1155 Troutwine Road
Crown Point, IN 46307

219.662.7710
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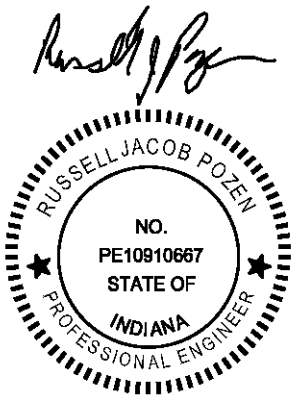
OSNI Medical Office
9900 Columbia Avenue Munster, IN

Storm Water Technical Report
Revised: September 24, 2025
~~**July 22, 2024**~~
~~**December 7, 2023**~~

Prepared for:

OSNI
730 45th Ave
Munster, IN 46321



Prepared by:

DVG Team Inc.
1155 Troutwine Road
Crown Point, IN 46307

Table of Contents

Exhibits

1.0 Project Description

Orthopedic Specialists of Northwest Indiana (OSNI) is proposing to develop a building addition to the existing Gate Church located at 9900 Columbia Avenue in Munster, Indiana. The project will be built in two (2) phases. Phase one includes the demo of the existing parking lot and rebuilding a new parking lot, gutting and rebuilding the interior of the existing building, along with new utilities and appropriate detention to serve the facility. Phase two will include the expansion of the existing building, as well as additional utilities and parking to serve the expansion.

The intent of this report is to model drainage conditions and demonstrate how the new development will accommodate the Town of Munster's Stormwater Technical Standards.

See **Exhibit 1 USGS Location Map** to view the project location.

2.0 Drainage Analysis

The total drainage area for this development is 3.15 acres. The whole lot was designed as tributary to the proposed dry detention basin. See **Exhibit 2**. All runoffs will ultimately discharge through a 12-inch RCP pipe with a 5" restrictor into the existing storm sewer system on the Northwest side of the property.

Per the Munster Stormwater Technical Standards, for sites less than 5 acres the allowable release rate shall be based on the pre-existing runoff rate of the 2-yr, 10 min. rainfall intensity using a 0.15 runoff coefficient and rational method (Q=CIA)**.** As shown in Exhibit 5, the allowable release for the project site is 1.79cfs (Q=0.15*3.84*3.10). The proposed 5" restrictor reduces the release to 1.37 cfs meeting this requirement.

The dry bottom detention pond was sized to have sufficient capacity for this development. With a proposed bottom of 609.70 and a proposed HWL of 614.00. The required detention per rational method is 0.32 ac-ft. and the proposed dry basin provides 0.65 ac/ft. See **Exhibit 2** for pond storage calculations. The size of the weir was determined by taking 1.25 times the peak inflow taken from the rational method calculation. See **Exhibit 2** for the rational method pond calculation and weir check calculation.

3.0 Storm Sewer Design

The OSNI Medical office project utilizes storm sewers and sheet flow design to transport stormwater. Storm sewer design takes into consideration the full development of Phase 2.

Storm sewer calculations were performed for each storm structure and its respective tributary area. The proposed sewers shall be HDPE material having a Manning's n-value of 0.012. Hydraflow Storm Sewers Extension was used for the storm sewer modeling using a 10-yr design

flow. This proposed storm sewer system then ties into an existing storm sewer in the Northwest corner of the site.

See **Exhibit 3 Storm Sewer Calculations** for the results of the proposed storm sewer design.

Included are the following:

- **Storm Sewer Tributary Exhibit**
- **Runoff Coefficient Calculations**
- **Inlet Capacity Calculations**
- **Storm Sewer 10-Year Design Calculations**
- **Storm Sewer 10-Year Design Profile**

4.0 Overland Flood Route

100 – year overland flow calculations were done for cross sections A through E to determine overland flow routes and freeboard. The freeboard to the proposed adjacent building was sufficient for each cross section. **Exhibit 4** for 100-year overland flow locations, modeling, and freeboard calculations.

Included are the following:

- **Overall Overland Flood Route Exhibit**
- **Overland Flood Route Calculations**
- **Overland Flood Route Cross Sections**

5.0 Water Quality Regulations / Storm Water Quality Infrastructure

Compliance with the EPA Rule 13, Phase 2 Water Quality Regulations, is achieved by implementing several pre-approved post-construction best management practices (BMP) structures. The Town of Munster requires that post-construction BMPs must meet the 80% Total Suspended Solids (TSS) removal rate, and compliance with the EPA Rule 13, Phase 2 Water Quality Regulations, is achieved by implementing several pre-approved post-construction best management practices (BMP) structures.

This development will make use of a Hydrodynamic Separator as an approved Water Quality Device BMP method. When properly sized and maintained these structures will be effective for the required TSS removal.

The water quality flow was calculated using Rational Method for the 1-inch (first flush) storm event. Based on the this flow, the Hydrodynamic Separator was selected as indicated on the Engineering Plan Set based on this information.

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Exhibit 1

USGS Location Map

The National Map Advanced Viewer

10/5/2023, 2:26:29 PM

1:9,028

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

USGS The National Map: Orthoimagery and US Topo. Data refreshed August, 2023.

USGS
2021 USGS

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Exhibit 2

Detention Pond Calculations

DETENTION BASIN (DRY)
T/B: 615.00
HWL: 614.00
BTM: 609.70
REQ. DET.: 0.32AC-FT
PROVIDED DET.: 0.65 AC-FT

DETENTION TRIBUTARY AREA
AREA = 3.10 AC
C = 0.66

EXISTING RENOVATED BLDG
W/BUILDING ADDITIONS
F/F: 617.14±
"GATE CHURCH"
(9900 COLUMBIA AVENUE)

1 STORY
BRICK & FRAME
BUILDING
F.F.=617.14

PROP BLDG (PHASE 2)
F/F: 617.40

CORE DRILL EX. MH
PROP. INV: 609.50
(FILL IN EX. HOLE WITH BRICK & NON-SHRINK GROUTE)

33 LF - 12" HDPE AT 0.39%

CB #13 /48"Ø
10222T, 1020A
R: 615.00
I: 609.63 W/ 5-INCH RESTRICTOR
(SEE DETAIL C204)

CB #14 /48"Ø
10222T, 1020M1
R: 614.50
I: 610.05 (S,E)

HYDRODYNAMIC SEPARATOR #1B
10222T, TYPE A SOLID LID
R: 614.80
I: 610.30 (S,W)
(AS-3 BYP CW - SEE DETAIL C204)

71 LF - 24" HDPE AT 0.35%

19 LF - 12" HDPE AT 0.37%

14 LF - 24" HDPE AT 0.35%

74 LF - 18" HDPE AT 0.68%

89 LF - 15" HDPE AT 0.67%

44 LF - 12" HDPE AT 0.91%

100 LF - 12" HDPE AT 1.30%

89 LF - 18" HDPE AT 0.28%

73 LF - 18" HDPE AT 0.28%

81 LF - 15" HDPE AT 0.31%

47 LF - 12" HDPE AT 0.74%

24 LF - 12" HDPE AT 0.62% (PHASE 1)

24 LF - 12" HDPE AT 0.62% (PHASE 2)

44 LF - 12" HDPE AT 0.39% (PHASE 2)

76 LF - 10" PERFORATED PVC, SDR 35 AT 0.29% (PHASE 2)
(SEE DETAIL C204)

84 LF - 12" PERFORATED PVC, SDR 35 AT 0.31% (PHASE 2)
(SEE DETAIL C204)

REMOVE PH. TIES AND CAP
CONNECT TO STORM PIPE
INV = 612.30

FS #1 /24"Ø
W/TRASH RACK
INV: 610.00

FS #2 /12"Ø
W/TRASH RACK
INV: 609.70

FS #3
W/TRASH RACK
INV: 612.50
(TEMPORARY)

CB #1 /48"Ø
10222T, 1020M1
R: 614.25
I: 610.80 (N,E,S)

CB #2 /48"Ø
10222T, 1020M1
R: 614.55
I: 611.10 (N,S)

CB #3 /48"Ø
10222T, 1020M1
R: 614.90
I: 611.40 (S)
I: 611.30 (N,E)

CB #4 /48"Ø
10222T, 1020M1
R: 615.00
I: 611.60 (S,W)

CB #5 /48"Ø
10222T, 1020M1
R: 615.30
I: 611.55 (S,W)

CB #6 /48"Ø
10222T, 1020M1
R: 615.30
I: 611.80 (E,N)

CB #7 /48"Ø
10222T, 1020M1
R: 615.10
I: 611.90 (E,W)

CB #8 /48"Ø
10222T, 1020M1
R: 615.20
I: 612.15 (E,W)

CB #9 /48"Ø
10222T, 1020N
R: 615.90
I: 612.62

CB #10 /48"Ø
10222T, 1020N
R: 615.90
I: 612.88

INL #14 /24"Ø
10222T, 1020M1
CURB RAMP R: 616.50
I: 613.30

INL #11 /24"Ø
10222T, 1020N
R: 614.90
I: 613.10

INL #15 /24"Ø
10222T, 1020M1
R: 614.80
I: 611.80

X-SECTION "A"
X-SECTION "B"
X-SECTION "C"
X-SECTION "D"

CURB RAMP

89 LF - 18" HDPE AT 0.28%

(EXCEPT W. 125')

W. LINE OF THE WEST 125' OF LOT 1

E. LINE OF THE WEST 125' OF LOT 1

LOT 3

LOT 4

HOSPICE ADDITION
(PLAT BOOK 80, PAGE 16)

10' UTILITY EASEMENT
(PER P.B. 80, PG. 16)

15' UTILITY & DRAINAGE EASEMENT
(PER P.B. 80, PG. 16)

15' UTILITY & DRAINAGE EASEMENT
(PER P.B. 85, PG. 60)

CALVARY COMMUNITY CHURCH ADDITION
(PLAT BOOK 85, PAGE 60)

TAX ID. 45-06-36-251-004.000-027
COMMUNITY FOUNDATION OF NORTHWEST INDIANA, INC.
LIMITED LIABILITY COMPANY WARRANTY DEED
DOC. NO. 2019 059960
REC. 9/4/2019

TAX ID. 45-06-36-251-004.000-027
COMMUNITY FOUNDATION OF NORTHWEST INDIANA, INC.
LIMITED LIABILITY COMPANY WARRANTY DEED
DOC. NO. 2019 059960
REC. 9/4/2019

DOC. NO. 2017 003349
REC. 1/18/2017

EXCEPTION
(WEST 125 FEET OF LOT 1)

SITE BENCHMARK
MAG NAIL
ELEV=614.94 (NAVD88)

3/4" IPF
0.3' B.G.

