DRAFT GEOTECHNICAL INVESTIGATION REPORT FOR 21.22-ACRE POLOPOLUS SITE PROPOSED COMMERCIAL DEVELOPMENT

7270 Hamner Avenue
City of Eastvale, Riverside County, California
Converse Project No. 14-81-55-02

May 12, 2017

Prepared For:

Lewis Retail Centers
1156 N. Mountain Avenue City
of Upland, CA 91786

Prepared By:

Converse Consultants
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Converse Consultants
Geotechnical Engineering, Environmental & Groundwater Science, Inspection & Testing Services

May 12, 2017

Mr. Rick Manners
VP Retail Project Development
Lewis Retail Centers
1156 N. Mountain Avenue
City of Upland, CA 91786

Subject: **DRAFT GEOTECHNICAL INVESTIGATION REPORT FOR 21.22-ACRE POLOPOLUS SITE PROPOSED COMMERCIAL DEVELOPMENT**
7270 Hamner Avenue
City of Eastvale, Riverside County, California
Converse Project No. 14-81-55-02

Dear Mr. Manners:

Converse Consultants (Converse) has prepared this report to present the findings of our geotechnical investigation performed for the 21.22-acre Polopolus site, located at 7270 Hamner Avenue in the City of Eastvale, Riverside County, California. This report was prepared in accordance with our proposal dated April 5, 2017.

Our geotechnical investigation and evaluation identified areas of undocumented fill, possible liquefaction potential, slope stability concerns and corrosive soils that need to be considered during development of the project.

If you have any questions regarding this report, please feel free to contact us at 909-796-0544. The opportunity to be of continued service to Lewis Retail Centers is greatly appreciated.

CONVERSE CONSULTANTS

Hashmi S. E. Quazi, PhD, PE, GE
Principal Engineer

Dist.:4/Addressee
HS/SM/HSQ/kvg

PROFESSIONAL CERTIFICATION

This report has been prepared by the following professionals whose seals and signatures appear hereon.

The findings, recommendations, specifications and professional opinions contained in this report were prepared in accordance with the generally accepted professional engineering and engineering geologic principle and practice in this area of Southern California. We make no other warranty, either expressed or implied.

Hashmi S. E. Quazi, PhD, PE, GE Principal Engineer	Scot Mathis, PG, CEG Senior Geologist

EXECUTIVE SUMMARY

The following is a summary of our geotechnical investigation, conclusions and recommendations, as presented in the body of this report. Please refer to the appropriate sections of the report for complete conclusions and recommendations. In the event of a conflict between this summary and the report, or an omission in the summary, the report shall prevail.

- The approximately 22-Acre Polopolus site is located in the City of Eastvale. It is bounded by existing homes to the north and east, a sport complex to the south and by Hamner Drive to the west. There are currently multiple structures on the western half of the site., including a private residence, abandoned greenhouse, storage sheds and in-ground swimming pool. There are several abandoned storage tanks, two groundwater wells, irrigation risers and above-ground utilities also present onsite.

- An approximately 200-foot by 400-foot area in the southeastern corner of the site was covered with loose piles of end-dumped soils, but we understand that piles were spread on the site soon after our field investigation. The soils piles contained rebar, concrete, and wood debris. Debris piles, containing dead trees and potting containers, were observed on other part of the site. The topography of the western portion of the site is mostly flat, with a gentle gradient sloping away from the center of the site towards the south and west. The eastern half of the site has a gentle to moderate gradient that slopes from the north towards the south.

- Site elevation range from 645 feet above mean sea level (amsl) to near the residence in the north-central portion of the site to approximately 596 feet amsl in the southeastern corner of the sit. The topography of the western half of the site is mostly flat, with a gentle gradient sloping away from the center of the site towards the south and west. The eastern half of the site has a gentle to moderate gradient that slopes from the north towards the south.

- A portion of the southern half of the site has been previously graded into 3 northeast-southwest oriented terraces. The terraces are separated by approximately 2:1 (horizontal:vertical) slopes of approximately 4 to 8 feet in height. The slopes appear to be in poor condition, with areas of erosion and vegetation.

- We understand approximately 6.02-acre of the northeast portion of the site will be dedicated to the city of Eastvale for their future Civic Center and Library. Lewis Retail Centers intends to develop the site for commercial use. Seven, one to four story buildings are planned, which will include retail stores, medical office building and a 4-story hotel.

- The buildings will be light to moderately loaded wood frame or masonry wall and steel building. It will be founded on shallow footings with slab-on-grade, except for the 4-story hotel building which might require deep foundations.

- On-site water infiltration may be installed to discharge surface run-off.

- Our scope of work included project setup, subsurface exploration, percolation testing and infiltration rate evaluation, laboratory testing, engineering analysis, design and construction recommendations and finally, preparation of this report.

- Thirteen exploratory borings (BH-01 through BH-15) out of fifteen borings were drilled on April 11 through April 13, 2017 to their maximum planned ranging from 16.5 to 51.5 feet bgs.

- Six percolation tests (PT-01 and PT-06) were conducted at the proposed percolation pond location on April 13, 2017 at depths ranging from 10.5 to 17.7 feet bgs.

- Undocumented fill ranging from approximately 9 to 14 feet in thickness was encountered at the southeast portion of the site. The fill soils were primarily silty and clayey sand. Below the fill and in other areas, the site is underlain to at least 51.5 feet by alluvial sediments consisting primarily of silty sand and clayey sand. The soil conditions encountered are relatively uniform across the site, both laterally and vertically.

- Groundwater was not encountered in our exploratory borings to a maximum explored depth of 51.5 feet bgs. The historical high groundwater level at the site is approximately 15 feet bgs.

- The site soils have very low to low expansion potential. This should be verified after completion of grading. The impact of low expansion soils may be mitigated by nominal treatment or using additional reinforcement for foundation and slab design.

- The site soils have a slight to moderate collapse potential. Remedial grading will further reduce the impact of collapsible soils.

- The site soils do not contain elevated concentrations of soluble sulfates but chlorides are moderate which recommend concrete is exposed to moisture, but not to external sources of chlorides, such as deicing chemicals, salt, brackish water, or seawater. The site soils are moderately to severely corrosive to ferrous metals corrosive to ferrous metals. A corrosion engineer should be consulted for the corrosion mitigation measures for ferrous metals in contact with soil.

- Onsite have sand equivalents ranging from 10 to 25. Pipe bedding requirements should be determined by the pipe designer.

- The in-situ density and moisture content of the fill soils ranged from 83 to 122 pounds per cubic feet (pcf) and 6 to 15 percent, respectively. The in-situ density ranged from 103 to 135 pounds per cubic feet (pcf). The fill soils should be removed, processed and compacted to 90 to 95 percent of the laboratory maximum density.

- The *in-situ* moisture contents of the upper 5 feet of soils at the time of our investigation was generally in the range of 2 to 15 percent. The optimum moisture content for the site soils is approximately 5 to 9 percent. Moisture conditioning will be required during site grading.

- The project site is not located within a currently designated State of California or San Bernardino County Earthquake Fault Zone. There are no known active faults projecting toward or extending across the project site. Seismic design parameters for the site are presented in the text of this report.

- The site has the potential for up to 0.24 inches of dry seismic settlement. The anticipated differential settlement is expected to be less than 0.5 inches over 40 horizontal feet.

- The potential for earthquake-induced liquefaction lateral spreading, landsliding, or flooding at the site from offsite sources is considered low.

- The site soils are anticipated to be readily excavatable with conventional heavy duty earthworking and trenching equipment.

- Prior to the start of any earthwork, the site should be cleared of all vegetation, existing fill, and debris. The materials resulting from the clearing and grubbing operations should be removed from the site.

- At least the upper 5 feet of the native soils across the site should be processed and replaced as compacted fill. Based on the field observation deeper removal may be required.

- Structures founded deeper than 5 feet below grade should be overexcavated to a depth of 12 inches below the bottom of the footings. The depth of overexcavation should be uniform across the entire structure. The overexcavation should extend to at least 2 feet beyond the footprint of the structure.

- All areas to receive asphalt or concrete pavement should be overexcavated to a depth of 12 inches below subgrade. The overexcavation should extend at least 1 foot beyond the edge of pavement.

- Excavated on-site soils are generally considered suitable for re-use as compacted fill. Prior to re-use, excavated soils should be cleared of all debris, vegetation, rocks larger than 3 inches in maximum dimension, and other deleterious materials. Rocks larger than 1 inch in the largest dimension should not be placed within the upper 12 inches of fill beneath footings and slabs.

- All surfaces to receive additional fill should be scarified to a depth of 6 inches. The scarified soil should be moisture conditioned to within ± 3 percent of optimum moisture for granular soils or 0 to 2 percent above optimum for fine soils. The scarified soil should be recompacted to at least 90 percent of the laboratory maximum dry density prior to the placement of any fill.

- Fill soils should be evenly spread in horizontal, 8-inch-maximum, loose lifts. The fill materials should be thoroughly mixed and moisture conditioned to within 3 percent of optimum moisture content for granular soils and up to 2 percent above optimum moisture content for fine-grained soils.

- All fill placed at the site should be compacted to at least 90 percent of the laboratory maximum dry density. The upper 12 inches of soil below asphalt and concrete pavement, should be compacted to at least 95 percent of laboratory maximum dry density.

- The proposed at-grade structures may be supported by continuous/or isolated spread shallow footings supported by at least 24 inches of compacted fill. The footings should be at least 18 inches in width and embedded to at least 18 inches below the lowest adjacent grade. The footing dimensions and reinforcement should be based on structural design. Continuous and isolated footings can be designed based on allowable net bearing capacity of 2,500 psf.

- A backfill drag coefficient of 0.35 may be assumed between formed concrete and concrete fill.

- The total settlement of shallow footings from static structural loads and short-term settlement of properly compacted fill is anticipated to be 1 inch or less. The differential settlement resulting from static loads is anticipated to be 0.5 inches or less.

- The planned structures should be designed in anticipation of up to 2.35 inches of dynamic settlement and dynamic differential settlement of up to 0.5 inches in 40 horizontal feet during a large earthquake. The static and dynamic settlement estimates should not be combined for design purposes.

- The estimated infiltration rates ranged from 0.02 to 0.47 inches per hour. We recommend a design infiltration rate not exceeding 0.83 inches per hour.

- Preliminary asphalt concrete pavement structural sections for the anticipated range of traffic indices and an R-value of 30 have been provided in the text of this report.

- Lateral earth pressures, foundation design parameters, and pipeline design parameters are presented in the text of this report.

- Recommendations for temporary sloped excavations and temporary shoring are provided in the text of this report.

Based on our investigation, it is our professional opinion that the project site is suitable for construction of the proposed commercial development, provided the findings and conclusions presented in this geotechnical investigation report are considered in the planning, design and construction of the project.

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1.0 INTRODUCTION

This report presents the results of our preliminary geotechnical investigation performed for the 21.22-acre Polopolus site, located at 7270 Hamner Drive in the City of Eastvale, Riverside County, California. The approximate location of the site is shown on Figure No. 1, *Site Location Map*. In 2014, we performed geotechnical due diligence to evaluate the existing site conditions to identify any geologic, seismic or geotechnical constraints that may impact the proposed development of the site. A total of twenty test pits were excavated within the project site to depths ranging from 5.3 to 15 feet below the ground surface (bgs). Laboratory tests were conducted for the purpose of the purpose of classification and evaluation of soil relevant physical characteristics and engineering properties.

The purposes of this investigation were to determine the nature and engineering properties of the subsurface soils and to provide preliminary site grading and engineering recommendations for design and construction of foundations for commercial development.

This report is prepared for the project described herein and is intended for use solely by Lewis Retail Centers and its authorized agent(s). It should not be used as a bidding document but may be made available to the potential contractors for information on factual data only. For bidding purposes, the contractors should be responsible for making their own interpretation of the data contained in this report.

Phase II Environmental Site Assessment is being performed by Converse under separate cover in order to evaluate the extent of environmental impacts from past site activities.

2.0 SITE DESCRIPTION

The overall site condition remains unchanged from our 2014 investigation (Converse, 2014). The approximate 21.22-acre site is bounded by existing homes to the north and east, a sports complex to the south and by Hamner Drive to the west. There are currently multiple structures on the western half of the site, including a private residence (shown in Photograph No. 1), abandoned greenhouses, storage sheds and an in-ground swimming pool. There are several abandoned storage tanks, two groundwater wells, irrigation risers and above-ground utilities also present onsite.

An approximately 200-foot by 400-foot area in the southeastern corner of the site was covered by loose piles of end-dumped soil as shown in Photograph No. 2, but we understand the piles were spread soon after our investigation field work. The soil piles contained rebar, concrete, and wood debris. Debris piles, containing dead trees and potting containers, were observed on other parts of the site.

Site elevations range from approximately 645 feet above mean sea level (amsl) near the residence in the north-central portion of the site to approximately 596 feet amsl in

Project Site:21.22-Acre Polopolus Site Proposed Commercial Development
Location: 7270 Hamner Avenue, City of Eastvale, Riverside County, California
Client:Lewis Retail Centers

Site Location Map

Project No:
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Converse Consultants

FIGURE
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the southeastern corner of the site. The topography of the western half of the project site is mostly flat, with a gentle gradient sloping away from the center of the site towards the south and west. The eastern half of the site has a gentle to moderate gradient that slopes from the north towards the south.

Photograph No.1, Private residence

Photograph No. 2, Piles of dumped soil

Photograph No. 3, Terraces along the southeast property line

The southeastern site boundary has been graded into three northeast-southwest-oriented terraces as shown in Photograph No. 3. The terraces are separated by approximately 2:1 (horizontal:vertical) slopes of approximately 4 to 8 feet in height. The slopes appear to be in poor condition, with areas of erosion and vegetation including trees and low level grasses. Vegetation within the rest of the site consists of scattered stands of trees, areas of low to mid-level bushes and low level grasses.

3.0 PROJECT DESCRIPTION

The approximately 21.22-Acre Polopolus site is located in the City of Eastvale. It is bounded by existing homes to the north and east, a sport complex to the south and by Hamner Drive to the west. We understand approximately 6.02-acre of the northeast portion of the site will be used by the City of Eastvale to build a Civic Center and a Library.

The remaining property will be developed for commercial developments which will include retail stores, medical office building and a 4-story hotel. In addition to the commercial structures, the project will likely include underground utilities, roadways, open spaces, sidewalks, driveway approaches, and other features typical of commercial developments.

Based on the conceptual grading earthwork, the proposed site development will require cut and fill grading operations. The grading plan was available at the time of this report.

We anticipate that the maximum cuts will not be more than 15 feet in depth and fills will not be more than 22 feet in depth and slopes will generally be less than 25 feet in height.

4.0 HISTORICAL PROPERTY USE

According to historical information gathered by Converse (Converse, 2014a), the property appeared to be undeveloped land in 1931. By 1938, the property appeared to be occupied by agricultural fields. By 1953, the north central portion of the property appeared to be redeveloped with a residential dwelling and a barn. By 1960, the south-central portion of the property appeared to be vacant land.

By 1967, the northwest portion of the property appeared to be redeveloped with a commercial structure for nursery operations. Horticulture storage was observed around the residential structure and barns, and the remainder of the property appeared to be vacant land. Between 1977 and 2006, nursery operations and horticulture storage appeared to increase across the property to include the construction of greenhouses near the residential structure. By 2012, the property appeared to be a vacant nursery in the same general configuration as observed during our April 2017 reconnaissance.

5.0 SCOPE OF WORK

The scope of this investigation includes the following tasks presented below.

5.1 Document Review

We reviewed existing documents pertaining to local geology, faulting and seismicity, groundwater depth and secondary effects of earthquakes. We also revised converse's previous investigation reports for the site (Converse, 2014a and 2014b).

5.2 Project Set-up

We conducted a field reconnaissance to assess existing site conditions, including signs of prior use of the property, drainage locations, erosion and other physical features that have to be considered as part of the planned development.

As part of the project set-up, our staff performed the following.

- Mark the boring locations in the field.
- Notify Underground Service Alert (USA) at least 48 hours prior to drilling to clear the borings locations of any conflicts with existing underground utilities.
- Engage a California-licensed driller to drill exploratory borings.

5.3 Field Exploration

Our subsurface investigation consisted of drilling fifteen (15) soil borings (BH-1 through BH-15) between April 11 and April 13, 2017. Borings (BH-2 and BH-7) were not drilled due to suspected utility conflict. The drilling was performed with a CME-75 truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers and a drive sampler for soil sampling. The depths of the borings ranged from 21.5 to 51.5 ft bgs. The approximate locations of the borings are shown on Figure No. 2, *Soil Boring and Test Pit Location Map*.

A detailed description of the field exploration procedures and Logs of Borings are presented in Appendix A, *Field Exploration.*

5.4 Infiltration Testing

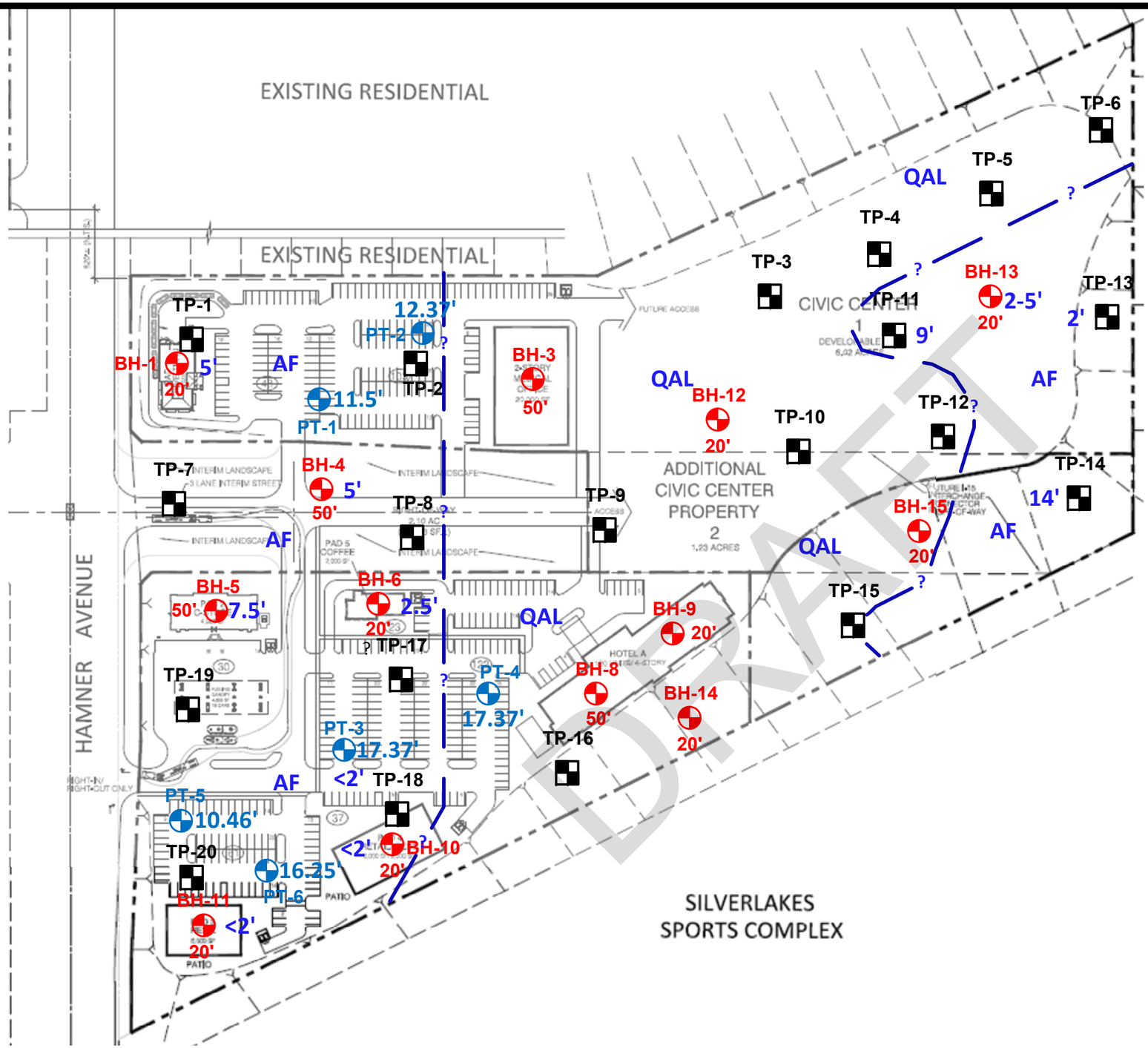
Six percolation test holes (PT-1 through PT-6) were drilled on April 13, 2017 to depths ranging from approximately 10.5 to 17.7 feet bgs. Percolation tests were performed in general accordance with Riverside County guidelines (RCFCWCD, 2011) between April 16 and April 18, 2017. Approximate locations of the percolation tests are shown on Figure No. 2, *Soil Boring and Test Pit Location Map*. For a detailed description of the testing and estimation of infiltration rates, see Appendix C, *Infiltration Testing*.

5.5 Laboratory Testing

Representative samples of the site soils were tested in the laboratory to aid in the soil classification and to evaluate the relevant engineering properties of the site soils. These tests included the following.

- *In-situ* moisture contents and dry density (ASTM D2216)
- Collapse (ASTM D5333)
- Expansion index (ASTM D4829)
- Sand Equivalent (ASTM D2419)
- Gradation analysis (ASTM D422)
- Maximum dry density and optimum moisture content (ASTM D1557)
- Soil corrosivity (California Tests 643, 422, 417, and 532)
- R-value (Caltrans Test Method CT 301)
- Direct Shear (ASTM D3080)
- Consolidation (ASTM D2435)

For *in-situ* moisture and dry density data, see the Logs of Test Pits in Appendix A, *Field Exploration*. For a description of the laboratory test methods and test results, see Appendix B, *Laboratory Testing Program*.



EXPLANATION

BH-15 — Number and Approximate Location of Proposed Exploratory Boring

PT-6 — Number and Approximate Location of Proposed Percolation Test

TP-20 — Number and Approximate Location of 2014 Due Diligence Test Pit

14' — Approximate Depth of Suspected Undocumented Fill

AF — Artificial Fill

QAL — Alluvium

300'

N

Project: 21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
Location: City of Eastvale, Riverside County, California
For: Lewis Retail Center

Soil Boring and Test Pit Location Map

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Figure No.
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5.6 Report Preparation

Data and information obtained from the document review, field exploration, and laboratory testing program were compiled. The data were evaluated to identify geotechnical and geologic conditions that may impact the proposed development. This report documents our findings, conclusions, and recommendations.

6.0 SITE CONDITIONS

The subsurface and surface conditions encountered at the site during our investigation are described in the following sections.

6.1 Regional Geology

The site is located in the northwestern portion of the Peninsular Ranges Geomorphic Province of Southern California. The Peninsular Ranges province is characterized by northwest tending valleys and mountain ranges which have formed in response to regional tectonic forces along the boundary between the Pacific and North American tectonic plates. The geologic structure is dominated by northwest trending right-lateral faults, most notable, the San Andreas Fault, San Jacinto Fault, Elsinore Fault, Whittier Fault, and the Newport-Inglewood Fault. The province extends southward from the Transverse Ranges province at the north end of the Los Angeles Basin to the southern tip of the Baja California Peninsula.

Basement rocks in the region are predominantly granitic and metamorphic rocks associated with the Mesozoic-age Southern California Batholith. Erosional remnants of granitic rocks are exposed in isolated hilly outcrops within the northern portions of the Chino Basin. Cenozoic-age sedimentary rocks overly the basement rocks in many areas and are well exposed in the Santa Ana Mountains and the Chino Hills southwest and west of the site.

The site is located in the southeastern portion of the Chino Basin, a broad alluvial area that is drained by the Santa Ana River. The Santa Ana River, which flows near the site, originates in the San Bernardino Mountains, northeast of the site, and flows southwesterly toward Santa Ana Canyon at the southwest margin of the Basin, and onward to the Pacific Ocean. The deepest portion of the Chino Basin lies to the northeast of the site where Pleistocene and recent alluvial deposits reach hundreds of feet thick.

6.2 Site Geology

The site is located in the historical floodplain of the Santa Ana River. The current river channel is located approximately 1,800 feet southeast of the site.

The subject site is underlain by Pleistocene axial-channel deposits of the Santa Ana River. These deposits consist primarily of sand, but contain scattered gravel and pebble layers, and silt and clay. These alluvial deposits are typically moderately to well-consolidated (Morton and Miller, 2006; Morton and Gray, 1995).

6.3 Subsurface Profile

Our subsurface exploration encountered alluvial deposits and undocumented fill. These units are described in the following sections. For additional information on the subsurface conditions, see the Logs of Test Borings and Test Pits in Appendix A, *Field Exploration*. The approximate locations of the units are shown in Figure No. 2, *Soil Boring and Test Pit Location Map.*

6.3.1 Undocumented Fill (map symbol Af)

Based on the existence of utility lines including a network of irrigation pipelines, a layer of up to 24 inches of undocumented fill is anticipated throughout the site.

Deeper fill was encountered within BH-1, BH-4, BH-5, BH-11. BH-13, TP-11, TP-13 and TP-14. The fill consisted of primarily of silty and clayey sand, and in the southeast portion of the site contained plastic bags, wood, rebar and concrete fragments. An organic odor was noted within the fill soil.

Where encountered, the deeper fill ranged from approximately 9 to 14 feet in thickness. Based on the site topography and the elevation of the adjacent properties, we anticipate that the maximum fill thickness is less than 20 feet; however, deeper fills may be present locally.

6.3.2 Alluvium (map symbol Qal)

The soil borings and test pits encountered alluvial deposits of sands, silts and clays. The alluvium extended to the maximum explored depth of 51.5 feet below ground surface (bgs).

Layers of gravel and cobbles were encountered within the shallow alluvium in some borings and test pits. Where encountered, the gravelly layer was up to approximately 10 feet in thickness and contained particles up to approximately 12 inches in maximum dimension. Although material larger than 12 inches in dimension was not encountered during our field exploration, it may be present within the sub-surface soils.

Caliche stringers were encountered within the clay layers in TP-15 and TP-17. These clay layers were approximately 4 to 5 feet in thickness.

6.4 Groundwater

Groundwater was not encountered within any of our borings or test pits to the maximum explored depth of 51.5 feet bgs.

Regional groundwater data (WMWD, 2013) was reviewed to evaluate the current groundwater levels within one mile of the project site. The nearest well to the site is State Well No. 02S/07W-36J, which is located on the northern edge of the Santa Ana River floodplain, approximately 0.5 miles southwest of the project site, at an elevation of 590 feet above mean sea level (amsl). Depth to groundwater within this well was measured at 11.9 feet below ground surface (bgs) on April 10, 2013. Groundwater depths within this well have ranged between 9.0 and 12.2 feet bgs since April of 2012. This groundwater level corresponds to a high elevation of approximately 581 feet amsl.

Historical groundwater levels were also evaluated for wells within one mile of the project site. Based on a review of the National Water Information System (USGS, 2017), the nearest well to the site is USGS Well No. 335731117330601, which was located approximately 0.15 miles east of the project site at an elevation of 601 feet amsl. A review of records from 1962 through 1994, indicate a historical high groundwater level of 21.3 ft bgs, or approximately 580 feet amsl, measured in April, 1969. This well site was abandoned in 1994.

Several other wells were located approximately 0.65 miles south of the site. These wells are not considered to be representative of conditions at the site because they are located on the bank of the active channel of the Santa Ana River, and are likely influenced by surface flow in the river.

The ground surface elevation of the project site ranges from approximately 596 feet amsl to 635 feet amsl. The historical high groundwater level varies widely due to the highly variable surface elevations throughout the project site. Historical high groundwater levels may be as shallow as 15 feet bgs in the far southeast corner of the project site at the bottom of the slope. The current depth to groundwater is deeper than 51.5 feet bgs in the deep borings located at higher elevations throughout the site.

6.5 Excavatability

Based on the exploratory soil borings and test pits, the on-site soils should be generally excavatable with conventional heavy duty earthmoving equipment. Difficult excavation may be encountered locally due to the presence of gravel, cobbles, and boulders. Bedrock was not encountered to the maximum depth explored of 51.5 feet bgs.

6.6 Subsurface Variations

Based on results of the subsurface exploration and our experience, some variations in the continuity and nature of subsurface conditions within the project site should be

anticipated. Because of the uncertainties involved in the nature and depositional characteristics of the earth material at the site, care should be exercised in interpolating or extrapolating subsurface conditions between or beyond the test pit locations.

6.7 Flooding

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) indicates that the majority of the project site is not within a flood hazard zone. However, a small portion of the southeast corner of the project site is within the 100-year and 500-year flood zones, identified as Zones AE and X (FEMA, August 28, 2008).

A portion of the southern half of the project site is located within a Riverside County-designated flood hazard zone (Riverside County, 2017).

7.0 FAULTING AND SEISMICITY

7.1 Faulting

The site is not located within a currently designated State of California Earthquake Fault Zone (CGS, 2003; Riverside County, 2017). Based on regional geologic mapping, there are no known active faults projecting toward or extending across the project site (Morton and Miller, 2006).

The proposed site is situated in a seismically active region. As is the case for most areas of Southern California, ground shaking resulting from earthquakes associated with nearby and more distant faults may occur at the project site. During the life of the project, seismic activity associated with active faults can be expected to generate moderate to strong ground shaking at the site.

The following table contains a list of active and potentially active faults within 100 kilometers of the subject site. The fault parameters and distances presented in the following table are based on the output from EQFAULT (Blake, 2000), revised in accordance with CGS fault parameters (Cao et. al., 2003).

Table No. 1, Summary of Regional Faults

Fault Name and Section	Approximate Distance to Site (kilometers)	Max. Moment Magnitude (Mw)
Chino-Central Ave. (Elsinore)	11.1	6.7
Whittier	14.0	6.8
Elsinore-Glen Ivy	14.0	6.8
San Jose	22.3	6.4
San Jacinto-San Bernardino	25.3	6.7
Sierra Madre	26.8	7.2

Fault Name and Section	Approximate Distance to Site (kilometers)	Max. Moment Magnitude (Mw)
Cucamonga	26.9	6.9
Elysian Park Thrust	29.7	6.7
San Jacinto-San Jacinto Valley	30.3	6.9
San Andreas-Southern	35.5	7.4
San Andreas-San Bernardino	35.5	7.5
San Andreas-Mojave	39.5	7.4
San Andreas-1857 Rupture	39.5	7.8
Cleghorn	39.8	6.5
Elsinore-Temecula	40.0	6.8
Compton Thrust	43.6	6.8
Clamshell-Sawpit	44.4	6.5
North Frontal Fault Zone (West)	46.4	7.2
Raymond	48.3	6.5
Newport-Inglewood (L.A. Basin)	51.6	7.1
Newport-Inglewood (Offshore)	52.5	7.1
Verdugo	57.5	6.9
San Jacinto-Anza	63.8	7.2
Hollywood	65.2	6.4
Palos Verdes	68.0	7.3
North Frontal Fault Zone (East)	75.9	6.7
Pinto Mountain	77.7	7.2
Helendale-S. Lockhardt	77.9	7.3
San Gabriel	78.0	7.2
Sierra Madre (San Fernando)	78.4	6.7
Santa Monica	80.4	6.6
Elsinore-Julian	81.7	7.1
Coronado Bank	83.9	7.6
Northridge (E. Oak Ridge)	86.4	7.0
Malibu Coast	90.5	6.7
Rose Canyon	92.8	7.2
Lenwood-Lockhardt-Old Woman Springs	95.8	7.5
Santa Susana	96.8	6.7

7.2 CBC Seismic Design Parameters

Seismic parameters based on the 2013 and 2016 California Building Code and site coordinates 33.9570° north latitude and 117.5560° west longitude are provided in the following table.

Table No. 2, CBC Seismic Parameters

Parameter	Value
Site Class	"D"
Mapped Short period (0.2-sec) Spectral Response Acceleration, S_s	1.5g
Mapped 1-second Spectral Response Acceleration, S_1	0.6g
Site Coefficient (from Table 1613.5.3(1)), F_a	1.0
Site Coefficient (from Table 1613.5.3(2)), F_v	1.5
MCE 0.2-sec period Spectral Response Acceleration, SM_s	1.5g
MCE 1-second period Spectral Response Acceleration, SM_1	0.9g
Design Spectral Response Acceleration for short period S_{ds}	1.0g
Design Spectral Response Acceleration for 1-second period, S_{d1}	0.6g
Peak Ground Acceleration, PGA_m	0.5g

7.3 Secondary Effects of Seismic Activity

In general, secondary effects of seismic activity include surface fault rupture, soil liquefaction, seismic settlement, lateral spreading, landslides, tsunamis, seiches, and earthquake-induced flooding. Site-specific potential for each of these seismic hazards is discussed in the following sections.

Surface Fault Rupture: The site is not located within a currently designated State of California Earthquake Fault Zone (CGS, 2003; Riverside County, 2017). Based on a review of regional geologic mapping (Morton and Miller, 2006; Morton and Gray, 1995) no known active surface fault zone crosses or projects toward the site. The potential for surface rupture resulting from the movement of the nearby major faults is not known with certainty but is considered very low.

Dynamic Settlement (Liquefaction and Dry Seismic Settlement): Liquefaction is defined as the phenomenon in which a soil mass within about the upper 50 feet of the ground surface suffers a substantial reduction in its shear strength, due the development of excess pore pressures. During earthquakes, excess pore pressures in saturated soil deposits may develop as a result of induced cyclic shear stresses, resulting in liquefaction.

