GEOTECHNICAL EVALUATION

FOR

SONORAN FOOTHILLS
SOUTHWEST CORNER OF WEST DOVE VALLEY ROAD & NORTH PALOMA PARKWAY
PHOENIX, ARIZONA

GEOTEK

GEOTECHNICAL | ENVIRONMENTAL | MATERIALS

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FOR

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SOUTHWEST CORNER OF WEST DOVE VALLEY ROAD
& NORTH PALOMA PARKWAY
PHOENIX, ARIZONA

Prepared For:

ARIZONA STATE LAND DEPARTMENT

and

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JANUARY 10, 2014

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January 10, 2014
Project No. 1312-PHR3

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Attention: Mr. Jeff Deason
Land Development Manager

Subject: Geotechnical Evaluation
Sonoran Foothills
SWC of West Dove Valley Road & North Paloma Parkway
Phoenix, Arizona

In accordance with your request and authorization, GeoTek Residential, LLC (GTR) has prepared this report in accordance with the disclosure requirements of the Arizona Department of Real Estate (A.A.C. R4-28-1203). GTR has completed a geotechnical evaluation for the subject site and this report presents the results of our evaluation, discussion of our findings, and provides geotechnical recommendations for earthwork construction, soil corrosivity, utility construction, foundation recommendations and pavement sections.

In our opinion, proposed development of the site is feasible from a geotechnical viewpoint provided that the recommendations included herein are incorporated into the design and construction phases of the project. Included in the report are discussions of various geotechnical conditions related to site development.

It is our understanding that development of the proposed Sonoran Foothills residential project is to consist of grading the site, installing improvements and erecting one to two story wood frame residential structures and associated improvements. We advanced and logged fifteen (15) backhoe test pits and fifteen (15) hollow stem borings at the site. Native alluvial soils consist of gravelly, silty sands, sandy gravels with cobbles and to a lesser extent, sandy clays. The soils generally classify as low expansive.

Building foundation design criteria for the site is based on low expansive pad conditions, determined from laboratory testing, and the recommendation for a BRAB Type II foundation system design which is lightly reinforced against shrinkage and temperature cracking. This type of

foundation system can be reinforced with either steel reinforcement bars or post-tensioned cables.

Depending upon finish elevation of site improvements, special excavation techniques could be required during site grading or utility excavation.

The recommendations included in the following report should be incorporated in to design and construction at the Sonoran Foothills project.

GeoTek Residential, LLC (GTR) appreciates the opportunity to have participated in this phase of your project. Should you have any questions concerning the contents of this report or any other matter, please do not hesitate to contact us at (480) 505-9422.

Respectfully submitted,
GeoTek

Registered Professional Engineer (Civil)
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GARY N.
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EXPIRES 6/30/16

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Summary of Field Density and Moisture Test Results

1.0 INTENT

It is the intent of this report to assist in the design and construction of the proposed development. The advice and recommendations presented throughout this report are intended to reduce risks associated with construction of the project. The professional opinions and geotechnical recommendations contained in this report are not intended to imply total performance of the project or guarantee that unusual or variable conditions will not be discovered during or after construction.

2.0 PURPOSE AND SCOPE OF SERVICES

The purpose of the evaluation was to assess the general subsurface conditions at the site and to present geotechnical recommendations with regard to earthwork and other soil supported components of the project.

The scope of this evaluation included the following:

- Review of published geologic maps, and aerial photographs,
- Field exploration consisting of fifteen (15) backhoe test pits and fifteen (15) hollow stem borings,
- Density tests of native soils,
- Laboratory testing on selected soil samples,
- Compilation, review, and analysis of data,
- Report preparation with our findings and recommendations for the site development and construction.

3.0 SITE AND PROJECT INFORMATION

3.1 Site Description

The project site consists of approximately 144 acres of native desert land located at the southwest corner of West Dove Valley Road and North Paloma Parkway in Phoenix, Arizona. The site is essentially undeveloped. The site is bound by residential development to the west, West Dove Valley Road and residential development to the north, North Paloma Parkway and residential development to the east, and native desert, West Bronco Butte Trail and residential development to the south.

3.2 Proposed Development

It is our understanding that site development would consist of performing typical cut and fill earthwork to attain the desired graded configuration for the construction of one- to two-story detached single family residential structures. Dead and live foundation loading conditions are expected to be less than 50 kips for column loads and up to 2 kips per lineal foot for wall loads for the residential structures, typical of the wood and/or metal frame and stucco nature of the construction. It is further assumed that the final site grade will be within 10 feet of existing site grade and that no basements or below grade structures are proposed.

4.0 FIELD AND LABORATORY TESTING PROCEDURES

4.1 Field Exploration

Field exploration included advancing fifteen (15) test pits utilizing a rubber tired backhoe and fifteen (15) borings utilizing hollow stem auger. The approximate locations of the test pits and borings are indicated on Figure 2, Geotechnical Location Map, included in Appendix A. A log of each test pit and boring is included in Appendix B.

The backhoe test pit and hollow stem auger excavations were performed to observe soil conditions to a depth of 10 to 20 feet or practical refusal, obtain soil samples for laboratory testing, and assess rippability by light duty trenching equipment. The test pits and borings were logged by a GTR field Engineer and representative soil samples were collected at various depths. The samples were sealed in moisture resistant containers and returned to our laboratory. Moisture and density tests were obtained of in-place native soils with the use of a portable nuclear densometer or gauge in accordance with ASTM D-6938.

Test pits and borings were located in the field by GTR by estimating distances from identifiable landmarks and the use of a hand-held GPS device. The locations should be considered accurate only to the degree implied by the location method used. The test pits and borings were backfilled upon completion.

4.2 Laboratory Testing

Laboratory tests were performed on selected samples to provide a reasonable representation of the engineering properties of the soils. Testing was performed in general accordance with applicable ASTM, AASHTO, or ADOT procedures. The laboratory test results are presented in Appendix C.

5.0 EARTH MATERIALS

5.1 Existing Fill

The site is essentially undeveloped, native desert. A few dirt roadways are present and small berms (1 foot) were observed along the eastern border of the site. A rock-lined drainage channel is present along the south portion of the site, adjacent to West Bronco Butte Trail. Existing fill encountered will need to be removed and replaced in accordance with the Earthwork Section of this report.

5.2 Native Alluvium

Native alluvial soils consist of gravelly silty sands, sandy gravels and gravelly sands with varying amounts of cobbles and to a lesser extent, sandy clays. The soils were generally moderately to strongly cemented. The consistency of the alluvium ranged from loose and soft in the upper one (1) foot to medium dense to very dense and very stiff throughout the depths of the borings and test pits. The moisture content was typically slightly moist to moist. The test pit logs presented in Appendix B should be referred to for more detailed information.

6.0 GENERAL SITE CONDITIONS

6.1 Regional Geologic Setting

The site is located in Maricopa County, Arizona within the northern portion of the West Salt River Valley sub-basin of the Phoenix Active Management Area (AMA). Located within the Basin and Range physiographic province, the Phoenix AMA consists of gently sloping alluvial plains separated by predominantly north to northwest trending mountain ranges (ADWR, 1993). Land-surface elevations within the Phoenix AMA range from less than 800 feet above mean sea level (MSL) at Gillespie Dam to over 6,000 feet MSL in the Superstition Mountains. Elevations on the basin floors typically range from 950 to 2,500 feet MSL.

The Phoenix AMA is underlain by a thick sequence of Cenozoic valley fill deposits, which consist of unconsolidated to semi-consolidated clays, silts, sands, and gravels. Sediments beneath the site area are basin fill deposits that characteristically range from dense sand, gravel and cobbles to fine-grained silts and clays containing little gravel or coarse sand.

Fine-grained sediments are readily transported to the basin center, but coarser constituents typically accumulate around the apron of the mountain range and in the center of prominent river channels. Deposits of heavily cemented sandy clay to clayey sand (caliche) having characteristics of soft rock are encountered in many areas.

6.2 Tectonic Faulting and Regional Seismicity

The site is in an area of fairly low seismic activity. No known active or potentially active tectonic faults are shown crossing the site on published maps, nor was evidence of recent faulting observed during our field evaluation. In addition, no photo lineaments were observed crossing the property in our review of aerial photographs. The possibility of ground acceleration or shaking at the site may be considered approximately similar to the central Arizona region as a whole.

It is reasonable to assume that structures built in this area will be subject to at least one seismic event during their life, therefore, it is recommended that all structures be designed and constructed in accordance with the International Building Code (IBC).

The site is located at approximately 33.78° North Latitude and 112.10° West Longitude. The mapped spectral response accelerations (SA) for 0.2 second and 1.0 second periods for Site Class "D" at the site was determined from the USGS Website, Earthquake Hazards Program, Interpolated Probabilistic Ground Motion for the Conterminous 48 States by Latitude/Longitude, 2012 International Building Code Data Edition. The results are presented in the following table:

Mapped Spectral Response Acceleration (SA)	% of g
0.2 sec period (S_S)-Site Class B	21.5
1.0 sec period (S_1)-Site Class B	6.6
0.2 sec period (SD_S)-Site Class D	22.9
1.0 sec period (SD_1)-Site Class D	10.6

6.1 Secondary Seismic Constraints

The following list includes other potential seismic related hazards that have been evaluated with respect to the site, but in our opinion, the potential for these seismically related constraints to affect the site is considered negligible.

* Liquefaction
* Dynamic Settlements
* Surface Fault Rupture
* Ground Lurching or Shallow Ground Rupture

It is important to keep in perspective that if a seismic event were to occur on any major fault, intense ground shaking could be induced to this general area. Potential damage to any settlement sensitive structures would likely be greatest from the vibrations and impelling force caused by the inertia of the structures mass than that created from secondary seismic constraints.

Considering the subsurface soil conditions and local seismicity, it is estimated that the site has a very low risk associated with the potential for these phenomenon to occur and adversely affect surface improvements. These potential risks are no greater at this site than they are for other structures and improvements developed on the alluvial materials in this vicinity.

6.4 Vicinity Surface Drainage

The site is generally undeveloped, native desert land. Natural drainages generally run in a north northeast to south southwest direction. A rock-lined drainage channel is present along the south portion of the site, adjacent to West Bronco Butte Trail. Elevations range from 1608 feet above MSL to 1650 feet above MSL (Google Earth, 2013). Presently, surface water flows to the natural drainages and the rock-lined channel.

6.5 Groundwater

According to the published maps, the Phoenix AMA includes approximately 5,646 square miles of mostly Sonoran Desert. The major urban area, consisting of several incorporated cities and unincorporated areas, is largely surrounded by land devoted to agriculture, sparse development and open desert. Broad alluvial valleys and low rugged mountains that rise abruptly from pediments sloping toward valley floors characterize the natural landscape. The valleys are structural basins filled with thick sedimentary deposits that range from unconsolidated to highly consolidated that tend to be good natural storage places for groundwater (ADWR, 1992).

Groundwater was not encountered in our explorations onsite and from a review of local data, ground water is not anticipated to adversely affect planned development. Seeps, springs, or other indications of high ground water levels were not noted on the subject property. These observations reflect conditions at the time of this investigation and do not preclude changes in local ground water conditions in the future from natural causes, damaged structures (lines, pipes etc.), or heavy irrigation.

6.6 Land Subsidence

The site is not located in a mapped area of significant ground water withdrawal, ground subsidence due to withdrawal or an Earth Fissure Study Area according to maps published by the Arizona Geologic Survey. No fissures were identified in the general vicinity and none were observed during site mapping.

7.0 CONCLUSIONS

Based on review of the referenced reports and our field exploration, laboratory testing, engineering and geologic analyses, it is our opinion that the subject site is suited for development from a geotechnical engineering and geologic viewpoint . The recommendations presented herein

should be incorporated into the final design, grading, and construction phases of development. The engineering analyses performed concerning site preparation and the recommendations presented below, have been completed using the information provided to us regarding site development.

In the event that the information concerning proposed development is not correct, the conclusion and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report are modified or approved in writing by this office

8.0 RECOMMENDATIONS - CONSTRUCTION GUILDLINES

8.1 General

All grading should conform to the 2012 International Building Code (IBC) and MAG Specifications and the City of Phoenix MAG Supplements, except where specifically superseded in the text of this report. During earthwork construction all removals, drain systems, slopes, and the general grading procedures of the contractor should be observed and the fill selectively tested by a representative of GTR.

If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and if warranted, modified and/or additional recommendations will be offered. It is recommended that the earthwork contractor(s) perform their own independent reconnaissance of the site to observe field conditions first hand.

If the contractor(s) should have any questions regarding site conditions, site preparation, or the remedial recommendations provided, they should contact an engineer at GTR for any necessary clarifications prior to submitting earthwork bids. All applicable requirements of local and national construction and general industry safety orders, the Occupational Safety and Health Act, and the Construction Safety Act should be met.

8.2 Removals/Processing - General

Presented below are removal/processing recommendations for the earth materials encountered on the project. Debris, vegetation, and other deleterious material should be stripped/removed from areas proposed for structural fill placement and disposed of offsite prior to the start of construction. If existing improvements or property line restrictions limit removals, condition specific recommendations would be provided on a case-by-case basis.

Based on the field investigation and preliminary laboratory testing, the soils onsite consist of low expansive alluvium consisting of gravelly silty sands, sandy gravels and gravelly sands with varying amounts of cobbles and to a lesser extent, sandy clays. Cobbles and gravels generally increase with depth.

Based on a review of the exploratory logs and our site reconnaissance, at a minimum, removals/processing into alluvium should be accomplished to a depth of 12 inches across the site (Figure 4, Appendix A). If the left in place soils can be scarified to encounter a competent layer below, they may be processed in place, otherwise, they should be removed to competent material. Locally deeper removals/processing may be necessary based on the conditions exposed (e.g., areas near natural drainages, etc.).

The foundation soil for the proposed structures should consist of a minimum of two (2) feet of moisture conditioned and compacted soil (Figure 3, Appendix A). With some effort and depending upon earthwork equipment used, the bottom one (1) foot of material could likely be processed in place without removing (over excavating) the soils.

The streets and private drives should also be provided with a minimum 12-inches of moisture conditioned and compacted soil. Based on the elevation of the lowest invert for the deepest utility (likely sewer), pre-trenching with the use of a large excavator or other applicable equipment during earthwork construction may be considered. Excavation difficulty is discussed in Section 8.3, Excavation Difficulty, of this report.

