PRELIMINARY HYDROLOGY REPORT
FOR A 2-YEAR STORM EVENT

Kingdom Hall
of
Jehovah's Witnesses

LOCATED AT 23061 & 23071 EL TORO RD, CITY OF LAKE FOREST, COUNTY OF ORANGE, CALIFORNIA

MAY 7, 2018

PREPARED FOR:
JW CONGREGATION SUPPORT
1005 Red Mills Road
Wallkill, NY 12589
Phone: (360) 280-0910

PREPARED BY:
H E I T E C
777 E. Tahquitz Canyon Way, Suite 200-49
Palm Springs, CA 92262
Phone: (760) 340-9060

PRELIMINARY HYDROLOGY REPORT
Kingdom Hall of Jehovah's Witnesses

SITE DESCRIPTION AND PURPOSE OF REPORT

The property herein described is located on El Toro Rd, in the City of Orange, Orange County, California. The 2.30 acre site is currently vacant. The proposed project includes two single-story church buildings of 3,327 sf each; a parking lot area of 54,506 sf provides 140 parking spaces; landscaped areas totaling 45,747 sf including a Dry Extended Detention Basin (DEDB) at the south corner of property. The project is bordered on the southeast by El Toro Road, on the southwest by railroad right-of-way, on the northwest by single family homes, and on the northeast by an apartment complex.

The purpose of this preliminary drainage report is to determine the volume from the 2 year 24 hour storm to size the stormwater storage facilities.

DRAINAGE DESIGN

The existing site drains southwesterly towards the railroad right-of-way. Runon from El Toro Road and the existing Kingdom Hall enters the site along the southeasterly boundary and flows toward the railroad right-of-way as well.

The existing runon will be intercepted by a proposed V-ditch located along the southeasterly boundary to prevent comingling of the offsite and onsite stormwater. The V-ditch will convey the runon along the site boundary to a proposed rock apron sized to reduce the velocity before discharging into the railroad right-of-way and the historic drainage path.

The site drains toward a proposed Dry Extended Detention Basin (DEDB) at the south corner of the site. Landscape islands are incorporated throughout the site. Curb-cuts will be provided to allow sheet flow from paving to drain into and across the landscape islands. The roof drains will discharge to the ground and be routed to the DEDB by vegetative channels. The flow from the overall site will be conveyed to the DEDB. Please see the Conceptual Site Plan and Conceptual Grading Plan for additional detail.

The DEDB is sized for the LID/WQMP Design Capture Volume (DCV). The DCV is based upon these values: d = 0.85 in, A = 2.59 acres, imp = 0.61.

$$C = (0.75 \times imp) + 0.15 = 0.61$$

$$DCV = C \times d \times A \times 43{,}560 \times 1/12 = 4{,}892 \text{ cf}$$

The proposed Dry Extended Detention Basin (DEDB) with volume of 5,296 cf will provide adequate volume to store the Design Capture Volume (DCV) of 4,892 cf.

HYDROLOGIC CONDITIONS OF CONCERN

The existing site consists of soil type D that is graded with no vegetation (runoff curve number, CN=94). The proposed site with 61% impervious (CN=98) and 39% landscaped (CN=89) produces an combined CN of 94, which is the same as the existing site. Therefore, prior to WQMP stormwater treatment, the volume and velocity of stormwater runoff for post-development conditions are nearly identical to those of the pre-development conditions.

