Kimley»Horn

MEMORANDUM

To: Town of Munster

From: Taylor Eschbach, P.E.
           Kimley-Horn and Associates, Inc.

Date: Aprill 14th, 2025

Re: *Drainage Report*
          Proposed MOR Munster Development
          9260 Calumet Ave.
          Munster, IN

Introduction

Kimley-Horn and Associates, Inc., serves as the engineering consultant for Midwest Orthopedics at Rush, who is proposing to construct a medical office building. The sitework includes grading, storm sewer, water, sanitary sewer, and paving installation along with associated dry utilities and landscaping.

The site was previously covered entirely by the building footprint of the Simmons office and manufacturing facility but is currently an open undeveloped grass lot with no existing structures or utilities.

Existing Conditions

The existing site has relatively mild slopes and generally drains from west to east. Runoff from the existing site is collected in the existing storm sewer system that runs north in the existing private access road east of the site. The storm sewer system is ultimately tributary to an existing storm water lift station northwest of the Lake Business Center Campus and south of Fisher Street.

There is no existing impervious area on site as the property is in the process of being re-developed but as mentioned above, the site was previously 100% impervious.

Proposed Conditions

The site will consist of the proposed medical office building with associated parking and utilities. The site will have on site storm sewer pipes that are routed to an underground detention system designed to include manufactured BMP pre-treatment for storm water quality. Per coordination with Town staff, the underground stormwater management system has been sized to detain the difference between the volume required under the current Town of Munster Stormwater Ordinance and the volume required under the previous Ordinance when the site was developed as 100% impervious area. As shown in the attachments, this volume was determined to be approximately 0.48 acre-feet of volume. The underground detention system then discharges to the existing storm sewer network in the private access road east of the site property. The discharge from the underground system will be controlled

by a restrictor which will help ensure that the existing storm sewer network immediately downstream of the site has adequate capacity for the site runoff during the 10-year storm.

The on-site impervious area is approximately 1.91 acres as seen on the attached impervious area exhibit. See attached Stormwater calculations for underground detention sizing. See attached existing storm sewer calculations and tributary area map exhibit for existing storm sewer capacity.

Stormwater Storage Volume Requirements

The required stormwater storage volume for the proposed development was calculated using the following steps.

1. **The allowable release rate under the 2003 ordinance was calculated to be 1.26 cfs** assuming a predevelopment C-value of 0.15, a 10-minute time of concentration, and the 2-yr rainfall data in the 2003 ordinance.
2. **The required stormwater storage volume under the 2003 ordinance was calculated to be 0.52 ac-ft** at the peak during the 100-yr, 2-hour storm event. This calculation method was consistent with the stormwater approval for the hotel site to the north on the Lake Business Center campus.
3. **The allowable release rate under the 2023 ordinance was calculated to be 0.47 cfs** assuming 0.2 cfs per acre.
4. **The required stormwater storage volume under the 2023 ordinance was calculated to be 1.00 ac-ft** using HydroCAD software to generate a hydrologic model. This model assumed a 48-inch diameter underground detention system with a control structure.
5. As discussed with the Town, the proposed on-site stormwater storage volume required will be the difference between the 2023 requirement and the 2003 requirement:

> **1.0   ac-ft – 0.52 ac-ft = 0.48 ac-ft stormwater storage volume required**

Proposed Detention System

In order to meet the requirements above, an underground detention system will be proposed under the on-site parking lot. This system is intended to provide approximately 0.50 ac-ft of storage between the pipes and stone backfill. Manufactured BMP pre-treatment structures will be installed upstream of the underground detention system to provide a storm water quality benefit for the site. Downstream of the underground detention system, a control structure will be provided to maximize the detention volume provided.

A calculation summary for the proposed system has been included in the attachments. Preliminary calculations indicate an 11-inch orifice would maximize the underground system during the 100-year storm without overtopping. This would result in a release rate of approximately 5.66 cfs in the 100-yr, 24-hr storm and 4.06 cfs in the 10-yr, 24-hr storm.

Downstream Storm Sewer Capacity

After discussion with Town staff, Kimley-Horn reviewed the storm sewer capacity of the existing pipe network immediately downstream of the proposed connection point. As shown on the Utility Plan sheet, the proposed development intends to connect to the existing storm sewer network at the existing storm manhole to the southwest of the 9140 Calumet Avenue retail building (currently Noodles and Company). As shown in the attachments, a tributary area was determined for all area upstream of this structure including the proposed development. A rational method calculation was used for this area to determine an estimated 10-year peak runoff without any on-site detention. A similar exercise was performed for the next storm structure downstream with a slightly larger tributary area. The tributary area map and runoff calculations can be found in the attachments.

Alternatively, the estimated 10-year peak flows were also determined if on-site underground stormwater detention were to be provided. These reduced flows were determined using a HydroCAD model for the proposed development. The calculations summary has been included in the attachments and the estimated flows are summarized in the table below.

Manning's equation was used to determine existing pipe capacities for these two 30-inch diameter pipe segments immediately downstream. Both were determined to have sufficient capacity for the runoff from the proposed development as shown in the summary table below:

