

Appendix L

Drainage Report



**2nd Street and Pacific Coast Highway
Retail Project
City of Long Beach
County of Los Angeles, CA**

DRAINAGE REPORT

April 5, 2017

DRAINAGE REPORT

For:
2nd Street and Pacific Coast Highway
Retail Project
City of Long Beach
County of Los Angeles, CA

Psomas Project No: 2CEN110300

Prepared for:

Centercal Properties, LLC
1600 East Franklin Avenue
El Segundo, CA 90425

Project Site Location/Address:
2nd Street and Pacific Coast Highway
Long Beach, CA 90803

Prepared by:

PSOMAS
3 Hutton Centre Drive, Suite 200
Santa Ana, California 92707
(714) 751-7373
(714) 545-8883 Fax

Preparation Date:

April 5, 2017



A handwritten signature in blue ink that reads "Bruce W. Kirby". The signature is written in a cursive style and is located to the right of the professional engineer seal.

TABLE OF CONTENTS

| | |
|--|----------|
| 1.0 Introduction | 1 |
| 1.1 Project Background | 1 |
| 1.2 Purpose and Scope | 1 |
| 2.0 Hydrology | 2 |
| 2.1 General Approach..... | 2 |
| 2.2 Data Sources | 2 |
| 2.3 Watershed Characteristics | 2 |
| 2.5 50-Year Analysis..... | 4 |
| 3.0 Limitations | 5 |
| 4.0 References | 5 |
| 5.0 Appendices | 6 |
| Appendix 1 LACDPW Hydrology Data | |
| Isohyet and Hydrologic Soil Classification Map | |
| Appendix 2 Project Site | |
| Location and Vicinity Map | |
| Appendix 3 Hydrology Calculations and Hydraulic Calculations | |
| Appendix 4 Hydrology Maps | |
| Existing Condition | |
| Interim Condition (Proposed) | |
| Ultimate Condition (Future) | |

1.0 Introduction

Project Background

The project site is located in the City of Long Beach at the southwest corner of the intersection of 2nd Street and Pacific Coast Highway. The project site is approximately 10.77 acres which is currently being used as a hotel with a surface parking lot. The proposed development consists of retail uses and parking structures.

The proposed project will generally maintain the same drainage areas and discharge points as that of the existing condition. The drainage collected from the building roof drains and parking structures will be treated using raised filtration planter boxes which will discharge into each respective adjacent street via parkway culverts before flowing into the existing catch basins in Marina Drive and Pacific Coast Highway.

The proposed project will demolish existing parking lots and buildings, and will include a storm drain relocation plan for the 36" RCP running through the site, which picks up the drainage from the east side of the project site, PCH and the adjacent property to the south. The total on-site and off-site drainage area to the existing catch basins in Marina Drive and PCH is approximately 23.8 acres, and the total area tributary to the 36" storm drain is approximately 15.3 acres in the existing condition and 13.3 acres in the proposed condition. The proposed 36" RCP storm drain line will connect into the existing 36" RCP public storm drain at the west side of the site adjacent to Marina Drive, and continue flowing southwesterly into Alamitos Bay

In the existing condition, there is a large on-site grate inlet catch basin which collects surface drainage from the adjacent parking lot and building at the northwest corner of the site (approximately 2.2 acres), and connects into the 36" storm drain. However, the proposed site is not allowed to have any on-site catch basins, therefore, the northwest area of the site will instead drain into Marina Drive.

Purpose and Scope

The project falls under the jurisdiction of the City of Long Beach, County of Los Angeles. The purpose of this drainage concept report is:

- To meet City of Long Beach, County of Los Angeles, Land Development requirements in allowing final design and construction to proceed in a timely manner;
- To determine the proposed development's impact on existing hydrologic conditions;
- To provide sufficient detailed information to support detailed hydraulic design of storm drainage facilities.

2.0 Hydrology

2.1 General Approach

The watershed of the project was identified and characterized for the existing and proposed conditions to analyze the relocated 36" RCP storm drain running through the site. The LA County computer program, HydroCalc, was used to estimate the runoff flowrate for the 50-year storm event to calculate the peak flows and times of concentration for the overland portions of the analyses (i.e. initial areas). The total flow to the 36" RCP storm drain was calculated by summing the individual 50-year flows for each subarea. These calculations are in accordance with LACDPW requirements.

2.2 Data Sources

The primary source of data is from the *LACDPW: Hydrology Manual* (January 2006). For this project, the 50-year storm, which in Los Angeles County is defined as the Capital Flood, was used to analyze the storm drain system.

2.3 Watershed Characteristics

Rainfall and soil characteristics for the 2nd and PCH Retail Project are illustrated in the Los Alamitos quadrant of Hydrologic Map Figure LACDPW 1-H1.6 (*Appendix 1*). The 50-year (24-hour) rainfall isohyet nearest the project area is approximately 4.8 inches.

In addition to the isohyet data, the hydrologic map shows the classification of the soil type. The project site falls within soil classification area 015 (Tujunga Fine Sandy Loam). The project on-site area to be disturbed is 10.8 acres in size. The total tributary watershed area to be studied is 23.8 acres in size.

The project site is approximately 78% impervious in the existing condition, with the buildings, driveways, parking structure and sidewalks indicating the impervious areas, and turf, trees and landscaping the pervious areas. The proposed site will increase the imperviousness to approximately 85%, and will include many of the same features at the existing site, but also will include biofiltration planters, which will receive the surface runoff before it flows into the storm drain system. The treatment rates and volumes of these biofiltration BMPs are detailed and calculated in the project SUSMP.

The *LACDPW HydroCalc* program was used to calculate the times of concentration and peak flows for existing and proposed conditions. The peak flows for each subarea were summed to determine the overall peak flow to the 36" storm drain, which is a more conservative approach than routing and confluencing the peak flows. The LA County WSPG hydraulic analysis program was used to determine the hydraulic grade line in the proposed 36" storm drain. The downstream control for the hydraulic grading

line calculations was taken as the soffit of the 36” storm drain pipe at the point of connection, which is at elevation 1.2 feet (i.e. approx. 1.2 feet above mean sea level / NGVD29). The hydraulic capacities of the existing 24” and 30” laterals along PCH that drain into the 36” storm drain, and the 15” storm drain lateral in Marina Drive were calculated. It was verified that the laterals along PCH have enough capacity for the 50-year flows, but the 15” lateral is deficient in capacity for both the existing and proposed condition.

The drainage concept, according to the City of Long Beach, is that all of the on-site flows should discharge into the street before entering the catch basins and underground storm drain system. However, in the existing condition, a portion of on-site flow currently drains to an onsite catch basin and into the existing 36” storm drain. However, in the proposed condition, if this drainage is added to the street flow in Marina Drive, the flow to the existing catch basin and 15” lateral would be increased significantly. Instead, a portion of the site is proposed to drain into laterals directly from the BMPs and connect into the 36” storm drain to reflect the existing flow pattern, and, therefore, allow the runoff in Marina Drive to match the existing condition. The hydrology peak flow, hydraulic grade line, and pipe capacity calculations are provided in *Appendix 4*.

The results from the 50-year storm hydrology calculations are summarized in the following table:

Table 1.1: Hydrology Report Summary

| | Existing Condition | Proposed Condition |
|--|---------------------------|---------------------------|
| Drainage area to 36” RCP storm drain being relocated through site | 15.26 Ac | 15.75 Ac |
| 50-Year Peak Flow Rate | 24.12 CFS | 25.40 CFS |
| Drainage area to 15” RCP storm drain in Marina Drive | 8.44 Ac | 7.67 Ac |
| 50-Year Peak Flow Rate | 10.75 CFS | 10.32 CFS |

In conclusion, the existing storm drain being relocated through the project site can remain to be 36” RCP.

3.0 Limitations

This report was prepared to comply with the guidelines established by the County of Los Angeles and their representatives. Evaluation of the appropriateness of these guidelines and the accuracy of the County data were beyond the scope of this work.

Usage of this report is limited to address the purpose and scope previously defined by the project owner. Psomas shall not be held responsible for any unauthorized application of this report and the contents therein.

The opinions represented in this report have been derived in accordance with current standards of civil engineering practice. No other warranty is expressed or implied.

4.0 References

Los Angeles County Department of Public Works, *LACDPW Hydrology Manual and Appendices* (2006)

Los Angeles County Department of Public Works, *Low Impact Development Standards Manual*, (February 2014)

5.0 Appendices

Appendix 1 LACDPW Hydrology Data

Isohyet and Hydrologic Soil Classification Map

33° 52' 30"

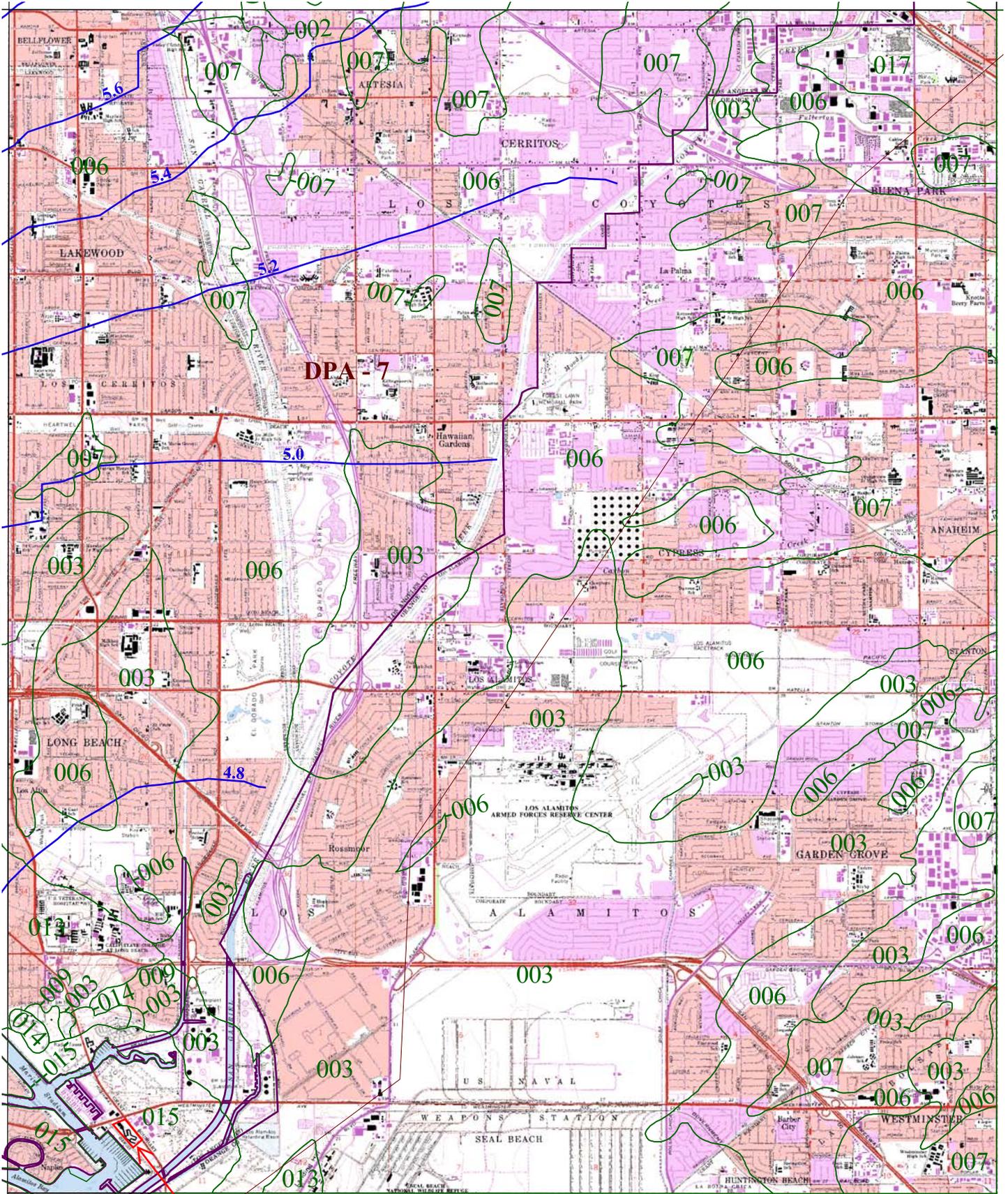
WHITTIER 1-H1.10

-118° 07' 30"