The Water Quality Management Plan requires treatment of the stormwater prior to leaving the site. The treatment process inherently lengthens the runoff time of concentration. However, per the *Technical Guidance Document for the Preparation of Conceptual / Preliminary and/or Project Water Quality Management Plans (WQMPs)* Appendix I, Footnote 5:

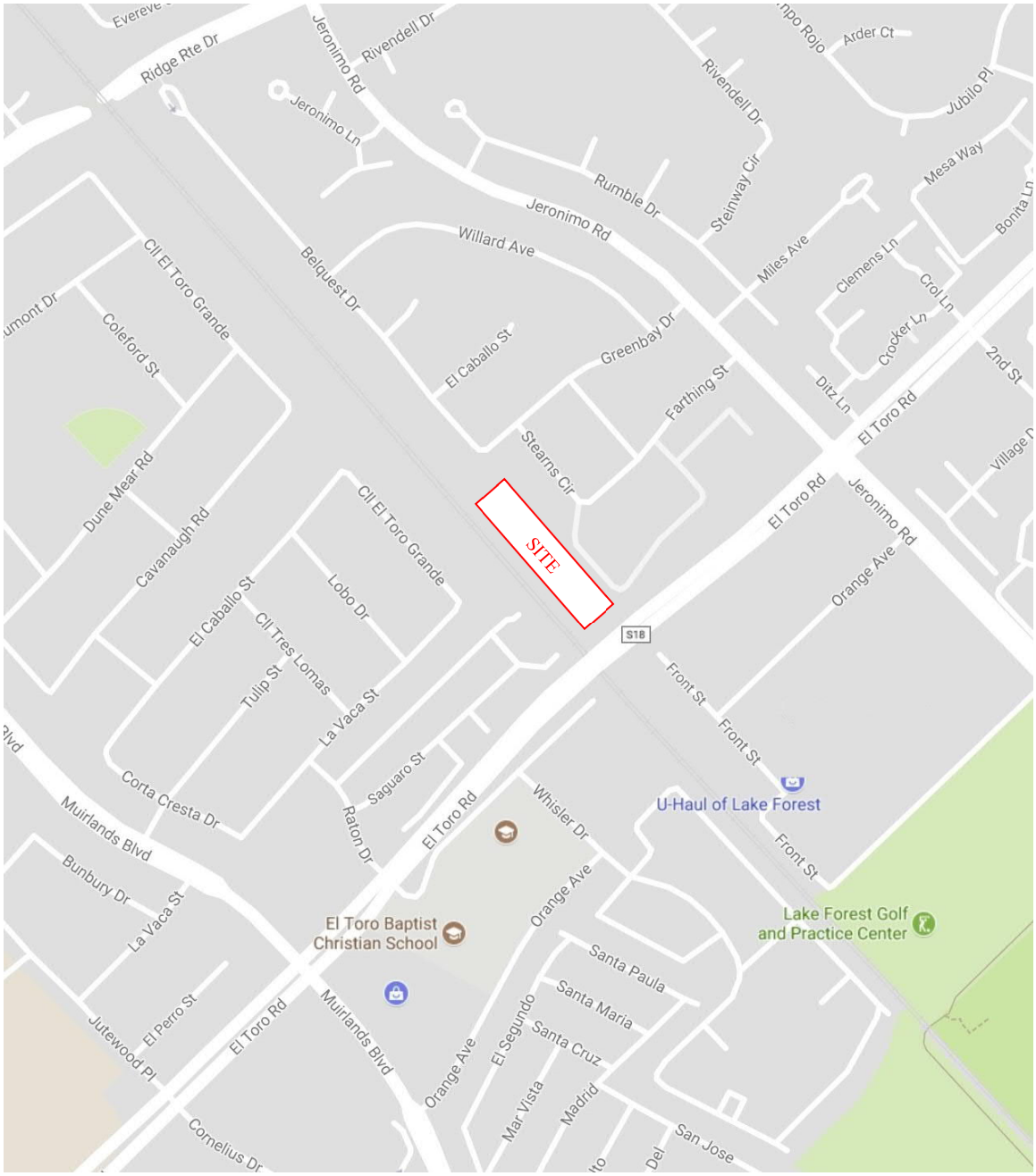
> The North County Permit (Order R8-2009-0030), as adopted, provides the option of reducing Tc to less than the existing condition Tc (within 5 percent) as part of the primary and preferred option for mitigating HCOCs. However, a longer Tc is generally associated with natural conditions than urban conditions, and a longer Tc nearly universally results in lower concern for hydromodification impacts. In addition, it is not physically possible for a project to implement BMPs consistent with LID provisions of the permit without substantially increasing the Tc of the site. The use of retention BMPs results in water not discharged under design conditions, while the use of biotreatment BMPs general results in water not immediately discharged. Therefore, it would not generally be possible to mitigate HCOCs using the primary option for compliance described above while complying with LID requirements. This TGD therefore interprets this provision such that increases in Tc would be acceptable and reduction in Tc of more than 5 percent would not be acceptable. This interpretation is consistent with the overall goal of the permit to protect receiving waters from stormwater impacts to the MEP.