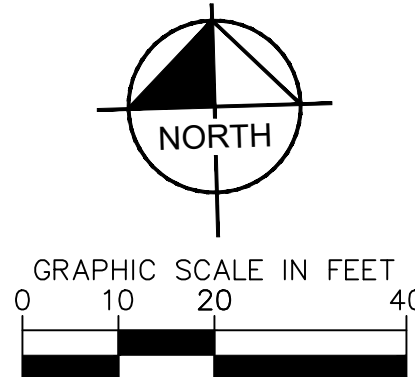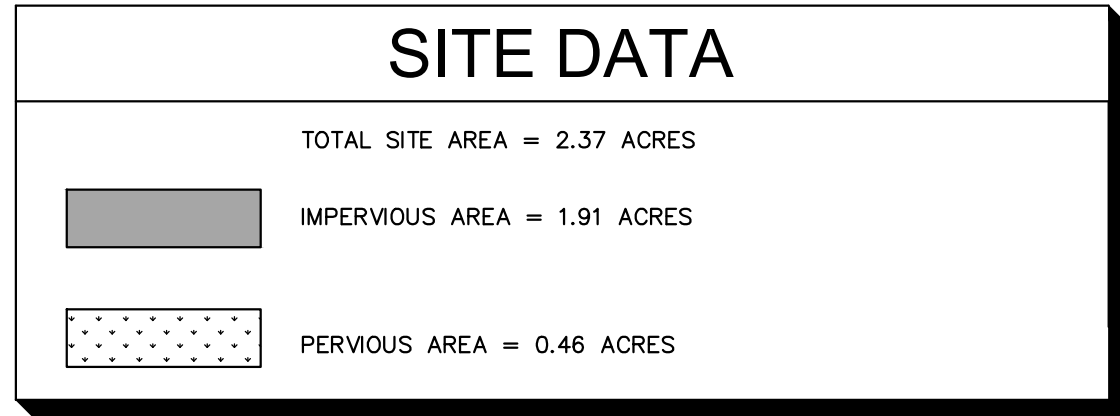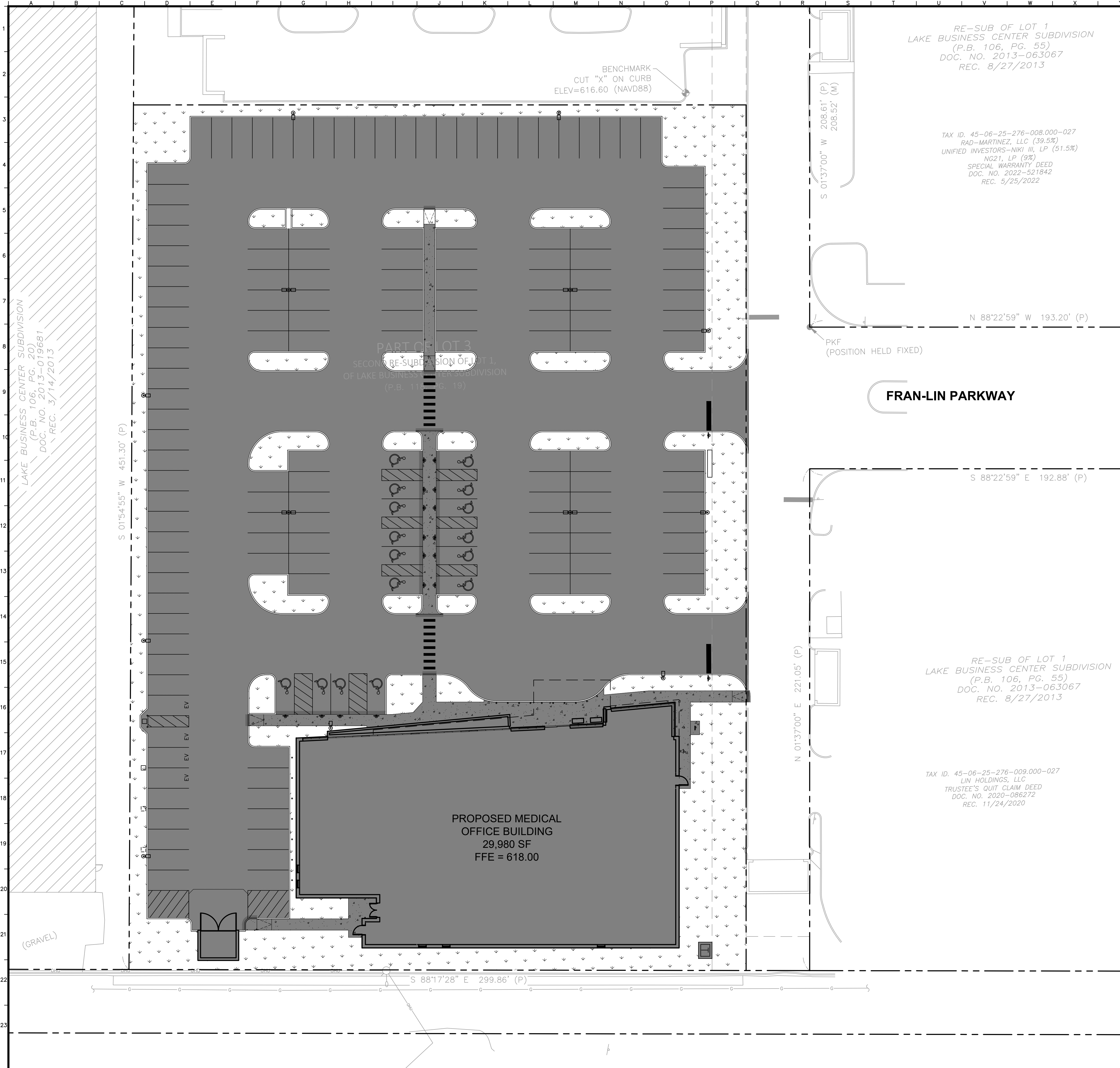|	Existing Pipe Capacity (cfs)	Proposed 10-Year Peak Flow Without On-Site Detention (cfs)	Proposed 10-Year Peak Flow With On-Site Detention (cfs)
Downstream Pipe Segment #1	22.22	19.72	14.39
Downstream Pipe Segment #2	25.52	23.24	17.91

Conclusions

As summarized above and as supported in the attached calculations, it is our opinion that the existing storm sewer extension constructed with the adjacent retail parcels provides adequate capacity for the proposed development. Considering that the subject property was previously 100% impervious, the proposed development will provide a reduction in impervious coverage from its previously developed condition. Providing approximately 0.5 ac-ft of detention on-site will provide a significant benefit for the property and the surrounding parcels.

Attachments

- Appendix A - Impervious Area Exhibit
- Appendix B – Required Stormwater Management Under 2003 Ordinance
- Appendix C – Required Stormwater Management Under 2023 Ordinance
- Appendix D – Proposed On-Site Underground Detention Model
- Appendix E – Tributary Area Map
- Appendix F – Downstream Storm Sewer Capacity Calculations

NORTH

GRAPHIC SCALE IN FEET
0 10 20   40

Indiana811
Know what's below. Call before you dig.

RE-SUB OF LOT 1
LAKE BUSINESS CENTER SUBDIVISION
(P.B. 106, PG. 55)
DOC. NO. 2013-063067
REC. 8/27/2013

TAX ID. 45-06-25-276-008.000-027
RAD-MARTINEZ, LLC (39.5%)
UNIFIED INVESTORS-NIKI III, LP (51.5%)
NG21, LP (9%)
SPECIAL WARRANTY DEED
DOC. NO. 2022-521842
REC. 5/25/2022

S 01°37'00" W 208.61' (P)
208.52' (M)

N 88°22'59" W 193.20' (P)

PKF
(POSITION HELD FIXED)

BENCHMARK
CUT "X" ON CURB
ELEV=616.60 (NAVD88)

LAKE BUSINESS CENTER SUBDIVISION
(P.B. 106, PG. 20)
DOC. NO. 2013-019681
REC. 3/14/2013

PART OF LOT 3
SECOND RE-SUBDIVISION OF LOT 1,
OF LAKE BUSINESS CENTER SUBDIVISION
(P.B. 119, PG. 19)

S 01°54'55" W 451.30' (P)

FRAN-LIN PARKWAY

S 88°22'59" E 192.88' (P)

RE-SUB OF LOT 1
LAKE BUSINESS CENTER SUBDIVISION
(P.B. 106, PG. 55)
DOC. NO. 2013-063067
REC. 8/27/2013

N 01°37'00" E 221.05' (P)