LONG BEACH 1-H1.5

ANAHEIM

-118° 00' 00"



Project Site

SEAL BEACH

33° 45' 00"



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

LOS ALAMITOS 50-YEAR 24-HOUR ISOHYET

1-H1.6



Appendix 2 Project Site
Location and Vicinity Map



PROJECT NUMBER:
2CEN110300

PLANS PREPARED BY:
PSOMAS
3 Hutton Centre Drive
Suite 200
Santa Ana, CA 92707
(714) 751-7373 Fax(714) 545-8883

PREPARED FOR:

CENTERCAL
PROPERTIES, LLC
1600 EAST FRANKLIN AVENUE
EL SEGUNDO, CA 90425

Appendix 3 50 - Year Hydrology and Hydraulic Calculations

50-YEAR, 24-HOUR PROPOSED CONDITION LACDPW HydroCalc RESULTS

| Project | Subarea | Area (acres) | Length (ft) | Slope (ft/ft) | 50-Year 24-Hour Depth | Imperviousness | Soil | Tc (min) | Intensity (in/hr) | Cu | Cd | Flow rate (cfs) | Volume (ac-ft) |
|-----------------------|---------|--------------|-------------|---------------|-----------------------|----------------|------|----------|-------------------|-------|------|-----------------|----------------|
| Proposed-50YR | 1 | 1.31 | 570 | 0.005 | 4.8 | 0.90 | 15 | 10.0 | 2.07 | 0.30 | 0.84 | 2.27 | 0.43 |
| Proposed-50YR | 2 | 1.43 | 480 | 0.005 | 4.8 | 0.86 | 15 | 9.0 | 2.17 | 0.31 | 0.82 | 2.54 | 0.45 |
| Proposed-50YR | 3 | 2.08 | 680 | 0.005 | 4.8 | 0.82 | 15 | 12.0 | 1.90 | 0.28 | 0.79 | 3.11 | 0.63 |
| Proposed-50YR | 4 | 1.27 | 500 | 0.005 | 4.8 | 0.87 | 15 | 10.0 | 2.07 | 0.30 | 0.82 | 2.16 | 0.40 |
| Proposed-50YR | 5 | 1.01 | 595 | 0.005 | 4.8 | 0.84 | 15 | 11.0 | 1.98 | 0.29 | 0.80 | 1.60 | 0.31 |
| Proposed-50YR | 6 | 0.44 | 260 | 0.005 | 4.8 | 0.83 | 15 | 6.0 | 2.63 | 0.37 | 0.81 | 0.94 | 0.13 |
| Proposed-50YR | 7 | 0.79 | 410 | 0.005 | 4.8 | 0.84 | 15 | 9.0 | 2.17 | 0.31 | 0.81 | 1.38 | 0.24 |
| Proposed-50YR | 8 | 1.35 | 370 | 0.005 | 4.8 | 0.88 | 15 | 8.0 | 2.30 | 0.33 | 0.83 | 2.58 | 0.43 |
| Proposed-50YR | 9 | 1.09 | 480 | 0.005 | 4.8 | 0.82 | 15 | 10.0 | 2.07 | 30.00 | 0.79 | 1.78 | 0.33 |
| ON-SITE TOTAL | | 10.77 | | | | 0.85 | | | | | | 18.36 | 3.35 |
| Proposed-50YR | 20 | 1.18 | 762 | 0.0039 | 4.8 | 0.96 | 15 | 13.0 | 1.83 | 0.27 | 0.87 | 1.89 | 0.41 |
| Proposed-50YR | 21 | 0.53 | 367 | 0.0014 | 4.8 | 0.93 | 15 | 10.0 | 2.07 | 0.30 | 0.86 | 0.94 | 0.18 |
| Proposed-50YR | 22 | 0.42 | 313 | 0.0014 | 4.8 | 0.93 | 15 | 9.0 | 2.17 | 0.31 | 0.86 | 0.78 | 0.14 |
| Proposed-50YR | 23 | 0.38 | 295 | 0.0014 | 4.8 | 0.93 | 15 | 8.0 | 2.30 | 0.33 | 0.86 | 0.75 | 0.13 |
| Proposed-50YR | 24 | 4.09 | 924 | 0.0016 | 4.8 | 0.82 | 15 | 18.0 | 1.57 | 0.23 | 0.78 | 5.00 | 1.23 |
| Proposed-50YR | 25 | 4.39 | 1141 | 0.0009 | 4.8 | 0.90 | 15 | 22.0 | 1.43 | 0.20 | 0.83 | 5.20 | 1.43 |
| Proposed-50YR | 26 | 1.35 | 902 | 0.0011 | 4.8 | 0.84 | 15 | 19.0 | 1.53 | 0.22 | 0.79 | 1.63 | 0.41 |
| Proposed-50YR | 27 | 0.70 | 524 | 0.0039 | 4.8 | 0.85 | 15 | 10.0 | 2.07 | 0.30 | 0.81 | 1.17 | 0.22 |
| OFF-SITE TOTAL | | 13.04 | | | | 0.87 | | | | | | 17.36 | 4.15 |
| TOTAL | | 23.81 | | | | 0.86 | | | | | | 35.72 | 7.50 |

Peak Flow Hydrologic Analysis

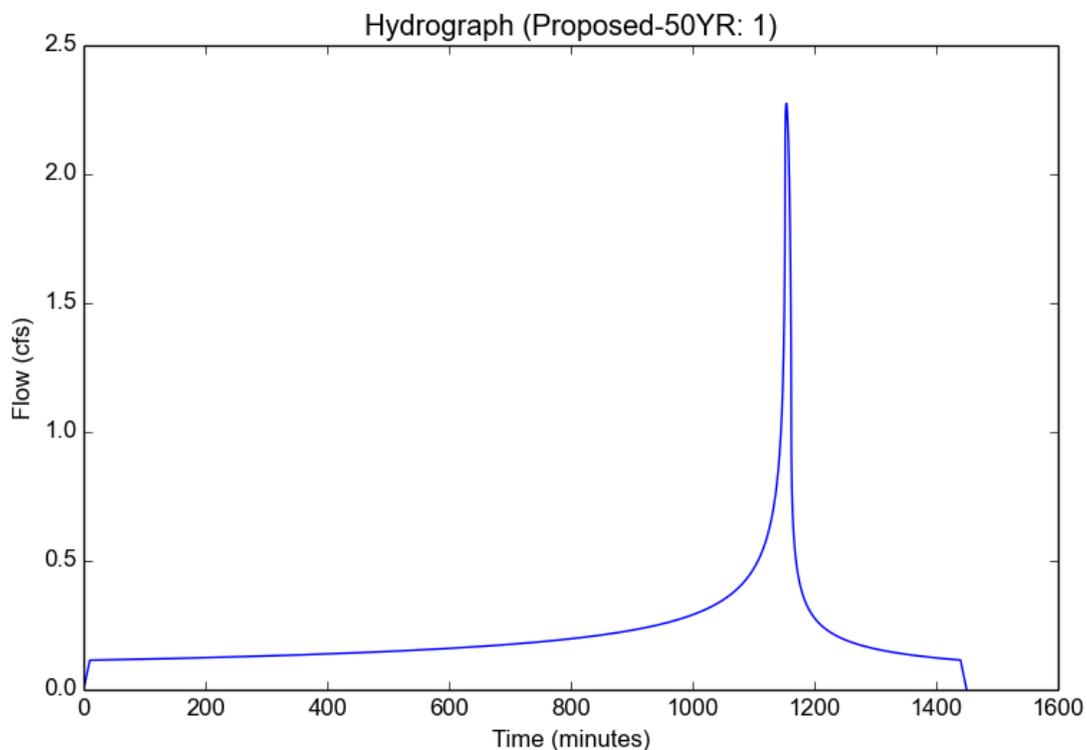
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 1 |
| Area (ac) | 1.31 |
| Flow Path Length (ft) | 570.0 |
| Flow Path Slope (vft/hft) | 0.005 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.9 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|------------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 2.0676 |
| Undeveloped Runoff Coefficient (Cu) | 0.2985 |
| Developed Runoff Coefficient (Cd) | 0.8398 |
| Time of Concentration (min) | 10.0 |
| Clear Peak Flow Rate (cfs) | 2.2747 |
| Burned Peak Flow Rate (cfs) | 2.2747 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.4268 |
| 24-Hr Clear Runoff Volume (cu-ft) | 18590.2764 |



Peak Flow Hydrologic Analysis

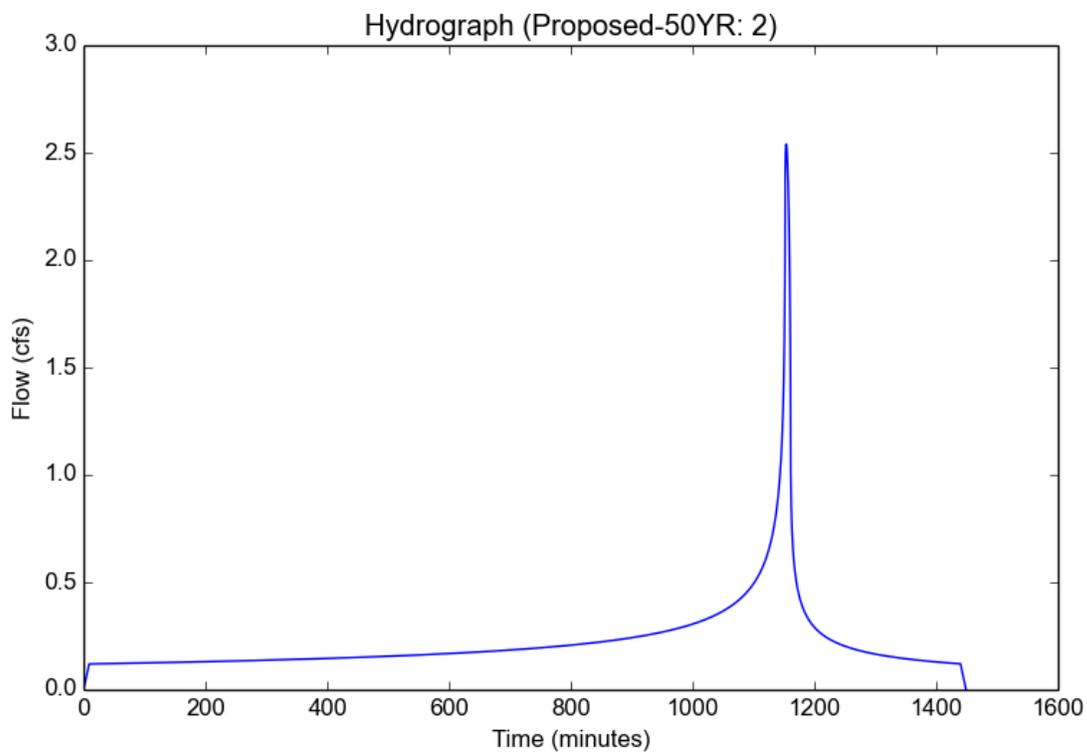
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 2 |
| Area (ac) | 1.43 |
| Flow Path Length (ft) | 480.0 |
| Flow Path Slope (vft/hft) | 0.005 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.86 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|------------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 2.1725 |
| Undeveloped Runoff Coefficient (Cu) | 0.3111 |
| Developed Runoff Coefficient (Cd) | 0.8176 |
| Time of Concentration (min) | 9.0 |
| Clear Peak Flow Rate (cfs) | 2.5399 |
| Burned Peak Flow Rate (cfs) | 2.5399 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.448 |
| 24-Hr Clear Runoff Volume (cu-ft) | 19516.1667 |



