

SITE HYDROLOGY AND HYDRAULICS REPORT

CENTENNIAL HIGH SCHOOL

2606 N. CENTRAL AVENUE,
COMPTON, CA 90222

August 1, 2025

PREPARED FOR:

DLR Group
700 S FLOWER STREET 22ND FLOOR
LOS ANGELES, CA 90017

PREPARED BY:



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We are pleased to submit this report regarding the Hydrology and Hydraulics Report for the Centennial High School, Compton Unified School District.

This report is comprised of three sections:

- **Narrative Report and Results**

This includes Introduction and Scope, Project Site Hydrology, Project Site Hydraulics, Stormwater Mitigation, Best Management Practices for Low Impact Development, and Project Conclusions and Recommendations

- **Calculations**

This includes modeling and calculation results of the hydrology and hydraulics analysis and BMP calculations and sizing.

- **Appendix**

This includes rainfall information, utility plans, operation and maintenance guidelines for BMPs used in this project.

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1. INTRODUCTION

1.1 Scope

This Hydrology and Hydraulics Report prepared by VCA Engineers Inc. was commissioned by DLR Group to summarize the stormwater management for the Centennial High School. This report will demonstrate that the proposed drainage system will adequately meet the drainage needs of the project site.

This report will show the calculations of the storm water runoff generated by the site (site hydrology), the conveyance and discharge system of the runoff (site hydraulics). The storm water runoff will be conveyed into the Los Angeles County Flood Control District (LACFCD) main storm drain line located along El Segundo Blvd.

The scope of work will be limited to be within the property line of parcel (Figure 1). The pre-development site is comprised of twenty-two (22) buildings, fifteen (15) portable buildings, asphalt paved parking lots, planter areas, dirt areas, gravel areas, track and field, walls, concrete pavement, concrete pavers, concrete stairs, and ramps. Pre-development imperviousness is 43%.

The proposed development will consist of eight (8) buildings, asphalt paved parking lots, concrete pavement, concrete stairs, ramps, landscape areas, athletic/sport fields, tennis and basketball courts, and pool area. The post-development imperviousness of the site is 58%.

Imperviousness and Perviousness comparison of existing conditions and proposed conditions is presented in Table 1.

Connections to the storm drainage situated El Segundo Street are under the jurisdiction of Los Angeles County Flood Control District (LACFCD) and will require LACFCD approval.

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Site Condition	Imperviousness		Perviousness	
	Area (SF)	%	Area (SF)	%
Pre-Construction	604,796	43	800,315	57
Post Construction	808,751	58	596,360	42
Total Site Area	1,405,111 SF (32.26 ACRES)			

Table 1. Site Conditions Pre-Construction and Post-Construction

1.2 Standards and References

The standards below used in the design of the site's stormwater management:

1. Standard Plans and Specifications for Public Works Construction (Green Book), 2021 Edition
2. Compton Unified School District.
3. County of Los Angeles Low Impact Development (LID) Standards Manual (2009)
4. California Building Code, 2022 Edition
5. State Water Resources Control Board (SWRCB)
6. Americans with Disabilities Act (ADA)

2. PROJECT SITE DESCRIPTION

2.1 Project Area

The project site area is approximately 1,405,111 SF (32.26 Acres). The current site consists of 13.88 acres (43%) of impervious area including existing building roofs, walls, walkways and pavements, and 18.38 acres (57%) of pervious area including landscaping, and synthetic turf. Existing site area is shown in Figure 1.

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2.2 Project Site Location

The site is located at 2606 N Central Ave, Compton, California 90222, covering an area of approximately 32 acres. The site is bounded by the Compton Creek Channel and N Parmelee Avenue to the East, and W El Segundo Blvd to the North, Central Avenue to the West, and W 131st Street to the South. The geographic coordinates of the site are latitude 33° 54' 55.13" N and longitude 118° 15' 13.57" W. An aerial perspective of the site is depicted in enclosed Figure 1.

Following a thorough evaluation of the Topographic Survey conducted by J Braley, dated April 09, 2025, it has been determined that the site exhibits an elevation variation of approximately 9 feet. The lowest elevation within the property is observed at the northeast corner of the site, whereas the highest elevation is recorded at the southwest corner of the site, in which may influence surface drainage patterns and potential development considerations.

The site consists of one (1) parcel per the Assessor's Parcel Number (APN) 6145-001-900. The Assessor's Map is shown in Figure 2, is retrieved from the LA County Assessor's Map.

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Figure 1. Project Site Location

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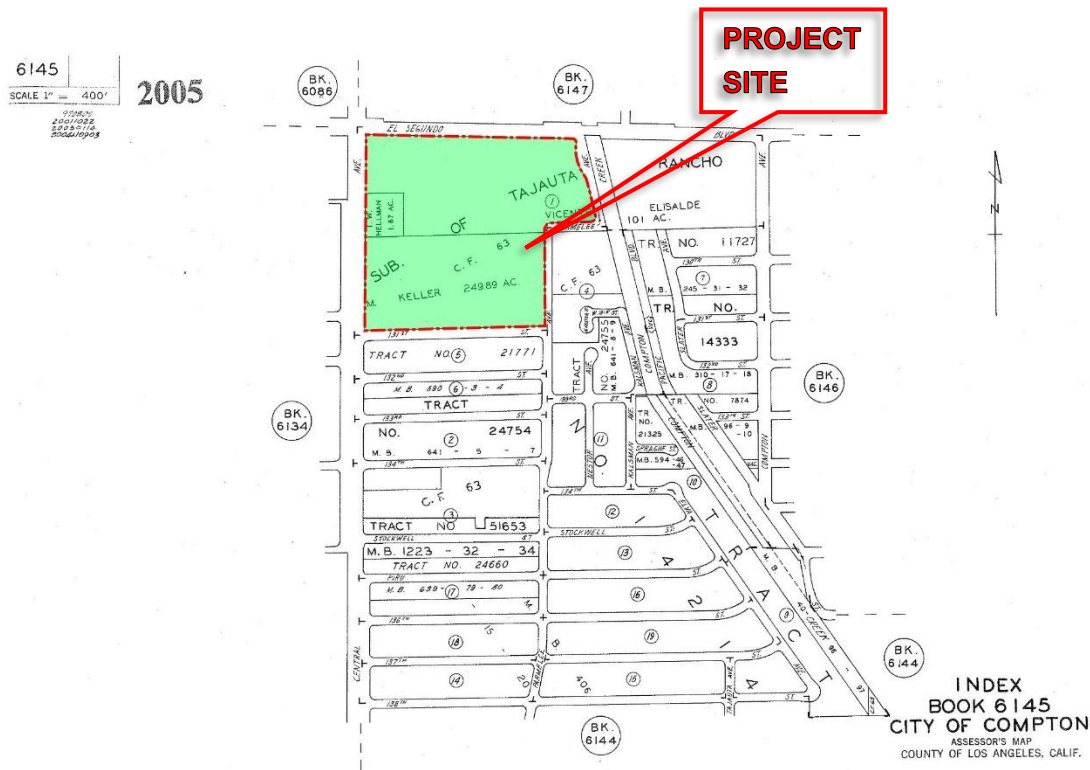


Figure 2. Project Site Assessor's Map

2.3 Existing Site Condition and Storm Drainage System

2.3.1 Existing Site Improvements

The pre-development area is currently 43% impervious and 57% pervious. The existing site currently consists of school buildings, a surface parking lot, football field, baseball field and athletic courts.

2.3.2 Existing Drainage Pattern

On-site surface drainage currently flows through low points or catch basins, which then discharge into existing storm drain. There is a total of five (5) side-opening catch basins located at the sidewalk: two (2) along W El Segundo Blvd which is connected

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into the City's main storm drain line, two (2) along Central Avenue, and one (1) along Parmelee Avenue. The street flowline along the project site is sloping with elevations ranging from approximately 85.58 ft. to 96.76 ft. MSL.

2.3.3 Existing Drainage Structures

As shown in the As-Built Drawings (Appendix II), a 102-inch diameter RCP storm drain owned by Los Angeles County Flood Control District is located along W El Segundo Blvd, with its plan and profile in Appendix II based on County as-built records. A 48-inch diameter RCP storm drain, owned by the City of Compton, is also present along W El Segundo Blvd. Additionally, a 54-inch diameter RCP storm drain owned by Los Angeles County Flood Control District is located along Central Avenue, with its plan and profile also shown in Appendix II. All storm drain lines are maintained by the Los Angeles County Flood Control District (LACFCD).

2.3.4 Estimated Capacity of existing 102" Dia. RC Pipe

A request of information, regarding the connection to the 102" dia. RCP main stormdrain line, will be submitted to Public Works Hydraulic Analysis Unit to determine the allowable flow rate. LA County has placed restrictions on runoff that enters into their system. The County will provide an allowable flow rate after review of the project and the existing storm drain system's capacity.

2.4 Proposed Site Condition and Storm Drainage System

2.4.1 Proposed Site Development Area

The total proposed development area is 32.26 acres. The impervious area will be 18.57 acres at 58% and the pervious area is 13.69 acres at 42% of the total site.

The proposed development includes new asphalt-paved driveway aisles and parking lots located on the north, west, and south sides of the site, as well as new concrete pavement and a driveway aisle on the east side along Parmelee Avenue. The project also features new school buildings, athletic facilities including softball, baseball, practice football, and football fields, basketball and tennis courts, a new swimming

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pool, and landscaped areas. Refer to Appendix VI for the proposed site plan.

2.4.2 Proposed Drainage System

This section will describe the stormwater management approach for the Centennial High School.

Determination of the tributary areas of the site was the first order of the approach. Grading, Utility, and Roof Plans were analyzed to delineate the site into two (2) major tributary areas (see Figure 4). These two major areas have been subdivided into one hundred ninety-six (196) separate tributary areas. One hundred fourteen (114) tributary areas belong to the north portion while the remaining eighty-two (82) tributary areas are under the south portion. The composition of the imperviousness and perviousness of the tributary areas was the second order of the approach, as such, the site plan was analyzed to determine these values. A spreadsheet was developed to record the gross area, impervious area of each tributary area. Appendix V shows the spreadsheet of the site area delineations.

Since the project site was divided into two major tributary areas, a storm drain system was assigned to each one. Each system will have a detention tank and Maxwell system. Storm water runoff will be collected via catch basins, area drains, and trench drains, conveyed to the intended detention tank for storage then discharge into the Maxwell drywell system. Storm water exceeding the 85th percentile, 24-hour storm event will be collected via overflow pipes. The overflow will bypass the Maxwell and directly connect into the sump pump then conveyed directly into the proposed outfall to the LACFCD storm drainage system.

Each system will have its own connection into the existing LACFCD 102" dia. RCP storm drain line, which runs along W El Segundo Blvd (see Appendix I). The utility plan (see Appendix VII) will show two (2) proposed outfall connections that are both located near northeast of the project site.

Outfall 1 is on the northeast side of the project site and will be sized to the allowable flow rate as imposed by the County. The onsite storm drain system associated with

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Outfall 1, which will be identified as South System, will collect the stormwater runoff (Appendix IV) from the southern side of the project site. The South System is composed of one (1) bio-retention system, one (1) detention tank, and one (1) drywell system. Runoff will be collected via sheet flow, roof drains, and inlets located at low points and conveyed to their respective LID BMP. A detention tank is implemented onsite since the drywell system cannot accommodate the 85th percentile volume of the north portion. Both the treated and overflow stormwater runoff from the combined detention tank and drywell system, and the Silva Cell bio-retention system will be diverted into a sump pump which is connected to the outfall.

Outfall 2 is also situated at the northeast portion of the site and will be sized to the allowable flow rate as imposed by the County. The onsite storm drain system associated with outfall 2, which will be identified as the North System, will be collecting the stormwater runoff from the entire north portion of the project site. Runoff will be collected via sheet flow, roof drains, and inlets located at low points and conveyed to the north system's detention tank then into the drywell system. A detention tank is implemented onsite since there will be a circumstance wherein the drywell system cannot accommodate the 85th percentile volume of the north portion. A 10" dia. outlet pipe is designed using the 85th percentile storm event; therefore, it will retain water before discharging into drywell system. An overflow pipe of 36" dia. has been added to the tank to be discharging directly into the pump then into the outfall.