TAX ID. 45-06-25-276-009.000-027
LIN HOLDINGS, LLC
TRUSTEE'S QUIT CLAIM DEED
DOC. NO. 2020-086272
REC. 11/24/2020

PROPOSED MEDICAL
OFFICE BUILDING
29,980 SF
FFE = 618.00

EV EV

EV EV

(GRAVEL)

S 88°17'28" E 299.86' (P)

SITE DATA

TOTAL SITE AREA = 2.37 ACRES

IMPERVIOUS AREA = 1.91 ACRES

PERVIOUS AREA = 0.46 ACRES

	PLAN COMMISSION FILING		04/14/25	TRE
	SITE PLAN REVISIONS		03/28/25	TRE
No.	REVISIONS		DATE	BY

SCALE: AS NOTED
DESIGNED BY: OTL
DRAWN BY: ALG
CHECKED BY: TRE

**IMPERVIOUS
AREA EXHIBIT**

MUNSTER MOB
9260 CALUMET AVENUE
MUNSTER, IN 46321

ORIGINAL ISSUE:
02/24/2025

KHA PROJECT NO.
268411004

SHEET NUMBER

EX. 1

APPENDIX B - REQUIRED STORMWATER MANAGEMENT UNDER 2003 ORDINANCE

Q=Cia

Allowable Release Rate Calculation for Pre Building Condition (Duration, Intensity and C value pulled from 2003 Ordinance)

durations (min)	I (in/hr)	c (Runoff Coefficient)	A (Acres)	Q (CFS)
10	3.55	0.15	2.37	1.262
20	2.6	0.15	2.37	0.924
30	2.1	0.15	2.37	0.747
40	1.8	0.15	2.37	0.640
50	1.6	0.15	2.37	0.569
60	1.4	0.15	2.37	0.498
90	1.05	0.15	2.37	0.373
120	0.8	0.15	2.37	0.284
180	0.6	0.15	2.37	0.213

3. To calculate the allowable two (2) year release rate, the following date shall be used:

| Storm (hrs)	Duration (min)	Intensity (in/hr)
0.17	10	3.55
0.33	20	2.60
0.50	30	2.10
0.67	40	1.80
0.83	50	1.60
1.00	60	1.40
1.50	90	1.05
2.00	120	0.80
3.00	180	0.60

Storage Required during Building Phase

Developed "C"	Storm Duration (HR)	Rainfall Frequency (IN)	Rainfall Intensity (IN/HR)	Drainage Area (Acres)	Inflow Rate (CFS)	Release Rate (CFS)	Storage Rate (CFS)	Storage Required (AC*FT)
0.9	0.08	0.85	10.63	2.37	22.674	1.26	21.414	0.142
0.9	0.17	1.5	8.82	2.37	18.813	1.26	17.553	0.247
0.9	0.25	1.92	7.68	2.37	16.381	1.26	15.121	0.312
0.9	0.5	2.63	5.26	2.37	11.220	1.26	9.960	0.412
0.9	1	3.35	3.35	2.37	7.146	1.26	5.886	0.486
0.9	2	4.13	2.07	2.37	4.415	1.26	3.155	0.522
0.9	3	4.56	1.52	2.37	3.242	1.26	1.982	0.491
0.9	6	5.34	0.89	2.37	1.898	1.26	0.638	0.317
0.9	12	6.19	0.52	2.37	1.109	1.26	-0.151	-0.150
0.9	18	6.69	0.37	2.37	0.789	1.26	-0.471	-0.700
0.9	24	7.12	0.3	2.37	0.640	1.26	-0.620	-1.230
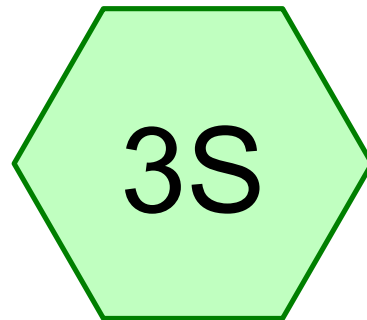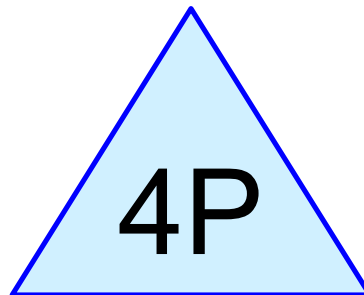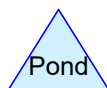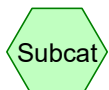
3S

(new Subcat)

4P

Underground SWM - 1.0 acft

Subcat   Reach   Pond   Link

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	100-YR, 24-HR	Type II 24-hr		Default	24.00	1	8.02	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.490	80	>75% Grass cover, Good, HSG D (3S)
1.880	98	Paved parking, HSG D (3S)
2.370	**94**	**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: (new Subcat)   Runoff Area=2.370 ac   79.32% Impervious   Runoff Depth>6.78"
                                           Tc=10.0 min   CN=94   Runoff=23.20 cfs 1.339 af

Pond 4P: Underground SWM - 1.0 acft   Peak Elev=3.98' Storage=1.000 af   Inflow=23.20 cfs 1.339 af
                                           Outflow=0.46 cfs 0.374 af

Total Runoff Area = 2.370 ac   Runoff Volume = 1.339 af   Average Runoff Depth = 6.78"
20.68% Pervious = 0.490 ac   79.32% Impervious = 1.880 ac

