HYDROLOGY STUDY

FOR:

Lancaster Forbes Industrial Park
(Forbes & Market Street)

IN THE CITY OF LANCASTER,
LOS ANGELES COUNTY

PREPARED BY:

SIKAND ENGINEERING ASSOCIATES

15230 Burbank Boulevard, Suite 100
Van Nuys, California 91411
818-787-8550

Doug Farmer, Civil Engineer

Submittal Date: 09-07-2022

ENGINEER'S CERTIFICATION

THE REGISTERED PROFESSIONAL ENGINEER CERTIFIES THAT THE FLOOD AND STORM FACILITIES HAVE BEEN DESIGNED IN ACCORDANCE WITH THE CITY OF LANCASTER ENGINEERING DESIGN GUIDELINES POLICIES & PROCEDURES AND LOS ANGELES COUNTY STANDARDS.

TABLE OF CONTENTS

SECTION 1

INTRODUCTION

Purpose of the Study
Project Description
Hydrologic Criteria & Methodology
Hydrology Summary & Conclusion

Purpose of the Study

The purpose of this study is to provide the criteria for the design of the on-site storm drain system and other drainage devices and to comply with the requirements established by the City of Lancaster for peak flow reduction, flood protection, dry-lane requirements, and nuisance water management.

Project Description

The Project site is located at the southern ends of both Market Street and Forbes Street, in the City of Lancaster, County of Los Angeles, California. It is bounded by vacant lots to the north and west, West Avenue L-8 to the south, and by a commercial area to the east (see Vicinity Map on Section 2).

***EXISTING CONDITION*:**
The total area within the existing boundaries of the property is about 11.8 acres. The site is currently vacant and undeveloped, with minor vegetation. It's elevation ranges from 2507 to 2500, and it generally drains from south to north. The site drainage flows overland to the north and into both Market Street and Forbes Street, and eventually joins the existing earth channel creek that runs north into Pond Two. In addition, the site is located within the FEMA Flood Zone "X", or within area of minimal flood hazard (see FEMA FIRM on Section 2).

***PROPOSED CONDITION*:**
The proposed development is a 2-building industrial park with paved parking lots and private driveways, perimeter fence and gates. The project will have gate access from all three streets: Market Street, Forbes Street and West Avenue L-8. The proposed development also includes an onsite privately-maintained storm drain system and a combination open retention basin and underground retention storage to reduce the post-development peak flow from the site. The site outflow will be directed into Forbes Street through a parkway drain spillway, thus following the flow conveyance from the existing condition.

Hydrologic Criteria & Methodology

This report follows the hydrologic criteria and methodology set forth by City of Lancaster "Engineering Design Guidelines", which is also applying the hydrologic procedures of the Los Angeles County Department of Public Works, as explained in its "Hydrology Manual".

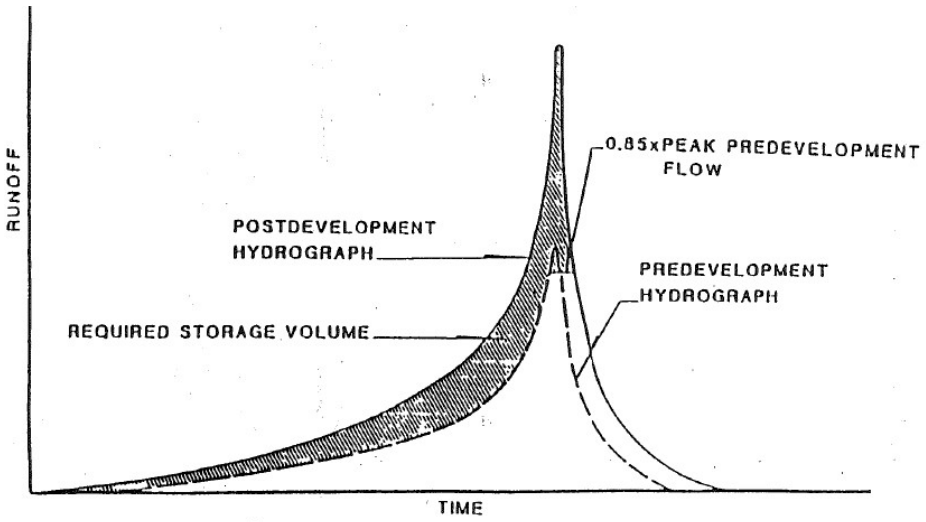
The following are the criteria used in the calculations:

- Storm Frequency:
  - 50-yr for calculating minimum finish floor elevations
  - 25-yr for developed areas, for storm drain design
  - 10-yr for offsite street dry lane calculations
  - 25-, 10- and 2-yr for basin calculations

- Soil Type Number = 124 (or 324 for flow burning using the LAR04 program)
- Basin Name = Antelope Valley
- Isohyet = 2.9” (50-yr, 24-hr)
  2.55" (25-yr, 24-hr)
  2.07" (10-yr, 24-hr)
  1.12" (2-yr, 24-hr)
  0.75" (First Flush, 24-hr)
- % Imperviousness:
  1% for undeveloped areas
  91% for proposed industrial areas.

Time of Concentration (TC) and design Peak Flow (Q) for each subarea are calculated using Hydrocalc program. Burning of flows, outlet Peak Qs and Hydrographs are calculated using the F0601M program (LAR04), also known as the Modified Rational Method program (MODRAT) (see Sections 3 & 4 for TC and MODRAT Calculations).

An MS Excel spreadsheet was used to calculate the minimum retention storage volume requirement from the MODRAT pre- and post-development Q25 hydrographs (as well as for 10-yr and 2-yr frequencies), that corresponds to a maximum outlet discharge of 85% of pre-development condition, as shown on Figure 3.8.1 below (see Section 5, Retention Basin Analysis).



RETARDING BASIN MINIMUM STORAGE REQUIREMENTS
FIGURE 3.8.1

Since the City does not have a specific nuisance flow calculation for industrial areas, the study is using the HydroCalc program to calculate the 0.75" first flush (85th percentile rainfall is less at 0.6") (see Section 6, Nuisance Water Calculations).

FlowMaster is used to determine capacities, etc. of open channels for the street sections, parkway drain and full-flow capacities of pipe sizes using the Manning's equation (see Section 7, Hydraulic Calculations).

Hydrology Summary & Conclusions

The proposed retention storage combination, open basin and underground CMP storages, and onsite storm drain system are be sized based on the storm flows from the total onsite tributary area of 11.8 acres; while offsite tributary, if any, will be directed away and around the site.

Comparing the outlet conditions between the Pre-Development and Post-Development as shown in the Q summary table below, the proposed development has demonstrated that the proposed increases in flow for the required 2-, 10- & 25-year frequencies are mitigated by the proposed retention storage combination, such that, all final proposed outflows are equal to or lower than the 85% of their respective pre-development flows. Therefore, the City's requirement is met. The minimum required retention storage volume from Q25 is 57,404 cu-ft, while the proposed development provided a storage combination capacity of 58,970 cu-ft.

Alignments and layouts of the drainage devices, retention storage combination, access ramp, and storm drain system are shown on the Proposed Conditions Map (see Section 4).

Outlet Q Summary Table:

	Pre-Development			**Post-Development**		**Post-Development/ Post-Retention**	
Frequency	**Area** (Ac)	**Q** (cfs)	**85%xQ** (cfs)	**Area** (Ac)	**Q** (cfs)	**Area** (Ac)	**Q** (cfs)
2-yr	11.8	0.76	**0.65**	11.8	2.99	11.8	**0.65**
10-yr	11.8	1.28	**1.09**	11.8	5.55	11.8	**1.09**
25-yr	11.8	1.66	**1.41**	11.8	7.67	11.8	**1.41**
50-yr				11.8	9.03		

The following is the summary of the other requirements from the City:

Forbes Street & West Avenue L-8 (Pvt Drive) Dry Lane Requirements:
As the main outlet conveyance, for Forbes Street, the tributary Q10 of 5.57 cfs and flattest slope of 0.5% resulted in a water surface top width of 24.03', therefore providing a dry lane of 24.03' which is greater than the 12' center of full width required for an undivided street; For West Avenue L-8 (pvt drive), the tributary Q10 of 5.57 cfs and flattest slope of 0.3%

resulted in a water surface top width of 17.62', therefore providing a dry lane of 10.38' (half-width) which is greater than the 10' required for a divided street (see Section 7 for FlowMaster cross sections and worksheets).

Capital Flood Minimum Finish Floor Elevations:

For the L-8 private driveway (south of buildings), the prorated Q50 of 0.66 (Capital Flood) on 0.3% slope resulted in a depth of 3.3" (or 0.275'). The minimum Finish Floor elevations will be set = Highest Frontage Gutter FL + 0.275' + 1.0'.

Retention Spillway Outlet:

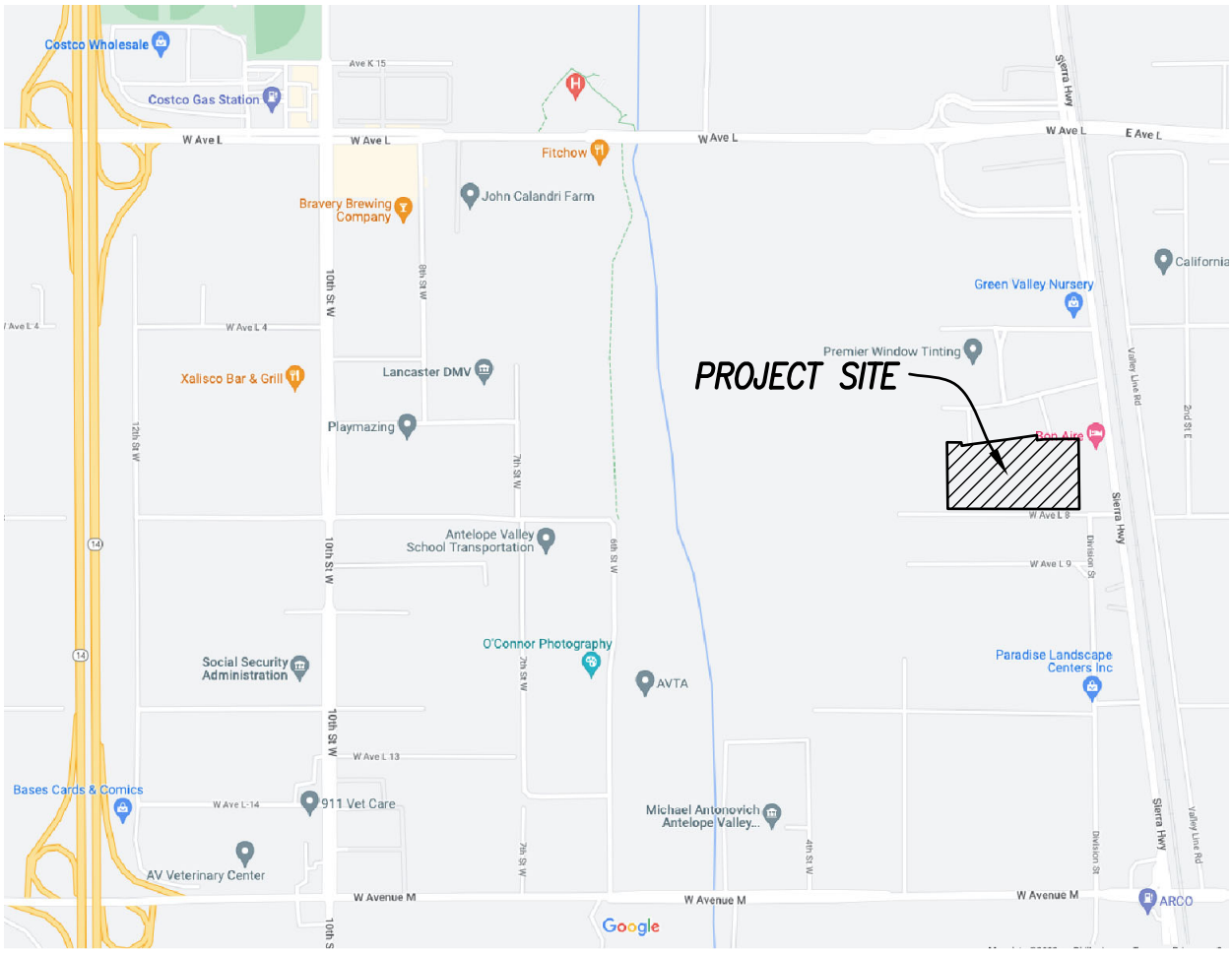
The proposed parkway drain that outlets into Forbes Street is the retention spillway, and is sized based on the 125% of the total post-development Q25 (125% x 7.69 = 9.61 cfs). The structure is 7'-wide, with depth of 4" and slope of 1% minimum. The calculation resulted in a normal depth of 3.5' (or 0.292'). (see Section 7 for FlowMaster cross sections and worksheets).

Nuisance Water Management:

As mentioned above, the City does not have a specific nuisance flow calculation for industrial areas, thus, the study is using the HydroCalc program to calculate the 0.75" first flush (85^{th} percentile rainfall is less at 0.6") and will be providing filter inserts as BMP on all inlets (see Section 6, Nuisance Water Calculations).

SECTION 2

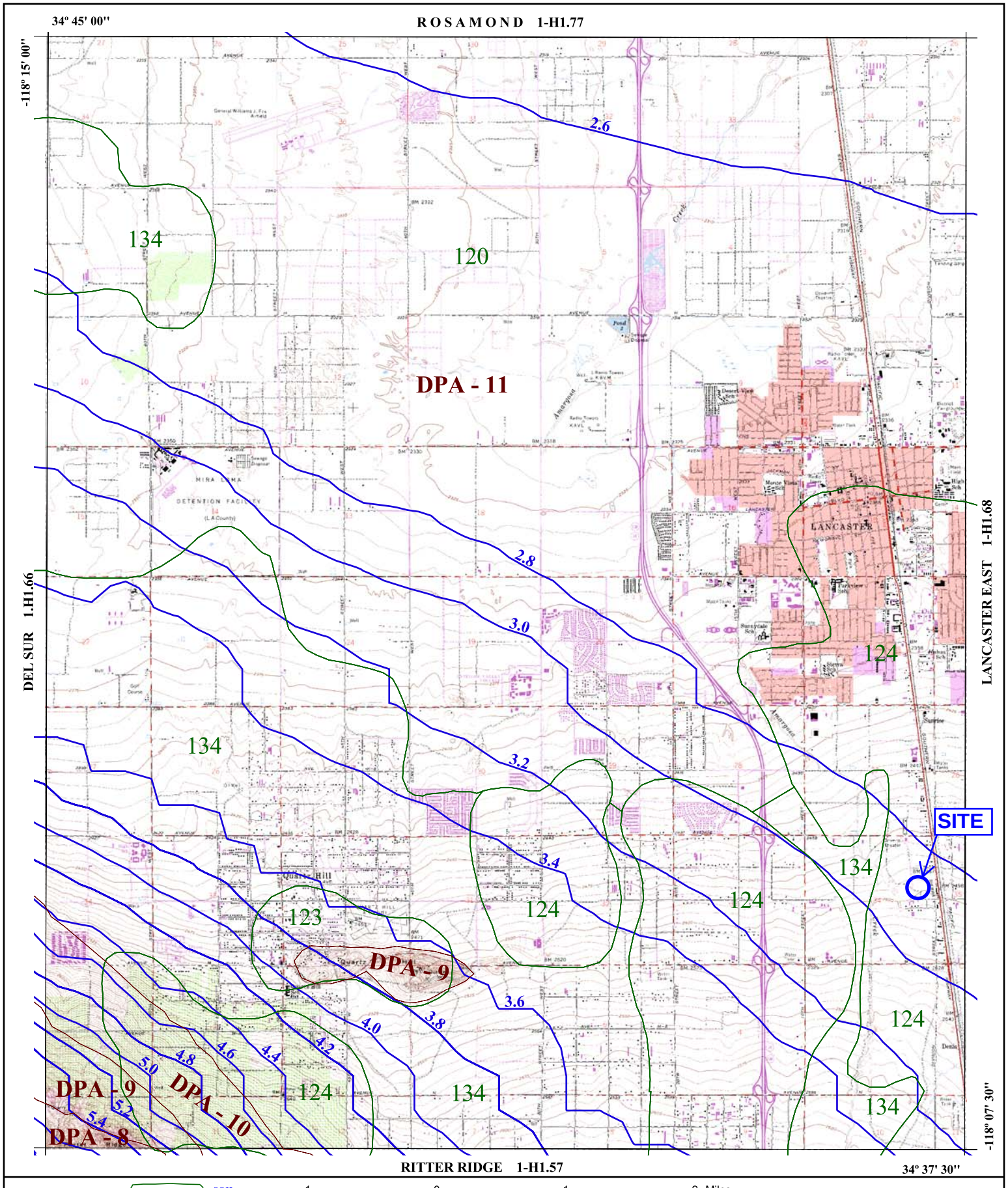
HYDROLOGIC INFORMATION



NORTH

VICINITY MAP

NOT TO SCALE



016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA - 6 DEBRIS POTENTIAL AREA

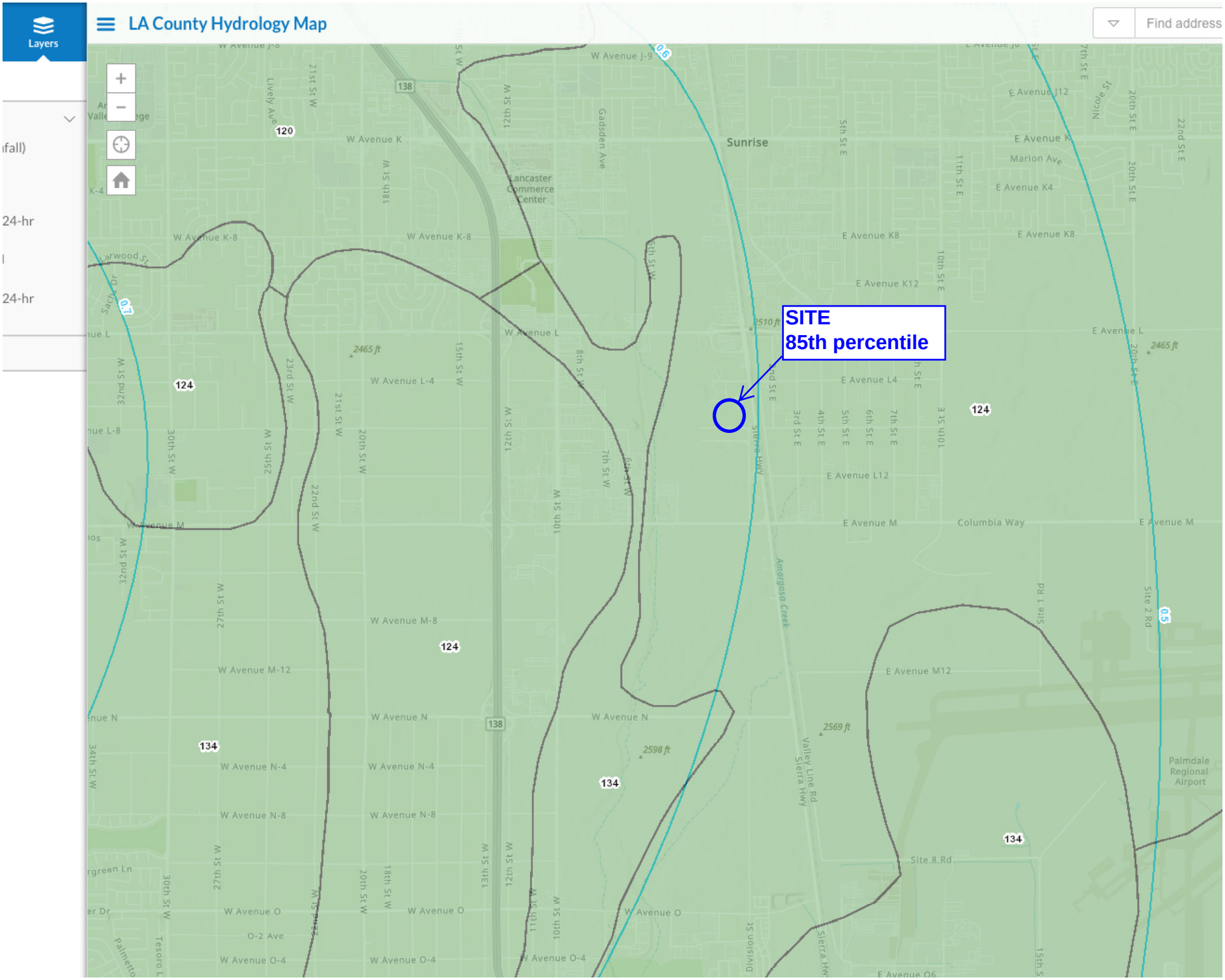
1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

LANCASTER WEST
50-YEAR 24-HOUR ISOHYET

1-H1.67

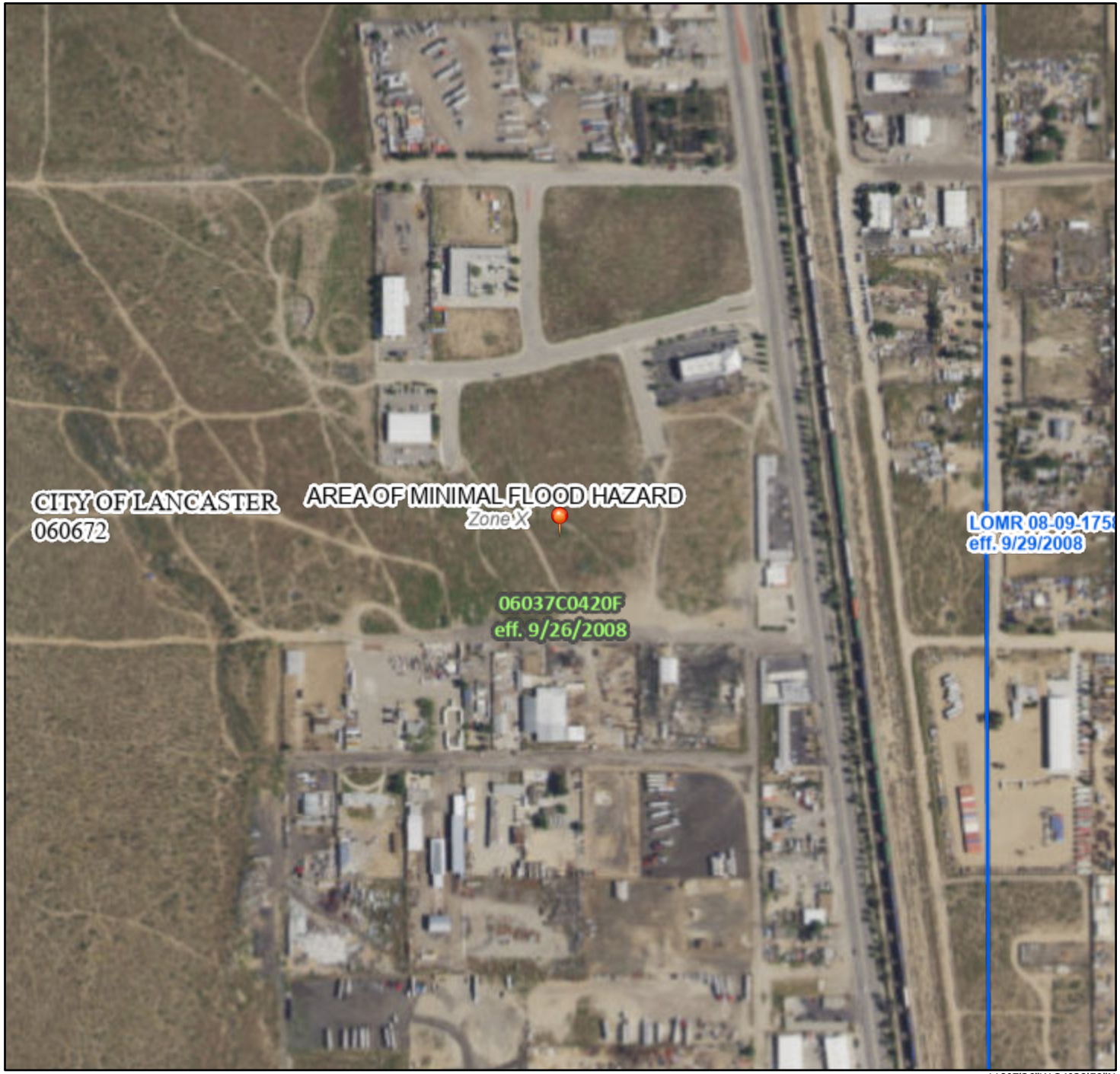
LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works


Layers
LA County Hydrology Map
Find address
SITE
85th percentile
Sunrise
Lancaster Commerce Center
E Avenue K
E Avenue K8
E Avenue K12
E Avenue L
E Avenue L4
E Avenue L12
E Avenue M
E Avenue M12
W Avenue K
W Avenue K-8
W Avenue L
W Avenue L-4
W Avenue M-8
W Avenue M-12
W Avenue N
W Avenue N-4
W Avenue N-8
W Avenue O
W Avenue O-4
Columbia Way
Sierra Hwy
Valley Line Rd
Site 8 Rd
Palmdale Regional Airport
Antelope Creek
2510 ft
2465 ft
2569 ft
2598 ft
120
124
134
138

National Flood Hazard Layer FIRMette

FEMA

118°8'13"W 34°39'29"N



118°7'36"W 34°38'59"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

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

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 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 Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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 8/29/2022 at 10:03 PM 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 unmapped and unmodernized areas cannot be used for regulatory purposes.

