STORMWATER MANAGMENT SUMMARY

FOR

PROPOSED TAKE 5 OIL CHANGE

Missouri Hwy 291

Lee's Summit, Missouri

October 7, 2022

PREPARED FOR

DRIVEN ASSESTS, L.L.C.

2101 Pearl Street

Boulder, CO 80302

PREPARED BY:

HIGH TIDE CONSULTANTS, LLC 700 CANAL BLVD.

THIBODAUX, LA 70301

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OCTOBER 7, 2022

Stormwater Management Summary

Introduction:

The purpose of this document is to provide a summary of the pre and post development drainage conditions for the 0.50 acre site located along the west side of highway 291, and just north of the Meineke Car Care which is located at 320 NE 291 Hwy, Lee's Summit, MO 64086. The site is made up of a vacant grass lot which will be redeveloped into a Take 5 Oil Change facility. This analysis will demonstrate that the proposed developments drainage system will meet the requirements set forth by the City of Lee's Summit.

Methodology:

The peak rates of runoff are calculated using the Rational Method:

Where:

Q= Peak rate of runoff to system in cfs

C= Runoff Coefficient as determined in accordance with Paragraph 5602.3 of APWA 5600 i = Rainfall intensity in inches per hour as determined in accordance with Paragraph 5602.6 K= Dimensionless coefficient to account for antecedent precipitation as follows, except the product of C*K shall not exceed 1.0. See Table 5602-1 from APWA 5600

Table 5602-1: Antecedent Coefficient

Design Storm	<u>K</u>
10% and more	1.0
4%	1.1
2%	1.2
1%	1.25

Runoff Coefficient(C) values are taken from Table 5602-3 of APWA 5600 and include: Undeveloped Areas - C = 0.30

Impervious Surfaces - C = 0.90

Weighted C values have been calculated using C = 0.3 + 0.6 * I, where I is percent impervious /100.

The rainfall intensity (i) has been determined using the formulas found in section 5602.6 of the APWA 5600, for the 10, 25, 50, and 100 year return periods.

The time of concentrations (Tc) for the drainage areas have been determined using the formulas found in Section 5602.7 of APWA (below plus the travel time in the system). The Tc paths are shown on the attached drainage area exhibits.

$$T_I = 1.8 \cdot (1.1 - C) \cdot \frac{D^{1/2}}{S^{1/3}}$$

Stormwater ManagementStudy

Existing Conditions:

The proposed site is located along the west side of highway 291, and just north of the Meineke Car Care, which is located at 320 NE 291 Hwy, Lee's Summit, MO 64086. The site is located on the northwest side of the intersection of SE Langsford Rd. & NE Hwy 291. The site is bound to the east and south by CP-2 (Planned Community Commercial) zoned properties, bound to the west by a RP-2 (Planned Two Family Residential) & R-1 (Single Family Residential) properties, and bound to the north by a PO (Planned Office) zoned property. The site is currently occupied by a vacant grass lot that sits on approximately 0.50 acres of pervious cover.

The site has high points on the southwestern property line and slopes northeast towards Highway 291 with a slope of approximately 6.15%. The site drains via sheet flow to an existing roadside ditch located on the eastern side of the property, along Hwy. 291. The proposed site is flood zone X.

The time of concentration for the existing condition is 12.67 minutes and the weighted C value is 0.30.

The total pre-development runoff values are as follows:

Storm Event/Rainfall Return Period	10% / 10 YR	4% / 25 YR	2% / 50 YR	1% / 100 YR
Runoff (cfs):	0.84	1.07	1.30	1.48

A pre-development drainage area exhibit has been provided in Appendix A.

Proposed Development:

For the purposes of this analysis, the proposed development will consist of a 1,415 SF Take 5 Oil Change Facility along with associated parking and access drives.

The redevelopment of the site will increase the impervious area which will require the excess runoff to be stored on site. Green space areas will be provided internally to the parking areas as well as around the entire perimeter of the site.

