Appendix G

Hydrologic and Hydraulic Report / Stormwater Quality Report

HYDROLOGIC AND HYDRAULIC REPORT / STORMWATER QUALITY REPORT

for

Lockwood 3
Outlet Center Drive and Lockwood Street
Oxnard, CA 93030

Prepared For:

SVM Development, LLC

Prepared By:

CCE Design Associates Inc
771 E. Daily Drive, Suite 120 | Camarillo, CA 93010
445 S. Figueroa St, Suite 3100 | Los Angeles, CA 90071
805.738.5434

HYDROLOGIC AND HYDRAULIC REPORT / STORMWATER QUALITY REPORT

for

Lockwood 3
Outlet Center Drive and Lockwood Street
Oxnard, CA 93030

Date:	September 22, 2023
Project Manager:	Jared Q. Adams, P.E. RCE No. 86086
Project Engineer:	Jared Q. Adams
CCE Job Number:	C20.0275D

Prepared By:

_____

Jared Q. Adams, P.E. Date
CCE Design Associates, Inc

1. Table of Contents

2. Introduction

PURPOSE

The purpose of this report is to validate the grading and drainage design for the proposed Lockwood Street Apartments project, as well as to implement stormwater treatment in accordance with local requirements. The project will involve the construction of a 234-unit residential apartment complex with associated parking.

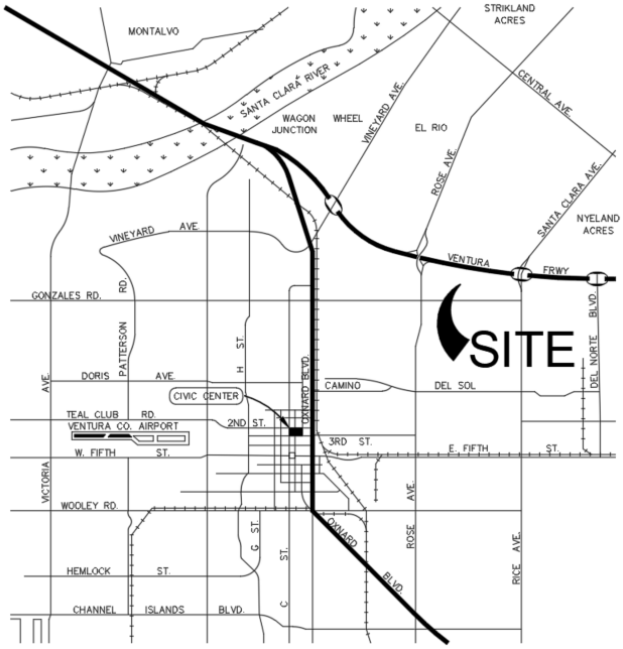
SITE LOCATION

The project is located on the Northwest corner of Outlet Center Drive and Lockwood Street in Oxnard, California. The APN is 213-0-090-275.

The site is a vacant lot, bounded by a vacant lot to the south, car dealership to the west, the 101 Ventura Freeway to the north and commercial buildings to the east.

LOCATION PLAN

The location within the City of Oxnard is provided on the below map:



DESCRIPTION

The site is located on Lockwood Street between Rose Avenue and Rice Avenue, and adjacent to the 101 Freeway. The lot exists near the northwest corner of the intersection of Outlet Center Drive and Lockwood Street. The surrounding lots fronting Lockwood Street are largely developed as commercial use with varying ages of construction. The total onsite area will be 5.17 acres once complete.

DRAINAGE

Drainage in the area trends from north to south, gently sloping along the Oxnard plain towards the ocean. There is also a slight drainage trend from west to east; however, this is subtle.

The site may receive a small portion of run-on from the freeway property to the north. This would be limited in nature as the freeway and drainage appurtenances intercept runoff from the north and direct it into Caltrans drainage systems. We have estimated that portion of run-on as part of our calculations (noting that the freeway is crowned in this area with a defined width)

The site is located within a shaded Zone X, (outside of the 100-year (1%) annual chance floodplain).

As the neighborhood and watershed is largely built out, there are no anticipated substantial changes to drainage patterns in the area from future development. Rather, as sites develop and fall under MS4 requirements, drainage patterns in the area would likely improve.

EMERGENCY OVERFLOW

The design includes an emergency overflow from the CDS Unit to Lockwood Street via overland flow. The building foundation is set higher than all surrounding grades at finished floor elevation of 81.00. Catch basins are located throughout the drive aisles which collect into the CDS Unit for pretreatment on the South of the property, then into the CMP Infiltration System.

In the event the underground storm drain system should be inundated or clogged; runoff within both the west side and east side of the site will collect in ribbon gutters and be conveyed to the south. The ribbon gutter undulates as it meanders through the site; however, the highest spillover points at each individual sump are at elevation 80.46, allowing for discharge prior to flow reaching the building. In addition, the building is designed as a podium structure, with all units located above the ground floor.

In the event of overland overflow, the driveways will allow flow so that the overflow can sheet flow to Lockwood Street.

3. References

- "Modified Cook's Method for Stormwater Runoff Calculations," City of Oxnard, Public Works Department, Standard Plan Plate #59.
- "Ventura County Hydrology Manual," Ventura County Watershed Protection District, Revised 2017.
- "Master Plan of Drainage," City of Oxnard, June 1979.
- "Ventura County Technical Guidance Manual for Stormwater Quality Control Measures," Ventura County Watershed Protection District, Updated 2018.

4. Objectives

The objective of this report is to determine proposed stormwater flow rates for this project based on existing topography and infrastructure, and then changes resulting from the development of this project. This report will address the following items:

- **Drainage Concept** – This report will discuss the proposed drainage concept for the site in further detail and will demonstrate compliance with criteria pursuant to the City of Oxnard (and

County of Ventura requirements for stormwater quality as outlined in the Technical Guidance Manual).

- **Low Impact Development (LID) –** This project will be designed pursuant to the Ventura County Technical Guidance Manual which provides for LID.
- **Flood Control –** This project will be designed in a manner to meet flood control protection from the FEMA 100-year storm event.

5. Procedure

This hydrology study was prepared using the design criteria and methodology developed by the City of Oxnard. Calculations presented within this study were determined using the Modified Cook's Method for Stormwater Runoff Calculations.

The overall lot is 5.17 acres in size (225,206 square feet) and the adjacent roadway improvements area is 0.31 acres, making for a total usable lot size of 4.86 acres. The freeway will be picked up and conveyed offsite as originally envisioned during the Tract 4317 design and will not contribute to site flow.

The associated construction documents and attached hydrology map provide details on the storm drain collection and conveyance facilities as well as the storm water treatment devices selected. The routing to the underground infiltration system will take place utilizing a series of ribbon gutters, catch basins and underground piping around the building, draining into the underground system.

6. Hydrology

The hydrology was calculated as a single tributary for processing with VCRAT, and will be proportioned accordingly for pipe hydraulic calculations during the construction document phase. The Hydrology Map is included as Attachment F of this report, as is the calculation sheets performed using the Cook's Method (Attachment B).

7. Detention / Retention

The expectation due to the location and nature of this development is that detention will be required for this site. As a result, detention calculations are included as an attachment to this report.

To generate an input hydrograph for routing purposes, hydrology was run using Cook's Method, and the site was then iteratively processed through VCRAT to generate an output hydrograph. It should be noted that the hydrograph generated through VCRAT is based on the underlying software and then "fattened" based on the overall 100-year storm depth to provide a conservative design. As a result, the best approach to generating a reasonably accurate hydrograph is to iteratively modify percent impervious values and time of concentration values in VCRAT until the peak flow matches the Cook's Method output. As the output was not dependent on a time of concentration and was only based on city methodology, the time of concentration calculation was not performed, and the hydrograph was generated through VCRAT to match the Cook's Method peak flow output. As a result, it should be noted that the time of concentration and percent impervious values in the VCRAT output are meaningless and should not be compared with the Cook's Method calculations.

The hydrograph generated includes the project site area, and does not include the portion of Lockwood Street that is not collected. As a result, the site is required to "overdetain" to account for the portion of Lockwood Street that is not picked up. Therefore, the allowable discharge from the detention system is 4.15 cfs (4.15 cfs plus 1.02 cfs of street flow = 5.17 cfs of total site flow).

The 100-year design flow was calculated to be 16.9 cfs using the Cooks' Method calculation for the site area that drain to the detention and infiltration systems. We are assuming the same unit flow of 3.1 cfs/acre will apply to the street areas (which generates the 1.02 cfs undetained). It should be noted that the Tract 4317 storm drain system assumed outflow of 4.66 cfs plus approximately 0.67 cfs of street flow for a total of 5.33 cfs. The 5.17 cfs that drains into this system is therefore in compliance with both the 1.0 cfs per acre requirement as well as the storm drain capacity calculation.

The detention and retention requirements will be fulfilled by separate underground systems. The infiltration device will be set vertically lower and separated from the detention chambers. Invert elevations in the CDS device will route flow to the infiltration system and will prevent flow from draining to the detention system until head builds to a certain level, at which point runoff will begin filling the detention chambers.

Per the calculations contained herein, the outflow from the system is approximately 6.91 cfs, satisfying the detention requirement.

8. Stormwater Quality

Stormwater quality for this project is in accordance with the 2011 Ventura County Technical Guidance Manual (TGM).

PROJECT APPLICABILITY

Per Section 1.5 of the TGM, this project is applicable as a new development project equal to 1 acre or greater of disturbed area that adds more than 10,000 square feet of impervious surface area. Therefore, the project shall mitigate the entire development project area.

SITE CONDITIONS

As previously stated in this report, the site is relatively flat, and slopes are generally 5% or less, making infiltration or other retention BMPs an effective option. Based on the soils report dated April 30, 2020 by MTC Engineering the onsite soils are predominately Group B soils and are consistent with typical infiltration rates for granular soils. The corresponding Ventura County Soil Number is 5. Groundwater was not encountered in Boring 6 and Boring 7 on the east side of the property.

Research conducted as part of a soils report by Yeh and Associates found groundwater elevation data from the Department of Water Resources for a well (No. 02N22W35C001S) located 2,795 feet south west of the project at the St. Johns Medical Center Property. This data showed that from 1972 to 2002, a high groundwater elevation of 12.6 feet below the surface was detected in March 1996. The same research showed a well (02N22W25N002S) located 2,300 feet east of the site with a high groundwater elevation of 17.3 feet below the surface. The average of these two provides approximately 15.5 feet of depth. The existing natural grade at the infiltration basin location is at elevation 78; therefore, with the system invert being at elevation 70, this provides 7.5' of separation to the highest recorded groundwater. As the TGM allows for the use of highest seasonal groundwater,

it is anticipated that this will be significantly deeper, allowing for an adequate safety margin for infiltrating.

Based on the existing onsite soil conditions and recommendation from the project geotechnical engineer, the use of infiltration or other retention BMPs is feasible. Percolation testing was performed at the site on August 28, 2020, by Geolabs and the measured subsurface percolation rate was found to be 24 in/hr. From this measured percolation rate, the adjusted measured percolation rate or converted field infiltration rate was determined to be 12.4 in/hr. This value was then reduced further by applying factors of safety described in the Technical Guidance Manual; the final design percolation rate for this project site is 2.2 in/hr. The results of the percolation test are included in this report as Attachment G. Even with these reductions, the infiltration system will drain within the required 72 hours.

SITE DESIGN PRINCIPLES AND TECHNIQUES

Site design principles and techniques have been applied to this proposed development to reduce the hydrologic and water quality impacts typically associated with redevelopment. The following is a list of site design features incorporated in this project and a brief explanation of how they were implemented:

- Site planning – Adequate space has been allocated for deployment of Retention BMPs to fully treat the SQDV. The site has been laid out in a manner to effectively disconnect impervious surface so that 5% EIA is achieved.
- Protect and restore natural areas – Existing natural areas will be preserved to the maximum extent possible.
- Minimize impervious cover – Landscape areas were included throughout the site where practical.
- Apply LID BMPs – Implemented throughout the site at varying degrees.
- Implement Integrated Water Resource Management Practices – Project has been designed to meet the 2011 VC TGM as part of Order R4-2010-0108 which complements the goals of the IWRMP.

SOURCE CONTROL MEASURES

Source Control Measures are operational practices that reduce potential pollutants at the source. Applicable Source Control Measures for this project are storm drainage signage (S-1) which are to be added to all storm drain inlets, proper design of outdoor trash storage and waste handling areas (S-3), and proof of control measure maintenance (S-8) through a Maintenance Agreement containing a site specific Maintenance Plan for all proposed BMPs to be maintained by the owner / operator of the site.

RETENTION AND TREATMENT CONTROL BMPS

Retention BMPs are proposed to be the primary Treatment Control to mitigate stormwater runoff from the site. The primary pollutants of concern for the post-developed condition of this project are sediment, nutrients, metals, oil and grease, and trash and debris, all of which are effectively treated using retention BMPs.

Calculations for the Stormwater Quality Design Volume (SQDV) required to be mitigated for the project area along with the maximum infiltration depth (dmax) as outlined in the TGM are shown in Attachment

D of this report. The proposed retention BMP to be utilized is underground infiltration through the use of a Proprietary Infiltration (INF-6) system. Per the calculations, the required SQDV for the site is 9,952 cubic feet, the maximum depth of infiltration is 13.53 feet, and the required SQDF (Stormwater Quality Design Flowrate used for design of pre-treatment devices) is 0.90 cfs.

Important to note, this project intends to treat the entire site, including the EIA and all developed pervious surfaces, using the proposed retention BMP.

Specifically, the Contech 60" CMP Infiltration System has been selected as the project retention BMP. As stated, the required SQDV is calculated to be 9,952 cf which is provided in the 60" CMP section with surrounding rock. See the detention calculations in Attached C. Calculations supporting the 60" CMP system sizing are contained within Attachment D of this report.

Additionally, pre-treatment will be provided upstream of the proposed infiltration system. Pre-treatment will be met through the inclusion of a centralized sediment and trash basin/manhole (hydrodynamic separator). More specifically, the Contech CDS Model 2025-5, or approved equal, has been selected as the pre-treatment device. This CDS unit will function as both a treatment and a diversion structure and will provide full trash capture for the site as all site flow will be drained to this CDS unit. The CDS Model 2025-5 has been designed and sized to remove 80-percent of 50-micron particles in accordance with City of Oxnard standards and is a full-capture system listed on the State's Certified Devices list (DS-88).

9. Summary and Conclusions

The following summarizes the hydrology results contained within this report and the appendices of this report:

Development Condition	Peak Flow
Existing (pre-developed) 100-year Condition	6.03 cfs
Undetained Developed 100-year Condition	16.9 cfs
Detained Developed 100-year Condition	5.17 cfs

The total detention volume that will be **retained onsite for stormwater purposes is 9,951 cubic feet**, and additional **detention storage required (in addition to retention storage) is 24,837 cubic feet**. It should be noted that the 9,951 cubic feet of volume for stormwater treatment will infiltrate and will not leave the site. The assumed **infiltration rate is 2.25 inches per hour**.

The infiltration gallery is a 72-inch pipe with 12 inches of rock below the pipe for a **total system depth of 84 inches**. The total **depth of the detention system is 84 inches**, containing a 60 inch pipe with 12 inches of rock above and below the pipe.

The development of this site is in accordance with City of Oxnard and Ventura County criteria for stormwater quality and quantity. The onsite runoff is collected and treated pursuant to Ventura County MS4 standards.

The development of this site will not have adverse impact to downstream storm drain facilities. While the analysis of offsite systems is beyond the scope of this report, the project improves upon the original design, meeting full MS4 compliance standards for the site, including the EIA and developed pervious surfaces.

Additionally, the grading design and proposed drainage system are designed in a manner to convey stormwater flows away from structures in a manner to provide protection from flooding pursuant to City of Oxnard, County of Ventura, and FEMA requirements. All buildings will be constructed outside of 100-year storm event flood limits which are shown on the Hydrology Map.

10. Attachments

Attachment A	Hydrology Input Data (Oxnard Supporting Data)
Attachment B	Cook's Method Hydrology Calculations (Flood Control)
Attachment C	Detention Calculations
Attachment D	Hydraulic Calculations
Attachment E	Stormwater Quality Treatment Calculations
Attachment F	Hydrology Map
Attachment G	Infiltration Test Report

DESIGN ASSOCIATES INC

Attachment A

Hydrology Input Data (Oxnard Supporting Data)

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MODIFIED RATIONAL FORMULA

"C" FACTORS*

ITEMS	RUNOFF PRODUCING CHARACTERISTICS			
RELIEF	40 Steep, slopes exceed 30%	30 Hilly, slopes 10% to 30%	20 Rolling, slopes 5% to 10%	10 Flat, slopes 0 to 5%
SURFACE STORAGE	20 Negligible, surface depressions few and shallow. Drainageways steep & small, no ponds or marshes.	15 Low, well defined system of small drainageways, no ponds or marshes.	10 Normal, considerable surface depression storage, lakes and ponds less than 2% of drainage area.	5 High, surface depression storage high, drainage system not sharply defined.
SOIL SCS CLASS	20 Rock or thin soil mantle. Negligible infiltration capacity. D	15 Clay or other soil of low infiltration capacity. C	10 Normal, deep permeable soils. B	5 High, sands, loamy sands & other loose open soils. A
VEGETAL COVER	20 No effective soil cover, bare or very sparse cover.	15 Clean cultivated crops or poor natural cover, less than 10% of drainage area under good cover.	10 50% of drainage area in good grassland or woodland, 50% of area in clean cultivated crops.	5 About 90% of drainage area in good grassland woodland or equivalent cover.