5/8" IRF

IRF S0514
0.3' B.G.

IRF TORRENGA
(POSITION HELD FIXED)

IRF S0507
0.11' N.
0.2' W.

5/8" IRF
BENT WES
0.3' B.G.
0.18' N.
0.3' W.

RIM 617.22
BTTM 596.17
W INV. (DROP) 608.78

615.13' (M)
S 88°24'11" E 375.00' (P) 374.70' (M)
500.00' (P) 499.73' (M)
225.87' (P)
N 01°35'49" E 370.00' (P,M)
125.00' (D) 125.15' (M)
382.77' (P) 382.97' (M)
N 88°24'11" W 257.77' (P,M)

20' BUILDING SETBACK

OTIS BOWEN DRIVE
60' RIGHT-OF-WAY (DEDICATED BY P.B. 85, PG. 60)
(30.0' B/CURB-B/CURB)

COLUMBIA AVENUE
66' RIGHT-OF-WAY (DEDICATED BY P.B. 85, PG. 60)
(37.7' B/CURB-B/CURB)

CONCRETE CURBING

6" PVC

12" WM

16" WOLVERINE PIPELINE

45' WOLVERINE PIPELINE COMPANY EASEMENT (PER DOC. NO. 484235)

10' WATER MAIN EASEMENT

outlet

NOT FOR CONSTRUCTION

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REGION CONTRACTORS, LLC
912 W. AVE H, SUITE 2
GRIFFITH, IN 46319

DATE:	REVISIONS AND NOTES:

OSNI MEDICAL OFFICE BLDG

Proposed Detention
Tributary Area Exhibit

N

0' 10' 20'
SCALE: 1" = 20'

DESIGN BY	DATE
RJP	08/28/23
PROJECT NO.	
23-0031	
EX	

RAINFALL INTENSITY TABLE

Rainfall Intensity-Lake County, IN

	INTENSITY (in/hr)										
DURATION (yr)	**5-min**	**10-min**	**15-min**	**30-min**	**60-min**	**2-hour**	**3-hour**	**6-hour**	**12-hour**	**18-hour**	**24-hour**
2	5.04	3.84	3.20	2.22	1.40	0.86	0.61	0.37	0.22	0.16	0.13
5	8.24	4.74	3.96	2.74	1.73	1.06	0.76	0.46	0.27	0.19	0.15
10	7.08	5.46	4.52	3.12	1.97	1.21	0.87	0.52	0.30	0.22	0.18
25	8.16	6.24	5.16	3.58	2.25	1.38	0.99	0.60	0.35	0.25	0.20
50	9.00	6.90	5.72	3.96	2.49	1.53	1.10	0.66	0.38	0.28	0.22
100	9.84	7.50	6.20	4.32	2.72	1.67	1.20	0.72	0.42	0.31	0.24

BY: JB
DATE: 8/28/2023

REQUIRED DETENTION VOLUME

PROJECT: **OSNI Medical Office**
Munster, IN

Existing Runoff Coefficient, C	0.15	*Per Ordinance
Rainfall Intensity, 2yr-10min.	3.84	*Per Ordinance
Existing Site Area, A	3.10	acres
Allowable Release Rate = Q = C*I*A	1.79	cfs

BY: JB
DATE: 8/28/2023

RUNOFF COEFFICIENT

PROJECT: **OSNI Medical Office**
Munster, IN

AREA DESCRIPTION: Proposed Site Area + Offsite

TRIBUTARY AREA	COVER DESCRIPTION (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	Runoff Coeffient — Hydrologic Analysis and Design 4th Edition			AREA (x acres / sq. ft. / %)	PRODUCT OF Runoff Coefficient AND AREA
	Impervious (Asphalt/Conrete/Building)	0.90			1.57	1.41
	Pervious (grass)	0.30			1.28	0.38
	HWL of Detention Basin	1.00			0.25	0.25
				TOTAL =	135036.0	2.0
				TOTAL =	3.10	acre

CURVE NUMBER (WEIG = Total product 2.0 / Total area 3.10 = 0.66

C weighted

Use C = **0.66**

BY: JB
DATE: 8/28/2023

REQUIRED DETENTION VOLUME

PROJECT: **OSNI Medical Office**
Munster, IN

Drainage Area, A	3.15	acres
Runoff Coefficient, C	0.66	
Design Release Rate	1.372	
Allowable Release Rate	1.786	

STORM DURATION (hr.)	Rainfall Intensity, 100-yr (in/hr)	Inflow Rate, Qd (cfs)	Outflow Rate, Qu (cfs)	Storage Rate (cfs)	Required Storage (acre-ft)
0.08	9.84	20.47	1.79	18.68	0.129
0.17	7.50	15.60	1.79	13.81	0.192
0.25	6.20	12.90	1.79	11.11	0.231
0.50	4.32	8.99	1.79	7.20	0.300
1.00	2.72	5.66	1.79	3.87	0.323
2.00	1.67	3.47	1.79	1.69	0.281
3.00	1.20	2.50	1.79	0.71	0.178
6.00	0.72	1.50	1.79	0.00	0.000
12.00	0.42	0.87	1.79	0.00	0.000
18.00	0.31	0.64	1.79	0.00	0.000
24.00	0.24	0.50	1.79	0.00	0.000

Storage Requirement (acre-ft)	**0.323**
Storage Requirement (cu. ft.)	**14,056**

DVG, Inc.

BY: JB
DATE: 8/28/2023
CHECKED: RJP
DATE: 1/11/2024

DETENTION VOLUME

CLIENT: Region Contractors LLC
PROJECT: OSNI Medical Office
DESCRIPTION: Proposed Dry Pond

RETENTION ITEM: Dry Pond

BTTM 609.70

***Pond elevation areas derived from CAD drawing area measurement**

ELEVATION	(ft)	AREA				AVERAGE AREA (ac)	Δ ELEVATION (ft)	INCREMENTAL STORAGE (ac-ft)	CUMULATIVE STORAGE (ac-ft)
		Contour (sq. ft.)			(ac)				
BTTM	609.70	5	0	0	0.000				0.000
	610.00					0.003	0.30	0.001	0.001
	610.00	271	0	0	0.006				0.001
	610.50					0.052	1.00	0.052	0.027
	611.00	4287	0	0	0.098				0.053
	611.50					0.145	1.00	0.145	0.126
	612.00	8323	0	0	0.191				0.198
	612.50					0.208	1.00	0.208	0.302
	613.00	9778	0	0	0.224				0.406
	613.50					0.242	1.00	0.242	0.527
HWL	614.00	11341	0	0	0.260				0.648
	614.50					0.268	1.00	0.268	0.782
TB	615.00	12000	0	0	0.275				0.916

BY: JB
DATE: 8/28/2023

ORIFICE SIZING CALCULATIONS

PROJECT: **OSNI Medical Office**
Munster, IN

TRIBUTARY AREA: A_E= 3.10 acres

OUTLET:

	Size (in)	*Elevation*
Orifice	5.00	609.70

HYDRAULIC DIMENSIONS:

	Unit		
ORIFICE AREA	sq. ft.	0.1364	(Cross sectional area of restrictor pipe)
ORIFICE DIAMETER	inches	5.00	(Diameter of restrictor pipe)
ORIFICE DISCHARGE COEFFICIENT	--	0.62	(Values between 0.58 - 0.64)
ORIFICE ELEVATION	ft-NGVD	609.70	(Invert elevation of outfall pipe)
CENTROID ELEVATION	ft-NGVD	609.91	

ELEVATION-DISCHARGE RELATIONSHIP:

Orifice Flow Equation: $Q = CA(2gH)^{0.5}$

Elevation	$Q_{ORIFICE}$	
ft.	cu. ft./s	
609.70	0.00	BOTTOM
610.00	0.21	
611.00	0.71	
612.00	0.98	
613.00	1.19	
614.00	1.37	HWL
615.00	1.53	

PEAK RUNOFF RATE

Critical Duration = 100-year, 3-hr storm

ORIFICE DISCHARGE RATE @ HWL	1.372	cubic feet/second

ALLOWABLE RELEASE RATE =	**1.786**	cubic feet/second
MEETS RESTRICTED RELEASE RATE?	**YES**	

BY: JB
DATE: 8/28/2023

WEIR CHECK CALCULATIONS

PROJECT: OSNI Medical Office
Munster, IN

HYDRAULIC DIMENSIONS:

	Unit	WEIR	
WEIR LENGTH	ft.	20.00	(Width of weir)
WEIR COEFFICIENT, *C*	--	2.60	(Values between 2.30 - 2.80)
WEIR ELEVATION	ft-NGVD	614.00	
SIDE SLOPE, *Z*	(Z:1) ft.	4.00	(Side slope of Broad Crested weir)

ELEVATION-DISCHARGE RELATIONSHIP:

