HYDROLOGY STUDY

TR No 82127
VALLEY VIEW
13811 VALLEY VEIW AVE
LA MIRADA, CA
COUNTY OF LOS ANGELES

PREPARED FOR:
The Olson Company
3010 Old Ranch Parkway, Ste 100.
Seal Beach, CA 90740

PREPARED BY:
B & E Engineers
20 E. Foothill Blvd, Ste 230
Arcadia Ca. 91006
TEL. (626) 446-4449
FAX. (626) 446-6566

MAY 2019
JN. 2017420
BY; George G

REGISTERED PROFESSIONAL ENGINEER
RAMY F. AWAD
No. 41729
Exp. 3-31-20
CIVIL
STATE OF CALIFORNIA

B&E Engineers

5/14/19

Table of Contents

APPENDICES

INTRODUCTION

This report presents the hydrologic analysis for Tentative Tract 82127 which is at 13811 Valley View, in the City of La Mirada, County of Los Angeles and is a residential subdivision of a 2.32 acres site that proposes 56 new condominium units. The site currently exists as undeveloped land and is bound by public streets only to the east side. Residential homes to the north and industrial buildings along the westerly and southerly boundary.

The purpose of this report is to study the flows from for both the pre- and post-development conditions for the 25yr, 10yr, 2yr storm frequencies and to determine 85th percentile rainfall volume which is required to be mitigated in order to comply with the Low Impact Development (LID) requirements.

HYDROLOGY DESIGN CRITERIA

The following Hydrology Data criteria was provided by the LADPW online Hydrology Map 1-H1.4 provided at: http://dpw.lacounty.gov/wrd/hydrologygis/. These values are used as inputs into the HyroCalc as shown in the calculations in Appendices B and C.

Runoff Calculation: LADPW HydroCalc

Design 50-Year 24-Hour Isohyet: 5.6”

Soil Type: 006

85TH Percentile Isohyet: 0.82”

Pre-Development Imperviousness: 15%

Post-Development Imperviousness: 85%

EXISTING DRAINAGE CONDITIONS

The existing site condition has two sub areas: Subarea 1A consists of a 1.32-acre area and drains towards the west side of the site. Subarea 1B consists of a 1.00-acre area and will drain to Valley View Ave. as shown in the pre-development hydrology map in Appendix E. The following table summarizes the values found:

Condition	Subarea Number	Area (Acres)	2-year Peak Flowrate (Q_2)	10-year Peak Flowrate (Q_10)	25-year Peak Flowrate (Q_25)
Pre-Development	1A	1.32	0.60	2.71	2.90
	2B	1.00	0.41	1.55	2.20

PROPOSED DRAINAGE CONDITIONS

In the post-development condition, the site will drain to the east towards Valley View Ave. where it will be intercepted into a catch basin then diverted into a dry well which will infiltrate into the ground. If the flows should increase beyond the capacity of the drywell due to a higher frequency storm event, a proposed diversion weir will overflow storm water to a proposed parkway drain on Valley View Ave. Appendices E provide detailed hydrology maps for both the pre-development and post-development conditions. The following table provides a summary of the post-development hydrology values:

Condition	Subarea Number	Area (Acres)	2-year Peak Flowrate (Q_2)	10-year Peak Flowrate (Q_10)	25-year Peak Flowrate (Q_25)
Post-Development	1A	2.26	1.38	3.23	4.42
	1B	0.06	0.06	0.13	0.16

WATER QUALITY

Using the LA County 85th percentile Isohyets Map, water quality design rainfall depth for the project was determined to be 0.82 inch (85th percentile, 24-hr storm event) which is greater than 0.75 inch, 24-hr event. All water quality calculations were conducted using the Los Angeles County's Hydrocalc as shown in the calculations found within the Appendix D of this report. The table below summarizes the volume required for mitigation that complies with LID requirements. The project site proposes a storage tank and dry well in order to infiltrate the required volume. A 6-ft diameter storage pipe will be constructed in line with the proposed dry well in order to store the required volume while the drywell percolates the total LID volume. If a larger frequency storm event should occur then a proposed diversion weir will be installed within an upstream catch basin which will divert excess runoff into a proposed parkway drain on Valley View Ave. In order to provide a greater level of flood protection, the proposed dry well will also have an overflow pipe which will convey excess runoff to a parkway drain. Appendix A provides calculations for the proposed drywell, a design drawing for the drywells manufacturer and a reference to a portion of the soils report providing the support for infiltration feasibility.

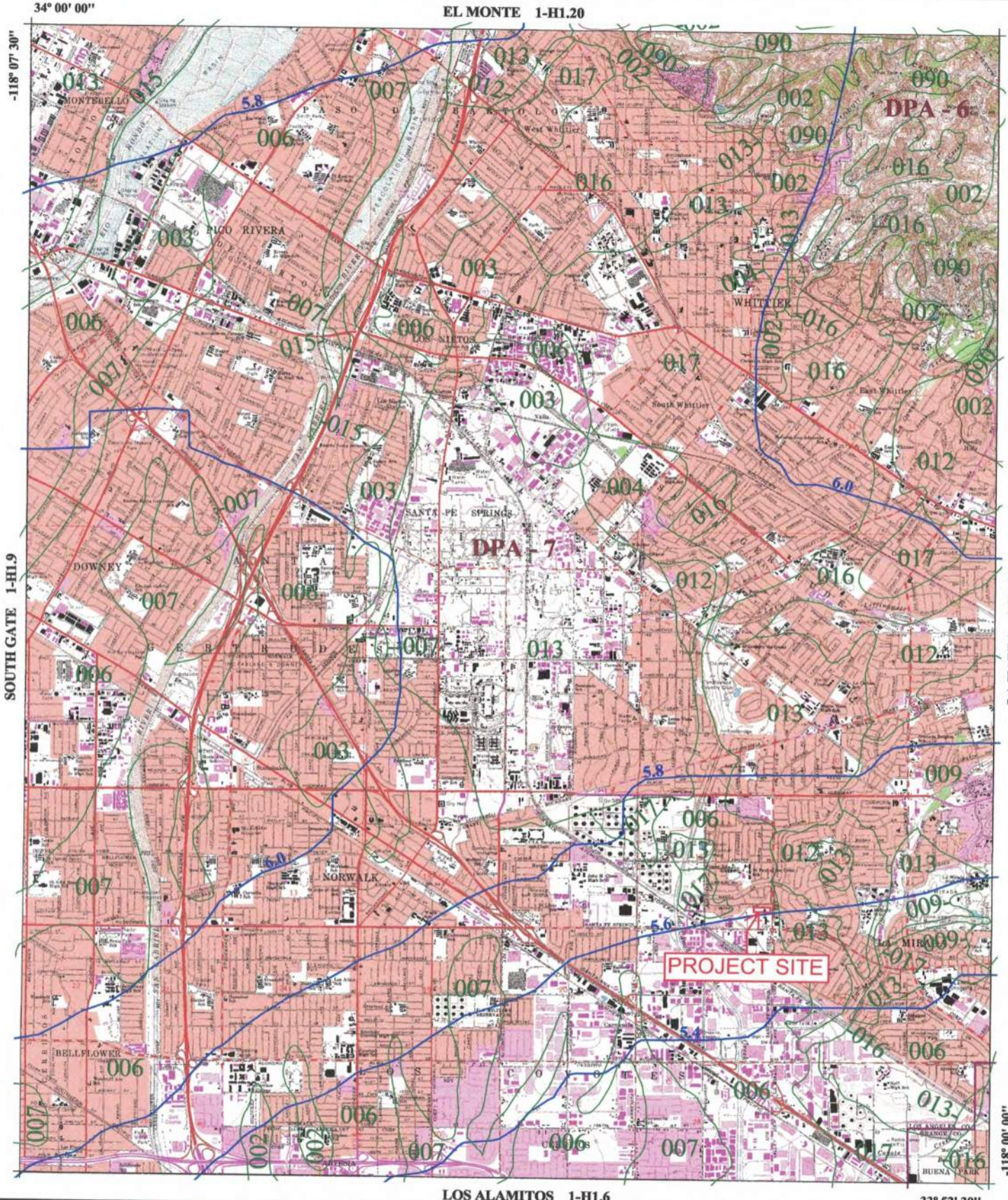
Granted that the drywell ha a storage volume of 336 CF the site is provided with a storage tank to detain 5,204 CF, the total mitigated volume provided is 5,540 CF which is greater than the required volume of 5,204 CF.

Condition	Subarea Number	Area (Acres)	Clear Runoff Volume (24-Hr)
Post-Development	1A	2.26	5,203.9 cf

CONCLUSION

The calculations provided within this report and within the enclosed Hydrology Map provide an understanding that it is evident that the post-development conditions will increase the total amount of runoff which will be conveyed by this site. However, based on the proposed on-site storage pipe and drywells, there will be a reduction in the overall flow which is discharged. Thus, the tributary storm water runoff from this project will not adversely affect persons, downstream properties or drainage facilities and in adequate conformance with the LA County design criteria, guidelines, policies and procedures.

APPENDIX A
Reference Material



N
W E
S

016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA - 6 DEBRIS POTENTIAL AREA

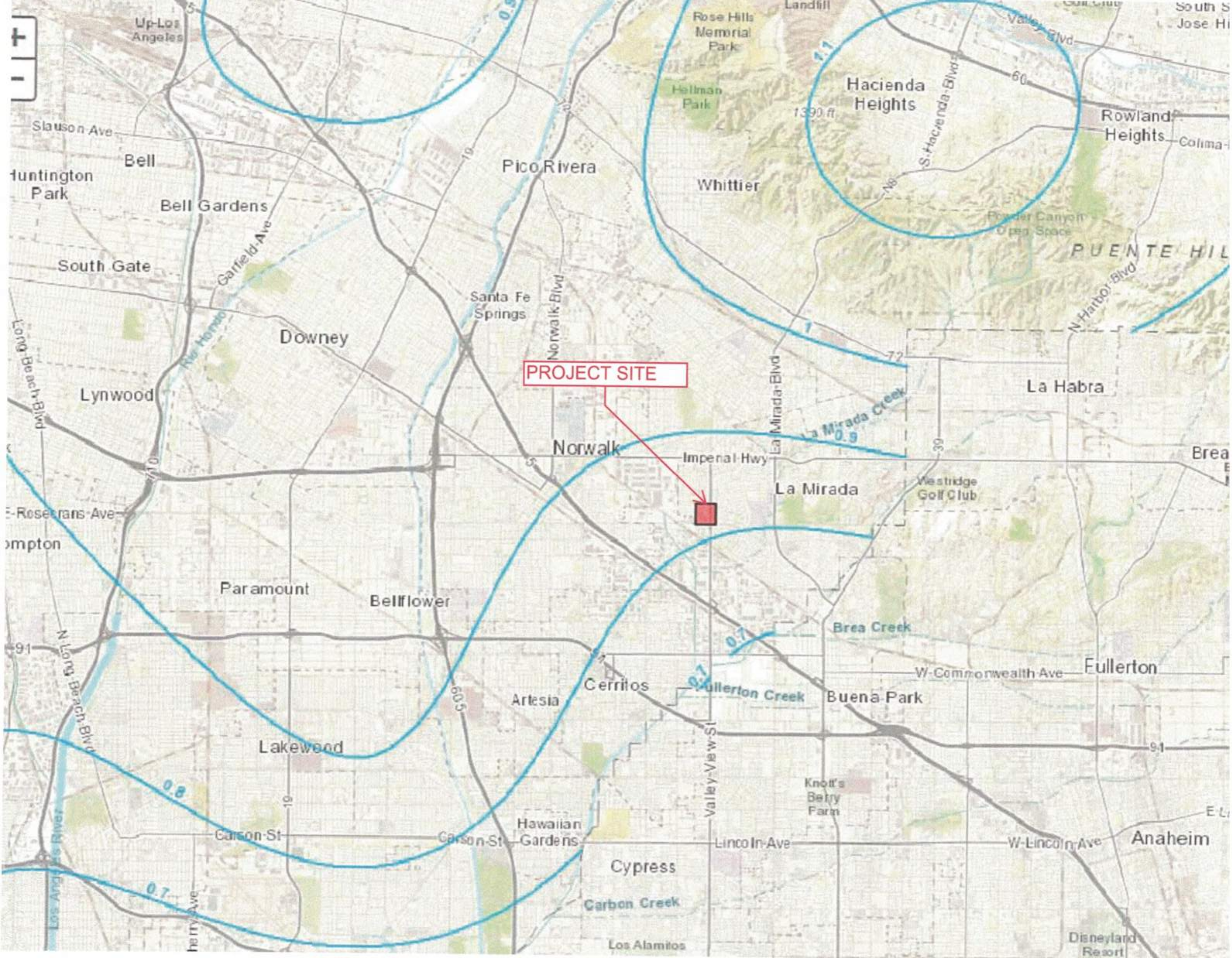
1 0 1 2 Miles

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

WHITTIER
50-YEAR 24-HOUR ISOHYET

1-H1.10

LOS ANGELES COUNTY PUBLIC WORKS
Public Service That Works

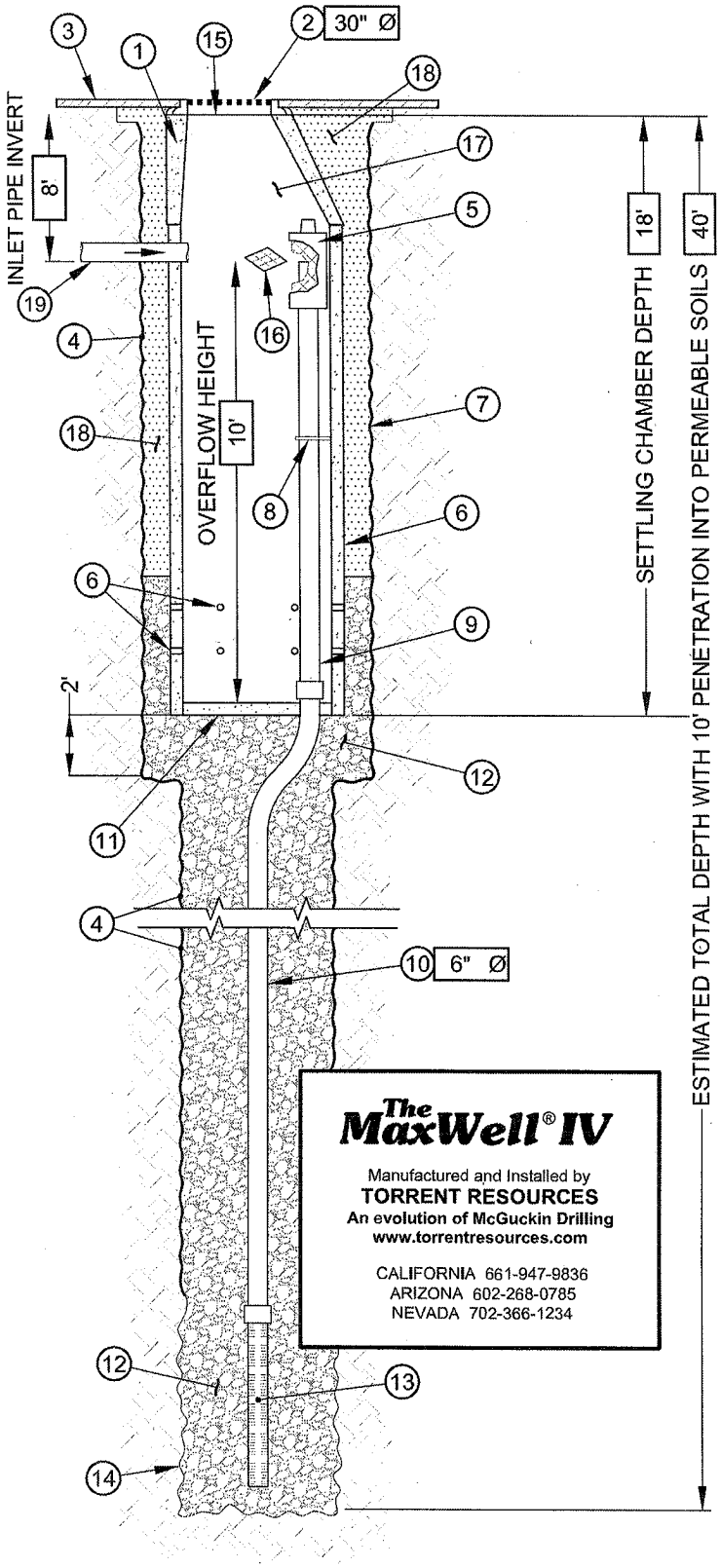

PROJECT SITE
Norwalk
La Mirada
Imperial Hwy
La Mirada Blvd
Valley View St
Norwalk Blvd
Santa Fe Springs
Downey
Pico Rivera
Whittier
Hacienda Heights
Rowland Heights
Bell
Bell Gardens
Huntington Park
South Gate
Lynwood
Paramount
Bellflower
Cerritos
Artesia
Lakewood
Hawaiian Gardens
Cypress
Buena Park
Fullerton
La Habra
Brea
Anaheim
Los Alamitos
Knott's Berry Farm
Disneyland Resort
Westridge Golf Club
Rose Hills Memorial Park
Hellman Park
Powder Canyon Open Space
PUENTE HIL
Up-Los Angeles
Slauson Ave
Garfield Ave
Rio Hondo
Long Beach Blvd
N Long Beach Blvd
E Rosecrans Ave
Carson St
Lincoln Ave
W Lincoln Ave
W Commonwealth Ave
N Harbor Blvd
S Hacienda Blvd
Valley Blvd
Colima
La Mirada Creek
Brea Creek
Fullerton Creek
Carbon Creek
Los Angeles River
0.7
0.8
0.9
1
1.1
1390 ft

B&E: Olson La Mirada Residential

The MaxWell® IV Drainage System Detail And Specifications

ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **BOLTED RING & GRATE** - DIAMETER AS SHOWN. CLEAN CAST IRON WITH WORDING **"STORM WATER ONLY"** IN RAISED LETTERS. **BOLTED IN 2 LOCATIONS** AND SECURED TO CONE WITH MORTAR. RIM ELEVATION ±0.02' OF PLANS.
3. **GRADED BASIN OR PAVING** (BY OTHERS).
4. NON-WOVEN GEOTEXTILE SLEEVE, MIRAFITM/ 140 NL. MIN. 6 FT Ø, HELD APPROX. 10 FEET OFF THE BOTTOM OF EXCAVATION.
5. **PUREFLO® DEBRIS SHIELD** - ROLLED 16 GA. STEEL X 24" LENGTH WITH VENTED ANTI-SIPHON AND INTERNAL .265" MAX. SWO FLATTENED EXPANDED STEEL SCREEN X 12" LENGTH. **FUSION BONDED EPOXY COATED.**
6. **PRE-CAST LINER** - 4000 PSI CONCRETE 48" ID. X 54" OD. **CENTER IN HOLE** AND ALIGN SECTIONS **TO MAXIMIZE BEARING SURFACE. EIGHT (8) PERFORATIONS PER FOOT, 2 ROWS MINIMUM.**
7. **MIN. 6' Ø DRILLED SHAFT.**
8. **SUPPORT BRACKET** - FORMED 12 GA. STEEL. **FUSION BONDED EPOXY COATED.**
9. **OVERFLOW PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
10. **DRAINAGE PIPE** - ADS HIGHWAY GRADE WITH TRI-A COUPLER. **SUSPEND PIPE** DURING BACKFILL OPERATIONS TO PREVENT BUCKLING OR BREAKAGE. DIAMETER AS NOTED.
11. **BASE SEAL** - GEOTEXTILE OR CONCRETE SLURRY.
12. **ROCK** - WASHED, SIZED BETWEEN 3/8" AND 1-1/2" TO **BEST COMPLEMENT SOIL CONDITIONS.**
13. **FLOFAST® DRAINAGE SCREEN** - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH 32 SLOTS PER ROW/FT. 120" OVERALL LENGTH WITH TRI-B COUPLER.
14. **MIN. 4' Ø SHAFT** - DRILLED TO **MAINTAIN PERMEABILITY** OF DRAINAGE SOILS.
15. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER** AT PROJECT COMPLETION.
16. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY. TYPICAL, TWO PER CHAMBER.
17. **FREEBOARD DEPTH VARIES** WITH INLET PIPE ELEVATION. INCREASE SETTLING CHAMBER DEPTH AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE OVERFLOW PIPE INLET.
18. STABILIZED BACKFILL - TWO-SACK SLURRY MIX.
19. **INLET PIPE** (BY OTHERS).



ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

February 2, 2018
J.N.: 2700.00

Mr. Haggai Mazler
The Olson Company
3010 Old Ranch Parkway, Suite 100
Seal Beach, California 90740

Subject: **Geotechnical Due-Diligence Investigation and Percolation Study, Proposed Residential Development, 13811 Valley View Avenue, La Mirada, California.**

Dear Mr. Mazler,

Albus-Keefe & Associates, Inc. is pleased to present to you our geotechnical due-diligence report for the proposed residential development at the subject site. This report presents the results of our historical photos review, subsurface exploration, laboratory testing, and engineering analyses. Conclusions relevant to the feasibility of the proposed site development are also presented in this report based on the findings of our work.

We appreciate this opportunity to be of service to you. If you have any questions regarding the contents of this report, please do not hesitate to call.

Sincerely,

ALBUS-KEEFE & ASSOCIATES, INC.

Paul Hyun Jin Kim
Associate Engineer

TABLE OF CONTENTS

REPORT

FIGURES AND PLATES

APPENDICES

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of our work was to evaluate the feasibility of proposed site development in order to assist you in your land acquisition evaluation and due-diligence review. The scope of our work for this investigation was focused primarily on the geotechnical issues that we expect could have significant fiscal impacts on future site development. *While this report is comprehensive for the intended purpose, it is not intended for final design purposes. As such, additional geotechnical studies may be warranted based on our review of future rough grading plans and foundation plans*. The scope of our geotechnical due-diligence work included the following:

- Review of published geologic and seismic data for the site and surrounding area
- Review of historical photos for the surrounding area
- Excavation and sampling of three exploratory borings
- Excavation and installation of one percolation test well
- Engineering analyses of data from the exploration and laboratory testing
- Evaluation of site seismicity, liquefaction potential, and settlement potential
- Preparation of this report

1.2 SITE LOCATION AND DESCRIPTION

The site is located at 13811 Valley View Avenue (APN: 8059-028-049) in the city of La Mirada, California. The site is bordered by several one-story single-family homes to the north (several small structures and trees are situated along the property line), Valley View Avenue to the east, large industrial buildings with an asphalt paved parking area to the south and west. The location of the site and its relationship to the surrounding areas is shown on the Site Location Map, Figure 1.

The site is rectangular in shape and comprises approximately 2.3 acres of land. The site is currently unoccupied with exception of remnant foundations and concrete slabs of demolished structures. An asphalt driveway present along the north property line is in poor condition due to several cracks observed. A concrete driveway along the south property line was observed to be in good condition. Property line masonry walls and the footprint of the previous pool are also present. The western portion of the site consists of undeveloped land that was previously utilized as a backyard. This area was observed to be uneven and could possibly be the result of previous agricultural usage. Most of the previous improvements which include the demolished residential home were located in the central portion of the site. The eastern portion of the site consisted of matured trees and a driveway.

N

SITE LOCATION MAP
The Olson Company
Proposed Residential Development
13811 Valley View Avenue
La Mirada, California

NOT TO SCALE

FIGURE 1

A security fence with two gates bounds the property along the east property line. On the south portion of the site, a retaining wall runs along the property line. This retaining wall retains approximately 1 to 2 feet of soil. A chain-link fence currently runs along the west property line. The west-adjacent property is situated approximately 5 feet lower than the subject property rear yard pad. The site is bounded by a retaining wall along the north property line. The retaining wall retains approximately 1 to 5 feet of soil on the subject site. The north-adjacent properties are situated approximately 5 to 10 feet lower than the subject property. The north-adjacent properties are separated from the subject property by approximately 2:1 (h:v) slopes and some minor planter walls. Some minor erosion was noted along the base of the property line retaining wall. Step cracking was also observed on the retaining wall but overall the entirety of the retaining wall was in good condition.

The site is relatively level gently sloping towards the east. Based on Google Earth 2017, the elevation ranges from 104 to 110 feet above mean sea level (MSL).

Vegetation at the west portion of the site consist of ground cover and small shrubs. Several medium size trees are located along the north property line. Ground cover, medium sized shrubs, and large trees are located at the east portion of the site. Previously utilized planters are located at the central portion of the site but only sparse ground cover is present.

1.3 PROPOSED DEVELOPMENT

We understand the site will be developed for residential use consisting of 56 units of two- and three-story townhomes. It is anticipated that all proposed structures will be constructed on grade (i.e. no subterranean elements). The main street is planned along the north portion of the site. Associated interior driveways, perimeter/retaining walls, storm water infiltration system, and underground utilities are also planned.

No grading or structural plans were available in preparing of this report. However, we anticipate that minor rough grading of the site will be required to achieve future surface configuration and we expect the proposed residential dwellings will be wood-framed structures with concrete slabs on grade yielding relatively light foundation loads. Grading is anticipated to match the west- and south-adjacent grades.

2.0 INVESTIGATION

2.1 RESEARCH

We have reviewed the referenced geologic publications, maps, and historical aerial photos of the vicinity. Data from these sources were utilized to the development of some of our findings and conclusions presented in this report. In 1952, the site appears to be undeveloped with a possible farm adjacent to the site. By 1963, a residential building is constructed in the central portion of the site. During 1972 to 2003, trees are present at the eastern portion of the site and a pool, gazebo, and two garages were constructed. Sometime after 2003, the structures and related improvements were demolished. Historical topographic maps indicate that the subject property is situated on the

northwestern edge of a terrace, beyond which, descends approximately 10 to 15 feet to La Canada Verde Creek.

2.2 SUBSURFACE EXPLORATION

Subsurface exploration for this investigation was conducted at the site on January 16, 2018, and consisted of drilling three (3) exploratory borings. The borings were drilled to maximum depths of approximately 61.5 feet below the existing ground surface utilizing a truck-mounted, hollow-stem-auger drill rig. Representatives of *Albus-Keefe & Associates, Inc*. logged the exploratory excavations. Visual and tactile identifications were made of the materials encountered, and their descriptions are presented on the Exploration Logs in Appendix A. The approximate locations of the exploratory excavations completed by this firm are shown on the enclosed Geotechnical Map, Plate 1.

Bulk, relatively undisturbed and Standard Penetration Test (SPT) samples were obtained at selected depths within the exploratory boring for subsequent laboratory testing. Relatively undisturbed samples were obtained using a 3-inch O.D., 2.5-inch I.D., California split-spoon soil sampler lined with brass rings. SPT samples were obtained from the boring using a standard, unlined SPT soil sampler. During each sampling interval, the sampler was driven 18 inches with successive drops of a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler was recorded for each six inches of advancement. The total blow count for the lower 12 inches of advancement per soil sample is recorded on the exploration log. Samples were placed in sealed containers or plastic bags and transported to our laboratory for analyses. The borings were backfilled with auger cuttings upon completion of sampling.

In addition, one percolation test boring, P-1, was also excavated to an approximate depth of 30 feet in the vicinity of exploratory boring B-1 for subsequent percolation testing. The percolation test well was later backfilled with auger cuttings upon completion of testing. Results of our percolation testing are discussed later in this report in Section 5.11.

2.3 LABORATORY TESTING

Selected samples of representative earth materials from the borings were tested in our laboratory. Tests consisted of in-situ moisture and dry density, maximum dry density and optimum moisture content, expansion index, soluble sulfate content, consolidation/collapse potential, direct shear, corrosivity (pH, chloride, & minimum resistivity), Atterberg limits, and grain size analysis. Descriptions of laboratory testing and a summary of the test results are presented in Appendix B and on the exploration log in Appendix A.

3.0 SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

Descriptions of the earth materials encountered during our investigation are summarized below and are presented in detail on the Exploration Logs presented in Appendix A.

Soils encountered at the site consisted of older alluvial deposits to the maximum depth of 61.5 feet. As observed in our exploratory borings B-1 and B-2, the alluvial deposits in surficial soils typically consisted of strong brown sandy clay that is porous, dry to moist, and very stiff to hard. The soils below comprised of interlayered coarse-grained and fine-grained material. The coarse-grained material consisted of sand with variable amounts of silt that was observed to be medium dense to very dense and damp to moist. The fine-grained material consisted of silt and clays with variable amounts of sand. These materials were stiff to hard and damp to moist. The subsurface profile of exploratory boring B-3 was observed to be comprised of brown silty sand and sand that is dry and medium dense. The upper 10 feet of soils in boring B-3 was observed to be porous. Gray silt was observed at depth and was moist and hard. Although not encountered, localized areas of artificial fill associated with previously existing improvements may also be present on the site.

A more detailed description of the interpreted soil profile at each of the boring locations, based upon the borehole cuttings and soil samples, are presented in Appendix A. The stratigraphic descriptions in the logs represent the predominant materials encountered and relatively thin, often discontinuous layers of different material may occur within the major divisions.

3.2 GROUNDWATER

A review of the CDMG Seismic Hazard Zone Report 037 indicates that historical high groundwater levels for the general site area is as shallow as 15 feet below the existing ground surface. However, groundwater was not encountered during this firm's subsurface exploration to the maximum depth explored, approximately 61.5 feet below the existing ground surface.

After review of historic ground water data made available by the County of Los Angeles Department of Public Works through online services, a timeline could be established from the late-1950s to the early-2010s and the corresponding ground water depths in proximity to the site. The data indicates that regional groundwater has not risen above a depth of approximately 60 feet since about 1967.

3.3 FAULTING

Geologic literature and field exploration do not indicate the presence of active faulting within the site. The site does not lie within an "Earthquake Fault Zone" as defined by the State of California in the Alquist-Priolo Earthquake Fault Zoning Act. Table 3.1 presents a summary of all the known seismically active faults within 10 miles of the site based on the 2008 National Seismic Hazards Maps.

TABLE 3.1
Summary of Faults

Name	Distance (miles)	Slip Rate (mm/yr.)	Preferred Dip (degrees)	Slip Sense	Rupture Top (km)	Fault Length (km)
Puente Hills (Coyote Hills)	1.00	0.7	26	thrust	2.8	17
Puente Hills (Santa Fe Springs)	1.56	0.7	29	thrust	2.8	11
Elsinore;W+GI+T+J+CM	5.08	--	84	strike slip	0	241
Elsinore;W	5.08	2.5	75	strike slip	0	46
Elsinore;W +GI	5.08	--	81	strike slip	0	83
Elsinore;W+GI+T	5.08	--	84	strike slip	0	124
Elsinore;W+GI+T+J	5.08	--	84	strike slip	0	199
Puente Hills (LA)	7.10	0.7	27	thrust	2.1	22

4.0 ANALYSES

4.1 SEISMICITY

We have performed probabilistic seismic analyses utilizing the U.S. Seismic Design Maps web application by the U.S. Geological Survey (USGS). From our analyses, we obtain a PGA of 0.733 in accordance with Figure 22-7 of ASCE 7-10. The F_{PGA} factor for site class D is 1.0. Therefore, the PGA_M = 1.0 x 0.733 = 0.73g. The mean event associated with a probability of exceedance equal to 2% over 50 years has a moment magnitude of 6.81 and the mean distance to the seismic source is 6.4 miles.

4.2 SETTLEMENT

Analyses were performed to evaluate potential for static settlement. Our analyses were based on the results of consolidation tests performed on selected samples from our borings. Results of our testing indicate the older alluvial soils are prone to significant collapse upon wetting (hydrocollapse). We estimate that footings would undergo a total settlement of up to about 5 inches if underlain by onsite soils that became wetted after construction. If the existing 4 to 6 feet of older alluvial soils are removed and recompacted, we estimate the total settlement will be less than 1 inch.

5.0 CONCLUSIONS

5.1 FEASIBILITY OF PROPOSED DEVELOPMENT

From a geotechnical point of view, the proposed site development is considered feasible provided appropriate geotechnical recommendations are incorporated into the design and construction of the project. Key issues that could have significant fiscal impacts on the geotechnical aspects of the proposed site development are discussed in the following sections of this report.

5.2 GEOLOGIC HAZARDS

5.2.1 Ground Rupture

No known active faults are known to project through the site nor does the site lie within the boundaries of an "Earthquake Fault Zone" as defined by the State of California in the Alquist-Priolo Earthquake Fault Zoning Act. Therefore, the potential for ground rupture due to an earthquake beneath the site is considered low. The nearest zoned fault is the Whittier fault located approximately 5 miles.

5.2.2 Ground Shaking

The site is situated in a seismically active area that has historically been affected by generally moderate to occasionally high levels of ground motion. The site lies in relative close proximity to several seismically active faults; therefore, during the life of the proposed structures, the property will probably experience similar moderate to occasionally high ground shaking from these fault zones, as well as some background shaking from other seismically active areas of the Southern California region. Potential ground accelerations have been estimated for the site and are presented in Section 4.1 of this report. Design and construction in accordance with the current California Building Code (C.B.C.) requirements is anticipated to adequately address potential ground shaking.

5.2.3 Liquefaction

Engineering research of soil liquefaction potential (Youd, et al., 2001) indicates that generally three basic factors must exist concurrently in order for liquefaction to occur. These factors include:

- A source of ground shaking, such as an earthquake, capable of generating soil mass distortions.
- A relatively loose silty and/or sandy soil.
- A relative shallow groundwater table (within approximately 50 feet below ground surface) or completely saturated soil conditions that will allow positive pore pressure generation.

The liquefaction susceptibility of the onsite subsurface soils was evaluated by analyzing the potential concurrent occurrence of the above-mentioned three basic factors. The liquefaction evaluation for this site was completed under the guidance of Special Publication 117A: Guidelines for Evaluating and Mitigating Seismic Hazards in California (CDMG, 2008).

Although, the site is mapped with a historical high groundwater level of approximately 15 feet, research of groundwater data from existing wells in the vicinity of the site indicate groundwater levels in excess of 60 feet. Therefore, the potential for liquefaction at the site is very low. The site is also underlain by Pleistocene aged soils that are not considered susceptible to liquefaction. In addition, the site is not located within a mapped liquefaction hazard zone by the California Geologic Survey.

5.3 STATIC SETTLEMENT

Our exploration and laboratory testing indicated the alluvial soils are porous and prone to significant hydrocollapse. These materials are likely to cause settlements beyond the tolerances of proposed site development in their current state. If the upper 4 to 6 feet of older alluvial soils are removed and replaced as compacted fill, total and differential static settlements are anticipated to be less than 1 inch and ½-inch over 30 feet, respectively. The greater depths of removals are anticipated to be along the east portion of the site. These estimated magnitudes of static settlements are considered within tolerable limits for the proposed foundation loads.

5.4 EXCAVATION AND MATERIAL CHARACTERISTICS

In general, the existing near-surface soils are considered unsuitable in their existing condition to support proposed structural fills and site development. This condition can be mitigated by removal and recompaction of unsuitable soils. The anticipated depth of removal to mitigate structural load-induced settlement below the proposed residential buildings, retaining walls, and pavement is on the order of 4 to 6 feet below existing ground surface.

Temporary construction slopes and trench excavations can likely be cut vertically up to a height of 4 feet within the onsite materials provided that no surcharging of the excavations is present. Temporary excavations greater than 4 feet in height will likely require side laybacks to 1:1 (H:V) or flatter to mitigate the potential for sloughing. Due to the need for deep removals, residential structures will generally require a setback of at least 6 feet beyond property lines or other factors that would limit lateral removal of soils. Even at this setback, removals along the property lines adjacent residential buildings will likely require slot cutting techniques to provide a suitable projection to competent soils.

Demolition of the existing site improvements will generate a considerable amount of concrete and asphaltic concrete debris. Significant portions of concrete and asphaltic concrete debris can likely be reduced in size to less than 4 inches and incorporated within fill soils during earthwork operations.

