

**APPENDIX E2**  
**GEOTECHNICAL EVALUATION (APN 0167-061-03)**

April 6, 2022  
J.N. 22-199**MERITAGE HOMES**5 Peters Canyon Road, Suite 310  
Irvine, California 92606

Attention: Ms. Johanna Crooker

**Subject: Due-Diligence/Feasibility Geotechnical Assessment, 5±-Acre Parcel of Agricultural Land, Assessor Parcel Number (APN) 0167-061-03, Site East of 1160 W. Pioneer Avenue, City of Redlands, San Bernardino County, California**

Dear Ms. Crooker:

In accordance with your request, **Petra Geosciences, Inc. (Petra)** has performed a geotechnical due-diligence evaluation of the subject site for development of residential lots and related utility and street improvements. This report presents our findings and professional opinions with respect to the geotechnical feasibility of the proposed development, geotechnical constraints that should be taken into consideration during development of the site and potential mitigation measures to bring the site to compliance from a geotechnical engineering viewpoint.

*It must be emphasized that that this report is intended as a feasibility-level geotechnical assessment only and is based solely on a review of the referenced background geologic literature and our limited subsurface exploration and laboratory testing. As such, the contents of this report are not suitable for submittal to regulatory agencies, nor should the findings or conclusions provided herein be relied upon for earthwork, quantity calculation or procedure, or structural engineering design. This geotechnical evaluation does not address soil contamination or other environmental issues affecting the property which will be provided under separate cover.*

**SITE GENERAL OVERVIEW**

The subject site is located at 1160 W. Pioneer Avenue in the city of Redlands, San Bernardino County, California. According to the California Department of Conservation, Geologic Energy Management Division (CalGEM) Online Mapping System (2021), the site is located within Township 01 South, Range 03 West, Section 16, San Bernardino Base and Meridian. A site location map is included as Figure 1.

The rectangular shaped site is comprised of approximately 5±-acres of vacant land and is identified as Assessor Parcel Number (APN) 0167-061-03. The site can be accessed via W. Pioneer Avenue along the

south property boundary. Citrus Valley High School forms the eastern boundary of the site. Vacant land and an orchard bound the west and north boundaries, respectively.

The site slopes gently to the north with existing elevations on the order of approximately 1,276± feet above mean sea level (msl) along the south portion of the site, to 1,272± feet above msl along the north portion of the site. Light to moderate vegetation covers the site with several mature trees along the south and east boundaries of the site.

## **DUE DILIGENCE ASSESSMENT**

### **Literature Review**

Petra has reviewed available published and unpublished geologic/geotechnical maps and literature, as well as online aerial imagery in the general area of the project site, see references. No geotechnical reports are known to exist for this site. Petra conducted a Due Diligence study of the westerly adjacent parcel in September of 2021 (see Ref. Petra, 2021). Given the similarity of the two parcels in regard to geology and material properties of the site soils, data from that study has been utilized in this analysis. For completeness, borings logs, laboratory data and percolation study results from that study/report are presented herein as Appendix C.

### **Site Reconnaissance and Subsurface Investigation**

A preliminary subsurface exploration program was conducted within the site by representatives of Petra on March 14, 2022. The field investigation included the excavation of 4 exploratory borings (B-1 through B-4) to approximate depths of 26.5 feet below existing ground surface (bgs) utilizing a conventional rubber-tired drill rig. Following drilling and logging the borings were loosely backfilled with the soil cuttings. The log of borings are presented in Appendix A. The approximate locations of the exploratory borings are shown on Figure 2. The purpose of our preliminary investigation was to evaluate the subsurface surface soil materials to determine the unsuitable soil removal depths (remedial grading).

As part of the 2021 study of the adjacent site, 6 hollow stem borings were drilled and logged. One of the borings (B-6) was converted to a field percolation well to evaluate the infiltration rate of the alluvial deposits underlying the site. Those borings and percolation test are deemed applicable to this study and are included in Appendix C along with a Site Map with boring locations.

### **Laboratory Testing**

The preliminary laboratory program consisted of testing select undisturbed and/or bulk samples of onsite native soil materials for in-situ moisture and dry density, and consolidation characteristics. The laboratory data is tabulated in Appendix B and the results are included in the conclusions and recommendations section herein. Laboratory testing for the westerly adjacent site was conducted including expansion index, maximum dry density and optimum moisture content, and general corrosion potential (sulfate, chloride, pH, resistivity). That data is applicable to the subject site and is included in Appendix C.

## **FINDINGS**

### **Proposed Development**

Although there are no preliminary grading plans, the current conceptual development is expected to consist of building pads for single-family residences with other site improvements consisting of in-tract streets and underground utility lines (sewer, water, storm drain and dry utilities), an offsite sewer line, masonry block screen walls, concrete sidewalks and landscaping etc. Given the relatively flat topography of the site, it is anticipated that design grades will only require minor adjustments to existing grades/elevations.

### **Site Reconnaissance**

A representative of Petra conducted a site reconnaissance and performed photo documentation during the field investigation on March 14, 2022 to observe the current surface conditions at subject site. The property is situated in an area of residential, commercial and open space/undeveloped land use.

The site surrounding areas consist of agricultural fields and the Santa Ana River beyond to the north; a drainage channel and the 210 Foothill Freeway, with commercial development beyond to the west; Pioneer Avenue, with vacant land beyond to the south and; Citrus Valley High School, with Texas Street, vacant land and residential development beyond to the east.

Based on photo archives, the site appears to have been used for cultivated orchards since at least 1930 until sometime between/during 1994 and 2002. Sometime between/during 1994 and 2002 the orchards were removed from the site and the site has remained vacant land to present.

Dumped household trash was observed in several areas of the site and included plastic bags, plastic bottles, cans, pans, wood, cardboard and other miscellaneous household trash along with windblown trash. There was no evidence of sumps, pits, pools, or lagoons identified during our site reconnaissance. Two metal light

towers, tubed fencing, metal bleachers and a ticket building are located along the easterly boundary for the adjacent high school track and football field.

### **Preliminary Geotechnical Field and Laboratory Results**

As noted, our preliminary field investigation included the excavation of four exploratory test borings (B-1 through B-4) to depths of approximately 26.5 feet bgs. The following presents the results of the subsurface and laboratory investigations.

#### **Hollow Stem Auger Borings**

Based on the four borings, the site is underlain by native younger alluvial soil deposits to the maximum depth explored of 26.5 feet bgs. These alluvial soils generally consisted of thinly to thickly interbedded sequences of dry to slightly moist sand and silty sand with low to medium density in the upper 20 to 25 feet.. Thin interbeds of sandy silt were occasionally encountered, as well as thin gravel layers. Logs of the borings are included as Appendix A.

The result of our analysis indicates that the site is not susceptible to seismically induced liquefaction settlement; however, it is considered susceptible to seismically induced dry sand/dynamic settlement. Based on our analysis, total dry sand settlement can range from 4 to 6 inches at the location studied with a potential for differential settlement of 2 inches over a distance of 40 feet.

In the literature, prediction of the seismic settlement for unsaturated sandy soils, referred to as “dry sand” settlement, is based on observation of performance of 5 sites that were comprised of clean sands (i.e., sands with 5 percent fines or less). However, the shallow site soils, above the assumed historic high ground water level, are comprised of sands with substantial amounts of fines. This influences (reduces) the settlement potential under a seismic event. To overcome this, the measured parameters of soils with fines are first converted to clean sand values and then will be used in the predictive routines. This is an indirect approach and, therefore, lacks the performance-based verification requirements. For this reason, some review agencies do not require “dry sand” settlement calculations as a part of their approval process.

For the subject site, the total seismic settlement is considered to be within the tolerable range and mitigation of the adverse impact of 1 to 2 inches of differential settlement on proposed structures may include post tensioned slabs along with the structural engineer’s design calculations.

### Percolation Test Results

A falling-head percolation test was performed for the 2021 study. The boring/well location is adjacent to the southwest corner of the subject site. The purpose of the percolation study was to determine the shallow site infiltration rate,  $I_t$  [expressed in units of inches/hour, utilizing the Porchet Method (RCFCWCD, 2011)]. Following a presoaking period, field testing was conducted in a perforated-cased borehole (with ¾-inch gravel surrounding the pipe) at 10-minute intervals for a period of approximately 1 hour. Test data are attached in Appendix C. The infiltration rate,  $I_t$ , was calculated by determining the volumetric water flow rate through the wetted borehole surface area, expressed in terms of inches per hour. An un-factored infiltration rate of 2.8 inches per hour is obtained. A Reduction Factor of 1.25 should be considered for Site Suitability considerations to the value of Infiltration Rate provided herein.

### Laboratory Tests

Limited laboratory testing was conducted on various representative fill samples collected from drill rig locations for engineering and classification properties. The in-situ moisture and dry density results are indicated on the boring logs in Appendix A. Consolidation test results conducted for this study are presented in Appendix B. Laboratory tests results for the 2021 study are presented in Appendix C. Based on the combined results of the laboratory tests on the subject and adjacent sites, the native soils in the upper 5 feet across the site were found to generally consist of very dry to slightly moist sand to silty sand that have a very low expansion potential (EI of 0). Lab testing found site soils to have a negligible corrosion potential to concrete materials (soluble sulfate of 0.0009 percent), very low exposure to chlorides (108 mg/L), moderately alkaline (soil pH of 8.4) and are considered mildly corrosive to buried metallic elements and (minimum resistivity of 10,000 ohm-cm). Maximum dry density and optimum moisture content had a value of 125.0 pcf at 9.0 percent optimum moisture content. Collapse testing of the native alluvium soils indicate a collapse potential generally on the order of 0.2 to 0.6 percent indicating a relatively low collapse potential.

### Compressible/Collapsible Soils

Based on our borings and laboratory testing, the existing soils, including all topsoil and the upper portions of low-density and dry alluvial soils, are considered unsuitable for support of proposed fills, structures, pavement or other improvements and should be removed to underlying competent alluvial soils and replaced as properly compacted fill. Based on our boring data, the upper 6 feet of site soils should be uniformly removed to competent alluvium and then the bottom excavation should be tested in the field. If the natural bottom excavation is found to have a minimum of 85 percent in-situ relative density, then the bottom surface may be properly processed to at least 12 inches in depth by moisture content to at least 2 percent above optimum moisture content and recompacted to at least 90 percent relative compaction. Then

engineered fill placement may commence to design grades. Localized areas of deeper excavation/removal of unsuitable soils may be necessary and contingencies should be planned for.

### **Groundwater**

Groundwater was not encountered in our borings to the maximum explored depth. In addition, California Department of Water Resources website indicated that recent groundwater levels since 1990 in the nearby area are greater than 130 feet bgs. Groundwater may have been as shallow as 55 feet back in the 1940's however it is highly unlikely groundwater levels would rise to those previous elevations in the future. Groundwater is not anticipated to impact the proposed development.

### **Faulting**

Based on our review of published geologic maps, no faults are known to project through the property, and no portion of the site lies within an Earthquake Fault Hazard Zone as designated by the State of California pursuant to the Alquist-Priolo Earthquake Zoning Act. Therefore, it is our opinion that surface-rupture will not affect the site.

### **Strong Ground Motions**

The site is located in a seismically active area of Southern California and will likely be subjected to very strong seismically-related ground shaking during the anticipated life span of the project. Structures within the site should therefore be designed and constructed to resist the effects of strong ground motion in accordance with the 2019 California Building Code (CBC).

### **Liquefaction and Dynamic Settlement Potential**

Based on review of the San Bernardino County geologic hazard maps the site is not located within a mapped liquefaction hazard zone, however the site is in close proximity to an area mapped as high liquefaction potential. Regional groundwater depths from nearby in the area indicate recent depths of over 130 feet bgs or more, however historic high groundwater in the 1940's was as high as 55 feet± bgs. Our borings did not encounter groundwater to a depth of 56.5 feet bgs, therefore liquefaction does not appear to be a hazard at this site.

Based on the relatively young age and low density of the underlying alluvium, a seismic or "dry sand" settlement analysis was performed. Based on our preliminary analysis, the potential for seismic (dynamic) settlement at this site was determined to be between 4 to 6 inches. It is our professional opinion that the

adverse impacts of this additional settlement on structural behavior could be mitigated by a placement of an engineered fill layer and a foundation design using a differential settlement of 2 inches in 40 feet.

### **CONCLUSIONS AND RECOMMENDATIONS**

Based on our site reconnaissance, limited field investigation and laboratory testing, the development of the subject project site is considered feasible from a geotechnical engineering standpoint. It is recommended that the following geotechnical issues be considered by the Client during this due diligence period.

#### **Primary Geotechnical Issues**

Our professional opinion, from a geotechnical engineering viewpoint, regarding various aspects of site condition and/or proposed development is presented herein. The following presents the salient points of our due diligence assessment that we recommend be considered for future site development.

- **Design Level Geotechnical Report and Grading Plan Review Report:** The City of Redlands will require a formal geotechnical report during the review and approval process and may also require a geotechnical review of the final grading plans. Any formal geotechnical reports should include recommendations for site rough grading, post-grading improvements, and preliminary building foundation design based on the current 2019 California Building Code.
- **Demolition, Clearing and Grubbing:** All existing site improvements, underground utility lines and/or structures will need to be demolished are removed from the site. In addition, due the past site usage, the possibility does exist that other unknown underground structures may be found below current grades. It is recommended that all vegetation (including the root ball), debris and trash encountered on the site be removed and disposed in accordance with current local regulations.

It is unknown if there are any septic tanks or leach fields on the site. If any are encountered during site development, it is recommended that they be removed in accordance with current regulations.

- **Removal of Unsuitable Soil Materials:** Based on our boring data, the upper 6 feet of native site soils/alluvium were generally loose and dry and generally unsuitable for support of proposed fills or structures and should be removed to competent alluvium exhibiting at least 85 percent in-situ relative density. Design cut lots should be overexcavated a minimum of 3 feet below finish pad grades or 6 feet below natural grades, whichever is greater. Remedial grading removals in street and non-structural areas may be reduced to 2 feet below design grades or at least 3 feet below existing site grades, whichever is deeper. The bottom of all remedial excavations should be properly processed in-place prior to fill placement.
- **Suitability of Onsite Soils for Fill:** All onsite soils consisting of “clean” native soils/alluvium are considered suitable for use in engineering fill provided they are free of organics or other deleterious materials. The near-surface site soils (upper 5± feet) may be in a very dry condition and may need to be pre-watered for an extended period to bring the site soils to near optimum conditions at the onset of grading.