Weir Flow Equation: Q = C*L*H^3/2

Elevation	Weir
ft.	cu. ft./s
614.00	0.00
614.50	20.22
615.00	52.00

WEIR CHECK

Q_{IN} = 20.47

$Q_{design} = 1.25 \times Q_{IN}$ = 25.6

Weir capacity @ TB + 1.0' = 52.0

► **OK**

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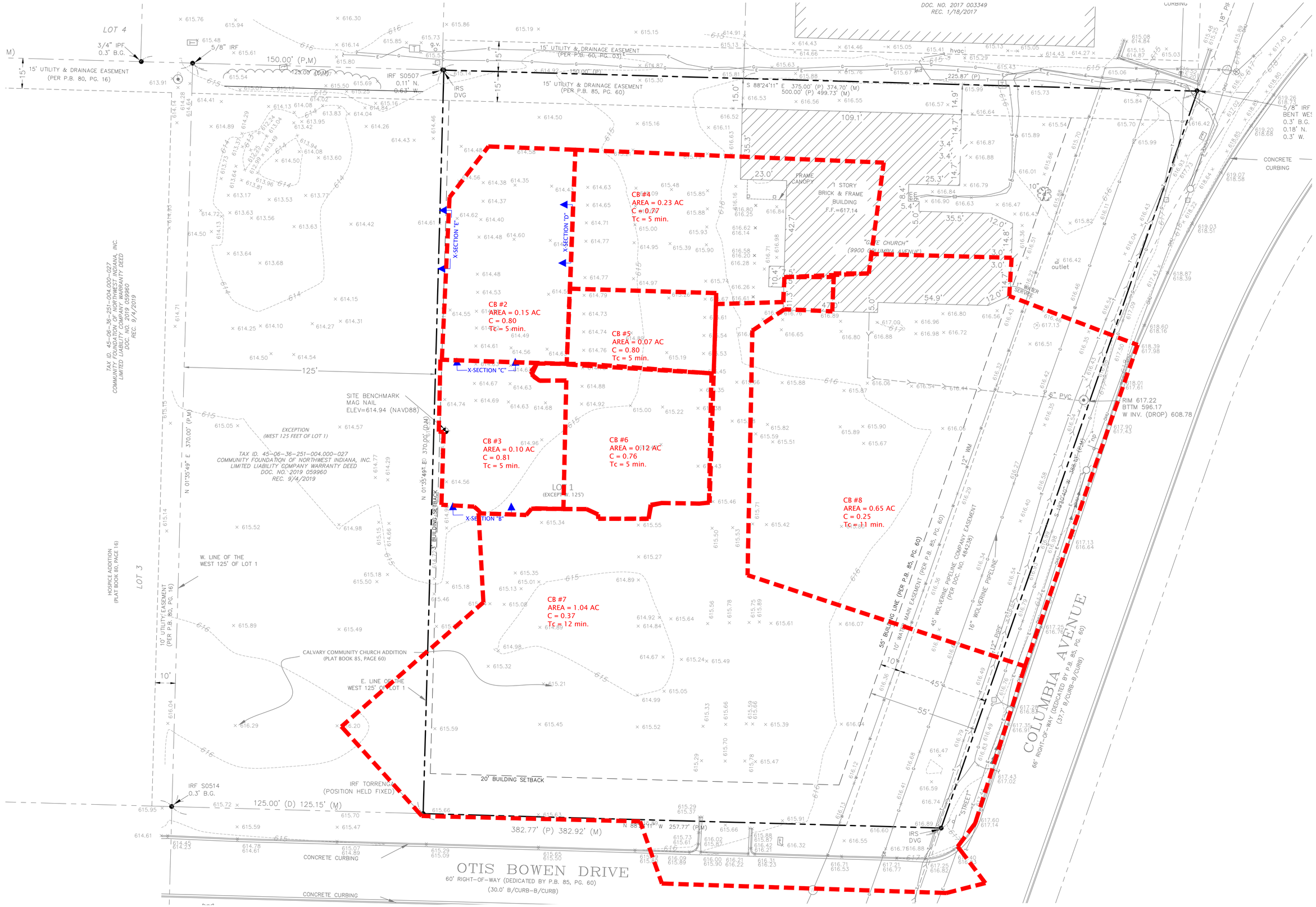
Exhibit 3

Storm Sewer Calculations



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DATE:	REVISIONS AND NOTES:

OSNI MEDICAL OFFICE BLDG

Storm Sewer
Tributary Area Exhibit

N

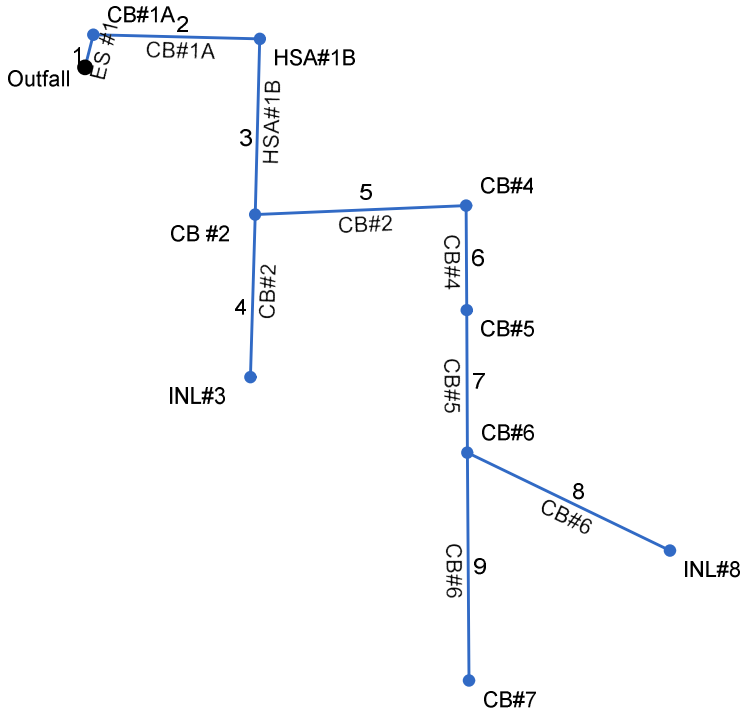
0' 10' 20'
SCALE: 1" = 20'

NOT FOR CONSTRUCTION

DESIGN BY	DATE
RJP	07/19/24
PROJECT NO.	
23-0031	
EX	

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

STORM SEWER PLAN & PROFILES - PHASE 1



Project File: SS-OSNI_NEW SCOPE.stm	Number of lines: 9	Date: 7/21/2024

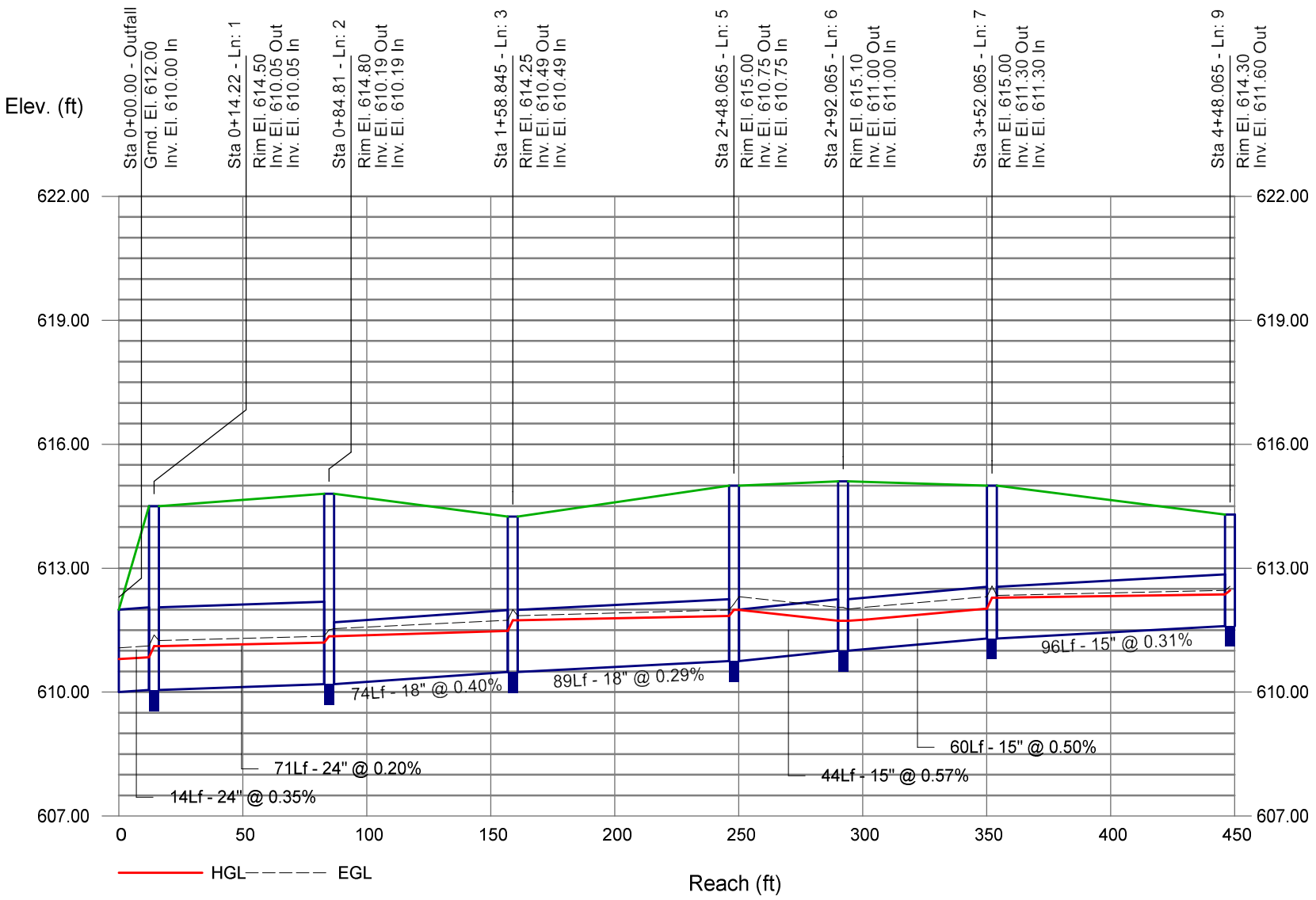
BY: RJP
DATE: 7/19/2024
CHECKED: _____
DATE: _____

PROJECT: **OSNI Medical Office - Munster, IN**
DESCRIPTION: **Storm Sewer Design Calculations**
DESIGN STORM: **10 yr Storm Event**
RAINFALL DATA: **Munster Stormwater Technical Manual**
COMPUTATIONAL METHOD: **Hydraflow Storm Sewers Extension for Autodesk AutoCAD Civil 3D**