Proportion Impervious Data

Code	Land Use Description	% Impervious
1111	High-Density Single Family Residential	42
1112	Low-Density Single Family Residential	21
1121	Mixed Multi-Family Residential	74
1122	Duplexes, Triplexes and 2-or 3-Unit Condominiums and Townhouses	55
1123	Low-Rise Apartments, Condominiums, and Townhouses	86
1124	Medium-Rise Apartments and Condominiums	86
1125	High-Rise Apartments and Condominiums	90
1131	Trailer Parks and Mobile Home Courts, High-Density	91
1132	Mobile Home Courts and Subdivisions, Low-Density	42
1140	Mixed Residential	59
1151	Rural Residential, High-Density	15
1152	Rural Residential, Low-Density	10
1211	Low- and Medium-Rise Major Office Use	91
1212	High-Rise Major Office Use	91
1213	Skyscrapers	91
1221	Regional Shopping Center	95
1222	Retail Centers (Non-Strip With Contiguous Interconnected Off-Street	96
1223	Modern Strip Development	96
1224	Older Strip Development	97
1231	Commercial Storage	90
1232	Commercial Recreation	90
1233	Hotels and Motels	96
1234	Attended Pay Public Parking Facilities	91
1241	Government Offices	91
1242	Police and Sheriff Stations	91
1243	Fire Stations	91
1244	Major Medical Health Care Facilities	74
1245	Religious Facilities	82
1246	Other Public Facilities	91
1247	Non-Attended Public Parking Facilities	91
1251	Correctional Facilities	91
1252	Special Care Facilities	74
1253	Other Special Use Facilities	86
1261	Pre-Schools/Day Care Centers	68
1262	Elementary Schools	82
1263	Junior or Intermediate High Schools	82
1264	Senior High Schools	82
1265	Colleges and Universities	47
1266	Trade Schools and Professional Training Facilities	91
1271	Base (Built-up Area)	65
1271.01	Base High-Density Single Family Residential	42
1271.02	Base Duplexes, Triplexes and 2-or 3-Unit Condominiums and T	55

Code	Land Use Description	% Impervious
1271.03	Base Government Offices	91
1271.04	Base Fire Stations	91
1271.05	Base Non-Attended Public Parking Facilities	91
1271.06	Base Air Field	45
1271.07	Base Petroleum Refining and Processing	91
1271.08	Base Mineral Extraction - Oil and Gas	10
1271.09	Base Harbor Facilities	91
1271.10	Base Navigation Aids	47
1271.11	Base Developed Local Parks and Recreation	10
1271.12	Base Vacant Undifferentiated	1
1272	Vacant Area	2
1273	Air Field	45
1274	Former Base (Built-up Area)	65
1275	Former Base Vacant Area	2
1276	Former Base Air Field	91
1311	Manufacturing, Assembly, and Industrial Services	91
1312	Motion Picture and Television Studio Lots	82
1313	Packing Houses and Grain Elevators	96
1314	Research and Development	91
1321	Manufacturing	91
1322	Petroleum Refining and Processing	91
1323	Open Storage	66
1324	Major Metal Processing	91
1325	Chemical Processing	91
1331	Mineral Extraction - Other Than Oil and Gas	10
1332	Mineral Extraction - Oil and Gas	10
1340	Wholesaling and Warehousing	91
1411	Airports	91
1411.01	Airstrip	10
1412	Railroads	15
1412.01	Railroads-Attended Pay Public Parking Facilities	91
1412.02	Railroads-Non-Attended Public Parking Facilities	91
1412.03	Railroads-Manufacturing, Assembly, and Industrial Services	91
1412.04	Railroads-Petroleum Refining and Processing	91
1412.05	Railroads-Open Storage	66
1412.06	Railroads-Truck Terminals	91
1413	Freeways and Major Roads	91
1414	Park-and-Ride Lots	91
1415	Bus Terminals and Yards	91
1416	Truck Terminals	91
1417	Harbor Facilities	91
1418	Navigation Aids	47
1420	Communication Facilities	82
1420.01	Communication Facilities-Antenna	2

use for post-dev't

Code	Land Use Description	% Impervious
1431	Electrical Power Facilities	47
1431.01	Electrical Power Facilities-Powerlines (Urban)	2
1431.02	Electrical Power Facilities-Powerlines (Rural)	1
1432	Solid Waste Disposal Facilities	15
1433	Liquid Waste Disposal Facilities	96
1434	Water Storage Facilities	91
1435	Natural Gas and Petroleum Facilities	91
1435.01	Natural Gas and Petroleum Facilities-Manufacturing, Assembly, and In	91
1435.02	Natural Gas and Petroleum Facilities-Petroleum Refining and Processing	91
1435.03	Natural Gas and Petroleum Facilities-Mineral Extraction – Oil and Gas	10
1435.04	Natural Gas and Petroleum Facilities-Vacant Undifferentiated	1
1436	Water Transfer Facilities	96
1437	Improved Flood Waterways and Structures	100
1440	Maintenance Yards	91
1450	Mixed Transportation	90
1460	Mixed Transportation and Utility	91
1460.01	Mixed Utility and Transportation-Improved Flood Waterways and Structures	100
1460.02	Mixed Utility and Transportation-Railroads	15
1460.03	Mixed Utility and Transportation-Freeways and Major Roads	91
1500	Mixed Commercial and Industrial	91
1600	Mixed Urban	89
1700	Under Construction (Use appropriate value)	91
1810	Golf Courses	3
1821	Developed Local Parks and Recreation	10
1822	Undeveloped Local Parks and Recreation	2
1831	Developed Regional Parks and Recreation	2
1832	Undeveloped Regional Parks and Recreation	1
1840	Cemeteries	10
1850	Wildlife Preserves and Sanctuaries	2
1850.01	Wildlife-Commercial Recreation	90
1850.02	Wildlife-Other Special Use Facilities	86
1850.03	Wildlife-Developed Local Parks and Recreation	10
1860	Specimen Gardens and Arboreta	15
1870	Beach Parks	10
1880	Other Open Space and Recreation	10
2110	Irrigated Cropland and Improved Pasture Land	2
2120	Non-Irrigated Cropland and Improved Pasture Land	2
2200	Orchards and Vineyards	2
2300	Nurseries	15
2400	Dairy, Intensive Livestock, and Associated Facilities	42
2500	Poultry Operations	62
2600	Other Agriculture	42
2700	Horse Ranches	42

Code	Land Use Description	% Impervious
3100	Vacant Undifferentiated	1
3200	Abandoned Orchards and Vineyards	2
3300	Vacant With Limited Improvements (Use appropriate value)	42
3400	Beaches (Vacant)	1
4100	Water, Undifferentiated	100
4200	Harbor Water Facilities	100
4300	Marina Water Facilities	100
4400	Water Within a Military Installation	100

use for pre-dev't

SECTION 3

EXISTING CONDITION

HydroCalc and MODRAT Calculations:
Onsite 25-, 10- and 2-yr Frequency (Burned)
Existing Hydrology Map

Peak Flow Hydrologic Analysis

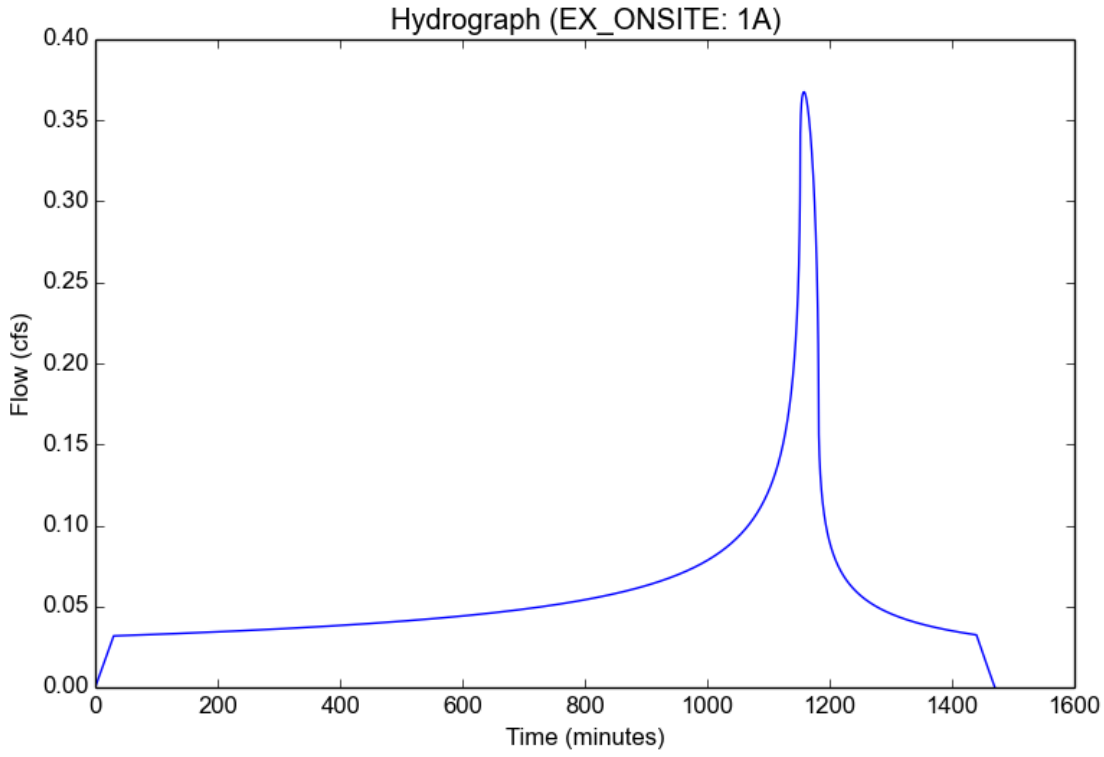
File location: D:/SikandEngineering&Associates (SEA)/22004_LANCASTER FORBES Industrial Park/HYDRO_HYDRA/TC/PR-EX_ONSITE Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	EX_ONSITE
Subarea ID	1A
Area (ac)	11.8
Flow Path Length (ft)	538.0
Flow Path Slope (vft/hft)	0.014
50-yr Rainfall Depth (in)	2.9
Percent Impervious	0.01
Soil Type	124
Design Storm Frequency	2-yr
Fire Factor	0.34
LID	False

Output Results

Modeled (2-yr) Rainfall Depth (in)	1.1223
Peak Intensity (in/hr)	0.2885
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	0.3676
Burned Peak Flow Rate (cfs)	0.6066
24-Hr Clear Runoff Volume (ac-ft)	0.1182
24-Hr Clear Runoff Volume (cu-ft)	5148.9919



Peak Flow Hydrologic Analysis

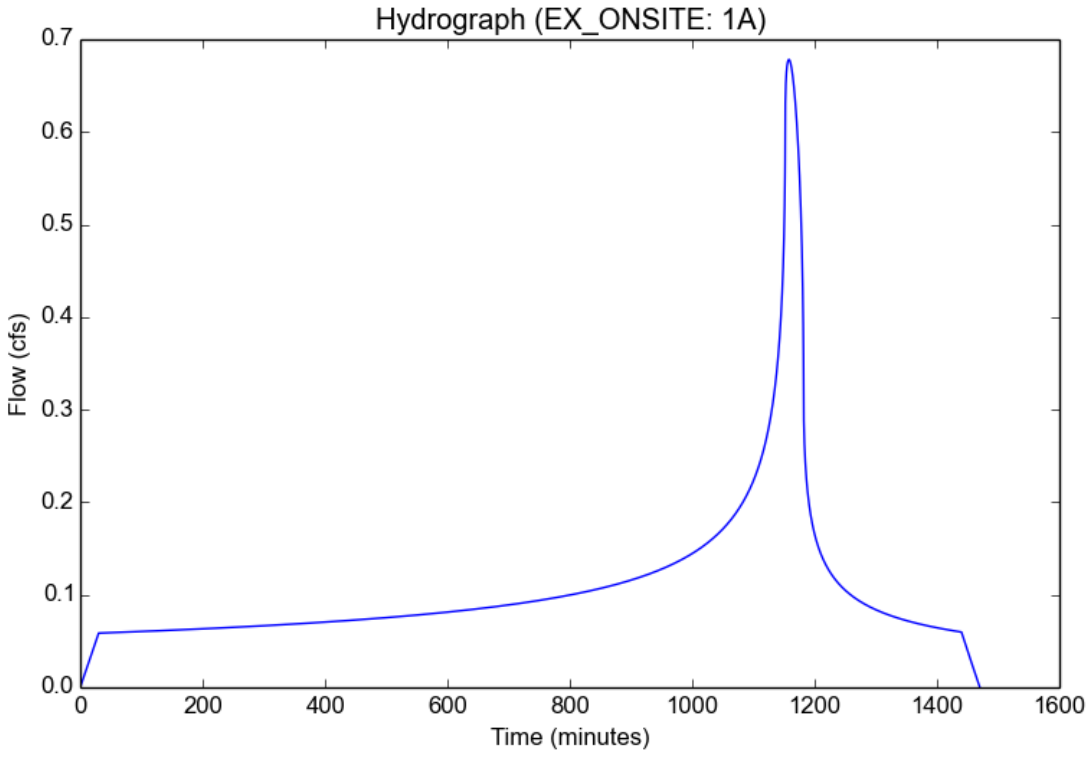
File location: D:/SikandEngineering&Associates (SEA)/22004_LANCASTER FORBES Industrial Park/HYDRO_HYDRA/TC/PR-EX_ONSITE Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	EX_ONSITE
Subarea ID	1A
Area (ac)	11.8
Flow Path Length (ft)	538.0
Flow Path Slope (vft/hft)	0.014
50-yr Rainfall Depth (in)	2.9
Percent Impervious	0.01
Soil Type	124
Design Storm Frequency	10-yr
Fire Factor	0.34
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	2.0706
Peak Intensity (in/hr)	0.5322
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	0.6782
Burned Peak Flow Rate (cfs)	1.2077
24-Hr Clear Runoff Volume (ac-ft)	0.2181
24-Hr Clear Runoff Volume (cu-ft)	9499.6906



Peak Flow Hydrologic Analysis

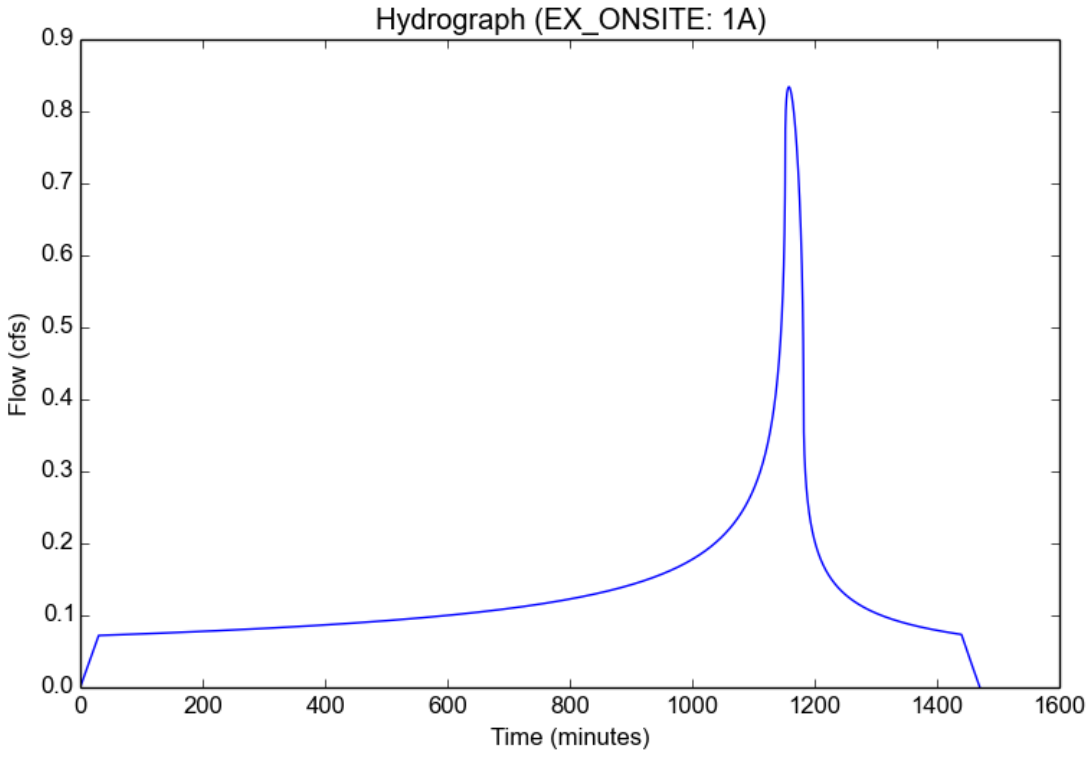
File location: D:/SikandEngineering&Associates (SEA)/22004_LANCASTER FORBES Industrial Park/HYDRO_HYDRA/TC/PR-EX_ONSITE Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	EX_ONSITE
Subarea ID	1A
Area (ac)	11.8
Flow Path Length (ft)	538.0
Flow Path Slope (vft/hft)	0.014
50-yr Rainfall Depth (in)	2.9
Percent Impervious	0.01
Soil Type	124
Design Storm Frequency	25-yr
Fire Factor	0.34
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	2.5462
Peak Intensity (in/hr)	0.6544
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	0.834
Burned Peak Flow Rate (cfs)	1.5204
24-Hr Clear Runoff Volume (ac-ft)	0.2682
24-Hr Clear Runoff Volume (cu-ft)	11681.6923



```
006     1    1A 324  111.830A06                              G1
006     1    2A 324       99A06                          2  2
```

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\LAR04_RETARD\scr_soilx_34.dat

Lancaster Forbes, AREA A, EXIST. 2-YR FREQ BURNED STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	11.8	.77	11.8	.77	0	0.	.00000	.00	.00	0.	324	30	A 6	.01
1	2A	.0	.00	11.8	.77	0	0.	.00000	.00	.00	0.	324	99	A 6	.00

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
Lancaster Forbes, AREA A, EXIST. 2-YR FREQ BURNED, OUTLET HYD.
HYDROGRAPH AT 1 2A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.06	200	.06	300	.07	400	.07
500	.08	600	.08	700	.09	800	.10	900	.12
1000	.14	1050	.18	1100	.23	1110	.25	1120	.28
1130	.33	1131	.34	1132	.34	1133	.35	1134	.35
1135	.36	1136	.36	1137	.37	1138	.38	1139	.39
1140	.40	1141	.41	1142	.42	1143	.43	1144	.44
1145	.45	1146	.47	1147	.48	1148	.50	1149	.55
1150	.60	1151	.64	1152	.69	1153	.74	1154	.75
1155	.76	1156	.76	1157	.77	1158	.77	1159	.76
1160	.77	1161	.76	1162	.76	1163	.76	1164	.75
1165	.74	1166	.74	1167	.73	1168	.72	1169	.71
1170	.70	1171	.69	1172	.67	1173	.66	1174	.65
1175	.63	1176	.61	1177	.59	1178	.57	1179	.51
1180	.46	1181	.41	1182	.35	1183	.30	1184	.28
1185	.27	1186	.25	1187	.25	1188	.24	1189	.23
1190	.22	1191	.22	1192	.21	1193	.20	1194	.20
1195	.20	1196	.20	1197	.19	1198	.19	1199	.18
1200	.18	1201	.18	1202	.18	1203	.17	1204	.17
1205	.17	1206	.17	1207	.16	1208	.16	1209	.16
1210	.16	1211	.16	1212	.16	1213	.15	1214	.15
1215	.15	1216	.15	1217	.14	1218	.14	1219	.14
1220	.14	1221	.14	1222	.14	1223	.14	1224	.13
1225	.13	1226	.13	1227	.13	1228	.13	1229	.13
1230	.13	1231	.13	1232	.13	1233	.13	1234	.12
1235	.12	1236	.12	1237	.12	1238	.12	1239	.12
1240	.12	1241	.12	1242	.12	1243	.12	1244	.12
1245	.12	1246	.12	1247	.11	1248	.11	1249	.11
1250	.11	1251	.11	1252	.11	1253	.11	1254	.11
1255	.11	1256	.11	1257	.11	1258	.11	1259	.11
1260	.11	1261	.10	1262	.10	1263	.10	1264	.10
1265	.10	1266	.10	1267	.10	1268	.10	1269	.10
1270	.10	1271	.10	1272	.10	1273	.10	1274	.10
1275	.10	1276	.10	1277	.10	1278	.10	1279	.10
1280	.09	1281	.10	1282	.09	1283	.09	1284	.10
1285	.09	1286	.09	1287	.09	1288	.09	1289	.09
1290	.09	1291	.09	1292	.09	1293	.09	1294	.09
1295	.09	1296	.09	1297	.09	1298	.09	1299	.09
1300	.09	1310	.09	1320	.08	1330	.08	1340	.07
1350	.08	1360	.07	1370	.07	1380	.07	1390	.07
1400	.07	1420	.06	1440	.06	1460	.01	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = .22(Ac.Ft)

```
006     1    1A 324  111.830A10                              G1
006     1    2A 324       99A10                          2  2
```

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\LAR04_RETARD\scr_soilx_34.dat

Lancaster Forbes, AREA A, EXIST. 10-YR FREQ BURNED STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	11.8	1.28	11.8	1.28	0	0.	.00000	.00	.00	0.	324	30	A10	.01
1	2A	.0	.00	11.8	1.28	0	0.	.00000	.00	.00	0.	324	99	A10	.00

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
Lancaster Forbes, AREA A, EXIST. 10-YR FREQ BURNED, OUTLET HYD.
HYDROGRAPH AT 1 2A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.10	200	.11	300	.11	400	.12
500	.13	600	.14	700	.16	800	.17	900	.20
1000	.24	1050	.31	1100	.39	1110	.43	1120	.48
1130	.57	1131	.57	1132	.58	1133	.59	1134	.60
1135	.61	1136	.62	1137	.63	1138	.64	1139	.66
1140	.67	1141	.68	1142	.70	1143	.71	1144	.73
1145	.76	1146	.78	1147	.81	1148	.83	1149	.91
1150	.99	1151	1.07	1152	1.15	1153	1.23	1154	1.25
1155	1.27	1156	1.27	1157	1.28	1158	1.28	1159	1.28
1160	1.28	1161	1.28	1162	1.27	1163	1.26	1164	1.25
1165	1.24	1166	1.24	1167	1.22	1168	1.20	1169	1.18
1170	1.17	1171	1.15	1172	1.13	1173	1.11	1174	1.08
1175	1.05	1176	1.02	1177	.99	1178	.96	1179	.87
1180	.78	1181	.69	1182	.60	1183	.51	1184	.47
1185	.45	1186	.43	1187	.41	1188	.40	1189	.39
1190	.38	1191	.37	1192	.36	1193	.35	1194	.34
1195	.34	1196	.33	1197	.32	1198	.32	1199	.31
1200	.31	1201	.30	1202	.30	1203	.29	1204	.29
1205	.28	1206	.28	1207	.27	1208	.27	1209	.27
1210	.27	1211	.27	1212	.26	1213	.26	1214	.25
1215	.25	1216	.25	1217	.25	1218	.24	1219	.24
1220	.24	1221	.24	1222	.24	1223	.23	1224	.23
1225	.23	1226	.23	1227	.22	1228	.22	1229	.22
1230	.22	1231	.22	1232	.22	1233	.21	1234	.22
1235	.21	1236	.21	1237	.21	1238	.21	1239	.20
1240	.20	1241	.20	1242	.20	1243	.20	1244	.20
1245	.20	1246	.20	1247	.19	1248	.19	1249	.19
1250	.19	1251	.19	1252	.19	1253	.19	1254	.19
1255	.19	1256	.18	1257	.18	1258	.19	1259	.18
1260	.18	1261	.18	1262	.18	1263	.18	1264	.17
1265	.18	1266	.18	1267	.18	1268	.17	1269	.17
1270	.17	1271	.17	1272	.17	1273	.17	1274	.17
1275	.17	1276	.17	1277	.17	1278	.17	1279	.16
1280	.16	1281	.16	1282	.16	1283	.16	1284	.16
1285	.16	1286	.16	1287	.16	1288	.16	1289	.16
1290	.16	1291	.16	1292	.16	1293	.16	1294	.16
1295	.15	1296	.15	1297	.15	1298	.15	1299	.15
1300	.15	1310	.15	1320	.14	1330	.14	1340	.13
1350	.13	1360	.13	1370	.12	1380	.12	1390	.12
1400	.12	1420	.11	1440	.10	1460	.03	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = .38(Ac.Ft)

```
006     1    1A 324  111.830A13                              G1
006     1    2A 324       99A13                          2  2
```

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\LAR04_RETARD\scr_soilx_34.dat