Summary for Subcatchment 3S: (new Subcat)
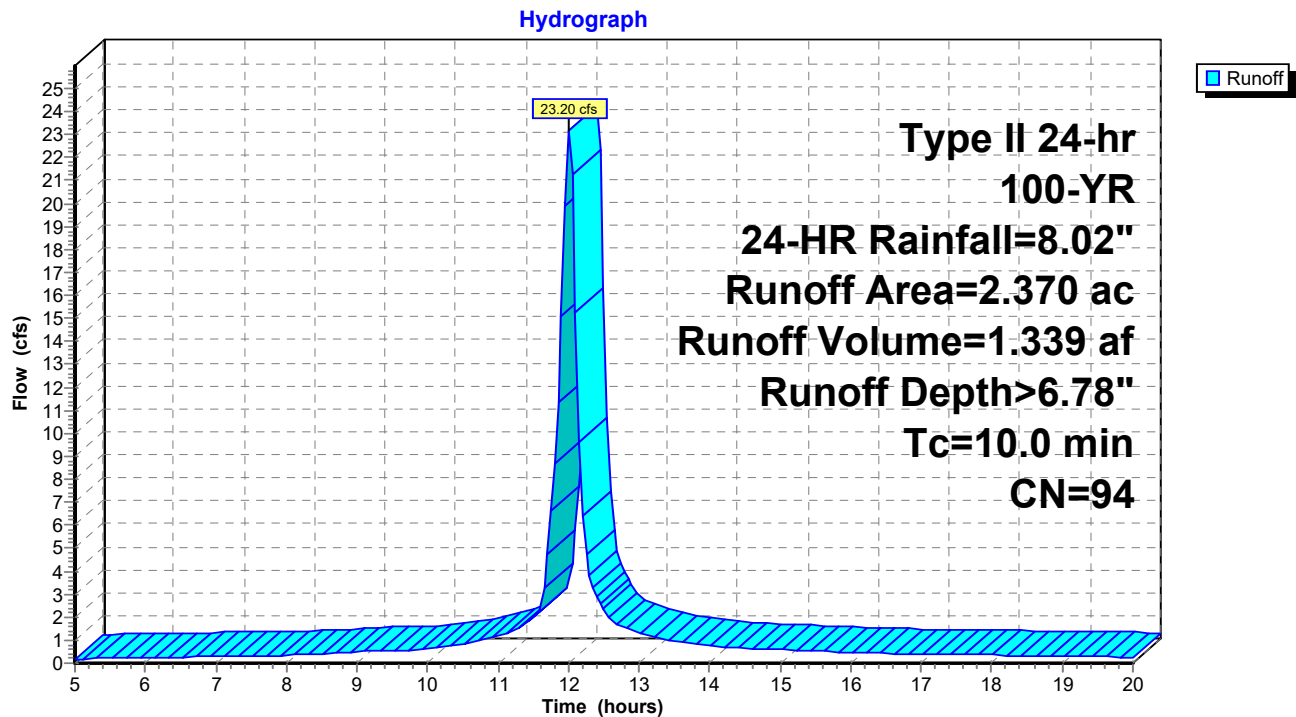
Runoff   =   23.20 cfs @ 12.01 hrs, Volume=   1.339 af, Depth> 6.78"
    Routed to Pond 4P : Underground SWM - 1.0 acft

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YR, 24-HR Rainfall=8.02"

Area (ac)	CN	Description
1.880	98	Paved parking, HSG D
0.490	80	>75% Grass cover, Good, HSG D
2.370	94	Weighted Average
0.490		20.68% Pervious Area
1.880		79.32% Impervious Area

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

Subcatchment 3S: (new Subcat)

Hydrograph

Type II 24-hr
100-YR
24-HR Rainfall=8.02"
Runoff Area=2.370 ac
Runoff Volume=1.339 af
Runoff Depth>6.78"
Tc=10.0 min
CN=94

Summary for Pond 4P: Underground SWM - 1.0 acft

[82] Warning: Early inflow requires earlier time span

Inflow Area =   2.370 ac, 79.32% Impervious, Inflow Depth > 6.78"   for 100-YR, 24-HR event
Inflow   =   23.20 cfs @   12.01 hrs, Volume=   1.339 af
Outflow   =   0.46 cfs @   15.96 hrs, Volume=   0.374 af, Atten= 98%, Lag= 237.0 min
Primary   =   0.46 cfs @   15.96 hrs, Volume=   0.374 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3.98' @ 15.96 hrs   Surf.Area= 0.045 ac   Storage= 1.000 af

Plug-Flow detention time= 284.7 min calculated for 0.372 af (28% of inflow)
Center-of-Mass det. time= 146.0 min (884.4 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	1.001 af	**48.0" Round Pipe Storage**
			L= 3,470.0'

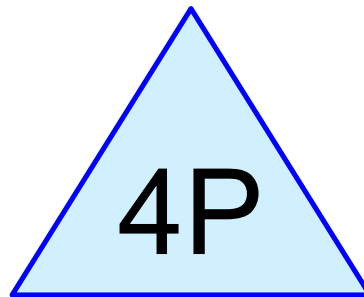| Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.46 cfs @ 15.96 hrs HW=3.98'   (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 0.46 cfs @ 9.45 fps)
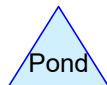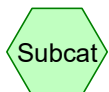
Pond 4P: Underground SWM - 1.0 acft
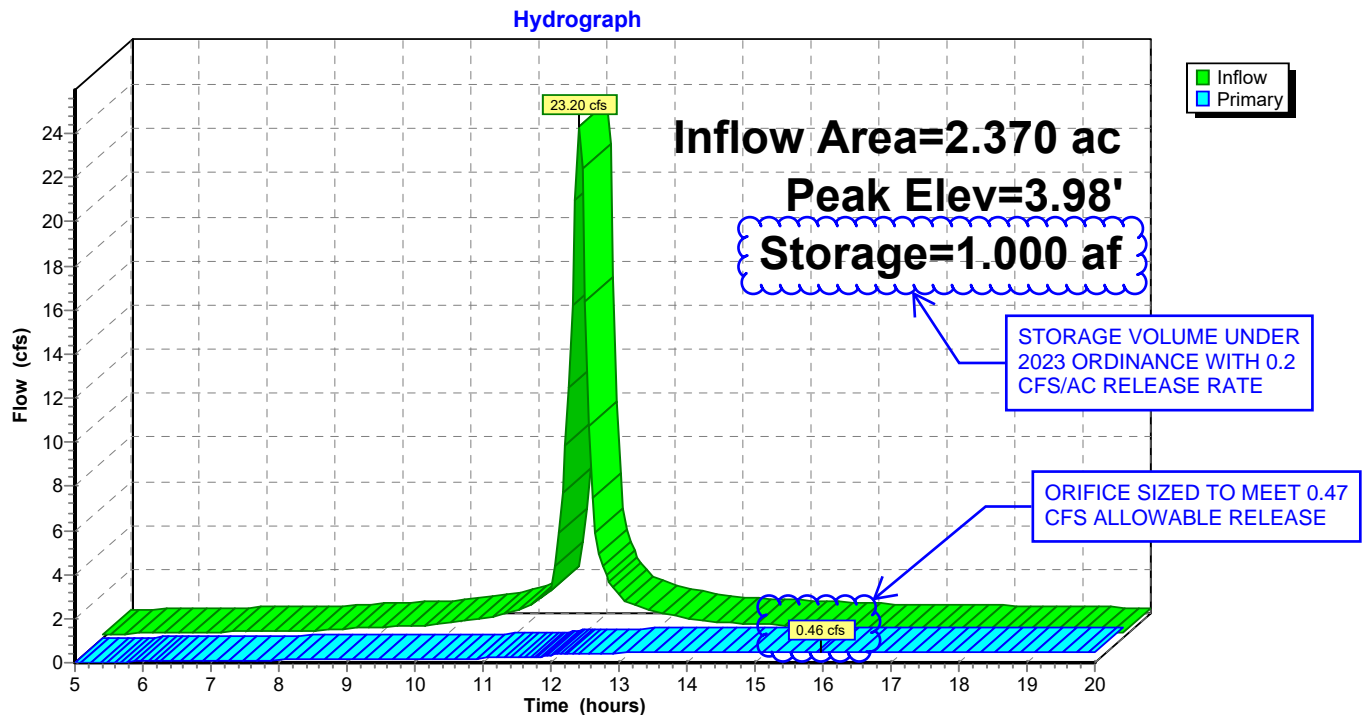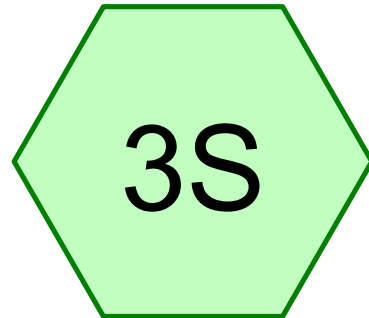
3S