Line No.	Upstream Structure	Downstream Structure	Drainage Area (ac)	Total Area (ac)	Runoff Coeff. (C)	Tc (min)	Time in Pipe (min)	i Sys (in/hr)	Known Q (cfs)	Flow Rate (cfs)	Capacity Full (cfs)	Vel Ave (ft/s)	n-Value	Line Length (ft)	Line Size (in)	Line Slope (%)	Grnd/Rim Elev Up (ft)	Invert Up (ft)	Invert Dn (ft)	HGL Up (ft)	HGL Dn (ft)
9	CB#7	CB#6	1.04	1.04	0.37	12.00	12.00	5.12	0.00	1.97	3.91	2.20	0.012	96	15	0.31	614.30	611.60	611.30	612.36	612.29
8	INL#8	CB#6	0.65	0.65	0.25	11.00	11.00	5.33	0.00	0.87	2.31	2.18	0.012	95	12	0.36	615.00	612.00	611.66	612.43	612.29
7	CB#6	CB#5	0.12	1.81	0.76	5.00	13.00	4.94	0.00	3.15	4.95	4.27	0.012	60	15	0.50	615.00	611.30	611.00	612.02 j	611.73
6	CB#5	CB#4	0.07	1.88	0.80	5.00	13.40	4.87	0.00	3.38	5.27	3.66	0.012	44	15	0.57	615.10	611.00	610.75	611.73	611.99
5	CB#4	CB#2	0.23	2.11	0.77	5.00	13.60	4.82	0.00	4.20	6.14	2.86	0.012	89	18	0.29	615.00	610.75	610.49	611.84	611.74
4	INL#3	CB#2	0.10	0.10	0.81	5.00	5.00	7.07	0.00	0.57	2.47	1.96	0.012	69	12	0.41	614.55	611.50	611.22	611.83	611.74
3	CB #2	HSA#1B	0.15	2.36	0.80	5.00	14.30	4.72	0.00	5.06	7.19	3.75	0.012	74	18	0.40	614.25	610.49	610.19	611.48	611.35
2	HSA#1B	CB#1A	0.00	2.36	0.00	5.00	14.70	4.65	0.00	4.99	10.91	3.04	0.012	71	24	0.20	614.80	610.19	610.05	611.20	611.11
1	CB#1A	ES #1	0.00	2.36	0.00	5.00	15.40	4.54	0.00	4.87	14.53	4.17	0.012	14	24	0.35	614.50	610.05	610.00	610.85	610.80

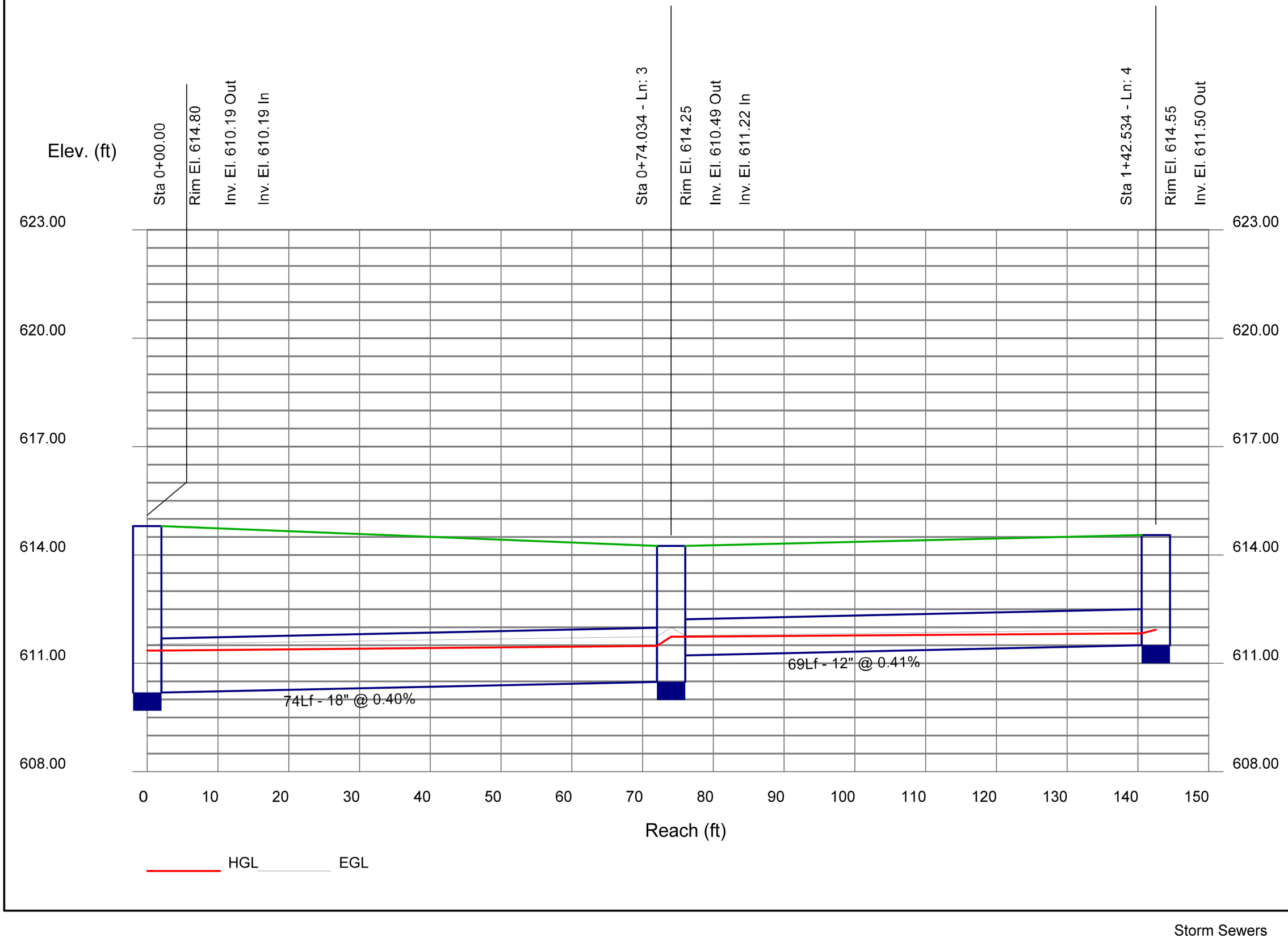
Storm Sewer Profile

Proj. file: SS-OSNI_NEW SCOPE.stm



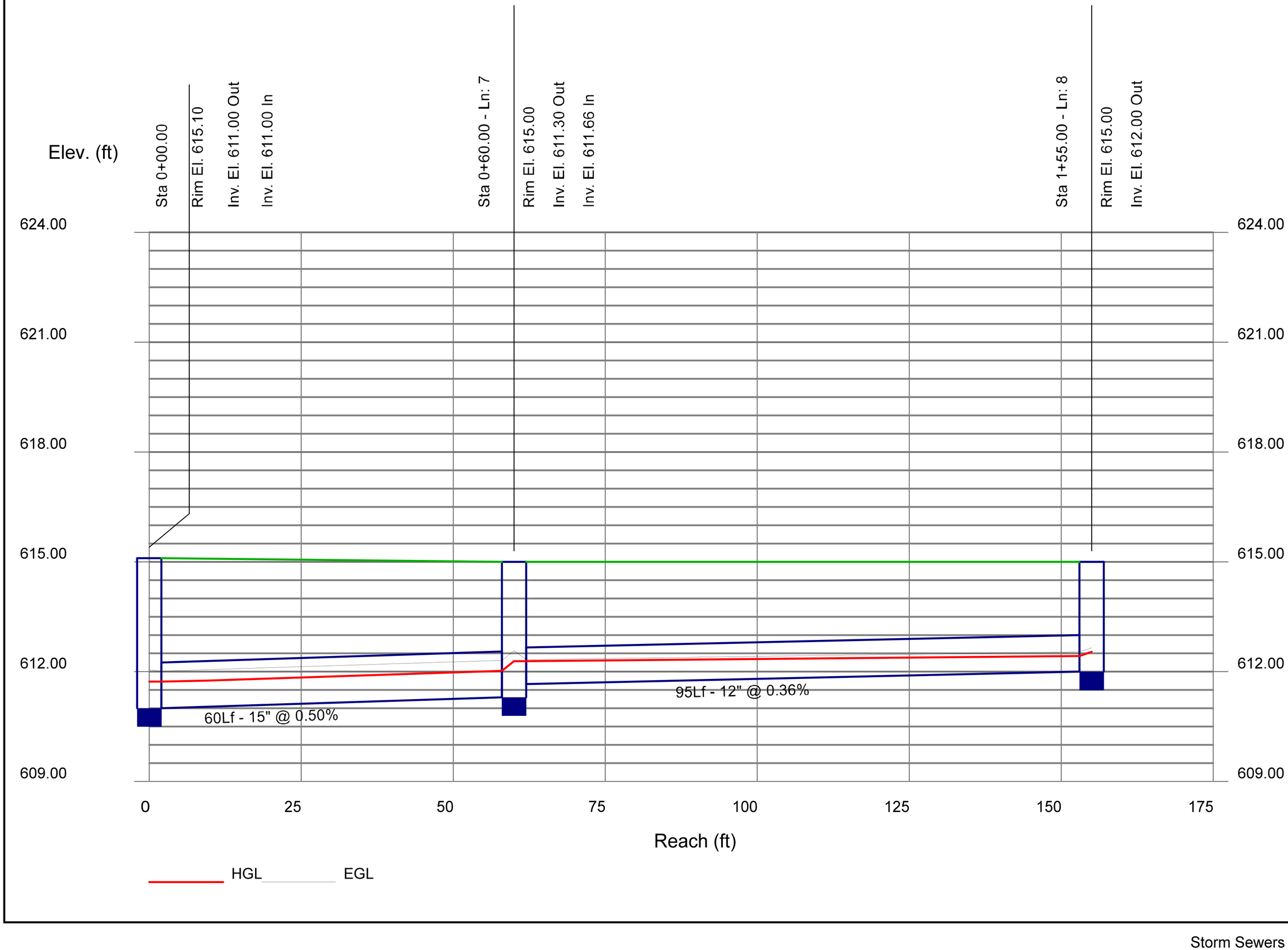
Storm Sewer Profile

Proj. file: SS-OSNI_NEW SCOPE.stm



Storm Sewer Profile

Proj. file: SS-OSNI_NEW SCOPE.stm



1155 Troutwine Road
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Exhibit 4

Overland Flood Route Calculations

Overland Flood Route Computation Calculation

Project: OSNI Medical Office
Date: 10/11/2023

Storm Event: 100yr
*** Areas Calculated from Exhibit 5, within the Stormwater Technical Report**
*** Overflow Elevations taken from Calculation, Within This Report**

Cross Section: A					
Tc=	5	min			
Area=	0.42	acres			
C=	0.84				
i=	9.84	in/hr			
Rational Method Q_{100}=CiA			**Q=**	**3.45**	**cfs**
100YR Overflow Water Elevation=				**616.00**	**Elev**
Freeboard to Nearest Bldg=				**1.14**	**ft**

