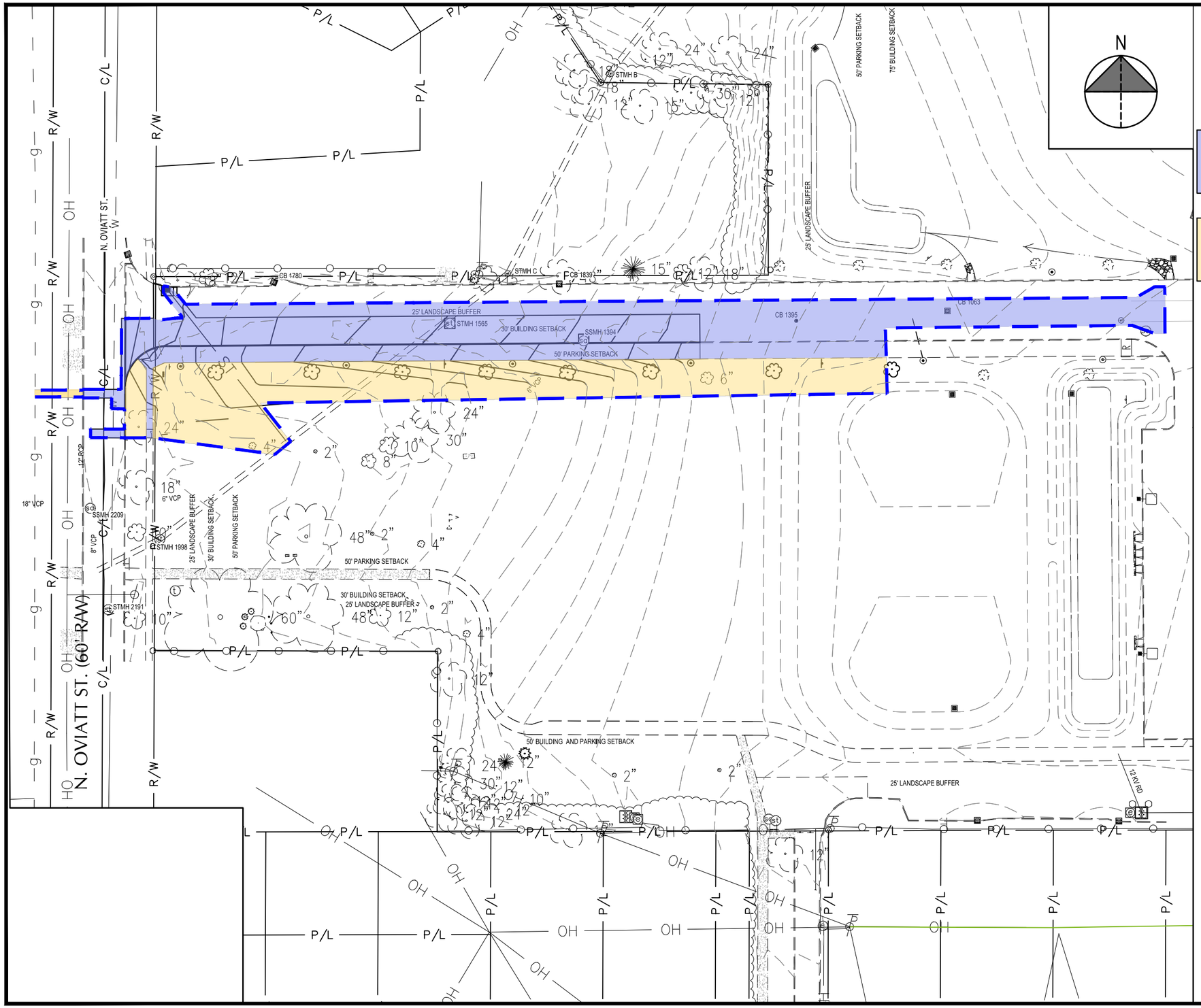

POST-DEVELOPED CONDITIONS

TOTAL DISTURBED AREA UNDER ANALYSIS = 0.69 ACRES

BOUNDARY OF ANALYSIS

COVER TYPE:	IMPERVIOUS SURFACE COVER
RUNOFF COEFFICIENT	0.98
AREA (ACRES):	0.42

COVER TYPE:	PERVIOUS SURFACE COVER
RUNOFF COEFFICIENT	0.35
AREA (ACRES):	0.27

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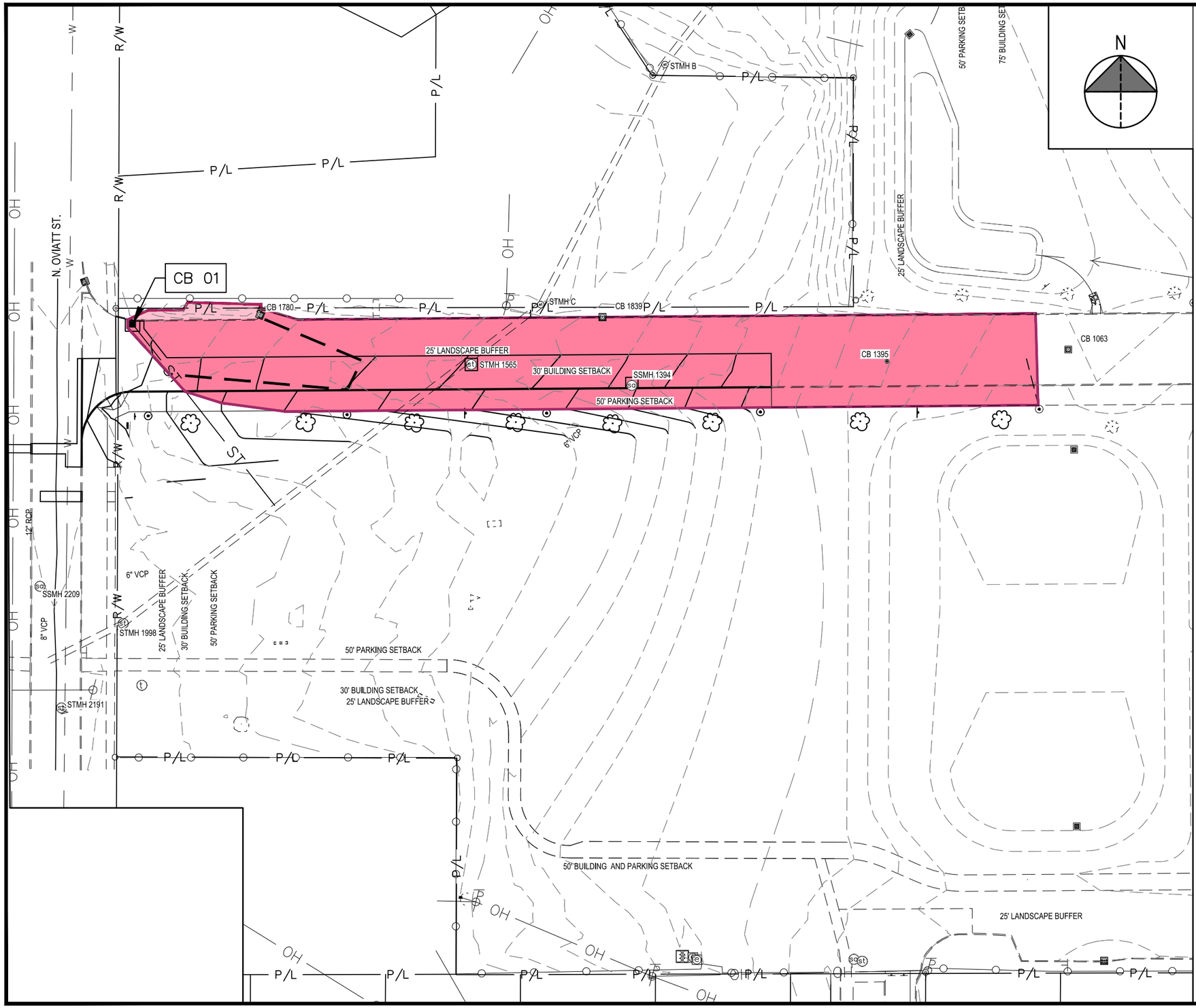