Care should be taken by the contractor during filling of the down cut, seasonal drainages. These drainages are often a collection area for uncontrolled fill and/or soft/loose soils and the removal bottom must be observed and approved by a representative of GTR prior to placing fill. If the sides of the drainages are steeper than a 5 to 1 to slope, the contractor should bench the contact between the native material and the fill (Figure 4, Appendix A) for better stability and more uniform support. Benches should be no more than 3 feet vertical and be at least 6 feet wide. With some effort and depending upon earthwork equipment used, the bottom one (1) foot of material could likely be processed in place without removing (over excavating) the soils. The depth of the moisture conditioning and compaction should be verified by a representative of GTR.

Processing should extend at least five feet laterally beyond proposed structures and improvements (e.g., flatwork, block walls, etc.). The depth of the moisture conditioning and compaction should be verified by a representative of GTR.

8.3 Excavation Difficulty

The native alluvium consisted of dense to very dense gravelly, silty sand with some cobbles and it is anticipated that conventional earthwork equipment may be used to excavate these alluvial materials encountered during our explorations. However, an increase in the presence of cobbles, boulders and/or cementation may adversely affect excavation difficulty.

8.4 Fill Placement

Subsequent to completing the recommended removals/processing and ground preparation, excavated onsite soils may be placed in relatively thin lifts (with a maximum lift thickness of 12 inches), cleaned of vegetation and debris, brought to at least optimum moisture content, and compacted to a minimum relative compaction of 95 percent of the laboratory standard ASTM D698.

It should be noted that the maximum lift thickness requirement to meet both the minimum relative compaction and moisture content requirements is a function of several variables including (but not limited to) the type of soil (e.g., clay, silt, sand, gravel, cobbles, etc.), type and size of compaction equipment (e.g., sheep's foot roller, scraper, jumping jack, etc.), number of passes, frequency of operation of compaction equipment, moisture content, confinement (e.g., relatively soft bottom versus bedrock), etc. Thus, the maximum lift thickness can vary considerably and still achieve proper moisture contents and relative compaction. The maximum lift thickness should be appropriately decreased based on the factors listed above. It is left to a representative of GTR (e.g., grading/field technician) to determine the appropriate lift thickness based on observation and testing of the fill. Excessive lift thickness (in the judgment of a GTR representative) will result in issuing of non-compliance.

If needed, when testing the fill for dry density and moisture content, a pothole/test pit should be excavated to a minimum depth to remove any loose surficial material. The area should then be leveled prior to performing a density test. A failing soil density test is based on either a dry density of less than 95 percent compaction or moisture content less than optimum of the laboratory standard ASTM D698.

8.5 Materials

Base course materials for use beneath interior floor slabs and pavements should be well-graded sand or gravel materials meeting the M.A.G. Specifications for Aggregate Base Course (ABC) materials, Section 702.

8.5.1 On-Site Soil:

On-site soils that are cleaned of oversized material and debris may be used as structural fill.

8.5.2 Import Material:

It is possible that additional soils will be imported to the site for earthwork construction purposes. A sample of any intended import material should first be submitted to GTR so that, if necessary, additional laboratory or chemical testing can be performed to verify that the intended import material is compatible with onsite soils.

8.6 Construction Observations

We recommend that site preparation and foundation construction activities be observed and/or tested by a GTR representative working under the direction of the project geotechnical engineer. This representative would have at least the following duties:

- Observe and document adequate removal of existing surficial vegetation and other deleterious materials.
- Observe and approve the exposed subgrade soils under the building and pavement areas.
- Approve any material used as engineered fill in building and pavement areas to document that it meets the requirements.
- Monitor the progress of earthwork and compaction operations including performing field density tests at a minimum rate of one test for every 1000 cubic yards of material placed, one for every two vertical feet of material placed, or where there is a change in material, whichever is greater. For residential/commercial grading, one finished pad grade density test should also be taken for each lot/pad. As a result, every residential/commercial pad will have at least one density test shown and plotted on the field-grading plan.
- Monitor footing excavation operations to document that the recommended soils and compaction requirements in engineered fill are fulfilled.
- Provide a final report documenting on-site activities, site progress, and whether the above requirements have been fulfilled.

8.7 Soil Corrosion and Cement Type

Soils within the area vary in corrosive potential to concrete and metal; therefore, materials selected for construction purposes should be resistant to corrosion. Testing of onsite soils indicate sulfate content of 1 to 160 ppm, which may be characterized as negligible sulfate content (ACI 318-05). Type II cement or equivalent for negligible sulfate exposure conditions is acceptable for concrete mixtures. Testing of onsite soils indicate chloride content of 10 to 145 ppm, which is below the limits where protection of tendons is required (PTI Design of Post-Tensioned Slabs-On-Ground Third Edition, latest updates).

All concrete should be designed, mixed, placed, finished, and cured in accordance with the guidelines presented by the Portland Cement Association (PCA) and the American Concrete Institute (ACI).

8.8 Utility Construction

8.8.1 Trench Excavations

Cobbles were encountered throughout the site and appear to increase with depth. Depending on the depth, trench excavation may require special excavation equipment where excessive cobbles are encountered.

Trench walls may remain in a near-vertical slope for very short periods of time. If utility trenches extend to a depth of five (5) feet or more below construction grade, the contractor or others should develop a trench safety plan to protect personnel entering the excavation. Trench safety should conform to OSHA safety guidelines and other applicable industry standards.

Backfill of trenches, excluding pipe bedding and pipe zone material, should utilize processed and compacted on-site soils in order to provide more uniform improvement support conditions and reduce potential differential settlement and expansion problems.

8.8.2 Utility Trench Backfill

Considering the overall nature of the soil observed onsite, it should be anticipated that materials would need to be imported to the site for use as pipe bedding and pipe zone material. Utility trench backfill should be placed in accordance with the appropriate M.A.G. standards or City of Phoenix Supplements. The onsite soils may not meet specifications for selected and granular trench backfill. Compaction testing and observation, along with probing, should be performed to verify the desired results. Sand backfill, unless excavated from the trench, should not be used adjacent to perimeter footings or in trenches on slopes.

8.9 Slope Stability

All slopes should be designed at gradients of 2 to 1 (Horizontal to Vertical) or flatter. All slopes should be constructed in accordance with the minimum requirements of the City of Phoenix and the 2012 IBC.

Cut and fill slopes are anticipated to perform adequately in the future with respect to gross and surficial stability if the soil materials are maintained in a solid to semi-solid state (as defined by the soils Atterberg Limits) and are limited to the heights prescribed herein. The slopes should be adequately protected from erosion.

8.10 Earthwork Balance

The volume change of excavated materials upon compaction as engineered fill is anticipated to vary with material type, depth and location. However, at your request, we performed additional field

density tests in the alluvial material to determine in place density of the soils and calculated an estimated suggested design value regarding shrinkage. We obtained samples in the field to determine the laboratory maximum dry density in accordance with ASTM 698. We performed 18 field density tests in the 18 backhoe test trenches and then were able to calculate an estimated shrinkage. We assumed that on average the compaction of fill material would be placed at 97 percent per ASTM 698.

It should be noted that statically the suggested shrinkage value could be determined with a greater percentage of accuracy with an increased amount of testing. However, we were able to determine a shrinkage value based on limited testing. In addition to the Suggested Design Value we provided the General Range of Volume Change based on our experience with similar alluvial soils. The data actually indicates areas of some horizontal and vertical variation. Excavation and compaction of the fill are estimated to result in volume changes as listed below.

Depth (Feet)	General Range of Volume Change (%)	Suggested Design Value (%)
0 to 1	-8 to -26	-10
1 to 2.5	-9 to -25	-9
2.5 to 5	-9 to -25	-12

In addition to the volume changes noted above, ground loss or subsidence of 0.05 to 0.10 feet should be expected in alluvial areas due to soil consolidation from the static and dynamic loading conditions created by earthwork equipment. This ground loss should be expected in all graded areas of the site.

The removal of vegetation will have an impact on the site balance and is not included in the factors provided above. This is difficult to assess and it could be significant depending on actual conditions encountered.

It should be noted the above factors are preliminary estimates only and are considered averages for the site; actual values will vary. Final earthwork balance factors are dependent on various factors that cannot be accurately predicted or anticipated.

9.0 RECOMMENDATIONS – FOUNDATIONS

9.1 General

Foundation design and construction recommendations are based on preliminary laboratory testing and engineering analysis performed on near surface earth materials. The proposed foundation

systems should be designed and constructed in accordance with the guidelines contained herein and in the IBC.

Based on our preliminary laboratory testing, the soils onsite were low expansive. As a result, low expansive foundation design parameters are provided below.

9.2 Conventional Foundation Recommendations

The proposed structures can be supported on a conventional shallow foundation system; provided the soils are reworked as outlined in this report and our recommendations are followed:

- Shallow spread foundations bearing on the properly compacted engineered fill as outlined above can be designed for a total allowable soil bearing pressure of 2,000 psf. Generally, a one-third increase may be applied to the design bearing pressure when considering short duration wind and seismic loads.
- The allowable soil bearing pressure may be increased by 250 psf, to a maximum of 2,500 psf, for each additional foot of either the width or depth beyond those recommended below.
- For lateral sliding resistance, a 0.45 coefficient of friction may be utilized for a concrete to soil contact when multiplied by the dead load.
- Passive earth pressure may be computed as an equivalent fluid having a density of 350 pounds per square foot per foot of depth with a maximum earth pressure of 2,500 pounds per square foot.

- Exterior footings should be founded at least 12 inches below lowest adjacent grade to provide adequate embedment depth and to achieve the recommended bearing pressure. Individual column and continuous wall footings should have a minimum width of 12 inches, or as determined by building codes or the Structural Engineer.
- Interior footings should be founded at a nominal depth of 12 inches into compacted soil. Individual column and continuous wall footings should have a minimum width of 12 inches, or as determined by building codes or the Structural Engineer.
- The minimum area and width are recommended for ease of construction and to provide a margin of safety against a local shear or punching failure of the foundation soils.
- The need for interior stiffening beams should be assessed by the Structural Engineer in accordance with the applicable building codes.
- The footings and interior beam should be reinforced as determined by the Structural Engineer.

Provided the recommendations for site preparation are carried out, total and differential settlements under design loads are expected to be on the order of 1-inch and ½-inch, respectively.

9.3 Post-tensioned Slabs

The information and recommendations presented below are not meant to supersede design by a registered structural engineer or civil engineer familiar with post-tensioned slab design. Upon request, GTR could provide additional input/consultation regarding soil parameters, as related to post-tensioned slab design. Post-tensioned slabs should be designed so that the superimposed loads are distributed evenly over the subgrade soils. Unless interior utility trenches are compacted and verified by a representative of GTR, slabs should be able to span a minimum of ten feet unsupported. All footings should maintain a minimum horizontal distance of 7 feet from the outside bottom edge of the footing to the face of an adjacent descending slope.

These recommendations are provided for relatively light foundation loading conditions, such as those anticipated for the proposed structures. These foundation loads are anticipated to be less than 50 kips for column loads and less than 2 kips per lineal foot for wall loads. Post-tensioned slabs should be designed using sound engineering practice and be in conformance with local and/or national code requirements.

These foundation recommendations for low expansive pad conditions are meant to be consistent with a BRAB Type II foundation system which is lightly reinforced against shrinkage and temperature cracking. This type of foundation system can be reinforced with either steel reinforcement bars or post-tensioned cables. Post–tensioning for this type of foundation system should utilize the recommended design procedure by the Post-tensioning Institute for "Design of Post-tensioned Slabs-on-Grade" (third edition manual) using a minimum prestress force of 0.10A, after all losses including the effects of subgrade friction. All reinforcing (steel or post-tensioning) should be properly designed and specified by the structural engineer.

Design:

1. The maximum allowable bearing pressure applicable beneath stiffening breams and perimeter beams is 1500 psf provided they are founded entirely on properly compacted fill. The bearing value may be increased by one-third for seismic or other temporary loads.

2. Care should be taken to ensure that slabs founded on perimeter beams are not potentially undermined through erosion.

3. The interior flat portions of the slab should be underlain by a minimum of four (4) inches of Aggregate Base Course material.

4. The modulus of subgrade (soil) reaction (k) is estimated to be 150 pounds per cubic inch (pci) provided the subgrade soils are prepared in accordance with the Earthwork Recommendations section of this report.

5. For lateral sliding resistance, a 0.45 coefficient of friction may be utilized for a concrete to soil contact when multiplied by the dead load. A coefficient of friction of 1.0 should be used between the slab support material and the concrete slab should be assumed to determine any tendon spacing.

6. Passive earth pressure may be computed as an equivalent fluid having a density of 350 pounds per square foot per foot of depth with a maximum earth pressure of 2,500 pounds per square foot.

7. All footings should maintain a minimum 7-foot horizontal set back from the bottom outside edge of the footing and any adjacent descending slope face.

8. Local Standard-of-Care has historically has not incorporated a vapor retarder in to design or construction. Final determination on the use of a vapor retarder should be left to the slab designer or architect. If a vapor retarder is used it should conform to the specifications presented in ASTM E1745-97 and should be placed as described in ASTM E1643-98 and the Guide for Concrete Floor and Slab Construction, published by the American Concrete Institute (ACI 302.1R-96).

9.4 Foundation Settlement

Provided that the recommendations contained in this report are incorporated into final design and construction phase of project, total settlement is estimated to be less than 1 inch. Differential settlement should be less than one-half the total settlement. The settlement estimates presented assume stable subgrade soil moisture content will be maintained.

9.5 Retaining and Block Walls

The design parameters provided below assume that low expansive soils are used to backfill any retaining walls. If expansive soils are used to backfill the walls, increased active and at-rest earth pressures will need to be utilized for design. Building walls, below grade, should be waterproofed or damp-proofed, depending on the degree of moisture protection desired.

9.5.1 Design:

1. Preliminary analysis indicates that an allowable bearing value of 2,000 pounds per square foot may be used for design of footings which maintain a minimum width of 12 inches and a minimum depth of at least 12 inches into the properly compacted fill or processed and compacted alluvial materials. The bearing value may be increased by one-third for seismic or other temporary loads. A bearing value increase of 350 psf is

allowed for each additional foot of width or depth up to a maximum bearing value of 3,000 psf without additional review.

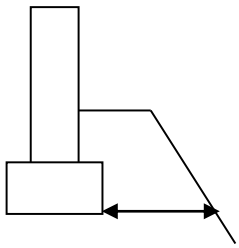
2. For lateral sliding resistance, a 0.45 coefficient of friction may be utilized for a concrete to soil contact when multiplied by the dead load.