Soil liquefaction occurs during or after strong ground shaking. There are several requirements for liquefaction to occur. They are as follows.

- Soils must be submerged.
- Soils must be loose to medium-dense.
- Ground motion must be intense.
- Duration of shaking must be sufficient for the soils to lose shear resistance.

The vicinity of the project site has been designated as having very high liquefaction potential by Riverside County (Riverside County, 2017). Groundwater is currently deeper than 50 feet bgs. The historical high groundwater level at the site is estimated to be 15 feet bgs.

Dry seismic settlement occurs when relatively loose unsaturated sediments above the groundwater elevation may densify and settle when subjected to ground shaking during earthquakes. The site is underlain by loose to medium dense sediments, which may be susceptible to settlement during seismic shaking.

Liquefaction potential was analyzed based on soil data gathered for three 50-foot-deep borings (BH-3 through BH-5). Based on the analyses presented in Appendix C, *Liquefaction and Settlement Analysis*., there is a potential for up to approximately 2 inches of liquefaction induced settlement at the site, however, much of the settlement potential is limited to the top 5 feet of the unsaturated zone.

Seismic induced settlement analyses were also performed based on soil data gathered for borings BH-3 through BH-5. As presented in Appendix C, *Liquefaction and Settlement Analysis*, there is a potential for up to 2.35 inches of dry seismic settlement, with much of the settlement potential being limited to the top 5 feet.

Landslides: Seismically induced landslides and other slope failures are common occurrences during or soon after earthquakes. Slopes graded in accordance with the recommendations of this report and current codes are anticipated to be stable.

Lateral Spreading: Seismically induced lateral spreading involves primarily lateral movement of earth materials due to ground shaking. It differs from the slope failure in that complete ground failure involving large movement does not occur due to the relatively smaller gradient of the initial ground surface. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The project site is in an area with a high susceptibility to liquefaction (Riverside County, 2017), however, based on the relatively fine-grained and dense nature of the site soils, as well as the low potential for liquefaction, the risk for lateral spreading is considered low.

Tsunamis: Tsunamis are large waves generated in open bodies of water by fault displacement or major ground movement. Based on the inland location of the site, tsunamis do not pose a hazard to this site.

Seiches: Seiches are large waves generated in enclosed bodies of water in response to ground shaking. Due to the elevation of the site above the Santa Ana River, and the absence of other significant bodies of water near the site, the potential for flooding due to seiching is considered low.

Earthquake-Induced Flooding: Dams or other water-retaining structures may fail as a result of large earthquakes. Several regional dams, including the Seven Oaks Dam, are located upstream of the site in the Santa Ana River watershed. Due to the elevation of the site above the Santa Ana River, it is unlikely that the site would be impacted by flooding due to earthquake-induced failure of off-site facilities.

8.0 LABORATORY TEST RESULTS

Results of the various laboratory tests are presented in Appendix B, *Laboratory Testing Program,* except for the results of *in-situ* moisture and dry density tests which are presented on the Logs of Borings and Test Pits in Appendix A, *Field Exploration.* The results are also discussed below.

8.1 Physical Testing

- *In-situ* Moisture and Dry Density – Results of *in-situ* moisture and dry density tests performed in accordance with ASTM Standard D2216 are presented on the Logs of Borings in Appendix A, *Field Exploration.* The *in-situ* moisture and dry density results of the near-surface soil samples are summarized below.
    - o Native Soil: *In-situ* dry densities of the upper 7 feet of native soil ranged from 103 to 135 pounds per cubic feet (pcf). *In-situ* moisture contents of the upper 7 feet of soil ranged from 2 to 20 percent.
    - o Undocumented Fill: *In-situ* dry densities of undocumented fills ranged from 83 to 122 pounds per cubic feet (pcf). *In-situ* moisture contents of the undocumented fills ranged from 6 to 15 percent.
- Expansion Index – Thirteen representative samples from the upper 15 feet of the site materials were tested to evaluate the expansion potential in accordance with ASTM Standard D4829. The test results are presented in Table No. B-1, *Result of Expansion Index Tests*, in Appendix B, *Laboratory Testing Program*. Expansion indices ranged from 3 to 45, indicating that the tested material has a “Very Low” to “Low” expansion potential.
- Sand Equivalent – Four representative bulk soil samples were tested to evaluate sand equivalent (SE) in accordance with the ASTM Standard D2419 test method. The measured SE of the soil samples tested ranged from 10 to 25 as presented in Table No B-2, *Results of Sand Equivalent Tests*, in Appendix B, *Laboratory Testing Program*.
- R-value Tests – Three R-value tests were performed on representative bulk soil samples in accordance with California Standard Method 301-G. The test result is presented in Table No. B-3, *R-value Test Result*, in Appendix B, *Laboratory Testing Program*. Based on the test results, the R-value of near surface site soils ranges from 30 to 34. These values indicate that the upper 10 feet of the subgrade soil have low resistance to traffic loading.
- Collapse Potential – Sixteen relatively undisturbed representative samples collected from the upper 6.5 feet were tested in accordance with the ASTM Standard D5333

test method. The collapse potentials were measured under a vertical stress of 2.0 kips per square foot (ksf). The samples collected had measured collapses of 0.1 to 4.8 percent. The results for the samples which collapsed corresponded to “Slight” to “Moderate” collapse potential. The test results are presented in Table No. B-6, *Result of Collapse Tests*, in Appendix B, *Laboratory Testing Program*.

- Organic Content – Eight (8) representative soil samples from the upper 10 feet bgs were tested to evaluate the organic content in accordance with the ASTM Standard D2974. The organic content of the soils tested ranged from 0.3 to 1.9 percent. Results of the direct shear tests are presented in Table No. B-5, *Organic Content Test Results,* in Appendix B, *Laboratory Testing Program.*
- Grain Size Analysis – Twelve representative samples were tested to determine the relative grain size distribution in accordance with the ASTM Standard D422. Test results are graphically presented in Drawings No. B-1a, B-1b, B-1c and B-1d, *Grain Size Distribution Results.*
- Maximum Dry Density and Optimum Moisture Content – Results of eight typical moisture-density relationships tested in accordance with ASTM D1557 are presented in Table B-7, *Maximum Dry Density Test Results* and in Drawing No. B-2a and B-2b, *Moisture-Density Relationship Results*, in Appendix B, *Laboratory Testing Program*. The laboratory maximum dry densities were range from 122.5 pounds per cubic foot (pcf) for to 135.0 pcf. The optimum moisture contents range from 4.9 percent to 10.0 percent.
- Direct Shear – Direct shear tests were performed on three relatively undisturbed samples in accordance with ASTM Standard D3080. Results of the direct shear tests are presented in Table No. B-8, *Summary of Direct Shear Test Results,* and in Drawings No. B-3 through B-5, *Direct Shear Test Results,* in Appendix B, *Laboratory Testing Program*.
- Consolidation Test – Three consolidation tests were performed on relatively undisturbed samples of the site soil, in accordance to ASTM Standard D2435. Test results are shown on Drawings No. B-6 through B-8, *Consolidation Test Results,* in Appendix B, *Laboratory Testing Program.*

8.2 Chemical Testing - Corrosivity Evaluation

Four representative soil samples were tested to determine minimum electrical resistivity, pH, and chemical content, including soluble sulfate and chloride concentrations. The purpose of these tests was to determine the corrosion potential of site soils when placed in contact with common pipe materials. These tests were performed by EG Labs in accordance with California Test Methods 643, 422, and 417. The test results are summarized in the table below and are presented in Appendix B, *Laboratory Testing Program.*

Table No. 3, Corrosivity Test Results

Boring No.	Depth (feet)	pH	Soluble Sulfates (CA 417) (percent by weight)	Soluble Chlorides (CA 422) (ppm)	Min. Resistivity (CA 643) (Ohm-cm)
BH-1	1.0-5.0	7.83	0.020	155	1,600
BH-6	1.0-5.0	7.79	0.008	195	1,200
BH-12	1.0-5.0	7.83	0.014	185	1,300
BH-14	1.0-5.0	7.47	0.004	245	540

9.0 SLOPE STABILITY ANALYSIS

Slope stability analysis was performed considering the existing and proposed slope. Discussion of both slope configuration is presented in the section below.

9.1 Existing Slopes

A portion of the southern half of the site has been previously graded into 3 northeast-southwest oriented terraces. The terraces are separated by approximately 2:1 (horizontal:vertical) slopes of approximately 4 to 8 feet in height. The slopes appear to be in poor condition, with areas of erosion and vegetation.

Slopes constructed of properly compacted fill, at a slope ratio of 2:1 (horizontal:vertical) or flatter are generally considered to be stable. Cut slopes steeper than 5:1 in uncompacted alluvial soils are generally not considered to be stable due to generally lower density and shear strength, and high potential for heterogeneity in natural soils.

No documentation of the previous site grading was provided for Converse to review. Therefore, we were not able to determine with certainty whether the existing slopes were graded as cut or compacted fill slopes.

9.2 Proposed Slopes

The stability of proposed cut slopes in the southeastern portion of the site were evaluated under dry conditions using the Slide 7.0 software (RocScience, 2016). Slopes were selected due to their height, slope ratio, and proximity to proposed structures. The purpose of the analyses was to evaluate the anticipated factors of safety against failure of the project slopes under static and pseudostatic conditions. Pseudostatic analyses using a seismic coeffiecient of 0.15 were performed in order to evaluate the stability of the slopes during a large earthquake.

A detailed description of the input parameters and analytical methods are presented in Appendix D, *Slope Stability Analysis*. The resulting factors of safety are summarized in the tables below.

Table No. 4, Factors of Safety Against Slope Failure, Dry

Slope Location	Cut/Fill; Slope Height (ft); Ratio (H:V)	Static FOS	Pseudostatic FOS
Maximum Slope on Southeast Side of Property	Fill Benched Into Cut; 25' (maximum); 2:1 (maximum)	1.9	1.4
Southeast of Proposed 4-Story Hotel	Fill Benched Into Cut; 12' (maximum); 2:1 (maximum)	1.6	1.3

The County of Riverside Technical Guidelines for Review of Geotechnical and Geologic Reports recommends a factor of safety of 1.5 under static loading conditions and 1.1 under pseudostatic loading conditions (County of Riverside, 2000). The proposed slopes have anticipated factors of safety of greater than 1.5 and 1.1 under static and pseudostatic loading conditions, respectively, provided the recommendations in Section 10.4, *Fill Slopes* are followed. These factors of safety meet the established minimum factors of safety against slope failure (County of Riverside, 2000). These values were calculated under the assumption that the slopes will be constructed with excavated on-site soils compacted to 90 percent of the laboratory maximum dry density resulting in a friction angle of at least 35 degrees and a cohesion of at least 150 psf.

10.0 EARTHWORK RECOMENDATIONS

We anticipate that cut-and-fill grading techniques will be used during development of the site. Recommendations for site preparation and remedial grading, and estimates of shrinkage and subsidence are provided in the following sections.

10.1 General

This section contains our general recommendations regarding earthwork and grading for the proposed improvements. These recommendations are based on the results of our field exploration, laboratory tests, our experience with similar projects, and data evaluation as presented in the preceding sections. These recommendations may require modification by the geotechnical consultant based on observation of the actual field conditions during grading.

Prior to the start of construction, all underground existing utilities and appurtenances should be located at the project site. Such utilities should either be protected in-place or removed and replaced during construction as required by the project specifications. All excavations should be conducted in such a manner as not to cause loss of bearing and/or lateral support of existing structures or utilities.

All debris, surface vegetation, deleterious material, existing fill, and surficial soils containing roots and perishable materials should be stripped and removed from the site. Deleterious material, including organics, concrete, and debris generated during excavation, should not be placed as fill.

The final bottom surfaces of all excavations should be observed and approved by the project geotechnical consultant prior to placing any fill. Based on these observations, localized areas may require remedial grading deeper than indicated herein. Therefore, some variations in the depth and lateral extent of excavation recommended in this report should be anticipated.

10.2 Site Preparation

All existing structures, vegetation, and debris should be removed from the site prior to grading. Two existing water wells should be properly abandoned in accordance with applicable regulations. Extensive irrigation piping should be removed and disposed of off-site.

10.3 Remedial Earthwork

Undocumented fill (0 ft. - 14 ft.) and the near-surface alluvial (5 foot) soils are compressible and are considered unsuitable for the support of structures or additional fills. Excavated alluvium and fill, cleared of debris and oversized rocks, are generally expected to be suitable for re-use as compacted fill.

Building footings, slabs-on-grade, and other shallow or at-grade structures and pavements should be uniformly supported by compacted fill. In order to provide uniform support, structural areas should be overexcavated, scarified, and recompacted as follows.

Areas to support structures should be overexcavated to a minimum depth of 24 inches below the bottom of the footings, or deeper as required to expose undisturbed native soils with an *in situ* dry density of at least 85 percent of the laboratory maximum dry density. The depth of overexcavation should be uniform across the entire structure. The overexcavation should extend to at least 2 feet beyond the footprint of the structure. The overexcavation bottom should be scarified and compacted as described in Section 10.4, *Compacted Fill Placement.*

All areas to receive asphalt or concrete pavement should be overexcavated to a depth of 12 inches below finish grade. The overexcavation should extend at least one foot beyond the edge of pavement.

If isolated pockets of very soft, loose, or pumping subgrade are encountered, the overexcavation should be locally deepened, as needed, to expose undisturbed, firm, and unyielding soils.

10.3.1 Alluvium Removal

In general, we anticipate that the removals will extend at least 4 to 5 feet below the existing ground surface; however, the actual removal depth should be based on observations and field density testing during grading. Deeper removals should be anticipated in some areas. Overexcavations should extend to at least 4 feet below grade or deeper as required to expose undisturbed native soils with an *in situ* dry density of at least 85 percent of the laboratory maximum dry density.

All undocumented fill soils should be completely removed prior to the placement of compacted fill. Where encountered in the southeastern portion of the site, the fill ranged from approximately 9 to 14 feet in thickness. Based on the site topography and the elevation of the adjacent properties, we anticipate that the maximum fill thickness is less than 20 feet; however deeper fills may be present. In the remainder of the site where utilities are present, we anticipate shallow fills.

10.3.2 Test Pit Backfill Recommendations

All test pits were backfilled loose with excavated soils. Then test pits should be located during grading and the loose backfill soils should be removed to the final excavated depth shown on the Logs of Test Pits, presented in Appendix A, *Field Exploration* and replaced as compacted backfill.

10.4 Compacted Fill Placement

All surfaces to receive structural fills should be scarified to a depth of 6 inches. The soil should be moisture conditioned to within ±3 percent of optimum moisture content for coarse soils and 0 to 2 percent above optimum moisture content for fine soils. The scarified soils should be recompacted to at least 90 percent of the laboratory maximum dry density.

Fill soils should be thoroughly mixed and moisture conditioned to within ±3 percent of optimum moisture content for coarse soils and 0 to 2 percent above optimum moisture content for fine soils. Fill soils should be evenly spread in horizontal lifts not exceeding 8 inches in uncompacted thickness.

All fill placed at the site should be compacted to at least 90 percent of the laboratory maximum dry densities as determined by ASTM Standard D1557 test method, unless a higher compaction is specified herein. At least the upper 12 inches of subgrade soils underneath pavements intended to support vehicle loads should be scarified, moisture conditioned, and compacted to at least 95 percent of the laboratory maximum dry density.

Fill materials should not be placed, spread or compacted during unfavorable weather conditions. When site grading is interrupted by heavy rain, filling operations should not

resume until the geotechnical consultant approves the moisture and density conditions of the previously placed fill.

10.5 Fill Slopes

Fill slopes up to approximately 25 feet in height will be constructed along the southeast portion of the property. The fill slopes will likely consist of excavated onsite material.

Compacted fill should be placed in accordance with Section 10.4, *Compacted Fill Placement*. Fill slopes placed above existing surfaces or cut slopes should be constructed with keyways. Where fill is placed against existing slopes steeper than 5:1 H:V, the new fill slopes should be keyed and benched to provide increased lateral support after removal of the unsuitable surficial soils, when present. The fill slopes should be constructed with keyways and benches as shown in Figure No. 3, *Fill Slope Detail*. The keyways and benches should be excavated to competent native alluvium as determined by the onsite geotechnical representative.

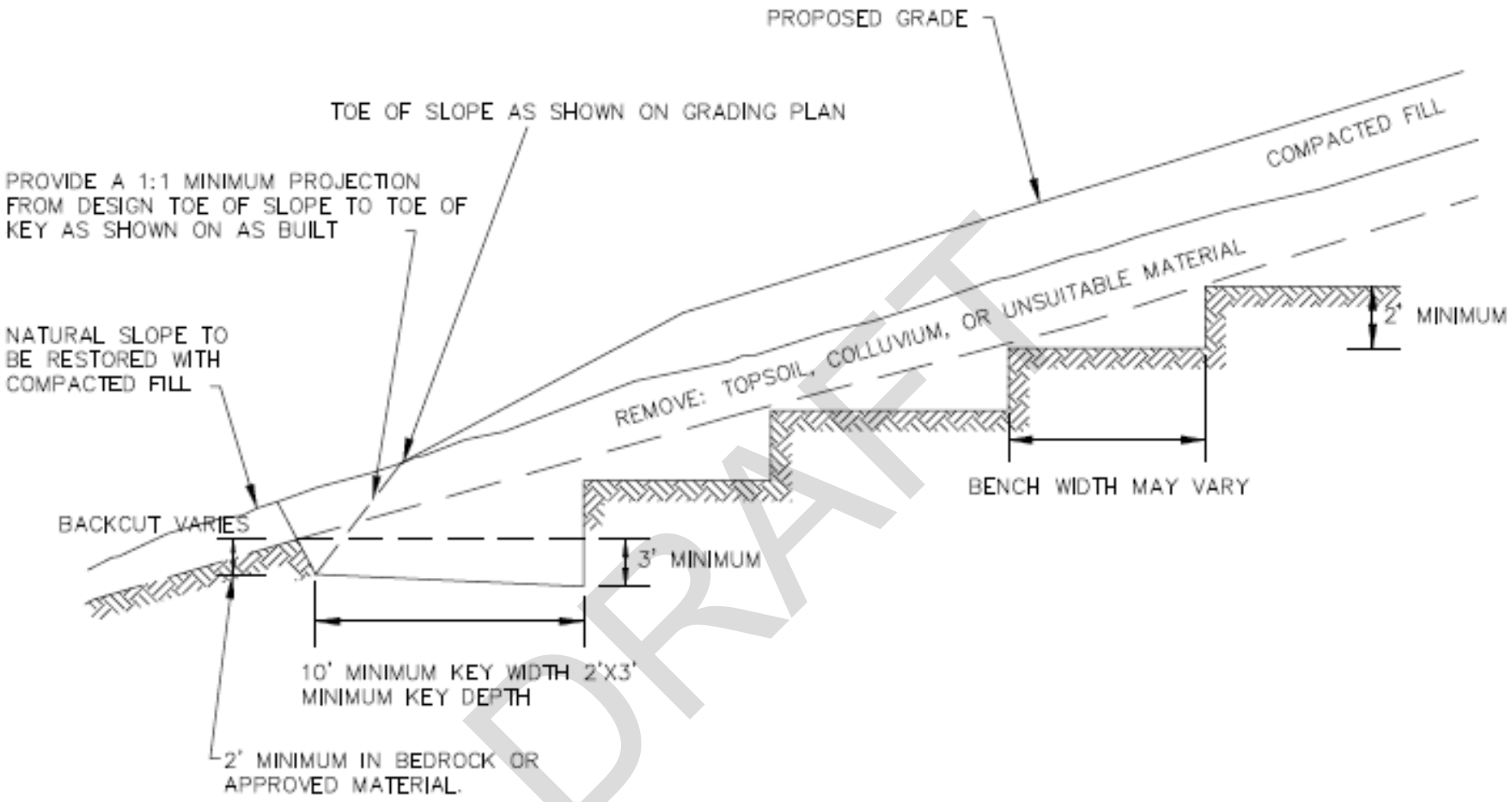
Fill slopes should be properly compacted out to the slope face. This may be achieved by either overbuilding then cutting back to the compacted core, frequent backrolling, or by utilizing other methods that meet the intent of the project specifications. The fill slope face should be track rolled to achieve compaction.

10.6 Shrinkage and Subsidence

The volume of excavated and recompacted soils may be expected to increase or decrease as a result of grading. The shrinkage and/or bulkage would depend on, among other factors, the depth of cut and/or fill, and the grading method and equipment utilized. For preliminary estimation, bulking and shrinkage factors for various units of earth material at the site may be taken as presented below.

- The shrinkage factor (defined as a percentage of soil volume reduction when moisture conditioned and compacted to the average of 92 percent relative compaction) for the upper 5 feet of soils is estimated to range from three 3 to five 5 percent. A value of 4 percent may be used for earthwork planning.
- Subsidence (defined as the settlement of native materials from the equipment load applied during grading) would depend on the construction methods including type of equipment utilized. For estimation purposes, ground subsidence may be taken as 0.1 feet.

Although these values are only approximate, they represent our best estimates of the factors to be used to calculate lost volume that may occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field-testing using the actual equipment and grading techniques be conducted.



FILL SLOPE DETAIL

Project: 21.22 Acre Polopolus Site Proposed Commercial Development
Location: 7270 Hamner Avenue, City of Eastvale, Riverside County, California
For: Lewis Retail Centers

Project No
14-81-155-02

Converse Consultants

FIGURE
3

11.0 UNDERGROUND UTILITIES

We anticipate that the proposed development will include construction of sewer, water, storm drain, and dry utilities. Recommendations for earthwork associated with construction of underground utilities are presented in the following sections.

11.1 Pipe Bedding

Bedding is defined as the material supporting and surrounding the pipe to 1 foot above the pipe. To provide uniform and firm support for the pipe, compacted granular materials such as clean sand, gravel or ¾-inch crushed aggregate, or crushed rock may be used as pipe bedding material. The type and thickness of the granular bedding placed underneath and around the pipe, if any, should be selected by the pipe designer. The load on the rigid pipes and deflection of flexible pipes and, hence, the pipe design, depends on the type and the amount of bedding placed underneath and around the pipe. Bedding materials should be vibrated in-place to achieve compaction. Care should be taken to densify the bedding material below the springline of the pipe. Prior to placing the pipe bedding material, the pipe subgrade should be uniform and properly graded to provide uniform bearing and support to the entire section of the pipe placed on bedding material. During the digging of depressions for proper sealing of the pipe joints, the pipe should rest on a prepared bottom for as near its full length as is practicable.

Migration of fines from the surrounding native and/or fill soils must be considered in selecting the gradation of any imported bedding material. We recommend that the pipe bedding material should satisfy the following criteria:

$$D_{15} < 2.5 \text{ mm and } D_{50} < 19.0 \text{ mm}$$

where D_{15} and D_{50} represent particle sizes of the bedding material corresponding to 15 percent and 50 percent passing by weight, respectively.

11.2 Trench Zone Backfill

The trench zone is defined as the portion of the trench above the pipe bedding extending up to the final grade level of the trench surface. Excavated site soils free of oversize particles and deleterious matter may be used to backfill the trench zone. Detailed trench backfill recommendations are provided below.

- Trench excavations to receive backfill should be free of trash, debris or other unsatisfactory materials at the time of backfill placement.
- Trench zone backfill should be compacted to at least 90 percent of the laboratory maximum dry density as per ASTM D1557 test method. At least the upper 1 foot of

trench backfill underlying pavement should be compacted to at least 95 percent of the laboratory maximum dry density as per ASTM D1557 test method.

- Particles larger than 1 inch should not be placed within 12 inches of the pavement subgrade. No more than 30 percent of the backfill volume should be larger than ¾-inch in the largest dimension. Gravel should be well mixed with finer soil. Rocks larger than 3 inches in the largest dimension should not be placed as trench backfill.
- Trench backfill should be compacted by mechanical methods, such as sheepsfoot, vibrating or pneumatic rollers or mechanical tampers to achieve the density specified herein. The backfill materials should be brought to within ± 3 percent of optimum moisture content for coarse-grained soil, and between optimum and 2 percent above optimum for fine-grained soil, then placed in horizontal layers. The thickness of uncompacted layers should not exceed 8 inches. Each layer should be evenly spread, moistened or dried as necessary, and then tamped or rolled until the specified density has been achieved.
- The contractor should select the equipment and processes to be used to achieve the specified density without damage to adjacent ground, structures, utilities and completed work.
- The field density of the compacted soil should be measured by the ASTM Standard D1556 (Sand Cone) or ASTM D6938 (Nuclear Gauge) or equivalent.
- Observations and field tests should be performed by the project soils consultant to confirm that the required degree of compaction has been obtained. Where compaction is less than that specified, additional compactive effort should be made with adjustment of the moisture content as necessary, until the specified compaction is obtained.
- It should be the responsibility of the contractor to maintain safe working conditions during all phases of construction.
- Trench backfill should not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations should not resume until field tests by the project's geotechnical consultant indicate that the moisture content and density of the fill are in compliance with project specifications.

12.0 DESIGN AND CONSTRUCTION RECOMMENDATIONS

Recommendations for the design and construction of the proposed structures are presented in the following sections. The recommendations provided are based on the assumption that, in preparing the site, the above earthwork recommendations will be implemented.

12.1 Shallow Foundation Design Parameters

Except for the 4-story hotel, we understand the other six structures will be one to two story lightly loaded structure. For preliminary design, we have provided shallow foundation design parameters, if required we can provide deep foundation in our final geotechnical investigation report. One or two-story wood frame, lightly loaded structures

may be supported on conventional continuous (strip) and/or isolated (spread) footings designed in accordance with the California Building Code (CBSC, 2016). Footings should be supported by at least 24 inches of fill compacted to 90 percent of the laboratory maximum dry density as described in Section 10.4, *Compacted Fill Placement.*

The footings should be at least 18 inches in width and embedded to at least 18 inches below the lowest adjacent grade. The footing dimensions and reinforcement should be based on structural design. Continuous and isolated footings can be designed based on allowable net bearing capacity of 2,500 psf.

The net allowable bearing values indicated above are for the dead loads and frequently applied live loads and are obtained by applying a factor of safety of 3.0 to the net ultimate bearing capacity. If normal code requirements are applied for design, the above vertical bearing value may be increased by 33 percent for short duration loadings, which will include loadings induced by wind or seismic forces.

12.2 Lateral Earth Pressures and Resistance to Lateral Loads

In the following subsections, the lateral earth pressures and resistance to lateral loads are estimated by using on-site native soils strength parameters obtained from laboratory testing.

12.2.1 Active Earth Pressures

The active earth pressure behind any buried wall or foundation depends primarily on the allowable wall movement, type of backfill materials, backfill slopes, wall or foundation inclination, surcharges, and any hydrostatic pressures. The recommended lateral earth pressures for the site are presented in the following table.

Table No. 5, Active and At-Rest Earth Pressures

Loading Conditions	Lateral Earth Pressure (psf)
Active earth conditions (wall is free to deflect at least 0.001 radian)	38
At-rest (wall is restrained)	60

These pressures assume a level ground surface behind the walls for a distance greater than the walls height, no surcharge and no hydrostatic pressure.

If water pressure is allowed to build up behind the walls, the active pressures should be reduced by 50 percent and added to a full hydrostatic pressure to compute the design pressures against the walls.

12.2.2 Passive Earth Pressure

Resistance to lateral loads can be assumed to be provided by a combination of friction acting at the base of foundations and by passive earth pressure. A coefficient of friction of 0.35 between formed concrete and soil may be used with the dead load forces. An allowable passive earth pressure of 200 psf per foot of depth may be used for the sides of footings poured against recompacted soils. A factor of safety of 1.5 was applied in calculating passive earth pressure. The maximum value of the passive earth pressure should be limited to 2,500 psf for compacted fill.

Vertical and lateral bearing values indicated above are for the total dead loads and frequently applied live loads. If normal code requirements are applied for design, the above vertical bearing and lateral resistance values may be increased by 33 percent for short duration loading, which will include the effect of wind or seismic forces.

Due to the low overburden stress of the soil at shallow depth, the upper 1 foot of passive resistance should be neglected unless the soil is confined by pavement or slab.

12.3 Slabs-on-Grade

Structural design elements of slabs-on-grade, including but not limited to thickness, reinforcement, joint spacing, should be selected based on the analysis performed by the project structural engineer considering anticipated loading conditions and the modulus of subgrade reaction of the supporting materials.

An under-slab moisture barrier should be utilized in areas where moisture-sensitive flooring systems may be used. The moisture barrier should consist of a minimum by 6-mil-thick impermeable membrane. All seams and openings should be overlapped and sealed.

Up to 2 inches of sand may be placed beneath the membrane to provide protection from any rocks or debris in the subgrade soil. The sand layer below the membrane may be comprised of onsite earth materials free of rocks or other debris which may damage the barrier. Up to 2 inches of sand may be placed above the membrane to provide protection during construction and to aid in the concrete curing. The thickness of the sand layers above and below the membrane should be determined by the structural engineer based on the foundation design. The sand layer above the moisture barrier may be eliminated at the discretion of the structural engineer.

Slabs should be designed and constructed as promulgated by the American Concrete Institute (ACI) and the Portland Cement Association (PCA). Care should be taken during concrete placement to avoid slab curling. Prior to the slab pour, all utility trenches should be properly backfilled and compacted.

The upper 12 inches of soil subgrade under slabs-on-grade should be moisture conditioned to 0 to 3 percent above optimum moisture content within 12 hours prior to placement of concrete.

Subgrade for slabs-on-grade should be firm and uniform. All loose or disturbed soils including under-slab utility trench backfill should be recompacted.

12.4 Soil Expansion

Based on the laboratory test results, the expansion index of the onsite soils ranges from 3 to 45, corresponding to expansion potentials ranging from very low to low. In general, the very low, and low expansive test results correlated to silty sand and clayey sand soil types.

During grading, the site soils will likely be moved and blended, and additional soil may be imported. The expansion indices of the final finish-grade soils will vary from the results obtained during our investigation. The expansion potential of the finish-grade soils should be tested at the completion of grading.

Shallow foundations should be designed to accommodate the anticipated soil expansion. Foundation design recommendations are provided in Section 12.1, *Shallow Foundation Design Parameters*.

12.5 Settlement

The total settlement of shallow footings from static structural loads and short-term settlement of properly compacted fill is anticipated to be 1 inch or less. The differential settlement resulting from static loads is anticipated to be 0.5 inches or less over a horizontal distance of 40 feet.

Our analysis of the potential dynamic settlement is presented in Appendix E, *Settlement Analysis*. We estimate that the site has the potential for up to 0.24 inches of dynamic settlement during a large earthquake. Differential settlement is expected to be limited due to the uniform soil conditions at the site. We recommend that the planned structures be designed conservatively in anticipation of dynamic differential settlement of up to 0.5 inches in 40 horizontal feet.

The static and dynamic settlement estimates should not be combined for design purposes. The maximum combined static and dynamic settlement is not anticipated to exceed the maximum anticipated dynamic settlement.

12.6 Soil Corrosivity

The results of chemical testing of Six representative samples of soils from the site were evaluated for corrosivity with respect to common construction materials such as concrete and steel. The test results are presented in Appendix B, *Laboratory Testing*

Program and design recommendations pertaining to soil corrosivity are presented below.

The sulfate contents of the sampled soils correspond to American Concrete Institute (ACI) exposure category S0 for these sulfate concentrations (ACI 318-11, Table 4.2.1). No concrete type restrictions are specified for exposure category S0 (ACI 318-11, Table 4.3.1). A minimum compressive strength of 2,500 psi is recommended.

We anticipate that concrete structures such as footings, slabs, and flatwork will be exposed to moisture from precipitation and irrigation. Based on the site location and the results of chloride testing of the site soils, we do not anticipate that concrete structures will be exposed to external sources of chlorides, such as deicing chemicals, salt, brackish water, or seawater. ACI specifies exposure category C1 where concrete is exposed to moisture, but not to external sources of chlorides (ACI 318-11, Table 4.2.1). ACI provides concrete design recommendations in ACI 318-11, Table 4.3.1, including a compressive strength of at least 2,500 psi and a maximum chloride content of 0.3 percent.

The minimum electrical resistivities when saturated ranged from 540 to 3,560 ohm-cm. These values indicate that the site soils are severely to corrosive to ferrous metals in contact with the soil (Romanoff, 1957). Converse does not practice in the area of corrosion consulting. A qualified corrosion consultant should provide appropriate corrosion mitigation measures for any ferrous metals in contact with the site soils.

12.7 Asphalt Concrete Pavement

Laboratory testing indicated that samples of the on-site soil had R-values of 30, 32 and 34. Preliminary asphalt concrete pavement sections corresponding to Traffic Indices (TIs) ranging from 5 to 8 and a R-value of 30 are presented in the following table.

Table No. 6, Recommended Preliminary Pavement Sections

R-value	Traffic Index (TI)	Pavement Section	
		Asphalt Concrete (inches)	Aggregate Base (inches)
	5	3.0	6.0
	6	3.5	6.5
	7	4.0	8.0
	8	5.0	10.0

At or near the completion of grading, subsurface samples should be tested to evaluate the actual subgrade R-value for final pavement design.

Prior to placement of aggregate base, at least the upper 12 inches of subgrade soils should be scarified, moisture-conditioned if necessary, and recompacted to at least 95

percent of the laboratory maximum dry density as defined by ASTM Standard D1557 test method.

Base materials should conform with Section 200-2.2,"*Crushed Aggregate Base*," of the current Standard Specifications for Public Works Construction (SSPWC; Public Works Standards, 2015) and should be placed in accordance with Section 301.2 of the SSPWC.