Onsite disposal systems, clarifiers, and other underground improvements may be present on site. If encountered during future rough grading, these improvements will require proper abandonment or removal.

Off-site improvements exist near and along the property lines. The presence of the existing offsite improvements will limit removals of unsuitable materials adjacent the property lines. Special grading techniques, such as slot cutting, will be required adjacent to the property lines were offsite structures are nearby, particularly along the north property line due to the adjacent structures situated

atop the slope. Construction of perimeter site walls will likely require deepened footings or caissons and grade beams where removals are restricted by property boundaries.

Subsurface soils are anticipated to be relatively easy to excavate with conventional heavy earthmoving equipment. Removal and recompaction of the site materials will result in some moderate shrinkage and subsidence. Design of site grading will require consideration of this loss when evaluating earthwork balance issues.

The existing near surface soils are typically below optimum moisture content and is anticipated to require water to achieve proper compaction.

5.5 SHRINGKAGE AND BULKAGE

Volumetric changes in earth quantities will occur when excavated onsite soil materials are replaced as properly compacted fill. We estimate the existing upper 6 feet of earth materials will shrink up to approximately 5 to 10 percent. Subsidence of removal bottoms is estimated to be up to 0.1 feet. The estimates of shrinkage and bulkage are intended as an aid for project engineers in determining earthwork quantities. However, these estimates should be used with some caution since they are not absolute values. Contingencies should be made for balancing earthwork quantities based on actual swelling and bulkage that occurs during the grading process.

5.6 SOIL EXPANSION

Based on our laboratory test results and the USCS visual manual classification, the near-surface soils within the site are generally anticipated to possess a **Low** expansion potential. Additional testing for soil expansion may be required subsequent to rough grading and prior to construction of foundations and other concrete work to confirm these conditions.

5.7 FOUNDATIONS

Considering the **Low** expansion potential of site soils, conventional shallow foundations may be used to support habitable structures and miscellaneous structures at the site. Alternatively, Post-tension slabs may be utilized.

In the absence of a geotechnical evaluation of slope stability, the CBC requires the bottom outer edge of foundations located adjacent a top of slope to be setback from the slope face a horizontal distance of at least one-third the height of the slope. The CBC states this horizontal distance should not be less than 7 feet but need not exceed 40 feet.

5.8 CONCRETE MIX DESIGN

Laboratory testing of onsite soil indicates **Negligible** soluble sulfate content. Concrete designed to follow the procedures provided in ACI 318, Section 4.3, Table 4.3.1 for negligible sulfate exposure are anticipated to be adequate for mitigation of sulfate attack on concrete. Upon completion of

rough grading, an evaluation of as-graded conditions and further laboratory testing will be required for the site to confirm or modify the conclusions provided in this section.

5.9 CORROSION POTENTIAL

Laboratory testing of onsite soil indicates indicate a minimum resistivity of 1,000 ohm-cm, chloride content of 24.5 ppm, and a pH of 8.3. Based on laboratory test results, site soils are **Corrosive** to metals. Structures fabricated from metals should have appropriate corrosion protection if they will be in direct contact with site soils. Under such conditions, a corrosion specialist should provide specific recommendations.

5.10 PAVEMENT SECTIONS

Existing near-surface soils are anticipated to have a moderate R-value. Based on the assumed R-value of 5 and a traffic index of 5.5, a preliminary pavement structural section of 3 inches asphaltic concrete over 11 inches of aggregate base may be used for planning and estimating purpose. R-value testing will be required subsequent to rough grading and prior to construction of interior driveways to confirm these conditions.

5.11 PERCOLATION CHARACTERISTICS

Based on the subsurface exploration and percolation testing at 13811 Valley View Avenue, infiltration of storm water is considered feasible with the use of dry wells. Preliminary analyses indicate that dry wells could likely provide a peak measured infiltration flow of approximately 0.11 cfs and empty within 48 hours. The typical dry well is estimated to be 40 feet deep. The site is underlain by interbedded layers of sand, silty sand, and fine-grained soils. The presence of fine-grained interbeds will tend to diminish the effectiveness of infiltration, even by dry wells. Further percolation testing and/or evaluation may be necessary based on review of preliminary WQMP design plans.

6.0 LIMITATIONS

This report is based on the proposed development and geotechnical data as described herein. The materials described herein and in other literature are believed representative of the total project area, and the conclusions contained in this report are presented on that basis. However, soil materials can vary in characteristics between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein. As such, observation and testing by a geotechnical consultant prior to and during the grading and construction phases of the project are essential to confirming the basis of this report.

This report summarizes several geotechnical topics that should be beneficial for project planning and budgetary evaluations. *The information presented herein is intended only for a preliminary feasibility evaluation and **is not** intended to satisfy the requirements of a site specific and detailed geotechnical investigation required for further planning and permitting.*

This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and time period. The contents of this report are professional opinions and as such, are not to be considered a guaranty or warranty.

This report should be reviewed and updated after a period of one year or if the site ownership or project concept changes from that described herein.

This report has been prepared for the exclusive use of **The Olson Company** to assist the project consultants in determining the feasibility of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

Respectfully submitted,

ALBUS-KEEFE & ASSOCIATES, INC

Mark Principe
Staff Engineer

Paul Hyun Jin Kim
Associate Engineer
P.E. 77214

REFERENCES

Publications

California Department of Conservation, Division of Mines and Geology, Seismic Hazard Report 037, "Seismic Hazard Zone Report for the Whittier 7.5-Minute Quadrangles, Los Angeles County, California", 1998.

California Department of Conservation, Division of Mines and Geology, Special Publication 117A "Guidelines for Evaluating and Mitigating Seismic Hazards in California", 2008.

Southern California Earthquake Center (SCEC), University of Southern California, "Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California," March, 1999.

Youd, T.L., Idriss, I.M., Andrus, R.D., Arango, I., Castro, G., Christian, J., Dobry, R., Finn, W.D.L., Harder, L.F., Hynes, M.E., Ishihara, K., Koester, J.P., Liao, S.S.C., Marcuson, W.F., Martin, G.R., Mitchell, J.K., Moriwaki, Y., Power, M.S., Robertson, P.K., Seed, R.B., and Stokoe, K.H., "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils", Journal of Geotechnical and Geoenvironmental Engineering, October, 2001.

Plans

KTGY Architecture + Planning, Conceptual Density Study, Bora & Valley View, La Mirada, LA County, CA, #2017-1142, Dated January 29, 2017

SITE INFORMATION
Project Name: La Mirada (Bora & Valley View)
Address: 13811 Valley View Ave, La Mirada, CA 90638
APN(s): 8059-028-049
Zoning: M2 Industrial with Special Housing Overlay (Infill Area 8)
Land Use: Single Family Residential

INFILL AREA 8 DEVELOPMENT STANDARDS
Front Setback: 10'
Street Side Setback: 10'
Side Setback: 5'
Rear Setback: 10'
Building Height: 45'
Coverage 50%
FAR: 1.0
Min Floor Step-Back: 5'
Landscaping: 20%
Max Density: 30 du/ac

SITE SUMMARY
Site Area: ±2.27 Acres (±99,000sf)
Units:
18 units - 16x45 (tandem garage) - 32%
18 units - 16x45 (side-side garage) - 32%
20 units - 21x38 (side-side garage) - 36%
56 units - Total
Density: ±24.3 du/ac
Parking:
112 spaces - garages
19 spaces - guest
131 spaces - total (2.33 sp/unit)

Open Space: ±14,000sf (±250sf/unit)

Building Coverage: ±42,000sf (42%)
Pavement Coverage ±34,500sf (35%)
Landscape Coverage: ±22,500sf (23%)

EXPLANATION
(Locations Approximate)

- Exploratory Boring
- Percolation Test Boring

ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

GEOTECHNICAL MAP

Job No.: 2700.00	Date: 02/02/18	Plate: 1

ktgy
Architecture + Planning
888.456.5849
ktgy.com

The Olson Company
3010 Old Ranch Parkway, Suite 100
Seal Beach, CA 90704

BORA & VALLEY VIEW
LA MIRADA, CA # 2017-1142

CONCEPTUAL DENSITY STUDY
JANUARY 29, 2017

0 15 30 60

APPENDIX A

EXPLORATION LOGS

EXPLORATION LOG

Project:		Location:
Address:		Elevation:
Job Number:	Client:	Date:
Drill Method:	Driving Weight:	Logged By:

Depth (feet)	Lith-ology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		EXPLANATION							
		Solid lines separate geologic units and/or material types.							
		Dashed lines indicate unknown depth of geologic unit change or material type change.							
5		**Solid black rectangle** in Core column represents California Split Spoon sampler (2.5in ID, 3in OD).			■				
		Double triangle in core column represents SPT sampler.			⧗				
10		**Solid black rectangle** in Bulk column respresents large bag sample.				■			
		Other Laboratory Tests:							
		Max = Maximum Dry Density/Optimum Moisture Content							
		EI = Expansion Index							
		SO4 = Soluble Sulfate Content							
15		DSR = Direct Shear, Remolded							
		DS = Direct Shear, Undisturbed							
		SA = Sieve Analysis (1" through #200 sieve)							
		Hydro = Particle Size Analysis (SA with Hydrometer)							
		200 = Percent Passing #200 Sieve							
		Consol = Consolidation							
		SE = Sand Equivalent							
20		Rval = R-Value							
		ATT = Atterberg Limits							

EXPLORATION LOG

Project:		Location: B-1
Address: 13811 Valley View Ave, La Mirada, CA 90638		Elevation: 112.0
Job Number: 2700.00	Client: The Olson Company	Date: 1/16/2018
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: SB

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		OLDER ALLUVIUM (Qoal)							Max EI SO4 DS ATT pH Resist Ch
		Sandy Clay (CL): Strong brown, dry, hard, fine grained sand, abundant pores, pores up to 1/4 inches, rootlets and roots present, some medium grained sand		59	■	■	7	117	
5		@ 4 ft, Increased medium sand, reduced pores, pinhole pores		70	■	■	8.3	120.8	Consol
		Clayey Sand / Silty Sand (SC/SM): Reddish brown, moist, medium dense, fine grained sand, pinhole pores, rootlets present		23	■		7.8	108.3	Consol
10				25	■		6.2	113.1	
		Silty Sand (SM): Light brown to brown, moist, medium dense, fine grained sand, micaceous							
15		Sandy Silt / Silty Sand (ML/SM): Gray, moist, hard / very dense, fine grained sand, iron oxide stains, pores present		71/ 10"	⧗				
		Sandy Silt (ML): Gray, moist, hard, fine grained sand, iron oxide stains, micaceous							
20				29	⧗				
		Silty Sand (SM): Gray, moist, dense, fine grained sand, iron oxide stains, trace medium grained sand							

EXPLORATION LOG

Project:		Location: B-1
Address: 13811 Valley View Ave, La Mirada, CA 90638		Elevation: 112.0
Job Number: 2700.00	Client: The Olson Company	Date: 1/16/2018
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: SB

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
				32					
		Sand with Silt (SP-SM): Brown to grayish brown, damp, dense, fine to coarse grained sand, little gravel, gravel up to 3/4 inch							
30				37					
		@ 33 ft, Gravel present							
35		@ 35 ft, Medium to coarse grained sand		25					
		Silty Sand (SM): Gray, moist, dense, medium grained sand, micaceous							
		@ 38 ft, Gravel present							
		@ 39 ft, Reduced gravel							
40		Sand (SP): Gray to brown, damp, dense, medium to coarse grained sand, few gravel, gravel up to 1/2 inch		34					
		Sandy Silt (ML): Gray, moist, hard, fine grained sand, iron oxide stains, micaceous							
45				32					
		Sand (SP): Gray, damp, dense, medium to coarse grained sand, clay nodules, trace gravel							

EXPLORATION LOG

Project:		Location: B-1
Address: 13811 Valley View Ave, La Mirada, CA 90638		Elevation: 112.0
Job Number: 2700.00	Client: The Olson Company	Date: 1/16/2018
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: SB

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
50		Sand with Silt (SP-SM): Gray, damp, dense, medium sand, trace coarse sand		36					
		Clay with Sand (CL): Brown, damp, fine grained sand, some fine gravel, gravel up to 1/2 inch							
55									
		Clay (CL): Pale brown, moist, very stiff, fine grained sand, iron oxide stains, sand lense present, with silt							
60				15					
		End of boring at 61.5 feet. No groundwater encountered. Backfilled with soil cuttings. Installed percolation test well (P-1) 10 feet away.							

EXPLORATION LOG

Project:		Location: B-2
Address: 13811 Valley View Ave, La Mirada, CA 90638		Elevation: 109.0
Job Number: 2700.00	Client: The Olson Company	Date: 1/16/2018
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: SB

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		OLDER ALLUVIUM (Qoal)							
		Sandy Clay (CL): Strong brown, dry, very stiff, fine grained sand, rootlets and pores present, caliche stringers		51	■		7.9	117.9	
5		@ 4 ft, Reduced pores, no caliche stringers		44	■		10	120.8	
		Sandy Silt / Silty Sand (ML/SM): Strong brown, damp to moist, medium dense, fine grained sand, rootlets and pores present		30	■		7.1	115.2	Consol
10		Silty Sand / Clayey Sand (SM/SC): Brown to pale, damp, medium dense, fine grained sand, micaceous		17	■		14	93	
		Silt (ML): Gray, moist, hard, iron oxide stains, micaceous							
15				65	⧗				
		Silty Sand (SM): Gray, damp, medium dense, fine grained sand, micaceous							
20				20	⧗				
		Clay (CL): Light gray, moist, very stiff, trace fine grained sand, caliche stringers							
		Silt (ML): Grayish brown, moist, very stiff, iron oxide stains							

EXPLORATION LOG

Project:		Location: B-2
Address: 13811 Valley View Ave, La Mirada, CA 90638		Elevation: 109.0
Job Number: 2700.00	Client: The Olson Company	Date: 1/16/2018
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: SB

Depth (feet)	Lith-ology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
				23					
		Clay (CL): Gray, moist, very stiff, micaceous, iron oxide stains							
		End of boring at 26.5 feet. No groundwater encountered. Backfilled with soil cuttings.							

EXPLORATION LOG

Project:		Location: B-3
Address: 13811 Valley View Ave, La Mirada, CA 90638		Elevation: 106.0
Job Number: 2700.00	Client: The Olson Company	Date: 1/16/2018
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: SB

Depth (feet)	Lith-ology	Material Description	Water	Samples: Blows Per Foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
		OLDER ALLUVIUM (Qoal) Silty Sand (SM): light brown to brown, dry, medium dense, fine grained sand, pores and rootlets present, trace carbonate blebs		28			2.5	106.3	
5		Silty Sand / Sandy Silt (SM/ML): light brown to brown, dry, medium dense / stiff, fine grained sand, abundant pores, rootlets present		19			3.5	107.4	Consol
		Silty Sand (SM): Light brown, dry, medium dense, fine to medium grained sand, trace coarse grained sand, pores and rootlets present		34			4	108.1	
10		Silty Sand to Sand (SM/SP): Brown, damp, medium dense, fine to medium grained sand, trace fine gravel, abundant pores, trace coarse sand, rootlets present		46			3.5	114.1	Consol
		Sand (SP): Brown, damp, dense, fine to medium grained sand, some fine gravel, thin silt layers		37					
15									
20		@ 20 ft, Grayish brown, trace silt, trace coarse sand		31					

EXPLORATION LOG

Project:		Location: B-3
Address: 13811 Valley View Ave, La Mirada, CA 90638		Elevation: 106.0
Job Number: 2700.00	Client: The Olson Company	Date: 1/16/2018
Drill Method: Hollow-Stem Auger	Driving Weight: 140 lbs / 30 in	Logged By: SB

Depth (feet)	Lith-ology	Material Description	Water	Samples			Laboratory Tests		
				Blows Per Foot	Core	Bulk	Moisture Content (%)	Dry Density (pcf)	Other Lab Tests
		@ 25 ft, Fine to coarse grained sand, trace fine gravel, no silt layers		33					
		Silt (ML): Gray, moist, hard, iron oxide stains, trace pores							
		End of boring at 26.5 feet. No groundwater encountered. Backfilled with soil cuttings.							

APPENDIX B

LABORATORY TEST PROGRAM

LABORATORY TESTING PROGRAM

Soil Classification

Soils encountered within the exploratory borings were initially classified in the field in general accordance with the visual-manual procedures of the Unified Soil Classification System (ASTM D 2487). The samples were re-examined in the laboratory and classifications reviewed and then revised where appropriate. The assigned group symbols are presented on the Exploration Logs provided in Appendix A.

In-Situ Moisture Content and Dry Density

Moisture content and dry density of in-place soil materials were determined in representative strata. Test data are presented on the Exploration Logs provided in Appendix A.

Laboratory Maximum Dry Density

Maximum dry density and optimum moisture content of onsite soils were determined for selected samples in general accordance with Method A of ASTM D 1557. Pertinent test values are given on Table B-1.

Direct Shear

The Coulomb shear strength parameters, angle of internal friction and cohesion, were determined for a bulk sample obtained from one our borings. The tests were performed in general conformance with Test Method ASTM D 3080. The sample was remolded to 90 percent of maximum dry density and at the optimum moisture content. Three specimens were prepared for each test, artificially saturated, and then sheared under varied loads at an appropriate constant rate of strain. Results are graphically presented on Plate B-7.

Soluble Sulfate Content

Chemical analysis was performed on selected samples to determine soluble sulfate content. The tests were performed in accordance with California Test Method No. 417. The test results are included on Table B-1.

Expansion Potential

An Expansion Index test was performed on a selected sample in accordance with ASTM D 4829. The test result and expansion potential are presented on Table B-1.

Atterberg Limits

Atterberg Limits (Liquid Limit, Plastic Limit, and Plasticity Index) were performed in accordance with Test Method ASTM D4318. Pertinent test values are presented within Table B-1.