Cross Section: B					
Tc=	5	min			
Area=	0.58	acres			
C=	0.85				
i=	9.84	in/hr			
Rational Method Q_{100}=CiA			**Q=**	**4.83**	**cfs**
100YR Overflow Water Elevation=				**615.42**	**Elev**
Freeboard to Nearest Bldg=				**1.72**	**ft**

Cross Section: C					
Tc=	5	min			
Area=	0.89	acres			
C=	0.85				
i=	9.84	in/hr			
Rational Method Q_{100}=CiA			**Q=**	**7.44**	**cfs**
100YR Overflow Water Elevation=				**615.29**	**Elev**
Freeboard to Nearest Bldg=				**1.85**	**ft**

Cross Section: D					
Tc=	5	min			
Area=	0.61	acres			
C=	0.85				
i=	9.84	in/hr			
Rational Method Q_{100}=CiA			**Q=**	**5.10**	**cfs**
100YR Overflow Water Elevation=				**615.80**	**Elev**
Freeboard to Nearest Bldg=				**1.34**	**ft**

Cross Section: E					
Tc=	5	min			
Area=	1.64	acres			
C=	0.85				
i=	9.84	in/hr			
Rational Method Q_{100}=CiA			**Q=**	**13.72**	**cfs**
100YR Overflow Water Elevation=				**614.93**	**Elev**
Freeboard to Nearest Bldg=				**2.21**	**ft**

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 11 2023

X-Section A

User-defined

Invert Elev (ft)	= 615.80
Slope (%)	= 1.70
N-Value	= 0.011

Calculations

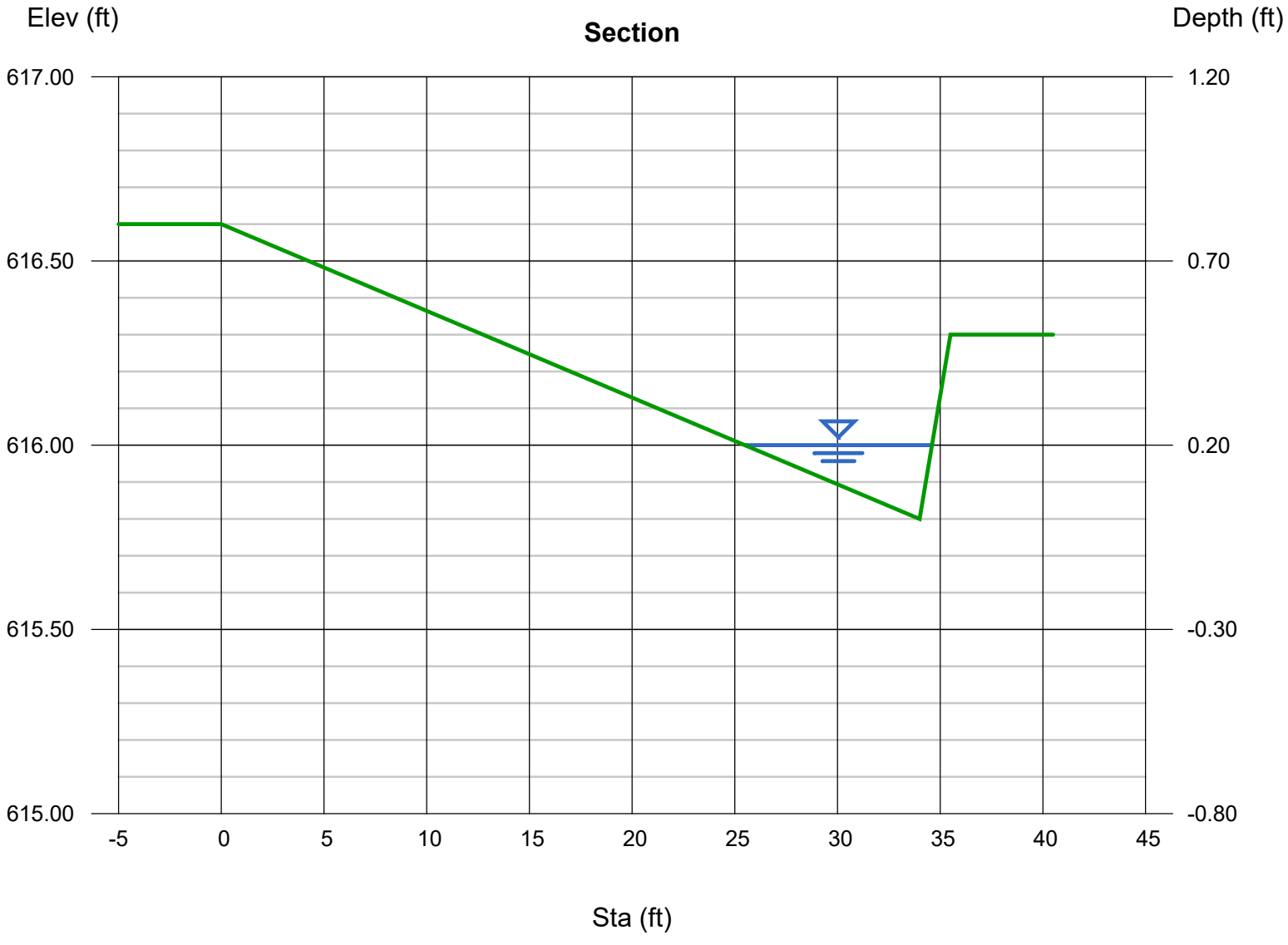
Compute by:	Known Q
Known Q (cfs)	= 3.45

(Sta, El, n)-(Sta, El, n)...

(0.00, 616.60)-(34.00, 615.80, 0.011)-(35.50, 616.30, 0.011)

Highlighted

Depth (ft)	= 0.20
Q (cfs)	= 3.450
Area (sqft)	= 0.91
Velocity (ft/s)	= 3.79
Wetted Perim (ft)	= 9.14
Crit Depth, Yc (ft)	= 0.27
Top Width (ft)	= 9.10
EGL (ft)	= 0.42



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 11 2023

X-Section B

User-defined

Invert Elev (ft)	= 615.80
Slope (%)	= 1.70
N-Value	= 0.011

Calculations

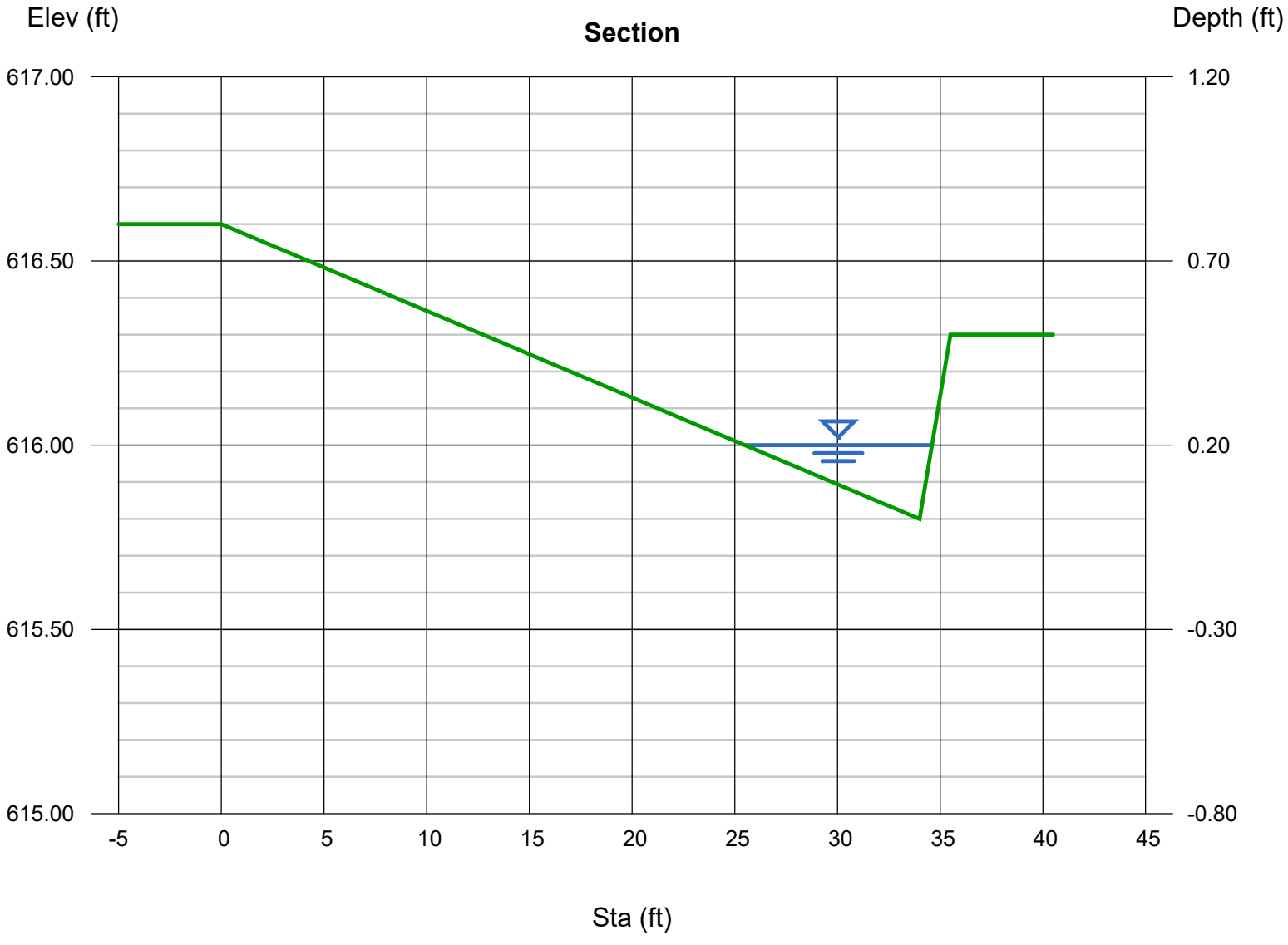
Compute by:	Known Q
Known Q (cfs)	= 3.45

(Sta, El, n)-(Sta, El, n)...