Peak Flow Hydrologic Analysis

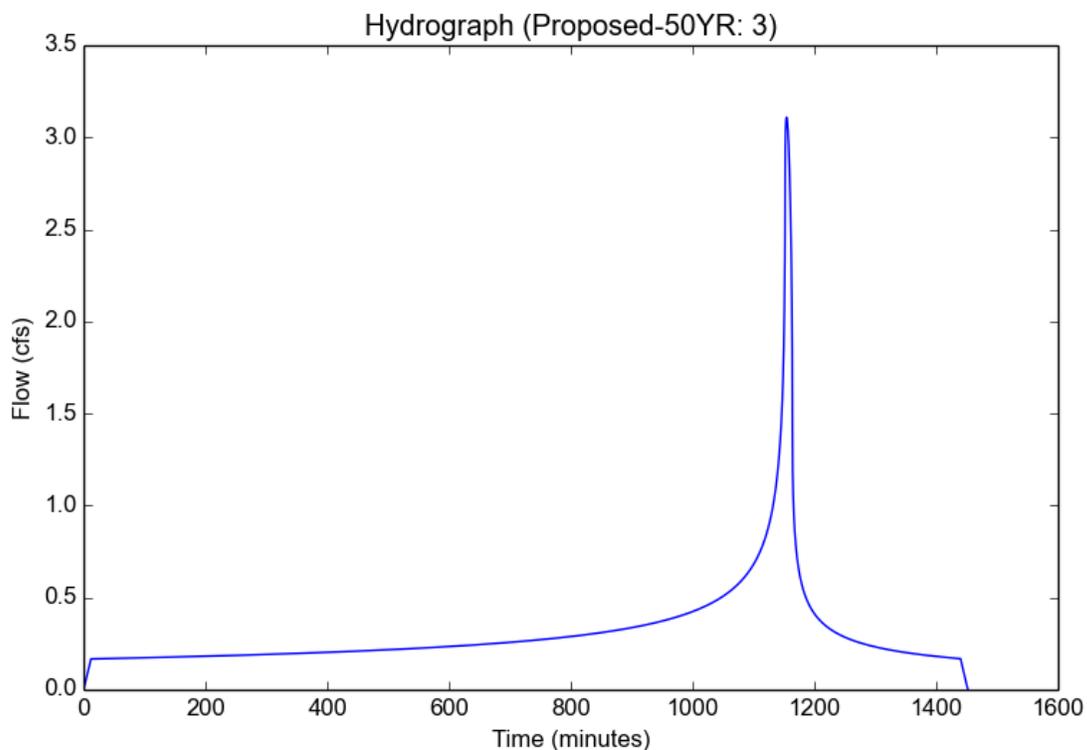
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 3 |
| Area (ac) | 2.08 |
| Flow Path Length (ft) | 680.0 |
| Flow Path Slope (vft/hft) | 0.005 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.82 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|-----------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 1.8978 |
| Undeveloped Runoff Coefficient (Cu) | 0.276 |
| Developed Runoff Coefficient (Cd) | 0.7877 |
| Time of Concentration (min) | 12.0 |
| Clear Peak Flow Rate (cfs) | 3.1092 |
| Burned Peak Flow Rate (cfs) | 3.1092 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.6255 |
| 24-Hr Clear Runoff Volume (cu-ft) | 27247.126 |



Peak Flow Hydrologic Analysis

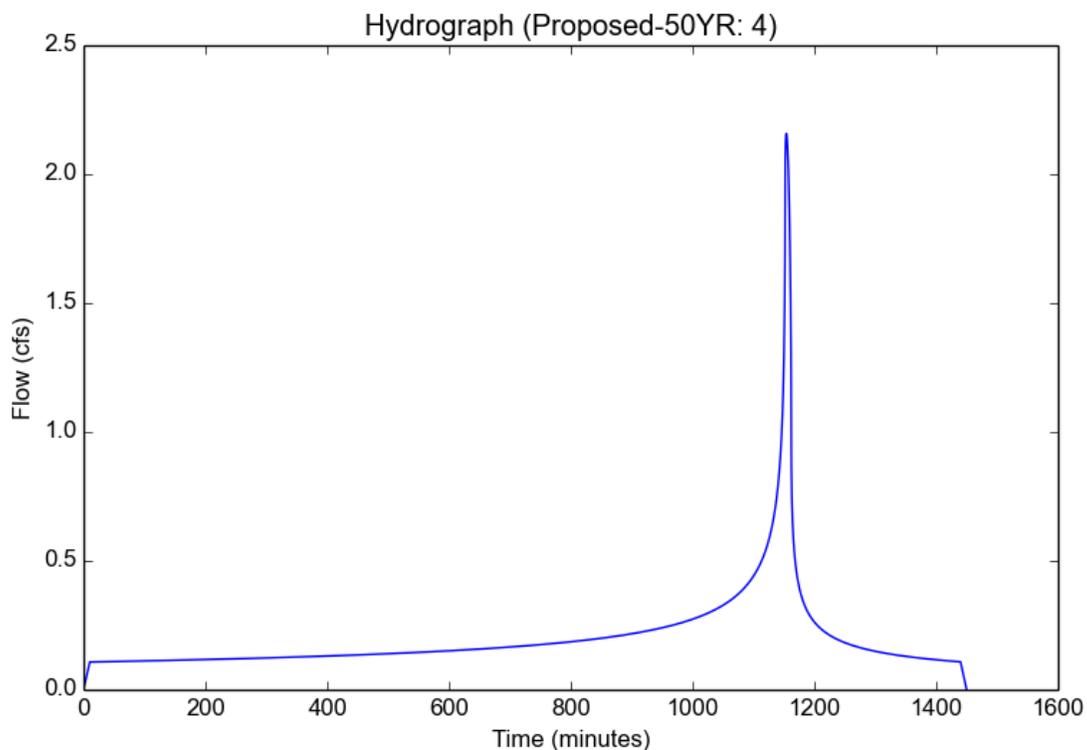
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 4 |
| Area (ac) | 1.27 |
| Flow Path Length (ft) | 500.0 |
| Flow Path Slope (vft/hft) | 0.005 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.87 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|------------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 2.0676 |
| Undeveloped Runoff Coefficient (Cu) | 0.2985 |
| Developed Runoff Coefficient (Cd) | 0.8218 |
| Time of Concentration (min) | 10.0 |
| Clear Peak Flow Rate (cfs) | 2.1579 |
| Burned Peak Flow Rate (cfs) | 2.1579 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.4018 |
| 24-Hr Clear Runoff Volume (cu-ft) | 17504.1052 |



Peak Flow Hydrologic Analysis

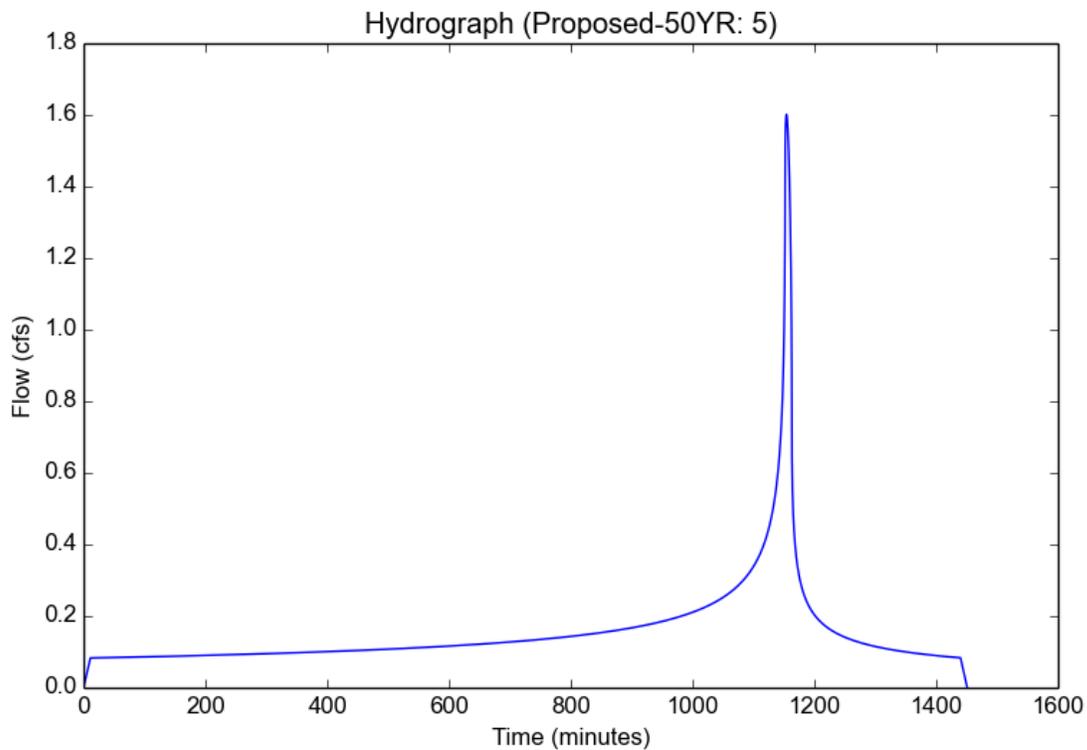
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 5 |
| Area (ac) | 1.01 |
| Flow Path Length (ft) | 595.0 |
| Flow Path Slope (vft/hft) | 0.005 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.84 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|------------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 1.977 |
| Undeveloped Runoff Coefficient (Cu) | 0.2871 |
| Developed Runoff Coefficient (Cd) | 0.8019 |
| Time of Concentration (min) | 11.0 |
| Clear Peak Flow Rate (cfs) | 1.6013 |
| Burned Peak Flow Rate (cfs) | 1.6013 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.3101 |
| 24-Hr Clear Runoff Volume (cu-ft) | 13507.0124 |



Peak Flow Hydrologic Analysis

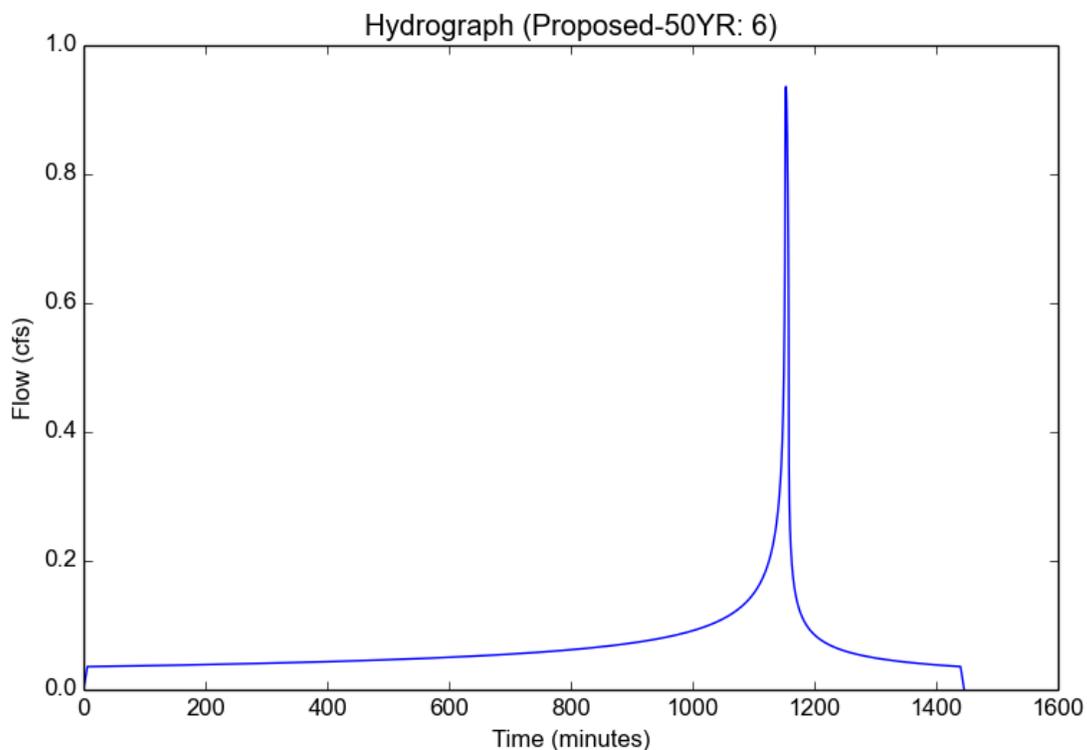
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 6 |
| Area (ac) | 0.44 |
| Flow Path Length (ft) | 260.0 |
| Flow Path Slope (vft/hft) | 0.005 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.83 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|-----------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 2.6286 |
| Undeveloped Runoff Coefficient (Cu) | 0.366 |
| Developed Runoff Coefficient (Cd) | 0.8092 |
| Time of Concentration (min) | 6.0 |
| Clear Peak Flow Rate (cfs) | 0.9359 |
| Burned Peak Flow Rate (cfs) | 0.9359 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.1338 |
| 24-Hr Clear Runoff Volume (cu-ft) | 5827.2922 |