All storm drain pipes that will be discharging into the LACFCD storm drain system will be sized accordingly. For Site Hydraulic Calculation refer to Section 4. See Appendix IX for sample calculations.

Approval from the LACFCD will be obtained for the proposed connections.

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3. PROJECT HYDROLOGY

3.1 Hydrology Data

3.1.1 Design Frequency

Drainage design calculations are based on a 25-year frequency storm event, according to Section 4.3 Urban Flood Protection of the 2006 Los Angeles County Hydrology Manual.

3.1.2 Rainfall Depth

Based on the Isohyetal Map, the rainfall for the project site falls between 5.8 inches and 6.0 inches. The rainfall used for the project site is 5.9 inches for a 50-year, 24-hour storm event and 5.18 inches for a 25-year, 24-hour storm event (Appendix III).

3.1.3 Percentage of Imperviousness

The percentage of imperviousness for the post-development project is approximately 58% of the total area and is shown in Appendix VIII.

3.2 Stormwater Discharge for the Existing Site

The stormwater runoff currently produced by the pre-development site was calculated using the software HydroCalc provided by the LA County Department of Public Works. Appendix IV displays the stormwater runoff flow and volume based on a 25-year, 24-hour storm event. The existing site produces an estimated total of 291,780 cubic feet of stormwater at a peak flow rate of 82.36 cfs.

3.3 Stormwater Discharge for the Proposed Site

The stormwater runoff currently produced by the post-development site was calculated using the software HydroCalc provided by the LA County Department of Public Works. Appendix IV shows the stormwater run-off flow and volume based on a 25-year, 24-hour storm event. The post-development site produces an estimated total of 357,482 cubic feet

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of stormwater at a peak flow rate of 82.36 cfs.

3.3.1 Runoff flow and Volume

Refer to Table 2, for the comparison of both the proposed and existing storm water discharge for a 25-yr, 24-hr storm event.

Site Condition	Runoff Volume (cubic ft.)	Peak Flow Rate (cfs)
Existing	291,780	82.36
Proposed	357,482	82.36

Table 2 – Proposed and Existing 25-yr, 24hr Stormwater Discharge

3.3.2 Tributary Areas

The project site was divided into two (2) primary tributary areas to show its flow distribution among the LID BMPs integrated into the site (see Figure 4). The main tributary areas were then divided into a total of one hundred ninety-six (196) catchment areas, based on uniformity in drainage conditions for the new site improvements (see Figure 4). Each catchment area is corresponding to its flow distribution into stormdrain inlets (trench drains, catch basins, and area drains).

4. PROJECT SITE HYDRAULIC CALCULATIONS

4.1 Basis of Design

The analysis of the hydraulic characteristic of the storm drain system was performed using the HydroCalc Method Version 1.0.3, Manning's Equation was used to determine the velocity and flow capacities, and the design of the stormwater management system is designed based on the LA County Hydrology manual.

Slope on concrete pavement shall have minimum slope of 0.50%, the slope on AC pavement shall have the minimum slope of 0.70%. Pipe was designed to have minimum

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slope of 0.50%. Pipe's sizing has considered 75% d/D ratio.

Stormwater collection inlet drainage has been sized to reflect 75% clog factor, which means the inlet is able to allow weir flow of the peak flow of the 25-year storm event of its tributary area when 75% of the its perimeter has been clogged or blocked.

All of the tributary areas have stormwater collection inlet and a combination of slope of surface, drainage gutter, detention pipes, collection catch basin, trench drain and underground pipes are used to ensure the treatment of the project site's stormwater.

4.2 Site Drainage Design

With the aid of the Pipe Sizing spreadsheet shown in Appendix V, the proposed storm drain pipes were sized to a 25-year storm frequency. The type of pipe is classified as HDPE storm drain line ranging from 6" diameter to 36" diameter. The HDPE pipes have a Manning's roughness coefficient of 0.012. All calculations for the pipe design are included in Appendix V.

The project's drainage design shall be divided into two (2) storm drain systems (see Figure 4) that will both be discharging into the main street line.

Per County of Los Angeles Low Impact Development (LID) Standards Manual (2009), Best Management Practice (BMPs) should be implemented in the following hierarchy: infiltration, bio-filtration, capture and use, and combination of the above three BMPs.

Since infiltration is feasible, based on the percolation test conducted dated July 14, 2025 (see Appendix X), the project's BMP will be a drywell. While each system will have its own designated Maxwell Drywell system to collect and infiltrate water runoff into the ground, a detention tank will also be used to store the rest of the volume for the 85th percentile storm event.

For the south portion, a combination of BMP's will be used. One (1) Silva Cell system, biofiltration BMP, will also be implemented to treat the plaza area between, Building C and Building D.

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The pump is located right before the on-site stormwater goes into the LACFCD's existing storm drain manhole situated along the W El Segundo Blvd.

An information request will need to be submitted to the Los Angeles County Public Works design division. An allowable flow rate discharge to the LACFCD's storm drain system will be appointed to the site project.

There are total of one hundred ninety-six (196) tributary areas in the proposed project site which are considered for drainage design in the site (see Figure 5). The tributary areas allow stormwater to sheet flow to the collection inlet then goes into underground storm water pipe system. The 24-hr clear runoff volume from the 85th-percentile storm event (in this project site, the 85th-percentile storm is greater than the 0.75 inch storm event) will be treated by the LID BMPs.

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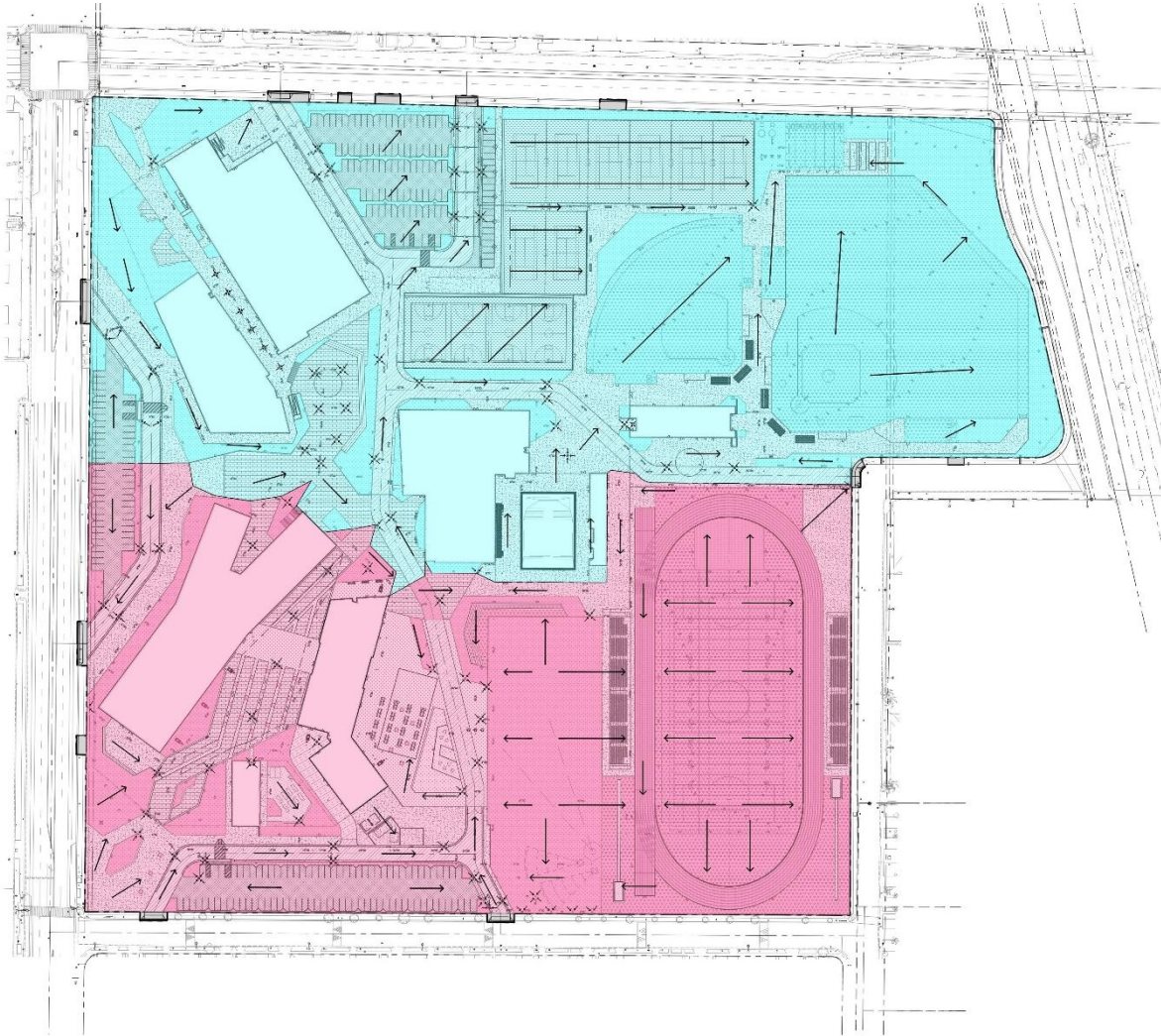


Figure 4: Primary Tributary of SD Catchment Areas of the Proposed Site

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Figure 5: Tributary of SD Catchment Areas of the Proposed Site

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5. HYDRAULIC CALCULATION OF THE STORM DRAINAGE SYSTEM

5.1 Storm Drainage Pipe

The pipe sizing procedure is conducted as follows, first we determine the tributary areas for each segment of the major pipes. The tributary areas generated peak flow was combined into one peak flow for each segment of the pipes. There are individual pipes in the underground pipe system of the project site. The three hundred fifty (350) pipes in the drainage system was label from B1 to B62 including some labeled as B16A, B16B, etc. as shown in Figure Appendix V: SD Diagram.

The three hundred fifty (350) stormdrain pipes sizing design peak flow from 25-year storm is designed separately as where it is located at the project site. See Appendix V for the pipe sizing summary.

These pipes are then sized using Manning equation to determine based on their slope, diameter and d/D ratio (75% being used in this project). The sizing of the pipe is determined so that the design velocity is larger than 2 feet/s and the pipe's allowable flow capacity is larger than the peak flow rate of 25-year design stormwater goes into the pipe. Refer to Appendix V for the summary of the pipe sizing calculation.

5.2 Storm Drainage Catch Basin

The catch basin sizing procedure is conducted as follows: first, we determine the tributary areas for each drainage catchment inlets. Then, there are seventy-four (74) catch basins established on site. The longest flow path length was generated from high point to low point of each catchment area. The value of slope was generated by the ratio of change in elevation (high to low) to flow path length. The imperviousness per tributary areas were calculated based on each tributary areas. Lastly, the value for the peak flow rate (cfs) for each catch basin was calculated. The values obtained per procedures are summarized as below in Table 4.

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Table 4: Summary of Values to obtain the peak flow rate per catch basin.

Catch basin sizing requires the value of peak flow rate including the A_o (minimum area require for outflow pipe), catch basin design size, area of the Outflow Pipe, A_g (design are of grating opening), and % opening of grate. Table 5 shows the relationship of these said values.