PROPOSED CATCHMENT MAP
MIDDLE SCHOOL DRIVE WIDENING

TRIBUTARY BOUNDARY = 0.07 ACRES
DESIGN BOUNDARY = 0.44 ACRES

COVER TYPE:	IMPERVIOUS SURFACE COVER
AREA (ACRES):	0.43
C	0.98

COVER TYPE:	PERVIOUS SURFACE COVER
AREA (ACRES):	0.01
C	0.35

RATIONAL EQUATION

Q=CiA
WHERE:
C= (0.43*0.98)+(0.01*0.35)/0.44
C=0.97

i= 10 MINUTE 100 YEAR STORM
i= 6.56 INCHES/HOUR (NOAA)

A= 0.44 ACRES
Q=CiA
Q=(0.97)(6.56)(0.44)
Q=2.80 CFS

MANNINGS EQUATION

PROPOSED PIPE
SLOPE = 0.5%
DIA.= 12"
HDPE N=0.009
PIPE Q = 3.65 CFS

3.65 CFS> 2.80CFS; THUS PIPE IS SIZED ADEQUATELY TO CARRY 100 YEAR STORM TO 3'X3' BOX CULVERT IN EVENT UPSTREAM INLETS ARE CLOGGED.

Watershed Model Schematic

Legend

Hyd.	Origin	Description
1	Rational	PRE
2	Rational	POST

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Rational	------	4.253	5.091	-------	6.164	6.975	8.023	8.791	9.569	PRE
2	Rational	------	2.995	3.585	-------	4.341	4.912	5.650	6.191	6.739	POST

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	4.253	1	10	2,552	------	------	------	PRE
2	Rational	2.995	1	10	1,797	------	------	------	POST

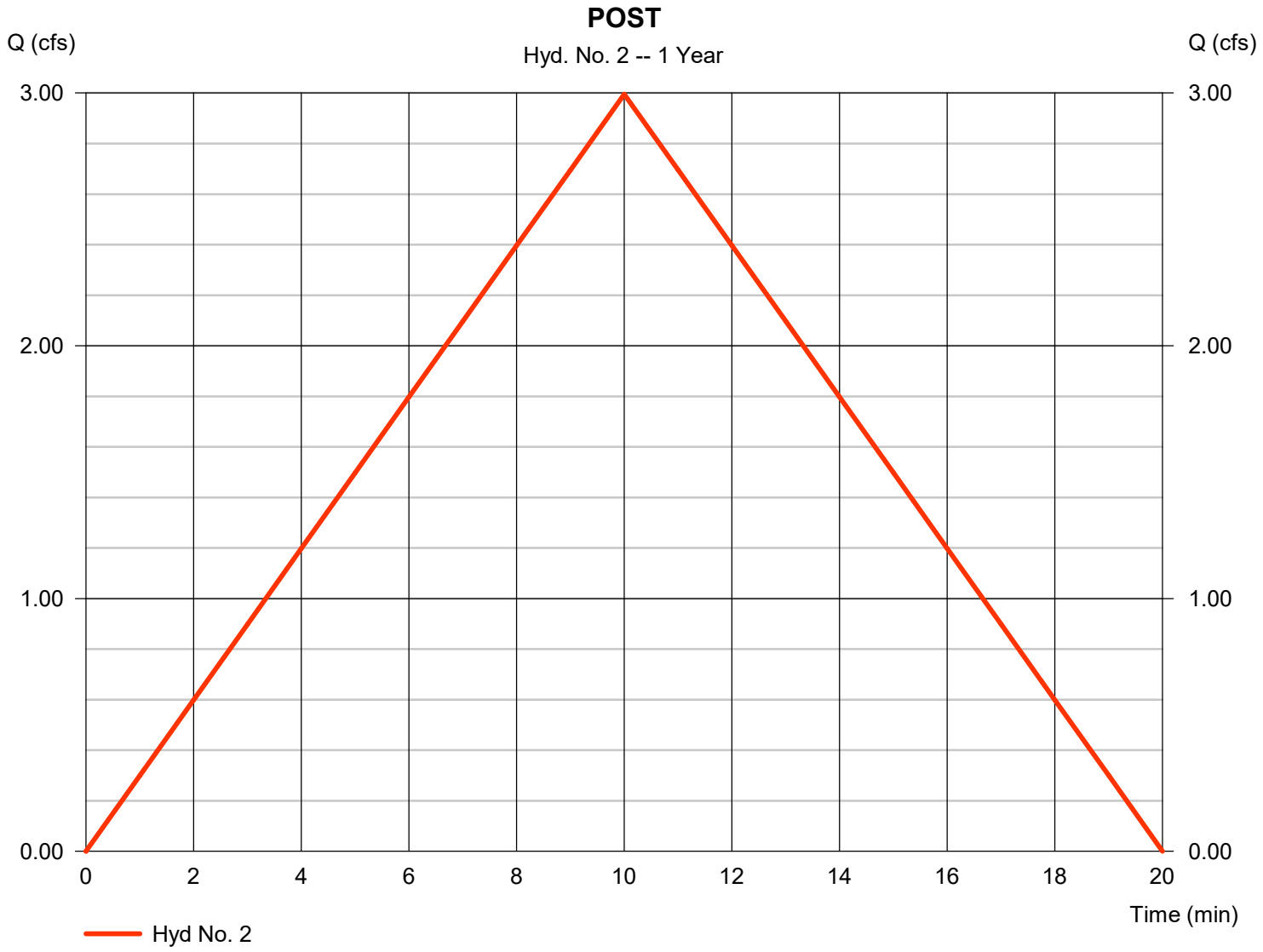
Hydrograph Report

Hyd. No. 2

POST

Hydrograph type	=	Rational	Peak discharge	=	2.995 cfs
Storm frequency	=	1 yrs	Time to peak	=	10 min
Time interval	=	1 min	Hyd. volume	=	1,797 cuft
Drainage area	=	1.990 ac	Runoff coeff.	=	0.5*
Intensity	=	3.010 in/hr	Tc by User	=	10.00 min
IDF Curve	=	Hudson IDF.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(0.470 x 0.98) + (1.520 x 0.35)] / 1.990



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	5.091	1	10	3,054	------	------	------	PRE
2	Rational	3.585	1	10	2,151	------	------	------	POST