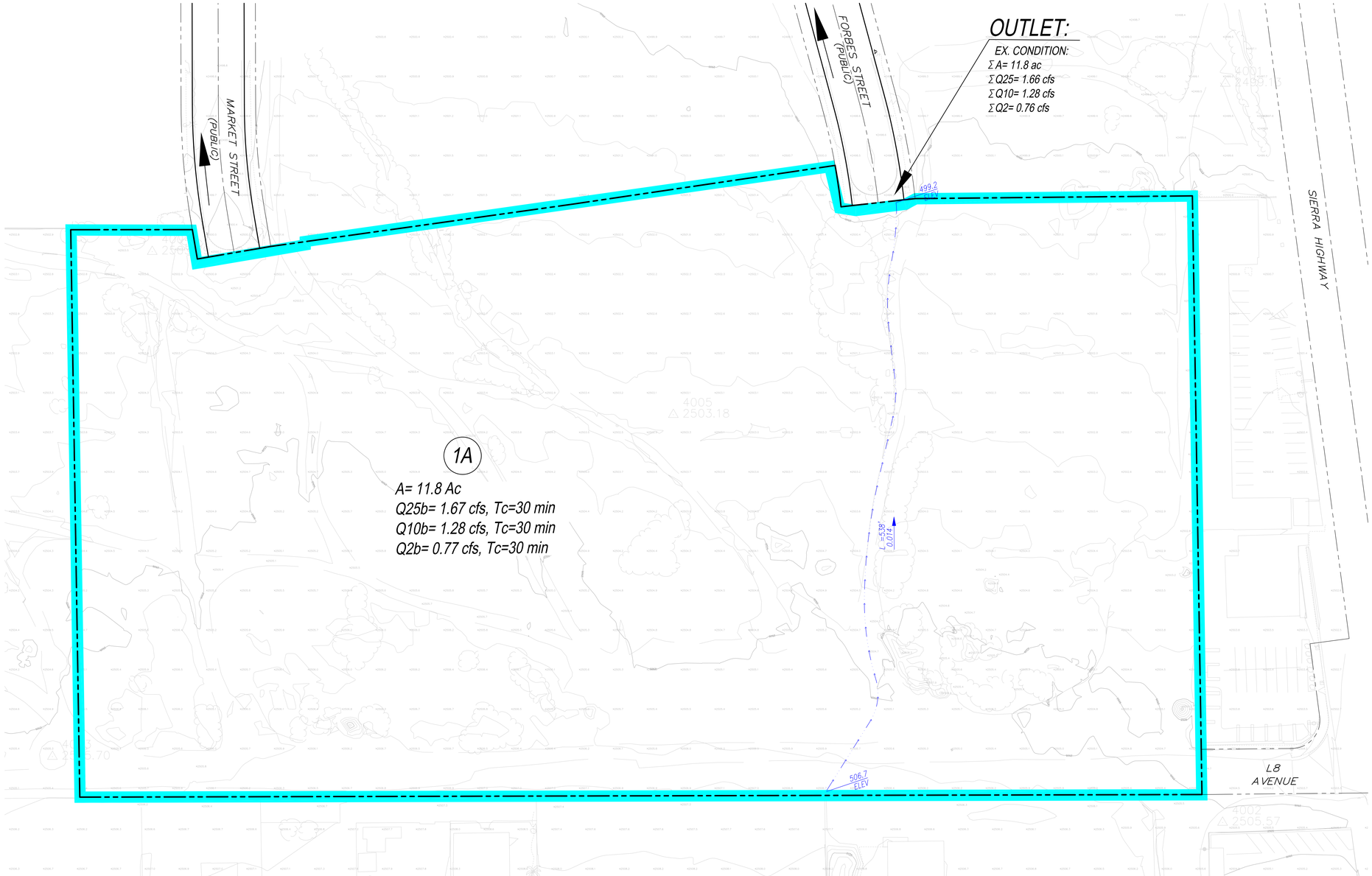
Lancaster Forbes, AREA A, EXIST. 25-YR FREQ BURNED STORM DAY 4

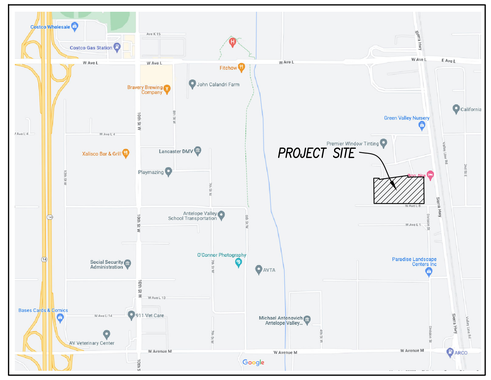
LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	11.8	1.67	11.8	1.67	0	0.	.00000	.00	.00	0.	324	30	A13	.01
1	2A	.0	.00	11.8	1.67	0	0.	.00000	.00	.00	0.	324	99	A13	.00

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
Lancaster Forbes, AREA A, EXIST. 25-YR FREQ BURNED, OUTLET HYD.
HYDROGRAPH AT 1 2A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.14	200	.15	300	.15	400	.16
500	.17	600	.19	700	.20	800	.23	900	.26
1000	.32	1050	.40	1100	.51	1110	.56	1120	.63
1130	.74	1131	.74	1132	.75	1133	.77	1134	.78
1135	.79	1136	.80	1137	.82	1138	.84	1139	.85
1140	.87	1141	.89	1142	.91	1143	.93	1144	.95
1145	.98	1146	1.02	1147	1.05	1148	1.09	1149	1.19
1150	1.30	1151	1.40	1152	1.50	1153	1.60	1154	1.63
1155	1.65	1156	1.66	1157	1.67	1158	1.67	1159	1.67
1160	1.67	1161	1.66	1162	1.66	1163	1.64	1164	1.63
1165	1.62	1166	1.61	1167	1.59	1168	1.56	1169	1.55
1170	1.53	1171	1.50	1172	1.47	1173	1.44	1174	1.41
1175	1.37	1176	1.33	1177	1.29	1178	1.24	1179	1.13
1180	1.01	1181	.90	1182	.78	1183	.67	1184	.62
1185	.59	1186	.57	1187	.54	1188	.52	1189	.50
1190	.49	1191	.48	1192	.47	1193	.46	1194	.45
1195	.44	1196	.43	1197	.42	1198	.42	1199	.41
1200	.40	1201	.39	1202	.39	1203	.38	1204	.38
1205	.37	1206	.37	1207	.36	1208	.36	1209	.35
1210	.35	1211	.34	1212	.34	1213	.33	1214	.33
1215	.33	1216	.32	1217	.32	1218	.32	1219	.32
1220	.31	1221	.31	1222	.31	1223	.31	1224	.30
1225	.30	1226	.30	1227	.30	1228	.29	1229	.29
1230	.29	1231	.29	1232	.28	1233	.28	1234	.28
1235	.28	1236	.28	1237	.27	1238	.27	1239	.27
1240	.27	1241	.27	1242	.27	1243	.26	1244	.26
1245	.26	1246	.26	1247	.26	1248	.25	1249	.25
1250	.25	1251	.25	1252	.25	1253	.24	1254	.25
1255	.25	1256	.24	1257	.24	1258	.24	1259	.24
1260	.24	1261	.24	1262	.23	1263	.24	1264	.23
1265	.23	1266	.23	1267	.23	1268	.23	1269	.23
1270	.23	1271	.23	1272	.22	1273	.22	1274	.22
1275	.22	1276	.22	1277	.22	1278	.22	1279	.22
1280	.21	1281	.22	1282	.21	1283	.22	1284	.21
1285	.21	1286	.21	1287	.21	1288	.21	1289	.21
1290	.21	1291	.20	1292	.21	1293	.20	1294	.20
1295	.20	1296	.20	1297	.20	1298	.20	1299	.20
1300	.20	1310	.19	1320	.19	1330	.18	1340	.18
1350	.17	1360	.17	1370	.16	1380	.16	1390	.15
1400	.15	1420	.15	1440	.14	1460	.04	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = .51(Ac.Ft)





NORTH

VICINITY MAP

NOT TO SCALE

LEGEND

- MAIN DRAINAGE BOUNDARY
- FLOW LINE
- TRACT BOUNDARY

(1A) .... LOCATION/SUBAREA NAME
A .... AREA IN ACRES, Ac
Q .... STORM FLOW IN CUBIC FEET PER SECOND, FREQUENCY AS SHOWN, cfs
Tc .... TIME OF CONCENTRATION, min
b .... BURNED FLOW, cfs
Σ ... TOTAL

HYDROLOGY CRITERIA

.... STORM FREQUENCY:
25-, 10- & 2-YR FOR OUTLET COMPARISON CALCULATIONS
.... BASIN NAME = ANTELOPE VALLEY
.... SOIL TYPE NUMBER = 124
(324 FOR FLOW BURNING USING LAR04 PROGRAM)
.... ISOHYET:
2.9" (50-YR, 24-hr)
2.55" (25-YR, 24-hr)
2.07" (10-YR, 24-hr)
1.12" (2-YR, 24-hr)
.... % IMPERVIOUSNESS:
1% FOR UNDEVELOPED AREAS

EXISTING CONDITION

HYDROLOGY MAP

for Lancaster Forbes Industrial Park

Forbes St & Market St

IN THE CITY OF LANCASTER, LOS ANGELES COUNTY

DATE: 08/07/2022

NORTH

SCALE: 1"=40'

PREPARED BY :
SIKAND
Engineering | Planning | Surveying
15230 Burbank Blvd. #100, Van Nuys, CA 91411
Phone : (818) 787- 8550, Fax : (818) 901-7451
www.sikand.com, E-mail: info@sikand.com

REGISTERED PROFESSIONAL ENGINEER
DOUG FARMER
No.49041
Exp. 09-30-2024
CIVIL
STATE OF CALIFORNIA

SHEET 1 OF 1 SHEETS

SECTION 4

PROPOSED CONDITION

HydroCalc and MODRAT Calculations:
Onsite 50-, 25-, 10- and 2-yr Frequency
Proposed Hydrology Map

Peak Flow Hydrologic Analysis

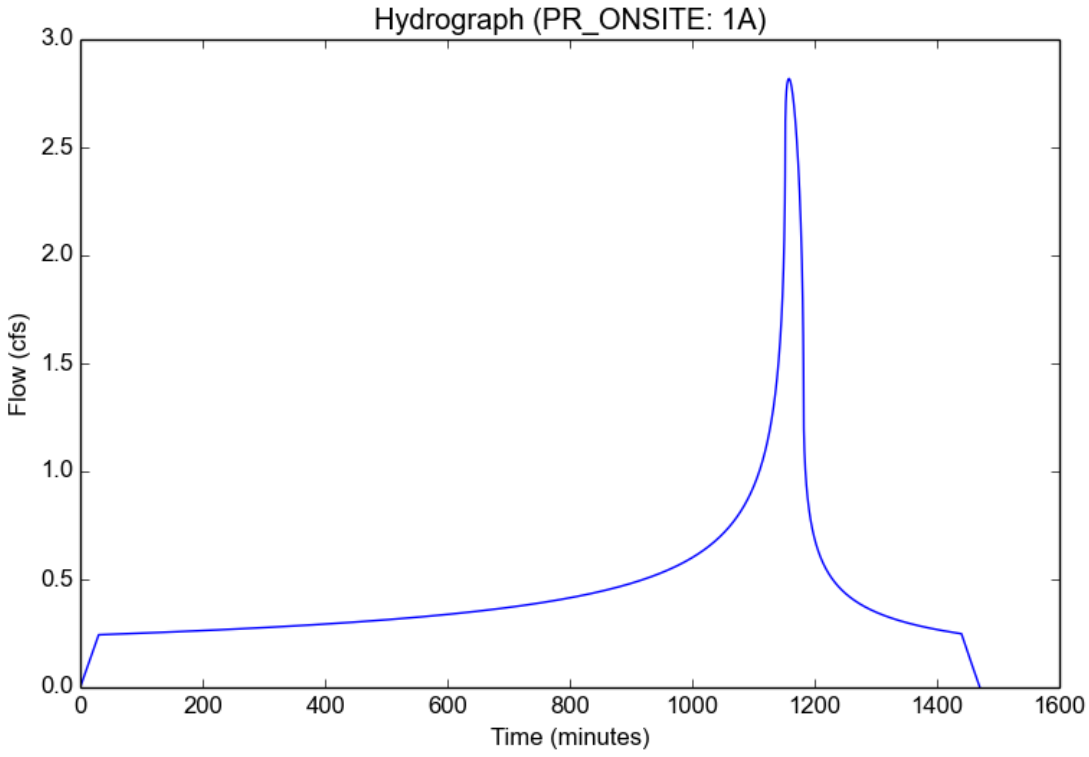
File location: D:/SikandEngineering&Associates (SEA)/22004_LANCASTER FORBES Industrial Park/HYDRO_HYDRA/TC/PR-EX_ONSITE Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	PR_ONSITE
Subarea ID	1A
Area (ac)	11.8
Flow Path Length (ft)	867.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	2.9
Percent Impervious	0.91
Soil Type	124
Design Storm Frequency	2-yr
Fire Factor	0
LID	False

Output Results

Modeled (2-yr) Rainfall Depth (in)	1.1223
Peak Intensity (in/hr)	0.2885
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.828
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	2.8183
Burned Peak Flow Rate (cfs)	2.8183
24-Hr Clear Runoff Volume (ac-ft)	0.9062
24-Hr Clear Runoff Volume (cu-ft)	39475.6049



Peak Flow Hydrologic Analysis

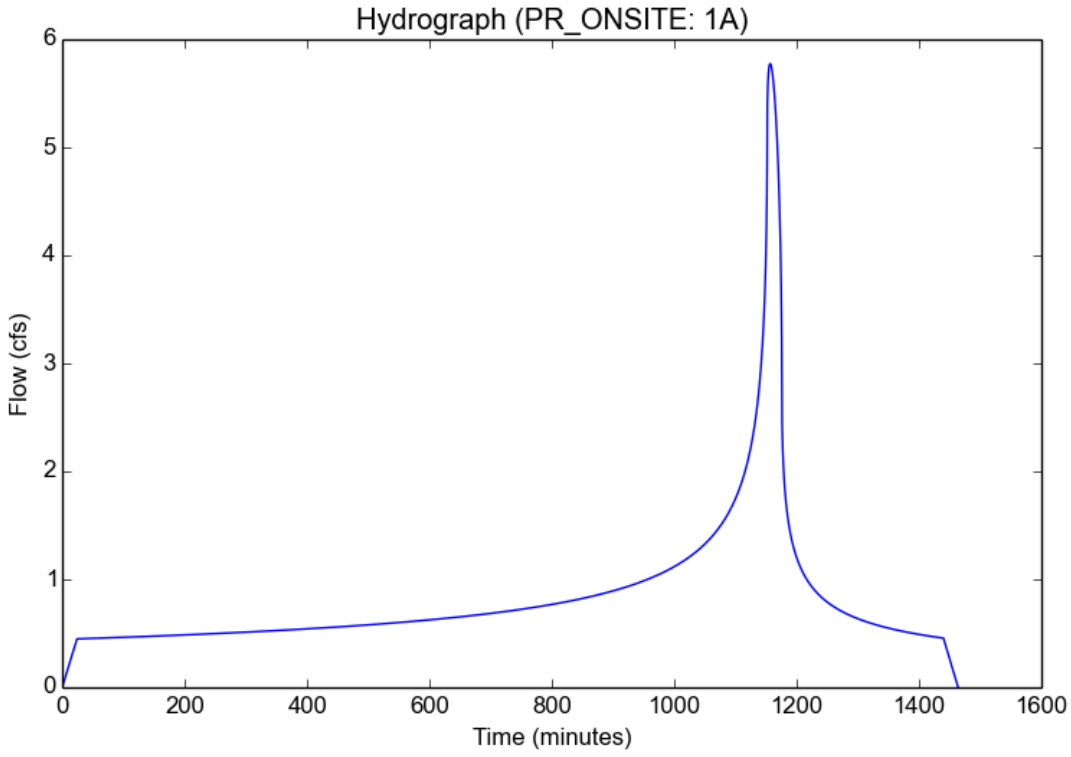
File location: D:/SikandEngineering&Associates (SEA)/22004_LANCASTER FORBES Industrial Park/HYDRO_HYDRA/TC/PR-EX_ONSITE Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	PR_ONSITE
Subarea ID	1A
Area (ac)	11.8
Flow Path Length (ft)	867.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	2.9
Percent Impervious	0.91
Soil Type	124
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	2.0706
Peak Intensity (in/hr)	0.591
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.828
Time of Concentration (min)	24.0
Clear Peak Flow Rate (cfs)	5.7747
Burned Peak Flow Rate (cfs)	5.7747
24-Hr Clear Runoff Volume (ac-ft)	1.672
24-Hr Clear Runoff Volume (cu-ft)	72830.6579



Peak Flow Hydrologic Analysis

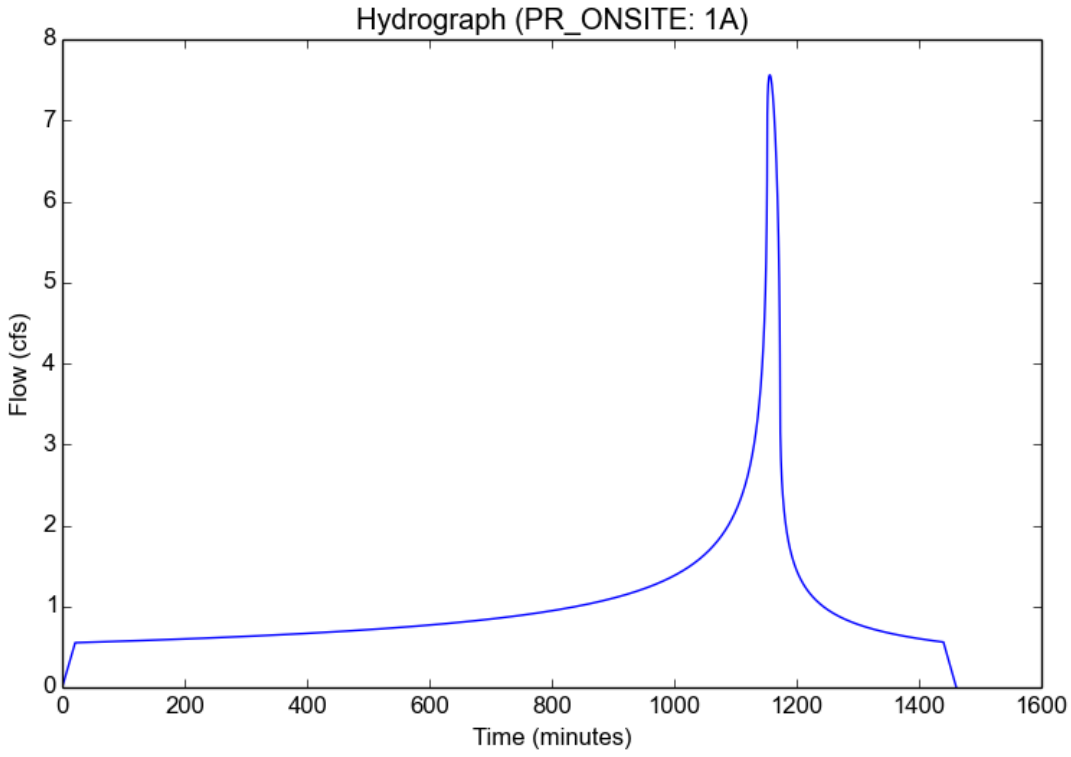
File location: D:/SikandEngineering&Associates (SEA)/22004_LANCASTER FORBES Industrial Park/HYDRO_HYDRA/TC/PR-EX_ONSITE Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	PR_ONSITE
Subarea ID	1A
Area (ac)	11.8
Flow Path Length (ft)	867.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	2.9
Percent Impervious	0.91
Soil Type	124
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	2.5462
Peak Intensity (in/hr)	0.7739
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.828
Time of Concentration (min)	21.0
Clear Peak Flow Rate (cfs)	7.561
Burned Peak Flow Rate (cfs)	7.561
24-Hr Clear Runoff Volume (ac-ft)	2.056
24-Hr Clear Runoff Volume (cu-ft)	89559.1138



Peak Flow Hydrologic Analysis

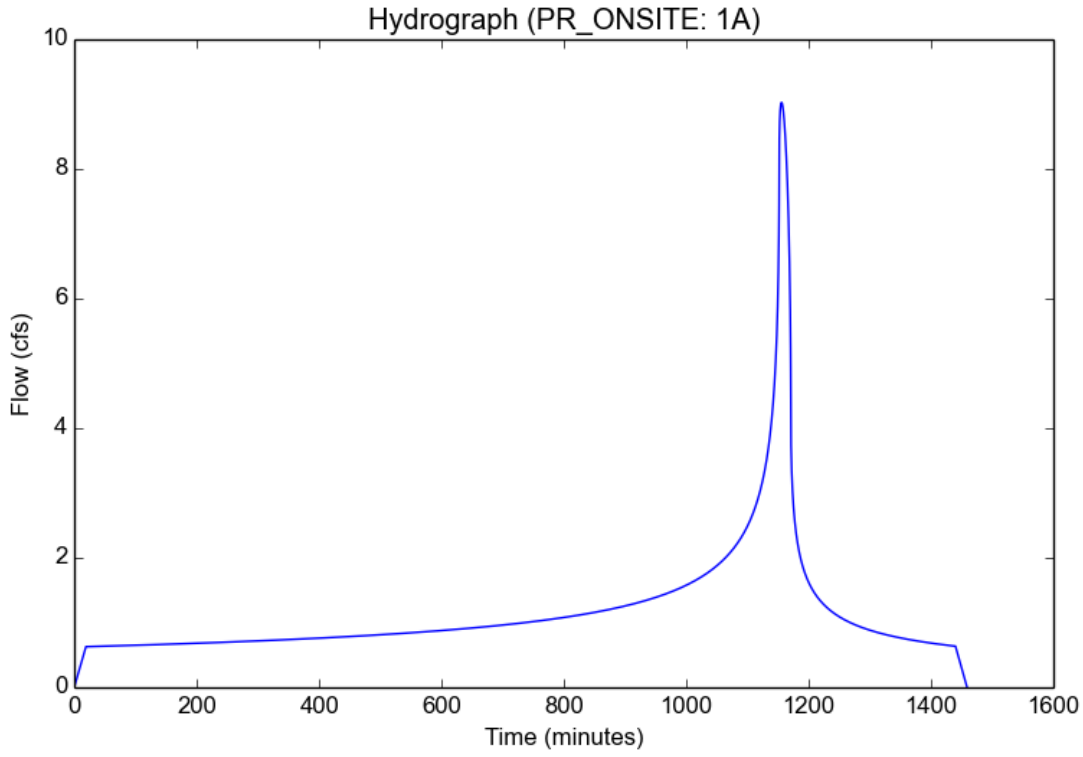
File location: D:/SikandEngineering&Associates (SEA)/22004_LANCASTER FORBES Industrial Park/HYDRO_HYDRA/TC/PR-EX_ONSITE Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	PR_ONSITE
Subarea ID	1A
Area (ac)	11.8
Flow Path Length (ft)	867.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	2.9
Percent Impervious	0.91
Soil Type	124
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	2.9
Peak Intensity (in/hr)	0.9239
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.828
Time of Concentration (min)	19.0
Clear Peak Flow Rate (cfs)	9.0264
Burned Peak Flow Rate (cfs)	9.0264
24-Hr Clear Runoff Volume (ac-ft)	2.3417
24-Hr Clear Runoff Volume (cu-ft)	102003.4424



```
006     1    1A 124 9111.830A064  527 00700                   G1
006     1    2A 124       99A06                            2  2
```

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\LAR04_RETARD\scr_soilx_34.dat

Lancaster Forbes, AREA A, PROP. 2-YR FREQ STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	11.8	3.01	11.8	3.01	4	527.	.00700	2.00	.00	0.	124	30	A 6	.91
1	2A	.0	.00	11.8	3.00	0	0.	.00000	.00	.00	0.	124	99	A 6	.00