Table 5: Summarization of Catch Basin Sizing

Formulas used in relation for the computations of catch basin sizing are as follows;

Minimum area Required Equation

$$Q = C \times A_o \times (2gh)^{1/2}$$

$$A_o = Q / [C \times (2gh)^{1/2}]$$

Runoff Coefficient (C) = 0.90 → Per data on HydroCalc

Gravitational Constant (g) = 32.2 ft/s²

Grate Opening Check

Design Area of Grate Opening (A_g) = % Opening x Gross Area of Grate

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Appendix I

EXISTING LACFCD 102" DIA. RCP

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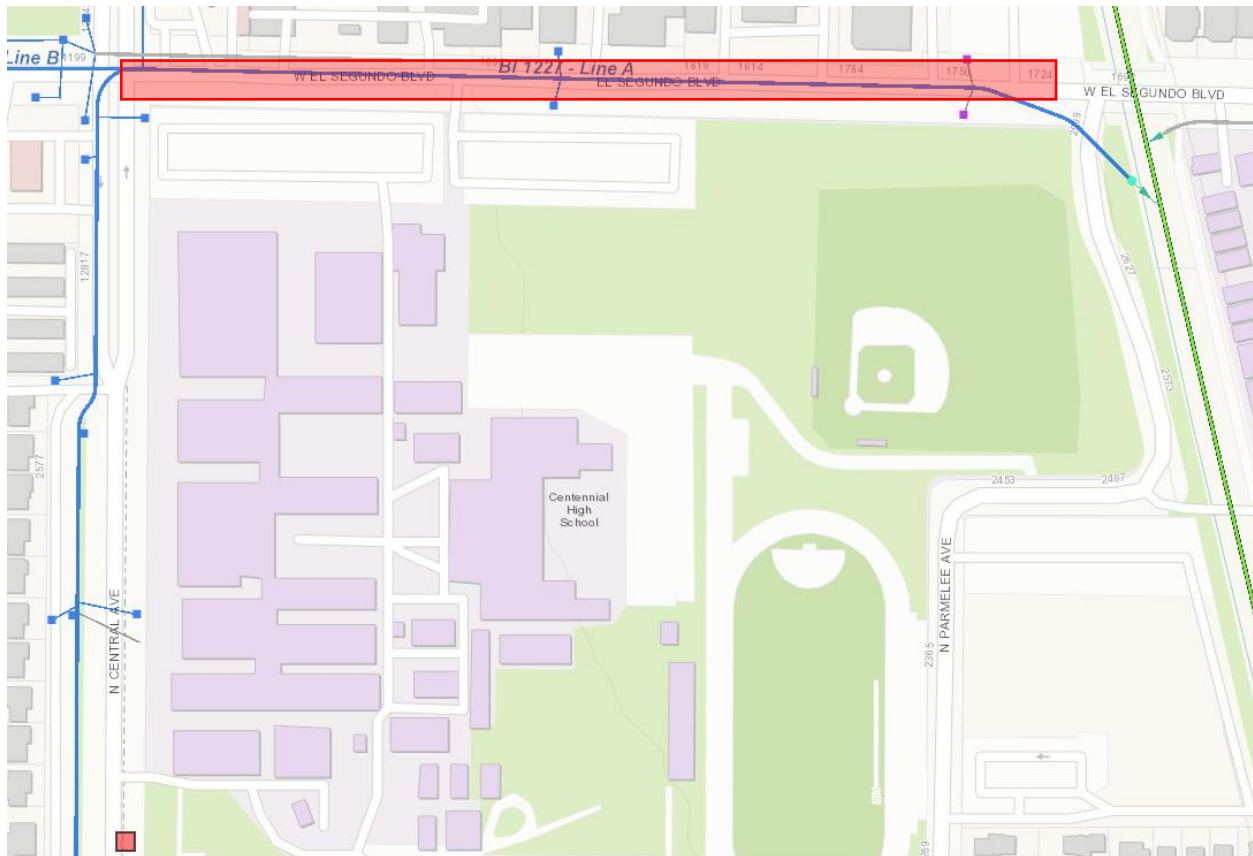
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Los Angeles County Storm Drain System: LACFCD 102" dia. RCP along the W El Segundo Blvd



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Appendix II

HYDRAULICS ANALYSIS REPORT - RESULT

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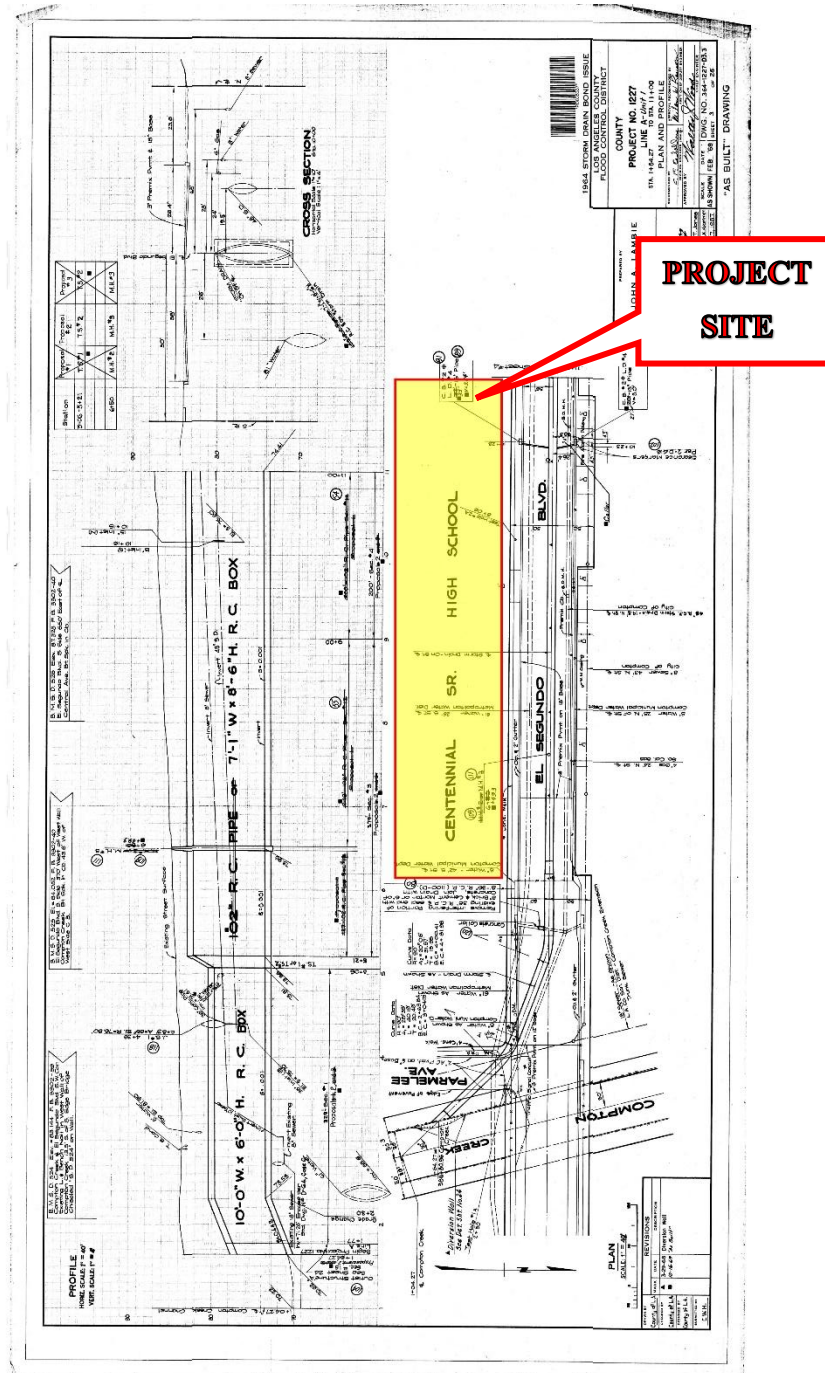
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LA County Stormdrain Line – North of the Site



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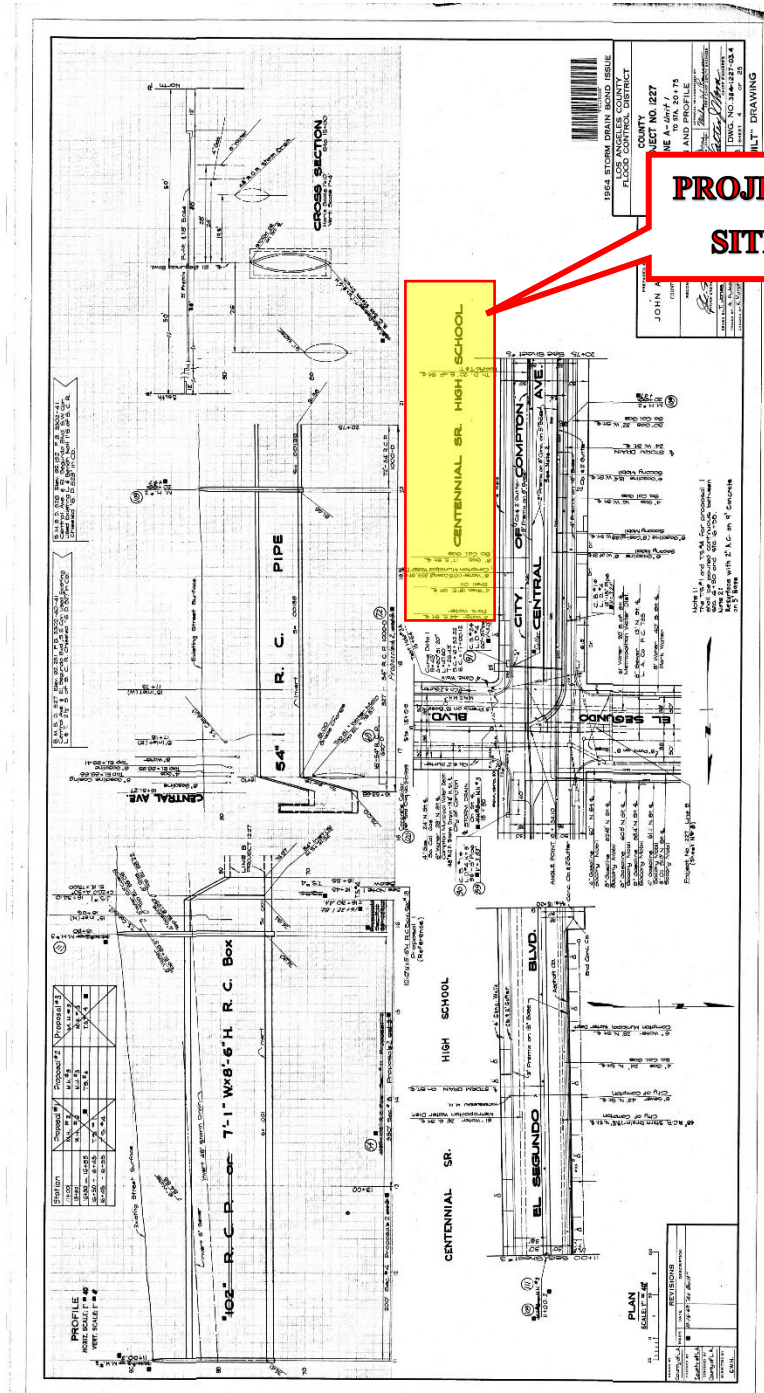
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PROJECT SITE



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**LOS ANGELES COUNTY
PUBLIC WORKS**
DESIGN DIVISION – HYDRAULIC ANALYSIS UNIT

INFORMATION REQUEST INSTRUCTIONS

1. Please fill out the Information Request Summary on page 2 of this PDF form. **The fields marked with an asterisk are required.** At the bottom are buttons that you may use to Save and/or Print the form. Please save the form and email it as an attachment with "Information Request" in the subject line along with any other attachments for requests as described in items 2 - 4 below. Address the email to hydraulicinfo@dpw.lacounty.gov. Please note that an incomplete form will cause a delay in processing.
2. Include the as-built drawing showing the proposed connection location and identify the station or catch basin at the proposed connection. Most as-built drawings can be obtained from the following website: <http://dpw.lacounty.gov/des/plans/>. Please make sure that you select the Drainage tab prior to searching. The Los Angeles County Storm Drain System website <http://dpw.lacounty.gov/fcd/stormdrain/> is also a useful reference.
3. A project Location Map is required with your submission. The Location Map can be made using Google Maps. Please shade the area with your proposed improvements on the location map, including any offsite areas draining into this area, and attach it with your email request. Alternatively you can use an assessor map as your location map while still adhering to the above instructions. You can obtain the assessor map from <http://assessor.lacounty.gov/homeowners/property-search>.
4. In addition, submit a preliminary sketch or plan showing any proposed improvements in the areas you indicated on the assessor map.