REV. APPR. BY DATE

"C" FACTOR
(FOR CITY OF OXNARD)

C =40 - 45	FOR UNDEVELOPED
C = 60	FOR RESIDENTIAL
C = 70	FOR COMMERCIAL AND INDUSTRIAL

NOTE:

In hydrologic Calculations, use values of "C" given in lower table.
Use of values of "C" given in upper table have to be approved by the City Engineer.

CITY OF Oxnard

GENERAL REQUIREMENTS – DRAINAGE

DRAWN: SOHER CKD. Jay Patil APPR. BY Benjamin Y. Wong

Public Works Department

STANDARD PLAN

PLATE 60

SHEET OF

FREQUENCY FACTORS – %

RETURN FREQUENCY	RETURN PERIOD	FACTOR
50%	2	25
20%	5	65
10%	10	100
4%	25	135
2%	50	170
1%	100	200
0.1%	1,000	400

RAINFALL INTENSITY CORRECTION FACTOR

OXNARD AREA	=	123%

SHAPE CORRECTION FACTORS – %

L/W \ AREA	0.01 S.M.	0.1 S.M.	1 S.M.	10 S.M.	100 S.M.	1,000 S.M.
1	115	125	132	141	154	172
1.5	112	115	119	124	131	141
2	108	110	110	113	117	122
3	100	100	100	100	100	100
4	98	95	94	91	89	86
5 or greater	95	91	88	85	82	78

1 S.M. = 1 Square Mile = 640 Acres

Just for information only

REV. APPR BY DATE

CITY OF Oxnard

GENERAL REQUIREMENTS – DRAINAGE

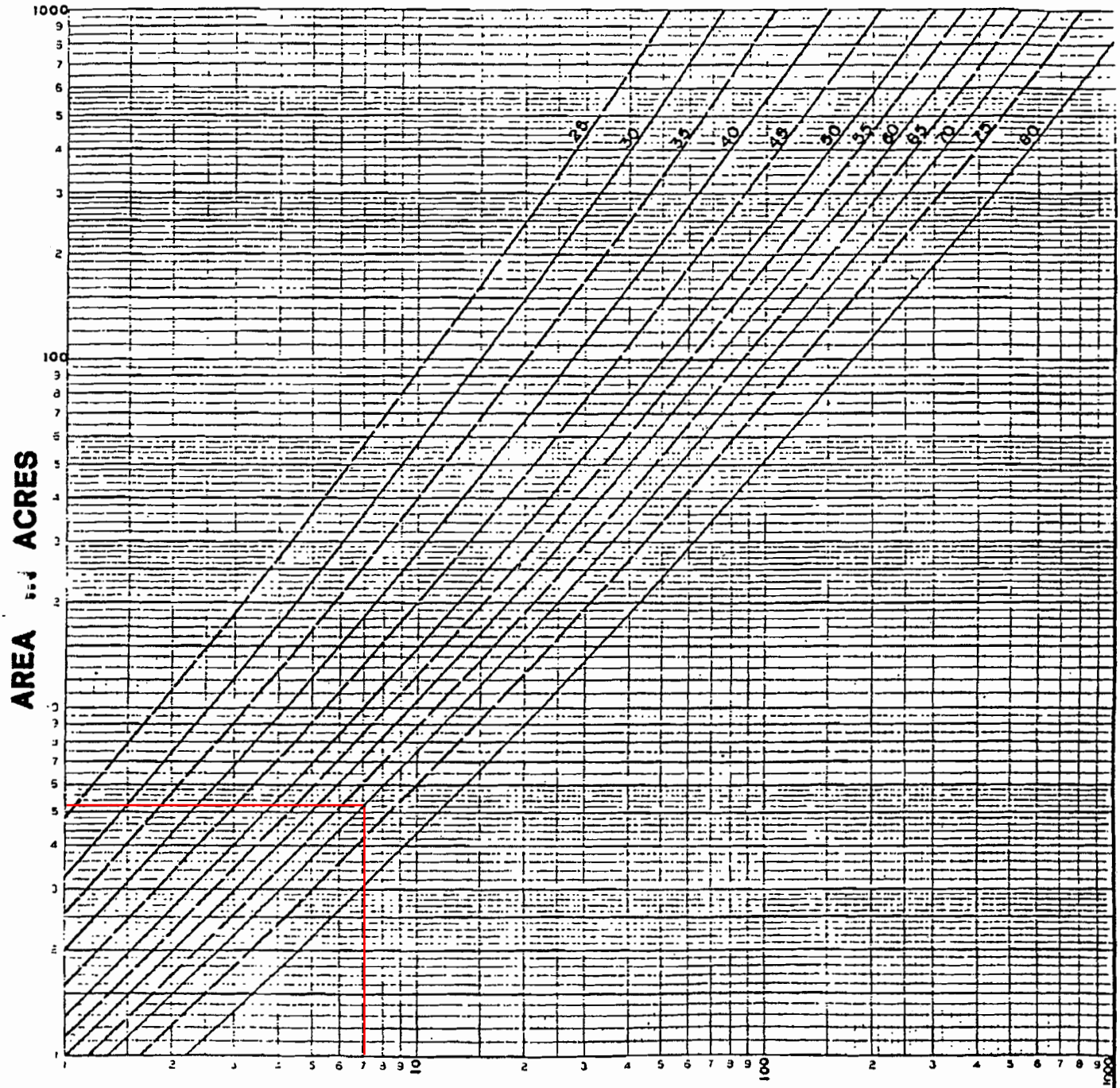
STANDARD PLAN

DRAWN: SOWER CKD. Joy Patel APPR. BY Benjamin Y. Wong

Public Works Department

PLATE 61

SHEET OF



CITY OF Oxnard

GENERAL REQUIREMENTS – DRAINAGE

DRAWN: SQHER | CKD. Jay Patel | APPR. BY Benjamin Y. Wong

Public Works Department

STANDARD PLAN

PLATE 62

SHEET OF

DESIGN ASSOCIATES INC

Attachment B

Cook's Method Hydrology Calculations (Flood Control)

CCE DESIGN ASSOCIATES INC
Cook's Method Calculations

Prepared: 7/10/2023
By: JQ Adams

Project	Lockwood Apts	Job No	C20.0275	Sheet	1 of 1		
Watershed	Proposed Calcs		Designed	JA	Date	1/8/2021	
Concentration Point			Checked		Date		

Watershed Constants:

Drainage Area	5.17	Acres					
Length	1075	feet	Fall	1	feet	Slope	0.09%
Width	= (Area x 43560)/Length =		209.5	feet			
Length/Width	5.13	Shape Correction Factor		98%			
Soil Type	"B" assumed	RI Correction Factor		123%			

Computation of "C"

Type of Development	"C" Factor	Present	Future
Undeveloped	45	100%	0%
Residential	60	0%	0%
Commercial/Ind.	70	0%	100%

* Note: Residential "C" value calculated using the Modified Rational Formula

Runoff: Q (curve) =	7.0	cfs
x L/W factor	6.9	cfs
x RI Correc. Factor	8.4	cfs

Frequency	Freq. Factor	Q	
20% (5 year)	65%	5.5	cfs
10% (10 year)	100%	8.4	cfs
4% (25 year)	135%	11.4	cfs
2% (50 year)	170%	14.3	cfs
1% (100 year)	200%	16.9	cfs

DESIGN ASSOCIATES INC

Attachment C

Detention Calculations

Table of Contents

Project Name:

Hydrology Studio v 3.0.0.27

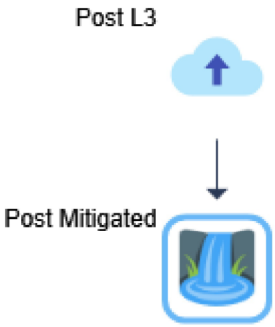
07-10-2023

Basin Model

Hydrology Studio v 3.0.0.27

Project Name:

07-10-2023



Hydrograph by Return Period

Project Name:

07-10-2023

Hydrology Studio v 3.0.0.27

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Outflow (cfs)							
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
1	Manual	Post L3		16.95			0.000			16.95
2	Pond Route	Post Mitigated		4.098			0.000			4.098

Hydrograph 100-yr Summary

Project Name:

07-10-2023

Hydrology Studio v 3.0.0.27

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	Manual	Post L3	16.95	19.23	115,954	----		
2	Pond Route	Post Mitigated	4.098	19.67	82,084	1	105.86	24,837

Hydrograph Report

Project Name:

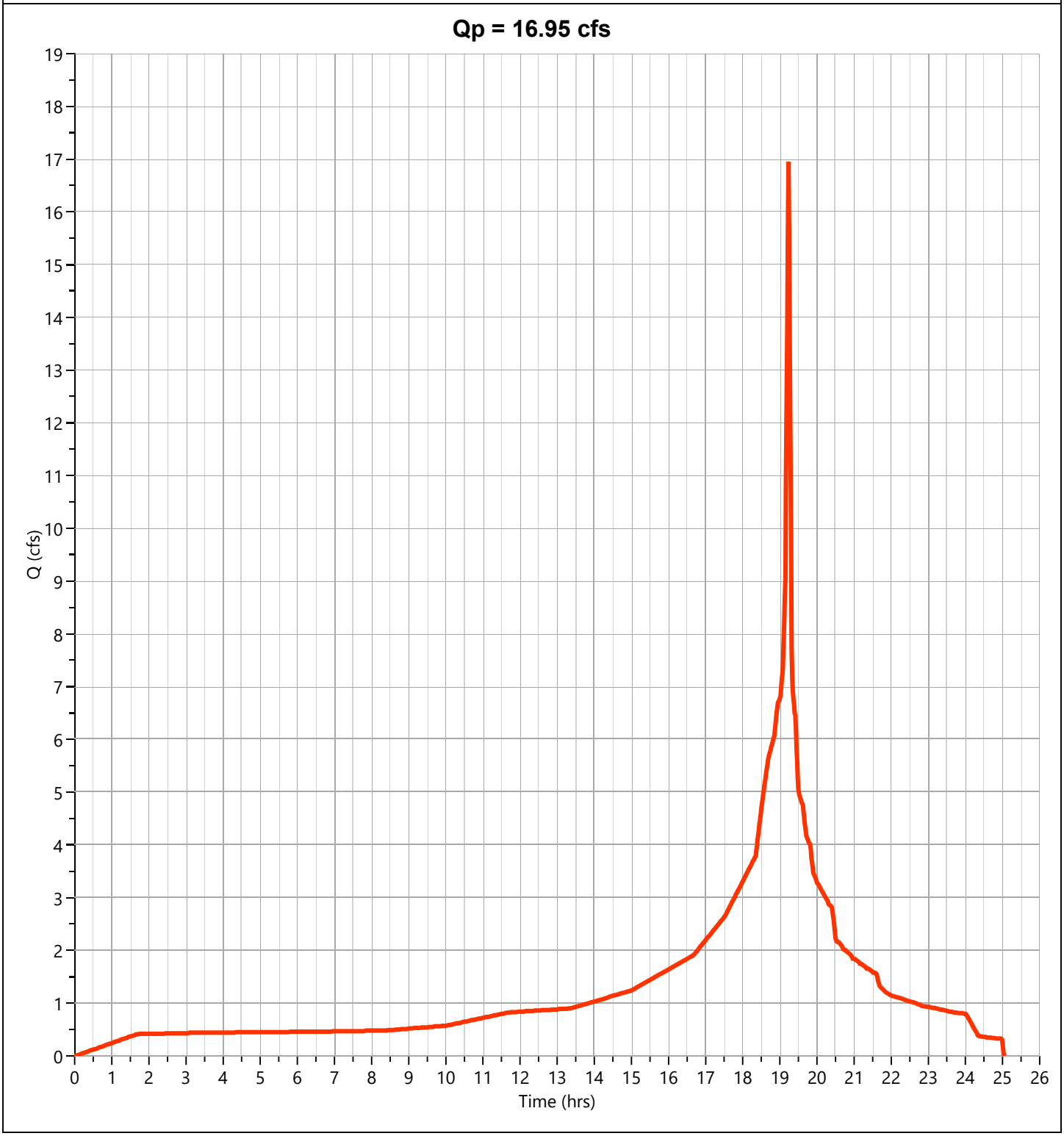
Hydrology Studio v 3.0.0.27

07-10-2023

Post L3

Hyd. No. 1

Hydrograph Type	= Manual	Peak Flow	= 16.95 cfs
Storm Frequency	= 100-yr	Time to Peak	= 19.23 hrs
Time Interval	= 1 min	Hydrograph Volume	= 115,954 cuft



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.27

07-10-2023

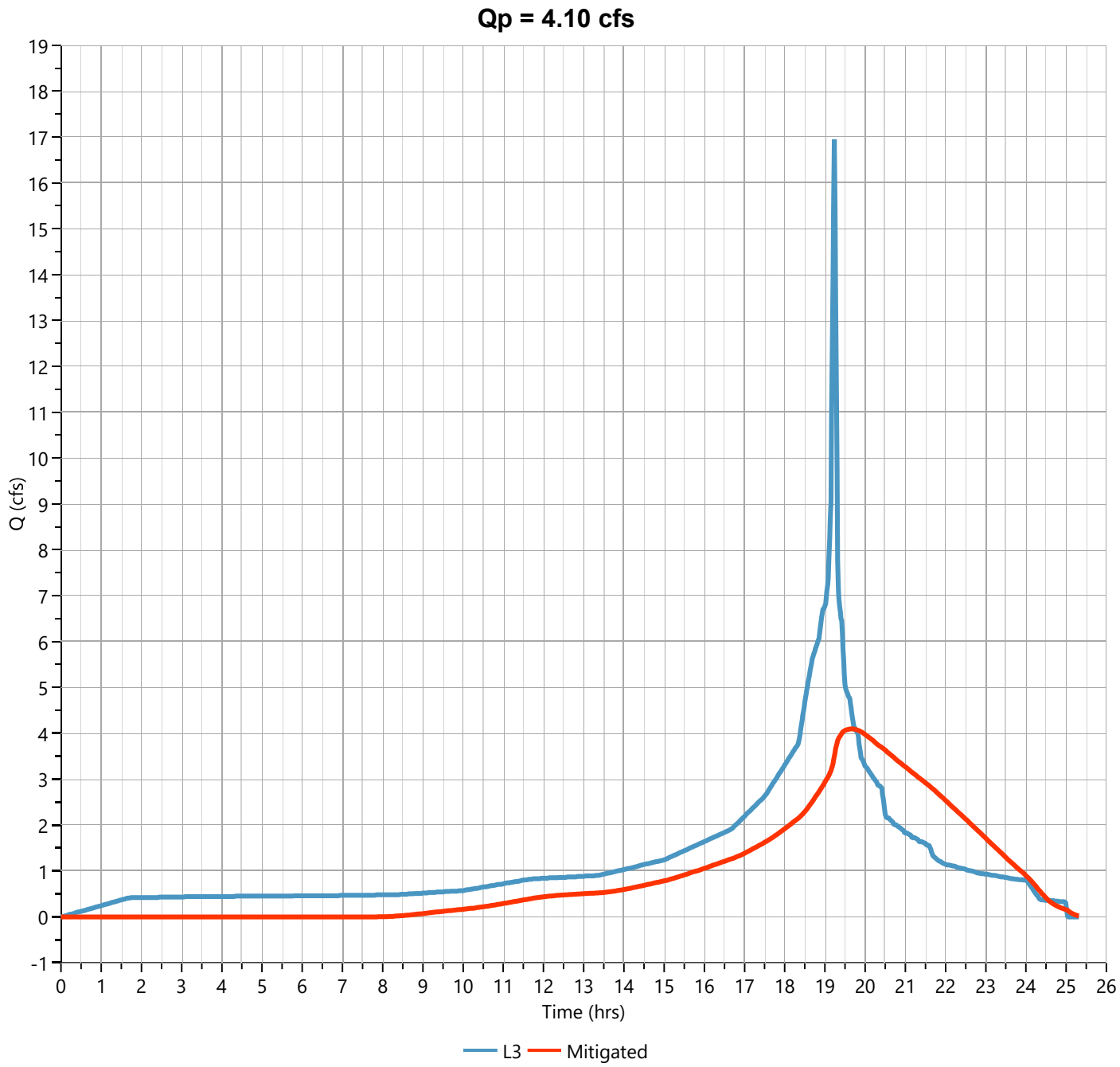
Post Mitigated

Hyd. No. 2

Hydrograph Type	= Pond Route	Peak Flow	= 4.098 cfs
Storm Frequency	= 100-yr	Time to Peak	= 19.67 hrs
Time Interval	= 1 min	Hydrograph Volume	= 82,084 cuft
Inflow Hydrograph	= 1 - L3	Max. Elevation	= 105.86 ft
Pond Name	= UG Basins	Max. Storage	= 24,837 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 2.71 hrs



Pond Report

Project Name:

Hydrology Studio v 3.0.0.27

07-10-2023

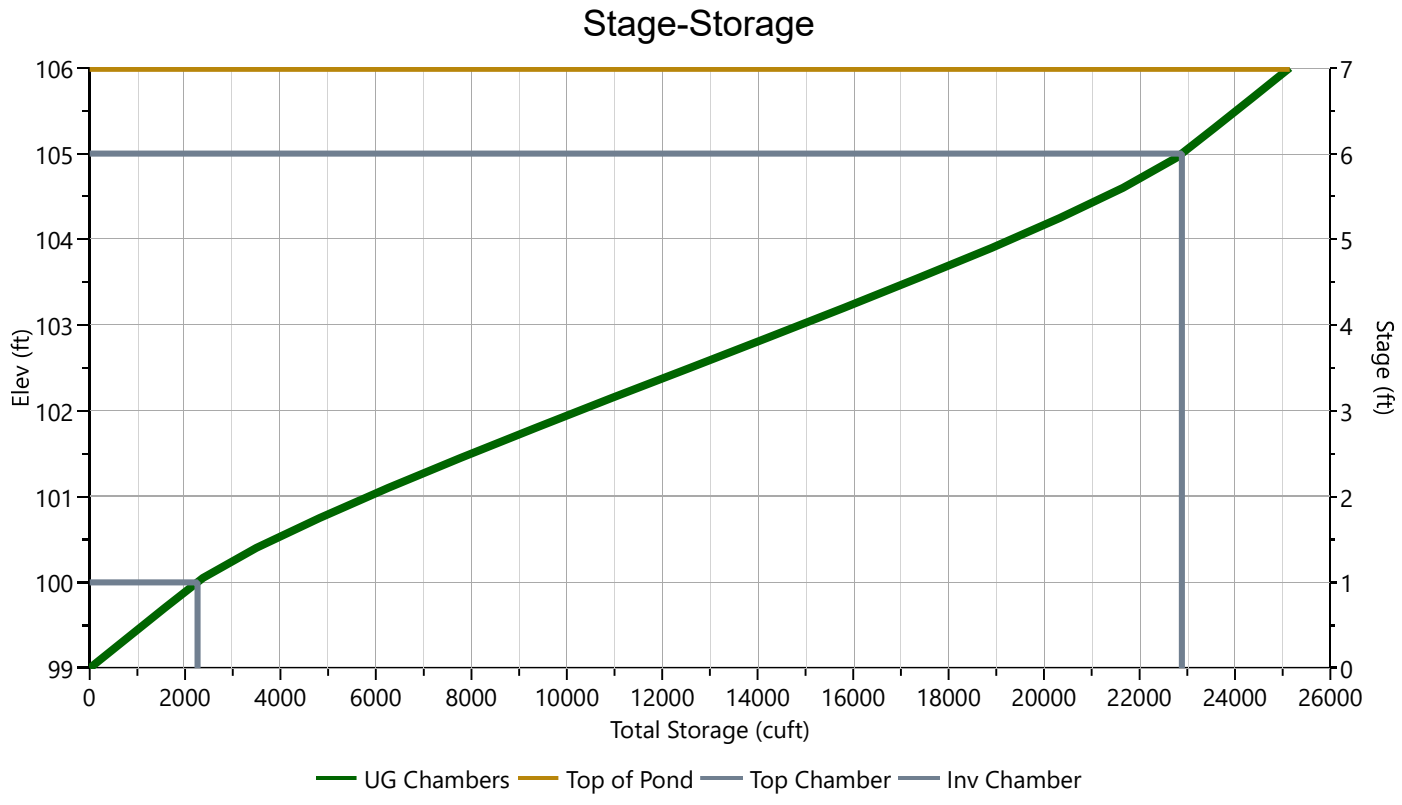
UG Basins

Stage-Storage

Underground Chambers	
Description	**Input**
Invert Elev Down, ft	100.00
Chamber Rise, ft	5.00
Chamber Shape	Circular
Chamber Span, ft	5.00
Barrel Length, ft	800.00
No. Barrels	1
Barrel Slope, %	0.00
Headers, y/n	No
Stone Encasement, y/n	Yes
Encasement Bottom Elevation, ft	99.00
Encasement Width per Chamber, ft	7.00
Encasement Depth, ft	7.00
Encasement Voids, %	40.00

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
0.00	99.00	5,614	0.000	0.000
0.35	99.35	5,614	786	786
0.70	99.70	5,614	786	1,572
1.05	100.05	5,614	802	2,374
1.40	100.40	5,614	1,124	3,499
1.75	100.75	5,614	1,319	4,818
2.10	101.10	5,614	1,437	6,255
2.45	101.45	5,614	1,518	7,773
2.80	101.80	5,614	1,574	9,347
3.15	102.15	5,614	1,605	10,952
3.50	102.50	5,614	1,624	12,576
3.85	102.85	5,614	1,624	14,199
4.20	103.20	5,614	1,608	15,807
4.55	103.55	5,614	1,571	17,378
4.90	103.90	5,614	1,518	18,896
5.25	104.25	5,614	1,437	20,333
5.60	104.60	5,614	1,319	21,652
5.95	104.95	5,614	1,123	22,775
6.30	105.30	5,614	802	23,577
6.65	105.65	5,614	786	24,363
7.00	106.00	5,614	786	25,149



Pond Report

Project Name:

Hydrology Studio v 3.0.0.27

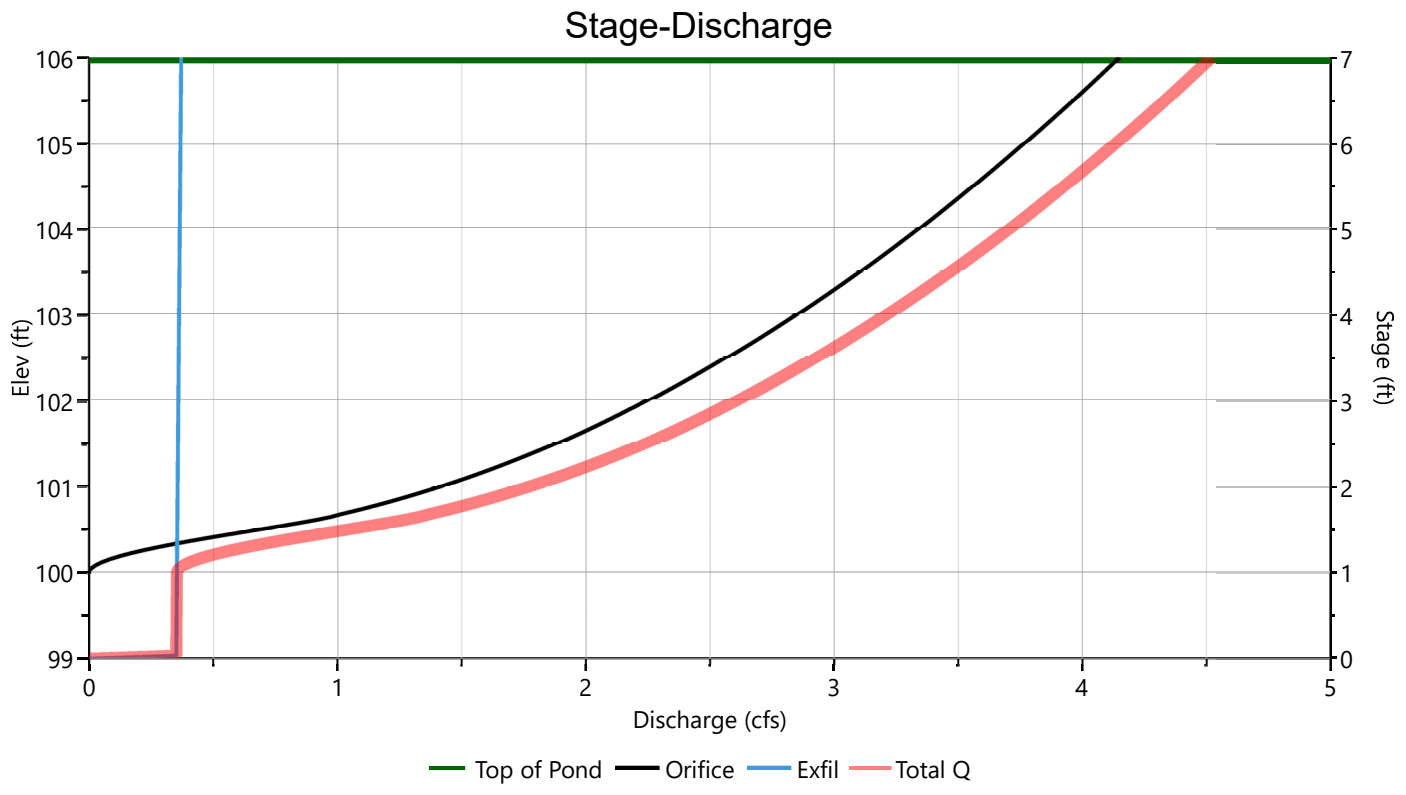
07-10-2023

UG Basins

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser	
		1	2	3		
Rise, in		8.15			Hole Diameter, in	
Span, in		8.15			No. holes	
No. Barrels		1			Invert Elevation, ft	
Invert Elevation, ft		100.00			Height, ft	
Orifice Coefficient, Co		0.60			Orifice Coefficient, Co	
Length, ft						
Barrel Slope, %						
N-Value, n	0.000					
Weirs	**Riser***	**Weirs**			**Ancillary**	
		1	2	3		
Shape / Type					Exfiltration, in/hr	2.70**
Crest Elevation, ft						
Crest Length, ft						
Angle, deg						
Weir Coefficient, Cw						

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.27

07-10-2023

UG Basins

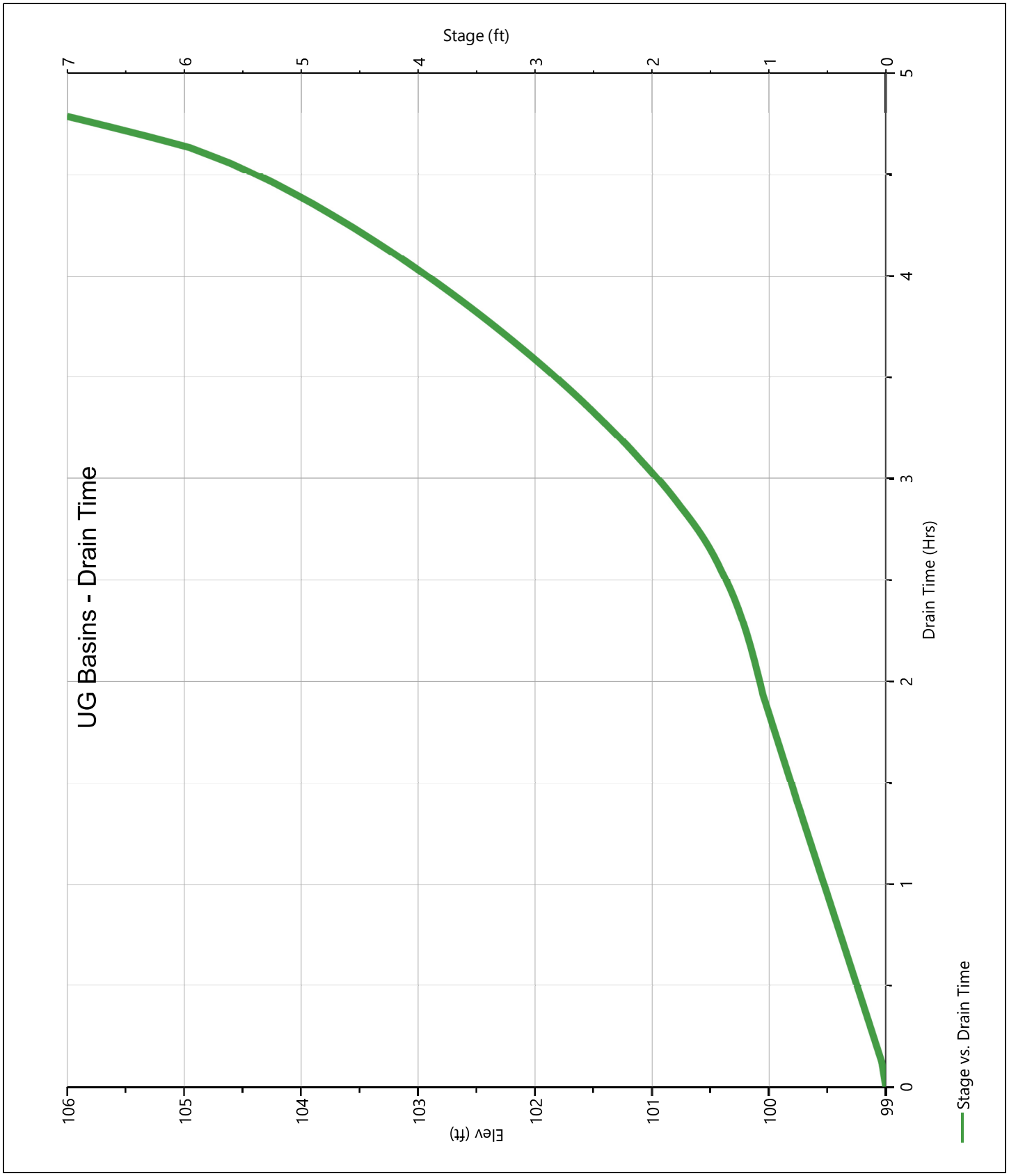
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	99.00	0.000		0.000								0.000		0.000
0.35	99.35	786		0.000								0.352		0.352
0.70	99.70	1,572		0.000								0.353		0.353
1.05	100.05	2,374		0.009								0.354		0.363
1.40	100.40	3,499		0.478								0.355		0.833
1.75	100.75	4,818		1.117								0.356		1.473
2.10	101.10	6,255		1.521								0.357		1.878
2.45	101.45	7,773		1.838								0.358		2.196
2.80	101.80	9,347		2.108								0.359		2.467
3.15	102.15	10,952		2.347								0.360		2.707
3.50	102.50	12,576		2.564								0.361		2.924
3.85	102.85	14,199		2.763								0.362		3.125
4.20	103.20	15,807		2.950								0.363		3.313
4.55	103.55	17,378		3.125								0.364		3.489
4.90	103.90	18,896		3.291								0.365		3.656
5.25	104.25	20,333		3.449								0.366		3.815
5.60	104.60	21,652		3.600								0.367		3.967
5.95	104.95	22,775		3.745								0.368		4.113
6.30	105.30	23,577		3.885								0.369		4.253
6.65	105.65	24,363		4.019								0.370		4.389
7.00	106.00	25,149		4.150								0.371		4.520

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

UG Basins

Pond Drawdown



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Attachment D

Hydraulic Calculations

Channel Report

Project Name: New Project

Studio Express by Hydrology Studio v 1.0.0.0

03-26-2021

Channel 1

Channel 1

CIRCULAR PIPE

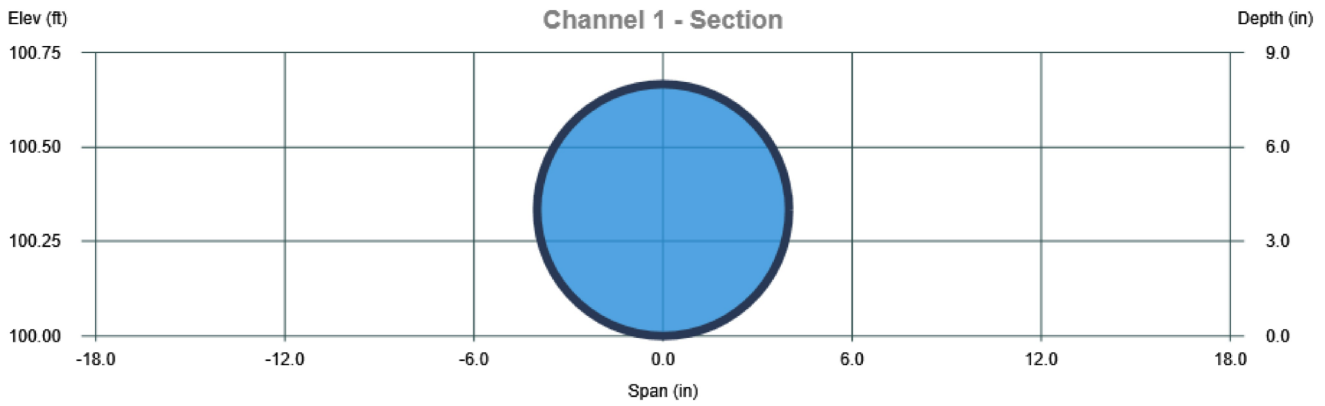
Diameter	= 8.0 in
Invert Elevation	= 100.00 ft
Pipe Slope	= 0.200 %
Manning's n	= 0.010

DISCHARGE

Method	= Known Depth
known Depth	= 0.67 ft

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(in)	(sqft)	(ft/s)	(ft)		(in)	(ft)	(ft)	(lb/sqft)	(ft)
0.70	8.0	0.35	2.01	2.09	0.010	4.8	100.7	100.73	0.08	0.00



Inlet Report

Project filename: Pipe Hydraulics.stx

Studio Express by Hydrology Studio v 1.0.0.13

10-10-2022

Inlet 1A

Inlet 1

DROP GRATE INLET

Location	= In Sag
Clear Open Area	= 4.00 sqft
Grate Width	= 2.00 ft
Grate Length	= 2.00 ft
Cross Slope, Sx	= 0.005 ft/ft
Gutter Width	= 3.00 ft
Clog Factor	= 50 %

DISCHARGE

Method	= Q vs Depth
Q Min	= 0.25 cfs
Q Max	= 6.50 cfs
Maximum Depth	= 6 in

CALCULATION SAMPLE

Q Catch	Q Captured	Q Bypassed	Gutter Spread	Inlet Spread	Gutter Depth	Inlet Depth	Efficiency
(cfs)	(cfs)	(cfs)	(ft)	(ft)	(in)	(in)	(%)
0.25	0.25	0.00	---	26.08	---	0.7	100

Inlet Report

Project filename: Pipe Hydraulics.stx

Studio Express by Hydrology Studio v 1.0.0.13

10-10-2022

Inlet 4B

Inlet 2

DROP GRATE INLET

Location	= In Sag
Clear Open Area	= 4.00 sqft
Grate Width	= 2.00 ft
Grate Length	= 2.00 ft
Cross Slope, Sx	= 0.005 ft/ft
Gutter Width	= 3.00 ft
Clog Factor	= 50 %

DISCHARGE

Method	= Q vs Depth
Q Min	= 0.25 cfs
Q Max	= 6.50 cfs
Maximum Depth	= 6 in

CALCULATION SAMPLE

Q Catch	Q Captured	Q Bypassed	Gutter Spread	Inlet Spread	Gutter Depth	Inlet Depth	Efficiency
(cfs)	(cfs)	(cfs)	(ft)	(ft)	(in)	(in)	(%)
0.25	0.25	0.00	---	26.08	---	0.7	100