Shrinkage/Importing of Fill: Although grading plans and preliminary grading quantities are not currently available, all earthwork calculations should take into account soil shrinkage and site subsidence during remedial alluvial removals and replacement as compacted fill. Estimated shrinkage of native alluvium could be on the order of 15 to 17± percent when removed and compacted as engineered fill and site subsidence could be on the order of 0.1 to 0.2 feet.

In the event that import is needed to complete grading of the site, the potential source(s) should be evaluated prior to importing to the site such that non-expansive, low corrosive soils that are free of deleterious materials will be used.

- Deep Utility Trenching: Based on the observed soil types, sands and silty sands with generally low fines content, caving of trench excavations may be of concern. Deeper trenching for utility lines may need to be laid back at a slope excavation flatter than normal or shoring may need to be employed.
- Expansion and Corrosion Potential of Site Soils: Our laboratory testing indicated site soils to be very low in expansion potential and have a negligible exposure to sulfates. Additionally, site soils are considered moderately corrosive to buried metallic elements. Sampling and laboratory testing should be performed during grading operations for expansion and general corrosion potential for the purposes of providing final foundation and other design recommendations.
- Building Foundation Design: Based on the observed soils types and anticipated engineered grading, conventional foundations are expected to be feasible, however, based on our dynamic settlement analysis that indicated 2 inches of potential settlement, we recommend a post-tensioned slab on-grade for the proposed dwellings. Final foundation design would be provided at the completion of site grading depending on the as-graded conditions and expansion potential of soils at or near finish grades. Very low expansion soils are anticipated across the site at this time.
- Pavement Design: Based on the observed soil types, sands and silty sands, a preliminary pavement design of 3 inches of asphalt over 6 inches of base for in-tract streets may be utilized for budgeting purposes. Final pavement design should be provided at the completion of site and street grading based on final sampling and testing of subgrade soils for R-value.
- Onsite Stormwater Infiltration: Based on the observed soil types, sands and silty sands with generally low fines content, we expect to have reasonable percolation or infiltration rates. As indicated by the percolation test conducted in Boring B-6/P-1, onsite storm water infiltration systems may be effective for transmitting water into the subsurface. Once basin locations and depths are known, supplemental field infiltration testing should be performed and the required setbacks established.

### **REPORT LIMITATIONS**

This report is based on the existing conditions of the subject property and the geotechnical observations made during our site reconnaissance and preliminary field investigation and limited laboratory testing. The soil conditions observed in our field investigation are believed to be representative of the general area conditions; however, soil conditions can vary in characteristics between excavations, both laterally and vertically and we recommend supplemental test pits for further evaluation during the design phase of the

project. The conclusions and opinions contained in this report are based on the results of the described geotechnical evaluations and represent our professional judgment. This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and in the same time period. The contents of this report are professional opinions and as such, are not to be considered a guaranty or warranty.

This report should be reviewed and updated after a period of one year or if the site ownership or project concept changes from that described herein. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

This opportunity to be of service is sincerely appreciated. If you have any additional questions or concerns, please feel free contact this office.

Respectfully submitted,

**PETRA GEOSCIENCES, INC.**

  
4/6/22

Siamak Jafroudi, PhD  
Senior Principal Engineer  
GE 2024



TMW/SJ/lv

Attachments:   References  
                    Figure 1 – Site Location Map  
                    Figure 2 – Boring Location Map  
                    Appendix A – Boring Logs  
                    Appendix B – Laboratory Test Data  
                    Appendix C – Supplemental Data from 2021 Due Diligence Study

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### **REFERENCES**

- California Department of Water Resources, 2019, Water Data Library, accessed March,  
<http://www.water.ca.gov/waterdatalibrary/>
- California Geologic Survey, 2019, Earthquake Zones of Required Investigation, accessed March,  
<https://maps.conservation.ca.gov/cgs/EQZApp/app/>
- Google Earth™ 2019, by Google Earth, Inc., accessed March,  
<http://www.google.com/earth/index.html>
- Macrostrat, Creative Commons Attribution 4.0, 2018, accessed October,  
<https://macrostrat.org/map/>
- Matti, J. C. et. al., 2003, Geologic Map of the Redlands 7.5' Quadrangle, San Bernardino and Riverside Counties, California; USGS Open-file Report 03-302.
- Petra Geosciences, Inc., 2021, Due-Diligence/Feasibility Geotechnical Assessment, 10±-Acre Parcel of Agricultural Land, Assessor Parcel Number (APN) 0167-061-01, Site East of 1160 W. Pioneer Avenue, City of Redlands, San Bernardino County, California; report by Petra Geosciences, Inc., J.N. 21-315, dated September 10.
- San Bernardino County Land Use Plan, 2010, General Plan Geologic Hazard Overlays, Figure FH31 C, Redlands.



Base Map Reference: Google Earth (2022) Map

|                                                                                                                                                                                |                  |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------|
| <b>PETRA GEOSCIENCES, INC.</b><br>40880 County Center Drive, Suite M<br>Temecula, California 92591<br>PHONE: (951) 600-9271<br>COSTA MESA TEMECULA VALENCIA PALM DESERT CORONA |                  |                 |
| <b>SITE LOCATION MAP</b>                                                                                                                                                       |                  |                 |
| 1160 W. Pioneer Avenue Project<br>Redlands, California                                                                                                                         |                  |                 |
|  <b>PETRA</b><br>GEOSCIENCES <sup>INC.</sup>                                               | DATE: April 2022 | <b>Figure 1</b> |
|                                                                                                                                                                                | J.N.: 22-199     |                 |



## EXPLANATION



Approximate Location of Site Boundary



Approximate Location of Exploratory Boring TD = Total Depth



Reference: Google Earth Image, 2022

## PETRA GEOSCIENCES, INC.

40880 County Center Drive, Suite M

Temecula, California 92591

PHONE: (951) 600-9271

COSTA MESA TEMECULA VALENCIA PALM DESERT CORONA

## BORING LOCATION MAP

1160 W. Pioneer Avenue Project  
Redlands, California



DATE: April 2022

J.N.: 22-199

**Figure 2**

# ***APPENDIX A***

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## ***BORING LOGS***

# Soil Classification

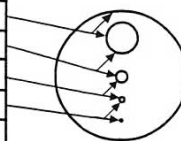


| 4 Moisture Content |
|--------------------|
| Dry                |
| Slightly Moist     |
| Moist              |
| Very Moist         |
| Wet (Saturated)    |

| Modifiers |           |
|-----------|-----------|
| Trace     | < 1 %     |
| Few       | 1 - 5 %   |
| Some      | 5 - 12 %  |
| Numerous  | 12 - 20 % |

| Soil Classification Should Include:                                                              |
|--------------------------------------------------------------------------------------------------|
| <u>PREFERRED ORDER</u>                                                                           |
| 1. Group Name                                                                                    |
| 2. Group Symbol                                                                                  |
| 3. Color                                                                                         |
| 4. Moisture Content                                                                              |
| 5. Relative Density / Consistency                                                                |
| 6. Grain Size Range                                                                              |
| 7. Structure                                                                                     |
| 8. Odor                                                                                          |
| 9. Additional comments indicating soil characteristics which might affect engineering properties |

| 6 Grain Size |              |            |                                |
|--------------|--------------|------------|--------------------------------|
| Description  | Sieve Size   | Grain Size | Approximate Size               |
| Boulders     | >12"         | >12"       | Larger than basketball-sized   |
| Cobbles      | 3 - 12"      | 3 - 12"    | Fist-sized to basketball-sized |
| Gravel       | coarse       | 3/4 - 3"   | Thumb-sized to fist-sized      |
|              | fine         | #4 - 3/4"  | Pea-sized to thumb-sized       |
| Sand         | coarse       | #10 - #4   | Rock salt-sized to pea-sized   |
|              | medium       | #40 - #10  | Sugar-sized to rock salt-sized |
|              | fine         | #200 - #40 | Flour-sized to sugar-sized to  |
| Fines        | Passing #200 | <0.0029"   | Flour-sized and smaller        |



| 1 2 Unified Soil Classification System                                                                |                                                                      |
|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Coarse-grained Soils<br>> 1/2 of materials is larger than #200 sieve                                  | GRAVELS<br>more than half of coarse fraction is larger than #4 sieve |
|                                                                                                       | Clean Gravels (less than 5% fines)                                   |
|                                                                                                       | Gravels with fines                                                   |
|                                                                                                       | SANDS<br>more than half of coarse fraction is smaller than #4 sieve  |
| Fine-grained Soils<br>> 1/2 of materials is smaller than #200 sieve                                   | Clean Sands (less than 5% fines)                                     |
|                                                                                                       | Sands with fines                                                     |
|                                                                                                       | SILTS & CLAYS<br>Liquid Limit<br>Less Than 50                        |
|                                                                                                       | SILTS & CLAYS<br>Liquid Limit<br>Greater Than 50                     |
| Highly Organic Soils                                                                                  |                                                                      |
| The No. 200 U.S. Standard Sieve is about the smallest particle visible to the naked eye               |                                                                      |
| GW Well-graded gravels, gravel-sand mixtures, little or no fines                                      |                                                                      |
| GP Poorly-graded gravels, gravel-sand mixtures, little or no fines                                    |                                                                      |
| GM Silty Gravels, poorly-graded gravel-sand-silt mixtures                                             |                                                                      |
| GC Clayey Gravels, poorly-graded gravel-sand-clay mixtures                                            |                                                                      |
| SW Well-graded sands, gravelly sands, little or no fines                                              |                                                                      |
| SP Poorly-graded sands, gravelly sands, little or no fines                                            |                                                                      |
| SM Silty Sands, poorly-graded sand-gravel-silt mixtures                                               |                                                                      |
| SC Clayey Sands, poorly-graded sand-gravel-clay mixtures                                              |                                                                      |
| ML Inorganic silts & very fine sands, silty or clayey fine sands, clayey silts with slight plasticity |                                                                      |
| CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays  |                                                                      |
| OL Organic silts & clays of low plasticity                                                            |                                                                      |
| MH Inorganic silts, micaceous or diatomaceous fine sand or silt                                       |                                                                      |
| CH Inorganic clays of high plasticity, fat clays                                                      |                                                                      |
| OH Organic silts and clays of medium-to-high plasticity                                               |                                                                      |
| PT Peat, humus swamp soils with high organic content                                                  |                                                                      |

| 5 Consistency - Fine Grained Soils |                    |                                    |                                                                                          |
|------------------------------------|--------------------|------------------------------------|------------------------------------------------------------------------------------------|
| Apparent Density                   | SPT (# blows/foot) | Modified CA Sampler (# blows/foot) | Field Test                                                                               |
| Very Soft                          | <2                 | <3                                 | Easily penetrated by thumb; exudes between thumb and fingers when squeezed in hand       |
| Soft                               | 2-4                | 3-6                                | Easily penetrated one inch by thumb; molded by light finger pressure                     |
| Firm                               | 5-8                | 7-12                               | Penetrated over 1/2 inch by thumb with moderate effort; molded by strong finger pressure |
| Stiff                              | 9-15               | 13-25                              | Indented about 1/2 inch by thumb but penetrated only with great effort                   |
| Very Stiff                         | 16-30              | 26-50                              | Readily indented by thumbnail                                                            |
| Hard                               | >30                | >50                                | Indented with difficulty by thumbnail                                                    |

| 5 Relative Density - Coarse Grained Soils |                    |                                    |                                                                                        |
|-------------------------------------------|--------------------|------------------------------------|----------------------------------------------------------------------------------------|
| Apparent Density                          | SPT (# blows/foot) | Modified CA Sampler (# blows/foot) | Field Test                                                                             |
| Very Loose                                | <4                 | <5                                 | Easily penetrated with 1/2-inch reinforcing rod pushed by hand                         |
| Loose                                     | 4-10               | 5-12                               | Easily penetrated with 1/2-inch reinforcing rod pushed by hand                         |
| Medium Dense                              | 11-30              | 13-35                              | Easily penetrated 1-foot with 1/2-inch reinforcing rod driven with a 5-lb hammer       |
| Dense                                     | 31-50              | 36-60                              | Difficult to penetrated 1-foot with 1/2-inch reinforcing rod driven with a 5-lb hammer |
| Very Dense                                | >50                | >60                                | Penetrated only a few inches with 1/2-inch reinforcing rod driven with a 5-lb hammer   |

# EXPLORATION LOG

| Project: <b>Meritage Homes</b>                                              |                |                                                                                                                                 |                       | Boring No.: <b>B-1</b>         |                  |                  |                            |                         |                       |  |
|-----------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------|------------------|------------------|----------------------------|-------------------------|-----------------------|--|
| Location: <b>Pioneer Ave, E of 210 FWY &amp; N of Domestic Ave, Redland</b> |                |                                                                                                                                 |                       | Elevation: <b>1273ft (msl)</b> |                  |                  |                            |                         |                       |  |
| Job No.: <b>22-199</b>                                                      |                | Client: <b>Meritage Homes</b>                                                                                                   |                       | Date: <b>03/14/2022</b>        |                  |                  |                            |                         |                       |  |
| Drill Method: <b>Hollow Stem Auger</b>                                      |                | Driving Weight: <b>140lbs/30"</b>                                                                                               |                       | Logged By: <b>SB</b>           |                  |                  |                            |                         |                       |  |
| Depth<br>(Feet)                                                             | Lith-<br>ology | Material Description                                                                                                            | W<br>A<br>T<br>E<br>R | Samples                        |                  |                  | Laboratory Tests           |                         |                       |  |
|                                                                             |                |                                                                                                                                 |                       | Blows<br>per<br>6 in.          | C<br>o<br>r<br>e | B<br>u<br>l<br>k | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab<br>Tests |  |
| 0                                                                           |                | <b>ALLUVIUM</b><br><u>Silty Sand (SM)</u> : Light brown, slightly moist, loose, fine- to coarse-grained sand.<br>Same as above. |                       | 2<br>4<br>7                    |                  |                  | 1.9                        | 111.5                   | CON                   |  |
| 5                                                                           |                | <u>Poorly graded Sand with Silt (SP-Sm)</u> : Light brownish-gray, slightly moist, medium dense, fine- to coarse-grained sand.  |                       | 4<br>6<br>8                    |                  |                  | 1.5                        | 105.9                   |                       |  |
|                                                                             |                | <u>Silty Sand (SM)</u> : Light brownish-gray, slightly moist, medium dense, fine- to coarse-grained sand.                       |                       | 4<br>6<br>10                   |                  |                  | 1.4                        | 106.7                   |                       |  |
| 10                                                                          |                | Same as above.                                                                                                                  |                       | 6<br>12<br>14                  |                  |                  | 1.6                        |                         |                       |  |
| 15                                                                          |                | Same as above.                                                                                                                  |                       | 9<br>15<br>16                  |                  |                  | 1.6                        |                         |                       |  |
| 20                                                                          |                | <u>Sandy Silt (ML)</u> : Light brown, moist to very moist, Very stiff, fine- to medium-grained sand.                            |                       | 10<br>12<br>14                 |                  |                  | 12.4                       | 100.1                   |                       |  |
| 25                                                                          |                | Moist to very moist, becomes stiff.                                                                                             |                       | 6<br>7<br>11                   |                  |                  | 21.7                       | 90.0                    |                       |  |
| 30                                                                          |                | Total Depth= 26.5'<br>No groundwater encountered during drilling<br>Boring backfilled with cuttings.                            |                       |                                |                  |                  |                            |                         |                       |  |
| 35                                                                          |                |                                                                                                                                 |                       |                                |                  |                  |                            |                         |                       |  |