Peak Flow Hydrologic Analysis

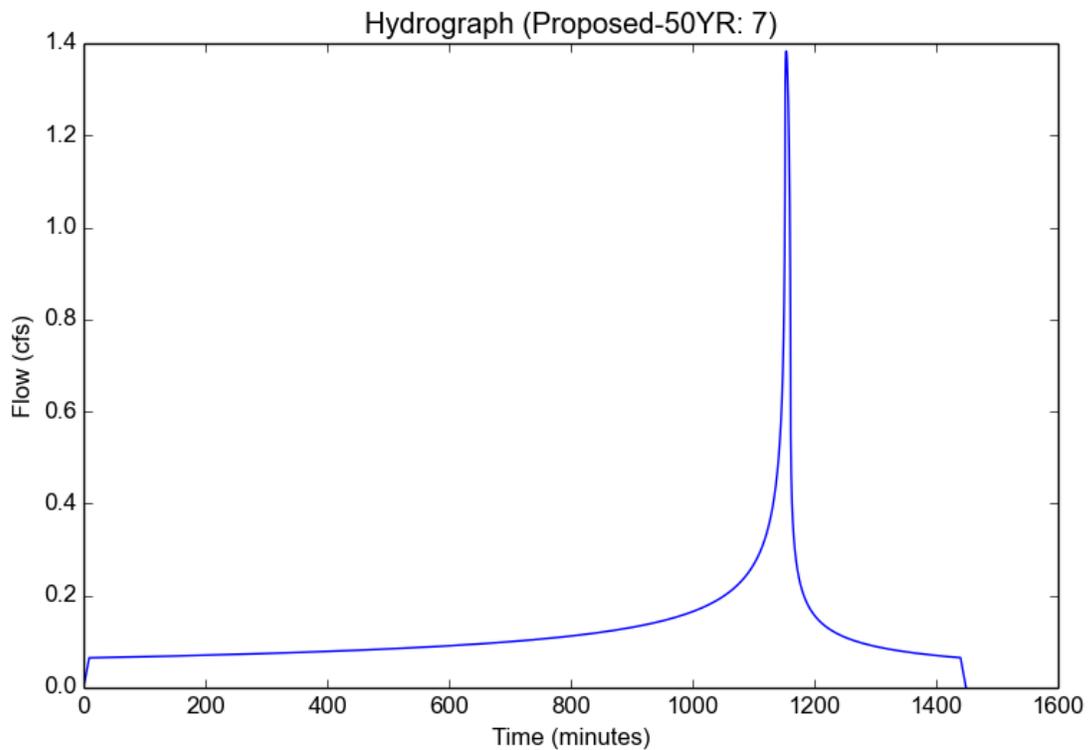
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 7 |
| Area (ac) | 0.79 |
| Flow Path Length (ft) | 410.0 |
| Flow Path Slope (vft/hft) | 0.005 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.84 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|------------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 2.1725 |
| Undeveloped Runoff Coefficient (Cu) | 0.3111 |
| Developed Runoff Coefficient (Cd) | 0.8058 |
| Time of Concentration (min) | 9.0 |
| Clear Peak Flow Rate (cfs) | 1.383 |
| Burned Peak Flow Rate (cfs) | 1.383 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.2426 |
| 24-Hr Clear Runoff Volume (cu-ft) | 10566.7394 |



Peak Flow Hydrologic Analysis

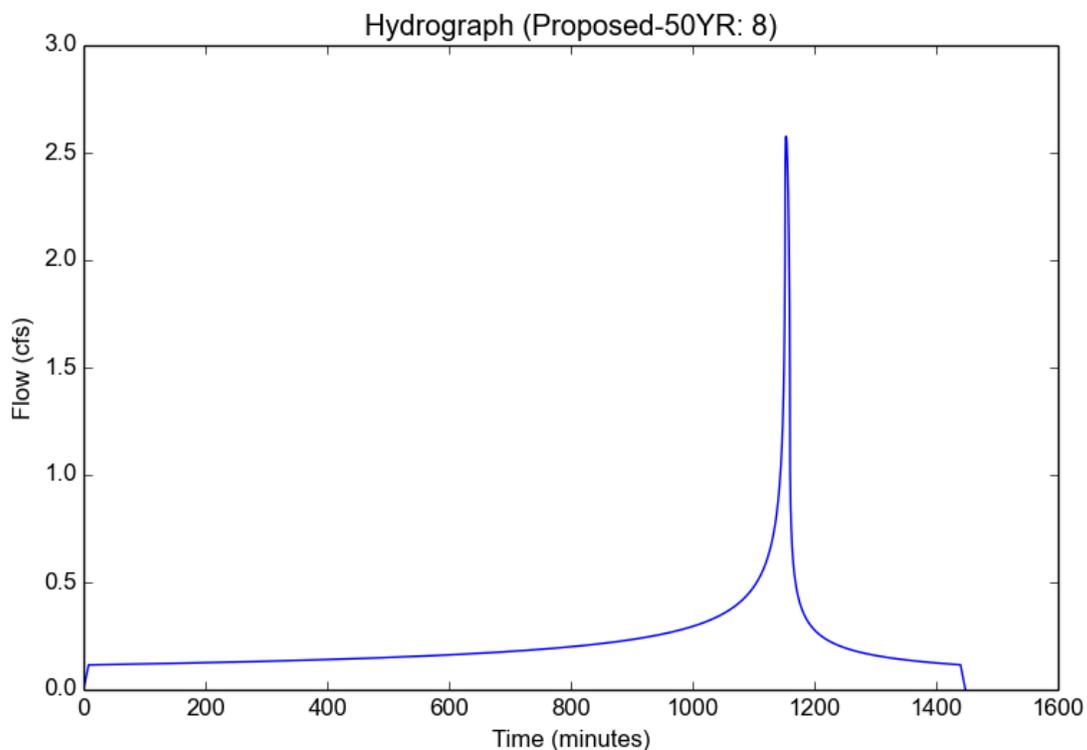
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 8 |
| Area (ac) | 1.35 |
| Flow Path Length (ft) | 370.0 |
| Flow Path Slope (vft/hft) | 0.005 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.88 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|------------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 2.2962 |
| Undeveloped Runoff Coefficient (Cu) | 0.326 |
| Developed Runoff Coefficient (Cd) | 0.8311 |
| Time of Concentration (min) | 8.0 |
| Clear Peak Flow Rate (cfs) | 2.5763 |
| Burned Peak Flow Rate (cfs) | 2.5763 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.4314 |
| 24-Hr Clear Runoff Volume (cu-ft) | 18792.8518 |



Peak Flow Hydrologic Analysis

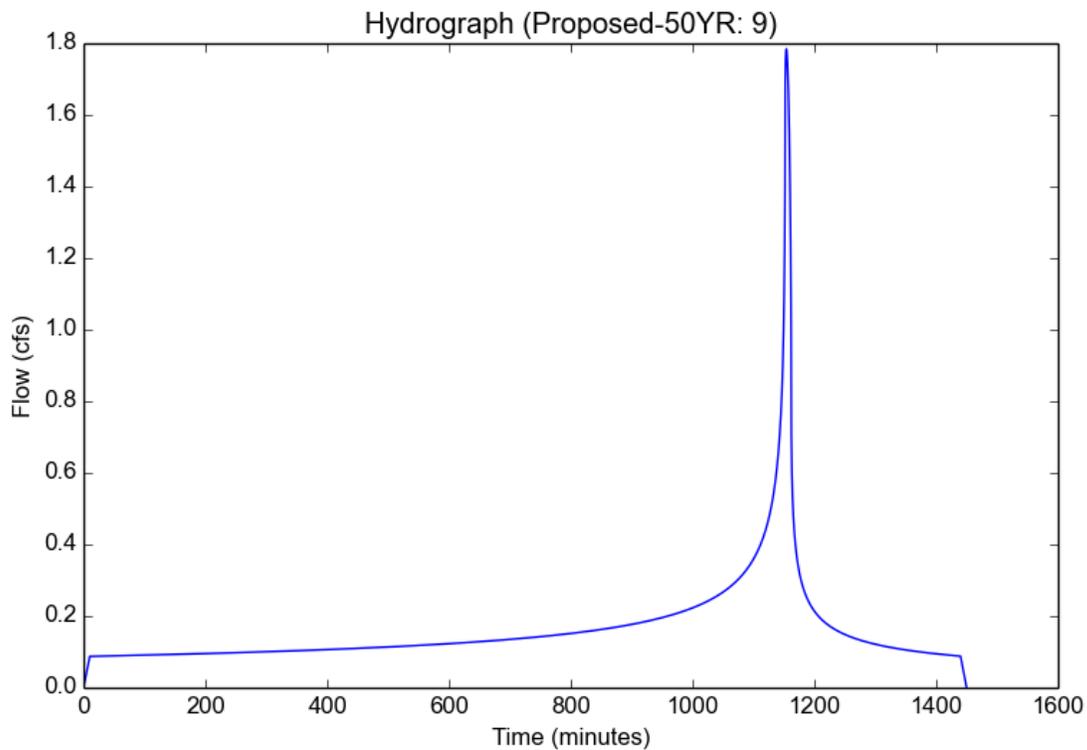
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 9 |
| Area (ac) | 1.09 |
| Flow Path Length (ft) | 480.0 |
| Flow Path Slope (vft/hft) | 0.005 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.82 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|------------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 2.0676 |
| Undeveloped Runoff Coefficient (Cu) | 0.2985 |
| Developed Runoff Coefficient (Cd) | 0.7917 |
| Time of Concentration (min) | 10.0 |
| Clear Peak Flow Rate (cfs) | 1.7843 |
| Burned Peak Flow Rate (cfs) | 1.7843 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.3279 |
| 24-Hr Clear Runoff Volume (cu-ft) | 14281.4804 |



Peak Flow Hydrologic Analysis

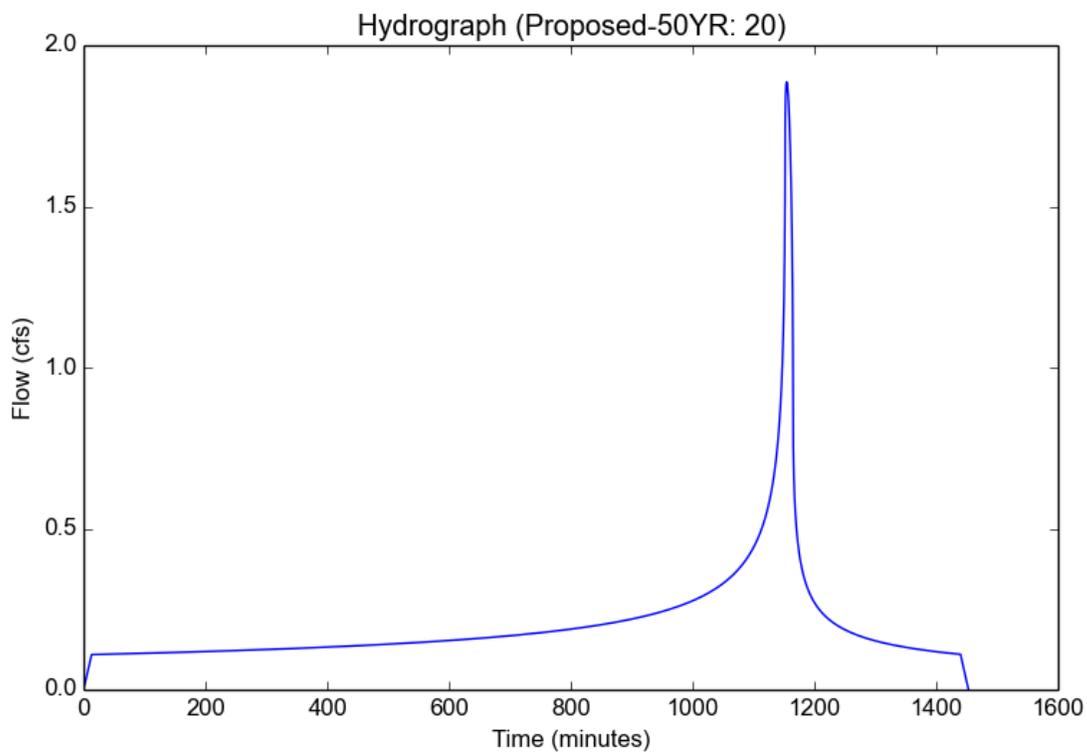
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 20 |
| Area (ac) | 1.18 |
| Flow Path Length (ft) | 770.0 |
| Flow Path Slope (vft/hft) | 0.0039 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.96 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|------------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 1.8277 |
| Undeveloped Runoff Coefficient (Cu) | 0.2661 |
| Developed Runoff Coefficient (Cd) | 0.8746 |
| Time of Concentration (min) | 13.0 |
| Clear Peak Flow Rate (cfs) | 1.8863 |
| Burned Peak Flow Rate (cfs) | 1.8863 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.4065 |
| 24-Hr Clear Runoff Volume (cu-ft) | 17707.9684 |