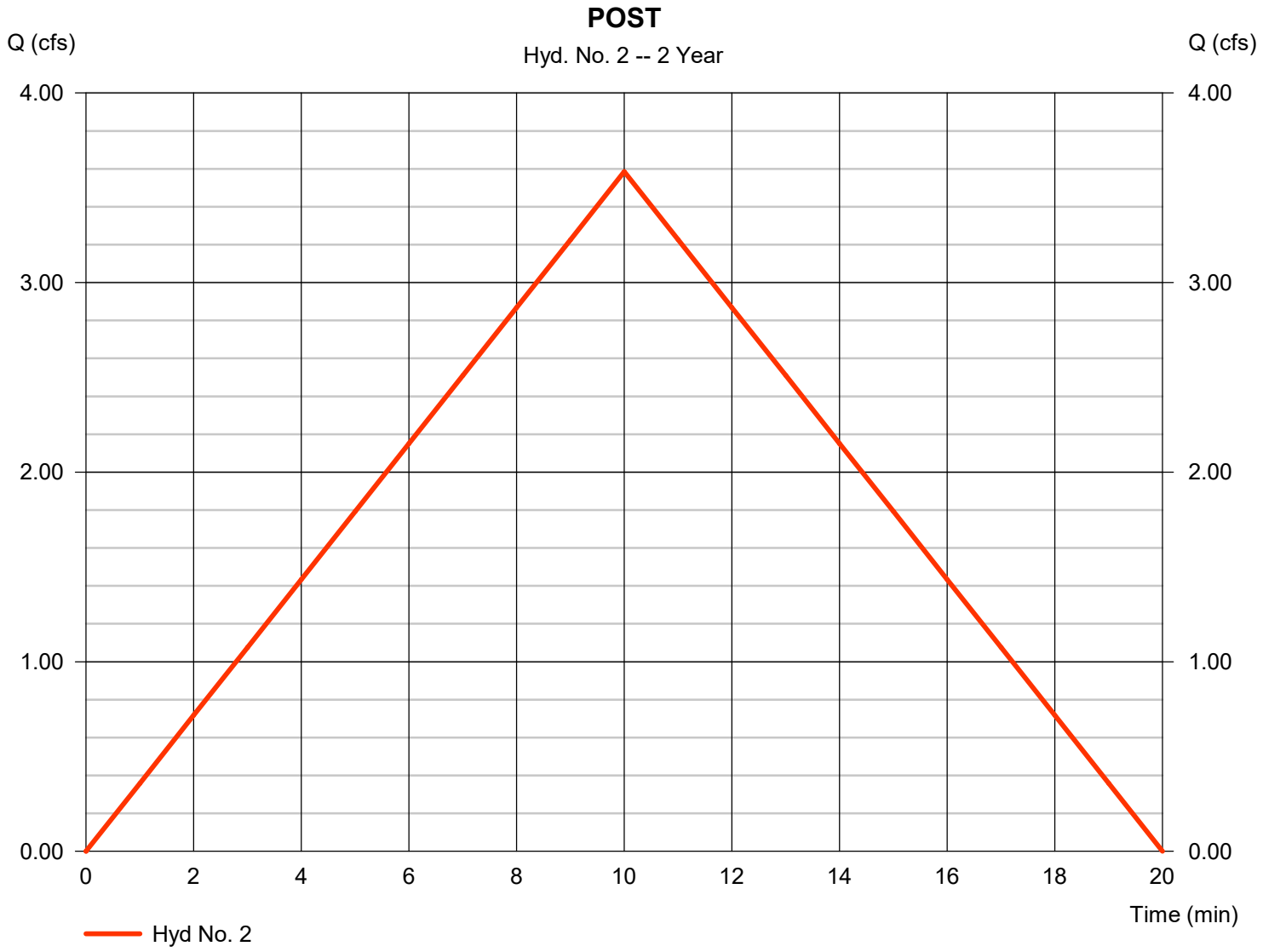
Hydrograph Report

Hyd. No. 2

POST

Hydrograph type	=	Rational	Peak discharge	=	3.585 cfs
Storm frequency	=	2 yrs	Time to peak	=	10 min
Time interval	=	1 min	Hyd. volume	=	2,151 cuft
Drainage area	=	1.990 ac	Runoff coeff.	=	0.5*
Intensity	=	3.603 in/hr	Tc by User	=	10.00 min
IDF Curve	=	Hudson IDF.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(0.470 x 0.98) + (1.520 x 0.35)] / 1.990



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	6.164	1	10	3,698	------	------	------	PRE
2	Rational	4.341	1	10	2,604	------	------	------	POST

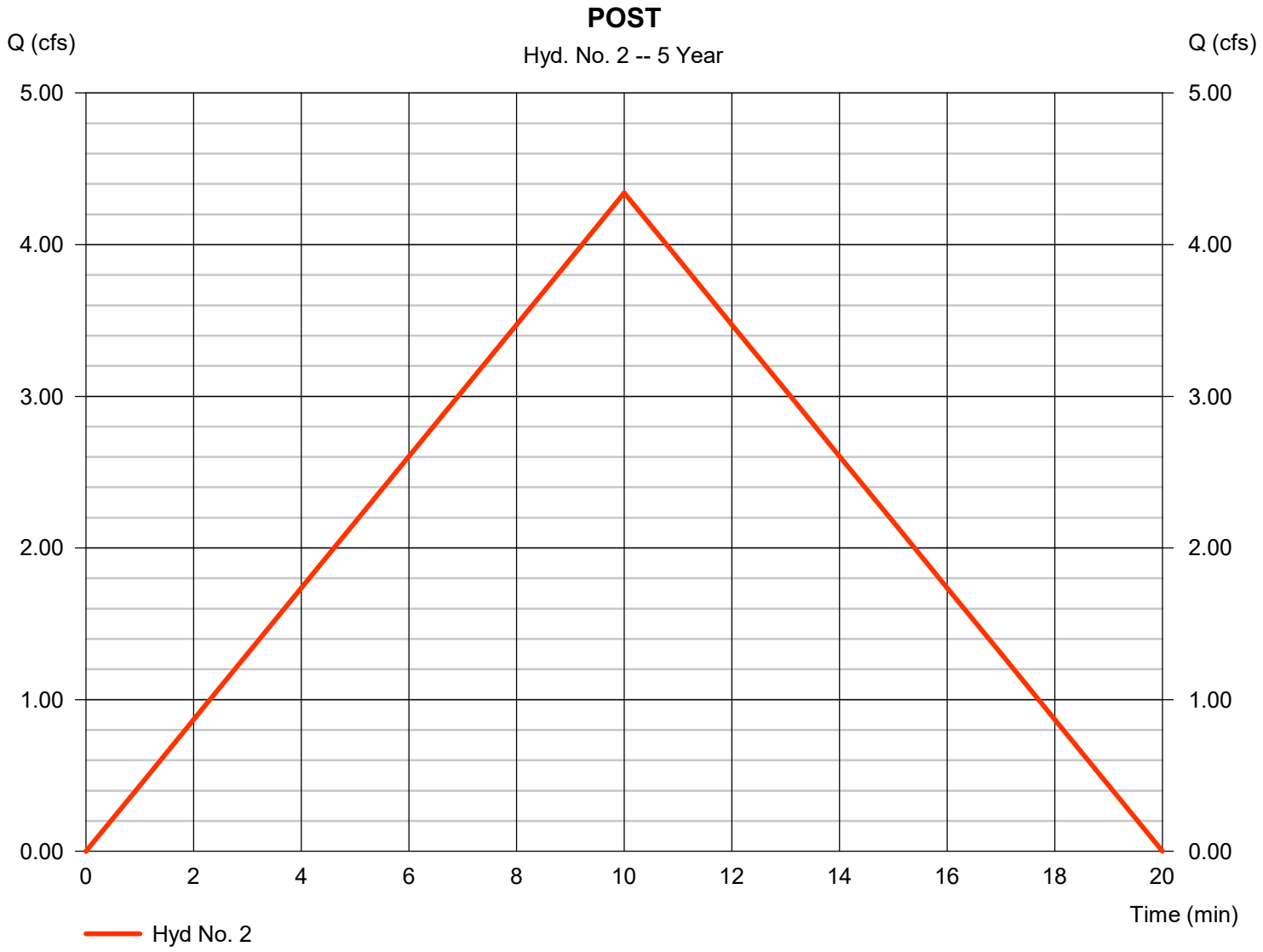
Hydrograph Report

Hyd. No. 2

POST

Hydrograph type	=	Rational	Peak discharge	=	4.341 cfs
Storm frequency	=	5 yrs	Time to peak	=	10 min
Time interval	=	1 min	Hyd. volume	=	2,604 cuft
Drainage area	=	1.990 ac	Runoff coeff.	=	0.5*
Intensity	=	4.362 in/hr	Tc by User	=	10.00 min
IDF Curve	=	Hudson IDF.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(0.470 x 0.98) + (1.520 x 0.35)] / 1.990