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
Lancaster Forbes, AREA A, PROP. 2-YR FREQD, OUTLET HYD.
HYDROGRAPH AT 1 2A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.26	200	.27	300	.29	400	.30
500	.33	600	.35	700	.38	800	.43	900	.48
1000	.59	1050	.71	1100	.92	1110	.98	1120	1.09
1130	1.26	1131	1.28	1132	1.30	1133	1.32	1134	1.34
1135	1.36	1136	1.38	1137	1.40	1138	1.42	1139	1.45
1140	1.48	1141	1.51	1142	1.54	1143	1.57	1144	1.61
1145	1.64	1146	1.68	1147	1.72	1148	1.77	1149	1.83
1150	1.90	1151	2.01	1152	2.17	1153	2.35	1154	2.53
1155	2.70	1156	2.83	1157	2.90	1158	2.95	1159	2.98
1160	2.99	1161	3.00	1162	3.00	1163	2.99	1164	2.98
1165	2.97	1166	2.96	1167	2.94	1168	2.91	1169	2.88
1170	2.85	1171	2.81	1172	2.77	1173	2.73	1174	2.68
1175	2.64	1176	2.59	1177	2.53	1178	2.46	1179	2.39
1180	2.31	1181	2.18	1182	2.02	1183	1.86	1184	1.68
1185	1.50	1186	1.34	1187	1.23	1188	1.15	1189	1.09
1190	1.04	1191	1.00	1192	.97	1193	.94	1194	.91
1195	.88	1196	.86	1197	.84	1198	.83	1199	.82
1200	.80	1201	.78	1202	.77	1203	.75	1204	.74
1205	.73	1206	.72	1207	.71	1208	.70	1209	.69
1210	.68	1211	.68	1212	.67	1213	.66	1214	.66
1215	.65	1216	.63	1217	.62	1218	.62	1219	.61
1220	.60	1221	.60	1222	.59	1223	.59	1224	.59
1225	.58	1226	.57	1227	.56	1228	.56	1229	.55
1230	.55	1231	.54	1232	.54	1233	.53	1234	.53
1235	.53	1236	.53	1237	.52	1238	.52	1239	.51
1240	.51	1241	.50	1242	.50	1243	.49	1244	.49
1245	.49	1246	.49	1247	.49	1248	.49	1249	.49
1250	.48	1251	.48	1252	.47	1253	.47	1254	.47
1255	.47	1256	.46	1257	.46	1258	.46	1259	.45
1260	.45	1261	.45	1262	.45	1263	.45	1264	.44
1265	.44	1266	.43	1267	.43	1268	.43	1269	.43
1270	.43	1271	.43	1272	.43	1273	.43	1274	.42
1275	.42	1276	.42	1277	.42	1278	.42	1279	.41
1280	.41	1281	.41	1282	.41	1283	.41	1284	.40
1285	.40	1286	.40	1287	.40	1288	.40	1289	.40
1290	.39	1291	.39	1292	.39	1293	.39	1294	.39
1295	.39	1296	.39	1297	.39	1298	.39	1299	.38
1300	.38	1310	.37	1320	.35	1330	.33	1340	.32
1350	.32	1360	.32	1370	.31	1380	.30	1390	.29
1400	.29	1420	.28	1440	.27	1460	.26	1500	.26

TOTAL VOLUME THIS HYDROGRAPH = .95(Ac.Ft)

```
006     1    1A 124 9111.824A104  527 00700                  G1
006     1    2A 124       99A10                          2  2
```

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\LAR04_RETARD\scr_soilx_34.dat

Lancaster Forbes, AREA A, PROP. 10-YR FREQ STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	11.8	5.57	11.8	5.57	4	527.	.00700	2.00	.00	0.	124	24	A10	.91
1	2A	.0	.00	11.8	5.55	0	0.	.00000	.00	.00	0.	124	99	A10	.00

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
Lancaster Forbes, AREA A, PROP. 10-YR FREQD, OUTLET HYD.
HYDROGRAPH AT 1 2A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.44	200	.46	300	.48	400	.51
500	.54	600	.58	700	.64	800	.70	900	.81
1000	.98	1050	1.20	1100	1.54	1110	1.66	1120	1.90
1130	2.21	1131	2.24	1132	2.27	1133	2.30	1134	2.34
1135	2.38	1136	2.42	1137	2.46	1138	2.49	1139	2.54
1140	2.58	1141	2.64	1142	2.69	1143	2.75	1144	2.82
1145	2.89	1146	2.97	1147	3.07	1148	3.17	1149	3.28
1150	3.43	1151	3.69	1152	4.03	1153	4.40	1154	4.79
1155	5.13	1156	5.34	1157	5.46	1158	5.52	1159	5.54
1160	5.55	1161	5.54	1162	5.52	1163	5.48	1164	5.43
1165	5.37	1166	5.31	1167	5.24	1168	5.16	1169	5.07
1170	4.96	1171	4.83	1172	4.69	1173	4.55	1174	4.36
1175	4.07	1176	3.71	1177	3.34	1178	2.96	1179	2.60
1180	2.33	1181	2.13	1182	1.99	1183	1.88	1184	1.80
1185	1.74	1186	1.67	1187	1.62	1188	1.57	1189	1.53
1190	1.49	1191	1.46	1192	1.42	1193	1.39	1194	1.36
1195	1.33	1196	1.31	1197	1.28	1198	1.27	1199	1.25
1200	1.23	1201	1.21	1202	1.19	1203	1.17	1204	1.15
1205	1.14	1206	1.13	1207	1.12	1208	1.10	1209	1.09
1210	1.07	1211	1.06	1212	1.05	1213	1.04	1214	1.03
1215	1.02	1216	1.01	1217	.99	1218	.99	1219	.98
1220	.97	1221	.97	1222	.95	1223	.94	1224	.94
1225	.93	1226	.92	1227	.91	1228	.91	1229	.90
1230	.89	1231	.89	1232	.88	1233	.87	1234	.87
1235	.86	1236	.85	1237	.85	1238	.84	1239	.83
1240	.83	1241	.82	1242	.82	1243	.81	1244	.81
1245	.80	1246	.80	1247	.79	1248	.79	1249	.79
1250	.78	1251	.78	1252	.77	1253	.77	1254	.76
1255	.76	1256	.76	1257	.76	1258	.75	1259	.74
1260	.74	1261	.74	1262	.74	1263	.73	1264	.73
1265	.72	1266	.72	1267	.71	1268	.71	1269	.71
1270	.71	1271	.71	1272	.70	1273	.69	1274	.69
1275	.69	1276	.69	1277	.69	1278	.69	1279	.68
1280	.67	1281	.67	1282	.67	1283	.66	1284	.66
1285	.65	1286	.65	1287	.65	1288	.65	1289	.66
1290	.66	1291	.65	1292	.65	1293	.64	1294	.64
1295	.64	1296	.64	1297	.64	1298	.63	1299	.63
1300	.62	1310	.59	1320	.59	1330	.57	1340	.55
1350	.53	1360	.53	1370	.51	1380	.49	1390	.49
1400	.49	1420	.46	1440	.44	1460	.44	1500	.44

TOTAL VOLUME THIS HYDROGRAPH = 1.58(Ac.Ft)

```
006     1    1A 124 9111.821A134  527 00700                   G1
006     1    2A 124       99A13                             2  2
```

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\LAR04_RETARD\scr_soilx_34.dat

Lancaster Forbes, AREA A, PROP.25-YR FREQ STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	11.8	7.73	11.8	7.73	4	527.	.00700	2.00	.00	0.	124	21	A13	.91
1	2A	.0	.00	11.8	7.69	0	0.	.00000	.00	.00	0.	124	99	A13	.00

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
Lancaster Forbes, AREA A, PROP.25-YR FREQD, OUTLET HYD.
HYDROGRAPH AT 1 2A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.57	200	.60	300	.63	400	.67
500	.71	600	.76	700	.82	800	.92	900	1.06
1000	1.27	1050	1.57	1100	1.99	1110	2.19	1120	2.55
1130	2.92	1131	2.96	1132	3.00	1133	3.04	1134	3.08
1135	3.13	1136	3.18	1137	3.24	1138	3.29	1139	3.36
1140	3.43	1141	3.51	1142	3.60	1143	3.70	1144	3.80
1145	3.90	1146	4.00	1147	4.13	1148	4.28	1149	4.45
1150	4.70	1151	5.11	1152	5.62	1153	6.18	1154	6.75
1155	7.21	1156	7.47	1157	7.60	1158	7.67	1159	7.69
1160	7.67	1161	7.63	1162	7.57	1163	7.49	1164	7.39
1165	7.26	1166	7.14	1167	7.00	1168	6.82	1169	6.62
1170	6.41	1171	6.11	1172	5.67	1173	5.13	1174	4.56
1175	4.00	1176	3.48	1177	3.11	1178	2.85	1179	2.65
1180	2.50	1181	2.38	1182	2.29	1183	2.21	1184	2.14
1185	2.08	1186	2.02	1187	1.98	1188	1.93	1189	1.88
1190	1.84	1191	1.81	1192	1.77	1193	1.74	1194	1.71
1195	1.68	1196	1.65	1197	1.62	1198	1.60	1199	1.57
1200	1.55	1201	1.54	1202	1.51	1203	1.49	1204	1.47
1205	1.45	1206	1.43	1207	1.41	1208	1.40	1209	1.37
1210	1.36	1211	1.34	1212	1.33	1213	1.31	1214	1.30
1215	1.28	1216	1.27	1217	1.26	1218	1.25	1219	1.24
1220	1.24	1221	1.23	1222	1.21	1223	1.21	1224	1.20
1225	1.19	1226	1.18	1227	1.16	1228	1.16	1229	1.15
1230	1.15	1231	1.14	1232	1.13	1233	1.12	1234	1.12
1235	1.11	1236	1.10	1237	1.10	1238	1.09	1239	1.08
1240	1.07	1241	1.07	1242	1.06	1243	1.05	1244	1.04
1245	1.03	1246	1.02	1247	1.02	1248	1.02	1249	1.01
1250	1.00	1251	.99	1252	.99	1253	.99	1254	.99
1255	.98	1256	.97	1257	.97	1258	.97	1259	.96
1260	.96	1261	.95	1262	.95	1263	.94	1264	.94
1265	.93	1266	.93	1267	.92	1268	.92	1269	.91
1270	.91	1271	.91	1272	.91	1273	.90	1274	.90
1275	.89	1276	.89	1277	.88	1278	.88	1279	.87
1280	.87	1281	.87	1282	.86	1283	.86	1284	.85
1285	.85	1286	.85	1287	.85	1288	.84	1289	.84
1290	.83	1291	.83	1292	.83	1293	.82	1294	.82
1295	.81	1296	.81	1297	.81	1298	.81	1299	.81
1300	.80	1310	.78	1320	.75	1330	.74	1340	.72
1350	.69	1360	.67	1370	.67	1380	.64	1390	.62
1400	.62	1420	.61	1440	.58	1460	.57	1500	.57

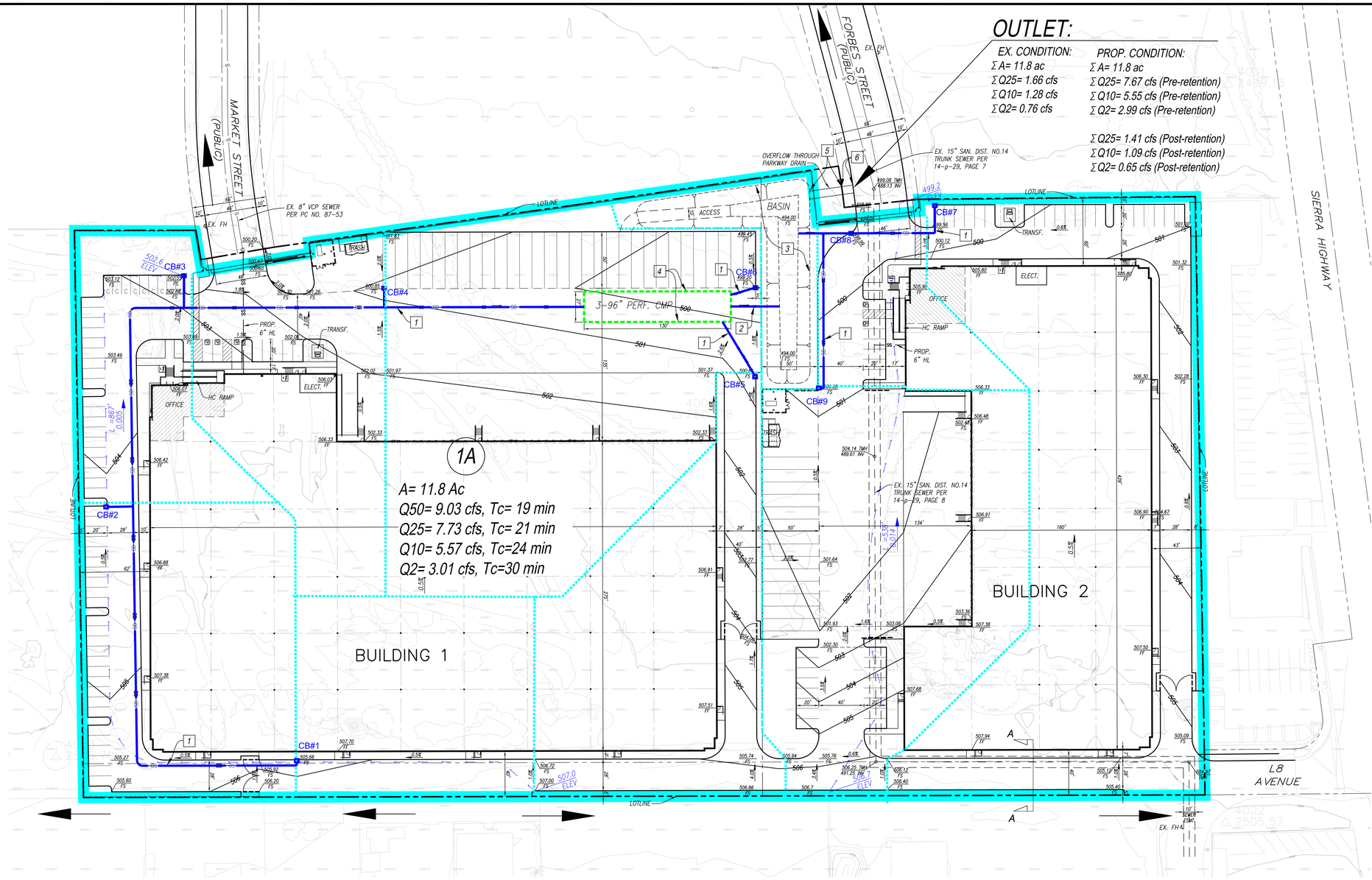
TOTAL VOLUME THIS HYDROGRAPH = 2.06(Ac.Ft)

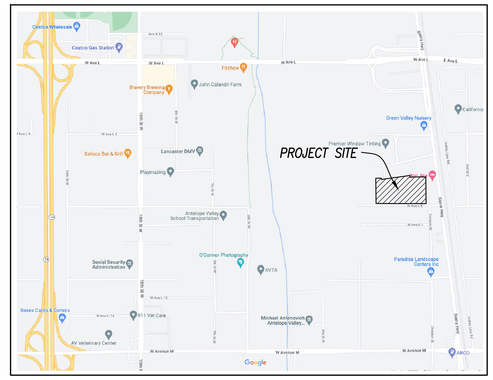
OUTLET:

EX. CONDITION:
- Σ A= 11.8 ac
- Σ Q25= 1.66 cfs
- Σ Q10= 1.28 cfs
- Σ Q2= 0.76 cfs

PROP. CONDITION:
- Σ A= 11.8 ac
- Σ Q25= 7.67 cfs (Pre-retention)
- Σ Q10= 5.55 cfs (Pre-retention)
- Σ Q2= 2.99 cfs (Pre-retention)

- Σ Q25= 1.41 cfs (Post-retention)
- Σ Q10= 1.09 cfs (Post-retention)
- Σ Q2= 0.65 cfs (Post-retention)





VICINITY MAP
NOT TO SCALE

LEGEND

- MAIN DRAINAGE BOUNDARY
- CATCH BASIN SUBAREA
- FLOW LINE
- TRACT BOUNDARY
- PROPOSED STORM DRAIN PIPE (PRIVATELY-MAINTAINED)
- UNDERGROUND RETENTION STORAGE AREA LIMITS

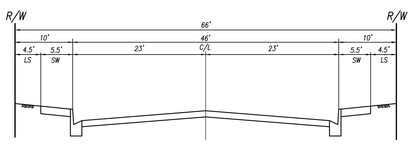
(1A) .... LOCATION/SUBAREA NAME
A .... AREA IN ACRES, Ac
Q .... STORM FLOW IN CUBIC FEET PER SECOND, FREQUENCY AS SHOWN, cfs
Tc .... TIME OF CONCENTRATION, min
Σ .... TOTAL
[1] .... PROPOSED STORM DRAIN AND CATCH BASINS WITH FILTER INSERTS, TO BE PRIVATELY-MAINTAINED
[2] .... PROPOSED STORAGE CONNECTOR DRAIN, TO BE PRIVATELY-MAINTAINED
[3] .... PROPOSED RETENTION BASIN WITH ACCESS RAMP, TO BE PRIVATELY-MAINTAINED
[4] .... PROPOSED UNDERGROUND RETENTION STORAGE,TO BE PRIVATELY-MAINTAINED
[5] .... PROPOSED 7'-WIDE SPILLWAY PARKWAY DRAIN @1% SLOPE,TO BE PRIVATELY-MAINTAINED
[6] .... PROPOSED 7'-WIDE SPILLWAY PARKWAY DRAIN @2% SLOPE,TO BE PUBLICLY-MAINTAINED

HYDROLOGY CRITERIA

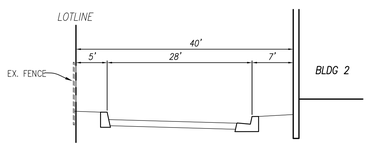
.... STORM FREQUENCY:
- 50-YR FOR CALCULATING MINIMUM FINISH FLOOR
- 25-YR FOR DEVELOPED AREAS, FOR STORM DRAIN DESIGN
- 10-YR FOR OFFSITE STREET DRY LANE CALCULATIONS
- 25-, 10- & 2-YR FOR BASIN CALCULATIONS

.... BASIN NAME = ANTELOPE VALLEY
.... SOIL TYPE NUMBER = 124
.... ISOHYET:
- 2.9" (50-YR, 24-hr)
- 2.55" (25-YR, 24-hr)
- 2.07" (10-YR, 24-hr)
- 1.12" (2-YR, 24-hr)

.... % IMPERVIOUSNESS:
91% FOR PROPOSED INDUSTRIAL AREAS



TYPICAL SECTION
NO SCALE
FORBES ST. & MARKET ST.



PRIVATE DRIVE
SECTION A–A
NOT TO SCALE

CATCH BASIN Q25 PRORATION

CB subarea	Area (ac)	Q25rate (cfs/ac)	Qsubarea (cfs)	Qjunction (cfs)
CB1	0.86	0.655	0.56	
CB2	1.13	0.655	0.74	1.3
CB3	0.66	0.655	0.43	1.73
CB4	0.96	0.655	0.63	2.36
CB5	1.24	0.655	0.81	
CB6	2.15	0.655	1.41	
BASIN	0.32	0.655	0.21	
CB5	2.35	0.655	1.54	
CB6	0.43	0.655	0.28	1.82
CB7	1.7	0.655	1.11	2.93

RETENTION BASIN NOTES:

MINIMUM Q25 RETENTION STORAGE REQUIRED = 57,404 CU-FT

COMBINED UNDERGROUND STORAGE & BASIN CAPACITY PROVIDED = 58,970 CU-FT

GENERAL NOTES

1. STORM DRAIN ALIGNMENTS SHOWN ARE NOT NECESSARILY APPROVED.
2. ALL ONSITE PROPOSED STORM DRAINS & APPURTENANT STRUCTURES TO BE PRIVATELY MAINTAINED UNLESS OTHERWISE NOTED.

PROPOSED CONDITION

HYDROLOGY MAP
for Lancaster Forbes Industrial Park

Forbes St & Market St

IN THE CITY OF LANCASTER, LOS ANGELES COUNTY

DATE: 08/07/2022

NORTH
SCALE: 1"=40'

PREPARED BY :
SIKAND
Engineering | Planning | Surveying
15230 Burbank Blvd. #100, Van Nuys, CA 91411
Phone : (818) 787- 8550, Fax : (818) 901-7451
www.sikand.com, E-mail: info@sikand.com

REGISTERED PROFESSIONAL ENGINEER
DOUG FARMER
No.49041
Exp. 09-30-2024
CIVIL
STATE OF CALIFORNIA

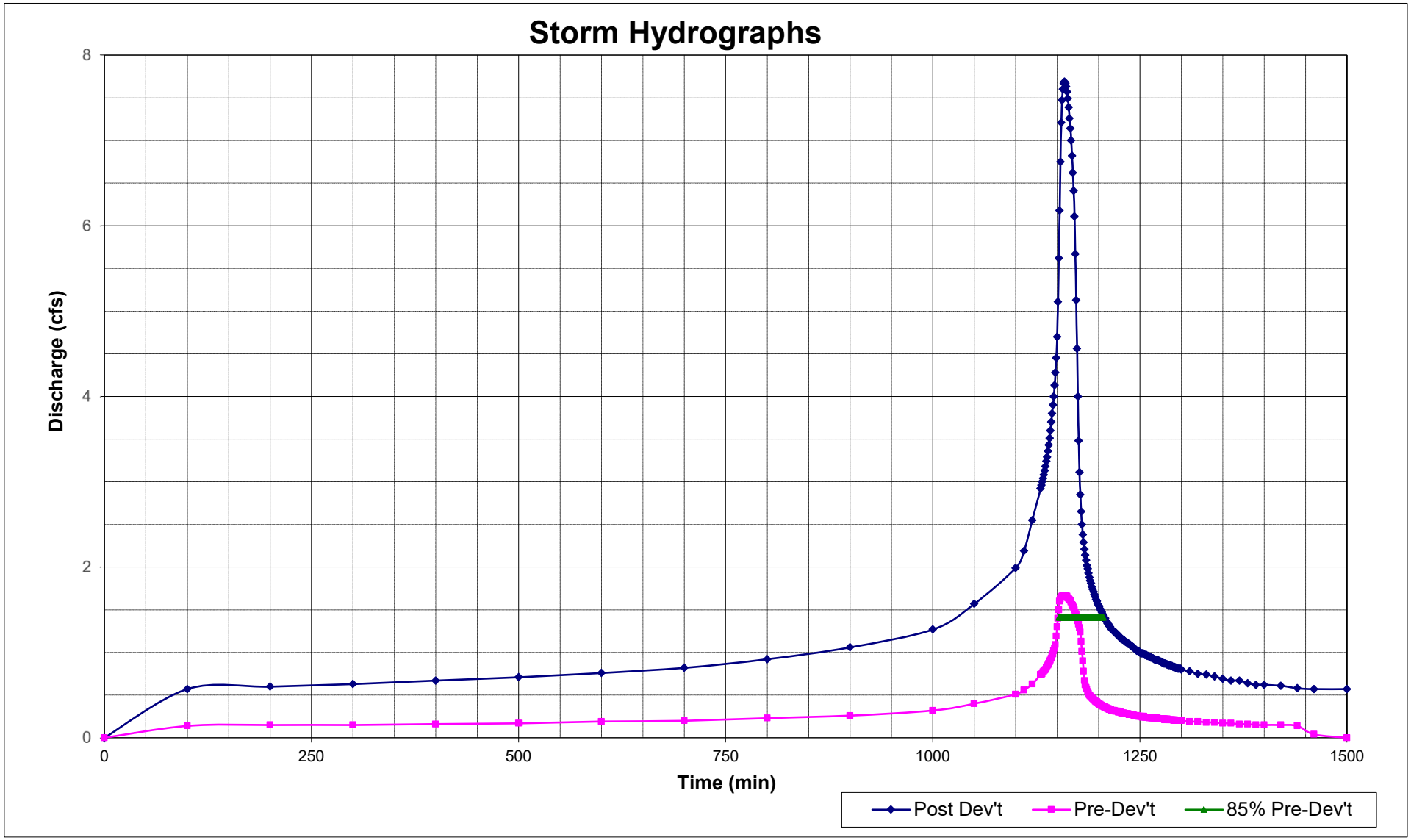
SHEET 1 OF 1 SHEETS

SECTION 5

RETENTION BASIN ANALYSIS

25-, 10- and 2-yr Frequency Retention Requirement
Basin Sizing, Drawdown Calculation & Exhibit
Excerpt from Infiltration Testing Report

Retention Basin, Min. Req'd. Volume, 25-yr Frequency



Peak $Q_{POST\text{-}DEV'T}$ =	**7.67** cfs
Peak $Q_{PRE\text{-}DEV'T}$ =	**1.66** cfs
85% Peak $Q_{PRE\text{-}DEV'T}$ =	**1.41** cfs
$V_{FOR\ STORAGE}$ =	**57404.28** ft^3
$V_{FOR\ STORAGE}$ =	**1.32** ac-ft