Peak Flow Hydrologic Analysis

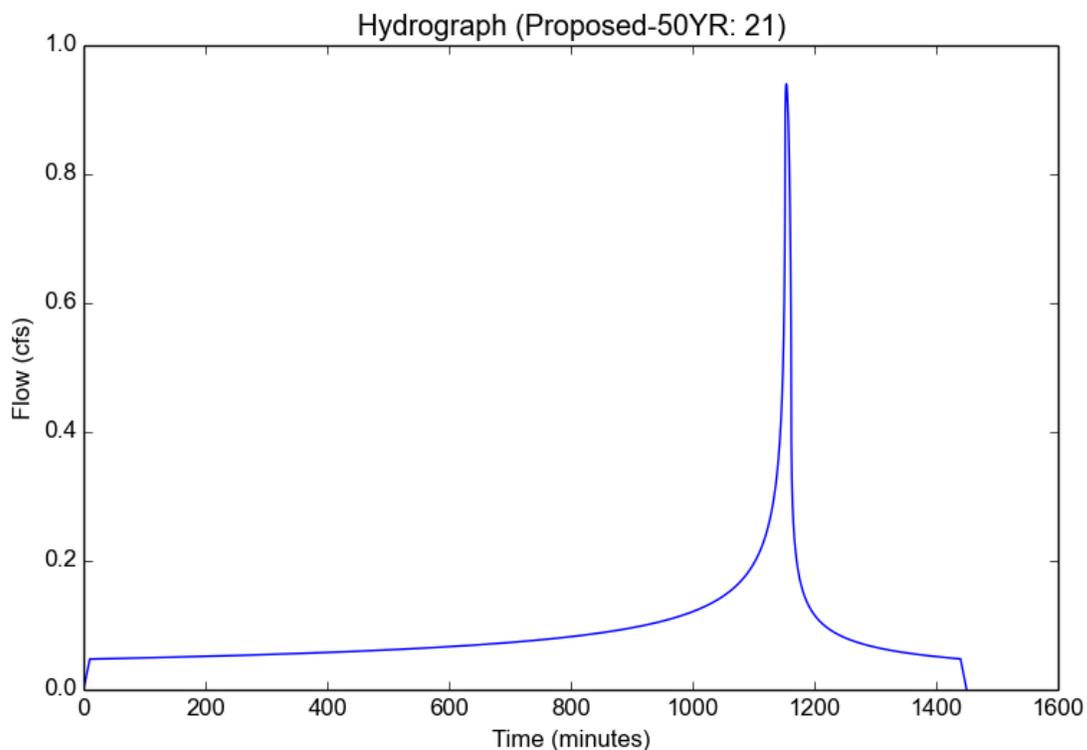
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 21 |
| Area (ac) | 0.53 |
| Flow Path Length (ft) | 380.0 |
| Flow Path Slope (vft/hft) | 0.0014 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.93 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|-----------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 2.0676 |
| Undeveloped Runoff Coefficient (Cu) | 0.2985 |
| Developed Runoff Coefficient (Cd) | 0.8579 |
| Time of Concentration (min) | 10.0 |
| Clear Peak Flow Rate (cfs) | 0.9401 |
| Burned Peak Flow Rate (cfs) | 0.9401 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.1776 |
| 24-Hr Clear Runoff Volume (cu-ft) | 7737.6509 |



Peak Flow Hydrologic Analysis

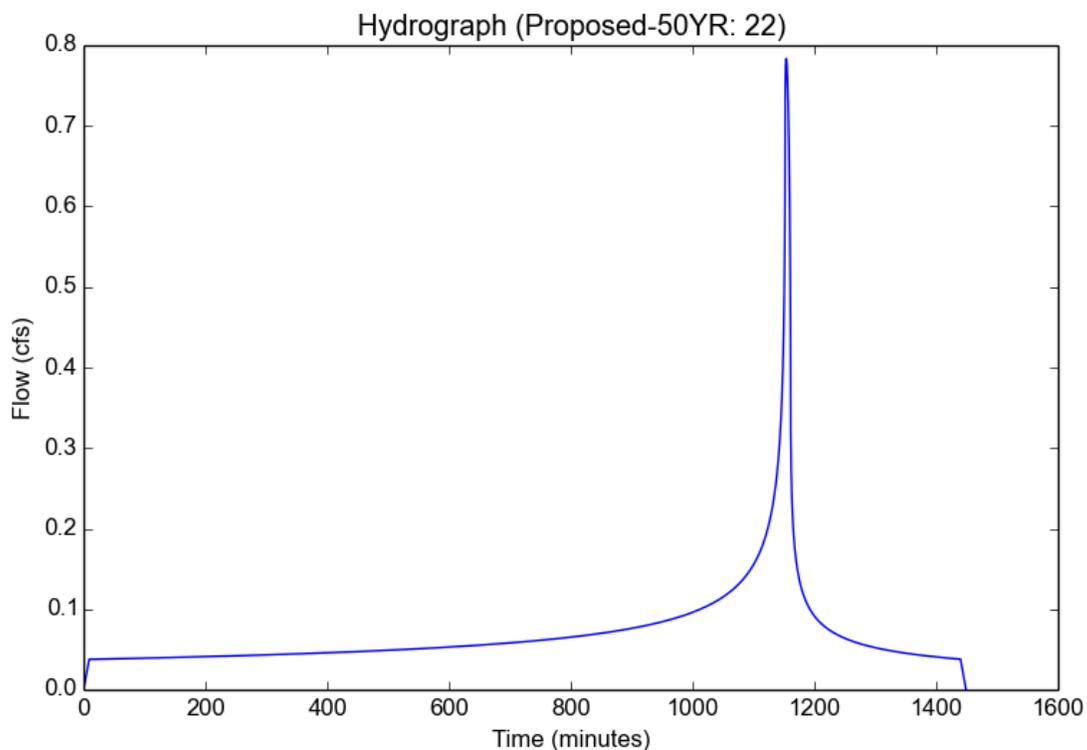
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 22 |
| Area (ac) | 0.42 |
| Flow Path Length (ft) | 320.0 |
| Flow Path Slope (vft/hft) | 0.0014 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.93 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|-----------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 2.1725 |
| Undeveloped Runoff Coefficient (Cu) | 0.3111 |
| Developed Runoff Coefficient (Cd) | 0.8588 |
| Time of Concentration (min) | 9.0 |
| Clear Peak Flow Rate (cfs) | 0.7836 |
| Burned Peak Flow Rate (cfs) | 0.7836 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.1408 |
| 24-Hr Clear Runoff Volume (cu-ft) | 6131.9338 |



Peak Flow Hydrologic Analysis

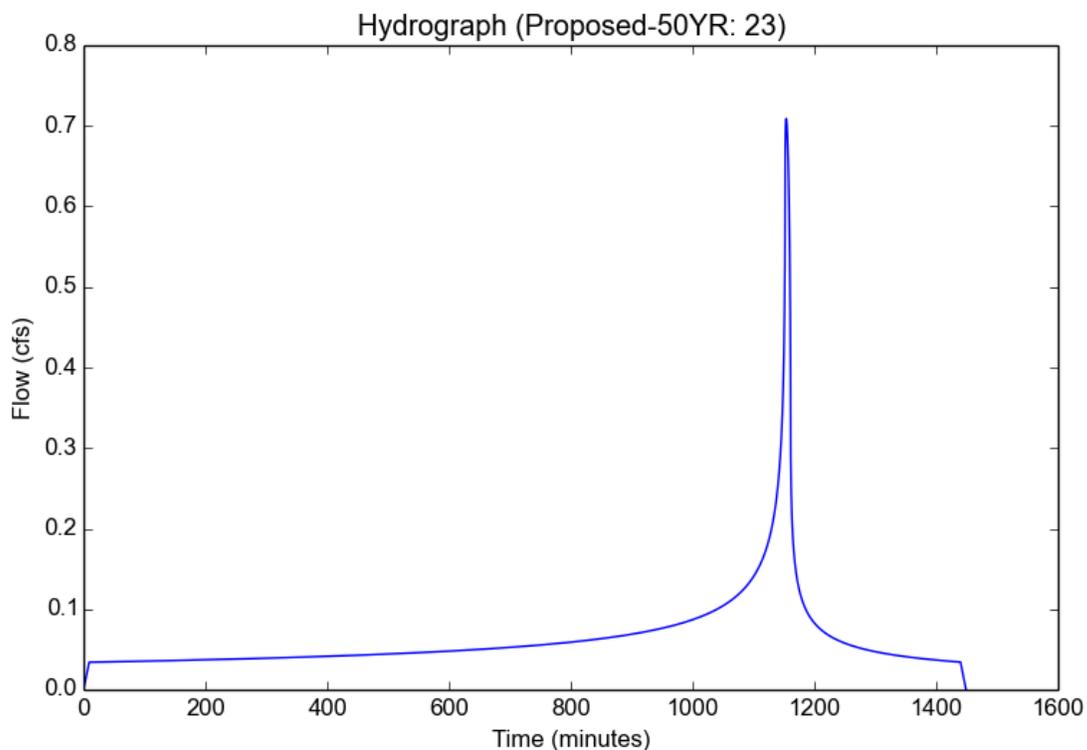
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 23 |
| Area (ac) | 0.38 |
| Flow Path Length (ft) | 305.0 |
| Flow Path Slope (vft/hft) | 0.0014 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.93 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|-----------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 2.1725 |
| Undeveloped Runoff Coefficient (Cu) | 0.3111 |
| Developed Runoff Coefficient (Cd) | 0.8588 |
| Time of Concentration (min) | 9.0 |
| Clear Peak Flow Rate (cfs) | 0.709 |
| Burned Peak Flow Rate (cfs) | 0.709 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.1274 |
| 24-Hr Clear Runoff Volume (cu-ft) | 5547.9401 |