3. Passive earth pressure may be computed as an equivalent fluid having a density of 350 pounds per square foot per foot of depth with a maximum earth pressure of 2,500 pounds per square foot. However, for block and retaining walls within 5 feet of descending slopes, passive earth pressures should be considered negligible without further review by GTR.

4. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

5. GTR recommends the following with regards to horizontal set back of block and retaining wall footings. The recommendations are minimums and do not account for erosion, therefore, slopes should be maintained. For block or retaining walls near slopes, the horizontal set back measured from the outside edge of the block or retaining wall footing to any adjacent descending slope face should follow the table shown below:

Descending Slope Height	*Minimum Horizontal Setback*
Up to 5 feet high	2' 8"
Greater than 5 feet and up to 8 feet high	3' 8"
Greater than 8 feet and up to 10 feet high	4' 8"



6. The soils onsite were found to have a minimal corrosive potential to concrete and metal, however, materials selected for construction purposes should be resistant to corrosion. We recommend the use of sulfate resistant concrete (Type II Portland Cement or equivalent for "negligible" sulfate exposure conditions) for all concrete mixtures that will be in contact with soil. All concrete should be designed, mixed, placed, finished, and cured in accordance with the guidelines presented by the Portland Cement Association (PCA), the American Concrete Institute (ACI) and the IBC.

9.5.2 Wall Foundation Construction:

The following table contains preliminary foundation design and construction recommendations for walls that are constructed on low expansive soils. Footings should be founded at a minimum depth of 12 inches for block walls and 12 inches for retaining walls below the lowest adjacent grade. See Figure 5, Retaining Wall Detail.

EXPANSIVE NATURE OF SOIL	MINIMUM FOOTING DEPTH (1)	
	Retaining Walls (w/ min. 2 ft. retained)	Block Walls
LOW	12 inches	12 inches

(1) denotes that depth should be measured from the lowest adjacent grade

All walls should be reinforced with a minimum of two No. 4 reinforcing bars, one placed near the top of wall and one placed near the bottom of the wall footing. In the upper bond beam, "U" blocks should be used. The walls should use both vertical and horizontal reinforcement and be designed to resist the effects a two-way 1/400 angular distortion would impart on a wall. Prior to pouring concrete, the subgrade soils should be lightly moisture conditioned to prevent loss of water during pouring and curing of the concrete.

9.6 Restrained Walls

Any retaining walls that will be restrained prior to placing and compacting backfill material or that have reentrant or male corners, should be designed for an at-rest equivalent fluid pressure of 55pcf, plus any applicable surcharge loading. For areas of male or re-entrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall laterally from the corner.

9.7 Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls up to 10 feet high. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall. Appropriate fluid unit weights are given below for specific slope gradients of the retained material. These do not include other superimposed loading conditions such as traffic, structures, seismic events, or adverse geologic conditions.

Surface Slope of Retained Material (H:V)	Equivalent Fluid Weight (P.C.F.)
Level	35
2 to 1	55

9.8 Wall Backfill and Drainage

All retaining walls should be provided with an adequate backdrain and outlet system (a minimum 1 outlet per 10 feet of wall) to prevent buildup of hydrostatic pressures and be designed in

accordance with minimum standards presented herein. Gravel used in backdrain systems should be a minimum of 12 inches of 3/4 to 1-1/2 inch clean crushed rock wrapped in filter fabric that extends to within 18 inches of the surface (Figure 5, Appendix A).

The surface of the backfill should be sealed by pavement or the top 18 inches compacted with native low permeability soil. Proper surface drainage should also be provided. Manufactured alternatives to a gravel backdrain system are available but should be reviewed by GTR prior to installation.

10.0 PRELIMINARY PAVEMENT SECTIONS

10.1 Flexible Pavements

The pavement section presented below is based on subgrade conditions observed on the site and the City of Phoenix Standard Supplemental Details for Public Works Construction dated 2012. Final design of pavement sections should be based on laboratory testing performed subsequent to mass grading. Flexible pavement should be constructed on a subgrade processed as described in section 8.2.

10.2 Asphalt Pavement Construction

Material used in pavement construction should comply with the current version of MAG *Standard Specifications for Public Works Construction*, Section 710. Per City of Phoenix requirements for local residential streets, the minimum thickness of asphalt is 2 inches.

Per City of Phoenix Standard Detail P1102, 'Depth of Base Coarse, Residential Street' and laboratory test results, the minimum depth of base course for residential streets is 6 inches. Additional analyses and laboratory testing will be required once the subdivision plan is finalized to address streets that may be classified as major collectors or arterials.

All pavement section changes should be properly transitioned. If adverse conditions are encountered during the preparation of subgrade materials, special construction methods may be needed. All subgrade materials should be compacted to a minimum relative compaction of 95 percent of AASHTO T-99, Standard Proctor. All aggregate bases should be compacted to a minimum relative compaction of 100 percent of AASHTO T-99, Standard Proctor.

Positive site drainage away from pavement areas should be maintained at all times. Water should not be allowed to pond or seep into the ground in or adjacent to pavement areas. If planters or landscaping are adjacent to paved areas, measures should be taken to minimize the potential for water to enter the pavement section. Pavement installation should be carried out under applicable portions of M.A.G. Section 32.

11.0 DEVELOPMENT CRITERIA

11.1 Site Improvements

As is commonly known, soil movement is problematic with respect to the design, construction, and long-term performance of concrete flatwork. Due to the nature of concrete flatwork, it is essentially impossible to totally mitigate the effects of soil movement. Recommendations for exterior concrete flatwork design and construction can be provided upon request.

If, in the future, any additional improvements are planned for the site, additional recommendations concerning the geological or geotechnical aspects of design and construction of said improvements could be provided upon request. This office should be notified in advance of any fill placement, grading, or trench backfilling after rough grading has been completed. This includes any grading, utility trench and retaining wall backfills.

11.2 Landscaping Maintenance and Planting

Water has been shown to weaken the inherent strength of all earth materials. Graded slopes constructed within and utilizing onsite materials may be erosive. Eroded debris may be reduced and surficial slope stability enhanced by establishing and maintaining a suitable vegetation cover as soon as possible after construction. Compaction to the face of fill slopes would help to reduce short-term erosion until vegetation is established. Plants selected for landscaping should be lightweight, deep-rooted types, which require little water and are capable of surviving the prevailing climate.

From a geotechnical standpoint leaching is not recommended for establishing landscaping. If the surface soils are processed for the purpose of adding amendments, they should be recompacted to 95 percent compaction (Based on ASTM D698). Only the minimum amount of irrigation necessary to sustain plant life should be provided. Over watering landscape areas could adversely affect proposed site improvements.

We recommend that any proposed open bottom planter areas adjacent to the structure be eliminated, or set back a minimum distance of 5 feet and suggest that desert landscape using xeriscape technology is used outside of this buffer zone. As an alternative, closed bottom type planters could be utilized.

An outlet, placed in the bottom of the planter, could be installed to direct drainage away from structures or any exterior concrete flatwork. Irrigation timers should be adjusted on a monthly basis in accordance with the local Water Authority/Water District's posted "Watering Schedule" for low use conditions.

11.3 Drainage

Positive drainage is a key to the successful performance of any foundation or slab scheme. Surface and subsurface drainage should be established prior to and maintained during and after construction to prevent water from ponding and/or saturating the existing or slab areas.

The design should divert water away from where it could penetrate the ground. See Figure 6, Site Drainage Detail, in Appendix A. Care should be taken in design and construction to provide adequate control of domestic and storm water in order to prevent seepage into the underlying soils. We recommend desert plants be used in landscaping to reduce water near the houses. Landscaping irrigation systems and plants should be located at least 5 feet away from the homes.

12.0 PLAN REVIEW

Final grading, foundation, and improvement plans should be submitted to this office for review and comment as they become available, to reduce the potential for any misunderstandings between the plans and the intent of the recommendations presented herein. In addition, foundation excavations and earthwork construction performed on the site should be observed and tested by this office. If conditions are found to differ substantially from those stated, appropriate recommendations would be offered at that time.

13.0 LIMITATIONS

The soil conditions presented in this report are an interpolation of the subsurface conditions based on the data obtained from the limited borings and test pits at the subject site. Regardless of the thoroughness of a geotechnical exploration, there is always a possibility that conditions between the borings will be different from those at the specific boring locations. In addition, it is possible that the conditions discovered in the field will be different from those anticipated by the designer or contractor, or that construction activities may alter the soil conditions at the site.

The nature and extent of variations across the site may not become evident until construction commences. Therefore, the geotechnical engineer should be made aware of any variations or differences from the results presented in this report.

The analyses and recommendations submitted in this report are based on our understanding of the above described project information and on our interpretation of the data collected from the site and laboratory tests performed during this subsurface exploration.

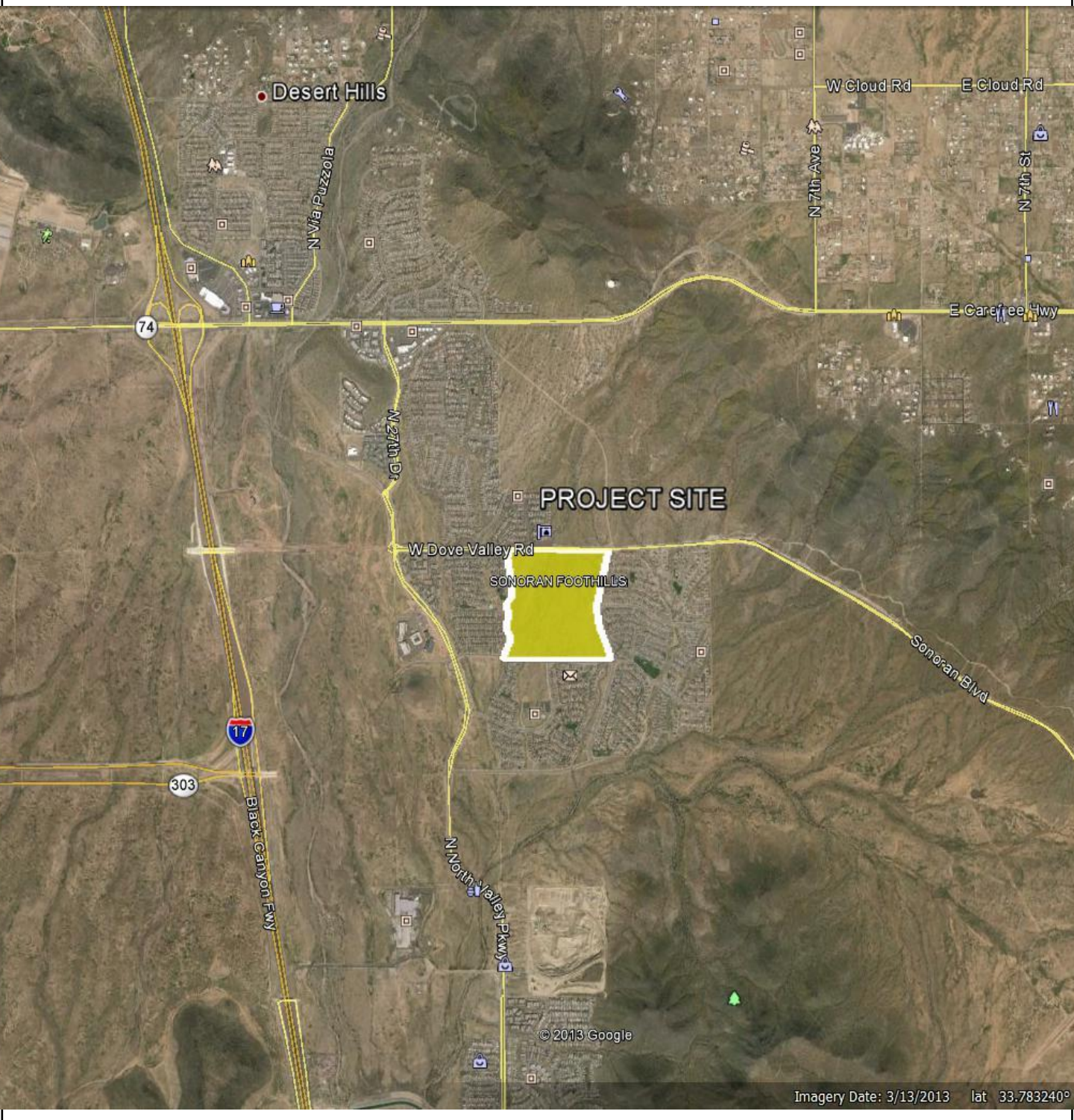
Our recommendations are based on our previous experience with similar subsurface conditions encountered at other sites under similar loading conditions. The recommendations apply only to the specific project discussed in this report. If information in this report is incorrect or if additional

information becomes available, we should be contacted immediately so that we can review our recommendations.

The materials encountered on the project site and utilized in our laboratory study are believed representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during mass grading. Site conditions may vary due to seasonal changes or other factors. GTR assumes no responsibility or liability for work, testing, or recommendations performed or provided by others. Because our study is based upon the site materials observed, selective laboratory testing and engineering analysis, the conclusions and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.

