Geotechnical Investigation

Rancho Vistoso Neighborhood 5
Parcels X and W

Rancho Vistoso Boulevard and Moore Loop
Oro Valley, Arizona
ProTeX Job No.: 7466

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February 20, 2018

Pulte Group
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Re: **Geotechnical Investigation**

Project: Rancho Vistoso Neighborhood 5 - Parcel X and W
Rancho Vistoso Boulevard and Moore Loop
Oro Valley, Arizona

ProTeX Job No.: 7466

Attention: Mr. Sam Mills

At your request, ProTeX has completed a soil investigation for the subject project. The accompanying report includes field observations and laboratory testing supporting our conclusions and recommendations for the proposed development.

Respectfully submitted,
ProTeX - the PT Xperts, LLC

Registered Professional Engineer
CERTIFICATE NO. 65980
KEITH E. RITTER
DATE SIGNED 2/20/18
ARIZONA U.S.A.
Expires March 31, 2018

Date Expires: 3/31/2018
Keith E. Ritter, P.E.

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Jones Tembo, P.E

TABLE OF CONTENTS

APPENDICES

Appendix A – Laboratory Test Results
- Grain Size Distribution, Atterberg Limits and Expansion Tests
- R-Value
- Chloride, Sulfate

Appendix B – Site Information
- Site Plan

Appendix C-Field Testing
- Boring Logs

Appendix D-USCS Classification Chart
- Legend

Rancho Vistoso Neighborhood 5 - Parcel X and W
Rancho Vistoso Boulevard and Moore Loop
Oro Valley, Arizona
ProTeX Job No.: 7466

Executive Summary

ProTeX was contracted by Pulte Group to provide general information with respect to the engineering characteristics of onsite soils and provide recommendations for foundations and pad preparation for the site referred to as the Rancho Vistoso Neighborhood 5 - Parcel X and W located at Rancho Vistoso Boulevard and Moore Loop in Oro Valley, Arizona.

This firm understands the proposed development will consist of one or two story single family residential structures imposing relatively light to moderate foundation loads.

Field investigation and laboratory testing indicated that the site consists mainly of non-plastic to low-medium plasticity silty sand, sandy silt and clayey sand soils. The expansion potential for site soils when foundation bearing soils are exposed to a moisture increase is anticipated to be very low for the surface level soils. All lots are subject to non-expansive soils and post-tensioned or conventional slab/foundation systems are recommended.

Settlements at the site are anticipated to be within accepted tolerances provided that pad preparation is performed as specified and no significant changes in moisture content of foundation/floor slab bearing soils occur and proper drainage and irrigation control are maintained. Drainage should be directed away from the structure and off the lot during and after construction and should be maintained for the life of the project. In no case should long-term ponding be allowed near structures. Proper design and placement of yard vegetation and irrigation systems should be used so that structural foundation slab bearing soils are not exposed to moisture content fluctuations.

The site is located within an area of regional groundwater withdrawal; however, based on the Earth fissure Maps provided by the Arizona Geological Survey there is no indication of earth fissures on site or within approximately 25 miles of the site.

Based on the findings of the soils investigation, the site is considered suitable to construct single family residential structures imposing relatively light to moderate foundation loads provided floor and foundation systems are properly designed, soils properly conditioned as specified and proper maintenance of drainage and irrigation systems.

1.0 INTRODUCTION

1.1 Scope

ProTeX was retained by Pulte Group to evaluate the surface and subsurface soil conditions. The content of this report contains the findings from the field exploration and laboratory testing, with supporting recommendations for the proposed development.

1.2 Proposed Site Development

We understand that the proposed development will consist of one or two story single family residential structures of masonry, wood and/or steel frame construction imposing relatively light to moderate foundation loads.

1.3 Terms and Conditions

This report was prepared for Pulte Group. The contents of this report may not be relied upon by any other party without the expressed written permission of ProTeX - the PT Xperts, LLC and the written permission of Pulte Group. The report presents site conditions at the time of the investigation and for the aforementioned proposed development. The report should be updated prior to construction if a maximum of one year has elapsed from the issued date.

2.0 FIELD AND LABORATORY TESTING

2.1 Geotechnical Site Reconnaissance

The site consists of approximately 46 acres of currently undeveloped native desert land. At the time of the field site visit on January 26, 2018 the following site conditions were observed:

- Site vegetation consisted of a light to moderate coverage of various weeds, bushes, trees and cacti spread evenly across the property boundaries
- Site is depressed approximately 50 to 80 feet below surrounding hillside developments with the general slope and drainage direction trending toward the south east as evidenced by several naturally forming washes

2.2 Field Investigation

A total of 10 test holes (B1 to B10) were completed at the site for the purpose of evaluating subsurface conditions. All of test holes terminated at a nominal depth of 15 feet. At each test hole location, the soils encountered were visually observed, classified, logged and representative samples were obtained where applicable. An additional 11 test holes (BC1 to BC11) were advanced along the proposed minor collector roadway (Moore Road Loop) for the purpose of pavement design. Refer to the site plan in Appendix B for approximate test hole locations.

2.3 Laboratory Testing

Subsequent to the field investigation, soil samples were submitted for laboratory testing. Tests were performed to determine the following:

- **Sieve Analysis and Atterberg Limits**- Used for formal classification of soils in general accordance with the Unified Soil Classification System (USCS) per ASTM Test Method D2487. Sieve analysis is performed in general accordance with ASTM Test Methods D421, D422 and D-1140. The Atterberg Limits were determined in general accordance with ASTM Test Method D-4318.
- **Resistance Value (R-Value)** – The R-Value test procedure expresses a material's resistance to deformation as a function of the ratio of the transmitted lateral pressure to the applied vertical pressure in general accordance to ASTM D-2844. Subgrade materials tested are assigned an R-Value for the purpose of pavement section design analysis.
- **Expansion Index**- To determine the potential expansion of remolded soils based on the Expansion Index Test Method (ASTM D4829).

Expansion Index- Expansive Potential Categorization	
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

- **Sulfates and Chlorides**- Soils were tested for water soluble sulfate (ARIZ 733) and chloride (ARIZ 736) content. This content could negatively impact project steel/concrete.

Laboratory Test Summary

Location	Depth (ft)	PI	%Passing #200	Correlated R-Value*	Tested R-Value	USCS Soil Class	Expansion Index
B1	0-3	NP	6	92	-	SP-SM	
B2	0-3	NP	74	36	-	ML	
B2	5-7	NP	17	-	-	SM	
B3	0-3	3	50	45	-	ML	
B4	5-7	NP	26	-	-	SM	2
B5	0-3	NP	22	75	-	SM	
B6	0-3	NP	3	96	-	SP	
B7	0-3	NP	3	96	-	SP	
B7	8-10	NP	24	-	-	SM	
B8	0-3	NP	13	84	-	SM	0
B9	0-3	NP	6	92	-	SP-SM	
BC1	0-3	NP	5	93	-	SW-SM	
BC2	0-3	NP	7	91	-	SW-SM	
BC3	0-3	NP	19	77	77	SM	
BC4	0-3	NP	11	86	-	SP-SM	
BC5	0-3	NP	17	79	-	SM	
BC6	0-3	NP	15	81	79	SM	
BC7	0-3	NP	17	79	-	SM	
BC8	0-3	NP	29	67	-	SM	
BC9	0-3	NP	6	92	-	SW-SM	
BC10	0-3	12	20	48	53	SC	
BC11	0-3	NP	4	95	-	SP	

Correlated R-Values were determined from Table 202.02-3 of the ADOT Materials Preliminary Engineering and Design Manual

See Appendix A for a detailed compilation of the laboratory test results.

3.0 GENERAL SITE CONDITIONS

3.1 Soil Stratigraphy

Based on the field exploration and laboratory testing the subsurface profile, to the depths explored, consist primarily of Silty sands, Sandy silts and Clayey sands with plasticity index ranging from non-plastic to 12 extending to the depths explored. Refer to the boring logs in Appendix C for a detailed description of the subsurface soil profile.

3.2 Potential for Soil Hydro-Collapse (Settlement Potential)

Field Blow Counts (N-values) indicate the subsurface soils are loose/soft and susceptible to hydro-collapse at the anticipated foundation load of 1500psf (See the attached laboratory test results and boring logs). The potential for hydro-consolidation of the subsurface soils can be mitigated. Foundation bearing soils should be over-excavated and re-compacted. (See Section 5.0 – Site Preparation).

3.3 Potential for Soil Expansion (Expansion Potential)

The expansion potential of the native soils, to the depths explored based on ASTM test method D4829, is considered very low. Soils selected for testing for expansion potential were those that represented clayey soils with varying plasticity index values to determine the range of expansive potential soils across the site. The Expansion Index values typically tend to be higher with higher plasticity indices. However, soils that have low plasticity indices in addition to a small percent passing the 200 sieve may have lower potential for expansion based on the soil composition as can be seen in the test data for the site (Expansion Index values of 0 and 2).

3.4 Potential for Corrosion

Soils were tested for water soluble sulfates and chlorides The International Building Code specifies limits for soluble sulfate levels of 1000ppm. The soils tested yielded results below these levels and do not require any specialized design requirements. The test results are presented in Appendix A.

3.5 Excavation and Workability

Based on the soil borings, it is anticipated that conventional excavation equipment may be utilized to depths of 15 feet. However, this generalized assessment is not intended to be the sole basis for contractors preparing earthwork bids. Undiscovered shallow bedrock, cemented soils, cobbles, boulders, and weathered/broken bedrock may make excavation more difficult than expected. In addition, the relative ease/efficiency of excavation is heavily dependent on operator skill and the type of equipment assigned to the project. Thus, prospective earthwork contractors bidding on this project need to assess site excavation conditions for themselves. Trench shoring, benching, or laying back of

excavations greater than 3 feet in depth may be required to satisfy government safety regulations for personnel safety.

3.6 Earth Fissure Review

The site is located within an area of regional groundwater withdrawal. Arizona Geological Survey has been commissioned to study earth fissures associated with the groundwater withdrawal. The Earth Fissure Maps provided by the Arizona Geological Survey indicate no known earth fissures on site or within approximately 25 miles of the site.

3.7 Seismic Characteristics

The subject site is located in an area of low seismic activity. Values have been developed based on knowledge of the local geological conditions, soils encountered during the site investigation of the subsurface soils, and the 2012/15 International Building Code (IBC). Based on knowledge of the geology of the area a 100 feet boring was not advanced.

Site Class	D (Stiff Soil Profile)
Central Latitude	32.436309° N
Central Longitude	110.963402° W
S_s Spectral Acceleration for Short Period	0.271g
S_1 Spectral Acceleration for a 1-Second period	0.078g
F_a Site Coefficient for Short Period	1.584
F_v Site Coefficient for a 1-second Period	2.400

3.8 Liquefaction Potential

The soil encountered during the site investigation consisted of silty sand, sandy silt and clayey sand soils. Based on the soil types and the low ground motion hazard (relatively low ground acceleration), the potential for liquefaction of the site soils is considered to negligible.

3.9 Shrinkage

Field and laboratory tests such as blow counts (N-values), in-situ densities, and hydro-collapse testing indicates that during grading, soils will likely be compacted to densities greater than the current density of the native soils. Both site specific testing and experience indicates that there is variability of the site soils subsurface and thus shrinkage across the site will vary such that uniform shrinkage across this site during earthwork operations is unlikely. The shrinkage values provided are based on standard construction techniques and may vary depending on the equipment used and the manner in which the grading is performed.

Depth (ft)	Estimated Shrinkage (%)
0-3	10-15

4.0 RECOMMENDATIONS

The recommendations contained herein are based on the findings of the field investigation, laboratory test results and local experience.

4.1 Foundations

It is highly recommended that the design of foundations be done under the direction of a registered professional engineer with structural expertise. Conventional or post-tension slab-on-grade foundations may be utilized in the design of light to moderately loaded single family residential structures. Conventional foundations can be utilized for isolated patio footings, site walls or in conjunction with post-tensioned slabs. It is recommended that foundation excavations be inspected prior to placement of concrete to ensure they are free of debris and loose soils.

Foundation design should anticipate total movement at the recommended design bearing pressure and is expected to be less than about ¾ inches with differential movement approaching 50 to 75% of the total movement.

4.1.1 Conventional Foundation System

Shallow foundations systems should bear a minimum of 1.5 feet below lowest adjacent grade extending laterally within 5 feet from the edge of foundation. Due to the properties of the native soils as indicated by field testing, it is recommended that foundations bear on firm undisturbed native soils or controlled compacted fill. Controlled compacted fill may consist of on-site and/or imported material that is placed on areas that are scarified, moisture processed and recompacted. The following table provides allowable bearing capacities for the site.

Allowable Bearing Capacity for Shallow Depth Conventional Slab-On-Grade/Foundation Systems:

*Footing Depth (ft.)	Bearing Stratum	Allowable Soil Bearing Capacity
1.5	Firm Undisturbed Native Soils or Controlled Compacted Fill	1500 psf

****Depth to base of perimeter footings is measured from the lowest adjacent finished grade elevation within 5 feet of edge of footing. Depth to base of interior footings measured from top of floor slab when used in conjunction with post-tension slabs.***

Foundation widths should meet building code minimums and should not be larger than 7 feet and 4 feet, for spread and continuous foundations, respectively.

The recommended foundation bearing pressures should be considered allowable maximums for dead plus design live loads and may be increased by one-third when considering total loads including transient wind or seismic forces. The weight of the foundation concrete below grade may be neglected in dead load computations.

Lightly loaded interior walls imposing a load of 800 plf or less may bear on a 12 inch thick and 12 inch wide thickened floor slab section. Loads exceeding 800 plf should be supported on a foundation independent of the floor slab. It is suggested that thickened sections be reinforced, and control joints be used to allow some deflection and thereby minimize the potential for slab cracking.

Foundation excavations should be inspected so that they are free of loose soil that may have blown or sloughed into the excavations and ensure that the footings will bear upon firm native undisturbed soils or engineered fill.

The stem walls should be well reinforced to distribute stresses caused by possible non-uniform bearing capacity and/or minor differential foundation movements. It is recommended that stem walls and footings be reinforced. The structural engineer should design the footings and stems for the site soil conditions.

Preparation of the site to raise or lower the building pad should be done in accordance to the Section 5 - Site Preparation.

4.1.2 Post-tension Slab-on-Grade Foundation System

The evaluation contained herein is based on the findings of the field investigation, laboratory test results and local experience.

The soils at these sites appear to have a very low potential for expansion. Thus, we recommend that post-tension slab-on-grade be designed by a registered engineer with experience in post-tension slab-on-grade design. The post-tension slab may bear at pad grade provided the foundation system is designed as a raft or mat. An allowable bearing capacity of 1250 psf at the pad surface and a Modulus of Subgrade Reaction of 150 pounds per cubic inch (pci) may be used for design foundation bearing on properly prepared pad soils consisting of 1.0 foot of compacted fill.

If the post-tension slab is not designed as a raft or mat foundation system, then an edge turndown with a minimum depth of embedment of 1.5 feet shall be used. A bearing capacity of 1500 psf is assigned for foundations founded at a minimum depth of 1.5 feet below lowest adjacent grade and should be bearing upon firm native undisturbed soils or controlled compacted fill. Anticipated total movement at the recommended design bearing pressures is expected to be less than about ¾ inch with differential movement approaching 50 to 75% of the total movement.

4.2 Slab-on-Grade

A minimum of 4 inches of aggregate base course (PAG specification for ABC) should immediately underlie interior floor slabs on grade. Interior concrete slabs-on-grade should contain a minimum of 5.0 sacks of Portland cement per cubic yard and have a minimum thickness of 4 inches.

Exterior slabs on grade should bear directly on grade and contain a minimum of 5.0 sacks of Portland cement per cubic yard with a minimum thickness of 4 inches. A minimum of 6 inches of subgrade should be scarified moisture processed and compacted to the specifications in the earthwork section of this report.

4.3 Lateral Loadings

The design of retaining walls for the site should be designed to retain the lateral loads applied by the site soils. The following values are provided in Equivalent Fluid Pressures for unrestrained, restrained and passive resistance.

Lateral Equivalent Fluid Pressures for Backfill:	
*Unrestrained Walls	35 pcf
*Restrained Walls	50 pcf
Passive Resistance	373 pcf
Coefficient of Base Friction:	0.50

The backfill pressures stated do not include temporary forces imposed during compaction of the backfill, swelling pressures developed by over-compacted clayey backfill soils, hydrostatic pressures from inundation of backfills, and/or surcharge loads. Walls should be suitably braced during backfilling to prevent damage and deflection.

Design of below grade structures should account for or prevent potential hydrostatic buildup. In addition, any below grade structure penetrations to facilitate drainage may allow piping of soil and water if not addressed properly in the design of the structure.

4.4 Drainage

Establishment and long-term maintenance of proper lot post-construction surface drainage is critical. Because of the potential for an adverse effect on structures, it is highly recommended that moisture infiltration and fluctuation of bearing soils for structural foundation/floor be minimized. Roof runoff should be collected and discharged away from the house structures. Drainage of surface water away from the structures should be provided during construction and maintained by the homeowner throughout the life of the structure. In no case should long-term ponding be allowed near house structures. IRC Section R401.3 specifically requires "The grade away from the foundation walls shall fall a minimum of 6 inches within the first 10 feet. Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, drains or swales shall be provided to ensure drainage away from the house structure". Thus, un-drained landscape "islands" bounded by concrete flatwork and/or foundation wall/slab elements are to be avoided. Installation of rain gutters along the perimeter of the residential structure with drain systems to transport water away from the foundation and to the outfall of the lot is an option to minimize moisture infiltration and fluctuation of bearing soils for structural foundation/floor systems.

In yard areas, it is suggested that, where possible, finished slopes extend a minimum of 10 feet horizontally from building walls and have a minimum vertical fall of 6 inches. Backfill against footings, exterior walls and in utility trenches should be compacted to minimize the possibility of moisture infiltration through loose soil.

Drainage and moisture infiltration should be considered during landscaping design and placement to ensure foundation and slab bearing soils are not exposed to moisture infiltration or moisture content fluctuation. Distance from house structures to vegetative plants, planters, irrigation lines or landscape borders should not be less than 3 feet. Trees should be placed at a distance of 8 feet

or more. Landscape irrigation schedules should be adjusted for climatic changes to minimize moisture content fluctuation of foundation bearing soils.

4.5 Slope Protection/Soil Erodibility

Slopes, whether naturally occurring or constructed of cuts and fills, may be subjected to soil erosion. The main variables that affect soil erosion of slopes are velocity of surface water drainage, transportation of soils by wind, gradient and length of the slope and soil types found on the site. Cut and fill slopes greater than 10 feet in height should not exceed a maximum gradient of 1:1 (Horizontal to Vertical), in order to provide slope stability against considerable failure. After construction, the applicable erosion protection method should be applied as quickly as possible to avoid soil loss from exposed slope areas. Unprotected slopes should be kept moist during construction to avoid transportation of surface soils due to winds. The following table shows the erosion protection methods for various slope gradients with vertical slope heights of less than 10 feet.

Slope Gradient (Horizontal to Vertical)	Slope Protection
3:1 or less	Re-vegetate with native species or provide other ground covers such as netting or crushed rock
2:1 to 2.99:1	Rip-rap with filter cloth or cover with mulch, jute, or excelsior netting and then re-vegetate with native species or provide ground covers
1:1 to 1.99:1	Grouted or wire-tied rip-rap, asphalt emulsion, or concrete revetments
0.99:1 or Steeper	Stability analysis or retaining wall designed by a structural engineer

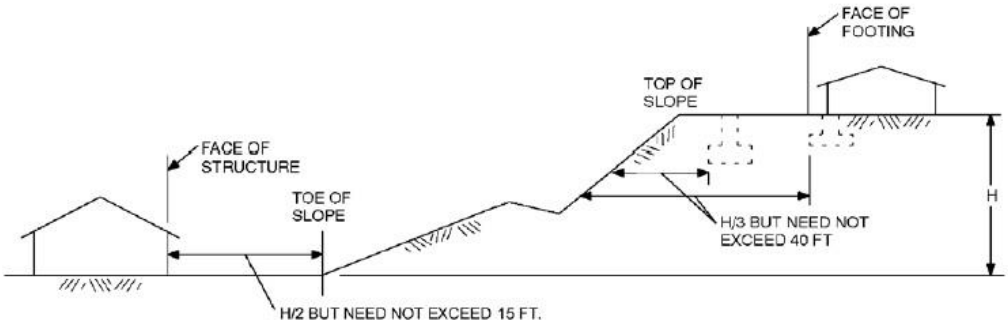
Erosion of sloped areas if not properly maintained or detected will progressively cause soil loss and an eventual loss of support to structures, retaining walls and associated street infrastructure. Recommendations to ensure slope protection against erosion should involve evaluation after heavy or prolonged rains, repairs of eroded areas and implementation of erosion maintenance plan.

Note: Soils along the site boundary adjacent to the large wash area may require to be stabilized for protection against flow velocities and bank erosion. Stabilization of banks typically consists of soil cement. Design, testing and Construction of cement stabilized banks should be performed in accordance to Pima Association of Governments specifications in Section 920 if required.

4.6 Slope Stability

Stability of cut and fill slopes are dependent on soil properties such as density, cohesion, moisture content, etc. Site specific laboratory testing and experience indicates that these properties can vary significantly across the site. Temporary slopes for installation of underground utilities or structures should follow OSHA guidelines. A minimum slope of 2.5:1 horizontal to vertical may be utilized for design of cut slopes and compacted fill slopes. The slope recommendation does not consider safety for fall dangers.

The placement of building and structures on or adjacent to slopes steeper than one unit vertical in three units horizontal shall require conformance to ***International Residential Code R403.1.7 Footings on or Adjacent to Slopes.*** Foundations should be located on the lot or embedded deeper to meet the requirements that the foundations are bearing at elevations that equates to the aforementioned 1:3 slope requirement see the diagram from the IRC below.



4.7 Pavement Section Recommendations

The pavement recommendations have been prepared in accordance with Town of Oro Valley requirements. The design for the proposed Minor Collector (Moore Road Loop) and

Local/Residential streets is based on pavement design parameters and coefficients provided in the Oro Valley Subdivision Street Standards and Policies Manual and surface soil properties:

Analysis Period	20 years
Change in Serviceability Factor	2.0
Regional Factor	1.7
Reliability (Local/Residential Streets)	85%
Reliability (Collector Street)	90%
Standard Deviation	0.45
Design R-Value (Local/Residential Streets)	77*
Design R-Value (Minor Collector Street)	78*
Resilient Modulus (Local/Residential Streets)	26,000 psi**
Resilient Modulus (Minor Collector Street)	26,000 psi**
Structural Coefficients	
Asphaltic Concrete	0.42
Aggregate Base	0.12
Estimated Equivalent Single Axle Load (ESAL)	
Local/Residential Streets	150,000
Minor Collector Street	400,000

Design R-value is based on the correlated R-values using percent passing #200 and PI for Local/Residential Streets and a combination of tested R-values and correlated R-values for the Collector Street (Moore Road Loop)

****Calculated Design R-Values for both Local/Residential and Collector Streets resulted in the Resilient Modulus greater than the maximum 26,000 psi specified in the ADOT Materials Preliminary Engineering and Design Manual: therefore, a Resilient Modulus of 26,000 was used in the pavement section design for Local/Residential and Collector Streets***

Pavement Section Recommendations for Local/Residential Streets:

Option 1-Unbounded Granular Base Section:	
Asphaltic Concrete	3.0 inches*
Aggregate Base Coarse	5.0 inches*
Structural Number	1.86
Option 2-Full Depth Asphaltic Concrete Section:	
Asphaltic Concrete	4.5 inches
Structural Number	1.89

Calculated SN (Structural Number) was lower than the SN required for Town of Oro Valley Minimum Pavement Sections; therefore, Town of Oro Valley Minimum Pavement Sections are recommended

Pavement Section Recommendations for Collector Street (Moore Road Loop):

Option 1-Unbounded Granular Base Section:	
Asphaltic Concrete	3.0 inches*
Aggregate Base Coarse	6.0 inches*
Actual Structural Number	1.98
Option 2-Full Depth Asphaltic Concrete Section:	
Asphaltic Concrete	5.0 inches
Actual Structural Number	2.10

Calculated SN (Structural Number) was lower than the SN required for Town of Oro Valley Minimum Pavement Sections; therefore, Town of Oro Valley Minimum Pavement Sections are recommended

Pavement materials and placement should conform to Pima Association of Governments (P.A.G.) specifications. In no case should pavement surfacing be placed on unstable wet subgrade and/or aggregate base course.

5.0 SITE PREPARATION

The following recommendations are presented for site grading. *It is recommended that a ProTeX geotechnical engineer's representative observe and test the earthwork and foundation portions of this project to ensure compliance with this Soil Investigation report.*

Prior to placement of fill a representative of ProTeX should observe the clearing process. Clearing will include removal of below and above grade vegetation and associated organic root systems. The areas cleared should be inspected prior to and during scarification for evidence of organic material or loose areas that may require additional removal or processing.

Due to light to moderate vegetation and loose/soft surface conditions, the surface soils should be over-excavated a minimum depth of 1.0 foot below existing grade or 1.0 foot below finished pad grade elevation, whichever is deeper. It is recommended that the over-excavation extend across the entire building pad and to a minimum lateral distance of five feet beyond foundation edges.

After clearing and over-excavation, **the exposed soils should be scarified a minimum of 8 inches moisture conditioned and compacted.** The surface should be free from ruts, or other uneven features that would tend to prevent uniform compaction by the equipment used.

Sloping areas steeper than 5:1 (horizontal: vertical) should be benched to reduce the potential for slippage between slopes and fills. Benches should be level and wide enough to accommodate compaction and earth moving equipment.

Fill material should be free of organics, vegetative matter, deleterious or foreign material, rocks, and lumps having a diameter of more than 6 inches. Native soils may be used as fill material provided they are compacted as specified. If imported fill material is required, it should be approved very low expansive potential soils.

Fill material should be placed in layers, that when compacted, do not exceed 6 inches. Each layer should then be placed evenly and thoroughly mix during spreading to ensure uniformity of moisture throughout each layer. Each fill layer should be compacted to specified density and moisture content.

Compaction equipment should be able to compact the fill to the specified density. Compaction of each layer should be continuous over its entire area and the compaction equipment should make sufficient passes to ensure that density has been obtained.

Soil compaction is recommended to the following densities and moisture contents as determined in accordance with ASTM D-698, AASHTO T-99 or applicable equivalent:

Compaction Specifications for Post-Tension and Conventional Foundations		
Material	**Compaction**	**Percent Moisture**
Below Conventional Interior Floors	95% Min	-2 to +2 of Optimum
Below Conventional Foundation Level and Post-Tension Slab-on-Grade	95% Min	-2 to +2 of Optimum
Fills at Depths 5 to 10 Feet Below Finish Grade	98% Min	-2 to +2 of Optimum
Fills at Depths 10 Feet or Greater Below Finish Grade	100% Min	-2 to +2 of Optimum

A ProTeX geotechnical engineer's representative should observe the grading operations to verify that all cut and fill areas are in accordance with the specifications. This office should be notified prior to earthwork operations so that appropriate observation and materials testing can be provided.

When work is interrupted by heavy rains, fill operations should not be resumed until the geotechnical engineer's representative indicates that the moisture content and density of the previously placed fill are as specified.

If building pads are altered or portions excavated as a part of construction activities, fill soils should be compacted as specified. If pads are not built on for an extended period of time, reconditioning of build pads may be required. Should this be the case, a representative of ProTeX should evaluate the pads for further recommendations.

6.0 CLOSURE

6.1 Limitations

The recommendations contained in this report are based on the assumption that the subsurface conditions do not deviate appreciably from those disclosed by the test holes. Should unusual material or conditions be encountered during construction, the ProTeX geotechnical engineer should be notified to make supplemental recommendations should this be required. This report is issued with

the understanding that it is the responsibility of the owner to see that its provisions are carried out or brought to the attention of those concerned.

The scope of services for this project does not include any environmental assessment of the site or identification of contaminated or hazardous materials or conditions.

The findings of this report are considered valid as of the present date. However, changes in the conditions of the site can occur with the passage of time, whether due to natural events or to human activities on this or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, this report may become invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified.

6.2 Recommended Additional Services

The recommendations provided in this report are based on the assumption that a testing plan will be implemented with an adequate schedule of testing to ensure that the construction process meets the recommendations/specifications presented in this report. The testing and observation should be performed under the direction of the ProTeX Geotechnical Engineer/representative and should include, but not necessarily be limited to the following:

1. Observe and document that the existing surface and subsurface structures, vegetation and abandoned utilities are removed from the site as required in the earthwork section.

2. Approve and document that fill material used as engineered fill in building and pavement areas meets the specifications.

3. After clearing the site; monitor the over excavation, scarification and removal of any soft/loose conditions down to firm native soils.

4. Monitor and test placement of fill soils in building and pavement locations to verify and document conformance with project specifications.

Appendix A

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180800 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	B1 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Poorly-graded sand with silt

Symbol: SP-SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**0**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	99		
#10	89		
#40	29		
#100	9		
#200	5.7		

Remarks:

Reviewed By:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180801 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	B2 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silt with sand

Symbol: ML

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**0**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	100		
#10	98		
#40	92		
#100	84		
#200	74		

Remarks:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180802 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	B2 (5-7')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**0**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	97		
#10	82		
#40	45		
#100	24		
#200	17		

Remarks:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180803 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	B3 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**21**
Plastic Limit	**18**
Plasticity Index	**3**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Sandy silt

Symbol: ML

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**0**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	98		
#10	94		
#40	80		
#100	65		
#200	50		

Remarks:

Reviewed By:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180804 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	B4 (5-7')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

ASTM D4829

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **2**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**5**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	95		
#10	82		
#40	50		
#100	34		
#200	26		

Remarks:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180805 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	B5 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**7**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	96		
#4	93		
#10	87		
#40	62		
#100	37		
#200	22		

Remarks:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180806 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	B6 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Poorly-graded sand with gravel

Symbol: SP

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**0**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	98		
#10	80		
#40	20		
#100	6		
#200	3.1		

Remarks:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180807 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	B7 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Poorly-graded sand with gravel

Symbol: SP

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**1**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	99		
#10	84		
#40	18		
#100	5		
#200	2.9		

Remarks:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180808 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	B7 (8-10')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**2**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	98		
#10	89		
#40	53		
#100	33		
#200	24		

Remarks:

Reviewed By:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180809 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	B8 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

ASTM D4829

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **0**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**3**

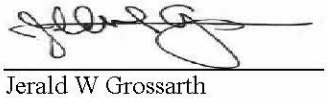
* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	97		
#10	82		
#40	34		
#100	18		
#200	13		

Remarks:

Reviewed By:



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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180810 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	B9 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Poorly-graded sand with silt

Symbol: SP-SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**5**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	95		
#10	83		
#40	34		
#100	10		
#200	5.9		

Remarks:

Reviewed By:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180811 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	BC1 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Well-graded sand with silt and gravel

Symbol: SW-SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**27**

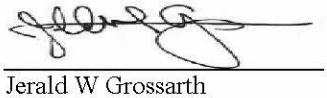
* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	86		
1/2"	77		
#4	73		
#10	63		
#40	21		
#100	8		
#200	5.1		

Remarks:

Reviewed By:



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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180812 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	BC2 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Well-graded sand with silt

Symbol: SW-SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**2**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	98		
#10	89		
#40	32		
#100	11		
#200	6.8		

Remarks:

Reviewed By:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180813 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	BC3 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand with gravel

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**18**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	93		
#4	82		
#10	66		
#40	34		
#100	25		
#200	19		

Remarks:

Reviewed By:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180814 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	BC4 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Poorly-graded sand with silt

Symbol: SP-SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**5**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	98		
#4	95		
#10	71		
#40	28		
#100	17		
#200	11		

Remarks:

Reviewed By:

Jerald W Grossarth

ProTeX the PT Xperts LLC
1102 W. Southern Ave., Ste. 4
Tempe, AZ 85282
Office: (602)-272-7891
Fax: (602) 272-7892

Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180815 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	BC5 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**7**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	93		
#10	80		
#40	42		
#100	25		
#200	17		

Remarks:

Reviewed By:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180816 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	BC6 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**13**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	92		
#4	87		
#10	78		
#40	40		
#100	22		
#200	15		

Remarks:

Reviewed By:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180817 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	BC7 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**5**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	95		
#10	81		
#40	38		
#100	23		
#200	17		

Remarks:

Reviewed By:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180818 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	BC8 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**3**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	97		
#10	91		
#40	61		
#100	38		
#200	29		

Remarks:

Reviewed By:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180819 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	BC9 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Well-graded sand with silt

Symbol: SW-SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**3**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	97		
#10	82		
#40	23		
#100	9		
#200	5.8		

Remarks:

Reviewed By:

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180820 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	BC10 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**31**
Plastic Limit	**19**
Plasticity Index	**12**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Clayey sand

Symbol: SC

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**6**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	99		
#4	94		
#10	81		
#40	40		
#100	25		
#200	20		

Remarks:

Reviewed By:

Jerald W Grossarth

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Tempe, AZ 85282
Office: (602)-272-7891
Fax: (602) 272-7892

Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	7466
Project Name:	Rancho Vistoso	ProTeX Lab No:	180821 - Phoenix
Job Name:	5X and 5W	Date Received:	1/29/2018
Material:	Geo - Soil Samples (Native)	Sampled By:	Spencer Drenth
Material Supplier:	-	Date Sampled:	1/26/2018
Sample Location:	BC11 (0-3')	Submitted By:	

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Poorly-graded sand with gravel

Symbol: SP

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**5**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	99		
#4	95		
#10	80		
#40	20		
#100	6		
#200	3.7		

Remarks:

Reviewed By:

Jerald W Grossarth

R VALUES RANCHO VISTRO NHS REPORT

Report Number: 65151173.0023
Service Date: 02/06/18
Report Date: 02/15/18
Task:

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ 85282-6767
480-897-8200

Client

ProTeX
Attn: Jeff Ritter
1102 W. Southern Ave, Ste. 4
Tempe, AZ 85282

Project

ProTeX Rancho Vistro NHS Parcls W&X
In House - Terracon Tempe Lab
Tempe, AZ

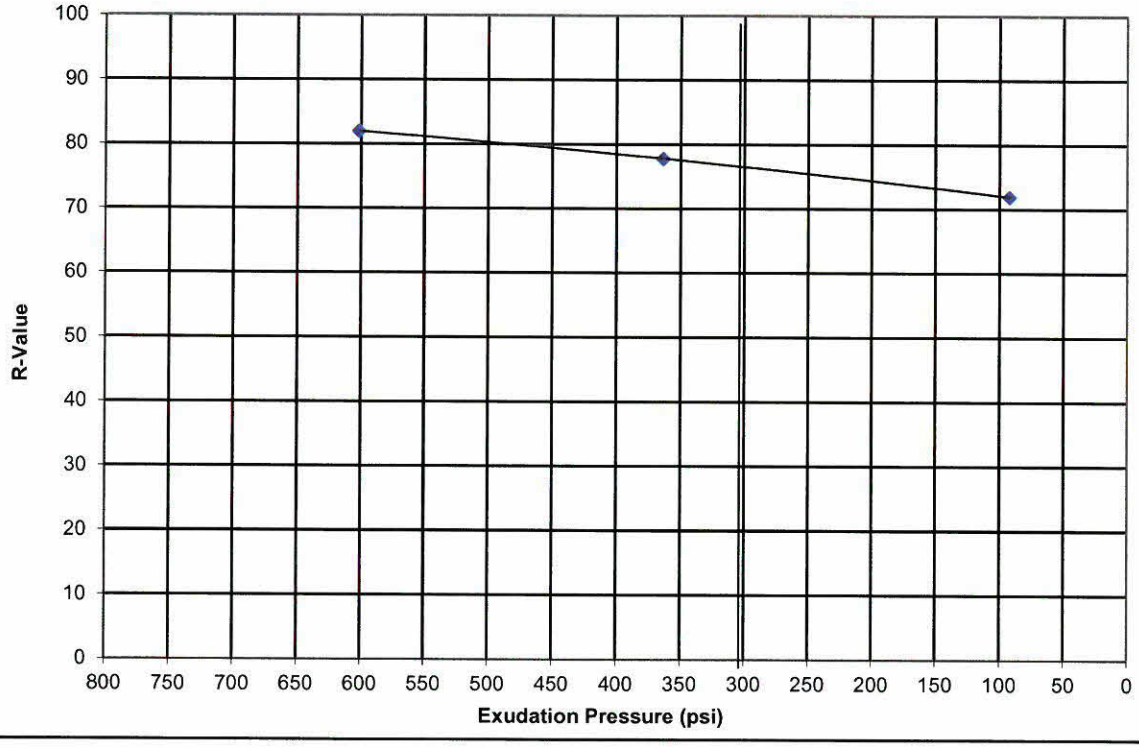
Project No. 65151173

Material Description: Sitly Sand
Sample Location: Moore Road Loop
Lab Number: 1326 Sample Source: BC 3 @ 0-5'

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	A	B	C
Moisture Content	8.8%	8.4%	7.9%
Compaction Pressure (psi)	350	350	350
Specimen Height (inches)	2.47	2.53	2.55
Dry Density (pcf)	134.1	131.1	129.7
Horiz. Pres. @ 1000lbs (psi)	17.0	14.0	12.0
Horiz. Pres. @ 2000lbs (psi)	28.0	22.0	18.0
Displacement	4.60	4.48	4.34
Expansion Pressure (psi)	0.0	0.0	0.0
Exudation Pressure (psi)	92	363	601
R Value	72	78	82

R-Value: 77



Services:
Terracon Rep:
Reported To:
Contractor:

Report Distribution

(1) ProTeX, Emailed

(1) ProTeX, Engineering Department

Reviewed By:

Clifford, Metz
Laboratory Manager

R VALUES RANCHO VISTRO NHS REPORT

Report Number: 65151173.0023
Service Date: 02/06/18
Report Date: 02/19/18
Task:

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ 85282-6767
480-897-8200

Client

ProTeX
Attn: Jeff Ritter
1102 W. Southern Ave, Ste. 4
Tempe, AZ 85282

Project

ProTeX Rancho Vistro NHS Parcls W&X
In House - Terracon Tempe Lab
Tempe, AZ

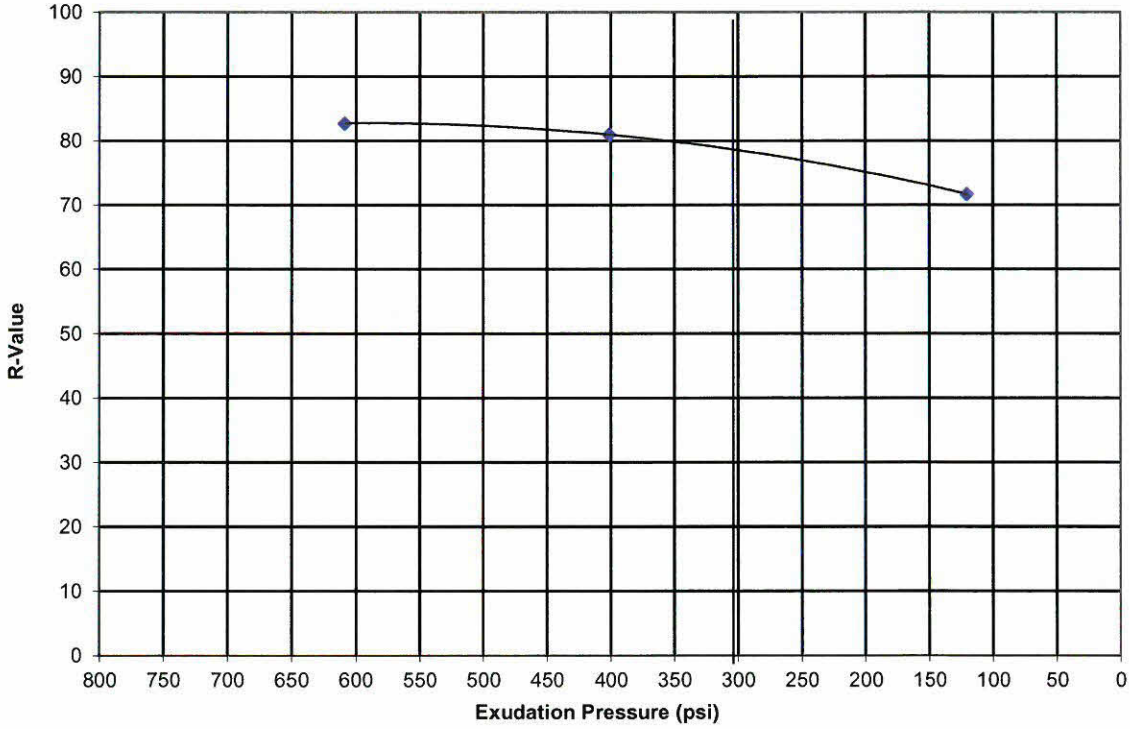
Project No. 65151173

Material Description: Silty Sand
Sample Location: Moore Road Loop
Lab Number: 1326 Sample Source: BC 6 @ 0-5'

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	A	B	C
Moisture Content	9.7%	9.3%	8.9%
Compaction Pressure (psi)	350	350	350
Specimen Height (inches)	2.52	2.55	2.54
Dry Density (pcf)	127.7	126.4	127.7
Horiz. Pres. @ 1000lbs (psi)	15.0	12.0	11.0
Horiz. Pres. @ 2000lbs (psi)	26.0	17.0	16.0
Displacement	5.09	4.95	4.70
Expansion Pressure (psi)	0.0	0.0	0.0
Exudation Pressure (psi)	120	401	609
R Value	72	81	83

R-Value: 79



Services:
Terracon Rep:
Reported To:
Contractor:

Report Distribution

(1) ProTeX, Emailed
(1) ProTeX, Engineering Department

Reviewed By:

Clifford, Metz
Laboratory Manager

R VALUES RANCHO VISTRO NHS REPORT

Report Number: 65151173.0023
Service Date: 02/06/18
Report Date: 02/15/18
Task:

Terracon
4685 S Ash Ave Ste H-4
Tempe, AZ 85282-6767
480-897-8200

Client

ProTeX
Attn: Jeff Ritter
1102 W. Southern Ave, Ste. 4
Tempe, AZ 85282

Project

ProTeX Rancho Vistro NHS Parcls W&X
In House - Terracon Tempe Lab
Tempe, AZ

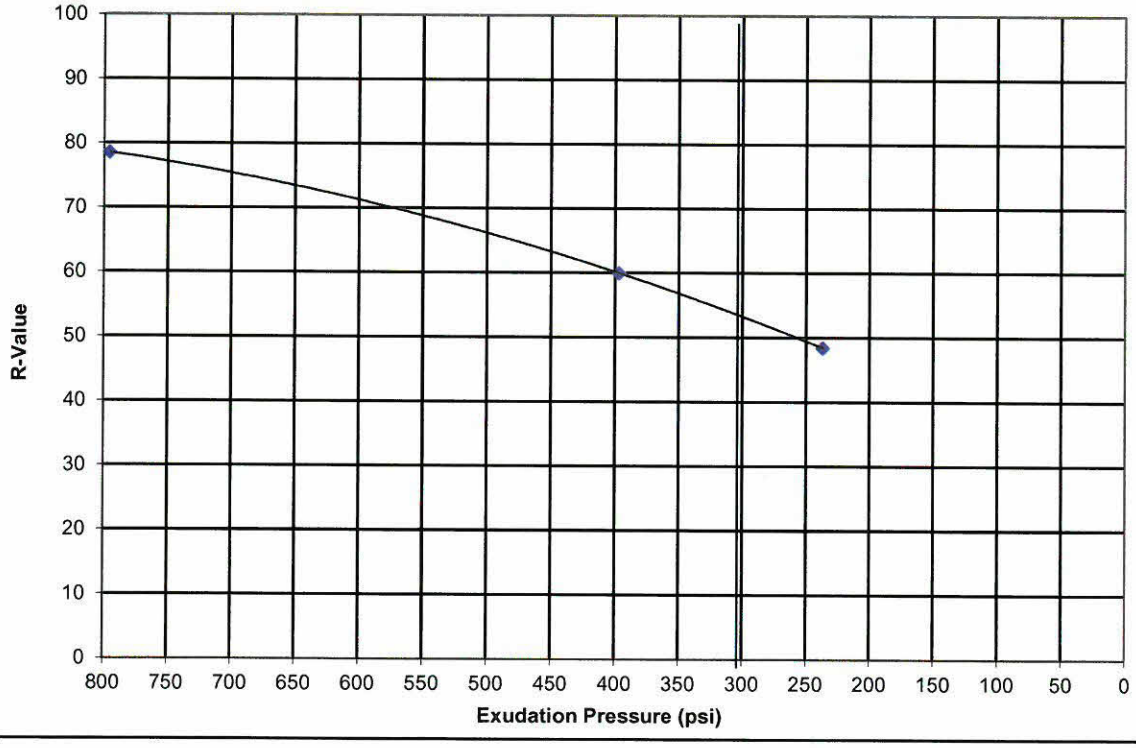
Project No. 65151173

Material Description: Clayey Silty Sand
Sample Location: Moore Road Loop
Lab Number: 1326 Sample Source: BC 10 @ 0-5'

RESISTANCE R-VALUE AND EXPANSION PRESSURE OF COMPACTED SOILS (ASTM D2844)

SPECIMEN I. D.	A	B	C
Moisture Content	12.1%	11.2%	10.4%
Compaction Pressure (psi)	150	350	350
Specimen Height (inches)	2.50	2.51	2.47
Dry Density (pcf)	124.7	125.1	126.7
Horiz. Pres. @ 1000lbs (psi)	28.0	23.0	14.0
Horiz. Pres. @ 2000lbs (psi)	59.0	44.0	22.0
Displacement	4.56	4.40	4.29
Expansion Pressure (psi)	0.0	0.0	0.3
Exudation Pressure (psi)	237	397	796
R Value	48	60	79

R-Value: 53



Services:
Terracon Rep:
Reported To:
Contractor:

Report Distribution

(1) ProTeX, Emailed
(1) ProTeX, Engineering Department

Reviewed By:

Clifford, Metz
Laboratory Manager

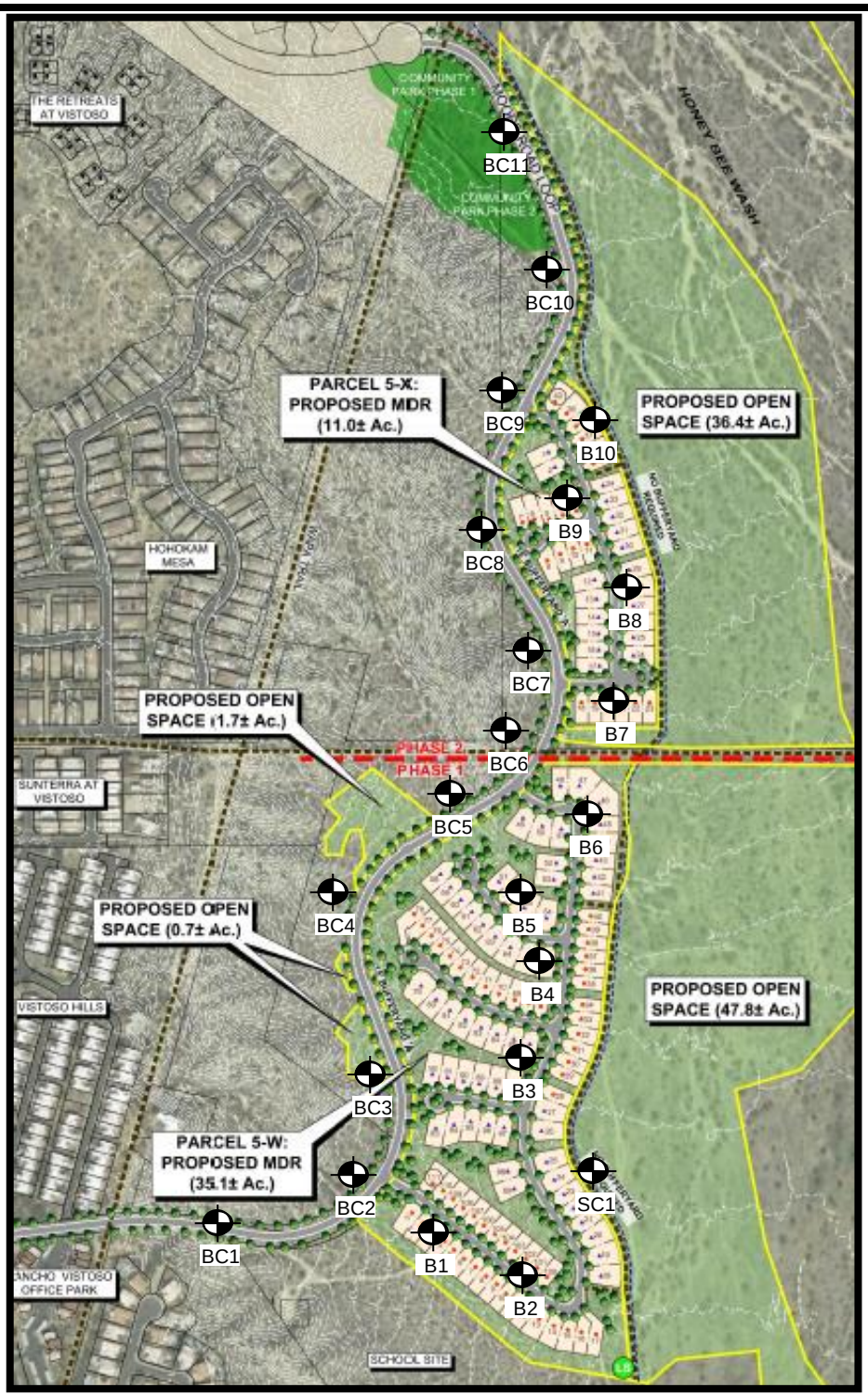
Summary of Laboratory Test Results Potential for Corrosion

Client: Pulte Tucson Land Builder: Pulte Tucson Land Project Name: Rancho Vistoso

Job Name: 5X and 5W Job ID #: 7466

ProTeX Lab#	Location	Depth	Material Type	Sample Date	Sulfate (SO4) (ppm)	Chloride (CL) (ppm)	Soluble Salts (ppm)	Minimum Resistivity (ohms-cm)	pH	Oxidation-Reduction Potential of Water (mV)
180800	B1	0-3'	Geo - Soil Samples	1/26/2018	45	2				
180806	B6	0-3'	Geo - Soil Samples	1/26/2018	46	2				
180810	B9	0-3'	Geo - Soil Samples	1/26/2018	28	1				
180822	SC1	0-3'	Geo - Soil Samples	1/26/2018	28					

Appendix B



Legend:

Approximate Test Hole Location

N

Site Plan

Scale: N.T.S.	Drawn by: SD.	Date: 2/13/2018

Rancho Vistoso – 5X and 5W

Rancho Vistoso Boulevard and Moore Road Loop

Oro Valley, Arizona

ProTeX Job No.: 7466

Appendix C

LOG OF BORING No. B1

PROJECT: Rancho Vistoso - 5X and 5W **PROJECT NO.:** 7466
CLIENT: Pulte Land
PROJECT LOCATION: Rancho Vistoso Boulevard and Moore Loop Road
LOCATION: See Site Map **ELEVATION:**
DRILLER: D&S Drilling **LOGGED BY:** Sd
DRILLING METHOD: 8" Power Auger **DATE:** 1/26/2018
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼ **CAVING>**

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200
0					
	Poorly Graded Sand with Silt, non-plastic, slightly damp, brown		80800		5.7
2.5					
5					
7.5					
	8-10		80801		74
	Silt with Sand, non-plastic, slightly damp, brown				
10					
12.5					
15					
	Boring terminated at 15 ft.				
17.5					

TEST RESULTS
Plastic Limit ⊢ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

LOG OF BORING No. B2

PROJECT: Rancho Vistoso - 5X and 5W | PROJECT NO.: 7466
CLIENT: Pulte Land
PROJECT LOCATION: Rancho Vistoso Boulevard and Moore Loop Road
LOCATION: | ELEVATION:
DRILLER: | LOGGED BY:
DRILLING METHOD: | DATE:
DEPTH TO - WATER> INITIAL: | AFTER 24 HOURS: | CAVING>

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS: Plastic Limit — Liquid Limit; Water Content - ●; Penetration - ▨ (10 20 30 40 50)
0						
	Silt with Sand, non-plastic, slightly damp, brown		80803	5 5 5	74	
2.5						
5		5-7	80804	6 5 9	17	
	Silty Sand, non-plastic, slightly damp, brown					
7.5						
10						
12.5						
15						
	Boring terminated at 15 ft.					
17.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

LOG OF BORING No. B3

PROJECT: Rancho Vistoso - 5X and 5W **PROJECT NO.:** 7466
CLIENT: Pulte Land
PROJECT LOCATION: Rancho Vistoso Boulevard and Moore Loop Road
LOCATION: **ELEVATION:**
DRILLER: **LOGGED BY:**
DRILLING METHOD: **DATE:**
DEPTH TO - WATER> INITIAL: **AFTER 24 HOURS:** **CAVING>**

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS
0						Plastic Limit — Liquid Limit; Water Content - ●; Penetration - ▨ (10 20 30 40 50)
	Silt with Sand, low plasticity, slightly damp, brown		80805		50	
2.5						
			80806			
5						
7.5						
10			80807			
12.5						
15						
	Boring terminated at 15 ft.					
17.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Figure

LOG OF BORING No. B4

PROJECT: Rancho Vistoso - 5X and 5W **PROJECT NO.:** 7466
CLIENT: Pulte Land
PROJECT LOCATION: Rancho Vistoso Boulevard and Moore Loop Road
LOCATION: **ELEVATION:**
DRILLER: **LOGGED BY:**
DRILLING METHOD: **DATE:**
DEPTH TO - WATER> INITIAL: **AFTER 24 HOURS:** **CAVING>**

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS: Plastic Limit — Liquid Limit; Water Content - ●; Penetration - ▨ (10 20 30 40 50)
0						
	Silty Sand, non-plastic, slightly damp, brown		80808			
				3 4 4		
2.5						
				7 8 5		
5			80809		26	
7.5						
10						
12.5						
15						
	Boring terminated at 15 ft.					
17.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

LOG OF BORING No. B5

PROJECT: Rancho Vistoso - 5X and 5W | PROJECT NO.: 7466
CLIENT: Pulte Land
PROJECT LOCATION: Rancho Vistoso Boulevard and Moore Loop Road
LOCATION: | ELEVATION:
DRILLER: | LOGGED BY:
DRILLING METHOD: | DATE:
DEPTH TO - WATER> INITIAL: | AFTER 24 HOURS: | CAVING>

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS: Plastic Limit — Liquid Limit; Water Content - ●; Penetration - ▨ (10 20 30 40 50)
0						
	Silty Sand, non-plastic, slightly damp, brown		80810		22	
2.5						
5			80811			
7.5						
10						
12.5						
15						
	Boring terminated at 15 ft.					
17.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

LOG OF BORING No. B6

PROJECT: Rancho Vistoso - 5X and 5W | PROJECT NO.: 7466
CLIENT: Pulte Land
PROJECT LOCATION: Rancho Vistoso Boulevard and Moore Loop Road
LOCATION: | ELEVATION:
DRILLER: | LOGGED BY:
DRILLING METHOD: | DATE:
DEPTH TO - WATER> INITIAL: | AFTER 24 HOURS: | CAVING>

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS
0						Plastic Limit — Liquid Limit; Water Content - ●; Penetration - ▨ (10 20 30 40 50)
	Poorly Graded Sand, non-plastic, slightly damp, light brown		80812		3.1	
2.5						
5						
7.5						
10						
12.5						
15						
	Boring terminated at 15 ft.					
17.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Figure

LOG OF BORING No. B7

PROJECT: Rancho Vistoso - 5X and 5W | PROJECT NO.: 7466
CLIENT: Pulte Land
PROJECT LOCATION: Rancho Vistoso Boulevard and Moore Loop Road
LOCATION: | ELEVATION:
DRILLER: | LOGGED BY:
DRILLING METHOD: | DATE:
DEPTH TO - WATER> INITIAL: | AFTER 24 HOURS: | CAVING>

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS
0						Plastic Limit — Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50
	Poorly Graded Sand, non-plastic, slightly damp, light brown		80813	2 2 3	2.9	
2.5						
5				3 4 4		
7.5						
		8-10	80814		24	
	Silty Sand, non-plastic, slightly damp, brown					
10						
12.5						
15						
	Boring terminated at 15 ft.					
17.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Figure

LOG OF BORING No. B8

PROJECT: Rancho Vistoso - 5X and 5W | PROJECT NO.: 7466
CLIENT: Pulte Land
PROJECT LOCATION: Rancho Vistoso Boulevard and Moore Loop Road
LOCATION: | ELEVATION:
DRILLER: | LOGGED BY:
DRILLING METHOD: | DATE:
DEPTH TO - WATER> INITIAL: | AFTER 24 HOURS: | CAVING>

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS
0						Plastic Limit — Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50
	Silty Sand, non-plastic, slightly damp, brown		80815		13	
2.5						
5						
		7-9				
7.5	Poorly Graded Sand with Silt, non-plastic, slightly damp, brown		80816		5.9	
10						
12.5						
15						
	Boring terminated at 15 ft.					
17.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Figure

LOG OF BORING No. B9

PROJECT: Rancho Vistoso - 5X and 5W | PROJECT NO.: 7466
CLIENT: Pulte Land
PROJECT LOCATION: Rancho Vistoso Boulevard and Moore Loop Road
LOCATION: | ELEVATION:
DRILLER: | LOGGED BY:
DRILLING METHOD: | DATE:
DEPTH TO - WATER> INITIAL: | AFTER 24 HOURS: | CAVING>

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS: Plastic Limit — Liquid Limit; Water Content - ●; Penetration - (10 20 30 40 50)
0						
	Silty Sand, non-plastic, slightly damp, brown		80817			
2.5						
5						
7.5						
10						
12.5						
15						
	Boring terminated at 15 ft.					
17.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Figure

LOG OF BORING No. B10

PROJECT: Rancho Vistoso - 5X and 5W | PROJECT NO.: 7466
CLIENT: Pulte Land
PROJECT LOCATION: Rancho Vistoso Boulevard and Moore Loop Road
LOCATION: | ELEVATION:
DRILLER: | LOGGED BY:
DRILLING METHOD: | DATE:
DEPTH TO - WATER> INITIAL: | AFTER 24 HOURS: | CAVING>

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS
0						Plastic Limit — Liquid Limit; Water Content - ●; Penetration - ▨ (10 20 30 40 50)
	Silty Sand, non-plastic, slightly damp, brown			2 1 3		
2.5						
5				3 5 2		
7.5						
10						
12.5						
15						
	Boring terminated at 15 ft.					
17.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

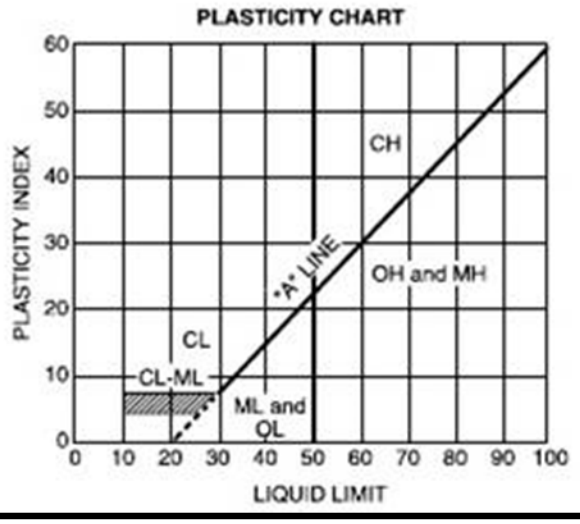
Figure

Appendix D

Key To Soil Symbols and Classifications

Common Strata Symbols

- High plasticity clay (CH -- C)
- Inorganic silts and clays (CH-MH -- MC)
- Low plasticity clay (CL -- O)
- Low-high plasticity clays (CL-CH -- CO)
- Silty low plasticity clay (CL-ML -- CZ)
- Fill (FILL -- F)
- Clayey gravel (GC -- 08)
- Clayey sand and gravel (GC-SC -- DO8)
- Silty gravel (GM -- Z8)
- Silty clayey gravel (GM-GC -- ZO8)
- Silty sand and gravel (GM-SM -- 08)
- Poorly graded gravel (GP -- G)
- Poorly graded gravel with clay (GP-GC -- DGO3)
- Poorly graded gravel with silt (GP-GM -- DGZ3)
- Poorly graded gravel and sand (GP-SP -- :G)
- Well graded gravel (GW -- 83)
- Well graded sand (SW -- D)
- Well graded sand with clay (SW-SC -- DR)
- Well graded sand with silt (SW-SM -- D=)
- Well graded gravel with clay (GW-GC -- 83O)
- Well graded gravel with silt (GW-GM -- 83Z)
- Well graded gravel/ clayey gravel (GW-GP -- 83G)
- Well graded gravel and sand (GW-SW -- 83D)
- Elastic silt (MH -- M)
- Silt (ML -- Z)
- High plasticity organic clays (OH -- 5)
- Low plasticity organic silts (OL -- 4)
- Basalt (or generic rock) (ROCK --])
- Clayey sand (SC -- DO)
- Silty sand (SM -- 0)
- Poorly graded clayey silty sand (SC-SM -- :ZO)
- Poorly graded silty fine sand (SM-ML -- :Z)
- Poorly graded sand (SP -- :)
- Poorly graded sand with clay (SP-SC -- :R)
- Poorly graded sand with silt (SP-SM -- :=)
- Well graded sand with gravel (SW -- D9)
- Silty sand with gravel (SM -- 09)
- Clayey sand with gravel (SC -- DO9)



Relative Density of Cohesionless Soils (blows/ft)	
Very Loose	0 to 4
Loose	5 to 10
Medium	11 to 30
Dense	31 to 50
Very Dense	over 50

Relative Degree of Plasticity (PI)	
Non-Plastic	0
Low	1 to 7
Low-Medium	8 to 14
Medium	15 to 21
Medium-High	22 to 28
High	29 to 35
Very High	Over 35

Relative Proportions (%)	
Trace	1 to 10
Little	11 to 20
Some	21 to 35
With	36 to 50

Particle Size Identification (Diameter)	
Boulder	8.0" or Larger
Cobbles	3.0" to 8.0"
Coarse Gravel	0.75" to 3.0"
Fine Gravel	5.0 mm to 3.0"
Coarse Sand	2.0 mm to 5.0 mm
Medium Sand	0.4 mm to 2.0 mm
Fine Sand	0.07 mm to 0.4 mm
Silt	0.002 mm to 0.07 mm
Clay	Less Than 0.002

Geotechnical Investigation

Rancho Vistoso Valley Vista
Lots 1-47 and Lots 98-127

Rancho Vistoso Boulevard and Arrowsmith Drive
Oro Valley, Arizona
ProTeX Job No.: 9297

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July 8, 2019

Pulte Group
3011 West Ina Road
Tucson, AZ 85741

Re: **Geotechnical Investigation-Post Grading**

Project: **Rancho Vistoso Valley Vista - Lots 1-47 and Lots 98-127**
Rancho Vistoso Boulevard and Arrowsmith Drive
Oro Valley, Arizona

ProTeX Job No.: 9297

Attention: Mr. Tom Collins

At your request, ProTeX has completed a soil investigation for the subject project. The accompanying report includes field observations and laboratory testing supporting our conclusions and recommendations for the proposed development.

Respectfully submitted,
ProTeX - the PT Xperts, LLC

Professional Engineer Civil CERTIFICATE NO. 65968 KEITH E. RITTER DATE SIGNED 7-8-19 ARIZONA U.S.A.

Registered Professional Engineer (Civil) CERTIFICATE NO. 47662 JONES TEMBO Date Signed 7-8-2019 ARIZONA, U.S.A. Expires 03/31/2020

Date Expires: 3/31/2021
Keith E. Ritter, P.E.

Jones Tembo, P.E.

TABLE OF CONTENTS

APPENDICES

Appendix A – Laboratory Test Results
- Hydro-Collapse Tests/In-Situ Moisture and Densities
- Grain Size Distribution, Atterberg Limits and Expansion Tests
- Chloride, Sulfate

Appendix B – Site Information
- Site Plan

Appendix C-Field Testing
- Boring Logs

Appendix D-USCS Classification Chart
- Legend

Rancho Vistoso Valley Vista - Lots 1-47 and Lots 98-127
Rancho Vistoso Boulevard and Arrowsmith Drive
Oro Valley, Arizona
ProTeX Job No.: 9297

Executive Summary

ProTeX was contracted by Pulte Group to provide general information with respect to the engineering characteristics of onsite soils and provide recommendations for foundations and pad preparation for the non-built finished lots located in the master plan community referred to as Rancho Vistoso Valley Vista - Lots 1-47 and Lots 98-127 in Oro Valley, Arizona.

This firm understands the proposed development will consist of one or two story single-family residential structures imposing relatively light to moderate foundation loads.

Field investigation and laboratory testing indicated that the site consists mainly of non-plastic silty sand soils with varying amounts of gravel. The expansion potential for site soils when foundation bearing soils are exposed to a moisture increase is anticipated to be very low. All lots are subject to very low expansive soils and post-tensioned or conventional slab/foundation systems are recommended.

Settlements at the site are anticipated to be within accepted tolerances provided that pad preparation is performed as specified and no significant changes in moisture content of foundation/floor slab occurs and proper drainage and irrigation control are maintained. During and after building construction drainage away from the structure should be maintained to direct roof run off away from the structure and off the lot for the life of the project. In no case should long-term ponding be allowed near structures. Proper design and placement of yard vegetation and irrigation systems should be used so that structural foundation slab bearing soils are not exposed to moisture content fluctuations.

The site is located within an area of regional groundwater withdrawal; however, based on the Earth fissure Maps provided by the Arizona Geological Survey there is no indication of earth fissures on site or within approximately 25 miles of the site.

Based on the findings of the soils investigation, the site is considered suitable to construct single-family residential structures imposing relatively light to moderate foundation loads provided floor and foundation systems are properly designed, soils properly conditioned as specified and proper maintenance of drainage and irrigation systems.

1.0 INTRODUCTION

1.1 Scope

ProTeX was retained by Pulte Group, to evaluate the surface and subsurface soil conditions following mass grading of building pads. It is our understanding that the building pads are within a few tenths of finished pad grade. The content of this report contains the findings from the field exploration and laboratory testing, with supporting recommendations for the proposed development.

1.2 Proposed Site Development

This firm understands the proposed development will consist of one or two story single-family residential structures constructed of wood masonry and/or steel frame construction imposing relatively light to moderate foundation loads.

1.3 Terms and Conditions

This report was prepared for Pulte Group. The contents of this report may not be relied upon by any other party without the expressed written permission of ProTeX - the PT Xperts, LLC and the written permission of Pulte Group. The report presents site conditions at the time of the investigation and for the aforementioned proposed development. The report should be updated prior to construction if a maximum of one year has elapsed from the issued date.

2.0 FIELD AND LABORATORY TESTING

2.1 Geotechnical Site Reconnaissance

The subject site consists of 77 previously graded lots in the Rancho Vistoso Valley Vista which includes Lots 1-47 and Lots 98-127 in a master planned community. It is this firm's understanding that the lots have been graded to or within a few tenths of finished grade. The lots are relatively flat and level and had little to no vegetation at the time of the field investigation. It should be noted that grading fills range from approximately 1 to 9 feet based on documentation in the ProTeX

Building Pad-Post-Tension Foundation report (ProTeX Job ID#: 0234Dev-3579-8944) published June 13, 2019 and test hole observations during this Post-Grade Geotechnical investigation. (refer to the site map in Appendix B).

2.2 Field Investigation

A total of eight (8) test holes were completed at the site for the purpose of evaluating subsurface conditions. Test holes were terminated at a nominal depth of 10 feet. At each test hole location the soils encountered were visually observed, classified, logged and representative samples were obtained where applicable. Refer to the site plan in Appendix B for approximate test hole locations.

2.3 Laboratory Testing

Subsequent to the field investigation, soil samples were submitted for laboratory testing. Tests were performed to determine the following:

- **Hydro-collapse**- Used to evaluate undisturbed lateral ring confined (obtained from a split-barrel California-type Sampler) one-dimensional vertical soil movement under load (1500 and 2000 psf) to water inundation/saturation in general accordance with the American Society for Testing and Materials (ASTM) Test Method D4546.
- **Sieve Analysis and Atterberg Limits**- Used for formal classification of soils in general accordance with the Unified Soil Classification System (USCS) per ASTM Test Method D2487. Sieve analysis is performed in general accordance with ASTM Test Methods D421, D422 and D1140. The Atterberg Limits were determined in general accordance with ASTM Test Method D4318.
- **Expansion Index**- To determine the potential expansion of remolded soils based on the Expansion Index Test Method (ASTM D4829).

Expansion Index- Expansive Potential Categorization	
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

- **Sulfates and Chlorides**- Soils were tested for water soluble sulfate and chloride content (ARIZ 733 and ARIZ 736). This content could negatively impact project steel/concrete. The test results are presented in Appendix A.

Laboratory Test Summary

Location	Depth (ft)	Plasticity Index (PI)	Percent Passing #200 Sieve	USCS Soil Classification	Expansion Index
B1	0-3	NP	19	SM	1
B1	5-7	NP	14	SM	1
B2	0-3	NP	23	SM	
B3	0-3	NP	22	SM	
B4	0-3	NP	22	SM	
B4	5-7	NP	25	SM	
B5	0-3	NP	22	SM	
B5	5-7	NP	25	SM	
B6	0-3	NP	20	SM	
B7	0-3	NP	20	SM	
B7	5-7	NP	15	SM	
B8	0-3	NP	19	SM	

See Appendix A for a detailed compilation of the laboratory test results.

3.0 GENERAL SITE CONDITIONS

3.1 Soil Stratigraphy

Based on the field exploration and laboratory testing the subsurface profile consists of non-plastic silty sand soils, with varying amounts of gravel and cobbles extending to the depths explored. As a part of the mass grading of the site, approximately 1 to 9 feet of fill exists across the site. Refer to the boring logs in Appendix C for a detailed description of the subsurface soil profile.

3.2 Potential for Soil Hydro-Collapse (Settlement Potential)

Laboratory Testing and Field Blow Counts (N-values) generally indicate the subsurface soils have a very low to low potential for hydro-collapse at the anticipated foundation load of 1250psf (See the attached boring logs).

3.3 Potential for Soil Expansion (Swell Potential)

The expansion potential of the native soils, to the depths explored based on ASTM test method D4829, is considered very low (Expansion Index values of 1). Soils selected for testing for expansion potential were those that represented clayey soils with varying plasticity index values to determine the range of expansive potential soils across the site. The silty sands that tested non-plastic are

comprised of silts and sands and are considered to have a very low potential for expansion and thus were not tested.

3.4 Potential for Corrosion

Soils were tested for water soluble sulfates and chlorides. The International Building Code specifies limits for soluble sulfate levels of 1000ppm. The soils tested yielded results below these levels and do not require any specialized design requirements. The test results are presented in Appendix A.

3.5 Excavation and Workability

Based on the soil borings, it is anticipated that conventional excavation equipment may be utilized to a depth of 10 feet. However, this generalized assessment is not intended to be the sole basis for contractors preparing earthwork bids. Undiscovered shallow bedrock, cemented soils, cobbles, boulders, and weathered/broken bedrock may make excavation more difficult than expected. In addition, the relative ease/efficiency of excavation is heavily dependent on operator skill and the type of equipment assigned to the project. Thus, prospective earthwork contractors bidding on this project need to assess site excavation conditions for themselves. Trench shoring, benching, or laying back of excavations greater than 3 feet in depth may be required to satisfy government safety regulations for personnel safety.

3.6 Seismic Characteristics

The subject site is located in an area of low seismic activity. Values have been developed based on knowledge of the local geological conditions, soils encountered during the site investigation of the subsurface soils, and the 2015 International Building Code (IBC). Based on knowledge of the geology of the area a 100 feet boring was not advanced. The following values are presented for use in design consideration:

Site Class	D (Stiff Soil Profile)
Central Latitude	32.436309°N
Central Longitude	110.963402° W
S_s Spectral Acceleration for Short Period	0.271g
S_1 Spectral Acceleration for a 1-Second period	0.078g
F_a Site Coefficient for Short Period	1.584
F_v Site Coefficient for a 1-second Period	2.400

3.7 Liquefaction Potential

The soil encountered during the site investigation consisted of silty sand soils with varying amounts of gravel. Based on the soil types and the low ground motion hazard (relatively low ground acceleration), the potential for liquefaction of the site soils is considered to negligible.

3.8 Earth Fissure Review

The site is located within an area of regional groundwater withdrawal. Arizona Geological Survey has been commissioned to study earth fissures associated with the groundwater withdrawal. The Earth Fissure Maps provided by the Arizona Geological Survey indicate no known earth fissures on site or within 25 miles of the site.

4.0 RECOMMENDATIONS

The recommendations contained herein are based on the findings of the field investigation, laboratory test results and local experience.

4.1 Foundations

It is highly recommended that the design of foundations be designed under the direction of a registered professional engineer with structural expertise. Based on field and laboratory testing, soil characteristics do not require expansive design per International Residential Code R403.1.8/International Building Code 1803.5.3. Conventional or Post-Tension slab-on-grade

foundations may be utilized in the design of light to moderately loaded single family residential structures.

Recommendations for grading of the site has been provided to minimize movements of the foundations. However, foundation design should anticipate post-construction settlement based on the recommended design bearing pressure to be ¾ inch with differential movement on the order of 50 percent of the total movement.

4.1.1 Conventional Foundation System

Shallow foundations systems should bear a minimum of 1.5 feet below lowest adjacent grade extending laterally within 5 feet from the edge of foundation. Due to the properties of the native soils as indicated by laboratory testing, it is recommended that foundations bear on firm undisturbed native soils or approved controlled compacted fill. Controlled compacted fill may consist of on-site and/or imported material that is placed on areas that are scarified, moisture processed and recompacted. The following table provides allowable bearing capacities for the site based on the building pads being properly prepared per the earthwork section of the report.

Allowable Bearing Capacity for Shallow Depth Conventional Slab-On-Grade/Foundation Systems:

*Footing Depth (ft.)	Bearing Stratum	Allowable Soil Bearing Capacity
1.5	Firm Undisturbed Native Soils or Approved Controlled Compacted Fill	1500 psf

****Depth to base of perimeter footings is measured from the lowest adjacent finished grade elevation within 5 feet of edge of footing. Depth to base of interior footings measured from top of floor slab when used in conjunction with post-tension slabs.***

Foundation widths should meet building code minimums and should not be larger than 7 feet and 4 feet, for spread and continuous foundations, respectively.

The recommended foundation bearing pressures should be considered allowable maximums for dead plus design live loads and may be increased by one-third when considering total loads

including transient wind or seismic forces. The weight of the foundation concrete below grade may be neglected in dead load computations.

Lightly loaded interior walls imposing a load of 800 plf or less may bear on a 12-inch-thick and 12-inch-wide thickened floor slab section. Loads exceeding 800 plf should be supported on a foundation independent of the floor slab. It is suggested that thickened sections be reinforced, and control joints be used to allow some deflection and thereby minimize the potential for slab cracking.

Foundation excavations should be inspected so that they are free of loose soil that may have blown or sloughed into the excavations and ensure that the footings will bear upon firm native undisturbed soils or engineered fill.

The stem walls should be well reinforced to distribute stresses caused by possible non-uniform bearing capacity and/or minor differential foundation movements. It is recommended that stem walls and footings be reinforced. The structural engineer should design the footings and stems for the site soil conditions.

Interior slabs on grade should bear directly on 4 inches of Aggregate Base Course (ABC). The concrete slabs should consist of a minimum thickness of 4 inches and be reinforced to account for site soil conditions.

Preparation of the site to raise or lower the building pad should be done in accordance to the Section 5 - Site Preparation.

4.1.2 Post-Tension Slab-on-Grade Foundation System

The following parameters are provided for the design of Post-Tension slab-on-grade foundations based on the building pads being properly prepared per the earthwork section of this report for Post-Tensioned foundations.

Allowable Bearing Capacity	1250 psf at Pad Surface
Modulus of Subgrade Reaction	200 (pci)
Aggregate Base Course (ABC)	None Required

Bearing capacities stated in the conventional foundation section at specified embedment depth may be utilized in association with Post-Tensioned slab on grade designs.

4.1 Exterior Slab-on-Grade

Exterior slabs on grade should bear on 4 inches of ABC or directly on grade and contain a minimum of 5.0 sacks of Portland cement per cubic yard with a minimum thickness of 4 inches. A minimum of 6 inches of sub-grade should be scarified moisture processed and compacted to the specifications in the site preparation section of this report.

4.2 Lateral Earth Pressures

The design of retaining walls for the site should be designed to retain the lateral loads applied by the site soils. The following values are provided in Equivalent Fluid Pressures for unrestrained, restrained and passive resistance.

Lateral Equivalent Fluid Pressures for Backfill:	
*Unrestrained Walls	35 pcf
*Restrained Walls	50 pcf
Passive Resistance	350 pcf
Coefficient of Base Friction:	0.50

The backfill pressures stated do not include temporary forces imposed during compaction of the backfill, swelling pressures developed by over-compacted clayey backfill soils, hydrostatic pressures from inundation of backfills, and/or surcharge loads. Walls should be suitably braced during backfilling to prevent damage and deflection.

Design of below grade structures should account for or prevent potential hydrostatic buildup. In addition, any below grade structure penetrations to facilitate drainage may allow piping of soil and water if not addressed properly in the design of the structure.

4.3 Drainage

Establishment and long term maintenance of proper lot post-construction surface drainage is critical. Because of the potential for an adverse effect on structures, it is highly recommended that moisture infiltration and fluctuation of bearing soils for structural foundation/floor be minimized. Roof runoff should be collected and discharged away from the house structures. Drainage of surface water away from the structures should be provided during construction and maintained by the homeowner throughout the life of the structure. In no case should long-term ponding be allowed near house structures. IRC Section R401.3 specifically requires "The grade away from the foundation walls shall fall a minimum of 6 inches within the first 10 feet. Where lot lines, walls, slopes or other physical barriers prohibit 6 inches of fall within 10 feet, drains or swales shall be provided to ensure drainage away from the house structure". Thus, un-drained landscape "islands" bounded by concrete flatwork and/or foundation wall/slab elements are to be avoided. Installation of rain gutters along the perimeter of the residential structure with drain systems to transport water away from the foundation and to the outfall of the lot is an option to minimize moisture infiltration and fluctuation of bearing soils for structural foundation/floor systems.

In yard areas, it is suggested that, where possible, finished slopes extend a minimum of 10 feet horizontally from building walls and have a minimum vertical fall of 6 inches. Backfill against footings, exterior walls and in utility trenches should be compacted to minimize the possibility of moisture infiltration through loose soil.

Drainage and moisture infiltration should be considered during landscaping design and placement to ensure foundation and slab bearing soils are not exposed to moisture infiltration or moisture content fluctuation. Distance from house structures to vegetative plants, planters, irrigation lines or landscape borders should not be less than 3 feet. Trees should be placed at a distance of 8 feet

or more. Landscape irrigation schedules should be adjusted for climatic changes to minimize moisture content fluctuation of foundation bearing soils.

4.4 Slope Stability

Stability of cut and fill slopes are dependent on soil properties such as density, cohesion, moisture content, etc. Site specific laboratory testing and experience indicates that these properties can vary significantly across the site. Temporary slopes for installation of underground utilities or structures should follow OSHA guidelines. A minimum slope of 2.5:1 horizontal to vertical may be utilized for design of cut slopes and compacted fill slopes. The slope recommendation does not consider safety for fall dangers.

5.0 SITE PREPARATION

Building pads shall be cleared of all vegetation, debris and any disturbance corrected prior to construction. A representative of ProTeX should observe and/or test to certify building pads prior to construction.

If building pads are disturbed, building pads should be re-graded. Re-grading should consist of ripping the pads a minimum of 6 inches (or depth of disturbance), moisture conditioning and re-compacting to specified moisture and density. However, re-grading requirements may be greater depending on the pad disturbance.

Site soils should be mechanically backfilled against foundations and within utility trenches. Utility trenches in particular can provide a pathway for any excess moisture to migrate in under the PT foundation system. ***Thus, it is critical to reduce/minimize the risk for excess soil swell associated with potential moisture increase beneath the slab.*** The backfill material should be placed in a 6 inch lift thickness, moisture condition and compacted minimum/maximum per cent of maximum dry density as indicated in the following table. Further, each backfill lift should be placed evenly and thoroughly mixed during spreading to ensure uniformity of moisture throughout. Any additional fill required in landscape and yard areas shall be placed and compacted as specified.

Soil compaction is recommended to the following densities and moisture contents as determined in accordance with ASTM D-698, AASHTO T-99 or applicable equivalent:

Compaction Specifications for Post-Tension and Conventional Foundations		
Material	**Compaction**	**Percent Moisture**
Below Conventional Foundation Level and Post-Tension Slab-on-Grade	95% Min	-3 to +3 of Optimum

If building pads are altered or portions excavated as a part of construction activities, fill soils should be compacted as specified. Should this be the case, a representative of ProTeX should evaluate the pads for further recommendations.

6.0 CLOSURE

6.1 Limitations

The recommendations contained in this report are based on the assumption that the subsurface conditions do not deviate appreciably from those disclosed by the test holes. Should unusual material or conditions be encountered during construction, the ProTeX geotechnical engineer should be notified to make the necessary supplemental recommendations. This report is issued with the understanding that it is the responsibility of the owner to see that its provisions are carried out or brought to the attention of those concerned.

The scope of services for this project does not include any environmental assessment of the site or identification of contaminated or hazardous materials or conditions.

The findings of this report are considered valid as of the present date. However, changes in the conditions of the site can occur with the passage of time, whether due to natural events or to human activities on this or adjacent sites. In addition, changes in applicable or appropriate codes and

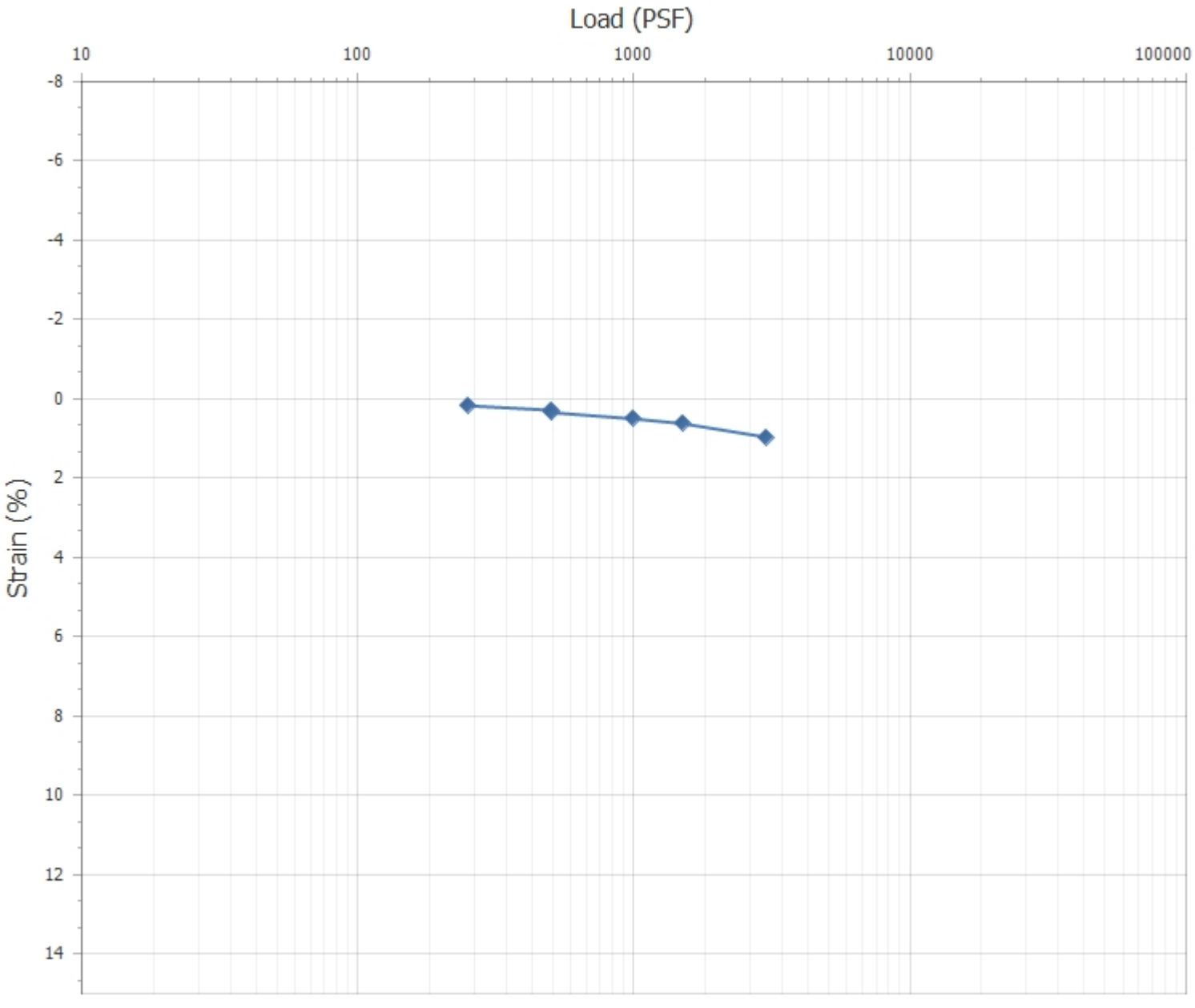
standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, this report may become invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified.

Appendix A

ProTeX the PT Xperts LLC
1102 W. Southern Ave., Ste. 4
Tempe, AZ 85282
Office: (602)-272-7891
Fax: (602) 272-7892

Consolidation

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194582 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B1 (Ring 0')	Submitted By:	Keith E Ritter



Source: B1 - Ring 0'

Moisture Content:	4.2 %	Sample Type:	Undisturbed
Dry Unit Weight:	114.4 lb/ft³	Load at Saturation:	500 PSF
Remarks:		Reviewed By:	jmoloney

ProTeX the PT Xperts LLC
1102 W. Southern Ave., Ste. 4
Tempe, AZ 85282
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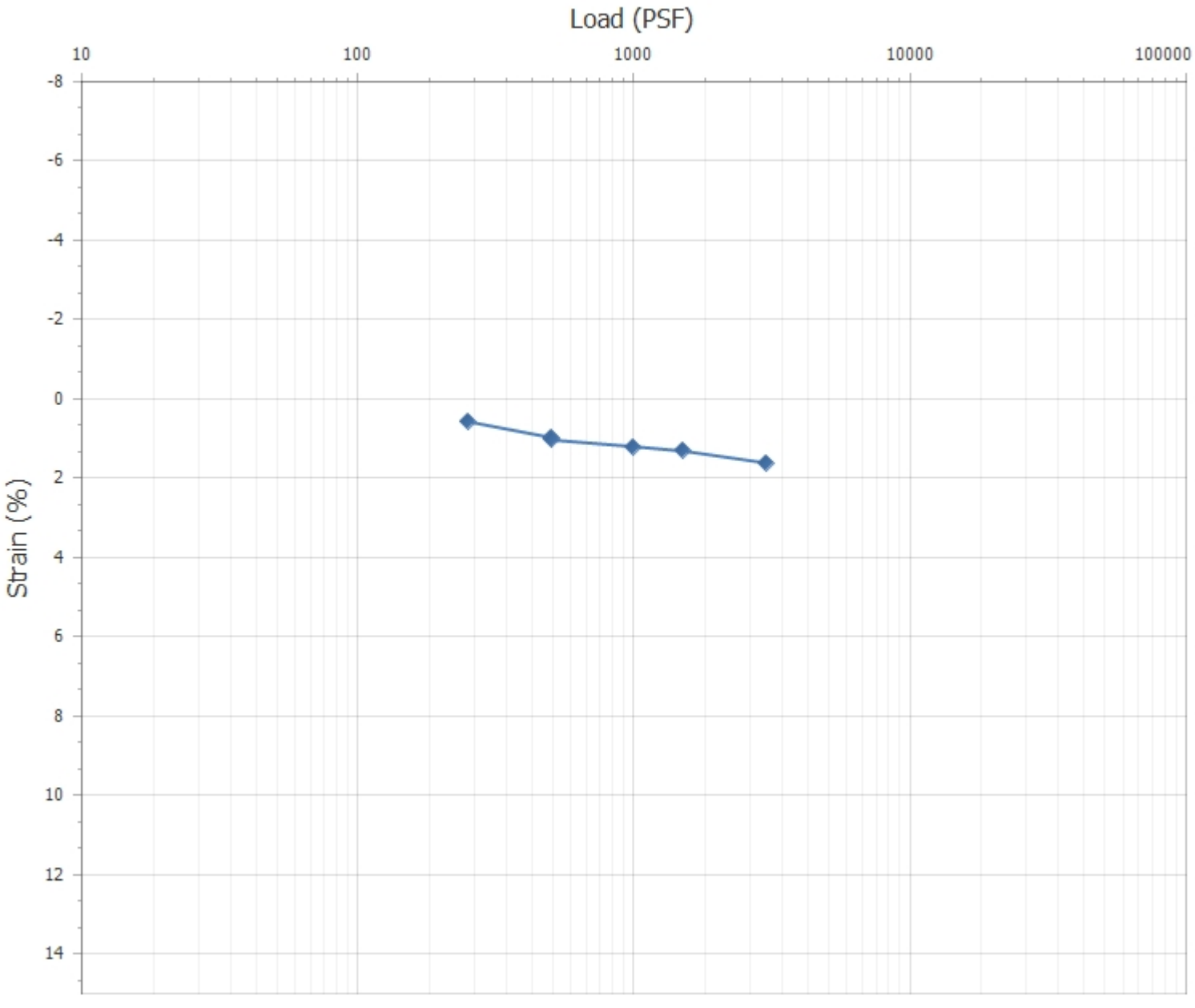
Consolidation

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194583 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B4 (Ring 1')	Submitted By:	Keith E Ritter



Source: B4 - Ring 1'

Moisture Content:	6.1 %	Sample Type:	Undisturbed
Dry Unit Weight:	118.3 lb/ft³	Load at Saturation:	500 PSF
Remarks:		Reviewed By:	jmoloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194570 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B1 (0-3')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

ASTM D4829

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **1**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**10**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	95		
#4	90		
#10	78		
#40	39		
#100	24		
#200	19		

Remarks:

Reviewed By: Jayde Moloney

Jayde Moloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194571 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B1 (5-7')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

ASTM D4829

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **1**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**11**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	95		
#4	89		
#10	75		
#40	34		
#100	19		
#200	14		

Remarks:

Reviewed By: Jayde Moloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194572 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B2 (0-3')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**5**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	95		
#10	85		
#40	43		
#100	27		
#200	23		

Remarks:

Reviewed By: Jayde Moloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194573 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B3 (0-3')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**6**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	98		
#4	94		
#10	83		
#40	42		
#100	26		
#200	22		

Remarks:

Reviewed By: Jayde Moloney

Jayde Moloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194574 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B4 (0-3')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**4**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	96		
#10	86		
#40	43		
#100	27		
#200	22		

Remarks:

Reviewed By: Jayde Moloney

Jayde Moloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194575 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B4 (5-7')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**3**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	97		
#10	85		
#40	45		
#100	30		
#200	25		

Remarks:

Reviewed By: Jayde Moloney

Jayde Moloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194576 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B5 (0-3')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**6**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	99		
#4	94		
#10	84		
#40	45		
#100	28		
#200	22		

Remarks:

Reviewed By: Jayde Moloney

Jayde Moloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194577 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B5 (5-7')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**5**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	98		
#4	95		
#10	84		
#40	45		
#100	30		
#200	25		

Remarks:

Reviewed By: Jayde Moloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194578 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B6 (0-3')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**9**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	96		
#4	91		
#10	77		
#40	38		
#100	24		
#200	20		

Remarks:

Reviewed By: Jayde Moloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194579 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B7 (0-3')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**6**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	99		
#4	94		
#10	82		
#40	40		
#100	24		
#200	20		

Remarks:

Reviewed By: Jayde Moloney

Jayde Moloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194580 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B7 (5-7')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**6**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	100		
1/2"	100		
#4	94		
#10	77		
#40	35		
#100	21		
#200	15		

Remarks:

Reviewed By: Jayde Moloney

Jayde Moloney

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Soils Summary

Client:	Pulte Tucson Land	ProTeX Job No:	9297
Project Name:	Rancho Vistoso Valley Vista	ProTeX Lab No:	194581 - Phoenix
Job Name:	Phase 1A,1B,1C - Lots 1-47, 98-127	Date Received:	6/20/2019
Material:	Geo (PG)	Sampled By:	Amos McCurdy
Material Supplier:	-	Date Sampled:	6/17/2019
Sample Location:	B8 (0-3')	Submitted By:	Keith E Ritter

AASHTO T89/T90

Plasticity Index

Liquid Limit	**NV**
Plastic Limit	**NP**
Plasticity Index	**NP**

Expansion Index, (EI)	Potential Expansion
0 - 20	Very Low
21 - 51	Low
52 - 90	Medium
91 - 130	High
> 130	Very High

Expansion Index

EI = **NA**

Percent Swell of Soil

% Swell	**NV**

Notes:

pH and Resistivity

pH Reading:	**NA**
Resistivity (ohms-cm)	**NA**

Class: Silty sand

Symbol: SM

Moisture Density (Proctor)

Max. Dry Density	**NV**
Opt. Moisture %	**NV**
Corr. Max. Dry Density	**NV**
Corr. Opt. Moisture %	**NV**
% Rock	**12**

* = out of specification

AASHTO T11/T27

Sieve	% Pass	Specs	*
1"	93		
1/2"	93		
#4	88		
#10	78		
#40	42		
#100	25		
#200	19		

Remarks:

Reviewed By: Jayde Moloney

Jayde Moloney

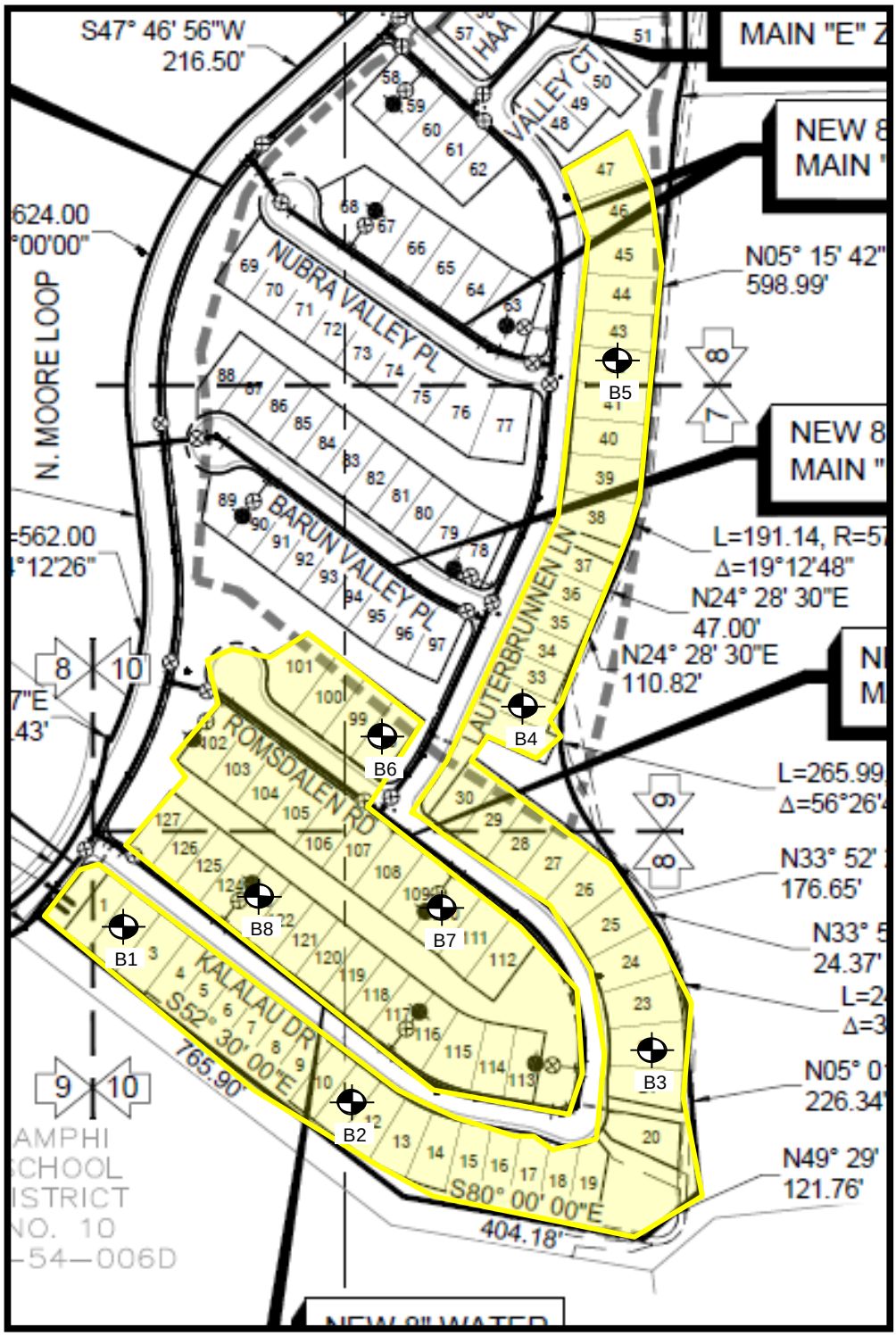
Summary of Laboratory Test Results Potential for Corrosion

Client: Pulte Tucson Land Builder: Pulte Tucson Land Project Name: Rancho Vistoso Valley Vista

Job Name: Phase 1A,1B,1C - Lots 1-47, 98-127 Job ID #: 9297

ProTeX Lab#	Location	Depth	Material Type	Sample Date	Sulfate (SO4) (ppm)	Chloride (CL) (ppm)	Soluble Salts (ppm)	Minimum Resistivity (ohms-cm)	pH	Oxidation-Reduction Potential of Water (mV)
194570	B1	0-3'	Geo	6/17/2019	36	11				
194573	B3	0-3'	Geo	6/17/2019	38	12				
194576	B5	0-3'	Geo	6/17/2019	41	13				

Appendix B



Legend:

Approximate Boring Location

Site Plan

Scale: N.T.S.	Drawn by: KR	Date: 6/17/19

Rancho Vistoso Valley Vista - (Lots 1-47 and Lots 98-127)

Rancho Vistoso Boulevard and Arrowsmith Drive

Oro Valley, Arizona

ProTeX Job No.: 9297

Appendix C

LOG OF BORING No. B1

PROJECT: Rancho Vistoso Valley Vista - (Lots 1-47 and Lots 98-127) **PROJECT NO.:** 9297
CLIENT: Pulte Group
PROJECT LOCATION: Rancho Vistoso Boulevard and Arrowsmith Drive
LOCATION: See Site Map **ELEVATION:**
DRILLER: D & S Drilling **LOGGED BY:** AM
DRILLING METHOD: 8" Power Auger **DATE:** 6/17/2019
DEPTH TO - WATER> INITIAL: **AFTER 24 HOURS:** **CAVING>** C

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200
0	Fill (SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		194570	R 5 5	19
2.5	(SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		194571		14
5					
7.5					
10	Boring terminated at 10 ft.				
12.5					
15					
17.5					

TEST RESULTS
Plastic Limit — Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

LOG OF BORING No. B2

PROJECT: Rancho Vistoso Valley Vista - (Lots 1-47 and Lots 98-127) **PROJECT NO.:** 9297
CLIENT: Pulte Group
PROJECT LOCATION: Rancho Vistoso Boulevard and Arrowsmith Drive
LOCATION: See Site Map **ELEVATION:**
DRILLER: D & S Drilling **LOGGED BY:** AM
DRILLING METHOD: 8" Power Auger **DATE:** 6/17/2019
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼ **CAVING>** C

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200
0	Fill (SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		1 9 4 5 7 2	12 14 11	23
2.5	(SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp				
5					
7.5					
10	Boring terminated at 10 ft.				
12.5					
15					
17.5					

TEST RESULTS
Plastic Limit ⊢——⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

LOG OF BORING No. B3

PROJECT: Rancho Vistoso Valley Vista - (Lots 1-47 and Lots 98-127) **PROJECT NO.:** 9297
CLIENT: Pulte Group
PROJECT LOCATION: Rancho Vistoso Boulevard and Arrowsmith Drive
LOCATION: See Site Map **ELEVATION:**
DRILLER: D & S Drilling **LOGGED BY:** AM
DRILLING METHOD: 8" Power Auger **DATE:** 6/17/2019
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼ **CAVING>** C

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200
0					
	Fill (SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		194573		22
2.5					
5					
7.5					
	(SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		9		
10	Boring terminated at 10 ft.				
12.5					
15					
17.5					

TEST RESULTS
Plastic Limit ⊢——⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

LOG OF BORING No. B4

PROJECT: Rancho Vistoso Valley Vista - (Lots 1-47 and Lots 98-127) **PROJECT NO.:** 9297
CLIENT: Pulte Group
PROJECT LOCATION: Rancho Vistoso Boulevard and Arrowsmith Drive
LOCATION: See Site Map **ELEVATION:**
DRILLER: D & S Drilling **LOGGED BY:** AM
DRILLING METHOD: 8" Power Auger **DATE:** 6/17/2019
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼ **CAVING>** C

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200
0					
	Fill (SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		194574	R 12 20	22
2.5					
5			194575		25
7.5	(SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp				
10	Boring terminated at 10 ft.				
12.5					
15					
17.5					

TEST RESULTS
Plastic Limit ⊢——⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

LOG OF BORING No. B5

PROJECT: Rancho Vistoso Valley Vista - (Lots 1-47 and Lots 98-127) **PROJECT NO.:** 9297
CLIENT: Pulte Group
PROJECT LOCATION: Rancho Vistoso Boulevard and Arrowsmith Drive
LOCATION: See Site Map **ELEVATION:**
DRILLER: D & S Drilling **LOGGED BY:** AM
DRILLING METHOD: 8" Power Auger **DATE:** 6/17/2019
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼ **CAVING>** C

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200
0					
	Fill (SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		194576		22
2.5					
5			194577		25
7.5	(SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp				
10	Boring terminated at 10 ft.				
12.5					
15					
17.5					

TEST RESULTS
Plastic Limit ⊢——⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

LOG OF BORING No. B6

PROJECT: Rancho Vistoso Valley Vista - (Lots 1-47 and Lots 98-127) **PROJECT NO.:** 9297
CLIENT: Pulte Group
PROJECT LOCATION: Rancho Vistoso Boulevard and Arrowsmith Drive
LOCATION: See Site Map **ELEVATION:**
DRILLER: D & S Drilling **LOGGED BY:** AM
DRILLING METHOD: 8" Power Auger **DATE:** 6/17/2019
DEPTH TO - WATER> INITIAL: **AFTER 24 HOURS:** **CAVING>** C

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS
0	Fill (SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		194578		20	Plastic Limit — Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50
2.5	(SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		2			
5						
7.5						
10	Boring terminated at 10 ft.					
12.5						
15						
17.5						

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

LOG OF BORING No. B7

PROJECT: Rancho Vistoso Valley Vista - (Lots 1-47 and Lots 98-127) **PROJECT NO.:** 9297
CLIENT: Pulte Group
PROJECT LOCATION: Rancho Vistoso Boulevard and Arrowsmith Drive
LOCATION: See Site Map **ELEVATION:**
DRILLER: D & S Drilling **LOGGED BY:** AM
DRILLING METHOD: 8" Power Auger **DATE:** 6/17/2019
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼ **CAVING>** C

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200
0	Fill (SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		194579	11 14 22	20
2.5					
4	(SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		194580		15
5					
7.5					
10	Boring terminated at 10 ft.				
12.5					
15					
17.5					

TEST RESULTS
Plastic Limit ⊢——⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Figure

LOG OF BORING No. B8

PROJECT: Rancho Vistoso Valley Vista - (Lots 1-47 and Lots 98-127) **PROJECT NO.:** 9297
CLIENT: Pulte Group
PROJECT LOCATION: Rancho Vistoso Boulevard and Arrowsmith Drive
LOCATION: See Site Map **ELEVATION:**
DRILLER: D & S Drilling **LOGGED BY:** AM
DRILLING METHOD: 8" Power Auger **DATE:** 6/17/2019
DEPTH TO - WATER> INITIAL: **AFTER 24 HOURS:** **CAVING>** C

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200
0	Fill (SM) Silty Sand some Gravel, non-plastic, light brown, slightly damp		194581		19
2.5	(SM) Silty Sand trace Gravel, non-plastic, light brown, slightly damp		2		
5					
7.5					
10	Boring terminated at 10 ft.				
12.5					
15					
17.5					

TEST RESULTS
Plastic Limit — Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

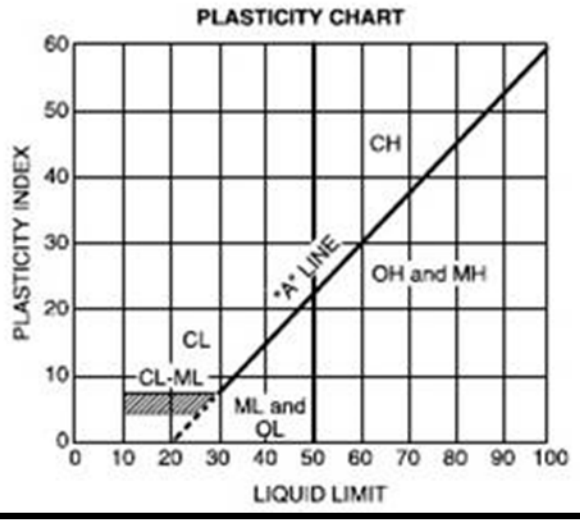
This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Appendix D

Key To Soil Symbols and Classifications

Common Strata Symbols

- High plasticity clay (CH -- C)
- Inorganic silts and clays (CH-MH -- MC)
- Low plasticity clay (CL -- O)
- Low-high plasticity clays (CL-CH -- CO)
- Silty low plasticity clay (CL-ML -- CZ)
- Fill (FILL -- F)
- Clayey gravel (GC -- 08)
- Clayey sand and gravel (GC-SC -- DO8)
- Silty gravel (GM -- Z8)
- Silty clayey gravel (GM-GC -- ZO8)
- Silty sand and gravel (GM-SM -- 08)
- Poorly graded gravel (GP -- G)
- Poorly graded gravel with clay (GP-GC -- DGO3)
- Poorly graded gravel with silt (GP-GM -- DGZ3)
- Poorly graded gravel and sand (GP-SP -- :G)
- Well graded gravel (GW -- 83)
- Well graded sand (SW -- D)
- Well graded sand with clay (SW-SC -- DR)
- Well graded sand with silt (SW-SM -- D=)
- Well graded gravel with clay (GW-GC -- 83O)
- Well graded gravel with silt (GW-GM -- 83Z)
- Well graded gravel/ clayey gravel (GW-GP -- 83G)
- Well graded gravel and sand (GW-SW -- 83D)
- Elastic silt (MH -- M)
- Silt (ML -- Z)
- High plasticity organic clays (OH -- 5)
- Low plasticity organic silts (OL -- 4)
- Basalt (or generic rock) (ROCK --])
- Clayey sand (SC -- DO)
- Silty sand (SM -- 0)
- Poorly graded clayey silty sand (SC-SM -- :ZO)
- Poorly graded silty fine sand (SM-ML -- :Z)
- Poorly graded sand (SP -- :)
- Poorly graded sand with clay (SP-SC -- :R)
- Poorly graded sand with silt (SP-SM -- :=)
- Well graded sand with gravel (SW -- D9)
- Silty sand with gravel (SM -- 09)
- Clayey sand with gravel (SC -- DO9)



Relative Density of Cohesionless Soils (blows/ft)	
Very Loose	0 to 4
Loose	5 to 10
Medium	11 to 30
Dense	31 to 50
Very Dense	over 50

Relative Degree of Plasticity (PI)	
Non-Plastic	0
Low	1 to 7
Low-Medium	8 to 14
Medium	15 to 21
Medium-High	22 to 28
High	29 to 35
Very High	Over 35

Relative Proportions (%)	
Trace	1 to 10
Some	11 to 15
With	15 to 35
And	36 to 50

Particle Size Identification (Diameter)	
Boulder	8.0" or Larger
Cobbles	3.0" to 8.0"
Coarse Gravel	0.75" to 3.0"
Fine Gravel	5.0 mm to 3.0"
Coarse Sand	2.0 mm to 5.0 mm
Medium Sand	0.4 mm to 2.0 mm
Fine Sand	0.07 mm to 0.4 mm
Silt	0.002 mm to 0.07 mm
Clay	Less Than 0.002

GENERAL NOTES

GENERAL NOTES:

1. ALL CONSTRUCTION SHALL CONFORM TO THE 2018 EDITION OF THE INTERNATIONAL RESIDENTIAL CODE (2018 IRC), INCLUDING LOCAL AMENDMENTS.
2. THE CONTRACT DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE MEANS, METHODS, OR SEQUENCES OF CONSTRUCTION. THE STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES, OR PROCEDURES OF CONSTRUCTION. THE STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR CONSTRUCTION SITE SAFETY OR SAFETY PRECAUTIONS AND PROGRAMS INCIDENT THERETO.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION FROM LOADS DUE TO CONSTRUCTION EQUIPMENT, CONSTRUCTION MATERIALS, THE ELEMENTS, AND THE LIKE. OBSERVATION VISITS TO THE SITE BY THE STRUCTURAL ENGINEER SHALL NOT INCLUDE INSPECTION OF THE ABOVE ITEMS.
4. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT THE CONSTRUCTION SITE PRIOR TO COMMENCING WORK. REPORT ANY DISCREPANCIES TO THE STRUCTURAL ENGINEER PRIOR TO COMMENCING WORK.
5. OMISSIONS AND/OR CONFLICTS BETWEEN VARIOUS ELEMENTS OF THE DRAWINGS, NOTES, AND/OR DETAILS SHALL BE REPORTED TO THE STRUCTURAL ENGINEER AND RESOLVED WITH THE STRUCTURAL ENGINEER PRIOR TO COMMENCING WORK.
6. DO NOT SCALE DIMENSIONS. USE WRITTEN DIMENSIONS ONLY. WHERE NO DIMENSION IS INDICATED, CONSULT WITH THE STRUCTURAL ENGINEER FOR CLARIFICATION PRIOR TO COMMENCING WORK.
7. DETAILS SHOWN SHALL BE INCORPORATED INTO THE PROJECT AT ALL RELEVANT LOCATIONS WHETHER SPECIFICALLY CALLED OUT OR NOT. TYPICAL DETAILS SHALL APPLY THROUGHOUT CONSTRUCTION UNLESS DETAILED OTHERWISE. WHERE DETAILS ARE NOT PROVIDED, CONSTRUCTION SHALL BE AS SHOWN FOR SIMILAR WORK. IF THERE IS NO SIMILAR WORK, CONSTRUCTION SHALL BE PER INDUSTRY STANDARDS.
8. WHERE REFERENCE IS MADE TO TESTING AND MATERIAL STANDARDS, SUCH STANDARDS SHALL BE THE LATEST EDITION UNDER THE CURRENT IBC, INCLUDING APPLICABLE LOCAL AMENDMENTS.

DESIGN LOADS:

1. BASIC WIND SPEED = 115 MPH (ULTIMATE)
   RISK CATEGORY: II
   WIND EXPOSURE: C

2. LIVE LOADS:
   EXTERIOR CONCRETE
   SLAB–ON–GRADE: 100 PSF

CONCRETE:

MINIMUM 28 DAY STRENGTH 3,000 PSI EXCEPT AS FOLLOWS: (TYPE II, U.N.O.)

SLABS ON GRADE ---------- 4,000 PSI
FOUNDATIONS ---------- 3,000 PSI

MECHANICALLY VIBRATE ALL CONCRETE WHEN PLACED, EXCEPT THAT SLABS ON GRADE NEED BE VIBRATED ONLY AROUND UNDER–FLOOR DUCTS, ETC. MAXIMUM SLUMP 4 1/2" FOR CONCRETE WITHOUT PLASTICIZER. IF PLASTICIZER IS USED, A HIGHER FINAL SLUMP MAY BE ALLOWED UPON STRUCTURAL ENGINEER'S APPROVAL. CAST CLOSURE POUR AROUND COLUMNS AFTER COLUMN DEAD LOAD IS APPLIED. UNLESS APPROVED OTHERWISE IN WRITING BY THE ARCHITECT, ALL CONCRETE SLABS ON GRADE SHALL BE BOUND BY CONTROL JOINTS (KEYED OR SAW CUT), SUCH THAT THE ENCLOSED AREA DOES NOT EXCEED 225 SQUARE FEET. KEYED CONTROL JOINTS NEED ONLY OCCUR AT EXPOSED EDGES DURING POURING, ALL OTHER JOINTS MAY BE SAW CUT. CONTRACTOR SHALL SUBMIT PROPOSED LOCATIONS FOR APPROVAL PRIOR TO CONSTRUCTION.

REINFORCING:

ASTM A615 (Fy = 60 KSI) DEFORMED BARS FOR ALL BARS. ALL GRADE 60 REINFORCING TO BE WELDED SHALL BE ASTM A706. WELDED WIRE FABRIC PER ASTM A185, WIRE PER ASTM A82. NO TACK WELDING OF REINFORCING BARS ALLOWED WITHOUT PRIOR REVIEW OF PROCEDURE WITH THE STRUCTURAL ENGINEER. LATEST ACI CODE AND DETAILING MANUAL APPLY. CLEAR CONCRETE COVERAGES AS FOLLOWS:

CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH -- 3"
EXPOSED TO EARTH OR WEATHER
#6 OR LARGER ---------- 2"
#5 AND SMALLER ---------- 1 1/2"
COLUMNS (TO TIES) ---------- 1 1/2"
BEAMS (TO STIRRUPS) ---------- 1 1/2"
FLAT SLAB ---------- 3/4"
ALL OTHER PER LATEST EDITION OF ACI 318.

LAP SPLICES IN CONCRETE:

LAP SPLICES, UNLESS NOTED OTHERWISE, SHALL BE CLASS "B" TENSION LAP SPLICES PER LATEST EDITION OF ACI 318. LAP SPLICES IN CONCRETE COLUMNS SHALL BE STANDARD COMPRESSION LAP SPLICES. STAGGER SPLICES A MINIMUM OF ONE LAP LENGTH. LAPS IN WELDED WIRE FABRIC SHALL BE MADE SO THAT THE OVERLAP, MEASURED BETWEEN OUTERMOST CROSS WIRES OF EACH FABRIC SHEET, IS NOT LESS THAN THE SPACING OF CROSS WIRES PLUS 2 INCHES. ALL WELDED WIRE FABRIC SHALL BE CHAIRED TO ENSURE PROPER CLEARANCES.

ALL SPLICE LOCATIONS SUBJECT TO APPROVAL BY THE STRUCTURAL ENGINEER. PROVIDE BENT CORNER BARS TO MATCH AND LAP WITH HORIZONTAL BARS AT ALL CORNERS AND INTERSECTIONS PER TYPICAL DETAILS. REINFORCING BAR SPACING GIVEN ARE MAXIMUM ON CENTERS. ALL BARS PER CRSI SPECIFICATIONS AND HANDBOOK. DOWEL ALL VERTICAL REINFORCING TO FOUNDATION WITH STANDARD 90–DEGREE HOOKS UNLESS NOTED OTHERWISE. SECURELY TIE ALL BARS IN LOCATION BEFORE PLACING CONCRETE. CONCRETE COLUMN DOWEL EMBEDMENT SHALL BE A STANDARD COMPRESSION DOWEL WITH EMBEDMENT LENGTH ACCORDING TO THE LATEST EDITION OF THE ACI 318. (UNLESS NOTED OTHERWISE ON PLANS OR DETAILS).

MASONRY:

MECHANICALLY VIBRATE GROUT IN VERTICAL SPACES IMMEDIATELY AFTER POURING AND AGAIN ABOUT 5 MINUTES LATER. PROVIDE CLEANOUTS IF GROUT LIFT EXCEEDS 4'–0" IN BLOCK WALLS. MAXIMUM GROUT LIFT SHALL BE 8'–0". UNLESS NOTED OTHERWISE ON THE PLANS, PLACE CONTROL JOINTS IN MASONRY WALLS SUCH THAT NO STRAIGHT RUN OF WALL EXCEEDS 24'–0". CONTROL JOINTS SHALL NOT OCCUR AT WALL CORNERS, INTERSECTIONS, ENDS, WITHIN 24" OF CONCENTRATED POINTS OF BEARING OR JAMBS, OR OVER OPENINGS UNLESS SPECIFICALLY SHOWN ON THE STRUCTURAL DRAWINGS. ALL MASONRY BELOW FINISHED FLOOR OR GRADE SHALL BE GROUTED SOLID. LAP SPLICES SHALL BE AS FOLLOWS:

BAR SIZE	#3	#4	#5	#6	#7	#8	#9
BAR LAPS (inches)	27	36	45	54	63	72	81

HOLLOW CONCRETE MASONRY UNITS SHALL CONFORM TO ASTM C90, NORMAL WEIGHT, RUNNING BOND, MORTAR TYPE S (1800 PSI), COMPRESSIVE STRENGTHS AS FOLLOWS:

F'm(PSI)	UNIT STRENGTH, NET (PSI)	GROUT (PSI)	LOCATION
1500	1900	2000	TYPICAL U.N.O.

VERTICAL REINFORCING:

1 #4 IN CENTER OF GROUT AT CENTER OF WALL, CONTINUOUS FULL HEIGHT OF WALL AT ALL CORNERS, INTERSECTIONS, WALL ENDS, BEAM BEARINGS, JAMBS, EACH SIDE OF CONTROL JOINTS AND AT INTERVALS NOT TO EXCEED 24" O.C. UNLESS NOTED OTHERWISE. TIE AT 8'–0" VERTICALLY, WITH SINGLE WIRE LOOP TIE BY A.A. WIRE PRODUCTS COMPANY. LAP SPLICES SHALL BE AS PER SCHEDULE UNDER "MASONRY" SECTION. DOWEL ALL VERTICAL REINFORCING TO FOUNDATION WITH DOWELS TO MATCH VERTICAL REINFORCING.

HORIZONTAL REINFORCING:

1 #5 IN MINIMUM 8" DEEP GROUTED CONTINUOUS BOND BEAM AT TOP OF PARAPET OR TOP OF A FREESTANDING WALL AND AT BOTTOM OF WALL. USE 1 #4 HORIZONTAL BOND BEAM AT 48" O.C. VERTICALL SPACED FOR ALL ALL WALLS WITHOUT RUNNING BOND (STACKED BOND). PLACE THESE BARS CONTINUOUS THRU CONTROL JOINTS PER TYPICAL DETAIL. PROVIDE BENT BARS PER TYPICAL DETAILS, TO MATCH HORIZONTAL BOND BEAM REINFORCING, AT CORNERS AND WALL INTERSECTION TO MAINTAIN BOND BEAM CONTINUITY. LAP SPLICES SHALL BE AS PER SCHEDULE UNDER "MASONRY" SECTION. DO NOT SPLICE WITHIN 8'–0" OF CONTROL JOINTS. STANDARD WEIGHT (NO. 9 GAGE WIRE) DUR–O–WAL OR DUR–O–WIRE (OR EQUIVALENT) LADDER TYPE JOINT REINFORCEMENT AT 16" O.C. IN MASONRY WALLS.

HELICAL STEEL PILES:

1. HELICAL DRIVEN STEEL PILE FOUNDATION SYSTEM SHALL BE 2 7/8"ø PILES BY RAM JACK FOUNDATION SYSTEMS PER ICC–ES REPORT ESR–1854.
2. INSTALLATION FOR HELICAL DRIVEN PILES SHALL BE AS SPECIFIED IN ICC–ES REPORT ESR–1854.
3. FOUNDATION REPOST BRACKETS SHALL BE RD. 2136 OR RD. 2306 (FORMALLY BRACKET #4021.1 & 4021.55, RESPECTIVELY). THE VERTICAL AND BOTTOM FACES OF THE FOUNDATION MUST BE SMOOTH AND AT RIGHT ANGLES OF EACH OTHER FOR THE MOUNTING OF THE PILE BRACKET. PROVIDE HIGH STRENGTH NON–SHRINK, NON–METALLIC FIVE STAR GROUT PER ASTM C 1007 TO CREATE UNIFORM BEARING SURFACES AS REQ'D TO MEET THIS CONDITION.
4. PILES SHALL BE DRIVEN TO A DEPTH NECESSARY TO ACHIEVE AND SUSTAIN A REQUIRED AXIAL LOAD AS INDICATED ON THE DRAWINGS. THE TABLE BELOW INDICATES CORRESPONDING DIAL GAUGE MAXIMUM TORQUE RATING FOR INSTALLATION LOG DOCUMENTATION.
5. PILES SHALL BE DRIVEN TO A MINIMUM DEPTH OF 5 FEET.
6. TO ACHIEVE THE REQUIRED AXIAL LOAD, ADVANCEMENT OF THE PILE SHALL CONTINUE UNTIL ONE OF THE FOLLOWING TWO ITEMS OCCUR:
   A. A FIELD VERIFIED HYDRAULIC PRESSURE CORRESPONDING TO THE AXIAL LOAD REQUIREMENT IS REACHED AND SUSTAINED.
   B. THE STRUCTURE EXPERIENCES FLEXURAL UPLIFT.
7. FOUNDATION JACKING SHALL BE PERFORMED ONLY TO THE POINT OF SUPPORTING THE (E) FOUNDATION SYSTEM. DO NOT LIFT THE FOUNDATION SYSTEM UNLESS CONDITIONS WARRANT SUCH (I.E. THERE ARE EXISTING RELIEF CRACKS IN THE AREA THAT ARE ANTICIPATED TO CLOSE WHEN THE FOUNDATION IS LIFTED).
8. THE INSTALLATION CONTRACTOR SHALL SUBMIT THE FOLLOWING DOCUMENTATION TO THE ENGINEER OF RECORD:
   A. BEFORE THE START OF WORK, SUBMIT INSTALLER'S CERTIFICATION BY THE MANUFACTURER.
      AT THE END OF WORK, SUBMIT INSTALLATION LOG INDICATING THE FOLLOWING FOR EACH PILE INSTALLED, BRACKET PRODUCT NUMBER USED, SUSTAINED AXIAL LOAD ACHIEVED, PILE INCLINATION ANGLE, AND PILE INSTALLATION DEPTH.

NEW CONSTRUCTION PILE CAPACITIES				
HELICAL PILE DIAMETER (IN)	TORQUE RATING (FT–LBS)	KT	BRACED PILE CAPACITY (KIP)	
			ULTIMATE	ALLOWABLE (S.F. = 2)
2 3/8	4,000	10	40.0	20.0
2 7/8	8,000	9	72.0	36.0
3 1/2	14,000	7	98.0	49.0
4 1/2	23,000	6	138.0	69.0

*VALUES OBTAINED FROM RAMJACK DESIGN MANUAL.

1 BRACED PILE IS DEFINED IN SECTION 1810.2.2 OF THE 2018 INTERNATIONAL BUILDING CODE (IBC). CONTRACTOR SHALL ENSURE THE DEFINITION IS CLEARLY UNDERSTOOD BEFORE RELYING ON THE BRACED PILE CAPACITIES LISTED ABOVE.

2 THE MINIMUM CENTER–TO CENTER SPACING OF HELICAL DRIVEN PILES SHALL BE 4D WHERE "D" IS THE HELICAL PLATE DIAMETER (8").

SPECIAL INSPECTIONS:

1. THESE PLANS HAVE BEEN PREPARED IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN ICC–ES REPORT #ESR–1854 (REVISED MARCH 2022). THE REPAIRS ARE MADE ONLY TO ENHANCE THE VERTICAL STABILITY OF THE PORTION OF THE STRUCTURE TO RECEIVE HYDRAULIC PILE UNDERPINNING, AS INDICATED ON THE DRAWINGS. NO MEANS OF STABILIZATION FOR ANY OTHER PORTIONS OF THE STRUCTURE IS INTENDED OR IMPLIED IN THE DESIGN.
2. THESE DRAWINGS PERTAIN TO STRUCTURAL ITEMS ONLY AND DO NOT ADDRESS PLUMBING, MECHANICAL, ELECTRICAL, OR ARCHITECTURAL ITEMS.
3. THESE DRAWINGS SPECIFICALLY EXCLUDE ANY WORK TO BE DONE ON WALLS AND WALL FINISHES, SUCH AS PLASTER OR STUCCO.
4. THESE DRAWINGS ARE FOR THE EXCLUSIVE USE OF OUR CLIENT.
5. THESE DRAWINGS ARE APPLICABLE ONLY FOR REPAIRS PERFORMED WITHIN 60 DAYS OF THE DATE INDICATED ON THE DRAWINGS.

SPECIAL INSPECTION:

PER IBC CHAPTER 17, SPECIAL INSPECTION IS REQUIRED FOR THE FOLLOWING ITEMS:

CONCRETE: VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERRENCED STANDARD (NOTE 1)	IBC REFERENCE
1. Inspection of reinforcing steel, and placement.	–	X	ACI 318: 3.5, 7.1–7.7	1913.4
2. Inspection of reinforcing steel welding in accordance with Table 1704.3, item 5b.	–	–	AWS D1.4 ACI 318: 3.5.2	---
3. Inspect bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased.	X	–	ACI 318: APPENDIX D	1912
4. Inspection of prestressing concrete: a. Application of prestressing forces.		–	ACI 318: 18.20 ACI 318: 18.18.4	---
5. Verifying use of required design mix.	–	X	ACI 318: CH. 4, 5.2–5.4	1904.2.2, 1913.2, 1913.3
6. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	–	ASTM C 172 ASTM C 31 ACI 318: 5.6, 5.8	1913.10
7. Inspection of concrete placement for proper application techniques.	X	–	ACI 318: 5.9, 5.10	1913.6, 1913.7, 1913.8
8. Inspection for maintenance of specified curing temperature and techniques.	–	X	ACI 318: 5.11, 5.13	1913.9
9. Inspect formwork for shape, location and dimensions of the concrete member being formed.	–	X	ACI 318: 6.1.1	

NOTES:
1. WHERE APPLICABLE, SEE ALSO SECTION 1705.11, SPECIAL INSPECTION FOR SEISMIC RESISTANCE.
2. TABLES TAKEN DIRECTLY FROM IBC FOR REFERENCE.

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD (NOTE1)	IBC REFERENCE
SOILS: 1. Excavation, recompaction and proper bearing surface for foundations not the responsibility of the structural engineer. Special inspection certificate to be completed by geotechnical engineer.	– –	– X		

DUTIES AND RESPONSIBILITIES OF THE SPECIAL INSPECTOR:

A) THE SPECIAL INSPECTOR SHALL OBSERVE THE WORK ASSIGNED TO BE CERTAIN IT CONFORMS WITH THE APPROVED DESIGN DRAWINGS AND SPECIFICATION.
B) THE SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE BUILDING OFFICIAL, AND TO THE ENGINEER.
C) UPON COMPLETION OF THE ASSIGNED WORK THE ENGINEER OR ARCHITECT SHALL COMPLETE AND SIGN THE APPROPRIATE FORMS CERTIFYING THAT TO THE BEST OF HIS KNOWLEDGE THE WORK IS IN CONFORMANCE WITH THE APPROVED PLANS AND SPECIFICATIONS AND THE APPLICABLE WORKMANSHIP PROVISIONS OF THE CODE.

ADDITIONAL NOTES:

1. THESE PLANS HAVE BEEN PREPARED IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN ICC–ES REPORT #ESR–1854 (REVISED FEBRUARY 2014). THE REPAIRS ARE MADE ONLY TO ENHANCE THE VERTICAL STABILITY OF THE PORTION OF THE STRUCTURE TO RECEIVE HYDRAULIC PILE UNDERPINNING, AS INDICATED ON THE DRAWINGS. NO MEANS OF STABILIZATION FOR ANY OTHER PORTIONS OF THE STRUCTURE IS INTENDED OR IMPLIED IN THE DESIGN.
2. THESE DRAWINGS PERTAIN TO STRUCTURAL ITEMS ONLY AND DO NOT ADDRESS PLUMBING, MECHANICAL, ELECTRICAL, OR ARCHITECTURAL ITEMS.
3. THESE DRAWINGS SPECIFICALLY EXCLUDE ANY WORK TO BE DONE ON WALLS AND WALL FINISHES, SUCH AS PLASTER OR STUCCO.
4. THESE DRAWINGS ARE FOR THE EXCLUSIVE USE OF OUR CLIENT.
5. THESE DRAWINGS ARE APPLICABLE ONLY FOR REPAIRS PERFORMED WITHIN 60 DAYS OF THE DATE INDICATED ON THE DRAWINGS.

ABBREVIATIONS:

ADD'L	ADDITIONAL
BLDG.	BUILDING
CLR.	CLEAR
CONC.	CONCRETE
CONN.	CONNECTION
CONST.	CONSTRUCTION
CONT.	CONTINUOUS
CMU	CONCRETE MASONRY UNIT
DEG.	DEGREE(S)
DTL.	DETAIL
(E)	EXISTING
EA.	EACH
ELEV.	ELEVATION
EQ.	EQUAL/EQUALLY
FTG.	FOOTING
HORIZ.	HORIZONTAL
K	KIPS
KSI	KIPS PER SQUARE INCH
LB.	POUND
MAT'L	MATERIAL
MAX.	MAXIMUM
MCJ	MASONRY CONTROL JOINT
MFR.	MANUFACTURER
MIN.	MINIMUM
(N)	NEW
O.C.	ON CENTER
OPNG.	OPENING
OPP.	OPPOSITE
PAR.	PARALLEL
PERP.	PERPENDICULAR
PSI	POUND PER SQUARE INCH
REQ'D	REQUIRED
REV.	REVISION
SCHED.	SCHEDULE
SIM.	SIMILAR
STL	STEEL
STRUCT.	STRUCTURAL/STRUCTURE
TRANS.	TRANSVERSE
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
VERT.	VERTICAL

PULTE HOMES
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PM ENGINEERING
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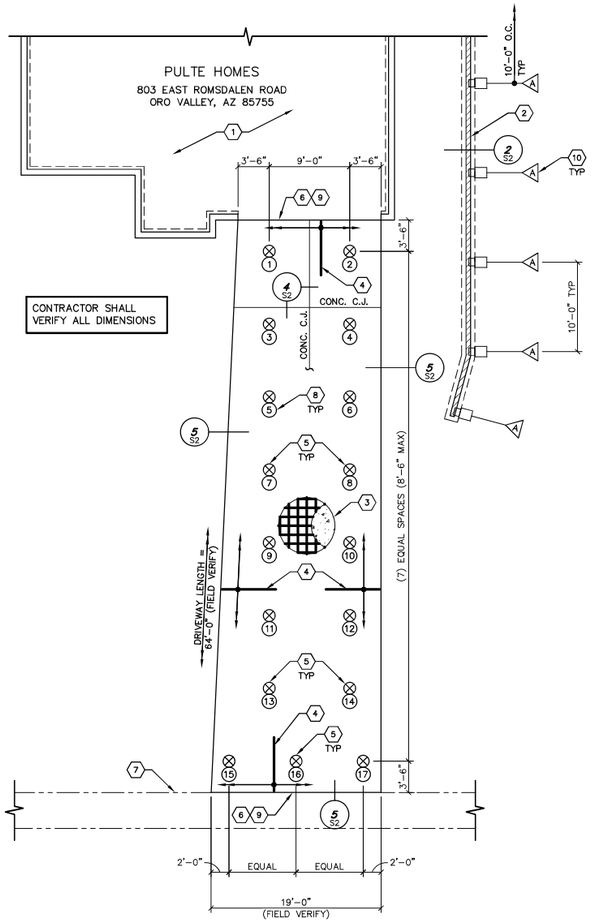
Chandler, Arizona 85226
Phone: (480)213–4309
Email: pkukla@cox.net
Job Number: 1014589

DATE: 05–23–2023
REVISIONS:
1 _____
2 _____
3 _____
4 _____
5 _____

Registered Professional Engineer (Structural) CERTIFICATE NO. 22969 PAUL M. KUKLA 05/23/2023 REGISTERED ENGINEER ARIZONA, U.S.A.

S1

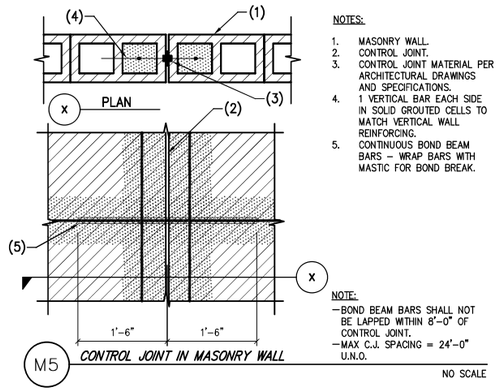
STRUCTURAL NOTES



1 PARTIAL FOUNDATION PLAN

SCALE: 1/8" = 1'-0"

NORTH



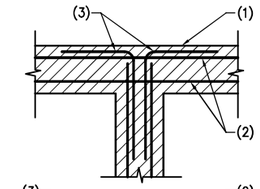
NOTES:

1. MASONRY WALL.
2. CONTROL JOINT.
3. CONTROL JOINT MATERIAL PER ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.
4. 1 VERTICAL BAR EACH SIDE IN SOLID GROUTED CELLS TO MATCH VERTICAL WALL REINFORCING.
5. CONTINUOUS BOND BEAM BARS – WRAP BARS WITH MASTIC FOR BOND BREAK.

NOTE:
– BOND BEAM BARS SHALL NOT BE LAPPED WITHIN 8'–0" OF CONTROL JOINT.
– MAX C.J. SPACING = 24'–0" U.N.O.

M5 *CONTROL JOINT IN MASONRY WALL*

NO SCALE

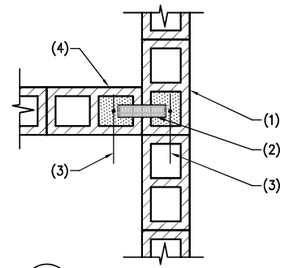


NOTES:

1. MASONRY WALL.
2. BOND BEAM REINFORCING.
3. CORNER BARS SAME SIZE AND SPACING AS HORIZONTAL REINFORCING – LAP PER G.S.N. (24" MINIMUM).

M2 *MASONRY BOND BEAM AT INTERSECTING WALLS*

NO SCALE

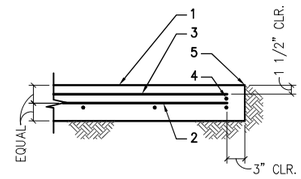


NOTES:

1. MASONRY WALL.
2. 1/8" THICK X 1 1/4" WIDE X 2" X 8" X 2" BENT STEEL "Z" BAR AT 48" O.C.
3. 1 VERTICAL BAR IN GROUTED CELLS AT END OR AT INTERSECTION OF WALLS.
4. MASONRY WALL WHICH ABUTS CONTINUOUS MASONRY WALL AND IT NOT "TOOTHED" INTO IT.

M4 *TYPICAL CONNECTION FOR NON–TOOTHED ABUTTING MASONRY WALLS*

NO SCALE

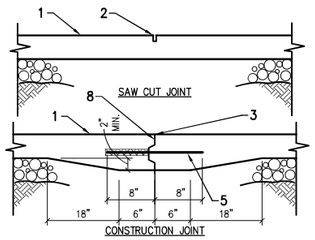


NOTES:

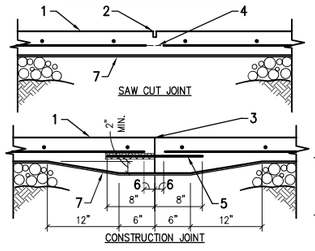
1. 6" CONCRETE SLAB ON GRADE.
2. #4 AT 12" O.C. EACH WAY.
3. #4x6'–0" AT 10" O.C. TOP BARS.
4. #4 CONTINUOUS.
5. SLAB EDGE.

5 REINFORCED CONCRETE SLAB ON GRADE AT SLAB EDGE

N.T.S.



UNREINFORCED CONCRETE SLAB



NOTES:

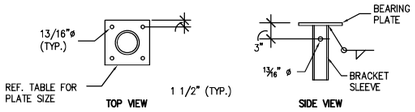
1. CONCRETE SLAB ON GRADE.
2. SAWCUT – 1/8" WIDE x1/4 SLAB THICKNESS IN DEPTH – CUT SHALL BE MADE SOON ENOUGH TO PREVENT SHRINKAGE CRACKING, BUT NOT SO SOON AS TO CAUSE SPALLING OF THE CONCRETE WHILE SAWING. WORK MUST BE ACCOMPLISHED WITHIN 24 HOURS OF CONCRETE PLACEMENT.
3. CONSTRUCTION JOINT.
4. CUT EVERY OTHER BAR.
5. 1/2"ø x16" LONG SMOOTH DOWEL AT 24" O.C. – DOWELS MUST BE CAREFULLY ALIGNED AND SUPPORTED DURING CONCRETE OPERATION. MISALIGNED DOWELS CAUSE CRACKING.
6. STOP SLAB REINF. AT 1 1/2" FROM JOINT.
7. VAPOR BARRIER WHERE SPECIFIED ON PLAN.
8. AT CONTRACTOR OPTION TO USE KEY JOINT IN LIEU OF SLAB DOWEL AT SLAB LEAVE OUT AREA ONLY.

NOTE:
– CONSTRUCTION JOINTS NEED ONLY OCCUR AT EXPOSED EDGES DURING PLACEMENT UNLESS SPECIFICALLY NOTED ON THE PLANS.

– SLAB'S REINFORCEMENT TO BE LOCATED AT THE TOP 1/3 OF SLAB THICKNESS WHERE VAPOR BARRIER SPECIFIED ON PLANS.

4 REINFORCED CONCRETE SLAB CONTROL JOINTS IN CONCRETE SLAB ON GRADE

N.T.S.

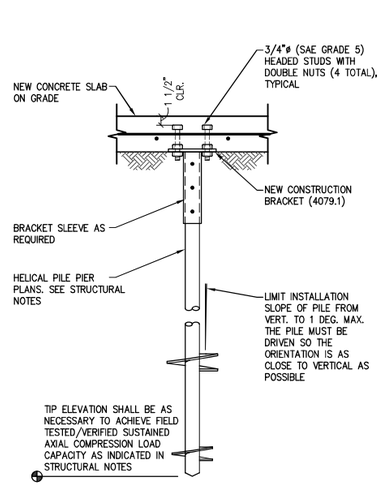


STANDARD NEW CONSTRUCTION BRACKET CHART

PART NUMBER	DIAMETER OF PILE	ALLOWABLE LOAD CAPACITY	BEARING PLATE SIZE	BRACKET SLEEVE AND LENGTH
4074	2 7/8"	24.2 KIPS	PL 7/8" x 8" x 0'-8	2 7/8"Ø x 0'-8
4075	2 7/8"	20.6 KIPS	PL 7/8" x4" x 0'-8	3 1/2"Ø x 0'-10
4079	2 7/8"	36.5 KIPS	PL 7/8" x 8" x 0'-8	3 1/2"Ø x 0'-10
4076	3 1/2"	65.1 KIPS	PL 1" x 9" x 0'-9	2 7/8"Ø x 0'-10
4077	4 1/2"	75.8 KIPS	PL 1" x 9" x 0'-9	3 1/2"Ø x 0'-10
RD.1045	5.563"	80 KIPS	PL 1" x 10" x 0'-10	4 1/2"Ø x 0'-10

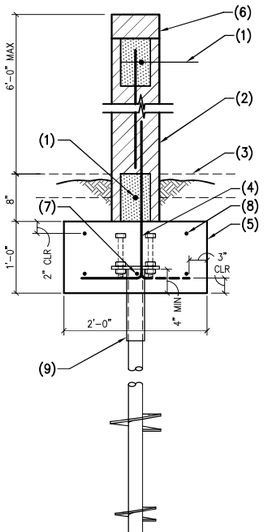
NOTES:

1. POLYETHYLENE COPOLYMER THERMOPLASTIC COATING PER ICC–ES AC 228
2. REFERENCE PRE–CONSTRUCTION BRACKET CHART FOR ALLOWABLE LOAD CAPACITY OF BRACKET ONLY.
3. MANUFACTURER TO HAVE IN EFFECT INDUSTRY RECOGNIZED WRITTEN QUALITY CONTROL AND ASSURANCE FOR ALL MATERIALS AND MANUFACTURING PROCESSES.
4. MANUFACTURER SHALL BE ISO CERTIFIED.
5. ALL WELDING IS TO BE DONE BY WELDERS CERTIFIED UNDER SECTION 5 OF THE AWS CODE D1.1.
6. THE CAPACITY OF THE UNDERPINNING SYSTEM IS A FUNCTION OF MANY INDIVIDUAL ELEMENTS, INCLUDING THE CAPACITY OF THE FOUNDATION, BRACKET, PIER SHAFT, HELICAL PLATE, AND BEARING STRATA, AS WELL AS THE STRENGTH OF THE FOUNDATION BRACKET CONNECTION AND THE QUALITY OF THE INSTALLATION OF THE PILE. YOUR ACHIEVABLE CAPACITIES COULD BE HIGHER OR LOWER THAN THOSE LISTED DEPENDING ON THE ABOVE FACTORS.
7. SEE ICC–ES EVALUATION REPORT ESR–1854 AND RAM JACK ENGINEERING HANDBOOK FOR ALLOWABLE VALUES AND/OR CONDITIONS OF USE CONCERNING MATERIAL PRESENTED IN THIS DOCUMENT.



3 NEW CONSTRUCTION BRACKET WITH HELICAL PILE

N.T.S.



NOTES:

1. 1 #5 CONTINUOUS IN 8" DEEP GROUTED BOND BEAM.
2. 6" MASONRY WALL W/ #4 VERTICALS AT 24" O.C.
3. FINISHED GRADE OR CONC. SLAB WHERE OCCURS.
4. DOWELS TO MATCH AND LAP VERTICAL WALL REINFORCING PER G.S.N. – ALTERNATE BENDS.
5. CONTINUOUS CONCRETE FOOTING.
6. MASONRY CAP PER ARCH'L.
7. 3 #5 CONTINUOUS.
8. 2 #5 CONTINUOUS TOP AND BOTTOM.
9. PROVIDE 3 1/2"ø X 4'–0" LONG GUIDE SLEEVE, TYPICAL.

NOTES:
– FOR TOP OF WALL ELEV., REFER TO ARCH'L/CIVIL/ LANDSCAPE DWGS.
– SPECIAL INSPECTION IS REQUIRED FOR REINFORCING STEEL AND FOOTING.
– SEE G.S.N. SHEET S1 FOR MASONRY WALL INFORMATION NOT NOTED.
– PROVIDE MASONRY CONTROL JOINTS, MCJS, PER G.S.N.
– PROVIDE 3'–4" LAP SPLICE FOR FOOTING REINFORCING. STAGGER SPLICES.

2 *TYPICAL FREE–STANDING MASONRY WALL AND FOOTING*

NO SCALE

KEYNOTES

1. (E) SINGLE FAMILY RESIDENCE.
2. NEW 6" MASONRY SCREEN WALL.
3. NEW 6" THICK CONCRETE SLAB–ON–GRADE WITH #4 AT 12" O.C. EACH WAY CENTERED IN SLAB. OVER 4" A.B.C. SEE GEOTECHNICAL REPRESENTATIVE FOR UNDERLYING SOILS PREPARATION.
4. #4x6'–0" AT 10" O.C. TOP BARS, SEE DETAIL 5/S2.
5. ⊗ INDICATES HELICAL DRIVEN PILE WITH NEW CONSTRUCTION BRACKET – SEE DETAIL 3/S2. CONSTRUCTION BRACKET SHALL BE #4079.1 AS SPECIFIED IN ICC–ES REPORT 1854.
6. LIMIT OF NEW CONCRETE DRIVEWAY.
7. (E) CONCRETE SIDEWALK TO REMAIN.
8. ① INDICATES PIER NUMBER FOR FIELD VERIFICATION PURPOSES.
9. PROVIDE 1/2" COMPRESSIBLE MATERIAL AT LIMIT OF CONCRETE.
10. ⊗ INDICATES HELICAL DRIVEN PILE WITH NEW CONSTRUCTION BRACKET – SEE DETAIL 3/S2. CONSTRUCTION BRACKET

GENERAL NOTES:

1. THESE FOUNDATION UNDERPINNING DRAWINGS HAVE BEEN PREPARED IN AN ATTEMPT TO ADDRESS DIFFERENTIAL FOUNDATION SETTLEMENT OCCURRING ONLY AT SPECIFIC AREAS OF THE EXISTING FOUNDATION SYSTEM. SHOULD SETTLEMENT OCCUR AT OTHER AREAS OF THE FOUNDATION SYSTEM NOT SUPPORTED BY PILES, ADDITIONAL CRACKS MAY DEVELOP IN THE EXISTING FOUNDATION AND/OR WALLS NEAR THE AREAS OF THE PILES.
2. THESE FOUNDATION UNDERPINNING PLANS ARE BASED ON INFORMATION PROVIDED BY RAM JACK OF ARIZONA. DIMENSIONS SHOWN ARE APPROXIMATE AND ARE BASED ON FIELD MEASUREMENTS TAKEN BY RAM JACK OF ARIZONA.

LEGEND:

⊗ 2 7/8"ø HELICAL PIER – 18.2 KIP LOAD (SEE DETAIL 3/S2)

A 2 7/8"ø HELICAL PIER – 20.0 KIP LOAD (SEE DETAIL 2/S2)

PULTE HOMES

803 EAST
ROMSDALEN ROAD
ORO VALLEY, AZ 85755

PM ENGINEERING
4939 West Ray Road, Suite 4–XXX
Chandler, Arizona 85226
Phone: (480)213–4309
Email: pkukla@cox.net
Job Number: 1014589

DATE: 05–23–2023
REVISIONS:
1
2
3
4
5

Registered Professional Engineer Certificate No. 22969 PAUL M. KUKLA 05/23/2023 ARIZONA U.S.A.

S2

PARTIAL FOUNDATION PLAN

STRUCTURAL CALCULATIONS

FOR

PULTE HOMES

803 EAST RAMSDALEN ROAD

ORO VALLEY, AZ

FOUNDATION UNDERPINNING

PREPARED FOR:

RAM JACK OF ARIZONA

MAY 22, 2023

BASIS OF DESIGN

DESCRIPTION OF STRUCTURE: Calculations are for foundation underpinning of an (E) single-family residence using Hydraulic steel piles. A portion of the residence is *to* be underpinned to stabilize a concrete driveway that has settled.

BUILDING CODE:
2018 IBC Section 1810

CONCRETE: ---------- fc = 3000 psi for foundations; 4000 psi for driveway SOG

REINFORCING STEEL:-------- ASTM A 615, Gr. 60

STRUCTURAL STEEL: ---------- See ICC-ES Report ESR-1854

UNDERPINNING SYSTEM:-------- Ram Jack® Helical Foundation Systems per ICC-ES Report ESR-1854 (Revised March 2022)

•STEEL PILES:---------- 2 7/8", 3 1/2" diam. Steel pipe

•SUPPORT BRACKET:------ #4079.1 New construction bracket per ICC-ES Report 1854

SOILS: ---------- ICC-ES Report ESR-1854 indicates a soils report must be submitted for each project. When using hydraulic driven piles and when design under IRC, in-field load testing of each driven pile is preferred in lieu of a soils report, which only generally describes soils in the vicinity of the repairs. In-field load testing for each driven pile provides for the most accurate and reliable method of axial load capacity verification, and is superior to a soils report in terms of in-place or installed performance verification. This project requires in-place load verification of each pile, which shall be submitted for approval to the EOR via an installation log. In-place load verification shall be provided for using pressure readings obtained from dial gauges associated with hydraulic equipment used to install the piles. The installation log shall include axial load capacities corresponding to in-field measured pressure dial gauge readings.

SPECIAL INSPECTIONS: ---------- ICC-ES Report ESR-1854 indicates that periodic Special Inspections are required for installation of helical piles, with no mention of Special Inspections for hydraulically driven piles. This project requires periodic Special Inspection for the installation of the driven piles. Periodic Special Inspection shall include the following items:

1. Verify mfr. and installer's certification by the mfr.
2. Verify bracket product number.
3. Verify installation of brackets complies with approved construction documents and ICC-ES Report ESR-1854.
4. Verify pile type and size.
5. Verify installed pile inclination angle.
6. Verify installed pile locations.
7. Verify installation log complies with requirements indicated.

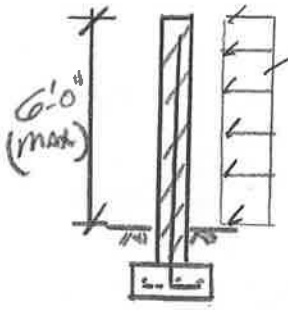
Job Name PULTE HOMES 803

Job No. _____ Sheet No. _____

By _____ Date 5/23

MASONRY SCREEN WALL:

- 6" CMU
- WIND SPEED = 115 MPH
  RISK CATEGORY II
  WIND EXPOSURE C
- ∴ WIND CONTROLS OVER SEISMIC



25 PSF (ULTIMATE)
SEE WIND ANALYSIS PRINTOUT

SEISMIC DESIGN CAT. "C"
$S_{DS} = 0.284$ (PER ATC HAZARDS)

ASCE EQ. (13.3-1)

$$F_p = \frac{0.4 a_p S_{DS} W}{\left(\frac{R_p}{I}\right)}\left(1+2\frac{z}{h}\right)$$

$a_p = 2.5$, $R_p = 2.5$ (FREE STANDING WALL)

$$F_p = \frac{0.4(0.284)(2.5)(50PSF)}{\left(\frac{2.5}{1.0}\right)}\left(1+2(1.0)\right)$$

$= 17.0$ PSF $<$ 25.0PSF WIND GOVERNS

USE: 6" CMU
W/ #4 VERT'S @ 24" ℄
W/ CONT. 2'-0" X 1'-0"
FTNG. W/ 3 #4 CONT.
(SEE PRINTOUT)

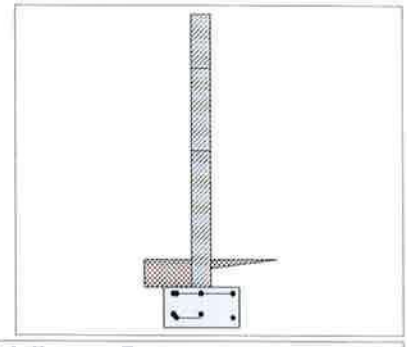
Cantilevered Retaining Wall

Criteria

Retained Height	=	0.67 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	8.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,200.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	50.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	50.0 psf
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	25.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios

Overturning	=	1.81 OK
Sliding	=	4.62 OK
Total Bearing Load	=	817 lbs
...resultant ecc.	=	6.39 in
Soil Pressure @ Toe	=	1,165 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	1,200 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,631 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	5.1 psi OK
Footing Shear @ Heel	=	2.1 psi OK
Allowable	=	82.2 psi

Sliding Calcs

Lateral Sliding Force	=	165.4 lbs
less 100% Passive Force	= -	437.4 lbs
less 100% Friction Force	= -	326.9 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing pressures.

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		3rd	2nd	Bottom
Design Height Above Ftg	ft =	Stem OK 5.33	Stem OK 3.33	Stem OK 0.00
Wall Material Above "Ht"	=	Masonry	Masonry	Masonry
Design Method	=	ASD	ASD	ASD
Thickness	=	6.00	6.00	6.00
Rebar Size	=	# 4	# 4	# 4
Rebar Spacing	=	24.00	24.00	24.00
Rebar Placed at	=	Center	Center	Edge
Design Data				
fb/FB + fa/Fa	=	**0.021**	**0.129**	**0.519**
Total Force @ Section				
Service Level	lbs =	20.1	50.1	108.5
Strength Level	lbs =			
Moment....Actual				
Service Level	ft-# =	13.5	83.7	335.6
Strength Level	ft-# =			
Moment.....Allowable	ft-# =	647.3	647.3	647.3
Shear.....Actual				
Service Level	psi =	0.3	0.7	1.6
Strength Level	psi =			
Shear.....Allowable	psi =	41.7	42.2	43.1
Anet (Masonry)	in2 =	67.50	67.50	67.50
Rebar Depth 'd'	in =	2.75	2.75	2.75
Masonry Data				
f'm	psi =	1,350	1,350	1,350
Fs	psi =	32,000	32,000	32,000
Solid Grouting	=	Yes	Yes	Yes
Modular Ratio 'n'	=	23.87	23.87	23.87
Wall Weight	psf =	58.0	58.0	58.0
Short Term Factor	=	1.000	1.000	1.000
Equiv. Solid Thick.	in =	5.60	5.60	5.60
Masonry Block Type	=	Medium Weight		
Masonry Design Method	=	ASD		
Concrete Data				
f'c	psi =			
Fy	psi =			

Footing Dimensions & Strengths

Toe Width	=	0.75 ft
Heel Width	=	1.25
Total Footing Width	=	2.00
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	2.00 ft

f'c = 3,000 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,631	0 psf
Mu' : Upward	=	377	1 ft-#
Mu' : Downward	=	131	131 ft-#
Mu: Design	=	247	130 ft-#
Actual 1-Way Shear	=	5.11	2.06 psi
Allow 1-Way Shear	=	43.82	43.82 psi
Toe Reinforcing	=	# 4 @ 18.00 in	
Heel Reinforcing	=	# 4 @ 18.00 in	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined

Min footing T&S reinf Area	0.52	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:	
#4@ 9.26 in	#4@ 18.52 in	
#5@ 14.35 in	#5@ 28.70 in	
#6@ 20.37 in	#6@ 40.74 in	

Summary of Overturning & Resisting Forces & Moments

		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#			.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	48.8	0.56	27.2	Soil Over Heel	=	55.3	1.63	89.8
Surcharge over Heel	=	26.6	0.84	22.2	Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=	37.5	1.63	60.9
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=			
Load @ Stem Above Soil	=	90.0	4.67	420.3	* Axial Live Load on Stem	=			
	=				Soil Over Toe	=		0.38	
					Surcharge Over Toe	=	37.5	0.38	14.1
Total		165.4	**O.T.M.**	469.7	Stem Weight(s)	=	386.9	1.00	386.9
	=		=		Earth @ Stem Transitions	=			
					Footing Weight	=	300.0	1.00	300.0
					Key Weight	=		2.00	
					Vert. Component	=			
					Total =		817.1 lbs	**R.M.=**	851.7

Resisting/Overturning Ratio = 1.81
Vertical Loads used for Soil Pressure = 817.1 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.108	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

Code Search

Code: International Building Code 2018

Occupancy:

Occupancy Group = B Business

Risk Category & Importance Factors:

Risk Category =	II
Wind factor =	1.00
Snow factor =	1.00
Seismic factor =	1.00

Type of Construction:

Fire Rating:

Roof =	0.0 hr
Floor =	0.0 hr

Building Geometry:

Roof angle (θ)	0.00 / 12	0.0 deg
Building length	128.0 ft	
Least width	128.0 ft	
Mean Roof Ht (h)	6.0 ft	
Parapet ht above grd	0.0 ft	
Minimum parapet ht	0.0 ft	

Live Loads:

Roof
0 to 200 sf: 20 psf
200 to 600 sf: 24 - 0.02Area, but not less than 12 psf
over 600 sf: 12 psf

Roofs used for roof gardens	100 psf

Floor:

Typical Floor	50 psf
Partitions	15 psf
Corridors above first floor	80 psf
Lobbies & first floor corridors	100 psf
Stairs and exit ways	100 psf

Company
Address
City, State
Phone

JOB TITLE Pulte Masonry Screen wall

JOB NO. | SHEET NO.
CALCULATED BY PMK | DATE 5/20/23
CHECKED BY | DATE

Wind Loads : ASCE 7- 16

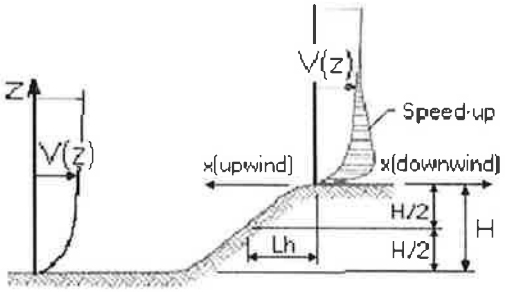
Ultimate Wind Speed	115 mph
Nominal Wind Speed	89.1 mph
Risk Category	II
Exposure Category	C
Enclosure Classif.	Open Building
Internal pressure	+/-0.00
Directionality (Kd)	0.85
Kh case 1	0.849
Kh case 2	0.849
Type of roof	Monoslope

Topographic Factor (Kzt)

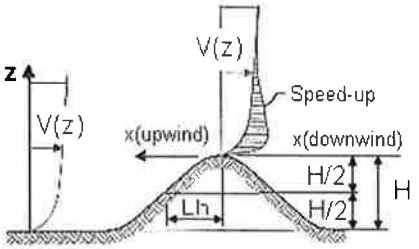
Topography		Flat
Hill Height	(H)	80.0 ft
Half Hill Length (Lh)		100.0 ft
Actual H/Lh	=	0.80
Use H/Lh	=	0.50
Modified Lh	=	160.0 ft
From top of crest: x =		50.0 ft
Bldg up/down wind?		downwind

H/Lh= 0.50 K_1 = 0.000
x/Lh = 0.31 K_2 = 0.792
z/Lh = 0.09 K_3 = 1.000

At Mean Roof Ht:
Kzt = $(1+K_1K_2K_3)^2$ = 1.00



ESCARPMENT



2D RIDGE or 3D AXISYMMETRICAL HILL

Gust Effect Factor

h =	6.0 ft
B =	128.0 ft
/z (0.6h) =	15.0 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).
If building h/B>4 then may be flexible and should be investigated.
h/B = 0.05 Rigid structure (low rise bldg)

G = 0.85 Using rigid structure default

Rigid Structure

$\bar{e}$ =	0.20
ℓ =	500 ft
z_{min} =	15 ft
c =	0.20
g_Q, g_v =	3.4
L_z =	427.1 ft
Q =	0.88
I_z =	0.23
G =	**0.86** use G = 0.85

Flexible or Dynamically Sensitive Structure

Natural Frequency (η_1) =	0.0 Hz			
Damping ratio (β) =	0			
/b =	0.65			
/α =	0.15			
Vz =	97.1			
N_1 =	0.00			
R_n =	0.000			
R_h =	28.282	η =	0.000	h = 6.0 ft
R_B =	28.282	η =	0.000	
R_L =	28.282	η =	0.000	
g_R =	0.000			
R =	0.000			
Gf =	0.000			

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JOB TITLE Pulte Masonry Screen wall

JOB NO. | SHEET NO.
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Enclosure Classification

Test for Enclosed Building: Ao < 0.01Ag or 4 sf, whichever is smaller

Test for Open Building: All walls are at least 80% open.
Ao ≥ 0.8Ag

Test for Partially Enclosed Building: Predominately open on one side only

	Input	
Ao	500.0	sf
Ag	600.0	sf
Aoi	1000.0	sf
Agi	10000.0	sf

	Test	
Ao ≥ 1.1Aoi	NO	
Ao > 4' or 0.01Ag	YES	
Aoi / Agi ≤ 0.20	YES	Building is NOT Partially Enclosed

Conditions to qualify as Partially Enclosed Building. Must satisfy all of the following:
Ao ≥ 1.1Aoi
Ao > smaller of 4' or 0.01 Ag
Aoi / Agi ≤ 0.20
Where:
Ao = the total area of openings in a wall that receives positive external pressure.
Ag = the gross area of that wall in which Ao is identified.
Aoi = the sum of the areas of openings in the building envelope (walls and roof) not including Ao.
Agi = the sum of the gross surface areas of the building envelope (walls and roof) not including Ag.

Test for Partially Open Building: A building that does not qualify as open, enclosed or partially enclosed. (This type building will have same wind pressures as an enclosed building.

Reduction Factor for large volume partially enclosed buildings (Ri) :

If the partially enclosed building contains a single room that is unpartitioned , the internal pressure coefficient may be multiplied by the reduction factor Ri.

Total area of all wall & roof openings (Aog): 0 sf
Unpartitioned internal volume (Vi) : 0 cf
Ri = 1.00

Ground Elevation Factor (Ke)

Grd level above sea level = 0.0 ft
Constant = 0.00256 Adj Constant = 0.00256
Ke = 1.0000

Company
Address
City, State
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JOB TITLE Pulte Masonry Screen wall

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Wind Loads - MWFRS all h (Except for Open Buildings)

Open Building - procedure doesn't apply

Kh (case 2) =	0.85			GCpi =	+/-0.00
Base pressure (q_h) =	**24.4 psf**	Bldg dim parallel to ridge =	128.0 ft	G =	0.85
Roof Angle (θ) =	0.0 deg	Bldg dim normal to ridge =	128.0 ft	qi = qh	
Roof tributary area:		h =	6.0 ft		
Wind normal to ridge =(h/2)*L:	384 sf	ridge ht =	6.0 ft		
Wind parallel to ridge =(h/2)*L:	384 sf				

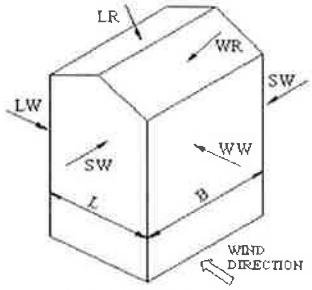
Ultimate Wind Surface Pressures (psf)

Surface	Wind Normal to Ridge L/B = 1.00 h/L = 0.05				Wind Parallel to Ridge L/B = 1.00 h/L = 0.05				
	Cp	q_hGC_p	w/+q_iGC_{pi}	w/-q_hGC_{pi}	Dist.*	Cp	q_hGC_p	w/ +q_iGC_{pi}	w/ -q_hGC_{pi}
Windward Wall (WW)	0.80	16.6	see table below			0.80	16.6	see table below	
Leeward Wall (LW)	-0.50	-10.4	-10.4	-10.4		-0.50	-10.4	-10.4	-10.4
Side Wall (SW)	-0.70	-14.5	-14.5	-14.5		-0.70	-14.5	-14.5	-14.5
Leeward Roof (LR)		**				Included in windward roof			
Neg Windward Roof: 0 to h/2*	-0.90	-18.7	-18.7	-18.7	0 to h/2*	-0.90	-18.7	-18.7	-18.7
h/2 to h*	-0.90	-18.7	-18.7	-18.7	h/2 to h*	-0.90	-18.7	-18.7	-18.7
h to 2h*	-0.50	-10.4	-10.4	-10.4	h to 2h*	-0.50	-10.4	-10.4	-10.4
> 2h*	-0.30	-6.2	-6.2	-6.2	> 2h*	-0.30	-6.2	-6.2	-6.2
Pos/min windward roof press.	-0.18	-3.7	-3.7	-3.7	Min press.	-0.18	-3.7	-3.7	-3.7

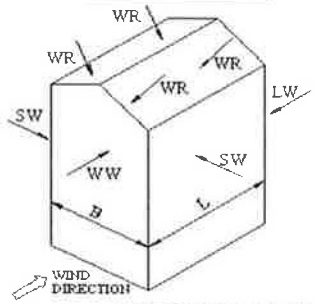
**Roof angle < 10 degrees. Therefore, leeward roof is included in windward roof pressure zones.

*Horizontal distance from windward edge

For monoslope roofs, entire roof surface is either windward or leeward surface.



WIND NORMAL TO RIDGE



WIND PARALLEL TO RIDGE

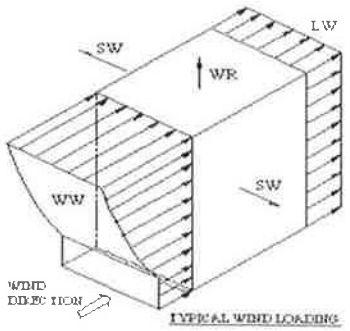
Parapet			
z	Kz	Kzt	qp (psf)
0.0 ft	0.85	1.00	0.0

Windward parapet: 0.0 psf (GCpn = +1.5)
Leeward parapet: 0.0 psf (GCpn = -1.0)

Windward roof overhangs : 16.6 psf (upward - add to windward roof pressure)

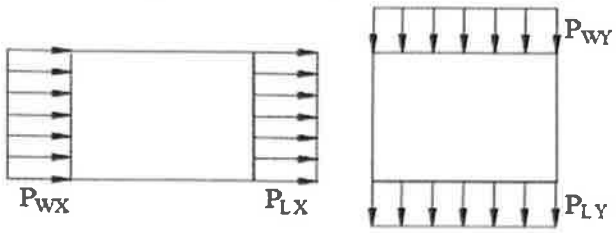
Windward Wall Pressures at "z" (psf)

	z	Kz	Kzt	Windward Wall q_zGC_p	Windward Wall w/+q_iGC_{pi}	Windward Wall w/-q_hGC_{pi}	Combined WW + LW Wind Normal to Ridge	Combined WW + LW Wind Parallel to Ridge
h=	0 to 15'	0.85	1.00	16.6	16.6	16.6	27.0	27.0

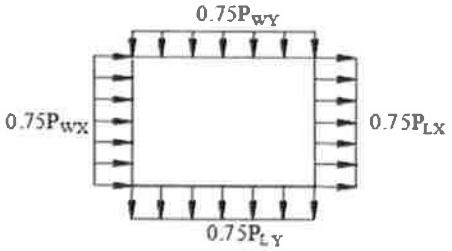


TYPICAL WIND LOADING

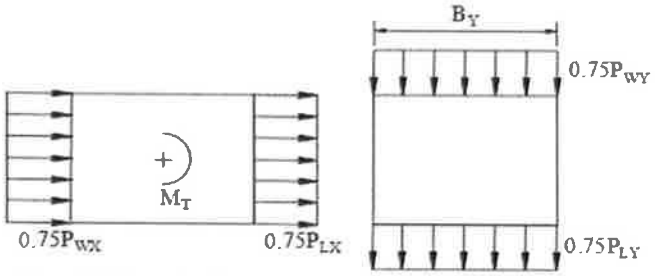
NOTE: ASCE 7 requires the application of full and partial loading of the wind pressures per the 4 cases below.



CASE 1



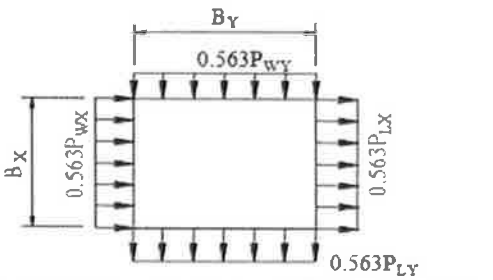
CASE 3



$M_T = 0.75(P_{WX}+P_{LX})B_X e_X$
$e_X = \pm 0.15\ B_X$

$M_T = 0.75(P_{WY}+P_{LY})B_Y e_Y$
$e_Y = \pm 0.15\ B_Y$

CASE 2



$M_T = 0.563(P_{WX}+P_{LX})B_X e_X + 0.563(P_{WY}+P_{LY})B_Y e_Y$
$e_X = \pm 0.15\ B_X$ $e_Y = \pm 0.15\ B_Y$

CASE 4

Wind Forces at Floors

Total Floors = 1
T/Fdn (dist below grade) = 2.0 ft

Building dimension (parallel with ridge) = 128.0 ft e = 19.20 ft
Building dimension (normal to ridge) = 128.0 ft e = 19.20 ft
L is the building dimension parallel to the wind direction

Level	Elevation Above Grade (ft)	Height of Centroid to Fdn (ft)	Wind Normal to Ridge L	B	Area (sf)	Applied Force (k)	Story Shear (k)	Overturning Moment ('k)	Wind Parallel to Ridge Area	Applied Force (k)	Story Shear (k)	Overturning Moment ('k)
Equip,etc		0.00	wind on equip, screenwalls, etc =					0.0				
Parapet	0.00	0.00				0.0		0.0		0.0		
T/Ridge	0.00	0.00			0.0	0.0		0.0	0.0	0.0		0.0
Roof	15.00	17.00	128.0	128.0	960.0	25.9	25.9	0.0	960.0	25.9	25.9	0.0
1	0.00	2.00	128.0	128.0	960.0	25.9	51.8	388.7	960.0	25.9	51.8	388.7
FDN		0.00						492.4				492.4

Flexural Strength of Reinforced Concrete Floor Slab

NOTE: ACI provides the minimum reinforcement criteria for flexural members in section 10.5.1.

$$A_{s,min.} = \frac{3\sqrt{f'_c}}{f_y} bd$$

Depth of stress block, a : $a = \frac{A_s f_y}{0.85 f'_c b}$

Maximum factored flexural strength of section, $M_{u,\,max}$: $M_u = \emptyset A_s f_y \left(d - \frac{a}{2}\right)$

Uniform load factor combination: $w_u = 1.2\,DL + 1.6\,LL$

Maximum allowable span, l :

single span - $l = \sqrt{\frac{M_u'}{0.125\ w_u}}$

two span - (negative moment controls) $l = \sqrt{\frac{M_u'}{0.125\ w_u}}$

three span - (negative moment controls) $l = \sqrt{\frac{M_u'}{0.10\ w_u}}$

Assumptions: Floor slab is assumed to be 6" thick and reinforced with #4 bars @ 12" O.C. each way. A 12" strip of floor slab was used for this analysis based on a minimum concrete compressive strength of 4,000 psi. This analysis assumes the reinforcement is placed in the center of the slab.

Concrete 28 day Compressive Strengths to be Analyzed, *150 pcf*

$f'c$: 4.0 ksi

Yield Strength of Reinforcement

f_y: 60.0 ksi

Live Load Conditions, *LL*

100 psf

6" Thick Slab-on-grade(f'c = 4,000 psi)

Effective Concrete Depth, d :	3.0	in
Minimum Reinforcement Per ACI, $A_{s,\,min}$:	0.2	in^2
Depth of Stress Block, a :	0.39216	in
Strength Reduction Factor, Ø:	0.90	
Maximum factored flexural strength of section, $M_{u,\,max}$:	2.52353	kip-ft

Factored Loads For 6" SOG , w_u (f'c = 4,000 psi)

Live Load = 100 psf :	0.25	kip	**Pile Load**	
Maximum Spacing for Single Span Condition, l :	**8.986**	ft	18.17	kip
Maximum Spacing for Two Span Condition, l :	**8.986**	ft	18.17	kip
Maximum Spacing for Three Span Condition, l :	**10.047**	ft	22.71	kip

Punching Shear Calculation of Reinforced Concrete Floor Slab

NOTE: ACI section 11.12.2.1 provides the punching shear capacity, Vc, of nonprestressed slabs and footings:

$$V_c = \phi 4 \sqrt{f'_c}\, b_o d$$

where:
- Ø = 0.75 (strength reduction factor per ACI section 9.3.2.3)
- f'_c = 28 day compressive strength of concrete, psi
- b_o = perimeter of critical section for slabs and footings, in
- d = distance from extreme compression fiber to centroid of tension reinforcement, in

Concrete 28 day Compressive Strengths to be Analyzed

$f'c$:	4,000	psi

length of bearing plate :	8.000	in
width of bearing plate :	8.000	in

6" Thick Floor Slab Reinforced w/ #4 bar @ 12" O.C.E.W

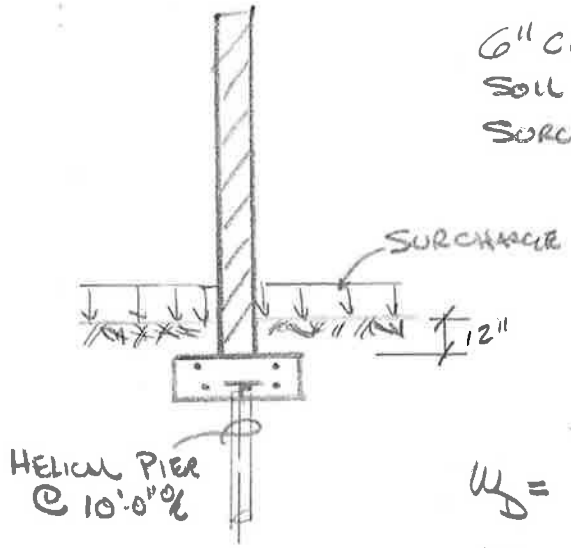
d =	3.0	in
b_o =	44	in
Total perimeter of critical sections =	44	in

V_c =	**25.05**	**kip**

Job Name _____

Job No. _____ Sheet No. _____

By _____ Date _____

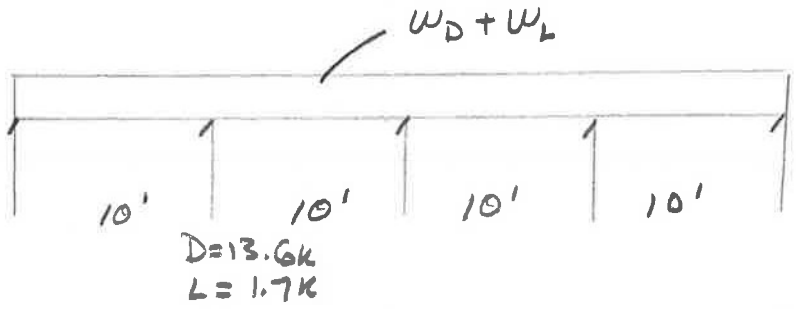


6" CMU = 60 PSF
SOIL = 120 PCF
SURCHARGE = 50 PSF

LOAD TO WALL FOOTING:

$W_D = 60PSF(6'+1') + 120PCF(1')(2')(2)$
$= 900 PLF$
$W_L = 50PSF(3') = 150 PLF$
$W_{DU} = 1.2(900) = 1080PLF$
$W_{LU} = 1.6(150) = 240 PLF$

CHECK FOOTING TO SPAN CONT. 10'-0" MAX.



USE 2'-0" WIDE x 12" DP. CONT. FTG. W/ 3 #5 BOT & 2 #5 TOP CONT. (f'_c = 3 KSI)

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 1 JUN 2023, 5:08PM
File: Amazon.ec6

Concrete Beam

Lic. # : KW-06004221

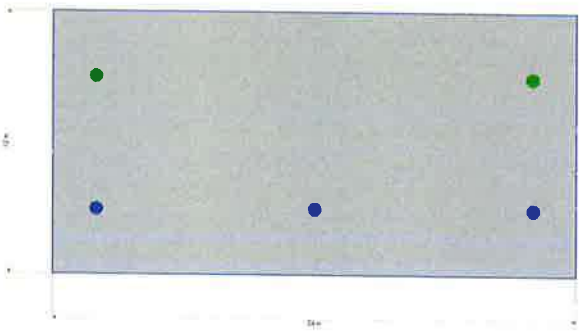
DESCRIPTION: Pulte Homes Cont. screen wall footing

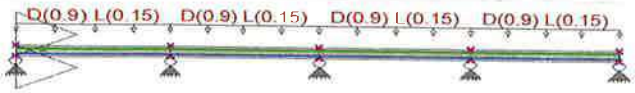
CODE REFERENCES

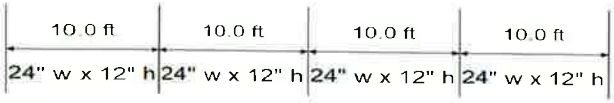
Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

f'c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
fr = f'c $^{1/2}$ * 7.50	=	410.792 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0			
Elastic Modulus	=	3,122.0 ksi	Fy - Stirrups		40.0 ksi
fy - Main Rebar	=	60.0 ksi	E - Stirrups	=	29,000.0 ksi
E - Main Rebar	=	29,000.0 ksi	Stirrup Bar Size #		3
			Number of Resisting Legs Per Stirrup	=	2







Cross Section & Reinforcing Details

Rectangular Section, Width = 24.0 in, Height = 12.0 in

Span #1 Reinforcing....
3-#5 at 3.0 in from Bottom, from 0.0 to 10.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 10.0 ft in this span

Span #2 Reinforcing....
3-#5 at 3.0 in from Bottom, from 0.0 to 10.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 10.0 ft in this span

Span #3 Reinforcing....
3-#5 at 3.0 in from Bottom, from 0.0 to 10.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 10.0 ft in this span

Span #4 Reinforcing....
3-#5 at 3.0 in from Bottom, from 0.0 to 10.0 ft in this span
2-#5 at 3.0 in from Top, from 0.0 to 10.0 ft in this span

Beam self weight calculated and added to loads

Load for Span Number 1
Uniform Load : D = 0.90, L = 0.150 k/ft, Tributary Width = 1.0 ft

Load for Span Number 2
Uniform Load : D = 0.90, L = 0.150 k/ft, Tributary Width = 1.0 ft

Load for Span Number 3
Uniform Load : D = 0.90, L = 0.150 k/ft, Tributary Width = 1.0 ft

Load for Span Number 4
Uniform Load : D = 0.90, L = 0.150 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.553 : 1	Maximum Deflection		
Section used for this span		Typical Section	Max Downward Transient Deflection	0.002 in	Ratio = 77662 >=360
Mu : Applied		-17.871 k-ft	Max Upward Transient Deflection	0.000 in	Ratio = 0 <360.0
Mn * Phi : Allowable		32.323 k-ft	Max Downward Total Deflection	0.014 in	Ratio = 8693 >=180
Location of maximum on span		0.000 ft	Max Upward Total Deflection	0.000 in	Ratio = 0 <180.0
Span # where maximum occurs		Span # 4			

Concrete Beam

Lic. # : KW-06004221

DESCRIPTION: Pulte Homes Cont. screen wall footing

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2	Support 3	Support 4	Support 5
Overall MAXimum	5.264	15.314	12.443	15.314	5.264
Overall MINimum	0.589	1.714	1.393	1.714	0.589
+D+H	4.675	13.600	11.050	13.600	4.675
+D+L+H	5.264	15.314	12.443	15.314	5.264
+D+Lr+H	4.675	13.600	11.050	13.600	4.675
+D+S+H	4.675	13.600	11.050	13.600	4.675
+D+0.750Lr+0.750L+H	5.117	14.886	12.095	14.886	5.117
+D+0.750L+0.750S+H	5.117	14.886	12.095	14.886	5.117
+D+0.60W+H	4.675	13.600	11.050	13.600	4.675
+D+0.750Lr+0.750L+0.450W+H	5.117	14.886	12.095	14.886	5.117
+D+0.750L+0.750S+0.450W+H	5.117	14.886	12.095	14.886	5.117
+0.60D+0.60W+0.60H	2.805	8.160	6.630	8.160	2.805
+D+0.70E+0.60H	4.675	13.600	11.050	13.600	4.675
+D+0.750L+0.750S+0.5250E+H	5.117	14.886	12.095	14.886	5.117
+0.60D+0.70E+H	2.805	8.160	6.630	8.160	2.805
D Only	4.675	13.600	11.050	13.600	4.675
L Only	0.589	1.714	1.393	1.714	0.589
H Only					

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	1	0.00	9.00	6.55	6.55	0.00	1.00	18.60	Vu < PhiVc/2	lot Reqd 9.6.	18.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	0.63	9.00	5.50	5.50	3.81	1.00	18.60	Vu < PhiVc/2	lot Reqd 9.6.	18.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.26	9.00	4.45	4.45	6.95	0.48	17.70	Vu < PhiVc/2	lot Reqd 9.6.	17.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	1.89	9.00	3.39	3.39	9.42	0.27	17.33	Vu < PhiVc/2	lot Reqd 9.6.	17.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	2.53	9.00	2.34	2.34	11.23	0.16	17.13	Vu < PhiVc/2	lot Reqd 9.6.	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.16	9.00	1.29	1.29	12.38	0.08	16.99	Vu < PhiVc/2	lot Reqd 9.6.	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	3.79	9.00	0.23	0.23	12.86	0.01	16.88	Vu < PhiVc/2	lot Reqd 9.6.	16.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	4.42	9.00	-0.82	0.82	12.67	0.05	16.94	Vu < PhiVc/2	lot Reqd 9.6.	16.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.05	9.00	-1.87	1.87	11.82	0.12	17.07	Vu < PhiVc/2	lot Reqd 9.6.	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	5.68	9.00	-2.93	2.93	10.30	0.21	17.23	Vu < PhiVc/2	lot Reqd 9.6.	17.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.32	9.00	-3.98	3.98	8.12	0.37	17.50	Vu < PhiVc/2	lot Reqd 9.6.	17.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	6.95	9.00	-5.04	5.04	5.27	0.72	18.11	Vu < PhiVc/2	lot Reqd 9.6.	18.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	7.58	9.00	-6.09	6.09	1.76	1.00	18.60	Vu < PhiVc/2	lot Reqd 9.6.	18.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	8.21	9.00	-7.14	7.14	2.42	1.00	18.02	Vu < PhiVc/2	lot Reqd 9.6.	18.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	8.84	9.00	-8.20	8.20	7.26	0.85	17.84	Vu < PhiVc/2	lot Reqd 9.6.	17.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	1	9.47	9.00	-9.25	9.25	12.77	0.54	17.49	PhiVc/2 < Vu <=	<0.5W, Not F	17.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.11	9.00	8.76	8.76	16.94	0.39	17.31	PhiVc/2 < Vu <=	<0.5W, Not F	17.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	10.74	9.00	7.71	7.71	11.74	0.49	17.43	Vu < PhiVc/2	lot Reqd 9.6.	17.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	11.37	9.00	6.65	6.65	7.21	0.69	17.66	Vu < PhiVc/2	lot Reqd 9.6.	17.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	12.00	9.00	5.60	5.60	3.34	1.00	18.02	Vu < PhiVc/2	lot Reqd 9.6.	18.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	12.63	9.00	4.55	4.55	0.13	1.00	18.02	Vu < PhiVc/2	lot Reqd 9.6.	18.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	13.26	9.00	3.49	3.49	2.41	1.00	18.60	Vu < PhiVc/2	lot Reqd 9.6.	18.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	13.89	9.00	2.44	2.44	4.28	0.43	17.60	Vu < PhiVc/2	lot Reqd 9.6.	17.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	14.53	9.00	1.39	1.39	5.49	0.19	17.19	Vu < PhiVc/2	lot Reqd 9.6.	17.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	15.16	9.00	0.33	0.33	6.03	0.04	16.93	Vu < PhiVc/2	lot Reqd 9.6.	16.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	15.79	9.00	-0.72	0.72	5.91	0.09	17.02	Vu < PhiVc/2	lot Reqd 9.6.	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	16.42	9.00	-1.77	1.77	5.12	0.26	17.31	Vu < PhiVc/2	lot Reqd 9.6.	17.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	17.05	9.00	-2.83	2.83	3.67	0.58	17.87	Vu < PhiVc/2	lot Reqd 9.6.	17.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	17.68	9.00	-3.88	3.88	1.55	1.00	18.60	Vu < PhiVc/2	lot Reqd 9.6.	18.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	18.32	9.00	-4.94	4.94	1.24	1.00	18.02	Vu < PhiVc/2	lot Reqd 9.6.	18.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	18.95	9.00	-5.99	5.99	4.69	0.96	17.97	Vu < PhiVc/2	lot Reqd 9.6.	18.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	2	19.58	9.00	-7.04	7.04	8.80	0.60	17.56	Vu < PhiVc/2	lot Reqd 9.6.	17.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	20.21	9.00	7.39	7.39	10.32	0.54	17.48	Vu < PhiVc/2	lot Reqd 9.6.	17.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	20.84	9.00	6.34	6.34	5.98	0.79	17.78	Vu < PhiVc/2	lot Reqd 9.6.	17.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	21.47	9.00	5.29	5.29	2.31	1.00	18.02	Vu < PhiVc/2	lot Reqd 9.6.	18.0	0.0	0.0

Concrete Beam

Lic. # : KW-06004221

DESCRIPTION: Pulte Homes Cont. screen wall footing

Detailed Shear Information

Load Combination	Span Number	Distance (ft)	'd' (in)	Vu (k) Actual	Vu (k) Design	Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Phi*Vn (k)	Spacing (in) Req'd	Spacing (in) Suggest
+1.20D+1.60L+0.50S+1.60H	3	22.11	9.00	4.23	4.23	0.69	1.00	18.60	Vu < PhiVc/2	lot Reqd 9.6.	18.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	22.74	9.00	3.18	3.18	3.03	0.79	18.23	Vu < PhiVc/2	lot Reqd 9.6.	18.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	23.37	9.00	2.13	2.13	4.71	0.34	17.45	Vu < PhiVc/2	lot Reqd 9.6.	17.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	24.00	9.00	1.07	1.07	5.72	0.14	17.10	Vu < PhiVc/2	lot Reqd 9.6.	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	24.63	9.00	0.02	0.02	6.06	0.00	16.86	Vu < PhiVc/2	lot Reqd 9.6.	16.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	25.26	9.00	-1.03	1.03	5.74	0.14	17.09	Vu < PhiVc/2	lot Reqd 9.6.	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	25.89	9.00	-2.09	2.09	4.76	0.33	17.43	Vu < PhiVc/2	lot Reqd 9.6.	17.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	26.53	9.00	-3.14	3.14	3.10	0.76	18.18	Vu < PhiVc/2	lot Reqd 9.6.	18.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	27.16	9.00	-4.20	4.20	0.79	1.00	18.60	Vu < PhiVc/2	lot Reqd 9.6.	18.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	27.79	9.00	-5.25	5.25	2.19	1.00	18.02	Vu < PhiVc/2	lot Reqd 9.6.	18.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	28.42	9.00	-6.30	6.30	5.84	0.81	17.80	Vu < PhiVc/2	lot Reqd 9.6.	17.8	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	29.05	9.00	-7.36	7.36	10.15	0.54	17.49	Vu < PhiVc/2	lot Reqd 9.6.	17.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	3	29.68	9.00	-8.41	8.41	15.13	0.42	17.34	Vu < PhiVc/2	lot Reqd 9.6.	17.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	30.32	9.00	9.60	9.60	14.76	0.49	17.43	PhiVc/2 < Vu <=	<0.5W, Not F	17.4	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	30.95	9.00	8.55	8.55	9.03	0.71	17.68	Vu < PhiVc/2	lot Reqd 9.6.	17.7	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	31.58	9.00	7.49	7.49	3.96	1.00	18.02	Vu < PhiVc/2	lot Reqd 9.6.	18.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	32.21	9.00	6.44	6.44	0.44	1.00	18.60	Vu < PhiVc/2	lot Reqd 9.6.	18.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	32.84	9.00	5.39	5.39	4.17	0.97	18.55	Vu < PhiVc/2	lot Reqd 9.6.	18.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	33.47	9.00	4.33	4.33	7.24	0.45	17.64	Vu < PhiVc/2	lot Reqd 9.6.	17.6	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	34.11	9.00	3.28	3.28	9.65	0.25	17.30	Vu < PhiVc/2	lot Reqd 9.6.	17.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	34.74	9.00	2.23	2.23	11.39	0.15	17.11	Vu < PhiVc/2	lot Reqd 9.6.	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	35.37	9.00	1.17	1.17	12.46	0.07	16.98	Vu < PhiVc/2	lot Reqd 9.6.	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	36.00	9.00	0.12	0.12	12.87	0.01	16.87	Vu < PhiVc/2	lot Reqd 9.6.	16.9	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	36.63	9.00	-0.93	0.93	12.61	0.06	16.96	Vu < PhiVc/2	lot Reqd 9.6.	17.0	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	37.26	9.00	-1.99	1.99	11.69	0.13	17.08	Vu < PhiVc/2	lot Reqd 9.6.	17.1	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	37.89	9.00	-3.04	3.04	10.10	0.23	17.25	Vu < PhiVc/2	lot Reqd 9.6.	17.3	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	38.53	9.00	-4.09	4.09	7.85	0.39	17.54	Vu < PhiVc/2	lot Reqd 9.6.	17.5	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	39.16	9.00	-5.15	5.15	4.93	0.78	18.23	Vu < PhiVc/2	lot Reqd 9.6.	18.2	0.0	0.0
+1.20D+1.60L+0.50S+1.60H	4	39.79	9.00	-6.20	6.20	1.34	1.00	18.60	Vu < PhiVc/2	lot Reqd 9.6.	18.6	0.0	0.0

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
MAXimum BENDING Envelope					
Span # 1	1	10.000	-16.81	32.32	0.52
Span # 2	2	10.000	-17.87	32.32	0.55
Span # 3	3	10.000	-16.94	32.32	0.52
Span # 4	4	10.000	-17.87	32.32	0.55
+1.40D+1.60H					
Span # 1	1	10.000	-16.79	32.32	0.52
Span # 2	2	10.000	-17.85	32.32	0.55
Span # 3	3	10.000	-16.92	32.32	0.52
Span # 4	4	10.000	-17.85	32.32	0.55
+1.20D+0.50Lr+1.60L+1.60H					
Span # 1	1	10.000	-16.81	32.32	0.52
Span # 2	2	10.000	-17.87	32.32	0.55
Span # 3	3	10.000	-16.94	32.32	0.52
Span # 4	4	10.000	-17.87	32.32	0.55
+1.20D+1.60L+0.50S+1.60H					
Span # 1	1	10.000	-16.81	32.32	0.52
Span # 2	2	10.000	-17.87	32.32	0.55
Span # 3	3	10.000	-16.94	32.32	0.52
Span # 4	4	10.000	-17.87	32.32	0.55
+1.20D+1.60Lr+L+1.60H					
Span # 1	1	10.000	-15.91	32.32	0.49
Span # 2	2	10.000	-16.91	32.32	0.52
Span # 3	3	10.000	-16.03	32.32	0.50
Span # 4	4	10.000	-16.91	32.32	0.52
+1.20D+1.60Lr+0.50W+1.60H					
Span # 1	1	10.000	-14.40	32.32	0.45

Concrete Beam

DESCRIPTION: Pulte Homes Cont. screen wall footing

Load Combination Segment	Span #	Location (ft) along Beam	Bending Stress Results (k-ft) Mu : Max	Phi*Mnx	Stress Ratio
Span # 2	2	10.000	-15.30	32.32	0.47
Span # 3	3	10.000	-14.50	32.32	0.45
Span # 4	4	10.000	-15.30	32.32	0.47
+1.20D+L+1.60S+1.60H					
Span # 1	1	10.000	-15.91	32.32	0.49
Span # 2	2	10.000	-16.91	32.32	0.52
Span # 3	3	10.000	-16.03	32.32	0.50
Span # 4	4	10.000	-16.91	32.32	0.52
+1.20D+1.60S+0.50W+1.60H					
Span # 1	1	10.000	-14.40	32.32	0.45
Span # 2	2	10.000	-15.30	32.32	0.47
Span # 3	3	10.000	-14.50	32.32	0.45
Span # 4	4	10.000	-15.30	32.32	0.47
+1.20D+0.50Lr+L+W+1.60H					
Span # 1	1	10.000	-15.91	32.32	0.49
Span # 2	2	10.000	-16.91	32.32	0.52
Span # 3	3	10.000	-16.03	32.32	0.50
Span # 4	4	10.000	-16.91	32.32	0.52
+1.20D+L+0.50S+W+1.60H					
Span # 1	1	10.000	-15.91	32.32	0.49
Span # 2	2	10.000	-16.91	32.32	0.52
Span # 3	3	10.000	-16.03	32.32	0.50
Span # 4	4	10.000	-16.91	32.32	0.52
+0.90D+W+1.60H					
Span # 1	1	10.000	-10.80	32.32	0.33
Span # 2	2	10.000	-11.47	32.32	0.36
Span # 3	3	10.000	-10.88	32.32	0.34
Span # 4	4	10.000	-11.47	32.32	0.36
+1.20D+L+0.20S+E+1.60H					
Span # 1	1	10.000	-15.91	32.32	0.49
Span # 2	2	10.000	-16.91	32.32	0.52
Span # 3	3	10.000	-16.03	32.32	0.50
Span # 4	4	10.000	-16.91	32.32	0.52
+0.90D+E+0.90H					
Span # 1	1	10.000	-10.80	32.32	0.33
Span # 2	2	10.000	-11.47	32.32	0.36
Span # 3	3	10.000	-10.88	32.32	0.34
Span # 4	4	10.000	-11.47	32.32	0.36

Overall Maximum Deflections

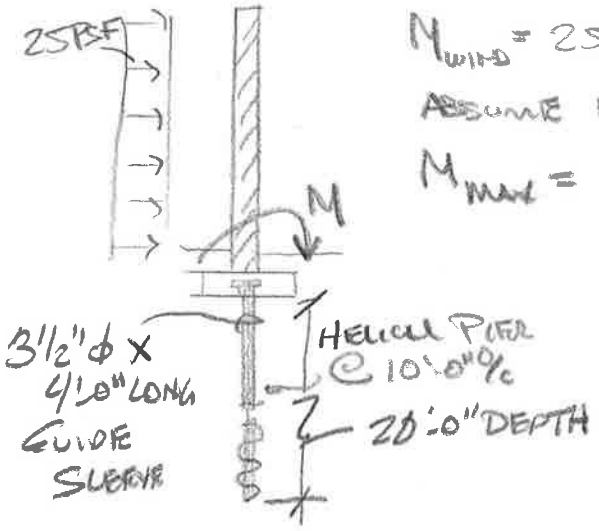
Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
+D+L+H	1	0.0138	4.474	+D+L+H	-0.0002	10.263
+D+L+H	2	0.0040	5.526	+D+L+H	-0.0003	0.789
+D+L+H	3	0.0040	4.474	+D+L+H	-0.0003	9.211
+D+L+H	4	0.0138	5.526		0.0000	9.211

Job Name _____

Job No. _____ Sheet No. _____

By _____ Date _____

CHECK HELICAL PIER FOR WIND LOAD MOMENT:



$M_{WIND} = 25PSF(6)^2/2 = 450\,\#/1$

ASSUME HELICAL PIER SPACING = 10'-0" O/C

$M_{MAX} = 450\,\#/1(10')(12"/1) = \underline{54{,}000\ IN\#}$

GIVEN: - 2 7/8" ϕ HELICAL PIER
- 20'-0" DEPTH (ASSUMED)
- TRY 3 1/2" ϕ X 4'-0" LONG GUIDE SLEEVE AT UPPER PORTION OF HELICAL PIER

(SEE L-PILE ANALYSIS)

$f_y = 17{,}951\ PSI < F_y = 65{,}000\ PSI$ √OK

USE 2 7/8" ϕ HELICAL PIER W/ 3 1/2" ϕ X 4'-0" GUIDE SLEEVE - SPACE @ 10'-0" O/C

==

LPile for Windows, Version 2019-11.003

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

==

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Files Used for Analysis

Path to file locations:
\Users\mlemons\Desktop\

Name of input data file:
Pulte Fence.lp11d

Name of output report file:
Pulte Fence.lp11o

Name of plot output file:
Pulte Fence.lp11p

Name of runtime message file:
Pulte Fence.lp11r

Date and Time of Analysis

Date: May 30, 2023 Time: 16:24:43

Problem Title

Project Name:

Job Number:

Client:

Engineer:

Description:

Program Options and Settings

Computational Options:
- Conventional Analysis

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected

- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 2
Total length of pile = 20.000 ft
Depth of ground surface below top of pile = 0.5000 ft

Pile diameters used for p-y curve computations are defined using 4 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	3.5000
2	4.000	3.5000
3	4.000	2.8750
4	20.000	2.8750

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a steel pipe pile
Length of section = 4.000000 ft
Pile diameter = 3.500000 in
Shear capacity of section = 0.0000 lbs

Pile Section No. 2:

Section 2 is a steel pipe pile
Length of section = 16.000000 ft
Pile diameter = 2.875000 in
Shear capacity of section = 0.0000 lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 1 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 0.500000 ft
Distance from top of pile to bottom of layer = 20.000000 ft
Effective unit weight at top of layer = 115.000000 pcf
Effective unit weight at bottom of layer = 115.000000 pcf
Friction angle at top of layer = 29.000000 deg.
Friction angle at bottom of layer = 29.000000 deg.
Subgrade k at top of layer = 90.000000 pci
Subgrade k at bottom of layer = 90.000000 pci

(Depth of the lowest soil layer extends 0.000 ft below the pile tip)

Summary of Input Soil Properties

Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	kpy pci
1	Sand	0.5000	115.0000	29.0000	90.0000

(Reese, et al.) 20.0000 115.0000 29.0000 90.0000

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length	Run Analysis
1	1	V = 0.0000 lbs	M = 54000. in-lbs	0.0000000	No	Yes

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with
specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 2

Pile Section No. 1:

Dimensions and Properties of Steel Pipe Pile:

Length of Section = 4.000000 ft
Outer Diameter of Pipe = 3.500000 in
Pipe Wall Thickness = 0.471000 in
Yield Stress of Pipe = 65.000000 ksi
Elastic Modulus = 29000. ksi
Cross-sectional Area = 4.481981 sq. in.
Moment of Inertia = 5.264469 in^4
Elastic Bending Stiffness = 152670. kip-in^2
Plastic Modulus, Z = 4.356179in^3
Plastic Moment Capacity = Fy Z = 283.151645in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As = 291.329 kips
Nominal Axial Tensile Capacity = -291.329 kips

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Total Stress ksi	Run Msg
0.00002722	4.1554107	152678.	1.7500000	1.3674376	
0.00005443	8.3108215	152678.	1.7500000	2.7348752	
0.00008165	12.4662322	152678.	1.7500000	4.1023127	
0.0001089	16.6216429	152678.	1.7500000	5.4697503	
0.0001361	20.7770537	152678.	1.7500000	6.8371879	
0.0001633	24.9324644	152678.	1.7500000	8.2046255	
0.0001905	29.0878751	152678.	1.7500000	9.5720631	
0.0002177	33.2432858	152678.	1.7500000	10.9395006	
0.0002450	37.3986966	152678.	1.7500000	12.3069382	
0.0002722	41.5541073	152678.	1.7500000	13.6743758	
0.0002994	45.7095180	152678.	1.7500000	15.0418134	

0.0003266	49.8649288	152678.	1.7500000	16.4092509	
0.0003538	54.0203395	152678.	1.7500000	17.7766885	
0.0003810	58.1757502	152678.	1.7500000	19.1441261	
0.0004083	62.3311610	152678.	1.7500000	20.5115637	
0.0004355	66.4865717	152678.	1.7500000	21.8790013	
0.0004627	70.6419824	152678.	1.7500000	23.2464388	
0.0004899	74.7973932	152678.	1.7500000	24.6138764	
0.0005171	78.9528039	152678.	1.7500000	25.9813140	
0.0005443	83.1082146	152678.	1.7500000	27.3487516	
0.0005716	87.2636253	152678.	1.7500000	28.7161892	
0.0005988	91.4190361	152678.	1.7500000	30.0836267	
0.0006260	95.5744468	152678.	1.7500000	31.4510643	
0.0006532	99.7298575	152678.	1.7500000	32.8185019	
0.0006804	103.8852683	152678.	1.7500000	34.1859395	
0.0007076	108.0406790	152678.	1.7500000	35.5533771	
0.0007349	112.1960897	152678.	1.7500000	36.9208146	
0.0007621	116.3515005	152678.	1.7500000	38.2882522	
0.0007893	120.5069112	152678.	1.7500000	39.6556898	
0.0008165	124.6623219	152678.	1.7500000	41.0231274	
0.0008437	128.8177327	152678.	1.7500000	42.3905649	
0.0008709	132.9731434	152678.	1.7500000	43.7580025	
0.0008982	137.1285541	152678.	1.7500000	45.1254401	
0.0009254	141.2839648	152678.	1.7500000	46.4928777	
0.0009526	145.4393756	152678.	1.7500000	47.8603153	
0.0009798	149.5947863	152678.	1.7500000	49.2277528	
0.0010070	153.7501970	152678.	1.7500000	50.5951904	
0.0010342	157.9056078	152678.	1.7500000	51.9626280	
0.0010615	162.0610185	152678.	1.7500000	53.3300656	
0.0011159	170.3718400	152678.	1.7500000	56.0649407	
0.0011703	178.6826614	152678.	1.7500000	58.7998159	
0.0012248	186.9934829	152678.	1.7500000	61.5346911	
0.0012792	195.3043043	152678.	1.7500000	64.2695662	
0.0013336	203.4365463	152545.	1.7500000	65.0000000	Y
0.0013881	211.0044220	152015.	1.7500000	65.0000000	Y
0.0014425	217.8937103	151054.	1.7500000	65.0000000	Y
0.0014969	224.0362816	149665.	1.7500000	65.0000000	Y
0.0015514	229.5002183	147935.	1.7500000	65.0000000	Y
0.0016058	234.2904501	145904.	1.7500000	65.0000000	Y
0.0016602	238.5062582	143659.	1.7500000	65.0000000	Y
0.0017147	242.1150048	141203.	1.7500000	65.0000000	Y
0.0017691	245.2055574	138606.	1.7500000	65.0000000	Y
0.0018235	247.8868836	135939.	1.7500000	65.0000000	Y
0.0018780	250.2558019	133260.	1.7500000	65.0000000	Y
0.0019324	252.3695663	130600.	1.7500000	65.0000000	Y
0.0019868	254.2709677	127979.	1.7500000	65.0000000	Y
0.0020413	255.9943631	125410.	1.7500000	65.0000000	Y
0.0020957	257.5557544	122898.	1.7500000	65.0000000	Y
0.0021501	258.9577990	120439.	1.7500000	65.0000000	Y
0.0022046	260.2512351	118052.	1.7500000	65.0000000	Y
0.0022590	261.4547986	115740.	1.7500000	65.0000000	Y

0.0023134	262.5490707	113489.	1.7500000	65.0000000	Y
0.0023679	263.5521396	111304.	1.7500000	65.0000000	Y
0.0024223	264.5075771	109197.	1.7500000	65.0000000	Y
0.0024767	265.3603305	107142.	1.7500000	65.0000000	Y
0.0025312	266.1753367	105160.	1.7500000	65.0000000	Y
0.0025856	266.9243604	103235.	1.7500000	65.0000000	Y
0.0026400	267.6283340	101373.	1.7500000	65.0000000	Y
0.0026945	268.2836581	99569.	1.7500000	65.0000000	Y
0.0027489	268.9020156	97822.	1.7500000	65.0000000	Y
0.0028033	269.4728295	96126.	1.7500000	65.0000000	Y
0.0028578	270.0274848	94489.	1.7500000	65.0000000	Y
0.0029122	270.5222294	92893.	1.7500000	65.0000000	Y
0.0029666	271.0169741	91355.	1.7500000	65.0000000	Y
0.0030211	271.4584147	89855.	1.7500000	65.0000000	Y
0.0030755	271.8848591	88404.	1.7500000	65.0000000	Y
0.0031299	272.3045052	87000.	1.7500000	65.0000000	Y
0.0031844	272.6698093	85628.	1.7500000	65.0000000	Y
0.0032388	273.0351135	84301.	1.7500000	65.0000000	Y
0.0034565	274.3235486	79364.	1.7500000	65.0000000	Y
0.0036743	275.3656513	74944.	1.7500000	65.0000000	Y
0.0038920	276.2361597	70975.	1.7500000	65.0000000	Y
0.0041097	276.9635601	67392.	1.7500000	65.0000000	Y
0.0043275	277.5726266	64142.	1.7500000	65.0000000	Y
0.0045452	278.1011052	61186.	1.7500000	65.0000000	Y
0.0047629	278.5742777	58488.	1.7500000	65.0000000	Y
0.0049807	278.9581344	56008.	1.7500000	65.0000000	Y
0.0051984	279.3131865	53731.	1.7500000	65.0000000	Y
0.0054161	279.6136937	51626.	1.7500000	65.0000000	Y
0.0056339	279.8932193	49680.	1.7500000	65.0000000	Y
0.0058516	280.1236833	47871.	1.7500000	65.0000000	Y
0.0060693	280.3541473	46192.	1.7500000	65.0000000	Y
0.0062871	280.5344985	44621.	1.7500000	65.0000000	Y
0.0065048	280.7069479	43154.	1.7500000	65.0000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	280.7069478566

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the

LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Pile Section No. 2:

Dimensions and Properties of Steel Pipe Pile:

Length of Section	=	16.000000 ft
Outer Diameter of Pipe	=	2.875000 in
Pipe Wall Thickness	=	0.217000 in
Yield Stress of Pipe	=	65.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	1.812027 sq. in.
Moment of Inertia	=	1.610904 in^4
Elastic Bending Stiffness	=	46716. kip-in^2
Plastic Modulus, Z	=	1.536503in^3
Plastic Moment Capacity = Fy Z	=	99.872714in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As	=	117.782 kips
Nominal Axial Tensile Capacity	=	-117.782 kips

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending	Bending	Bending	Depth to	Max Total	Run

Curvature rad/in.	Moment in-kip	Stiffness kip-in2	N Axis in	Stress ksi	Msg
0.00003313	1.5479271	46718.	1.4375000	1.3674376	
0.00006627	3.0958542	46718.	1.4375000	2.7348752	
0.00009940	4.6437812	46718.	1.4375000	4.1023128	
0.0001325	6.1917083	46718.	1.4375000	5.4697504	
0.0001657	7.7396354	46718.	1.4375000	6.8371880	
0.0001988	9.2875625	46718.	1.4375000	8.2046256	
0.0002319	10.8354895	46718.	1.4375000	9.5720632	
0.0002651	12.3834166	46718.	1.4375000	10.9395008	
0.0002982	13.9313437	46718.	1.4375000	12.3069384	
0.0003313	15.4792708	46718.	1.4375000	13.6743760	
0.0003645	17.0271978	46718.	1.4375000	15.0418136	
0.0003976	18.5751249	46718.	1.4375000	16.4092512	
0.0004307	20.1230520	46718.	1.4375000	17.7766887	
0.0004639	21.6709791	46718.	1.4375000	19.1441263	
0.0004970	23.2189062	46718.	1.4375000	20.5115639	
0.0005301	24.7668332	46718.	1.4375000	21.8790015	
0.0005633	26.3147603	46718.	1.4375000	23.2464391	
0.0005964	27.8626874	46718.	1.4375000	24.6138767	
0.0006295	29.4106145	46718.	1.4375000	25.9813143	
0.0006627	30.9585415	46718.	1.4375000	27.3487519	
0.0006958	32.5064686	46718.	1.4375000	28.7161895	
0.0007289	34.0543957	46718.	1.4375000	30.0836271	
0.0007621	35.6023228	46718.	1.4375000	31.4510647	
0.0007952	37.1502498	46718.	1.4375000	32.8185023	
0.0008283	38.6981769	46718.	1.4375000	34.1859399	
0.0008615	40.2461040	46718.	1.4375000	35.5533775	
0.0008946	41.7940311	46718.	1.4375000	36.9208151	
0.0009277	43.3419582	46718.	1.4375000	38.2882527	
0.0009609	44.8898852	46718.	1.4375000	39.6556903	
0.0009940	46.4378123	46718.	1.4375000	41.0231279	
0.0010271	47.9857394	46718.	1.4375000	42.3905655	
0.0010603	49.5336665	46718.	1.4375000	43.7580031	
0.0010934	51.0815935	46718.	1.4375000	45.1254407	
0.0011265	52.6295206	46718.	1.4375000	46.4928783	
0.0011597	54.1774477	46718.	1.4375000	47.8603159	
0.0011928	55.7253748	46718.	1.4375000	49.2277535	
0.0012259	57.2733018	46718.	1.4375000	50.5951911	
0.0012591	58.8212289	46718.	1.4375000	51.9626287	
0.0012922	60.3691560	46718.	1.4375000	53.3300662	
0.0013585	63.4650102	46718.	1.4375000	56.0649414	
0.0014247	66.5608643	46718.	1.4375000	58.7998166	
0.0014910	69.6567185	46718.	1.4375000	61.5346918	
0.0015573	72.7525726	46718.	1.4375000	64.2695670	
0.0016235	75.7494483	46657.	1.4375000	65.0000000	Y
0.0016898	78.4335212	46416.	1.4375000	65.0000000	Y
0.0017561	80.7414838	45978.	1.4375000	65.0000000	Y
0.0018223	82.6355751	45346.	1.4375000	65.0000000	Y

0.0018886	84.1800903	44573.	1.4375000	65.0000000	Y
0.0019549	85.4715266	43722.	1.4375000	65.0000000	Y
0.0020211	86.5956859	42845.	1.4375000	65.0000000	Y
0.0020874	87.5693683	41951.	1.4375000	65.0000000	Y
0.0021537	88.4283876	41059.	1.4375000	65.0000000	Y
0.0022199	89.1949520	40179.	1.4375000	65.0000000	Y
0.0022862	89.8823626	39315.	1.4375000	65.0000000	Y
0.0023525	90.5019324	38471.	1.4375000	65.0000000	Y
0.0024187	91.0634015	37649.	1.4375000	65.0000000	Y
0.0024850	91.5752271	36851.	1.4375000	65.0000000	Y
0.0025513	92.0412049	36077.	1.4375000	65.0000000	Y
0.0026175	92.4614650	35324.	1.4375000	65.0000000	Y
0.0026838	92.8502583	34596.	1.4375000	65.0000000	Y
0.0027501	93.2128984	33895.	1.4375000	65.0000000	Y
0.0028163	93.5435439	33215.	1.4375000	65.0000000	Y
0.0028826	93.8472856	32556.	1.4375000	65.0000000	Y
0.0029489	94.1369534	31923.	1.4375000	65.0000000	Y
0.0030151	94.3961334	31307.	1.4375000	65.0000000	Y
0.0030814	94.6440432	30715.	1.4375000	65.0000000	Y
0.0031477	94.8722524	30140.	1.4375000	65.0000000	Y
0.0032139	95.0869456	29586.	1.4375000	65.0000000	Y
0.0032802	95.2870429	29049.	1.4375000	65.0000000	Y
0.0033465	95.4760023	28530.	1.4375000	65.0000000	Y
0.0034127	95.6506369	28027.	1.4375000	65.0000000	Y
0.0034790	95.8203847	27542.	1.4375000	65.0000000	Y
0.0035453	95.9720142	27070.	1.4375000	65.0000000	Y
0.0036115	96.1236437	26616.	1.4375000	65.0000000	Y
0.0036778	96.2590994	26173.	1.4375000	65.0000000	Y
0.0037441	96.3900049	25745.	1.4375000	65.0000000	Y
0.0038103	96.5188416	25331.	1.4375000	65.0000000	Y
0.0038766	96.6311411	24927.	1.4375000	65.0000000	Y
0.0039429	96.7434407	24536.	1.4375000	65.0000000	Y
0.0042079	97.1399207	23085.	1.4375000	65.0000000	Y
0.0044730	97.4610899	21789.	1.4375000	65.0000000	Y
0.0047381	97.7296687	20626.	1.4375000	65.0000000	Y
0.0050031	97.9543061	19579.	1.4375000	65.0000000	Y
0.0052682	98.1425474	18629.	1.4375000	65.0000000	Y
0.0055333	98.3059706	17766.	1.4375000	65.0000000	Y
0.0057984	98.4523537	16979.	1.4375000	65.0000000	Y
0.0060634	98.5711865	16257.	1.4375000	65.0000000	Y
0.0063285	98.6811234	15593.	1.4375000	65.0000000	Y
0.0065936	98.7742148	14980.	1.4375000	65.0000000	Y
0.0068586	98.8608192	14414.	1.4375000	65.0000000	Y
0.0071237	98.9322550	13888.	1.4375000	65.0000000	Y
0.0073888	99.0036908	13399.	1.4375000	65.0000000	Y
0.0076538	99.0596180	12943.	1.4375000	65.0000000	Y
0.0079189	99.1130997	12516.	1.4375000	65.0000000	Y

Summary of Results for Nominal Moment Capacity for Section 2

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	99.1130996940

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Computed Values of Pile Loading and Deflection for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 0.0 lbs
Applied moment at pile head = 54000.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.5239	54000.	0.00	-0.01900	17951.	1.53E+08	0.00	0.00	0.00
0.2000	0.4793	54000.	-1.53E-09	-0.01815	17951.	1.53E+08	0.00	0.00	0.00
0.4000	0.4367	54000.	6.12E-10	-0.01730	17951.	1.53E+08	0.00	0.00	0.00

```
    0.6000     0.3963     54000.    -2.7233   -0.01645     17951.   1.53E+08    -2.2694
13.7452       0.00
    0.8000     0.3578     53987.   -14.5616   -0.01560     17946.   1.53E+08    -7.5959
50.9511       0.00
    1.0000     0.3214     53930.   -38.8963   -0.01475     17927.   1.53E+08   -12.6830
94.7156       0.00
    1.2000     0.2870     53800.   -74.3505   -0.01390     17884.   1.53E+08   -16.8623
141.0145      0.00
    1.4000     0.2546     53573.  -119.6392   -0.01306     17809.   1.53E+08   -20.8783
196.7873      0.00
    1.6000     0.2243     53226.  -176.2483   -0.01222     17693.   1.53E+08   -26.2959
281.3723      0.00
    1.8000     0.1960     52727.  -247.9346   -0.01139     17527.   1.53E+08   -33.4426
409.5722      0.00
    2.0000     0.1696     52036.  -339.1169   -0.01057     17298.   1.53E+08   -42.5426
601.9208      0.00
    2.2000     0.1453     51099.  -454.0444   -0.00975     16986.   1.53E+08   -53.2303
879.5256      0.00
    2.4000     0.1228     49856.  -592.1300   -0.00896     16573.   1.53E+08   -61.8410
1209.       0.00
    2.6000     0.1022     48257.  -744.0007   -0.00819     16042.   1.53E+08   -64.7180
1519.       0.00
    2.8000    0.08349     46285.  -901.1578   -0.00745     15386.   1.53E+08   -66.2462
1904.       0.00
    3.0000    0.06649     43932.     -1060.   -0.00674     14604.   1.53E+08   -66.4452
2398.       0.00
    3.2000    0.05115     41195.     -1218.   -0.00607     13694.   1.53E+08   -65.2356
3061.       0.00
    3.4000    0.03736     38083.     -1371.   -0.00545     12660.   1.53E+08   -61.5927
3957.       0.00
    3.6000    0.02501     34617.     -1510.   -0.00487     11507.   1.53E+08   -54.6869
5249.       0.00
    3.8000    0.01396     30835.     -1628.   -0.00436     10250.   1.53E+08   -43.1626
7420.       0.00
    4.0000    0.00408     26804.     -1698.   -0.00391      8910.   1.53E+08   -15.4150
9072.       0.00
    4.2000   -0.00479     22685.     -1693.   -0.00311     20243.   4.67E+07    19.1546
9590.       0.00
    4.4000   -0.01087     18676.     -1615.   -0.00205     16666.   4.67E+07    45.7762
10109.       0.00
    4.6000   -0.01464     14931.     -1491.   -0.00119     13324.   4.67E+07    58.2170
9544.       0.00
    4.8000   -0.01657     11521.     -1342.  -5.09E-04     10281.   4.67E+07    65.8343
9535.       0.00
    5.0000   -0.01708      8490.     -1179.   5.33E-06      7576.   4.67E+07    70.1796
9860.       0.00
    5.2000   -0.01655      5864.     -1008.   3.74E-04      5233.   4.67E+07    71.8911
10428.       0.00
    5.4000   -0.01529      3652.  -836.1034   6.18E-04      3258.   4.67E+07    71.4288
11215.       0.00
```

5.6000	-0.01358	1851.	-667.3816	7.60E-04	1651.	4.67E+07	69.1728
12228.	0.00						
5.8000	-0.01164	448.0787	-505.8208	8.19E-04	399.8458	4.67E+07	65.4612
13498.	0.00						
6.0000	-0.00965	-577.3630	-358.5059	8.15E-04	515.2135	4.67E+07	57.3012
14256.	0.00						
6.2000	-0.00773	-1273.	-232.6778	7.68E-04	1136.	4.67E+07	47.5556
14774.	0.00						
6.4000	-0.00596	-1694.	-130.0355	6.92E-04	1512.	4.67E+07	37.9797
15293.	0.00						
6.6000	-0.00440	-1897.	-49.6386	6.00E-04	1693.	4.67E+07	29.0177
15811.	0.00						
6.8000	-0.00308	-1932.	10.3524	5.01E-04	1724.	4.67E+07	20.9748
16330.	0.00						
7.0000	-0.00200	-1847.	52.3624	4.04E-04	1648.	4.67E+07	14.0335
16848.	0.00						
7.2000	-0.00114	-1681.	79.1290	3.13E-04	1500.	4.67E+07	8.2721
17366.	0.00						
7.4000	-4.95E-04	-1467.	93.4781	2.33E-04	1309.	4.67E+07	3.6855
17885.	0.00						
7.6000	-2.69E-05	-1232.	98.1478	1.63E-04	1100.	4.67E+07	0.2060
18403.	0.00						
7.8000	2.89E-04	-996.2999	95.6619	1.06E-04	889.0544	4.67E+07	-2.2776
18922.	0.00						
8.0000	4.82E-04	-773.2706	88.2458	6.05E-05	690.0329	4.67E+07	-3.9025
19440.	0.00						
8.2000	5.79E-04	-572.7200	77.7812	2.59E-05	511.0703	4.67E+07	-4.8180
19958.	0.00						
8.4000	6.06E-04	-399.9211	65.7918	9.60E-07	356.8721	4.67E+07	-5.1732
20477.	0.00						
8.6000	5.84E-04	-256.9195	53.4536	-1.59E-05	229.2638	4.67E+07	-5.1086
20995.	0.00						
8.8000	5.30E-04	-143.3437	41.6227	-2.62E-05	127.9136	4.67E+07	-4.7505
21514.	0.00						
9.0000	4.58E-04	-57.1306	30.8740	-3.13E-05	50.9808	4.67E+07	-4.2068
22032.	0.00						
9.2000	3.80E-04	4.8515	21.5468	-3.27E-05	4.3293	4.67E+07	-3.5659
22550.	0.00						
9.4000	3.01E-04	46.2942	13.7917	-3.14E-05	41.3109	4.67E+07	-2.8967
23069.	0.00						
9.6000	2.29E-04	71.0516	7.6157	-2.84E-05	63.4034	4.67E+07	-2.2499
23587.	0.00						
9.8000	1.65E-04	82.8495	2.9240	-2.44E-05	73.9313	4.67E+07	-1.6598
24106.	0.00						
10.0000	1.12E-04	85.0868	-0.4442	-2.01E-05	75.9277	4.67E+07	-1.1470
24624.	0.00						
10.2000	6.88E-05	80.7173	-2.6858	-1.58E-05	72.0286	4.67E+07	-0.7210
25142.	0.00						
10.4000	3.58E-05	72.1950	-4.0104	-1.19E-05	64.4237	4.67E+07	-0.3828
25661.	0.00						

10.6000	1.17E-05	61.4676	-4.6227	-8.47E-06	54.8510	4.67E+07	-0.1275
26179.	0.00						
10.8000	-4.85E-06	50.0060	-4.7109	-5.61E-06	44.6232	4.67E+07	0.05398
26698.	0.00						
11.0000	-1.52E-05	38.8553	-4.4389	-3.32E-06	34.6727	4.67E+07	0.1727
27216.	0.00						
11.2000	-2.08E-05	28.6991	-3.9432	-1.59E-06	25.6098	4.67E+07	0.2405
27734.	0.00						
11.4000	-2.29E-05	19.9280	-3.3318	-3.40E-07	17.7829	4.67E+07	0.2690
28253.	0.00						
11.6000	-2.24E-05	12.7066	-2.6861	4.98E-07	11.3388	4.67E+07	0.2690
28771.	0.00						
11.8000	-2.05E-05	7.0348	-2.0636	1.01E-06	6.2775	4.67E+07	0.2497
29290.	0.00						
12.0000	-1.76E-05	2.8014	-1.5014	1.26E-06	2.4998	4.67E+07	0.2188
29808.	0.00						
12.2000	-1.44E-05	-0.1717	-1.0201	1.33E-06	0.1532	4.67E+07	0.1823
30326.	0.00						
12.4000	-1.13E-05	-2.0950	-0.6278	1.27E-06	1.8694	4.67E+07	0.1446
30845.	0.00						
12.6000	-8.34E-06	-3.1851	-0.3234	1.13E-06	2.8422	4.67E+07	0.1090
31363.	0.00						
12.8000	-5.82E-06	-3.6472	-0.09976	9.56E-07	3.2546	4.67E+07	0.07735
31882.	0.00						
13.0000	-3.75E-06	-3.6639	0.05385	7.68E-07	3.2695	4.67E+07	0.05066
32400.	0.00						
13.2000	-2.13E-06	-3.3888	0.1498	5.87E-07	3.0240	4.67E+07	0.02928
32918.	0.00						
13.4000	-9.34E-07	-2.9450	0.2005	4.24E-07	2.6280	4.67E+07	0.01302
33437.	0.00						
13.6000	-9.72E-08	-2.4262	0.2178	2.87E-07	2.1650	4.67E+07	0.00138
33955.	0.00						
13.8000	4.41E-07	-1.8995	0.2119	1.75E-07	1.6950	4.67E+07	-0.00633
34474.	0.00						
14.0000	7.45E-07	-1.4092	0.1912	9.04E-08	1.2575	4.67E+07	-0.01086
34992.	0.00						
14.2000	8.75E-07	-0.9815	0.1627	2.90E-08	0.8759	4.67E+07	-0.01294
35510.	0.00						
14.4000	8.84E-07	-0.6284	0.1312	-1.23E-08	0.5607	4.67E+07	-0.01327
36029.	0.00						
14.6000	8.15E-07	-0.3516	0.1004	-3.75E-08	0.3138	4.67E+07	-0.01242
36547.	0.00						
14.8000	7.04E-07	-0.1464	0.07246	-5.03E-08	0.1307	4.67E+07	-0.01087
37066.	0.00						
15.0000	5.74E-07	-0.00384	0.04863	-5.42E-08	0.00343	4.67E+07	-0.00899
37584.	0.00						
15.2000	4.44E-07	0.08697	0.02939	-5.20E-08	0.07761	4.67E+07	-0.00704
38102.	0.00						
15.4000	3.24E-07	0.1372	0.01467	-4.63E-08	0.1224	4.67E+07	-0.00522
38621.	0.00						

15.6000	2.22E-07	0.1574	0.00408	-3.87E-08	0.1405	4.67E+07	-0.00361
39139.	0.00						
15.8000	1.38E-07	0.1568	-0.00300	-3.06E-08	0.1399	4.67E+07	-0.00229
39658.	0.00						
16.0000	7.45E-08	0.1430	-0.00724	-2.29E-08	0.1276	4.67E+07	-0.00125
40176.	0.00						
16.2000	2.82E-08	0.1220	-0.00931	-1.61E-08	0.1089	4.67E+07	-4.79E-04
40694.	0.00						
16.4000	-2.97E-09	0.09829	-0.00983	-1.05E-08	0.08771	4.67E+07	5.09E-05
41213.	0.00						
16.6000	-2.21E-08	0.07485	-0.00931	-6.03E-09	0.06680	4.67E+07	3.83E-04
41731.	0.00						
16.8000	-3.19E-08	0.05363	-0.00817	-2.73E-09	0.04785	4.67E+07	5.62E-04
42250.	0.00						
17.0000	-3.52E-08	0.03563	-0.00675	-4.37E-10	0.03180	4.67E+07	6.26E-04
42768.	0.00						
17.2000	-3.40E-08	0.02125	-0.00526	1.02E-09	0.01896	4.67E+07	6.13E-04
43286.	0.00						
17.4000	-3.02E-08	0.01040	-0.00386	1.84E-09	0.00928	4.67E+07	5.52E-04
43805.	0.00						
17.6000	-2.52E-08	0.00272	-0.00264	2.17E-09	0.00243	4.67E+07	4.65E-04
44323.	0.00						
17.8000	-1.98E-08	-0.00227	-0.00164	2.19E-09	0.00203	4.67E+07	3.70E-04
44842.	0.00						
18.0000	-1.47E-08	-0.00513	-8.60E-04	2.00E-09	0.00458	4.67E+07	2.78E-04
45360.	0.00						
18.2000	-1.02E-08	-0.00640	-2.92E-04	1.70E-09	0.00571	4.67E+07	1.95E-04
45878.	0.00						
18.4000	-6.53E-09	-0.00654	9.35E-05	1.37E-09	0.00583	4.67E+07	1.26E-04
46397.	0.00						
18.6000	-3.66E-09	-0.00595	3.31E-04	1.05E-09	0.00531	4.67E+07	7.15E-05
46915.	0.00						
18.8000	-1.51E-09	-0.00495	4.52E-04	7.66E-10	0.00442	4.67E+07	2.99E-05
47434.	0.00						
19.0000	2.31E-11	-0.00378	4.88E-04	5.42E-10	0.00337	4.67E+07	-4.62E-07
47952.	0.00						
19.2000	1.09E-09	-0.00261	4.61E-04	3.78E-10	0.00233	4.67E+07	-2.20E-05
48470.	0.00						
19.4000	1.84E-09	-0.00157	3.89E-04	2.71E-10	0.00140	4.67E+07	-3.75E-05
48989.	0.00						
19.6000	2.39E-09	-7.42E-04	2.85E-04	2.11E-10	6.62E-04	4.67E+07	-4.93E-05
49507.	0.00						
19.8000	2.85E-09	-2.00E-04	1.54E-04	1.87E-10	1.78E-04	4.67E+07	-5.95E-05
50026.	0.00						
20.0000	3.29E-09	0.00	0.00	1.82E-10	0.00	4.67E+07	-6.93E-05
25272.	0.00						

* This analysis computed pile response using nonlinear moment-curvature rela-
  tionships. Values of total stress due to combined axial and bending stresses
  are computed only for elastic sections only and do not equal the actual

stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =     0.52385169 inches
Computed slope at pile head      =    -0.01899518 radians
Maximum bending moment           =         54000. inch-lbs
Maximum shear force              =         -1698. lbs
Depth of maximum bending moment  =       0.000000 feet below pile head
Depth of maximum shear force     =     4.00000000 feet below pile head
Number of iterations             =             14
Number of zero deflection points =              6
```

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type	Pile-head Load 1	Load Type	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	V, lb	0.00	M, in-lb	54000.	0.00	0.5239	-0.01900	-1698.	54000.

Maximum pile-head deflection = 0.5238516876 inches
Maximum pile-head rotation = -0.0189951805 radians = -1.088344 deg.

The analysis ended normally.

TOWN OF ORO VALLEY Building Department **SPECIAL INSPECTION CERTIFICATE**

Project Name:	Date:
PULTE RANCHO VISTOSO – MASONRY SCREEN WALL LOT 20	06/05/2023
Project Address:	**Permit No. (When Applicable)**
803 EAST ROMSDALEN ROAD	

☐ **CERTIFICATE OF SPECIAL INSPECTION BY OWNER**
(To be filled in and signed by the owner before permit is issued.)

In accordance with Section 1704 of the 2018 International Building Code as adopted and amended by the Town of Oro Valley, which requires that the execution of certain construction work be placed under the inspection of the architect, engineer, or special inspector appointed by me, I certify that the construction of the above described building project will receive such special inspection on my behalf.

Name of Architect (if any):	Contractor: Straight Line Pier DBA Ram Jack Arizona
Name of Structural Engineer: PM ENGINEERING	Signature of Owner or Legal Agent: Dianna Taylor agent

☑ **SPECIAL INSPECTION RESPONSIBILITY CERTIFICATE**
(To be filled in and sealed before building permit is issued.)

Registered Professional Engineer (Civil) CERTIFICATE NO. 47662 JONES TEMBO Date Signed 6.5.2023 ARIZONA U.S.A. Expires 03/31/2026

Place Registration Seal and Signature Above.

I certify that I am familiar with the plans and specifications of the above named project and, in accordance with Section 1704 of the 2018 International Building Code as adopted and amended by the Town of Oro Valley, I hereby assume responsibility for carrying out the required special inspection. Inspection reports will be filed with the Building Official as required by Section 1704.1.2. The following individual(s) will be special field inspectors(s) under my direct supervision and are to be on the job site to render complete and competent inspection.

Category	Special Inspector
PIER INSTALLATION VERIFICATION	J. TEMBO
CONCRETE TESTING	J. KILMER / J. NAVARRO
REINFORCED MASONRY	J. KILMER / J. TEMBO

SPECIAL INSPECTOR QUALIFICATIONS [2018 IBC 1704.2.1] ARE APPROVED: _____
The Architect or Engineer of record shall be notified of any change in inspectors Building Official Date

☐ **CERTIFICATE OF COMPLIANCE AND APPLICATION FOR CERTIFICATE OF OCCUPANCY**
(To be filled in and sealed before occupancy certificate is issued.)

Place Registration Seal and Signature Above.

The construction of the above named project is substantially complete and request is hereby made for issuance of the certificate of occupancy per Section 111 of the 2018 International Building Code as adopted and amended by the Town of Oro Valley.

I certify that, to the best of my knowledge, the requirements of the approved plans for which special inspection is required and Section 1704 of the 2018 International Building Code as adopted and amended by the Town of Oro Valley have been met. A guarantee that the contractor has necessarily fulfilled the obligations of his contract is neither intended nor implied.

Architect or Engineer Responsible for Inspection:

Note: All signatures and seals are to be original "wet" signatures and seals. Photo copied or reproduced signatures and seals will not be accepted. "Stamped" signatures also will not be accepted.