# EXPLORATION LOG

| Project: <b>Meritage Homes</b>                                              |                                                                                    |                                                                                                                  |                       | Boring No.: <b>B-2</b>         |                                                                                       |                  |                            |                         |                       |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------|---------------------------------------------------------------------------------------|------------------|----------------------------|-------------------------|-----------------------|
| Location: <b>Pioneer Ave, E of 210 FWY &amp; N of Domestic Ave, Redland</b> |                                                                                    |                                                                                                                  |                       | Elevation: <b>1274ft (msl)</b> |                                                                                       |                  |                            |                         |                       |
| Job No.: <b>22-199</b>                                                      |                                                                                    | Client: <b>Meritage Homes</b>                                                                                    |                       | Date: <b>03/14/2022</b>        |                                                                                       |                  |                            |                         |                       |
| Drill Method: <b>Hollow Stem Auger</b>                                      |                                                                                    | Driving Weight: <b>140lbs/30"</b>                                                                                |                       | Logged By: <b>SB</b>           |                                                                                       |                  |                            |                         |                       |
| Depth<br>(Feet)                                                             | Lith-<br>ology                                                                     | Material Description                                                                                             | W<br>A<br>T<br>E<br>R | Samples                        |                                                                                       |                  | Laboratory Tests           |                         |                       |
|                                                                             |                                                                                    |                                                                                                                  |                       | Blows<br>per<br>6 in.          | C<br>o<br>r<br>e                                                                      | B<br>u<br>l<br>k | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab<br>Tests |
| 0                                                                           |  | <b>ALLUVIUM</b><br><u>Sandy Silt (SM)</u> : Light brown, slightly moist, loose, fine- to coarse-grained sand.    |                       |                                |                                                                                       |                  |                            |                         |                       |
|                                                                             |                                                                                    | Becomes very moist.                                                                                              |                       | 3<br>5<br>6                    |    |                  | 21.7                       | 112.7                   | CON                   |
| 5                                                                           |                                                                                    | Becomes medium dense.                                                                                            |                       | 4<br>7<br>7                    |    |                  | 21.7                       | 115.7                   |                       |
|                                                                             |                                                                                    | Same as above.                                                                                                   |                       | 5<br>7<br>9                    |    |                  | 2.9                        | 95.5                    |                       |
| 10                                                                          |                                                                                    | Becomes light gray.                                                                                              |                       | 6<br>8<br>9                    |    |                  | 2.0                        |                         |                       |
|                                                                             |                                                                                    |                                                                                                                  |                       |                                |                                                                                       |                  |                            |                         |                       |
| 15                                                                          |                                                                                    | <u>Silty Sand (SM)</u> : Light brownish-gray, slightly moist, medium dense, fine- to coarse-grained sand.        |                       | 5<br>9<br>12                   |  |                  | 1.6                        | 114.1                   |                       |
|                                                                             |                                                                                    |                                                                                                                  |                       |                                |                                                                                       |                  |                            |                         |                       |
| 20                                                                          |                                                                                    | <u>Sandy Silt (ML)</u> : Gray, slightly moist, very stiff, fine- to medium-grained sand.                         |                       | 5<br>11<br>17                  |  |                  | 4.7                        | 102.1                   |                       |
|                                                                             |                                                                                    |                                                                                                                  |                       |                                |                                                                                       |                  |                            |                         |                       |
| 25                                                                          |                                                                                    | <u>Poorly graded Sand with Silt (SP-SM)</u> : Light brownish-gray, slightly moist, fine- to coarse-grained sand. |                       | 10<br>26<br>30                 |  |                  | 1.3                        |                         |                       |
|                                                                             |                                                                                    |                                                                                                                  |                       |                                |                                                                                       |                  |                            |                         |                       |
| 30                                                                          |                                                                                    |                                                                                                                  |                       |                                |                                                                                       |                  |                            |                         |                       |
| 35                                                                          |                                                                                    |                                                                                                                  |                       |                                |                                                                                       |                  |                            |                         |                       |
|                                                                             |                                                                                    | Total Depth= 26.5'<br>No groundwater encountered during drilling<br>Boring backfilled with cuttings.             |                       |                                |                                                                                       |                  |                            |                         |                       |

# EXPLORATION LOG

| Project: <b>Meritage Homes</b>                                              |                               |                                                                                                                                | Boring No.: <b>B-3</b>         |                         |                  |                  |                            |                         |                       |
|-----------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------|------------------|------------------|----------------------------|-------------------------|-----------------------|
| Location: <b>Pioneer Ave, E of 210 FWY &amp; N of Domestic Ave, Redland</b> |                               |                                                                                                                                | Elevation: <b>1275ft (msl)</b> |                         |                  |                  |                            |                         |                       |
| Job No.: <b>22-199</b>                                                      |                               | Client: <b>Meritage Homes</b>                                                                                                  |                                | Date: <b>03/14/2022</b> |                  |                  |                            |                         |                       |
| Drill Method: <b>Hollow Stem Auger</b>                                      |                               | Driving Weight: <b>140lbs/30"</b>                                                                                              |                                | Logged By: <b>SB</b>    |                  |                  |                            |                         |                       |
| Depth<br>(Feet)                                                             | Lith-<br>ology                | Material Description                                                                                                           | W<br>A<br>T<br>E<br>R          | Samples                 |                  |                  | Laboratory Tests           |                         |                       |
|                                                                             |                               |                                                                                                                                |                                | Blows<br>per<br>6 in.   | C<br>o<br>r<br>e | B<br>u<br>l<br>k | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab<br>Tests |
| 0                                                                           |                               | <b>ALLUVIUM</b><br><u>Silty Sand (SM)</u> : Light brown, slightly moist, medium dense, fine- to coarse-grained sand.           |                                |                         |                  |                  |                            |                         |                       |
|                                                                             |                               | (SP-SM): Same as above.                                                                                                        |                                | 5<br>7<br>7             |                  |                  | 2.5                        | 113.7                   |                       |
|                                                                             |                               | <u>Poorly graded Sand with Silt (SP-SM)</u> : Light brownish-gray, slightly moist, medium dense, fine- to coarse-grained sand. |                                | 5<br>7<br>9             |                  |                  | 3.2                        | 109.8                   |                       |
| 5                                                                           |                               | <u>Silty Sand (SM)</u> : Light gray, slightly moist, dense, fine- to coarse-grained sand.                                      |                                | 6<br>8<br>7             |                  |                  | 2.3                        |                         |                       |
|                                                                             |                               | No recovery, same as above.                                                                                                    |                                | 5<br>9<br>6             |                  |                  |                            |                         |                       |
| 10                                                                          |                               | <u>Sandy Silt (ML)</u> : Brown, dry, stiff, fine- to medium-grained sand.                                                      |                                | 5<br>5<br>9             |                  |                  | 8.9                        | 101.7                   | CON                   |
|                                                                             |                               |                                                                                                                                |                                |                         |                  |                  |                            |                         |                       |
| 15                                                                          |                               | Becomes brownish gray.                                                                                                         |                                | 4<br>7<br>12            |                  |                  | 6.6                        | 102.2                   |                       |
|                                                                             |                               |                                                                                                                                |                                |                         |                  |                  |                            |                         |                       |
| 20                                                                          |                               | <u>Poorly graded Sand with Silt (SP-SM)</u> : Light brownish-gray, slightly moist, dense, fine- to coarse-grained sand.        |                                | 19<br>18<br>28          |                  |                  | 1.7                        | 110.4                   |                       |
|                                                                             |                               |                                                                                                                                |                                |                         |                  |                  |                            |                         |                       |
| 25                                                                          | same as above, trace gravel,. |                                                                                                                                | 14<br>20<br>22                 |                         |                  | 2.0              | 106.8                      |                         |                       |
|                                                                             |                               |                                                                                                                                |                                |                         |                  |                  |                            |                         |                       |
|                                                                             |                               | Total Depth= 26.5'<br>No groundwater encountered during drilling<br>Boring backfilled with cuttings.                           |                                |                         |                  |                  |                            |                         |                       |
| 30                                                                          |                               |                                                                                                                                |                                |                         |                  |                  |                            |                         |                       |
|                                                                             |                               |                                                                                                                                |                                |                         |                  |                  |                            |                         |                       |
| 35                                                                          |                               |                                                                                                                                |                                |                         |                  |                  |                            |                         |                       |

# EXPLORATION LOG

| Project: <b>Meritage Homes</b>                                              |                                                                                     |                                                                                                                                     |                       | Boring No.: <b>B-4</b>                                                              |                                                                                       |                  |                            |                         |                       |       |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------|----------------------------|-------------------------|-----------------------|-------|
| Location: <b>Pioneer Ave, E of 210 FWY &amp; N of Domestic Ave, Redland</b> |                                                                                     |                                                                                                                                     |                       | Elevation: <b>1276ft (msl)</b>                                                      |                                                                                       |                  |                            |                         |                       |       |
| Job No.: <b>22-199</b>                                                      |                                                                                     | Client: <b>Meritage Homes</b>                                                                                                       |                       | Date: <b>03/14/2022</b>                                                             |                                                                                       |                  |                            |                         |                       |       |
| Drill Method: <b>Hollow Stem Auger</b>                                      |                                                                                     | Driving Weight: <b>140lbs/30"</b>                                                                                                   |                       | Logged By: <b>SB</b>                                                                |                                                                                       |                  |                            |                         |                       |       |
| Depth<br>(Feet)                                                             | Lith-<br>ology                                                                      | Material Description                                                                                                                | W<br>A<br>T<br>E<br>R | Samples                                                                             |                                                                                       |                  | Laboratory Tests           |                         |                       |       |
|                                                                             |                                                                                     |                                                                                                                                     |                       | Blows<br>per<br>6 in.                                                               | C<br>o<br>r<br>e                                                                      | B<br>u<br>l<br>k | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab<br>Tests |       |
| 0                                                                           |    | <b>ALLUVIUM</b><br><u>Silty Sand (SM)</u> : Light brown, dry, medium dense, fine- to coarse-grained sand.                           |                       |                                                                                     |                                                                                       |                  | 3.4                        | 117.7                   | CON                   |       |
|                                                                             |                                                                                     | Same as above.                                                                                                                      |                       | 4<br>6<br>7                                                                         |    |                  |                            |                         |                       |       |
| 5                                                                           |                                                                                     | Same as above.                                                                                                                      |                       | 3<br>5<br>6                                                                         |    | 4.5              |                            |                         |                       | 100.6 |
|                                                                             |    | <u>Sandy Silt (ML)</u> : Light brownish-gray, slightly moist, stiff, very fine- to medium-grained sand.                             | 5<br>7<br>12          |  | 1.9                                                                                   | 106.7            |                            |                         |                       |       |
|                                                                             |                                                                                     |                                                                                                                                     | 7<br>14<br>16         |  | 1.7                                                                                   | 106.1            |                            |                         |                       |       |
| 10                                                                          |   | <u>Silty Sand (SM)</u> : Light brownish-gray, dry to slightly moist, medium dense, fine- to medium-grained sand.                    |                       |                                                                                     |                                                                                       |                  |                            |                         |                       |       |
|                                                                             |                                                                                     |                                                                                                                                     |                       |                                                                                     |                                                                                       |                  |                            |                         |                       |       |
| 15                                                                          |                                                                                     | No recovery, same as above.                                                                                                         |                       | 9<br>14<br>18                                                                       |  |                  |                            |                         |                       |       |
|                                                                             |  |                                                                                                                                     |                       |                                                                                     |                                                                                       |                  | 1.3                        |                         |                       |       |
| 20                                                                          |                                                                                     | Becomes gray.                                                                                                                       |                       | 11<br>14<br>20                                                                      |  |                  |                            |                         |                       |       |
|                                                                             |                                                                                     |                                                                                                                                     |                       |                                                                                     |                                                                                       |                  |                            |                         |                       |       |
| 25                                                                          |  | <u>Poorly graded Sand with Silt (SP-SM)</u> : Light brownish-gray, dry to slightly moist, very dense, fine- to coarse-grained sand. |                       | 12<br>30<br>46                                                                      |  | 1.0              |                            |                         |                       |       |
|                                                                             |  | Total Depth= 26.5'<br>No groundwater encountered during drilling<br>Boring backfilled with cuttings.                                |                       |                                                                                     |                                                                                       |                  |                            |                         |                       |       |
| 30                                                                          |                                                                                     |                                                                                                                                     |                       |                                                                                     |                                                                                       |                  |                            |                         |                       |       |
| 35                                                                          |                                                                                     |                                                                                                                                     |                       |                                                                                     |                                                                                       |                  |                            |                         |                       |       |