RETENTION Basin Minimum Storage Requirement

Calculation Summary

25-yr Frequency

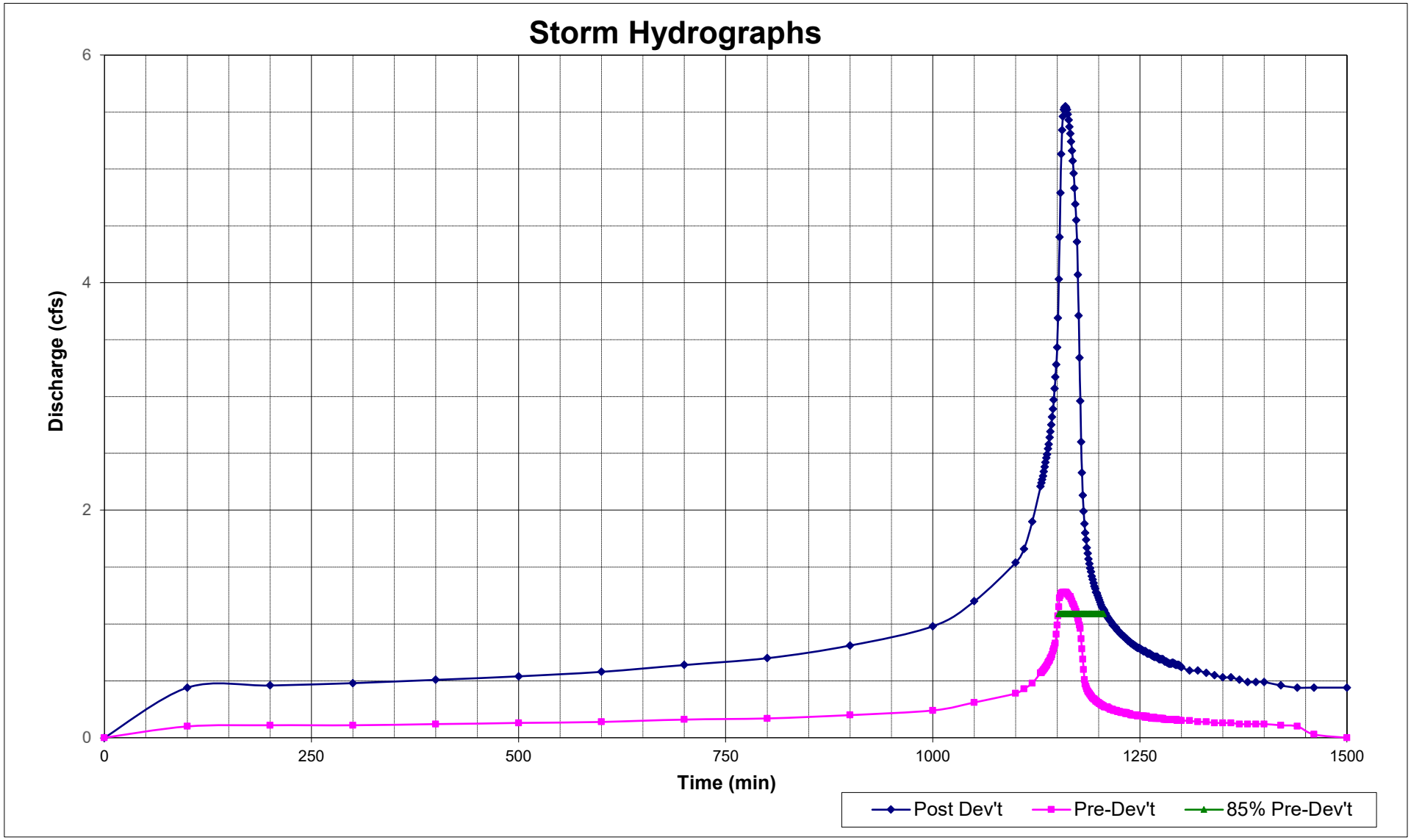
Post-Dev't		Pre-Dev't		85% Pre-Dev't				
Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Delta Q (cfs)	Volume (cu-ft)	Volume (ac-ft)
0	-	0	-		-	-	-	-
100	0.57	100	0.14		-	0.43	1,290	0.030
200	0.60	200	0.15		-	0.45	2,640	0.061
300	0.63	300	0.15		-	0.48	2,790	0.064
400	0.67	400	0.16		-	0.51	2,970	0.068
500	0.71	500	0.17		-	0.54	3,150	0.072
600	0.76	600	0.19		-	0.57	3,330	0.076
700	0.82	700	0.20		-	0.62	3,570	0.082
800	0.92	800	0.23		-	0.69	3,930	0.090
900	1.06	900	0.26		-	0.80	4,470	0.103
1000	1.27	1000	0.32		-	0.95	5,250	0.121
1050	1.57	1050	0.40		-	1.17	3,180	0.073
1100	1.99	1100	0.51		-	1.48	3,975	0.091
1110	2.19	1110	0.56		-	1.63	933	0.021
1120	2.55	1120	0.63		-	1.92	1,065	0.024
1130	2.92	1130	0.74		-	2.18	1,230	0.028
1131	2.96	1131	0.74		-	2.22	132	0.003
1132	3.00	1132	0.75		-	2.25	134	0.003
1133	3.04	1133	0.77		-	2.27	136	0.003
1134	3.08	1134	0.78		-	2.30	137	0.003
1135	3.13	1135	0.79		-	2.34	139	0.003
1136	3.18	1136	0.80		-	2.38	142	0.003
1137	3.24	1137	0.82		-	2.42	144	0.003
1138	3.29	1138	0.84		-	2.45	146	0.003
1139	3.36	1139	0.85		-	2.51	149	0.003
1140	3.43	1140	0.87		-	2.56	152	0.003
1141	3.51	1141	0.89		-	2.62	155	0.004
1142	3.60	1142	0.91		-	2.69	159	0.004
1143	3.70	1143	0.93		-	2.77	164	0.004
1144	3.80	1144	0.95		-	2.85	169	0.004
1145	3.90	1145	0.98		-	2.92	173	0.004
1146	4.00	1146	1.02		-	2.98	177	0.004
1147	4.13	1147	1.05		-	3.08	182	0.004
1148	4.28	1148	1.09		-	3.19	188	0.004
1149	4.45	1149	1.19		-	3.26	194	0.004
1150	4.70	1150	1.30		-	3.40	200	0.005
1151	5.11	1151	1.40		-	3.71	213	0.005
1152	5.62	1152	1.50	1152	1.41	4.21	238	0.005
1153	6.18	1153	1.60	1153	1.41	4.77	269	0.006
1154	6.75	1154	1.63	1154	1.41	5.34	303	0.007
1155	7.21	1155	1.65	1155	1.41	5.80	334	0.008
1156	7.47	1156	1.66	1156	1.41	6.06	356	0.008
1157	7.60	1157	1.67	1157	1.41	6.19	367	0.008
1158	7.67	1158	1.67	1158	1.41	6.26	373	0.009
1159	7.69	1159	1.67	1159	1.41	6.28	376	0.009
1160	7.67	1160	1.67	1160	1.41	6.26	376	0.009

1161	7.63	1161	1.66	1161	1.41	6.22	374	0.009
1162	7.57	1162	1.66	1162	1.41	6.16	371	0.009
1163	7.49	1163	1.64	1163	1.41	6.08	367	0.008
1164	7.39	1164	1.63	1164	1.41	5.98	362	0.008
1165	7.26	1165	1.62	1165	1.41	5.85	355	0.008
1166	7.14	1166	1.61	1166	1.41	5.73	347	0.008
1167	7.00	1167	1.59	1167	1.41	5.59	340	0.008
1168	6.82	1168	1.56	1168	1.41	5.41	330	0.008
1169	6.62	1169	1.55	1169	1.41	5.21	319	0.007
1170	6.41	1170	1.53	1170	1.41	5.00	306	0.007
1171	6.11	1171	1.50	1171	1.41	4.70	291	0.007
1172	5.67	1172	1.47	1172	1.41	4.26	269	0.006
1173	5.13	1173	1.44	1173	1.41	3.72	239	0.005
1174	4.56	1174	1.41	1174	1.41	3.15	206	0.005
1175	4.00	1175	1.37	1175	1.41	2.63	173	0.004
1176	3.48	1176	1.33	1176	1.41	2.15	143	0.003
1177	3.11	1177	1.29	1177	1.41	1.82	119	0.003
1178	2.85	1178	1.24	1178	1.41	1.61	103	0.002
1179	2.65	1179	1.13	1179	1.41	1.52	94	0.002
1180	2.50	1180	1.01	1180	1.41	1.49	90	0.002
1181	2.38	1181	0.90	1181	1.41	1.48	89	0.002
1182	2.29	1182	0.78	1182	1.41	1.51	90	0.002
1183	2.21	1183	0.67	1183	1.41	1.54	92	0.002
1184	2.14	1184	0.62	1184	1.41	1.52	92	0.002
1185	2.08	1185	0.59	1185	1.41	1.49	90	0.002
1186	2.02	1186	0.57	1186	1.41	1.45	88	0.002
1187	1.98	1187	0.54	1187	1.41	1.44	87	0.002
1188	1.93	1188	0.52	1188	1.41	1.41	86	0.002
1189	1.88	1189	0.50	1189	1.41	1.38	84	0.002
1190	1.84	1190	0.49	1190	1.41	1.35	82	0.002
1191	1.81	1191	0.48	1191	1.41	1.33	80	0.002
1192	1.77	1192	0.47	1192	1.41	1.30	79	0.002
1193	1.74	1193	0.46	1193	1.41	1.28	77	0.002
1194	1.71	1194	0.45	1194	1.41	1.26	76	0.002
1195	1.68	1195	0.44	1195	1.41	1.24	75	0.002
1196	1.65	1196	0.43	1196	1.41	1.22	74	0.002
1197	1.62	1197	0.42	1197	1.41	1.20	73	0.002
1198	1.60	1198	0.42	1198	1.41	1.18	71	0.002
1199	1.57	1199	0.41	1199	1.41	1.16	70	0.002
1200	1.55	1200	0.40	1200	1.41	1.15	69	0.002
1201	1.54	1201	0.39	1201	1.41	1.15	69	0.002
1202	1.51	1202	0.39	1202	1.41	1.12	68	0.002
1203	1.49	1203	0.38	1203	1.41	1.11	67	0.002
1204	1.47	1204	0.38	1204	1.41	1.09	66	0.002
1205	1.45	1205	0.37	1205	1.41	1.08	65	0.001
1206	1.43	1206	0.37	1206	1.41	1.06	64	0.001
1207	1.41	1207	0.36		-	-	32	0.001
1208	1.40	1208	0.36		-	-	-	-
1209	1.37	1209	0.35		-	-	-	-
1210	1.36	1210	0.35		-	-	-	-
1211	1.34	1211	0.34		-	-	-	-
1212	1.33	1212	0.34		-	-	-	-
1213	1.31	1213	0.33		-	-	-	-
1214	1.30	1214	0.33		-	-	-	-

1215	1.28	1215	0.33	-	-	-	-
1216	1.27	1216	0.32	-	-	-	-
1217	1.26	1217	0.32	-	-	-	-
1218	1.25	1218	0.32	-	-	-	-
1219	1.24	1219	0.32	-	-	-	-
1220	1.24	1220	0.31	-	-	-	-
1221	1.23	1221	0.31	-	-	-	-
1222	1.21	1222	0.31	-	-	-	-
1223	1.21	1223	0.31	-	-	-	-
1224	1.20	1224	0.30	-	-	-	-
1225	1.19	1225	0.30	-	-	-	-
1226	1.18	1226	0.30	-	-	-	-
1227	1.16	1227	0.30	-	-	-	-
1228	1.16	1228	0.29	-	-	-	-
1229	1.15	1229	0.29	-	-	-	-
1230	1.15	1230	0.29	-	-	-	-
1231	1.14	1231	0.29	-	-	-	-
1232	1.13	1232	0.28	-	-	-	-
1233	1.12	1233	0.28	-	-	-	-
1234	1.12	1234	0.28	-	-	-	-
1235	1.11	1235	0.28	-	-	-	-
1236	1.10	1236	0.28	-	-	-	-
1237	1.10	1237	0.27	-	-	-	-
1238	1.09	1238	0.27	-	-	-	-
1239	1.08	1239	0.27	-	-	-	-
1240	1.07	1240	0.27	-	-	-	-
1241	1.07	1241	0.27	-	-	-	-
1242	1.06	1242	0.27	-	-	-	-
1243	1.05	1243	0.26	-	-	-	-
1244	1.04	1244	0.26	-	-	-	-
1245	1.03	1245	0.26	-	-	-	-
1246	1.02	1246	0.26	-	-	-	-
1247	1.02	1247	0.26	-	-	-	-
1248	1.02	1248	0.25	-	-	-	-
1249	1.01	1249	0.25	-	-	-	-
1250	1.00	1250	0.25	-	-	-	-
1251	0.99	1251	0.25	-	-	-	-
1252	0.99	1252	0.25	-	-	-	-
1253	0.99	1253	0.24	-	-	-	-
1254	0.99	1254	0.25	-	-	-	-
1255	0.98	1255	0.25	-	-	-	-
1256	0.97	1256	0.24	-	-	-	-
1257	0.97	1257	0.24	-	-	-	-
1258	0.97	1258	0.24	-	-	-	-
1259	0.96	1259	0.24	-	-	-	-
1260	0.96	1260	0.24	-	-	-	-
1261	0.95	1261	0.24	-	-	-	-
1262	0.95	1262	0.23	-	-	-	-
1263	0.94	1263	0.24	-	-	-	-
1264	0.94	1264	0.23	-	-	-	-
1265	0.93	1265	0.23	-	-	-	-
1266	0.93	1266	0.23	-	-	-	-
1267	0.92	1267	0.23	-	-	-	-
1268	0.92	1268	0.23	-	-	-	-

1269	0.91	1269	0.23	-	-	-	-
1270	0.91	1270	0.23	-	-	-	-
1271	0.91	1271	0.23	-	-	-	-
1272	0.91	1272	0.22	-	-	-	-
1273	0.90	1273	0.22	-	-	-	-
1274	0.90	1274	0.22	-	-	-	-
1275	0.89	1275	0.22	-	-	-	-
1276	0.89	1276	0.22	-	-	-	-
1277	0.88	1277	0.22	-	-	-	-
1278	0.88	1278	0.22	-	-	-	-
1279	0.87	1279	0.22	-	-	-	-
1280	0.87	1280	0.21	-	-	-	-
1281	0.87	1281	0.22	-	-	-	-
1282	0.86	1282	0.21	-	-	-	-
1283	0.86	1283	0.22	-	-	-	-
1284	0.85	1284	0.21	-	-	-	-
1285	0.85	1285	0.21	-	-	-	-
1286	0.85	1286	0.21	-	-	-	-
1287	0.85	1287	0.21	-	-	-	-
1288	0.84	1288	0.21	-	-	-	-
1289	0.84	1289	0.21	-	-	-	-
1290	0.83	1290	0.21	-	-	-	-
1291	0.83	1291	0.20	-	-	-	-
1292	0.83	1292	0.21	-	-	-	-
1293	0.82	1293	0.20	-	-	-	-
1294	0.82	1294	0.20	-	-	-	-
1295	0.81	1295	0.20	-	-	-	-
1296	0.81	1296	0.20	-	-	-	-
1297	0.81	1297	0.20	-	-	-	-
1298	0.81	1298	0.20	-	-	-	-
1299	0.81	1299	0.20	-	-	-	-
1300	0.80	1300	0.20	-	-	-	-
1310	0.78	1310	0.19	-	-	-	-
1320	0.75	1320	0.19	-	-	-	-
1330	0.74	1330	0.18	-	-	-	-
1340	0.72	1340	0.18	-	-	-	-
1350	0.69	1350	0.17	-	-	-	-
1360	0.67	1360	0.17	-	-	-	-
1370	0.67	1370	0.16	-	-	-	-
1380	0.64	1380	0.16	-	-	-	-
1390	0.62	1390	0.15	-	-	-	-
1400	0.62	1400	0.15	-	-	-	-
1420	0.61	1420	0.15	-	-	-	-
1440	0.58	1440	0.14	-	-	-	-
1460	0.57	1460	0.04	-	-	-	-
1500	0.57	1500	-	-	-	-	-
					Totals:	**57,404**	**1.318**

Retention Basin, Min. Req'd. Volume, 10-yr Frequency



Peak $Q_{POST\text{-}DEV'T}$ =	**5.55** cfs
Peak $Q_{PRE\text{-}DEV'T}$ =	**1.28** cfs
85% Peak $Q_{PRE\text{-}DEV'T}$ =	**1.09** cfs
$V_{FOR\ STORAGE}$ =	**44417.04** ft^3
$V_{FOR\ STORAGE}$ =	**1.02** ac-ft

RETENTION Basin Minimum Storage Requirement

Calculation Summary

10-yr Frequency

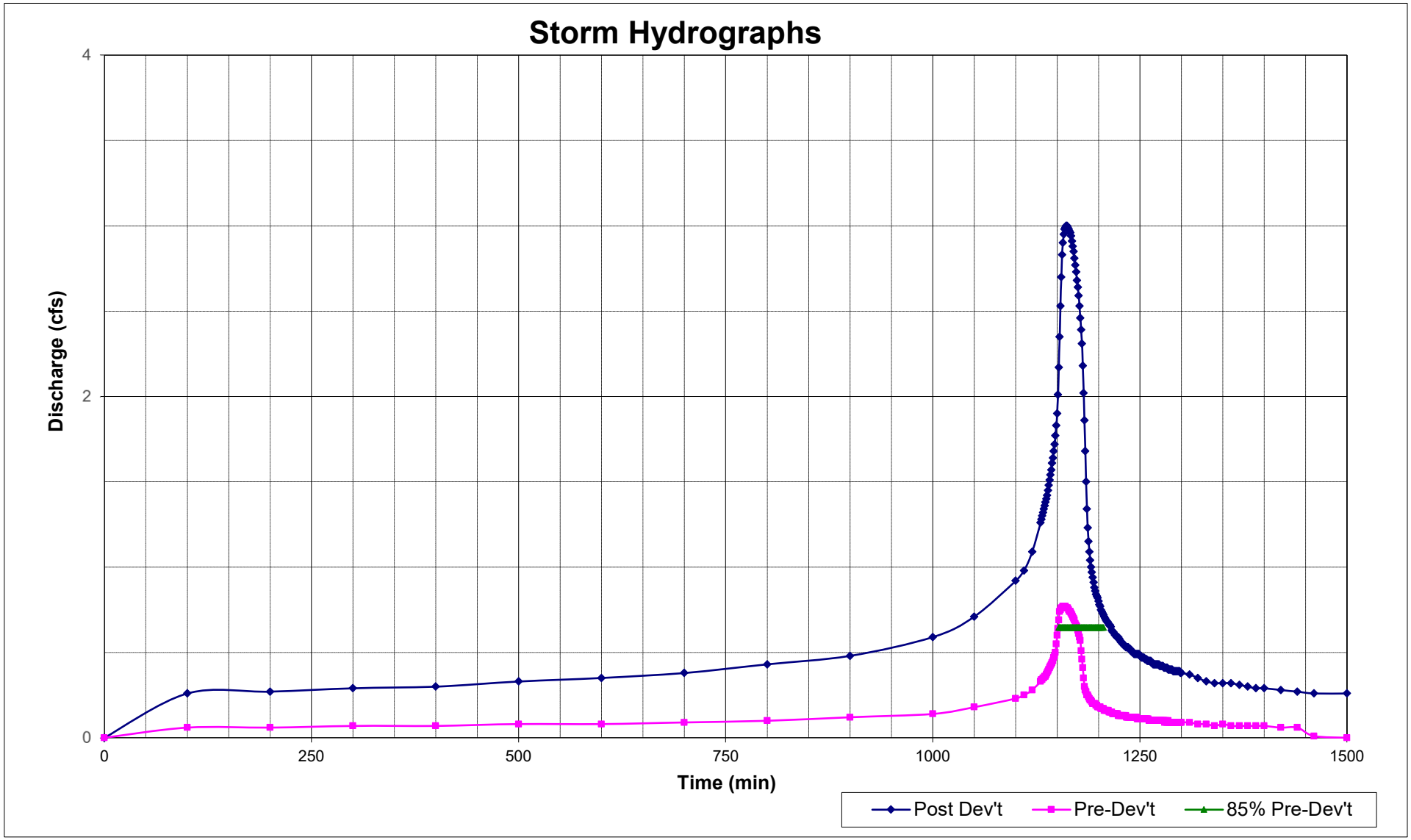
Post-Dev't		Pre-Dev't		85% Pre-Dev't				
Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Delta Q (cfs)	Volume (cu-ft)	Volume (ac-ft)
0	-	0	-		-	-	-	-
100	0.44	100	0.10		-	0.34	1,020	0.023
200	0.46	200	0.11		-	0.35	2,070	0.048
300	0.48	300	0.11		-	0.37	2,160	0.050
400	0.51	400	0.12		-	0.39	2,280	0.052
500	0.54	500	0.13		-	0.41	2,400	0.055
600	0.58	600	0.14		-	0.44	2,550	0.059
700	0.64	700	0.16		-	0.48	2,760	0.063
800	0.70	800	0.17		-	0.53	3,030	0.070
900	0.81	900	0.20		-	0.61	3,420	0.079
1000	0.98	1000	0.24		-	0.74	4,050	0.093
1050	1.20	1050	0.31		-	0.89	2,445	0.056
1100	1.54	1100	0.39		-	1.15	3,060	0.070
1110	1.66	1110	0.43		-	1.23	714	0.016
1120	1.90	1120	0.48		-	1.42	795	0.018
1130	2.21	1130	0.57		-	1.64	918	0.021
1131	2.24	1131	0.57		-	1.67	99	0.002
1132	2.27	1132	0.58		-	1.69	101	0.002
1133	2.30	1133	0.59		-	1.71	102	0.002
1134	2.34	1134	0.60		-	1.74	104	0.002
1135	2.38	1135	0.61		-	1.77	105	0.002
1136	2.42	1136	0.62		-	1.80	107	0.002
1137	2.46	1137	0.63		-	1.83	109	0.003
1138	2.49	1138	0.64		-	1.85	110	0.003
1139	2.54	1139	0.66		-	1.88	112	0.003
1140	2.58	1140	0.67		-	1.91	114	0.003
1141	2.64	1141	0.68		-	1.96	116	0.003
1142	2.69	1142	0.70		-	1.99	119	0.003
1143	2.75	1143	0.71		-	2.04	121	0.003
1144	2.82	1144	0.73		-	2.09	124	0.003
1145	2.89	1145	0.76		-	2.13	127	0.003
1146	2.97	1146	0.78		-	2.19	130	0.003
1147	3.07	1147	0.81		-	2.26	134	0.003
1148	3.17	1148	0.83		-	2.34	138	0.003
1149	3.28	1149	0.91		-	2.37	141	0.003
1150	3.43	1150	0.99		-	2.44	144	0.003
1151	3.69	1151	1.07		-	2.62	152	0.003
1152	4.03	1152	1.15	1152	1.09	2.94	167	0.004
1153	4.40	1153	1.23	1153	1.09	3.31	188	0.004
1154	4.79	1154	1.25	1154	1.09	3.70	210	0.005
1155	5.13	1155	1.27	1155	1.09	4.04	232	0.005
1156	5.34	1156	1.27	1156	1.09	4.25	249	0.006
1157	5.46	1157	1.28	1157	1.09	4.37	259	0.006
1158	5.52	1158	1.28	1158	1.09	4.43	264	0.006
1159	5.54	1159	1.28	1159	1.09	4.45	267	0.006
1160	5.55	1160	1.28	1160	1.09	4.46	267	0.006

1161	5.54	1161	1.28	1161	1.09	4.45	267	0.006
1162	5.52	1162	1.27	1162	1.09	4.43	267	0.006
1163	5.48	1163	1.26	1163	1.09	4.39	265	0.006
1164	5.43	1164	1.25	1164	1.09	4.34	262	0.006
1165	5.37	1165	1.24	1165	1.09	4.28	259	0.006
1166	5.31	1166	1.24	1166	1.09	4.22	255	0.006
1167	5.24	1167	1.22	1167	1.09	4.15	251	0.006
1168	5.16	1168	1.20	1168	1.09	4.07	247	0.006
1169	5.07	1169	1.18	1169	1.09	3.98	242	0.006
1170	4.96	1170	1.17	1170	1.09	3.87	236	0.005
1171	4.83	1171	1.15	1171	1.09	3.74	228	0.005
1172	4.69	1172	1.13	1172	1.09	3.60	220	0.005
1173	4.55	1173	1.11	1173	1.09	3.46	212	0.005
1174	4.36	1174	1.08	1174	1.09	3.28	202	0.005
1175	4.07	1175	1.05	1175	1.09	3.02	189	0.004
1176	3.71	1176	1.02	1176	1.09	2.69	171	0.004
1177	3.34	1177	0.99	1177	1.09	2.35	151	0.003
1178	2.96	1178	0.96	1178	1.09	2.00	131	0.003
1179	2.60	1179	0.87	1179	1.09	1.73	112	0.003
1180	2.33	1180	0.78	1180	1.09	1.55	98	0.002
1181	2.13	1181	0.69	1181	1.09	1.44	90	0.002
1182	1.99	1182	0.60	1182	1.09	1.39	85	0.002
1183	1.88	1183	0.51	1183	1.09	1.37	83	0.002
1184	1.80	1184	0.47	1184	1.09	1.33	81	0.002
1185	1.74	1185	0.45	1185	1.09	1.29	79	0.002
1186	1.67	1186	0.43	1186	1.09	1.24	76	0.002
1187	1.62	1187	0.41	1187	1.09	1.21	74	0.002
1188	1.57	1188	0.40	1188	1.09	1.17	71	0.002
1189	1.53	1189	0.39	1189	1.09	1.14	69	0.002
1190	1.49	1190	0.38	1190	1.09	1.11	68	0.002
1191	1.46	1191	0.37	1191	1.09	1.09	66	0.002
1192	1.42	1192	0.36	1192	1.09	1.06	65	0.001
1193	1.39	1193	0.35	1193	1.09	1.04	63	0.001
1194	1.36	1194	0.34	1194	1.09	1.02	62	0.001
1195	1.33	1195	0.34	1195	1.09	0.99	60	0.001
1196	1.31	1196	0.33	1196	1.09	0.98	59	0.001
1197	1.28	1197	0.32	1197	1.09	0.96	58	0.001
1198	1.27	1198	0.32	1198	1.09	0.95	57	0.001
1199	1.25	1199	0.31	1199	1.09	0.94	57	0.001
1200	1.23	1200	0.31	1200	1.09	0.92	56	0.001
1201	1.21	1201	0.30	1201	1.09	0.91	55	0.001
1202	1.19	1202	0.30	1202	1.09	0.89	54	0.001
1203	1.17	1203	0.29	1203	1.09	0.88	53	0.001
1204	1.15	1204	0.29	1204	1.09	0.86	52	0.001
1205	1.14	1205	0.28	1205	1.09	0.86	52	0.001
1206	1.13	1206	0.28	1206	1.09	0.85	51	0.001
1207	1.12	1207	0.27	1207	1.09	0.85	51	0.001
1208	1.10	1208	0.27	1208	1.09	0.83	50	0.001
1209	1.09	1209	0.27	1209	1.09	0.82	50	0.001
1210	1.07	1210	0.27		-	-	25	0.001
1211	1.06	1211	0.27		-	-	-	-
1212	1.05	1212	0.26		-	-	-	-
1213	1.04	1213	0.26		-	-	-	-
1214	1.03	1214	0.25		-	-	-	-