Consolidation

Consolidation Tests were performed by Albus-Keefe & Associates and Geo-logic Associates in general conformance with Test Method ASTM D 2435. Axial loads were applied in several increments to a laterally restrained 1-inch-thick sample. Loads were applied in geometric progression by doubling the previous load, and the resulting deformations were recorded at selected time intervals. The test samples were inundated at a selected surcharge loading in order to evaluate the effects of a sudden increase in moisture content. Results of these tests are graphically presented on Plates B-2 to B-5.

Corrosion

Select samples were tested for minimum resistivity and pH in accordance with California Test Method 643. Results of these tests are provided in Table B-1.

Particle-Size Analyses

Particle-size analyses were performed on selected samples in accordance with ASTM D 422. The results are presented graphically on the attached Plates B-1.

Hydrometer

Hydrometer analyses were performed on representative samples of site materials in accordance with ASTM D 7928. The results are presented graphically on the attached Plate B-1.

TABLE B-1
SUMMARY OF LABORATORY TEST RESULTS

Boring No.	Sample Depth (ft.)	Soil Description	Test Results	
B-1	0-5	Sandy Lean Clay (CL)	Maximum Dry Density:	128.5 pcf
			Optimum Moisture Content:	10.5%
			Liquid Limit:	28
			Plasticity Index:	15
			pH:	8.3
			Resistivity:	1,000 ohm-cm
			Chloride:	24.5 ppm
			Expansion Index:	36
			Expansion Potential:	Low
			Soluble Sulfate Content:	0.000%
			Sulfate Exposure:	Negligible

Note: Additional laboratory test results are provided on the boring logs in Appendix A.

ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

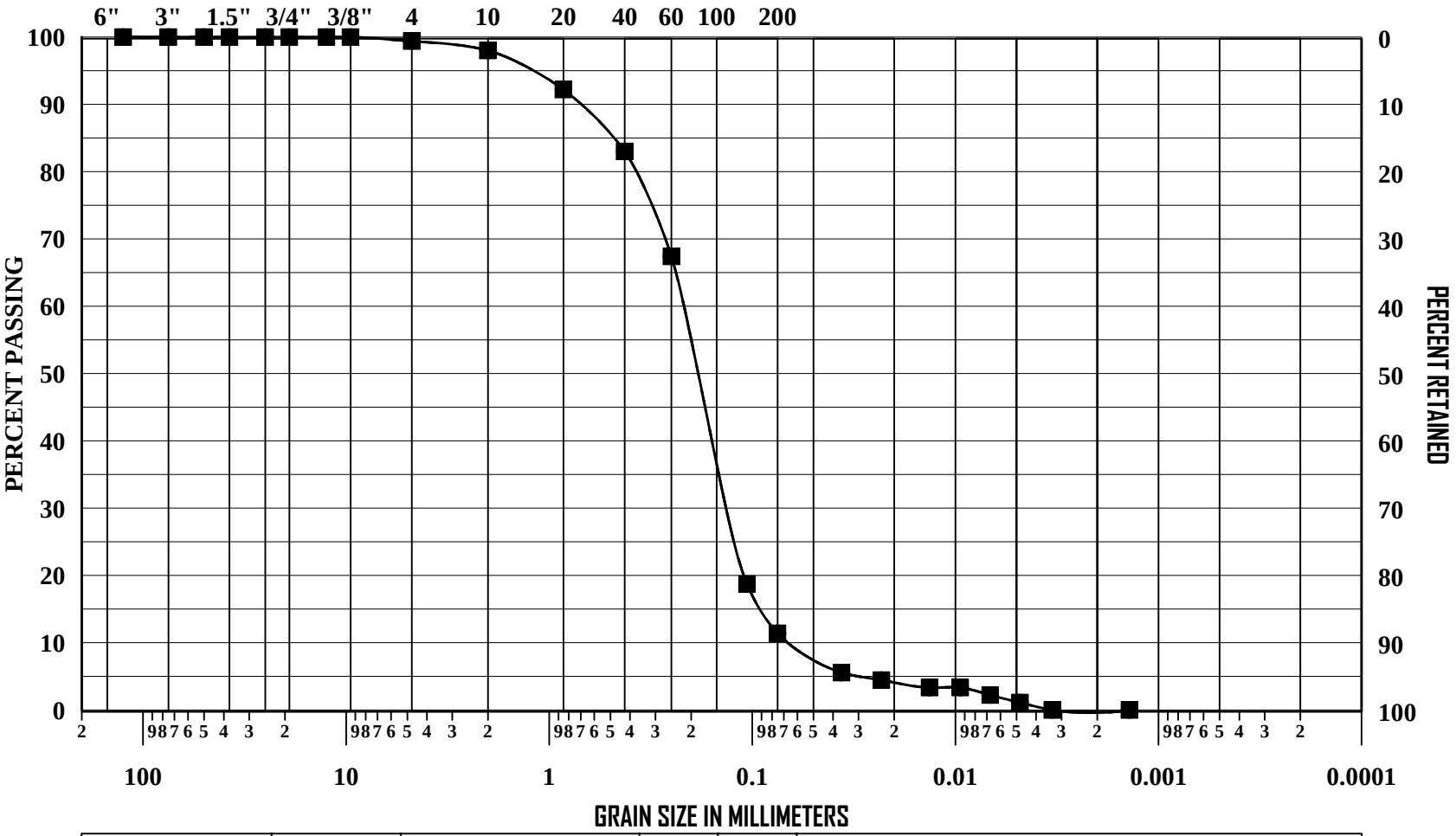
GRAIN SIZE DISTRIBUTION

Job No: 2700.00

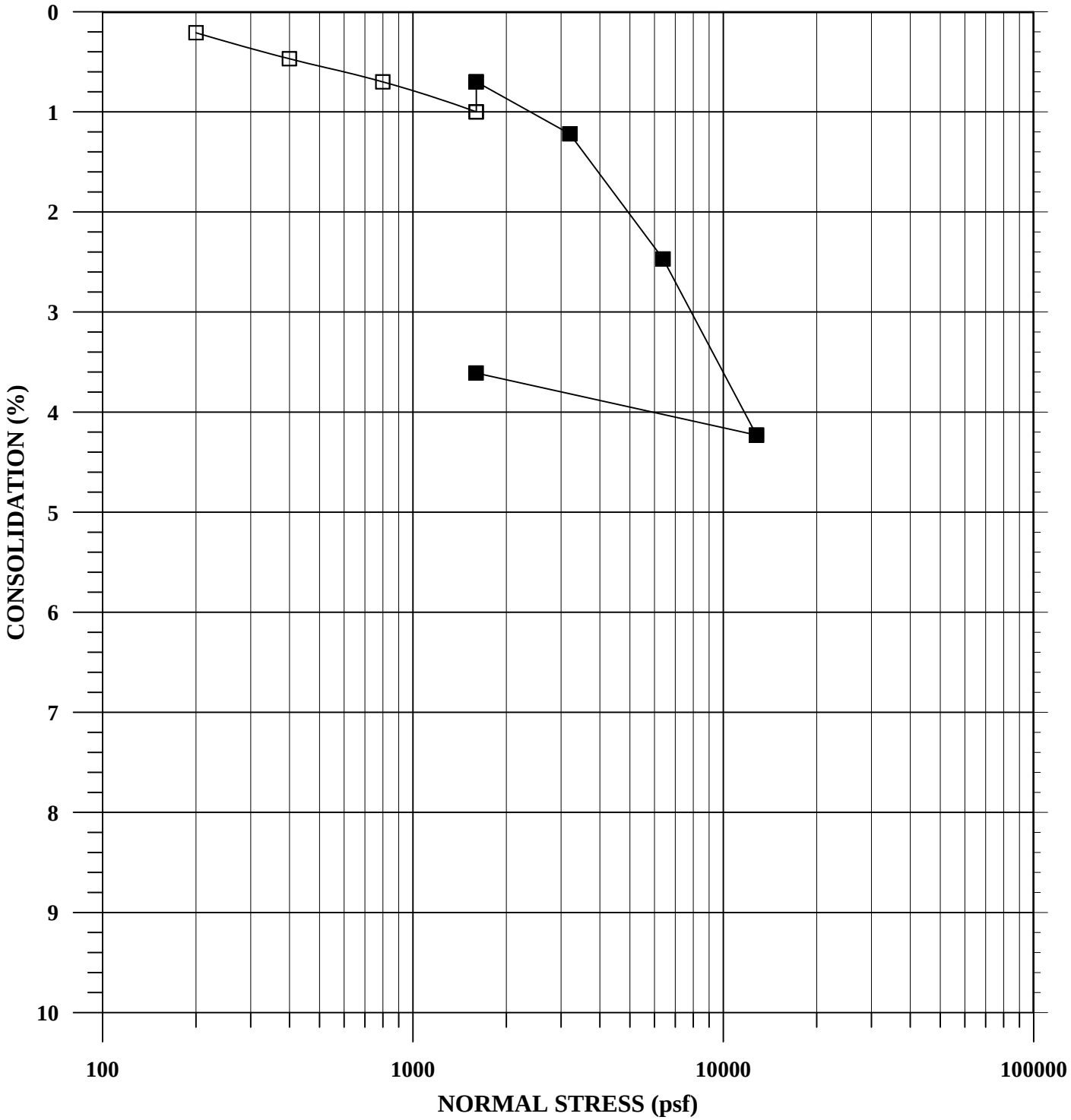
Plate No: B-1

UNIFIED SOIL CLASSIFICATION

COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

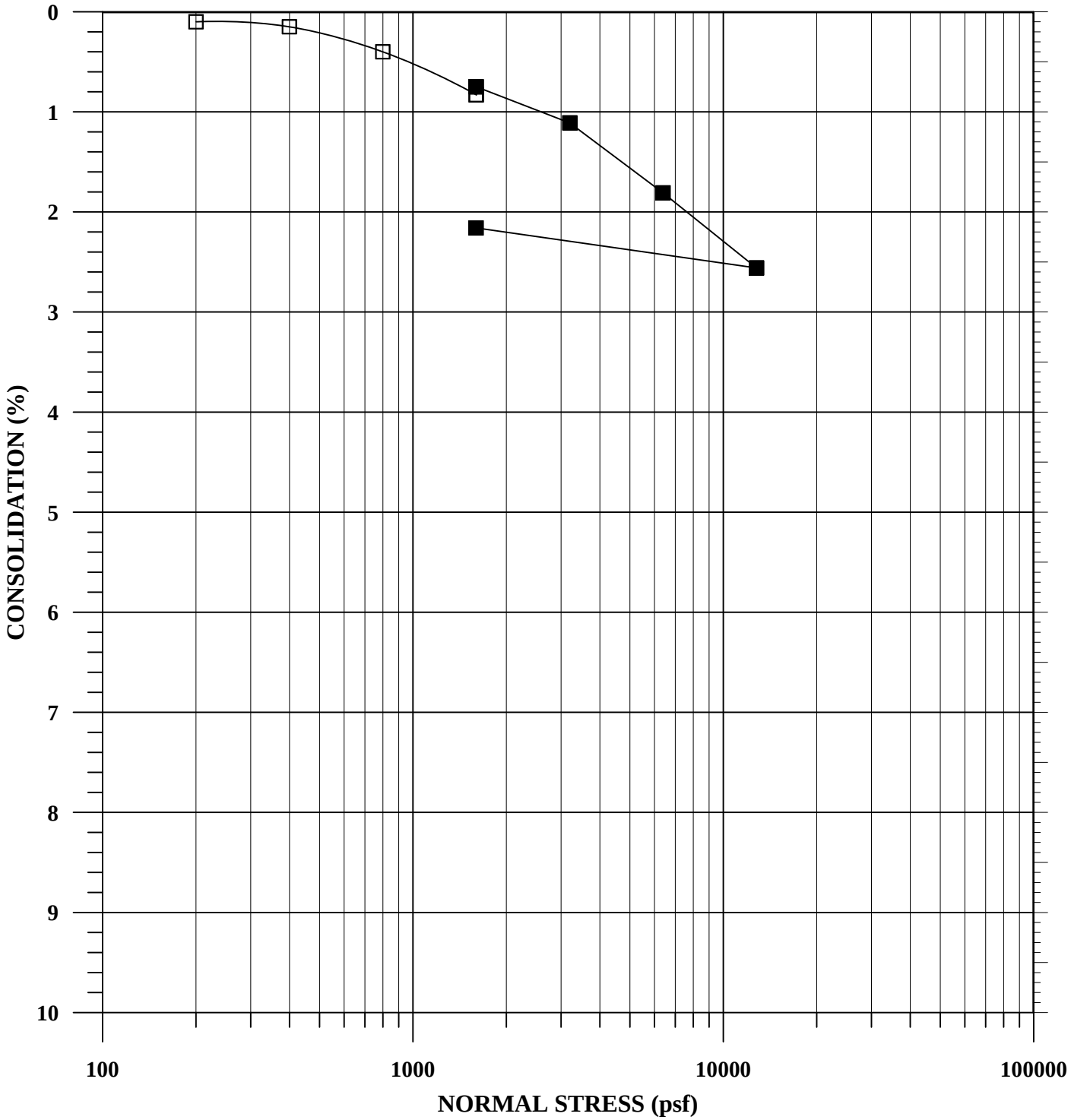


LOCATION	SAMPLE	SYMBOL	LL	PI	CLASSIFICATION
P-1	28 feet	●			Sand with Silt (SP-SM)



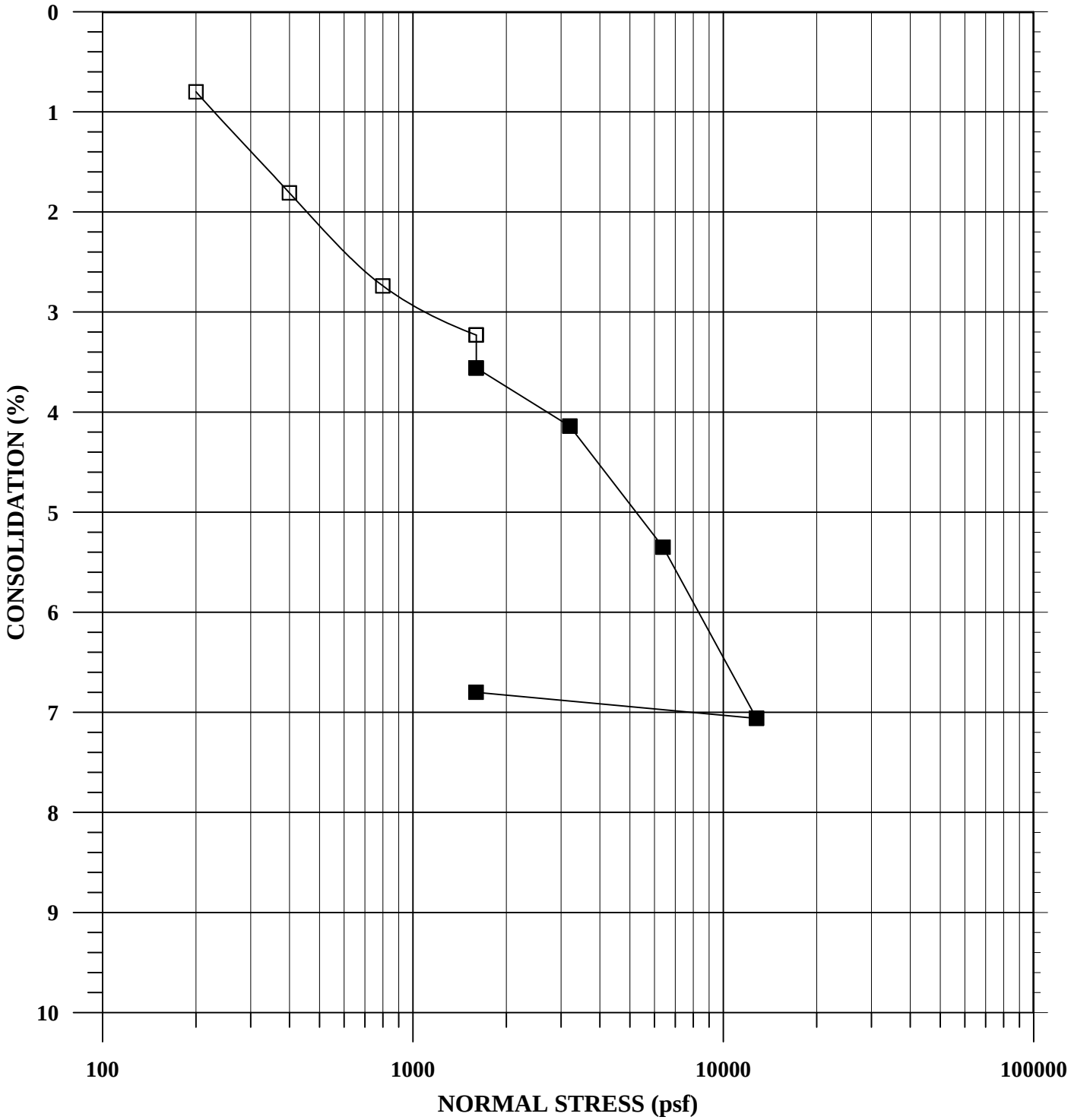
Sample Location:	**B-1**	**Initial Dry Density (pcf):**	**114.7**	**Legend**
Sample Depth:	**4 ft**	**Initial Moisure Content (%):**	**9.4**	□ □ □ Field Moisture ■—■—■ Saturated
Classification:	**CL**	**Final Moisture Content (%):**	**14.6**	

ALBUS-KEEFE & ASSOCIATES, INC. GEOTECHNICAL CONSULTANTS	**CONSOLIDATION TEST RESULTS**	**Job No: 2700.00** **Plate No: B-2**



Sample Location:	**B-1**	**Initial Dry Density (pcf):**	**109.0**	**Legend**
Sample Depth:	**6 ft**	**Initial Moisure Content (%):**	**8.3**	□ □ □ Field Moisture ■—■—■ Saturated
Classification:	**SC/SM**	**Final Moisture Content (%):**	**16.2**	

ALBUS-KEEFE & ASSOCIATES, INC. GEOTECHNICAL CONSULTANTS	**CONSOLIDATION TEST RESULTS**	**Job No: 2700.00** **Plate No: B-3**