**If you have any questions, contact Design Division staff via email
at hydraulicinfo@dpw.lacounty.gov or at (626) 458-7806**

BELOW SECTION TO BE COMPLETED BY THE HYDRAULIC ANALYSIS UNIT

REFERENCES SEARCHED:	
RESPONSE:	

INFORMATION PROVIDED BY: **Date:**

INFORMATION REVIEWED BY: **Date:**

revised 11/29/2022

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**LOS ANGELES COUNTY
PUBLIC WORKS
DESIGN DIVISION – HYDRAULIC ANALYSIS UNIT
INFORMATION REQUEST SUMMARY**

INFORMATION REQUESTED BY	
*Requester's Name: <u>AMMI MEZA</u>	
*Company: <u>VCA ENGINEERS INC.</u>	
*Phone Number: <u>323-729-6098</u>	Date: <u>7/29/2025</u>
*Email: <u>AMMI.MEZA@VCAENG.COM</u>	
Intended Use: <u>TO DISCHARGE ONSITE STORM WATER INTO LACFCD SD SYSTEM</u>	
Proposed Project Type: <u>HIGH SCHOOL</u>	Acreage Involved: <u>32.3</u>
*Will information be used in any litigation? ☐ YES ☒ NO	
Case Info. Name: _____	No: _____ Location: _____
INFORMATION NEEDED: ☐ Location Map Attached ☒ Plans Attached	
LACFCD Facility: Name: <u>EXISTING LACFCD 102" RCP PROJECT NO. 1227</u>	
Unit: <u>1</u>	Line: <u>A</u>
City: <u>COMPTON</u>	Station: <u>6+49.3, 6+69.6</u>
Address: <u>W EL SEGUNDO BLVD</u>	
*Street/Cross-street: <u>EL SEGUNDO BLVD./N C</u>	
REQUEST INFORMATION: (please select all that apply)	☒ HYDROLOGY ☒ HYDRAULICS ☒ ALLOWABLE Q (DISCHARGE)
Additional Info Requested:	

revised 11/29/2022

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Appendix III

RAINFALL DATA

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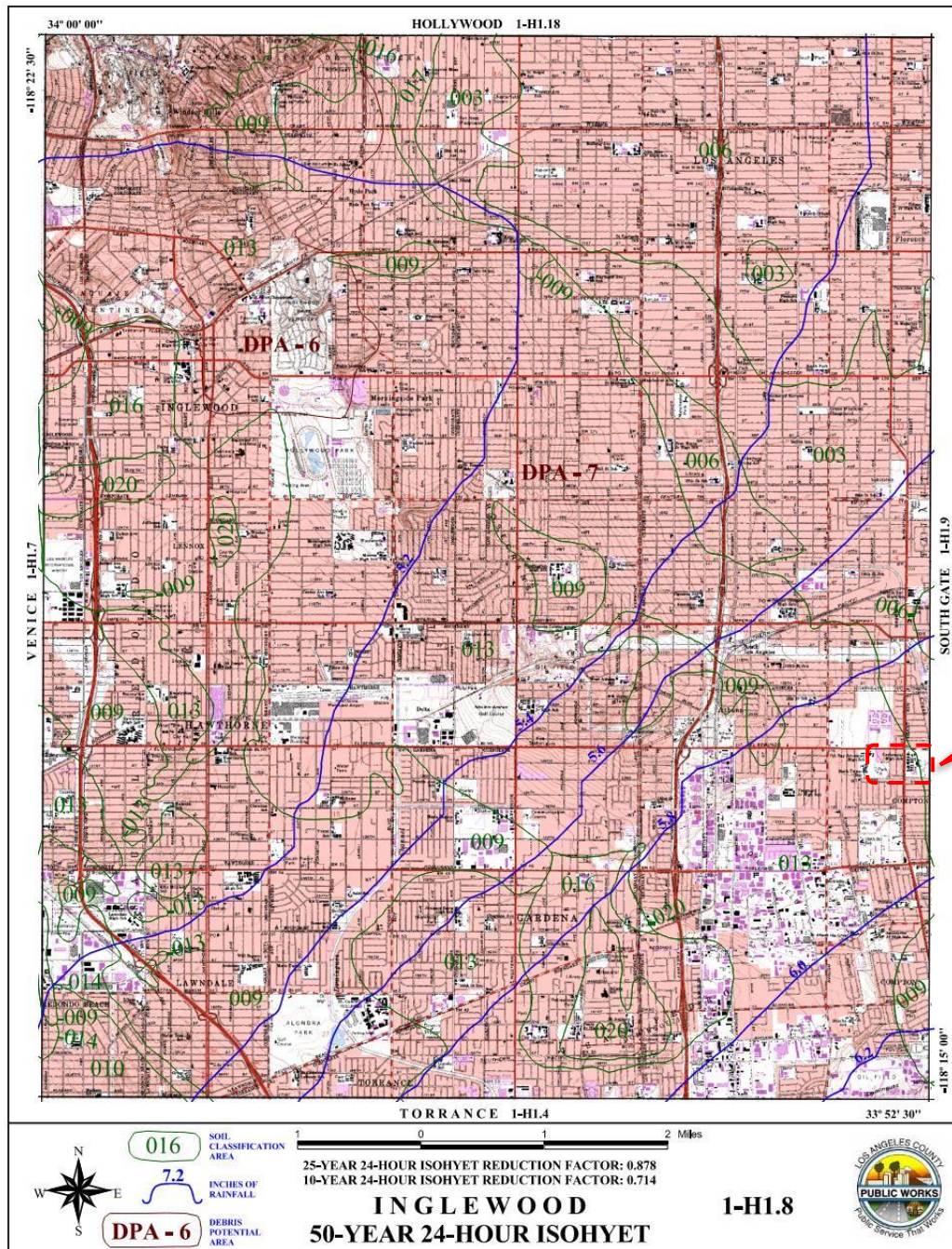
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Hydrologic Map: 50-year 24-hour Rainfall Isohyetal



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Appendix IV

HYDROCALC OUTPUT

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Existing storm water discharge at 25-yr storm event

Peak Flow Hydrologic Analysis

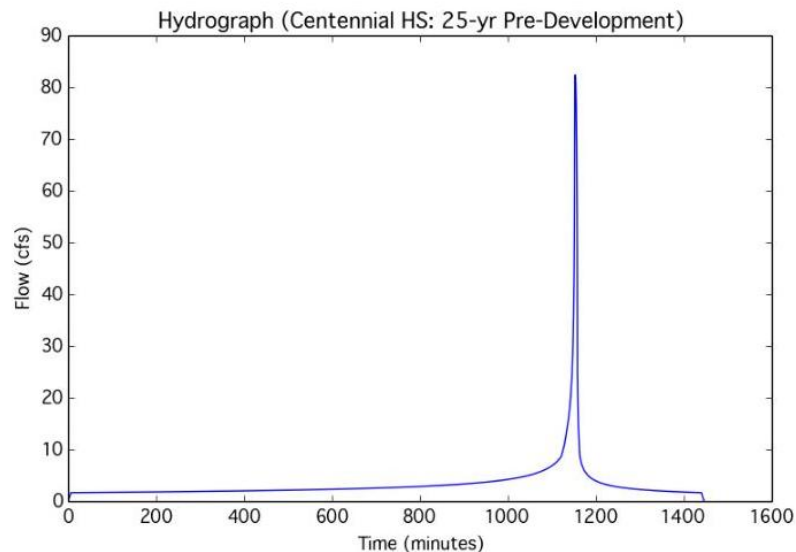
File location: //VCA-SERVER1/Civil Los Angeles/VCA Projects/2025 VCA PROJECTS/3365-125_Centennial High School/Calcs/LID CALCS/Centre
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Centennial HS
Subarea ID	25-yr Pre-Development
Area (ac)	32.26
Flow Path Length (ft)	500.0
Flow Path Slope (vft/hft)	0.05
50-yr Rainfall Depth (in)	5.9
Percent Impervious	0.43
Soil Type	13
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1802
Peak Intensity (in/hr)	2.8368
Undeveloped Runoff Coefficient (Cu)	0.9
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	82.3648
Burned Peak Flow Rate (cfs)	82.3648
24-Hr Clear Runoff Volume (ac-ft)	6.6983
24-Hr Clear Runoff Volume (cu-ft)	291779.9062



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Proposed storm water discharge at 25-yr storm event

Peak Flow Hydrologic Analysis

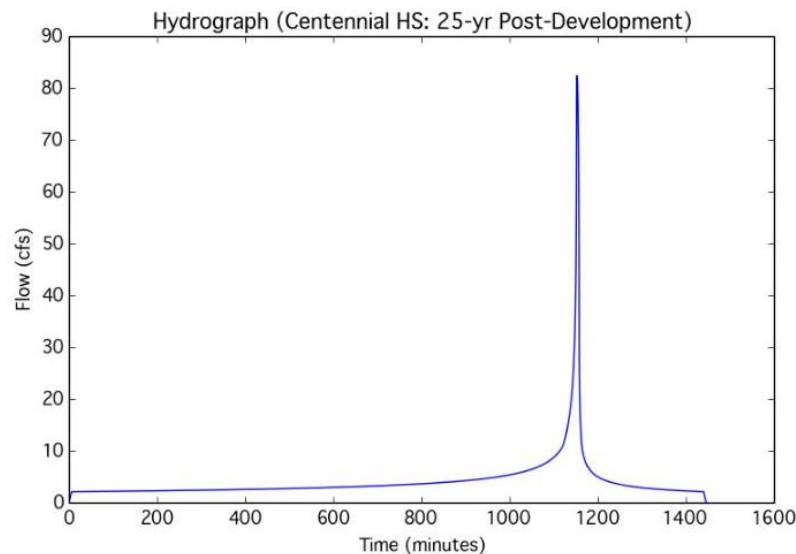
File location: //VCA-SERVER1/Civil Los Angeles/VCA Projects/2025 VCA PROJECTS/3365-125_Centennial High School/Calcs/LID CALCS/Cent
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Centennial HS
Subarea ID	25-yr Post-Development
Area (ac)	32.26
Flow Path Length (ft)	500.0
Flow Path Slope (vft/hft)	0.05
50-yr Rainfall Depth (in)	5.9
Percent Impervious	0.58
Soil Type	13
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1802
Peak Intensity (in/hr)	2.8368
Undeveloped Runoff Coefficient (Cu)	0.9
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	82.3648
Burned Peak Flow Rate (cfs)	82.3648
24-Hr Clear Runoff Volume (ac-ft)	8.2067
24-Hr Clear Runoff Volume (cu-ft)	357481.8206



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Outfall 1 discharge at 25-yr storm event

Peak Flow Hydrologic Analysis

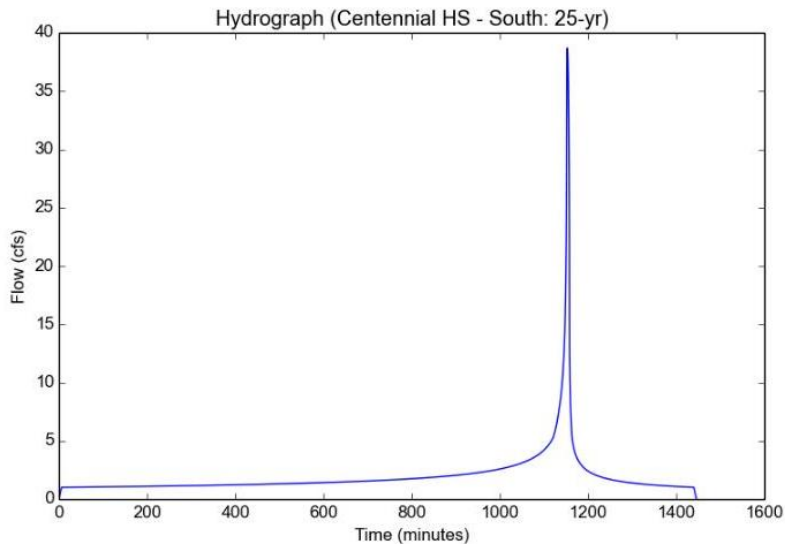
File location: //VCA-SERVER1/Civil Los Angeles/VCA Projects/2025 VCA PROJECTS/3365-125_Centennial High School/Calcs/LID CALCS/Ce
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Centennial HS - South
Subarea ID	25-yr
Area (ac)	15.15
Flow Path Length (ft)	500.0
Flow Path Slope (vft/hft)	0.05
50-yr Rainfall Depth (in)	5.9
Percent Impervious	0.6
Soil Type	13
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1802
Peak Intensity (in/hr)	2.8368
Undeveloped Runoff Coefficient (Cu)	0.9
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	38.6803
Burned Peak Flow Rate (cfs)	38.6803
24-Hr Clear Runoff Volume (ac-ft)	3.9485
24-Hr Clear Runoff Volume (cu-ft)	171995.2712



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Outfall 2 discharge at 25-yr storm event