1215	1.02	1215	0.25	-	-	-	-
1216	1.01	1216	0.25	-	-	-	-
1217	0.99	1217	0.25	-	-	-	-
1218	0.99	1218	0.24	-	-	-	-
1219	0.98	1219	0.24	-	-	-	-
1220	0.97	1220	0.24	-	-	-	-
1221	0.97	1221	0.24	-	-	-	-
1222	0.95	1222	0.24	-	-	-	-
1223	0.94	1223	0.23	-	-	-	-
1224	0.94	1224	0.23	-	-	-	-
1225	0.93	1225	0.23	-	-	-	-
1226	0.92	1226	0.23	-	-	-	-
1227	0.91	1227	0.22	-	-	-	-
1228	0.91	1228	0.22	-	-	-	-
1229	0.90	1229	0.22	-	-	-	-
1230	0.89	1230	0.22	-	-	-	-
1231	0.89	1231	0.22	-	-	-	-
1232	0.88	1232	0.22	-	-	-	-
1233	0.87	1233	0.21	-	-	-	-
1234	0.87	1234	0.22	-	-	-	-
1235	0.86	1235	0.21	-	-	-	-
1236	0.85	1236	0.21	-	-	-	-
1237	0.85	1237	0.21	-	-	-	-
1238	0.84	1238	0.21	-	-	-	-
1239	0.83	1239	0.20	-	-	-	-
1240	0.83	1240	0.20	-	-	-	-
1241	0.82	1241	0.20	-	-	-	-
1242	0.82	1242	0.20	-	-	-	-
1243	0.81	1243	0.20	-	-	-	-
1244	0.81	1244	0.20	-	-	-	-
1245	0.80	1245	0.20	-	-	-	-
1246	0.80	1246	0.20	-	-	-	-
1247	0.79	1247	0.19	-	-	-	-
1248	0.79	1248	0.19	-	-	-	-
1249	0.79	1249	0.19	-	-	-	-
1250	0.78	1250	0.19	-	-	-	-
1251	0.78	1251	0.19	-	-	-	-
1252	0.77	1252	0.19	-	-	-	-
1253	0.77	1253	0.19	-	-	-	-
1254	0.76	1254	0.19	-	-	-	-
1255	0.76	1255	0.19	-	-	-	-
1256	0.76	1256	0.18	-	-	-	-
1257	0.76	1257	0.18	-	-	-	-
1258	0.75	1258	0.19	-	-	-	-
1259	0.74	1259	0.18	-	-	-	-
1260	0.74	1260	0.18	-	-	-	-
1261	0.74	1261	0.18	-	-	-	-
1262	0.74	1262	0.18	-	-	-	-
1263	0.73	1263	0.18	-	-	-	-
1264	0.73	1264	0.17	-	-	-	-
1265	0.72	1265	0.18	-	-	-	-
1266	0.72	1266	0.18	-	-	-	-
1267	0.71	1267	0.18	-	-	-	-
1268	0.71	1268	0.17	-	-	-	-

1269	0.71	1269	0.17	-	-	-	-
1270	0.71	1270	0.17	-	-	-	-
1271	0.71	1271	0.17	-	-	-	-
1272	0.70	1272	0.17	-	-	-	-
1273	0.69	1273	0.17	-	-	-	-
1274	0.69	1274	0.17	-	-	-	-
1275	0.69	1275	0.17	-	-	-	-
1276	0.69	1276	0.17	-	-	-	-
1277	0.69	1277	0.17	-	-	-	-
1278	0.69	1278	0.17	-	-	-	-
1279	0.68	1279	0.16	-	-	-	-
1280	0.67	1280	0.16	-	-	-	-
1281	0.67	1281	0.16	-	-	-	-
1282	0.67	1282	0.16	-	-	-	-
1283	0.66	1283	0.16	-	-	-	-
1284	0.66	1284	0.16	-	-	-	-
1285	0.65	1285	0.16	-	-	-	-
1286	0.65	1286	0.16	-	-	-	-
1287	0.65	1287	0.16	-	-	-	-
1288	0.65	1288	0.16	-	-	-	-
1289	0.66	1289	0.16	-	-	-	-
1290	0.66	1290	0.16	-	-	-	-
1291	0.65	1291	0.16	-	-	-	-
1292	0.65	1292	0.16	-	-	-	-
1293	0.64	1293	0.16	-	-	-	-
1294	0.64	1294	0.16	-	-	-	-
1295	0.64	1295	0.15	-	-	-	-
1296	0.64	1296	0.15	-	-	-	-
1297	0.64	1297	0.15	-	-	-	-
1298	0.63	1298	0.15	-	-	-	-
1299	0.63	1299	0.15	-	-	-	-
1300	0.62	1300	0.15	-	-	-	-
1310	0.59	1310	0.15	-	-	-	-
1320	0.59	1320	0.14	-	-	-	-
1330	0.57	1330	0.14	-	-	-	-
1340	0.55	1340	0.13	-	-	-	-
1350	0.53	1350	0.13	-	-	-	-
1360	0.53	1360	0.13	-	-	-	-
1370	0.51	1370	0.12	-	-	-	-
1380	0.49	1380	0.12	-	-	-	-
1390	0.49	1390	0.12	-	-	-	-
1400	0.49	1400	0.12	-	-	-	-
1420	0.46	1420	0.11	-	-	-	-
1440	0.44	1440	0.10	-	-	-	-
1460	0.44	1460	0.03	-	-	-	-
1500	0.44	1500	-	-	-	-	-
					Totals:	**44,417**	**1.020**

Retention Basin, Min. Req'd. Volume, 2-yr Frequency



Peak $Q_{POST\text{-}DEV'T}$ =	**2.99** cfs
Peak $Q_{PRE\text{-}DEV'T}$ =	**0.76** cfs
85% Peak $Q_{PRE\text{-}DEV'T}$ =	**0.65** cfs
$V_{FOR\ STORAGE}$ =	**26989.02** ft^3
$V_{FOR\ STORAGE}$ =	**0.62** ac-ft

RETENTION Basin Minimum Storage Requirement

Calculation Summary

2-yr Frequency

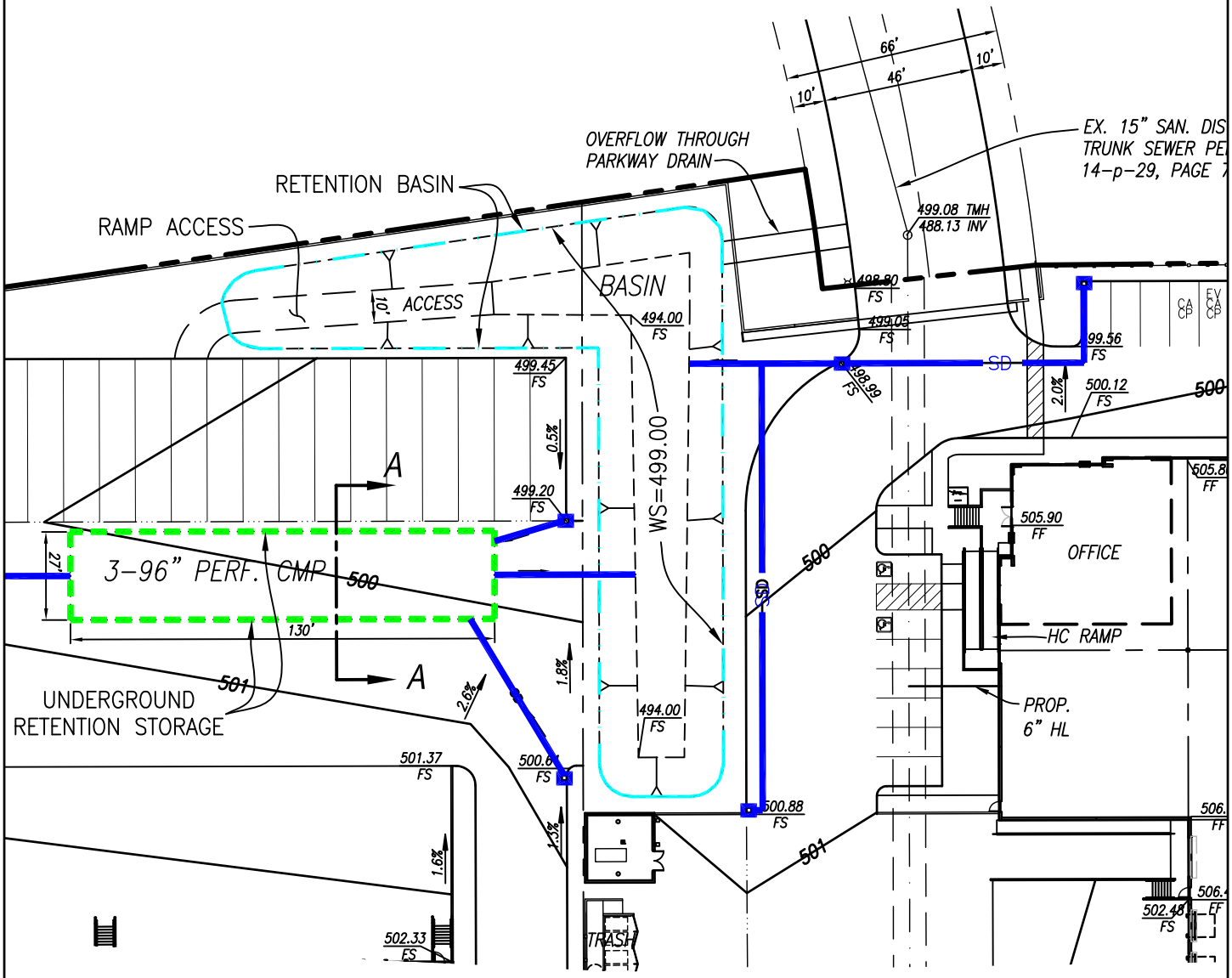
Post-Dev't		Pre-Dev't		85% Pre-Dev't				
Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Delta Q (cfs)	Volume (cu-ft)	Volume (ac-ft)
0	-	0	-		-	-	-	-
100	0.26	100	0.06		-	0.20	600	0.014
200	0.27	200	0.06		-	0.21	1,230	0.028
300	0.29	300	0.07		-	0.22	1,290	0.030
400	0.30	400	0.07		-	0.23	1,350	0.031
500	0.33	500	0.08		-	0.25	1,440	0.033
600	0.35	600	0.08		-	0.27	1,560	0.036
700	0.38	700	0.09		-	0.29	1,680	0.039
800	0.43	800	0.10		-	0.33	1,860	0.043
900	0.48	900	0.12		-	0.36	2,070	0.048
1000	0.59	1000	0.14		-	0.45	2,430	0.056
1050	0.71	1050	0.18		-	0.53	1,470	0.034
1100	0.92	1100	0.23		-	0.69	1,830	0.042
1110	0.98	1110	0.25		-	0.73	426	0.010
1120	1.09	1120	0.28		-	0.81	462	0.011
1130	1.26	1130	0.33		-	0.93	522	0.012
1131	1.28	1131	0.34		-	0.94	56	0.001
1132	1.30	1132	0.34		-	0.96	57	0.001
1133	1.32	1133	0.35		-	0.97	58	0.001
1134	1.34	1134	0.35		-	0.99	59	0.001
1135	1.36	1135	0.36		-	1.00	60	0.001
1136	1.38	1136	0.36		-	1.02	61	0.001
1137	1.40	1137	0.37		-	1.03	62	0.001
1138	1.42	1138	0.38		-	1.04	62	0.001
1139	1.45	1139	0.39		-	1.06	63	0.001
1140	1.48	1140	0.40		-	1.08	64	0.001
1141	1.51	1141	0.41		-	1.10	65	0.002
1142	1.54	1142	0.42		-	1.12	67	0.002
1143	1.57	1143	0.43		-	1.14	68	0.002
1144	1.61	1144	0.44		-	1.17	69	0.002
1145	1.64	1145	0.45		-	1.19	71	0.002
1146	1.68	1146	0.47		-	1.21	72	0.002
1147	1.72	1147	0.48		-	1.24	74	0.002
1148	1.77	1148	0.50		-	1.27	75	0.002
1149	1.83	1149	0.55		-	1.28	77	0.002
1150	1.90	1150	0.60		-	1.30	77	0.002
1151	2.01	1151	0.64		-	1.37	80	0.002
1152	2.17	1152	0.69	1152	0.65	1.52	87	0.002
1153	2.35	1153	0.74	1153	0.65	1.70	97	0.002
1154	2.53	1154	0.75	1154	0.65	1.88	108	0.002
1155	2.70	1155	0.76	1155	0.65	2.05	118	0.003
1156	2.83	1156	0.76	1156	0.65	2.18	127	0.003
1157	2.90	1157	0.77	1157	0.65	2.25	133	0.003
1158	2.95	1158	0.77	1158	0.65	2.30	137	0.003
1159	2.98	1159	0.76	1159	0.65	2.33	139	0.003
1160	2.99	1160	0.77	1160	0.65	2.34	140	0.003

1161	3.00	1161	0.76	1161	0.65	2.35	141	0.003
1162	3.00	1162	0.76	1162	0.65	2.35	141	0.003
1163	2.99	1163	0.76	1163	0.65	2.34	141	0.003
1164	2.98	1164	0.75	1164	0.65	2.33	140	0.003
1165	2.97	1165	0.74	1165	0.65	2.32	140	0.003
1166	2.96	1166	0.74	1166	0.65	2.31	139	0.003
1167	2.94	1167	0.73	1167	0.65	2.29	138	0.003
1168	2.91	1168	0.72	1168	0.65	2.26	137	0.003
1169	2.88	1169	0.71	1169	0.65	2.23	135	0.003
1170	2.85	1170	0.70	1170	0.65	2.20	133	0.003
1171	2.81	1171	0.69	1171	0.65	2.16	131	0.003
1172	2.77	1172	0.67	1172	0.65	2.12	129	0.003
1173	2.73	1173	0.66	1173	0.65	2.08	126	0.003
1174	2.68	1174	0.65	1174	0.65	2.03	124	0.003
1175	2.64	1175	0.63	1175	0.65	2.01	121	0.003
1176	2.59	1176	0.61	1176	0.65	1.98	120	0.003
1177	2.53	1177	0.59	1177	0.65	1.94	118	0.003
1178	2.46	1178	0.57	1178	0.65	1.89	115	0.003
1179	2.39	1179	0.51	1179	0.65	1.88	113	0.003
1180	2.31	1180	0.46	1180	0.65	1.85	112	0.003
1181	2.18	1181	0.41	1181	0.65	1.77	109	0.002
1182	2.02	1182	0.35	1182	0.65	1.67	103	0.002
1183	1.86	1183	0.30	1183	0.65	1.56	97	0.002
1184	1.68	1184	0.28	1184	0.65	1.40	89	0.002
1185	1.50	1185	0.27	1185	0.65	1.23	79	0.002
1186	1.34	1186	0.25	1186	0.65	1.09	70	0.002
1187	1.23	1187	0.25	1187	0.65	0.98	62	0.001
1188	1.15	1188	0.24	1188	0.65	0.91	57	0.001
1189	1.09	1189	0.23	1189	0.65	0.86	53	0.001
1190	1.04	1190	0.22	1190	0.65	0.82	50	0.001
1191	1.00	1191	0.22	1191	0.65	0.78	48	0.001
1192	0.97	1192	0.21	1192	0.65	0.76	46	0.001
1193	0.94	1193	0.20	1193	0.65	0.74	45	0.001
1194	0.91	1194	0.20	1194	0.65	0.71	44	0.001
1195	0.88	1195	0.20	1195	0.65	0.68	42	0.001
1196	0.86	1196	0.20	1196	0.65	0.66	40	0.001
1197	0.84	1197	0.19	1197	0.65	0.65	39	0.001
1198	0.83	1198	0.19	1198	0.65	0.64	39	0.001
1199	0.82	1199	0.18	1199	0.65	0.64	38	0.001
1200	0.80	1200	0.18	1200	0.65	0.62	38	0.001
1201	0.78	1201	0.18	1201	0.65	0.60	37	0.001
1202	0.77	1202	0.18	1202	0.65	0.59	36	0.001
1203	0.75	1203	0.17	1203	0.65	0.58	35	0.001
1204	0.74	1204	0.17	1204	0.65	0.57	35	0.001
1205	0.73	1205	0.17	1205	0.65	0.56	34	0.001
1206	0.72	1206	0.17	1206	0.65	0.55	33	0.001
1207	0.71	1207	0.16	1207	0.65	0.55	33	0.001
1208	0.70	1208	0.16	1208	0.65	0.54	33	0.001
1209	0.69	1209	0.16	1209	0.65	0.53	32	0.001
1210	0.68	1210	0.16	1210	0.65	0.52	32	0.001
1211	0.68	1211	0.16	1211	0.65	0.52	31	0.001
1212	0.67	1212	0.16	1212	0.65	0.51	31	0.001
1213	0.66	1213	0.15	1213	0.65	0.51	31	0.001
1214	0.66	1214	0.15	1214	0.65	0.51	31	0.001

1215	0.65	1215	0.15	1215	0.65	0.50	30	0.001
1216	0.63	1216	0.15		-	-	15	0.000
1217	0.62	1217	0.14		-	-	-	-
1218	0.62	1218	0.14		-	-	-	-
1219	0.61	1219	0.14		-	-	-	-
1220	0.60	1220	0.14		-	-	-	-
1221	0.60	1221	0.14		-	-	-	-
1222	0.59	1222	0.14		-	-	-	-
1223	0.59	1223	0.14		-	-	-	-
1224	0.59	1224	0.13		-	-	-	-
1225	0.58	1225	0.13		-	-	-	-
1226	0.57	1226	0.13		-	-	-	-
1227	0.56	1227	0.13		-	-	-	-
1228	0.56	1228	0.13		-	-	-	-
1229	0.55	1229	0.13		-	-	-	-
1230	0.55	1230	0.13		-	-	-	-
1231	0.54	1231	0.13		-	-	-	-
1232	0.54	1232	0.13		-	-	-	-
1233	0.53	1233	0.13		-	-	-	-
1234	0.53	1234	0.12		-	-	-	-
1235	0.53	1235	0.12		-	-	-	-
1236	0.53	1236	0.12		-	-	-	-
1237	0.52	1237	0.12		-	-	-	-
1238	0.52	1238	0.12		-	-	-	-
1239	0.51	1239	0.12		-	-	-	-
1240	0.51	1240	0.12		-	-	-	-
1241	0.50	1241	0.12		-	-	-	-
1242	0.50	1242	0.12		-	-	-	-
1243	0.49	1243	0.12		-	-	-	-
1244	0.49	1244	0.12		-	-	-	-
1245	0.49	1245	0.12		-	-	-	-
1246	0.49	1246	0.12		-	-	-	-
1247	0.49	1247	0.11		-	-	-	-
1248	0.49	1248	0.11		-	-	-	-
1249	0.49	1249	0.11		-	-	-	-
1250	0.48	1250	0.11		-	-	-	-
1251	0.48	1251	0.11		-	-	-	-
1252	0.47	1252	0.11		-	-	-	-
1253	0.47	1253	0.11		-	-	-	-
1254	0.47	1254	0.11		-	-	-	-
1255	0.47	1255	0.11		-	-	-	-
1256	0.46	1256	0.11		-	-	-	-
1257	0.46	1257	0.11		-	-	-	-
1258	0.46	1258	0.11		-	-	-	-
1259	0.45	1259	0.11		-	-	-	-
1260	0.45	1260	0.11		-	-	-	-
1261	0.45	1261	0.10		-	-	-	-
1262	0.45	1262	0.10		-	-	-	-
1263	0.45	1263	0.10		-	-	-	-
1264	0.44	1264	0.10		-	-	-	-
1265	0.44	1265	0.10		-	-	-	-
1266	0.43	1266	0.10		-	-	-	-
1267	0.43	1267	0.10		-	-	-	-
1268	0.43	1268	0.10		-	-	-	-

1269	0.43	1269	0.10	-	-	-	-
1270	0.43	1270	0.10	-	-	-	-
1271	0.43	1271	0.10	-	-	-	-
1272	0.43	1272	0.10	-	-	-	-
1273	0.43	1273	0.10	-	-	-	-
1274	0.42	1274	0.10	-	-	-	-
1275	0.42	1275	0.10	-	-	-	-
1276	0.42	1276	0.10	-	-	-	-
1277	0.42	1277	0.10	-	-	-	-
1278	0.42	1278	0.10	-	-	-	-
1279	0.41	1279	0.10	-	-	-	-
1280	0.41	1280	0.09	-	-	-	-
1281	0.41	1281	0.10	-	-	-	-
1282	0.41	1282	0.09	-	-	-	-
1283	0.41	1283	0.09	-	-	-	-
1284	0.40	1284	0.10	-	-	-	-
1285	0.40	1285	0.09	-	-	-	-
1286	0.40	1286	0.09	-	-	-	-
1287	0.40	1287	0.09	-	-	-	-
1288	0.40	1288	0.09	-	-	-	-
1289	0.40	1289	0.09	-	-	-	-
1290	0.39	1290	0.09	-	-	-	-
1291	0.39	1291	0.09	-	-	-	-
1292	0.39	1292	0.09	-	-	-	-
1293	0.39	1293	0.09	-	-	-	-
1294	0.39	1294	0.09	-	-	-	-
1295	0.39	1295	0.09	-	-	-	-
1296	0.39	1296	0.09	-	-	-	-
1297	0.39	1297	0.09	-	-	-	-
1298	0.39	1298	0.09	-	-	-	-
1299	0.38	1299	0.09	-	-	-	-
1300	0.38	1300	0.09	-	-	-	-
1310	0.37	1310	0.09	-	-	-	-
1320	0.35	1320	0.08	-	-	-	-
1330	0.33	1330	0.08	-	-	-	-
1340	0.32	1340	0.07	-	-	-	-
1350	0.32	1350	0.08	-	-	-	-
1360	0.32	1360	0.07	-	-	-	-
1370	0.31	1370	0.07	-	-	-	-
1380	0.30	1380	0.07	-	-	-	-
1390	0.29	1390	0.07	-	-	-	-
1400	0.29	1400	0.07	-	-	-	-
1420	0.28	1420	0.06	-	-	-	-
1440	0.27	1440	0.06	-	-	-	-
1460	0.26	1460	0.01	-	-	-	-
1500	0.26	1500	-	-	-	-	-
					Totals:	**26,989**	**0.620**

RETENTION (Private)
Basin Calculations



NORTH

PLAN

SCALE: 1" = 50'

BASIN DEPTH VS CAPACITY

Elevation	Area (ft^2)	Volume (ft^3)
494	3,034	
499	10,233	33,168

SIKAND
Engineering | Planning | Surveying
15230 Burbank Blvd., #100 Van Nuys, CA 91411
Phone: (818) 787-8550; Fax: (818) 901-7451
www.sikand.com; E-mail: info@sikand.com