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	6.975	1	10	4,185	------	------	------	PRE
2	Rational	4.912	1	10	2,947	------	------	------	POST

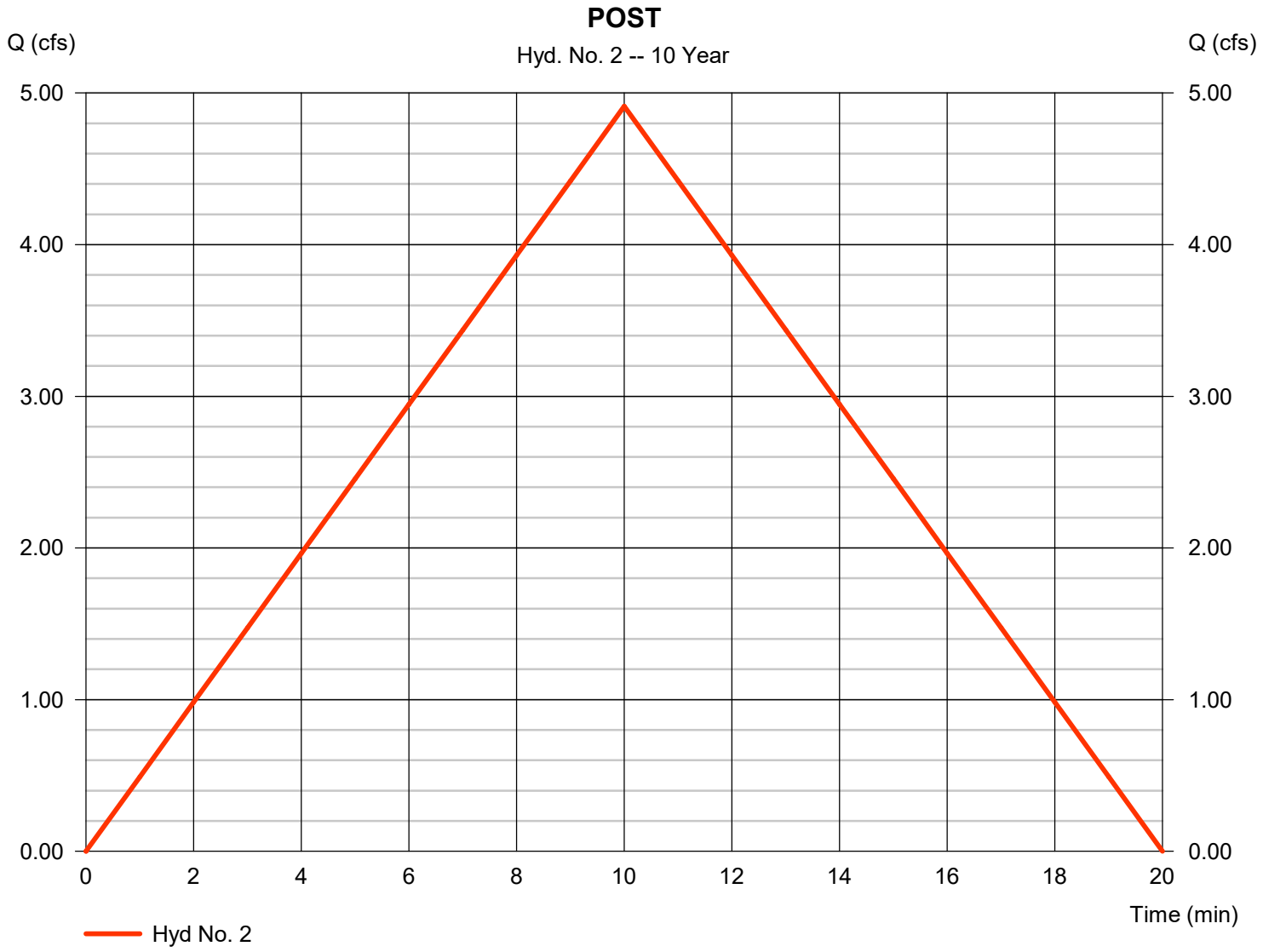
Hydrograph Report

Hyd. No. 2

POST

Hydrograph type	=	Rational	Peak discharge	=	4.912 cfs
Storm frequency	=	10 yrs	Time to peak	=	10 min
Time interval	=	1 min	Hyd. volume	=	2,947 cuft
Drainage area	=	1.990 ac	Runoff coeff.	=	0.5*
Intensity	=	4.937 in/hr	Tc by User	=	10.00 min
IDF Curve	=	Hudson IDF.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(0.470 x 0.98) + (1.520 x 0.35)] / 1.990



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	8.023	1	10	4,814	------	------	------	PRE
2	Rational	5.650	1	10	3,390	------	------	------	POST