Asphaltic concrete materials should conform to Section 203 of the SSPWC and should be placed in accordance with Section 302.5 of the SSPWC.

12.8 Concrete Flatwork

Except as modified herein, concrete walks, driveways, access ramps, curb and gutters should be constructed in accordance with Section 303-5, *Concrete Curbs, Walks, Gutters, Cross-Gutters, Alley Intersections, Access Ramps, and Driveways*, of the Standard Specifications for Public Works Construction (Public Works Standards, 2015).

The subgrade soils under the above structures should consist of compacted fill placed as described in this report. Prior to placement of concrete, the upper 12 inches of subgrade soils should be moisture conditioned to between within 3 percent of optimum moisture content for coarse-grained soils and 0 and 2 percent above optimum for fine-grained soils.

The thickness of driveways for passenger vehicles should be at least 4 inches, or as required by the civil or structural engineer. Transverse control joints for driveways should be spaced not more than 10 feet apart. Driveways wider than 12 feet should be provided with a longitudinal control joints.

Concrete walks subjected to pedestrian and bicycle loading should be at least 4 inches thick, or as required by the civil or structural engineer. Transverse joints should be spaced 15 feet or less and should be cut to a depth of one-fourth the slab thickness.

Positive drainage should be provided away from all driveways and sidewalks to prevent seepage of surface and/or subsurface water into the concrete base and/or subgrade.

12.9 Temporary Sloped Excavations

Temporary open-cut trenches may be constructed with side slopes as recommended in the following table. Temporary cuts encountering soft and wet fine-grained soils; dry loose, cohesionless soils or loose fill from trench backfill may have to be constructed at a flatter gradient than presented below. The final determination of temporary slope gradients should be based on review of the encountered soils by a competent person employed by the contractor, in accordance with Section 1541 of the OSHA Construction Safety Orders.

Table No. 7, Slope Ratios for Temporary Excavations

Soil Type	Depth of Excavation (feet)	Recommended Maximum Slope (Horizontal:Vertical)[1]
Sand	0-4	¾:1
	4-20	1½ :1
Silty Sand, Sandy Silt	0-4	Vertical
	4-20	1:1

[1] Slope ratio assumed to be uniform from top to toe of slope.

Spoils from the excavation should not be stockpiled more than 6 feet in height or within a horizontal distance from the trench edge equal to the depth of the trench.

For steeper temporary construction slopes or deeper excavations, or unstable soil encountered during the excavation, shoring should be provided by the contractor as necessary, to protect the workers in the excavation. Design recommendations for temporary shoring can be provided if necessary.

Surfaces exposed in slope excavations should be kept moist but not saturated to retard raveling and sloughing during construction. Adequate provisions should be made to protect the slopes from erosion during periods of rainfall. Surcharge loads, including construction materials, should not be placed within 5 feet of the unsupported slope edge. Stockpiled soils with a height higher than 6 feet will require greater distance from trench edges.

12.10 Slope Protection and Maintenance

Slopes will require maintenance through time to perform in a satisfactory manner. In most cases, lot and site maintenance can be performed along with normal care of the grounds and landscaping. The cost of maintenance is less expensive than repair resulting from neglect.

Most hillside problems are associated with water. Uncontrolled water from a broken pipe, excess landscape watering, or exceptionally wet weather causes the most damage. Drainage and erosion control are important aspects of slope stability, and the provisions incorporated into the graded site must not be altered without competent professional advice.

Any terrace drains and/or brow ditches on the slopes should be periodically maintained and kept clear so that water will not overflow onto the slope, causing erosion. All subdrains should be kept open and clear of debris and soil that could block them. Landscaping on the slopes should disturb the soil as little as possible and utilize drought-resistant plants that require a minimum amount of irrigation. Wet spots on or around the site should be noted and brought to the attention of Converse or an experienced geotechnical engineer. These may be natural seeps or an indication of broken water or

sewer lines.

Slopes should be planted as soon as possible after construction. Watering should be limited or stopped altogether during the rainy season when little irrigation is required. Over-saturation of the ground can cause subsidence within subsurface soils. Slopes should not be over-irrigated. Ground cover and other vegetation will require moisture during the hot summer months, but during the wet season, irrigation can cause ground cover to pull loose. This not only destroys the cover but also starts serious erosion. It is suggested to consult a professional landscape architect for planting and irrigation recommendations.

12.11 Site Drainage

Adequate positive drainage should be provided away from building pads to prevent ponding and to minimize percolation of water into the foundation soils. Building pads should have a gradient of at least 2 percent towards drainage facilities. Planters, shrubs or trees should not be placed adjacent to, or within 5 feet of the structural footprint.

Minimum irrigation water should be used. Excessive waters will percolate into subsurface soils. Such subsurface water will flow from raised-grade lots and/or tracts to adjacent lower-grade lots and/or tracts. This flow will supplement the percolating subsurface water resulting from the irrigation of the lower lots themselves and can result in overly saturated and/or perched groundwater conditions. Irrigation should be maintained such that it does not result in excess water. Surface drainage should preclude the possibility of flow over slope faces with the use of brow ditches, earth berms, and other methods.

Adequate drainage should also be provided for any cut/fill slopes, landscaped areas outside building pads such as parks and recreation areas, and paved areas. A desirable drainage gradient is 1 percent for paved areas and 2 percent in landscaped areas. Surface drainage should be directed to suitable non-erosive devices.

12.12 Infiltration Structure Design

Based on the percolation testing and conversion calculations presented in Appendix C, *Percolation Testing*, infiltration may not be feasible at this site. If infiltration is utilized for stormwater management, additional testing should be performed within soil layers containing lower silt and clay content.

The recommended infiltration rates include a required factor of safety of 3 to account for subsurface variations, uncertainty in the test method, and future siltation. The infiltration basin designer should determine whether additional design-related safety factors are appropriate.

Compacted soil will have lower permeability than loose soil. Care should be taken during site grading to avoid excessive compaction of the infiltration basin floor. Lightweight equipment should be used when possible to grade the basin.

Routine maintenance of infiltration basins is required to sustain the expected infiltration rates. Accumulated silt and debris should be removed. If possible, the basin floor should be lightly scarified to restore permeability.

13.0 GEOTECHNICAL SERVICES DURING CONSTRUCTION

This report has been prepared to aid in the evaluation of the site, to prepare grading recommendations, and to assist the structural engineer with the design of the proposed structures.

The project grading plans, when available, should be reviewed by Converse to confirm our assumptions and to verify conformance of the plan to our recommendations. A supplemental geotechnical investigation may be recommended to address the grading design.

Recommendations presented herein are based upon the assumptions that continuous earthwork monitoring will be provided by Converse. All excavation bottoms should be observed by a Converse representative prior to fill placement. Structural fill and backfill should be placed and compacted during continuous observation and testing by this office. Footing excavations should be observed by Converse prior to placement of steel and concrete, so that footings are founded on satisfactory materials and excavations are free of loose and disturbed materials.

The residential lots may be customized, including home additions and construction of garden walls, pools, landscape ponds, retaining walls, general regrading, and modification to landscaping. Any of these modifications may adversely impact existing foundation conditions, lot stability, and/or adjacent lots. It is therefore strongly recommended that proposed lot modifications be reviewed by Converse or an experienced geotechnical engineer and/or certified engineering geologist.

All homeowners should be made aware of the need for geotechnical evaluation of proposed foundation, grading, irrigation, and/or landscaping modifications.

14.0 CLOSURE

The findings and preliminary recommendations of this report were prepared in accordance with generally accepted professional engineering and engineering geologic principles and practice within our profession at this time in Southern California. Our conclusions and recommendations are based on the results of the field and laboratory investigations, combined with an interpolation of subsurface conditions between and beyond exploration locations.

As the project evolves, Converse's continued consultation and construction monitoring should be considered an extension of the geotechnical investigation services performed to date. Converse should review grading plans and specifications to verify that the recommendations presented herein have been appropriately interpreted, and that the design assumptions used in this report are valid. Where significant design changes occur, Converse may be required to augment or modify the recommendations presented herein. Subsurface conditions may differ in some locations from those encountered in the borings and test pits and may require additional analyses and, possibly, modified recommendations.

This report was prepared for Lewis Retail Centers for the subject project described herein. We are not responsible for technical interpretations made by others of our exploratory information. Specific questions or interpretations concerning our findings and conclusions may require a written clarification to avoid future misunderstandings.

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Appendix A

Field Exploration

APPENDIX A

FIELD EXPLORATION

Converse conducted a field investigation which included a site reconnaissance and subsurface exploration program consisting of exploratory borings and test pits. During the site reconnaissance, the surface conditions were noted and the approximate locations of the borings and percolation tests were established. Approximate locations of the boreholes, percolation tests, and test pits are shown in Figure No. 2, *Soil Boring and Test Pit Location Map.* The boring locations were determined using existing topography and boundary features as a guide and should be considered accurate only to the degree implied by the method used. The test pit locations were obtained from the previous investigation report (Converse, 2014b). A discussion of the field investigation methods is presented below.

Exploratory Borings

A total of thirteen (13) borings out of fifteen (15) borings were drilled on the site to a maximum depth of 51.5 feet below ground surface (bgs). Borings (BH-2, and BH-7) were not drilled due to suspected utility conflict. The borings were advanced using a drill rig equipped with an 8-inch diameter hollow-stem auger and a drive sampling system for soil sampling. The earth materials encountered were continuously logged and classified in the field by visual examination in accordance with the Unified Soil Classification System. The field descriptions have been modified where appropriate to reflect laboratory test results.

Relatively undisturbed ring and bulk samples of the subsurface soils were obtained at frequent intervals in the borings. The undisturbed samples were obtained using a California Modified Sampler (2.4 inches inside diameter and 3.0 inches outside diameter) lined with thin sample rings. The sampler was driven into the bottom of the boreholes with successive drops of a 140-pound hammer falling 30 inches by means of a mechanically driven pulley. The number of successive drops of the driving weight ("blows") required for each 6 inches of penetration of the sampler for the total of 18 inches are shown on the Logs of Borings. High blow counts were recorded in some areas, likely due to relatively dense soils, contact with scattered gravel, and light carbonate cementation.

The material was retained in brass rings (2.4 inches in diameter and one inch in height). The central portion of the sample was retained and carefully sealed in waterproof plastic containers for shipment to the laboratory. Bulk soil samples collected from the borings were sealed in plastic bags and brought to the laboratory.

Standard Penetration Tests (SPTs) were performed at depths of 20, 30, 40, and 50 feet below existing ground surface in the 50 feet deep borings. In this test, a standard split-spoon sampler (1.4 inches inside diameter and 2.0 inches outside diameter) was driven into the ground with successive drops of a 140-pound auto-hammer falling 30 inches.

The number of blows required for every 6-inch penetration of the sampler are shown on the Logs of Borings.

The exact depths at which material changes occur cannot always be established accurately, unless a more precise depth can be established by other means. Changes in material conditions that occur between driven samples are indicated in the logs at the top of the next drive sample.

The borings were backfilled loose with soil cuttings. As a result, the surface may settle over time. If construction is delayed, we recommend the owner monitor the boring site and backfill any settlement or depression that might occur, or provide protection around the area of the boring locations to prevent trip and fall injuries from occurring near the area of any potential settlement.

A key to soil symbols and terminology used in the borings logs is included in Drawing No. A-1, *Unified Soil Classification and Key to Boring Log Symbols*. For Logs of Borings, see Drawings No. A-2 through A-14, *Logs of Borings*.

Percolation test holes PT-1 through PT-6 were prepared as outlined in Appendix C, *Infiltration* Testing. After infiltration testing, the pipes were removed and the boreholes were backfilled with soil cuttings and lightly compacted by hand. The surface may settle over time. We recommend that the property owner monitor the boring locations and backfill any settlement or depressions that might occur, or provide fencing around the boring locations to prevent trip and fall injuries from occurring near the area of any potential settlement. For logs of percolation tests, see Drawings No. C-1 through C-6, *Log of Borings*.

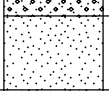
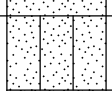
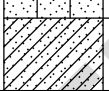
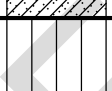
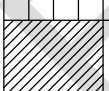
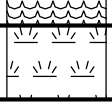
Exploratory Test Pits

A total of 20 test pits were excavated within the project site as reported in our previous investigation report (Converse, 2014b). The purpose of the test pits was to obtain subsurface information at the site, and collect undisturbed and bulk samples of various on-site soil types for laboratory testing. Test pits TP-8 through TP-11 and TP-14 through TP-20 were excavated on May 5, 2014. The test pits were excavated to depths ranging from approximately 5.3 to 15.0 feet bgs. Test pits TP-1 through TP-7 and TP-12 through TP-13 were excavated on May 6, 2014.The approximate locations of the test pits are shown on Figure No. 2, *Soil Boring and Test Pit Location Map*. The test pits were excavated to depths ranging from 5.3 to 15 feet below ground surface (bgs).

The test pits were excavated utilizing a rubber tire backhoe, equipped with a drive sampling system for soil sampling. Soils were logged and classified in the field by visual examination in accordance with the Unified Soil Classification System. The field descriptions were later modified where appropriate to reflect laboratory test results. For the Logs of Test Pits obtained from our previous report (Converse, 2014b), see Drawings No. A-15 through A-34, logs of test pits.

The test pits were backfilled loose with excavated soils. As a result, the surface will settle over time. If construction is delayed, we recommend the owner monitor the test pits and back fill any settlement or depression that might occur or provide fencing around the area of the test pit to prevent trip or fall injuries which may occur near the area of any potential settlement. Also, during site grading these test pits have to be located and all loose backfill soil removed and replaced as compacted fill.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE)	GRAVEL AND GRAVELLY SOILS (MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE)	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS (MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE)	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE)	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BORING LOG SYMBOLS

SAMPLE TYPE

STANDARD PENETRATION TEST
Split barrel sampler in accordance with ASTM D-1586-84 Standard Test Method

DRIVE SAMPLE 2.42" I.D. sampler (CMS).

DRIVE SAMPLE No recovery

BULK SAMPLE

GROUNDWATER WHILE DRILLING

GROUNDWATER AFTER DRILLING

LABORATORY TESTING ABBREVIATIONS

TEST TYPE
(Results shown in Appendix B)

CLASSIFICATION

Plasticity	pi
Grain Size Analysis	ma
Passing No. 200 Sieve	wa
Sand Equivalent	se
Expansion Index	ei
Compaction Curve	max
Hydrometer	h
Disturb	Dist.

STRENGTH

Pocket Penetrometer	p
Direct Shear	ds
Direct Shear (single point)	ds*
Unconfined Compression	uc
Triaxial Compression	tx
Vane Shear	vs
Consolidation	c
Collapse Test	col
Resistance (R) Value	r
Chemical Analysis	ca
Electrical Resistivity	er
Permeability	perm
Soil Cement	sc

Apparant Density	Very Loose	Loose	Medium	Dense	Very Dense
SPT (N)	< 4	4 - 11	11 - 30	31 - 50	> 50
CA Sampler	< 5	5 - 12	13 - 35	36 - 60	> 60
Relative Density (%)	< 20	20 - 40	40 - 60	60 - 80	> 80

Consistency	Very Soft	Soft	Medium	Stiff	Very Stiff	Hard
SPT (N)	< 2	2-4	5-8	9-15	16-30	> 30
CA Sampler	< 3	3-6	7-12	13-25	26-50	> 50

UNIFIED SOIL CLASSIFICATION AND KEY TO BORING LOG SYMBOLS

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
Client: Lewis Retail Center

Project No. **14-81-155-02**

Drawing No. **A-1**

Log of Boring No. BH-01

Dates Drilled: 4/11/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 620 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ARTIFICIAL FILL **CLAYEY SAND (SC):** fine-grained, reddish-brown.						ei, se, ca, er
			■		4/6/7	15	113	ds
5		**ALLUVIUM** **CLAYEY SAND (SC):** fine-grained, reddish-brown.	■		7/12/17	15	119	
		SAND with GRAVEL (SP): fine to coarse-grained, trace clay, gravel up to 1" inch largest dimension, red.	■		8/16/39	6	119	
10		**SANDY CLAY (CL):** fine to coarse-grained sand, possible staining, scattered gravel up to 1 inch in largest dimension, reddish-brown.	■		14/27/40	9	125	c
15		**CLAYEY SAND (SC):** fine to coarse-grained, few gravel up to 3 inches in largest dimension, reddish-brown.	■		13/34/50-3.5"	10	120	
20			■		37/35/50-4"	11	118	
		End of boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/11/17.						

Log of Boring No. BH-03

Dates Drilled: 4/12/2017 Logged by: Md Zahangir Alam Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 631 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, trace clay, reddish-brown.						ei, r
			■		4/9/12	13	124	col
5			■		7/9/11	11	117	ds
		-scattered gravel to 1" in largest dimension, light brownish gray	■		14/38/42	8	127	
10		-no clay	■		18/50-6"	10	119	
15		**SAND WITH SILT (SP-SM):** fine to coarse-grained, reddish-brown.	■		23/50-6"	6	109	
20		-trace of gravel	⊠		11/18/24			
25		-no clay	■		21/50-6"	5	113	
30		-light brownish gray	⊠		12/20/19			

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. 14-81-155-02

Drawing No. A-3a

Log of Boring No. BH-03

Dates Drilled: 4/12/2017 Logged by: Md Zahangir Alam Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 631 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		SAND WITH SILT (SP-SM): fine to coarse-grained, reddish-brown.	■		15/37/50	4	116	
40		-few gravel	☒		50-6"			
45		**SANDY CLAY (SM):** fine to coarse-grained sand, oange-brown.	■		5/20/50-6"	16	118	
50		-light brown	☒		12/21/36			
		End of boring at 51.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/12/17.						

Log of Boring No. BH-04

Dates Drilled: 4/12/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 624 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ARTIFICIAL FILL **SILTY SAND (SM):** fine to coarse-grained, with clay, olive brown.	■		5/17/35	15	116	
5		**ALLUVIUM** **CLAYEY SAND (SC):** fine to coarse-grained, reddish-brown.	■	▨	14/22/35	14	122	ei, ma, max
		-scattered gravel to 0.5" inch largest dimension,	■	▨	30/50-6"	8	111	
10			■		19/34/40	12	118	
15		**SILTY SAND (SM):** fine to coarse-grained, with clay, reddish-brown.	■		17/29/40	7	113	
20		"scattered gravel to 1"" inch largest dimesion, reddish-tan	☒		18/19/25			
25		-reddish-brown	■		21/41/45	6	113	
30		-reddish-brown	☒		10/14/18			

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Converse Consultants

Project No. 14-81-155-02

Drawing No. A-4a

Log of Boring No. BH-04

Dates Drilled: 4/12/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 624 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		CLAYEY SAND (SC): fine to coarse-grained, olive brown.	■		12/23/50	15	116	
40			☒		4/8/14			
45		scattered gravel, reddish-brown	■		4/18/50	12	121	
50		**SAND (SP):** fine to coarse-grained, reddish-brown.	☒		18/36/29			
		End of boring at 51.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/12/17.						

Log of Boring No. BH-05

Dates Drilled: 4/12/2017 Logged by: Jay Brunham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 622 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		FILL **SILTY SAND (SM):** fine to medium-grained, trace of clay, oange-brown.						se
			■		3/2/2	10	102	
5			■		3/3/3	11	103	col
		ALLUVIUM **CLAYEY SAND (SC):** fine to coarse-grained, reddish-brown.	■		7/10/13	11	114	
10		**SILTY SAND (SM):** fine to coarse-grained, trace of clay, light reddish brown.	■		13/18/18	6	116	
15		-hard drilling, rig chatter,	■		20/42/50-5.5"	5	124	c
20		**SAND WITH SILT (SP-SM):** fine to coarse-grained, reddish tan.	⊠		9/16/19			
25			■		14/28/50	5	120	
30			⊠		7/17/17			

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For: Lewis Retail Center

Project No. 14-81-155-02

Drawing No. A-5a

Log of Boring No. BH-05

Dates Drilled: 4/12/2017 Logged by: Jay Brunham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 622 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		CLAY with SAND (CL): fine-grained SAND, olive brown.	■		8/15/25	29	82	
40		**SAND with SILT (SP-SM):** fine to coarse-grained, reddish tan.	☒		13/32/50			
45			■		13/50-6"	6	102	
50		sample very moist	☒		14/32/50-4"			
		End of boring at 51.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/12/17.						

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21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. 14-81-155-02

Drawing No. A-5b

Log of Boring No. BH-06

Dates Drilled: 4/11/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 627 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ARTIFICIAL FILL **SILTY SAND (SP):** fine to medium-grained, reddish-brown.						ei, r, ca, er, col, ma
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, with gravel to 1" to the largest dimension, reddish-brown.			8/11/17	8	122	
5		-with cobble in cuttings			7/12/26	10	109	
		SAND (SP): fine to coarse-grained, with gravel to 3" inch largest dimension, brownish gray.			39/40/50-5"	4	116	ds
10					50.5"	2	111	
15		-no gravel, -reddsih gray			28/29/33	6	106	
20		**CLAY (CL):** dark brown.			11/24/31	23	106	
		End of boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/11/17.						

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Converse Consultants

Project No. 14-81-155-02

Drawing No. A-6

Log of Boring No. BH-08

Dates Drilled: 4/12/2017 Logged by: Md Zahangir Alam Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 627 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, olive brown.						se
			■		9/14/16	6	122	col
5			■		14/19/34	11	108	ds
		-reddish-brown	■		41/33/37	6	119	
10		**SAND (SP):** fine to coarse-grained, with trace of gravel, light brownish gray.	■		26/50-6"	2	115	
15		**SILTY SAND (SM):** fine grained, scattered gravel to 0.5" inch in largest dimension, light brownish gray.	■		7/22/50-5.5"	12	122	
20		-reddish tan	⊠		20/32/32			
25			■		19/50-6"	8	105	
30			⊠		4/13/23			

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Converse Consultants

Project No. 14-81-155-02

Drawing No. A-7a

Log of Boring No. BH-08

Dates Drilled: 4/12/2017 Logged by: Md Zahangir Alam Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 627 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		SANDY CLAY (CL): fine grained sand, oange-brown.	■		8/14/36	21	108	
40		-fine to coarse-grained	☒		12/16/22			
45		**SILTY SAND (SM):** fine to medium-grained, trace clay, brownish gray.	■		12/50-6"	5	110	
50		-fine to coarse-grained	☒		10/20/50			
		End of boring at 51.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/12/17.						

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
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Project No. 14-81-155-02

Drawing No. A-7b

Log of Boring No. BH-09

Dates Drilled: 4/11/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 630 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM						
		SAND (SP): fine to coarse-grained, reddish-brown.						
		-trace of clay	■		13/15/13	2	111	
5		**SILTY SAND (SM):** fine to coarse-grained, reddish brown.	■	▨	40/50-5-5"	3	106	ei, se, ma, max
		-rig chatter, cobble in cuttings		▨				
10			■		19/50-5"	2	92	
15					50-4.5"			
20					50-2"			
		End of boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/11/17.						

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21.22-Acre Polopolus Site Proposed Commercial Development
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For: Lewis Retail Center

Project No. 14-81-155-02

Drawing No. A-8

Log of Boring No. BH-10

Dates Drilled: 4/11/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 627 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM						
		SILTY SAND (SM): fine to coarse-grained, some white stanning, reddish-brown.	■		16/21/28	10	118	
5			■		18/23/32	8	119	
				▨				r
10		**SANDY SILT (ML):** fine to medium-grained sand, brown.	■	▨	6/14/22	21	95	
15		**SAND (SP):** fine to coarse-grained, tan.	■		15/20/24	4	112	
20		**SILTY SAND (SM):** fine to medium-grained, reddish-brown.	■		19/26/46	12	118	
		End of boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/11/17.						

Log of Boring No. BH-11

Dates Drilled: 4/11/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 617 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		FILL **CLAYEY SAND (SC):** fine to medium-grained, reddish-brown.						
5		**ALLUVIUM** **SILTY SAND (SM):** fine to medium-grained, reddish-brown.			2/3/5	6	107	max, col, ds
					3/4/5	7	107	col
10					3/4/6	6	107	
15		-mostly fine-grained			3/5/5	5	106	
20		**CLAYEY SAND (SC):** fine to coarse-grained, reddish-brown.			8/9/11	11	112	
		End of boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/11/17.						

Log of Boring No. BH-12

Dates Drilled: 4/13/2017 Logged by: Jay Burnham Checked By: Scot Mahtis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 626 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, scattered gravel to 1" inch in largest dimension, brownish rad.						ei, ca, er
			■	▨	11/22/26	6	124	
5			■		12/15/30	11	117	
		-fine to medium-grained,	■		24/41/50	6	127	
10			■		20/35/36	2	127	
15		**SANDY CLAY (CL):** fine grained sand, olive brown.	■		6/18/26	12	111	
20		**SILTY SAND (SM):** fine to coarse-grained,.	■		7/33/50-4.5"	8	94	
		End of boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/13/17.						

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. 14-81-155-02

Drawing No. A-11

Log of Boring No. BH-13

Dates Drilled: 4/11/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 620 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		FILL **SILTY SAND (SM):** fine to coarse-grained, brown.						
5		**ALLUVIUM** **SILTY SAND (SM):** fine to coarse-grained, some clay, reddish-brown.			9/14/25	6	118	
10		-with gravel to 1" inch in largest dimension,			11/25/40	14	110	
15					14/50-6"	4	119	
20		-fine-grained, tan			15/50-6"	7	112	
		End of boring at 21 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/11/17.						

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. 14-81-155-02

Drawing No. A-12

Log of Boring No. BH-14

Dates Drilled: 4/11/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 604 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, dark brown.		■				ei, ca, er, ma
			■		2/6/9	8	113	col
5		-red brown	■		8/9/11	11	118	col, c
		CLAY (CL): fine grained sand, brown.	■		7/14/25	25	95	
10			■		12/18/24	28	93	
15			■		6/11/15	19	96	
20		**SAND (SP):** fine to medium-grained, gray.	■			4	105	
		End of boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/11/17.						

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. 14-81-155-02

Drawing No. A-13

Log of Boring No. BH-15

Dates Drilled: 4/11/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 601 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **CLAYEY SAND (SC):** fine to coarse-grained, dark brown.	■		3/4/6	12	115	
5		**SANDY CLAY (CL):** fine grained, reddish-brown.	■	▨	4/6/6	14	114	ma
10			■		5/11/20	25	101	
15		**SILTY SAND (SM):** fine grained, olive brown.	■		9/22/35	9	120	
20		-gray, tan	■		16/23/25	5	103	ds
		End of boring at 21.5 feet bgs. No groundwater encountered. Borehole backfilled with soil cuttings on 4/11/17.						

Log of Test Pit No. TP- 1

Dates Drilled: 5/6/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 621 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		Area covered by 12" gravel						
		ALLUVIUM (Qal): **SILTY SAND (SM):** fine-to coarse-grained, slightly moist, some clay, brown.	■		5/7/8	10	112	col
5		**SANDY CLAY (CL):** fine-to medium-grained, olive brown.	■		10/12/17	16	117	
10		**GRAVELLY SAND WITH SILT (SP):** fine-to coarse-grained, gravel up to 3" in maximum dimension, moist, slightly dense, brown.	■		15/12/17	4	113	
		End of test pit at 10.5 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-6-14.						

Converse Consultants

Project Name
21.22 POLOPOLUS SITE
7270 HAMNER AVENUE
EASTVALE, CALIFORNIA
FOR: WILLIAM LYON HOMES

Project No. **14-81-155-01**

Drawing No. **A-15**

Log of Test Pit No. TP- 2

Dates Drilled: 5/6/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 624 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		ALLUVIUM (Qal): **CLAYEY SAND (SC):** fine-to medium-grained, dry, olive, brown.	■		50(6")	8	122	max,ca,er ei,organics
5			■		50(6")	7	135	
		End of test pit at 5.5 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-6-14.						

Converse Consultants

Project Name
21.22 POLOPOLUS SITE
7270 HAMNER AVENUE
EASTVALE, CALIFORNIA
FOR: WILLIAM LYON HOMES

Project No. **14-81-155-01**

Drawing No. **A-16**

Log of Test Pit No. TP- 3

Dates Drilled: 5/6/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 630 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal):						
		SILTY SAND (SM): fine-to coarse-grained, some clay, some gravel up to 3" in maximum dimension, dark brown.	■	▨	6/4/5	10	116	col
		CLAYEY SAND (SC): fine-to medium-grained, dark brown.	■		50(6")	11	104	
5		**GRAVELLY SAND (SP):** fine-to coarse-grained, gravel up to 3" in maximum dimension, some cobbles up to 9" in maximum dimension, slightly dense, slightly moist, brown.	■		50(6")	8	109	
		-some clay						
10		End of test pit at 10 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-6-14.						

Converse Consultants

Project Name
21.22 POLOPOLUS SITE
7270 HAMNER AVENUE
EASTVALE, CALIFORNIA
FOR: WILLIAM LYON HOMES

Project No. **14-81-155-01**

Drawing No. **A-17**

Log of Test Pit No. TP- 4

Dates Drilled: 5/6/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 631 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
5		**ALLUVIUM (Qal):** **GRAVELLY SAND WITH SILT (SP):** fine-to coarse-grained, gravel and cobbles up to 9" in maximum dimension, brown.	■		50(6")	4	115	
		End of testpit at 5.5 ft below ground surface. Groundwater not encountered. Test Pit backfilled with loose spoils and wheel rolled on 5-6-14.						

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FOR: WILLIAM LYON HOMES

Project No. **14-81-155-01**

Drawing No. **A-18**

Log of Test Pit No. TP- 5

Dates Drilled: 5/6/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 631 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal): **SILTY SAND (SM):** fine-to coarse-grained, some clay, some gravels up to 3" in maximum dimension, dark brown.	■		12/27/50(4")	6	122	col
5					50(4")			organics
10		End of test pit at 10 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-6-14.						

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Project No. **14-81-155-01**

Drawing No. **A-19**

Log of Test Pit No. TP- 6

Dates Drilled: 5/6/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 630 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		ALLUVIUM (Qal): **SILTY SAND (SM):** fine-to coarse-grained, some clay, some gravel up to 2" in maximum dimension, dark brown.	■		50(4")	10	110	
5		**SILTY SAND (SM):** fine-to coarse-grained, some gravel up to 3" in maximum dimension, orange/brown.			50(4")			
		End of test pit at 5.3 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-6-14.						

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Project No. **14-81-155-01**

Drawing No. **A-20**

Log of Test Pit No. TP- 7

Dates Drilled: 5/6/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 620 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		Area covered by 11" asphalt over 2" base						ma,max ei,organics
		SILTY SAND (SM): fine-to coarse-grained, with clay, brown.	■		5/5/8	7	116	
5			■		7/7/8	7	113	
		End of test pit at 6.5 ft below ground surface. Groundwater not encountered. Test Pit backfilled with loose spoils and wheel rolled on 5-6-14.						

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Project No. **14-81-155-01**

Drawing No. **A-21**

Log of Test Pit No. TP- 8

Dates Drilled: 5/5/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 624 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		ALLUVIUM (Qal): **SILTY SAND (SM):** fine-to coarse-grained, gravel and cobbles up to 6" in maximum dimension, roots, brown.	■		22/25/50(6")	5	127	
5		**SAND WITH SILT (SP):** fine-to coarse-grained, gravel up to 3" in maximum dimension, dry, slightly dense, brown.	■		9/11/21	2	122	
		End of test pit at 6.5 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-5-14.						

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Project No. **14-81-155-01**

Drawing No. **A-22**

Log of Test Pit No. TP- 9

Dates Drilled: 5/5/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 625 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal): **SILTY SAND (SM):** fine-to coarse-grained, roots, some gravel up to 3" in maximum dimension, brown.						
		CLAYEY SAND (SC): fine-to coarse-grained, olive brown.	■	▨	14/15/50(1")	8	106	ma,ei organics
5		**SAND (SP):** fine-to coarse-grained, some gravel up to 1" in maximum dimension, light brown.	■		8/12/15	2	113	
		GRAVELLY SAND (SP): fine-to coarse-grained, gravel and cobbles up to 9" in maximum dimension, caving 8-9' bgs, light brown.						
		End of test pit at 9 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-5-14.						

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Project No. **14-81-155-01**

Drawing No. **A-23**

Log of Test Pit No. TP-10

Dates Drilled: 5/5/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 624 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
5		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal): **SAND (SP):** fine-to coarse-grained, few gravel up to 1" in maximum dimension, brown.						
		GRAVELLY SAND WITH SILT (SP): fine-to coarse-grained, gravel and cobbles up to 9" in maximum dimension, brown.	■		13/16/50(2")	9	117	col
		End of test pit at 8 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-5-14.						

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Project No. **14-81-155-01**

Drawing No. **A-24**

Log of Test Pit No. TP-11

Dates Drilled: 5/5/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 626 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		FILL (Af): **SILTY SAND (SM):** fine-to coarse-grained, roots, dark brown. -some clay at 2' bgs.	■		13/6/6	9	115	ei
5		-rebar found at 7' bgs.	■		6/7/8	8	122	
10		**ALLUVIUM (Qal):** **SANDY SILT (ML):** fine-to coarse-grained, light brown.	■		12/13/14	20	106	
		End of test pit at 11.5 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-5-14.						

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Project No. **14-81-155-01**

Drawing No. **A-25**

Log of Test Pit No. TP-12

Dates Drilled: 5/6/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 624 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		ALLUVIUM (Qal): **SILTY SAND (SM):** fine-to coarse-grained, gravel and cobbles up to 9" in maximum dimension, brown.	■		7/14/50(2")	4	105	max,ca, er,organics
5		-some clay	■		12/50(4")	13	103	col
		End of test pit at 5.8 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-6-14.						

