Arizona Analytical Inspection & Testing

• Construction Inspections • Material Testing • Geotechnical Services

GEOTECHNICAL EVALUATION

For Twelve New Single-Family Residences

APNS 403-23-107 THROUGH 118

378, 370, 384, 392 N. HOMESTEAD PARKWAY

1183, 1195, 1201, 1209, 1210, 1198, 1192, 1186 W. WHITE HAWK DRIVE

CAMP VERDE, ARIZONA 86322

WHITE HAWK AT CAMP VERDE LOTS 1 - 12

Prepared by Arizona Analytical Inspection & Testing, LLC.

for

Nexstar Homes, LLC.

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Arizona Analytical Inspection & Testing

April 2nd, 2021
Job No. 2101327

Nexstar Homes, LLC.
2350 E. Germann Road #25
Chandler, Arizona 85286

Attention: Scott Simonton

Subject: Geotechnical Evaluation
Proposed Twelve New Single-Family Residences
APNs 403-23-107 through 118
378, 370, 384, 392 N. Homestead Parkway
1183, 1195, 1201, 1209, 1210, 1198, 1192, 1186 W. White Hawk Drive
Camp Verde, Arizona 86322

Dear Mr. Simonton:

We have completed a geotechnical evaluation for the subject site. This report presents the results of our evaluation, discussion of our findings, and provides geotechnical recommendations for earthwork construction, development criteria, and preliminary recommendations for foundation design purposes.

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

This report has been prepared for the exclusive use of Nexstar Homes and specific application to the subject project in accordance with generally accepted engineering practices. Since the recommendations presented herein are dependent upon their implementation in the design and construction of the proposed development, we would be pleased to review project plans and specifications relative to compliance with the intent of this report at no additional cost. We are also available to provide quality control services during the construction phase of the project. A fee schedule covering these services is available upon request. We appreciate the opportunity to have participated in this phase of your project. Should you have any questions concerning the contents of this report or any other matter, please do not hesitate to contact us.

Respectfully Submitted,

Arizona Analytical Inspection and Testing, LLC.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
24718
PHILLIP W.
ROSENDAHL
4/2/21
Date Signed
ARIZONA U.S.A.
EXP: 3/31/2022

1.0 INTRODUCTION

This report presents the result of a geotechnical evaluation conducted for twelve new single-family residences; the aerial photograph below shows the current site condition. The purpose of this investigation was to determine the suitability of the site soils for building foundation, and to make specific recommendations concerning site preparation, fill and backfill, and compaction requirements. Detailed recommendations regarding foundation design, allowable bearing capacity, and surface drainage are also included.

2.0 SCOPE OF SERVICES

This report is an informational document prepared as a professional service. It does not imply knowledge of all potentially problematic conditions which may be present. The primary role of geotechnical consultants is to use their professional expertise in evaluating the site's geotechnical features and to present opinions and statements of fact based upon 1) subsurface conditions encountered at a test pit location at the time of excavation, 2) laboratory tests conducted on selected representative samples, and 3) their experience with similar soil conditions. The information, conclusions and recommendations presented in this report are intended to assist owners, developers and others in decision-making regarding a course of action, and the degree of risk acceptable to them in undertaking development of the proposed project. Final decisions in this regard are always and ultimately made by the owner/developer and others. Accordingly, we are not responsible for financial (or time-related) gains or losses accrued by the owner/developer and others from the subject and adjacent properties.

3.0 SITE AND PROJECT INFORMATION

3.1 Site Description

This site consists of twelve lots that range in size between 0.26 and 0.76 acres. The subdivision is bound on the North by residential lots, on the West by a commercial lot, on the East by state trust land, and on the South by N. Homestead Parkway. The building site has been cleared of vegetation, contains existing asphalt paved streets, and is relatively flat with drainage occurring into the existing rip-rap lined drainage ditches onsite. All deleterious material will need to be removed.

3.2 Proposed Development

We understand that the project will consist of twelve new homes composed of one-story wood framed buildings with concrete slabs-on-grade. Foundation loads will be relatively light. It will involve over excavating, backfilling, grading the area to build pads for the residences, installing utilities, and constructing driveways.

Should the actual construction vary significantly from that stated above, we should be contacted to reassess our recommendations.

4.0 FIELD AND LABORATORY TESTING PROCEDURES

4.1 Field Exploration

Subsurface soils were explored by a Bobcat E20 at six locations to a depth of 8' with no refusal at TP-1 through TP-6. Soils encountered in the test pits were logged and classified, and selected representative samples returned to the laboratory for further analysis. The subsurface soil profile is shown on the "Test Pit Descriptions" which are included at the end of this report, along with a "Test Pit Locations" plan showing approximate locations of the test pits. Conventional methods and equipment can excavate the native soils encountered on-site without much difficulty to a depth of 8 feet and undiscovered shallow bedrock, cemented soils, cobbles and boulders may make excavation more difficult than expected. Soils encountered in the building pad area consisted primarily of fat clays, silty clays, and sandy clays (CH-CL). No ground water was encountered in any of the test holes at the time of the exploration.

4.2 Lab Testing

Test results indicate that natural moisture was moist for soils to the depths explored. Soils are moist, fat clays, silty clays, and sandy clays (CH-CL). Atterberg Limits tests performed on the fines portions of the samples indicate they have high to medium plasticity. These soils will show high volumetric sensitivity to changes in moisture, proper drainage is very important for these soils. Stratification lines shown on the Test Logs indicate approximate boundaries between soil layers; the transition may actually be more gradual.

5.0 GENERAL SITE CONDITIONS

5.1 Tectonic Faulting and Regional Seismicity

The site is in an area of low seismic activity. No known active or potentially active tectonic faults are shown crossing the site on published maps, nor was any evidence of recent faulting observed during our field evaluation. The possibility of ground acceleration or shaking at the site may be considered approximately similar to the Central Arizona region as a whole. Although we did not reach 100 feet, based on the nature of the subsoils encountered, 2018 IBC Site Class D may be utilized in the seismic design of the structures.

5.2 Vicinity Surface Drainage

Drainage from on-site and off-site properties must be closely evaluated by the project's civil designer. Surface runoff should be directed away from the structure and/or bearing members to prevent erosion and settlement of the foundation.

5.3 Subsurface Soil Conditions

The soil conditions were fairly consistent across the site. Soils consisted of native soils to the depths explored, approximately 8'. These deposits generally consist of loose to dense fat clays, silty clays, and sandy clays (CH-CL).

Our laboratory testing indicates that the on-site soils have high to moderate expansive potential. Based on our test results and observations, we anticipate that the low swell conditions will be present onsite after grading and following the recommendations in this report. The recommendations outlined in Section 6.1 are intended to prepare these soils for support of the intended structures.

6.0 ANALYSIS AND RECOMMENDATIONS

6.1 EARTHWORK CONSTRUCTION GUIDELINES

6.1.1 General

The field and laboratory investigations indicate that the site sub-soils are fat clays, silty clays, and sandy clays (CH-CL), loose to dense, moist and have a high to moderate expansive potential. The material encountered at the test hole locations was relatively uniform or homogeneous in nature. Soils become moderately dense at a depth of 8' and this may increase excavation difficulty for excavations deeper than that.

6.1.2 Site Preparation

The following recommendations are presented as a guide in the compilation of construction specifications. The recommendations are not comprehensive contract documents and should not be utilized as such.

Prior to beginning construction, the entire area to be affected by the construction shall be cleared and stripped of all vegetation, debris, and any fill or obviously loose or unstable soil which should be disposed of in accordance with local codes. Any depressions, erosional gullies, ditches, or holes produced from the removal of any deleterious materials shall be widened sufficiently to accommodate compaction equipment. Following the clearing and grubbing of the building site as described in the

previous paragraph: Testing results determine the need for sub-excavation of this site to be a minimum of 18 inches below proposed footing bottom elevation. Upon reaching the necessary excavation depth, scarify, moisture condition to optimum plus 4% and compact the bottom 8" of the sub-excavation and backfill with engineered fill to the compaction requirement in this report.

For conventional foundations, it is necessary that a minimum of 18 inches of imported, non-expansive, engineered fill lie beneath all foundations for the structures on this lot, including the footings. This is intended to provide a minimum of 18 inches compacted fill blanket beneath foundations, to minimize differential settlement and to stabilize the loose material. 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. If additional fill is required to meet plan grades, the recommendations of section 6.1.4 should be followed.

6.1.3 Material

Structural or engineered fill is any fill material that supports building(s), pavements, or other structures (structural areas). Engineered fill materials should be observed and tested by our firm. All fill material should be free of significant organic materials, vegetation, debris, oversized material, and other deleterious materials.

The on-site soils are not acceptable for use within the top 18 inches under any structural area for regular conventional foundation, it is necessary that a minimum of 18 inches of imported, non-expansive, engineered fill lie beneath all foundations for the structures and should have a lateral extent of at least 2 feet beyond the edges of all footings. The on-site soils are generally acceptable for use as fill in berms, slopes, or landscape area away from building or structural areas

The organic content of the fill material should be minimized. Although ASTM recommends no more than 3% organics in fill material, it is prudent to reduce organic content to negligible concentrations. If material is encountered with excessive organic content, it should not be used as fill material or mixed to achieve acceptable organic content or placed in landscape areas.

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

6.1.4 Fill and Backfill Requirements

Material excavated on site, after being processed, moistened and well mixed can be used for berms, slopes, and landscaping areas away from structural areas. For Retaining walls, stem walls or site walls: Compact subgrade and/or required fill material beneath retaining walls to the specified "Compaction Requirements" table. Specifications for backfill against retaining walls should be provided by the engineer.

Fill material should be placed in 10" maximum loose lifts, moisture conditioned, and compacted to a minimum of 95 percent of the ASTM D698 (standard proctor) maximum density. Oversized material of +3" shall be removed within the top 18" underneath slabs to provide a more uniform bearing surface. Fill placement in trench or wash areas and slope topography shall include horizontal layers placed in 6" lifts and benching each lift into the native soils at a lateral distance of 5' minimum.

Imported borrow for use in compacted fill should be approved by us to verify its suitability for its intended use. Imported borrow should be well graded with 100% of the material passing the 3" sieve

size (oversized). It should exhibit a swell potential less than 1.5% when a swell test is performed on remolded material compacted to 95% of ASTM D698 proctor density at a moisture content of between 2% to 3% below optimum and saturated under a surcharge load of 100 psf. Imported borrow should be uniformly moisture conditioned to optimum moisture content ±2% prior to compaction.

It is also recommended that 4" of ABC be placed, moisture conditioned, and compacted to a minimum of 95 percent of ASTM D698 (standard proctor) beneath the slab. This is intended to provide a more uniform bearing surface and aid in concrete curing.

All material should be placed and compacted as established in the following table of "**Compaction Requirements**".

LOCATION OF FILL	TYPE OF FILL	MINIMUM COMPACTION	MAXIMUM COMPACTION
Below Foundations Backfill < 3' Deep Backfill > 3' Deep	Native/Import Native/Import Native/Import	95% 95% 98%	
Beneath Interior Slabs and around foundation walls above footing elevation	Native Import Aggregate Base Course	95% 95% 95%	
Below Pavements	Native Import Aggregate Base Course	95% 95% 100%	
Below Curb and Gutter	Native or Import	90%	
Utility Trenches within 5' of buildings & areas beneath exterior slabs or walks	Native Import	90% 90%	
Utility Trenches greater than 5' from buildings where no structure will be supported	Native or Import	90% (top 2 ft.) and 85% (below 2 ft.)	
Common fills where no structure will be supported	Native Import	90% 90%	
Exterior building berm	Native Import	90% 90%	

6.1.5 Trench Excavations

It appears that shallow trench excavation for utilities may be accomplished utilizing conventional trenching equipment. Vertical trench walls are generally unstable, trench wall mitigation measures should be implemented for depths beyond five feet, in a trench safety plan to protect personnel entering the trench. Trench safety should conform to OSHA safety guidelines and other applicable industry standards. Backfill of trenches, excluding pipe bedding (under pipe) and pipe zone material (surrounding the pipe and 6" above pipe), should utilize processed, moistened and compacted approved import or on-site soils in order to provide more uniform support conditions and reduce potential differential settlement and expansion problems.

Materials loosened during excavation for spread footing foundations should be removed and/or moistened, processed and re-compacted to the specified compaction requirement above. Compacted

fill supporting foundations should extend laterally beyond the foundation perimeter a minimum distance of 5.0 feet or equal to 2.0 times the depth of fill placed below the foundation.

6.1.6 Construction Observations

Our testing and observation services can be retained during the following phases of construction:

1. Site clearing and inspection of over-excavation bottoms
2. Fill placement and compaction
3. Footing excavation (prior to forming and reinforcing steel placement)
4. Concrete Inspection and Testing
5. Any utility trenches excavated and backfilled after pad work
6. Any special inspection (post-tension, welds, epoxy, rebar, etc.)

These services are recommended to ensure compliance with the design concepts, specifications and recommendations.

6.2 FOUNDATION RECOMMENDATIONS

6.2.1 General

Soil characteristics near finish grades following earthwork will be used to establish the appropriate foundation design parameters. Based on the data available to date, we anticipate that low expansion soils will be utilized for foundation subgrade. The following preliminary recommendations for design of foundations are presented for your review and use.

6.2.2 Conventional Foundation

It is recommended that the proposed structures be supported on conventional spread footings bearing on a minimum of 18” inches of controlled compacted approved import material. A safe allowable bearing pressure of 2,000 psf may be utilized, this is based off of International Building Code 2018, Table 1806.2 Presumptive Load-Bearing Design and similar soils shown in Appendix F. This bearing capacity refers to all dead and live loading therefore being the total pressure. A one-third increase is permissible when considering short duration loadings such as wind or seismic.

Minimum footing widths of 16" and 24" are recommended for continuous perimeter footings and isolated rectangular spread footings, respectively. Footings should extend a minimum of 2.5 feet beneath finished grade. Finished grade references should be considered as below floor level for interior footings and as the lowest adjacent grade for perimeter footings. Estimated total settlement for this type of soil is expected to be minimal once mixed with import. Most of the settlement should occur during or soon after construction, there will be minimal differential settlement associated with these soils once processed per this report. It is recommended that two #4 reinforcing bars be placed longitudinal in both the stem and the footing to help minimize the potential for damage occurring to the foundations from differential movements.

**It is necessary that a minimum of 1.5 feet of controlled compacted fill lies beneath all foundations for the structures in order to utilize the bearing capacity for controlled compacted fill for design of foundation width. The controlled compacted fill should have a lateral extent of at least 2.0 feet beyond the edges of all footings. If there is less than 1.5 feet of controlled compacted fill consider the bearing condition to be unacceptable.*

6.2.3 Lateral Loadings

The following are recommended values that may be used in the analysis of foundations subject to lateral loadings:

Lateral Loadings – Imported Engineered Fill

Backfill Pressures	
Walls unrestrained from deflecting	35 psf/ft
Walls restrained from deflecting	50 psf/ft
Passive Pressure	
Continuous walls or footings	300 psf/ft
Column footings	350 psf/ft
Coefficient of Base Friction	
Used with passive resistance	0.35
Independent of passive resistance	0.45
Footing Toe Pressure	Increase maximum allowable by 1/3 (1.33 times the maximum allowable)

The preceding values are for natural soils at the site or for import fill meeting the requirements of this report. Also, these lateral pressures do not include pressures arising from the presence of:

- Hydrostatic conditions, submergence or partial submergence
- Sloping backfill - positively or negatively
- Surcharge loading – permanent or temporary
- Seismic or dynamic conditions.

The backfill pressures do not include lateral wall loads imposed due to backfilling operations. Walls shall be adequately braced during backfilling. Wall backfill shall not be over compacted.

6.2.4 Slabs-On-Grade

Interior floor slabs shall be supported on moisture conditioned and processed approved native or imported soils compacted to a minimum of 95% of the standard proctor at a moisture content of between –2% and +2% or as required by the final grading plans.

We recommend that a minimum 4 inches of Aggregate Base Course be placed beneath interior floor slabs to provide a more uniform bearing surface and aid in concrete curing. This material shall be compacted to a minimum of 95% of the Proctor density as determined by ASTM D698. All poured slabs should be separated from bearing members and utility lines to allow for independent slab movement. Also, slab contraction and isolation joints should be included. Floor slabs shall be a minimum of 4" thick and use a minimum of 2500 psi concrete. Slabs on grade can be designed to have wire mesh or rebar grid reinforcement to help minimize slab cracking.

Where loaded, interior walls are planned, these walls may be supported on thickened sections of the floor slab. The thickened sections should be a minimum of 12 inches in width and may use a bearing capacity of 1,500 psf. Control joints should be provided at the thickened slab section to help minimize floor slab cracking in that area. Also, slab contraction and isolation joints should be included.

7.0 SITE IMPROVEMENTS

7.1 Surface Drainage

Positive drainage must be provided during construction and throughout the life of the structure. Excessive water infiltration into construction excavations or foundations or utilities shall be prevented. Collection and diversion of washes, irrigation and roof drainage away from foundation areas is recommended. Planting and landscape areas should be constructed so that water will not pond adjacent to buildings, and so that drainage will not be impeded.

A positive slope must be provided away from foundations. Where the foundations will not be protected by directly adjoining slabs or pavement, we recommend a minimum 5 percent slope away from the building for a minimum distance of 10 feet and 2 percent slope away from the building outside of 10 feet.

7.2 Footing Trench Excavation

All footing excavations shall be level and clean of all loose or disturbed materials and inspected by our firm prior to placing reinforcement. Footing trench soil and any excess soils generated from utility trench excavations shall be compacted to a minimum relative compaction of 95 percent if not removed from the site. Considering the nature of the onsite soils, it shall be anticipated that caving or sloughing might be a factor in subsurface excavations (i.e., utilities or footings). Shoring or excavating the trench walls at the angle of repose (typically 25 to 45 degrees) may be necessary and shall be anticipated in non-cemented soils. Bottom of footings may need to be compacted with a jumping jack when loosened during excavating. All excavations shall conform to national and local safety codes.

7.3 Utility Trench Backfill

Considering the overall nature of the soil observed onsite, it shall be anticipated that materials may need to be imported to the site for use as pipe bedding and pipe zone material or be screened onsite to remove large rocks, etc. The onsite soils may not meet specifications for selected and granular trench backfill. Utility trench backfill shall be placed in accordance with the appropriate M.A.G. standards. Compaction testing and observation, along with probing, shall be performed to verify the desired results.

7.4 Cut Slope Stability Limitations

The stability of cut and fill slopes are dependent upon the soil properties encountered. The recommended slopes are as follows:

Cut Slopes:
- Non-Cemented Soils 2H:1V
- Cemented Soils: 1H:2V
- Competent Rock: 1H:4V

Compacted Fill Slopes:
- Sandy Silts/Silty Sands: 2.5H:1V
- Sandy Clays/Clayey Sand: 2H:1V

Steep slopes should be rock protected, benched and/or covered with landscaping to minimize erosion and reduce maintenance.

7.5 Foundations and Risks

The factors that aid in the design and construction of these foundations include risk, soil type, foundation and structural loading. The foundation systems are selected by the owner/builder. It should be noted that some levels of risk are associated with all foundation systems and there is no such thing as a "zero-risk" foundation. It also should be noted that the foundation recommendations presented in this report are not designed to resist soil movements as a result of sewer/plumbing leaks, excessive irrigation, poor drainage or water ponding near the foundation system.

The use of moisture retarders or barriers is desirable for any slab-on-grade, where the floor will be covered by products using water-based adhesives, wood, vinyl backed carpet, impermeable floor coatings (epoxy, acrylic terrazzo, etc.) or where the floor will be in contact with moisture sensitive equipment or furnishings. Final determination on the use of a moisture retarder should be left to the slab designer.

It is recommended that the owner/builder implement a foundation maintenance program to help reduce potential future unwanted foundation/slab movements throughout the life of the structure. The owner should conduct yearly observation of foundations and slabs and perform any maintenance necessary to improve drainage and minimize infiltrations of water from precipitation and/or irrigation.

8.0 PLAN REVIEW

It is requested that we be provided the opportunity for a general review of final design and specifications in order to ensure that earthwork, and foundation recommendations are properly interpreted and implemented in the design and specifications. It is also recommended that a qualified soil technician will observe the construction and provide sufficient testing to certify that cut and fill areas are constructed in accordance with the requirements contained herein and that foundation excavations are properly prepared prior to placement of concrete for the foundations. This proposed observation should include verification of over-excavation depths, compaction testing at 12" intervals, and observation time during pad construction to verify that the soils identified during this investigation are consistent with those used for pad construction. We will be pleased to answer any questions that may arise and provide further assistance as needed.

9.0 LIMITATIONS

This report is not intended as a bidding document, and any contractor reviewing this report must draw their own conclusions regarding specific construction techniques to be used on this project. The scope of services carried out by this firm does not include an evaluation pertaining to environmental issues. The subsoil investigation and design recommendations contained in this report pertain exclusively to the subsurface conditions observed at the selected sites tested and within the zone of significant influence of the anticipated foundation system. They do not address geologic conditions beyond the depth of investigation. If during the design phase or actual construction, conditions become evident which differ from those acknowledged in the scope of this Report, we should be advised immediately to reassess the recommendations contained herein.

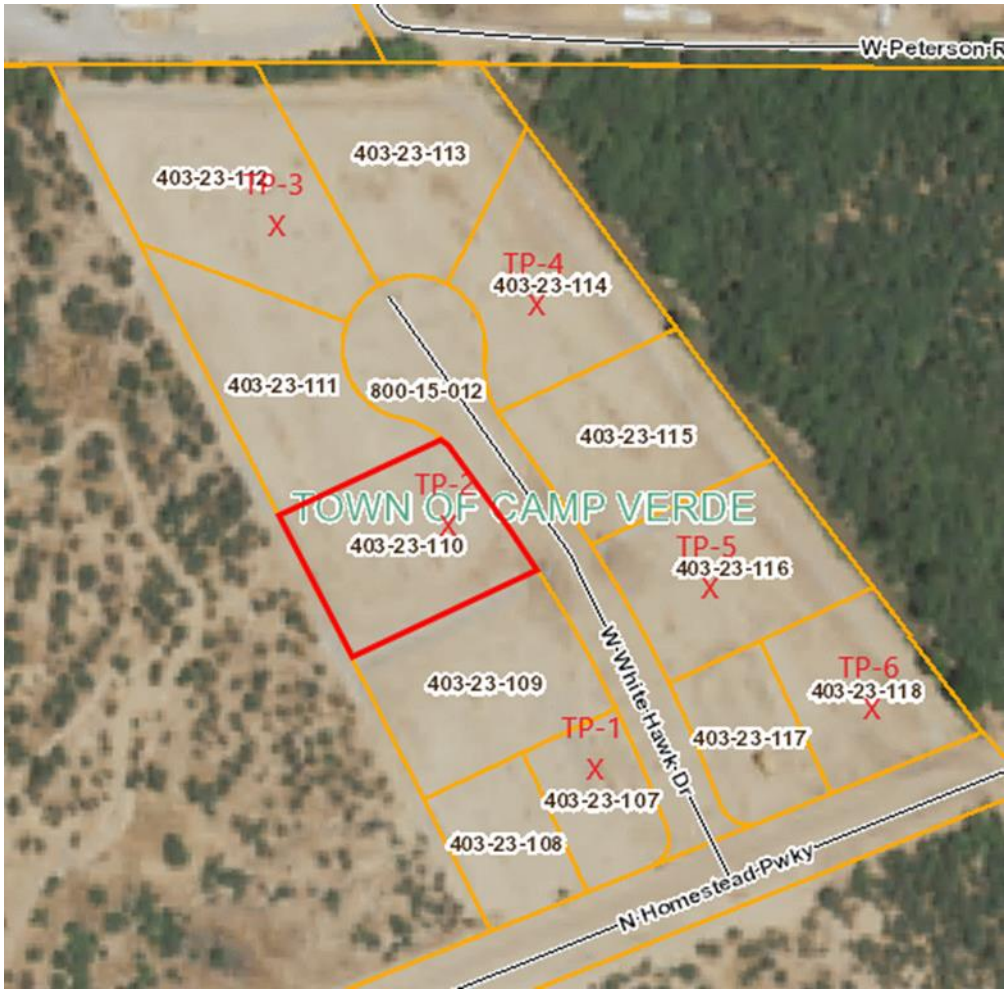
10.0 APPENDICES

10.1 Appendix A: *TEST PIT LOCATION PLAN*

Project: Twelve New Custom Homes

Location: APNs 403-23-107 through 118
378, 370, 384, 392 N. Homestead Parkway
1183, 1195, 1201, 1209, 1210, 1198, 1192, 1186 W. White Hawk Drive
Camp Verde, Arizona 86322

Date Sampled: March 22nd, 2021



10.2 Appendix B: *TEST PIT DESCRIPTION*

Project: Twelve New Custom Homes

Location: APNs 403-23-107 through 118
378, 370, 384, 392 N. Homestead Parkway
1183, 1195, 1201, 1209, 1210, 1198, 1192, 1186 W. White Hawk Drive
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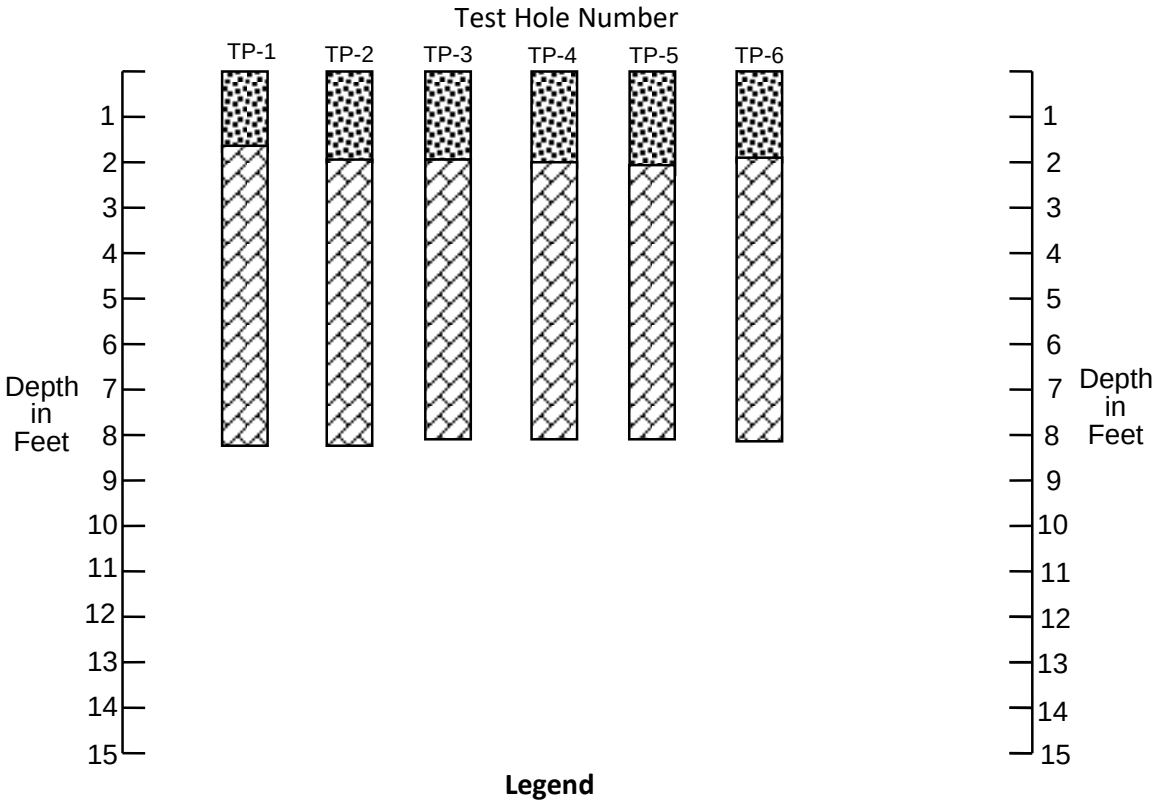


Legend

Top soil, brown, fat clays, silty clays, sandy clays, moist, soft or loose, organics

Dark brown to brown, silty clays, moist, and dense. No refusal.

No ground water was encountered in the test borings at the time of our investigation.

10.3 Appendix C: *SUMMARY OF LABORATORY TEST DATA*

Project: Twelve New Custom Homes

Location: APNs 403-23-107 through 118
378, 370, 384, 392 N. Homestead Parkway
1183, 1195, 1201, 1209, 1210, 1198, 1192, 1186 W. White Hawk Drive
Camp Verde, Arizona 86322

Date Sampled: March 22nd, 2021

Test Hole	Depth of	Moisture	Atterberg Limits		Sieve Analysis, % Passing				USCS Classification
Number	Sample (ft.)	Content %	L.L.	P.I.	No.4	No.10	No.30	No.200	Soil Type
TP-1	1.0'- 8.0'	13.2	45	24	100	98	96	84	CL
TP-2	1.0'- 8.0'	17.0	51	28	100	99	98	89	CH
TP-3	1.0'- 4.0'	15.7	48	26	100	99	98	86	CL
TP-3	4.0'- 8.0'	12.8	32	18	89	76	69	53	CL
TP-4	1.0'- 8.0'	11.3	34	14	96	93	79	51	CL
TP-5	1.0'- 4.0'	13.3	50	29	95	91	77	51	CH
TP-5	4.0'- 8.0'	12.9	33	14	81	79	72	53	CL
TP-6	1.0'- 8.0'	16.8	52	31	100	99	98	87	CH

NV = No Value N.P. = Non-Plastic

Soils were classified according to the Unified Soils Classification System (U.S.C.S.)

PI	Description
0	Non-Plastic
1 – 5	Slightly Plastic
5 – 10	Low Plasticity
10 – 20	Medium Plasticity
20 – 40	High Plasticity
>40	Very High Plasticity

10.4 Appendix D: UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)		
		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)		
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)		
		SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)		
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

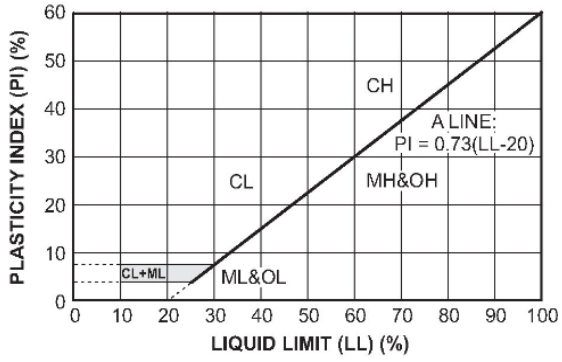
LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent ..... GW, GP, SW, SP
More than 12 percent ..... GM, GC, SM, SC
5 to 12 percent ..... Borderline cases requiring dual symbols

PLASTICITY CHART



10.5 Appendix E: *DEFINITION OF TERMINOLOGY*

Allowable Soil Bearing Capacity	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
Aggregate Base Course (ABC)	A sand and gravel mixture of specified gradation, used for slab and pavement support.
Backfill	A specified material placed and compacted in a confined area.
Base Course	A layer of specified material placed on a subgrade.
Concrete Slabs-On-Grade	A concrete surface layer cast directly upon ABC, crushed gravel or subgrade.
Controlled Compacted Fill	Engineered Fill. Specific material placed and compacted to a specified density and/or moisture conditions under observation of a representative of a soil engineer.
Differential Settlement	Unequal settlement between or within foundation elements of a structure.
Expansion Potential (Swell)	The potential of a soil to increase in volume due to the absorption of moisture.
Fill	Materials deposited by the action of man.
Finish Grade	The final grade created as a part of the project.
Native Grade	The naturally occurring ground surface.
Native Soil	Naturally occurring on-site soil.
Over excavate	Lateral Extent of Sub-excavation.
Process Soil	To remove and mix the material with moisture.
Scarify	To mechanically loosen soil or break down the existing soil structure.
Settlement	Downward movement of the soil mass and structure due to a vertical loading.
Soil	Any unconsolidated material composed of disintegrated vegetable or mineral matter that can be separated by gentle mechanical means, such as agitation in water.
Strip	To remove from present location.
Sub-Excavation	Vertical zone of soil removal and re-compaction required for adequate foundations or slab support.
Subgrade	Prepared native soil surface.

10.6 Appendix F: PRESUMPTIVE LOAD-BEARING VALUES

TABLE 1806.2
PRESUMPTIVE LOAD-BEARING VALUES

CLASS OF MATERIALS	VERTICAL FOUNDATION PRESSURE (psf)	LATERAL BEARING PRESSURE (psf/ft below natural grade)	LATERAL SLIDING RESISTANCE	
			Coefficient of friction[a]	Cohesion (psf)[b]
1. Crystalline bedrock	12,000	1,200	0.70	—
2. Sedimentary and foliated rock	4,000	400	0.35	—
3. Sandy gravel and/or gravel (GW and GP)	3,000	200	0.35	—
4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000	150	0.25	—
5. Clay, sandy clay, silty clay, clayey silt, silt and sandy silt (CL, ML, MH and CH)	1,500	100	—	130

For SI: 1 pound per square foot = 0.0479 kPa, 1 pound per square foot per foot = 0.157 kPa/m.
a. Coefficient to be multiplied by the dead load.
b. Cohesion value to be multiplied by the contact area, as limited by Section 1806.3.2.