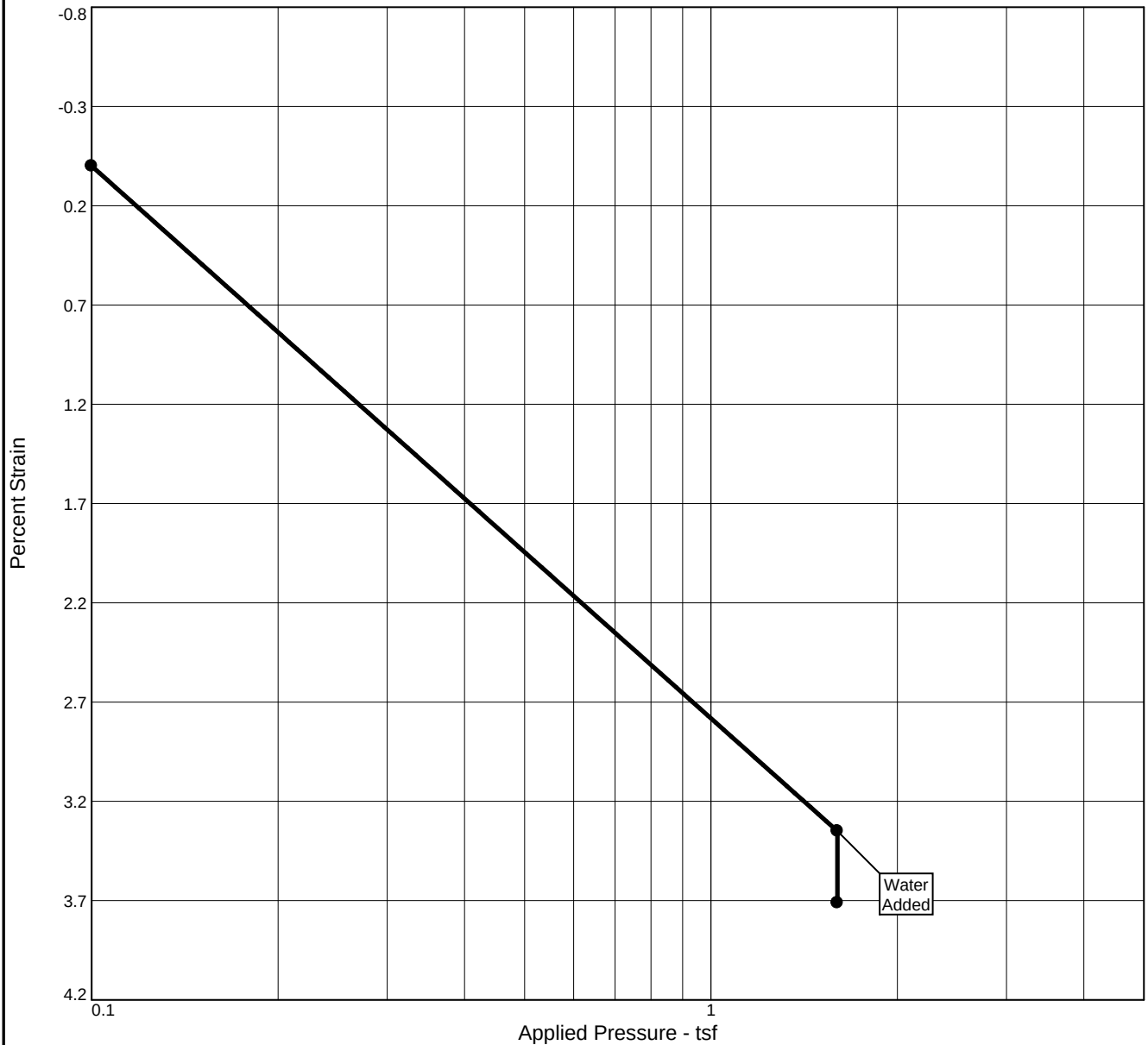
## ***APPENDIX B***

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### ***LABORATORY TEST DATA***

# CONSOLIDATION TEST REPORT

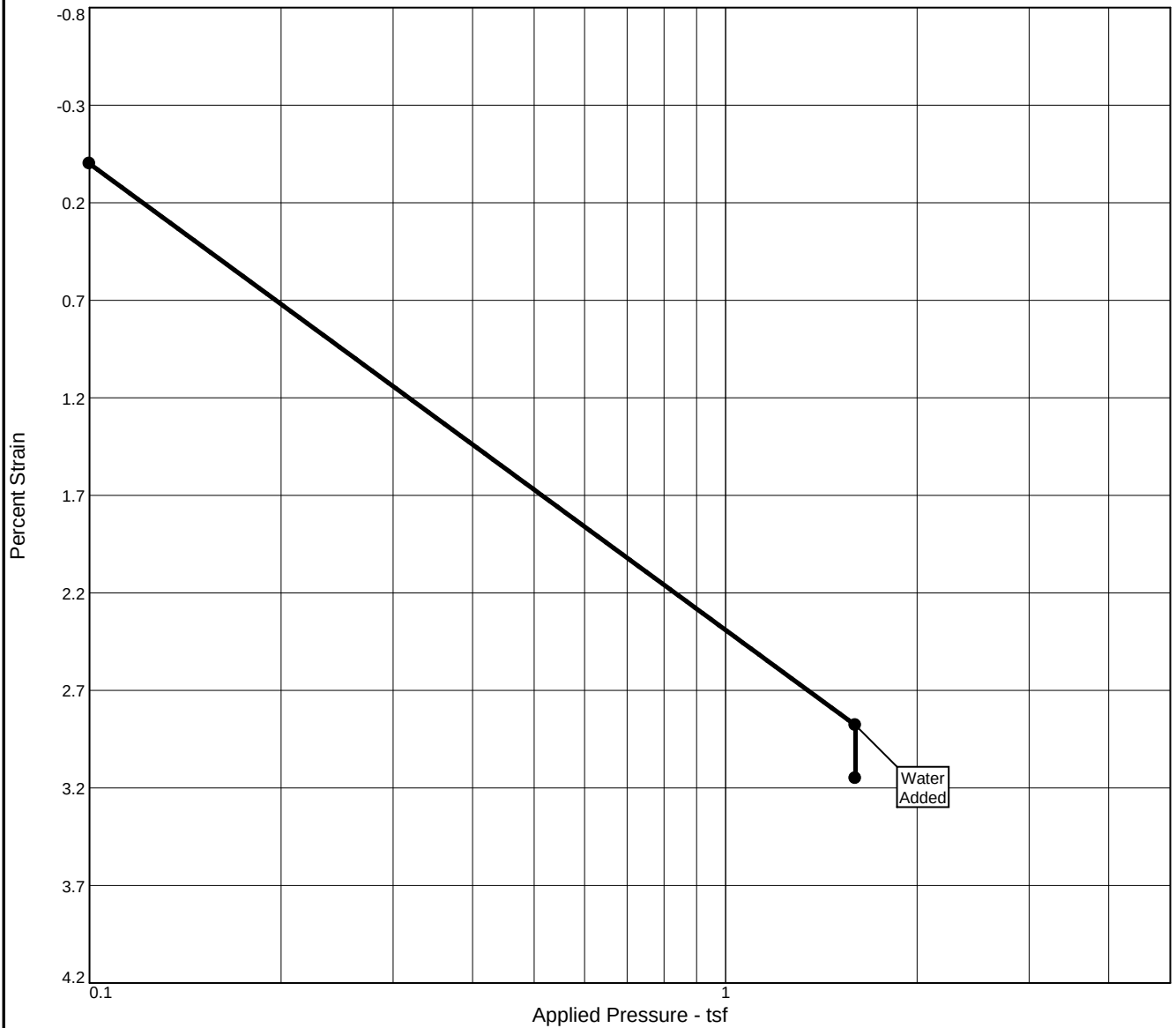


| Natural    |          | Dry Dens.<br>(pcf) | LL | PI | Sp. Gr. | Overburden<br>(tsf) | P <sub>c</sub><br>(tsf) | C <sub>c</sub> | C <sub>r</sub> | Initial Void<br>Ratio |
|------------|----------|--------------------|----|----|---------|---------------------|-------------------------|----------------|----------------|-----------------------|
| Saturation | Moisture |                    |    |    |         |                     |                         |                |                |                       |
| 6.1 %      | 1.4 %    | 102.6              |    |    | 2.65    | 0.832               |                         |                |                | 0.612                 |

| MATERIAL DESCRIPTION                     |  |  |  |  |  |  |  | USCS | AASHTO |
|------------------------------------------|--|--|--|--|--|--|--|------|--------|
| Light gray fine to coarse sand with Silt |  |  |  |  |  |  |  |      |        |

|                                                                                                |  |                               |  |                   |
|------------------------------------------------------------------------------------------------|--|-------------------------------|--|-------------------|
| <b>Project No.</b> 22-199                                                                      |  | <b>Client:</b> Meritage Homes |  | <b>Remarks:</b>   |
| <b>Project:</b> Pioneer Avenue E. of 210 FWY, Redland                                          |  |                               |  |                   |
| <b>Depth:</b> 8-9.5'                                                                           |  | <b>Sample Number:</b> B-1     |  |                   |
| <div></div> |  |                               |  | <b>Figure B-1</b> |

# CONSOLIDATION TEST REPORT

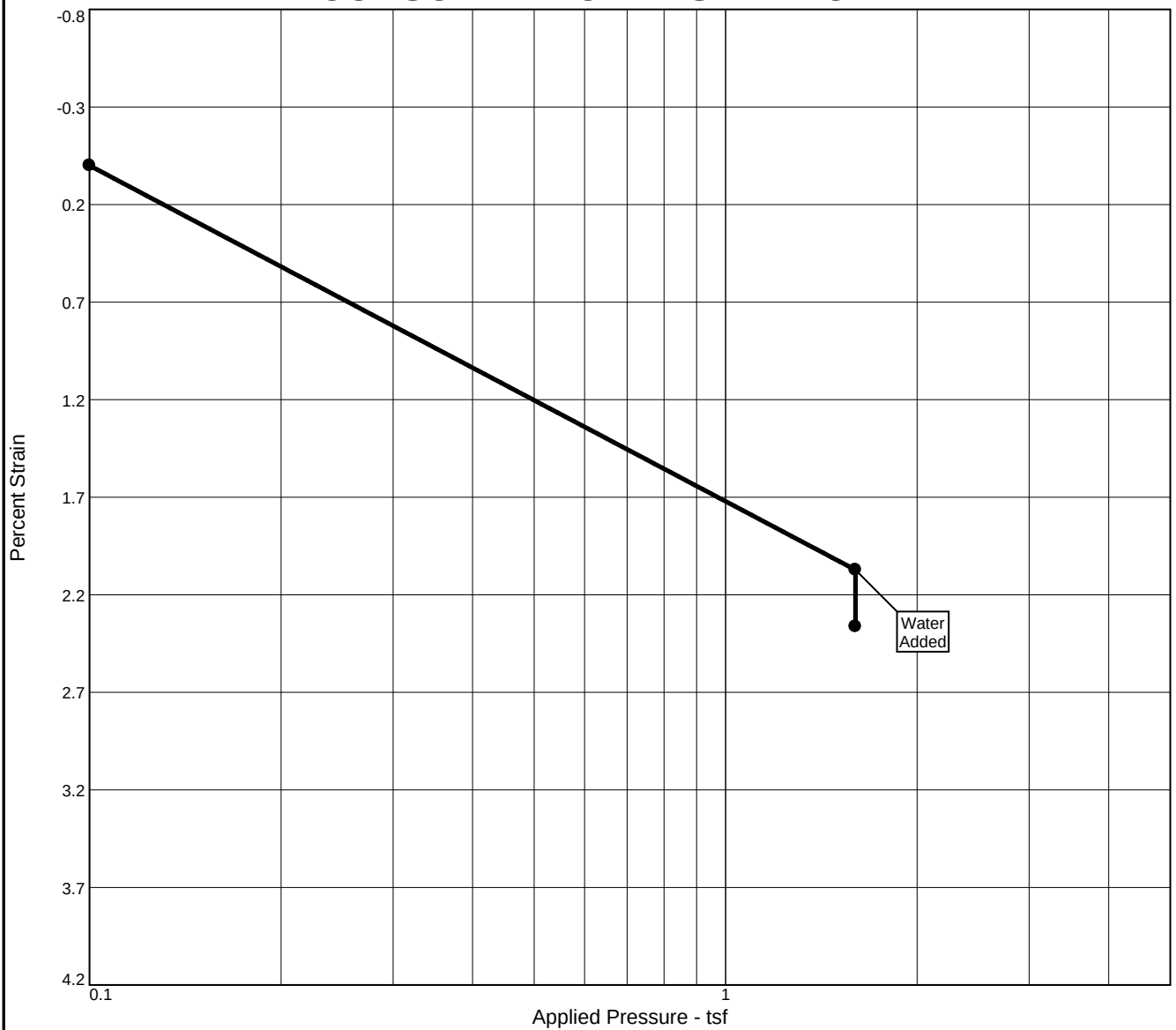


|                                                                                                                                                                |          |                    |    |    |         |                     |                |       |                 |                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------|----|----|---------|---------------------|----------------|-------|-----------------|-----------------------|
| Natural                                                                                                                                                        |          | Dry Dens.<br>(pcf) | LL | PI | Sp. Gr. | Overburden<br>(tsf) | $P_c$<br>(tsf) | $C_c$ | $C_r$           | Initial Void<br>Ratio |
| Saturation                                                                                                                                                     | Moisture |                    |    |    |         |                     |                |       |                 |                       |
| 10.7 %                                                                                                                                                         | 3.4 %    | 90.2               |    |    | 2.65    | 0.6530.99           |                |       |                 | 0.835                 |
| <b>MATERIAL DESCRIPTION</b>                                                                                                                                    |          |                    |    |    |         |                     |                |       | <b>USCS</b>     | <b>AASHTO</b>         |
| Light gray fine Sandy Silt                                                                                                                                     |          |                    |    |    |         |                     |                |       |                 |                       |
| <b>Project No.</b> 22-199 <b>Client:</b> Meritage Homes<br><b>Project:</b> Pioneer Avenue E. of 210 FWY, Redland<br><b>Depth:</b> 7' <b>Sample Number:</b> B-2 |          |                    |    |    |         |                     |                |       | <b>Remarks:</b> |                       |
|                                                                             |          |                    |    |    |         |                     |                |       |                 |                       |