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Project No.
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Drawing No.
A-26

Log of Test Pit No. TP-13

Dates Drilled: 5/6/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 605 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		FILL (Af): **SILTY SAND (SM):** fine-to coarse-grained, some gravel up to 2" in maximum dimension, wood fragments, concrete fragments, brown.	■		6/7/12	15	83	
5		**SANDY SILT (ML):** fine-to medium-grained, olive brown.						
10		**ALLUVIUM (Qal):** **SILTY SAND (SM):** fine-to coarse-grained, brown.						
		End of test pit at 11 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-6-14.						

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Project No. **14-81-155-01**

Drawing No. **A-27**

Log of Test Pit No. TP-14

Dates Drilled: 5/5/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 609 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		FILL (Af): **SILTY SAND (SM):** fine-to coarse-grained, dark brown.						
		SANDY SILT (ML): fine-to medium-grained, olive brown.	■		6/7/18	10	103	
5		**SANDY CLAY (CL):** fine-to medium-grained, olive, trash at 5' bgs.	■		6/8/8	23	90	
		-organics, green-gray color		▨				
10								
15		**ALLUVIUM (Qal):** **SILTY SAND (SM):** fine-to coarse-grained, some gravel up to 3" in maximum dimension, brown.						
		End of test pit at 15 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-5-14.						

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Project No. **14-81-155-01**

Drawing No. **A-28**

Log of Test Pit No. TP-15

Dates Drilled: 5/5/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 605 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal): **SILTY SAND (SM):** fine-to coarse-grained, brown.	■		6/8/8	8	113	
5		**CLAY (CL):** fine-to coarse-grained, brown.	■	▨	8/8/12	14	108	ma,col organics
10			■	▨	12/50(6")	27	95	
		End of test pit at 10 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-5-14.						

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Project No. **14-81-155-01**

Drawing No. **A-29**

Log of Test Pit No. TP-16

Dates Drilled: 5/5/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 613 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM (Qal): **SILTY SAND (SM):** fine-to coarse-grained, brown.						
		GRAVELLY SAND (SP): fine-to coarse-grained, gravel and cobbles up to 8" in maximum dimension.	■		7/12/15	2	123	
5		**SILTY SAND (SM):** fine-to coarse-grained, brown.	■		50(4")	12	111	
		End of test pit at 5.3 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-5-14.						

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Project No. **14-81-155-01**

Drawing No. **A-30**

Log of Test Pit No. TP-17

Dates Drilled: 5/5/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 623 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		ALLUVIUM (Qal): **SANDY CLAY (CL):** fine-to medium-grained, brown.						
		-caliche stringers 2-3.5' bgs	■		5/7/12	20	103	
5			■		5/12/50(1")	14	106	
		End of test pit at 6.1 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-5-14.						

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Project No. **14-81-155-01**

Drawing No. **A-31**

Log of Test Pit No. TP-18

Dates Drilled: 5/5/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 620 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		ALLUVIUM (Qal): **SANDY GRAVEL (GP):** fine-to coarse-grained, gravel up to 3" in maximum dimension, some cobbles up to 8" in maximum dimension, brown.	■	▨	15/21/50(1")	7	112	ma,ei organics col
5								
10		**CLAY (CL):** fine-grained, dense, brown.	■		10/21/14	28	97	
		End of test pit at 10.5 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-5-14.						

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Drawing No. **A-32**

Log of Test Pit No. TP-19

Dates Drilled: 5/5/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 620 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		ALLUVIUM (Qal): **SANDY CLAY (CL):** fine-to coarse-grained, few gravels up to 1/2" in maximum dimension, dense, brown.	■		7/18/12	14	122	
5		**SILTY SAND (SM):** fine-to coarse-grained, trace clay, gravel up to 3" in maximum dimension, brown.	■		13/15/17	9	119	
10		**CLAY (CL):** fine-grained, brown.	■		12/15/17	27	99	
		End of test pit at 10.5 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-5-14.						

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FOR: WILLIAM LYON HOMES

Project No. **14-81-155-01**

Drawing No. **A-33**

Log of Test Pit No. TP-20

Dates Drilled: 5/5/2014 Logged by: CG Checked By: SM

Equipment: Rubber Tire Backhoe, with 24" Bucket Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 611 Depth to Water (ft): Not Encountered

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	TEST
		ALLUVIUM (Qal): **SILTY SAND (SM):** fine-to coarse-grained, brown.						ma,max ei,organics
			■		4/3/3	6	117	
5								
			■		4/4/4	7	112	col
		End of test pit at 6.5 ft below ground surface. Groundwater not encountered. Test pit backfilled with loose spoils and wheel rolled on 5-5-14.						

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Project No. **14-81-155-01**

Drawing No. **A-34**

Appendix B

Laboratory Testing Program

APPENDIX B

LABORATORY TESTING PROGRAM

Tests were conducted in our geotechnical laboratory on representative soil samples for the purpose of classification and evaluation of soil relevant physical characteristics and engineering properties. The amount and selection of tests were based on the geotechnical parameters required for the evaluation of the engineering properties of the subsurface soils. Test results are presented herein and on the Logs of Borings and Test Pits in Appendix A, *Field Exploration*. The following is a summary of the various laboratory tests conducted for this project.

Moisture Content and Dry Density

Results of moisture content and dry density tests, performed on relatively undisturbed ring samples, were used to aid in the classification of the soils and to provide quantitative measure of the *in situ* dry density. Data obtained from this test provides qualitative information on strength and compressibility characteristics of site soils. For test results, see the Boring Logs and Test Pits in Appendix A, *Field Exploration*.

Expansion Index Test

Thirteen representative bulk samples were tested to evaluate the expansion potential. Six out of thirteen sample were tested during previous investigation. The tests were conducted in accordance with ASTM Standard D4829. The test results are presented in the following table.

Table No. B-1, Expansion Index Test Result

Boring No.	Depth (feet)	Soil Description	Expansion Index	Expansion Potential
BH-1	1-5	Clayey Sand (SC)	23	Low
BH-3	0-5	Silty Sand (SM)	45	Low
BH-4	5-10	Clayey Sand (SC)	43	Low
BH-6	1-5	Silty Sand (SM)	26	Low
BH-9	5-10	Silty Sand (SM)	6	Very Low
BH-12	1-5	Silty Sand (SM	3	Very Low
BH-14	1-5	Silty Sand (SM)	11	Very Low
TP-2	0-5	Clayey Sand (SC)	34	Low
TP-7	0-5	Silty Sand (SM)	6	Very Low

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Boring No.	Depth (feet)	Soil Description	Expansion Index	Expansion Potential
TP-9	3-5	Clayey Sand (SC)	44	Low
TP-11	0-5	Silty Sand (SM)	12	Low
TP-18	0-5	Silty Sand (SM)	5	Low
TP-20	0-5	Silty Sand (SM)	1	Very Low

Sand Equivalent

Four representative soil samples were tested in accordance with the ASTM D2419 test method to determine the sand equivalent. The test results are presented in the following table.

Table No. B-2, Sand Equivalent Test Results

Boring No.	Depth (feet)	Soil Description	Sand Equivalent
BH-1	1-5	Clayey Sand (SC)	10
BH-5	1-5	Silty Sand (SM)	10
BH-8	0-5	Silty Sand (SM)	18
BH-9	5-10	Silty Sand (SM)	25

R-value Test

Three representative bulk soil samples were tested for resistance value (R-value) in accordance with California Test 301. This test is designed to provide a relative measure of soil strength for use in pavement design. The test results are presented in the following table.

Table No. B-3, R-Value Test Results

Boring No.	Depth (feet)	Soil Description	R-value
BH-3	0-5	Silty Sand (SM)	30
BH-6	1-5	Silty Sand (SM)	32
BH-10	5-10	Silty Sand (SM)	34

Soil Corrosivity

Six representative soil samples were tested to determine minimum electrical resistivity, pH, and chemical content, including soluble sulfate and chloride concentrations. Two out of six samples were tested during previous investigation. The purpose of these tests

is to determine the corrosion potential of site soils when placed in contact with common construction materials. Current four tests were performed by EGLab, Inc. and rest two were performed by Schiff Associates, California. The test results are presented in the following table.

Table No. B-4, Corrosivity Test Results

Boring No.	Depth (feet)	pH	Soluble Sulfate (CT 417) (ppm)	Soluble Chlorides (CT 422) (ppm)	Saturated Resistivity (CT 643) (Ohm-cm)
BH-1	1-5	7.83	2	155	1,600
BH-6	1-5	7.79	0.8	195	1,200
BH-12	1-5	7.83	1.4	185	1,300
BH-14	1-5	7.47	0.4	245	540
TP-2	0-5	7.2	338	173	720
TP-12	0-5	7.9	52	15	3,560

Organic Content

Organic content test tests were performed during previous investigation on eight representative bulk samples in accordance with ASTM Standard D2974. The test results are presented in the following table.

Table No. B-5, Organic Content Test Results

Test Pit No.	Depth (feet)	Soil Description	Organic Content (%)
TP-2	0-5	Clayey Sand (SC)	1.9
TP-5	5-10	Silty Sand (SM)	0.3
TP-7	0-5	Silty Sand (SM)	0.8
TP-9	3-5	Clayey Sand (SC)	1.9
TP-12	0-5	Silty Sand (SM)	0.6
TP-15	5-10	Clayey Sand (SC)	1.7
TP-18	0-5	Silty Sand (SM)	0.9
TP-20	0-5	Silty Sand (SM)	1.3

Collapse Test

To evaluate the moisture sensitivity (collapse potential) of the encountered soils, sixteen representative ring samples were loaded to approximately 2 kips, allowed to stabilize

under load, and then submerged. Eight out of sixteen tests were performed during previous investigation. The test was performed in accordance with ASTM Standard D5333. The test results are presented in the following table.

Table No. B-6, Summary of Collapse Test Results

Boring No.	Depth (feet)	Soil Description	Percent Collapse (-) Swell (+)
BH-1*	10.0-11.5	Sandy Clay (CL)	-0.7
BH-3	2.5-4.0	Silty Sand (SM)	-0.2
BH-5	5.0-6.5	Silty Sand (SM)	-2.7
BH-5*	15.0-16.5	Silty Sand (SM)	-3.2
BH-6	2.5-4.0	Silty Sand (SM)	-0.3
BH-8	2.5-4.0	Silty Sand (SM)	-1.5
BH-11	5.0-6.5	Silty Sand (SM)	-2.3
BH-11	7.0-8.5	Silty Sand (SM)	-4.8
BH-14	2.5-4.0	Silty Sand (SC)	-2.8
BH-14	5.0-6.5	Silty Sand (SC)	-2.4
TP-1	2.0-3.5	Silty Sand (SM)	-1.1
TP-3	2.0-3.5	Clayey Sand (SC)	-2.7
TP-5	3.0-4.5	Gravelly Sand (SP)	-0.1
TP-10	2.0-3.5	Gravelly Sand (SP)	-0.6
TP-12	5.0-6.0	Silty Sand (SM)	-0.1
TP-15	5.0-6.5	Clayey Sand (SC)	0.0
TP-18	3.0-4.1	Silty Sand (SM)	-1.6
TP-20	5.0-6.5	Silty Sand (SM)	-2.6

(* Results from consolidation tests)

Grain Size Distribution

To aid in classification of the soils, twelve (12) mechanical grain-size analysis tests were performed on representative samples. Six out of twelve tests were performed during previous investigation. Tests were performed in accordance with the ASTM Standard D422 test method. For the test results, see Drawing No. B-1a, B-1b, B-1c and B-1d *Grain Size Distribution Results*.

Maximum Dry Density and Optimum-Moisture Relationship Test

Laboratory maximum dry density-moisture content relationship tests were performed on eight representative bulk samples. Five out of nine sample were tested during previous investigation. These tests were conducted in accordance with ASTM Standard D1557 test method. The test results are presented on Drawing No. B-2a and B-2b, *Moisture-Density Relationship Results*, and in the following table.

Table No. B-7, Laboratory Maximum Density Test Results

Borings No	Depth (feet)	Soil Classification	Maximum Dry Density (pcf)	Optimum Moisture (%)
BH-4	5-10	Clayey Sand (SC)	135.0	4.9
BH-9	5-10	Silty Sand (SM)	127.5	8.5
BH-11	1-5	Clayey Sand (SC)	127.6	8.6
TP-2	0-5	Clayey Sand (SC)	129.0	10.0
TP-7	0-5	Silty Sand (SM)	131.5	8.5
TP-12	0-5	Silty Sand (SM)	122.5	9.0
*TP-12	0-5	Silty Sand (SM)	125.9	8.1
TP-20	0-5	Silty Sand (SM)	131.0	7.0

* = with 10% Rock Correction

Direct Shear Test

Direct shear tests were performed on 3 representative samples under a soaked moisture condition. For each test, 3 samples contained in brass sampler rings was placed, one at a time, directly into the test apparatus and subjected to a range of normal loads appropriate for the anticipated conditions. Each sample was then sheared at a constant strain rate of 0.01 inch/minute. Shear deformation was recorded until a maximum of about 0.25-inch shear displacement was achieved. Peak strength was selected from the shear-stress vs. deformation data and plotted to determine the shear strength parameters. The test results are summarized in the following table and presented in Drawings No. B-3 through B-5, *Direct Shear Test Results.*

Table No. B-8, Summary of Direct Shear Test Results

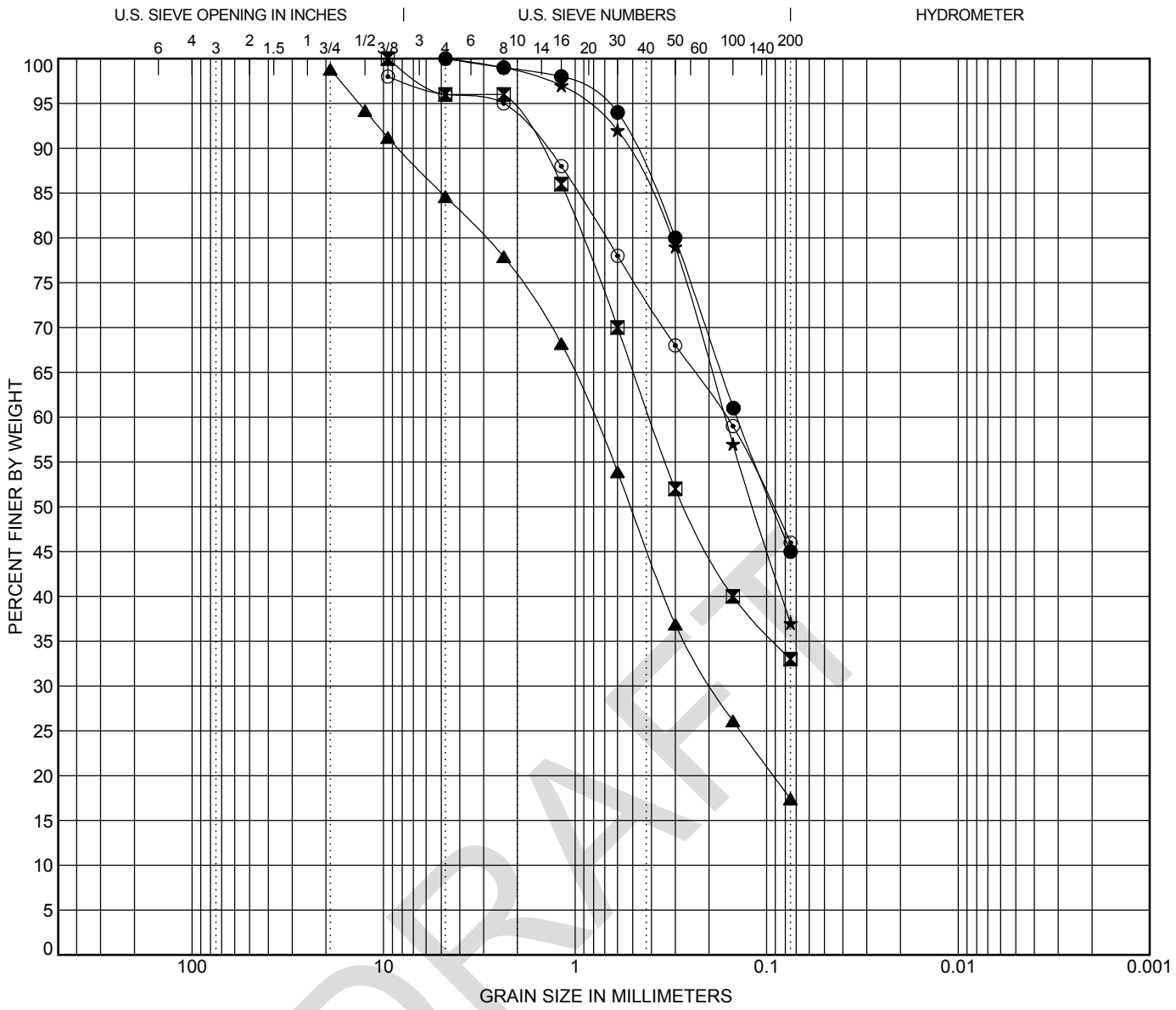
Boring No.	Depth (feet)	Natural/ Remolded	Soil Description	Average Initial Moisture Content (%)	Average Initial Dry Density (pcf)	Effective Cohesion (psf)	Effective Friction Angle (degrees)
BH-1	2.5-4.0	Natural	Clayey Sand (SC)	14.7	111.2	250	31
BH-6	7.5-9.0	Natural	Sand (SP)	29.5	95.9	220	27
BH-8	7.5-9.0	Natural	Silty Sand (SM)	29.5	87.2	30	35

Consolidation Test

Data obtained from this test performed on a relatively undisturbed ring sample was used to evaluate the settlement characteristics of the on-site soils under load. Preparation for this test involved trimming the sample, placing it in a one-inch-high brass ring, and loading it into the test apparatus, which contained porous stones to accommodate drainage during testing. Normal axial loads were applied to one end of the sample through the porous stones, and the resulting deflections were recorded at various time periods. The load was increased after the sample reached a reasonable state of equilibrium. Normal loads were applied at a constant load-increment ratio, successive loads being generally twice the preceding load. For test results, including sample density and moisture content, see Drawing No. B-6 through B-8, *Consolidation Test Results*.

Sample Storage

Soil samples presently stored in our laboratory will be discarded 30 days after the date of this report, unless this office receives a specific request to retain the samples for a longer period of time.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring No.	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	**BH-04**	**5-10**	**Clayey SAND (SC)**					
⊠	**BH-06**	**1-5**	**Silty SAND (SM)**					
▲	**BH-09**	**5-10**	**Silty SAND (SM)**					
★	**BH-11**	**1-5**	**Clayey SAND (SC)**					
⊙	**BH-14**	**1-5**	**Silty SAND (SM)**					

	Boring No.	Depth (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH-04**	**5-10**	**4.75**	**0.143**			**0.0**	**55.0**	**45.0**	
⊠	**BH-06**	**1-5**	**9.5**	**0.408**			**4.0**	**63.0**	**33.0**	
▲	**BH-09**	**5-10**	**19**	**0.801**	**0.193**		**14.2**	**67.2**	**17.4**	
★	**BH-11**	**1-5**	**4.75**	**0.165**			**0.0**	**63.0**	**37.0**	
⊙	**BH-14**	**1-5**	**9.5**	**0.162**			**2.0**	**50.0**	**46.0**	

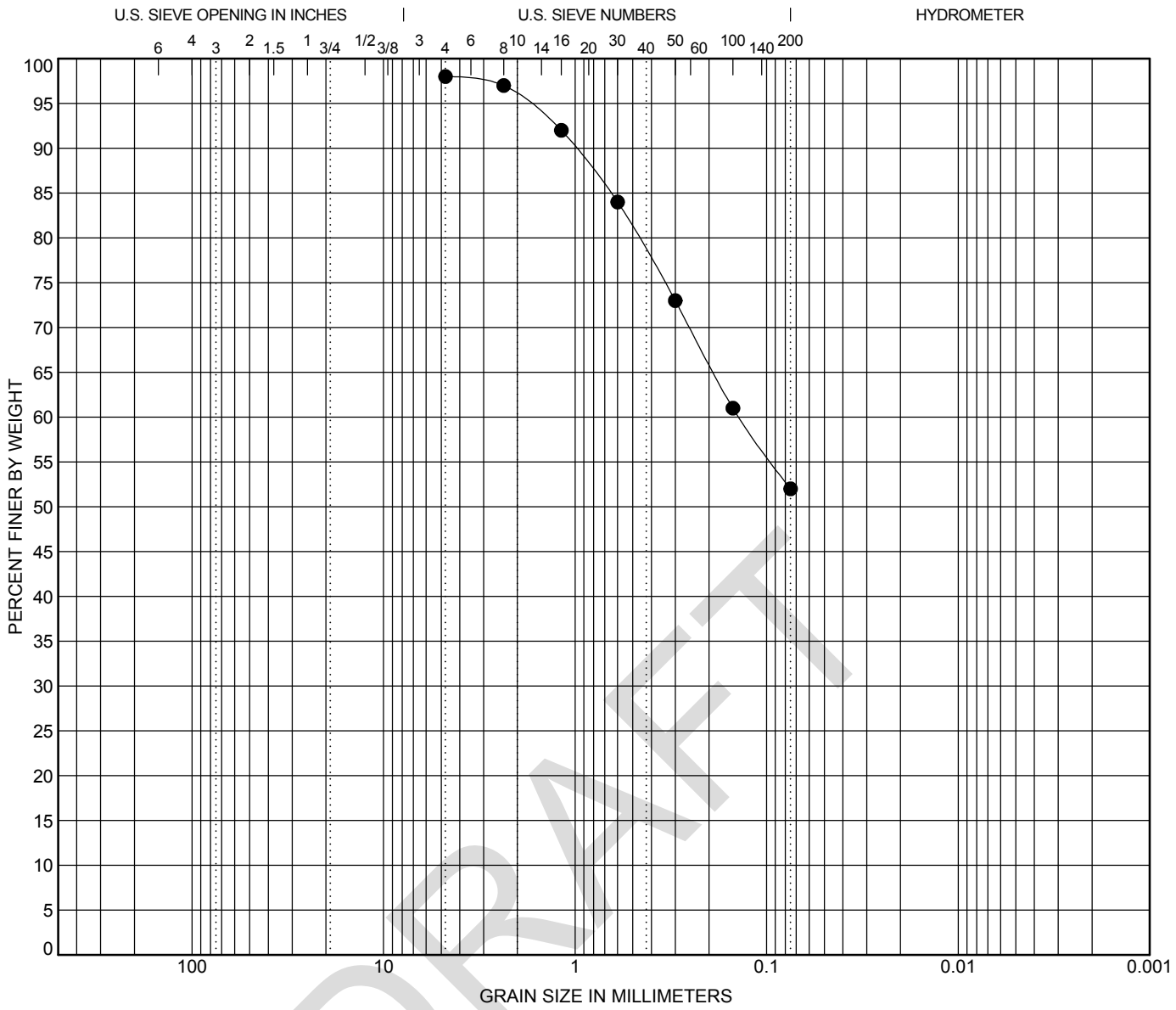
GRAIN SIZE DISTRIBUTION RESULTS

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. **14-81-155-02**

Drawing No. **B-1a**



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring No.	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	**BH-15**	**5-10**	**Sandy CLAY (CL)**					

	Boring No.	Depth (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH-15**	**5-10**	**4.75**	**0.139**			**0.0**	**46.0**	**52.0**	

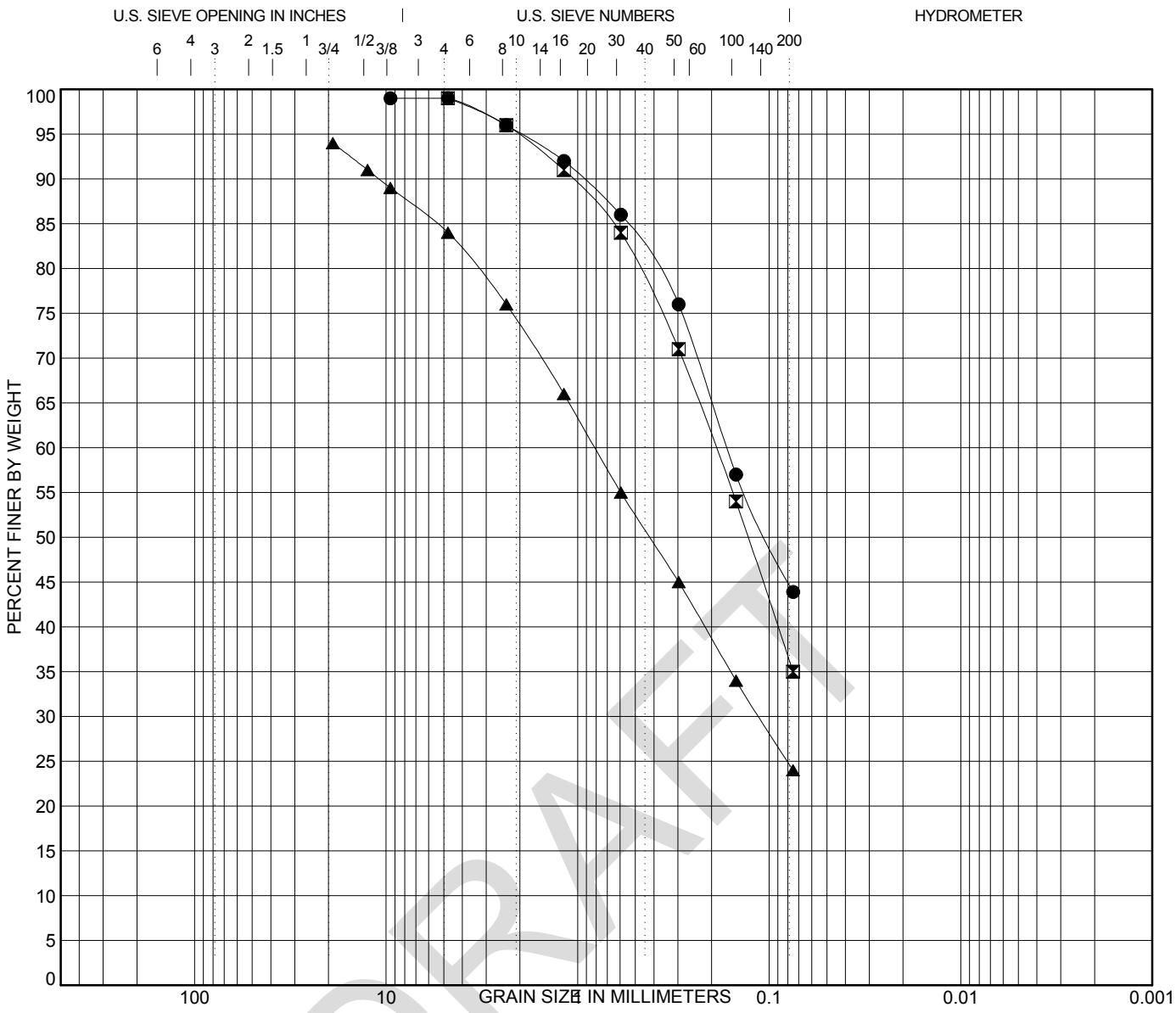
GRAIN SIZE DISTRIBUTION RESULTS

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. **14-81-155-02**

Drawing No. **B-1b**



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring No.	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	TP- 3	0-3	SILTY SAND (SM)					
⊠	TP- 7	0-5	SILTY SAND (SM)					
▲	TP- 9	3-5	CLAYEY SAND (SC)					

	Boring No.	Depth (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP- 3	0-3	9.5	0.166			0.0	55.1	43.9	
⊠	TP- 7	0-5	4.75	0.19			0.0	64.0	35.0	
▲	TP- 9	3-5	19	0.812	0.113		10.0	60.0	24.0	

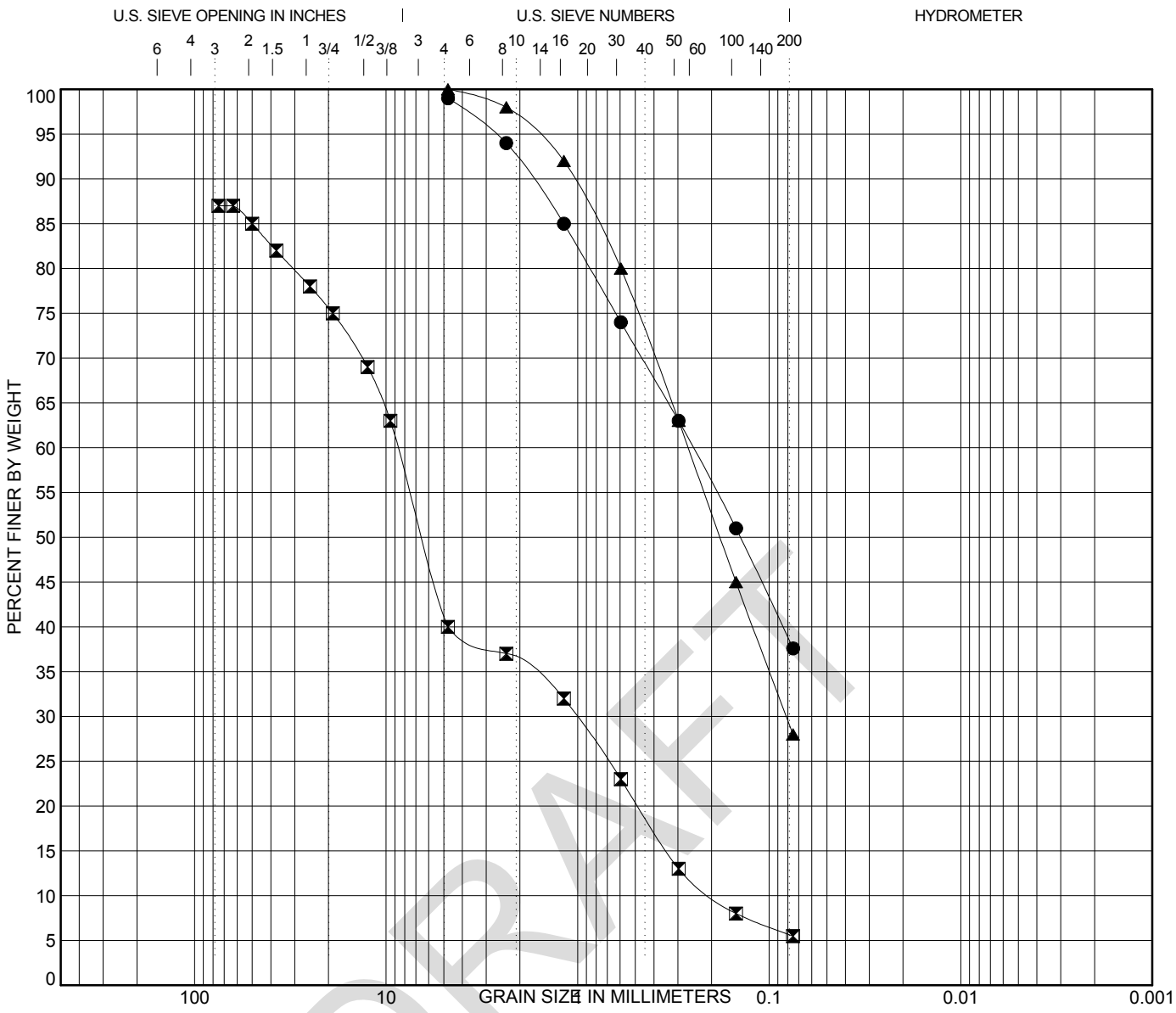
GRAIN SIZE DISTRIBUTION RESULTS

Converse Consultants

Project Name
21.22 POLOPOLUS SITE
7270 HAMNER AVENUE
EASTVALE, CALIFORNIA
FOR: WILLIAM LYON HOMES

Project No. **14-81-155-01**

Drawing No. **B-1c**



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring No.	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	**TP-15**	**5-10**	**CLAYEY SAND (SC)**					
⊠	**TP-18**	**0-5**	**SANDY GRAVEL (GP)**				**0.60**	**44.20**
▲	**TP-20**	**0-5**	**SILTY SAND (SM)**					

	Boring No.	Depth (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-15**	**5-10**	**4.75**	**0.25**			**0.0**	**61.4**	**37.6**	
⊠	**TP-18**	**0-5**	**75**	**8.679**	**1.013**	**0.196**	**47.0**	**34.5**	**5.5**	
▲	**TP-20**	**0-5**	**4.75**	**0.265**	**0.081**		**0.0**	**72.0**	**28.0**	