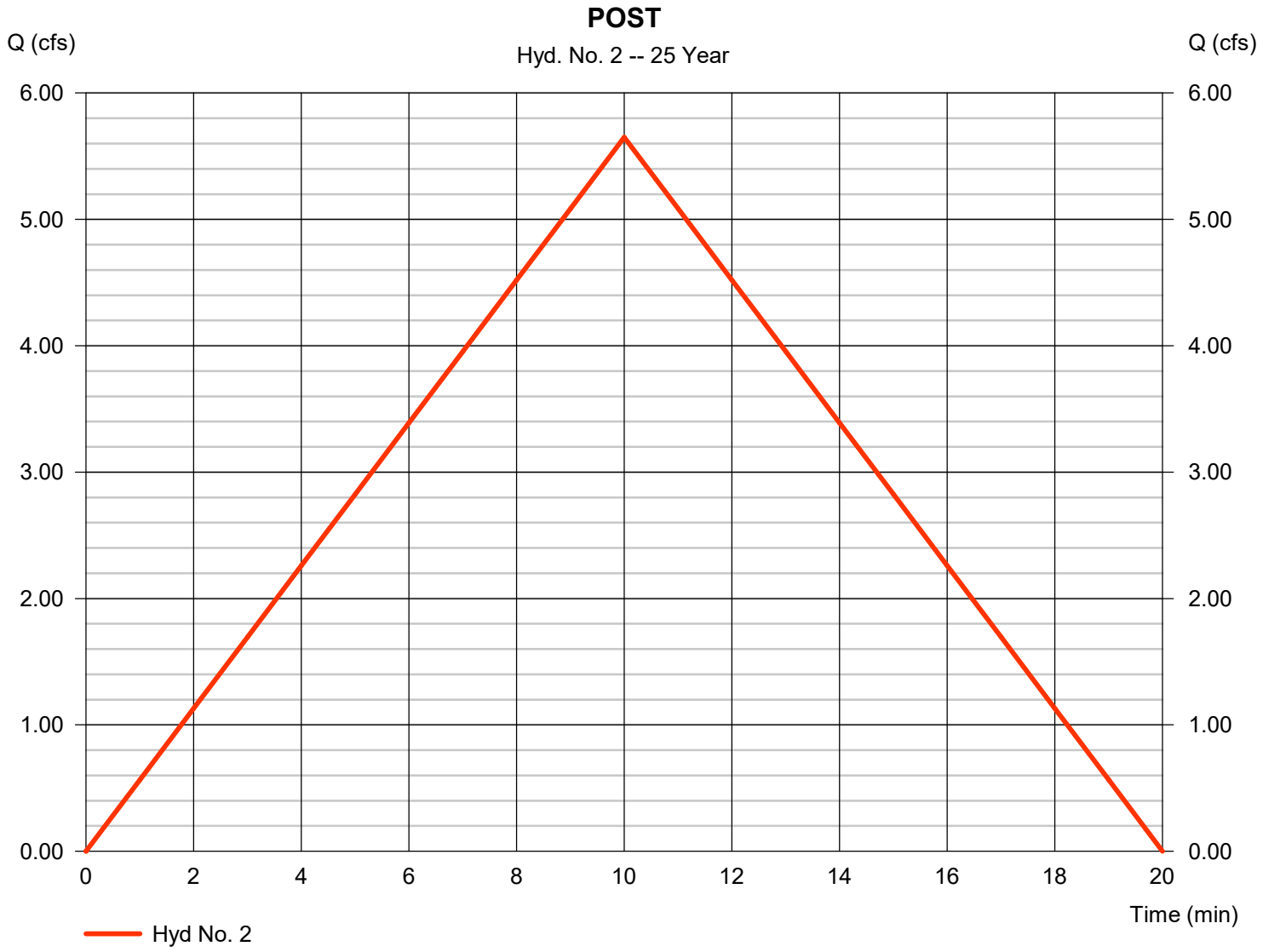
Hydrograph Report

Hyd. No. 2

POST

Hydrograph type	=	Rational	Peak discharge	=	5.650 cfs
Storm frequency	=	25 yrs	Time to peak	=	10 min
Time interval	=	1 min	Hyd. volume	=	3,390 cuft
Drainage area	=	1.990 ac	Runoff coeff.	=	0.5*
Intensity	=	5.679 in/hr	Tc by User	=	10.00 min
IDF Curve	=	Hudson IDF.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(0.470 x 0.98) + (1.520 x 0.35)] / 1.990



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	8.791	1	10	5,274	------	------	------	PRE
2	Rational	6.191	1	10	3,714	------	------	------	POST

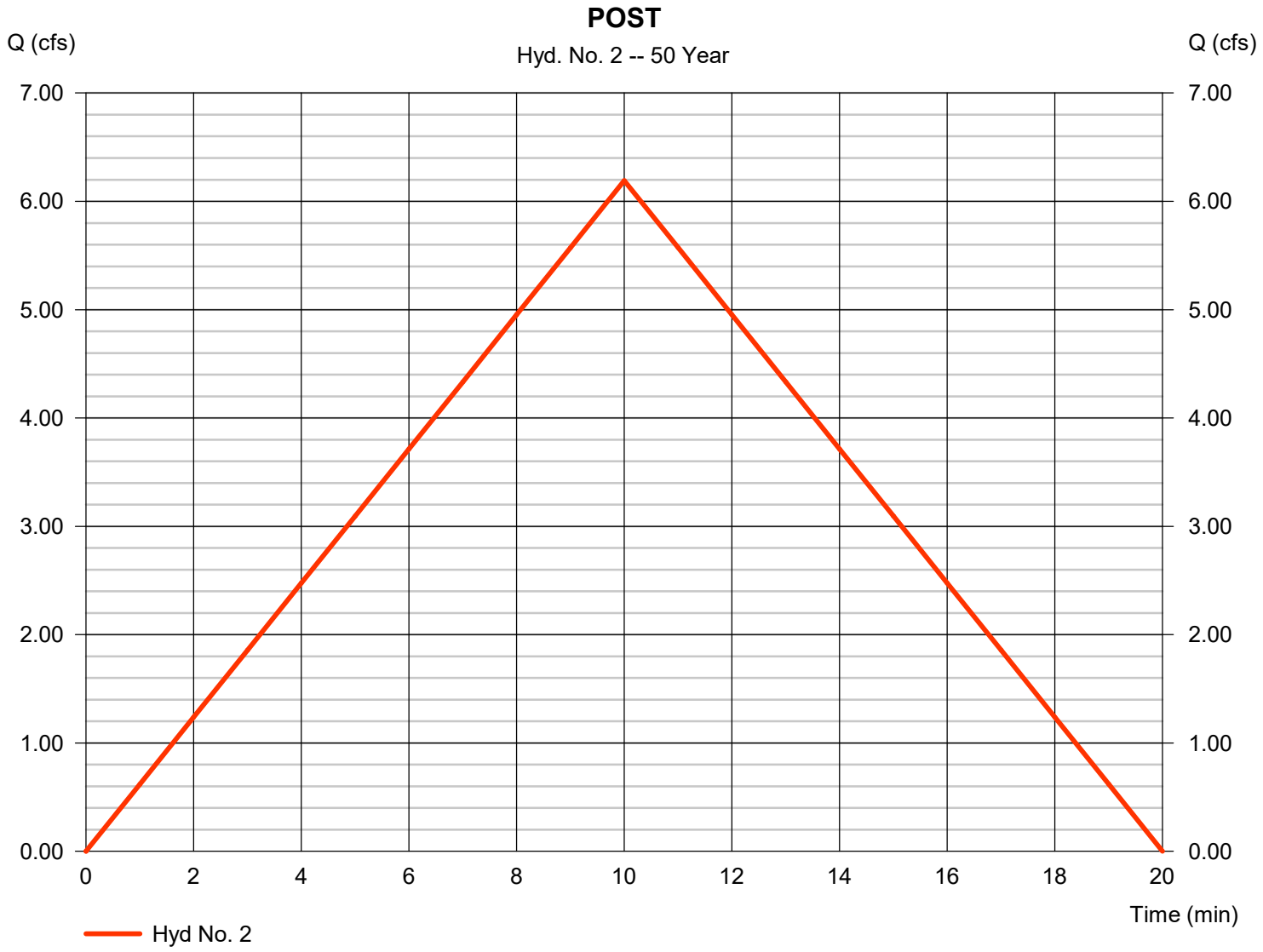
Hydrograph Report

Hyd. No. 2

POST

Hydrograph type	=	Rational	Peak discharge	=	6.191 cfs
Storm frequency	=	50 yrs	Time to peak	=	10 min
Time interval	=	1 min	Hyd. volume	=	3,714 cuft
Drainage area	=	1.990 ac	Runoff coeff.	=	0.5*
Intensity	=	6.222 in/hr	Tc by User	=	10.00 min
IDF Curve	=	Hudson IDF.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(0.470 x 0.98) + (1.520 x 0.35)] / 1.990



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	9.569	1	10	5,741	------	------	------	PRE
2	Rational	6.739	1	10	4,043	------	------	------	POST