Figure B-3

Tested By: SB

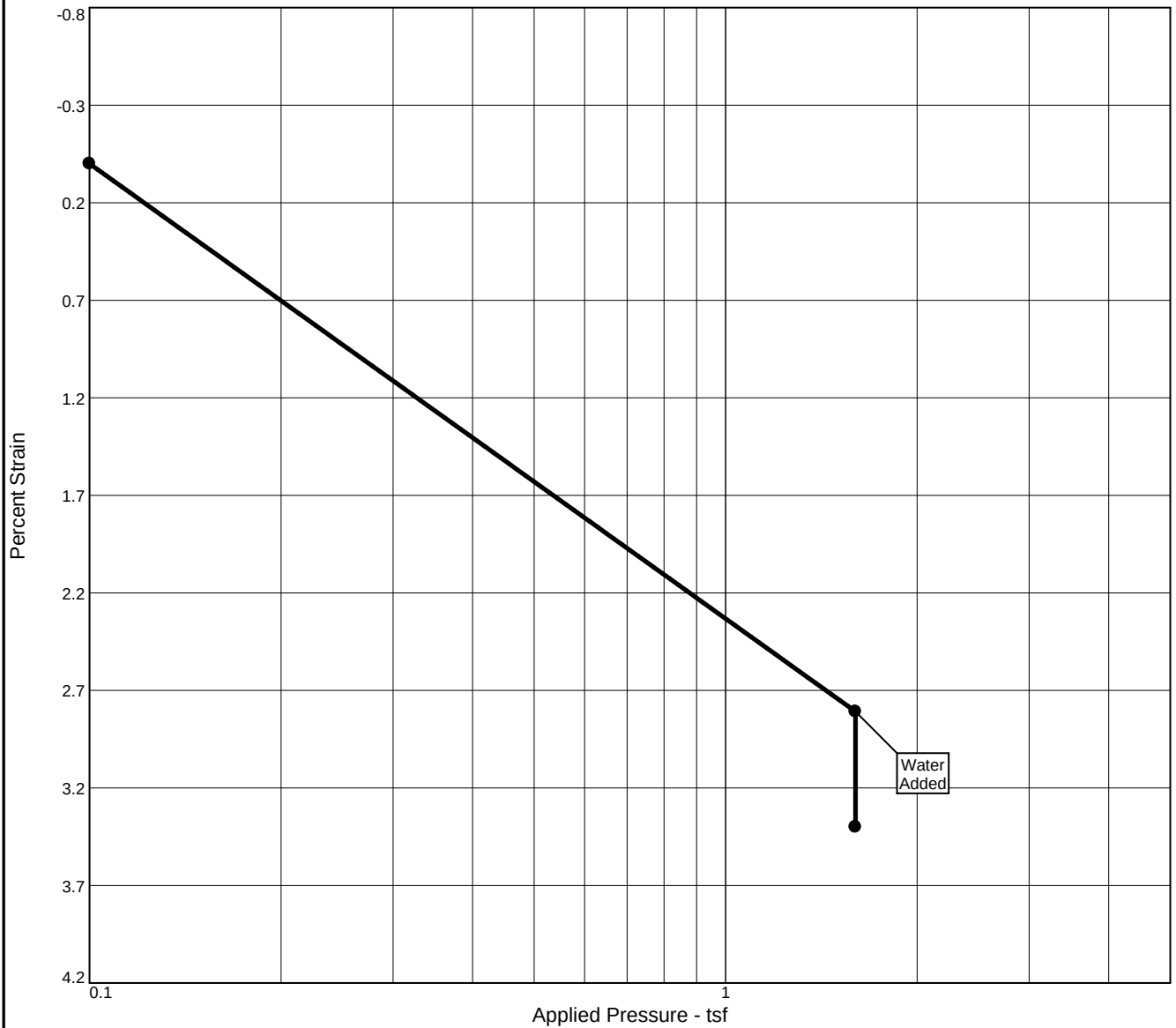
# CONSOLIDATION TEST REPORT



| Natural                                                                                                                                                                                                                          |          | Dry Dens.<br>(pcf) | LL | PI | Sp. Gr. | Overburden<br>(tsf) | $P_c$<br>(tsf) | $C_c$ | $C_r$ | Initial Void<br>Ratio                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------|----|----|---------|---------------------|----------------|-------|-------|-------------------------------------------|
| Saturation                                                                                                                                                                                                                       | Moisture |                    |    |    |         |                     |                |       |       |                                           |
| 36.4 %                                                                                                                                                                                                                           | 8.9 %    | 100.3              |    |    | 2.65    | 1.093               |                |       |       | 0.649                                     |
| MATERIAL DESCRIPTION                                                                                                                                                                                                             |          |                    |    |    |         |                     |                |       | USCS  | AASHTO                                    |
| Light gary fine Sandy Silt                                                                                                                                                                                                       |          |                    |    |    |         |                     |                |       |       |                                           |
| <div> <div>Project No. 22-199</div> <div>Client: Meritage Homes</div> </div> <div> <div>Project: Pioneer Avenue E. of 210 FWY, Redland</div> </div> <div> <div>Depth: 10</div> <div>Sample Number: B-3</div> </div> <div> </div> |          |                    |    |    |         |                     |                |       |       | <div>Remarks:</div> <div>Figure B-3</div> |
|                                                                                                                                                                                                                                  |          |                    |    |    |         |                     |                |       |       |                                           |
|                                                                                                                                                                                                                                  |          |                    |    |    |         |                     |                |       |       |                                           |

Tested By: SB

# CONSOLIDATION TEST REPORT



| Natural                                                                                        |          | Dry Dens.<br>(pcf) | LL | PI | Sp. Gr. | Overburden<br>(tsf) | P <sub>c</sub><br>(tsf) | C <sub>c</sub> | C <sub>r</sub> | Initial Void<br>Ratio |
|------------------------------------------------------------------------------------------------|----------|--------------------|----|----|---------|---------------------|-------------------------|----------------|----------------|-----------------------|
| Saturation                                                                                     | Moisture |                    |    |    |         |                     |                         |                |                |                       |
| 7.9 %                                                                                          | 1.9 %    | 100.5              |    |    | 2.65    | 0.717               |                         |                |                | 0.647                 |
| MATERIAL DESCRIPTION                                                                           |          |                    |    |    |         |                     |                         |                | USCS           | AASHTO                |
| Olive brown fine Sandy Silt                                                                    |          |                    |    |    |         |                     |                         |                |                |                       |
| <b>Project No.</b> 22-199 <b>Client:</b> Meritage Homes                                        |          |                    |    |    |         |                     | <b>Remarks:</b>         |                |                |                       |
| <b>Project:</b> Pioneer Avenue E. of 210 FWY, Redland                                          |          |                    |    |    |         |                     |                         |                |                |                       |
| <b>Depth:</b> 7-8.5' <b>Sample Number:</b> B-4                                                 |          |                    |    |    |         |                     |                         |                |                |                       |
| <div></div> |          |                    |    |    |         |                     | <b>Figure B-4</b>       |                |                |                       |
|                                                                                                |          |                    |    |    |         |                     |                         |                |                |                       |



Figure B-4

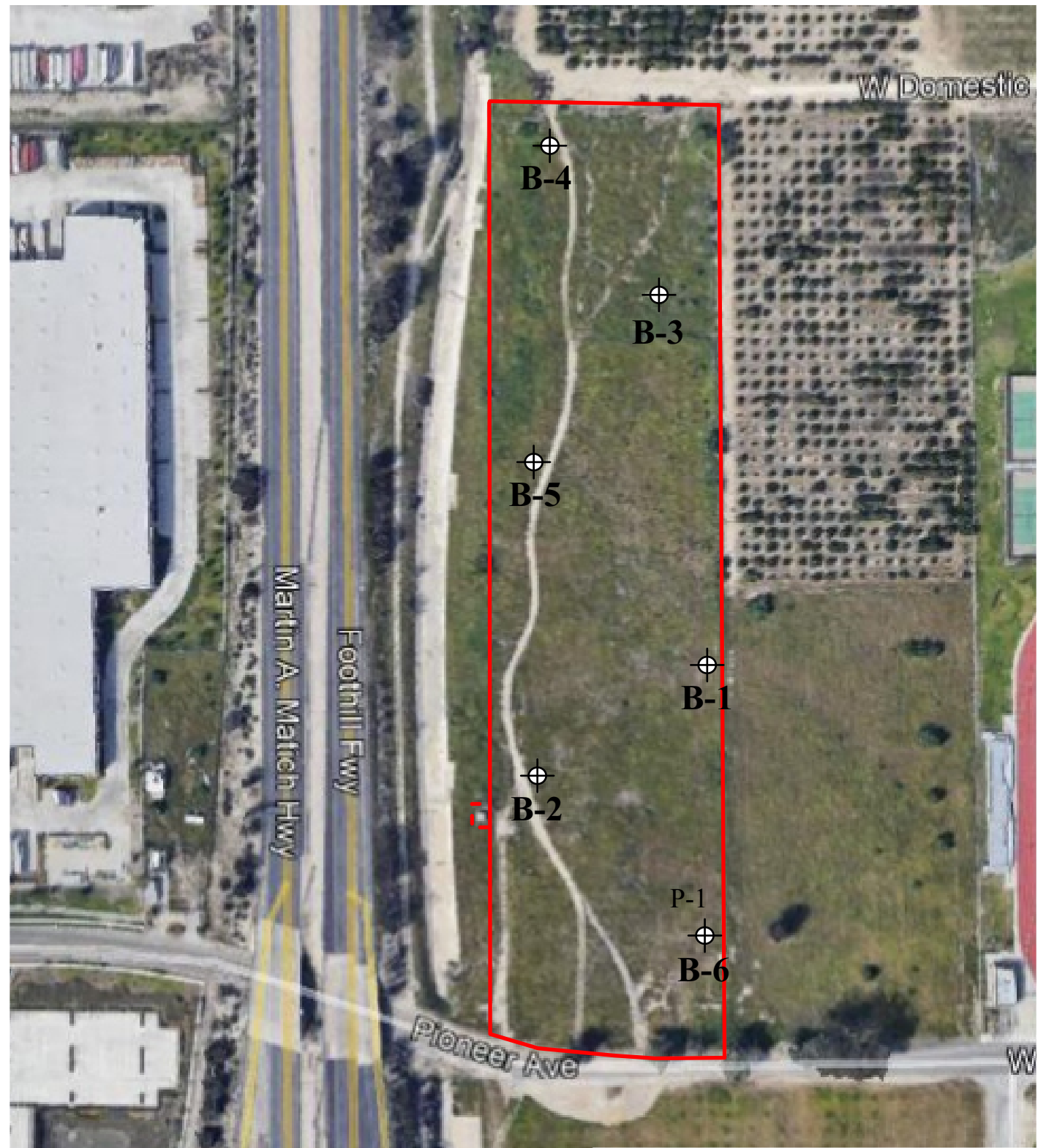
Tested By: SB

## ***APPENDIX C***

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### ***SUPPLEMENTAL DATA FROM 2021 DUE DILIGENCE STUDY***



## EXPLANAION



Approximate Location of Site Boundary



Approximate Location of Geotechnical Borings

B-6

P-1 Percolation Test Location



Reference: Goolge Earth Image, 2021

## PETRA GEOSCIENCES, INC.

40880 County Center Drive, Suite M

Temecula, California 92591

PHONE: (951) 600-9271

COSTA MESA TEMECULA VALENCIA PALM DESERT CORONA

## BORING LOCATION MAP

1160 W. Pioneer Avenue Project  
Redlands, California



DATE: Sept, 2021

J.N.: 21-315

**Figure 2**

# Soil Classification

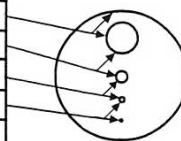


| 4 Moisture Content |
|--------------------|
| Dry                |
| Slightly Moist     |
| Moist              |
| Very Moist         |
| Wet (Saturated)    |

| Modifiers |           |
|-----------|-----------|
| Trace     | < 1 %     |
| Few       | 1 - 5 %   |
| Some      | 5 - 12 %  |
| Numerous  | 12 - 20 % |

| Soil Classification Should Include:                                                              |
|--------------------------------------------------------------------------------------------------|
| <u>PREFERRED ORDER</u>                                                                           |
| 1. Group Name                                                                                    |
| 2. Group Symbol                                                                                  |
| 3. Color                                                                                         |
| 4. Moisture Content                                                                              |
| 5. Relative Density / Consistency                                                                |
| 6. Grain Size Range                                                                              |
| 7. Structure                                                                                     |
| 8. Odor                                                                                          |
| 9. Additional comments indicating soil characteristics which might affect engineering properties |

| 6 Grain Size |              |            |                                |
|--------------|--------------|------------|--------------------------------|
| Description  | Sieve Size   | Grain Size | Approximate Size               |
| Boulders     | >12"         | >12"       | Larger than basketball-sized   |
| Cobbles      | 3 - 12"      | 3 - 12"    | Fist-sized to basketball-sized |
| Gravel       | coarse       | 3/4 - 3"   | Thumb-sized to fist-sized      |
|              | fine         | #4 - 3/4"  | Pea-sized to thumb-sized       |
| Sand         | coarse       | #10 - #4   | Rock salt-sized to pea-sized   |
|              | medium       | #40 - #10  | Sugar-sized to rock salt-sized |
|              | fine         | #200 - #40 | Flour-sized to sugar-sized to  |
| Fines        | Passing #200 | <0.0029"   | Flour-sized and smaller        |