Peak Flow Hydrologic Analysis

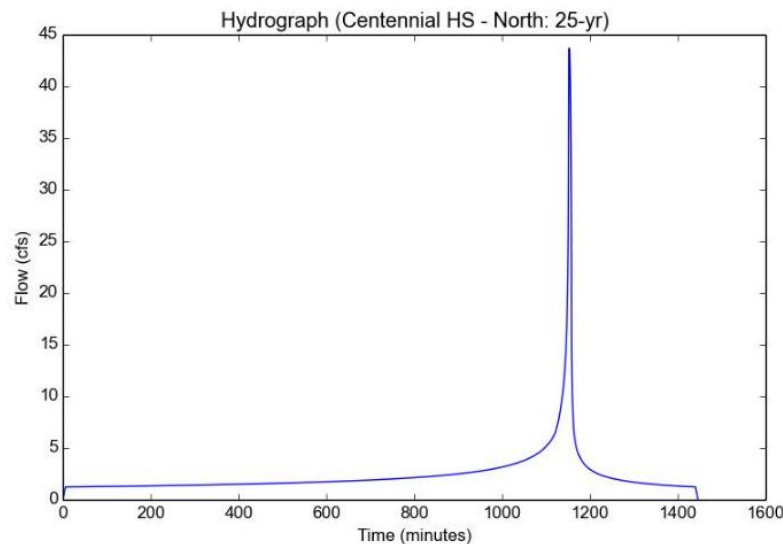
File location: //VCA-SERVER1/Civil Los Angeles/VCA Projects/2025 VCA PROJECTS/3365-125_Centennial High School/Calcs/LID CALCS/Cer
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Centennial HS - North
Subarea ID	25-yr
Area (ac)	17.11
Flow Path Length (ft)	500.0
Flow Path Slope (vft/hft)	0.05
50-yr Rainfall Depth (in)	5.9
Percent Impervious	0.66
Soil Type	13
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.1802
Peak Intensity (in/hr)	2.8368
Undeveloped Runoff Coefficient (Cu)	0.9
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	43.6845
Burned Peak Flow Rate (cfs)	43.6845
24-Hr Clear Runoff Volume (ac-ft)	4.7793
24-Hr Clear Runoff Volume (cu-ft)	208185.5493



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Appendix V

PIPE SIZING CALCULATIONS

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Pipe Sizing Summary (North System)

VCA Engineers, Inc.		Pipe Size and Cleaning Velocity Calculations			
Client:		Job No.:	3365		
Project:	Centennial High School	Date:	-		
		Engineer:			
SD	Peak Demand (cfs)	Pipe Size (in)	Pipe Slope	Flow Velocity Check	Flow Rate Check
SD1	0.30	6	0.50%	YES	YES
SD2	0.34	6	0.50%	YES	YES
SD3	0.70	8	0.50%	YES	YES
SD4	0.24	6	0.50%	YES	YES
SD5	1.13	10	0.50%	YES	YES
SD6	1.83	12	0.50%	YES	YES
SD7	0.10	6	0.50%	YES	YES
SD8	1.93	12	0.50%	YES	YES
SD9	0.73	8	0.50%	YES	YES
SD10	2.66	12	0.50%	YES	YES
SD11	0.20	6	0.50%	YES	YES
SD12	2.86	15	0.50%	YES	YES
SD13	0.08	6	0.50%	YES	YES
SD14	2.94	15	0.50%	YES	YES
SD15	0.02	6	0.50%	YES	YES
SD16	1.03	10	0.50%	YES	YES
SD17	1.05	10	0.50%	YES	YES
SD18	0.31	6	0.50%	YES	YES
SD19	1.37	10	0.50%	YES	YES
SD20	4.31	15	0.50%	YES	YES
SD21	0.37	6	0.50%	YES	YES
SD22	0.21	6	0.50%	YES	YES
SD23	0.91	8	0.50%	YES	YES
SD24	1.28	10	0.50%	YES	YES
SD25	4.76	15	0.50%	YES	YES
SD26	0.24	6	0.50%	YES	YES
SD27	5.00	18	0.50%	YES	YES
SD28	0.22	6	0.50%	YES	YES
SD29	5.22	18	0.50%	YES	YES
SD30	6.50	18	0.50%	YES	YES
SD31	0.03	6	0.50%	YES	YES
SD32	6.53	18	0.50%	YES	YES
SD33	0.02	6	0.50%	YES	YES
SD34	0.33	6	0.50%	YES	YES
SD35	0.35	6	0.50%	YES	YES
SD36	6.87	18	0.50%	YES	YES
SD37	0.01	6	0.50%	YES	YES

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SD38	6.89	18	0.50%	YES	YES
SD39	6.89	18	0.50%	YES	YES
SD40	4.42	15	0.50%	YES	YES
SD41	0.33	6	0.50%	YES	YES
SD42	0.38	6	0.50%	YES	YES
SD43	3.42	15	0.50%	YES	YES
SD44	0.43	6	0.50%	YES	YES
SD45	2.99	15	0.50%	YES	YES
SD46	0.56	8	0.50%	YES	YES
SD47	2.43	12	0.50%	YES	YES
SD48	0.08	6	0.50%	YES	YES
SD49	2.35	12	0.50%	YES	YES
SD50	0.19	6	0.50%	YES	YES
SD51	2.16	12	0.50%	YES	YES
SD52	0.08	6	0.50%	YES	YES
SD53	2.08	12	0.50%	YES	YES
SD54	0.56	8	0.50%	YES	YES
SD55	1.51	10	0.50%	YES	YES
SD56	0.07	6	0.50%	YES	YES
SD57	1.44	10	0.50%	YES	YES
SD58	0.06	6	0.50%	YES	YES
SD59	1.38	10	0.50%	YES	YES
SD60	0.29	6	0.50%	YES	YES
SD61	1.08	10	0.50%	YES	YES
SD62	0.63	8	0.50%	YES	YES
SD64	0.07	6	0.50%	YES	YES
SD65	0.53	8	0.50%	YES	YES
SD66	0.28	6	0.50%	YES	YES
SD67	0.11	6	0.50%	YES	YES
SD68	0.39	6	0.50%	YES	YES
SD69	0.00	6	0.50%	YES	YES
SD70	6.89	18	0.50%	YES	YES
SD71	0.11	6	0.50%	YES	YES
SD72	7.00	18	0.50%	YES	YES
SD73	0.09	6	0.50%	YES	YES
SD74	0.79	8	0.50%	YES	YES
SD75	0.42	6	0.50%	YES	YES
SD76	1.22	10	0.50%	YES	YES
SD77	0.66	8	0.50%	YES	YES
SD78	1.87	12	0.50%	YES	YES
SD79	0.18	6	0.50%	YES	YES
SD80	2.05	12	0.50%	YES	YES

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SD81	0.17	6	0.50%	YES	YES
SD82	2.22	12	0.50%	YES	YES
SD83	0.17	6	0.50%	YES	YES
SD84	2.39	12	0.50%	YES	YES
SD85	0.04	6	0.50%	YES	YES
SD86	0.03	6	0.50%	YES	YES
SD87	0.07	6	0.50%	YES	YES
SD88	0.06	6	0.50%	YES	YES
SD89	0.13	6	0.50%	YES	YES
SD90	0.15	6	0.50%	YES	YES
SD91	0.28	6	0.50%	YES	YES
SD92	2.67	12	0.50%	YES	YES
SD93	0.16	6	0.50%	YES	YES
SD94	0.25	6	0.50%	YES	YES
SD95	2.92	15	0.50%	YES	YES
SD96	0.20	6	0.50%	YES	YES
SD97	3.12	15	0.50%	YES	YES
SD98	0.19	6	0.50%	YES	YES
SD99	3.31	15	0.50%	YES	YES
SD100	0.24	6	0.50%	YES	YES
SD101	0.08	6	0.50%	YES	YES
SD102	3.63	15	0.50%	YES	YES
SD103	0.33	6	0.50%	YES	YES
SD104	3.96	15	0.50%	YES	YES
SD105	0.45	8	0.50%	YES	YES
SD106	0.33	6	0.50%	YES	YES
SD107	0.78	8	0.50%	YES	YES
SD108	0.15	6	0.50%	YES	YES
SD109	0.93	10	0.50%	YES	YES
SD110	0.13	6	0.50%	YES	YES
SD111	1.05	10	0.50%	YES	YES
SD112	0.16	6	0.50%	YES	YES
SD113	1.22	10	0.50%	YES	YES
SD114	5.18	18	0.50%	YES	YES
SD115	0.41	6	0.50%	YES	YES
SD116	5.59	18	0.50%	YES	YES
SD117	0.08	6	0.50%	YES	YES
SD118	5.67	18	0.50%	YES	YES
SD119	0.31	6	0.50%	YES	YES
SD120	5.98	18	0.50%	YES	YES
SD121	0.20	6	0.50%	YES	YES
SD122A	0.05	6	0.50%	YES	YES
SD122B	0.25	6	0.50%	YES	YES

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SD123	0.94	10	0.50%	YES	YES
SD124	1.19	10	0.50%	YES	YES
SD125	0.10	6	0.50%	YES	YES
SD126	1.29	10	0.50%	YES	YES
SD127	0.24	6	0.50%	YES	YES
SD128	1.53	10	0.50%	YES	YES
SD129	0.20	6	0.50%	YES	YES
SD130	1.73	12	0.50%	YES	YES
SD131	7.71	18	0.50%	YES	YES
SD132	0.02	6	0.50%	YES	YES
SD133	0.07	6	0.50%	YES	YES
SD134	7.78	18	0.50%	YES	YES
SD135	0.44	8	0.50%	YES	YES
SD136	8.22	24	0.50%	YES	YES
SD137	0.21	6	0.50%	YES	YES
SD138	8.43	24	0.50%	YES	YES
SD139	15.42	24	0.50%	YES	YES
SD140	0.17	6	0.50%	YES	YES
SD141	15.59	24	0.50%	YES	YES
SD142	0.21	6	0.50%	YES	YES
SD143	15.80	24	0.50%	YES	YES
SD144	0.21	6	0.50%	YES	YES
SD145	16.01	24	0.50%	YES	YES
SD146	0.07	6	0.50%	YES	YES
SD147	0.11	6	0.50%	YES	YES
SD148	0.17	6	0.50%	YES	YES
SD149	0.27	6	0.50%	YES	YES
SD150	0.17	6	0.50%	YES	YES
SD151	0.44	8	0.50%	YES	YES
SD152	1.40	10	0.50%	YES	YES
SD153	1.84	12	0.50%	YES	YES
SD154	0.19	6	0.50%	YES	YES
SD155	2.03	12	0.50%	YES	YES
SD156	0.32	6	0.50%	YES	YES
SD157	2.34	12	0.50%	YES	YES
SD158	0.08	6	0.50%	YES	YES
SD159	2.42	12	0.50%	YES	YES
SD160	0.21	6	0.50%	YES	YES
SD161	2.63	12	0.50%	YES	YES
SD162	18.64	30	0.50%	YES	YES
SD163	0.18	6	0.50%	YES	YES
SD164	18.82	30	0.50%	YES	YES
SD165	0.74	8	0.50%	YES	YES

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SD166	19.56	30	0.50%	YES	YES
SD167	0.23	6	0.50%	YES	YES
SD168	19.79	30	0.50%	YES	YES
SD169	0.10	6	0.50%	YES	YES
SD170	19.89	30	0.50%	YES	YES
SD171	0.03	6	0.50%	YES	YES
SD172	19.91	30	0.50%	YES	YES
SD173	0.10	6	0.50%	YES	YES
SD174	0.10	6	0.50%	YES	YES
SD175	0.20	6	0.50%	YES	YES
SD176	20.11	30	0.50%	YES	YES
SD177	0.26	6	0.50%	YES	YES
SD178	20.37	30	0.50%	YES	YES
SD179	0.33	6	0.50%	YES	YES
SD180	0.60	8	0.50%	YES	YES
SD181	20.97	30	0.50%	YES	YES
SD182	0.43	6	0.50%	YES	YES
SD183	0.17	6	0.50%	YES	YES
SD184	4.41	15	0.50%	YES	YES
SD185	4.48	15	0.50%	YES	YES
SD186	4.55	15	0.50%	YES	YES
SD187	4.65	15	0.50%	YES	YES
SD188	4.69	15	0.50%	YES	YES
SD189	25.66	30	0.50%	YES	YES
SD190	0.04	6	0.50%	YES	YES
SD191	25.70	30	0.50%	YES	YES
SD192	0.07	6	0.50%	YES	YES
SD193	0.13	6	0.50%	YES	YES
SD194	25.83	30	0.50%	YES	YES
SD195	3.56	15	0.50%	YES	YES
SD196	29.38	30	0.50%	YES	YES
SD197	1.71	12	0.50%	YES	YES
SD198A	2.67	12	0.50%	YES	YES
SD198B	6.98	18	0.50%	YES	YES
SD199	0.44	8	0.50%	YES	YES
SD200	7.42	18	0.50%	YES	YES
SD201	2.83	15	0.50%	YES	YES
SD202	10.25	24	0.50%	YES	YES
SD203	0.46	8	0.50%	YES	YES
SD204	10.71	24	0.50%	YES	YES
SD205	40.09	36	0.50%	YES	YES
SD206	8.24	24	0.50%	YES	YES