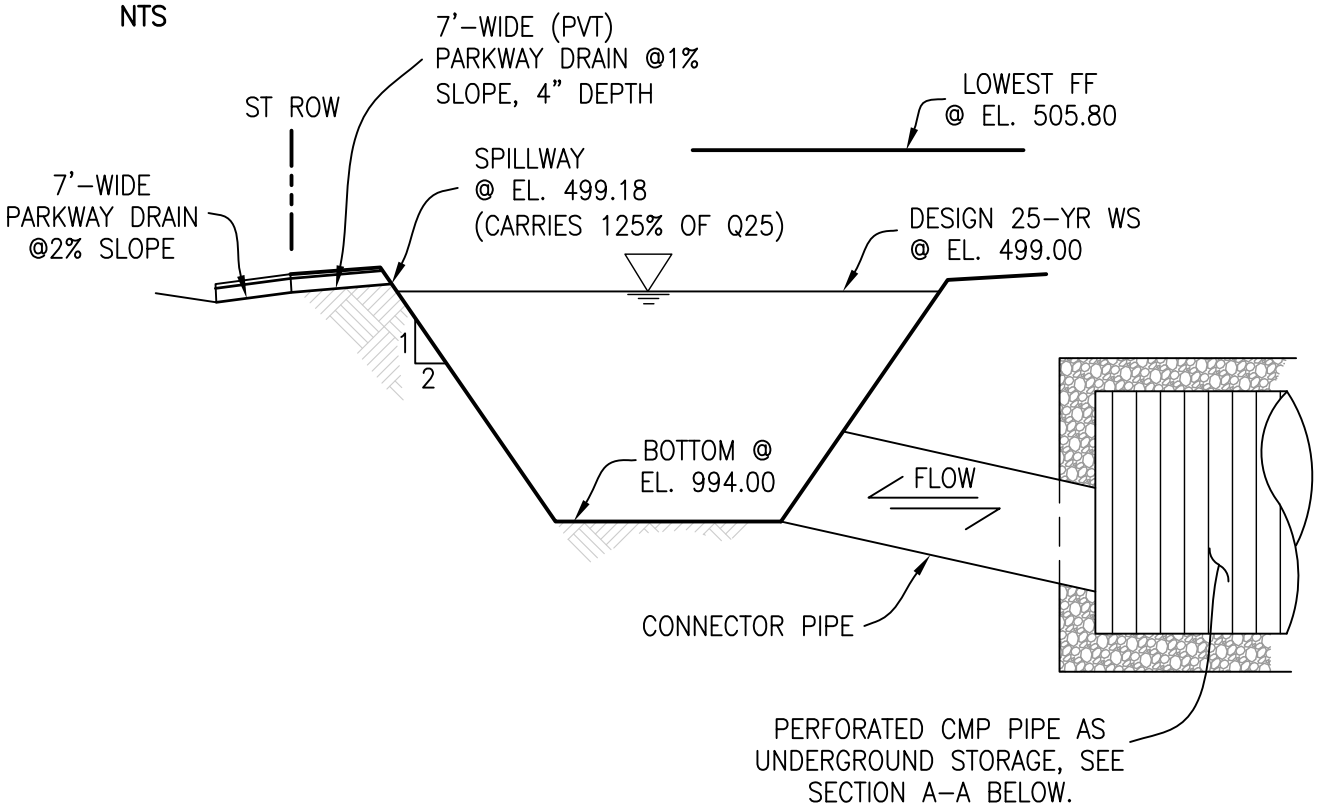
BY:	E.R.
W.O. NO.:	
DATE:	09/07/22
SCALE:	

CLIENT: **COVINGTON DEV'T PARTNERS, LLC**
3 CORPORATE PLAZA, SUITE 230
NEWPORT BEACH, CA 92660

PROJECT:
LANCASTER FORBES INDUSTRIAL PARK
City of Lancaster, Los Angeles County

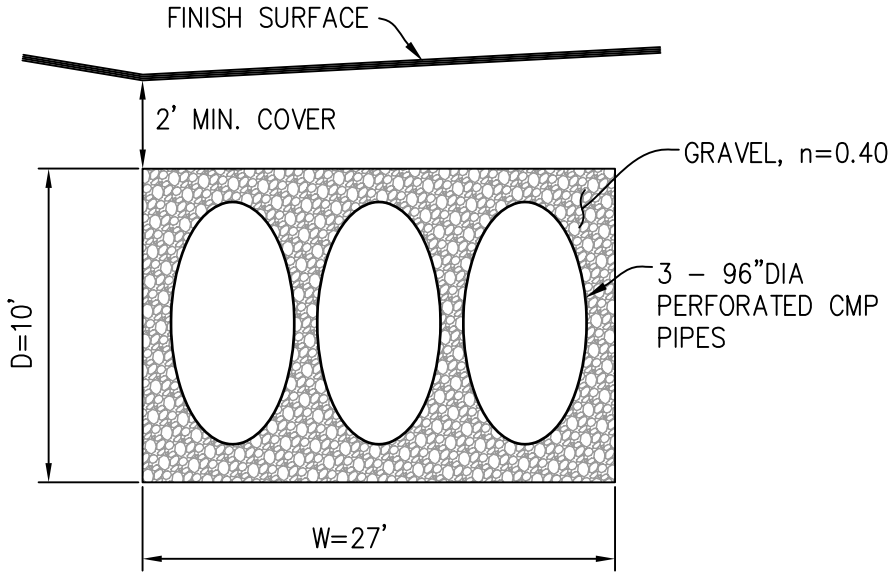
Basin Section:

NTS



ADDITIONAL UNDERGROUND RETENTION STORAGE Section A-A:

NTS



SIKAND
Engineering | Planning | Surveying
15230 Burbank Blvd., #100 Van Nuys, CA 91411
Phone: (818) 787-8550; Fax: (818) 901-7451
www.sikand.com; E-mail: info@sikand.com

BY:	E.R.
W.O. NO.:	
DATE:	09/07/22
SCALE:	NTS

CLIENT: **COVINGTON DEV'T PARTNERS, LLC**
3 CORPORATE PLAZA, SUITE 230
NEWPORT BEACH, CA 92660

PROJECT:
LANCASTER FORBES INDUSTRIAL PARK
City of Lancaster, Los Angeles County

UNDERGROUND STORAGE CAPACITY CALCULATION:

GIVEN:

VOLUME REQUIRED = 57,404 CU-FT
BARREL DIAMETER = 4'
NO. OF BARRELS = 4
LENGTH = 130'

STORAGE WIDTH = 27'
STORAGE DEPTH = 10'
STORAGE LENGTH = 130'

CALCULATION:

BARREL AREA = $4 \times \frac{\pi D^2}{4}$ = 150.80 SQ-FT

GRAVEL SECTION AREA = STORAGE SECTION AREA - BARREL AREA
= (27 x 10) - 150.80 = 119.21 SQ-FT

NET GRAVEL SECTION AREA (VOID AREA) = Axn = 119.21*0.40 = 47.68 SQ-FT

NET SECTION AREA = GRAVEL VOID AREA + BARREL AREA = 198.48 SQ-FT

NET UNDERGROUND STORAGE VOLUME = 198.48*130 = **25,802 CU-FT**

TOTAL STORAGE VOLUME = UNDERGROUND + BASIN = **58,970 CU-FT**

> Vreqd= 57,404 CU-FT, THEREFORE, OKAY!

INFILTRATION CALCULATION:

VOLUME REQUIRED = 57,404 CU-FT
BASIN TOTAL BOTTOM AREA = 3,034 + (27*130) = 6,544 SQ-FT
INFILTRATION RATE = 1.90 IN/HR

AVE. RETENTION DEPTH = 57,404 / 6,544 = 8.77'

DRAWDOWN PERIOD = DEPTH/RATE
= 8.77 FT (12IN/FT) /1.90 IN/HR
= 55.4 HOURS
= **2.31 DAYS** < 7 DAYS, THEREFORE, OKAY!

SIKAND
Engineering | Planning | Surveying
15230 Burbank Blvd., #100 Van Nuys, CA 91411
Phone: (818) 787-8550; Fax: (818) 901-7451
www.sikand.com; E-mail: info@sikand.com

BY:	E.R.
W.O. NO.:	
DATE:	09/07/22
SCALE:	

CLIENT: **COVINGTON DEV'T PARTNERS, LLC**
3 CORPORATE PLAZA, SUITE 230
NEWPORT BEACH, CA 92660

PROJECT:
LANCASTER FORBES INDUSTRIAL PARK
City of Lancaster, Los Angeles County

July 29, 2022

Covington Development Partners, LLC
3 Corporate Plaza, Suite 230
Newport Beach, California 92660

Attention: Mr. Michael Di Sano
Sr. Director - Entitlements

Project No.: **22G205-2**

Subject: **Results of Infiltration Testing**
Lancaster Forbes Industrial Park
South Terminus of Forbes Street
Lancaster, California

Reference: Geotechnical Investigation, Lancaster Forbes Industrial Park, Lancaster, California, Prepared by Southern California Geotechnical, Inc. (SCG) for Covington Development Partners, LLC, SCG Project No. 22G205-1, dated July 25, 2022.

Mr. Di Sano:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in accordance with our Proposal No. 22P209R, dated June 8, 2022. The scope of the infiltration testing consisted of site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils. The infiltration testing was performed in general accordance with the guidelines published by the County of Los Angeles – Department of Public Works Geotechnical and Materials Engineering Division. These guidelines are dated June 30, 2021 and titled Guidelines for Design, Investigation, and Reporting Low Impact Development Stormwater Infiltration, GS200.1.

Site Description

The subject site is located at the southern terminus of Forbes Street in Lancaster, California. The site is bounded to the north by a vacant lot and the termini of Forbes Street and Market Street, to the west by a vacant lot, to the south by West Avenue L-8, and to the east by an existing commercial building and a motel. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The site consists of an irregular-shaped parcel, 11.58± acres in size. The site is currently vacant and generally undeveloped, with the exception of a few dirt and gravel access roads. The

ground surface cover consists of exposed soil with sparse to moderate native shrubs and brush growth.

Detailed topographic information was not available at the time of this report. Based on elevations obtained from Google Earth and visual observations made at the time of the subsurface investigation, the site is relatively flat with an overall site topography gently sloping downward to the north at a gradient of approximately 1 percent.

Proposed Development

A conceptual site plan identified as Scheme A1.1, prepared by GAA Architects, has been provided to our office by the client. Based on this plan, the subject site will be developed with two (2) commercial/industrial buildings (identified as Building 1 and Building 2). Building 1 will be 147,000± ft² in size and will be located in the western region of the site. Building 2 will be 82,500± ft² in size and will be located in the eastern region of the site. Dock-high doors will be constructed along a portion of one building wall for each building. The proposed buildings are expected to be surrounded by asphaltic concrete (AC) pavements in the parking and drive areas, Portland cement concrete (PCC) pavements in the loading dock areas, and concrete flatwork and landscaped planters throughout the site.

We understand that this project may use on-site storm water infiltration. The conceptual site plan indicates that two (2) detention basins will be constructed in the south-central and north-central areas of the site, in between the proposed buildings. The depths of the proposed basins were unknown at the time of this report. Based on our experience with similar projects, the bottoms of the basins are expected to be 10 to 12± feet below the existing site grades.

Concurrent Study

SCG concurrently conducted a geotechnical investigation at the subject site, referenced above. As a part of this study, eight (8) borings (identified as Boring Nos. B-1 through B-8) were advanced to depths of 10 to 25± feet below the existing site grades.

Artificial fill soils were encountered at the ground surface at Boring Nos. B-1, B-2, B-4, B-7 and B-8, extending to depths of 2½ to 4½± feet below the existing site grades. The artificial fill soils generally consist of loose to medium dense silty sands with varying fine to coarse gravel content. Boring No. B-8 encountered a stratum consisting of silty sands to sandy silts, extending to a depth of 3± feet from the ground surface. Boring No. B-7 was drilled through a 1±-inch-thick open-graded gravel surficial layer. Native alluvial soils were encountered beneath the fill soils at Boring Nos. B-1, B-2, B-4, B-7 and B-8, and at the ground surface at the remaining boring locations, extending to at least the maximum depth explored of 25± feet below the existing site grades. The near-surface alluvium generally consists of loose to medium dense sands and silty sands with varying fine to coarse gravel content, extending to depths of 5½ to 8½± feet. At greater depths, the alluvium generally consists of medium dense sands and silty sands with varying fine to coarse gravel content, with occasional dense silty sands. Boring No. B-1 encountered a stratum consisting of medium dense silty sands to sandy silts at a depth of 12 to 17± feet.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the moisture content of the recovered soil samples and the lack of free water in the borings, the static groundwater table is at a greater depth than 25± feet below existing site grades.

As part of our research, we reviewed readily available groundwater data in order to determine regional groundwater depths. The primary reference used to determine the groundwater depths in the subject site area is the California Department of Water Resources website, https://wdl.water.ca.gov/waterdatalibrary/. Three monitoring wells are located within a 1,500±-foot radius of the site. Water level readings within these monitoring wells indicate a high groundwater level of 121± feet below the ground surface in February 1922.

Subsurface Exploration

Scope of Exploration

The subsurface exploration for the infiltration testing consisted of two (2) infiltration test borings advanced to a depth of 11± feet below the existing site grades. The borings were logged during drilling by a member of our staff and were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow stem augers. The approximate locations of the infiltration test borings (identified as Infiltration Test Nos. I-1 through I-4) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Native alluvium was encountered at the ground surface at both infiltration test locations, extending to at least the maximum depth explored of 11± feet below the existing site grades. The near-surface alluvium generally consists of loose silty sands with varying fine gravel content, extending to a depth of 7± feet. At greater depths, the alluvium generally consists of medium dense sands and gravelly sands with varying silt and clay content. The Boring Logs, which illustrate the conditions encountered at each test location are included within this report.

Infiltration Testing

We understand that the results of the testing will be used to prepare a preliminary design for the storm water infiltration systems that will be used at the subject site. The infiltration testing was performed in general accordance with the guidelines published by the County of Los Angeles – Department of Public Works Geotechnical and Materials Engineering Division. These guidelines are dated June 30, 2021 and titled Guidelines for Design, Investigation, and Reporting Low Impact Development Stormwater Infiltration, GS200.1.

Pre-soaking

The infiltration test boring was pre-soaked for at least 1 hour to ensure the sand around the annulus of the perforated pipe was fully saturated. The pre-soaking procedure consisted of filling each test boring with clean potable water to an elevation of at least 12± inches above the bottom of each test boring. In accordance with the Los Angeles County guidelines, since the water in the infiltration test borings did not completely infiltrate within a 30-minute time period after filling each boring, a falling head test was the appropriate test method. Based on the conditions encountered at each of the infiltration test borings, 26-minute measurement intervals were assigned at Infiltration Test No. I-1, and 30-minute measurement intervals were assigned at Infiltration Test No. 2.

Infiltration Testing Procedure

After the completion of the pre-soaking process, SCG performed the infiltration testing. A sufficient amount of water was added to the test borings so that the water level was approximately 3± feet higher than the bottom of the borings and less than or equal to the water level used during the pre-soaking process. As indicated above, 26-minute measurement intervals were assigned at Infiltration Test No. I-1, and 30-minute measurement intervals were assigned at Infiltration Test No. 2. A stabilized rate of drop, where the highest and lowest readings from three consecutive readings are within 10 percent of each other, was obtained for each of the test borings. These water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates for the tests are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used for design. These rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Measured Infiltration Rate (inches/hour)
I-1	11	Light Gray Brown fine to coarse Sand, trace to little Silt, trace Clay, trace fine Gravel	7.4
I-2	11	Light Gray Brown Gravelly fine to coarse Sand, little Clay, trace Silt	4.9

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the base of each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the

sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 and C-2 of this report.

Design Recommendations

Two (2) infiltration tests were performed in the south-central and north-central areas of the site, in between the proposed buildings. The measured infiltration rates at these infiltration test locations were 4.9 and 7.4 inches per hour. The Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration, GS200.1 prepared by the County of Los Angeles, Department of Public Works, Geotechnical and Materials Division (GMED) on June 30, 2021 dictate that a reduction factor be utilized in the design infiltration rate. The following reduction factors are considered in the design infiltration rate (DIR):

Reduction Factors	
Small Diameter Boring	$RF_t = 1$
Site Variability, number of tests, and thoroughness of subsurface investigation	$RF_v = 2$
Long-term siltation plugging and maintenance	$RF_s = 1$
Total Reduction Factor, $RF = RF_t + RF_v + RF_s$	$RF = 4$
Design Infiltration Rate (DIR) = Measured Percolation Rate/RF	DIR = See Below

Based on the results of the infiltration testing, the silt and clay content, and reduction factors, we recommend an infiltration rate of 1.9 inches per hour for the proposed detention basin located in the north-central area of the subject site, and an infiltration rate of 1.2 inches per hour for the proposed detention basin located in the south-central area.

The design of the proposed storm water infiltration systems should be performed by the project civil engineer, in accordance with the City of Lancaster and/or County of Los Angeles guidelines. However, it is recommended that the systems be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the systems. The presence of such materials would decrease the effective infiltration rates. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rate recommended above is based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates.** It should be noted that the recommended infiltration rates are based on infiltration testing at two (2) discrete locations and the overall infiltration rates of the storm water infiltration systems could vary considerably.

Infiltration Rate Considerations

The infiltration rates presented herein were determined in accordance with the Los Angeles County guidelines and are considered valid only for the time and place of the actual tests. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time

SECTION 6

NUISANCE WATER CALCULATIONS

HydroCalc 0.75" Q Result
Product Brochure

Peak Flow Hydrologic Analysis

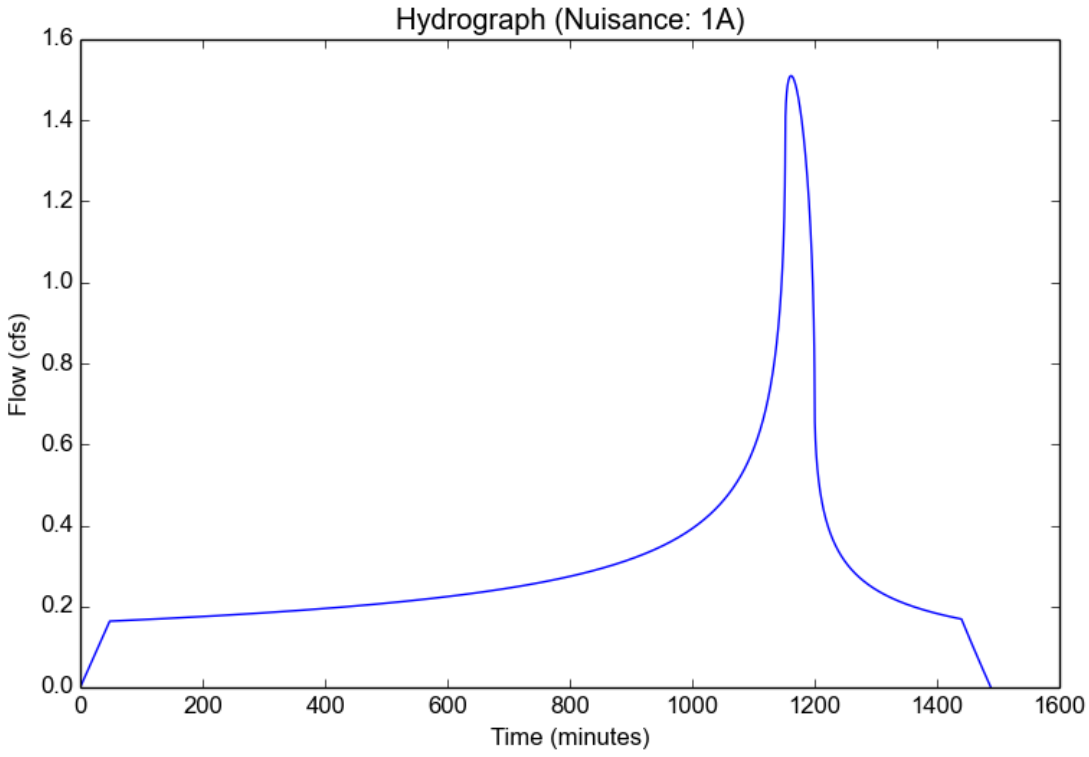
File location: D:/SikandEngineering&Associates (SEA)/22004_LANCASTER FORBES Industrial Park/HYDRO_HYDRA/TC/PR-EX_ONSITE Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

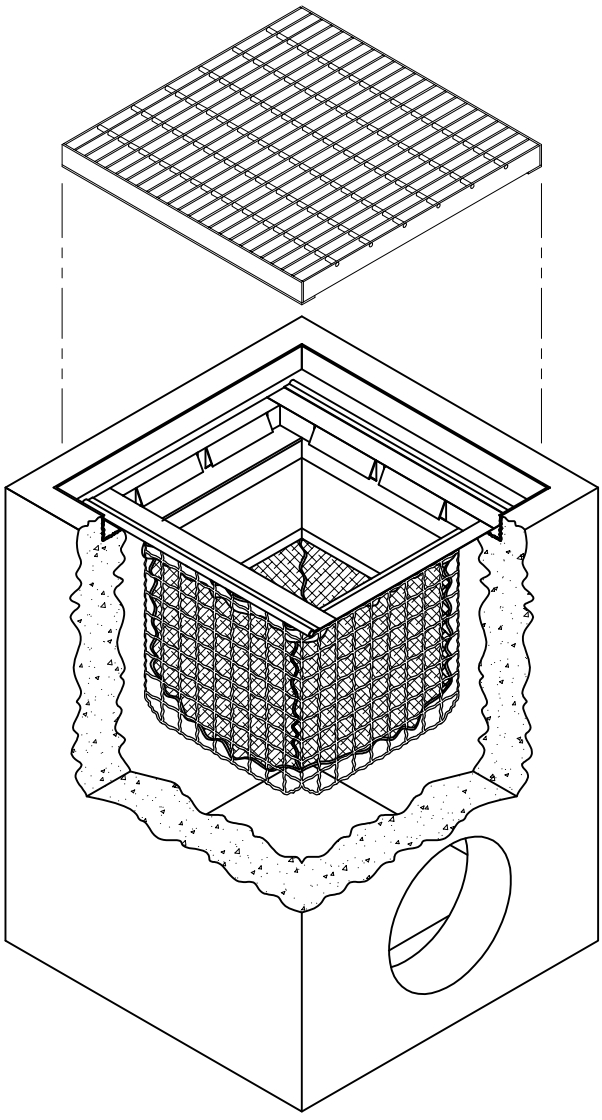
Project Name	Nuisance
Subarea ID	1A
Area (ac)	11.8
Flow Path Length (ft)	867.0
Flow Path Slope (vft/hft)	0.005
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.91
Soil Type	124
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

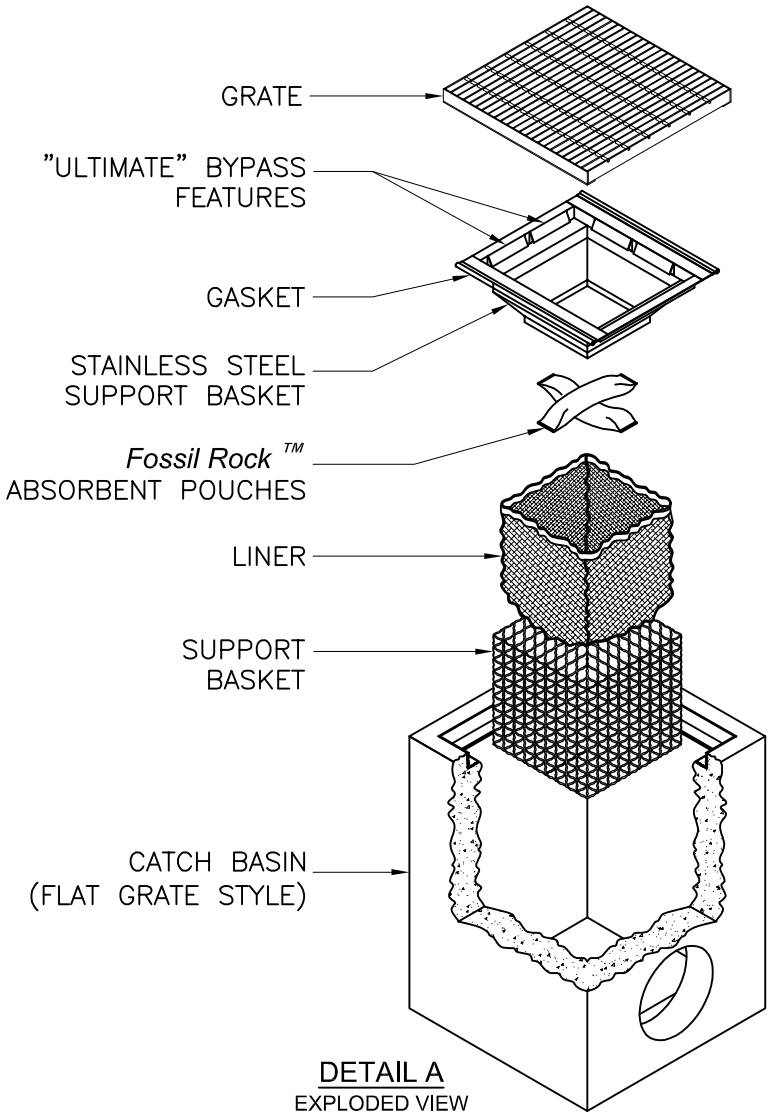
Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.1546
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.828
Time of Concentration (min)	48.0
Clear Peak Flow Rate (cfs)	1.5101
Burned Peak Flow Rate (cfs)	1.5101
24-Hr Clear Runoff Volume (ac-ft)	0.6056
24-Hr Clear Runoff Volume (cu-ft)	26380.8646



FGP-0001





DETAIL A
EXPLODED VIEW

FloGard® FILTER
-INSTALLED INTO CATCH BASIN-

U.S. PATENT # 6,00,023 & 6,877,029

NOTES:

1. Filter insert shall have a high flow bypass feature.
2. Filter support frame shall be constructed from stainless steel Type 304.
3. Filter medium shall be *Fossil Rock* ™, installed and maintained in accordance with manufacturer specifications.
4. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.