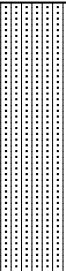
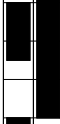


| 1 2 Unified Soil Classification System                                                                |                                                                      |
|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Coarse-grained Soils<br>> 1/2 of materials is larger than #200 sieve                                  | GRAVELS<br>more than half of coarse fraction is larger than #4 sieve |
|                                                                                                       | Clean Gravels (less than 5% fines)                                   |
|                                                                                                       | Gravels with fines                                                   |
|                                                                                                       | SANDS<br>more than half of coarse fraction is smaller than #4 sieve  |
| Fine-grained Soils<br>> 1/2 of materials is smaller than #200 sieve                                   | Clean Sands (less than 5% fines)                                     |
|                                                                                                       | Sands with fines                                                     |
|                                                                                                       | SILTS & CLAYS<br>Liquid Limit<br>Less Than 50                        |
|                                                                                                       | SILTS & CLAYS<br>Liquid Limit<br>Greater Than 50                     |
| Highly Organic Soils                                                                                  |                                                                      |
| The No. 200 U.S. Standard Sieve is about the smallest particle visible to the naked eye               |                                                                      |
| GW Well-graded gravels, gravel-sand mixtures, little or no fines                                      |                                                                      |
| GP Poorly-graded gravels, gravel-sand mixtures, little or no fines                                    |                                                                      |
| GM Silty Gravels, poorly-graded gravel-sand-silt mixtures                                             |                                                                      |
| GC Clayey Gravels, poorly-graded gravel-sand-clay mixtures                                            |                                                                      |
| SW Well-graded sands, gravelly sands, little or no fines                                              |                                                                      |
| SP Poorly-graded sands, gravelly sands, little or no fines                                            |                                                                      |
| SM Silty Sands, poorly-graded sand-gravel-silt mixtures                                               |                                                                      |
| SC Clayey Sands, poorly-graded sand-gravel-clay mixtures                                              |                                                                      |
| ML Inorganic silts & very fine sands, silty or clayey fine sands, clayey silts with slight plasticity |                                                                      |
| CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays  |                                                                      |
| OL Organic silts & clays of low plasticity                                                            |                                                                      |
| MH Inorganic silts, micaceous or diatomaceous fine sand or silt                                       |                                                                      |
| CH Inorganic clays of high plasticity, fat clays                                                      |                                                                      |
| OH Organic silts and clays of medium-to-high plasticity                                               |                                                                      |
| PT Peat, humus swamp soils with high organic content                                                  |                                                                      |

| 5 Consistency - Fine Grained Soils |                    |                                    |                                                                                          |
|------------------------------------|--------------------|------------------------------------|------------------------------------------------------------------------------------------|
| Apparent Density                   | SPT (# blows/foot) | Modified CA Sampler (# blows/foot) | Field Test                                                                               |
| Very Soft                          | <2                 | <3                                 | Easily penetrated by thumb; exudes between thumb and fingers when squeezed in hand       |
| Soft                               | 2-4                | 3-6                                | Easily penetrated one inch by thumb; molded by light finger pressure                     |
| Firm                               | 5-8                | 7-12                               | Penetrated over 1/2 inch by thumb with moderate effort; molded by strong finger pressure |
| Stiff                              | 9-15               | 13-25                              | Indented about 1/2 inch by thumb but penetrated only with great effort                   |
| Very Stiff                         | 16-30              | 26-50                              | Readily indented by thumbnail                                                            |
| Hard                               | >30                | >50                                | Indented with difficulty by thumbnail                                                    |

| 5 Relative Density - Coarse Grained Soils |                    |                                    |                                                                                        |
|-------------------------------------------|--------------------|------------------------------------|----------------------------------------------------------------------------------------|
| Apparent Density                          | SPT (# blows/foot) | Modified CA Sampler (# blows/foot) | Field Test                                                                             |
| Very Loose                                | <4                 | <5                                 | Easily penetrated with 1/2-inch reinforcing rod pushed by hand                         |
| Loose                                     | 4-10               | 5-12                               | Easily penetrated with 1/2-inch reinforcing rod pushed by hand                         |
| Medium Dense                              | 11-30              | 13-35                              | Easily penetrated 1-foot with 1/2-inch reinforcing rod driven with a 5-lb hammer       |
| Dense                                     | 31-50              | 36-60                              | Difficult to penetrated 1-foot with 1/2-inch reinforcing rod driven with a 5-lb hammer |
| Very Dense                                | >50                | >60                                | Penetrated only a few inches with 1/2-inch reinforcing rod driven with a 5-lb hammer   |

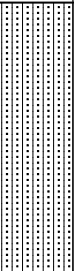
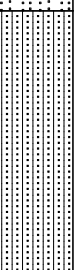
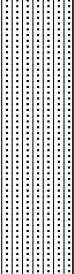
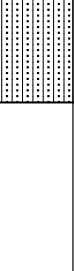
# EXPLORATION LOG

| Project: <b>1160 W. Pioneer Ave</b>    |                                                                                     |                                                                                                                                                                                                                  |                       | Boring No.: <b>B-1</b>         |                                                                                       |                  |                            |                         |                                                         |
|----------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------|---------------------------------------------------------------------------------------|------------------|----------------------------|-------------------------|---------------------------------------------------------|
| Location: <b>Redlands, California</b>  |                                                                                     |                                                                                                                                                                                                                  |                       | Elevation: <b>1268ft (msl)</b> |                                                                                       |                  |                            |                         |                                                         |
| Job No.: <b>21-315</b>                 |                                                                                     | Client: <b>Meritage</b>                                                                                                                                                                                          |                       | Date: <b>August 6, 2021</b>    |                                                                                       |                  |                            |                         |                                                         |
| Drill Method: <b>CME-75 Hollowstem</b> |                                                                                     | Driving Weight: <b>140lbs</b>                                                                                                                                                                                    |                       | Logged By: <b>BR</b>           |                                                                                       |                  |                            |                         |                                                         |
| Depth<br>(Feet)                        | Lith-<br>ology                                                                      | Material Description                                                                                                                                                                                             | W<br>A<br>T<br>E<br>R | Samples                        |                                                                                       | Laboratory Tests |                            |                         |                                                         |
|                                        |                                                                                     |                                                                                                                                                                                                                  |                       | Blows<br>per<br>6 in.          | C<br>o<br>r<br>e                                                                      | B<br>u<br>l<br>k | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab<br>Tests                                   |
| 0                                      |    | <u>Young Axial Valley Deposits (Qya) Silty Sand (SM):</u><br>Gray brown, dry, loose, fine to medium-grained sand, porous with scattered rootlets.<br>Gray brown, dry, medium dense, fine to medium-grained sand. |                       | 12<br>9<br>11                  |    |                  | 2.0                        | 106.1                   | Max,<br>Corrosion,<br>Atterberg,<br>Sieve,<br>Expansion |
| 5                                      |                                                                                     | Gray brown, dry, medium dense, fine to medium-grained sand.                                                                                                                                                      |                       | 5<br>7<br>8                    |    |                  | 1.1                        | 105.8                   |                                                         |
|                                        |                                                                                     | <u>Interbedded Silty Sand and Silt (SM-ML):</u> Olive gray, damp, loose, interbedded silty fine to medium-grained sand and slightly clayey silt, with <5% sub-rounded fine-grained gravel.                       |                       | 3<br>5<br>7                    |    |                  | 6.5                        | 94.9                    |                                                         |
| 10                                     |   | <u>Silty Sand (SM):</u> Olive brown, moist, medium dense, silty fine-grained sand.                                                                                                                               |                       | 8<br>12<br>12                  |   |                  | 6.4                        | 91.9                    |                                                         |
| 15                                     |                                                                                     | <u>Poorly Graded Sand (SP):</u> Olive brown, moist, medium dense, poorly graded fine-grained sand.                                                                                                               |                       | 5<br>8<br>13                   |  |                  | 5.0                        | 101.8                   |                                                         |
| 20                                     |                                                                                     | Gray brown, moist, medium dense, poorly graded fine to medium-grained sand.                                                                                                                                      |                       | 9<br>12<br>17                  |  |                  | 2.2                        |                         |                                                         |
| 25                                     |  | Gray brown, moist, medium dense, poorly graded fine to medium-grained sand, with <5% sub-rounded fine grained gravel.                                                                                            |                       | 7<br>8<br>12                   |  |                  |                            |                         |                                                         |
| 30                                     |                                                                                     | <u>Silty Sand (SM):</u> Olive brown, moist, medium dense, fine-grained sand.                                                                                                                                     |                       | 8<br>12<br>20                  |  |                  | 7.2                        | 98.4                    |                                                         |
| 35                                     |                                                                                     | Olive brown, moist, medium dense, fine-grained sand.                                                                                                                                                             |                       | 7                              |  |                  |                            |                         |                                                         |

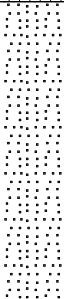
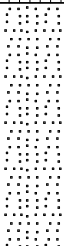
# EXPLORATION LOG

| Project: <b>1160 W. Pioneer Ave</b>    |                |                                                                                                                                                   |                       | Boring No.: <b>B-1</b>         |                                      |                            |                         |                       |
|----------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------|--------------------------------------|----------------------------|-------------------------|-----------------------|
| Location: <b>Redlands, California</b>  |                |                                                                                                                                                   |                       | Elevation: <b>1268ft (msl)</b> |                                      |                            |                         |                       |
| Job No.: <b>21-315</b>                 |                | Client: <b>Meritage</b>                                                                                                                           |                       | Date: <b>August 6, 2021</b>    |                                      |                            |                         |                       |
| Drill Method: <b>CME-75 Hollowstem</b> |                | Driving Weight: <b>140lbs</b>                                                                                                                     |                       | Logged By: <b>BR</b>           |                                      |                            |                         |                       |
| Depth<br>(Feet)                        | Lith-<br>ology | Material Description                                                                                                                              | W<br>A<br>T<br>E<br>R | Samples                        |                                      | Laboratory Tests           |                         |                       |
|                                        |                |                                                                                                                                                   |                       | Blows<br>per<br>6 in.          | C<br>o<br>r<br>e<br>B<br>u<br>l<br>k | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab<br>Tests |
| 40                                     |                | <u>Interbedded Silty Sand and Clean Sand (SP-SM):</u><br>Olive brown, moist, dense, interbedded sandy silt and clean fine to medium-grained sand. |                       | 8<br>12                        |                                      | 3.2                        | 103.5                   |                       |
|                                        |                |                                                                                                                                                   | 15<br>14<br>23        |                                |                                      |                            |                         |                       |
| 45                                     |                | <u>Silty Sand (SM):</u> Olive brown, moist, medium dense, fine grained-sand.                                                                      | 9<br>11<br>17         |                                |                                      |                            |                         |                       |
| 50                                     |                | <u>Poorly Graded Sand (SP):</u> Gray, damp, very dense, poorly graded fine to medium-grained sand.                                                |                       | 29<br>32<br>50                 |                                      | 2.0                        | 105.8                   |                       |
|                                        |                |                                                                                                                                                   |                       |                                |                                      |                            |                         |                       |
| 55                                     |                | <u>Silty Sand (SM):</u> Olive gray, damp, very dense, fine to medium-grained sand.                                                                |                       | 30<br>30<br>37                 |                                      |                            |                         |                       |
|                                        |                |                                                                                                                                                   |                       |                                |                                      |                            |                         |                       |
| 60                                     |                | Total depth 56.5-feet.<br>No groundwater or seepage.<br>Backfilled with cuttings.                                                                 |                       |                                |                                      |                            |                         |                       |
|                                        |                |                                                                                                                                                   |                       |                                |                                      |                            |                         |                       |
|                                        |                |                                                                                                                                                   |                       |                                |                                      |                            |                         |                       |
| 65                                     |                |                                                                                                                                                   |                       |                                |                                      |                            |                         |                       |
| 70                                     |                |                                                                                                                                                   |                       |                                |                                      |                            |                         |                       |

# EXPLORATION LOG

| Project: <b>1160 W. Pioneer Ave</b>    |                                                                                     |                                                                                                                     |                       | Boring No.: <b>B-2</b>         |                                                                                       |                  |                            |                         |                       |
|----------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------|---------------------------------------------------------------------------------------|------------------|----------------------------|-------------------------|-----------------------|
| Location: <b>Redlands, California</b>  |                                                                                     |                                                                                                                     |                       | Elevation: <b>1264ft (msl)</b> |                                                                                       |                  |                            |                         |                       |
| Job No.: <b>21-315</b>                 |                                                                                     | Client: <b>Meritage</b>                                                                                             |                       | Date: <b>August 6, 2021</b>    |                                                                                       |                  |                            |                         |                       |
| Drill Method: <b>CME-75 Hollowstem</b> |                                                                                     | Driving Weight: <b>140lbs</b>                                                                                       |                       | Logged By: <b>BR</b>           |                                                                                       |                  |                            |                         |                       |
| Depth<br>(Feet)                        | Lith-<br>ology                                                                      | Material Description                                                                                                | W<br>A<br>T<br>E<br>R | Samples                        |                                                                                       |                  | Laboratory Tests           |                         |                       |
|                                        |                                                                                     |                                                                                                                     |                       | Blows<br>per<br>6 in.          | C<br>o<br>r<br>e                                                                      | B<br>u<br>l<br>k | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab<br>Tests |
| 0                                      |    | <u>Young Axial Valley Deposits (Qya) Silty Sand (SM):</u><br>Olive gray, dry, loose, fine-grained sand.             |                       |                                |                                                                                       |                  |                            |                         |                       |
|                                        |                                                                                     | Olive gray, dry, loose, fine-grained sand, porous, with rootlets.                                                   |                       | 4<br>5<br>6                    |    |                  | 0.8                        | 98.9                    |                       |
| 5                                      |                                                                                     | Light gray, dry, medium dense, fine to medium-grained sand.                                                         |                       | 4<br>7<br>7                    |    |                  | 1.3                        |                         |                       |
|                                        |    | <u>Poorly Graded Sand (SP):</u> Light gray, dry, medium dense, poorly graded fine to medium-grained sand.           |                       | 4<br>8<br>10                   |    |                  | 0.7                        |                         |                       |
| 10                                     |   | <u>Silty Sand (SM):</u> Light gray, dry, medium dense, fine-grained sand, with <5% sub-rounded fine-grained gravel. |                       | 5<br>6<br>9                    |    |                  | 4.2                        | 95.5                    |                       |
| 15                                     |                                                                                     | Olive gray, damp, medium dense, fine-grained sand.                                                                  |                       | 7<br>8<br>12                   |  |                  | 2.3                        | 100.2                   |                       |
|                                        |                                                                                     | Olive brown, damp, loose, fine-grained sand, micaceous.                                                             |                       | 3<br>3<br>5                    |  |                  |                            |                         |                       |
| 20                                     |  |                                                                                                                     |                       | 6<br>7<br>9                    |  |                  | 1.9                        | 103.0                   |                       |
| 25                                     |                                                                                     | Olive gray to olive brown, moist, medium dense, fine-grained sand.                                                  |                       | 7<br>9<br>15                   |  |                  | 11.4                       | 93.4                    |                       |
|                                        |                                                                                     | Total Depth 26.5 feet.<br>No groundwater or seepage.<br>Backfilled with cuttings.                                   |                       |                                |                                                                                       |                  |                            |                         |                       |
| 30                                     |  |                                                                                                                     |                       |                                |                                                                                       |                  |                            |                         |                       |
|                                        |                                                                                     |                                                                                                                     |                       |                                |                                                                                       |                  |                            |                         |                       |
|                                        |                                                                                     |                                                                                                                     |                       |                                |                                                                                       |                  |                            |                         |                       |
|                                        |                                                                                     |                                                                                                                     |                       |                                |                                                                                       |                  |                            |                         |                       |
| 35                                     |                                                                                     |                                                                                                                     |                       |                                |                                                                                       |                  |                            |                         |                       |