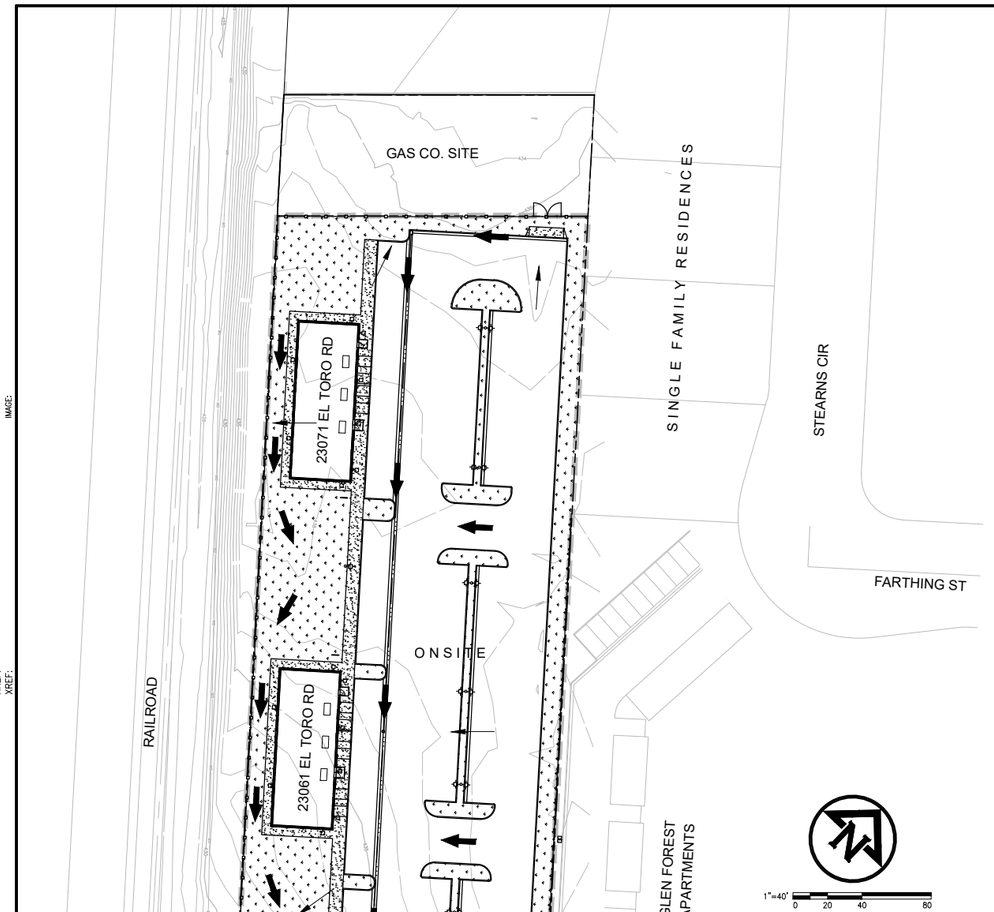
Thus, the proposed site will not adversely affect receiving waters susceptible to hydromodification.