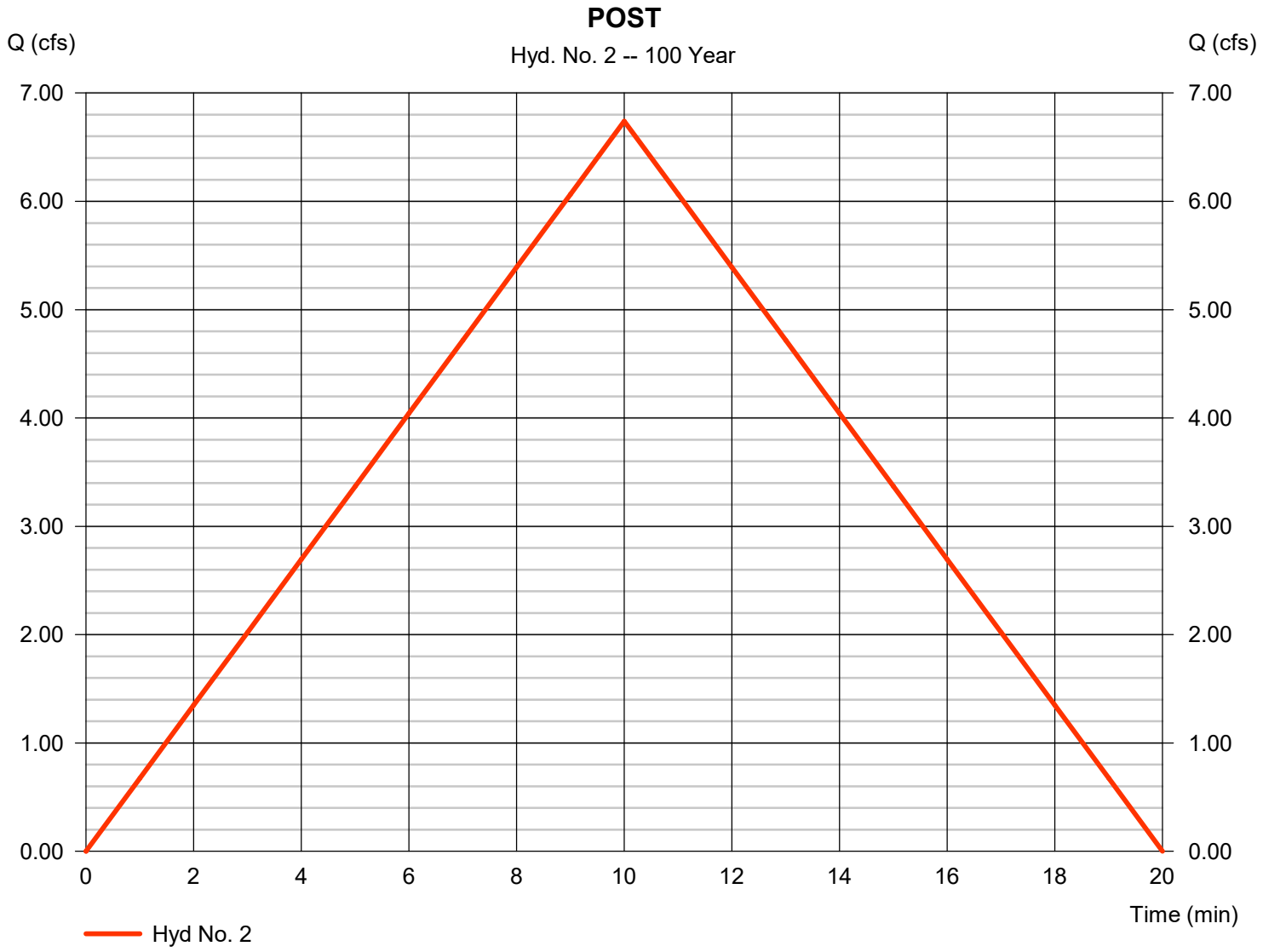
Hydrograph Report

Hyd. No. 2

POST

Hydrograph type	=	Rational	Peak discharge	=	6.739 cfs
Storm frequency	=	100 yrs	Time to peak	=	10 min
Time interval	=	1 min	Hyd. volume	=	4,043 cuft
Drainage area	=	1.990 ac	Runoff coeff.	=	0.5*
Intensity	=	6.773 in/hr	Tc by User	=	10.00 min
IDF Curve	=	Hudson IDF.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(0.470 x 0.98) + (1.520 x 0.35)] / 1.990



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	45.1304	10.4000	0.8978	--------
2	48.9583	10.0000	0.8710	--------
3	0.0000	0.0000	0.0000	--------
5	51.8623	9.6000	0.8320	--------
10	48.5688	8.5000	0.7836	--------
25	47.3122	7.6000	0.7392	--------
50	43.2550	6.4000	0.6932	--------
100	40.6329	5.5000	0.6537	--------

File name: Hudson IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	3.87	3.01	2.47	2.10	1.84	1.63	1.47	1.34	1.23	1.14	1.06	0.99
2	4.63	3.60	2.97	2.53	2.21	1.97	1.78	1.62	1.49	1.38	1.29	1.21
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	5.57	4.36	3.61	3.10	2.72	2.43	2.20	2.01	1.86	1.73	1.62	1.52
10	6.32	4.94	4.09	3.52	3.10	2.78	2.53	2.32	2.15	2.00	1.88	1.77
25	7.27	5.68	4.72	4.07	3.60	3.24	2.95	2.72	2.53	2.36	2.22	2.10
50	8.01	6.22	5.17	4.47	3.97	3.58	3.27	3.03	2.82	2.64	2.49	2.36
100	8.74	6.77	5.64	4.89	4.35	3.94	3.61	3.35	3.13	2.94	2.78	2.64

Tc = time in minutes. Values may exceed 60.

New MS\4_Working Files\00_(software version year) CAD\C\SWM\Detention\North Canton Rainfall Depth Data.IDF.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.03	2.43	1.00	3.03	3.53	4.28	4.93	5.63
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

NOAA Atlas 14, Volume 2, Version 3
Location name: Hudson, Ohio, USA*
Latitude: 41.2426°, Longitude: -81.4315°
Elevation: 1102 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	**3.88** (3.54-4.26)	**4.63** (4.22-5.09)	**5.59** (5.09-6.13)	**6.34** (5.75-6.94)	**7.28** (6.58-7.97)	**8.00** (7.20-8.76)	**8.71** (7.80-9.53)	**9.42** (8.39-10.3)	**10.4** (9.17-11.4)	**11.1** (9.71-12.2)
10-min	**3.01** (2.75-3.31)	**3.62** (3.30-3.97)	**4.35** (3.95-4.76)	**4.89** (4.44-5.35)	**5.57** (5.03-6.09)	**6.07** (5.45-6.64)	**6.56** (5.87-7.17)	**7.03** (6.26-7.70)	**7.63** (6.74-8.36)	**8.06** (7.07-8.86)
15-min	**2.46** (2.24-2.70)	**2.95** (2.69-3.24)	**3.56** (3.24-3.90)	**4.01** (3.64-4.39)	**4.59** (4.14-5.02)	**5.00** (4.50-5.48)	**5.43** (4.86-5.94)	**5.83** (5.19-6.38)	**6.34** (5.60-6.96)	**6.72** (5.89-7.38)
30-min	**1.63** (1.49-1.79)	**1.97** (1.80-2.16)	**2.44** (2.22-2.67)	**2.79** (2.53-3.05)	**3.24** (2.93-3.54)	**3.58** (3.22-3.91)	**3.92** (3.51-4.29)	**4.25** (3.79-4.66)	**4.70** (4.15-5.15)	**5.04** (4.41-5.53)
60-min	**0.994** (0.907-1.09)	**1.21** (1.10-1.33)	**1.53** (1.39-1.68)	**1.77** (1.61-1.94)	**2.10** (1.90-2.30)	**2.36** (2.12-2.58)	**2.62** (2.35-2.86)	**2.88** (2.57-3.16)	**3.25** (2.87-3.56)	**3.54** (3.10-3.89)
2-hr	**0.577** (0.526-0.634)	**0.702** (0.640-0.772)	**0.892** (0.812-0.978)	**1.04** (0.946-1.14)	**1.25** (1.13-1.37)	**1.42** (1.28-1.56)	**1.60** (1.43-1.76)	**1.80** (1.59-1.97)	**2.06** (1.81-2.27)	**2.28** (1.99-2.51)
3-hr	**0.409** (0.372-0.450)	**0.497** (0.452-0.547)	**0.632** (0.574-0.695)	**0.739** (0.669-0.812)	**0.892** (0.803-0.978)	**1.02** (0.910-1.12)	**1.15** (1.02-1.26)	**1.29** (1.14-1.42)	**1.49** (1.30-1.64)	**1.66** (1.43-1.82)
6-hr	**0.247** (0.225-0.271)	**0.298** (0.272-0.327)	**0.376** (0.343-0.412)	**0.440** (0.399-0.481)	**0.533** (0.481-0.582)	**0.610** (0.547-0.666)	**0.694** (0.617-0.758)	**0.785** (0.691-0.857)	**0.917** (0.796-1.00)	**1.03** (0.881-1.13)
12-hr	**0.144** (0.131-0.159)	**0.173** (0.158-0.191)	**0.216** (0.196-0.238)	**0.252** (0.229-0.278)	**0.305** (0.274-0.335)	**0.349** (0.312-0.384)	**0.398** (0.353-0.437)	**0.450** (0.396-0.495)	**0.528** (0.457-0.581)	**0.593** (0.508-0.655)
24-hr	**0.085** (0.078-0.092)	**0.101** (0.094-0.110)	**0.126** (0.116-0.137)	**0.146** (0.135-0.159)	**0.176** (0.161-0.191)	**0.201** (0.183-0.217)	**0.228** (0.206-0.247)	**0.257** (0.230-0.279)	**0.300** (0.264-0.326)	**0.336** (0.292-0.366)
2-day	**0.049** (0.045-0.053)	**0.058** (0.054-0.063)	**0.072** (0.066-0.077)	**0.083** (0.076-0.089)	**0.099** (0.091-0.107)	**0.112** (0.102-0.121)	**0.126** (0.114-0.137)	**0.142** (0.127-0.154)	**0.164** (0.145-0.178)	**0.182** (0.159-0.199)
3-day	**0.035** (0.032-0.037)	**0.041** (0.038-0.045)	**0.051** (0.047-0.055)	**0.058** (0.054-0.063)	**0.069** (0.064-0.075)	**0.078** (0.072-0.085)	**0.088** (0.080-0.095)	**0.098** (0.088-0.106)	**0.113** (0.100-0.123)	**0.125** (0.110-0.137)
4-day	**0.027** (0.026-0.030)	**0.033** (0.031-0.035)	**0.040** (0.037-0.043)	**0.046** (0.043-0.050)	**0.055** (0.050-0.059)	**0.061** (0.056-0.066)	**0.069** (0.063-0.074)	**0.076** (0.069-0.083)	**0.087** (0.078-0.095)	**0.096** (0.085-0.105)
7-day	**0.019** (0.018-0.020)	**0.022** (0.021-0.024)	**0.027** (0.025-0.029)	**0.031** (0.029-0.033)	**0.036** (0.034-0.039)	**0.041** (0.038-0.044)	**0.045** (0.042-0.049)	**0.050** (0.046-0.054)	**0.057** (0.051-0.061)	**0.062** (0.055-0.068)
10-day	**0.015** (0.014-0.016)	**0.018** (0.017-0.019)	**0.022** (0.020-0.023)	**0.024** (0.023-0.026)	**0.028** (0.026-0.030)	**0.031** (0.029-0.034)	**0.035** (0.032-0.037)	**0.038** (0.035-0.041)	**0.042** (0.039-0.046)	**0.046** (0.041-0.050)
20-day	**0.010** (0.010-0.011)	**0.012** (0.012-0.013)	**0.014** (0.014-0.015)	**0.016** (0.015-0.017)	**0.018** (0.017-0.020)	**0.020** (0.019-0.022)	**0.022** (0.021-0.023)	**0.024** (0.022-0.025)	**0.026** (0.024-0.028)	**0.028** (0.025-0.030)
30-day	**0.009** (0.008-0.009)	**0.010** (0.010-0.011)	**0.012** (0.011-0.013)	**0.013** (0.012-0.014)	**0.015** (0.014-0.016)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.019** (0.017-0.020)	**0.020** (0.019-0.021)	**0.021** (0.020-0.023)
45-day	**0.007** (0.007-0.008)	**0.009** (0.008-0.009)	**0.010** (0.009-0.010)	**0.011** (0.010-0.011)	**0.012** (0.012-0.013)	**0.013** (0.012-0.014)	**0.014** (0.013-0.015)	**0.015** (0.014-0.016)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)
60-day	**0.006** (0.006-0.007)	**0.008** (0.007-0.008)	**0.009** (0.008-0.009)	**0.010** (0.009-0.010)	**0.011** (0.010-0.011)	**0.011** (0.011-0.012)	**0.012** (0.012-0.013)	**0.013** (0.012-0.014)	**0.014** (0.013-0.014)	**0.014** (0.013-0.015)