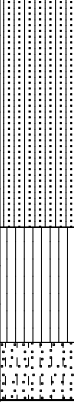
# EXPLORATION LOG

| Project: <b>1160 W. Pioneer Ave</b>    |                                                                                     |                                                                                                                                        |                       | Boring No.: <b>B-3</b>         |                                                                                       |                  |                            |                         |                       |
|----------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------|---------------------------------------------------------------------------------------|------------------|----------------------------|-------------------------|-----------------------|
| Location: <b>Redlands, California</b>  |                                                                                     |                                                                                                                                        |                       | Elevation: <b>1264ft (msl)</b> |                                                                                       |                  |                            |                         |                       |
| Job No.: <b>21-315</b>                 |                                                                                     | Client: <b>Meritage</b>                                                                                                                |                       | Date: <b>August 6, 2021</b>    |                                                                                       |                  |                            |                         |                       |
| Drill Method: <b>CME-75 Hollowstem</b> |                                                                                     | Driving Weight: <b>140lbs</b>                                                                                                          |                       | Logged By: <b>BR</b>           |                                                                                       |                  |                            |                         |                       |
| Depth<br>(Feet)                        | Lith-<br>ology                                                                      | Material Description                                                                                                                   | W<br>A<br>T<br>E<br>R | Samples                        |                                                                                       |                  | Laboratory Tests           |                         |                       |
|                                        |                                                                                     |                                                                                                                                        |                       | Blows<br>per<br>6 in.          | C<br>o<br>r<br>e                                                                      | B<br>u<br>l<br>k | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab<br>Tests |
| 0                                      |    | <u>Younger Axial Valley Deposits (Qya) Silty Sand (SM):</u><br>Olive brown, dry, loose, fine to medium-grained sand.                   |                       |                                |                                                                                       |                  |                            |                         |                       |
|                                        |                                                                                     | Olive brown, dry, loose, fine to medium-grained sand.                                                                                  |                       | 5<br>5<br>6                    |    |                  | 1.4                        | 105.9                   |                       |
| 5                                      |                                                                                     | Gray to olive gray, dry, medium dense, fine to medium-grained sand.                                                                    |                       | 4<br>5<br>8                    |    |                  | 2.1                        | 107.0                   |                       |
|                                        |   | <u>Poorly Graded Sand (SP):</u> Gray, dry, medium dense, poorly graded fine-grained sand.                                              |                       | 4<br>6<br>10                   |    |                  | 6.3                        | 89.9                    |                       |
| 10                                     |                                                                                     | Gray, dry, medium dense, poorly graded fine to medium-grained sand, with >5% sub-rounded fine-grained gravel.                          |                       | 5<br>7<br>13                   |    |                  | 2.3                        |                         |                       |
| 15                                     |                                                                                     | <u>Silty Sand (SM):</u> Olive brown, dry, medium dense, fine-grained sand.                                                             |                       | 6<br>6<br>12                   |  |                  | 6.8                        | 100.2                   |                       |
| 20                                     |  | <u>Poorly Graded Sand (SP):</u> Gray, dry, dense, poorly graded fine to medium-grained sand, with <5% sub-angular fine-grained gravel. |                       | 7<br>18<br>25                  |  |                  | 2.0                        | 107.1                   |                       |
|                                        |                                                                                     | Gray, dry, medium dense, poorly graded fine to medium-grained sand, with <5% sub-sub rounded fine-grained gravel.                      |                       | 6<br>11<br>13                  |  |                  |                            |                         |                       |
| 25                                     |                                                                                     | Gray, dry, dense, poorly graded fine to medium-grained sand, with >10% coarse sand grains.                                             |                       | 13<br>22<br>22                 |  |                  | 1.3                        |                         |                       |
|                                        |                                                                                     | Total Depth 26.5-feet.<br>No groundwater or seepage.<br>Backfilled with cuttings.                                                      |                       |                                |                                                                                       |                  |                            |                         |                       |
| 30                                     |                                                                                     |                                                                                                                                        |                       |                                |                                                                                       |                  |                            |                         |                       |
| 35                                     |                                                                                     |                                                                                                                                        |                       |                                |                                                                                       |                  |                            |                         |                       |

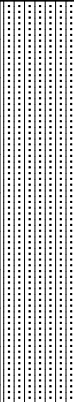
# EXPLORATION LOG

| Project: <b>1160 W. Pioneer Ave</b>    |                                                                                               |                                                                                                                           |                               |                 |                 | Boring No.: <b>B-4</b>         |                   |                 |
|----------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------|-----------------|--------------------------------|-------------------|-----------------|
| Location: <b>Redlands, California</b>  |                                                                                               |                                                                                                                           |                               |                 |                 | Elevation: <b>1260ft (msl)</b> |                   |                 |
| Job No.: <b>21-315</b>                 |                                                                                               |                                                                                                                           | Client: <b>Meritage</b>       |                 |                 | Date: <b>August 6, 2021</b>    |                   |                 |
| Drill Method: <b>CME-75 Hollowstem</b> |                                                                                               |                                                                                                                           | Driving Weight: <b>140lbs</b> |                 |                 | Logged By: <b>BR</b>           |                   |                 |
| Depth<br>(Feet)                        | Lithology                                                                                     | Material Description                                                                                                      | WATER                         | Samples         |                 | Laboratory Tests               |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               | Blows per 6 in. | C o r e B u l k | Moisture Content (%)           | Dry Density (pcf) | Other Lab Tests |
| 0                                      |                                                                                               | <u>Younger Axial Valley Deposits (Qya) Silty Sand (SM-ML):</u> Light gray brown, dry, medium dense, fine-grained sand.    |                               | 14              |                 | 0.9                            | 104.2             |                 |
|                                        |                                                                                               | 9                                                                                                                         |                               |                 |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
|                                        |                                                                                               | Light gray brown, dry, loose, fine to medium-grained sand.                                                                |                               | 4               |                 | 1.4                            | 97.4              |                 |
|                                        |                                                                                               |                                                                                                                           |                               | 6               |                 |                                |                   |                 |
| 5                                      |                                                                                               |                                                                                                                           |                               | 6               |                 |                                |                   |                 |
|                                        |                                                                                               | <u>Silt (ML):</u> Light gray, dry, medium dense, sandy silt.                                                              |                               | 5               |                 | 0.9                            | 105.3             |                 |
|                                        |                                                                                               |                                                                                                                           |                               | 9               |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               | 9               |                 |                                |                   |                 |
| 10                                     |                                                                                               | <u>Poorly Graded Sand (SP):</u> Gray, loose, dry, poorly graded fine to medium-grained sand, with <5% coarse sand grains. | 5                             |                 |                 |                                |                   |                 |
|                                        | Total depth 10.5-feet.<br>No groundwater or seepage.<br>Converted to percolation test boring. |                                                                                                                           | 3                             |                 |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           | 7                             |                 |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
| 15                                     |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
| 20                                     |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
| 25                                     |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
| 30                                     |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
|                                        |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |
| 35                                     |                                                                                               |                                                                                                                           |                               |                 |                 |                                |                   |                 |

# EXPLORATION LOG

| Project: <b>1160 W. Pioneer Ave</b>    |                                                                                   |                                                                                                                                                                                           |                       | Boring No.: <b>B-5</b>         |                                                                                     |                  |                            |                         |                       |
|----------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------|-------------------------------------------------------------------------------------|------------------|----------------------------|-------------------------|-----------------------|
| Location: <b>Redlands, California</b>  |                                                                                   |                                                                                                                                                                                           |                       | Elevation: <b>1262ft (msl)</b> |                                                                                     |                  |                            |                         |                       |
| Job No.: <b>21-315</b>                 |                                                                                   | Client: <b>Meritage</b>                                                                                                                                                                   |                       | Date: <b>August 6, 2021</b>    |                                                                                     |                  |                            |                         |                       |
| Drill Method: <b>CME-75 Hollowstem</b> |                                                                                   | Driving Weight: <b>140lbs</b>                                                                                                                                                             |                       | Logged By: <b>BR</b>           |                                                                                     |                  |                            |                         |                       |
| Depth<br>(Feet)                        | Lith-<br>ology                                                                    | Material Description                                                                                                                                                                      | W<br>A<br>T<br>E<br>R | Samples                        |                                                                                     |                  | Laboratory Tests           |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       | Blows<br>per<br>6 in.          | C<br>o<br>r<br>e                                                                    | B<br>u<br>l<br>k | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab<br>Tests |
| 0                                      |  | <u>Younger Axial Valley Deposits (Qya) Silty Sand (SM):</u><br>Light olive gray, dry, loose, fine-grained sand.                                                                           |                       | 5                              |  |                  | 1.8                        | 102.9                   |                       |
|                                        |                                                                                   |                                                                                                                                                                                           | 7                     |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           | 7                     |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           | 3                     |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   | Light olive gray, dry, medium dense, fine-grained sand.                                                                                                                                   |                       | 7                              |                                                                                     |                  | 2.7                        | 99.7                    |                       |
| 5                                      |                                                                                   |                                                                                                                                                                                           |                       | 9                              |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   | <u>Silt (ML):</u> Gray brown, dry, firm, sandy silt.                                                                                                                                      |                       | 3                              |                                                                                     |                  | 2.8                        | 96.8                    |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       | 5                              |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       | 7                              |                                                                                     |                  |                            |                         |                       |
| 10                                     |  | <u>Interbedded Silty Sand and Poorly Graded Sand (SP-SM):</u> Gray brown, dry, medium dense, interbedded silty fine to medium-grained sand and poorly graded fine to medium-grained sand. |                       | 5                              |  |                  | 2.8                        | 102.0                   |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       | 6                              |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       | 10                             |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   | Total depth 10.5-feet.<br>No groundwater or seepage.<br>Backfilled with cuttings.                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
| 15                                     |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
| 20                                     |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
| 25                                     |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
| 30                                     |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |
| 35                                     |                                                                                   |                                                                                                                                                                                           |                       |                                |                                                                                     |                  |                            |                         |                       |

# EXPLORATION LOG

| Project: <b>1160 W. Pioneer Ave</b>    |                                                                                   |                                                                                                         |                       | Boring No.: <b>B-6</b>         |                                                                                     |                  |                            |                         |                       |
|----------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------|-------------------------------------------------------------------------------------|------------------|----------------------------|-------------------------|-----------------------|
| Location: <b>Redlands, California</b>  |                                                                                   |                                                                                                         |                       | Elevation: <b>1270ft (msl)</b> |                                                                                     |                  |                            |                         |                       |
| Job No.: <b>21-315</b>                 |                                                                                   | Client: <b>Meritage</b>                                                                                 |                       | Date: <b>August 6, 2021</b>    |                                                                                     |                  |                            |                         |                       |
| Drill Method: <b>CME-75 Hollowstem</b> |                                                                                   | Driving Weight: <b>140</b>                                                                              |                       | Logged By: <b>BR</b>           |                                                                                     |                  |                            |                         |                       |
| Depth<br>(Feet)                        | Lith-<br>ology                                                                    | Material Description                                                                                    | W<br>A<br>T<br>E<br>R | Samples                        |                                                                                     |                  | Laboratory Tests           |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       | Blows<br>per<br>6 in.          | C<br>o<br>r<br>e                                                                    | B<br>u<br>l<br>k | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab<br>Tests |
| 0                                      |  | Young Axial Valley Deposits (Qya) Silty Sand (SM):<br>Gray brown, dry, medium dense, fine-grained sand. |                       | 8                              |  |                  | 0.7                        | 106.9                   |                       |
| 7                                      |                                                                                   |                                                                                                         | 7                     |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   | Gray brown, dry, medium dense, fine-grained sand, with <5% sub-rounded fine- grained gravel.            |                       | 5                              |  |                  | 1.7                        |                         |                       |
| 5                                      |                                                                                   |                                                                                                         | 6                     |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   | Olive gray brown, dry, medium dense, fine-grained sand.                                                 |                       | 4                              |  |                  | 0.8                        |                         |                       |
|                                        |                                                                                   |                                                                                                         | 6                     |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   | Gray, dry, medium dense, fine to coarse-grained sand, with <10% sub-angular fine gravel.                |                       | 7                              |  |                  | 1.3                        |                         |                       |
| 10                                     |                                                                                   |                                                                                                         | 9                     |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   | Total depth 10.5-feet.<br>No groundwater or caving.<br>Backfilled with cuttings.                        |                       | 11                             |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
| 15                                     |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
| 20                                     |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
| 25                                     |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
| 30                                     |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
|                                        |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |
| 35                                     |                                                                                   |                                                                                                         |                       |                                |                                                                                     |                  |                            |                         |                       |

**Maximum Dry Density and Optimum Moisture Content Test Data**

| Boring/Depth<br>(feet) | Soil Type  | Optimum<br>Moisture<br>(%) | Maximum<br>Dry Density<br>(pcf) |
|------------------------|------------|----------------------------|---------------------------------|
| B-1 @ 0-5              | Silty Sand | 9.0                        | 125.0                           |

Per ASTM Test Method ASTM D 1557

**Expansion Index Test Data**

| Boring/Depth<br>(feet) | Soil Type       | Expansion<br>Index | Expansion<br>Potential |
|------------------------|-----------------|--------------------|------------------------|
| B-1 @ 0-5              | Silty fine Sand | 0                  | Very Low               |