APPENDIX A

FIGURES



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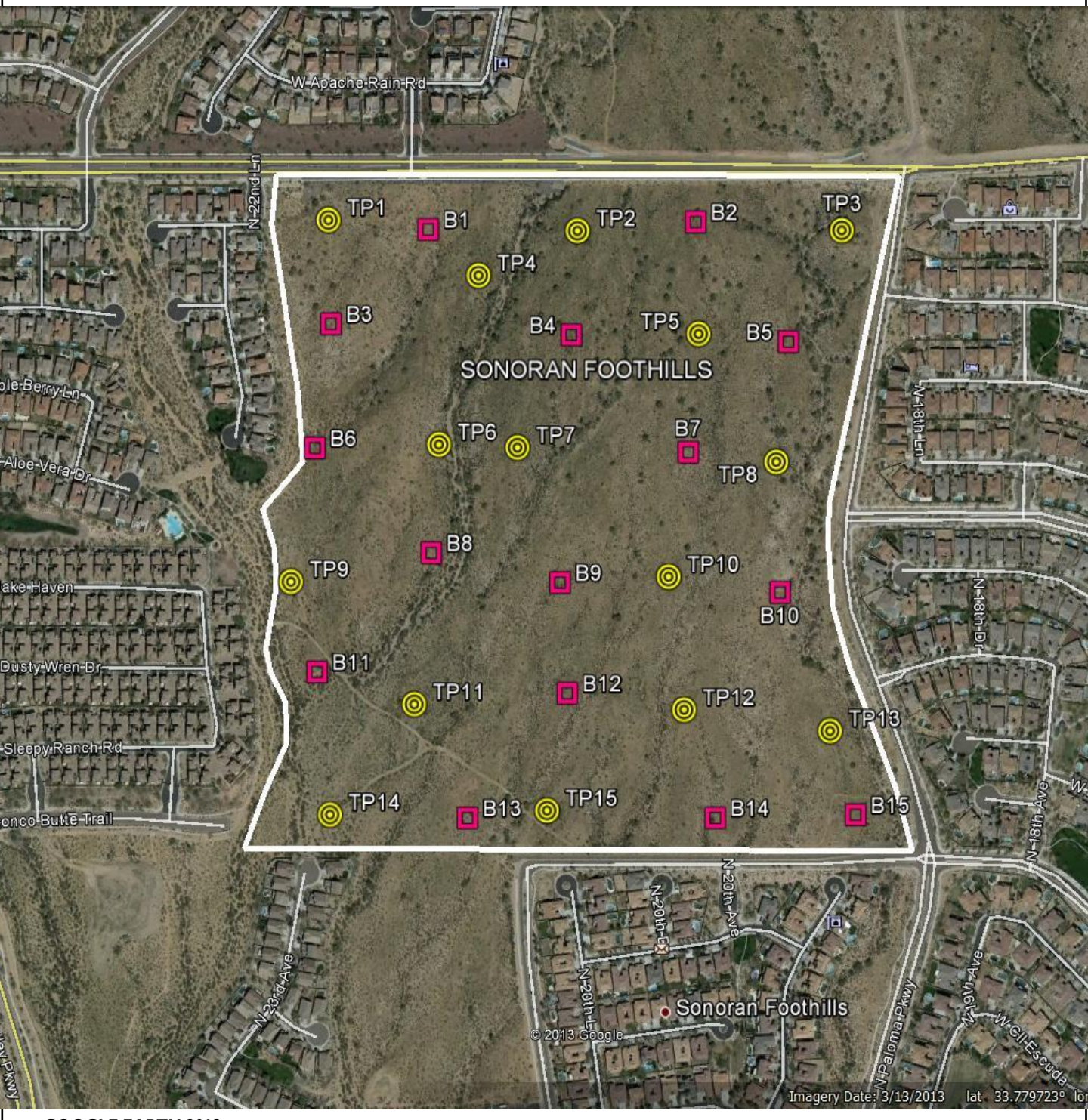
GEOTECHNICAL ENVIRONMENTAL MATERIALS

FIGURE 1
SITE LOCATION MAP
SONORAN FOOTHILLS
Phoenix, Arizona
Prepared for: Taylor Morrison, Inc.

Project No.:	Report Date:	Drawn By:
1312PHR3	December 2013	GNS



GOOGLE EARTH 2013

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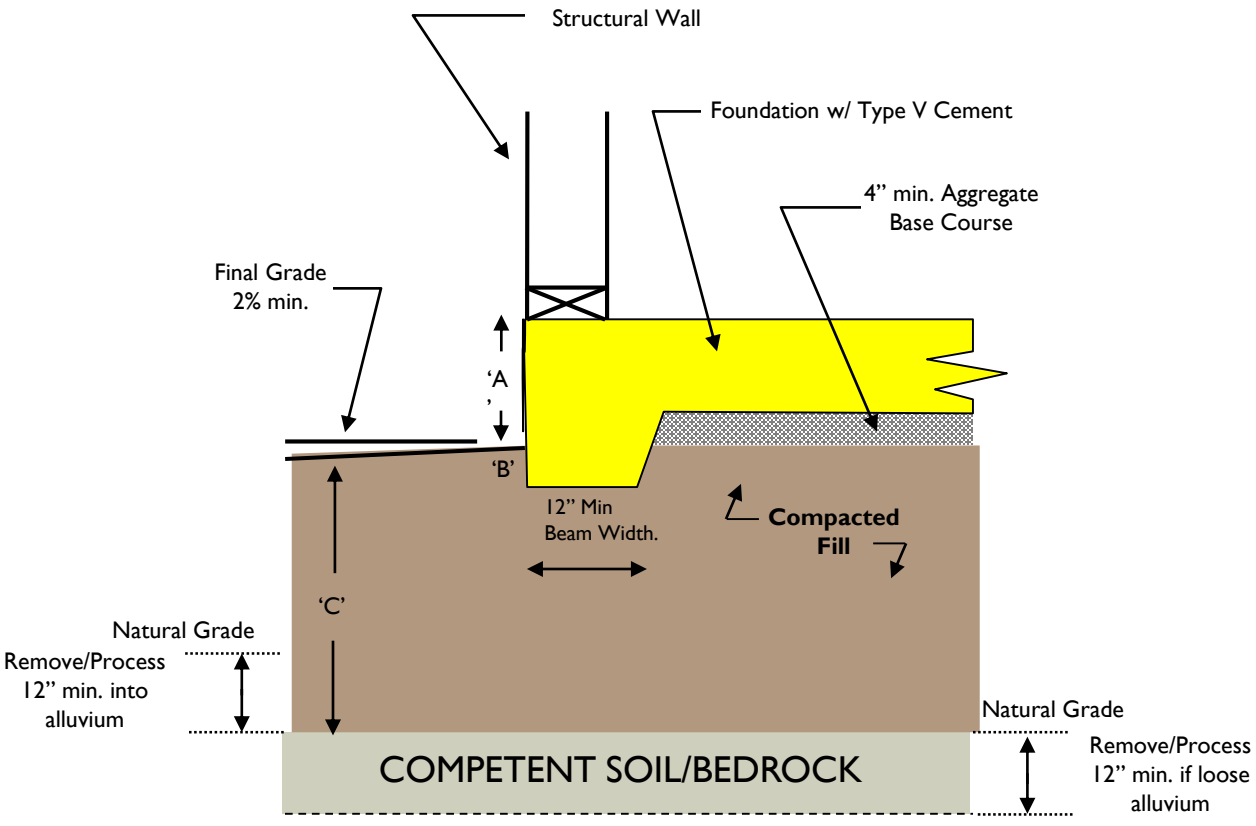
GEOTECHNICAL ENVIRONMENTAL MATERIALS

FIGURE 2
GEOTECHNICAL LOCATION MAP
SONORAN FOOTHILLS
Phoenix, Arizona
Prepared for: Taylor Morrison, Inc.

Project No.:	Report Date:	Drawn By:
1312PHR3	December 2013	GNS



'A' – Thickness of Perimeter Beam = 12" min.

'B' – 8" min. Shovel Footing

'C' – 24" min. Fill Blanket

Note: Concrete Slab shown is a "typical" detail only. Actual shape and dimensions to be designed by structural engineer and detailed in the project plans. The purpose of this detail is to show minimum perimeter beam, width, loose soil processing depths, and fill blanket thickness.

NOT TO SCALE

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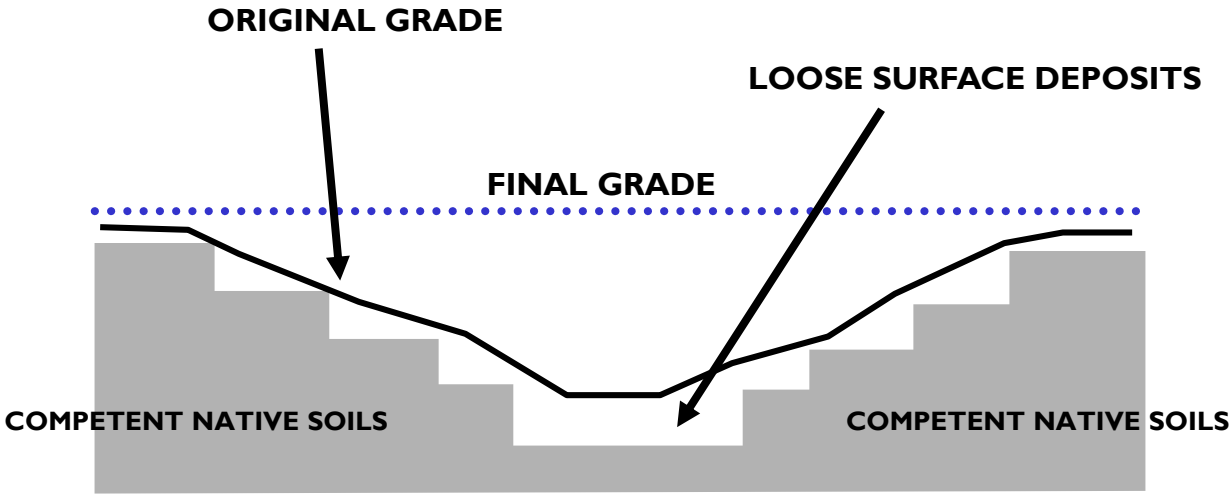
GEOTECHNICAL ENVIRONMENTAL MATERIALS

FIGURE 3
OVEREXCAVATION / FILL BLANKET
SONORAN FOOTHILLS
Phoenix, Arizona
Prepared for: Taylor Morrison, Inc.

Project No.:	Report Date:	Drawn By:
1312PHR3	December 2013	SRJ



BENCH WHERE SLOPE EXCEEDS 5:1 (H:V)
BENCHES SHOULD NOT EXCEED 3 FEET IN HEIGHT
AND SHOULD BE A MINIMUM OF 6 FEET IN WIDTH

NOT TO SCALE

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Phoenix, AZ85040
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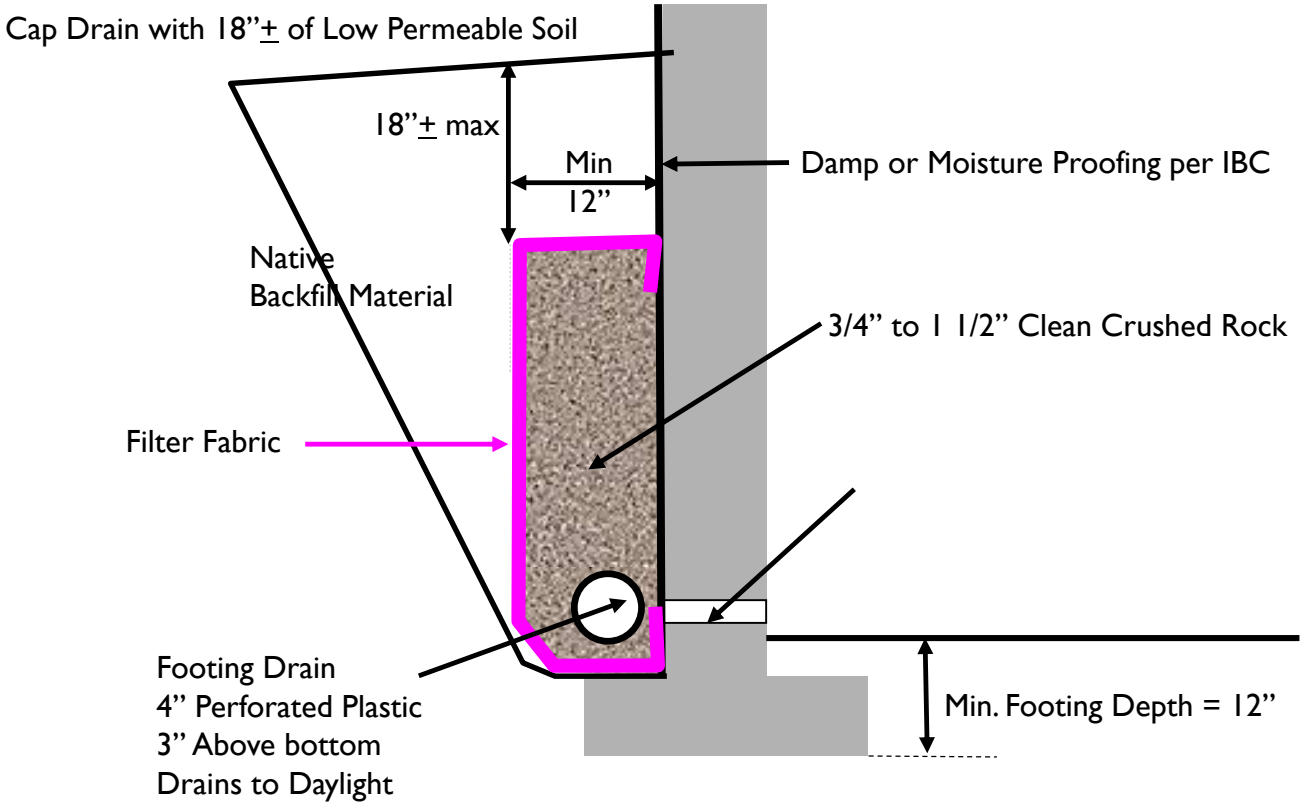
GEOTECHNICAL ENVIRONMENTAL MATERIALS

FIGURE 4
BENCHING DETAIL
SONORAN FOOTHILLS
Phoenix, Arizona
Prepared for: Taylor Morrison, Inc.

Project No.:	Report Date:	Drawn By:
1312PHR3	December 2013	RRD



RETAINING WALL DETAIL

NOT TO SCALE

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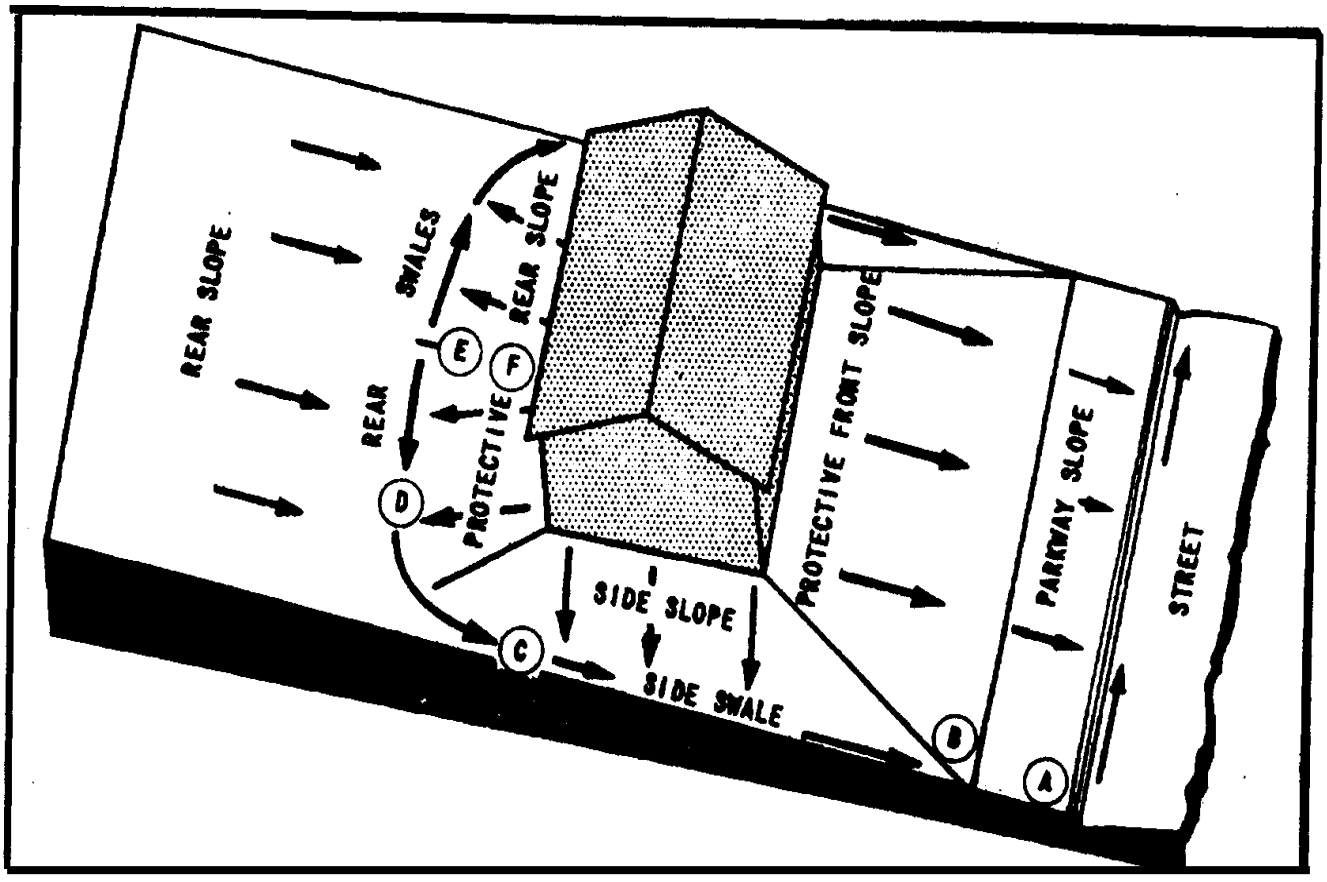
GEOTECHNICAL ENVIRONMENTAL MATERIALS

FIGURE 5
RETAINING WALL DETAIL
SONORAN FOOTHILLS
Phoenix, Arizona
Prepared for: Taylor Morrison, Inc.

Project No.:	Report Date:	Drawn By:
1312PHR3	January 2014	SRJ



Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond and/or seep into the ground. Pad drainage should be directed towards the street or other approved area. Roof gutters and down spouts should be considered to control roof drainage. Down spouts should outlet onto paved areas or a minimum of five feet from proposed structures or into a subsurface drainage system. Areas of seepage may develop due to irrigation or heavy rainfall. Minimizing irrigation will lessen this potential. If areas of seepage develop, recommendations for minimizing this effect could be provided upon request.

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GEOTECHNICAL ENVIRONMENTAL MATERIALS

FIGURE 6
SITE DRAINAGE DETAIL
SONORAN FOOTHILLS
Phoenix, Arizona
Prepared for: Taylor Morrison, Inc.

Project No.:	Report Date:	Drawn By:
1312PHR3	January 2014	RRD

APPENDIX B

TEST PIT LOGS

BORING LOG LEGEND

MATERIAL DESCRIPTION		
Soil Pattern	**USCS Symbol**	**USCS Classification**
	FILL	Artificial Fill
	GP or GW	Poorly/Well graded GRAVEL
	GM	Silty GRAVEL
	GC	Clayey GRAVEL
	GP-GM	Poorly graded GRAVEL with Silt
	GP-GC	Poorly graded GRAVEL with Clay
	SP or SW	Poorly/Well graded SAND
	SM	Silty SAND
	SC	Clayey SAND
	SP-SM	Poorly graded SAND with Silt
	SP-SC	Poorly graded SAND with Clay
	SC-SM	Silty Clayey SAND
	ML	SILT
	MH	Elastic SILT
	CL-ML	Silty CLAY
	CL	Lean CLAY
	CH	Fat CLAY
	PCEM	PARTIALLY CEMENTED
	CEM	CEMENTED
	BDR	BEDROCK

SAMPLING	
	SPT
	Ring Sample
NR	No Recovery
	Bulk Sample
	Water Table

CONSISTENCY					
Cohesionless Soils		**Cohesive Soils**		**Cementation**	
VL	Very Loose	So	Soft	MH	Moderately Hard
L	Loose	F	Firm	H	Hard
MD	Medium Dense	S	Stiff	VH	Very Hard
D	Dense	VS	Very Stiff		
VD	Very Dense				

TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1592

TEST PIT NUMBER: 1

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				GW	**NATIVE**: Well graded, Sandy GRAVEL, trace silt, some cobbles, predominantly medium to coarse grained sand, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2	X						5.7		0.0	
3										
4	X									
5					Note: gravels and cobbles increase with depth					
6										
7										
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1628

TEST PIT NUMBER: 2

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, some clay and sub-angular to sub-rounded gravel, some cobbles, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2										
3	X									
4										
5					Note: gravels and cobbles increase with depth					
6	X									
7										
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1635

TEST PIT NUMBER: 3

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, some clay and sub-angular to sub-rounded gravel, some cobbles, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2										
3	X									
4										
5					Note: gravels and cobbles increase with depth					
6										
7	X									
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1631

TEST PIT NUMBER: 4

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, some clay and sub-angular to sub-rounded gravel, some cobbles, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2	X						5.1		1.3	
3										
4	X									
5					Note: gravels and cobbles increase with depth					
6										
7										
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1608

TEST PIT NUMBER: 5

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, with sub-angular to sub-rounded gravel, some cobbles, trace clay, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2										
3	X						3.1			
4										
5					Note: gravels and cobbles increase with depth					
6										
7	X									
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1598

TEST PIT NUMBER: 6

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, some clay and sub-angular to sub-rounded gravel, some cobbles, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2										
3	X									
4										
5					Note: gravels and cobbles increase with depth					
6	X									
7										
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

4810 South 40th Street, Suite 3, Phoenix, Arizona 85040 Office: (480) 505-9422 Fax:(480) 505-9422

TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1615

TEST PIT NUMBER: 7

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, some clay, some sub-angular to sub-rounded gravel, some cobbles, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2	X						4.9		0.2	
3	X									
4	X									
5					Note: gravels and cobbles increase with depth					
6										
7										
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1618

TEST PIT NUMBER: 8

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, some clay and sub-angular to sub-rounded gravel, some cobbles, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2	X									
3	X									
4										
5					Note: gravels and cobbles increase with depth					
6										
7	X									
8	X									
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1543

TEST PIT NUMBER: 9

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SP-SM	**NATIVE**: Silty, gravelly SAND, trace clay, some cobbles, predominantly medium to coarse grained sand, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2	X									
3										
4										
5	X				Note: gravels and cobbles increase with depth		2.9		0.0	
6										
7										
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1628

TEST PIT NUMBER: 10

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1, 2, 3, 4, 5	X			SM	**NATIVE**: Silty SAND, with sub-angular to sub-rounded gravel, some clay, some cobbles, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown Note: gravels and cobbles increase with depth	L D-VD	1.6			
6, 7, 8, 9, 10	X			GW	**NATIVE**: Well graded, sandy GRAVEL, sub-rounded to sub-angular, some cobbles, some silt, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	D-VD	3.7			
11, 12, 13, 14, 15, 16, 17, 18, 19, 20					Excavation Stopped at 10.0 feet No Groundwater encountered					

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1575

TEST PIT NUMBER: 11

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SP-SM	**NATIVE**: Silty SAND with sub-angular to sub-rounded gravel, trace clay, some cobbles, predominantly medium to coarse grained sand, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2	X						5.4		0.0	
3										
4										
5	X				Note: gravels and cobbles increase with depth					
6										
7										
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1615

TEST PIT NUMBER: 12

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, some clay and sub-angular to sub-rounded gravel, some cobbles, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2	X									
3	X									
4										
5	X				Note: gravels and cobbles increase with depth					
6	X									
7										
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1602

TEST PIT NUMBER: 13

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				CL	**NATIVE**: Sandy CLAY, some silt, few sub-angular to sub-rounded gravel, some cobbles, upper 1 foot is soft, stiff to very stiff below, slightly moist to moist, moderately to strongly cemented, brown	S				
2	X					S-VS	4.3			
3	X				Note: gravels and cobbles increase with depth					
4										
5										
6	X									
7	X									
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1592

TEST PIT NUMBER: 14

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, some clay and sub-angular to sub-rounded gravel, some cobbles, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2										
3	X									
4										
5					Note: gravels and cobbles increase with depth					
6										
7	X									
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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TEST PIT LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	Backhoe
CLIENT:	Taylor Morrison	**OPERATOR:**	Casey's
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/3/2013
		ELEVATION:	1628

TEST PIT NUMBER: 15

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 6 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND with sub-angular to sub-rounded gravel, some clay, some cobbles, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2										
3	X						3.4		0.2	
4										
5					Note: gravels and cobbles increase with depth					
6	X									
7										
8										
9										
10										
11					Excavation Stopped at 10.0 feet					
12					No Groundwater encountered					
13										
14										
15										
16										
17										
18										
19										
20										

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BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1644

BORING NUMBER: 1

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty, gravelly SAND, trace clay, sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2		27								
3		22 50/4"								
4										
5					Practical Refusal on Cobbles at 4.0 Feet					
6										
7					No Groundwater Encountered					
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1631

BORING NUMBER: 2

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty, gravelly SAND, trace clay, sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2		50/3"								
3										
4										
5					Practical Refusal on Cobbles at 4.0 Feet					
6					No Groundwater Encountered					
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1621

BORING NUMBER: 3

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty, gravelly SAND, trace clay, sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2		50/2"								
3										
4					Practical Refusal on Cobbles at 3.5 Feet No Groundwater Encountered					
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1615

BORING NUMBER: 4

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty, gravelly SAND, trace clay, sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2		50/5"								
3										
4										
5		50/3"			Note: gravels and cobbles increase with depth					
6										
7										
8					Practical Refusal on Cobbles at 7.0 Feet					
9					No Groundwater Encountered					
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1618

BORING NUMBER: 5

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty, gravelly SAND, trace clay, sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L				
2						MD				
3		18 9 15								
4										
5		50/5"				D-VD				
6										
7										
8										
9										
10		25 15 28					1.8			
11										
12										
13										
14										
15		50/2"		GW	**NATIVE**: Well graded Sandy GRAVEL, trace silt and clay, some cobbles, sub-angular to sub-rounded, dense to very dense below, slightly moist, moderately to strongly cemented, brown	VD				
16										
17										
18										
19										
20		50/4"								
21					Excavation Stopped at 20.0 Feet					
22										
23					No Groundwater Encountered					
24										
25										
26										
27										
28										

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BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1625

BORING NUMBER: 6

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	Dry Density (pcf)	Swell (%)	Other Testing
1				SM	**NATIVE**: Silty, gravelly SAND, trace clay, sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2										
3		7 16 50/5"								
4										
5										
6		39 50/4"								
7					Note: gravels and cobbles increase with depth					
8										
9										
10		50/5"								
11										
12										
13					Practical Refusal on Cobbles at 12.0 Feet					
14					No Groundwater Encountered					
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1621

BORING NUMBER: 7

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	Dry Density (pcf)	Swell (%)	Other Testing
1				SM	**NATIVE**: Silty SAND, some clay and sub-angular to sub-rounded gravel, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2		37								
3		50/5"								
4										
5		50/5"			Note: gravels and cobbles increase with depth					
6										
7										
8					Practical Refusal on Cobbles at 7.0 Feet					
9										
10					No Groundwater Encountered					
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1615

BORING NUMBER: 8

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, some clay and sub-angular to sub-rounded gravel, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L				
2		50/5"				D-VD				
3										
4										
5		50/5"								
6					Note: gravels and cobbles increase with depth					
7										
8					Practical Refusal on Cobbles at 7.0 Feet					
9					No Groundwater Encountered					
10										
11										
12										
13										
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25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1595

BORING NUMBER: 9

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, trace clay, some sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L				
2		22				D-VD				
3		45								
4		50/4"			Note: gravels and cobbles increase with depth					
5										
6					Practical Refusal on Cobbles at 5.0 Feet					
7					No Groundwater Encountered					
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1595

BORING NUMBER: 10

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	Dry Density (pcf)	Swell (%)	Other Testing
1				SM	**NATIVE**: Silty SAND, trace clay, some sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2										
3		25 50/5"								
4										
5		50/5"			Note: gravels and cobbles increase with depth					
6										
7										
8										
9					Practical Refusal on Cobbles at 8.0 Feet					
10					No Groundwater Encountered					
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1562

BORING NUMBER: 11

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SW	NATIVE: Well graded SAND, some sub-angular to sub-rounded gravel, upper 1 foot is loose, dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2		10								
3		42 50/5"			Note: gravels and cobbles increase with depth					
4										
5					Practical Refusal on Cobbles at 4.0 Feet					
6					No Groundwater Encountered					
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1608

BORING NUMBER: 12

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	Dry Density (pcf)	Swell (%)	Other Testing
1				SM	**NATIVE**: Silty SAND, trace clay, some sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2		37								
3		50/4"								
4										
5		50/5"			Note: gravels and cobbles increase with depth					
6										
7										
8										
9					Practical Refusal on Cobbles at 8.0 Feet					
10					No Groundwater Encountered					
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1602

BORING NUMBER: 13

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	Dry Density (pcf)	Swell (%)	Other Testing
1				SM	**NATIVE**: Silty SAND, trace clay, some sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2		50/4"								
3										
4										
5		37								
6		50/3"								
7				GW	**NATIVE**: Well graded Sandy GRAVEL, trace silt and clay, some cobbles, sub-angular to sub-rounded, dense to very dense, slightly moist to moist, moderately to strongly cemented, brown	D-VD				
8										
9										
10		50/5"								
11										
12										
13					Practical Refusal on Cobbles at 13.0 Feet No Groundwater Encountered					
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1595

BORING NUMBER: 14

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, trace clay and considerable sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L D-VD				
2		29								
3		45 46								
4										
5		50/3"								
6					Note: gravels and cobbles increase with depth					
7										
8										
9					Practical Refusal on Cobbles at 8.0 Feet					
10					No Groundwater Encountered					
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

BORING LOG

GEOTEK

W.O. #:	1312-PHR3	**LOGGED BY:**	TAR
PROJECT:	Sonoran Foothills	**METHOD:**	HOLLOW AUGER
CLIENT:	Taylor Morrison	**OPERATOR**	D & S
LOCATION:	SWC of West Dove Valley Road & North Paloma Parkway	**DATE:**	12/6/2013
		ELEVATION:	1598

BORING NUMBER: 15

Depth (ft)	SAMPLES: Sample Type	SAMPLES: Blows / 12 in.	SAMPLES: Soil Pattern	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Consistency	LABORATORY TESTING: Water Content (%)	LABORATORY TESTING: Dry Density (pcf)	LABORATORY TESTING: Swell (%)	LABORATORY TESTING: Other Testing
1				SM	**NATIVE**: Silty SAND, trace clay, some sub-angular to sub-rounded gravel, upper 1 foot is loose, medium dense to very dense below, slightly moist to moist, moderately to strongly cemented, brown	L				
2		50/5"				D-VD				
3										
4										
5		50/2"								
6										
7					Note: gravels and cobbles increase with depth					
8										
9										
10		50/2"		GW	**NATIVE**: Well graded Sandy GRAVEL, trace silt and clay, some cobbles, sub-angular to sub-rounded, dense to very dense, slightly moist to moist, moderately to strongly cemented, brown	D-VD				
11										
12										
13										
14										
15					Practical Refusal on Cobbles at 14.0 Feet					
16					No Groundwater Encountered					
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										

APPENDIX C

SUMMARY OF LABORATORY RESULTS

LABORATORY TESTS RESULTS (1312-PHR3)

CHEMICAL TESTING (Sulfates and Chlorides)

Testing was performed to determine the amount of water-soluble salt in representative samples of the soil. Individual test results denote the parts per million analyte soluble in water at a 1:5 (soil to water) extraction ratio. Soluble Soil Chlorides Tests were also performed on samples of soil. The samples were prepared and tested in accordance with ADOT procedures. All chemical testing was performed by *IAS Laboratories*. Test results are presented below and on the following sheet(s).

Sample Location	**TP-2**	**TP-6**	**TP-8**	**TP-9**	**TP-12**	**TP-14**
Depth	3'-4'	3'-4'	2'-3'	2'-3'	5'-6'	3'-4'
Test Methods Used	ADOT Method ARIZ 733, 736 or 237b	ADOT Method ARIZ 733, 736 or 237b	ADOT Method ARIZ 733, 736 or 237b	ADOT Method ARIZ 733, 736 or 237b	ADOT Method ARIZ 733, 736 or 237b	ADOT Method ARIZ 733, 736 or 237b
Sampling Method	ASTM D-75	ASTM D-75	ASTM D-75	ASTM D-75	ASTM D-75	ASTM D-75
Sample Type (Single or Composite)	Single Location	Single Location	Single Location	Single Location	Single Location	Single Location
Sampled By:	G. Sheppard	G. Sheppard	G. Sheppard	G. Sheppard	G. Sheppard	G. Sheppard
Classification of Reduced Soil Sample	Clayey SAND	Silty SAND with Gravel	Silty SAND with Gravel	Silty SAND with Gravel	Silty SAND with Gravel	Silty SAND with Gravel
Sulfate (ppm)	2	1	1	13	160	5
Chloride (ppm)	66	24	10	23	145	21

EXPANSION TESTS

Swell tests were performed on remolded samples of soil. The samples were remolded at ± 95 percent of the material's maximum ASTM D-698 d. All samples were then placed under a 100 pound per square foot surcharge, and inundated with water for at least 24 hours. The percent swell was then recorded as the amount of vertical rise compared to the original one-inch sample height.

LABORATORY TESTS RESULTS (1312-PHR3) Continued

LOCATION	PERCENT SWELL	EXPANSION CLASSIFICATION
TP-1 @ 2'-3'	0.0	LOW
TP-4 @ 2'-3'	1.3	LOW
TP-7 @ 2'-3'	0.2	LOW
TP-9 @ 5'-6'	0.0	LOW
TP-11 @ 2'-3'	0.0	LOW
TP-15 @ 3'-4'	0.2	LOW

ATTERBERG LIMITS

Atterberg limits were performed on representative samples in general accordance with ASTM D 4318. The results are shown in the following plates.

PARTICLE SIZE ANALYSIS

Sieve analyses were performed in general accordance with AASHTO test method T 27. It should be noted that materials over 3 inches in size were selectively screened to better reflect the native materials that will be left after processing efforts of the contractor. Test results are presented in the following plates.

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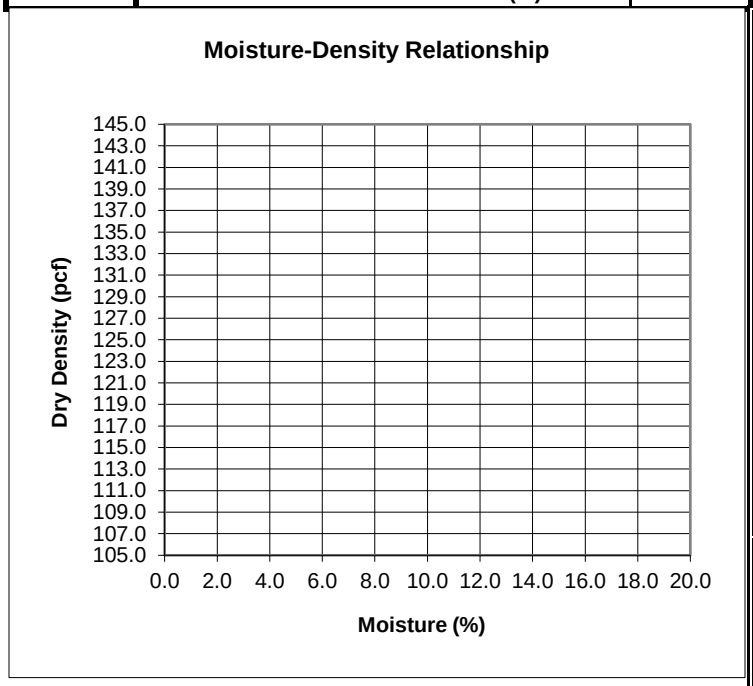
Phoenix, Arizona 85040
480-505-9422

CLIENT:	Taylor Morrison	**W.O. NO:**	1312-PHR3
PROJECT:	Sonoran Foothills	**LAB NO:**	7374
MATERIAL:	Soil Sample	**SAMPLE DATE:**	12/4/2013
	0	**SAMPLE NO:**	0
SOURCE:	TP-1 2'-3'	**SAMPLED BY:**	T. Ritter
	0		
SUPPLIER:	0		

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
AND AN 12" DROP (ASTM D698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318, METHOD "B")

Rock Correcion	**UNCORRECTED MAXIMUM DRY DENSITY (pcf):**	
	UNCORRECTED OPTIMUM MOISTURE (%):	
NA	**CORRECTED MAXIMUM DRY DENSITY (pcf):**	
	CORRECTED OPTIMUM MOISTURE (%):	



SIEVE SIZE	PERCENT PASSING	**SPEC.	
6"			
4"			
3"	100		
2"	100		
1 1/2"	100		
1"	82		
3/4"	74		
1/2"	66		
3/8"	60		
#4	44		
#8	30		
#10	27		
#16	18		
#30	11		
#40	9		
#50	7		
#100	4		
#200	1.4		
LL:			
PL:			
PI:	NP		
USCS:	GW		

Heave (Swell) Potential -100 PSF	0.00%

SE	N/A	**Soluble Sulfate**	N/A	**Solubility**	N/A

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.65 ASSUMED.

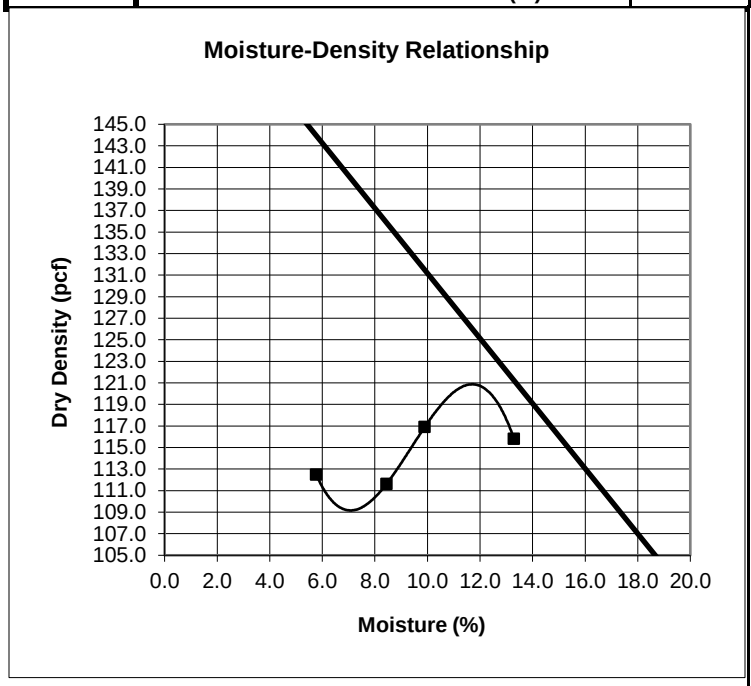
THIS IS A SUMMARIZED REPORT OF THE REFERENCED PROCEDURES AND DOES NOT INCLUDE ALL REPORTING REQUIREMENTS. ADDITIONAL DATA CAN BE PROVIDED AT CLIENT'S REQUEST.

GEOTEK, INC.
4810 North 40th Street, Suite #3
Phoenix, Arizona 85040
480-505-9422

CLIENT:	Taylor Morrison	**W.O. NO:**	1312-PHR3
PROJECT:	Sonoran Foothills	**LAB NO:**	7380
MATERIAL:	Soil Sample	**SAMPLE DATE:**	12/4/2013
	0	**SAMPLE NO:**	0
SOURCE:	TP-4 2'-3'	**SAMPLED BY:**	T. Ritter
	0		
SUPPLIER:			

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
AND AN 12" DROP (ASTM D698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318, METHOD "B")

Rock Correcion	**UNCORRECTED MAXIMUM DRY DENSITY (pcf):**	**121.0**
	UNCORRECTED OPTIMUM MOISTURE (%):	**11.5**
	CORRECTED MAXIMUM DRY DENSITY (pcf):	**130.3**
	CORRECTED OPTIMUM MOISTURE (%):	**9.3**



SIEVE SIZE	PERCENT PASSING	**SPEC.	
6"			
4"			
3"	100		
2"	100		
1 1/2"	100		
1"	98		
3/4"	98		
1/2"	95		
3/8"	93		
#4	86		
#8	75		
#10	73		
#16	64		
#30	56		
#40	53		
#50	50		
#100	45		
#200	39.0		
LL:	39		
PL:	26		
PI:	13		
USCS:	SM		

Heave (Swell) Potential -100 PSF	1.30%

SE	N/A	**Soluble Sulfate**	N/A	**Solubility**	N/A

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.65 ASSUMED.

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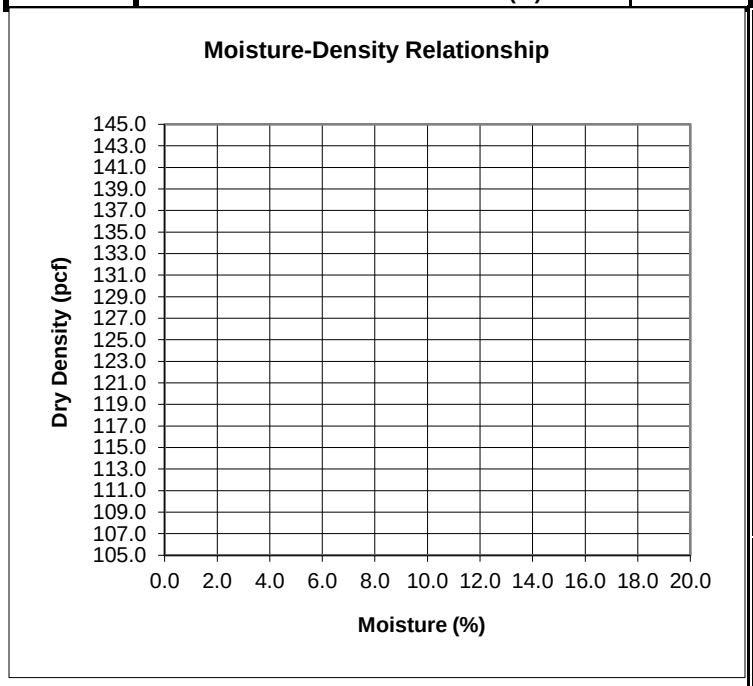
Phoenix, Arizona 85040
480-505-9422

CLIENT:	Taylor Morrison	**W.O. NO:**	1312-PHR3
PROJECT:	Sonoran Foothills	**LAB NO:**	7382
MATERIAL:	Soil Sample	**SAMPLE DATE:**	12/4/2013
	0	**SAMPLE NO:**	0
SOURCE:	TP-5 3'-4'	**SAMPLED BY:**	T. Ritter
	0		
SUPPLIER:	0		

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
AND AN 12" DROP (ASTM D698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318, METHOD "B")

Rock Correcion	**UNCORRECTED MAXIMUM DRY DENSITY (pcf):**	
	UNCORRECTED OPTIMUM MOISTURE (%):	
NA	**CORRECTED MAXIMUM DRY DENSITY (pcf):**	
	CORRECTED OPTIMUM MOISTURE (%):	



SIEVE SIZE	PERCENT PASSING	**SPEC.	
6"			
4"			
3"	100		
2"	100		
1 1/2"	100		
1"	94		
3/4"	92		
1/2"	89		
3/8"	87		
#4	79		
#8	68		
#10	65		
#16	55		
#30	45		
#40	40		
#50	35		
#100	27		
#200	21.0		
LL:			
PL:			
PI:	NP		
USCS:	SM		

Heave (Swell) Potential -100 PSF	

SE	N/A	**Soluble Sulfate**	N/A	**Solubility**	N/A

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.65 ASSUMED.

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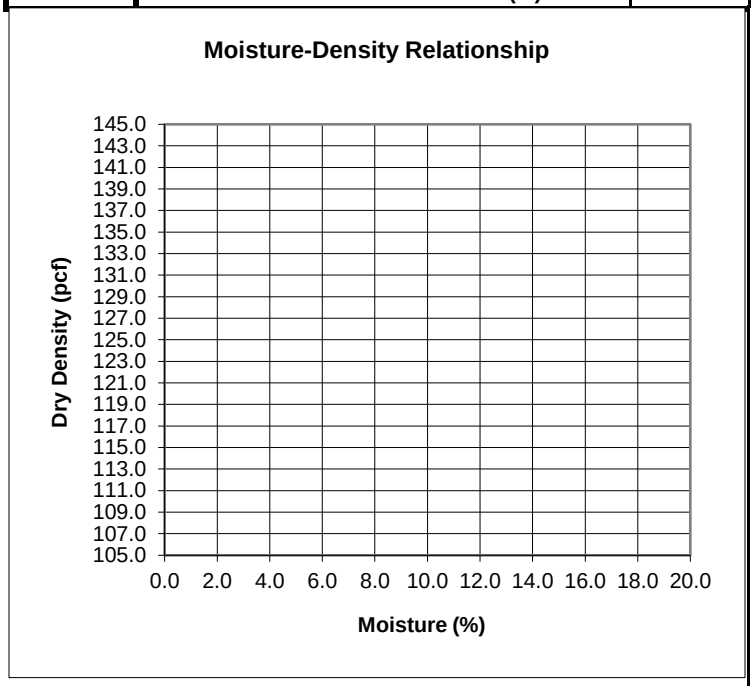
CLIENT:	Taylor Morrison	**W.O. NO:**	1312-PHR3
PROJECT:	Sonoran Foothills	**LAB NO:**	7386
MATERIAL:	Soil Sample	**SAMPLE DATE:**	12/4/2013
	0	**SAMPLE NO:**	0
SOURCE:	TP-7 2'-3'	**SAMPLED BY:**	T. Ritter
	0		
SUPPLIER:	0		

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
AND AN 12" DROP (ASTM D698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318, METHOD "B")

Rock Correcion	**UNCORRECTED MAXIMUM DRY DENSITY (pcf):**	
	UNCORRECTED OPTIMUM MOISTURE (%):	
NA	**CORRECTED MAXIMUM DRY DENSITY (pcf):**	
	CORRECTED OPTIMUM MOISTURE (%):	



SIEVE SIZE	PERCENT PASSING	**SPEC.	
6"			
4"			
3"	100		
2"	100		
1 1/2"	100		
1"	100		
3/4"	100		
1/2"	100		
3/8"	98		
#4	90		
#8	82		
#10	80		
#16	74		
#30	67		
#40	63		
#50	59		
#100	51		
#200	40.0		
LL:			
PL:			
PI:	NP		
USCS:	SM		

Heave (Swell) Potential -100 PSF	0.20%

SE	N/A	**Soluble Sulfate**	N/A	**Solubility**	N/A

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.65 ASSUMED.

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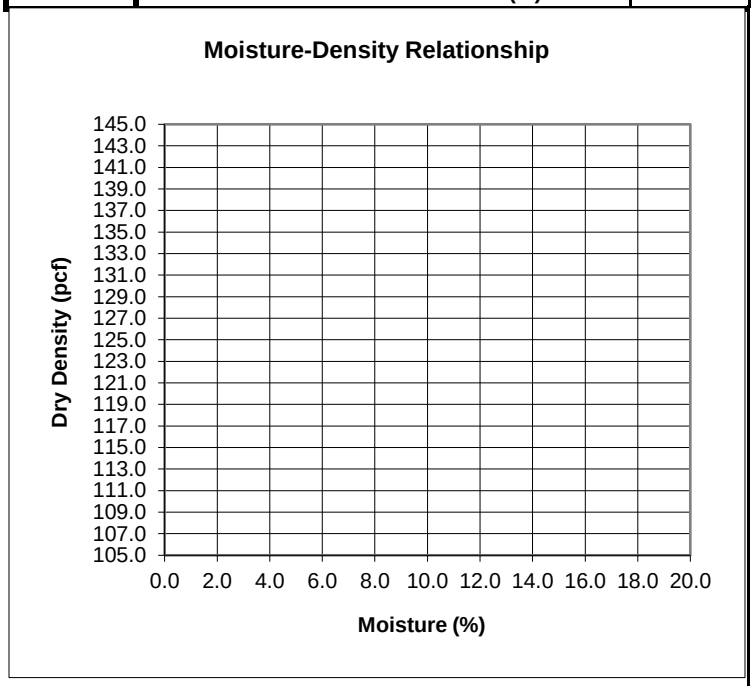
GEOTEK, INC.
4810 North 40th Street, Suite #3
Phoenix, Arizona 85040
480-505-9422

CLIENT:	Taylor Morrison	**W.O. NO:**	1312-PHR3
PROJECT:	Sonoran Foothills	**LAB NO:**	7391
MATERIAL:	Soil Sample	**SAMPLE DATE:**	12/4/2013
	0	**SAMPLE NO:**	0
SOURCE:	TP-9 5'-6'	**SAMPLED BY:**	T. Ritter
	0		
SUPPLIER:	0		

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
AND AN 12" DROP (ASTM D698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318, METHOD "B")

Rock Correcion	**UNCORRECTED MAXIMUM DRY DENSITY (pcf):**	
	UNCORRECTED OPTIMUM MOISTURE (%):	
NA	**CORRECTED MAXIMUM DRY DENSITY (pcf):**	
	CORRECTED OPTIMUM MOISTURE (%):	



SIEVE SIZE	PERCENT PASSING	**SPEC.	
6"			
4"			
3"	100		
2"	100		
1 1/2"	100		
1"	94		
3/4"	91		
1/2"	87		
3/8"	83		
#4	68		
#8	48		
#10	44		
#16	33		
#30	24		
#40	21		
#50	18		
#100	12		
#200	8.3		
LL:			
PL:			
PI:	NP		
USCS:	SP-SM		

Heave (Swell) Potential -100 PSF	0.00%

SE	N/A	**Soluble Sulfate**	N/A	**Solubility**	N/A

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.65 ASSUMED.

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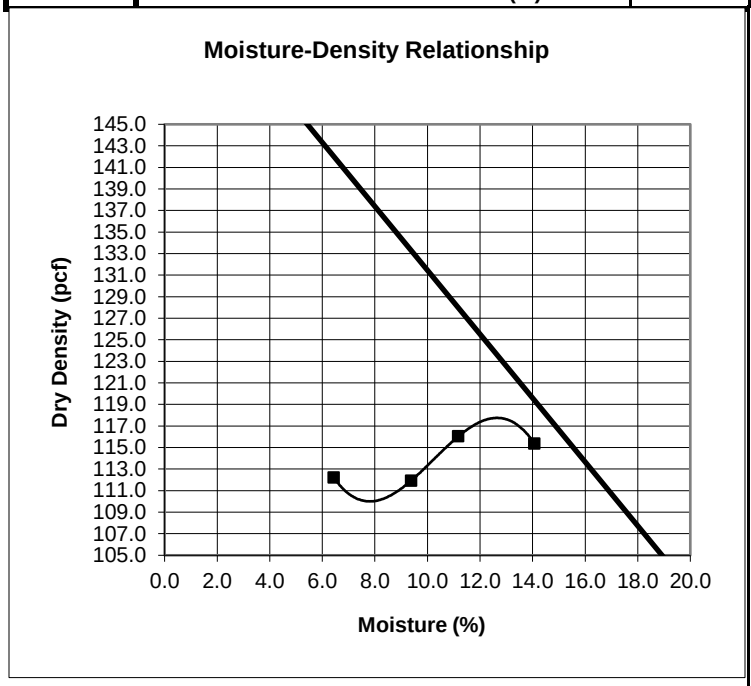
480-505-9422

CLIENT:	Taylor Morrison	**W.O. NO:**	1312-PHR3
PROJECT:	Sonoran Foothills	**LAB NO:**	7392
MATERIAL:	Soil Sample	**SAMPLE DATE:**	12/4/2013
	0	**SAMPLE NO:**	0
SOURCE:	TP-10 2'-3'	**SAMPLED BY:**	T. Ritter
	0		
SUPPLIER:			

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
AND AN 12" DROP (ASTM D698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318, METHOD "B")

Rock Correcion	**UNCORRECTED MAXIMUM DRY DENSITY (pcf):**	**117.5**
	UNCORRECTED OPTIMUM MOISTURE (%):	**12.5**
	CORRECTED MAXIMUM DRY DENSITY (pcf):	**128.8**
	CORRECTED OPTIMUM MOISTURE (%):	**9.1**



SIEVE SIZE	**PERCENT PASSING**	****SPEC.**	
6"			
4"			
3"	100		
2"	100		
1 1/2"	100		
1"	97		
3/4"	97		
1/2"	96		
3/8"	94		
#4	81		
#8	60		
#10	56		
#16	44		
#30	35		
#40	32		
#50	29		
#100	25		
#200	19.0		
LL:	0		
PL:	0		
PI:	NP		
USCS:	SM		

Heave (Swell) Potential -100 PSF	

SE	N/A	**Soluble Sulfate**	N/A	**Solubility**	N/A

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.65 ASSUMED.

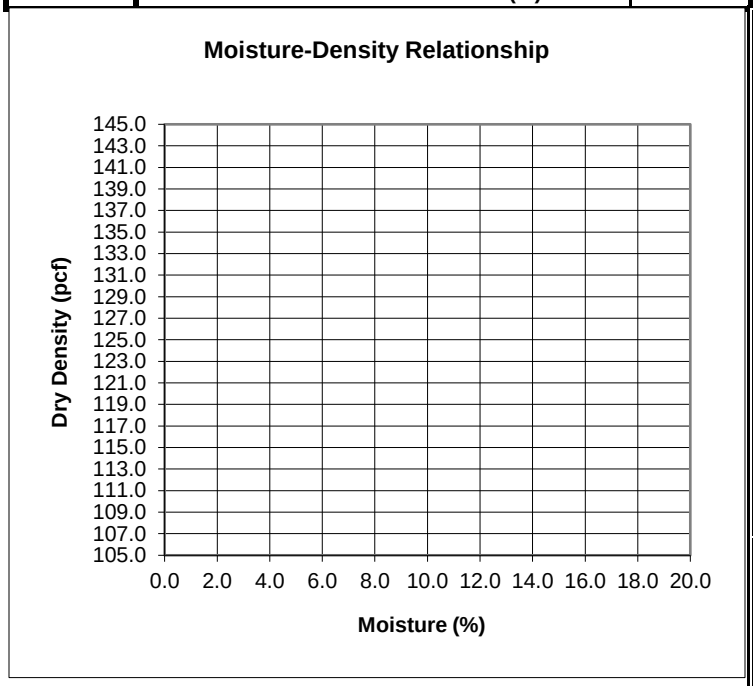
THIS IS A SUMMARIZED REPORT OF THE REFERENCED PROCEDURES AND DOES NOT INCLUDE ALL REPORTING REQUIREMENTS. ADDITIONAL DATA CAN BE PROVIDED AT CLIENT'S REQUEST.

GEOTEK, INC.
4810 North 40th Street, Suite #3
Phoenix, Arizona 85040
480-505-9422

CLIENT:	Taylor Morrison	**W.O. NO:**	1312-PHR3
PROJECT:	Sonoran Foothills	**LAB NO:**	7393
MATERIAL:	Soil Sample	**SAMPLE DATE:**	12/4/2013
	0	**SAMPLE NO:**	0
SOURCE:	TP-10 6'-7'	**SAMPLED BY:**	T. Ritter
	0		
SUPPLIER:	0		

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
AND AN 12" DROP (ASTM D698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318, METHOD "B")

Rock Correcion	**UNCORRECTED MAXIMUM DRY DENSITY (pcf):**	
	UNCORRECTED OPTIMUM MOISTURE (%):	
NA	**CORRECTED MAXIMUM DRY DENSITY (pcf):**	
	CORRECTED OPTIMUM MOISTURE (%):	



SIEVE SIZE	PERCENT PASSING	**SPEC.	
6"			
4"			
3"	100		
2"	100		
1 1/2"	100		
1"	97		
3/4"	80		
1/2"	76		
3/8"	75		
#4	72		
#8	67		
#10	65		
#16	58		
#30	51		
#40	47		
#50	42		
#100	34		
#200	25.0		
LL:			
PL:			
PI:	NP		
USCS:	SM		

Heave (Swell) Potential -100 PSF	

SE	N/A	**Soluble Sulfate**	N/A	**Solubility**	N/A

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.65 ASSUMED.

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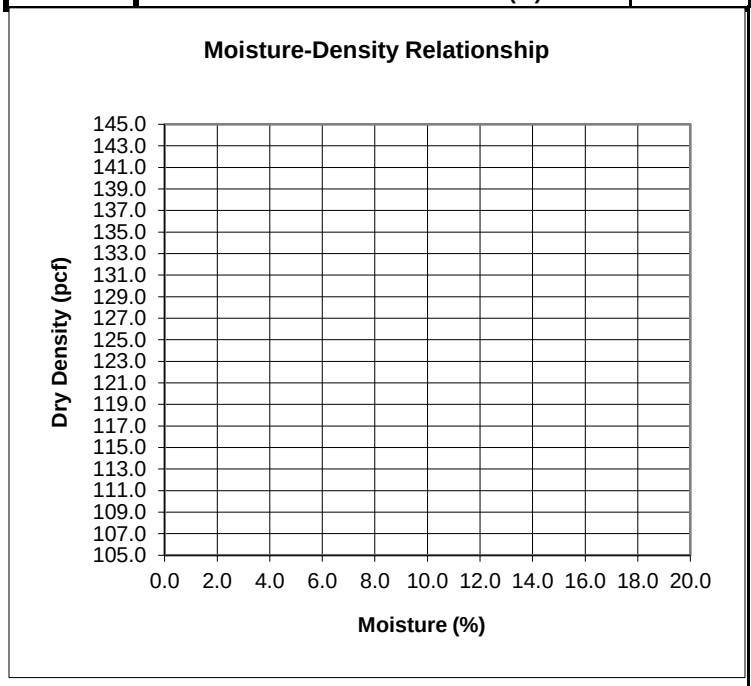
GEOTEK, INC.
4810 North 40th Street, Suite #3
Phoenix, Arizona 85040
480-505-9422

CLIENT:	Taylor Morrison	**W.O. NO:**	1312-PHR3
PROJECT:	Sonoran Foothills	**LAB NO:**	7394
MATERIAL:	Soil Sample	**SAMPLE DATE:**	12/4/2013
	0	**SAMPLE NO:**	0
SOURCE:	TP-11 2'-3'	**SAMPLED BY:**	T. Ritter
	0		
SUPPLIER:	0		

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
AND AN 12" DROP (ASTM D698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318, METHOD "B")

Rock Correcion	**UNCORRECTED MAXIMUM DRY DENSITY (pcf):**	
	UNCORRECTED OPTIMUM MOISTURE (%):	
NA	**CORRECTED MAXIMUM DRY DENSITY (pcf):**	
	CORRECTED OPTIMUM MOISTURE (%):	



SIEVE SIZE	PERCENT PASSING	**SPEC.	
6"			
4"			
3"	100		
2"	100		
1 1/2"	100		
1"	100		
3/4"	100		
1/2"	94		
3/8"	92		
#4	82		
#8	65		
#10	62		
#16	48		
#30	34		
#40	28		
#50	22		
#100	16		
#200	12.0		
LL:			
PL:			
PI:	NP		
USCS:	SP-SM		

Heave (Swell) Potential -100 PSF	0.00%

SE	N/A	**Soluble Sulfate**	N/A	**Solubility**	N/A

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.65 ASSUMED.

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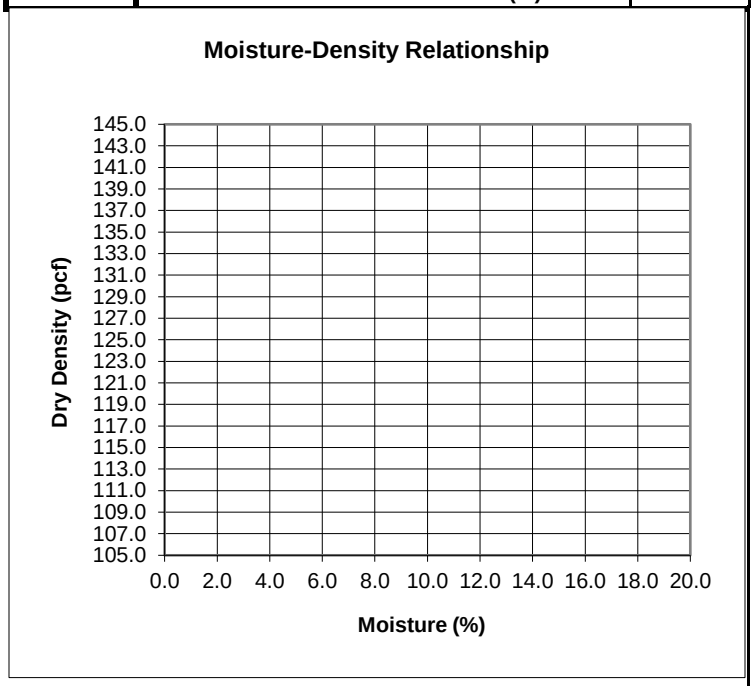
GEOTEK, INC.
4810 North 40th Street, Suite #3
Phoenix, Arizona 85040
480-505-9422

CLIENT:	Taylor Morrison	**W.O. NO:**	1312-PHR3
PROJECT:	Sonoran Foothills	**LAB NO:**	7398
MATERIAL:	Soil Sample	**SAMPLE DATE:**	12/4/2013
	0	**SAMPLE NO:**	0
SOURCE:	TP-13 2'-3'	**SAMPLED BY:**	T. Ritter
	0		
SUPPLIER:	0		

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
AND AN 12" DROP (ASTM D698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318, METHOD "B")

Rock Correcion	**UNCORRECTED MAXIMUM DRY DENSITY (pcf):**	
	UNCORRECTED OPTIMUM MOISTURE (%):	
NA	**CORRECTED MAXIMUM DRY DENSITY (pcf):**	
	CORRECTED OPTIMUM MOISTURE (%):	



SIEVE SIZE	PERCENT PASSING	**SPEC.	
6"			
4"			
3"	100		
2"	100		
1 1/2"	100		
1"	100		
3/4"	96		
1/2"	95		
3/8"	95		
#4	93		
#8	89		
#10	88		
#16	84		
#30	79		
#40	77		
#50	74		
#100	69		
#200	61.0		
LL:	27		
PL:	19		
PI:	8		
USCS:	CL		

Heave (Swell) Potential -100 PSF	

SE	N/A	**Soluble Sulfate**	N/A	**Solubility**	N/A

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.65 ASSUMED.

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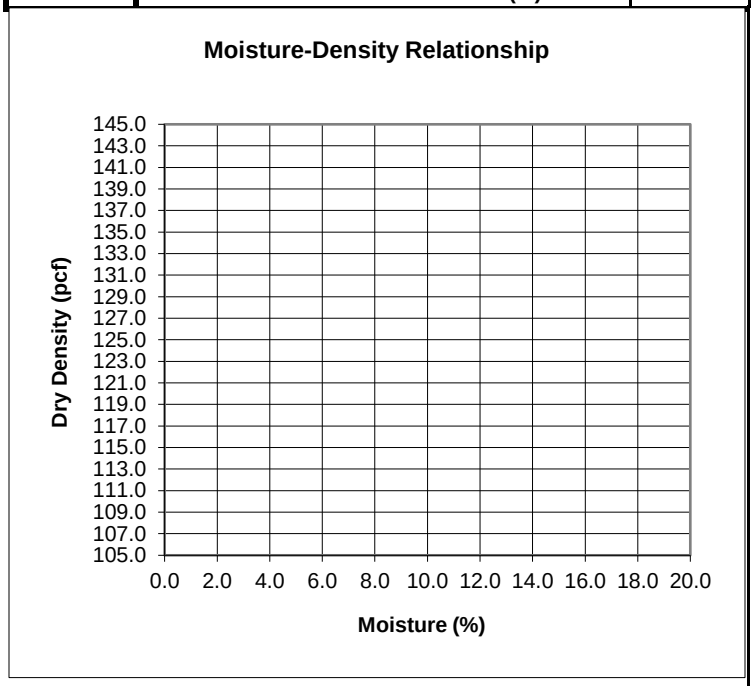
GEOTEK, INC.
4810 North 40th Street, Suite #3
Phoenix, Arizona 85040
480-505-9422

CLIENT:	Taylor Morrison	**W.O. NO:**	1312-PHR3
PROJECT:	Sonoran Foothills	**LAB NO:**	7402
MATERIAL:	Soil Sample	**SAMPLE DATE:**	12/4/2013
	0	**SAMPLE NO:**	0
SOURCE:	TP-15 3'-4'	**SAMPLED BY:**	T. Ritter
	0		
SUPPLIER:	0		

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
AND AN 12" DROP (ASTM D698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318, METHOD "B")

Rock Correcion	**UNCORRECTED MAXIMUM DRY DENSITY (pcf):**	
	UNCORRECTED OPTIMUM MOISTURE (%):	
NA	**CORRECTED MAXIMUM DRY DENSITY (pcf):**	
	CORRECTED OPTIMUM MOISTURE (%):	



SIEVE SIZE	PERCENT PASSING	**SPEC.	
6"			
4"			
3"	100		
2"	100		
1 1/2"	100		
1"	100		
3/4"	100		
1/2"	95		
3/8"	91		
#4	82		
#8	67		
#10	64		
#16	53		
#30	43		
#40	39		
#50	35		
#100	29		
#200	23.0		
LL:			
PL:			
PI:	NP		
USCS:	SM		

Heave (Swell) Potential -100 PSF	0.20%

SE	N/A	**Soluble Sulfate**	N/A	**Solubility**	N/A

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.65 ASSUMED.

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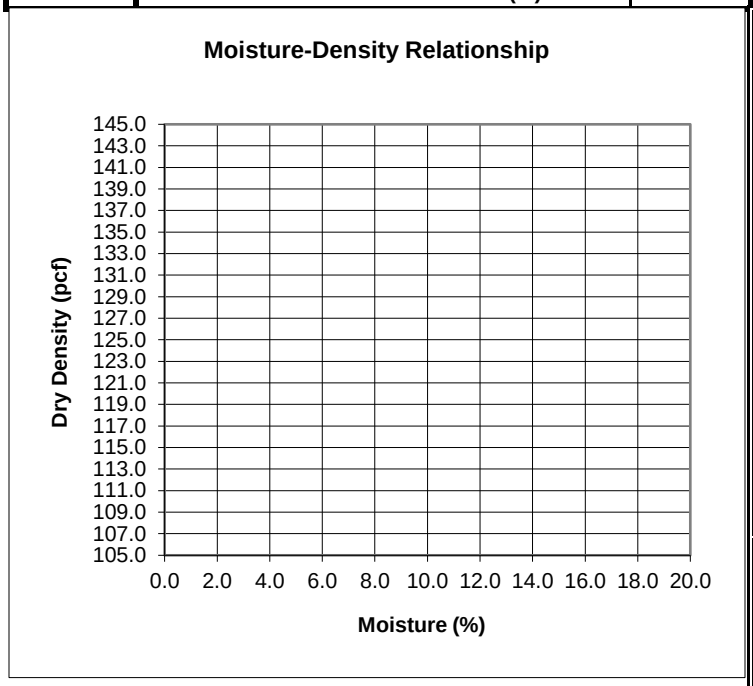
GEOTEK, INC.
4810 North 40th Street, Suite #3
Phoenix, Arizona 85040
480-505-9422

CLIENT:	Taylor Morrison	**W.O. NO:**	1312-PHR3
PROJECT:	Sonoran Foothills	**LAB NO:**	7411
MATERIAL:	Soil Sample	**SAMPLE DATE:**	12/4/2013
	0	**SAMPLE NO:**	0
SOURCE:	B-5 10'-11.5'	**SAMPLED BY:**	T. Ritter
	0		
SUPPLIER:	0		

LABORATORY COMPACTION CHARACTERISTICS OF SOILS USING
STANDARD EFFORTS (12,400ft-lb-ft/cu.ft) (ASTMD698A)
AND AN 12" DROP (ASTM D698A)
SIEVE ANALYSIS OF FINE AND COARSE AGGREGATES (ASTM C136/C117)
LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318, METHOD "B")

Rock Correcion	**UNCORRECTED MAXIMUM DRY DENSITY (pcf):**	
	UNCORRECTED OPTIMUM MOISTURE (%):	
NA	**CORRECTED MAXIMUM DRY DENSITY (pcf):**	
	CORRECTED OPTIMUM MOISTURE (%):	



SIEVE SIZE	PERCENT PASSING	**SPEC.	
6"			
4"			
3"	100		
2"	100		
1 1/2"	100		
1"	100		
3/4"	91		
1/2"	84		
3/8"	81		
#4	71		
#8	60		
#10	58		
#16	51		
#30	42		
#40	38		
#50	33		
#100	25		
#200	20.0		
LL:			
PL:			
PI:	NP		
USCS:	SM		

Heave (Swell) Potential -100 PSF	

SE	N/A	**Soluble Sulfate**	N/A	**Solubility**	N/A

NOTE: THE ZERO AIR VOIDS CURVE REPRESENTS A SPECIFIC GRAVITY OF: 2.65 ASSUMED.

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IAS Laboratories

2515 East University Drive
Phoenix, Arizona 85034
(602) 273-7248

Today's Date:	12/16/2013
Project #:	Sonoran Foothills 1312-PHB-3
Submitted By:	Gary Sheppard
Send Report To:	GeoTek, Inc.
Report Number:	6646901
Date Received:	12/10/2013

Soil Analysis Report

Sender Sample ID	Depth	Lab #	[1] Sulfate ppm	[2] Chloride ppm	[3] Soluble Salts ppm	[3] pH	Other
TP-2 7376	3-4"	885	2	66			
TP- 6 7384	3-4"	886	1	24			
TP- 8 7388	2-3"	887	1	10			
TP- 9 7390	2-3"	888	13	23			
TP-12 7397	5-6"	889	160	145			
TP-14 7400	3-4"	890	5	21			

Comments:

Reference:

[1] ADOT Method ARIZ 733

[2] ADOT Method ARIZ 736

[3] ADOT Method ARIZ 237b

APPENDIX D

SUMMARY OF FIELD DENSITY AND MOISTURE TEST RESULTS

GEOTECHNICAL I ENVIRONMENTAL I MATERIALS

G	

FIELD TESTING REPORT

W.O.: 1312-PHR3

DATE: 12/3/2013

NAME: T. RITTER

HOURS:

CLIENT:	TAYLOR MORRISON	PROJECT:	**1312-PHR3 SONORAN FOOTHILLS**	LOCATION:	SWC W DOVE VALLEY RD & N PALOMA PKWY
SUPT.:		CONTRACTOR:			Gauge Serial No.
Equipment: BACKHOE					**34845**

Soils Information:	Std. Density Count	Std. Moisture Count
	2315	631

Test No.	Location	Elevation below existing ground surface (ft)	Fill Depth	Moisture Content %	Dry Density p.c.f.	% Relative Compaction	%Required Compaction	Soil Type/ Lab No,	Pass/Fail
1	TEST PIT 3	-4		7.1	117.2				
2	TEST PIT 13	-1		8.2	115.6				
3	TEST PIT 8	-2		7.0	110.3				
4	TEST PIT 5	-3		11.5	101.1				
5	TEST PIT 10	-2		5.7	121.0				
6	TEST PIT 12	-4		7.4	118.4				
7	TEST PIT 15	-2		7.3	118.6				
8	TEST PIT 11	-1		8.2	120.4				
9	TEST PIT 14	-3		5.9	104.6				
10	TEST PIT 9	-4		6.1	103.5				
11	TEST PIT 6	-2		7.4	103.9				
12	TEST PIT 4	-1		7.7	105.3				
13	TEST PIT 1	-3		7.1	107.8				
14	TEST PIT 2	-1		8.4	110.2				
15	TEST PIT 7	-4		6.3	114.5				

COMMENTS: NATIVE MATERIAL IN-PLACE DENSITIES

GEOTEK

By: T. RITTER