(0.00, 616.60)-(34.00, 615.80, 0.011)-(35.50, 616.30, 0.011)

Highlighted

Depth (ft)	= 0.20
Q (cfs)	= 3.450
Area (sqft)	= 0.91
Velocity (ft/s)	= 3.79
Wetted Perim (ft)	= 9.14
Crit Depth, Yc (ft)	= 0.27
Top Width (ft)	= 9.10
EGL (ft)	= 0.42



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 11 2023

X-Section C

User-defined

Invert Elev (ft)	= 615.20
Slope (%)	= 2.00
N-Value	= 0.011

Calculations

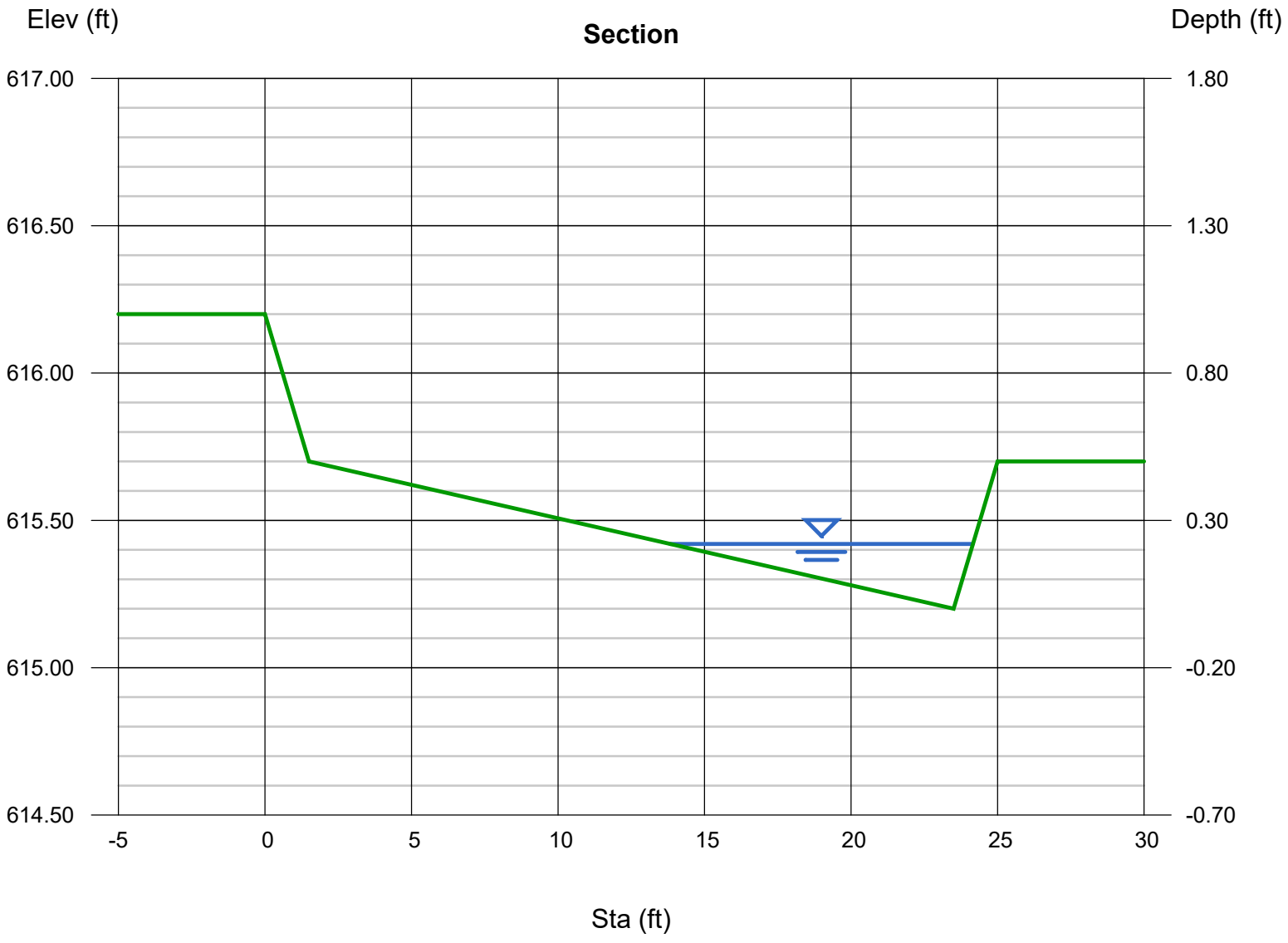
Compute by:	Known Q
Known Q (cfs)	= 4.83

Highlighted

Depth (ft)	= 0.22
Q (cfs)	= 4.830
Area (sqft)	= 1.14
Velocity (ft/s)	= 4.25
Wetted Perim (ft)	= 10.38
Crit Depth, Yc (ft)	= 0.31
Top Width (ft)	= 10.34
EGL (ft)	= 0.50

(Sta, El, n)-(Sta, El, n)...

(0.00, 616.20)-(1.50, 615.70, 0.011)-(23.50, 615.20, 0.011)-(25.00, 615.70, 0.011)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 11 2023

X-Section D

User-defined

Invert Elev (ft)	= 615.60
Slope (%)	= 2.20
N-Value	= 0.011

Calculations

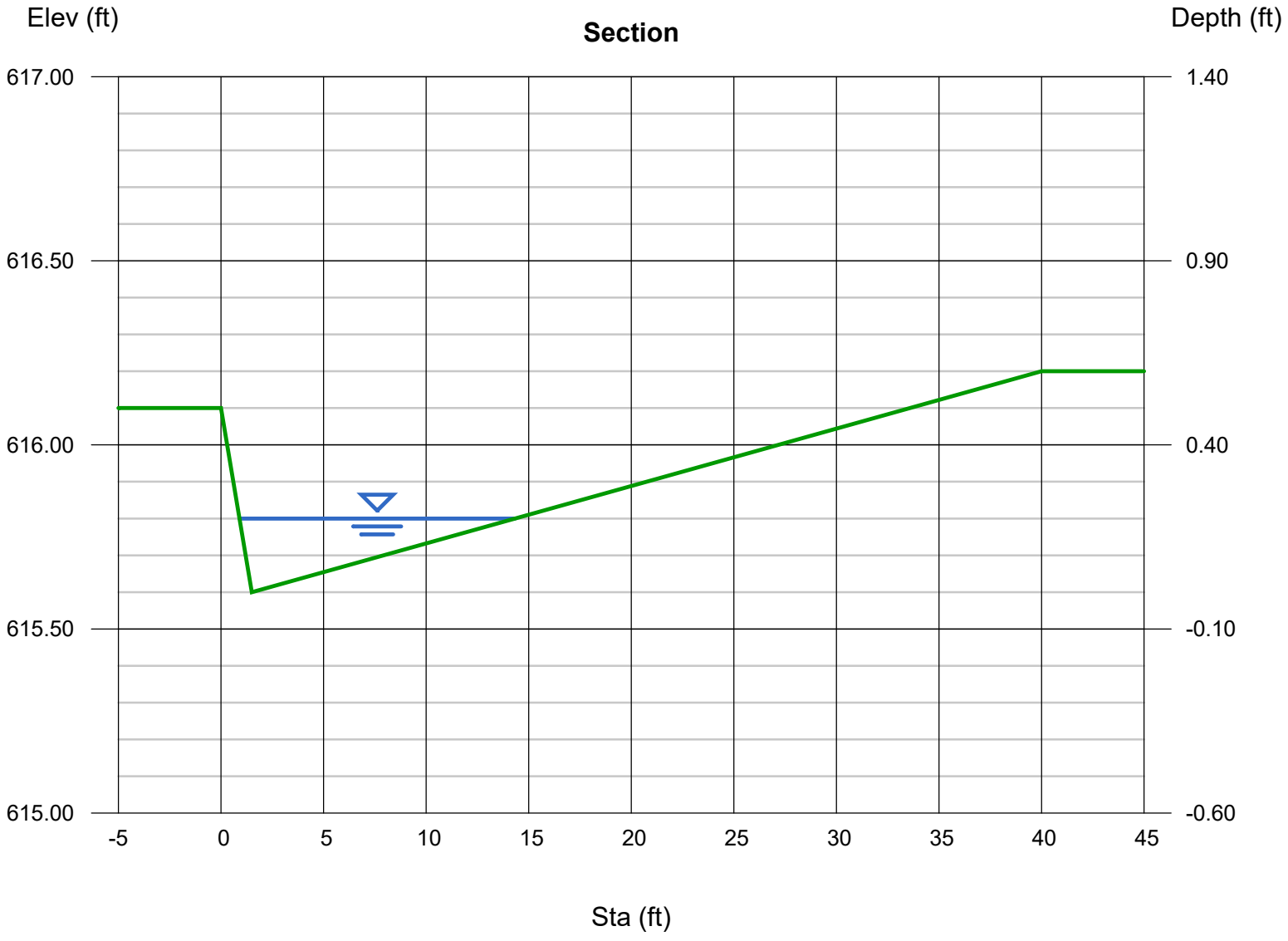
Compute by:	Known Q
Known Q (cfs)	= 5.10

(Sta, El, n)-(Sta, El, n)...

(0.00, 616.10)-(1.50, 615.60, 0.011)-(40.00, 616.20, 0.011)

Highlighted

Depth (ft)	= 0.20
Q (cfs)	= 5.100
Area (sqft)	= 1.34
Velocity (ft/s)	= 3.80
Wetted Perim (ft)	= 13.47
Crit Depth, Yc (ft)	= 0.27
Top Width (ft)	= 13.43
EGL (ft)	= 0.42



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Oct 11 2023

X-Section E

User-defined

Invert Elev (ft)	= 614.75
Slope (%)	= 2.20
N-Value	= 0.011

Calculations

Compute by:	Known Q
Known Q (cfs)	= 13.72

(Sta, El, n)-(Sta, El, n)...