Sample Location:	**B-2**	**Initial Dry Density (pcf):**	**-68.1**	**Legend**
Sample Depth:	**6 ft**	**Initial Moisure Content (%):**	**-328.3**	□ □ □ Field Moisture ■—■—■ Saturated
Classification:	**ML/SM**	**Final Moisture Content (%):**	**-341**	

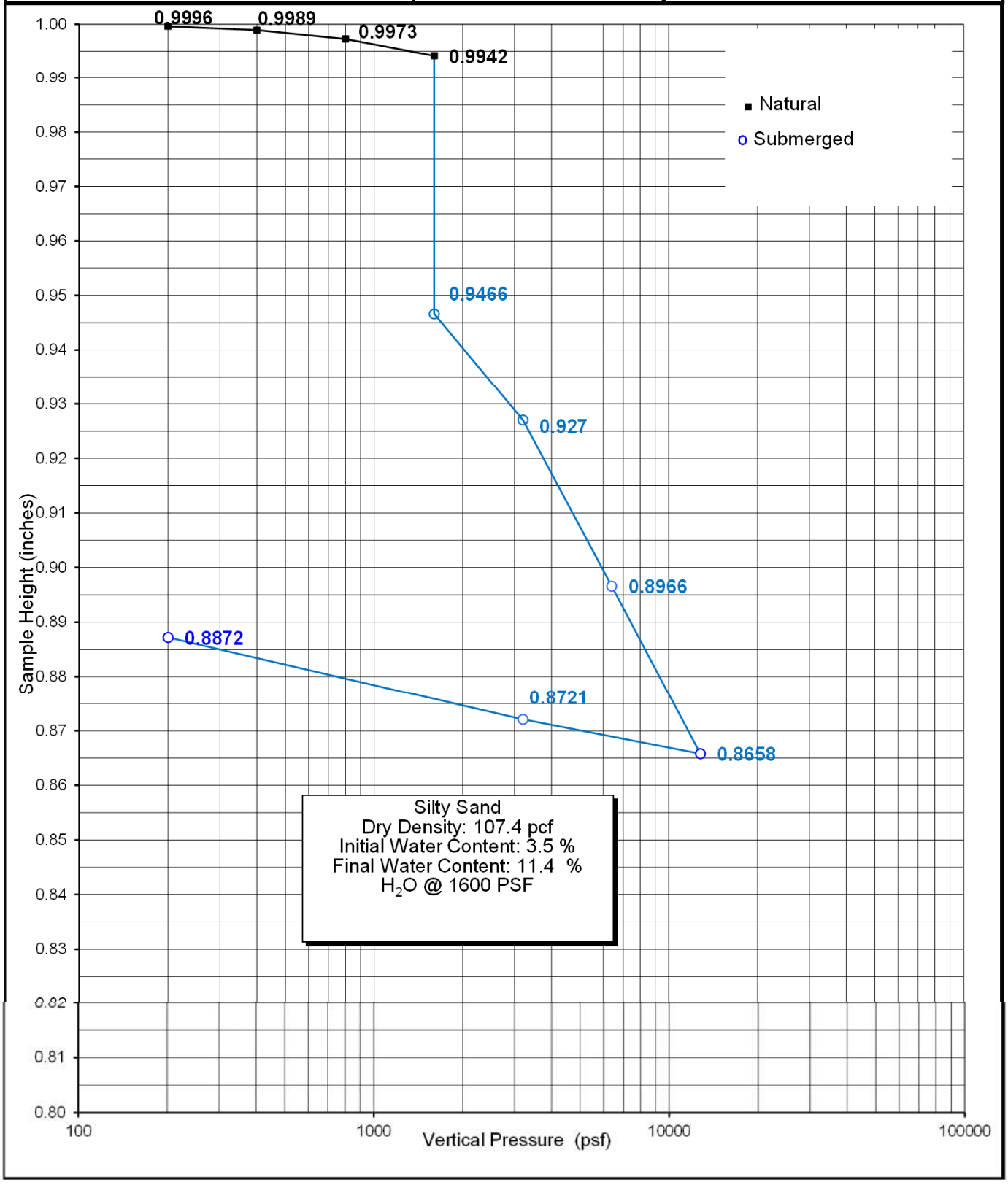
ALBUS-KEEFE & ASSOCIATES, INC. GEOTECHNICAL CONSULTANTS	**CONSOLIDATION TEST RESULTS**	**Job No: 2700.00** **Plate No: B-4**

Albus Keefe # 2700.00

CONSOLIDATION TEST - ASTM D2435

Job No. 2005-011

Boring / Sample No.	B-3	Depth:	4'	Date	01-23-18



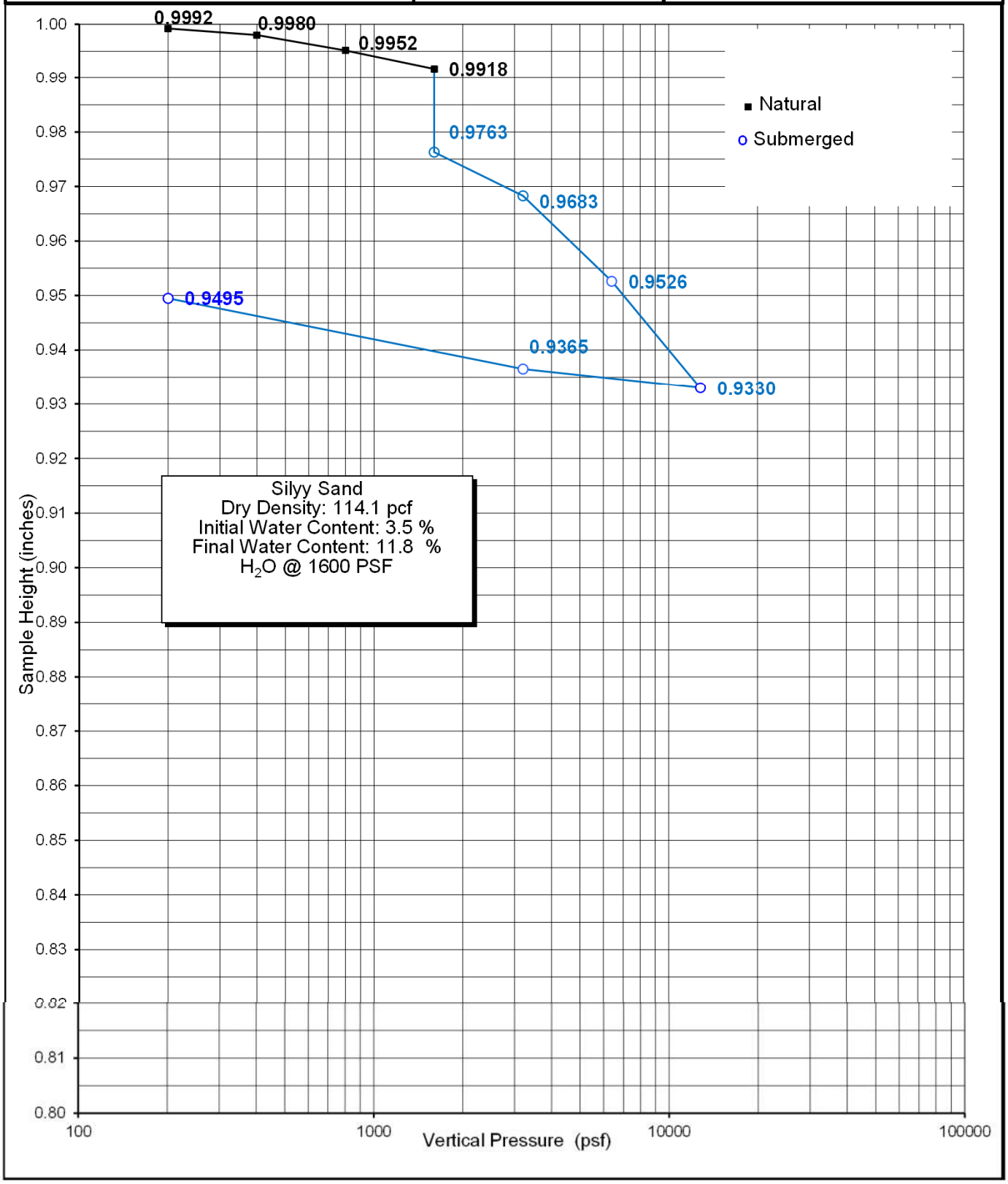
Geo-Logic ASSOCIATES

Albus Keefe # 2700.00

CONSOLIDATION TEST - ASTM D2435

Job No. 2005-011

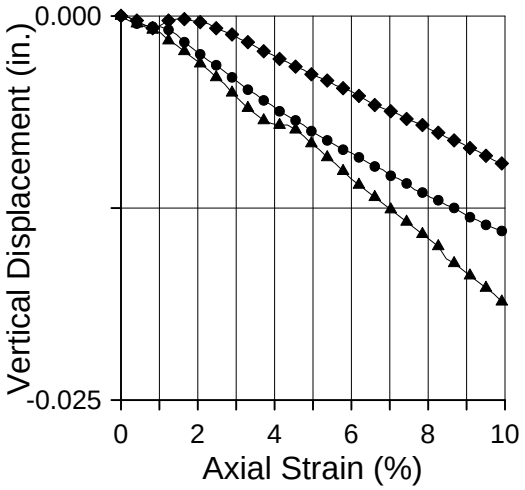
Boring / Sample No.	B-3	Depth:	10'	Date	01-23-18

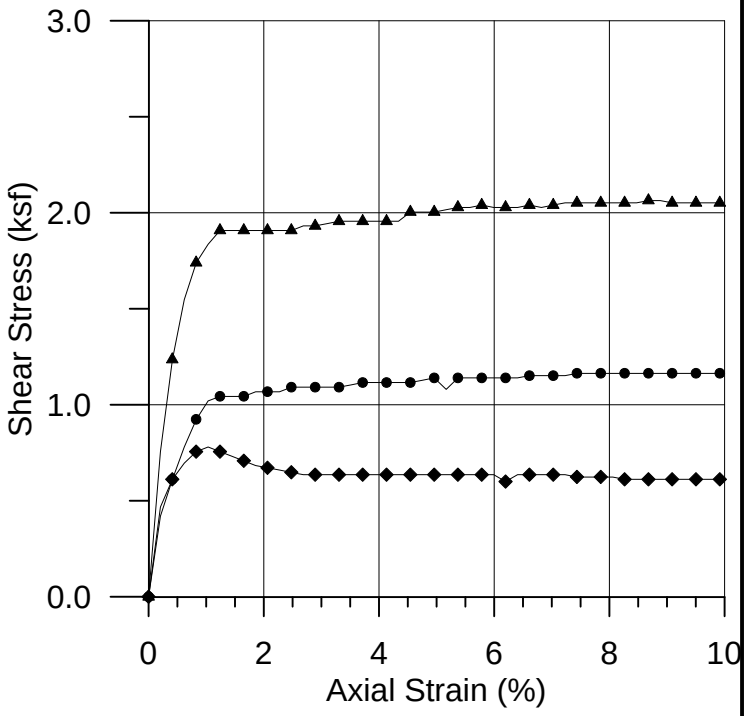


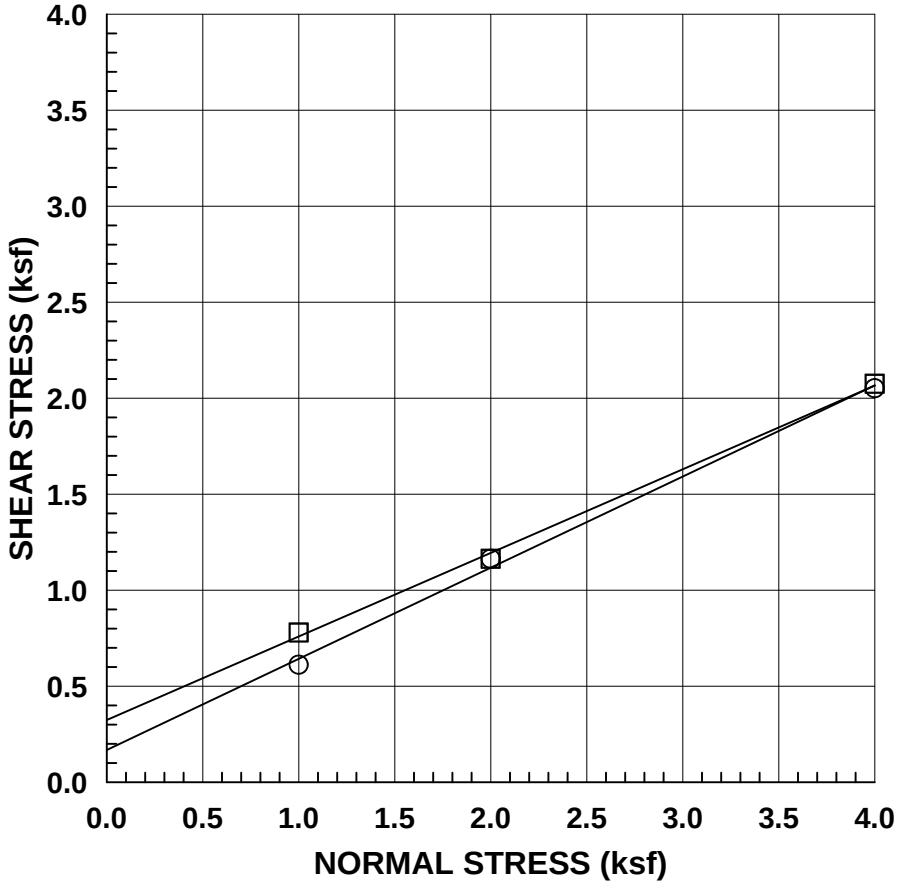
Geo-Logic ASSOCIATES

Plate B-6

Specimen No.	1	2	3
Normal Stress (ksf)	1	2	4
Peak Shear Stress (ksf)	0.78	1.164	2.076
Peak Displacement (in)	0.01	0.015	0.02
Ultimate Shear Stress (ksf)	0.612	1.164	2.052
Ultimate Displacement (in)	0.25	0.25	0.25
Initial Dry Density (pcf)	115.7	115.7	115.7
Initial Moisture Content (%)	10.5	10.5	10.5
Strain Rate (in/min)	0.005		







Strain Legend

◆	1
●	2
▲	4

Strength Legend

□	Peak
○	Ultimate

SAMPLE LOCATION	SAMPLE TYPE	SAMPLE DESCRIPTION
B-1 @ 0-5 feet	90% of 128.5 pcf @ 10.5%	Sandy Lean Clay (CL)

ALBUS-KEEFE & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

DIRECT SHEAR

Job No: 2700.00

Plate No: B-7

TRACT Nº 21791

TRACT Nº 21570

TRACT Nº 20712 ~ 74-76

TRACT Nº 22012

TRACT Nº 21672

Annexation Nº 76-2

CITY OF LA MIRADA Nº 15930

LARWIN DR.

GLADESIDE RD.

NORBECK DR.

DILWORTH ST.

LYNMARK DR.

BONAVISTA LN.

PARISE ST.

MANSA DR.

SWIFT DR.

DE ALCALA DR.

RAMO DR.

BORA DR.

TRIAD DR.

VALLEY VIEW DR.

CHANNEL

DRAINAGE

2" PVC, Loc 30' W/PL

18" DIP CI-250, Loc Var.

M.B. 564 33-35

M.B. 571 33-35

M.B. 569 ~ 72-75

Filed 3-31-78

SCALE 1" = 50'

S.F 264

S.F 266

S.F 247

S.F 283

S.F 265

LEGEND

CABLE TV
GAS
GASOLINE
OIL
ORN. LIGHTS
POWER
SEWER
SHARED TRENCH
STORM DRAIN
TELEPHONE
TRAFFIC SIGNAL
WATER
PAINT CHANGES

DRAFTED	UPDATED DATE
A.ZAMARRIPA	11-15-07
Jhulian H.	4-10-12

County of Los Angeles
DEPARTMENT OF PUBLIC WORKS
Mapping & Property Management Division
Mapping & GIS Services

LOS ANGELES COUNTY EXPRESSLY DISCLAIMS ANY LIABILITY FOR INACCURACIES WHICH MAY PRESENT IN THIS MAP.