Inlet Report

Project filename: Pipe Hydraulics.stx

Studio Express by Hydrology Studio v 1.0.0.13

10-10-2022

Inlet 5B

Inlet 3

DROP GRATE INLET

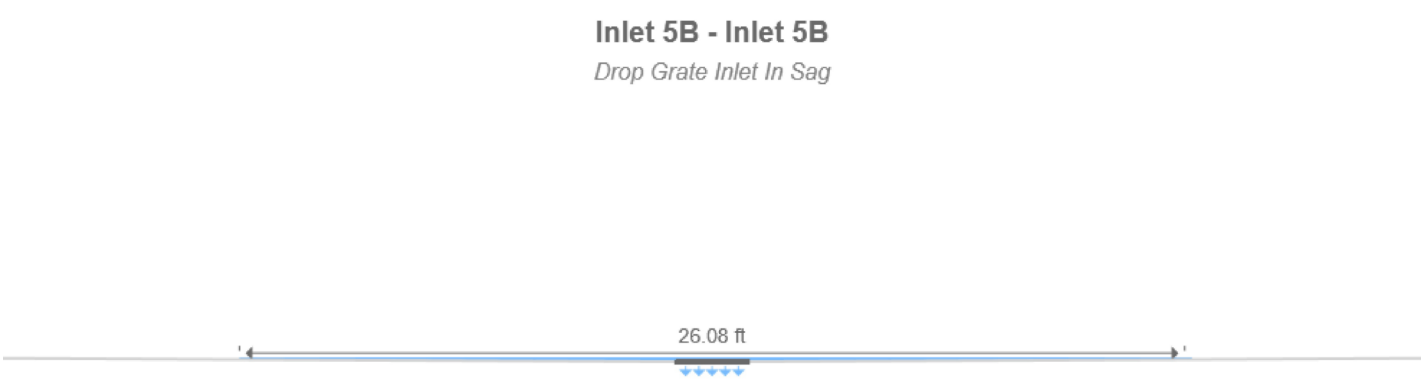
Location	= In Sag
Clear Open Area	= 4.00 sqft
Grate Width	= 2.00 ft
Grate Length	= 2.00 ft
Cross Slope, Sx	= 0.005 ft/ft
Gutter Width	= 3.00 ft
Clog Factor	= 50 %

DISCHARGE

Method	= Q vs Depth
Q Min	= 0.25 cfs
Q Max	= 6.50 cfs
Maximum Depth	= 6 in

CALCULATION SAMPLE

Q Catch	Q Captured	Q Bypassed	Gutter Spread	Inlet Spread	Gutter Depth	Inlet Depth	Efficiency
(cfs)	(cfs)	(cfs)	(ft)	(ft)	(in)	(in)	(%)
0.25	0.25	0.00	---	26.08	---	0.7	100



Channel Report

Project Name: New Project

Studio Express by Hydrology Studio v 1.0.0.0

03-26-2021

Channel 2

Channel 2

CIRCULAR PIPE

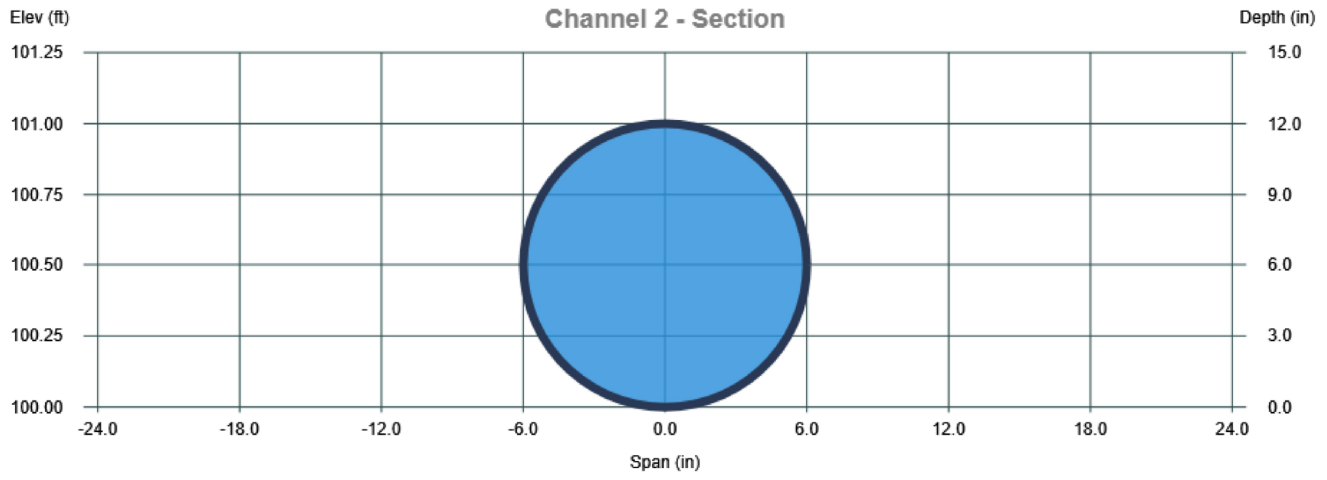
Diameter	= 12.0 in
Invert Elevation	= 100.00 ft
Pipe Slope	= 0.300 %
Manning's n	= 0.010

DISCHARGE

Method	= Known Depth
known Depth	= 1.00 ft

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(in)	(sqft)	(ft/s)	(ft)		(in)	(ft)	(ft)	(lb/sqft)	(ft)
2.53	12.0	0.79	3.23	3.14	0.010	8.3	101.0	101.16	0.19	0.00



Channel Report

Project Name: New Project

Studio Express by Hydrology Studio v 1.0.0.0

03-26-2021

Channel 3

Channel 3

CIRCULAR PIPE

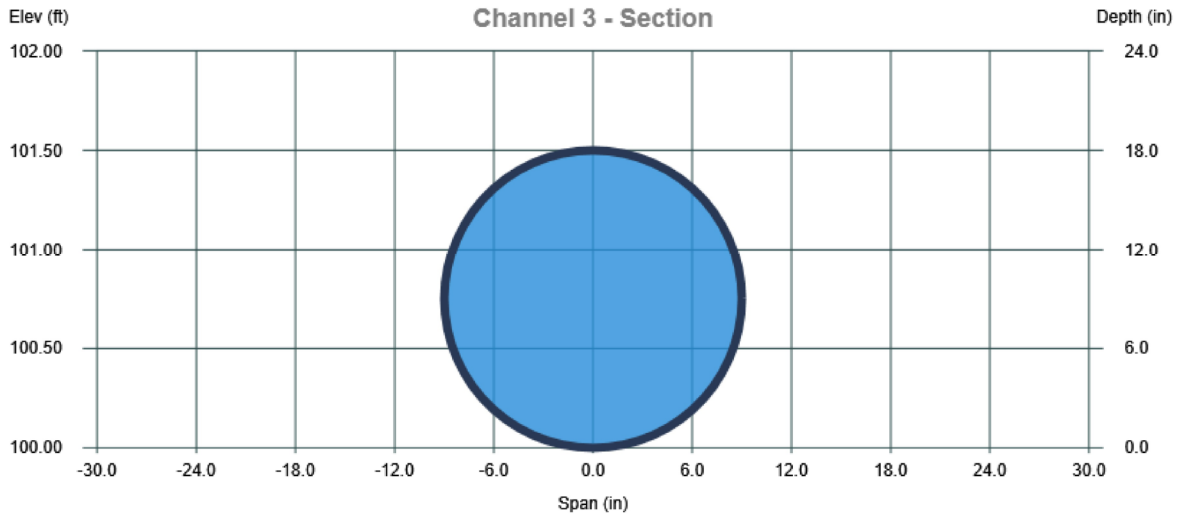
Diameter	= 18.0 in
Invert Elevation	= 100.00 ft
Pipe Slope	= 0.300 %
Manning's n	= 0.010

DISCHARGE

Method	= Known Depth
known Depth	= 1.50 ft

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(in)	(sqft)	(ft/s)	(ft)		(in)	(ft)	(ft)	(lb/sqft)	(ft)
7.47	18.0	1.77	4.23	4.71	0.010	12.7	101.5	101.78	0.28	0.00



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Attachment E

Stormwater Quality Treatment Calculations

Step 5: Apply BMPs to Reduce EIA to ≤ 5%

Step 1: Determine water quality design volume			
1-1. Enter Project area (acres), *Aproject*	Aproject =	5.17	acres
1-2. Enter the maximum allowable percent of the Project area that may be effective impervious area (%) (refer to permit), ranges from 5-30%, *%allowable*	%allowable =	5	%
1-3. **(5-a)** Determine the maximum allowable effective impervious area (acres), *EIAallowable = (Aproject)*(%allowable)*	EIAallowable =	**0.26**	acres
1-4. Enter Project impervious fraction, *Imp* (e.g. 60% = 0.60)	Imp =	0.73	
1-5. Determine the Project Total Impervious area (acres), *TIA*	TIA =	**3.77**	acres
1-6. **(5-b)** Determine the total area from which runoff must be retained (acres), *Aretain=TIA-EIAallowable*	Aretain =	**3.52**	acres
1-7. Determine pervious runoff coefficient using Table E-1, *Cp*	Cp =	0.05	
1-8. Runoff coefficient, *C = 0.95*	C =	0.95	
1-9. Enter design rainfall depth of the storm (in), *Pi*	Pi =	0.75	in
1-10. Calculate rainfall depth (ft), *P = Pi/12*	P =	**0.06**	ft
1-11. **(5-c)** Calculate Volume to be Retained (ft^3), *SQDV=43560*C*P*Aretain*	SQDV =	**9093**	ft^3

*Taken from the Technical Guidance Manual for Stormwater Quality Control Measures 2011
TGM Errata Update June 29, 2018
**Entire site including EIA and developed pervious areas are being treated by proposed Retention BMP

Step 7: Apply Treatment Control Measures
(INF-6)

Step 1: Determine water quality design volume			
1-1. Enter Project area from EIA and developed pervious surfaces (acres), $A_{EIA} = A_{project} - A_{retain}$	A_{EIA} =	1.65	acres
1-2. Enter Project impervious fraction, *Imp* (e.g. 60% = 0.60), *Imp = ((Apervious * 0.0) + (EIA * 1.0)) / A_{EIA}*	Imp =	0.16	
1-3. Determine pervious runoff coefficient using Table E-1, *Cp*	Cp =	0.05	
1-4. Calculate runoff coefficient, *C = 0.95*imp + Cp(1-imp)*	C =	0.19	
1-5. Enter design rainfall depth of the storm (in), *Pi*	Pi =	0.75	in
1-6. Calculate rainfall depth (ft), *P = Pi/12*	P =	0.06	ft
1-7. Calculate water quality design volume (ft3), *SQDV=43560×C*P*Aretain*	SQDV =	859	ft^3

*Taken from the Technical Guidance Manual for Stormwater Quality Control Measures 2011
TGM Errata Update June 29, 2018
**Entire site including EIA and developed pervious areas are being treated by proposed Retention BMP

Total SQDV
(INF-6)

Step 1: Determine total water quality design volume			
1-1. Enter SQDV from Step 5	SQDV1 =	9092.66	ft^3
1-2. Enter SQDV from Step 7	SQDV2 =	858.59	ft^3
1-3. Determine total SQDV, *SQDV = SQDV (step 5) + SQDV (step 7)*	SQDV =	9951.25	ft^3
Step 2: Determine the design percolation rate			
2-1. Enter measured soil percolation rate (in/hr, 0.5 in/hr min.), *Pmeasured*	Pmeasured =	12.40	in/hr
2-2. Determine percolation rate correction factor, *SA* based on suitability assessment (see Section 6 INF1)	SA =	2	
2-3. Determine percolation rate correction factor, *SB* based on design (see Section 6 INF-1)	Sb =	2.75	
2-4. Calculate combined safety factor, *S = SA* x *Sb*	S =	5.50	
2-5. Calculate the design percolation rate (in/hr), *Pdesign = Pmeasured/S*	Pdesign =	2.25	in/hr
Step 3: Calculate maximum infiltration depth			
3-1. Enter required drain time(hours,72 hrs max.), *t*	t =	72	hrs
3-2. Calculate max. depth of runoff that can be infiltrated within the *t* (ft), *dmax = Pdesign t/12*	dmax =	13.53	ft
Infiltration will be met through a proprietary device, therefore, neither the infiltration basin design or the infiltration trench design apply to this application. Specific volume calculations are provided on Sheet 4.			

*Taken from the Technical Guidance Manual for Stormwater Quality Control Measures 2011
TGM Errata Update June 29, 2018
**Entire site including EIA and developed pervious areas are being treated by proposed Retention BMP

Infiltration Basin Sizing

Factor Category		0.26	Weight	Value	Product	Comment
A	Suitability Assessment	Soil Assessment Methods	0.25	2	0.5	Percolation tests per "Stormwater Detention Infiltration Test Report' performed by Workman Geotechnical Engineering
		Predominant Soil Texture	0.25	2	0.5	Group B soils (Ventura soil number 5), f = 6.20 in/hr
		Site Soil Variability	0.25	1	0.25	Assumed relatively homogeneous soils
		Depth to Groundwater	0.25	3	0.75	Historical mapping indicates the depth to the highest historical groundwater is approximately 20 feet below grade
	Suitability Assessment Safety Factor $S_A=\Sigma p$				2	
B	Design	Tributary Area Size	0.25	3	0.75	Tributary area is less than 2 acres (0.79 ac)
		Level of Pretreatment	0.25	3	0.75	Site incorporates a hydrodynamic separator capacble of capturing 80% of TSS with d50 = 50 microns
		Redundancy	0.25	3	0.75	Medium redundancy, pre-treatment BMP's are capable of treating gross solids and TSS in the event of a system failure. In addition, each system treats individual tributary area, so if one system fails, the other systems will continue to treat the other tributaries.
		Compaction during Const.	0.25	2	0.5	There is a medium probability of unintended/indirect compaction.
	Design Safety Factor $SB=\Sigma p$				2.75	
Combined Safety Factor = S_A x S_B					**5.5**	

Water Quality Design Flow
(SQDF)

Step 1: Determine water quality design flow			
1-1. Enter Project area (acres), *Aproject*	Aproject =	5.17	acres
1-2. Enter Project impervious fraction, *Imp* (e.g. 60% = 0.60)	Imp =	0.85	
1-3. Determine pervious runoff coefficient using Table E-1, *Cp*	Cp =	0.05	
1-4. Calculate runoff coefficient, *C = 0.95*imp + Cp(1-imp)*	C =	0.87	
1-5. Enter design rainfall intensity (in/hr), *i*	i =	0.2	in/hr
1-6. Calculate water quality design flow (cfs), *SQDF=CiA*	SQDF =	**0.90**	cfs

*Taken from the Technical Guidance Manual for Stormwater Quality Control Measures 2011
TGM Errata Update June 29, 2018

Volume Calculations
Stormwater Infiltration System

Total Section Height	7	feet
Total Section Width	8	feet
Pipe Diameter	5	feet
Area of Rock	36.37	square feet
Volume of Rock	14.55	cubic feet / foot of system
+ Volume of Pipe	19.63	cubic feet / foot of system
Total Volume	34.18	cubic feet / foot of system
SQDV	9952	cubic feet
Required Length	291.16	feet
Provided Length	306	feet

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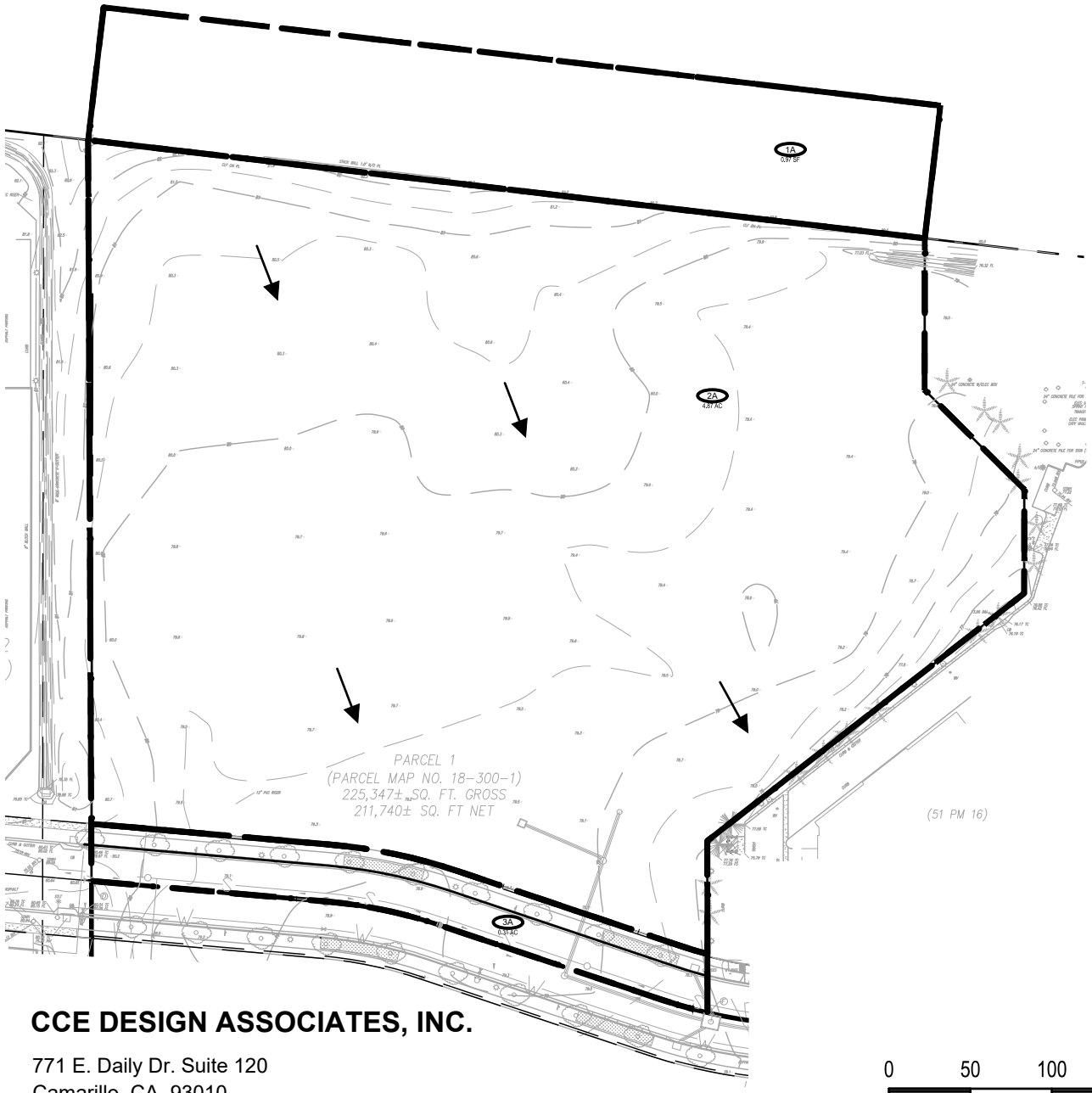
Attachment F