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Pipe Sizing Summary (South System)

VCA Engineers, Inc. Pipe Size and Cleaning Velocity Calculations					
Client: Centennial High School			Job No.: 3365		
Project: Centennial High School			Date: -		
			Engineer:		
SD	Peak Demand (cfs)	Pipe Size (in)	Pipe Slope	Flow Velocity Check	Flow Rate Check
SD1	0.29	6	50%	YES	OK
SD2	0.31	6	50%	YES	OK
SD3	0.61	8	50%	YES	OK
SD4	0.29	6	50%	YES	OK
SD5	0.90	8	50%	YES	OK
SD6	0.42	6	50%	YES	OK
SD7	0.13	6	50%	YES	OK
SD8	0.54	8	50%	YES	OK
SD9	0.09	6	50%	YES	OK
SD10	0.63	8	50%	YES	OK
SD11	0.15	6	50%	YES	OK
SD12	0.92	10	50%	YES	OK
SD13	1.56	10	50%	YES	OK
SD14	0.57	10	50%	YES	OK
SD15	2.13	12	50%	YES	OK
SD16	3.03	15	50%	YES	OK
SD17	0.31	6	50%	YES	OK
SD18	3.33	15	50%	YES	OK
SD19	0.50	8	50%	YES	OK
SD20	3.83	15	50%	YES	OK
SD21	0.55	8	50%	YES	OK
SD22A	0.51	8	50%	YES	OK
SD22B	1.06	10	50%	YES	OK
SD23	4.89	15	50%	YES	OK
SD24	0.60	8	50%	YES	OK
SD25	1.08	10	50%	YES	OK
SD26	5.97	18	50%	YES	OK
SD27	0.33	6	50%	YES	OK
SD28	6.30	18	50%	YES	OK
SD29	0.11	6	50%	YES	OK
SD30	6.41	18	50%	YES	OK
SD31	0.53	8	50%	YES	OK
SD32	6.94	18	50%	YES	OK
SD33	0.12	6	50%	YES	OK
SD34	7.06	18	50%	YES	OK
SD35	0.06	6	50%	YES	OK
SD36	7.12	18	50%	YES	OK

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SD37	0.64	8	50%	YES	OK
SD38	7.76	18	50%	YES	OK
SD39	0.16	6	50%	YES	OK
SD40	7.92	18	50%	YES	OK
SD41	0.50	8	50%	YES	OK
SD42	8.42	24	50%	YES	OK
SD43	0.48	8	50%	YES	OK
SD44	8.89	24	50%	YES	OK
SD45	0.46	8	50%	YES	OK
SD46	9.35	24	50%	YES	OK
SD47	0.09	6	50%	YES	OK
SD48	9.44	24	50%	YES	OK
SD49	0.11	6	50%	YES	OK
SD50	0.23	6	50%	YES	OK
SD51	0.08	6	50%	YES	OK
SD52	0.31	6	50%	YES	OK
SD53	0.14	6	50%	YES	OK
SD54	0.45	8	50%	YES	OK
SD55	0.45	8	50%	YES	OK
SD56	0.16	6	50%	YES	OK
SD57	0.61	8	50%	YES	OK
SD58	0.10	6	50%	YES	OK
SD59	0.71	8	50%	YES	OK
SD60	0.09	6	50%	YES	OK
SD61	0.81	8	50%	YES	OK
SD63	0.24	8	50%	YES	OK
SD64	1.85	12	50%	YES	OK
SD65	2.09	12	50%	YES	OK
SD66	0.40	15	50%	YES	OK
SD67A	0.40	15	50%	YES	OK
SD67B	0.97	10	50%	YES	OK
SD68A	1.73	18	50%	YES	OK
SD68B	1.07	10	50%	YES	OK
SD69A	3.47	18	50%	YES	OK
SD69B	0.5925	8	50%	YES	OK
SD70A	4.5061	18	50%	YES	OK
SD70B	1.0653	10	50%	YES	OK
SD71	9.3627	24	50%	YES	OK
SD72A	3.7913	15	50%	YES	OK
SD72B	13.154	24	50%	YES	OK
SD73	15.2458	24	50%	YES	OK
SD74	24.6889	30	50%	YES	OK

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SD75	0.2337	6	50%	YES	OK
SD76	0.2142	6	50%	YES	OK
SD77	0.4479	8	50%	YES	OK
SD78	0.1421	6	50%	YES	OK
SD79	0.59	8	50%	YES	OK
SD80	0.1224	6	50%	YES	OK
SD81	0.1196	6	50%	YES	OK
SD82	0.242	6	50%	YES	OK
SD83	0.1419	6	50%	YES	OK
SD84	0.1446	6	50%	YES	OK
SD85	0.2865	6	50%	YES	OK
SD86	0.5285	8	50%	YES	OK
SD87	0.0807	6	50%	YES	OK
SD88	0.6092	8	50%	YES	OK
SD89	0.1808	6	50%	YES	OK
SD90	0.79	8	50%	YES	OK
SD91	0.2142	6	50%	YES	OK
SD92	1.0042	10	50%	YES	OK
SD93	0.1947	6	50%	YES	OK
SD94	1.1989	10	50%	YES	OK
SD95	0.2809	6	50%	YES	OK
SD96	1.4798	10	50%	YES	OK
SD97	0.2809	6	50%	YES	OK
SD98	0.1752	6	50%	YES	OK
SD99	0.4561	8	50%	YES	OK
SD100	0.0807	6	50%	YES	OK
SD101	0.5368	8	50%	YES	OK
SD102	0.1808	6	50%	YES	OK
SD103	0.7176	8	50%	YES	OK
SD104	2.1974	12	50%	YES	OK
SD105	0.2893	6	50%	YES	OK
SD106A	2.4867	12	50%	YES	OK
SD106B	0.1196	6	50%	YES	OK
SD106C	2.6063	12	50%	YES	OK
SD107A	0.3088	6	50%	YES	OK
SD107B	2.9151	15	50%	YES	OK
SD108	40.6111	36	50%	YES	OK
SD109	0.4451	8	50%	YES	OK
SD110	0.3672	6	50%	YES	OK
SD111	0.8123	8	50%	YES	OK
SD112	0.8123	8	50%	YES	OK
SD113	0.8123	8	50%	YES	OK
SD114A	2.7343	15	50%	YES	OK

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SD114B	3.1933	15	50%	YES	OK
SD115	5.9276	18	50%	YES	OK
SD116	6.7399	18	50%	YES	OK
SD117	0.0974	6	50%	YES	OK
SD118A	1.6773	12	50%	YES	OK
SD118B	2.3087	12	50%	YES	OK
SD118C	3.2711	15	50%	YES	OK
SD118D	5.5798	18	50%	YES	OK
SD118E	6.8373	18	50%	YES	OK
SD118F	12.4171	24	50%	YES	OK
SD119	37.106	36	50%	YES	OK
SD120	0.4231	6	50%	YES	OK
SD121	0.0445	6	50%	YES	OK
SD122	0.4676	8	50%	YES	OK
SD123	0.5483	8	50%	YES	OK
SD124	0.2309	6	50%	YES	OK
SD125	0.3895	6	50%	YES	OK
SD126	2.5178	12	50%	YES	OK
SD127	43.1289	36	50%	YES	OK

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KEY PLAN

OVERALL SITE UTILITY PLAN

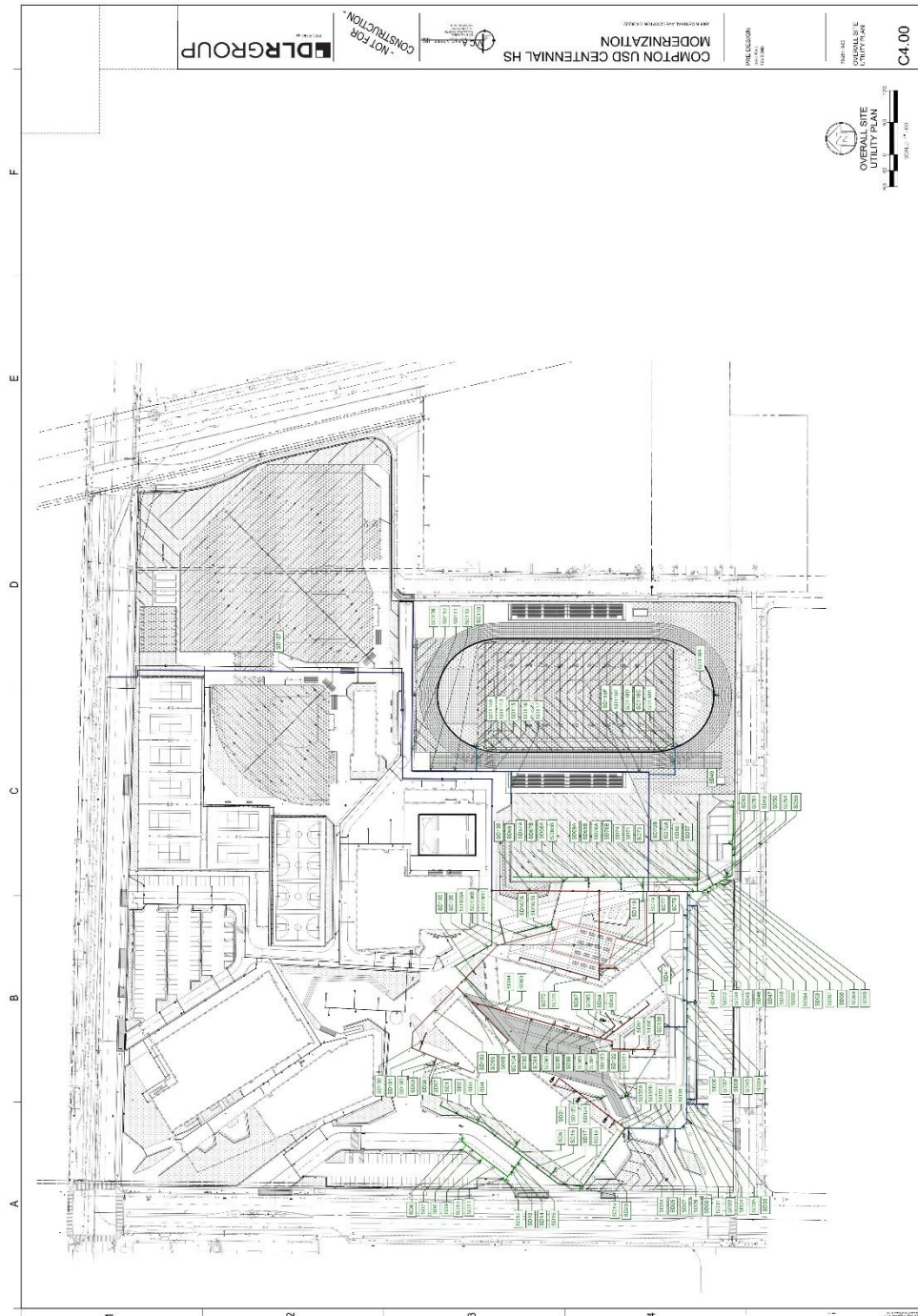
SHEET NOTES:

1. THE OWNER, WITH PERMITS AND APPROVALS, IS RESPONSIBLE FOR THE DESIGN AND CONSTRUCTION OF THE UTILITY SYSTEMS.
2. THE DESIGN OF THE UTILITY SYSTEMS IS BASED ON THE ASSUMPTIONS AND CONDITIONS SET FORTH IN THE SPECIFICATIONS AND NOTES TO THE SPECIFICATIONS.
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Storm Drain Diagram (South System)