L. A. COUNTY ROAD DEPT.

DRAWN BY H. Switzer 5-55
CHECKED BY A.J. Roh 6/56
CORRECTED BY
CORRECTED TO

APPENDIX B
Pre-Development Hydrology Calculations

Peak Flow Hydrologic Analysis

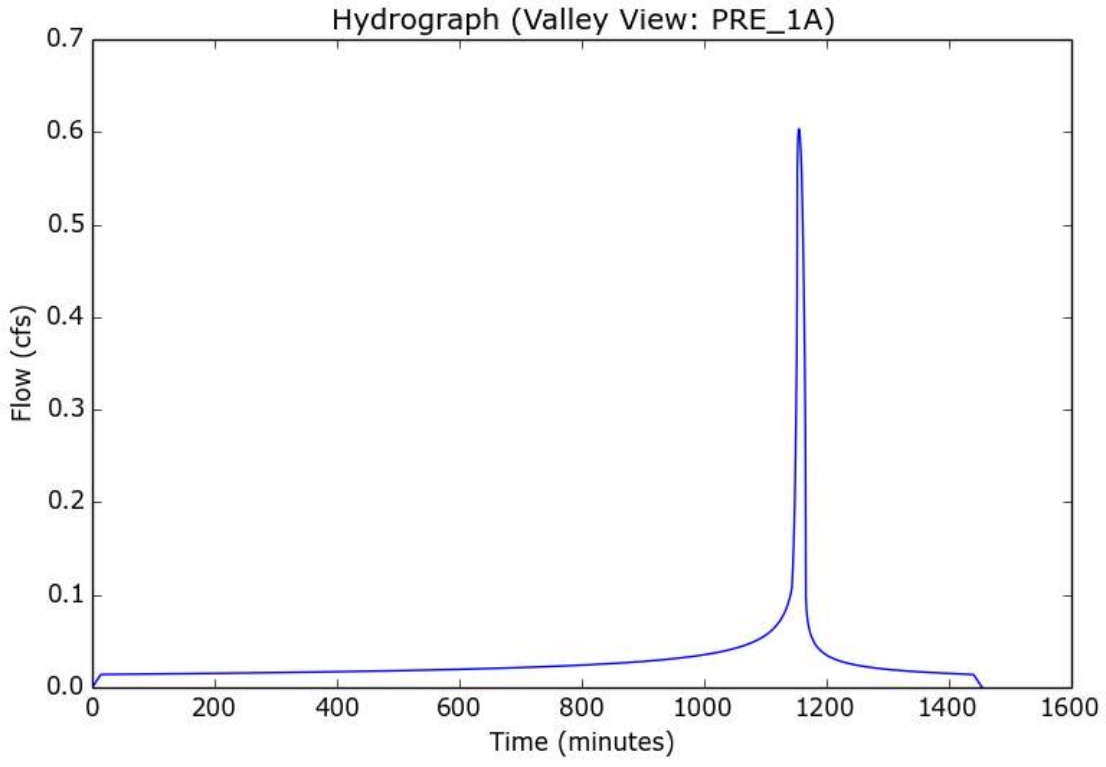
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Pre Develpment/Valley View - PRE_1A-2yr.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	PRE_1A
Area (ac)	1.32
Flow Path Length (ft)	333.0
Flow Path Slope (vft/hft)	0.014
50-yr Rainfall Depth (in)	5.6
Percent Impervious	0.15
Soil Type	6
Design Storm Frequency	2-yr
Fire Factor	0
LID	False

Output Results

Modeled (2-yr) Rainfall Depth (in)	2.1672
Peak Intensity (in/hr)	0.797
Undeveloped Runoff Coefficient (Cu)	0.5159
Developed Runoff Coefficient (Cd)	0.5735
Time of Concentration (min)	14.0
Clear Peak Flow Rate (cfs)	0.6034
Burned Peak Flow Rate (cfs)	0.6034
24-Hr Clear Runoff Volume (ac-ft)	0.0588
24-Hr Clear Runoff Volume (cu-ft)	2559.8418



Peak Flow Hydrologic Analysis

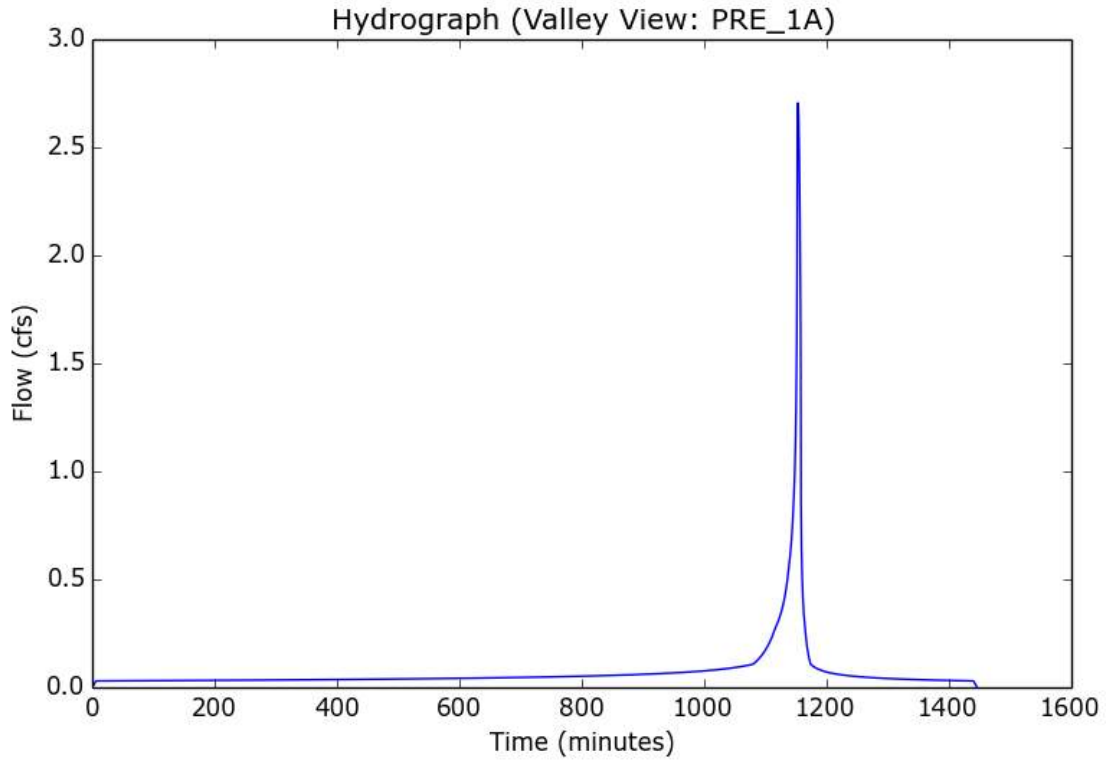
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Pre Develpment/Valley View - PRE_1A_10yr.p
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	PRE_1A
Area (ac)	1.32
Flow Path Length (ft)	333.0
Flow Path Slope (vft/hft)	0.014
50-yr Rainfall Depth (in)	6.5
Percent Impervious	0.15
Soil Type	6
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.641
Peak Intensity (in/hr)	2.5416
Undeveloped Runoff Coefficient (Cu)	0.7901
Developed Runoff Coefficient (Cd)	0.8066
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	2.7059
Burned Peak Flow Rate (cfs)	2.7059
24-Hr Clear Runoff Volume (ac-ft)	0.1485
24-Hr Clear Runoff Volume (cu-ft)	6469.1034



Peak Flow Hydrologic Analysis

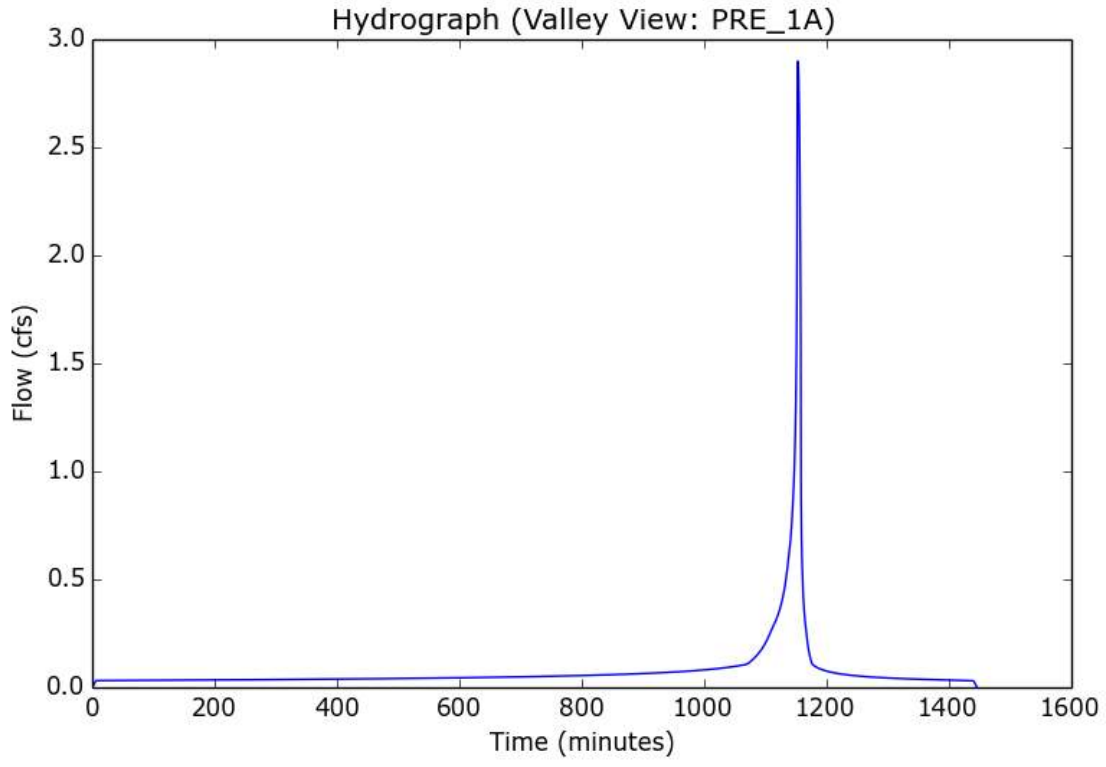
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Pre Develpment/Valley View - PRE_1A_25yr.p
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	PRE_1A
Area (ac)	1.32
Flow Path Length (ft)	333.0
Flow Path Slope (vft/hft)	0.014
50-yr Rainfall Depth (in)	5.6
Percent Impervious	0.15
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	4.9168
Peak Intensity (in/hr)	2.6926
Undeveloped Runoff Coefficient (Cu)	0.8007
Developed Runoff Coefficient (Cd)	0.8156
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	2.8988
Burned Peak Flow Rate (cfs)	2.8988
24-Hr Clear Runoff Volume (ac-ft)	0.1601
24-Hr Clear Runoff Volume (cu-ft)	6972.8554



Peak Flow Hydrologic Analysis

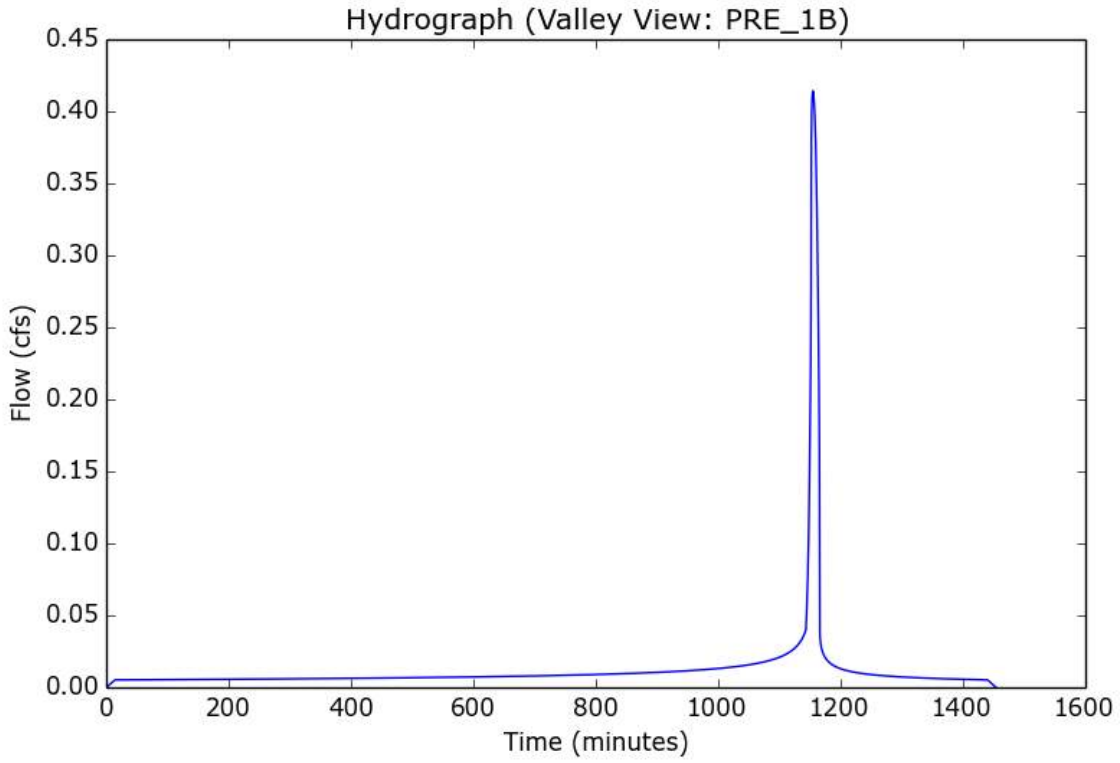
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Pre Develpment/Valley View - PRE_1B_2yr.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	PRE_1B
Area (ac)	1.0
Flow Path Length (ft)	304.0
Flow Path Slope (vft/hft)	0.0125
50-yr Rainfall Depth (in)	5.6
Percent Impervious	0.01
Soil Type	6
Design Storm Frequency	2-yr
Fire Factor	0
LID	False

Output Results

Modeled (2-yr) Rainfall Depth (in)	2.1672
Peak Intensity (in/hr)	0.797
Undeveloped Runoff Coefficient (Cu)	0.5159
Developed Runoff Coefficient (Cd)	0.5198
Time of Concentration (min)	14.0
Clear Peak Flow Rate (cfs)	0.4142
Burned Peak Flow Rate (cfs)	0.4142
24-Hr Clear Runoff Volume (ac-ft)	0.0253
24-Hr Clear Runoff Volume (cu-ft)	1102.1612



Peak Flow Hydrologic Analysis

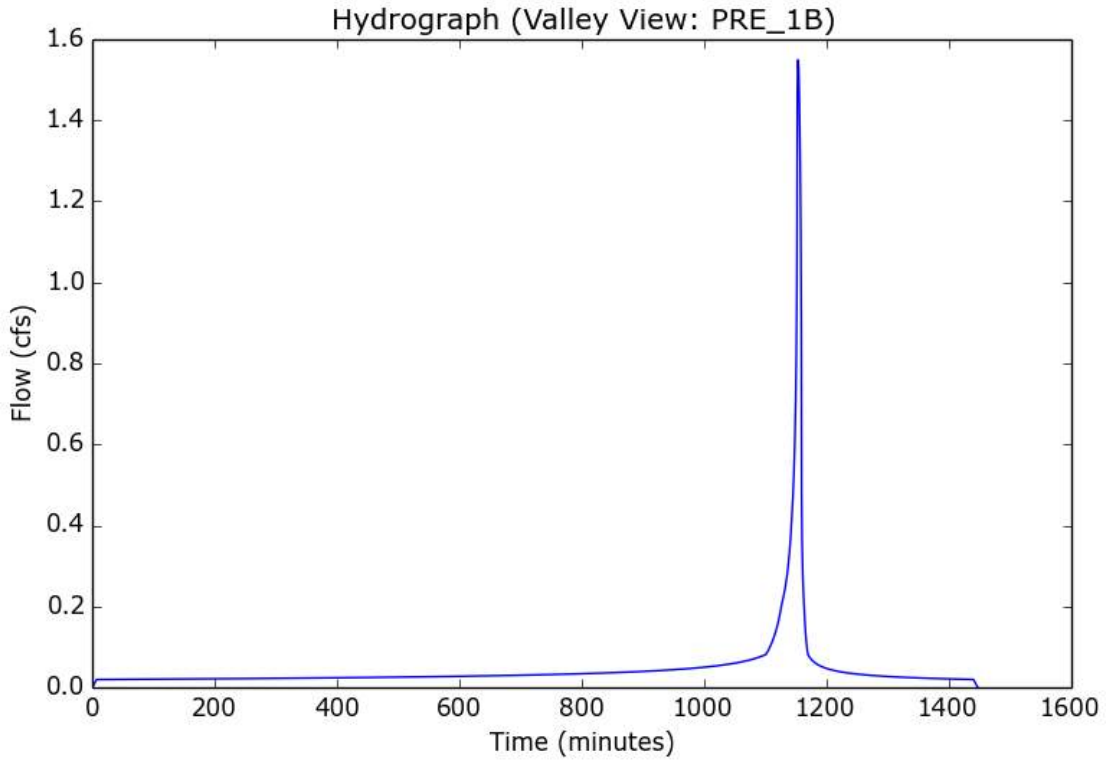
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Pre Develpment/Valley View - PRE_1B_10yr.p
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	PRE_1B
Area (ac)	1.0
Flow Path Length (ft)	304.0
Flow Path Slope (vft/hft)	0.0125
50-yr Rainfall Depth (in)	5.6
Percent Impervious	0.15
Soil Type	6
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	3.9984
Peak Intensity (in/hr)	2.0366
Undeveloped Runoff Coefficient (Cu)	0.7363
Developed Runoff Coefficient (Cd)	0.7609
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	1.5496
Burned Peak Flow Rate (cfs)	1.5496
24-Hr Clear Runoff Volume (ac-ft)	0.0929
24-Hr Clear Runoff Volume (cu-ft)	4048.3658



Peak Flow Hydrologic Analysis

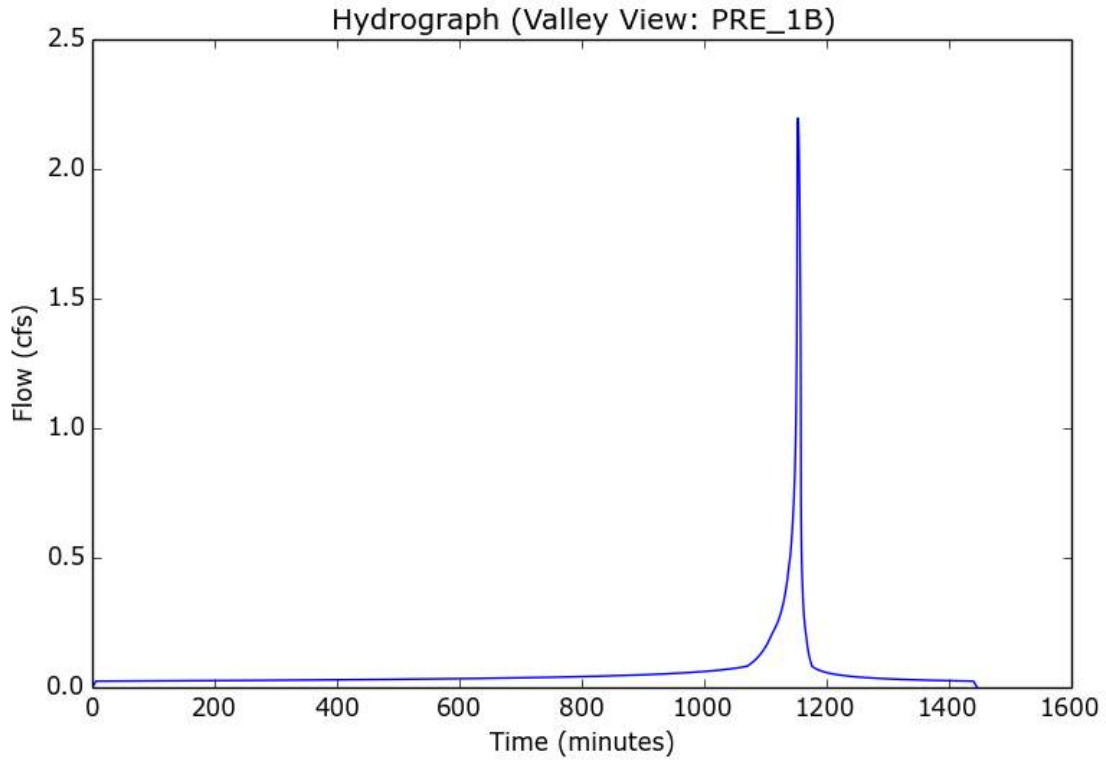
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Pre Develpment/Valley View - PRE_1B_25yr.p
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	PRE_1B
Area (ac)	1.0
Flow Path Length (ft)	304.0
Flow Path Slope (vft/hft)	0.0125
50-yr Rainfall Depth (in)	5.6
Percent Impervious	0.15
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	4.9168
Peak Intensity (in/hr)	2.6926
Undeveloped Runoff Coefficient (Cu)	0.8007
Developed Runoff Coefficient (Cd)	0.8156
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	2.1961
Burned Peak Flow Rate (cfs)	2.1961
24-Hr Clear Runoff Volume (ac-ft)	0.1213
24-Hr Clear Runoff Volume (cu-ft)	5282.4662