Hydrology Map

EXISTING CONDITION



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Camarillo, CA 93010
P:805.738.5434
www.ccedesignassociates.com

0 50 100 200 300

Scale 1" = 100 ft

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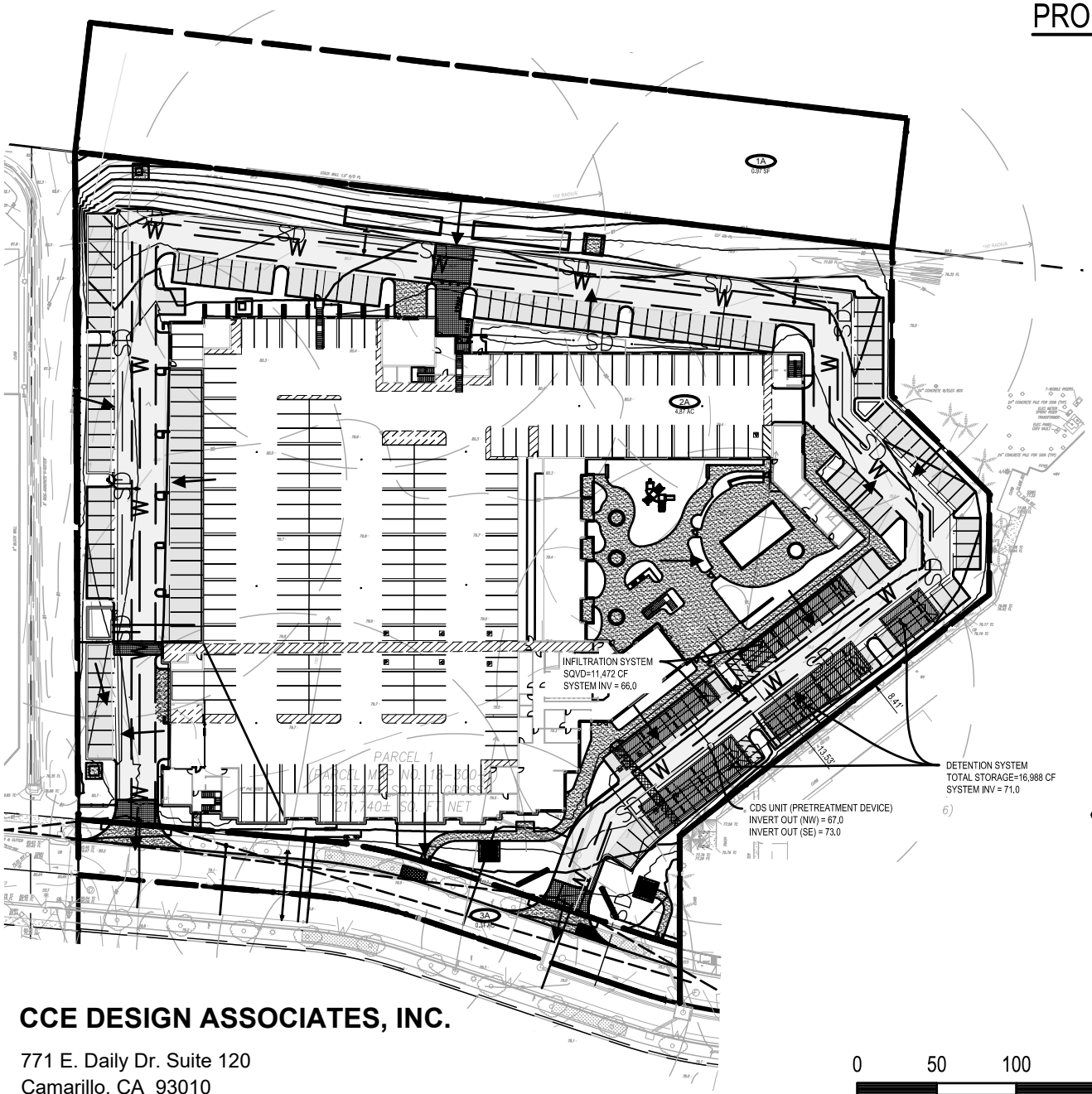
PROPOSED CONDITION



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Scale 1" = 100 ft

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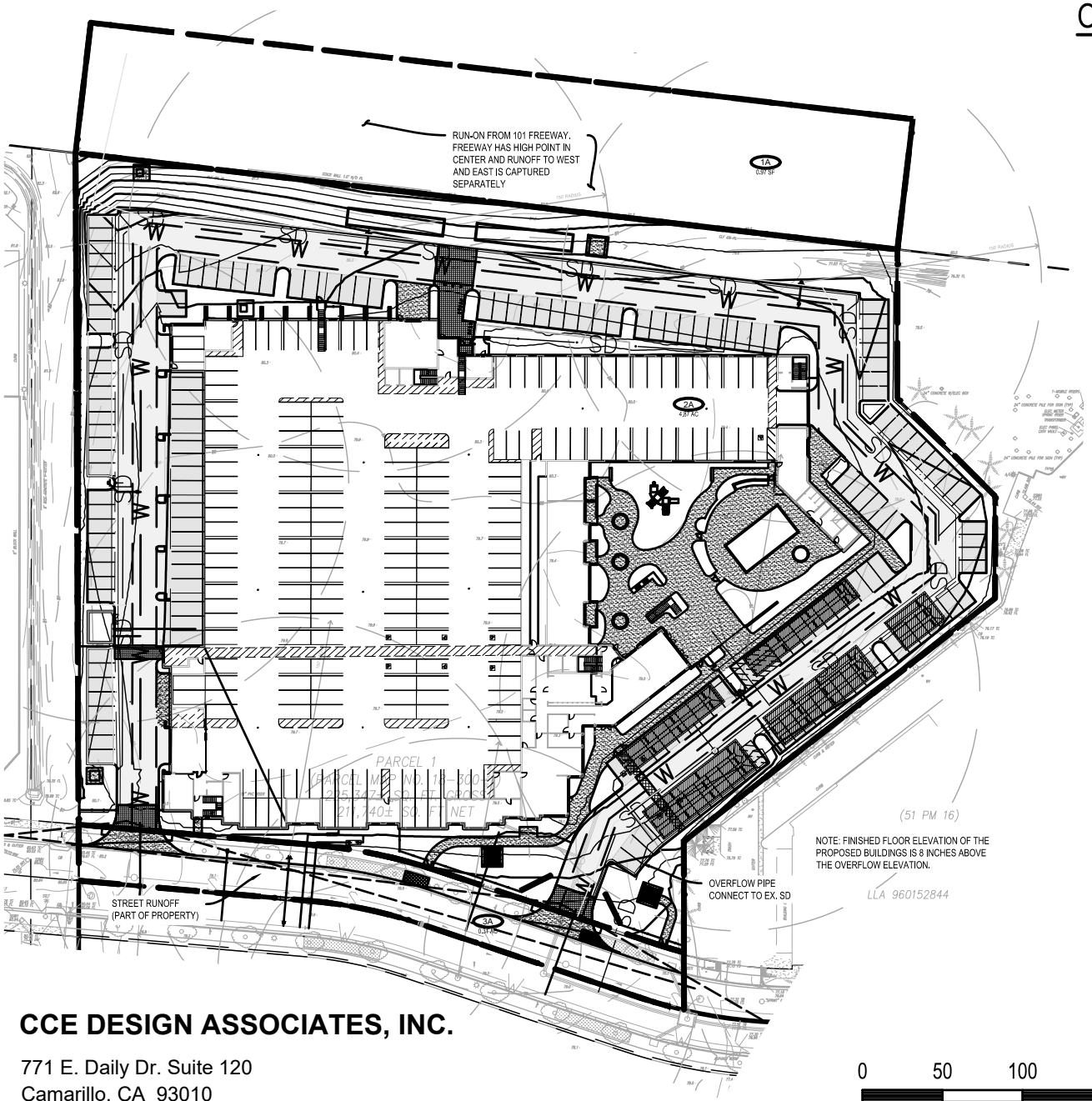
OVERLAND FLOW



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Scale 1" = 100 ft

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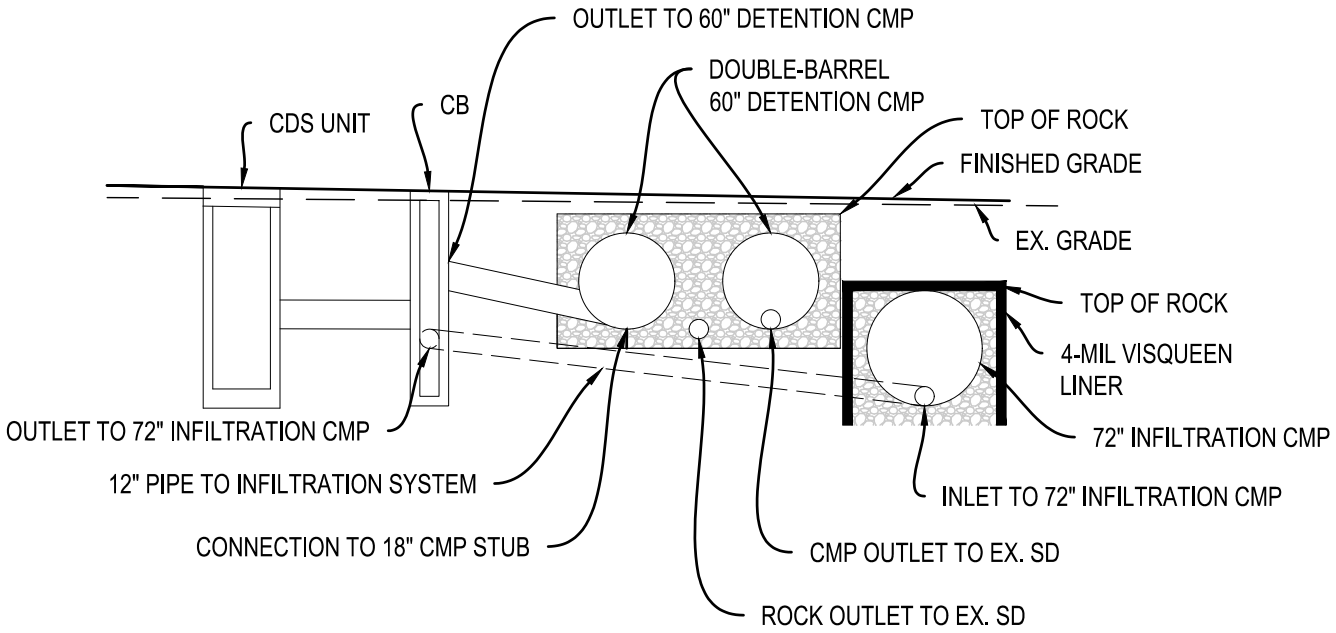

DETENTION / INFILTRATION SYSTEM SECTION

SCALE 1" = 10'

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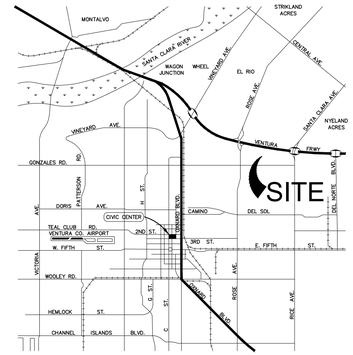
HYDROLOGY EXHIBIT



RUN-ON FROM 101 FREEWAY. FREEWAY HAS HIGH POINT IN CENTER AND RUNOFF TO WEST AND EAST IS CAPTURED SEPARATELY

1A
0.97 SF

2A
4.87 AC

3A
0.31 Ac

INFILTRATION SYSTEM
SQVD=11,472 CF
SYSTEM INV = 66.0

DETENTION SYSTEM
TOTAL STORAGE=25,149 CF
SYSTEM INV = 71.0

CDS UNIT (PRETREATMENT DEVICE)
INVERT OUT (NW) = 67.0
INVERT OUT (S

NOTE: FINISHED FLOOR ELEVATION OF THE PROPOSED BUILDINGS IS 8 INCHES ABOVE THE OVERFLOW ELEVATION.

OVERFLOW PIPE
CONNECT TO EX. SD

STREET RUNOFF
(PART OF PROPERTY)

(N) 15' FIRE ESMNT.

PARCEL 2
'69 PM 9)

PARCEL 1
LLA 960152844

LEGEND

NEW	EXISTING	
		ASPHALT BERM
		BLOCK/RETAINING WALL
		BUILDING LINE
		CONCRETE CURB
		CONCRETE CURB CUT
		CONCRETE CURB & GUTTER
100	100	CONTOUR LINE
		DRIVEWAY
		EDGE OF PAVEMENT
		FENCE LINE
GB	GB	GRADE BREAK
		LOT LINE
R	R	RIDGE LINE
S	S	SANITARY SEWER
		SIDEWALK
SD	SD	STORM DRAIN & CATCH BASIN
		TRACT BOUNDARY
W	W	WATER LINE AND WATER METER

ABBREVIATIONS

BFP	BACKFLOW PREVENTION DEVICE	FF	FINISHED FLOOR
BO	BLOWOFF	FG	FINISHED GRADE
BOW	BOTTOM OF WALL (AT GROUND)	FS	FINISHED SURFACE
BW	BACK OF WALK	GB	GRADE BREAK
BLDG	BUILDING	HP	HIGH POINT
CB	CATCH BASIN	INV	INVERT ELEVATION
CO	CLEANOUT	LP	LOW POINT
CONC	CONCRETE	MH	MANHOLE
CMP	CORRUGATED METAL PIPE	PIV	POST INDICATOR VALVE
DR	DOOR	POC	POINT OF CONNECTION
DS	DOWN SPOUT	R	RIDGE
ESMT	EASEMENT	RIM	RIM ELEVATION
EG	EXISTING GRADE	RD	ROOF DRAIN
FC	FACE OF CURB	TC	TOP OF CURB
FF	FINISHED FLOOR	TW	TOP OF WALL
FDC	FIRE DEPARTMENT CONNECTION	TE	TRASH ENCLOSURE
FH	FIRE HYDRANT	WM	WATER METER
FL	FLOW LINE	WV	WATER VALVE

0 15 30 60 90
Scale 1" = 30 ft

PREPARED BY:
CCE DESIGN ASSOCIATES, INC.
771 E. Daily Drive • Ste 120 • Camarillo, CA 93010
445 S Figueroa Street • Ste 3100 • Los Angeles, CA 90071
805.738.5434 • www.ccedesignassociates.com

JARED Q. ADAMS, P.E.
R.C.E. No. 86086
DATE

REGISTERED PROFESSIONAL ENGINEER
JARED Q. ADAMS
No. 86086
EXP. 9/30/24
CIVIL
STATE OF CALIFORNIA

REVISIONS

MARK	DATE	DESCRIPTION	BY

REVIEWED BY:
DATE
DATE

CITY OF OXNARD
Development Services Department

HYDRO EXHIBIT

ACCEPTED BY: _____ _____
CITY ENGINEER R.C.E. DATE

SHEET DRAWING NUMBER

SCALE: HORIZ. 1"=30'
VERT. 1"=30'
DRAWN BY: JQA
CHECKED BY: RC

SHEET No. 1 OF 1
DRAWING NUMBER

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Attachment G

Infiltration Test Report

GEOLABS-WESTLAKE VILLAGE
Foundation and Soils Engineering, Geology
A dba of
R&R Services
Corporation
3595 Old Conejo Road, Thousand Oaks, CA 91320
Voice: (818) 889-2562

February 3, 2023
W.O. 9511

Sunbelt Enterprises, LLC.
c.o SVM Development, LLC
5715 Mesmer Avenue
Los Angeles, California 90230

ATTENTION: Mr. Mark Ross

SUBJECT: Soil Assessment Report for Onsite Stormwater Infiltration,
Lockwood Street, Parcel 1 (APN 213-0-090-27) & Parcel 2 (APN 213-0-090-105),
City of Oxnard, California

Mr. Ross:

In accordance with your request, Geolabs – Westlake Village (GWV) has prepared this report to present the results of stormwater infiltration testing performed at the subject site. The purpose of our work was to evaluate the suitability of the site for onsite infiltration of stormwater, recommend a design infiltration rate, and provide an estimate of the depth to the seasonal high groundwater table.