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Example of Pipe Sizing

NORTH MAIN LINE													
PIPE SIZING				SD1	SD2	SD3	SD4	SD5	SD6	SD7	SD8	SD9	SD10
Accumulated Q (cfs) at this pipe section =				0.30	0.34	0.70	0.24	1.13	1.83	0.10	1.93	0.73	2.66
Calculations for Velocity and Discharge													
Diameter of Pipe	<i>D</i>	inches		6	6	8	6	10	12	6	12	8	12
Manning's Roughness Coefficient	<i>n</i>			0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Slope of SD Pipe	<i>S</i>	ft/ft		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Proportional Depth of Flow	<i>d/D</i>			0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Flow Depth	<i>d</i>	inches		4.5	4.5	6	4.5	7.5	9	4.5	9	6	9
Angle of Flow	theta	radians		4.1888	4.1888	4.1888	4.1888	4.1888	4.1888	4.1888	4.1888	4.1888	4.1888
Area of Flow	<i>a</i>	sq.ft		0.16	0.16	0.28	0.16	0.44	0.63	0.16	0.63	0.28	0.63
Wetted Perimeter	<i>p</i>	ft		1.05	1.05	1.40	1.05	1.75	2.09	1.05	2.09	1.40	2.09
Hydraulic Radius	<i>r</i>	ft		0.15	0.15	0.20	0.15	0.25	0.30	0.15	0.30	0.20	0.30
Using Manning's Equation, for pipe at flow depth 'd'													
Flow Velocity	<i>v</i>	fps		2.71	2.71	3.29	2.71	3.81	4.31	2.71	4.31	3.29	4.31
Pipe Capacity Flow Rate	<i>Q</i>	cfs		0.43	0.43	0.92	0.43	1.67	2.72	0.43	2.72	0.92	2.72
Is calculated Velocity greater than 2 fps?				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Is the pipe capacity > hydrology accumulated flow rate?				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Therefore, Pipe Size is OK				OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

SOUTH MAIN LINE													
PIPE SIZING				SD1	SD2	SD3	SD4	SD5	SD6	SD7	SD8	SD9	SD10
Accumulated Q (cfs) at this pipe section =				0.29	0.31	0.61	0.29	0.90	0.42	0.13	0.54	0.09	0.63
Calculations for Velocity and Discharge													
Diameter of Pipe	<i>D</i>	inches		6	6	8	6	8	6	6	8	6	8
Manning's Roughness Coefficient	<i>n</i>			0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
Slope of SD Pipe	<i>S</i>	ft/ft		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Proportional Depth of Flow	<i>d/D</i>			0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Flow Depth	<i>d</i>	inches		4.5	4.5	6	4.5	6	4.5	4.5	6	4.5	6
Angle of Flow	theta	radians		4.1888	4.1888	4.1888	4.1888	4.1888	4.1888	4.1888	4.1888	4.1888	4.1888
Area of Flow	<i>a</i>	sq.ft		0.16	0.16	0.28	0.16	0.28	0.16	0.16	0.28	0.16	0.28
Wetted Perimeter	<i>p</i>	ft		1.05	1.05	1.40	1.05	1.40	1.05	1.05	1.40	1.05	1.40
Hydraulic Radius	<i>r</i>	ft		0.15	0.15	0.20	0.15	0.20	0.15	0.15	0.20	0.15	0.20
Using Manning's Equation, for pipe at flow depth 'd'													
Flow Velocity	<i>v</i>	fps		2.71	2.71	3.29	2.71	3.29	2.71	2.71	3.29	2.71	3.29
Pipe Capacity Flow Rate	<i>Q</i>	cfs		0.43	0.43	0.92	0.43	0.92	0.43	0.43	0.92	0.43	0.92
Is calculated Velocity greater than 2 fps?				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Is the pipe capacity > hydrology accumulated flow rate?				YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Therefore, Pipe Size is OK				OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

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Appendix VI

SITE PLAN

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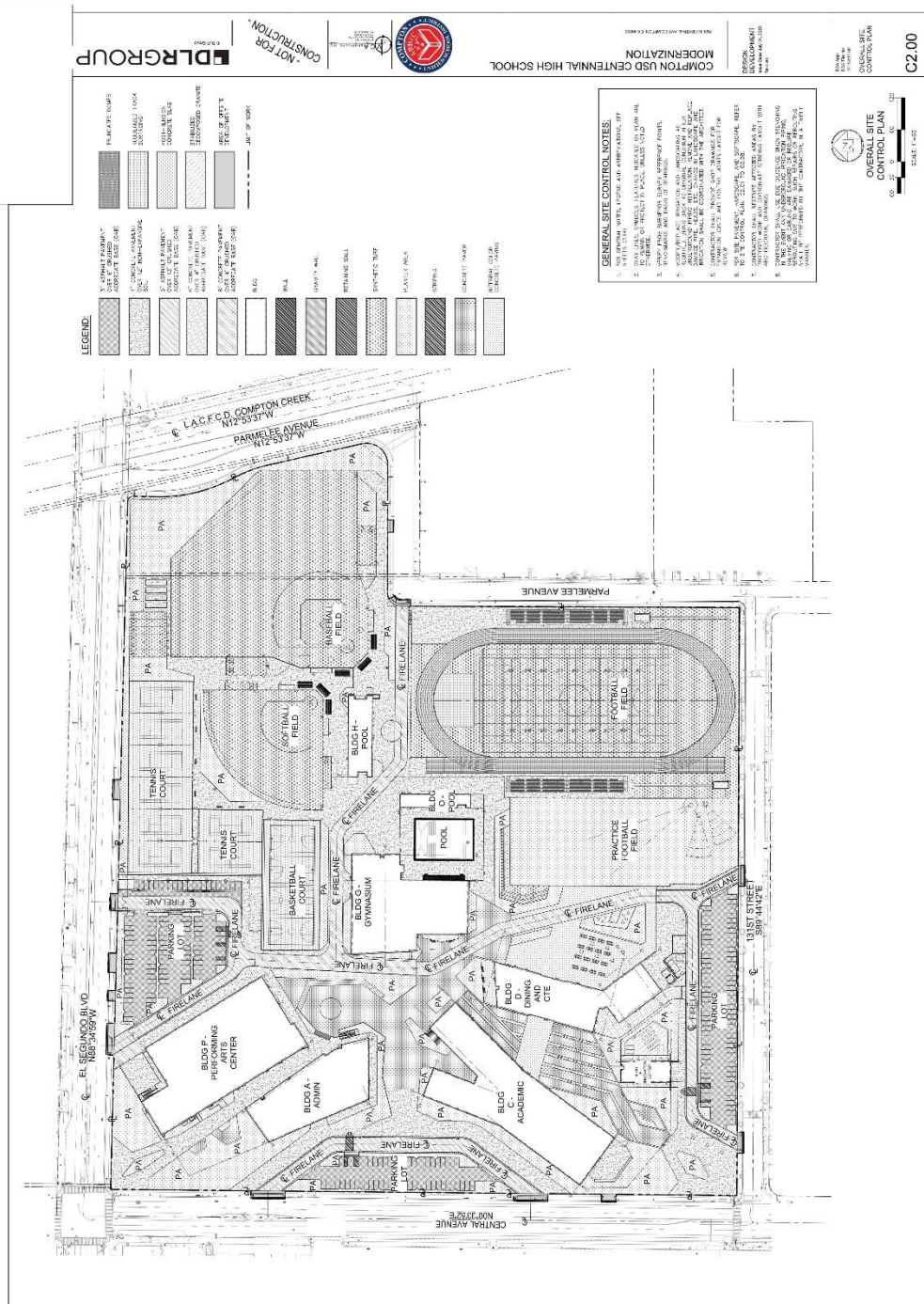
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Appendix VII

STORMDRAIN UTILITY PLAN

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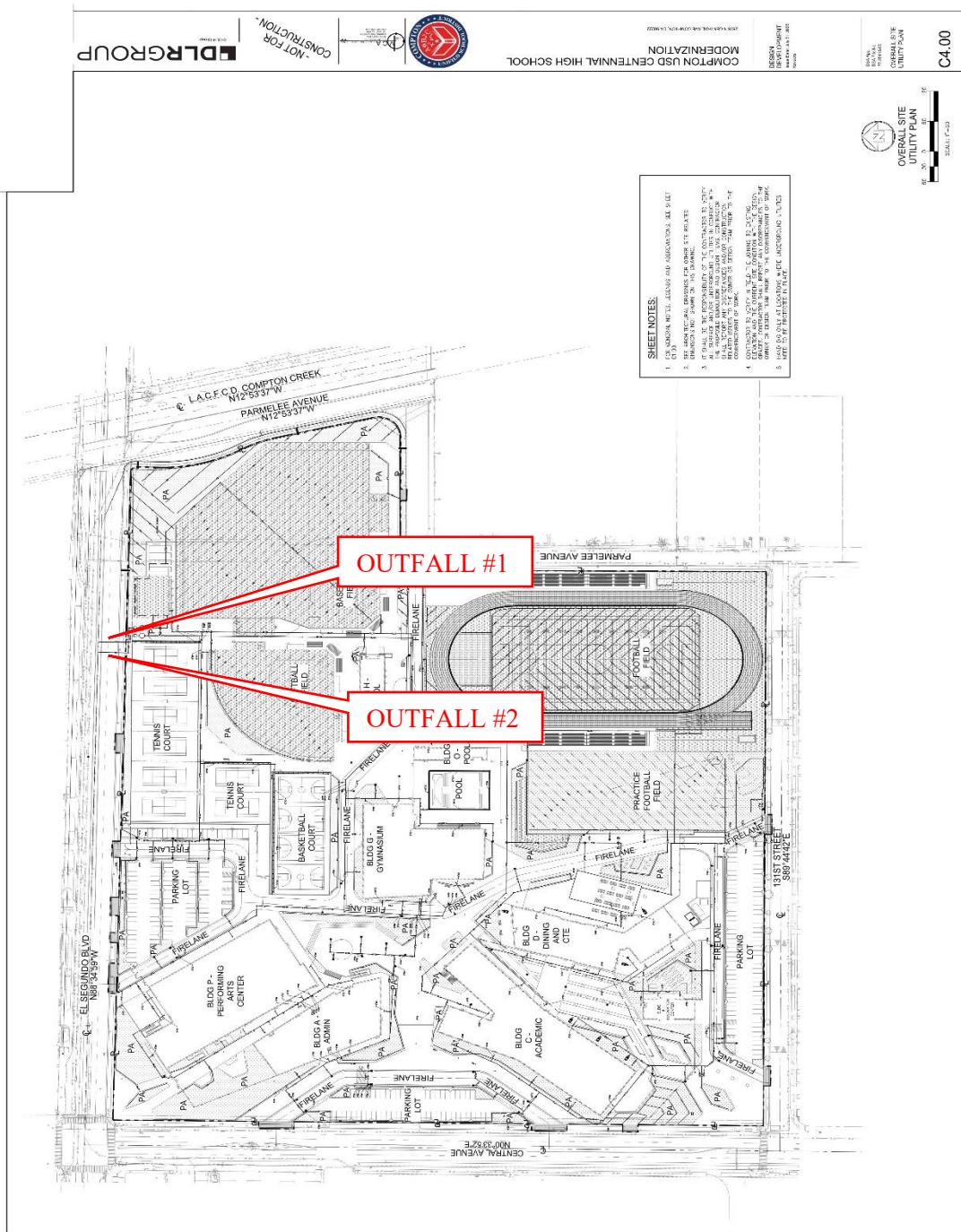
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Appendix VIII

IMPERVIOUS/PERVIOUS PERCENTAGE

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Storm Drain Diagram (North System)