(-33.00, 615.30)-(59.00, 615.10, 0.011)

Highlighted

Depth (ft)	= 0.18
Q (cfs)	= 13.72
Area (sqft)	= 3.70
Velocity (ft/s)	= 3.71
Wetted Perim (ft)	= 41.15
Crit Depth, Yc (ft)	= 0.25
Top Width (ft)	= 41.14
EGL (ft)	= 0.39

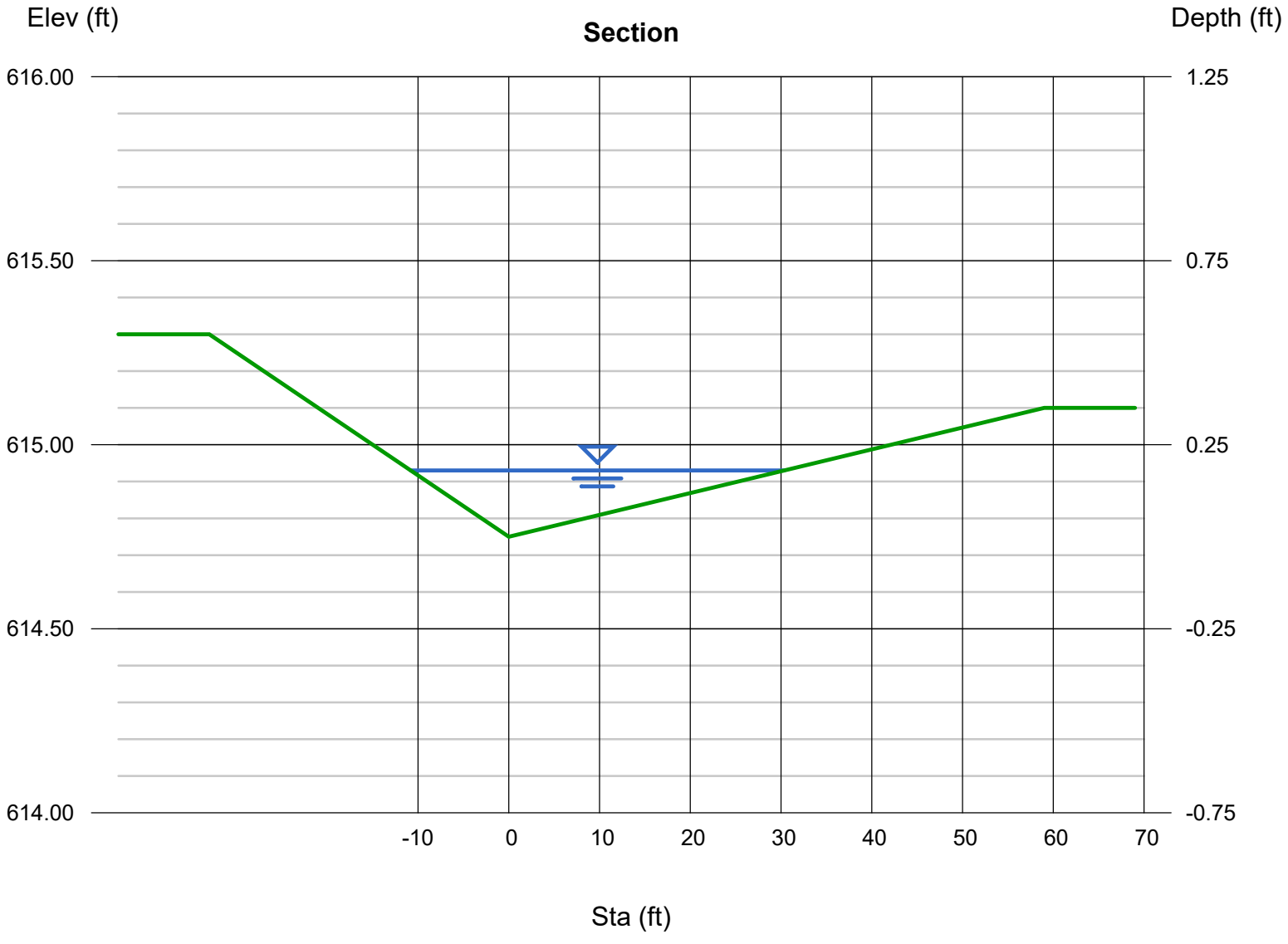


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Exhibit 5

Phase 2 – Addendum

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ADDENDUM

The ONSI Medical Facility dry pond and storm sewer system was originally designed to accommodate both Phase 1 and Phase 2 of the development (see Exhibits 2 and 4, respectively). Phase 1 was constructed in 2024. Phase 2 will add a parking lot south of the existing development, relocate the existing driveway connection off Otis Bowen Drive, and include additional sidewalk, lighting, and landscaping. No building expansion is proposed as part of Phase 2.

For runoff from the proposed parking lot, Phase 2 proposes two new storm structures (INL#9 and INL#10). These inlets will intercept flow previously directed to CB#7 and CB#8 under the Phase 1 design. Tributary areas and runoff coefficients for CB#7 and CB#8 have been revised accordingly in the Phase 2 storm sewer calculations.

Storm sewer modeling was performed considering both Phase 1 and Phase 2 tributary areas. The proposed storm sewers will consist of HDPE pipe with a Manning's n-value of 0.012. Hydraflow Storm Sewers Extension was used for modeling based on a 10-year design storm.

The **Exhibit 5 Addendum – Storm Sewer Calculations Phase 2** includes:

- Storm Sewer Tributary Exhibit
- Runoff Coefficient Calculations
- Inlet Capacity Calculations
- Storm Sewer 10-Year Design Calculations
- Storm Sewer 10-Year Design Profile

CB #4
AREA = 0.23 AC
C = 0.77
Tc = 5 min.

CB #2
AREA = 0.15 AC
C = 0.80
Tc = 5 min.

CB #5
AREA = 0.07 AC
C = 0.80
Tc = 5 min.

CB #3
AREA = 0.10 AC
C = 0.81
Tc = 5 min.

CB #6
AREA = 0.12 AC
C = 0.76
Tc = 5 min.

CB #7
AREA = 1.04 AC
C = 0.37
Tc = 12 min.

CB #8
AREA = 0.65 AC
C = 0.25
Tc = 11 min.

(MODIFIED)
EX. INL #8
AREA = 0.84 AC
C = 0.23
Tc = 11 min.

(MODIFIED)
EX CB #7
AREA = 0.33AC
C = 0.74
Tc = 5 min.

INL. #9
AREA = 0.20 AC
C = 0.56
Tc = 5 min.

INL. #10
AREA = 0.19 AC
C = 0.71
Tc = 5 min.

LEGEND

PHASE 1

PHASE 2
(EX CB#7 & EX CB#8 MODIFIED & INL #9 & INL#10 ADDED)

NOT FOR CONSTRUCTION

OSNI MEDICAL OFFICE BLDG
Storm Sewer
Tributary Area Exhibit

SCALE: 1" = 20'

DESIGN BY	DATE
GMPF	09/23/25

PROJECT NO. 23-0031

EX

DVG TEAM INC
1155 Troutwine Road
Crown Point, IN 46307
P: (219) 662-7710
F: (219) 662-2740
www.dvgteam.com

NOT FOR CONSTRUCTION

REGION CONTRACTORS, LLC
912 W. AVE H, SUITE 2
GRIFFITH, IN 46319

DATE: | REVISIONS AND NOTES:

BY: GMPF
DATE: 9/23/2025
CHECKED:
DATE:

INLET CAPACITY ANALYSIS

Project: OSNI Medical Office - Phase 2 Storm Sewer
Location: Munster, In

ORIFICE FLOW EQUATION

$$h = \frac{Q^2}{2g(CA)^2}$$

C = Orifice Coefficient (0.67 typical for storm sewer grates)
A_{open} = grate open area (sq. ft.)
% Clogged (decimal form)= 0.5

WEIR FLOW EQUATION

$$h = \frac{Q}{(3.33P)^{\frac{2}{3}}}$$

P = wetted perimeter (ft)
Q=10-yr flow (cfs)

10-YR FLOW EQUATION

$$Q = CIA$$

C=runoff coefficient
I=rainfall intensity (in/hr)
A=watershed area (acres)

Structure Label	Type of Grate	A_{open} (sq.ft.)	P (ft)	$C_{orifice}$	$A_{watershed}$ (acres)	C_{runoff}	I (in/hr)	Q (10-YR) (cfs)	Orifice Flow h (ft)	Weir Flow h (ft)	Ponding Depth (in)
EX INL #8	EJ 1020 M1	0.97	5.92	0.67	0.84	0.23	7.08	1.37	0.28	0.27	3.3
EX CB#7	EJ 1020 M1	0.97	5.92	0.67	0.33	0.74	7.08	1.73	0.44	0.32	5.3
INL #9	EJ 1020 M1	0.97	5.92	0.67	0.20	0.71	7.08	1.01	0.15	0.22	2.6
INL # 10	EJ 1020 M1	0.97	5.92	0.67	0.19	0.56	7.08	0.75	0.08	0.18	2.2