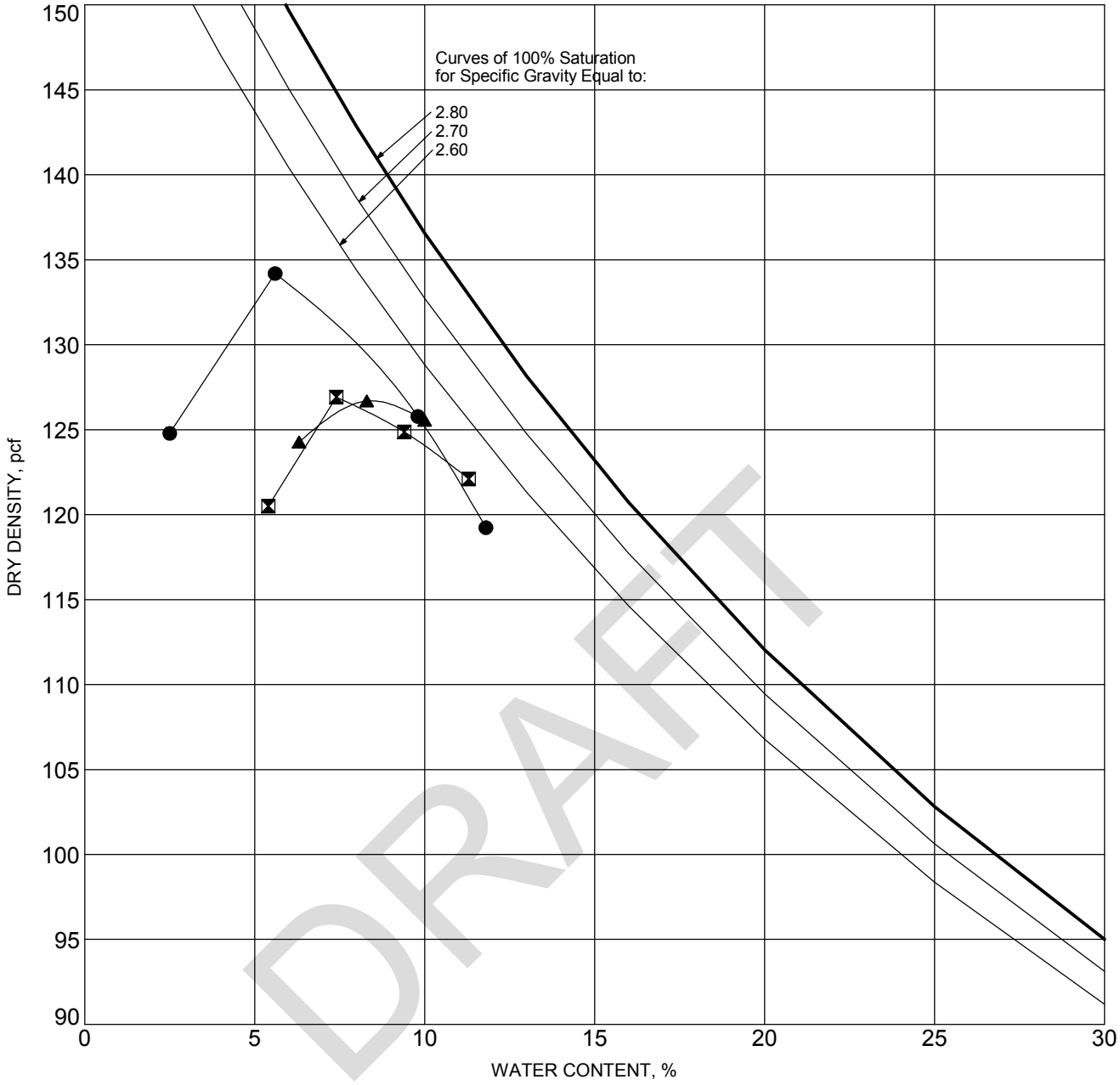
GRAIN SIZE DISTRIBUTION RESULTS

Converse Consultants

Project Name
21.22 POLOPOLUS SITE
7270 HAMNER AVENUE
EASTVALE, CALIFORNIA
FOR: WILLIAM LYON HOMES

Project No. **14-81-155-01**

Drawing No. **B-1d**



SYMBOL	BORING NO.	DEPTH (ft)	DESCRIPTION	ASTM TEST METHOD	OPTIMUM WATER, %	MAXIMUM DRY DENSITY, pcf
●	**BH-04**	**5-10**	**Clayey SAND (SC)**	**D1557 Method A**	**4.9**	**135**
⊠	**BH-09**	**5-10**	**Silty SAND (SM)**	**D1557 Method A**	**8.5**	**127.5**
▲	**BH-11**	**7-12**	**Silty SAND (SM)**	**D1557 Method A**	**8.6**	**127.6**

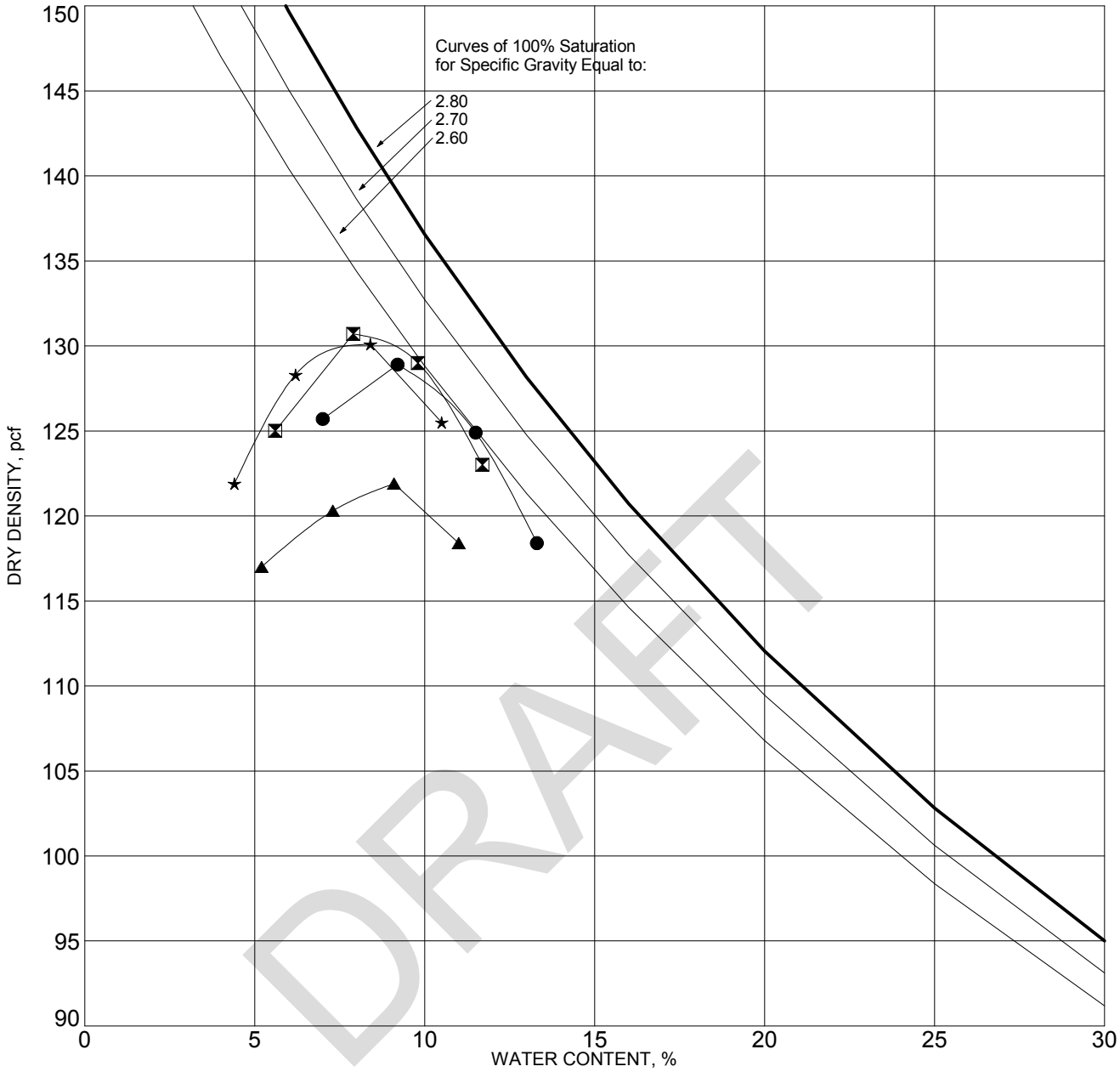
MOISTURE-DENSITY RELATIONSHIP RESULTS

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. **14-81-155-02**

Drawing No. **B-2a**



SYMBOL	BORING NO.	DEPTH (ft)	DESCRIPTION	ASTM TEST METHOD	OPTIMUM WATER, %	MAXIMUM DRY DENSITY, pcf
●	TP- 2	0-5	CLAYEY SAND (SC) - Reddish Brown	D1557 Method B	10	129
⊠	TP- 7	0-5	SILTY SAND (SM) - Olive Brown	D1557 Method B	8.5	131.5
▲	TP-12	0-5	SILTY SAND (SM) - Yellow Brown	D1557 Method B	9	122.5
★	TP-20	0-5	SILTY SAND (SM) - Dark Brown	D1557 Method B	7.5	131

NOTE:

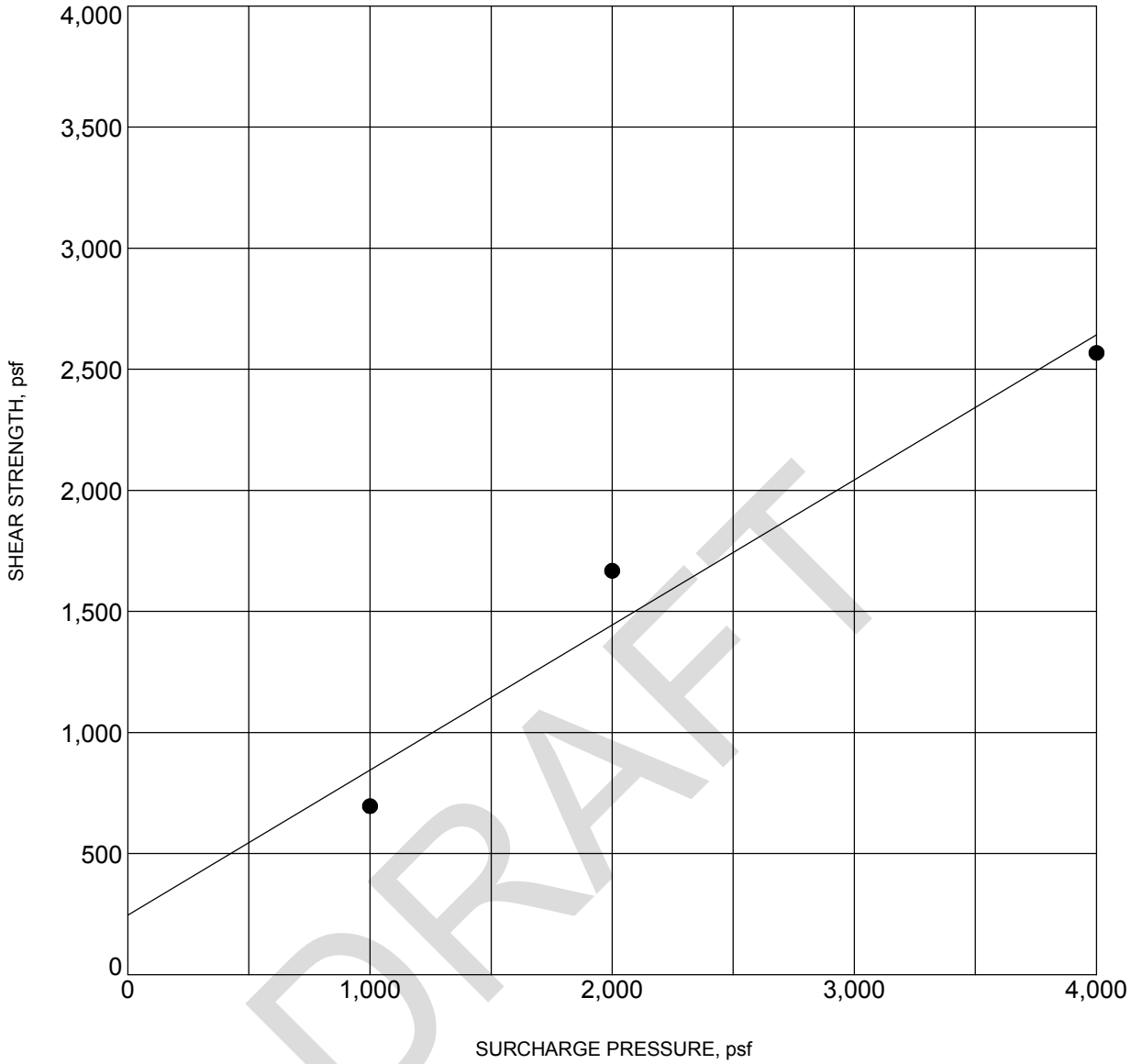
MOISTURE-DENSITY RELATIONSHIP RESULTS

Converse Consultants

Project Name
21.22 POLOPOLUS SITE
7270 HAMNER AVENUE
EASTVALE, CALIFORNIA
FOR: WILLIAM LYON HOMES

Project No.
14-81-155-01

Drawing No.
B-2b



BORING NO.	:	**BH-01**	DEPTH (ft)	:	**2.5-4.0**
DESCRIPTION	:	**Clayey SAND (SC)**			
COHESION (psf)	:	**250**	FRICTION ANGLE (degrees):		**31**
MOISTURE CONTENT (%)	:	**14.7**	DRY DENSITY (pcf)	:	**111.2**

NOTE: Ultimate Strength.

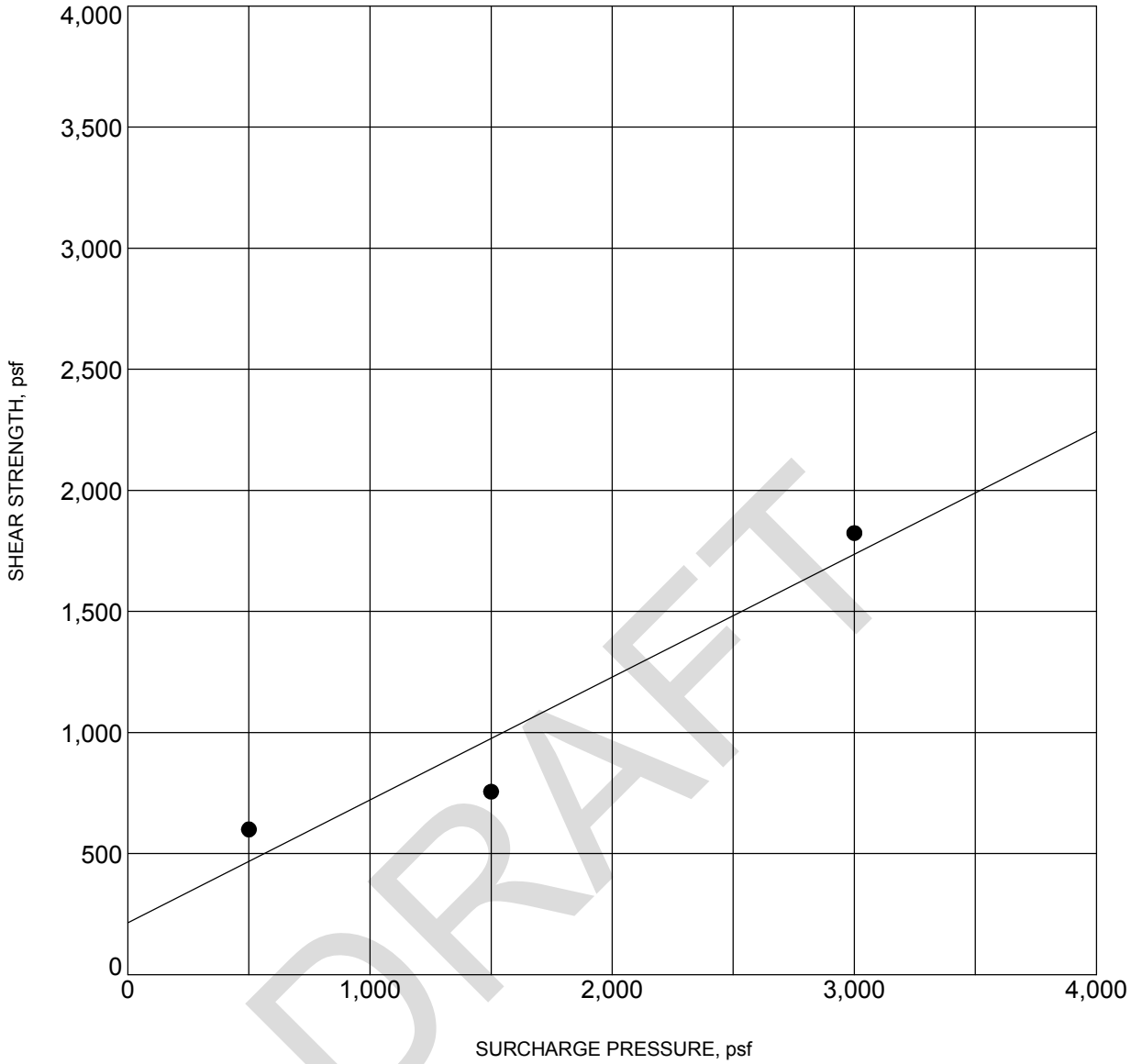
DIRECT SHEAR TEST RESULTS

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. **14-81-155-02**

Drawing No. **B-3**



BORING NO.	:	**BH-06**	DEPTH (ft)	:	**7.5-9.0**
DESCRIPTION	:	**Silty SAND (SM)**			
COHESION (psf)	:	**220**	FRICTION ANGLE (degrees):		**27**
MOISTURE CONTENT (%)	:	**3.2**	DRY DENSITY (pcf)	:	**112.4**

NOTE: Ultimate Strength.

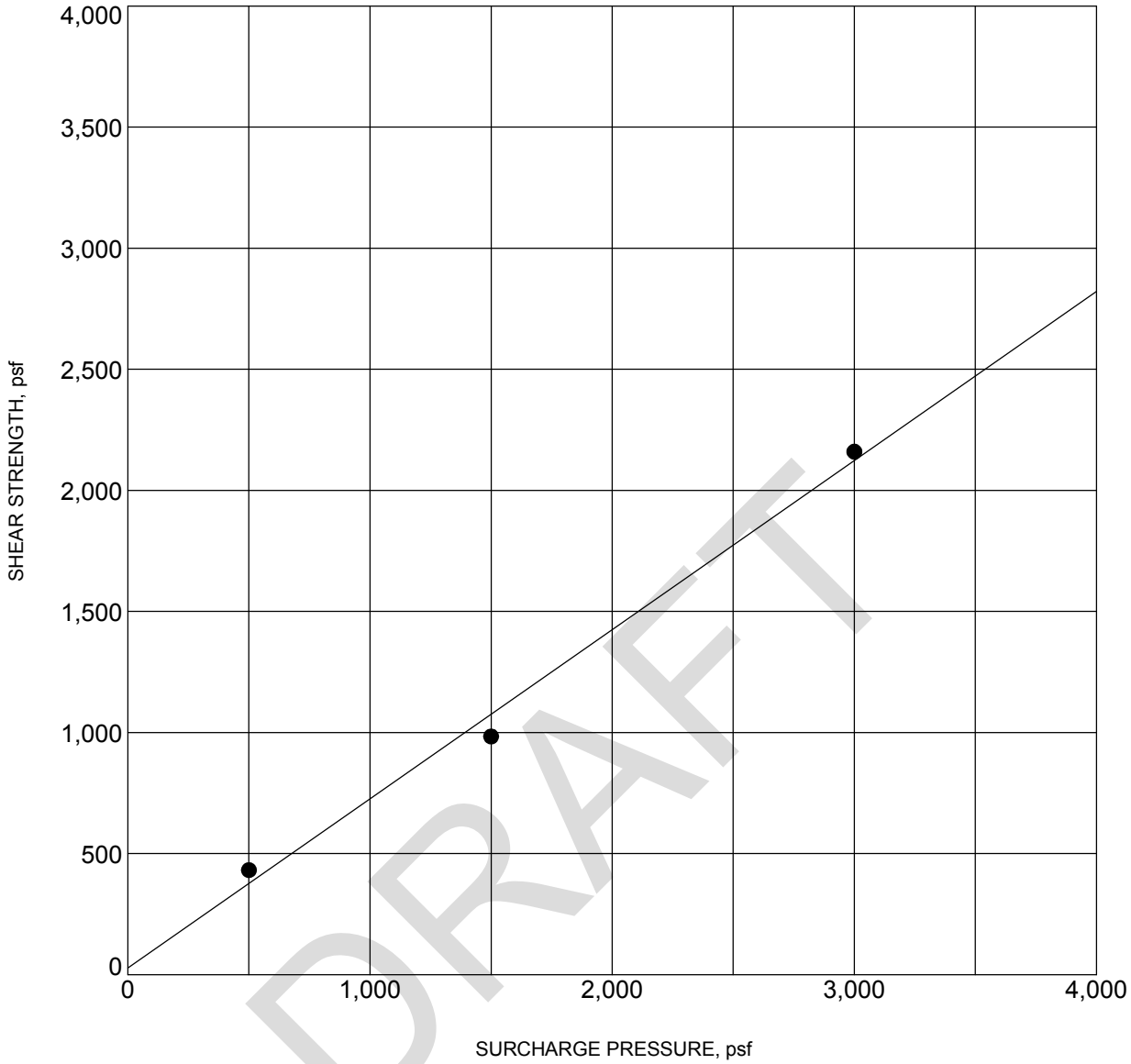
DIRECT SHEAR TEST RESULTS

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. **14-81-155-02**

Drawing No. **B-4**



BORING NO.	:	**BH-08**	DEPTH (ft)	:	**7.5-9.0**
DESCRIPTION	:	**SAND (SP)**			
COHESION (psf)	:	**30**	FRICTION ANGLE (degrees):		**35**
MOISTURE CONTENT (%)	:	**3.2**	DRY DENSITY (pcf)	:	**112.4**

NOTE: Ultimate Strength.

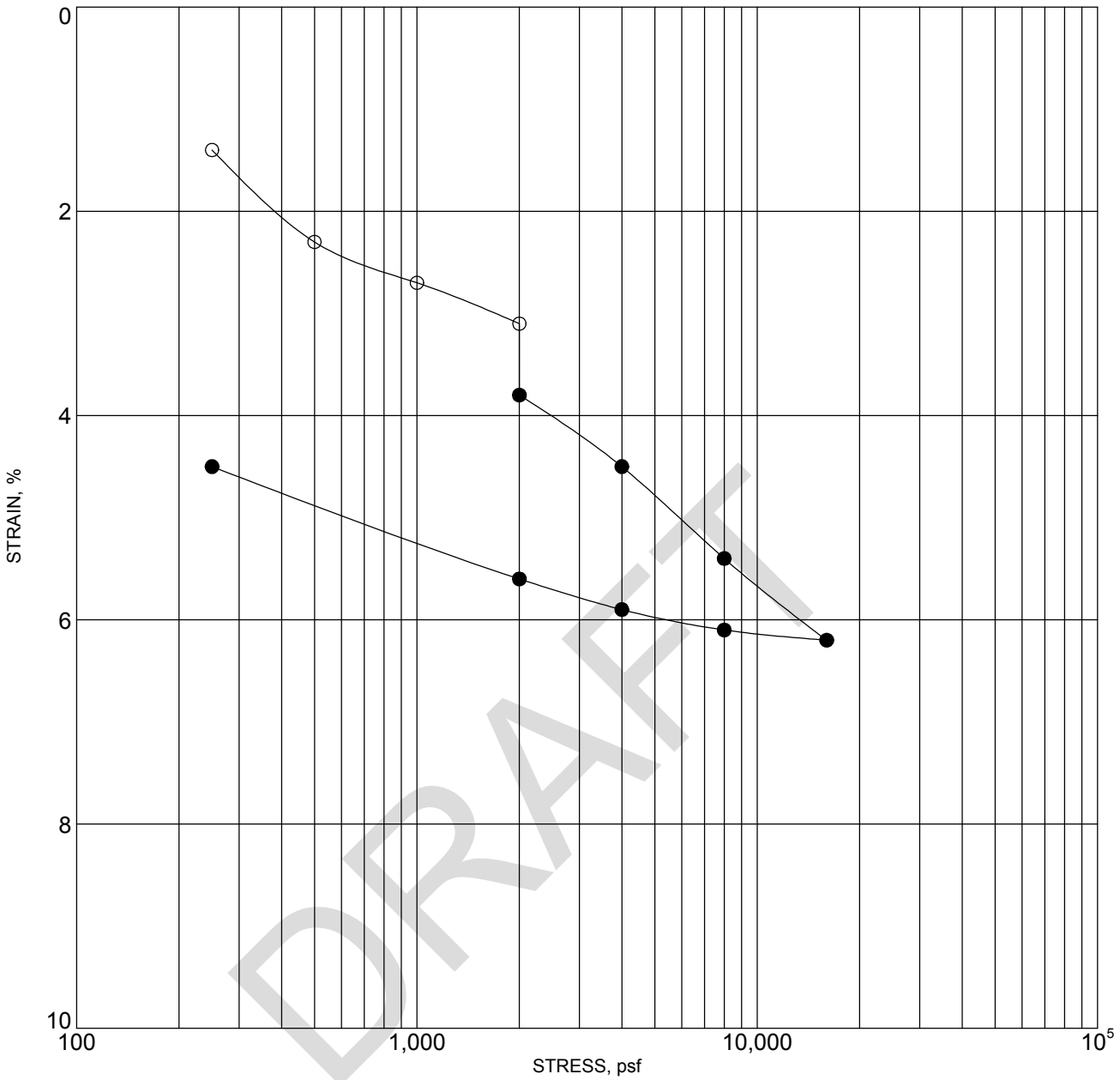
DIRECT SHEAR TEST RESULTS

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. **14-81-155-02**

Drawing No. **B-5**



BORING NO. :	**BH-01**	DEPTH (ft) :	**10-11.5**
DESCRIPTION :	**Sandy CLAY (CL)**		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	**9.0**	**125.2**	**74**	**0.32**
FINAL	**12.9**	**130.8**	**100**	**0.26**

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

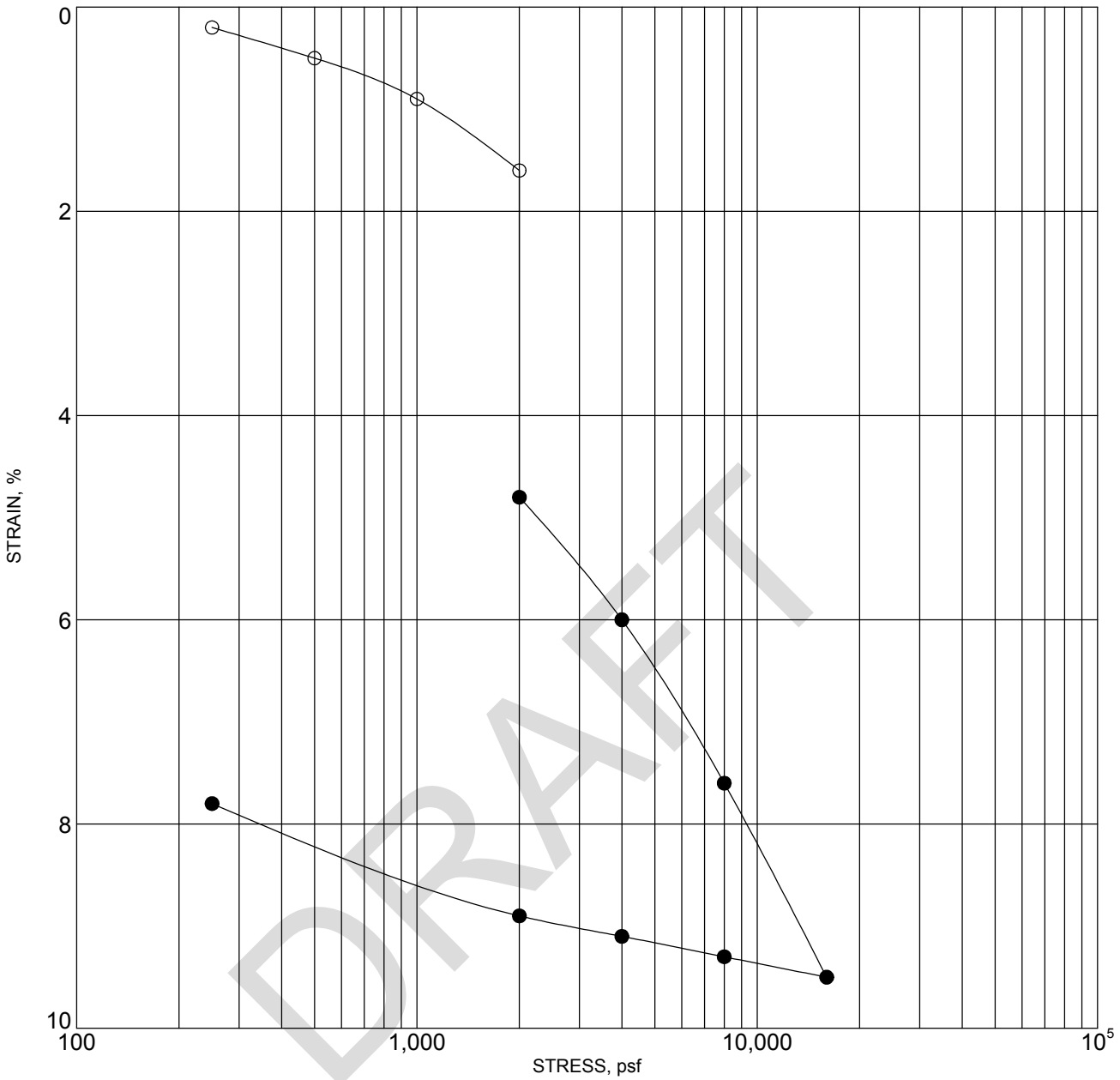
CONSOLIDATION TEST RESULTS

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. **14-81-155-02**

Drawing No. **B-6**



BORING NO. :	**BH-05**	DEPTH (ft) :	**15-16.5**
DESCRIPTION :	**Silty SAND (SM)**		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	**7.0**	**113.4**	**40**	**0.46**
FINAL	**12.4**	**122.2**	**100**	**0.35**

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

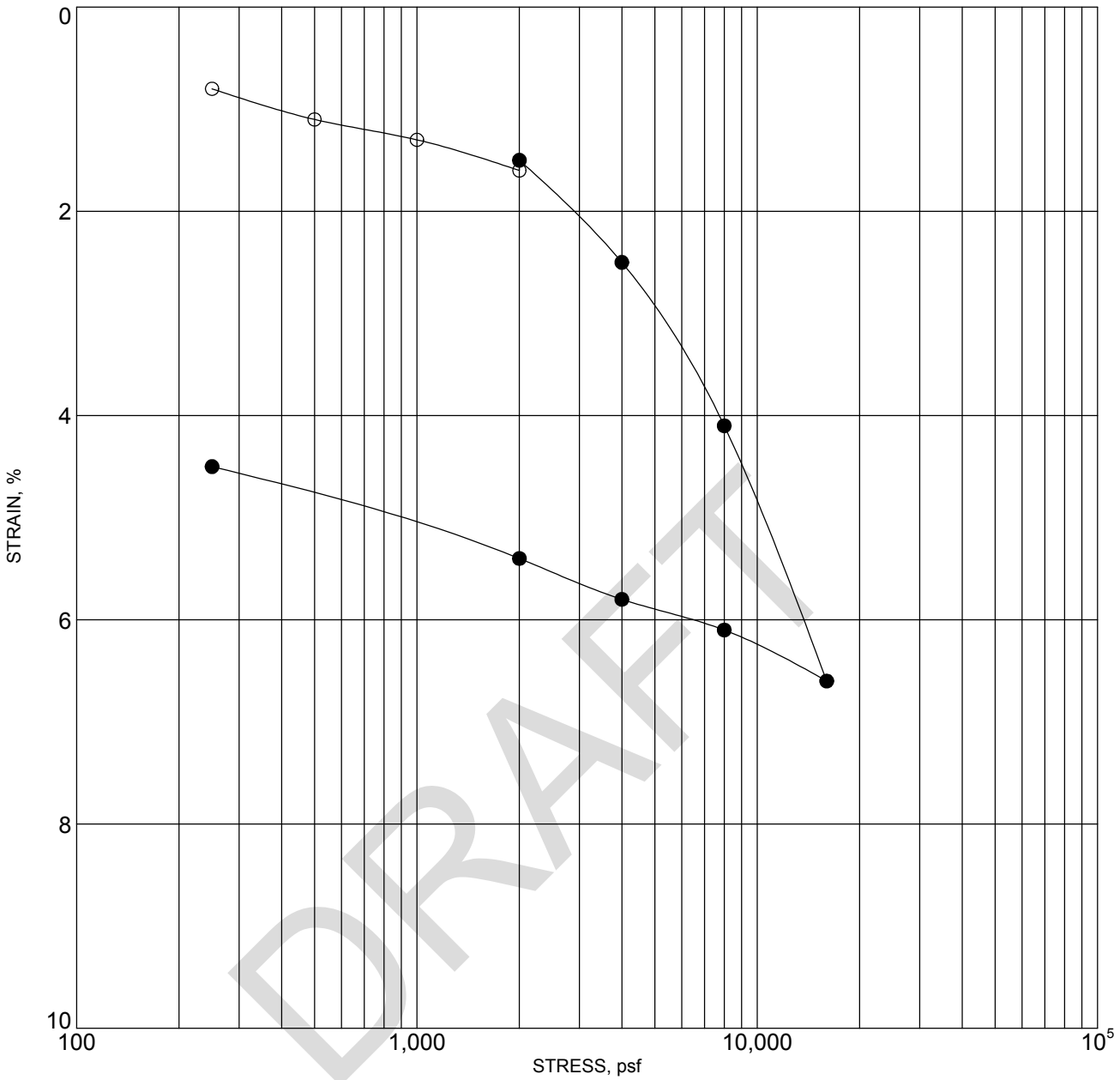
CONSOLIDATION TEST RESULTS

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. **14-81-155-02**

Drawing No. **B-7**



BORING NO. :	**BH-14**	DEPTH (ft) :	**5.0-6.5**
DESCRIPTION :	**Silty SAND (SM)**		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	**11.6**	**119.4**	**79**	**0.38**
FINAL	**16.2**	**124.8**	**100**	**0.33**

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

CONSOLIDATION TEST RESULTS

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Center

Project No. **14-81-155-02**

Drawing No. **B-8**

Appendix C

Infiltration Testing

APPENDIX C

INFILTRATION TESTING

Percolation testing was performed at six locations in general accordance with Riverside County guidelines (RCFCWCD, 2011), which allow use of a percolation testing method to estimate infiltration rates. Six percolation tests (PT-1 through PT-6) were performed at locations selected by Albert A. Webb Associates to correspond to the anticipated underground infiltration basin structures. Approximate locations of the percolation tests are shown in Figure No. 2, *Soil Boring and Test Pit Location Map.*

The test holes were drilled on April 13, 2016 to depths ranging from approximately 10.5 to 17.7 feet bgs using a truck-mounted drill rig equipped with eight-inch diameter hollow-stem augers. The depths of the test holes corresponded to proposed depths of infiltration. The native soils encountered were mixtures of silt, sand, and clay. These materials were similar to the materials encountered in the exploratory soil borings discussed in Appendix A, *Field Exploration*.