ITEM		DETAILED GROSS AREA	IMPERVIOUS AREA	PERVIOUS AREA
		[Square Feet]		
		Sum of Imp/Per Areas		
1	TA 1	4 763.03	0	4 763
2	TA 2	553.04	0	553
3	TA3	5 646.23	5 646	0
4	TA 4	3 729.50	152	3 577
5	TA 5	13 874.32	13 732	142
6	TA 6	1 632.58	0	1 633
7	TA 7	3 126.19	3 126	0
8	TA 8	11 390.87	11 285	106
9	TA 9	1 291.96	0	1 292
10	TA10	4 927.70	4 928	0
11	TA 11	16 206.82	16 098	109
12	TA12	299.57	0	300
13	TA 13	5 799.12	5 799	0
14	TA14	3 284.26	1 952	1 332
15	TA15	10 967.69	2 434	8 534
16	TA16	5 223.52	5 224	0
17	TA 17	3 775.05	3 775	0
18	TA 18	3 483.80	3 484	0
19	TA 19	413.30	413	0
20	TA 20	267.31	217	50
21	TA 21	5 170.40	5 170	0
22	TA 22	198.53	199	0

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23	TA23	9,851.58	6,421	3,430
24	TA 24	5,239.49	5,239	0
25	TA 25	654.32	0	654
26	TA 26	6,727.62	542	6,185
27	TA 27	8,836.44	8,836	0
28	TA 28	1,214.80	1,215	0
29	TA29	3,002.66	3,003	0
30	TA 30	1,202.10	1,202	0
31	TA 31	8,836.44	8,836	0
32	TA 32	1,134.66	1,135	0
33	TA 33	964.04	964	0
34	TA34	4,630.59	4,631	0
35	TA 35	9,785.51	9,786	0
36	TA 36	1,069.84	1,070	0
37	TA 37	4,324.27	4,324	0
38	TA 38	1,767.18	1,767	0
39	TA39	1,686.13	1,686.13	0.00
40	TA40	1,354.96	0.00	1,354.96
41	TA41	11,053.83	11,053.83	0.00
42	TA42	6,612.02	6,612.02	0.00
43	TA43	10,330.99	0.00	10,330.99
44	TA44	2,727.49	2,727.49	0.00
45	TA45	2,669.71	2,669.71	0.00
46	TA46	2,610.00	2,610.00	0.00
47	TA47	683.20	0.00	683.20
48	TA48	445.36	0.00	445.36

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49	TA49	945.26	945.26	0.00
50	TA50	2,365.37	2,365.37	0.00
51	TA51	2,553.19	0.00	2,553.19
52	TA52	1,333.30	1,333.30	0.00
53	TA53	3,129.74	3,129.74	0.00
54	TA54	2,925.53	2,925.53	0.00
55	TA55	3,834.08	1,825.46	2,008.62
56	TA56	1,250.77	439.93	810.84
57	TA57	5,161.53	5,161.53	0.00
58	TA58	7,020.69	7,020.69	0.00
59	TA59	5,125.43	4,672.99	452.44
60	TA60	2,374.86	2,374.86	0.00
61	TA61	1,942.18	1,942.18	0.00
62	TA62	2,551.16	2,551.16	0.00
63	TA63	6,401.00	6,401.00	0.00
64	TA64	1,253.18	0.00	1,253.18
65	TA65	4,864.65	0.00	4,864.65
66	TA66	3,185.26	3,185.26	0.00
67	TA67	743.62	743.62	0.00
68	TA68	14,663.12	13,867.39	795.73
69	TA69	1,531.18	1,291.10	240.08
70	TA70	3,785.59	3,785.59	0.00
71	TA71	3,169.72	3,169.72	0.00
72	TA72	304.57	0.00	304.57
73	TA73	828.19	0.00	828.19
74	TA74	6,858.73	6,858.73	0.00

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75	TA75	3,214.16	3,214.16	0.00
76	TA76	2,680.29	2,680.29	0.00
77	TA77	3,278.36	3,278.36	0.00
78	TA78	3,310.46	3,310.46	0.00
79	TA79	1,111.33	0.00	1,111.33
80	TA80	508.97	508.97	0.00
81	TA81	2,621.68	2,621.68	0.00
82	TA82	2,621.68	2,621.68	0.00
83	TA83	21,908.09	21,908.09	0.00
84	TA84	2,922.52	2,922.52	0.00
85	TA85	4,987.32	4,987.32	0.00
86	TA86	1,228.05	1,228.05	0.00
87	TA87	3,273.66	3,273.66	0.00
88	TA88	2,794.22	2,794.22	0.00
89	TA89	11,603.90	11,603.90	0.00
90	TA90	3,565.07	0.00	3,565.07
91	TA91	1,530.90	696.93	833.97
92	TA92	411.73	0.00	411.73
93	TA93	1,588.73	1,588.73	0.00
94	TA94	1,588.61	1,588.61	0.00
95	TA95	4,059.03	4,059.03	0.00
96	TA96	5,110.11	3,899.87	1,210.24
97	TA97	4,340.32	4,340.32	0.00
98	TA98	6,688.13	6,688.13	0.00
99	TA99	2,690.79	0.00	2,690.79
100	TA100	59,701.07	15,542.19	44,158.88
101	TA101	1,081.05	659.08	421.97

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102	TA102	1,034.87	632.56	402.31
103	TA103	1,571.89	1,088.33	483.56
104	TA104	584.56	451.27	133.29
105	TA105	586.03	586.03	0.00
106	TA106	1,087.74	0.00	1,087.74
107	TA107	905.20	905.20	0.00
108	TA108	55,717.82	12,093.19	43,624.63
109	TA109	26,726.98	26,726.98	0.00
110	TA110	15,087.88	15,087.88	0.00
111	TA111	6,947.49	1,024.41	5,923.08
112	TA112	44,279.94	44,279.94	0.00
113	TA113	7,150.72	7,150.72	0.00
114	TA114	129,036.24	14,860.84	114,175.40
TOTAL AREA		756,679.51	476,857.95	279,821.56

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Storm Drain Diagram (South System)

ITEM		DETAILED GROSS AREA	IMPERVIOUS AREA	PERVIOUS AREA
		[Square Feet]		
			Sum of Imp/Per Areas	
1	B 1	4,625.89	4,626	0
2	B2	4,871.99	4,872	0
3	B3	4,561.61	4,562	0
4	B4	6,531.22	6,531	0
5	B5	1,939.05	1,939	0
6	B6	1,435.44	1,435	0
7	B7	2,387.94	163	2,225
8	B8	12,066.02	12,066	0
9	B9	8,935.71	8,827	108
10	B10	4,786.15	4,786	0
11	B11	7,797.02	0	7,797
12	B12	7,426.99	6,714	713
13	B13	8,616.36	8,616	0
14	B14	8,011.67	8,012	0
15	B15	9,398.13	0	9,398
16	B16	5,178.09	5,178	0
17	B17	1,760.18	157	1,603
18	B18	8,337.88	8,263	75
19	B19	1,823.33	1,823	0
20	B20	1,016.78	594	423
21	B21	10,009.60	7,069	2,940
22	B22	7,765.47	6,625	1,141
23	B23	2,478.58	2,479	0
24	B24	7,442.20	6,573	869
25	B25	7,149.13	7,149	0

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26	B26	422.83	0	423
27	B27	1,477.03	0	1,477
28	B28	2,217.44	2,217	0
29	B29	2,555.99	2,556	0
30	B30	1,574.09	1,568	6
31	B31	1,445.42	231	1,214
32	B32	1,238.94	893	346
33	B33	1,681.59	1,366	316
34	B34A	2,220.07	0	2,220
35	B34B	1,774.16	0	1,774
36	B35	29,028.68	28,747	282
37	B36A	6,295.68	0	6,296
38	B36B	5,660.72	0	5,661
39	B36C	10,448.13	0	10,448
40	B36D	7,033.25	0	7,033
41	B36E	17,126.59	0	17,127
42	B36F	12,845.43	0	12,845
43	B37	20,344.12	10,795	9,549
44	B38	8,844.55	8,845	0
45	B39	9,277.31	8,928	350
46	B40	16,662	12,984	3,678
47	B41	3,642	3,642	0
48	B42	3,353.51	3,354	0
49	B43	2,225.44	2,225	0
50	B44	4,407.49	4,407	0
51	B45	2,761.04	2,761	0
52	B46	1,250.07	303	947
53	B47	2,832.44	881	1,952
54	B48	4,407.38	4,407	0

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55	B49	1,922.97	1,923	0
56	B50	1,890.80	1,891	0
57	B51	2,225.44	2,225	0
58	B52	2,264.20	2,264	0
59	B53	1,249.73	1,250	0
60	B54	2,829	2,829	0
61	B55	3,354	3,354	0
62	B56	3,065	3,065	0
63	B57	4,513	2,081	2,432
64	B58	1,890.87	1,891	0
65	B59	6,624.49	2,036	4,588
66	B60	717.39	227	490
67	B61	1,248.75	1,249	0
68	B62	2,502.17	2,502	0
69	B63	10,621.44	10,321	300
70	B64	8,084.35	7,984	100
71	B65	6,014.79	6,015	0
72	B66	3,069.22	3,069	0
73	B67	6,989.20	6,989	0
74	B68	5,750.80	0	5,751
75	B69A	51,234.41	0	51,234
76	B69B	49,997.40	7,007	42,990
77	B70	1,514	1,514	0
78	B71A	36,136	36,136	0
79	B71B	42,825	42,825	0
80	B71C	26,247	2,190	24,057
81	B72	3,598	0	3,598
82	B73	4,855	3,675	1,180
TOTAL AREA		624,640.08	376,683.86	247,956.22

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Appendix IX

SAMPLE PIPE SIZING CALCULATION

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PIPE SIZING				
<i>Calculations for Velocity and Discharge</i>				
	Diameter of Pipe	D	inches	12
	Manning's Roughness Coefficient	n		0.011
	Slope of SD Pipe	S	ft/ft	0.0165
	Proportional Depth of Flow	d/D		0.8
	Flow Depth	d	inches	9.6
	Angle of Flow	theta	radians	4.4286
	Area of Flow	a	sq.ft	0.67
	Wetted Perimeter	p	ft	2.21
	Hydraulic Radius	r	ft	0.30
<i>Using Manning's Equation, for pipe at flow depth 'd'</i>				
	Flow Velocity	v	fps	7.86
	Pipe Capacity Flow Rate	Q	cfs	5.30

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Appendix X

GEOTECHNICAL REPORT FOR DRYWELL INFILTRATION

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GROUNDWATER CONDITIONS

Perched groundwater was encountered during previous site exploration at depths of 43-47 feet (Fenagh, 2025). Static groundwater was not encountered to a maximum explored depth of over 50 feet bgs. The historical high groundwater level was established by the California Survey Seismic Hazard Evaluation Reports 027 and 034 entitled "Historically Highest Ground Water Contours" on the order of 10 feet bgs. Variations in groundwater levels may occur due to variations in ground surface topography, subsurface geologic conditions and structure, seasonal rainfall, local irrigation practices, new construction, and/or other factors.

INFILTRATION TESTING

Infiltration testing was performed in general accordance with Los Angeles County Public Works GS 200.1 guidelines for small diameter boring infiltration testing. Two, 8-inch diameter borings (Test P-1 and P-2) were tested at a depth of 30 feet to assess the feasibility of drywell infiltration. The boreholes were prepared by installing a 3-inch diameter, perforated PVC casing within the center of the boreholes and pea gravel in the annular space. The boreholes were pre-soaked for about 1 hour. The boreholes were refilled to within several feet of the surface, and the rate of drop in the water level was measured over a period of 3 hours until a stabilized rate of drop was obtained. Based on results of the testing, we calculated the measured infiltration rates shown in the following table.

Table 1 – Infiltration Testing Results

Test / Location	Depth (ft)	Measured Infiltration Rate (in/hr)
P-1	29	49
P-2	30	35

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of onsite exploration including testing, the infiltration feasibility is considered potentially feasible for design and construction of drywells from a geotechnical engineering perspective at approximately the tested locations. Design infiltration rates account for uncertainty and bias in measurement methods, site conditions, and siltation potential by applying a factor of safety of 3 or more to the field measured rates.

RATES FOR FEASIBILITY

Based on results of the testing, we calculated the measured (design) infiltration rates shown in the following table by applying appropriate reduction factors to the measured rate. We recommend an RF_i value of 1, and a RF_v of 1. We recommend RF_s be selected at the discretion of the design engineer. The results presented in Table 3-1 assume an RF_s value of 1, or a total reduction factor of 3.0 applied to the rates obtained from the testing.

Table 3-1 – Preliminary Infiltration Rates (for Feasibility)

Test / Location	Depth (ft)	Measured Infiltration Rate (in/hr)	Design Infiltration Rate* (in/hr)
P-1	29	49	16
P-2	30	35	12

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