The subject site is identified on the enclosed Site Location Map (Plate 1.1). Field data and the approximate locations of infiltration tests are shown on the enclosed Plot Map (Plate 1.2). Descriptions of the soils observed in our exploratory excavations are provided on the enclosed Boring Logs in Appendix A. A record of infiltration testing is provided on the enclosed Infiltration Test Logs in Appendix B. Details of our findings are presented in the following sections.

SITE DESCRIPTION

The subject site consists of two vacant parcels in the City of Oxnard located both north and south of Lockwood Street, west of its intersection with Outlet Center Drive. Parcel 1 (APN 213-0-090-27) is 5.17 acres on the north side of Lockwood Street. Parcel 2 (APN 213-0-090-105) is divided into two pieces on the south side of Lockwood Street: 3.08 acres on the west and 3.60 acres on the east. The site is bounded to the north by the Ventura Freeway (U.S. Highway 101), and to the east, south, and west by commercial development.

Site topography is flat lying with elevations ranging from approximately 77 to 81 feet. Historical aerial imagery shows that these lots were used for agricultural purposes before 1970. Between 1945 and 1959 a citrus grove was planted. Farming operations ceased sometime between 1970 and 1994 and the lot remained undeveloped. Farm structures were within the western portion as early as 1938. At the time of this writing, the ground surface is mostly dirt with sparse shrubs and grasses.

Figure 1. Subject site

PROPOSED PROJECT

A five-story apartment building with tuck-under parking and appurtenant on-grade parking areas is proposed on Parcel 1. A group of four-story apartment buildings with two courtyards and appurtenant parking areas are proposed on Parcel 2 West. A four-story senior apartment facility with seven individual buildings and appurtenant on-grade parking areas is proposed on Parcel 2 East. All three development areas are planned to be

provided with subterranean stormwater infiltration galleries. The approximate locations of the galleries are shown on the enclosed Plot Map (Plate 1.2).

FIELD INVESTIGATION

For this study, eight exploratory locations were selected to characterize the infiltration properties of the materials in the vicinity of the proposed stormwater infiltration galleries. Exploratory borings were excavated with a truck-mounted hollow-stem auger drill rig. Samples were driven with a 140 lb. automatic safety hammer lifted 30 inches. Drill rod was used to allow the hammer to remain above the auger. The boring diameter was approximately eight inches (outer diameter). The samplers consisted of both SPT split spoon sampler and a lined California split spoon sampler (2.375-inch I.D.). Borings were converted to infiltration test wells as described below in the INFILTRATION TESTING section. Both disturbed (bulk) and relatively undisturbed samples were obtained from the borings. These samples were secured and transported to our laboratory for testing. At the completion of infiltration testing, the borings were backfilled with drill spoils.

EARTH MATERIALS

Detailed logs of earth materials encountered during the field investigation are presented in Appendix A. Earth materials generally consisted of two layers of alluvium. The upper layer is a brown clayey to sandy silt that extends to depths of approximately 8 to 11 feet below the ground surface. The lower layer is a light brown fine to coarse-grained sand with local clayey interlayers that are less than one foot thick. These materials are consistent with those observed in previous excavations at the site (see references).

GROUNDWATER

Groundwater was not observed in any of the excavations performed for this study to the total depth explored of 17 feet. Our work for Parcel 2 West in 2021 did not encounter groundwater to the total depth explored of 30 feet (GWV 11 August 2022). Our work for Parcel 1 in 2022 encountered groundwater at a depth of 41 feet (GWV 20 September 2022).

Borings performed by Yeh and Associates in 2019 for Lockwood Street did not encounter groundwater to the total depth explored of 31.5 feet. Borings performed by MTC in 2020 for Parcel 2 East encountered groundwater at a depth of 36 feet. Borings performed by Independent Solutions in 2015 for the St. John's Regional Medical Center located approximately one-half mile to the southwest encountered groundwater at a depth of 35 feet.

The historical high groundwater level is mapped as being approximately ten feet below the ground surface at the subject site (CGS, 2002).

SEASONAL HIGH GROUNDWATER LEVEL

Seasonal variations in groundwater conditions are expected and are influenced by numerous factors including storm runoff, irrigation, and local groundwater pumping. To estimate a depth to the seasonal high

groundwater level, we followed the procedure in the Ventura County Technical Guidance Manual for Stormwater Quality Control Measures (hereafter referred to as the TGM). We averaged the annual minima for each water year on record from two nearby sites available through the Geotracker website and the California Water Data Library. A plot of this data is provided on the enclosed Plate GW which shows the seasonal high groundwater level for each water year, and the average seasonal high for each of the two sites.

The first is from the Oxnard Truck Center located at 2101 Ventura Boulevard, which is approximately 800 feet northeast of the subject site. Several groundwater monitoring wells were installed and monitored by Groundwater Solutions between 1992 and 2010 (Groundwater Solutions, 2010). We use the data from well MW-9 which has the longest history of monitoring. The depth to groundwater over this time period varied between 13.2 feet and 20.2 feet, with an average seasonal high of 16.2 feet.

The second is from the St. John's Regional Medical Center in Oxnard located at 1600 North Rose Avenue, which is approximately 2,300 feet southwest of the subject site. State well 02N22W35C001S is located in the northwest quadrant and has monitoring data from 1972 to 2002. We excluded data prior to water year 1993 because the groundwater level was very low, upwards of 80 feet below the ground surface, which appears to have been artificially lowered through activities like groundwater extraction. The depth to groundwater between water years 1993 and 2002 varied between 12.6 feet and 47.0 feet, with an average seasonal high of 20.6 feet.

A straight line drawn between the Oxnard Truck Center and St John's Regional Medical Center passes through the subject site. Interpolating between the two average seasonal highs we estimate the depth to the seasonal high groundwater level at the subject site to be 17.1 feet below the ground surface.

INFILTRATION TESTING

Eight infiltration tests were performed at the subject site, two at the location of each proposed infiltration gallery, to characterize the infiltration properties of the earth materials. Target test locations were provided to our office by the stormwater infiltration system engineer. Tests were conducted at depths of 7 and 17 feet below the ground surface. The tests were performed in wells constructed in exploratory borings I1 through I8 (see Plate 1.2). Test results are presented in Appendix B, Plates IT1 through IT8. Our testing was conducted in accordance with the "Small Diameter Boring Infiltration Test" method presented in the Administrative Manual Los Angeles County Public Works Geotechnical and Materials Engineering Division Document GS200.1 dated June 30, 2021. Test hole construction, infiltration test procedure, infiltration test results, and our recommendations are discussed in greater detail in the following sections.

TEST HOLE CONSTRUCTION

An eight-inch diameter hollow stem auger was used to excavate the infiltration test borings to their respective target depths. A two-inch diameter PVC pipe (solid with the lower one foot slotted) was placed in the

boring through the augers. The annulus was filled with clean (#3) sand to a height of approximately three to four feet above the bottom of the boring. Care was taken during installation of the pipe and sand pack to prevent slough from accumulating in the bottom of the borehole. At the completion of testing, the pipe was removed and the boring backfilled with drilling spoils.

INFILTRATION TEST PROCEDURE

Each test hole was presoaked in accordance with GS200.1. Testing proceeded immediately after the presoak period. Measurement intervals ranging from 1 to 60 minutes were selected depending on the rate that water drained during presoaking. Following each measurement interval, the boring was refilled to the start depth (between one to two feet of water in the bottom of the boring), except for the test in I6 which drained so slowly it was never refilled. This process was repeated until a stabilized rate of drop was obtained, which is when the highest and lowest readings are within ten percent of each other for three consecutive readings.

INFILTRATION TEST RESULTS

Testing was performed on January 25 and 26, 2023. Infiltration rates were determined by the following formula:

$$i = \frac{V}{A \times \Delta t \times RF_t}$$

i = infiltration rate [in/hr]
V = volume of water infiltrated during measurement interval [in^3]
A = average wetted surface area during measurement interval [in^2]
Δt = duration of measurement interval [hr]
RF_t = reduction factor for non-vertical flow

The final three measurements during each test were averaged to produce the "Measured Short-Term Infiltration Rate" presented in Table 1 below.

Table 1. Summary of field measured infiltration rates

Boring	Infiltration Test Log	Depth (feet)	Material Description	Measured Short-Term Infiltration Rate (in/hr)
I1	IT1	7	Silty very fine sand	0.19
I2	IT2	17	Fine to medium sand	6.5
I3	IT3	7	Silty very fine sand	0.43
I4	IT4	17	Fine to coarse sand	28.9
I5	IT5	7	Silty very fine sand	0.10
I6	IT6	17	Sandy clay	0.05
I7	IT7	17	Fine sand	44.2
I8	IT8	7	Clayey sand	0.22

RECOMMENDATIONS

To determine the design percolation rate, the measured short-term infiltration rate should be divided by the Combined Safety Factor presented in Table 6-4 of the TGM. Table 6-4 is reproduced below. Values of cells marked with an asterisk (*) should be selected by the stormwater infiltration system engineer.

Table 6-4. Infiltration Facility Safety Factor Determination Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	2	0.5
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	2	0.5
		Depth to groundwater / impervious layer	0.25	3	0.75
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			2.0
B	Design	Tributary area size	0.25	*	*
		Level of pre-treatment / expected sediment loads	0.25	*	*
		Redundancy	0.25	*	*
		Compaction during construction	0.25	*	*
		Design Safety Factor, $S_B = \Sigma p$			*
Combined Safety Factor = S_A x S_B					*

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.

Limitations on the proposed stormwater infiltration galleries are provided in the TGM under the heading INF-6: PROPRIETARY INFILTRATION. These types of systems require a native soil infiltration rate of 0.5 inches per hour. Based on the infiltration testing performed for this study, the upper silty layer of alluvium, represented by the infiltration tests conducted at a depth of 7 feet, is anticipated to have infiltration rates that are slower than the required value. We recommend the invert of the stormwater infiltration galleries be located within the lower sandy layer that begins at a depth of 8 to 11 feet below the ground surface, typically at a depth of 10 feet. Considering the depth to seasonal high groundwater is estimated to be 17 feet, this would provide at least 6 feet of separation from the invert of the galleries. We recommend a measured short-term infiltration rate of 6.5 inches per hour be applied to the lower sandy layer materials. That rate should be reduced by the safety factors in Table 6-4 above to determine the design percolation rate.

If designed and constructed in accordance with the recommendations contained within this report and the requirements of the City of Oxnard, we consider the site to be suitable for the proposed stormwater infiltration galleries.

CONSTRUCTION MONITORING

Site conditions may vary from those observed in our exploratory excavations. A representative of this office should observe excavations for the proposed stormwater infiltration galleries to evaluate whether the conditions encountered are consistent with those used for design. Supplemental recommendations may prove warranted based upon the materials exposed in the actual excavations.

CLOSURE

This geotechnical report has been prepared in accordance with generally accepted engineering practices at this time and location. No other warranties, either express or implied, are made as to the professional advice provided under the terms of our agreement and included in this report.

Thank you for this opportunity to be of service. Please do not hesitate to call if you have any questions.

Respectfully submitted,
GEOLABS-WESTLAKE VILLAGE

Ryan M. Prose
C.E.G. 2625

CERTIFIED ENGINEERING GEOLOGIST
RYAN M. PROSE
EG 2625
STATE OF CALIFORNIA

Lawrence K. Stark
G.E. 2772

REGISTERED PROFESSIONAL ENGINEER
LAWRENCE K. STARK
No. 2772
GEOTECHNICAL
STATE OF CALIFORNIA

RMP: af/jl

Enclosures:

Reference List	Plate R
Location Map	Plate 1.1
Plot Map	Plate 1.2
Groundwater Plots	Plate GW
Excavation Logs	Appendix A
Infiltration Test Logs	Appendix B

XC: (1) Addressee

REFERENCES

County of Los Angeles, June 30, 2021; *Guidelines for Geotechncial Investigation and Reporting, Low Impact Development Stormwater Infiltration*; GS200.1 in Administrative Manual, County of Los Angeles, Department of Public Works, Geotechnical and Materials Engineering Division.

Geolabs-Westlake Village, August 12, 2021; Preliminary Geotechnical Investigation, Proposed Multi-Family Residential Housing, Western Portion of Parcel 2, APN 213-0-090-105, City of Oxnard, California.

…, August 11, 2022; Update Geotechnical Report and Change of Consultant, Proposed Lockwood Phase 1 Senior Apartments, Outlet Center Drive, APN 213-0-090-105, City of Oxnard, California.

…, September 20, 2022; Preliminary Geotechnical Investigation, Proposed Multi-Family Residential Development, Lockwood Street, Parcel 1, APN 213-0-090-27, City of Oxnard, California.

Groundwater Solutions, Inc., January 18, 2010; Semi-Annual Groundwater Monitoring Report for the Second Half of 2009, Oxnard Truck Center, 2101 East Ventura Boulevard, Oxnard, California (EHD File #C87054).

Independent Solutions, September 12, 2016; Geologic and Geotechnical Study Report, St. Johns Oxnard (Facility ID 11172), Proposed ER/NICU/LDR Expansion and Renovation Project, 1600 North Ros Avenue, Oxnard, CA.

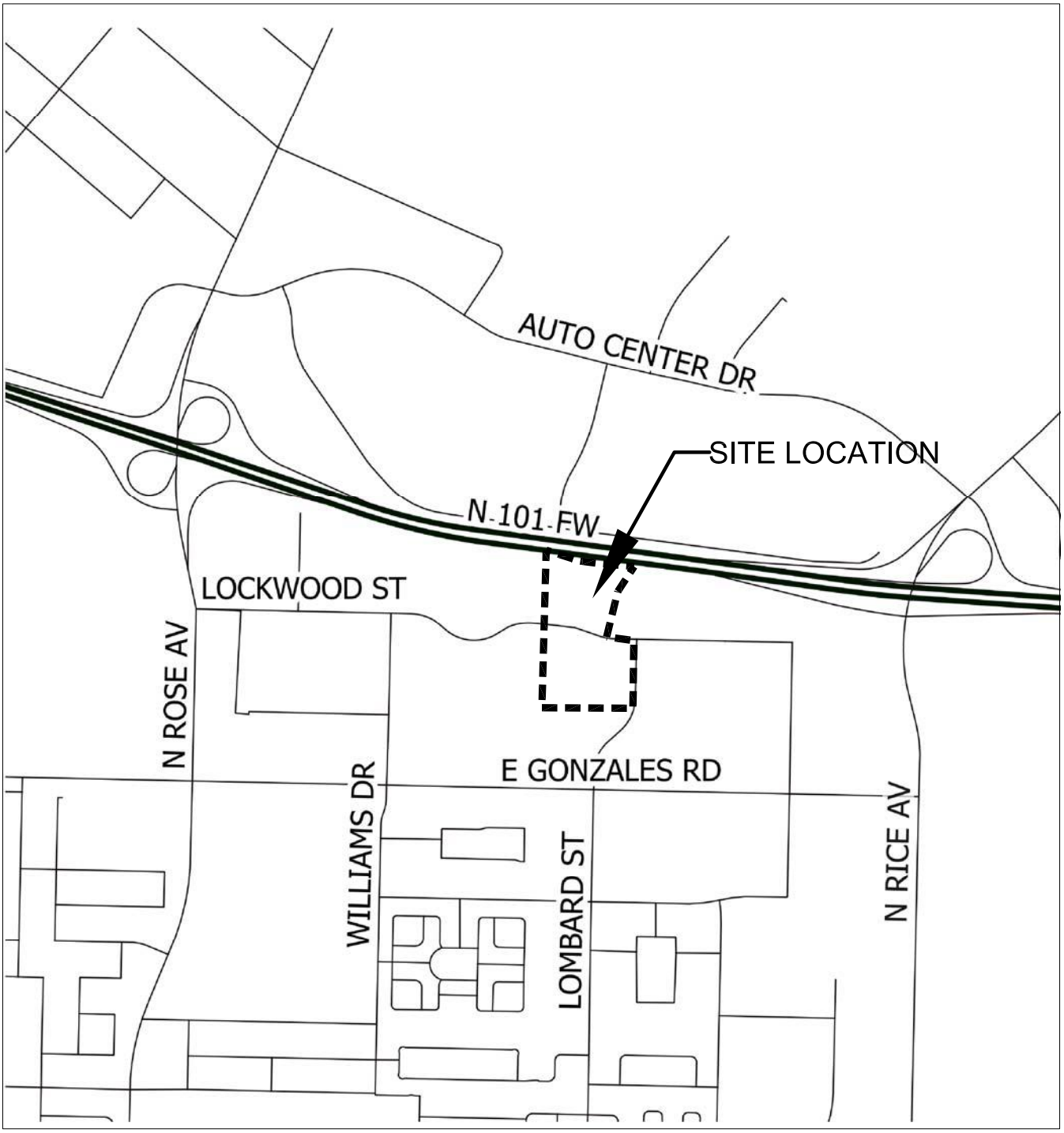
MTC Engineering, Inc., April 30, 2020; Preliminary Geotechnical Engineering Investigation, Proposed Commercial Building Complex, Driveways, and Parking Lots, 1053 Outlet Center Drive (Southwest corner of Outlet Center Drive and Lockwood Street (APN: 213-0-090-105)), Oxnard, CA 93030.

Larry Walker Associates and Geosyntec Consultants, June 29, 2018; Ventura County Technical Guidance Manual for Stormwater Quality Control Measures.

Yeh and Associates, Inc., October 11, 2019; Geotechnical Design Memorandum, Field Infiltration Testing for Permanent Onsite Stormwater Management, Lockwood Street West of Outlet Center Drive, Oxnard, California.