Upon completion of drilling, a 2-inch thick gravel layer was placed at the bottom of the each hole and a 2-inch diameter perforated pipe was installed above the gravel to the ground surface. The boring annulus around the pipe was filled with gravel to a depth approximately 4 feet below ground surface. The purpose of the pipe and gravel was to reduce the potential for erosion and caving due to the addition of water to the holes. The test holes were presoaked according to the Riverside County guidelines based on whether or not they qualified for the sandy test method.

Percolation testing was conducted between April 16 and April 18, 2017. During testing, the water level and total depth in the test holes were measured from the top of the pipe every 10 minutes for 1 hour for sandy soils or every 30 minutes for a minimum of six hours for non-sandy holes. After each measurement, the water level was adjusted if necessary. Following the completion of percolation testing, the percolation test holes were loosely backfilled with excavated soil.

Percolation rates describe the movement of water horizontally and downward into the soil from a boring or pit. Infiltration rates describe the downward movement of water through a horizontal surface, such as the floor of a retention basin. Percolation rates are related to infiltration rates, but are generally higher and require conversion before use in design. The percolation test data was used to estimate infiltration rates using the Porchet Inverse Borehole Method, in accordance with RCFCWCD guidelines. A conversion factor derived from California Test 750 (Caltrans, 1986) was applied to adjust for the presence of the gravel and pipe within the borehole. The RCFCWCD minimum required factor of safety of 3 was applied to the recommended infiltration rates to account for subsurface variations, uncertainty in the test method, and future siltation. If infiltration structures are included in

the site design, the infiltration structure designer should determine whether additional design-related safety factors are appropriate.

The measured percolation test data and calculations for conversion to infiltration rates, porosity correction, and factor of safety are shown on the following *Estimated Infiltration Rate from Percolation Test Data* sheets and *Infiltration Rate versus Time* graphs. The recommended design infiltration rate at each test hole is presented in the following table.

Table No. C-1, Recommended Design Infiltration Rates

Percolation Test Hole	Design Infiltration Rate (inches/hour)
PT-1	0.02
PT-2	0.47
PT-3	0.23
PT-4	0.06
PT-5	0.04
PT-6	0.38

Based on a requirement provided by Albert A. Webb Associates of a minimum infiltration rate of 0.83 inches per hour, the project site does not appear to be suitable for infiltration of stormwater at the depths tested. Recommendations for infiltration structures are provided in Section No. 12.13, *Infiltration Structure Design*.

Log of Boring No. PT-1

Dates Drilled: 4/13/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 623 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, olive brown.						
5		**CLAYEY SAND (SC):** fine to coarse-grained, olive gray.						
10		-reddish brown						
		End of pits at 12 feet bgs. No groundwater encountered. Borehole setup for infiltration testing and presoaked on 4/11317.						

Converse Consultants

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Centers

Project No. 14-81-155-02

Drawing No. C-1

Log of Boring No. PT-2

Dates Drilled: 4/13/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 622 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM **SILTY SAND (SM):** fine to medium-grained, trace clay olive brown.						
5		-red brown						
		-no clay, -light reddish brown						
10								
		End of pits at 12.4 feet bgs. No groundwater encountered. Borehole setup for infiltration testing and presoaked on 4/11317.						

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Centers

Converse Consultants

Project No. 14-81-155-02

Drawing No. C-2

Log of Boring No. PT-3

Dates Drilled: 4/13/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 628 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM						
		CLAYEY SAND (SC): fine to medium-grained, reddish-brown.						
5								
		SILTY SAND (SM): fine to coarse-grained, reddish-brown.						
10								
15		**CLAYEY SAND (SC):** fine to coarse-grained, reddish-brown.						
		End of pits at 17.5 feet bgs. No groundwater encountered. Borehole setup for infiltration and presoaked on 4/13/17.						

Log of Boring No. PT-4

Dates Drilled: 4/13/2017 Logged by: Jay Brunham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 629 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM						
		SILTY SAND (SM): fine to medium-grained, red.						
5		-fine to coarse grained, -trace of clay, reddish-brown						
10								
15		**CLAYEY SAND (SC):** fine to coarse-grained, scattered gravel to 1" inch in largest dimension,.						
		End of pits at 17.7 feet bgs. No groundwater encountered. Borehole setup for percolation test on 4/13/17.						

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Centers

Converse Consultants

Project No. 14-81-155-02

Drawing No. C-4

Log of Boring No. PT-5

Dates Drilled: 4/13/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 619 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM						
		CLAYEY SAND (SC): fine to coarse-grained, olive brown.						
5								
10		-dark reddish brown						
		End of pits at 10.5 feet bgs. No groundwater encountered. Borehole setup for percolation test on 4/13/17.						

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Centers

Converse Consultants

Project No. 14-81-155-02

Drawing No. C-5

Log of Boring No. PT-6

Dates Drilled: 4/13/2017 Logged by: Jay Burnham Checked By: Scot Mathis

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 624 Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		ALLUVIUM **SILTY SAND (SM):** fine to coarse-grained, reddish-brown.						
5		**CLAYEY SAND (SC):** fine to coarse-grained, reddish-brown.						
10								
15		End of pits at 16.2 feet bgs. No groundwater encountered. Borehole setup for percolation test on 4/13/17.						

21.22-Acre Polopolus Site Proposed Commercial Development
7270 Hamner Avenue
For: Lewis Retail Centers

Converse Consultants

Project No. 14-81-155-02

Drawing No. C-6

Estimated Infiltration Rate from Percolation Test Data

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-1
Personnel	Jay Burnham
Presoak Date	4/16/2017
Test Date	4/17/2017

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	4
Total Depth of Test hole, D_T (inches)	140
Inside Diameter of Pipe, I (inches)	2.00
Outside Diameter of Pipe, O (inches)	2.21
Porosity of Gravel, n	0.48
Porosity Correction Factor, C	0.51
Factor of Safety (FOS), F	3

Interval No.	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, D_f (inches)	Elapsed Time (min)	Initial Height of Water, H_0 (inches)	Final Height of Water, H_f (inches)	Change in Height of Water, ΔH (inches)	Average Head Height, H_{avg} (inches)	Infiltration Rate, I_t (inches/hr)	Corrected Infiltration Rate, I_c (inches/hr)	Infiltration Rate with FOS, I_f (inches/hr)
1	30.00	52.00	56.50	30.00	88.00	83.50	4.50	85.75	0.21	0.10	0.03
2	30.00	52.00	56.50	60.00	88.00	83.50	4.50	85.75	0.21	0.10	0.03
3	30.00	52.00	56.00	90.00	88.00	84.00	4.00	86.00	0.18	0.09	0.03
4	30.00	54.00	57.50	120.00	86.00	82.50	3.50	84.25	0.16	0.08	0.03
5	30.00	55.50	58.00	150.00	84.50	82.00	2.50	83.25	0.12	0.06	0.02
6	30.00	56.00	58.25	180.00	84.00	81.75	2.25	82.88	0.11	0.05	0.02
7	30.00	56.25	58.50	210.00	83.75	81.50	2.25	82.63	0.11	0.05	0.02
8	30.00	56.50	58.63	240.00	83.50	81.38	2.13	82.44	0.10	0.05	0.02
9	30.00	52.00	54.25	270.00	88.00	85.75	2.25	86.88	0.10	0.05	0.02
10	30.00	52.25	54.50	300.00	87.75	85.50	2.25	86.63	0.10	0.05	0.02
11	30.00	52.50	54.75	330.00	87.50	85.25	2.25	86.38	0.10	0.05	0.02
12	30.00	52.75	55.00	360.00	87.25	85.00	2.25	86.13	0.10	0.05	0.02

Recommended Design Infiltration Rate (inches/hr)	**0.02**

Infiltration calculations are based on the Porchet Inverse Borehole Method presented in Santa Ana Regional Water Quality Control Board Technical Guidance Document, Appendix VII, Example VII.1.

$H_0 = D_T - D_0$

$H_f = D_T - D_f$

$\Delta H = H_0 - H_f$

$H_{avg} = (H_0 + H_f) / 2$

$I_t = (\Delta H * (60 * r)) / (\Delta t * (r + (2 * H_{avg}))$

Porosity conversion calculations are based on the method provided in Caltrans California Test 750.

$C = n * (1 - (O / (2 * r))^2) + (I / (2 * r))^2$

$I_c = I_t * C$

$I_f = I_C * F$

Plate No.
C-7

Infiltration Rate versus Time

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-1
Personnel	Jay Burnham
Presoak Date	4/16/2017
Test Date	4/17/2017

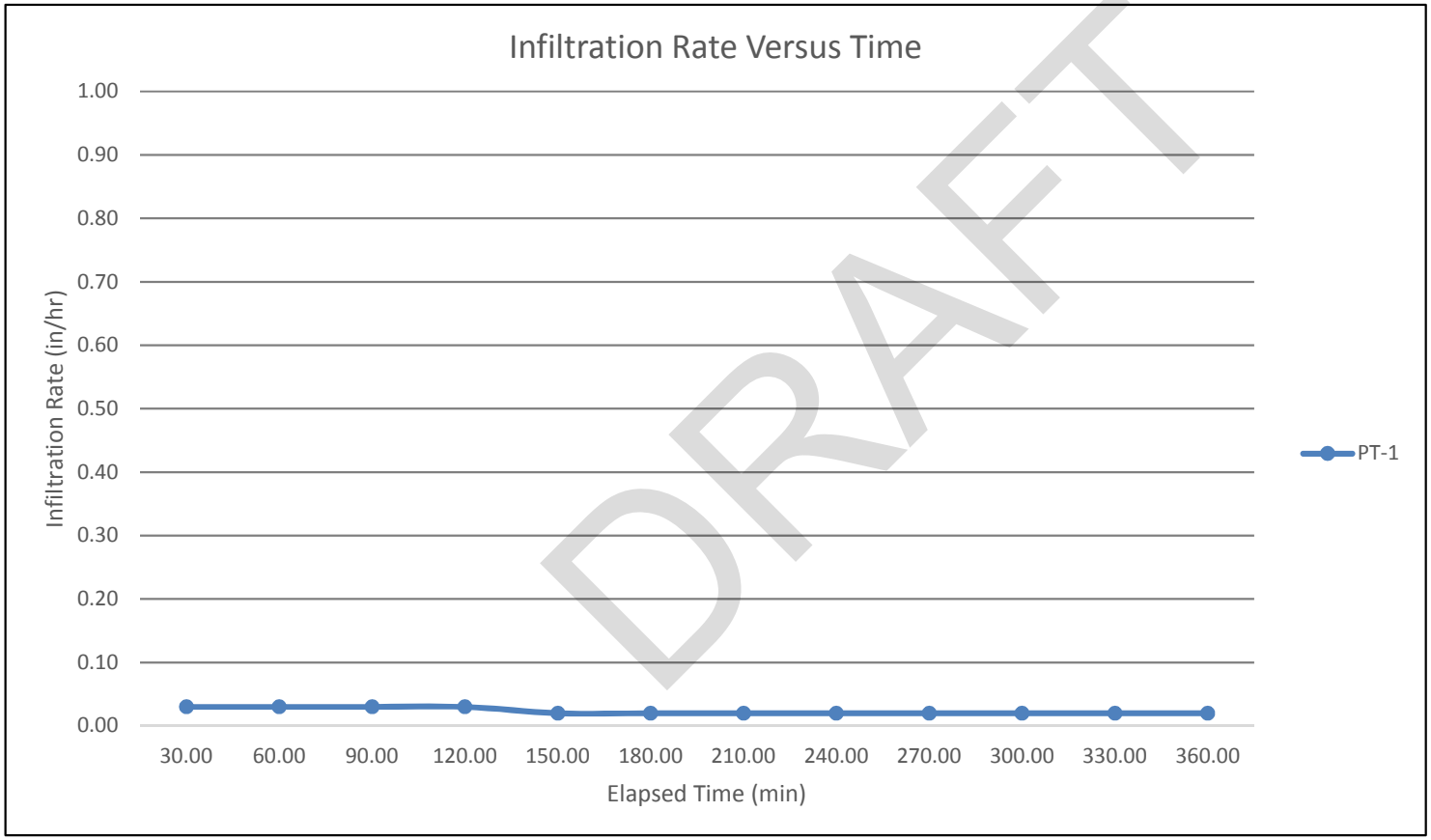


Plate No.
C-8

Estimated Infiltration Rate from Percolation Test Data

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-2
Personnel	Jay Burnham
Presoak Date	4/16/2017
Test Date	4/16/2017

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	4
Total Depth of Test hole, D_T (inches)	148
Inside Diameter of Pipe, I (inches)	2.00
Outside Diameter of Pipe, O (inches)	2.21
Porosity of Gravel, n	0.48
Porosity Correction Factor, C	0.51
Factor of Safety (FOS), F	3

Interval No.	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, D_f (inches)	Elapsed Time (min)	Initial Height of Water, H_0 (inches)	Final Height of Water, H_f (inches)	Change in Height of Water, ΔH (inches)	Average Head Height, H_{avg} (inches)	Infiltration Rate, I_t (inches/hr)	Corrected Infiltration Rate, I_c (inches/hr)	Infiltration Rate with FOS, I_f (inches/hr)
1	25.00	56.00	148.00	25.00	92.00	0.00	92.00	46.00	9.20	4.65	1.55
2	25.00	56.00	148.00	50.00	92.00	0.00	92.00	46.00	9.20	4.65	1.55
3	10.00	51.00	82.25	60.00	97.00	65.75	31.25	81.38	4.50	2.28	0.76
4	10.00	51.00	75.50	70.00	97.00	72.50	24.50	84.75	3.39	1.71	0.57
5	10.00	51.00	72.25	80.00	97.00	75.75	21.25	86.38	2.89	1.46	0.49
6	10.00	52.00	73.00	90.00	96.00	75.00	21.00	85.50	2.88	1.46	0.49
7	10.00	51.00	72.00	100.00	97.00	76.00	21.00	86.50	2.85	1.44	0.48
8	10.00	51.00	71.75	110.00	97.00	76.25	20.75	86.63	2.81	1.42	0.47

Recommended Design Infiltration Rate (inches/hr) 0.47

Infiltration calculations are based on the Porchet Inverse Borehole Method presented in Santa Ana Regional Water Quality Control Board Technical Guidance Document, Appendix VII, Example VII.1.

$H_0 = D_T - D_0$

$H_f = D_T - D_f$

$\Delta H = H_0 - H_f$

$H_{avg} = (H_0 + H_f) / 2$

$I_t = (\Delta H * (60 * r)) / (\Delta t * (r + (2 * H_{avg}))$

Porosity conversion calculations are based on the method provided in Caltrans California Test 750.

$C = n * (1 - (O / (2 * r))^2) + (I / (2 * r))^2$

$I_c = I_t * C$

$I_f = I_C * F$

Plate No.
C-9

Infiltration Rate versus Time

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-2
Personnel	Jay Burnham
Presoak Date	4/16/2017
Test Date	4/17/2017

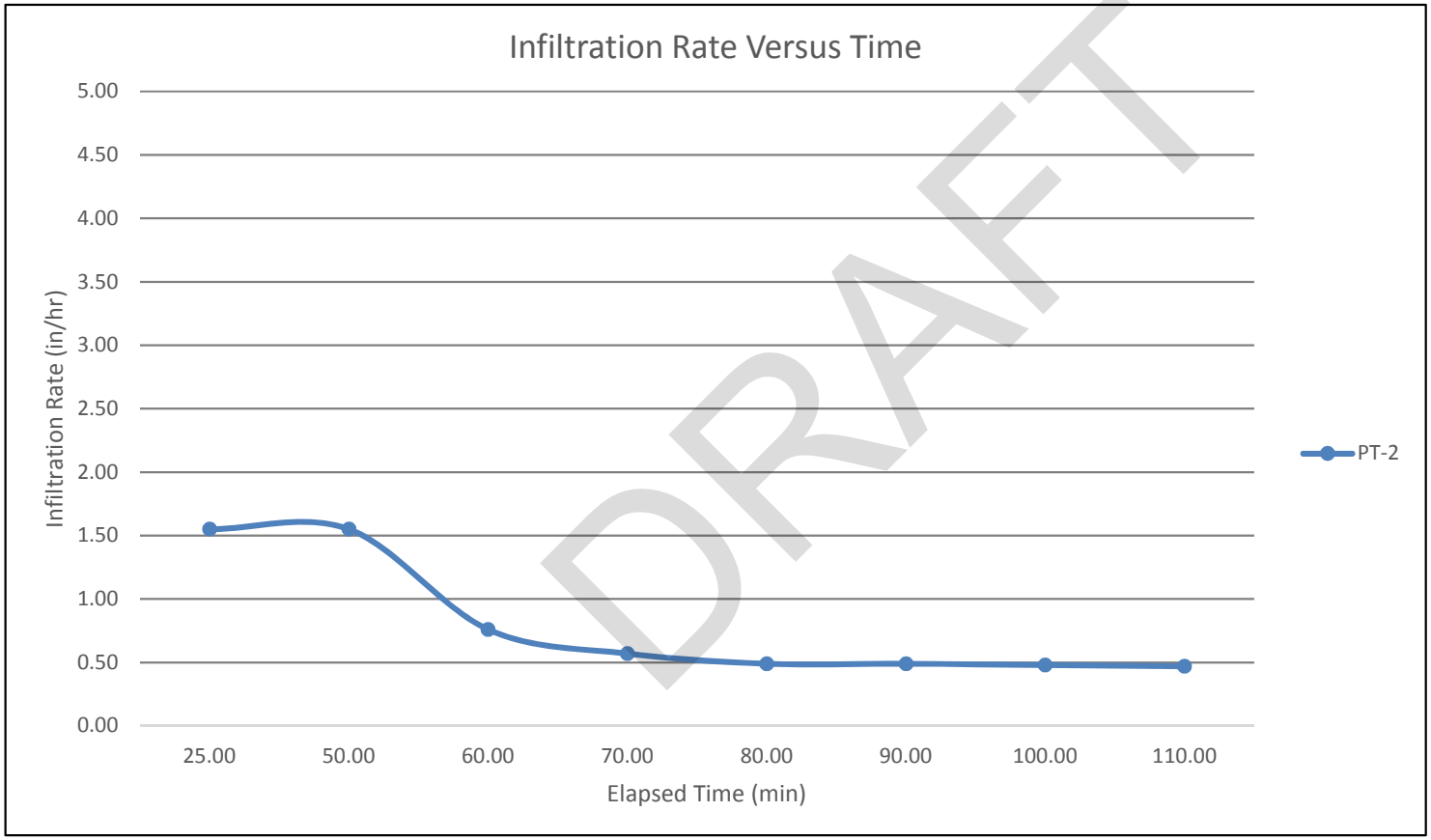


Plate No.
C-10

Estimated Infiltration Rate from Percolation Test Data

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-3
Personnel	Jay Burnham
Presoak Date	4/17/2017
Test Date	4/17/2017

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	4
Total Depth of Test hole, D_T (inches)	208
Inside Diameter of Pipe, I (inches)	2.00
Outside Diameter of Pipe, O (inches)	2.21
Porosity of Gravel, n	0.48
Porosity Correction Factor, C	0.51
Factor of Safety (FOS), F	3

Interval No.	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, D_f (inches)	Elapsed Time (min)	Initial Height of Water, H_0 (inches)	Final Height of Water, H_f (inches)	Change in Height of Water, ΔH (inches)	Average Head Height, H_{avg} (inches)	Infiltration Rate, I_t (inches/hr)	Corrected Infiltration Rate, I_c (inches/hr)	Infiltration Rate with FOS, I_f (inches/hr)
1	25.00	166.68	178.20	25.00	41.32	29.80	11.52	35.56	1.47	0.74	0.25
2	25.00	166.20	177.60	50.00	41.80	30.40	11.40	36.10	1.44	0.73	0.24
3	10.00	166.80	178.20	60.00	41.20	29.80	11.40	35.50	3.65	1.85	0.62
4	10.00	166.80	174.24	70.00	41.20	33.76	7.44	37.48	2.26	1.14	0.38
5	10.00	166.80	173.28	80.00	41.20	34.72	6.48	37.96	1.95	0.98	0.33
6	10.00	167.04	172.32	90.00	40.96	35.68	5.28	38.32	1.57	0.79	0.26
7	10.00	165.72	170.40	100.00	42.28	37.60	4.68	39.94	1.34	0.68	0.23
8	10.00	166.80	171.48	110.00	41.20	36.52	4.68	38.86	1.37	0.70	0.23

Recommended Design Infiltration Rate (inches/hr)	**0.23**

Infiltration calculations are based on the Porchet Inverse Borehole Method presented in Santa Ana Regional Water Quality Control Board Technical Guidance Document, Appendix VII, Example VII.1.

$H_0 = D_T - D_0$

$H_f = D_T - D_f$

$\Delta H = H_0 - H_f$

$H_{avg} = (H_0 + H_f) / 2$

$I_t = (\Delta H * (60 * r)) / (\Delta t * (r + (2 * H_{avg}))$

Porosity conversion calculations are based on the method provided in Caltrans California Test 750.

$C = n * (1 - (O / (2 * r))^2) + (I / (2 * r))^2$

$I_c = I_t * C$

$I_f = I_C * F$

Plate No.
C-11

Infiltration Rate versus Time

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-3
Personnel	Jay Burnham
Presoak Date	4/17/2017
Test Date	4/17/2017

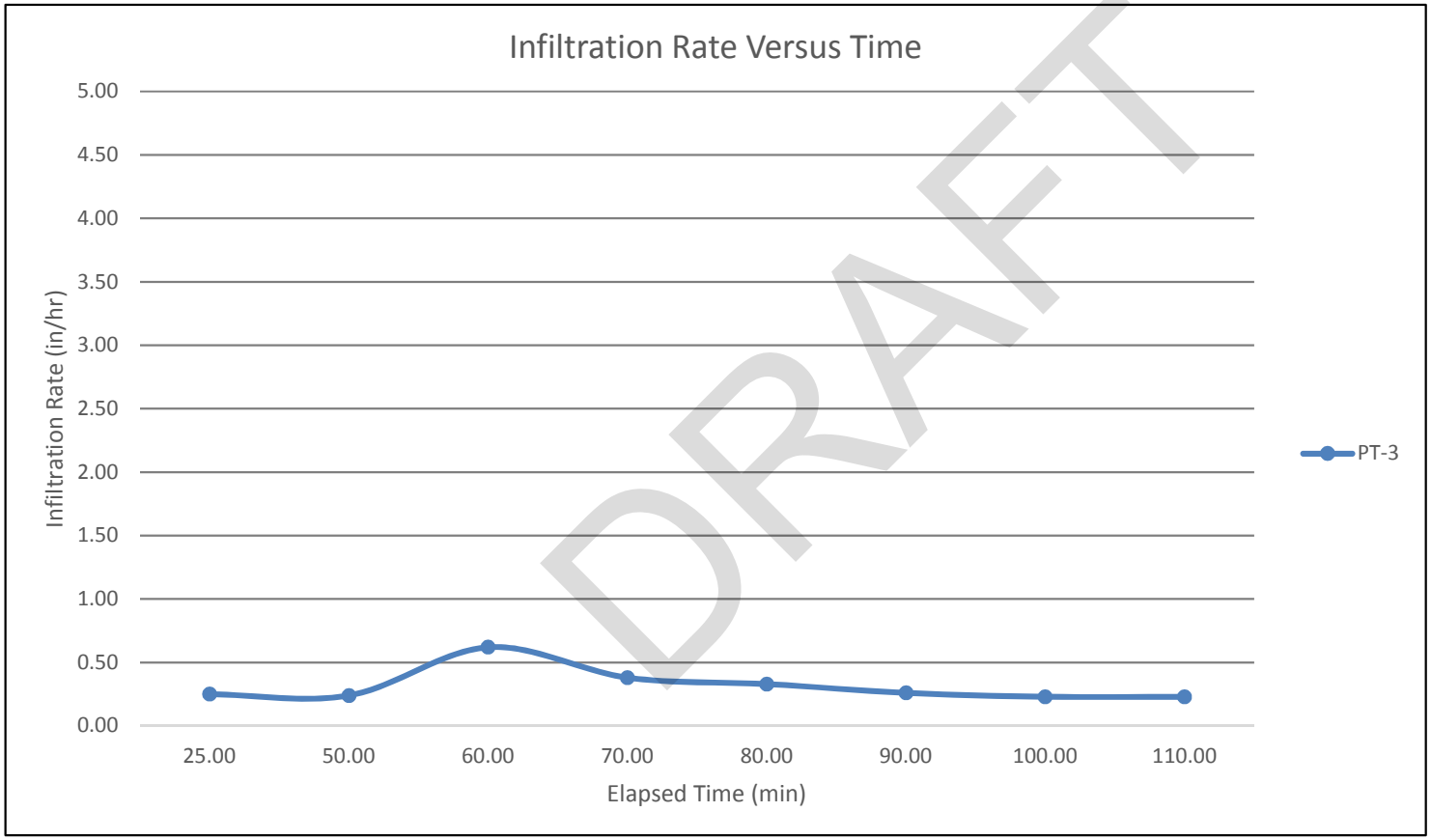


Plate No.
C-12

Estimated Infiltration Rate from Percolation Test Data

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-4
Personnel	Jay Burnham
Presoak Date	4/17/2017
Test Date	4/17/2017

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	4
Total Depth of Test hole, D_T (inches)	212
Inside Diameter of Pipe, I (inches)	2.00
Outside Diameter of Pipe, O (inches)	2.21
Porosity of Gravel, n	0.48
Porosity Correction Factor, C	0.51
Factor of Safety (FOS), F	3

Interval No.	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, D_f (inches)	Elapsed Time (min)	Initial Height of Water, H_0 (inches)	Final Height of Water, H_f (inches)	Change in Height of Water, ΔH (inches)	Average Head Height, H_{avg} (inches)	Infiltration Rate, I_t (inches/hr)	Corrected Infiltration Rate, I_c (inches/hr)	Infiltration Rate with FOS, I_f (inches/hr)
1	25.00	156.00	167.40	25.00	56.00	44.60	11.40	50.30	1.05	0.53	0.18
2	25.00	156.00	166.20	50.00	56.00	45.80	10.20	50.90	0.93	0.47	0.16
3	10.00	155.40	158.64	60.00	56.60	53.36	3.24	54.98	0.68	0.35	0.12
4	10.00	153.36	156.60	70.00	58.64	55.40	3.24	57.02	0.66	0.33	0.11
5	10.00	156.00	158.40	80.00	56.00	53.60	2.40	54.80	0.51	0.26	0.09
6	10.00	155.40	158.04	90.00	56.60	53.96	2.64	55.28	0.55	0.28	0.09
7	10.00	156.00	157.80	100.00	56.00	54.20	1.80	55.10	0.38	0.19	0.06
8	10.00	156.00	157.80	110.00	56.00	54.20	1.80	55.10	0.38	0.19	0.06

Recommended Design Infiltration Rate (inches/hr)	**0.06**

Infiltration calculations are based on the Porchet Inverse Borehole Method presented in Santa Ana Regional Water Quality Control Board Technical Guidance Document, Appendix VII, Example VII.1.

$H_0 = D_T - D_0$

$H_f = D_T - D_f$

$\Delta H = H_0 - H_f$

$H_{avg} = (H_0 + H_f) / 2$

$I_t = (\Delta H * (60 * r)) / (\Delta t * (r + (2 * H_{avg}))$

Porosity conversion calculations are based on the method provided in Caltrans California Test 750.

$C = n * (1 - (O / (2 * r))^2) + (I / (2 * r))^2$

$I_c = I_t * C$

$I_f = I_C * F$

Plate No.
C-13

Infiltration Rate versus Time

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-4
Personnel	Jay Burnham
Presoak Date	4/17/2017
Test Date	4/17/2017

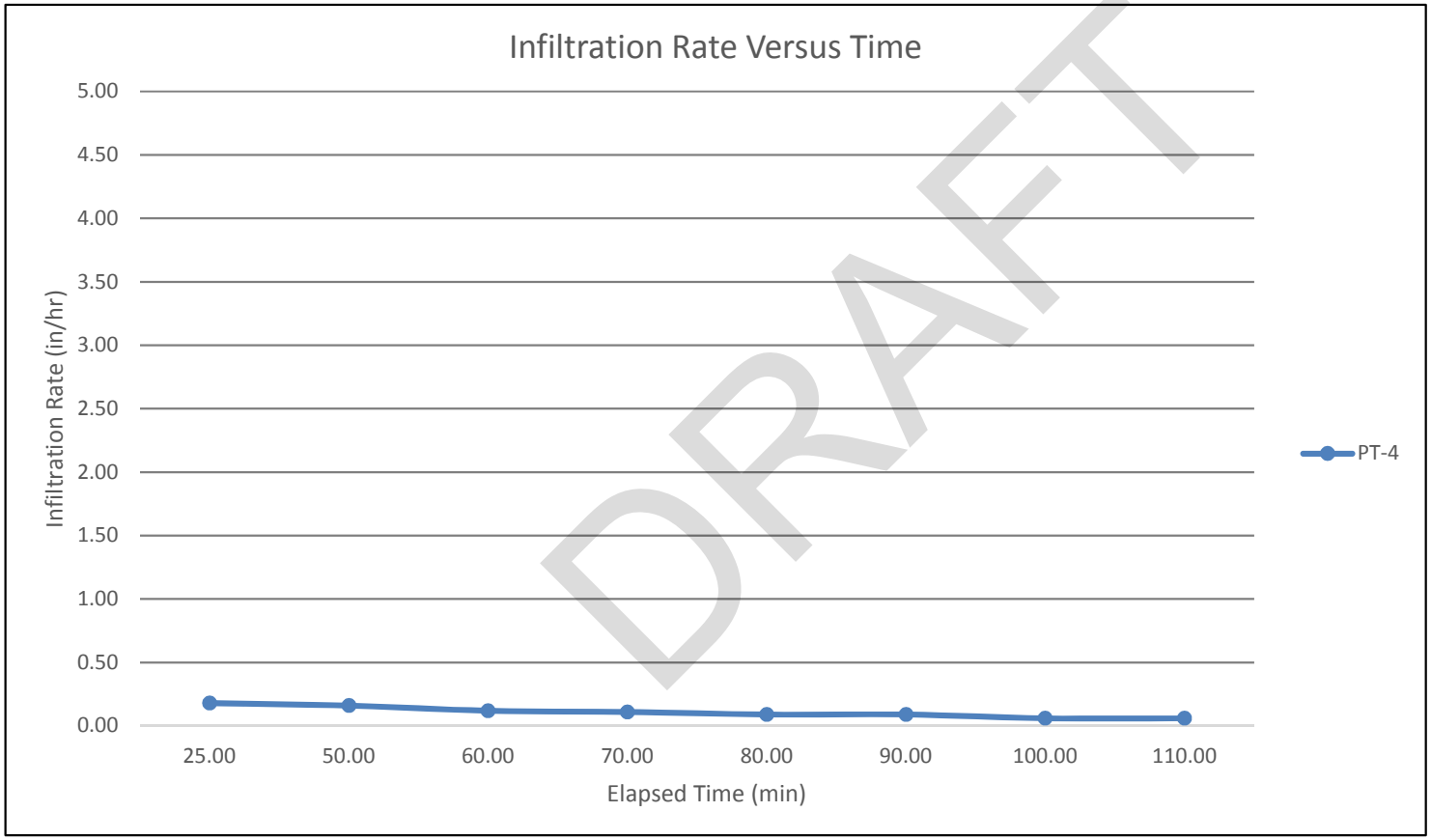


Plate No.
C-14

Estimated Infiltration Rate from Percolation Test Data

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-5
Personnel	Jay Burnham
Presoak Date	4/17/2017
Test Date	4/18/2017

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	4
Total Depth of Test hole, D_T (inches)	126
Inside Diameter of Pipe, I (inches)	2.00
Outside Diameter of Pipe, O (inches)	2.21
Porosity of Gravel, n	0.48
Porosity Correction Factor, C	0.51
Factor of Safety (FOS), F	3

Interval No.	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, D_f (inches)	Elapsed Time (min)	Initial Height of Water, H_0 (inches)	Final Height of Water, H_f (inches)	Change in Height of Water, ΔH (inches)	Average Head Height, H_{avg} (inches)	Infiltration Rate, I_t (inches/hr)	Corrected Infiltration Rate, I_c (inches/hr)	Infiltration Rate with FOS, I_f (inches/hr)
1	30.00	73.20	80.40	30.00	52.80	45.60	7.20	49.20	0.56	0.28	0.09
2	30.00	73.20	79.08	60.00	52.80	46.92	5.88	49.86	0.45	0.23	0.08
3	30.00	72.96	78.00	90.00	53.04	48.00	5.04	50.52	0.38	0.19	0.06
4	30.00	73.20	78.00	120.00	52.80	48.00	4.80	50.40	0.37	0.19	0.06
5	30.00	73.44	77.76	150.00	52.56	48.24	4.32	50.40	0.33	0.17	0.06
6	30.00	73.20	77.76	180.00	52.80	48.24	4.56	50.52	0.35	0.18	0.06
7	30.00	73.20	77.16	210.00	52.80	48.84	3.96	50.82	0.30	0.15	0.05
8	30.00	72.00	75.64	240.00	54.00	50.36	3.64	52.18	0.27	0.14	0.05
9	30.00	72.00	75.40	270.00	54.00	50.60	3.40	52.30	0.25	0.13	0.04
10	30.00	73.20	76.24	300.00	52.80	49.76	3.04	51.28	0.23	0.12	0.04
11	30.00	74.40	77.20	330.00	51.60	48.80	2.80	50.20	0.21	0.11	0.04
12	30.00	73.20	76.00	360.00	52.80	50.00	2.80	51.40	0.21	0.11	0.04

Recommended Design Infiltration Rate (inches/hr)	**0.04**

Infiltration calculations are based on the Porchet Inverse Borehole Method presented in Santa Ana Regional Water Quality Control Board Technical Guidance Document, Appendix VII, Example VII.1.