[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
Location name: Hudson, Ohio, USA*
Latitude: 41.2426°, Longitude: -81.4315°
Elevation: 1101 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	**0.323** (0.295-0.355)	**0.386** (0.352-0.424)	**0.466** (0.424-0.511)	**0.528** (0.479-0.578)	**0.607** (0.548-0.664)	**0.667** (0.600-0.730)	**0.726** (0.650-0.794)	**0.785** (0.699-0.860)	**0.865** (0.764-0.948)	**0.923** (0.809-1.01)
10-min	**0.502** (0.458-0.551)	**0.603** (0.550-0.661)	**0.725** (0.659-0.794)	**0.815** (0.740-0.892)	**0.928** (0.838-1.02)	**1.01** (0.909-1.11)	**1.09** (0.979-1.20)	**1.17** (1.04-1.28)	**1.27** (1.12-1.39)	**1.34** (1.18-1.48)
15-min	**0.615** (0.561-0.675)	**0.737** (0.672-0.809)	**0.890** (0.810-0.975)	**1.00** (0.911-1.10)	**1.15** (1.04-1.25)	**1.25** (1.12-1.37)	**1.36** (1.22-1.48)	**1.46** (1.30-1.60)	**1.59** (1.40-1.74)	**1.68** (1.47-1.85)
30-min	**0.814** (0.743-0.894)	**0.986** (0.900-1.08)	**1.22** (1.11-1.34)	**1.39** (1.26-1.52)	**1.62** (1.46-1.77)	**1.79** (1.61-1.96)	**1.96** (1.76-2.14)	**2.13** (1.89-2.33)	**2.35** (2.08-2.58)	**2.52** (2.21-2.77)
60-min	**0.994** (0.907-1.09)	**1.21** (1.10-1.33)	**1.53** (1.39-1.68)	**1.77** (1.61-1.94)	**2.10** (1.90-2.30)	**2.36** (2.12-2.58)	**2.62** (2.35-2.86)	**2.88** (2.57-3.16)	**3.25** (2.87-3.56)	**3.54** (3.10-3.89)
2-hr	**1.16** (1.05-1.27)	**1.40** (1.28-1.54)	**1.78** (1.62-1.96)	**2.08** (1.89-2.28)	**2.50** (2.26-2.75)	**2.85** (2.56-3.12)	**3.21** (2.87-3.52)	**3.59** (3.19-3.94)	**4.13** (3.63-4.53)	**4.57** (3.98-5.02)
3-hr	**1.23** (1.12-1.35)	**1.50** (1.36-1.64)	**1.90** (1.72-2.09)	**2.22** (2.01-2.44)	**2.68** (2.41-2.94)	**3.06** (2.74-3.35)	**3.46** (3.07-3.79)	**3.88** (3.42-4.25)	**4.48** (3.91-4.92)	**4.98** (4.31-5.48)
6-hr	**1.48** (1.35-1.63)	**1.79** (1.63-1.96)	**2.25** (2.05-2.47)	**2.64** (2.39-2.88)	**3.19** (2.88-3.49)	**3.66** (3.28-3.99)	**4.16** (3.70-4.54)	**4.70** (4.14-5.14)	**5.49** (4.77-6.01)	**6.16** (5.28-6.76)
12-hr	**1.74** (1.59-1.92)	**2.09** (1.91-2.31)	**2.61** (2.37-2.88)	**3.04** (2.76-3.35)	**3.68** (3.31-4.04)	**4.22** (3.77-4.63)	**4.80** (4.26-5.27)	**5.43** (4.78-5.97)	**6.37** (5.52-7.00)	**7.15** (6.12-7.89)
24-hr	**2.04** (1.89-2.21)	**2.44** (2.26-2.65)	**3.03** (2.81-3.29)	**3.52** (3.25-3.82)	**4.24** (3.88-4.58)	**4.84** (4.40-5.23)	**5.49** (4.96-5.94)	**6.19** (5.54-6.70)	**7.21** (6.36-7.84)	**8.07** (7.03-8.80)
2-day	**2.35** (2.19-2.55)	**2.82** (2.62-3.05)	**3.46** (3.21-3.74)	**4.00** (3.69-4.31)	**4.77** (4.38-5.15)	**5.41** (4.94-5.84)	**6.09** (5.52-6.59)	**6.83** (6.13-7.41)	**7.88** (6.97-8.59)	**8.76** (7.64-9.60)
3-day	**2.52** (2.35-2.72)	**3.01** (2.80-3.25)	**3.68** (3.42-3.97)	**4.24** (3.93-4.56)	**5.03** (4.63-5.42)	**5.67** (5.20-6.12)	**6.36** (5.79-6.88)	**7.10** (6.40-7.69)	**8.14** (7.25-8.86)	**9.01** (7.93-9.87)
4-day	**2.69** (2.51-2.89)	**3.20** (2.99-3.45)	**3.91** (3.64-4.20)	**4.48** (4.16-4.82)	**5.28** (4.89-5.69)	**5.94** (5.47-6.40)	**6.63** (6.06-7.16)	**7.36** (6.68-7.97)	**8.40** (7.53-9.13)	**9.27** (8.22-10.1)
7-day	**3.23** (3.02-3.46)	**3.84** (3.60-4.11)	**4.64** (4.34-4.97)	**5.29** (4.94-5.66)	**6.20** (5.76-6.64)	**6.94** (6.41-7.43)	**7.71** (7.07-8.27)	**8.51** (7.75-9.15)	**9.62** (8.66-10.4)	**10.5** (9.38-11.4)
10-day	**3.72** (3.50-3.97)	**4.42** (4.15-4.71)	**5.28** (4.96-5.63)	**5.97** (5.60-6.36)	**6.91** (6.46-7.36)	**7.66** (7.12-8.17)	**8.42** (7.79-8.99)	**9.20** (8.47-9.86)	**10.3** (9.36-11.1)	**11.1** (10.0-12.0)
20-day	**5.16** (4.88-5.46)	**6.09** (5.76-6.46)	**7.16** (6.78-7.59)	**8.00** (7.56-8.48)	**9.11** (8.58-9.66)	**9.96** (9.35-10.6)	**10.8** (10.1-11.5)	**11.6** (10.8-12.4)	**12.7** (11.7-13.6)	**13.5** (12.4-14.5)
30-day	**6.50** (6.16-6.85)	**7.65** (7.26-8.06)	**8.90** (8.44-9.38)	**9.84** (9.33-10.4)	**11.1** (10.5-11.7)	**12.0** (11.3-12.7)	**12.9** (12.1-13.6)	**13.8** (12.9-14.6)	**14.9** (13.9-15.8)	**15.7** (14.5-16.7)
45-day	**8.32** (7.94-8.73)	**9.77** (9.32-10.2)	**11.2** (10.7-11.7)	**12.3** (11.7-12.9)	**13.7** (13.0-14.3)	**14.7** (13.9-15.4)	**15.6** (14.8-16.4)	**16.6** (15.6-17.4)	**17.7** (16.6-18.7)	**18.5** (17.3-19.6)
60-day	**10.1** (9.62-10.5)	**11.8** (11.3-12.3)	**13.4** (12.8-14.0)	**14.6** (14.0-15.3)	**16.1** (15.4-16.9)	**17.2** (16.4-18.1)	**18.2** (17.3-19.2)	**19.2** (18.2-20.2)	**20.3** (19.2-21.5)	**21.1** (19.9-22.4)