Peak Flow Hydrologic Analysis

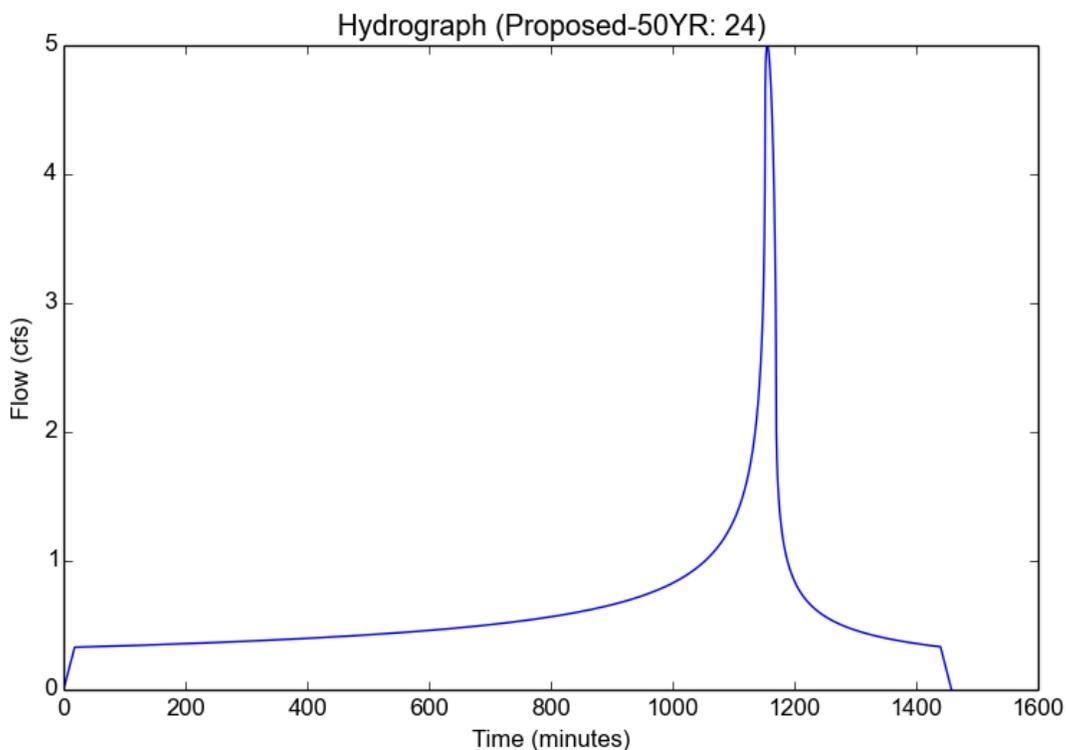
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 24 |
| Area (ac) | 4.09 |
| Flow Path Length (ft) | 935.0 |
| Flow Path Slope (vft/hft) | 0.0016 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.82 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|------------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 1.5685 |
| Undeveloped Runoff Coefficient (Cu) | 0.2295 |
| Developed Runoff Coefficient (Cd) | 0.7793 |
| Time of Concentration (min) | 18.0 |
| Clear Peak Flow Rate (cfs) | 4.9994 |
| Burned Peak Flow Rate (cfs) | 4.9994 |
| 24-Hr Clear Runoff Volume (ac-ft) | 1.2293 |
| 24-Hr Clear Runoff Volume (cu-ft) | 53546.6595 |



Peak Flow Hydrologic Analysis

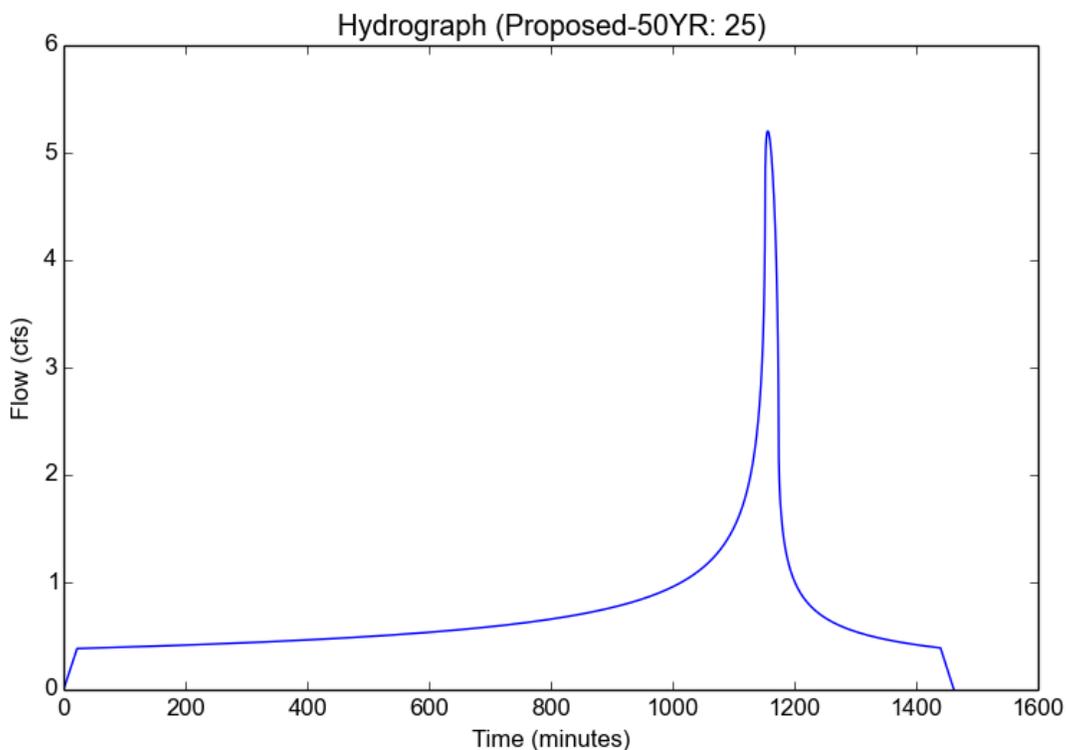
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 25 |
| Area (ac) | 4.39 |
| Flow Path Length (ft) | 1150.0 |
| Flow Path Slope (vft/hft) | 0.0009 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.9 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|-----------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 1.4273 |
| Undeveloped Runoff Coefficient (Cu) | 0.2017 |
| Developed Runoff Coefficient (Cd) | 0.8302 |
| Time of Concentration (min) | 22.0 |
| Clear Peak Flow Rate (cfs) | 5.2018 |
| Burned Peak Flow Rate (cfs) | 5.2018 |
| 24-Hr Clear Runoff Volume (ac-ft) | 1.4293 |
| 24-Hr Clear Runoff Volume (cu-ft) | 62259.141 |



Peak Flow Hydrologic Analysis

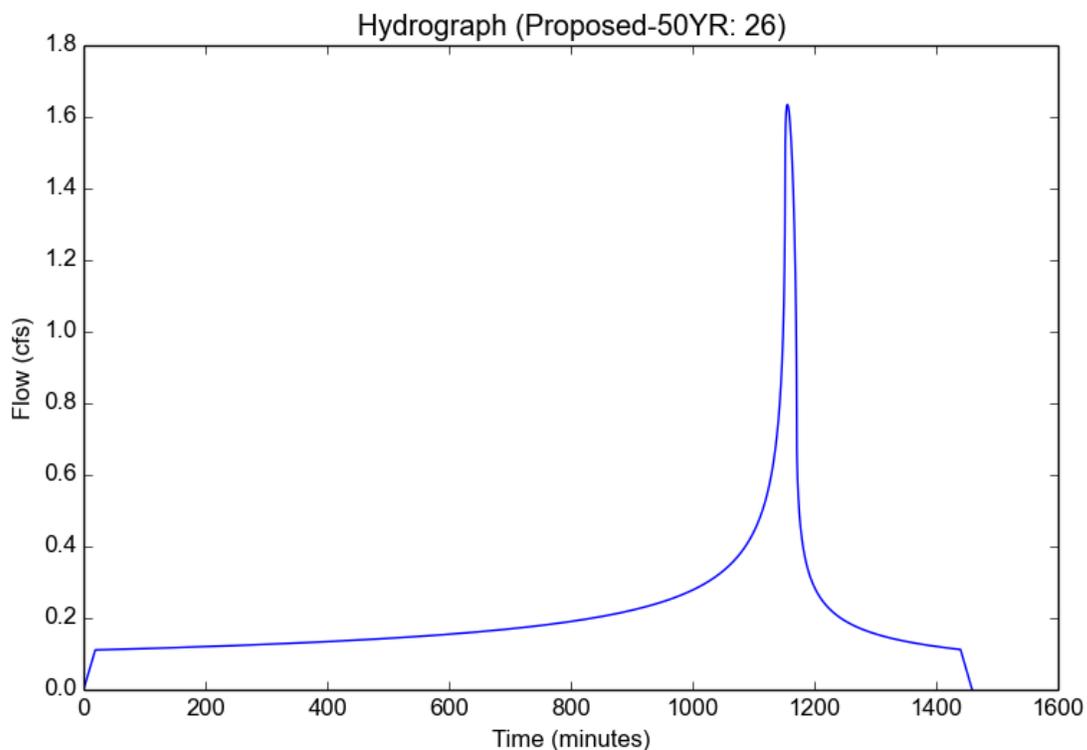
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 26 |
| Area (ac) | 1.35 |
| Flow Path Length (ft) | 902.0 |
| Flow Path Slope (vft/hft) | 0.0011 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.84 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|------------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 1.5291 |
| Undeveloped Runoff Coefficient (Cu) | 0.224 |
| Developed Runoff Coefficient (Cd) | 0.7918 |
| Time of Concentration (min) | 19.0 |
| Clear Peak Flow Rate (cfs) | 1.6346 |
| Burned Peak Flow Rate (cfs) | 1.6346 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.4142 |
| 24-Hr Clear Runoff Volume (cu-ft) | 18041.7348 |



Peak Flow Hydrologic Analysis

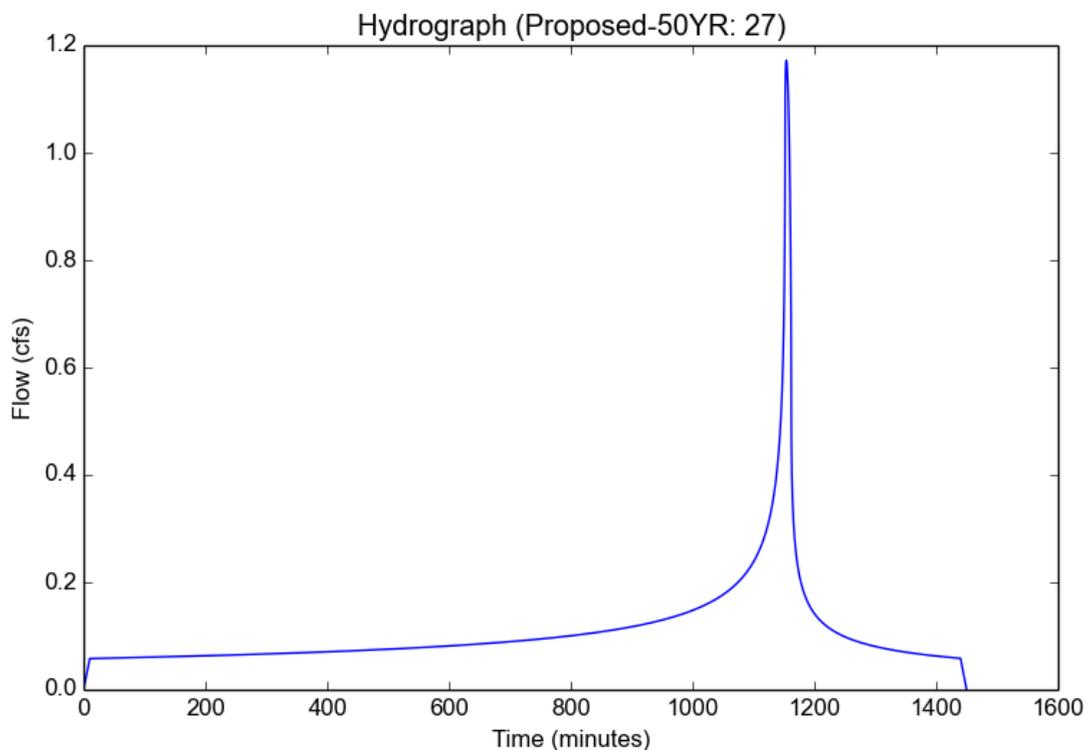
File location: M:/2CEN110300/ENGR/REPORTS/HYDR/CALCULATIONS/Hydrocalc/Proposed-50YR Report.pdf
Version: HydroCalc 0.3.1

Input Parameters

| | |
|---------------------------|---------------|
| Project Name | Proposed-50YR |
| Subarea ID | 27 |
| Area (ac) | 0.7 |
| Flow Path Length (ft) | 524.0 |
| Flow Path Slope (vft/hft) | 0.0039 |
| 50-yr Rainfall Depth (in) | 4.8 |
| Percent Impervious | 0.85 |
| Soil Type | 15 |
| Design Storm Frequency | 50-yr |
| Fire Factor | 0 |
| LID | False |