$H_0 = D_T - D_0$

$H_f = D_T - D_f$

$\Delta H = H_0 - H_f$

$H_{avg} = (H_0 + H_f) / 2$

$I_t = (\Delta H * (60 * r)) / (\Delta t * (r + (2 * H_{avg}))$

Porosity conversion calculations are based on the method provided in Caltrans California Test 750.

$C = n * (1 - (O / (2 * r))^2) + (I / (2 * r))^2$

$I_c = I_t * C$

$I_f = I_C * F$

Plate No.
C-15

Infiltration Rate versus Time

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-5
Personnel	Jay Burnham
Presoak Date	4/17/2017
Test Date	4/18/2017

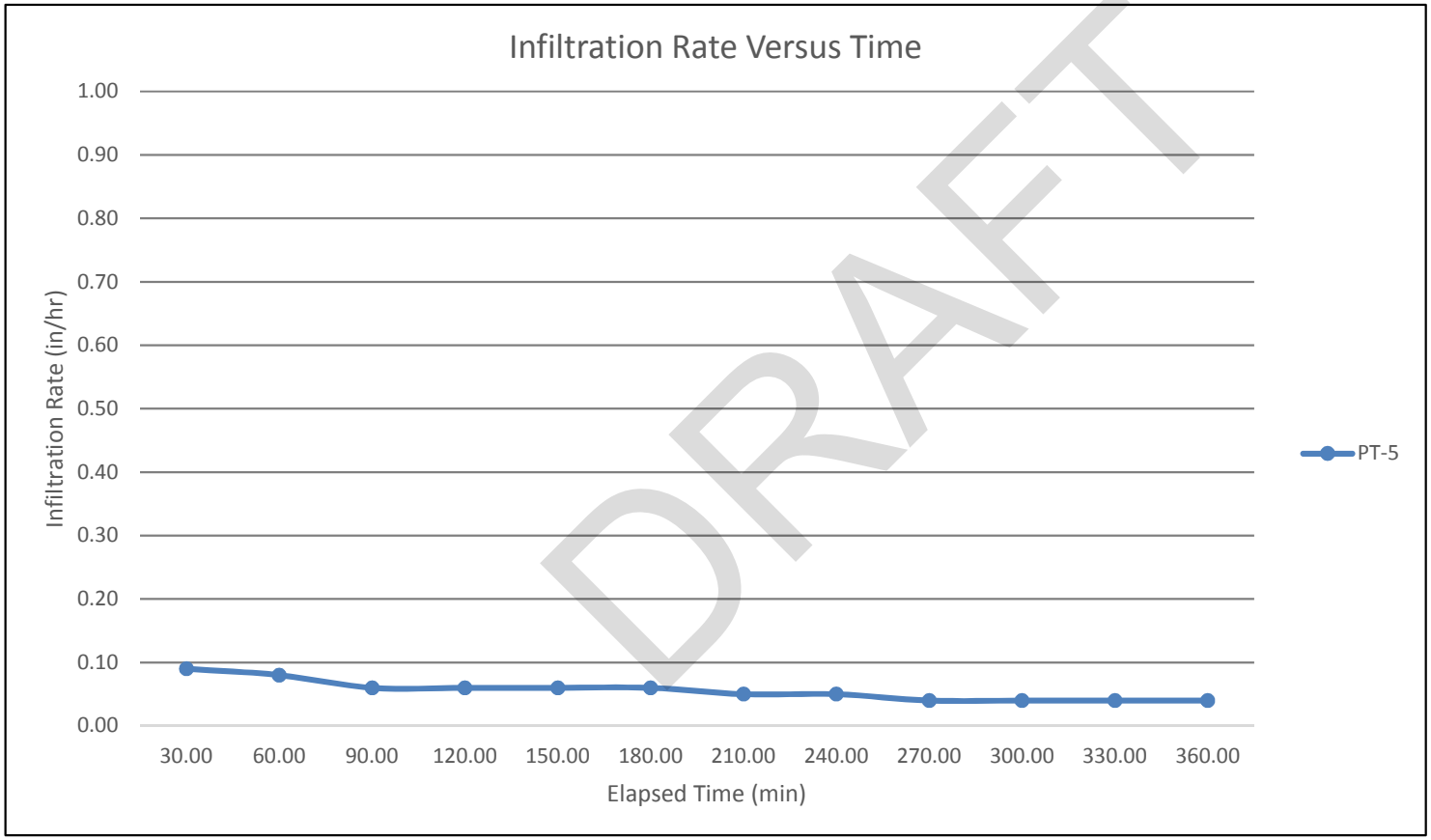


Plate No.
C-16

Estimated Infiltration Rate from Percolation Test Data

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-6
Personnel	Jay Burnham
Presoak Date	4/18/2017
Test Date	4/18/2017

Shaded cells contain calculated values.

Test Hole Radius, r (inches)	4
Total Depth of Test hole, D_T (inches)	195
Inside Diameter of Pipe, I (inches)	2.00
Outside Diameter of Pipe, O (inches)	2.21
Porosity of Gravel, n	0.48
Porosity Correction Factor, C	0.51
Factor of Safety (FOS), F	3

Interval No.	Time Interval, Δt (min)	Initial Depth to Water, D_0 (inches)	Final Depth to Water, D_f (inches)	Elapsed Time (min)	Initial Height of Water, H_0 (inches)	Final Height of Water, H_f (inches)	Change in Height of Water, ΔH (inches)	Average Head Height, H_{avg} (inches)	Infiltration Rate, I_t (inches/hr)	Corrected Infiltration Rate, I_c (inches/hr)	Infiltration Rate with FOS, I_f (inches/hr)
1	25.00	168.00	186.00	25.00	27.00	9.00	18.00	18.00	4.32	2.19	0.73
2	25.00	158.40	180.00	50.00	36.60	15.00	21.60	25.80	3.73	1.89	0.63
3	10.00	167.40	175.20	60.00	27.60	19.80	7.80	23.70	3.64	1.84	0.61
4	10.00	168.00	175.68	70.00	27.00	19.32	7.68	23.16	3.66	1.85	0.62
5	10.00	166.68	170.28	80.00	28.32	24.72	3.60	26.52	1.51	0.77	0.26
6	10.00	168.00	174.24	90.00	27.00	20.76	6.24	23.88	2.89	1.46	0.49
7	10.00	168.24	173.40	100.00	26.76	21.60	5.16	24.18	2.37	1.20	0.40
8	10.00	168.00	173.00	110.00	27.00	22.00	5.00	24.50	2.26	1.15	0.38

Recommended Design Infiltration Rate (inches/hr)	**0.38**

Infiltration calculations are based on the Porchet Inverse Borehole Method presented in Santa Ana Regional Water Quality Control Board Technical Guidance Document, Appendix VII, Example VII.1.

$H_0 = D_T - D_0$

$H_f = D_T - D_f$

$\Delta H = H_0 - H_f$

$H_{avg} = (H_0 + H_f) / 2$

$I_t = (\Delta H * (60 * r)) / (\Delta t * (r + (2 * H_{avg}))$

Porosity conversion calculations are based on the method provided in Caltrans California Test 750.

$C = n * (1 - (O / (2 * r))^2) + (I / (2 * r))^2$

$I_c = I_t * C$

$I_f = I_C * F$

Plate No.
C-17

Infiltration Rate versus Time

Project Name	21.22-Acre Polopolus Site, Proposed Commercial Development
Project Number	14-81-155-02
Test Number	PT-6
Personnel	Jay Burnham
Presoak Date	4/18/2017
Test Date	4/18/2017

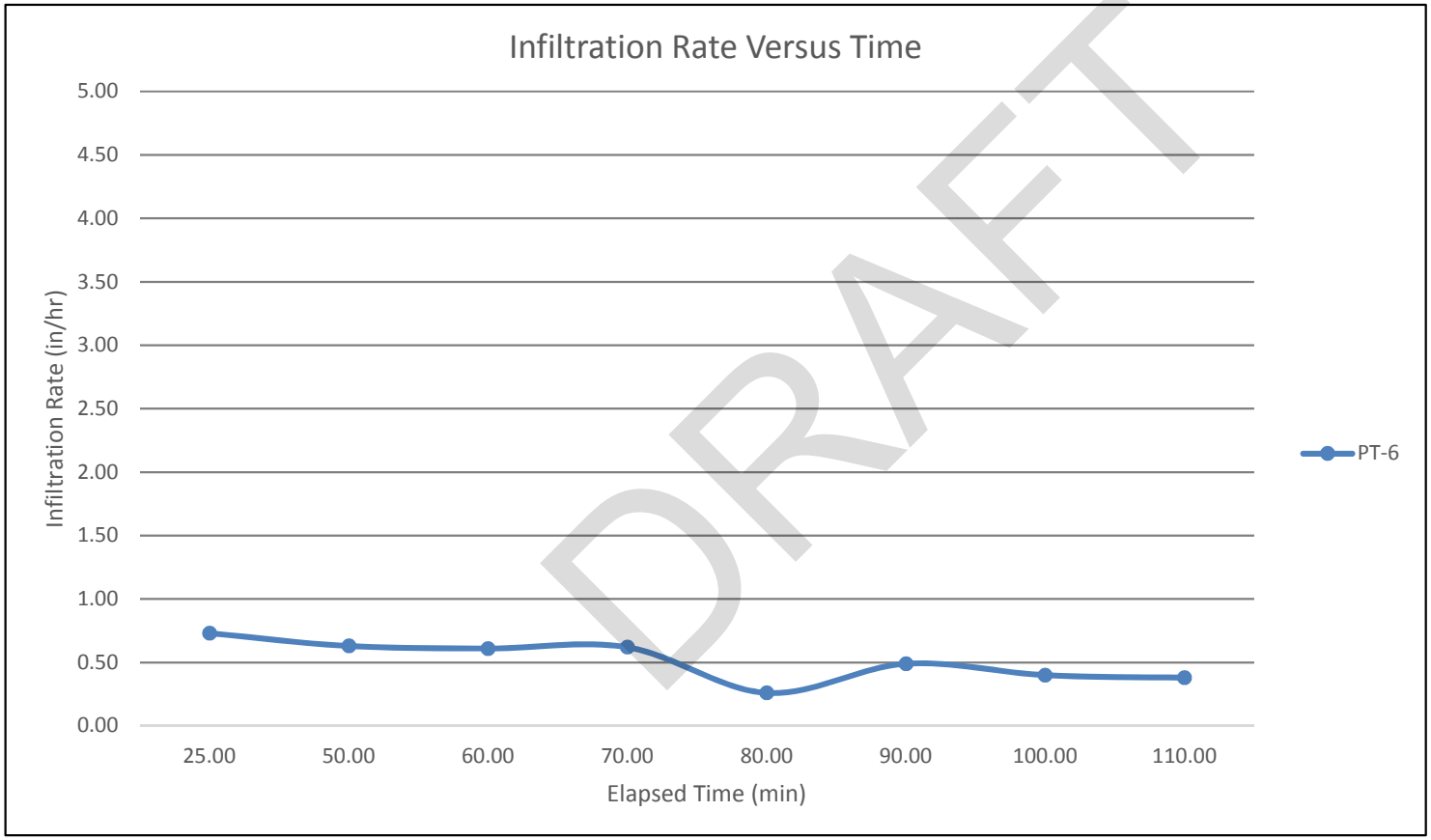


Plate No.
C-18

Appendix D

Slope Stability Analysis

APPENDIX D

SLOPE STABILITY ANALYSIS

The anticipated stability of the proposed cut-and-fill slopes located in the southeast portion of the property were evaluated under static and pseudostatic loading conditions using the Slide 7.0 software (RocScience, 2016). Slide 7.0 is a 2D limit equilibrium slope stability analysis program. These slopes were selected due to their height, slope ratio, and proximity to structures as shown on the conceptual grading plans (Webb, 2017).

A Mohr-Coulomb soil strength model was assumed, and factors of safety for slope stability were evaluated using the Morgenstern-Price solution procedure. Relevant material properties, including unit weight, friction angle, cohesion, and tensile strength were conservatively selected from laboratory test results and available scientific data and are presented below in the Table No. C-1, *Material Properties*.

Table No. D-1, Material Properties

Material	Unit Weight (lbs/ft^3)	Strength Type	Cohesion (psf)	Friction Angle (deg)	Tensile Strength (psf)
Alluvium	117.0	Mohr-Coulomb	100	30	N/A
Fill	120.0	Mohr-Coulomb	150	35	N/A

Table No. D-2, Slope Location and Properties

Slope Location	Cut/Fill	Slope Height (ft)	Slope Ratio (H:V)
Maximum Slope, Southeast Boundary	Fill over Native	25’ (maximum)	2:1 (maximum)
Southeast of Proposed 4-Story Hotel Structure	Fill over Native	12’ (maximum)	2:1 (maximum)

Grid searches within predefined areas were utilized to determine the critical slip surface in each case. Limit equilibrium methods for evaluating slope stability consider the static equilibrium of a soil mass above a potential failure surface. For conventional, two-dimensional methods of analysis; the slide mass above an assumed failure surface is first divided into vertical slices, then stresses are evaluated along the sides and base of each slice. The factor of safety against a slope failure (FS_{slope}) is defined as:

$$FS_{slope} = \frac{\text{shear strength of soil}}{\text{shear stress required for equilibrium}}$$

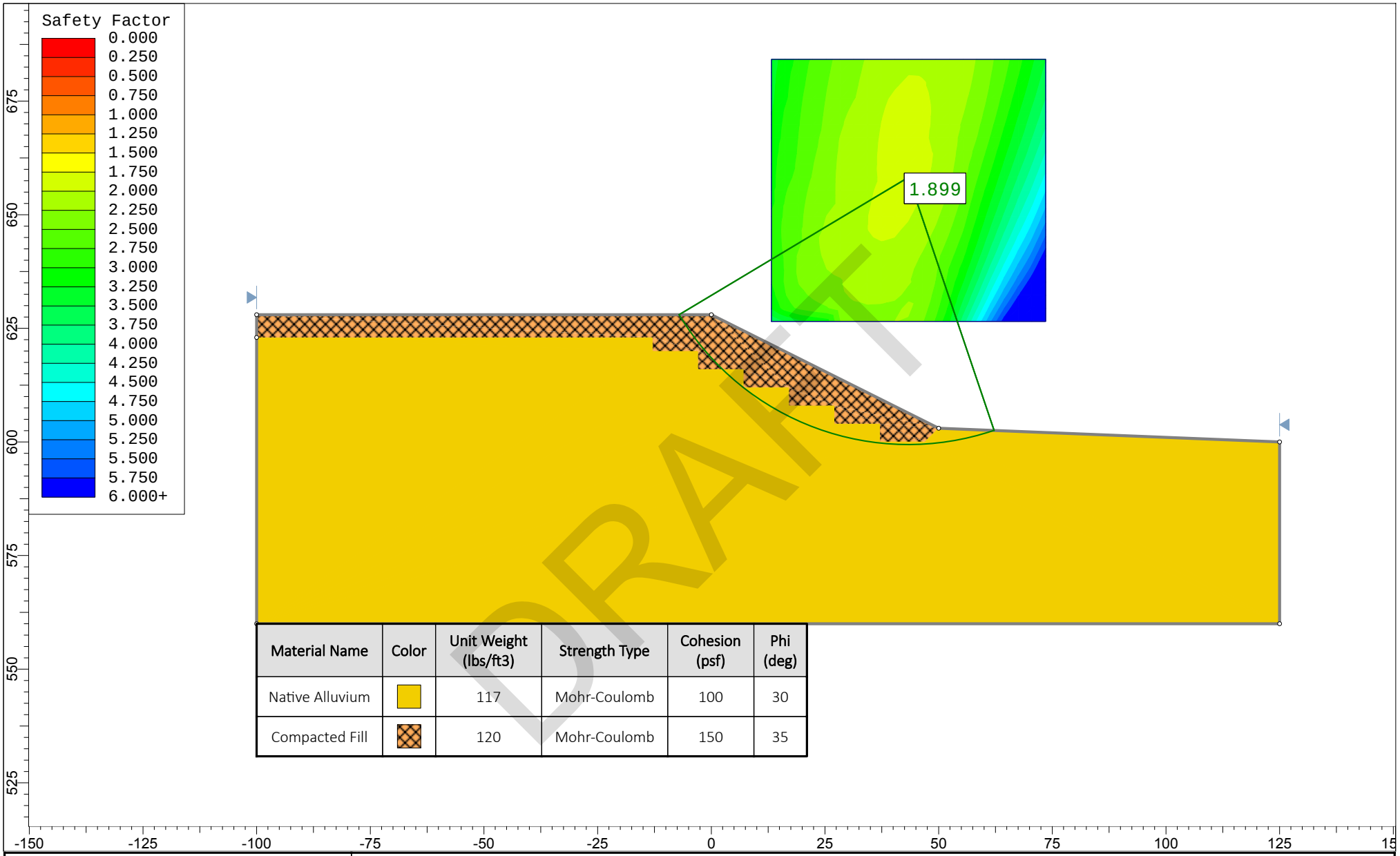
The strengths and stresses are computed along a defined failure surface located at the base of the vertical slices. The shearing resistance along the potential slip surface is computed, with appropriate Mohr-Coulomb strength parameters, as a function of the effective normal stress.

Pseudostatic slope stability analyses were also performed for the cross sections using a horizontal seismic load coefficient of 0.15.

The results of the analyses are discussed in Section 9.0, *Slope Stability Analysis* and are summarized in the following table. The following pages include figures presenting the results of the analysis for the proposed slope configurations.

Table No. D-3, Slope Stability Results

Slope Location	Static FOS	Pseudostatic FOS
Maximum Slope, Southeast Boundary	1.9	1.4
Southeast of Proposed 4-Story Hotel Structure	1.6	1.3

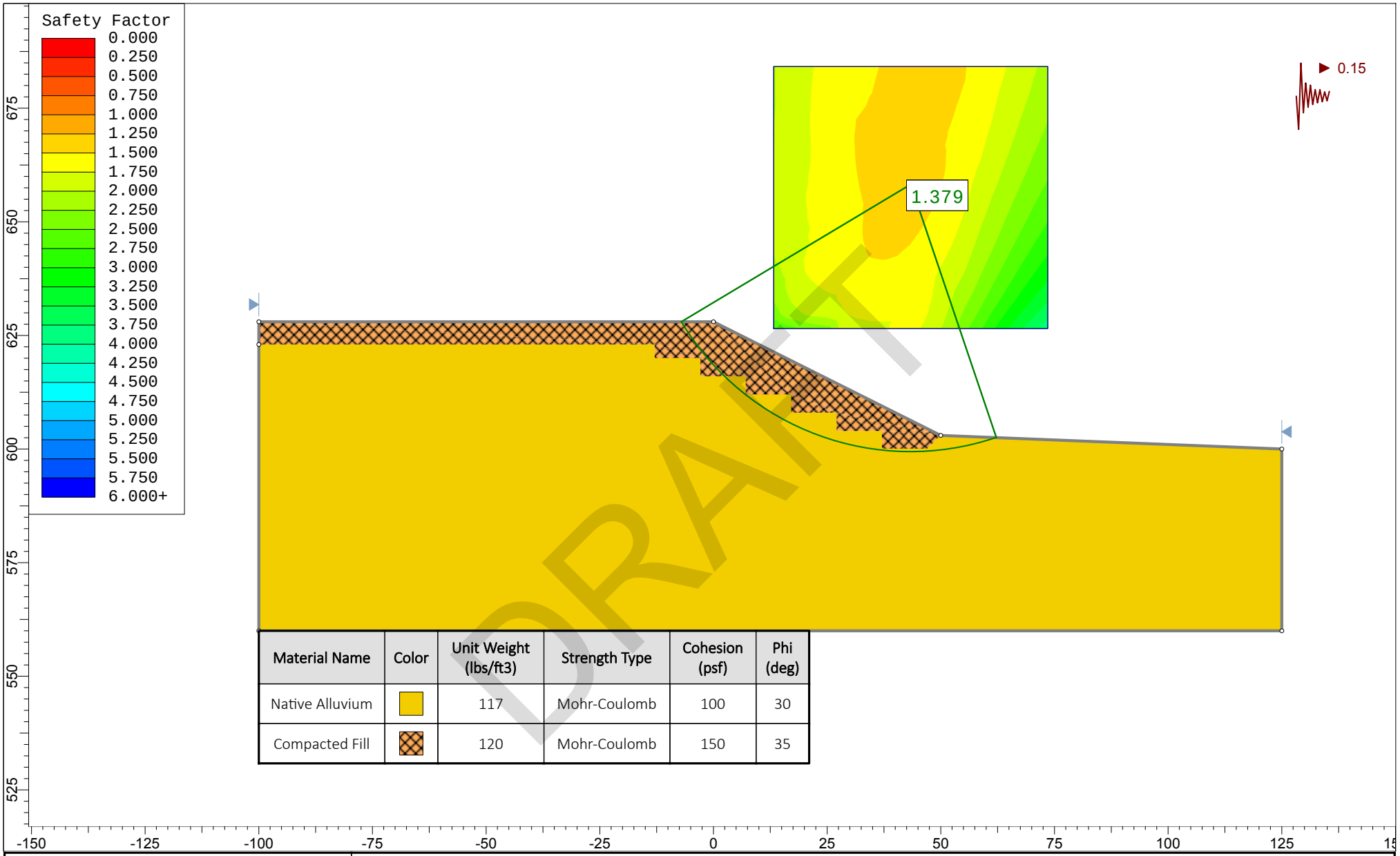


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Native Alluvium		117	Mohr-Coulomb	100	30
Compacted Fill		120	Mohr-Coulomb	150	35

SLIDEINTERPRET 7.020

Project	21.22-Acre Polopolus Site, Proposed Commercial Development		
Analysis Description	Maximum Slope - Static		
Scale	1:350	*Company*	Converse Consultants
Date	4/25/2017	*File Name*	Maximum Southeast Slope - static.slim

Drawing D-1



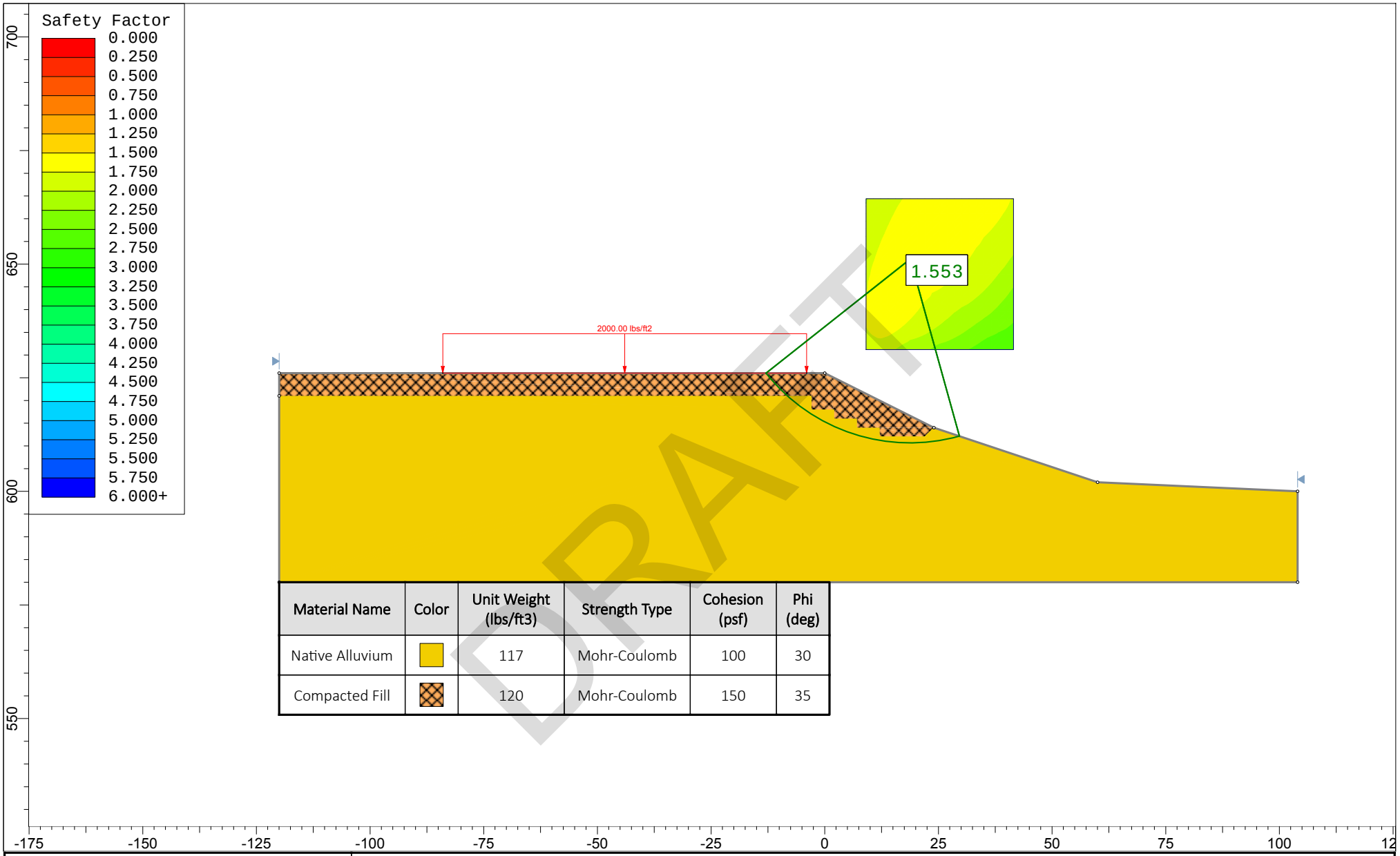
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Native Alluvium		117	Mohr-Coulomb	100	30
Compacted Fill		120	Mohr-Coulomb	150	35

rocscience

SLIDEINTERPRET 7.020

Project	21.22-Acre Polopolus Site, Proposed Commercial Development		
Analysis Description	Maximum Slope - Pseudostatic		
Scale	1:350	*Company*	Converse Consultants
Date	4/25/2017	*File Name*	Maximum Southeast Slope - pseudostatic.slim

Drawing D-2



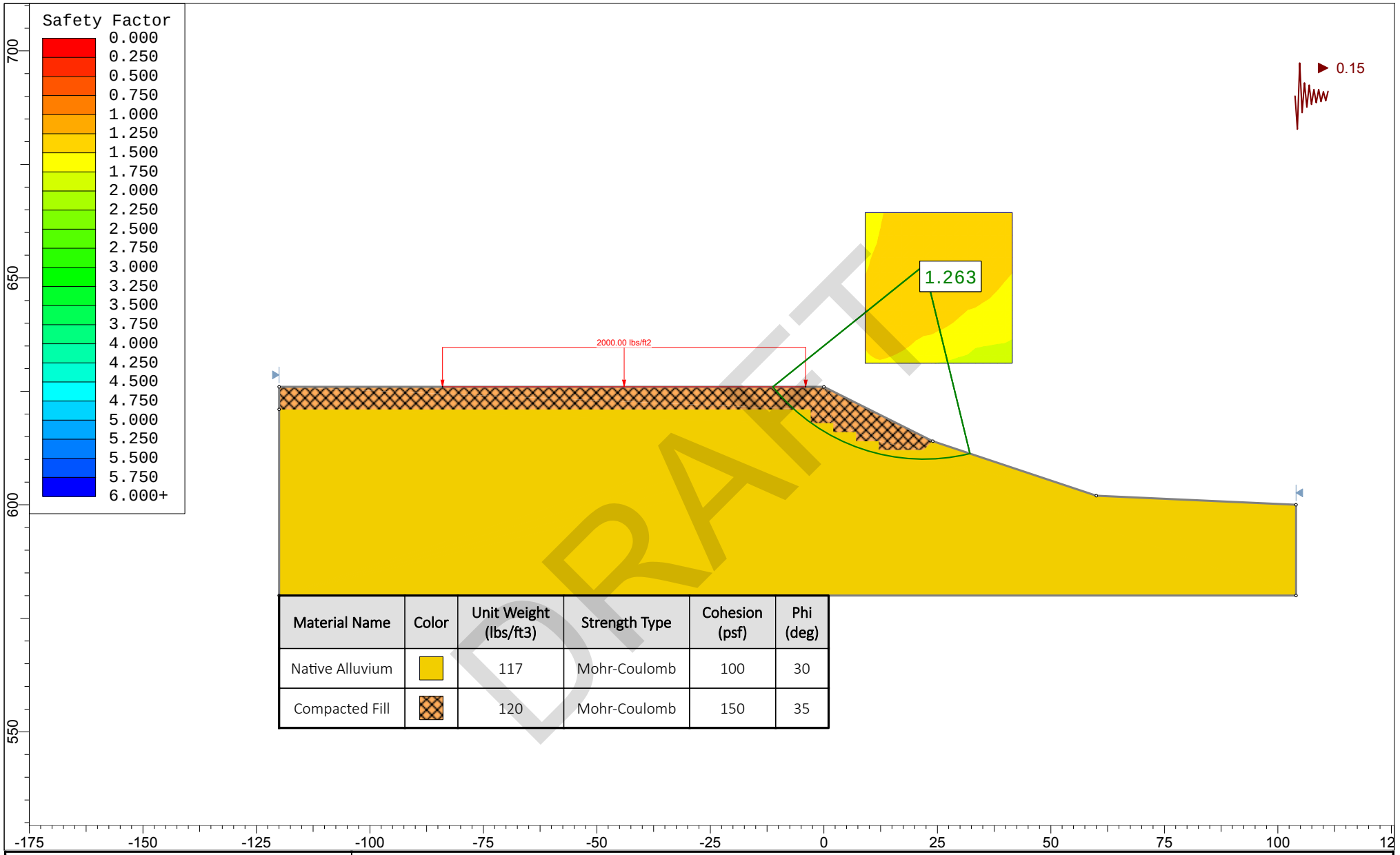
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Native Alluvium		117	Mohr-Coulomb	100	30
Compacted Fill		120	Mohr-Coulomb	150	35

rocscience

SLIDEINTERPRET 7.020

Project	21.22-Acre Polopolus Site, Proposed Commercial Development		
Analysis Description	Southeast of 4-Story Hotel Building - Static		
Scale	1:350	*Company*	Converse Consultants
Date	4/25/2017	*File Name*	Southeast of 4-story hotel building.slim

Drawing D-3



DRAFT

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Native Alluvium		117	Mohr-Coulomb	100	30
Compacted Fill		120	Mohr-Coulomb	150	35

rocscience

SLIDEINTERPRET 7.020

Project	21.22-Acre Polopolus Site, Proposed Commercial Development
Analysis Description	Southeast of 4-Story Hotel Building - Pseudostatic
Scale	1:350
Company	Converse Consultants
Date	4/25/2017
File Name	Southeast of 4-story hotel building - pseudostatic.slim

Drawing D-4

Appendix E

Settlement Analysis

APPENDIX E

SETTLEMENT ANALYSIS

The subsurface data obtained from the three 51.5-foot borings (Boring BH-3, BH-4 and BH-5) drilled during the field investigation were used to evaluate the dynamic settlement due to potential liquefaction and densification of relatively loose sediments subjected to ground shaking during earthquakes.

The dynamic analysis was performed using Liquefy Pro (Civiltech, 2012). An earthquake magnitude of M6.8 and a peak ground acceleration (PGA) of 0.5g, where g is the acceleration due to gravity, were selected for this analysis. The PGA was based on the CBC seismic design parameters presented in Section 8.2, *CBC Seismic Design Parameters*. An analysis considering both historical and current groundwater conditions were performed for each boring.

The results of our analyses are presented on Plates E-1 through E-6, and summarized in the following table.