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

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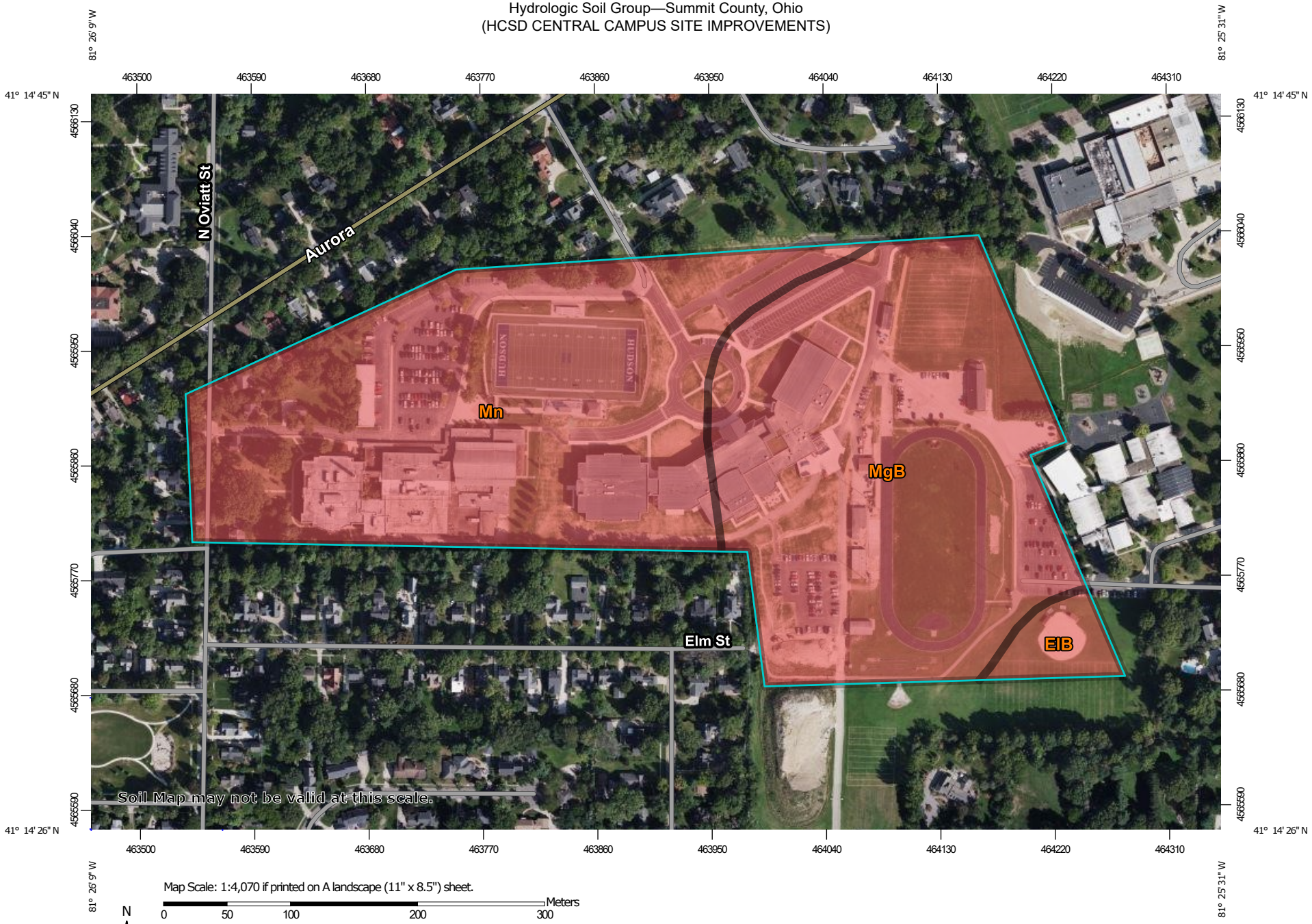
PF graphical

Hydrologic Soil Group—Summit County, Ohio
(HCSD CENTRAL CAMPUS SITE IMPROVEMENTS)



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 1:20,000.

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: Summit County, Ohio
Survey Area Data: Version 21, Aug 29, 2024

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

Date(s) aerial images were photographed: Sep 12, 2020—Sep 21, 2020

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
ElB	Ellsworth silt loam, 2 to 6 percent slopes	D	1.2	2.9%
MgB	Mahoning silt loam, 2 to 6 percent slopes	D	19.7	47.0%
Mn	Mahoning-Urban land complex, 0 to 2 percent slopes	D	21.1	50.1%
Totals for Area of Interest			**42.0**	**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