APPENDIX C
Post-Development Hydrology Calcuations

Peak Flow Hydrologic Analysis

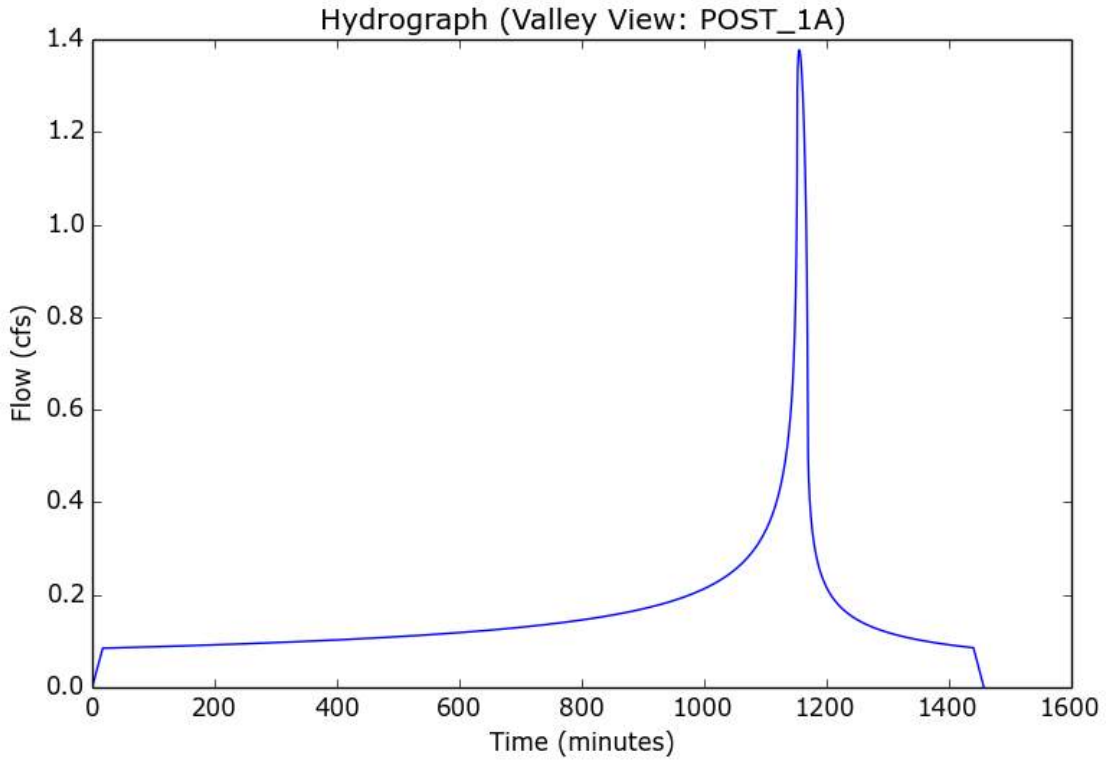
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Post Condition/Valley View - POST_1A_2yr.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	POST_1A
Area (ac)	2.26
Flow Path Length (ft)	637.0
Flow Path Slope (vft/hft)	0.0095
50-yr Rainfall Depth (in)	5.6
Percent Impervious	0.85
Soil Type	6
Design Storm Frequency	2-yr
Fire Factor	0
LID	False

Output Results

Modeled (2-yr) Rainfall Depth (in)	2.1672
Peak Intensity (in/hr)	0.7275
Undeveloped Runoff Coefficient (Cu)	0.484
Developed Runoff Coefficient (Cd)	0.8376
Time of Concentration (min)	17.0
Clear Peak Flow Rate (cfs)	1.3771
Burned Peak Flow Rate (cfs)	1.3771
24-Hr Clear Runoff Volume (ac-ft)	0.3177
24-Hr Clear Runoff Volume (cu-ft)	13838.2979



Peak Flow Hydrologic Analysis

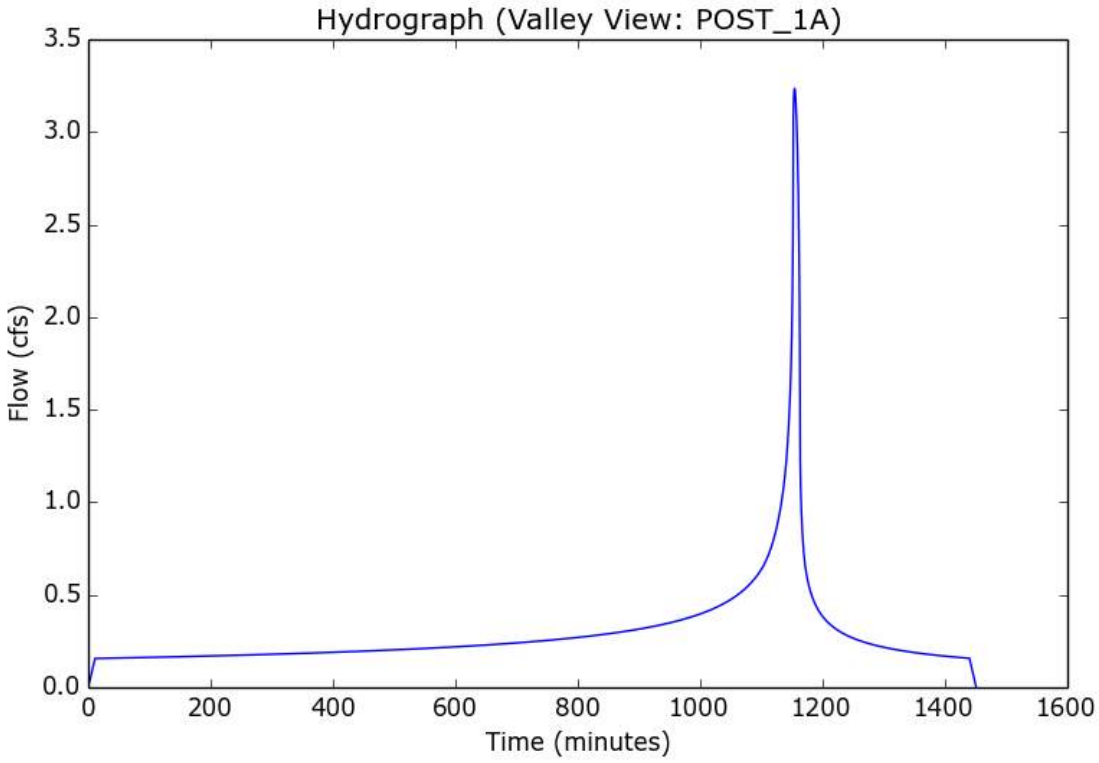
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Post Condition/Valley View - POST_1A_10yr.p
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	POST_1A
Area (ac)	2.26
Flow Path Length (ft)	637.0
Flow Path Slope (vft/hft)	0.0095
50-yr Rainfall Depth (in)	5.6
Percent Impervious	0.85
Soil Type	6
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	3.9984
Peak Intensity (in/hr)	1.6468
Undeveloped Runoff Coefficient (Cu)	0.6935
Developed Runoff Coefficient (Cd)	0.869
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	3.2344
Burned Peak Flow Rate (cfs)	3.2344
24-Hr Clear Runoff Volume (ac-ft)	0.5905
24-Hr Clear Runoff Volume (cu-ft)	25723.3



Peak Flow Hydrologic Analysis

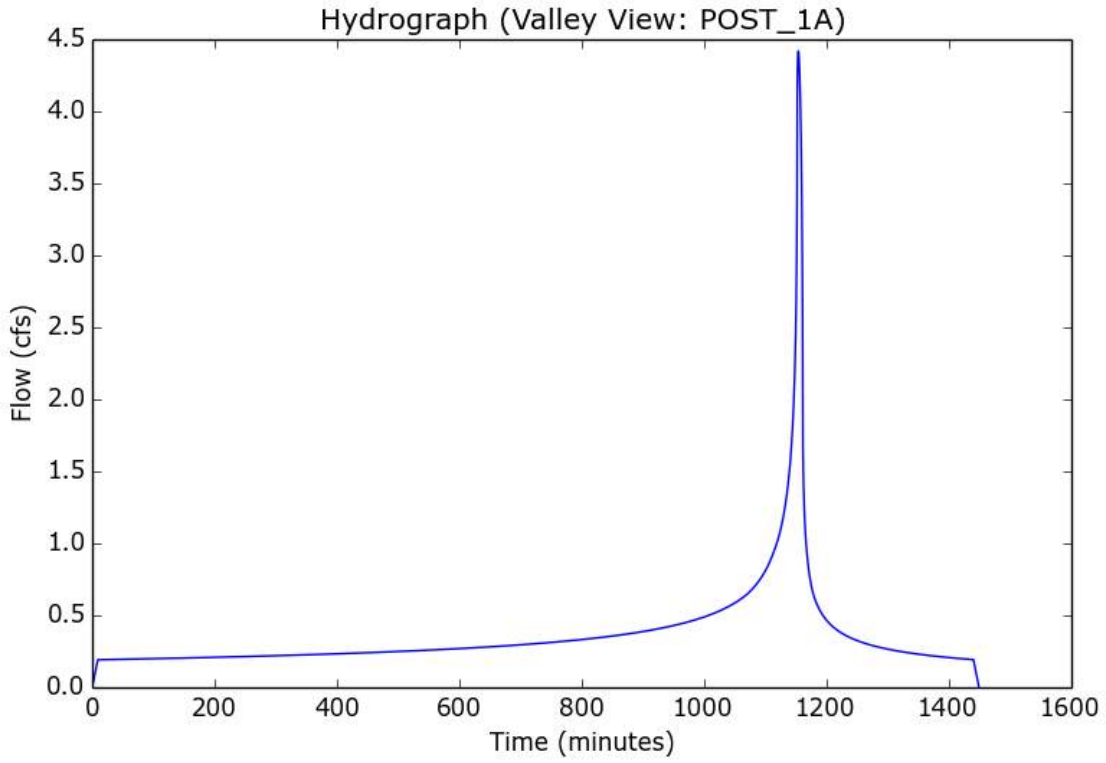
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Post Condition/Valley View - POST_1A_25yr.p
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	POST_1A
Area (ac)	2.26
Flow Path Length (ft)	637.0
Flow Path Slope (vft/hft)	0.0095
50-yr Rainfall Depth (in)	5.6
Percent Impervious	0.85
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	4.9168
Peak Intensity (in/hr)	2.2254
Undeveloped Runoff Coefficient (Cu)	0.757
Developed Runoff Coefficient (Cd)	0.8786
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	4.4186
Burned Peak Flow Rate (cfs)	4.4186
24-Hr Clear Runoff Volume (ac-ft)	0.7289
24-Hr Clear Runoff Volume (cu-ft)	31750.7422



Peak Flow Hydrologic Analysis

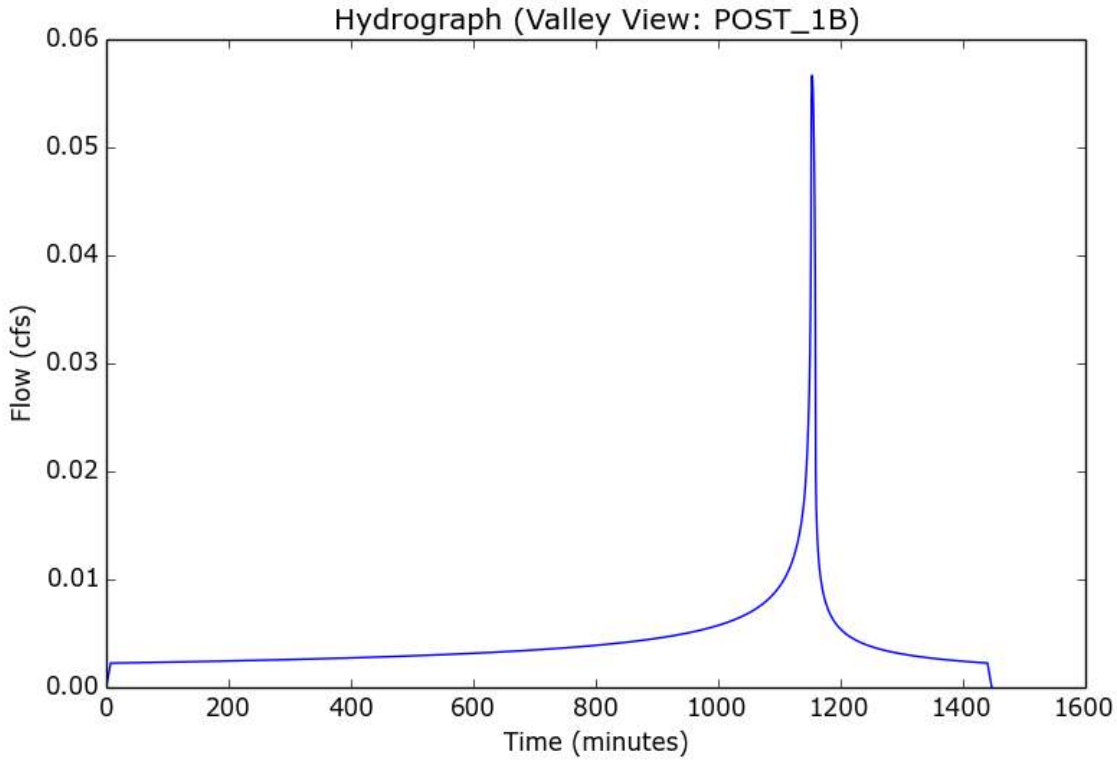
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Post Condition/Valley View - POST_1B_2yr.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	POST_1B
Area (ac)	0.06
Flow Path Length (ft)	173.0
Flow Path Slope (vft/hft)	0.017
50-yr Rainfall Depth (in)	5.6
Percent Impervious	0.85
Soil Type	6
Design Storm Frequency	2-yr
Fire Factor	0
LID	False

Output Results

Modeled (2-yr) Rainfall Depth (in)	2.1672
Peak Intensity (in/hr)	1.1039
Undeveloped Runoff Coefficient (Cu)	0.6044
Developed Runoff Coefficient (Cd)	0.8557
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	0.0567
Burned Peak Flow Rate (cfs)	0.0567
24-Hr Clear Runoff Volume (ac-ft)	0.0084
24-Hr Clear Runoff Volume (cu-ft)	367.6053



Peak Flow Hydrologic Analysis

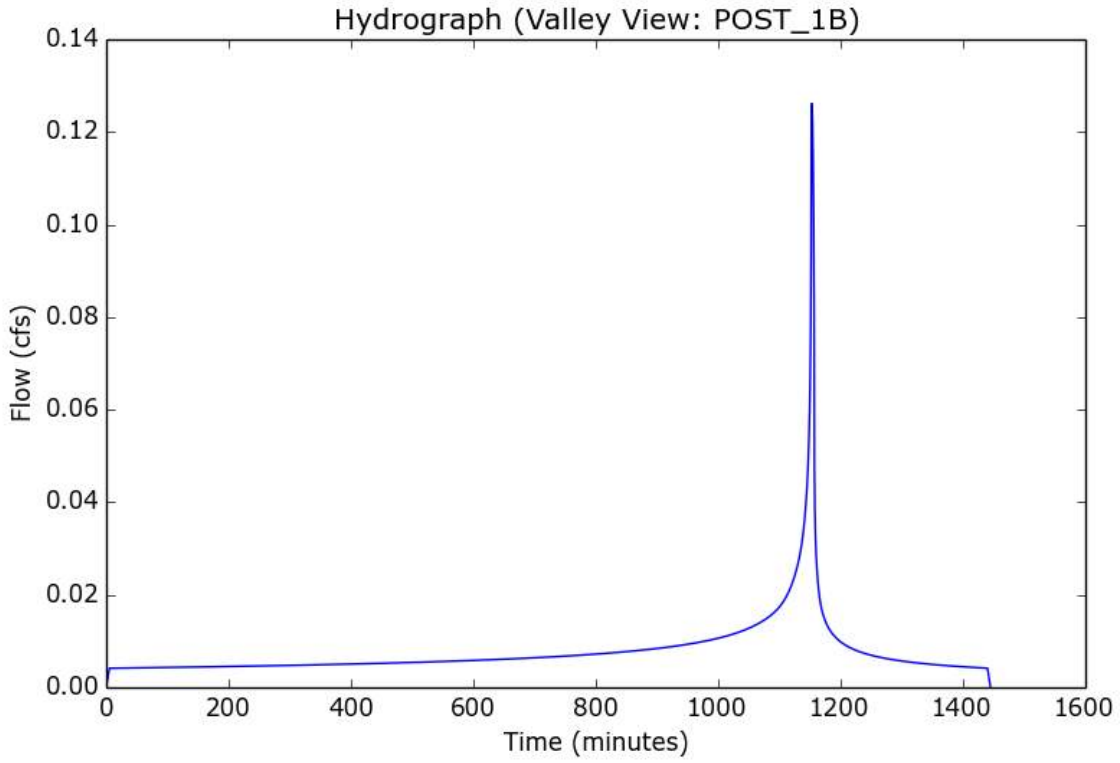
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Post Condition/Valley View - POST_1B_10yr.p
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	POST_1B
Area (ac)	0.06
Flow Path Length (ft)	173.0
Flow Path Slope (vft/hft)	0.017
50-yr Rainfall Depth (in)	5.6
Percent Impervious	0.85
Soil Type	6
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	3.9984
Peak Intensity (in/hr)	2.3856
Undeveloped Runoff Coefficient (Cu)	0.7746
Developed Runoff Coefficient (Cd)	0.8812
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.1261
Burned Peak Flow Rate (cfs)	0.1261
24-Hr Clear Runoff Volume (ac-ft)	0.0157
24-Hr Clear Runoff Volume (cu-ft)	683.0633