Per ASTM Test Method ASTM D 4829

**Corrosion Test Data**

| Boring/Depth<br>(feet) | Sulfate<br>(%) | Chloride<br>(mg/L) | pH  | Resistivity<br>(ohm-cm) | Corrosivity Potential                   |
|------------------------|----------------|--------------------|-----|-------------------------|-----------------------------------------|
| B-1 @ 2                | 0.0009         | 108                | 8.4 | 10,000                  | Concrete: Negligible<br>Steel: Moderate |

Per California Test Method CTM 417, 422, 643

# COMPACTION TEST REPORT

**Project No.:** 21-315

**Date:** 9/7/2021

**Project:** 1160 W. Pioneer Ave

**Client:** Meritage

**Source of Sample:** Phase 100      **Depth:** 0-5

**Sample Number:** B-1

**Remarks:** Expansion Index: 0 (Very Low)

## MATERIAL DESCRIPTION

**Description:** Brown Silty fine to medium Sand

**Classifications -**

**USCS:**

**AASHTO:**

**Nat. Moist. =**

**Sp.G. =**

**Liquid Limit =**

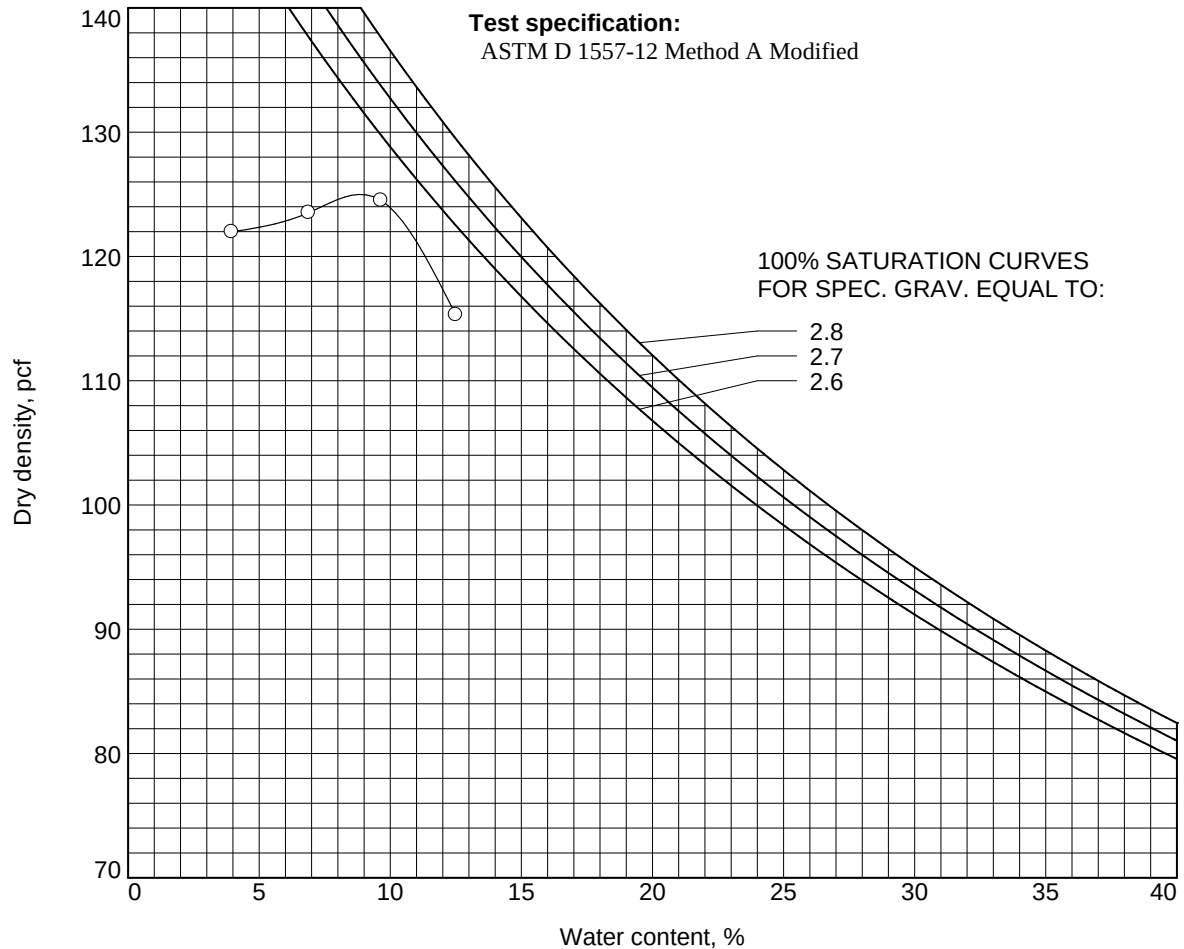
**Plasticity Index =**

**% < No.200 =** 29.9 %

## TEST RESULTS

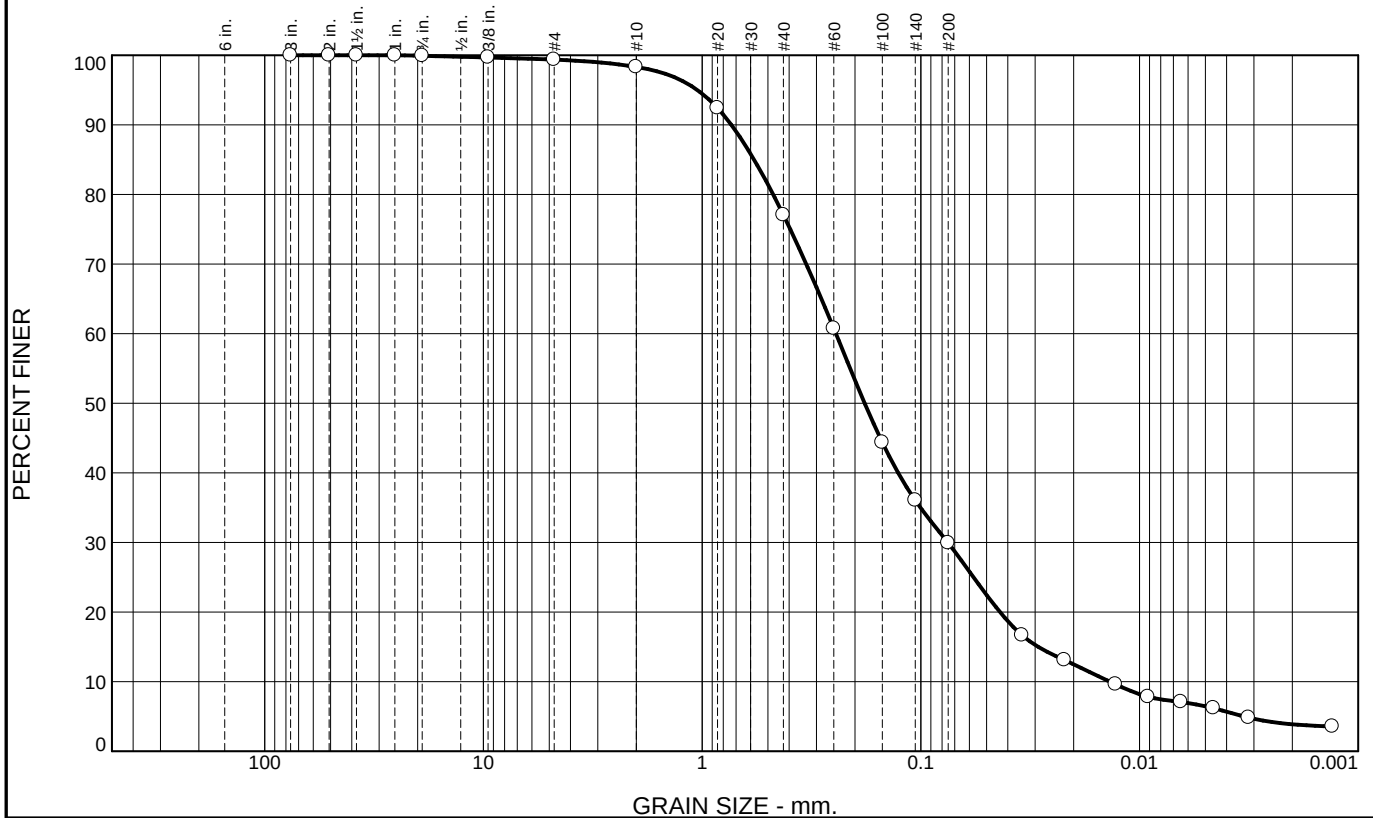
Maximum dry density = 125.0 pcf

Optimum moisture = 9.0 %



**Figure**

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |      |
|-------|----------|------|--------|--------|------|---------|------|
|       | Coarse   | Fine | Coarse | Medium | Fine | Silt    | Clay |
| 0.0   | 0.1      | 0.5  | 1.1    | 21.2   | 47.2 | 23.4    | 6.5  |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|------------|---------------|----------------|--------------|
| 3          | 100.0         |                |              |
| 2          | 100.0         |                |              |
| 1.5        | 100.0         |                |              |
| 1          | 100.0         |                |              |
| .75        | 99.9          |                |              |
| .375       | 99.7          |                |              |
| #4         | 99.4          |                |              |
| #10        | 98.3          |                |              |
| #20        | 92.4          |                |              |
| #40        | 77.1          |                |              |
| #60        | 60.8          |                |              |
| #100       | 44.4          |                |              |
| #140       | 36.0          |                |              |
| #200       | 29.9          |                |              |

\* (no specification provided)

|                                    |                          |                          |
|------------------------------------|--------------------------|--------------------------|
| <u><b>Material Description</b></u> |                          |                          |
| Brown Silty fine to medium Sand    |                          |                          |
| <u><b>Atterberg Limits</b></u>     |                          |                          |
| PL=                                | LL=                      | PI=                      |
| <u><b>Coefficients</b></u>         |                          |                          |
| D <sub>90</sub> = 0.7351           | D <sub>85</sub> = 0.5786 | D <sub>60</sub> = 0.2444 |
| D <sub>50</sub> = 0.1806           | D <sub>30</sub> = 0.0752 | D <sub>15</sub> = 0.0290 |
| D <sub>10</sub> = 0.0137           | C <sub>u</sub> = 17.90   | C <sub>c</sub> = 1.70    |
| <u><b>Classification</b></u>       |                          |                          |
| USCS=                              | AASHTO=                  |                          |
| <u><b>Remarks</b></u>              |                          |                          |

Source of Sample: Phase 100  
Sample Number: B-1

Depth: 0-5

Date: 9/9/2021



Client: Meritage  
Project: 1160 W. Pioneer Ave

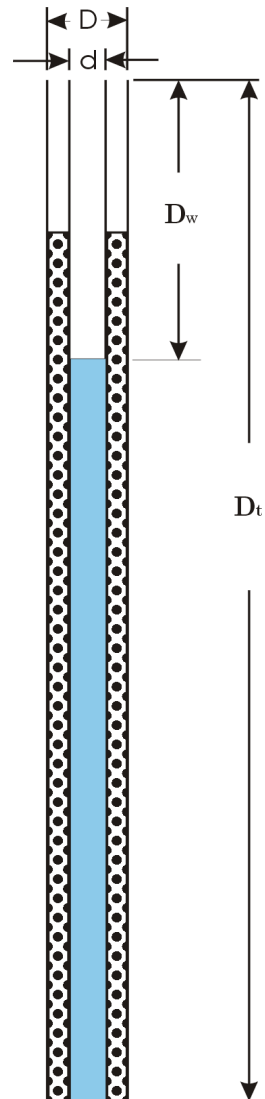
Project No: 21-315

Figure

**Test Number: P-1**  
Shallow Percolation Test Method

Total Depth of Boring,  $D_t$  (ft): 10  
Diameter of Hole,  $D$  (in): 8  
Diameter of Pipe,  $d$  (in): 3  
Agg. Correction (% Voids): 40  
Pre-soak depth (ft): 5

| Time Interval (min) | Depth to Water Surface $D_w$ (ft) |             | Change in Head (in) | Perc. Rate (min/in) | Perc. Rate (gal/day/ft <sup>2</sup> ) |
|---------------------|-----------------------------------|-------------|---------------------|---------------------|---------------------------------------|
|                     | 1st Reading                       | 2nd Reading |                     |                     |                                       |
| 25                  | 5.05                              | 9.42        | 52.44               | 0.48                | 51.86                                 |
| 25                  | 5.50                              | 9.26        | 45.12               | 0.55                | 46.94                                 |
| 10                  | 5.02                              | 6.55        | 18.36               | 0.54                | 30.37                                 |
| 10                  | 5.05                              | 6.70        | 19.80               | 0.51                | 33.44                                 |
| 10                  | 5.20                              | 6.72        | 18.24               | 0.55                | 31.43                                 |
| 10                  | 5.05                              | 6.68        | 19.56               | 0.51                | 32.96                                 |
| 10                  | 5.22                              | 6.78        | 18.72               | 0.53                | 32.57                                 |
| 10                  | 5.15                              | 6.73        | 18.96               | 0.53                | 32.51                                 |
|                     |                                   |             |                     |                     |                                       |
|                     |                                   |             |                     |                     |                                       |
|                     |                                   |             |                     |                     |                                       |
|                     |                                   |             |                     |                     |                                       |



**Percolation Rate: 0.53 Minutes/Inch**  
**39.62 gal/day/ft<sup>2</sup>**

**Infiltration Rate: 2.79 Inches/Hour\***  
(Porchet Method)

where Infiltration Rate,  $I_t = \Delta H (60r) / \Delta t (r + 2H_{avg})$

$$r = D / 2$$

$$H_o = D_t - D_o$$

$$H_f = D_t - D_f$$

$$\Delta H = \Delta D = H_o - H_f$$

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

\*Raw Number, Does Not Include a Factor of Safety

Testing by Bryan Rall 8/9/21

Reference: RCFCWCD, Design Handbook for LIDBMP, dated September, 2011

|                                                                                                                                                                                  |                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <b>PETRA GEOSCIENCES, INC.</b><br>40880 County Center Drive, Suite M<br>Temecula, CA 92591<br>PHONE: (951) 600-9271<br>COSTA MESA TEMECULA VALENCIA PALM DESERT CORONA SAN DIEGO |                                  |
| <b>PERCOLATION TEST SUMMARY</b>                                                                                                                                                  |                                  |
| 1160 W. Pioneer Ave<br>Redlands, California                                                                                                                                      |                                  |
|                                                                                              | DATE: Sept. 2021<br>J.N.: 21-315 |

**Figure 1**