Output Results

| | |
|-------------------------------------|-----------|
| Modeled (50-yr) Rainfall Depth (in) | 4.8 |
| Peak Intensity (in/hr) | 2.0676 |
| Undeveloped Runoff Coefficient (Cu) | 0.2985 |
| Developed Runoff Coefficient (Cd) | 0.8098 |
| Time of Concentration (min) | 10.0 |
| Clear Peak Flow Rate (cfs) | 1.172 |
| Burned Peak Flow Rate (cfs) | 1.172 |
| 24-Hr Clear Runoff Volume (ac-ft) | 0.2171 |
| 24-Hr Clear Runoff Volume (cu-ft) | 9457.3964 |



Program Package Serial Number: 7081

WATER SURFACE PROFILE LISTING

Date: 2-27-2017 Time: 4: 8:59

2ND STREET and PACIFIC COAST HIGHWAY PROJECT

50-YEAR, 24-HOUR PROPOSED CONDITION

36" STORM DRAIN RELOCATION

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/Dia.-FT | Base Wt/or I.D. | ZL | No Wth Prs/Pip |
|----------|-------------|------------|------------|---------|-----------|----------|----------------|------------|----------------|----------------|----------------|-----------------|-----|----------------|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 1002.250 | -1.820 | 3.000 | 1.180 | 20.46 | 2.89 | .13 | 1.31 | .00 | 1.45 | .00 | 3.000 | .000 | .00 | 1 .0 |
| .000 | .0010 | | | | | .0009 | .00 | 3.00 | .00 | 2.45 | .013 | .00 | .00 | PIPE |
| 1002.250 | -1.820 | 3.000 | 1.180 | 20.46 | 2.89 | .13 | 1.31 | .00 | 1.45 | .00 | 3.000 | .000 | .00 | 1 .0 |
| 52.600 | .0010 | | | | | .0009 | .05 | 3.00 | .00 | 2.45 | .013 | .00 | .00 | PIPE |
| 1054.850 | -1.770 | 2.998 | 1.228 | 20.46 | 2.89 | .13 | 1.36 | .00 | 1.45 | .16 | 3.000 | .000 | .00 | 1 .0 |
| 47.120 | .0011 | | | | | .0009 | .04 | 3.00 | .08 | 2.32 | .013 | .00 | .00 | PIPE |
| 1101.970 | -1.720 | 2.991 | 1.271 | 20.46 | 2.90 | .13 | 1.40 | .00 | 1.45 | .33 | 3.000 | .000 | .00 | 1 .0 |
| 132.270 | .0010 | | | | | .0009 | .12 | 2.99 | .11 | 2.40 | .013 | .00 | .00 | PIPE |
| 1234.240 | -1.590 | 2.979 | 1.389 | 20.46 | 2.90 | .13 | 1.52 | .00 | 1.45 | .50 | 3.000 | .000 | .00 | 1 .0 |
| 67.540 | .0010 | | | | | .0009 | .06 | 2.98 | .14 | 2.34 | .013 | .00 | .00 | PIPE |
| 1301.780 | -1.520 | 2.968 | 1.448 | 20.46 | 2.90 | .13 | 1.58 | .00 | 1.45 | .62 | 3.000 | .000 | .00 | 1 .0 |
| 45.630 | .0011 | | | | | .0009 | .04 | 2.97 | .15 | 2.28 | .013 | .00 | .00 | PIPE |
| 1347.410 | -1.470 | 2.957 | 1.487 | 20.46 | 2.90 | .13 | 1.62 | .00 | 1.45 | .71 | 3.000 | .000 | .00 | 1 .0 |
| 78.540 | .0009 | | | | | .0009 | .07 | 2.96 | .16 | 2.54 | .013 | .00 | .00 | PIPE |
| 1425.950 | -1.400 | 2.954 | 1.554 | 20.46 | 2.90 | .13 | 1.68 | .00 | 1.45 | .74 | 3.000 | .000 | .00 | 1 .0 |
| 81.300 | .0010 | | | | | .0008 | .07 | 2.95 | .17 | 2.40 | .013 | .00 | .00 | PIPE |
| 1507.250 | -1.320 | 2.943 | 1.623 | 20.46 | 2.91 | .13 | 1.75 | .00 | 1.45 | .82 | 3.000 | .000 | .00 | 1 .0 |
| 26.730 | .0011 | | | | | .0008 | .02 | 2.95 | .17 | 2.26 | .013 | .00 | .00 | PIPE |

STORM DRAIN
PIPE FLOW CALCULATIONS

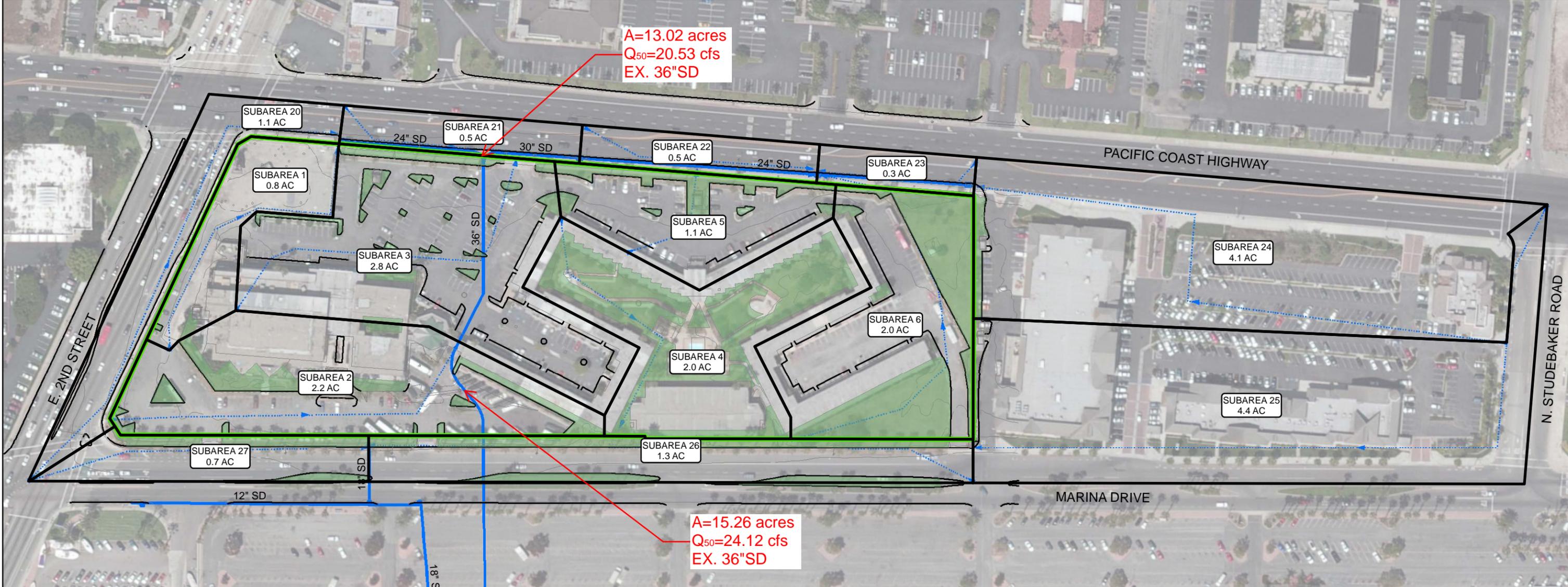
4/5/2017
2HMC020600

| SUBAREA | PCH EAST LATERAL STA. 15+58.70 TO 16+95.50 | PCH EAST LATERAL STA. 17+03.50 TO 20+48.27 | PCH EAST LATERAL STA. 20+55.27 TO 22+60.09 | PCH WEST LATERAL STA. 13+53.25 TO 15+58.70 | MARINA DRIVE 15" LATERAL |
|---|---|---|---|---|-------------------------------------|
| FLOW REGIME | NORMAL | FULL | FULL | FULL | FULL |
| DESIGN FLOW "Q" (cfs) | 16.88 cfs | 11.80 cfs | 5.00 cfs | 4.16 cfs | 10.32 cfs |
| PIPE DIAMETER "d" (inches) | 30" | 24" | 24" | 24" | 15" |
| PIPE MATERIAL | RCP | RCP | RCP | RCP | RCP |
| MANNINGS "n" VALUE | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 |
| PIPE SLOPE "S" (feet/feet) | 0.0139 | 0.0020 | 0.0020 | 0.0071 | 0.0024 |
| FRICTION SLOPE "S_f" (feet/feet) | 0.0139 | 0.0027 | 0.0005 | 0.0003 | 0.0255 |
| DEPTH OF FLOW "D" (feet) | 1.02' | 2.00' | 2.00' | 2.00' | 1.25' |
| FLOW AREA "A" (square feet) | 1.88 sf | 3.14 sf | 3.14 sf | 3.14 sf | 1.23 sf |
| WETTED PERIMETER "P" | 3.46' | 6.28' | 6.28' | 6.28' | 3.93' |
| HYDRAULIC RADIUS "R" (A/P) | 0.54' | 0.50' | 0.50' | 0.50' | 0.31' |
| FLOW TOP WIDTH, T (feet) | 2.46' | 0.00' | 0.00' | 0.00' | 0.00' |
| FLOW VELOCITY "V" (feet/second) | 8.97 fps | 3.76 fps | 1.59 fps | 1.32 fps | 8.41 fps |
| VELOCITY HEAD (V²/2G) (feet) | 1.25' | 0.22' | 0.04' | 0.03' | 1.10' |
| SPECIFIC ENERGY (D+ V²/2G) (lb-ft/lb) | 2.27' | 2.22' | 2.04' | 2.03' | 2.35' |
| FLOW CAPACITY DEPTH RATIO "D/d" | 0.94 | 0.94 | 0.94 | 0.94 | 1.00 |
| PIPE FLOW CAPACITY (cfs) | 52.00 cfs | 10.88 cfs | 10.88 cfs | 20.50 cfs | 3.16 cfs |

Appendix 4 Hydrology Maps

Existing Condition

Proposed Condition



50-YEAR, 24-HOUR EXISTING CONDITION TC CALCULATOR RESULTS

| Project | Subarea | Area (acres) | %imp | Frequency | Soil Type | Length (ft) | Slope (ft/ft) | Isohyet (in.) | Tc-calculated (min.) | Intensity (in./hr) | Cu | Cd | Flow rate (cfs) | Tc Equation | Volume (acre-ft) |
|----------------------|---------|--------------|------|-----------|-----------|-------------|---------------|---------------|----------------------|--------------------|-----|------|-----------------|--|------------------|
| Existing-50YR | 1 | 0.78 | 0.98 | 50 | 15 | 473 | 0.0042 | 4.8 | 9 | 2.17 | 0.3 | 0.89 | 1.51 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.28 |
| Existing-50YR | 2 | 2.24 | 0.86 | 50 | 15 | 572 | 0.0035 | 4.8 | 11 | 1.98 | 0.3 | 0.81 | 3.59 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.7 |
| Existing-50YR | 3 | 2.79 | 0.93 | 50 | 15 | 565 | 0.0027 | 4.8 | 11 | 1.98 | 0.3 | 0.85 | 4.69 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.93 |
| Existing-50YR | 4 | 2.00 | 0.56 | 50 | 15 | 397 | 0.0025 | 4.8 | 11 | 1.98 | 0.3 | 0.63 | 2.49 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.44 |
| Existing-50YR | 5 | 1.10 | 0.81 | 50 | 15 | 363 | 0.0041 | 4.8 | 8 | 2.3 | 0.3 | 0.79 | 2.00 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.33 |
| Existing-50YR | 6 | 1.98 | 0.60 | 50 | 15 | 642 | 0.0031 | 4.8 | 15 | 1.71 | 0.3 | 0.64 | 2.17 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.46 |
| ONSITE TOTAL | | 10.88 | | | | | | | | | | | 16.45 | | 3.14 |
| Existing-50YR | 20 | 1.12 | 0.97 | 50 | 15 | 768 | 0.0039 | 4.8 | 12 | 1.9 | 0.3 | 0.88 | 1.87 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.39 |
| Existing-50YR | 21 | 0.46 | 1.00 | 50 | 15 | 367 | 0.0014 | 4.8 | 9 | 2.17 | 0.3 | 0.9 | 0.90 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.16 |
| Existing-50YR | 22 | 0.46 | 0.99 | 50 | 15 | 359 | 0.0014 | 4.8 | 9 | 2.17 | 0.3 | 0.89 | 0.88 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.16 |
| Existing-50YR | 23 | 0.30 | 0.93 | 50 | 15 | 248 | 0.0002 | 4.8 | 11 | 1.98 | 0.3 | 0.86 | 0.52 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.1 |
| Existing-50YR | 24 | 4.05 | 0.99 | 50 | 15 | 924 | 0.0016 | 4.8 | 16 | 1.66 | 0.2 | 0.89 | 5.99 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 1.43 |
| Existing-50YR | 25 | 4.40 | 1.00 | 50 | 15 | 1141 | 0.0009 | 4.8 | 21 | 1.46 | 0.2 | 0.9 | 5.78 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 1.57 |
| Existing-50YR | 26 | 1.34 | 0.71 | 50 | 15 | 905 | 0.0011 | 4.8 | 20 | 1.49 | 0.2 | 0.71 | 1.42 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.36 |
| Existing-50YR | 27 | 0.70 | 0.78 | 50 | 15 | 507 | 0.0039 | 4.8 | 11 | 1.98 | 0.3 | 0.77 | 1.06 | $T_c = (10)^{0.5} \cdot 0.507 \cdot C_d \cdot D^{0.5} \cdot 5.19 \cdot (L)^{0.483} \cdot (S)^{-0.135}$ | 0.2 |
| OFFSITE TOTAL | | 12.83 | | | | | | | | | | | 18.42 | | 4.37 |
| TOTAL | | 23.71 | | | | | | | | | | | 34.87 | | 7.51 |