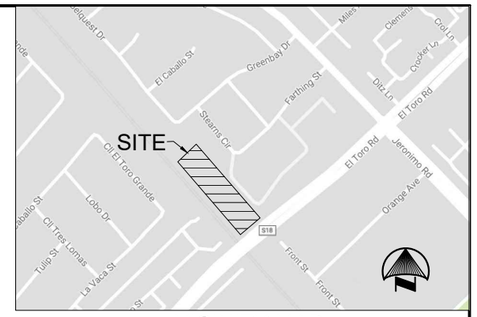
CONCLUSION

The drainage report contained herein has been designed in accordance with applicable state and local ordinances. Therefore, if developed as planned, the drainage from this site will not adversely affect persons or property onsite or downstream.

Vicinity Map







VICINITY MAP

AREAS:	IMPERVIOUS	PERVIOUS	TOTAL
ONSITE:			
PRE-DEV:	0.00	2.30	2.30 AC.
POST-DEV:	1.40	0.90	2.30 AC.
OFFSITE:	1.98	0.85	2.83 AC.

LEGEND

- PROPOSED DRAINAGE PATH
- EXISTING DRAINAGE PATH

PLEASE SEE CONCEPTUAL GRADING PLAN FOR ONSITE IMPROVEMENTS.

MICHAEL D. HACKER No. 55606 CIVIL STATE OF CALIFORNIA

CONSULTANT:
MICHAEL D. HACKER, P.E.
777 E. Tahquitz Canyon Way
Suite 200-49, Palm Springs, CA 92262
760.340.9060 m: 760.250.2538
mhackerrce@gmail.com

NOT FOR CONSTRUCTION
THIS DRAWING PROVIDED ONLY FOR
REVIEW AND APPROVAL

MARK:	DATE:	DESCRIPTION:
–	23 MAY 16	CONCEPT ISSUED

OWNER:
JWCS
1005 REDMILLS RD
WALLKILL, NY 12589-3221

ACCOUNT No.

PROJECT TITLE:
23061 & 23071
EL TORO ROAD
LAKE FOREST, CA

SHEET TITLE:
PRELIMINARY
DRAINAGE PLAN

PROJECT No.

SHEET No.
CD-101

IMAGE:
IMAGE:
IMAGE:
IMAGE:
IMAGE:
IMAGE:

XREF:
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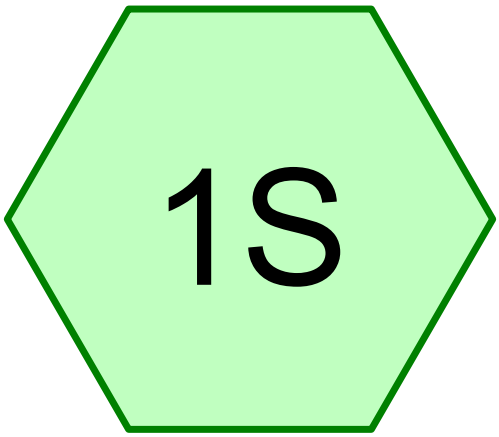


Existing Site

Subcat Reach Pond Link

Routing Diagram for Lake Forest
Prepared by HEITEC, Printed 5/6/2018

Time span=0.00-24.00 hrs, dt=0.10 hrs, 241 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 1S: Existing Site Runoff Area=2.300 ac 0.00% Impervious Runoff Depth>1.44"
Flow Length=590' Slope=0.0090 '/' Tc=12.9 min CN=94 Runoff=2.20 cfs 0.276 af

Total Runoff Area = 2.300 ac Runoff Volume = 0.276 af Average Runoff Depth = 1.44"
100.00% Pervious = 2.300 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Existing Site

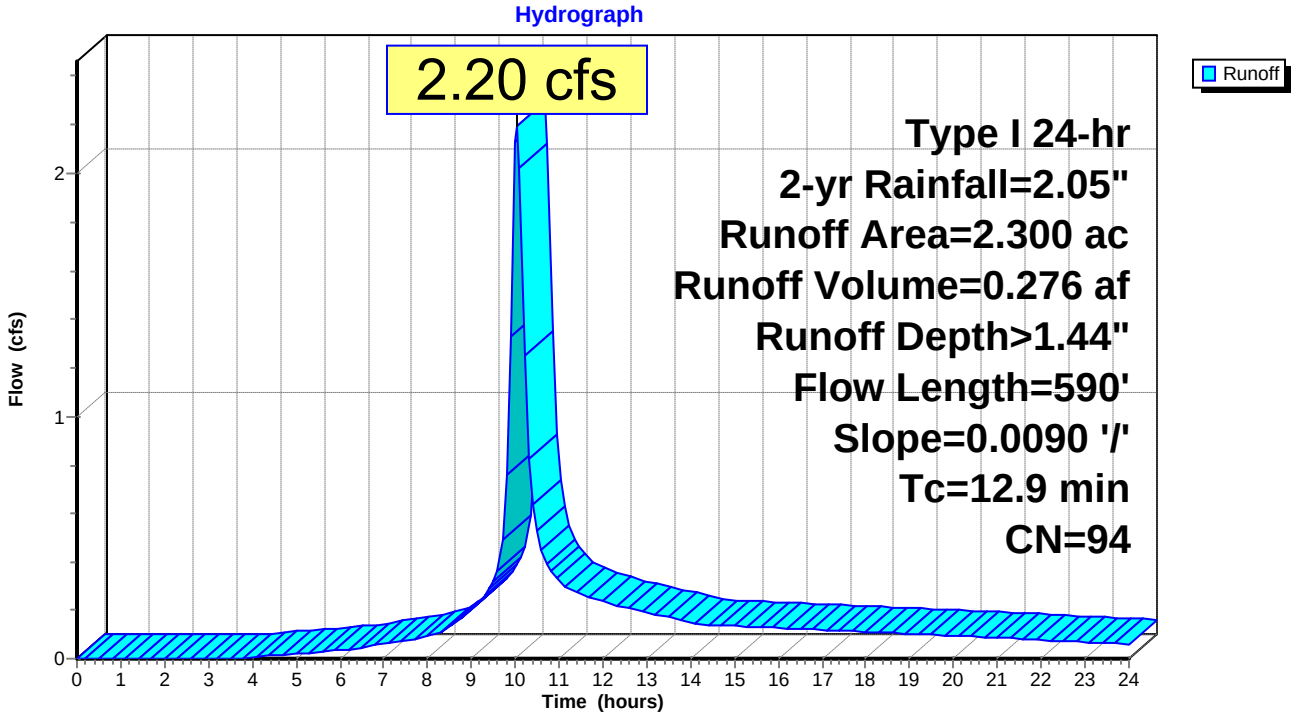
Runoff = 2.20 cfs @ 10.04 hrs, Volume= 0.276 af, Depth> 1.44"

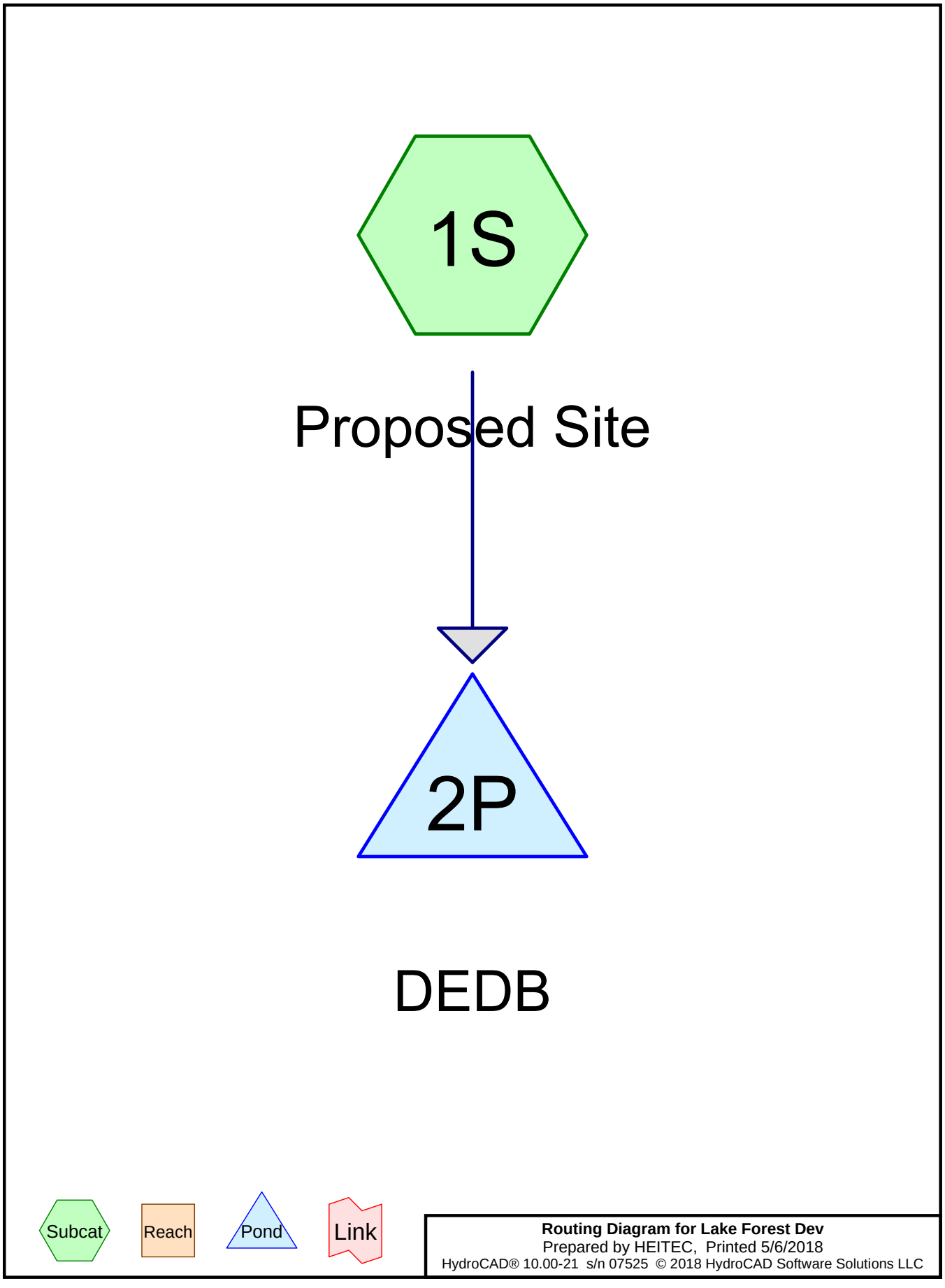
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.10 hrs
Type I 24-hr 2-yr Rainfall=2.05"

Area (ac)	CN	Description
2.300	94	Newly graded area, HSG D
2.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	590	0.0090	0.76		**Lag/CN Method,**

Subcatchment 1S: Existing Site





Routing Diagram for Lake Forest Dev
Prepared by HEITEC, Printed 5/6/2018

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 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 1S: Proposed Site Runoff Area=2.300 ac 60.87% Impervious Runoff Depth=1.44"
Flow Length=770' Slope=0.0050 '/' Tc=21.4 min CN=94 Runoff=1.82 cfs 0.277 af

Pond 2P: DEDB Peak Elev=31.97' Storage=0.098 af Inflow=1.82 cfs 0.277 af
Outflow=0.25 cfs 0.276 af

Total Runoff Area = 2.300 ac Runoff Volume = 0.277 af Average Runoff Depth = 1.44"
39.13% Pervious = 0.900 ac 60.87% Impervious = 1.400 ac

Summary for Subcatchment 1S: Proposed Site

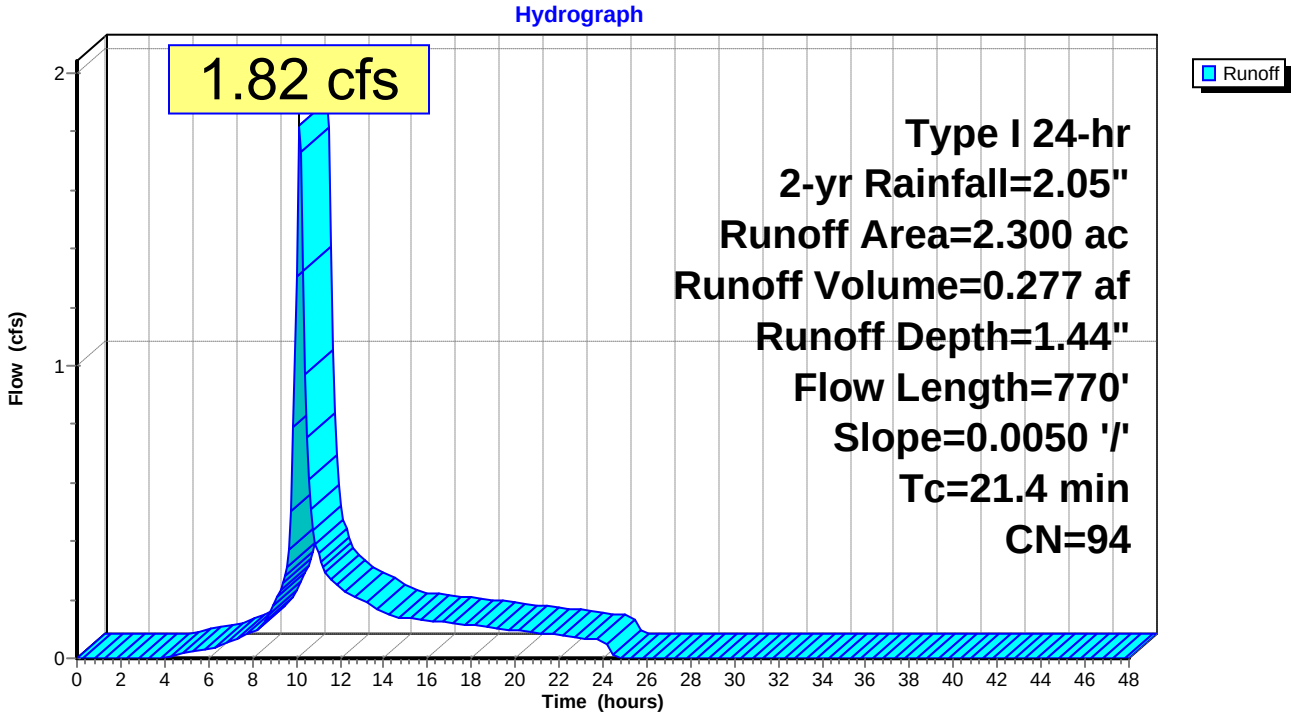
Runoff = 1.82 cfs @ 10.14 hrs, Volume= 0.277 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Type I 24-hr 2-yr Rainfall=2.05"

Area (ac)	CN	Description
1.400	98	Paved parking, HSG D
0.900	89	<50% Grass cover, Poor, HSG D
2.300	94	Weighted Average
0.900		39.13% Pervious Area
1.400		60.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.4	770	0.0050	0.60		**Lag/CN Method,**

Subcatchment 1S: Proposed Site



Summary for Pond 2P: DEDB

Inflow Area = 2.300 ac, 60.87% Impervious, Inflow Depth = 1.44" for 2-yr event
Inflow = 1.82 cfs @ 10.14 hrs, Volume= 0.277 af
Outflow = 0.25 cfs @ 11.98 hrs, Volume= 0.276 af, Atten= 87%, Lag= 110.4 min
Primary = 0.25 cfs @ 11.98 hrs, Volume= 0.276 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
Peak Elev= 31.97' @ 11.98 hrs Surf.Area= 0.069 ac Storage= 0.098 af