**** 10-YR Flow values are calculated using the Rational Method. Q=CIA***

Grate Properties	
Type	Open Area (sq.in.)
EJ 1020 M1	140.00
EJ 1020 N	135.00

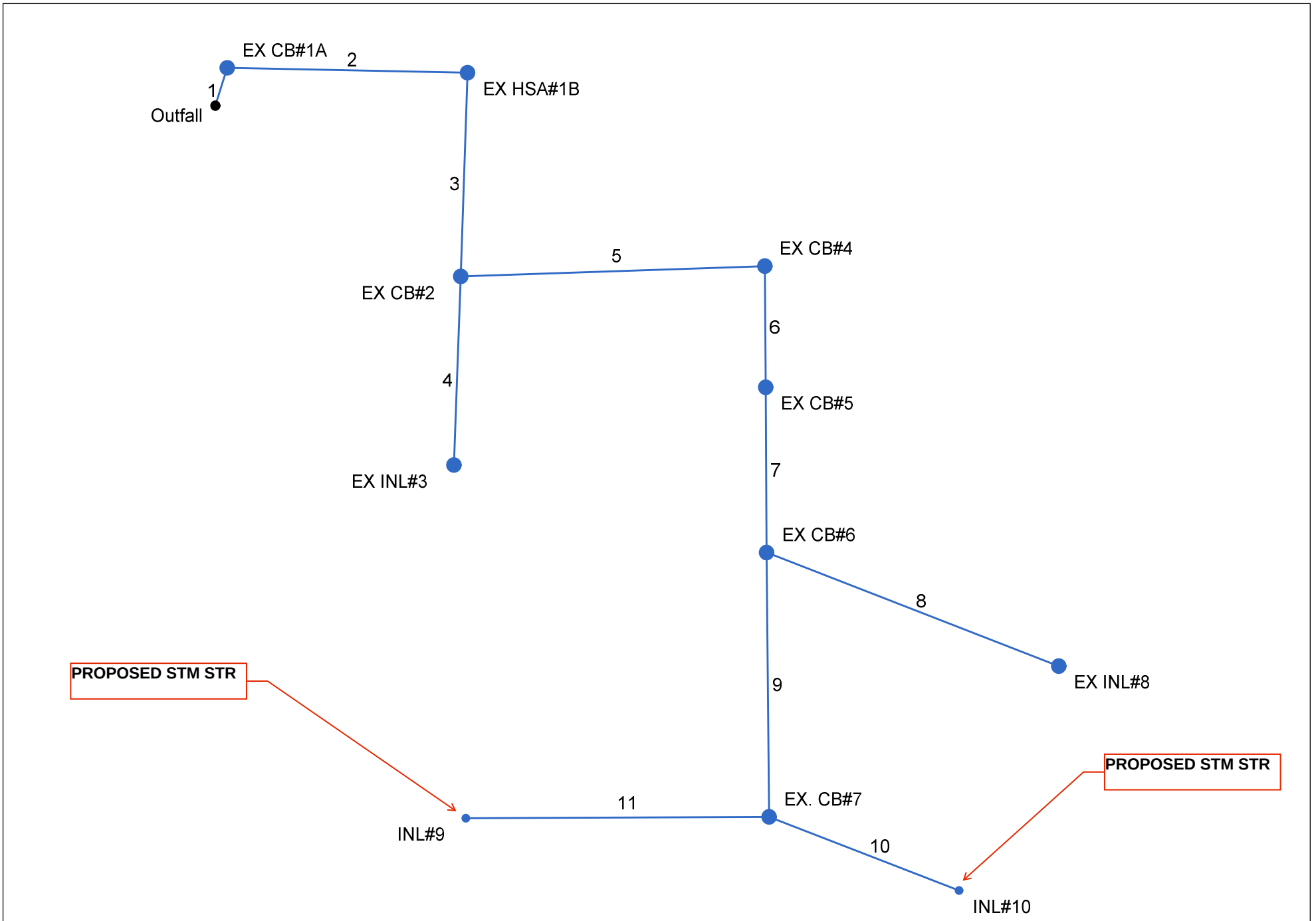
BY: RJP
DATE: 9/22/2025
CHECKED: _____
DATE: _____

PROJECT: **OSNI Medical Office - Munster, IN - PHASE 2**
DESCRIPTION: **Storm Sewer Design Calculations**
DESIGN STORM: **10 yr Storm Event**
RAINFALL DATA: **Munster Stormwater Technical Manual**
COMPUTATIONAL METHOD: **Hydraflow Storm Sewers Extension for Autodesk AutoCAD Civil 3D**

Line No.	Upstream Structure	Downstream Structure	Drainage Area (ac)	Total Area (ac)	Runoff Coeff. (C)	Tc (min)	Time in Pipe (min)	i Sys (in/hr)	Known Q (cfs)	Flow Rate (cfs)	Capacity Full (cfs)	Vel Ave (ft/s)	n-Value	Line Length (ft)	Line Size (in)	Line Slope (%)	Grnd/Rim Elev Up (ft)	Invert Up (ft)	Invert Dn (ft)	HGL Up (ft)	HGL Dn (ft)
11	INL#9	EX CB#7	0.20	0.20	0.56	5.00	5.00	7.07	0.00	0.79	1.92	1.01	0.012	89	12	0.25	614.57	611.82	611.60	612.99	612.95
10	INL#10	EX CB#7	0.19	0.19	0.71	5.00	5.00	7.07	0.00	0.95	2.68	1.21	0.012	62	12	0.48	614.65	611.90	611.60	612.99	612.95
9	EX. CB#7	EX. CB#6	0.33	0.72	0.74	5.00	6.50	6.53	0.00	3.21	3.91	2.61	0.012	96	15	0.31	614.30	611.60	611.30	612.85	612.70
8	EX INL#8	CB#6	0.84	0.84	0.23	11.00	11.00	5.33	0.00	1.03	2.31	1.46	0.012	95	12	0.36	615.00	612.00	611.66	612.76	612.70
7	EX CB#6	CB#5	0.12	1.68	0.76	5.00	12.20	5.08	0.00	3.94	4.95	3.21	0.012	60	15	0.50	615.00	611.30	611.00	612.55	612.36
6	EX CB#5	CB#4	0.07	1.75	0.80	5.00	12.50	5.02	0.00	4.18	5.27	3.40	0.012	44	15	0.57	615.10	611.00	610.75	612.34	612.18
5	EX CB#4	CB#2	0.23	1.98	0.77	5.00	12.70	4.99	0.00	5.03	6.14	3.03	0.012	89	18	0.29	615.00	610.75	610.49	612.03	611.89
4	EX INL#3	CB#2	0.10	0.10	0.81	5.00	5.00	7.07	0.00	0.57	2.47	1.42	0.012	69	12	0.41	614.55	611.50	611.22	611.92	611.89
3	EX CB#2	HSA#1B	0.15	2.23	0.80	5.00	13.20	4.89	0.00	5.92	7.24	3.91	0.012	74	18	0.41	614.25	610.49	610.19	611.63	611.46
2	EX HSA#1B	CB#1A	0.00	2.23	0.00	5	13.60	4.83	0.00	5.84	10.91	3.18	0.012	71	24	0.20	614.80	610.19	610.05	611.30	611.21
1	EX CB#1A	ES #1	0.00	2.23	0.00	5	14.20	4.73	0.00	5.72	14.53	4.34	0.012	14	24	0.35	614.50	610.05	610.00	610.92	610.87

PROPOSED STORM STRUCTURES
EXISTING STORM STRUCTURES

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



Project File: OSNI_Phase 2.stm	Number of lines: 11	Date: 9/23/2025

BY: AR
DATE: 9/4/2025
CHECKED: RJP
DATE: 9/22/2025

RUNOFF COEFFICIENT CALC (C)

PROJECT: **OSNI Medical Office - Munster, IN - Phase 2 Storm Sewer**

Cover Description	Runoff Coefficient
Lawn Area	0.16
Hard Surface Area	0.85

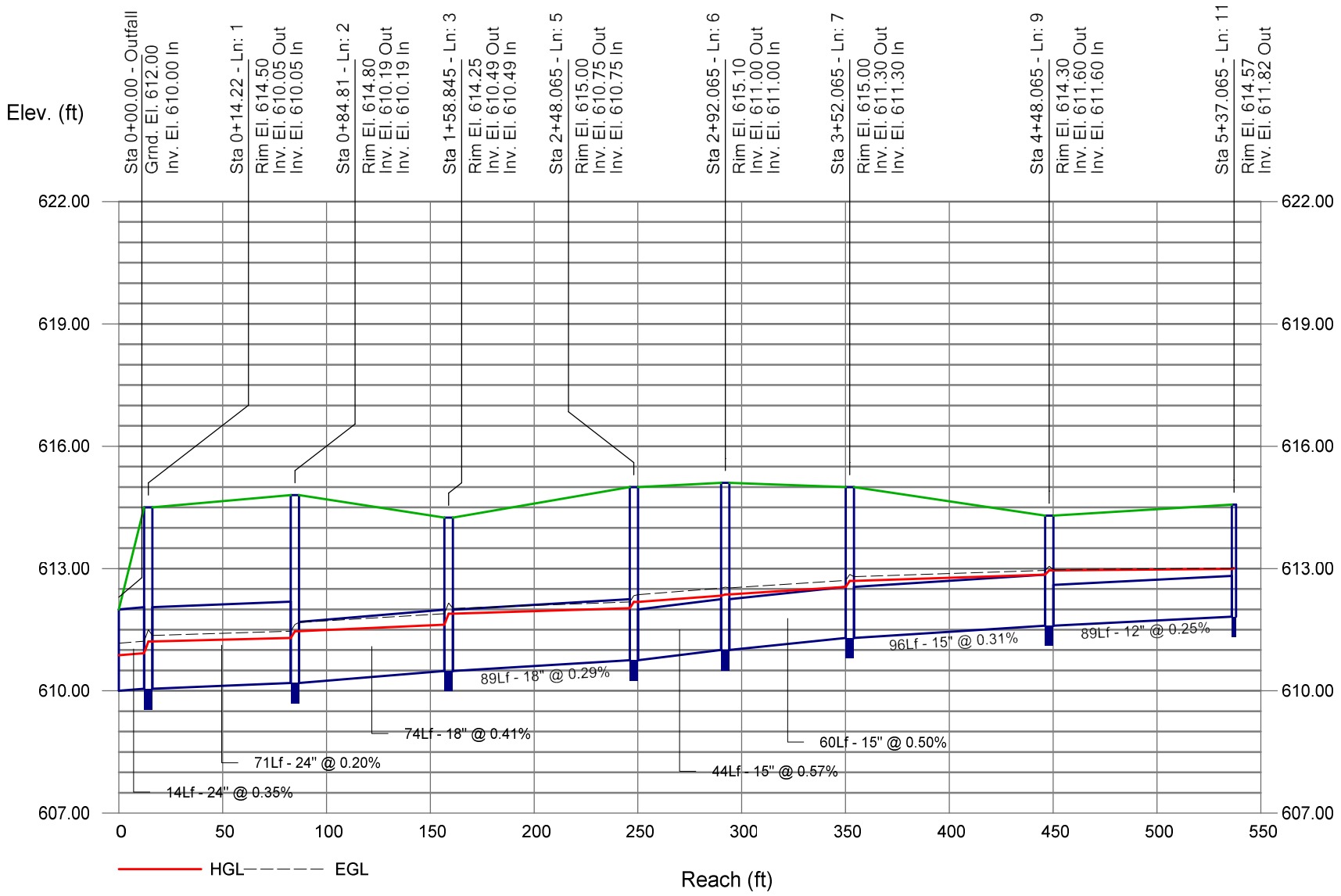
Structure Number	Total Area (sq. ft.)	Lawn Area (sq. ft.)	Hard Surface Area (sq. ft.)	Runoff C (Weighted)
Phase 2				
EX. INL #8	36683	32780	3903	0.23
EX. CB #7	14473	2300	12173	0.74
INL #9	8718	3603	5115	0.56
INL #10	8122	1706	6416	0.71

Note: Ex. INL#8 & Ex. CB#7 have updated Trib. Areas, Tc & C values per Phase 2 design.

Storm Sewer Profile

Proj. file: OSNI_Phase 2.stm

10 YR EVENT



Storm Sewer Profile

Proj. file: OSNI_Phase 2.stm

10 YR EVENT