OPEN SPACE SUMMARY TABLE

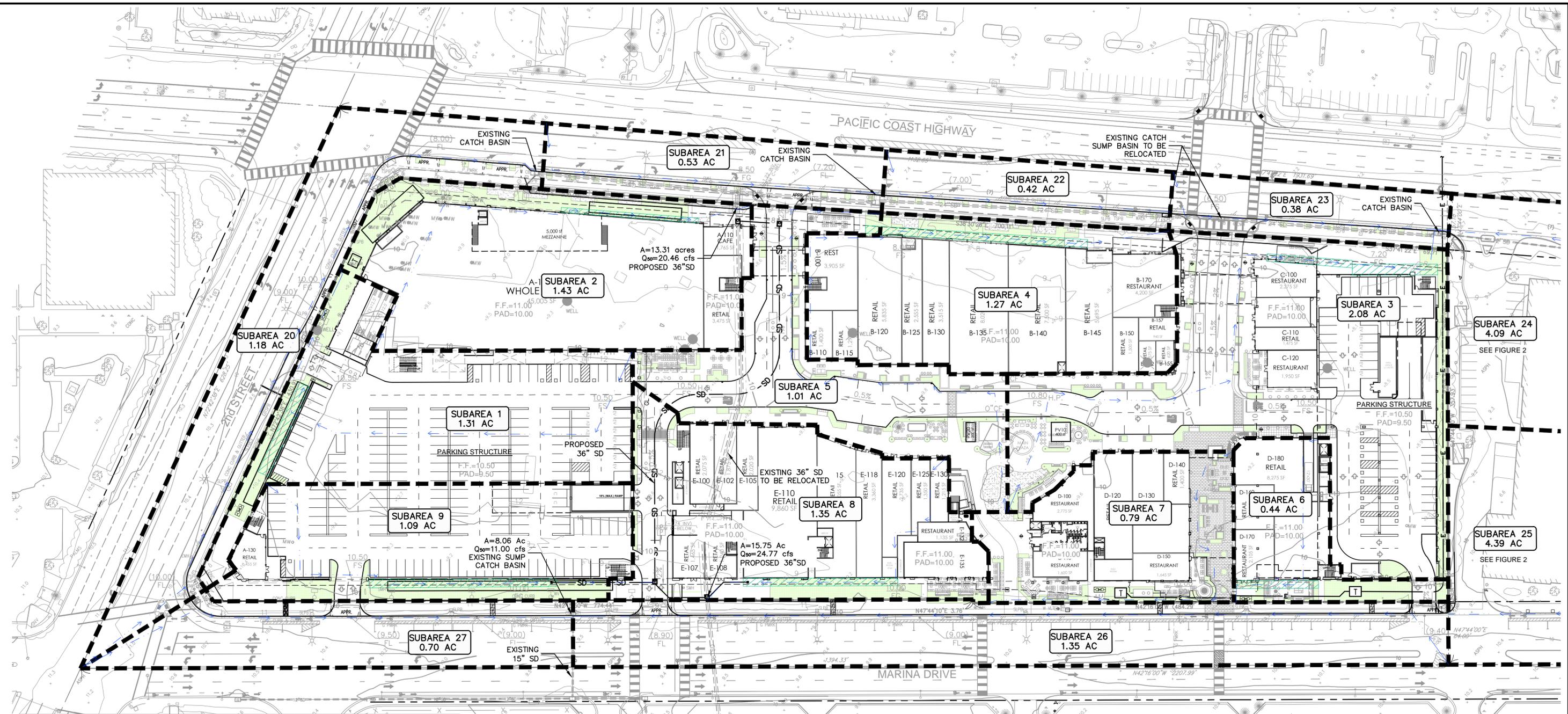
| | |
|---------------------------|----------------|
| EXISTING PERVIOUS SPACE | 4.2 AC |
| EXISTING IMPERVIOUS SPACE | 19.6 AC |
| PROPOSED PERVIOUS SPACE | 2.7 AC |
| PROPOSED IMPERVIOUS SPACE | 21.1 AC |
| TOTAL AREA | 23.8 AC |

- LEGEND**
- EXISTING HYDROLOGY BOUNDARY
 - PROJECT BOUNDARY
 - EXISTING STORM DRAIN
 - FLOW PATH
 - EXISTING OPEN SPACE



**FIGURE 2 EXISTING CONDITON HYDROLOGY MAP
2ND AND PCH DEVELOPMENT**

Path: I:\285_007.SP_Marina\GIS\MXD\235007_EXISTING_HYDROLOGY_MAP.mxd



50-YEAR, 24-HOUR PROPOSED CONDITION LACDPW HydroCalc RESULTS

| Project | Subarea | Area (acres) | Length (ft) | Slope (ft/ft) | 50-Year 24-Hour Depth | Imperviousness | Soil | Tc (min) | Intensity (in/hr) | Cu | Cd | Flow rate (cfs) | Volume (ac-ft) |
|-----------------------|--------------|--------------|-------------|---------------|-----------------------|----------------|------|----------|-------------------|------|------|-----------------|----------------|
| Proposed-50YR | 1 | 1.31 | 570 | 0.005 | 4.8 | 0.90 | 15 | 10.0 | 2.07 | 0.30 | 0.84 | 2.27 | 0.43 |
| Proposed-50YR | 2 | 1.43 | 480 | 0.005 | 4.8 | 0.86 | 15 | 9.0 | 2.17 | 0.31 | 0.82 | 2.54 | 0.45 |
| Proposed-50YR | 3 | 2.08 | 680 | 0.005 | 4.8 | 0.82 | 15 | 12.0 | 1.90 | 0.28 | 0.79 | 3.11 | 0.63 |
| Proposed-50YR | 4 | 1.27 | 500 | 0.005 | 4.8 | 0.87 | 15 | 10.0 | 2.07 | 0.30 | 0.82 | 2.16 | 0.40 |
| Proposed-50YR | 5 | 1.01 | 595 | 0.005 | 4.8 | 0.84 | 15 | 11.0 | 1.98 | 0.29 | 0.80 | 1.60 | 0.31 |
| Proposed-50YR | 6 | 0.44 | 260 | 0.005 | 4.8 | 0.83 | 15 | 6.0 | 2.63 | 0.37 | 0.81 | 0.94 | 0.13 |
| Proposed-50YR | 7 | 0.79 | 410 | 0.005 | 4.8 | 0.84 | 15 | 9.0 | 2.17 | 0.31 | 0.81 | 1.38 | 0.24 |
| Proposed-50YR | 8 | 1.35 | 370 | 0.005 | 4.8 | 0.88 | 15 | 8.0 | 2.30 | 0.33 | 0.83 | 2.58 | 0.43 |
| Proposed-50YR | 9 | 1.09 | 480 | 0.005 | 4.8 | 0.82 | 15 | 10.0 | 2.07 | 0.30 | 0.79 | 1.78 | 0.33 |
| ON-SITE TOTAL | 10.77 | | | | | 0.85 | | | | | | 18.36 | 3.35 |
| Proposed-50YR | 20 | 1.18 | 762 | 0.0039 | 4.8 | 0.96 | 15 | 13.0 | 1.83 | 0.27 | 0.87 | 1.89 | 0.41 |
| Proposed-50YR | 21 | 0.53 | 367 | 0.0014 | 4.8 | 0.93 | 15 | 10.0 | 2.07 | 0.30 | 0.86 | 0.94 | 0.18 |
| Proposed-50YR | 22 | 0.42 | 313 | 0.0014 | 4.8 | 0.93 | 15 | 9.0 | 2.17 | 0.31 | 0.86 | 0.78 | 0.14 |
| Proposed-50YR | 23 | 0.38 | 295 | 0.0014 | 4.8 | 0.93 | 15 | 8.0 | 2.30 | 0.33 | 0.86 | 0.75 | 0.13 |
| Proposed-50YR | 24 | 4.09 | 924 | 0.0016 | 4.8 | 0.82 | 15 | 18.0 | 1.57 | 0.23 | 0.78 | 5.00 | 1.23 |
| Proposed-50YR | 25 | 4.39 | 1141 | 0.0009 | 4.8 | 0.90 | 15 | 22.0 | 1.43 | 0.20 | 0.83 | 5.20 | 1.43 |
| Proposed-50YR | 26 | 1.35 | 902 | 0.0011 | 4.8 | 0.84 | 15 | 19.0 | 1.53 | 0.22 | 0.79 | 1.63 | 0.41 |
| Proposed-50YR | 27 | 0.70 | 524 | 0.0039 | 4.8 | 0.85 | 15 | 10.0 | 2.07 | 0.30 | 0.81 | 1.17 | 0.22 |
| OFF-SITE TOTAL | 13.04 | | | | | 0.87 | | | | | | 17.36 | 4.15 |
| TOTAL | 23.81 | | | | | 0.86 | | | | | | 35.72 | 7.50 |

BASE: DLP #48

PLANS PREPARED BY:
PSOMAS
 3 Hutton Centre Drive
 Suite 200
 Santa Ana, CA 92707
 (714) 751-7373 Fax(714) 545-8883

PREPARED FOR:
CENTERCAL
 1600 EAST FRANKLIN AVENUE
 EL SEGUNDO, CA 90425

2ND STREET and PACIFIC COAST HIGHWAY PROJECT
 FINAL SCHEMATIC DESIGN PACKAGE
 FIGURE 4: PROPOSED CONDITION HYDROLOGY MAP



GRAPHIC SCALE
 Note: For reduced sized prints, original scale is in inches

LEGEND

F.F.=11.00
 PAD=10.00
 F.F. = FINISH FLOOR

LEGEND

- EXISTING STORM DRAIN PIPE
- PROPOSED STORM DRAIN PIPE
- EASEMENT
- CENTERLINE
- PROPERTY LINE
- LIMITS OF WORK
- PROPOSED RAISED PLANTER BOX
- PROPOSED CATCH BASIN (CB)
- PROPOSED PARKWAY CULVERT (PC)
- PROPOSED JUNCTION STRUCTURE (J.S.)

Apr 05, 2017 - 10:57AM - M:\CENT110300\ENGR\SHEETS\HYDRO\PL-01_HYDR.DWG

| | | | |
|-----------------|------------|-------|-------|
| DATE: | 03-30-17 | SHEET | C02.0 |
| SCALE: | 1" = 50' | | 3 |
| PROJECT NUMBER: | 2CEN110300 | OF | 9 |

IN THE CITY OF LONG BEACH COUNTY OF LOS ANGELES STATE OF CALIFORNIA