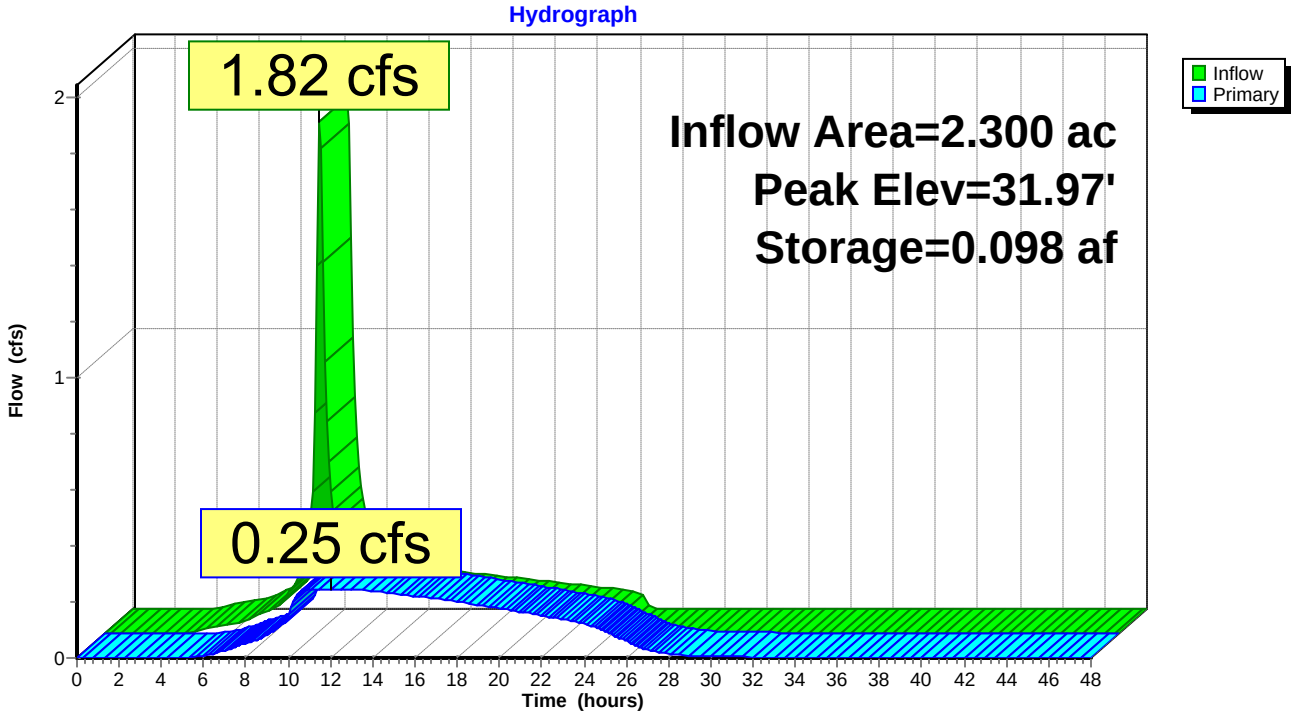
Plug-Flow detention time= 217.4 min calculated for 0.276 af (100% of inflow)
Center-of-Mass det. time= 218.2 min (997.7 - 779.5)

Volume	Invert	Avail.Storage	Storage Description
#1	30.10'	0.122 af	**16.00'W x 100.00'L x 2.20'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	32.00'	**100.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#2	Primary	30.10'	**3.0" Round Culvert** L= 21.6' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 30.10' / 29.10' S= 0.0463 '/' Cc= 0.900 n= 0.012, Flow Area= 0.05 sf

Primary OutFlow Max=0.25 cfs @ 11.98 hrs HW=31.97' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**2=Culvert** (Inlet Controls 0.25 cfs @ 5.02 fps)

Pond 2P: DEDB


Hydrograph
1.82 cfs
0.25 cfs
Inflow Area=2.300 ac
Peak Elev=31.97'
Storage=0.098 af
Inflow
Primary
Flow (cfs)
0
1
2
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
Time (hours)