Table E-1, Estimated Dynamic Settlement

Location	Groundwater Conditions (feet bgs)	Dynamic Settlement (inches)	Differential Dynamic Settlement (inch/40 linear feet)
BH-03	15 (HHGL*)	0.03	0.015
BH-03	>50 (Current)	0.17	0.085
BH-04	15 (HHGL*)	0.02	0.01
BH-04	>50 (Current)	0.15	0.075
BH-05	15 (HHGL*)	0.12	0.06
BH-05	>50 (Current)	0.24	0.12

***** Historic High Groundwater Level (HHGL)

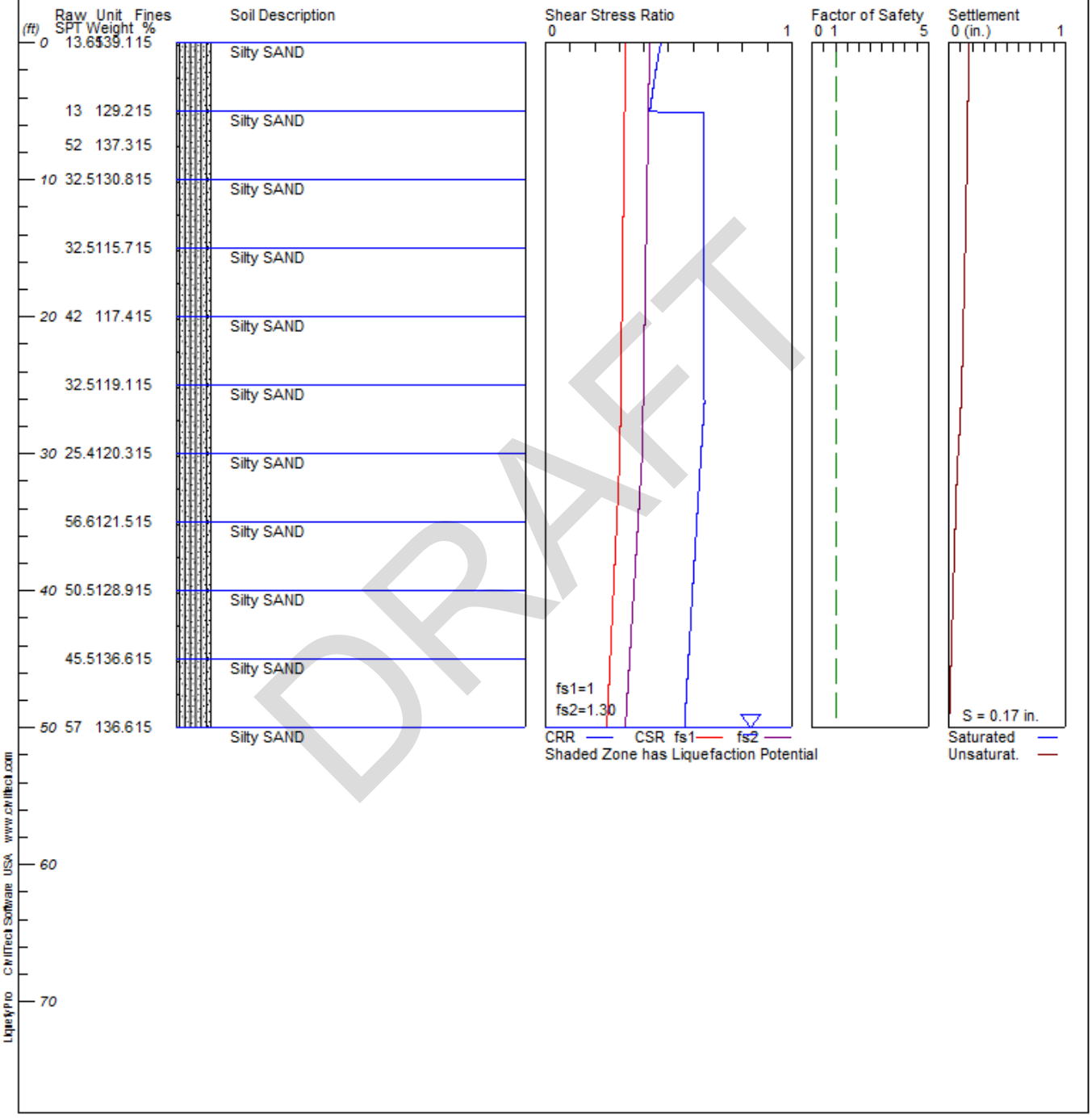
Based on our analysis, the site has the potential for up to 0.24 inches of dynamic settlement. Differential settlement is estimated as half of the total settlement over a horizontal distance of 40 feet.

LIQUEFACTION ANALYSIS

Polopolus Commercial Dev.

Hole No.=BH-3 Water Depth=50 ft Surface Elev.=636

Magnitude=6.8
Acceleration=0.5g

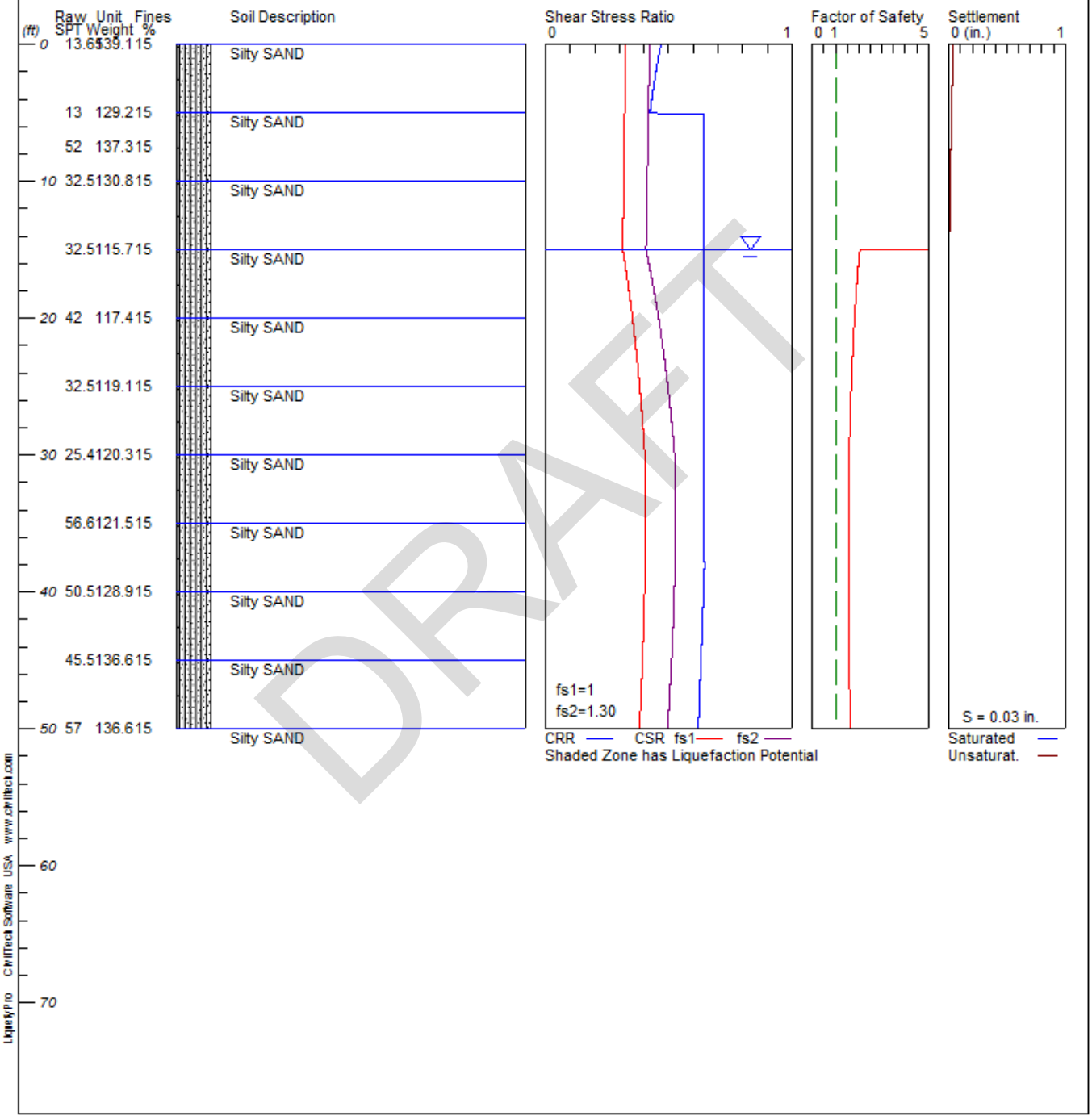


LIQUEFACTION ANALYSIS

Polopolus Commercial Dev.

Hole No.=BH-3 Water Depth=15 ft Surface Elev.=636

Magnitude=6.8
Acceleration=0.5g

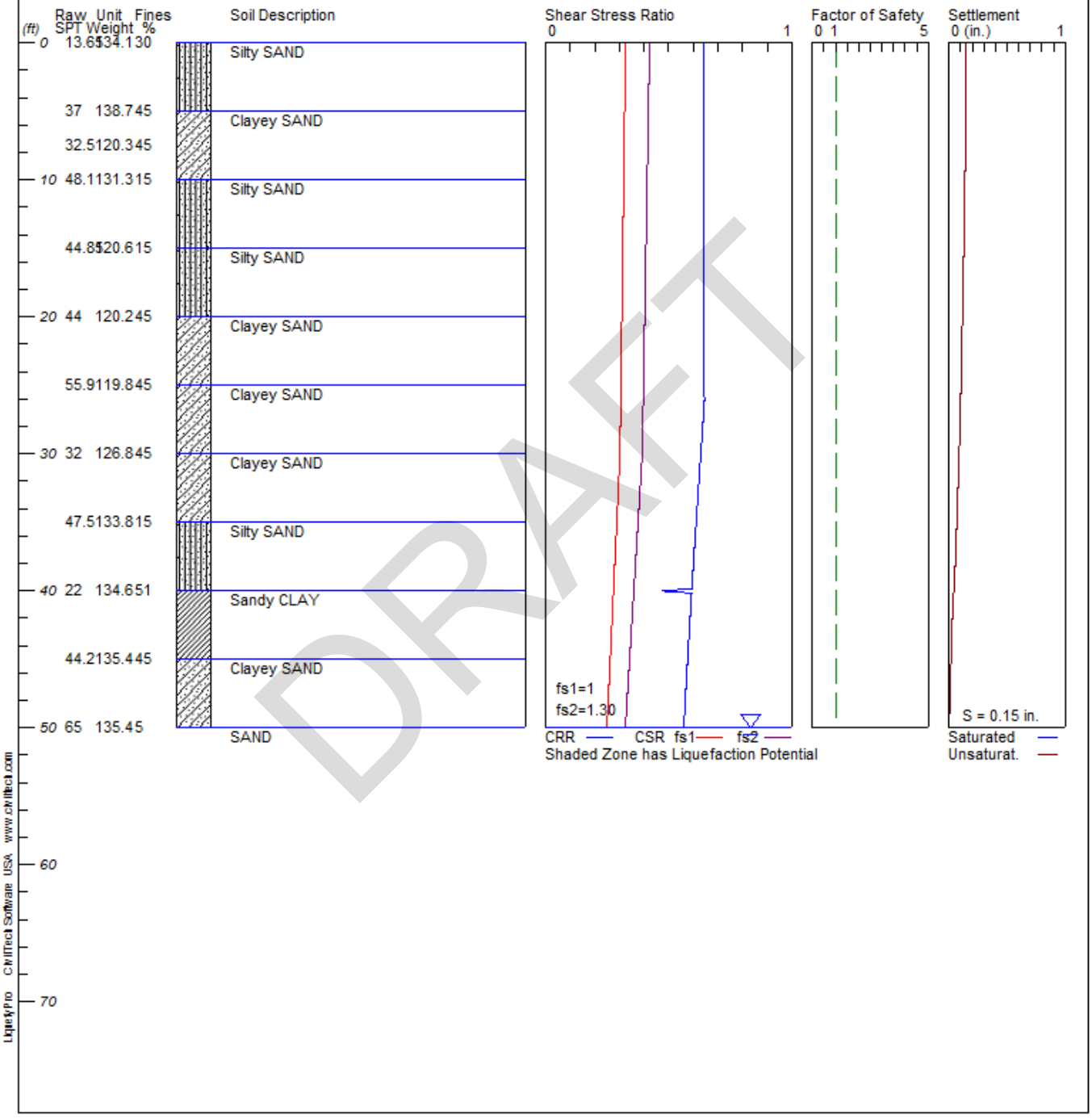


LIQUEFACTION ANALYSIS

Polopolus Commercial Dev.

Hole No.=BH-4 Water Depth=50 ft Surface Elev.=625

Magnitude=6.8
Acceleration=0.5g

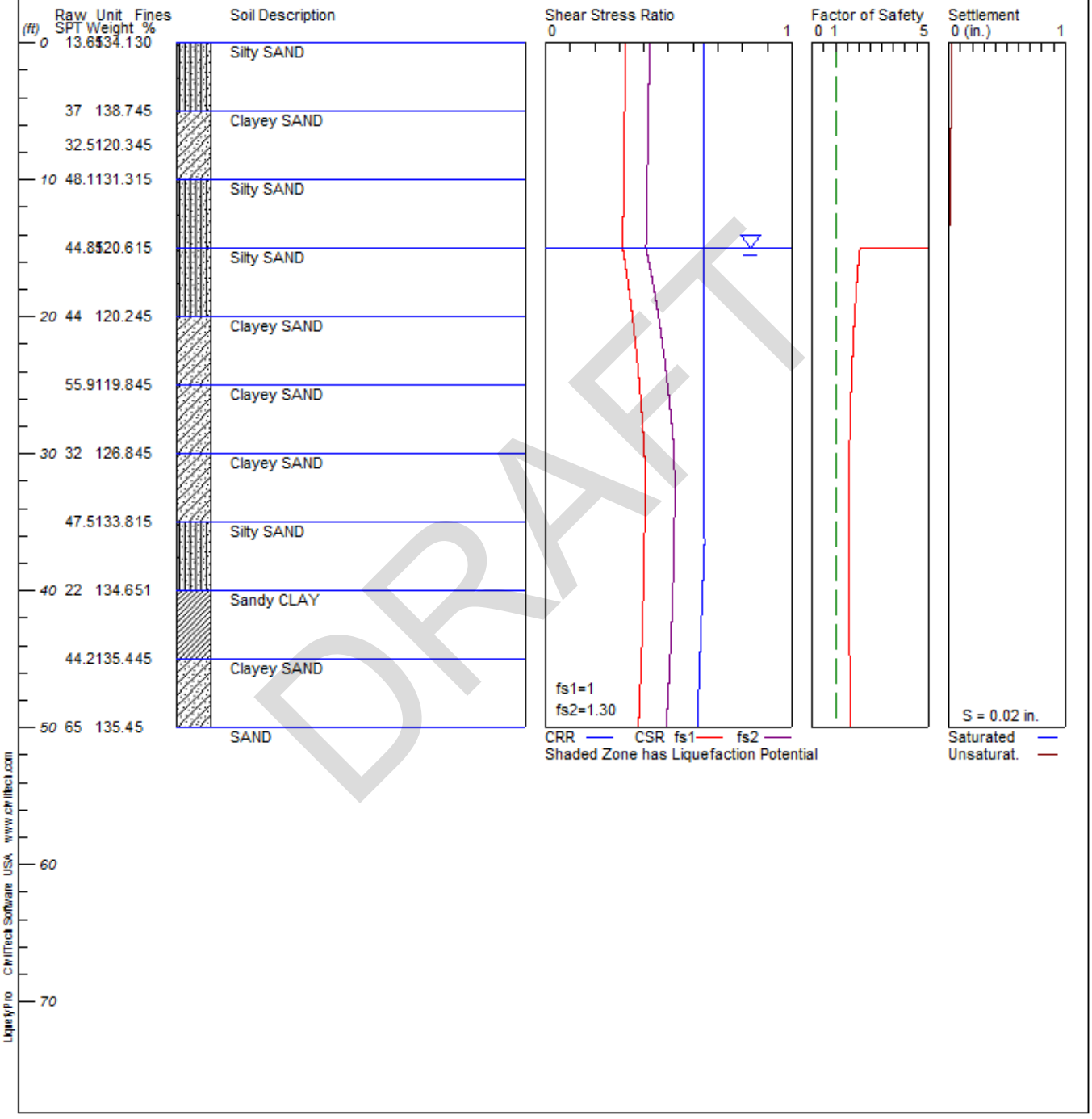


LIQUEFACTION ANALYSIS

Polopolus Commercial Dev.

Hole No.=BH-4 Water Depth=15 ft Surface Elev.=625

Magnitude=6.8
Acceleration=0.5g

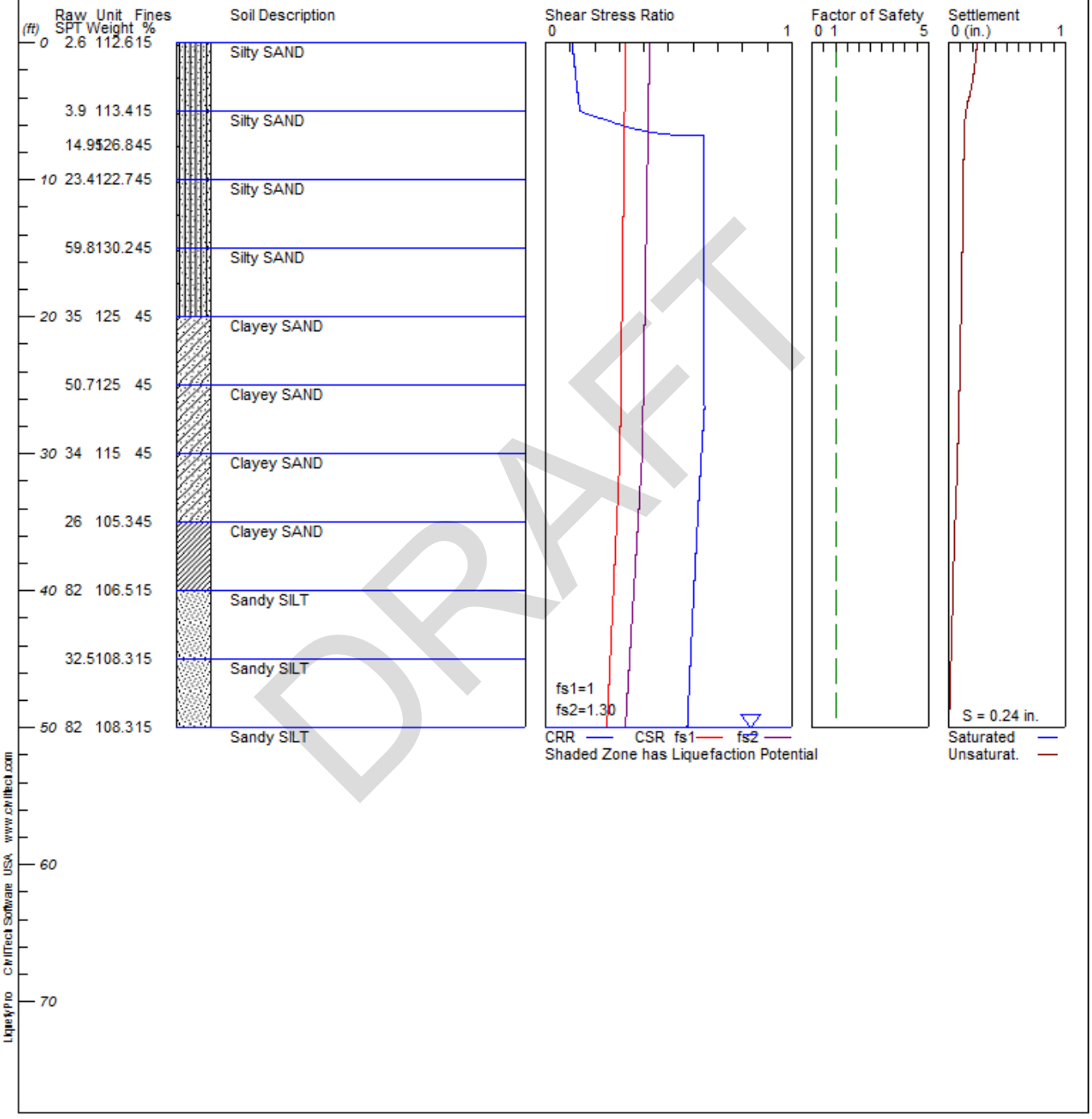


LIQUEFACTION ANALYSIS

Polopolus Commercial Dev.

Hole No.=BH-5 Water Depth=50 ft Surface Elev.=625

Magnitude=6.8
Acceleration=0.5g

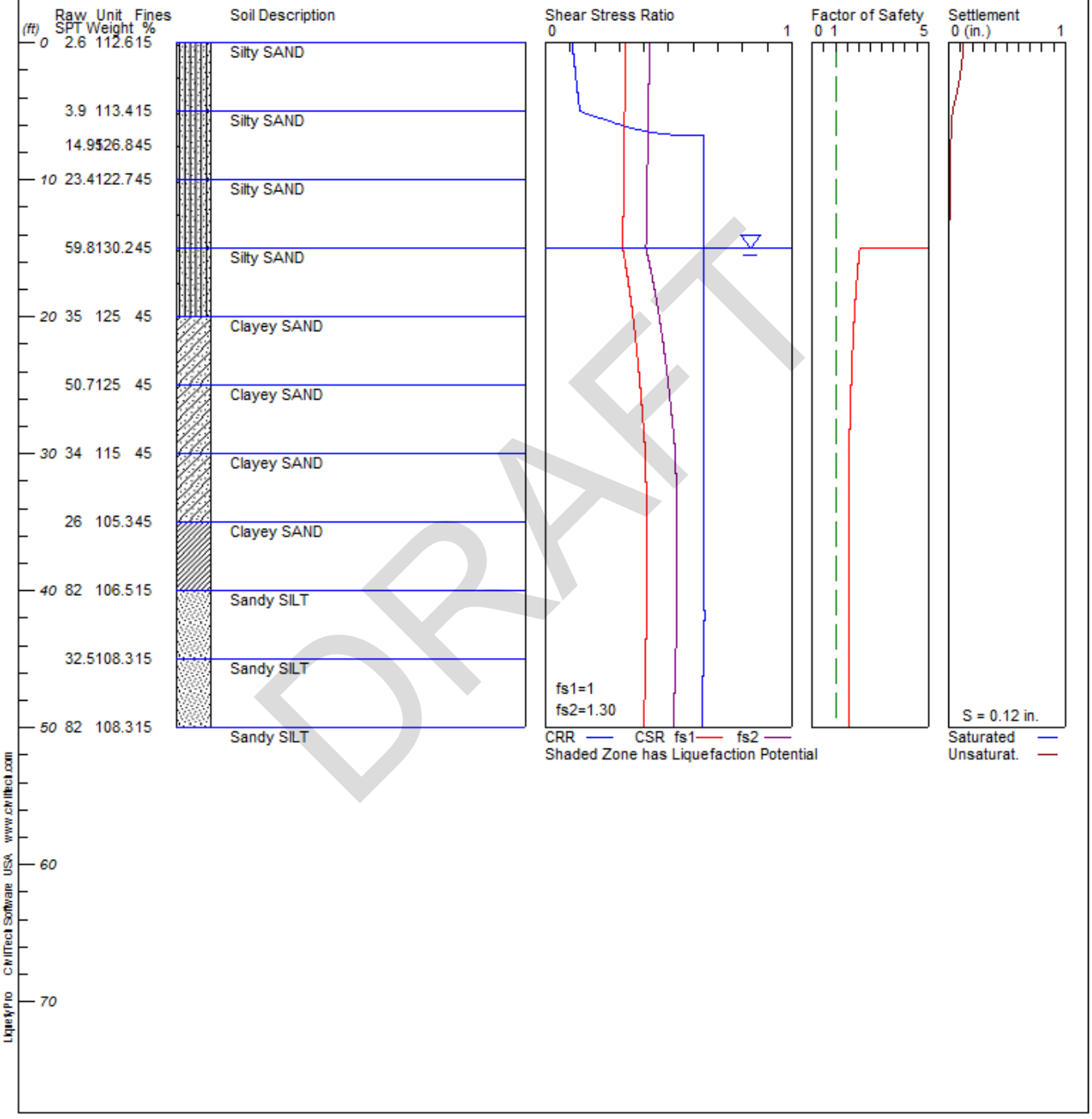


LIQUEFACTION ANALYSIS

Polopolus Commercial Dev.

Hole No.=BH-5 Water Depth=15 ft Surface Elev.=625

Magnitude=6.8
Acceleration=0.5g



Appendix F

Recommended Eartwork Specifications

APPENDIX F

RECOMMENDED EARTHWORK SPECIFICATIONS

F.1 Scope of Work

The work includes all labor, supplies and construction equipment required to construct the building pads in a good, workmanlike manner, as shown on the drawings and herein specified. The major items of work covered in this section include the following:

- Site Inspection
- Authority of Geotechnical Engineer
- Site Clearing
- Excavations
- Preparation of Fill Areas
- Placement and Compaction of Fill
- Trench Backfill
- Observation and Testing

F.2 Site Inspection

1. Contractor shall carefully examine the site and make all inspections necessary, in order to determine the full extent of the work required to make the completed work conform to the drawings and specifications. The Contractor shall satisfy himself as to the nature and location of the work, ground surface and the characteristics of equipment and facilities needed prior to and during prosecution of the work. The Contractor shall satisfy himself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered. Any inaccuracies or discrepancies between the actual field conditions and the drawings, or between the drawings and specifications must be brought to the Owner's attention in order to clarify the exact nature of the work to be performed.
2. This *Geotechnical Investigation Report* may be used as a reference to the surface and subsurface conditions on this project. The information presented in this report is intended for use in design and is subject to confirmation of the conditions encountered during construction. The exploration logs and related information depict subsurface conditions only at the particular time and location designated on the logs of borings. Subsurface conditions at other locations may differ from conditions encountered at the exploration locations. In addition, the passage of time may result in a change in subsurface conditions at the exploration locations. Any review of this information shall not relieve the Contractor from performing such independent investigation and evaluation to satisfy himself as to the nature of the surface and subsurface conditions to be encountered and the procedures to be used in performing his work.

F.3 Authority of the Geotechnical Engineer

1. The Geotechnical Engineer will observe the placement of compacted fill and will take sufficient tests to evaluate the uniformity and degree of compaction of filled ground.
2. As the Owner's representative, the Geotechnical Engineer will (a) have the authority to cause the removal and replacement of loose, soft, disturbed and other unsatisfactory soils and uncontrolled fill; (b) have the authority to approve the preparation of native ground to receive fill material; and (c) have the authority to approve or reject soils proposed for use in building areas.
3. The Civil Engineer and/or Owner will decide all questions regarding (a) the interpretation of the drawings and specifications, (b) the acceptable fulfillment of the contract on the part of the contractor and (c) the matters of compensation.

F.4 Site Clearing

1. Clearing and grubbing shall consist of the removal from building areas to be graded and clearing of all existing utilities and vegetation.
2. Organic and inorganic materials resulting from the clearing and grubbing operations shall be hauled away from the areas to be graded.

F.5 Excavations

1. Based on observations made during our field explorations, the near-surface soils can generally be excavated with conventional earthwork equipment.
2. Cobbles and boulders may be encountered locally.

F.6 Preparation of Fill Areas

1. All organic material, organic soils, undocumented fill soils and debris should be removed from all areas.
2. After the required removals have been made, the exposed native earth materials shall be excavated to provide a zone of dense, undisturbed, nonporous native sediments or structural fill for the support of footings, slabs-on-grade, exterior flatwork. Removals shall extend lot line to lot line. Removals should extend to the deepest of the following:
    a. 2 feet below existing grade,
    b. 5 feet below finish grade,
    c. 2 feet below bottom of footings,
    d. minimum removal depths recommended in the geotechnical report,
    e. 85 percent compacted native soil or 90 percent compacted documented fill soil.
3. Building pad subgrades shall be overexcavated as needed to provide a relatively uniform fill thickness beneath building pads. The fill thickness shall not vary by more than one-third within the building footprint.

4. The subgrade in all areas to receive fill shall be scarified to a minimum depth of twelve (12) inches, the soil moisture adjusted to within three (3) percent of optimum moisture content and then compacted to at least 90 percent of maximum dry density as determined by ASTM Standard D1557 test method.
5. Compacted fill may be placed on native soils or documented fill soils that have been properly scarified and recompacted as discussed above.
6. All areas to receive compacted fill will be observed and approved by the Geotechnical Engineer before the placement of fill.

F.7 Placement and Compaction of Fill

1. Compacted fill placed for the support of footings, slabs-on-grade, exterior concrete flatwork, and driveways will be considered structural fill. Structural fill may consist of approved on-site soils or imported fill that meets the criteria indicated below.
2. Fill consisting of selected on-site earth materials or imported soils approved by the Geotechnical Engineer shall be placed in layers on approved earth materials. Soils used as compacted structural fill shall have the following characteristics:
   a. All fill soil particles shall not exceed three (3) inches in nominal size, and shall be free of organic matter and miscellaneous inorganic debris and inert rubble.
   b. In order to limit moisture penetration to foundation earth materials, imported fill materials shall be similar to on-site earth materials with at least 30 percent passing the No. 200 sieve. As an alternative to 30 percent passing the No. 200 sieve, import materials with a remolded permeability of $1x10^{-6}$ cm/sec or less would be acceptable.
   c. Imported fill materials shall have an Expansion Index (EI) less than 21. All imported fill should be compacted to at least 90 percent of maximum dry density (ASTM D1557) at within three (3) percent of optimum moisture.
   d. Imported fill materials shall have less than 0.1 percent sulfate salts, if possible. If laboratory test results indicate import fill materials contain more than 0.1 percent sulfate salts, a concrete mix should be designed to resist the sulfate levels indicated by the laboratory test results.
3. Fill soils shall be evenly spread in maximum 8-inch lifts, watered or dried as necessary, mixed and compacted to at least the density specified below. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer.
4. All fill placed at the site shall be compacted to at least 90 percent of the maximum laboratory density as determined by the ASTM Standard D1557 test method. At least the upper twelve (12) inches of fill underlying pavements should be compacted to at least 95 percent of the laboratory maximum dry density. Soils shall be moisture conditioned to within three (3) percent of optimum moisture content.
5. Fill exceeding five (5) feet in height shall not be placed on native slopes that are steeper than 5:1 horizontal:vertical (H:V). Where native slopes are steeper than

5:1 H:V, and the height of the fill is greater than five (5) feet, the fill shall be benched into competent materials. The height and width of the benches shall be at least two (2) feet.

6. Representative samples of materials being used, as compacted fill will be analyzed in the laboratory by the Geotechnical Engineer to obtain information on their physical properties. Maximum laboratory density of each soil type used in the compacted fill will be determined by the ASTM Standard D1557 compaction method.
7. Fill materials shall not be placed, spread or compacted during unfavorable weather conditions. When site grading is interrupted by heavy rain, filling operations shall not resume until the Geotechnical Engineer approves the moisture and density conditions of the previously placed fill.
8. It shall be the Grading Contractor's obligation to take all measures deemed necessary during grading to provide erosion control devices in order to protect slope areas and adjacent properties from storm damage and flood hazard originating on this project. It shall be the contractor's responsibility to maintain slopes in their as-graded form until all slopes are in satisfactory compliance with job specifications, all berms have been properly constructed, and all associated drainage devices meet the requirements of the Civil Engineer.

F.8 Trench Backfill

1. Trench excavations to receive backfill shall be free of trash, debris or other unsatisfactory materials at the time of backfill placement.
2. Trench backfill shall be compacted to a minimum compaction of 90 percent of the laboratory maximum dry density as per ASTM Standard D1557 test method. At least the upper twelve (12) inches of trench underlying pavements should be compacted to at least 95 percent of the laboratory maximum dry density.
3. Rocks larger than one inch should not be placed within 12 inches of the top of the pipeline or within the upper 12 inches of pavement or structure subgrade. No more than 30 percent of the backfill volume shall be larger than 3/4-inch in largest dimension diameter and rocks shall be well mixed with finer soil.
4. The pipe design engineer should select bedding material for the pipe. In general, materials with a Sand Equivalent (SE) greater than or equal to 30, as determined by the ASTM Standard D2419 test method is recommended for bedding.
5. Trench backfill shall be compacted by mechanical methods, such as sheepsfoot, vibrating or pneumatic rollers, or mechanical tampers to achieve the density specified herein. The backfill materials shall be brought to within two (2) percent of optimum moisture content, then placed in horizontal layers. The thickness of uncompacted layers should not exceed eight (8) inches. Each layer shall be evenly spread, moistened or dried as necessary, and then tamped or rolled until the specified density has been achieved.
6. The contractor shall select the equipment and processes to be used to achieve the specified density without damage to adjacent ground and completed work.

7. The field density of the compacted soil shall be measured by the ASTM Standard D1556 or ASTM Standard D2922 test methods or equivalent.
8. Observation and field tests should be performed by Converse during construction to confirm that the required degree of compaction has been obtained. Where compaction is less than that specified, additional compactive effort shall be made with adjustment of the moisture content as necessary, until the specified compaction is obtained.
9. It is the responsibility of the contractor to maintain safe conditions during cut and/or fill operations.
10. Trench backfill shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by the project's geotechnical consultant indicate that the moisture content and density of the fill are as previously specified.

F.9 Observation and Testing

1. During the progress of grading, the Geotechnical Engineer will provide observation of the fill placement operations.
2. Field density tests will be made during grading to provide an opinion on the degree of compaction being obtained by the Contractor. Where compaction of less than specified herein is indicated, additional compactive effort with adjustment of the moisture content shall be made as necessary, until the required degree of compaction is obtained.
3. A sufficient number of field density tests will be performed to provide an opinion to the degree of compaction achieved. In general, density tests will be performed on each one foot lift of fill, but not less than one for each 500 cubic yards of fill placed.