Peak Flow Hydrologic Analysis

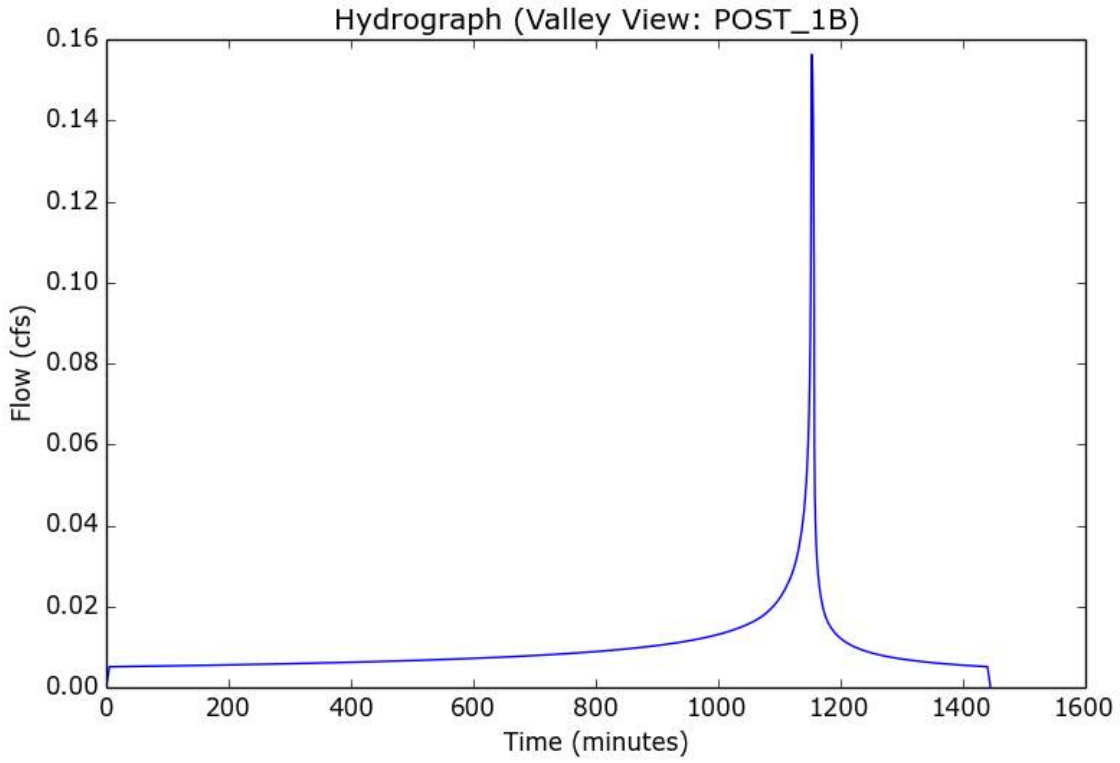
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/Post Condition/Valley View - POST_1B_25yr.p
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Valley View
Subarea ID	POST_1B
Area (ac)	0.06
Flow Path Length (ft)	173.0
Flow Path Slope (vft/hft)	0.017
50-yr Rainfall Depth (in)	5.6
Percent Impervious	0.85
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	4.9168
Peak Intensity (in/hr)	2.9335
Undeveloped Runoff Coefficient (Cu)	0.8176
Developed Runoff Coefficient (Cd)	0.8876
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.1562
Burned Peak Flow Rate (cfs)	0.1562
24-Hr Clear Runoff Volume (ac-ft)	0.0194
24-Hr Clear Runoff Volume (cu-ft)	843.1256



APPENDIX D
LID – 85th Percentile Calculations

Peak Flow Hydrologic Analysis

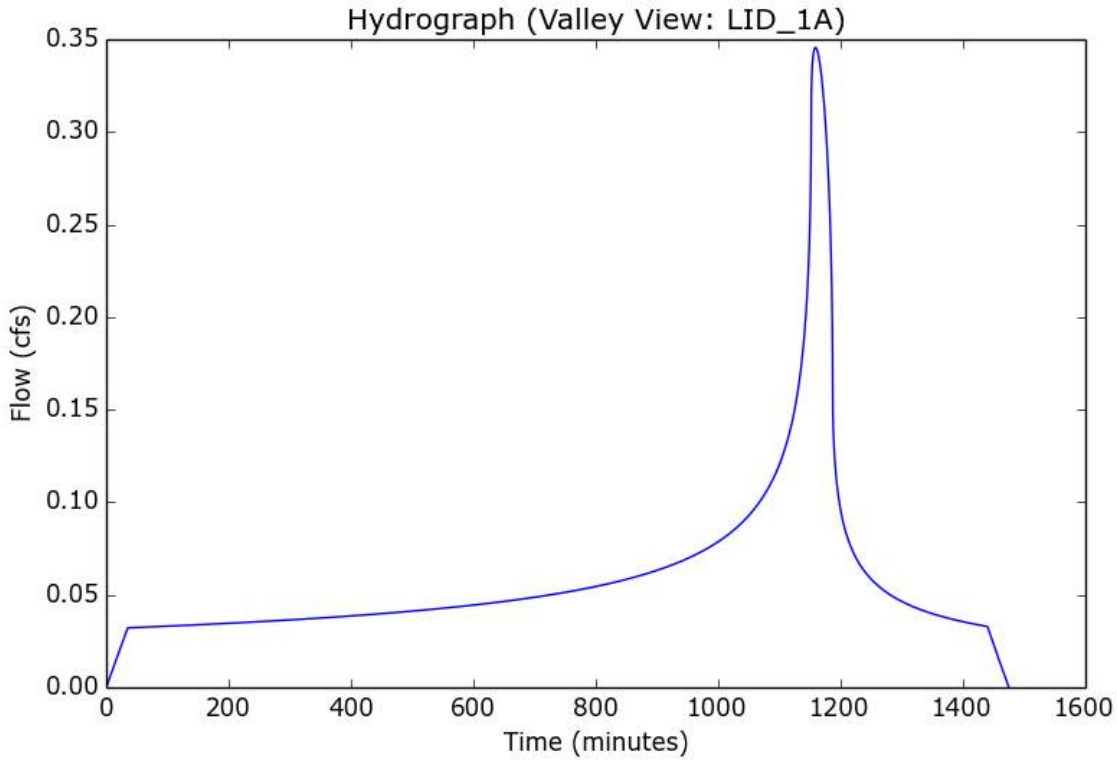
File location: P:/AUTOCAD PROJECTS/BY JOB NUMBER/2017420 - Valley View - La Mirada/Hydrology/LID/Valley View - LID_1A.pdf
Version: HydroCalc 1.0.2

Input Parameters

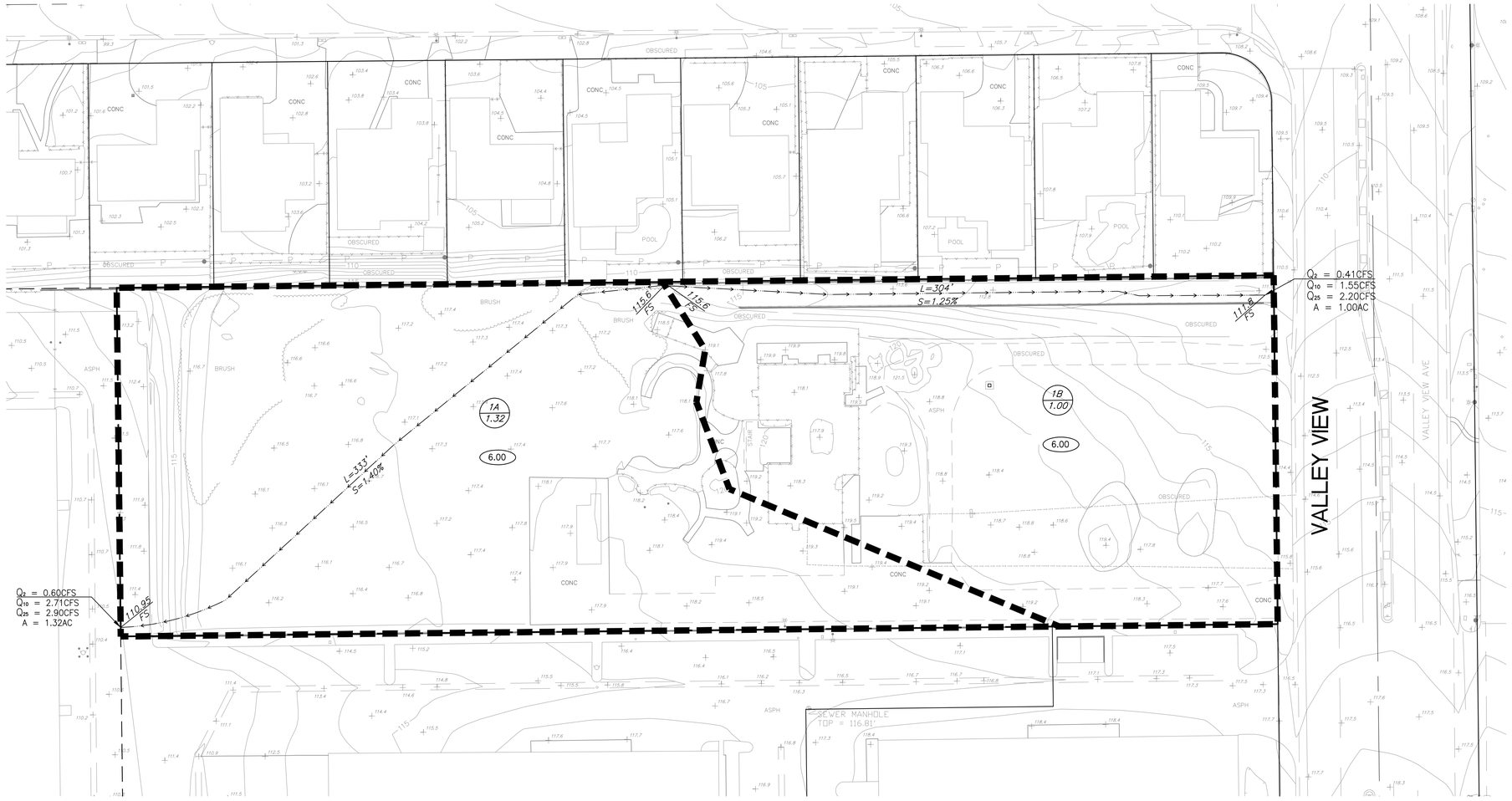
Project Name	Valley View
Subarea ID	LID_1A
Area (ac)	2.26
Flow Path Length (ft)	637.0
Flow Path Slope (vft/hft)	0.0095
85th Percentile Rainfall Depth (in)	0.82
Percent Impervious	0.85
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.82
Peak Intensity (in/hr)	0.196
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.78
Time of Concentration (min)	35.0
Clear Peak Flow Rate (cfs)	0.3456
Burned Peak Flow Rate (cfs)	0.3456
24-Hr Clear Runoff Volume (ac-ft)	0.1195
24-Hr Clear Runoff Volume (cu-ft)	5203.8672



APPENDIX E
Pre/Post Hydrology Maps



LEGEND

Q_2	RUNOFF IN CFS FOR 2 YR, FREQUENCY
Q_{10}	RUNOFF IN CFS FOR 10 YR, FREQUENCY
Q_{25}	RUNOFF IN CFS FOR 25 YR, FREQUENCY
B / 0.14	SUBAREA NUMBER / SUB AREA IN ACRES
5.00	TIME OF CONCENTRATION (FOR Q_{25})
←——←	SUBAREA BOUNDARY
— — —	FLOW LINE PATH
ΣQ_x	DESIGN "Q" FOR EACH

SCALE: 1" = 30'

0 15' 30' 60' 120'

B & E ENGINEERS
CIVIL ENGINEERING,SURVEYING, & LAND PLANNING
20 E. FOOTHILL BLVD., STE 230
ARCADIA, CA 91006
TEL.(626)446-4449

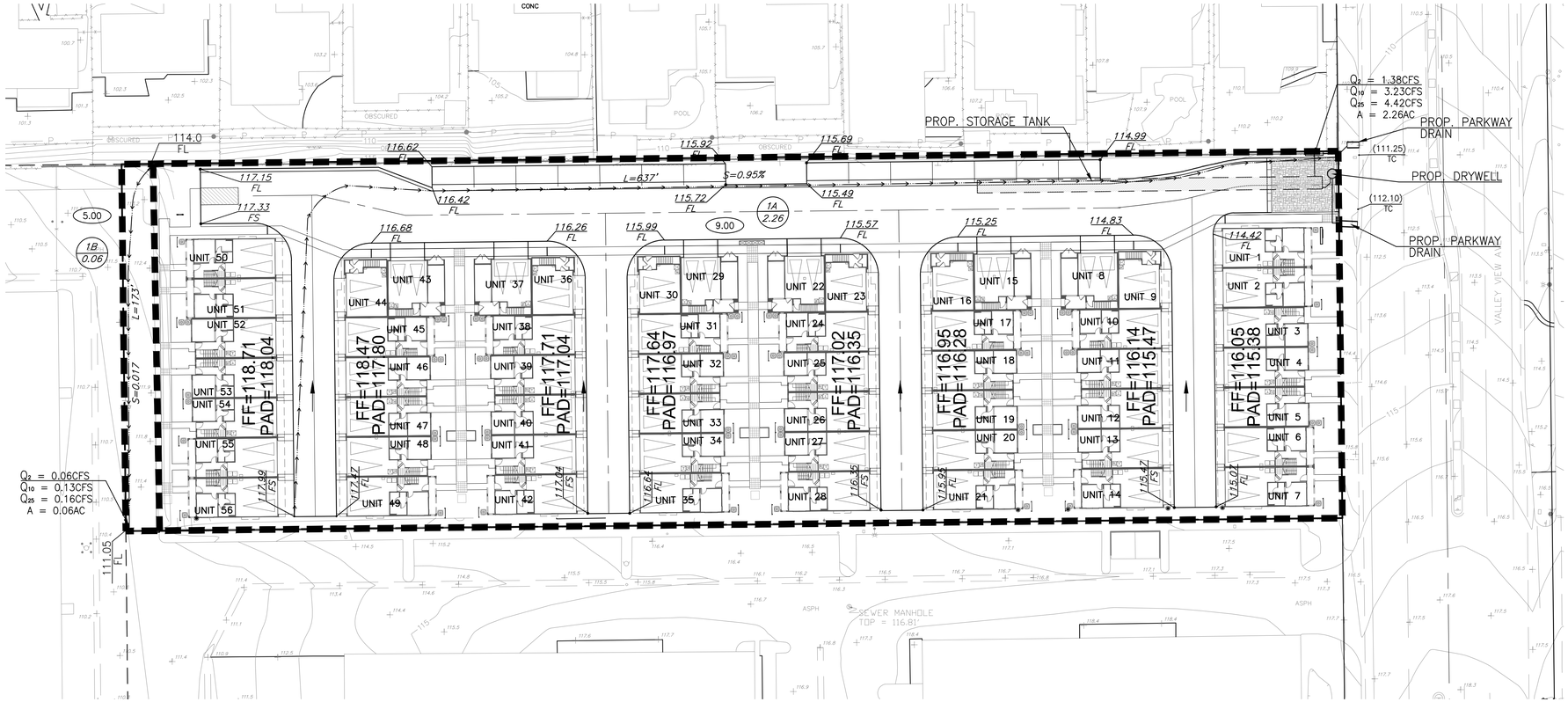
HYDROLOGY STUDY TRACT No 82127
PRE DEVELOPMENT CONDITION

IN THE CITY OF LA MIRADA, COUNTY OF LOS ANGELES
STATE OF CALIFORNIA

DATE: 03/20/2018
DESIGN/DRAWN: GG
REVIEWED: RA

JN:2017420

SHT. 1 OF 1 SHTS.



LEGEND

Q_2	RUNOFF IN CFS FOR 2 YR, FREQUENCY
Q_{10}	RUNOFF IN CFS FOR 10 YR, FREQUENCY
Q_{25}	RUNOFF IN CFS FOR 25 YR, FREQUENCY
B / 0.14	SUBAREA NUMBER / SUB AREA IN ACRES
5.00	TIME OF CONCENTRATION (FOR Q_{25})
← ←	SUBAREA BOUNDARY
	FLOW LINE PATH
ΣQ_x	DESIGN "Q" FOR EACH

SCALE: 1" = 30'

0 15' 30' 60' 120'

B & E ENGINEERS
CIVIL ENGINEERING,SURVEYING, & LAND PLANNING
20 E. FOOTHILL BLVD., STE 230
ARCADIA, CA 91006
TEL.(626)446-4449

HYDROLOGY STUDY TRACT No 82127
POST DEVELOPMENT CONDITION

IN THE CITY OF LA MIRADA, COUNTY OF LOS ANGELES
STATE OF CALIFORNIA

DATE: 05/10/2019
DESIGN/DRAWN: GG
REVIEWED: RA

JN:2017420

SHT. 1 OF 1 SHTS.