LOCATION MAP

Lockwood Street
Parcel 1 (APN 213-0-090-27)
& Parcel 2 (APN 213-0-090-105)
City of Oxnard, California



SOURCE : County of Ventura. Centerline, 2019, https://www.ventura.org/gis-and-mapping/mapping-base, Ventura County, 2011.

Path: P:\9511\Geo Invest - Infiltration.dwg (Layout: Plate 1.1 Site Location Map)

N

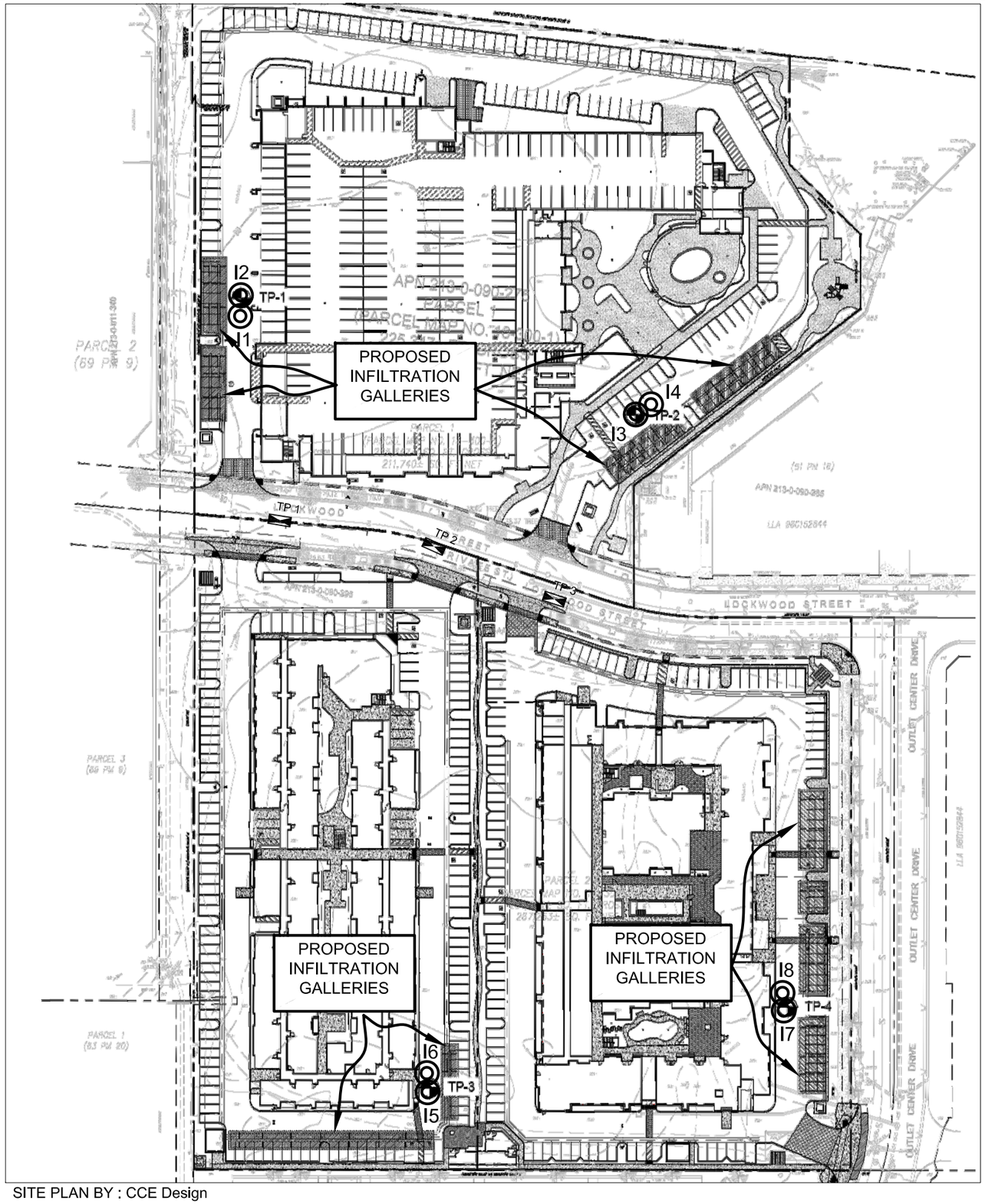
Geolabs – Westlake Village
GEOLOGY AND SOIL ENGINEERING

DATE 2/3/2023 BY JN
SCALE NTS W.O. 9511

PLATE 1.1

PLOT MAP

Infiltration Test Borings
Lockwood Street
Parcel 1 (APN 213-0-090-27)
& Parcel 2 (APN 213-0-090-105)
City of Oxnard, California



SITE PLAN BY : CCE Design

EXPLANATION

TP-4 — Location of proposed infiltration test

I8 — Approximate location of infiltration test by GWV, 2023

N

0 100 200

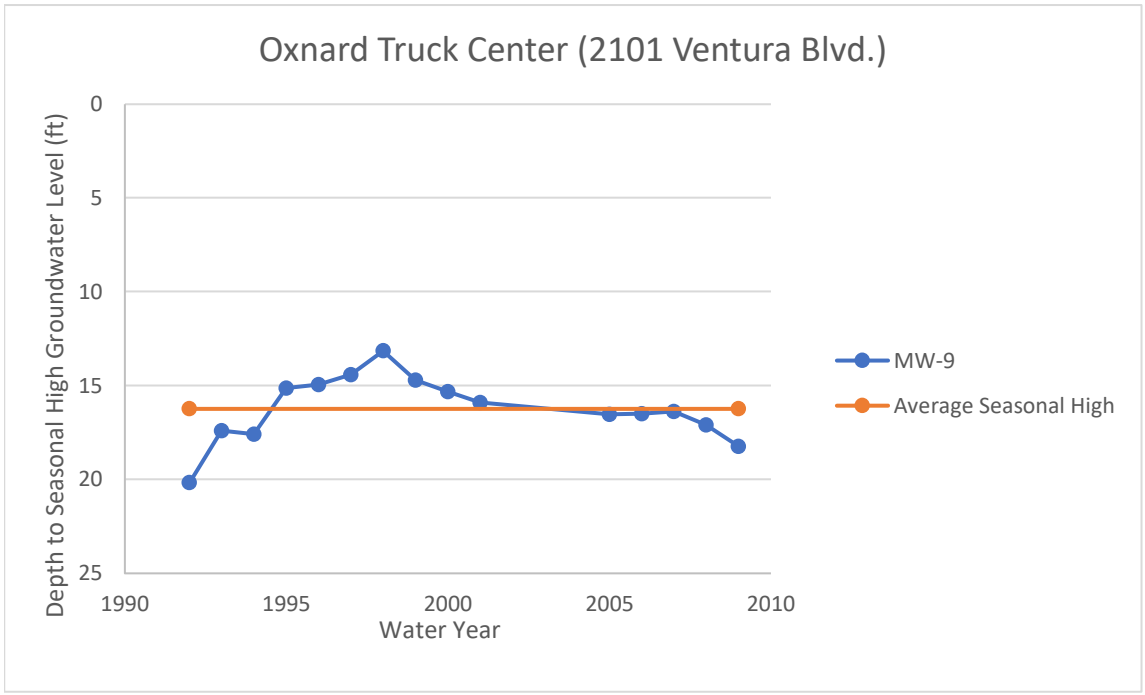
SCALE 1" = 100'

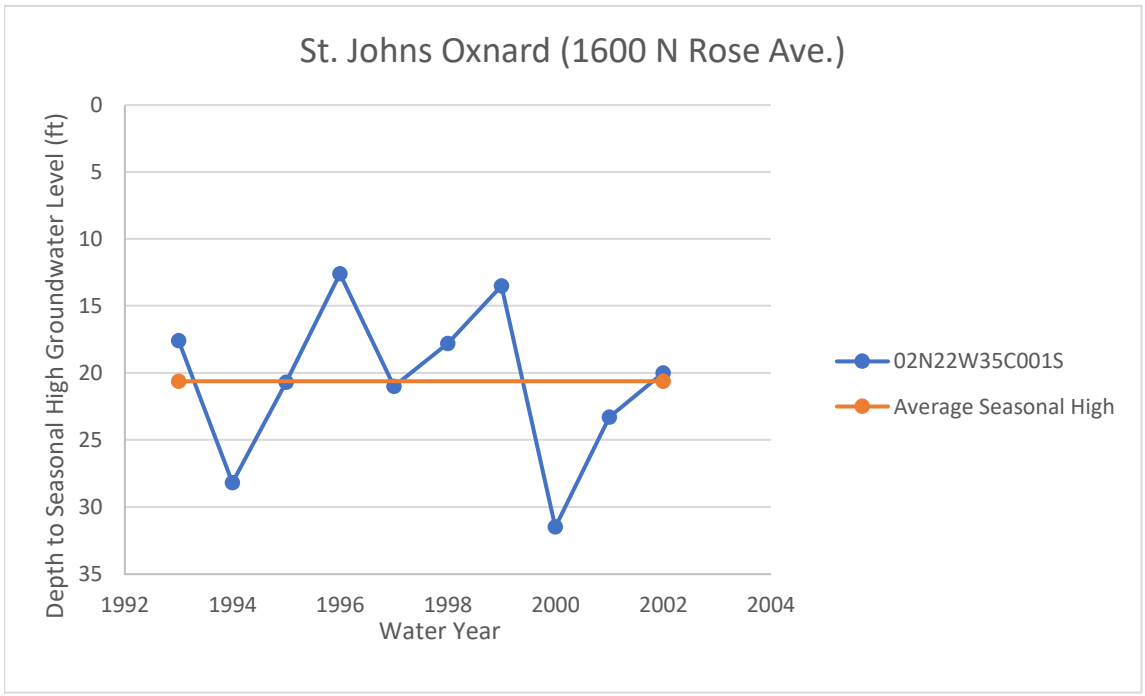
Path: P:\9511\Geo Invest - Infiltration.dwg (Layout: Plate 1.2 Plot Map)

Geolabs – Westlake Village
GEOLOGY AND SOIL ENGINEERING

DATE 2/3/2023 BY RP
SCALE 1"=100' W.O 9511

PLATE 1.2


Oxnard Truck Center (2101 Ventura Blvd.)
Depth to Seasonal High Groundwater Level (ft)
0
5
10
15
20
25
1990
1995
2000
2005
2010
Water Year
MW-9
Average Seasonal High


St. Johns Oxnard (1600 N Rose Ave.)
Depth to Seasonal High Groundwater Level (ft)
0
5
10
15
20
25
30
35
1992
1994
1996
1998
2000
2002
2004
Water Year
02N22W35C001S
Average Seasonal High

APPENDIX A
Excavation Logs

February 3, 2023
W.O. 9511

WO: 9511.006	**RIG TYPE:** H S A **%Eff.:**		**DATE:** 1/24/2023
CLIENT: SVM Lockwood LLC	**HAMMER TYPE:** Auto **HAMMER DROP(IN.):** 30"		**GEOLOGIST:** JN
PROJECT: Multi Family Residential	**HAMMER WEIGHTS:** 140 lbs.		**ELEVATION:** ±79'
LOCATION: N of Lockwood St.			**DRILLING CO.:** GC Services

	N	U	B	M	DD	DESCRIPTION	COMMENTS
0						Alluvium (Qal):	
						@0' - Light gray brown silty fine SAND (SM) with gravel, grass on surface,	
2.5	1/1/2		S			moist.	
						@2.5' - (14") silty fine SAND (SM) over (4") very fine sandy SILT, moist,	
						poorly graded, very loose.	
5.5	3/3/5	C				@5.5' - Light brown very silty fine SAND (SM) to very fine sandy SILT (SM),	
						poorly graded, loose, very moist, slightly micaceous, trace clay.	
7.5							
10							
15							
20							
25						TD 7'	
						No Groundwater	
						No Caving	
						Set pipe (8'9" length)	
						Sand - Bottom 4' around pipe	
30							
35							
40							

ADDITIONAL COMMENTS:

C = Modified California Sample
S = Standard Penetration Test

N = Field Blowcount
U = Undisturbed Sample
B = Disturbed Sample
X = Disturbed Bulk Sample
M = Moisture %
DD = Dry Density (pcf)

WO: 9511.006	**RIG TYPE:** H S A **%Eff.:**		**DATE:** 1/24/2023
CLIENT: SVM Lockwood LLC	**HAMMER TYPE:** Auto	**HAMMER DROP(IN.):** 30"	**GEOLOGIST:** JN
PROJECT: Multi Family Residential	**HAMMER WEIGHTS:**	140 lbs.	**ELEVATION:** ±79'
LOCATION: N of Lockwood St.			**DRILLING CO.:** GC Services

	N	U	B	M	DD	DESCRIPTION	COMMENTS
0						Alluvium Qal:	
						@0' - Light gray brown silty fine SAND (SM) with trace gravel, moist,	
2.5	1/1/1		S			poorly graded, grass on surface.	
						@2.5' - Silty fine SAND (SM) over very fine sandy SILT (SM), very loose,	
						moist.	
5.5	1/1/2		S			@5' - Light brown silty very fine SAND (SM) with some clay, moist,	
						poorly graded, very loose to soft, slightly plastic.	
7.5	P/1/2		S			@7.5' - Light gray and orange very silty very fine SAND (SM) with trace	
						clay, very loose, moist.	
10	3/6/7		S			@10' - Light brown, gray and orange fine SAND (SP), moist, poorly	
						graded, medium dense, trace fine subrounded gravel at bottom 2".	
12.5	4/6/9		S			@12.5' - Light gray fine SAND with medium sand and gravel (SP),	
						medium dense, slightly moist.	
15	16/25/32	C				@15.5' - Light grayish brown fine SAND (SP)with trace gravel over fine to	
						medium SAND (SP), dense, moist to slightly moist.	
20							
25						TD 17'	
						No Groundwater	
						No Caving	
						Set pipe (~19' long pipe)	
						Sand bottom 3' around pipe	
30							
35							
40							

ADDITIONAL COMMENTS:

C = Modified California Sample
S = Standard Penetration Test
P = Push

N = Field Blowcount
U = Undisturbed Sample
B = Disturbed Sample
X = Disturbed Bulk Sample
M = Moisture %
DD = Dry Density (pcf)

WO: 9511.006	**RIG TYPE:** H S A	**%Eff.:**	**DATE:** 1/24/2023
CLIENT: SVM Lockwood LLC	**HAMMER TYPE:** Auto	**HAMMER DROP(IN.):** 30"	**GEOLOGIST:** JN
PROJECT: Multi Family Residential	**HAMMER WEIGHTS:**	140 lbs.	**ELEVATION:** ±79'
LOCATION: N of Lockwood St.			**DRILLING CO.:** GC Services

	N	U	B	M	DD	DESCRIPTION	COMMENTS
0						Alluvium Qal:	
						@0' - Light gray brown silty fine SAND (SM) with fine gravel, moist,	
2.5	4/5/4		S			poorly graded.	
						@2.5' - Light grayish brown (14") silty fine SAND (SM) with clay, micaceous,	
						loose, poorly graded, moist, bottom 4" very fine sandy SILT (SM) with clay.	
5.5	6/6/7	C				@5.5' - Light brown very silty very fine SAND (SM), loose, moist,	
						poorly graded, micaceous.	
7.5							
10							
12.5							
15							
20							
25							
30						TD 7'	
						No Groundwater	
						No Caving	
						Place pipe (±8'1")	
						Sand bottom 3.5' around pipe	
35							
40							

ADDITIONAL COMMENTS:

C = Modified California Sample
S = Standard Penetration Test

N = Field Blowcount
U = Undisturbed Sample
B = Disturbed Sample
X = Disturbed Bulk Sample
M = Moisture %
DD = Dry Density (pcf)

WO: 9511.006	**RIG TYPE:** H S A **%Eff.:**		**DATE:** 1/24/2023
CLIENT: SVM Lockwood LLC	**HAMMER TYPE:** Auto	**HAMMER DROP(IN.):** 30"	**GEOLOGIST:** JN
PROJECT: Multi Family Residential	**HAMMER WEIGHTS:**	140 lbs.	**ELEVATION:** ±79'
LOCATION: N of Lockwood St.			**DRILLING CO.:** GC Services

	N	U	B	M	DD	DESCRIPTION	COMMENTS
0						Alluvium Qal:	
						@0' - Light grayish brown silty fine SAND (SM) with fine gravel, very	
2.5	4/4/5		S			sparse grass on surface, moist, poorly graded..	
						@2.5' - Light brown silty fine SAND (SM) over very fine sandy SILT (SM)	
						with trace clay, moist, loose, poorly graded.	
5	2/2/4		S			@5' - Light brown to pale brown silty SAND (SM) to silty very fine SAND.	
7.5	1/2/4		S			@7.5' - Light gray and light brown (12") very fine sandy SILT and CLAY (CL)	
						over (6"), light gray and orange silty very fine SAND (SM), poorly	
						graded, loose.	
10	4/6/7		S			@10' - (6") Brown CLAY (CL), slightly plastic, moist over (12") light gray	
						and orange fine SAND (SP), weathered, poorly graded, medium dense,	
12.5	10/11/14		S			moist to slightly moist, subrounded gravel on bottom, slightly friable	
						sand.	
						@12.5'-Light pale brown fine SAND(SP) grading to fine to coarse SAND(SW),	
15.5	16/35/50-6	R				medium dense, poorly to well-graded, slightly moist, slightly friable,	
						occasional gravel.	
						@15.5' - Light grayish brown fine to medium SAND (SP), and fine to coarse	
						SAND (SW), very dense, moist, poorly to well-graded layers.	
20							
						TD 17'	
						No Groundwater	
25						No Caving	
						Set pipe over ±4" sand (±18'7" pipe length)	
						Sand bottom 3' around pipe	
30							
35							
40							

ADDITIONAL COMMENTS:

C = Modified California Sample
S = Standard Penetration Test

N = Field Blowcount
U = Undisturbed Sample
B = Disturbed Sample
X = Disturbed Bulk Sample
M = Moisture %
DD = Dry Density (pcf)

WO: 9511.005	**RIG TYPE:** H S A **%Eff.:**		**DATE:** 1/24/2023
CLIENT: SVM Angelino Owner 2 LLC	**HAMMER TYPE:** Auto	**HAMMER DROP(IN.):** 30"	**GEOLOGIST:** JN
PROJECT: Multi Family Residential	**HAMMER WEIGHTS:**	140 lbs.	**ELEVATION:** ±77'
LOCATION: S of Lockwood St.			**DRILLING CO.:** GC Services

	N	U	B	M	DD	DESCRIPTION	COMMENTS
0						Alluvium (Qal):@0'	
						@0'-Medium brown silty fine SAND (SM) with some gravel, moist,	
2.5	2/2/4		S			grass on surface.	
						@2.5' - Light to medium brown silty fine to medium SAND (SM),	
						poorly graded, loose, moist, bottom 1" silty very fine SAND (SM),	
5.5	6/9/14	C				micaceous, moist.	
						@5.5' - Medium brown silty fine SAND (SM) with scattered coarse sand,	
7.5						poorly graded, moist, some pinhole pores, roothairs, medium dense.	
10							
12.5							
15.5							
						TD 7'	
						No Groundwater	
						No Caving	
						Set pipe (7'8" length)	
20						Sand bottom 3' around pipe	
25							
30							
35							
40							

ADDITIONAL COMMENTS:

C = Modified California Sample
S = Standard Penetration Test

N = Field Blowcount
U = Undisturbed Sample
B = Disturbed Sample
X = Disturbed Bulk Sample
M = Moisture %
DD = Dry Density (pcf)

WO: 9511.005	**RIG TYPE:** H S A **%Eff.:**		**DATE:** 1/24/2023
CLIENT: SVM Lockwood LLC	**HAMMER TYPE:** Auto	**HAMMER DROP(IN.):** 30"	**GEOLOGIST:** JN
PROJECT: Multi Family Residential	**HAMMER WEIGHTS:**	140 lbs.	**ELEVATION:** ±77'
LOCATION: S of Lockwood St.			**DRILLING CO.:** GC Services

	N	U	B	M	DD	DESCRIPTION	COMMENTS
0						Alluvium (Qal):	
						@0' - Medium brown silty fine SAND (SM) with some gravel, moist,	
2.5	1/1/1		S			grass on surface.	
						@2.5' - Light to medium brown (17") silty fine SAND (SM) with scattered	
						medium to coarse sand, over (1") silty very fine SAND, very loose, poorly	
5	1/1/2		S			graded, moist, trace clay.	
						@5'-Medium brown very silty fine SAND(SM) with trace clay over CLAY(CL)	
7.5	1/2/4		S			moist, very loose, soft, slightly plastic.	
						@7.5' - Light and medium brown silty very fine SAND (SM)with clay,	
						loose, poorly graded, layers are laminated.	
10	4/6/7		S			@10' - (4") Same as @5' over (10"). Light grayish brown fine SAND (SM)	
						with scattered coarse sand over (2") weathered fine SAND with fine gravel,	
12.5	3/5/8		S			medium dense, moist to slightly moist, poorly graded.	
						@12.5' - Light gray fine to coarse SAND (SP-SW), slightly moist,	
						moderately to well-graded, trace fine to medium subrounded gravel,	
15.5	4/5/8	R				slightly friable.	
						@15.5' - Fine gravel, fine to coarse SAND (SM) over light brown and	
						medium brown very fine sandy SILT (SM) and CLAY (CL), moist, medium	
						stiff, micas, very slightly plastic.	
20							
25							
30							
						TD 17'	
35						No Groundwater	
						No Caving	
						Set pipe (18'8" pipe length)	
						Sand Bottom 3' around pipe	
40							

ADDITIONAL COMMENTS:

C = Modified California Sample
S = Standard Penetration Test

N = Field Blowcount
U = Undisturbed Sample
B = Disturbed Sample
X = Disturbed Bulk Sample
M = Moisture %
DD = Dry Density (pcf)

WO: 9511.003	**RIG TYPE:** H S A **%Eff.:**		**DATE:** 1/24/2023
CLIENT: Sunbelt Enterprises LLC	**HAMMER TYPE:** Auto	**HAMMER DROP(IN.):** 30"	**GEOLOGIST:** JN
PROJECT: Multi Family Residential	**HAMMER WEIGHTS:** 140 lbs.		**ELEVATION:**
LOCATION: S of Lockwood St.			**DRILLING CO.:** GC Services

	N	U	B	M	DD	DESCRIPTION	COMMENTS
0						Artificial fill(af): Light brown silty fine SAND(SM), slightly moist, poorly graded.	
2.5	1/2/3		S			Alluvium (Qal): @2.5' - Light brown silty fine SAND (SM), moist.	
5	6/6/7		S			@5' - Brown CLAY (CL) over laminate layers of light gray and tan very silty very fine SAND (SM), poorly graded, slightly moist, medium	
7.5	2/3/6		S			medium dense, micaceous. @7.5' - Laminated light brown and tan and orange (7") very fine sandy SILT (SM) to silty SAND (SM) over (1") light gray fine SAND (SP), slightly	
10	6/8/15		S			moist, loose, weathered. @10' - Light gray fine to coarse SAND (SP-SW) with trace fine gravel,	
12.5	5/11/8		S			slightly moist, dense, poorly to well-graded. @12.5' - Light brown and gray fine SAND (SP) and fine to coarse SAND (SP-SW), moderately graded, trace fine gravel, over (2"), light	
15.5	14/30/50-6	C				brown and gray CLAY (CL), moist, slightly plastic, medium dense. @15.5' - Tan fine SAND (SP) with silt, poorly graded, very dense, moist.	
20							
25						TD 17' No Groundwater No Caving Set pipe (18'9" pipe length) Sand bottom 4' around pipe	
30							
35							
40							

ADDITIONAL COMMENTS:

C = Modified California Sample
S = Standard Penetration Test

N = Field Blowcount
U = Undisturbed Sample
B = Disturbed Sample
X = Disturbed Bulk Sample
M = Moisture %
DD = Dry Density (pcf)

WO: 9511.003	**RIG TYPE:** H S A **%Eff.:**		**DATE:** 1/24/2023
CLIENT: SVM Lockwood LLC	**HAMMER TYPE:** Auto	**HAMMER DROP(IN.):** 30"	**GEOLOGIST:** JN
PROJECT: Multi Family Residential	**HAMMER WEIGHTS:** 140 lbs.		**ELEVATION:**
LOCATION: S of Lockwood St.			**DRILLING CO.:** GC Services

	N	U	B	M	DD	DESCRIPTION	COMMENTS
0						Artificial fill (af):	
						@0' - Light brown silty fine SAND (SM), slightly moist, poorly graded.	
2.5	P/1/1		S			Alluvium (Qal):	
						@2.5' - Medium brown silty very fine SAND(SM) to very fine sandy SILT, SILT(SM) with some clay, moist, poorly graded, very loose, slightly plastic.	
5.5	5/11/12	C				@5.5' - Medium brown CLAY (CL), slightly plastic, moist, roothairs over laminated layers of light brownish tan and orange silty very fine SAND(SM), medium dense, poorly graded, micaceous.	
7.5							
10							
12.5							
15.5							
20						TD 7'	
25						No Groundwater No Caving Set pipe (9'2" pipe length) Sand bottom 4' around pipe	
30							
35							
40							

ADDITIONAL COMMENTS:

C = Modified California Sample
S = Standard Penetration Test
P = Push

N = Field Blowcount
U = Undisturbed Sample
B = Disturbed Sample
X = Disturbed Bulk Sample
M = Moisture %
DD = Dry Density (pcf)

APPENDIX B
Infiltration Test Logs

February 3, 2023
W.O. 9511

Infiltration Test Log

Date 1/25/2023

Project Location	Oxnard	**Boring/Test Number**	I1		
Earth Description	silty very fine sand	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	JN	**Depth of Boring (ft)**	7.0		
Liquid Description	clear water				
Measurement Method	sounder	**Depth to Water Table**	>17 ft		
		Initial Water Depth (d_1)	7.4		
Time Interval Standard					
Start Time for Pre-Soak	8:00 AM	**Water Remaining In Boring (Y/N)**	Y		
Start Time for Standard	9:05 AM	**Standard Time Interval Between Readings**	30 min		

Reading Number	Time Start/End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Elapsed Time Δd (inches)	Infiltration Rate (in/hr)	Comments
1	9:05 9:35	30.00	0.96	0.12	
2	9:45 10:15	30.00	1.44	0.18	
3	10:16 10:46	30.00	1.44	0.18	
4	10:48 11:18	30.00	1.56	0.20	
5	11:20 11:50	30.00	1.56	0.20	
6	11:51 12:21	30.00	1.44	0.18	
7	12:22 12:52	30.00	1.56	0.20	
8	12:53 13:23	30.00	1.56	0.20	

Measured Short-Term Infiltration Rate: **0.19 in/hr**

Infiltration Test Log

Date 1/25/2023

Project Location	Oxnard	**Boring/Test Number**	I2		
Earth Description	fine to medium sand	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	JN	**Depth of Boring (ft)**	17.0		
Liquid Description	clear water				
Measurement Method	sounder	**Depth to Water Table**	>17 ft		
		Initial Water Depth (d_1)	17.8		
Time Interval Standard					
Start Time for Pre-Soak	8:00 AM	**Water Remaining In Boring (Y/N)**	N		
Start Time for Standard	9:02 AM	**Standard Time Interval Between Readings**	10 min		

Reading Number	Time Start/End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Elapsed Time Δd (inches)	Infiltration Rate (in/hr)	Comments
1	9:02 9:12	10.00	10.80	7.5	
2	9:17 9:27	10.00	10.80	7.5	
3	9:30 9:40	10.00	10.80	7.5	
4	9:44 9:54	10.00	10.32	7.0	
5	9:56 10:06	10.00	10.32	7.0	
6	10:08 10:18	10.00	10.32	7.0	
7	10:20 10:30	10.00	10.20	6.9	
8	10:35 10:45	10.00	9.96	6.6	
9	10:53 11:03	10.00	9.84	6.5	
10	11:06 11:16	10.00	9.84	6.5	
11	11:22 11:32	10.00	9.84	6.5	

Measured Short-Term Infiltration Rate: **6.5 in/hr**

Infiltration Test Log

Date 1/25/2023

Project Location	Oxnard	**Boring/Test Number**	I3		
Earth Description	silty very fine sand	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	JN	**Depth of Boring (ft)**	7.0		
Liquid Description	clear water				
Measurement Method	sounder	**Depth to Water Table**	>17 ft		
		Initial Water Depth (d_1)	17.8		
Time Interval Standard					
Start Time for Pre-Soak	9:00 AM	**Water Remaining In Boring (Y/N)**	Y		
Start Time for Standard	10:00 AM	**Standard Time Interval Between Readings**	30 min		

Reading Number	Time Start/End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Elapsed Time Δd (inches)	Infiltration Rate (in/hr)	Comments
1	10:00 10:30	30.00	2.52	0.40	
2	10:30 11:00	30.00	2.64	0.42	
3	11:01 11:31	30.00	2.64	0.42	
4	11:33 12:03	30.00	2.76	0.44	
5	12:06 12:36	30.00	2.76	0.44	
6	12:37 13:07	30.00	2.76	0.44	
7	13:09 13:39	30.00	2.64	0.42	
8	13:41 14:11	30.00	2.76	0.44	

Measured Short-Term Infiltration Rate: **0.43 in/hr**

Infiltration Test Log

Date 1/25/2023

Project Location	Oxnard	**Boring/Test Number**	I4		
Earth Description	fine to coarse sand	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	JN	**Depth of Boring (ft)**	17.0		
Liquid Description	clear water				
Measurement Method	sounder	**Depth to Water Table**	>17 ft		
		Initial Water Depth (d_1)	17.8		
Time Interval Standard					
Start Time for Pre-Soak	1:20 PM	**Water Remaining In Boring (Y/N)**	N		
Start Time for Standard	2:28 PM	**Standard Time Interval Between Readings**	1 min		

Reading Number	Time Start/End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Elapsed Time Δd (inches)	Infiltration Rate (in/hr)	Comments
1	14:28 14:29	1.00	8.04	32.2	
2	14:30 14:31	1.00	9.00	37.9	
3	14:32 14:33	1.00	9.24	39.4	
4	14:34 14:35	1.00	7.44	28.9	
5	14:36 14:37	1.00	7.80	30.9	
6	14:38 14:39	1.00	7.56	29.6	
7	14:40 14:41	1.00	8.16	32.9	
8	14:42 14:43	1.00	7.56	29.6	
9	14:44 14:45	1.00	7.56	29.6	
10	14:46 14:47	1.00	7.44	28.9	
11	14:48 14:49	1.00	7.44	28.9	
12	14:50 14:51	1.00	7.44	28.9	

Measured Short-Term Infiltration Rate: **28.9 in/hr**

Infiltration Test Log

Date 1/26/2023

Project Location	Oxnard	**Boring/Test Number**	I5		
Earth Description	silty fine sand	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	JN	**Depth of Boring (ft)**	7.0		
Liquid Description	clear water				
Measurement Method	sounder	**Depth to Water Table**	>17 ft		
		Initial Water Depth (d_1)			
Time Interval Standard					
Start Time for Pre-Soak	7:20 AM	**Water Remaining In Boring (Y/N)**	Y		
Start Time for Standard		**Standard Time Interval Between Readings**	30 min		

Reading Number	Time Start/End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Elapsed Time Δd (inches)	Infiltration Rate (in/hr)	Comments
1	9:10 9:40		3.8	0.32	
2	9:42 10:12		3.6	0.30	
3	10:15 10:45		3.0	0.24	
4	10:46 11:16		2.4	0.19	
5	11:20 11:50		2.5	0.20	
6	11:52 12:22		2.4	0.19	
7	12:28 12:58		2.4	0.19	
8	13:00 13:30		2.4	0.19	

Measured Short-Term Infiltration Rate: **0.19 in/hr**

Infiltration Test Log

Date 1/26/2023

Project Location	Oxnard	**Boring/Test Number**	I6		
Earth Description	sandy silt and clay	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	JN	**Depth of Boring (ft)**	17.0		
Liquid Description	clear water				
Measurement Method	sounder	**Depth to Water Table**	>17 ft		
		Initial Water Depth (d_1)			
Time Interval Standard					
Start Time for Pre-Soak	Wed Jan 25 at 4 PM	**Water Remaining In Boring (Y/N)**	Y		
Start Time for Standard	Thur Jan 26 at 7:23 AM	**Standard Time Interval Between Readings**	60 min		

Reading Number	Time Start/End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Elapsed Time Δd (inches)	Infiltration Rate (in/hr)	Comments
1	7:23 8:23	60	0.5	0.03	
2	8:23 9:23	60	0.7	0.04	
3	9:23 10:23	60	0.7	0.04	
4	10:23 11:23	60	0.5	0.03	
5	11:23 12:23	60	1.0	0.07	
6	12:23 13:23	60	0.8	0.06	

Measured Short-Term Infiltration Rate: **0.05 in/hr**

Infiltration Test Log

Date 1/26/2023

Project Location	Oxnard	**Boring/Test Number**	I7		
Earth Description	fine sand	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	JN	**Depth of Boring (ft)**	17.0		
Liquid Description	clear water				
Measurement Method	sounder	**Depth to Water Table**	>17 ft		
		Initial Water Depth (d_1)			
Time Interval Standard					
Start Time for Pre-Soak	7:35 AM	**Water Remaining In Boring (Y/N)**	N		
Start Time for Standard		**Standard Time Interval Between Readings**	1 min		

Reading Number	Time Start/End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Elapsed Time Δd (inches)	Infiltration Rate (in/hr)	Comments
1	9:00 9:01	1.00	10.0	44.2	
2	9:02 9:03	1.00	9.5	41.0	
3	9:04 9:05	1.00	9.8	43.3	
4	9:06 9:07	1.00	10.0	44.2	
5	9:08 9:09	1.00	10.1	45.0	
6	9:10 9:11	1.00	10.0	44.2	
7	9:12 9:13	1.00	10.1	45.0	
8	9:14 9:15	1.00	10.0	44.2	

Measured Short-Term Infiltration Rate: **44.2 in/hr**

Infiltration Test Log

Date 1/26/2023

Project Location	Oxnard	**Boring/Test Number**	I8		
Earth Description	clayey sand	**Diameter of Boring (in)**	8	**Diameter of Casing (in)**	2
Tested by	JN	**Depth of Boring (ft)**	7.0		
Liquid Description	clear water				
Measurement Method	sounder	**Depth to Water Table**	>17 ft		
		Initial Water Depth (d_1)			
Time Interval Standard					
Start Time for Pre-Soak	7:20 AM	**Water Remaining In Boring (Y/N)**	Y		
Start Time for Standard		**Standard Time Interval Between Readings**	30 min		

Reading Number	Time Start/End (hh:mm)	Elapsed Time Δtime (mins)	Water Drop During Elapsed Time Δd (inches)	Infiltration Rate (in/hr)	Comments
1	9:05 9:35		4.8	0.41	
2	9:37 10:07		4.3	0.36	
3	10:09 10:39		4.6	0.38	
4	10:41 11:11		3.0	0.24	
5	11:13 11:43		3.1	0.26	
6	11:46 12:16		2.9	0.23	
7	12:18 12:48		2.6	0.21	
8	12:49 13:19		2.6	0.21	

Measured Short-Term Infiltration Rate: **0.22 in/hr**