The time of concentration for the proposed development condition is 10 minutes and the weighted C value is 0.61.

The total post-development runoff values, into the pond, are as follows:

Storm Event/ Rainfall Return Period:	10% 10 YR	4% / 25 YR	2% / 50 YR	1% / 100 YR
Runoff (cfs):	1.86	2.37	2.87	3.29

A post-development drainage area exhibit has been provided in Appendix B.

Stormwater ManagementStudy

Stormwater Requirements:

Drainage calculations will conform to the requirements of the City of Lee's Summit Storm Drainage Design Criteria, as well as section 5600 of the *Kansas City Metropolitan Chapter American Public Works Association Standard Specifications & Design Criteria*, specifically section 5601.5-A-4-a, the Default Strategy: Comprehensive Protection shall be followed.

APWA 5600	5	February 16, 2011
minimize	impacts to the ecology and water quality of the de	whetream drainage system. It is
recogniz necessa	ed for site-level runoff controls to be effective, consisten ry to realize measurable benefits along the downstream off control strategies that can be applied to sites within	t application across a watershed is system. This section presents four a watershed based on watershed
protection strategy defined Brotestic	n goals and identified problems. The City/County or local is to be applied within its watersheds or subsheds. If w by the local authority, the default strategy for new develo	authority shall pre-determine which vatershed control strategies are not opment shall be the <u>Comprehensive</u>
a Def	ault Strategy: Comprehensive Protection	
	and officiely in the second	

All runoff shall be routed to an on site detention pond, which has been appropriately sized to reduce the post-developed runoff exiting the site. Discharge from the pond will be via an outlet structure with a 4.5" orifice at an invert elevation of 982.00 and an 8" orifice at an invert elevation of 984.70' to regulate the flow rate from the pond.

Stormwater ManagementStudy

Summary of Runoff Calculations:

Storm Event	Pre- Developed	Post- Developed	Calculated Storage Volume	POND WSE
10-year	0.84 cfs	0.84 cfs	443 cuft	984.71 ft
25-year	1.07 cfs	0.97 cfs	559 cuft	985.01 ft
50-year	1.30 cfs	1.03 cfs	655 cuft	985.14 ft
100-year	1.48 cfs	1.08 cfs	755 cuft	985.28 ft

Conclusion:

All the referenced material and supporting documentation can be found below. Based on the findings, the proposed Take 5 Oil Change Facility will not have an adverse effect on the downstream storm system, and it meets the City of Lee's Summit stormwater requirements.

Stormwater ManagementStudy

Appendix A

Stormwater ManagementStudy





VICINITY MAP

DRAINAGE AREA TOTAL RUNOFF:					
RETURN PERIOD	Q (CFS)				
10 - YEAR	0.84				
25 - YEAR	1.07				
50 - YEAR	1.30				
100 - YEAR	1.48				

THE PROJECT SITE IS INCLUDED WITHIN THE WEST PRAIRIE LEE WATERSHED AREA AS SHOWN ON THE CITY OF LEE'S SUMMIT WATERSHED & OUTFALL MAP





40



PRE

REVISION

ALTA/NSPS LAND TITLE SURVEY

Sec. 5-47-31

SHAFER, KLINE & WARREN, INC.

11250 Corporate Avenue Lenexa. KS 66219-1392 913.888.7800 FAX: 913.888.7868 SURVEYING | ENGINEERING | CONSTRUCTION COPYRIGHT © 2017 SHAFER, KLINE & WARREN, INC.



Byram Realty, LLC 5350 W. 94th Terrace, Suite 201 Prairie Village KS, 66207 Phone: (913) 722–5229

Job No. 170159-010 March 6, 2017 klg

DESCRIPTION:

TRACT I:

The South 150 feet of the East 150 feet of the North 300 feet of the South 902 feet of the East 880 feet of the West One Half of the Northeast Quarter of Section 5, Township 47, Range 31, in Lee's Summit, Jackson County, Missouri, more particularly described as follows: Commencing at the Southwest corner of the Northeast Quarter of said Section 5, Township 47, Range 31; thence South 89 Degrees, 22 Minutes, 09 Seconds East along the South line of the West One Half of said Quarter Section, a distance of 1321.26 feet to the Southeast corner of said West One Half; thence North 00 Degrees, 40 Minutes, 00 Seconds East along the East line of said West One Half, a distance of 602.00 feet to the point of beginning; thence North 89 Degrees, 22 Minutes, 09 Seconds East, parallel with the South line of said West One Half, a distance of 150.00 feet; thence North 00 Degrees, 40 Minutes, 00 Seconds East, parallel with the East line of said West One Half, a distance of 150.00 feet; thence South 89 Degrees, 22 Minutes, 09 Seconds East, parallel with the South line of said West One Half, a distance of 150.00 feet to a point on the East line of aid West One Half; thence South 00 Degrees, 40 Minutes, 00 seconds West along said East line, a distance of 150.00 feet to the point of beginning. TRACT II:

Commencing at the Southwest corner of the East 1/2 of the Northeast 1/4 of Section 5, Township 47, Range 31, Lee's Summit, Jackson County, Missouri; thence along the West line of said 1/2 of 1/4 Section North 2 Degrees, 33 Minutes, 49 Seconds East 602 feet to the true point of beginning of this tract; thence along said West line North 2 Degrees, 33 Minutes, 49 Seconds East 478.79 feet; thence South 88 Degrees, 27 Minutes, 48 Seconds East 152.53 feet to a point on the West line of the Right-of-Way of M-291; thence along said Right-or-Way line as follows; South 16 Degrees, 32 Minutes, 36 Seconds West 73.03 feet to a point 135 feet opposite center line Station 117+00; thence South 11 Degrees, 23 Minutes, 57 Seconds West 200 feet to a point 135 feet opposite center line Station 119+00; thence South 1 Degree, 11 Minutes, 44 Seconds West 101.61 feet to a point 117 feet opposite center line Station 120+00; thence parallel to said center line South 11 Degrees, 23 Minutes, 57 Seconds West 50 feet; thence South 64 Degrees, 21 Minutes, 40 Seconds West 66.40 feet to a point 170 feet opposite center line Station 120+90; thence parallel to said center line South 11 Degrees, 23 Minutes, 57 Seconds West 31.03 feet; thence leaving said Right-of-Way North 87 Degrees, 26 Minutes, 43 Seconds West 35.61 feet to the true point of beginning.

TITLE NOTE:

Title information shown hereon was taken from Old Republic National Title Insurance Company commitment for Title insurance No. SKC0037555C and Dated October 18, 2016 at 8:00 A.M.

c. Easement granted to Missouri Public Service Corporation as set forth in instrument filed June 20, 1950, under Document No. 565542 in Book 862 at Page 458. (Affects all of Tract I) d. Easement granted to the City of Lee's Summit as set forth in instrument filed July 6, 1962, under Document No. 792933 in Book 1577 ac Page 301. (Does not Affect)

e. Easements for the benefit of the premises in question as set forth in Case No. 108618 filed November 20, 1950 under Document No. 571966 in Book 899 at Page 171, and as defined by instrument filed under Document No. 792062 in Book 1575 at Page 21. (Affects Tract I) f. Easement over a portion of the premises in question, granted to The State of Missouri, by the instrument recorded as Document No. 653850 in Book 1302 at Page 81. (Affects Subject Property)

g. Easement and Right-of-Way Agreement granted to The City of Lee's Summit, by the instrument filed May 23, 1962 as Document No. 790138 in Bock 1569 at Page 695. (as shown hereon)

h. Easement and Right-of-Way Agreement granted to The City of Lee's Summit, by the instrument filed June 11, 1962, under Document No. 791375 in Book 1573 at Page 199. (As shown hereon)

i. Easement over a portion of the premises in question, granted to The City of Lee's Summit, Missouri, by the instrument recorded as Document No. 868740 in Book 1781 at Page 176. (As shown hereon)

i. Lack of abutter's rights of direct access to Highway No. 291 from the premises in question as set forth in instrument filed January 9, 1969, under Document No. 1–31092 in Book 189 at Page 661, except such rights of access as provided therein. (Affects subject property not plottable)

k. Terms and provisions and easement contained in Easement Agreement by and between Royal Acres Limited, a Missouri Limited Partnership and Pine Woods Associates, a Missouri general partnership, filed for record May 9, 1986, as Document No. I-688562 in Book I1536 at Page 2123. (As shown hereon)

I. Sanitary Sewer Easement granted to the City of Lee's Summit as set forth in instrument filed October 15, 2002, under Document No. 2002/0091852. (As shown hereon)

To: Vivion Properties, LLC; LSMO I, LLC; Bennisonvestments, LLC; Silverlake Holdings, LLC; and Old Republic National Title Insurance Company This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2016 Minimum Standard Detail Requirements for ALTA/NSPS Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes items 1, 3, 4, 5, 6a, 8, and 11 of Table A thereof. The fieldwork was completed on February 24, 2017.



FLOOD NOTE:

January 20, 2017

General Notes:

The horizontal datum is based on the State plane coordinate system MO West Zone NAD 83

Adjusted to Ground Plane CAF=0.999901213

Elevations shown hereon are based upon NAVD88 Datum.

Contours shown hereon are at 1' contour intervals.

The accuracy standard for this survey is in accordance with type "URBAN"

ZONING NOTE:

No Zoning report or letter was furnished at the time of survey.

BENCHMARK 1 ELEV.: 982.13 Set square cut in the top of the South side of a 15" light pole base 100' \pm North of the Northeast property corner. East side of parking lot $70' \pm$ West of 291 HWY.

ELEV.: 991.62 BENCHMARK 2 Existing square cut on back of curb 50' \pm East Northeast of the Northeast corner of meineke on the North side drive at the flume.

 $Area = 75,218 \pm Sq. Ft. or 1.727 \pm Acres$



. Visual indications of utilities are as shown. Underground locations shown, as furnished by the respective utility companies, are approximate and shall be verified in the field at the time of construction. For actual field locations of underground utilities, call 1-800-344-7233. 2. The contractor shall be responsible for contacting all utility companies for

field location of all underground utility lines prior to any excavation and for the coordination and scheduling with utility owners of all work required to resolve conflicts with installations, constructions, excavations, removals, placements, relocation and other miscellaneous work.

Robert Craig Sandlin, PLS-2016000169 Shafer, Kline & Warren, Inc. Corporate Certificate/License No. 000003

Job No. 170159—010 Sec. 5-47-31

Jackson County Missouri 170159–010 SUR.DWG

This property lies within flood Zone X, defined as areas determined to be outside the limits of the 0.2% annual chance flood plane, and Other Flood areas as shown on the Flood Insurance rate map prepared by the Federal Emergency Management Agency for the City of Overland Park, Johnson County, Kansas, Community No. 29 174, Panel No. 0436G and dated







National Flood Hazard Layer FIRMette

0

250

500

1,000

1,500



Legend

94°22'3"W 38°55'24"N SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT Without Base Flood Elevation (BFE) Zone A. V. A9 With BFE or Depth Zone AE, AO, AH, VE, AR SPECIAL FLOOD HAZARD AREAS **Regulatory Floodway** 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 FEE Levee. See Notes. Zone X OTHER AREAS OF FLOOD HAZARD Area with Flood Risk due to Levee Zone D NO SCREEN Area of Minimal Flood Hazard Zone X 948 1 FEET Effective LOMRs OTHER AREAS Area of Undetermined Flood Hazard Zone D 959 - - - - Channel, Culvert, or Storm Sewer GENERAL STRUCTURES LIIII Levee, Dike, or Floodwall City of Lee's Summit 20.2 Cross Sections with 1% Annual Chance 290174 17.5 Water Surface Elevation AREA OF MINIMAL FLOOD HAZARD **Coastal Transect** Zone AE Base Flood Elevation Line (BFE) T47N R31W S5 Limit of Study Jurisdiction Boundary **Coastal Transect Baseline** OTHER **Profile Baseline** FEATURES Hydrographic Feature 961 FEET **Digital Data Available** No Digital Data Available MAP PANELS Unmapped The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location. This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/29/2022 at 11:09 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for

Feet 1:6,000 2,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

94°21'25"W 38°54'56"N

unmapped and unmodernized areas cannot be used for

regulatory purposes.



Web Soil Survey National Cooperative Soil Survey

Conservation Service

MAP	LEGEND	MAP INFORMATION		
Area of Interest (AOI) Area of Interest (AOI)	Spoil Area	The soil surveys that comprise your AOI were mapped at 1:24,000.		
Soils Soil Map Unit Polygons	 Very Stony Spot Wet Spot 	Warning: Soil Map may not be valid at this scale. Enlargement of maps beyond the scale of mapping can car		
Soil Map Unit Lines Soil Map Unit Points	 ✓ Other ✓ Special Line Features 	misunderstanding of the detail of mapping and accuracy of line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more de		
Special Point Features Blowout	Water Features Streams and Canals	Scale. Please rely on the bar scale on each map sheet for map		
Borrow Pit K Clay Spot	Transportation +++ Rails	measurements. Source of Map: Natural Resources Conservation Service		
Closed Depression	US Routes	Coordinate System: Web Mercator (EPSG:3857)		
🔹 Gravelly Spot	Major Roads	projection, which preserves direction and shape but distort distance and area. A projection that preserves area, such a Albers equal-area conic projection, should be used if more		
Lava Flow	Background Aerial Photography	accurate calculations of distance or area are required. This product is generated from the USDA-NRCS certified c		
Mine or Quarry		of the version date(s) listed below. Soil Survey Area: Jackson County, Missouri		
 Perennial Water Detroit of the second s		Survey Area Data: version 24, Aug 31, 2022 Soil map units are labeled (as space allows) for map scale 1:50.000 or larger.		
Saline Spot		Date(s) aerial images were photographed: Sep 6, 2019– 16, 2019		
Sandy SpotSeverely Eroded Spot		The orthophoto or other base map on which the soil lines we compiled and digitized probably differs from the backgroun		
SinkholeSlide or Slip		shifting of map unit boundaries may be evident.		
ø Sodic Spot				



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	0.0	1.5%
10180	Udarents-Urban land-Sampsel complex, 2 to 5 percent slopes	2.1	98.5%
Totals for Area of Interest		2.1	100.0%



Appendix B

Stormwater ManagementStudy



DRAINAGE AREA TOT	AL RUNOFF INTO POND:	DRAINAGE AREA TOTAL RUNOFF FROM POND:		
RETURN PERIOD	Q (CFS)	RETURN PERIOD	Q (CFS)	
10 - YEAR	1.86	10 - YEAR	0.84	
25 - YEAR	2.37	25 - YEAR	0.97	
50 - YEAR	2.87	50 - YEAR	1.03	
100 - YEAR	3.29	100 - YEAR	1.08	



VICINITY MAP

THE PROJECT SITE IS INCLUDED WITHIN THE WEST PRAIRIE LEE WATERSHED AREA AS SHOWN ON THE CITY OF LEE'S SUMMIT WATERSHED & OUTFALL MAP





REVISION

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021



Hydrograph Return Period Recap Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd.	Hydrograph	Inflow	Peak Outflow (cfs)						Hydrograph		
NO.	type (origin)	nya(s)	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Description
1	Rational						0.829	0.961	1.070	1.175	Pre Development
2	Rational						1.861	2.158	2.394	2.631	Post Dcevelopment
3	Reservoir	2					0.847	0.965	1.025	1.081	<no description=""></no>
									<u> </u>		

Proj. file: C:\Users\High Tide\High Tide Consultant Dropbox\Projects\Projects\2022/02+211807ake25022ee's Summit, MO - Todd Minnis

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

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	0.829	1	13	646				Pre Development
2	Rational	1.861	1	10	1,116				Post Dcevelopment
3	Reservoir	0.847	1	15	1,116	2	984.71	443	<no description=""></no>
3	Reservoir	0.847		15	1,116		984.71	443	<no description=""></no>

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 1

Pre Development

Hydrograph type	= Rational	Peak discharge	= 0.829 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.22 hrs
Time interval	= 1 min	Hyd. volume	= 646 cuft
Drainage area	= 0.502 ac	Runoff coeff.	= 0.3
Intensity	= 5.503 in/hr	Tc by User	= 13.00 min
IDF Curve	= IDF Curve APWA5600.IDF	Asc/Rec limb fact	= 1/1



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 2

Post Dcevelopment

Rational	Peak discharge	= 1.861 cfs
= 10 yrs	Time to peak	= 0.17 hrs
= 1 min	Hyd. volume	= 1,116 cuft
= 0.502 ac	Runoff coeff.	= 0.61
= 6.076 in/hr	Tc by User	= 10.00 min
IDF Curve APWA5600.IDF	Asc/Rec limb fact	= 1/1
	 Rational 10 yrs 1 min 0.502 ac 6.076 in/hr IDF Curve APWA5600.IDF 	 Rational Peak discharge 10 yrs Time to peak 1 min Hyd. volume 0.502 ac Runoff coeff. 6.076 in/hr Tc by User IDF Curve APWA5600.IDF Asc/Rec limb fact



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 3

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 0.847 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.25 hrs
Time interval	= 1 min	Hyd. volume	= 1,116 cuft
Inflow hyd. No.	= 2 - Post Dcevelopment	Max. Elevation	= 984.71 ft
Reservoir name	= Pond 1	Max. Storage	= 443 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Pond No. 1 - Pond 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 982.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)	
0.00	982.00	00	0	0	
1.00	983.00	65	22	22	
2.00	984.00	250	147	169	
3.00	985.00	535	384	553	
4.00	986.00	937	727	1,279	

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 4.50	8.00	0.00	0.00	Crest Len (ft)	Inactive	0.00	0.00	0.00
Span (in)	= 4.50	8.00	0.00	0.00	Crest El. (ft)	= 0.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
Invert El. (ft)	= 982.00	984.70	0.00	0.00	Weir Type	= Rect			
Length (ft)	= 1.00	1.00	0.00	0.00	Multi-Stage	= No	No	No	No
Slope (%)	= 0.50	0.50	0.00	n/a	-				
N-Value	= .013	.013	.013	n/a					
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)	= 0.000 (by	y Contour)		
Multi-Stage	= n/a	No	No	No	TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Weir Structures



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

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	0.961	1	13	750				Pre Development
2	Rational	2.158	1	10	1,295				Post Dcevelopment
3	Reservoir	0.965	1	16	1,295	2	985.01	559	<no description=""></no>
3	Reservoir	0.965		16	1,295	2	985.01	559	<no description=""></no>

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 1

Pre Development

Hydrograph type	= Rational	Peak discharge	= 0.961 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.22 hrs
Time interval	= 1 min	Hyd. volume	= 750 cuft
Drainage area	= 0.502 ac	Runoff coeff.	= 0.3
Intensity	= 6.384 in/hr	Tc by User	= 13.00 min
IDF Curve	= IDF Curve APWA5600.IDF	Asc/Rec limb fact	= 1/1



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 2

Post Dcevelopment

Hydrograph type	= Rational	Peak discharge	= 2.158 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 1,295 cuft
Drainage area	= 0.502 ac	Runoff coeff.	= 0.61
Intensity	= 7.049 in/hr	Tc by User	= 10.00 min
IDF Curve	= IDF Curve APWA5600.IDF	Asc/Rec limb fact	= 1/1



Friday, 10 / 7 / 2022

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 3

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 0.965 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.27 hrs
Time interval	= 1 min	Hyd. volume	= 1,295 cuft
Inflow hyd. No.	= 2 - Post Dcevelopment	Max. Elevation	= 985.01 ft
Reservoir name	= Pond 1	Max. Storage	= 559 cuft

Storage Indication method used.



Friday, 10 / 7 / 2022

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

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	1.070	1	13	834				Pre Development
2	Rational	2.394	1	10	1,437				Post Dcevelopment
3	Reservoir	1.025	1	16	1,436	2	985.14	655	<no description=""></no>
							303.14		

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 1

Pre Development

Hydrograph type	= Rational	Peak discharge	= 1.070 cfs
Storm frequency	= 50 yrs	Time to peak	= 0.22 hrs
Time interval	= 1 min	Hyd. volume	= 834 cuft
Drainage area	= 0.502 ac	Runoff coeff.	= 0.3
Intensity	= 7.104 in/hr	Tc by User	= 13.00 min
IDF Curve	= IDF Curve APWA5600.IDF	Asc/Rec limb fact	= 1/1



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 2

Post Dcevelopment

Hydrograph type	= Rational	Peak discharge	= 2.394 cfs
Storm frequency	= 50 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 1,437 cuft
Drainage area	= 0.502 ac	Runoff coeff.	= 0.61
Intensity	= 7.819 in/hr	Tc by User	= 10.00 min
IDF Curve	= IDF Curve APWA5600.IDF	Asc/Rec limb fact	= 1/1



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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 3

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 1.025 cfs
Storm frequency	= 50 yrs	Time to peak	= 0.27 hrs
Time interval	= 1 min	Hyd. volume	= 1,436 cuft
Inflow hyd. No.	= 2 - Post Dcevelopment	Max. Elevation	= 985.14 ft
Reservoir name	= Pond 1	Max. Storage	= 655 cuft

Storage Indication method used.



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Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

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	1.175	1	13	917				Pre Development
2	Rational	2.631	1	10	1,578				Post Dcevelopment
3	Reservoir	1.081	1	16	1,578	2	985.28	755	<no description=""></no>
3	Reservoir				1,578		985.28	755	

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 1

Pre Development

Hydrograph type	= Rational	Peak discharge	= 1.175 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.22 hrs
Time interval	= 1 min	Hyd. volume	= 917 cuft
Drainage area	= 0.502 ac	Runoff coeff.	= 0.3
Intensity	= 7.805 in/hr	Tc by User	= 13.00 min
IDF Curve	= IDF Curve APWA5600.IDF	Asc/Rec limb fact	= 1/1



Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 2

Post Dcevelopment

Hydrograph type	= Rational	Peak discharge	= 2.631 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 1,578 cuft
Drainage area	= 0.502 ac	Runoff coeff.	= 0.61
Intensity	= 8.591 in/hr	Tc by User	= 10.00 min
IDF Curve	= IDF Curve APWA5600.IDF	Asc/Rec limb fact	= 1/1



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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 3

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 1.081 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.27 hrs
Time interval	= 1 min	Hyd. volume	= 1,578 cuft
Inflow hyd. No.	= 2 - Post Dcevelopment	Max. Elevation	= 985.28 ft
Reservoir name	= Pond 1	Max. Storage	= 755 cuft

Storage Indication method used.