(new Subcat)

4P

Underground SWM - 0.5 acft

Subcat   Reach   Pond   Link

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	10-YR, 24-HR	Type II 24-hr		Default	24.00	1	4.94	2
2	100-YR, 24-HR	Type II 24-hr		Default	24.00	1	8.02	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.490	80	>75% Grass cover, Good, HSG D (3S)
1.880	98	Paved parking, HSG D (3S)
2.370	**94**	**TOTAL AREA**

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: (new Subcat)   Runoff Area=2.370 ac   79.32% Impervious   Runoff Depth>3.97"
                                           Tc=10.0 min   CN=94   Runoff=13.92 cfs 0.784 af

Pond 4P: Underground SWM - 0.5 acft   Peak Elev=2.09' Storage=0.265 af Inflow=13.92 cfs 0.784 af
                                           Outflow=4.06 cfs 0.775 af

Total Runoff Area = 2.370 ac   Runoff Volume = 0.784 af   Average Runoff Depth = 3.97"
20.68% Pervious = 0.490 ac   79.32% Impervious = 1.880 ac

2025-0414 - Preliminary SWM Model
Prepared by Kimley-Horn & Associates
HydroCAD® 10.20-5c s/n 02344 © 2023 HydroCAD Software Solutions LLC

Type II 24-hr 10-YR, 24-HR Rainfall=4.94"
Printed 4/14/2025
Page 5

Summary for Subcatchment 3S: (new Subcat)

Runoff   =   13.92 cfs @ 12.01 hrs, Volume=   0.784 af, Depth> 3.97"
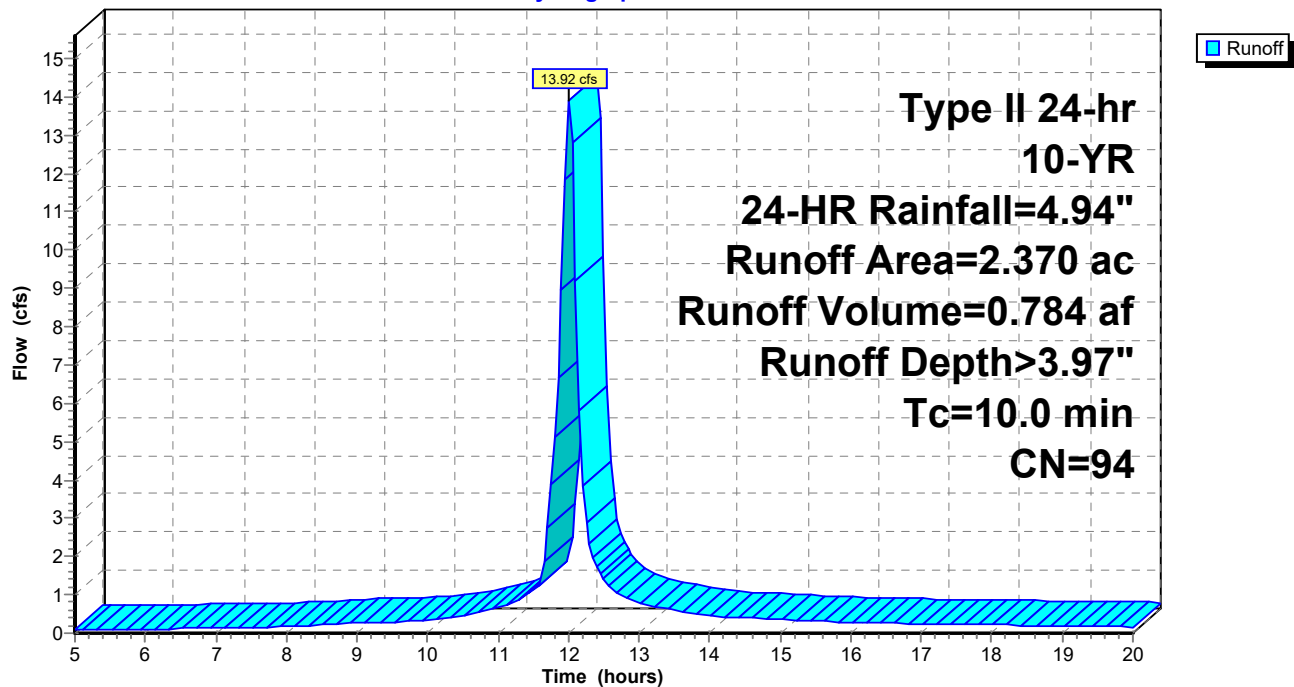   Routed to Pond 4P : Underground SWM - 0.5 acft

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YR, 24-HR Rainfall=4.94"

Area (ac)	CN	Description
1.880	98	Paved parking, HSG D
0.490	80	>75% Grass cover, Good, HSG D
2.370	94	Weighted Average
0.490		20.68% Pervious Area
1.880		79.32% Impervious Area

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

Subcatchment 3S: (new Subcat)

Hydrograph

Type II 24-hr
10-YR
24-HR Rainfall=4.94"
Runoff Area=2.370 ac
Runoff Volume=0.784 af
Runoff Depth>3.97"
Tc=10.0 min
CN=94

Summary for Pond 4P: Underground SWM - 0.5 acft

[82] Warning: Early inflow requires earlier time span

Inflow Area =		2.370 ac,	79.32% Impervious,	Inflow Depth > 3.97"	for 10-YR, 24-HR event	
Inflow	=	13.92 cfs @	12.01 hrs,	Volume=	0.784 af	
Outflow	=	4.06 cfs @	12.20 hrs,	Volume=	0.775 af,	Atten= 71%, Lag= 11.6 min
Primary	=	4.06 cfs @	12.20 hrs,	Volume=	0.775 af	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
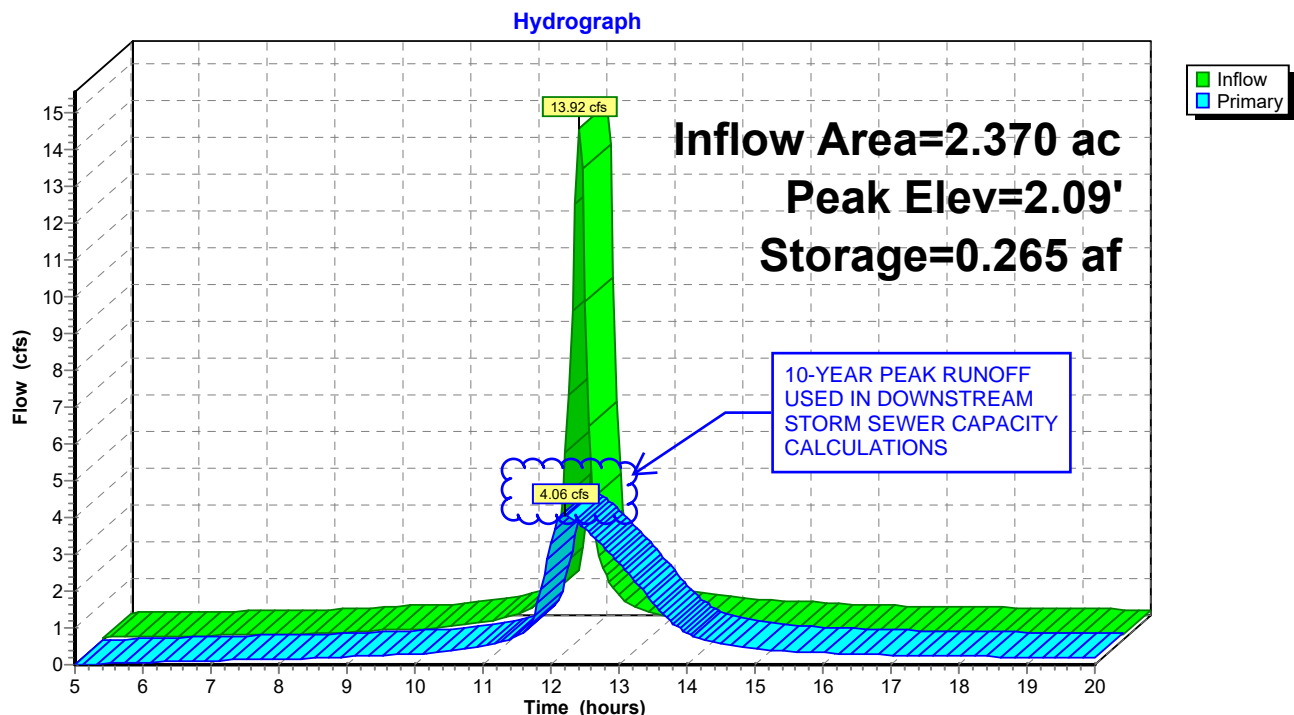Peak Elev= 2.09' @ 12.20 hrs   Surf.Area= 0.159 ac   Storage= 0.265 af

Plug-Flow detention time= 36.9 min calculated for 0.772 af (98% of inflow)
Center-of-Mass det. time= 31.3 min (776.7 - 745.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.501 af	**48.0" Round Pipe Storage**
			L= 1,735.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**11.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.06 cfs @ 12.20 hrs HW=2.09'   (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 4.06 cfs @ 6.15 fps)

Pond 4P: Underground SWM - 0.5 acft

Hydrograph

Inflow Area=2.370 ac
Peak Elev=2.09'
Storage=0.265 af

10-YEAR PEAK RUNOFF USED IN DOWNSTREAM STORM SEWER CAPACITY CALCULATIONS

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: (new Subcat) Runoff Area=2.370 ac 79.32% Impervious Runoff Depth>6.78"
Tc=10.0 min CN=94 Runoff=23.20 cfs 1.339 af

Pond 4P: Underground SWM - 0.5 acft Peak Elev=3.63' Storage=0.477 af Inflow=23.20 cfs 1.339 af
Outflow=5.66 cfs 1.325 af

Total Runoff Area = 2.370 ac Runoff Volume = 1.339 af Average Runoff Depth = 6.78"
20.68% Pervious = 0.490 ac 79.32% Impervious = 1.880 ac

2025-0414 - Preliminary SWM Model
Prepared by Kimley-Horn & Associates
HydroCAD® 10.20-5c s/n 02344 © 2023 HydroCAD Software Solutions LLC

Type II 24-hr 100-YR, 24-HR Rainfall=8.02"
Printed 4/14/2025
Page 8

Summary for Subcatchment 3S: (new Subcat)

Runoff   =   23.20 cfs @ 12.01 hrs, Volume=   1.339 af, Depth> 6.78"
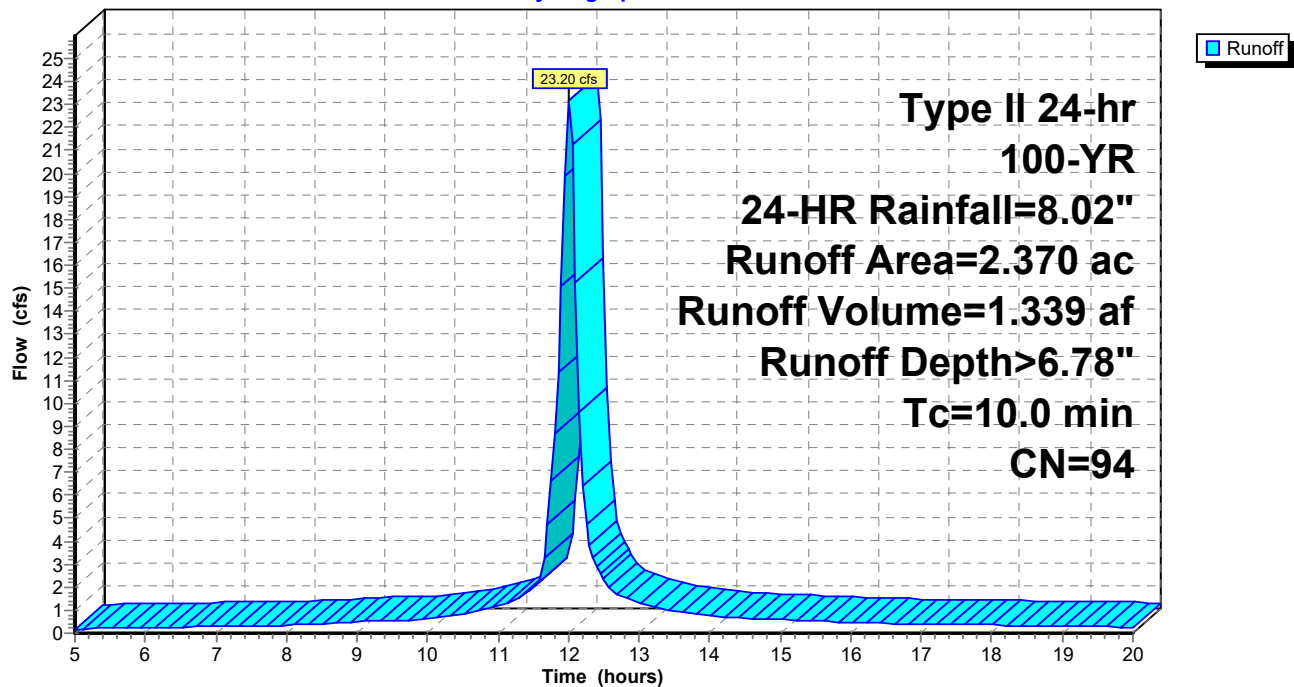   Routed to Pond 4P : Underground SWM - 0.5 acft

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-YR, 24-HR Rainfall=8.02"

Area (ac)	CN	Description
1.880	98	Paved parking, HSG D
0.490	80	>75% Grass cover, Good, HSG D
2.370	94	Weighted Average
0.490		20.68% Pervious Area
1.880		79.32% Impervious Area

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

Subcatchment 3S: (new Subcat)

Hydrograph

Type II 24-hr
100-YR
24-HR Rainfall=8.02"
Runoff Area=2.370 ac
Runoff Volume=1.339 af
Runoff Depth>6.78"
Tc=10.0 min
CN=94

2025-0414 - Preliminary SWM Model
Prepared by Kimley-Horn & Associates
HydroCAD® 10.20-5c s/n 02344 © 2023 HydroCAD Software Solutions LLC

Type II 24-hr 100-YR, 24-HR Rainfall=8.02"
Printed 4/14/2025
Page 9

Summary for Pond 4P: Underground SWM - 0.5 acft

[82] Warning: Early inflow requires earlier time span

Inflow Area =   2.370 ac,   79.32% Impervious,   Inflow Depth >   6.78"   for   100-YR, 24-HR event
Inflow   =   23.20 cfs @   12.01 hrs,   Volume=   1.339 af
Outflow   =   5.66 cfs @   12.22 hrs,   Volume=   1.325 af,   Atten= 76%,   Lag= 13.0 min
Primary   =   5.66 cfs @   12.22 hrs,   Volume=   1.325 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3.63' @ 12.22 hrs   Surf.Area= 0.092 ac   Storage= 0.477 af
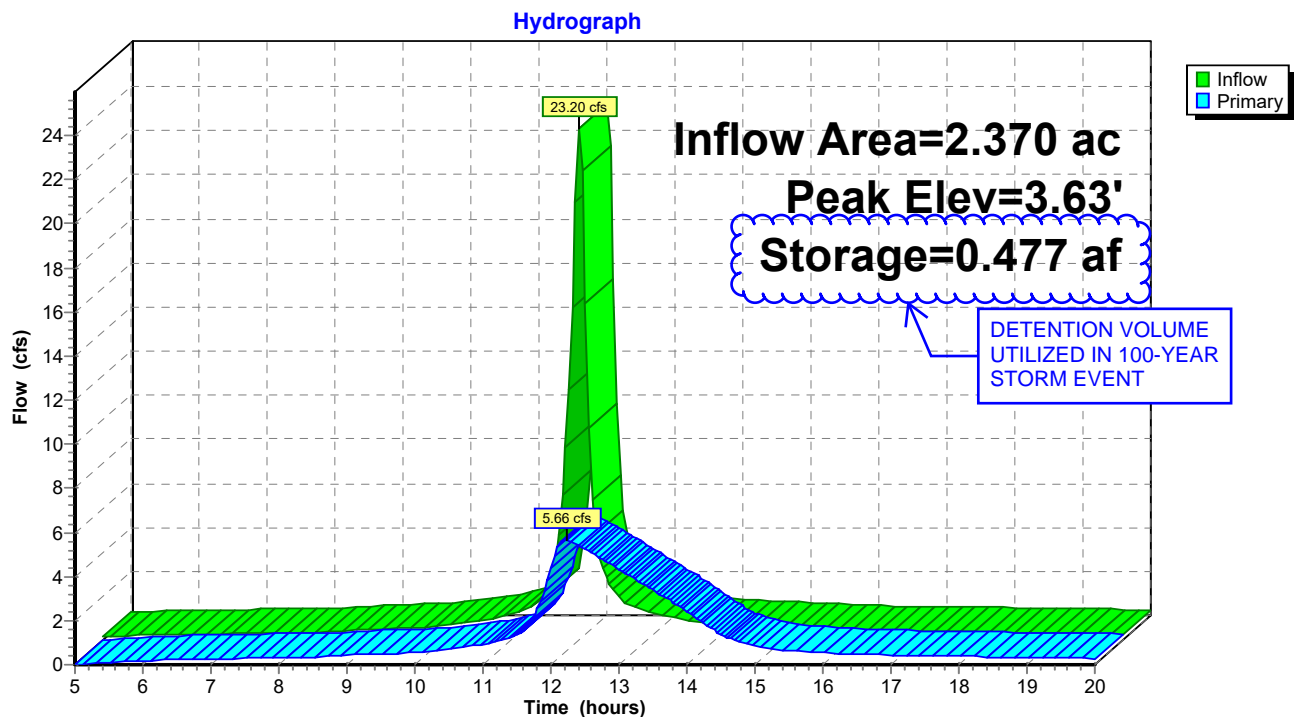
Plug-Flow detention time= 42.5 min calculated for 1.324 af (99% of inflow)
Center-of-Mass det. time= 37.5 min (775.9 - 738.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.501 af	**48.0" Round Pipe Storage** L= 1,735.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**11.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.65 cfs @ 12.22 hrs HW=3.62' (Free Discharge)
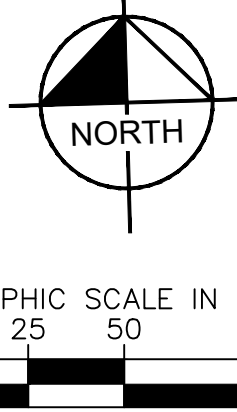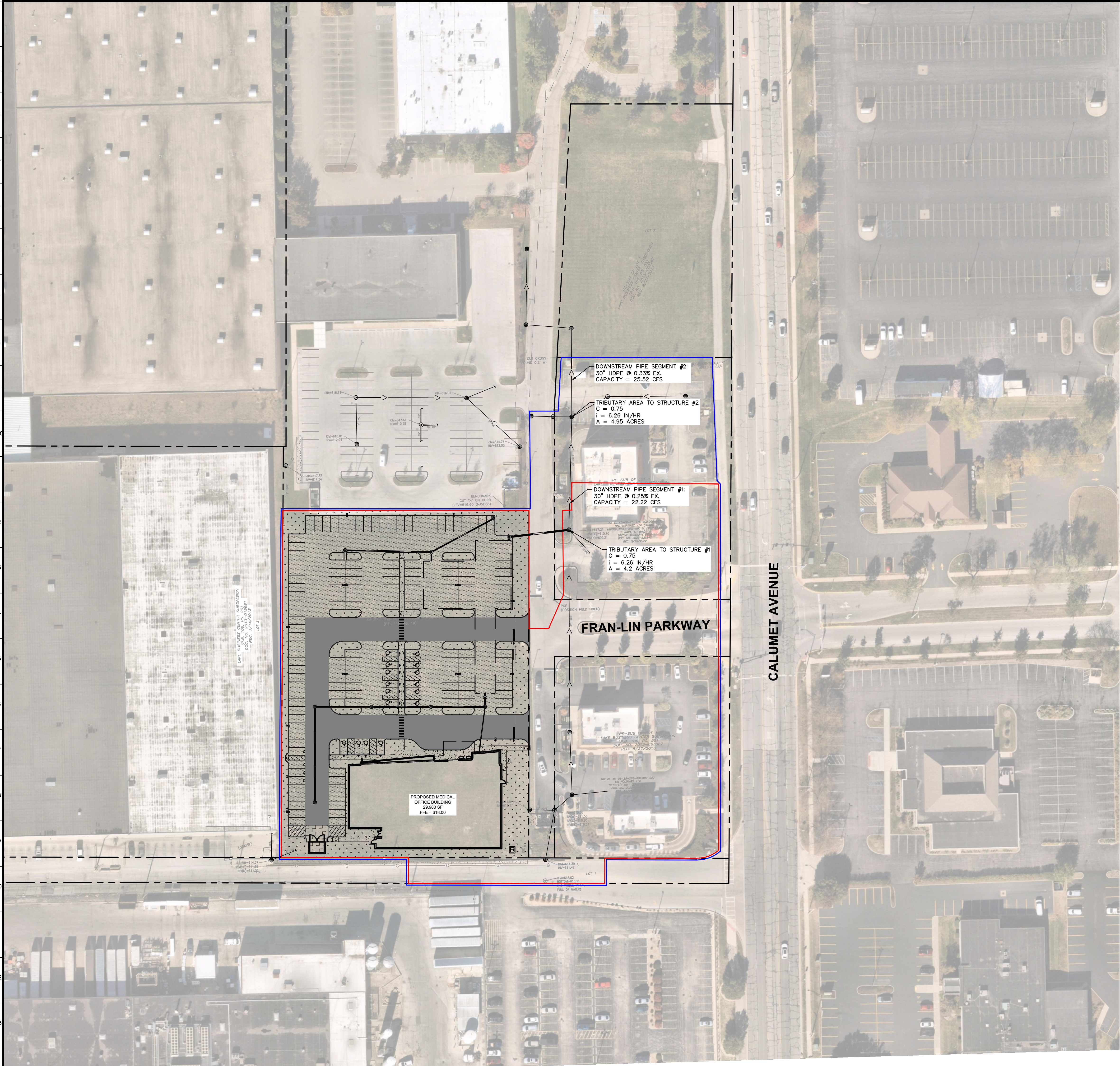└─**1=Orifice/Grate** (Orifice Controls 5.65 cfs @ 8.56 fps)

Pond 4P: Underground SWM - 0.5 acft

NORTH

GRAPHIC SCALE IN FEET
0   25   50   100

DOWNSTREAM PIPE SEGMENT #2:
30" HDPE @ 0.33% EX.
CAPACITY = 25.52 CFS

TRIBUTARY AREA TO STRUCTURE #2
C = 0.75
i = 6.26 IN/HR
A = 4.95 ACRES

DOWNSTREAM PIPE SEGMENT #1:
30" HDPE @ 0.25% EX.
CAPACITY = 22.22 CFS

TRIBUTARY AREA TO STRUCTURE #1
C = 0.75
i = 6.26 IN/HR
A = 4.2 ACRES

FRAN-LIN PARKWAY

CALUMET AVENUE

PROPOSED MEDICAL
OFFICE BUILDING
29,980 SF
FFE = 618.00

Kimley»Horn

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MIDWEST
ORTHOPAEDICS
at RUSH

SCALE: AS NOTED
DESIGNED BY: OTL
DRAWN BY: ALG
CHECKED BY: TRE

REVISIONS

No.   DATE   BY

MUNSTER MOB

TRIBUTARY AREA
MAP

9200 CALUMET AVENUE
MUNSTER, IN 46321

ORIGINAL ISSUE:
02/24/2025
KHA PROJECT NO.
268411004
SHEET NUMBER

EX.2

APPENDIX F - DOWNSTREAM STORM SEWER CAPACITY CALCULATIONS

Downstream Storm Sewer Capacity (Without On-Site Detention)
10-yr Storm
Point of connection SW of Noodles:

C =	0.75	Commercial (CBD) < 25-yr storm, Flat
i =	6.26	10-min, 10-yr storm
A =	4.2 ac	(MOR, Starbucks, Potbelly, Noodles, part of Pepsi driveway)
Q10 = CiA =	19.72 cfs	

30" HDPE @ 0.25% at connection point
Full Flow Capacity = 22.22 cfs (per Flowmaster)

Next Downstream Storm MH:

C =	0.75	Commercial (CBD) < 25-yr storm, Flat
i =	6.26	10-min, 10-yr storm
A =	4.95 ac	(MOR, Starbucks, Potbelly, Noodles, Bibibop, part of Pepsi driveway)
Q10 = CiA =	23.24 cfs	

30" HDPE @ 0.25% at connection point
Full Flow Capacity = 25.52 cfs (per Flowmaster)

Downstream Storm Sewer Capacity (With On-Site Detention)
10-yr Storm
Point of connection SW of Noodles:

C =	0.75	Commercial (CBD) < 25-yr storm, Flat
i =	6.26	10-min, 10-yr storm
A =	2.2 ac	(Starbucks, Potbelly, Noodles, part of Pepsi driveway)
Q10 = CiA =	10.33 cfs	(off-site)
Q10 =	4.06 cfs	(on-site, per HydroCAD model)
Total Q10 =	14.39 cfs	

30" HDPE @ 0.25% at connection point
Full Flow Capacity = 22.22 cfs (per Flowmaster)

Next Downstream Storm MH:

C =	0.75	Commercial (CBD) < 25-yr storm, Flat
i =	6.26	10-min, 10-yr storm
A =	2.95 ac	(Starbucks, Potbelly, Noodles, Bibibop, part of Pepsi driveway)
Q10 = CiA =	13.85 cfs	
Q10 =	4.06 cfs	(on-site, per HydroCAD model)
Total Q10 =	17.91 cfs	

30" HDPE @ 0.25% at connection point
Full Flow Capacity = 25.52 cfs (per Flowmaster)