Inlet Filtration

FloGard®

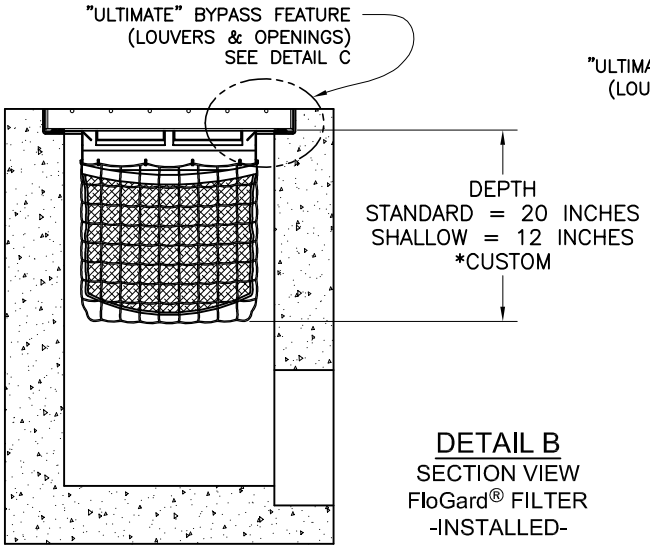
Catch Basin Insert Filter

Grated Inlet Style

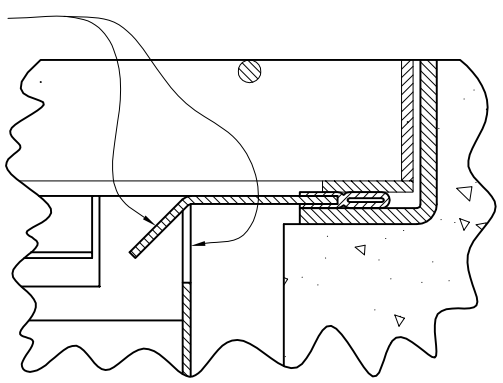
Oldcastle® Stormwater Solutions
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

DRAWING NO.	REV	ECO	DATE	
FGP-0001	G	ECO-0142 JPR 7/13/16	JPR 11/3/06	SHEET 1 OF 2

U.S. PATENT # 6,00,023 & 6,877,029



DETAIL B
SECTION VIEW
FloGard® FILTER
-INSTALLED-



DETAIL C
"ULTIMATE"
BYPASS FEATURES

* MANY OTHER STANDARD & CUSTOM SIZES & DEPTHS AVAILABLE UPON REQUEST.

SPECIFIER CHART

MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data In these columes Is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-	
	INLET ID Inside Dimension (inch x inch)	GRATE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft. / sec.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-12F	12 X 12	12 X 14	2.8	0.3	0.4	FGP-12F8	.15	.25
FGP-16F	16 X 16	16 X 19	4.7	0.8	0.7	FGP-16F8	.45	.4
FGP-18F	18 X 18	18 X 20	4.7	0.8	0.7	FGP-18F8	.45	.4
FGP-1824F	16 X 22	18 X 24	5.0	1.5	1.2	FGP-1824F8	.85	.7
FGP-1836F	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836F8	1.3	.9
FGP-2024F	18 X 22	20 X 24	5.9	1.2	1.0	FGP-2024F8	.7	.55
FGP-21F	22 X 22	22 X 24	6.1	2.2	1.5	FGP-21F8	1.25	.85
FGP-24F	24 X 24	24 X 27	6.1	2.2	1.5	FGP-24F8	1.25	.85
FGP-2430F	24 X 30	26 X 30	7.0	2.8	1.8	FGP-2430F8	1.6	1.05
FGP-2436F	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436F8	1.95	1.15
FGP-2448F	24 X 48	26 X 48	9.3	4.4	2.4	FGP-2448F8	2.5	1.35
FGP-28F	28 X 28	32 X 32	6.3	2.2	1.5	FGP-28F8	1.25	.85
FGP-30F	30 X 30	30 X 34	8.1	3.6	2.0	FGP-30F8	2.05	1.15
FGP-36F	36 X 36	36 X 40	9.1	4.6	2.4	FGP-36F8	2.65	1.35
FGP-3648F	36 X 48	40 X 48	11.5	6.8	3.2	FGP-3648F8	3.9	1.85
FGP-48F	48 X 48	48 X 54	13.2	9.5	3.9	FGP-48F8	5.45	2.25
FGP-SD24F	24 X 24	28 X 28	6.1	2.2	1.5	FGP-SD24F8	1.25	.85

Inlet Filtration

FloGard®

Catch Basin Insert Filter

Grated Inlet Style

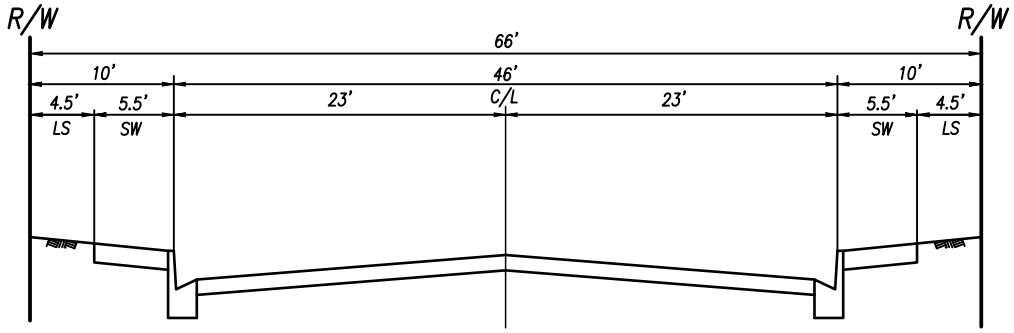
Oldcastle® Stormwater Solutions
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

DRAWING NO.	REV	ECO	DATE	
FGP-0001	G	ECO-0142 JPR 7/13/16	JPR 11/3/06	SHEET 2 OF 2

SECTION 7

HYDRAULIC CALCULATIONS

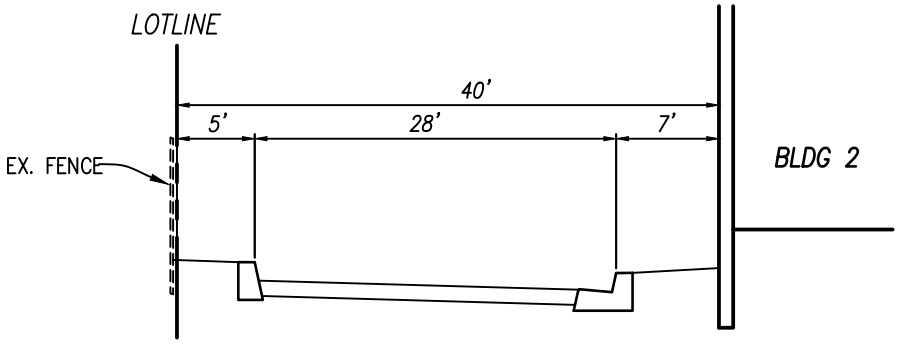
Street Sections
10-yr Dry Lane
25-yr Overflow to Parkway Drain
50-yr Driveway WS vs Proposed Finish Floor
Grating Inlet Capacity Calculation
Pipe Hydraulics



TYPICAL SECTION

NO SCALE

FORBES ST. & MARKET ST.



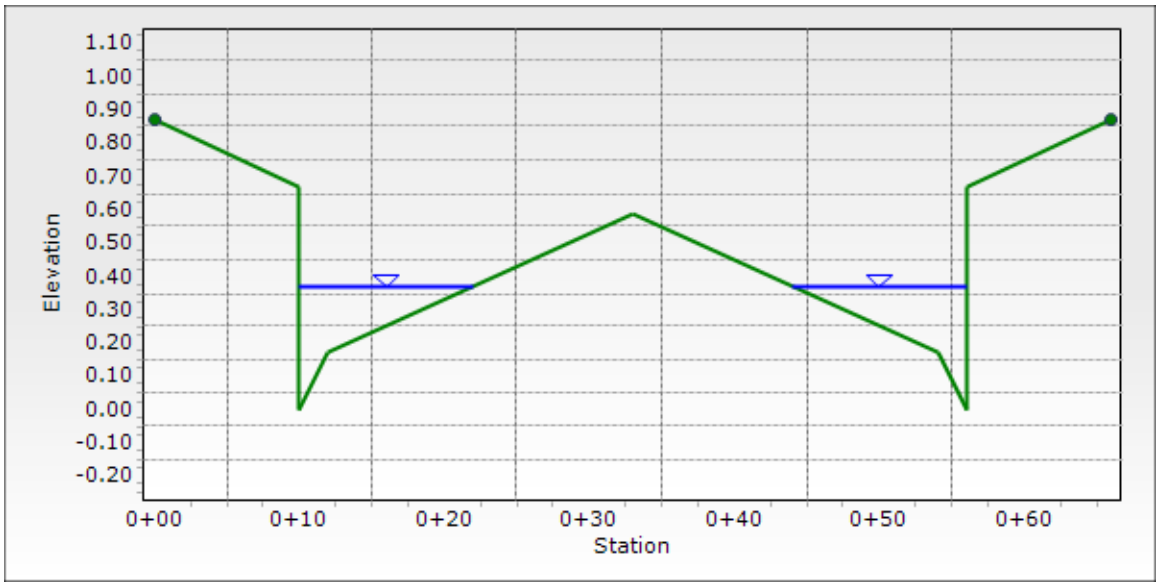
DRIVEWAYS

NOT TO SCALE

Cross Section for Forbes St_10yr Dry Lane

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.005 ft/ft
Normal Depth	4.4 in
Discharge	5.57 cfs



Worksheet for Forbes St_10yr Dry Lane

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.005 ft/ft
Discharge	5.57 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.87
0+10.00	0.67
0+10.00	0.00
0+12.00	0.17
0+33.00	0.59
0+54.00	0.17
0+56.00	0.00
0+56.00	0.67
0+66.00	0.87

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.87)	(0+66.00, 0.87)	0.015

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	4.4 in
Roughness Coefficient	0.015
Elevation	0.37 ft
Elevation Range	0.000 to 0.870 ft
Flow Area	3.1 ft²
Wetted Perimeter	24.787 ft
Hydraulic Radius	1.5 in
Top Width	24.03 ft
Normal Depth	4.4 in
Critical Depth	4.3 in
Critical Slope	0.007 ft/ft
Velocity	1.77 ft/s

Worksheet for Forbes St_10yr Dry Lane

Results	
Velocity Head	0.05 ft
Specific Energy	0.42 ft
Froude Number	0.862
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.000 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.4 in
Critical Depth	4.3 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Forbes St_10yr Dry Lane

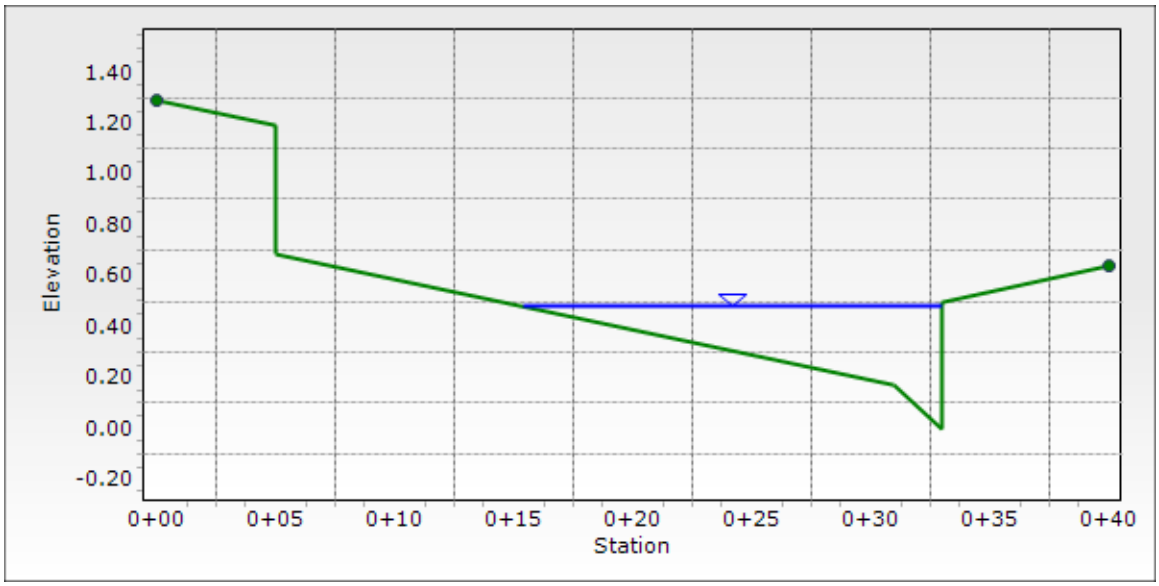
Messages:

Flow is divided.

Cross Section for Private Driveway L-8_10yr Dry Lane

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.003 ft/ft
Normal Depth	5.8 in
Discharge	5.57 cfs



Worksheet for Private Driveway L-8_10yr Dry Lane

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.003 ft/ft
Discharge	5.57 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.29
0+05.00	1.19
0+05.00	0.69
0+31.00	0.17
0+33.00	0.00
0+33.00	0.50
0+40.00	0.64

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.29)	(0+40.00, 0.64)	0.015

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	5.8 in
Roughness Coefficient	0.015
Elevation	0.48 ft
Elevation Range	0.000 to 1.290 ft
Flow Area	3.2 ft²
Wetted Perimeter	18.113 ft
Hydraulic Radius	2.1 in
Top Width	17.62 ft
Normal Depth	5.8 in
Critical Depth	5.2 in
Critical Slope	0.006 ft/ft
Velocity	1.72 ft/s
Velocity Head	0.05 ft
Specific Energy	0.53 ft

Worksheet for Private Driveway L-8_10yr Dry Lane

Results	
Froude Number	0.708
Flow Type	Subcritical

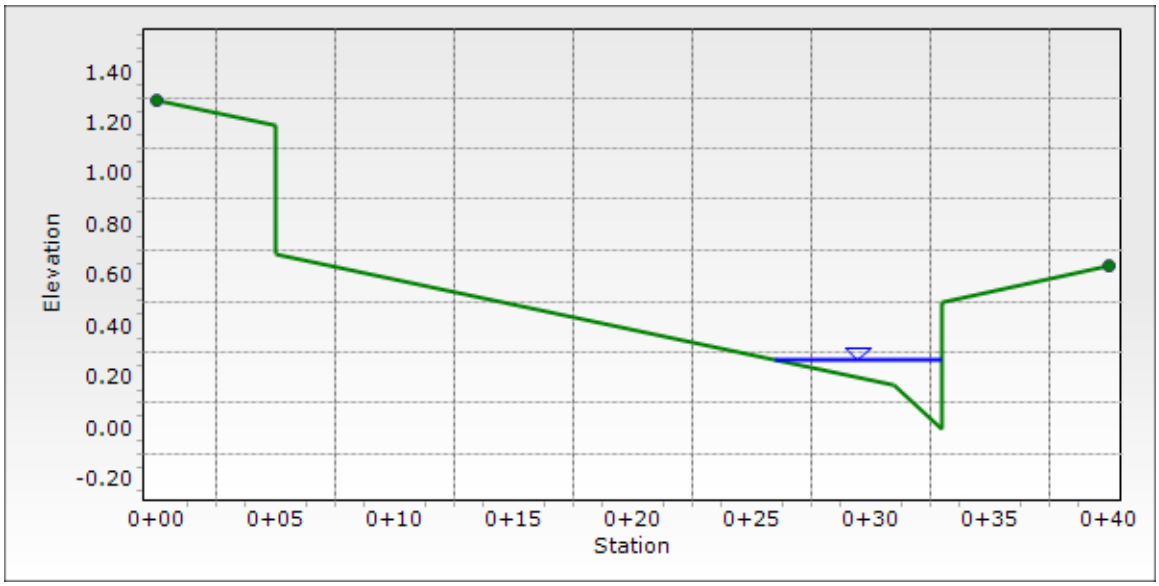
GVF Input Data	
Downstream Depth	0.0 in
Length	0.000 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.8 in
Critical Depth	5.2 in
Channel Slope	0.003 ft/ft
Critical Slope	0.006 ft/ft

Cross Section for Private Driveway L-8_50yr to FF

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.003 ft/ft
Normal Depth	3.3 in
Discharge	0.66 cfs



Worksheet for Private Driveway L-8_50yr to FF

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.003 ft/ft
Discharge	0.66 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.29
0+05.00	1.19
0+05.00	0.69
0+31.00	0.17
0+33.00	0.00
0+33.00	0.50
0+40.00	0.64

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.29)	(0+40.00, 0.64)	0.015

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	3.3 in
Roughness Coefficient	0.015
Elevation	0.27 ft
Elevation Range	0.000 to 1.290 ft
Flow Area	0.6 ft²
Wetted Perimeter	7.327 ft
Hydraulic Radius	1.0 in
Top Width	7.05 ft
Normal Depth	3.3 in
Critical Depth	2.8 in
Critical Slope	0.008 ft/ft
Velocity	1.05 ft/s
Velocity Head	0.02 ft
Specific Energy	0.29 ft

Worksheet for Private Driveway L-8_50yr to FF

Results	
Froude Number	0.623
Flow Type	Subcritical

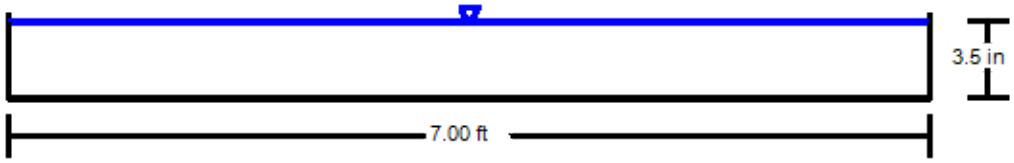
GVF Input Data	
Downstream Depth	0.0 in
Length	0.000 ft
Number Of Steps	0

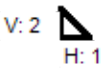
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.3 in
Critical Depth	2.8 in
Channel Slope	0.003 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for 125%Q25 OVERFLOW_Parkway Drain

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Normal Depth	3.5 in
Bottom Width	7.00 ft
Discharge	9.61 cfs





Worksheet for 125%Q25 OVERFLOW_Parkway Drain

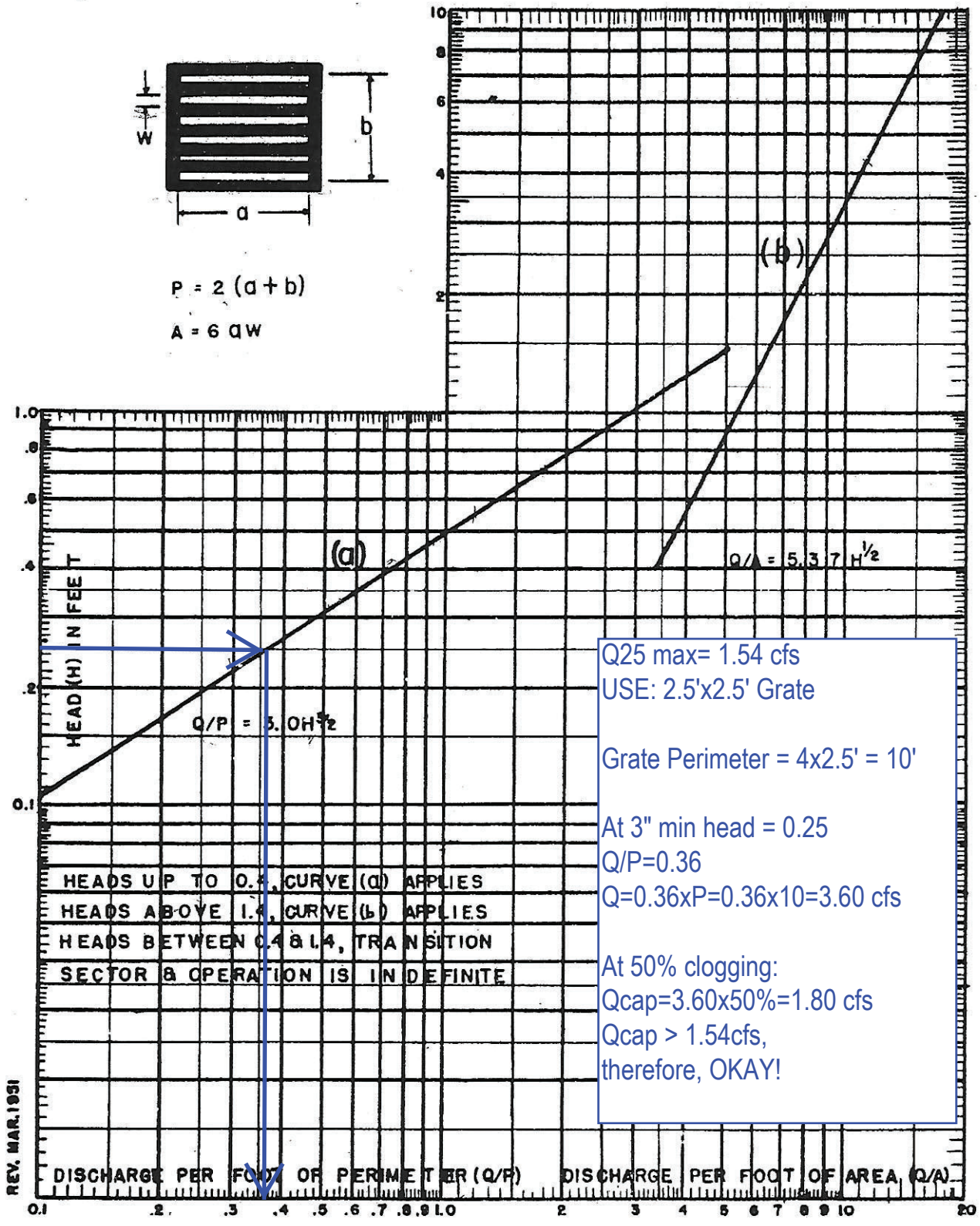
Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data		
Roughness Coefficient	0.013	
Channel Slope	0.010	ft/ft
Bottom Width	7.00	ft
Discharge	9.61	cfs

Results		
Normal Depth	3.5	in
Flow Area	2.0	ft^2
Wetted Perimeter	7.579	ft
Hydraulic Radius	3.2	in
Top Width	7.00	ft
Critical Depth	4.7	in
Critical Slope	0.004	ft/ft
Velocity	4.74	ft/s
Velocity Head	0.35	ft
Specific Energy	0.64	ft
Froude Number	1.554	
Flow Type	Supercritical	

GVF Input Data		
Downstream Depth	0.0	in
Length	0.000	ft
Number Of Steps	0	

GVF Output Data		
Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.5	in
Critical Depth	4.7	in
Channel Slope	0.010	ft/ft
Critical Slope	0.004	ft/ft



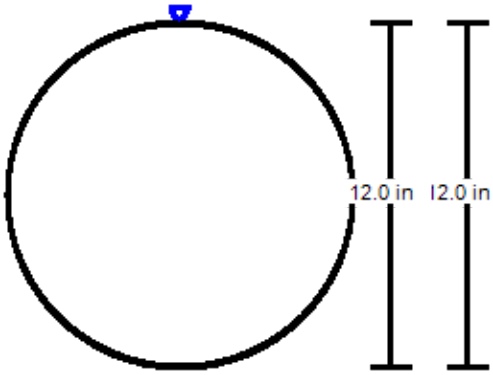
INLET CAPACITY OF GRATE AT SAG

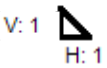
Plate 2.6-0658

Cross Section for 12"D Pipe

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	12.0 in
Diameter	12.0 in
Discharge	2.52 cfs





Worksheet for 12"D Pipe

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	12.0 in
Diameter	12.0 in
Discharge	2.52 cfs

Results	
Discharge	2.52 cfs
Normal Depth	12.0 in
Flow Area	0.8 ft²
Wetted Perimeter	3.142 ft
Hydraulic Radius	3.0 in
Top Width	0.00 ft
Critical Depth	8.2 in
Percent Full	100.0 %
Critical Slope	0.008 ft/ft
Velocity	3.21 ft/s
Velocity Head	0.16 ft
Specific Energy	1.16 ft
Froude Number	(N/A)
Maximum Discharge	2.71 cfs
Discharge Full	2.52 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

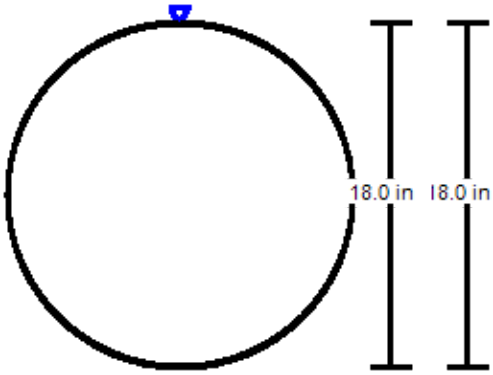
GVF Input Data	
Downstream Depth	0.0 in
Length	0.000 ft
Number Of Steps	0

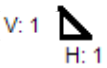
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	12.0 in
Critical Depth	8.2 in
Channel Slope	0.005 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for 18"D Pipe

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	7.43 cfs





Worksheet for 18"D Pipe

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	7.43 cfs

Results	
Discharge	7.43 cfs
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.712 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	12.7 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	4.20 ft/s
Velocity Head	0.27 ft
Specific Energy	1.77 ft
Froude Number	(N/A)
Maximum Discharge	7.99 cfs
Discharge Full	7.43 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0 in
Length	0.000 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	18.0 in
Critical Depth	12.7 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft