ENT 1578:2024 PG 1 of 166
ANDREA ALLEN
UTAH COUNTY RECORDER
2024 Jan 9 03:33 PM FEE 40.00 BY MG
RECORDED FOR AMERICAN FORK CITY

When Recorded Mail To:
American Fork City
51 East Main
American Fork UT 84003

NOTICE OF INTEREST, BUILDING REQUIREMENTS, AND ESTABLISHMENT OF RESTRICTIVE COVENANTS

This Notice is recorded to bind the attached Geotechnical Study dated May 14, 2021 along with the site grading plan to the property generally located at 42 E. 1100 S. (address), American Fork, UT 84003 and therefore mandating that all construction be in compliance with said Geotechnical Study and site grading plan per the requirements of American Fork City ordinances and standards and specification including specifically Ordinance 07-10-47, Section 6-5, Restrictive Covenant Required and 6-2-4, Liquefiable Soils. Said Sections require establishment of a restrictive covenant and notice to property owners of liquefiable soils or other unique soil conditions and construction methods associated with the property.

Exhibit A – Legal Description of Property
Exhibit B – Geotechnical Study
Exhibit C – Site Grading Plan

Dated this 3rd day of August, 2023.

OWNER(S):

(Signature) _____ (Signature) _____

Jacob M Horan
(Printed Name) _____ (Printed Name) _____

Manager
(Title) Red Pine Construction _____ (Title)

STATE OF UTAH)
§
COUNTY OF Utah)

On the 3rd day of August, 2023, personally appeared before me Jacob M. Horan and _____, Owner(s) of said Property, as (individuals and/or authorized representatives of a company), and acknowledged to me that such individuals or company executed the within instrument freely of their own volition and pursuant to the articles of organization where applicable.

TERILYN LURKER
NOTARY PUBLIC-STATE OF UTAH
COMMISSION# 710356
COMM. EXP. 02-04-2024

Terilyn Lurker
Notary Public
My Commission Expires: 2/4/2024

Approved as to form: American Fork City Attorney

Rev. 12/4/18

Dear Pat:

EXHIBIT A
Parcel Legal Description

A parcel of land being all or part of those three (3) entire tracts of land described as "Parcel 1" and "Parcel 2" in that Warranty Deed recorded July 1, 2021 as Entry No. 117663:2021 and that Warranty Deed recorded January 6, 2016 as Entry No. 1068:2016 in the Office of the Utah County Recorder. Said entire tract of land is located in the Southeast Quarter of Section 26, Township 5 South, Range 1 East, Salt Lake Base and Meridian and described as follows:

Beginning at the southwesterly corner of said "Parcel 2, which is 631.46 feet S. 89°00'19" E. along a monument line and 1970.35 feet North from a Reference Monument to the South Quarter Corner of said Section 26; said point also being 548.06 feet S. 89°48'53" E. along the Section line and 1899.49 feet North from said South Quarter Corner of Section 26; thence N. 00°28'09" E. 702.30 feet (Record = North 0°28'0" East 705.33 feet) along the westerly boundary line of said entire tract and extension thereof; thence S. 89°12'49" E. (Record = South 89°15'0" East) 738.72 feet to an existing fence; thence S. 00°24'46" W. (Record = South 0°27'17" West) 876.09 feet along said existing fence; thence N. 89°59'51" W. (Record = West 345.9 feet) 346.23 feet along southerly boundary line of said "Parcel 1"; thence N. 64°51'27" W. 432.87 feet (Record = North 64° 51'36" W 435 feet) along the southwesterly boundary line of said "Parcel 2" to the **Point of Beginning.**

The above-described parcel of land contains 615,124 sq. ft. in area or 14.121 acres, more or less. Two (2) Lots.

Exhibit B-Geotechnical Study

REPORT
GEOTECHNICAL STUDY
PROPOSED 6800 NORTH INDUSTRIAL
5900 WEST 6800 NORTH
AMERICAN FORK, UTAH

Submitted To:

Red Pine Construction
520 South 850 East, Suite A4
Lehi, Utah 84043

Submitted By:

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123

May 14, 2021

Job No. 2354-003-21

GSH

May 14, 2021
Job No. 2354-003-21

Mr. Mike Horan
Red Pine Construction
520 South 850 East, Suite A4
Lehi, Utah 84043

Mr. Horan:

Re: Report
Geotechnical Study
Proposed 6800 North Industrial
5900 West 6800 North
American Fork, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed at the site of the proposed 6800 North Industrial to be located near 5900 West 6800 North in American Fork, Utah. The general location of the site with respect to existing roadways, as of 2021, is presented on Figure 1, Vicinity Map. A more detailed layout of the site showing proposed facilities, existing roadways, and the borings drilled in conjunction with this study is presented on Figure 2, Site Plan.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of the study were planned in discussions between Mr. Mike Horan of Red Pine Construction and Mr. Alan Spilker of GSH Geotechnical, Inc. (GSH).

In general, the objectives of this study were to:

1. Define and evaluate the subsurface soil and groundwater conditions across the site.

2. Provide appropriate foundation, earthwork, pavement, and geoseismic recommendations to be utilized in the design and construction of the proposed facilities.

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123
Tel: 801.685.9190 Fax: 801.685.2990
www.gshgeo.com

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of the exploration, logging, and sampling of 15 borings.

2. A laboratory testing program.

3. An office program consisting of the correlation of available data, engineering analysis, and the preparation of this summary report.

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of the Professional Services Agreement No. 21-0434 dated April 12, 2021.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration borings, projected groundwater conditions, and the layout and design data discussed in Section 2, Proposed Construction. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The site is proposed to be developed with 3 warehouse structures and associated pavements. The structures are anticipated to be one extended level, constructed slab-on-grade, have footprints of 47,040 square feet to 115,808 square feet, and be supported upon conventional spread and continuous wall footings.

Maximum real column and wall loads are anticipated to be on the order of 70 to 225 kips and 3 to 8 kips per lineal foot, respectively. Real loads are defined as the total of all dead plus frequently applied (reduced) live loads.

Paved parking areas, drive lanes, and loading/unloading areas are planned around the structures.

Projected traffic in the parking areas is anticipated to consist of a light volume of automobiles and light trucks, occasional medium-weight trucks, and no heavy-weight trucks.

Projected traffic in the drive lanes and loading/unloading areas is anticipated to consist of a moderate volume of automobiles, light trucks, and medium-weight trucks with a light volume of heavy-weight trucks.

Site development will require some earthwork in the form of minor cutting and filling. At this time, we anticipate that maximum site grading cuts and fills, excluding utilities, will be on the order of 1 to 3 feet.

3. SITE INVESTIGATIONS

3.1 GENERAL

Subsurface conditions in unexplored locations or at other times may vary from those encountered at specific boring locations. If such variations are noted during construction or if project development plans are changed, GSH must review the changes and amend our recommendations, if necessary.

Boring locations were established by estimating distances and angles from site landmarks. If increased accuracy is desired by the client, we recommend that the boring locations and elevations be surveyed.

3.2 FIELD PROGRAM

To define and evaluate the subsurface soil and groundwater conditions across the site, 15 borings were completed within the accessible areas. These borings were completed to depths ranging from 5.0 to 51.5 feet with a truck-mounted drill rig equipped with hollow-stem augers. The approximate locations of the borings are presented on Figure 2.

The field portion of our study was under the direct control and continual supervision of an experienced member of our geotechnical staff. During the course of the drilling operations, a continuous log of the subsurface conditions encountered was maintained. In addition, samples of the typical soils encountered were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications were supplemented by subsequent inspection and testing in our laboratory. Graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3O, Boring Logs. Soils were classified in accordance with the nomenclature described on Figure 4, Key to Boring Log (USCS).

A 3.0-inch outside diameter, 2.42-inch inside diameter (Dames & Moore) and a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) were utilized at select locations and depths. The blow counts recorded on the boring logs were those required to drive the sampler 12 inches with a 140-pound hammer dropping 30 inches.

Following completion of exploration operations, 1.25-inch diameter slotted PVC pipe was installed in Borings B-1 through B-6, B-8 through B-10, B-12, and B-15 to provide a means of monitoring the groundwater fluctuations. The borings were backfilled with auger cuttings.

3.3 LABORATORY TESTING

3.3.1 General

To provide data necessary for our engineering analysis, a laboratory testing program was performed. This program included moisture, density, partial gradation, Atterberg limits, consolidation, and chemical tests.

Lab testing was ongoing at the time this report was written. Upon completion, an updated version of this report containing lab results will be sent, along with any revised recommendations.

4. SITE CONDITIONS

4.1 SURFACE

The site is located at approximately 5900 West 6800 North in American Fork, Utah. The topography of the site is relatively flat, grading down to the south with a total relief of approximately 6 to 9 feet. Site vegetation consists of agricultural grass fields with undeveloped/vacant grass land in the western portion of the site.

The site is bounded to the north by 6800 North Street followed by agricultural fields; to the east by single-family residential structures along with agricultural fields; to the south by agricultural fields and vacant/undeveloped brush/grass land; and to the west by vacant/undeveloped brush/grass land followed by 100 West Street and a single-family residential structure adjacent to the northwest corner of the site.

4.2 SUBSURFACE SOIL

The following paragraphs provide generalized descriptions of the subsurface profiles and soil conditions encountered within the borings conducted during this study. As previously noted, soil conditions may vary in unexplored locations.

The borings were completed to depths ranging from 5.0 to 51.5 feet. The soil conditions encountered in each of the borings, to the depths completed, were generally similar across the boring locations.

- Approximately 5.0 to 6.0 inches of topsoil was encountered in each boring. Topsoil thickness is frequently erratic and thicker zones of topsoil should be anticipated.

- Natural soils were encountered below the non-engineered fill or the ground surface in each boring. The natural soils consisted primarily of clay with varying silt, sand, and gravel content and sand with varying clay, silt, and gravel content.

The natural clay soils were very soft to stiff, dry to saturated, brown, dark brown, gray, and tan in color. The natural clay soils are anticipated to exhibit moderate strength and compressibility characteristics under the anticipated loading.

The natural sand soils were very loose to medium dense, dry to saturated, and gray and brown in color. The natural sand soils are anticipated to exhibit moderately high strength and moderately low compressibility characteristics under the anticipated load range.

For a more descriptive interpretation of subsurface conditions, please refer to Figures 3A through 3O, Boring Logs. The lines designating the interface between soil types on the boring logs generally represent approximate boundaries. In situ, the transition between soil types may be gradual.

4.3 GROUNDWATER

On May 13, 2021 (21 days following drilling), groundwater was measured within the PVC pipes installed as tabulated below:

Boring No.	Groundwater Depth (feet)
	May 13, 2021
B-1	4.8
B-2	Pipe Damaged
B-3	7.8
B-4	2.8
B-5	5.0
B-6	6.1
B-8	7.8
B-9	Pipe Damaged
B-10	7.1
B-12	4.6
B-15	3.6

Groundwater levels vary with changes in season and rainfall, construction activity, irrigation, snow melt, surface water run-off, and other site-specific factors.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The proposed structures may be supported upon conventional spread and continuous wall foundations supported upon suitable natural soils and/or structural fill extending to suitable natural soils.

The most significant geotechnical aspects at the site are:

1. The potential to encounter non-engineered fill at the site.

2. The relatively shallow depth to groundwater.

3. The potentially liquefiable sand layers encountered in Borings B-1, B-2, B-4, and B-12.

Prior to proceeding with construction, removal of the surface vegetation, root systems, topsoil, non-engineered fill (if encountered), and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed structure footprints and 3 feet beyond pavements and exterior flatwork areas will be required. All existing utility locations should be reviewed to assess their impact on the proposed construction and abandoned and/or relocated as appropriate.

Due to the developed nature of the surrounding area, non-engineered fills may exist in unexplored areas of the site. Based on our experience, non-engineered fills are frequently erratic in composition and consistency. All surficial loose/disturbed soils and non-engineered fills must be removed below all footings, floor slabs, and pavements. The in situ, non-engineered fills may remain below flexible pavements if free of any deleterious materials, of limited thickness, and if properly prepared, as discussed later in this report.

Groundwater was measured as shallow as 2.8 feet below the ground surface. GSH recommends placing floor slabs no closer than 4 feet from the highest groundwater elevation. Site grading fill may be utilized to raise the overall grade to achieve the required separation between the floor slab and the highest groundwater elevation.

Proof rolling of the natural clay subgrade must not be completed if cuts extend to within 1 foot of the groundwater surface. In areas where cuts are to extend to within 1 foot of the groundwater surface, stabilization must be anticipated.

To reduce disturbance of the natural soils during excavation, it is recommended that low-impact, track-mounted equipment with smooth edge buckets/blades be utilized.

Very loose to Medium dense, saturated sand layers were encountered in Borings B-1, B-2, B-4, and B-12. Due to liquefiable soils being present, the site has been determined to be Site Class F (in accordance with Section 20.3.1, Site Class F of ASCE 7-16). According to ASCE 7-16, a site-specific response analysis is required. Section 20.3.1 of ASCE 7-16 provides exception to this requirement under certain conditions. These options will need to be reviewed and evaluated by the project structural engineer. GSH is currently conducting a site-specific seismic response analysis and the results will be transmitted upon completion.

Detailed discussions pertaining to earthwork, foundations, pavements, and the geoseismic setting of the site are presented in the following sections.

5.2 EARTHWORK

5.2.1 Site Preparation

Initial site preparation will consist of the removal of the non-engineered fills (if encountered), surface vegetation, root systems, topsoil, and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed structure footprint and 3 feet beyond pavements and exterior flatwork areas. All existing utility locations should be reviewed to assess their impact on the proposed construction and abandoned and/or relocated as appropriate.

It must be noted that from a handling and compaction standpoint, soils containing high amounts of fines (silts and clays) are inherently more difficult to rework and are very sensitive to changes in moisture content, requiring very close moisture control during placement and compaction. This will be very difficult, if not impossible, during wet and cold periods of the year. Additionally, the on-site soils are likely above optimum moisture content for compacting at present and would require some drying prior to re-compacting.

Subsequent to stripping and prior to the placement of floor slabs, foundations, structural site grading fills, exterior flatwork, and pavements, the exposed subgrade must be proof rolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or otherwise unsuitable soils are encountered beneath footings, they must be completely removed. If removal depth required is greater than 2 feet below footings, GSH must be notified to provide further recommendations. In pavement, floor slab, and outside flatwork areas, unsuitable natural soils should be removed to a maximum depth of 2 feet and replaced with compacted granular structural fill.

Subgrade preparation as described must be completed prior to placing overlying structural site grading fills.

Due to the relatively high groundwater, site grading cuts should be kept to a minimum. Cuts extending to within 1 foot of the groundwater elevation will likely disturb the natural clay soils and proof rolling must not be completed. Stabilization must be anticipated in areas where cuts are to extend to within 1 foot of the groundwater surface.

To reduce disturbance of the natural soils during excavation, it is recommended that low-impact, track-mounted equipment with smooth edge buckets/blades be utilized.

GSH must be notified prior to the placement of structural site grading fills, floor slabs, footings, and pavements to verify that all loose/disturbed soils and non-engineered fills (if encountered) have been completely removed and/or properly prepared.

5.2.2 Temporary Excavations

Temporary excavations up to 8 feet deep in fine-grained cohesive soils, above or below the water table, may be constructed with sideslopes no steeper than one-half horizontal to one vertical (0.5H:1.0V). Excavations deeper than 8 feet are not anticipated at the site.

For granular (cohesionless) soils, construction excavations above the water table, not exceeding 4 feet, should be no steeper than one-half horizontal to one vertical (0.5H:1.0V). For excavations up to 8 feet, in granular soils and above the water table, the slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations encountering saturated cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring, bracing, and dewatering.

To reduce disturbance of the natural soils during excavation, it is recommended that low-impact, track-mounted equipment with smooth edge buckets/blades be utilized.

The static groundwater table was encountered as shallow as 2.8 feet below the existing surface and may be shallower with seasonal fluctuations. Consideration for dewatering of utility trenches, excavations for the removal of non-engineered fill, and other excavations below this level should be incorporated into the design and bidding process.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated.

5.2.3 Structural Fill

Structural fill is defined as all fill which will ultimately be subjected to structural loadings, such as imposed by footings, floor slabs, pavements, etc. Structural fill will be required as backfill over foundations and utilities, as site grading fill, and as replacement fill below footings. All structural fill must be free of surface vegetation, root systems, rubbish, topsoil, frozen soil, and other deleterious materials.

Structural site grading fill is defined as structural fill placed over relatively large open areas to raise the overall grade. For structural site grading fill, the maximum particle size shall not exceed 4 inches; although, occasional larger particles, not exceeding 8 inches in diameter, may be incorporated if placed randomly in a manner such that "honeycombing" does not occur and the desired degree of compaction can be achieved. The maximum particle size within structural fill placed within confined areas shall be restricted to 2 inches.

On-site soils may be re-utilized as structural site grading fill if they do not contain construction debris or deleterious material and meet the requirements of structural fill. Fine-grained soils will require very close moisture control and may be very difficult, if not impossible, to properly place and compact during wet and cold periods of the year.

Imported structural fill below foundations and floor slabs shall consist of a well graded sand and gravel mixture with less than 30 percent retained on the three-quarter-inch sieve and less than 20 percent passing the No. 200 Sieve (clays and silts).

To stabilize soft subgrade conditions (if encountered) or where structural fill is required to be placed closer than 2.0 feet above the water table at the time of construction, a mixture of coarse angular gravels and cobbles and/or 1.5- to 2.0-inch gravel (stabilizing fill) should be utilized. It may also help to utilize a stabilization fabric, such as Mirafi 600X or equivalent, placed on the natural ground if 1.5- to 2.0-inch gravel is used as stabilizing fill.

5.2.4 Fill Placement and Compaction

All structural fill shall be placed in lifts not exceeding 8 inches in loose thickness. Structural fills shall be compacted in accordance with the percent of the maximum dry density as determined by the AASHTO[1] T180 (ASTM[2] D1557) compaction criteria in accordance with the following table:

Location	Total Fill Thickness (feet)	Minimum Percentage of Maximum Dry Density
Beneath an area extending at least 5 feet beyond the perimeter of the structure	0 to 10	95
Site grading fills outside area defined above	0 to 5	90
Site grading fills outside area defined above	5 to 10	95
Utility trenches within structural areas	--	96
Road base	--	96

Structural fills greater than 10 feet thick are not anticipated at the site.

Subsequent to stripping and prior to the placement of structural site grading fill, the subgrade shall be prepared as discussed in Section 5.2.1, Site Preparation, of this report. In confined areas, subgrade preparation should consist of the removal of all loose or disturbed soils.

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1 American Association of State Highway and Transportation Officials
2 American Society for Testing and Materials

Coarse angular gravel and cobble mixtures (stabilizing fill), if utilized, shall be end dumped, spread to a maximum loose lift thickness of 15 inches, and compacted by dropping a backhoe bucket onto the surface continuously at least twice. As an alternative, the stabilizing fill may be compacted by passing moderately heavy construction equipment or large self-propelled compaction equipment over the surface at least twice. Subsequent fill material placed over the coarse gravels and cobbles shall be adequately compacted so that the "fines" are "worked into" the voids in the underlying coarser gravels and cobbles. Where soil fill materials are to be placed directly over more than about 18 inches of clean gravel, a separation geofabric, such as Mirafi 140N or equivalent, is recommended to be placed between the gravel and subsequent soil fills.

Non-structural fill may be placed in lifts not exceeding 12 inches in loose thickness and compacted by passing construction, spreading, or hauling equipment over the surface at least twice.

5.2.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (footings, floor slabs, flatwork, pavements, etc.) shall be placed at the same density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill shall be proof rolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proof rolling shall be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proof rolling, they shall be removed to a maximum depth of 2 feet below design finish grade and replaced with structural fill.

Many utility companies and City-County governments are now requiring that Type A-1a or A-1b (AASHTO Designation – granular soils with limited fines) soils be used as backfill over utilities. These organizations are also requiring that in public roadways, the backfill over major utilities be compacted over the full depth of fill to at least 96 percent of the maximum dry density as determined by the AASHTO T180 (ASTM D1557) method of compaction. GSH recommends that as the major utilities continue onto the site that these compaction specifications are followed.

Fine-grained soils, such as silts and clays, are not recommended for utility trench backfill in structural areas.

The static groundwater table was encountered as shallow as 2.8 feet below the existing surface and may be shallower with seasonal fluctuations. Dewatering of utility trenches and other excavations below this level should be anticipated.

To reduce disturbance of the natural soils during excavation, it is recommended that low-impact, track-mounted equipment with smooth edge buckets/blades be utilized.

5.3 GROUNDWATER

On May 13, 2021 (21 days following drilling), groundwater was measured within the PVC pipes installed as tabulated below:

Boring No.	Groundwater Depth (feet)
	May 13, 2021
B-1	4.8
B-2	Pipe Damaged
B-3	7.8
B-4	2.8
B-5	5.0
B-6	6.1
B-8	7.8
B-9	Pipe Damaged
B-10	7.1
B-12	4.6
B-15	3.6

Based on the anticipated cuts necessary to reach design subgrades, we anticipate temporary and permanent dewatering will be necessary. Floor slabs must be placed a minimum of 4 feet from the stabilized groundwater elevation. Site grading fill may be utilized to raise the overall grade to achieve the required separation between the floor slab and the highest groundwater elevation.

The groundwater measurements presented are conditions at the time of the field exploration and may not be representative of other times or locations. Groundwater levels may vary seasonally and with precipitation, as well as other factors including irrigation. Evaluation of these factors is beyond the scope of this study. Groundwater levels may, therefore, be at shallower or deeper depths than those measured during this study, including during construction and over the life of the structure.

The extent and nature of any dewatering required during construction will be dependent on the actual groundwater conditions prevalent at the time of construction and the effectiveness of construction drainage to prevent run-off into open excavations.

5.4 SPREAD AND CONTINUOUS WALL FOUNDATIONS

5.4.1 Design Data

The results of our analysis indicate that the proposed structures may be supported upon conventional spread and continuous wall foundations established upon suitable natural soils and/or structural fill extending to suitable natural soils. Under no circumstances shall foundations be established over non-engineered fills, loose or disturbed soils, topsoil, surface vegetation, root systems, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. More heavily loaded footings will require a certain amount of granular structural replacement fill as specified in Section 5.4.3, Settlements, of this report. For design, the following parameters are provided:

Minimum Recommended Depth of Embedment for Frost Protection	- 30 inches
Minimum Recommended Depth of Embedment for Non-frost Conditions	- 15 inches
Recommended Minimum Width for Continuous Wall Footings	- 18 inches
Minimum Recommended Width for Isolated Spread Footings	- 24 inches
Recommended Net Bearing Capacity for Real Load Conditions for Footings on Granular Structural Replacement Fill Extending to Suitable Natural Soils	- 1,500 pounds* per square foot
Bearing Capacity Increase for Seismic Loading	- 50 percent

* More heavily loaded footings must be underlain with some additional granular structural replacement structural fill to control settlements. See Section 5.4.3, Settlements below for specifics.

The term "net bearing capacity" refers to the allowable pressure imposed by the portion of the structure located above lowest adjacent final grade. Therefore, the weight of the footing and backfill to lowest adjacent final grade need not be considered. Real loads are defined as the total of all dead plus frequently applied live loads. Total load includes all dead and live loads, including seismic and wind.

5.4.2 Installation

Under no circumstances shall the footings be installed upon non-engineered fills, loose or disturbed soils, topsoil, surface vegetation, root systems, rubbish, construction debris, or other deleterious materials. If unsuitable soils are encountered, they must be removed and replaced with compacted granular fill. If granular soils become loose or disturbed, they must be recompacted prior to pouring the concrete.

The width of structural replacement fill below footings should be equal to the width of the footing plus one foot for each foot of fill thickness.

5.4.3 Settlements

Granular structural replacement fill will be required under more heavily loaded footings. For the required amount, refer to the table below:

Foundations	Loading	Minimum Thickness of Replacement Structural Granular Fill (feet)
Wall	Up to 8 kips per lineal foot	1.5
Spread	Up to 150 kips	1.5
	150 kips to 225 kips	2.5

Based on column loadings, soil bearing capacities, and the foundation recommendations as discussed above, we expect primary total settlement beneath individual foundations to be less than one inch.

The amount of differential settlement is difficult to predict because the subsurface and foundation loading conditions can vary considerably across the site. However, we anticipate differential settlement between adjacent foundations could vary from 0.5 to 0.75 inch. The final deflected shape of the structure will be dependent on actual foundation locations and loading.

5.5 LATERAL RESISTANCE

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of friction of 0.35 may be utilized for the footing interface with in situ natural clay soils and 0.40 for footing interface with natural granular soils or granular structural fill. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 300 pounds per cubic foot. Below the water table, this granular soil should be considered equivalent to a fluid with a density of 150 pounds per cubic foot.

A combination of passive earth resistance and friction may be utilized provided that the friction component of the total is divided by 1.5.

5.6 LATERAL PRESSURES

For dock-height fills and/or shallow retaining walls or utility boxes up to 4 feet tall, the following lateral pressure discussion is provided. Parameters, as presented within this section, are for backfills which will consist of drained granular soil placed and compacted in accordance with the recommendations presented herein.

The lateral pressures imposed upon subgrade facilities will, therefore, be basically dependent upon the relative rigidity and movement of the backfilled structure. For active walls, such as retaining walls which can move outward (away from the backfill), granular backfill may be considered equivalent to a fluid with a density of 40 pounds per cubic foot in computing lateral pressures. For more rigid walls that are not more than 10 inches thick, granular backfill may be considered equivalent to a fluid with a density of 50 pounds per cubic foot. For very rigid non-yielding walls, granular backfill should be considered equivalent to a fluid with a density with at least 60 pounds per cubic foot. The above values assume that the surface of the soils slope behind the wall is horizontal and that the granular fill within 3 feet of the wall will be compacted with hand-operated compacting equipment.

For seismic loading of retaining/below-grade walls, the uniform lateral pressures on the following page, in pounds per square foot (psf), should be added based on wall depth and wall case.

Uniform Lateral Pressures			
Wall Height (Feet)	**Active Pressure Case (psf)**	**Moderately Yielding Case (psf)**	**At Rest/Non-Yielding Case (psf)**
4	25	50	80

5.7 FLOOR SLABS

Floor slabs may be established upon suitable natural subgrade soils or structural fill extending to suitable natural soils. Under no circumstances shall floor slabs be established directly over non-engineered fills, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

Additionally, GSH recommends that floor slabs be constructed a minimum of 4.0 feet from the stabilized groundwater elevation. Site grading fill may be utilized to raise the overall grade to achieve the required separation between the floor slab and the highest groundwater elevation.

To facilitate curing of the concrete and to provide a capillary moisture break, it is recommended that floor slabs be directly underlain by at least 4 inches of "free-draining" fill, such as "pea" gravel or three-quarters to one inch minus clean gap-graded gravel.

Settlement of lightly loaded floor slabs designed according to previous recommendations (average uniform pressure of 200 pounds per square foot or less) is anticipated to be less than one-quarter of an inch.

5.8 PAVEMENTS

The natural clay soils will exhibit poor pavement support characteristics when saturated. All pavement areas must be prepared as previously discussed (see Section 5.2.1, Site Preparation). Under no circumstances shall pavements be established over non-engineered fills, loose or disturbed soils, topsoil, surface vegetation, root systems, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. With the subgrade soils and the projected traffic as discussed in Section 2, Proposed Construction, the following pavement sections are recommended:

Parking Areas

(Light Volume of Automobiles and Light Trucks,
Occasional Medium-Weight Trucks,
and No Heavy-Weight Trucks)
[1-3 equivalent 18-kip axle loads per day]

Flexible Pavements:
(Asphalt Concrete)

3.0 inches	Asphalt concrete
8.0 inches	Aggregate base
Over	Properly prepared natural subgrade soils and/or structural site grading fill extending to properly prepared natural subgrade soils

Rigid Pavements:
(Non-reinforced Concrete)

5.0 inches	Portland cement concrete (non-reinforced)
5.0 inches	Aggregate base
Over	Properly prepared natural subgrade soils, and/or structural site grading fill extending to properly prepared natural subgrade soils

Primary Drive Lanes/Loading and Unloading Areas

(Moderate Volume of Automobiles, Light Trucks,
and Medium-Weight Trucks,
with a Light Volume of Heavyweight Trucks)
[18 equivalent 18-kip axle loads per day]

Flexible Pavements:
(Asphalt Concrete)

4.0 inches	Asphalt concrete
8.0 inches	Aggregate base
8.0 inches*	Aggregate subbase
Over	Properly prepared natural subgrade soils and/or structural site grading fill extending to properly prepared natural subgrade soils

* Subbase may consist of granular site grading fills with a minimum California Bearing Ratio (CBR) of 30 percent.

Rigid Pavements:
(Non-reinforced Concrete)

7.0 inches	Portland cement concrete (non-reinforced)
6.0 inches	Aggregate base
Over	Properly prepared natural subgrade soils, and/or structural site grading fill extending to properly prepared natural subgrade soils

In areas with tight maneuvering heavy vehicles, rigid pavements are recommended.

For dumpster pads, we recommend a pavement section consisting of 8.0 inches of Portland cement concrete, 12.0 inches of aggregate base, over properly prepared natural subgrade or site grading structural fills. Dumpster pads should not be constructed overlying non-engineered fills under any circumstances.

These above rigid pavement sections are for non-reinforced Portland cement concrete. Concrete should be designed in accordance with the American Concrete Institute (ACI) and joint details should conform to the Portland Cement Association (PCA) guidelines. The concrete should have a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch and contain 6 percent ±1 percent air-entrainment.

The crushed stone should conform to applicable sections of the current Utah Department of Transportation (UDOT) Standard Specifications. All asphalt material and paving operations should meet applicable specifications of the Asphalt Institute and UDOT. A GSH technician shall observe placement and perform density testing of the base course material and asphalt.

Please note that the recommended pavement section is based on estimated post-construction traffic loading. If the pavement is to be constructed and utilized by construction traffic, the above pavement section may prove insufficient for heavy truck traffic, such as concrete trucks or tractor-trailers used for construction delivery. Unexpected distress, reduced pavement life, and/or premature failure of the pavement section could result if subjected to heavy construction traffic and the owner should be made aware of this risk. If the estimated traffic loading stated herein is not correct, GSH must review actual pavement loading conditions to determine if revisions to these recommendations are warranted.

5.9 CEMENT TYPES

A representative soil sample was collected and sent for laboratory analysis for pH and sulfate content. As of the date of this report, results are still pending and will be transmitted when available and with corresponding cement recommendations, if applicable.

5.10 GEOSEISMIC SETTING

5.10.1 General

Utah municipalities have adopted the International Building Code (IBC) 2018. The IBC 2018 code refers to ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16) determines the seismic hazard for a site based upon mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points). GSH performed refraction microtremor (ReMi) testing to obtain the shear-wave velocities for the site. GSH is currently conducting a site-specific seismic response analysis and the results will be transmitted upon completion within a separate report.

5.10.2 Faulting

Based on our review of available literature, no active faults pass through or immediately adjacent to the site. The nearest active mapped fault consists of the Utah Lake Faults, located about 1.23 miles to the south of the site.

5.10.3 Site Class

Due to liquefiable soils being present, the site has been determined to be Site Class F (in accordance with Section 20.3.1, Site Class F of ASCE 7-16). According to ASCE 7-16, a site-specific response analysis is required. Section 20.3.1 of ASCE 7-16 provides exception to this requirement under certain conditions. These options will need to be reviewed and evaluated by the project structural engineer. GSH is currently conducting a site-specific seismic response analysis and the results will be transmitted upon completion within a separate report.

5.10.4 Ground Motions

The IBC 2018 code is based on USGS mapping, which provides values of short and long period accelerations for average bedrock values for the Western United States and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for the MCE event and incorporates the appropriate soil amplification factor for a Site Class F. Based on the site latitude and longitude (40.3543 degrees north and 111.7982 degrees west, respectively) and Risk Category I, the values for this site are tabulated below:

Spectral Acceleration Value, T	Bedrock Boundary [mapped values] (% g)	Site Coefficient	Site Class * [adjusted for site class effects] (% g)	Design Values* (% g)
Peak Ground Acceleration	*	F_a = *	*	*
0.2 Seconds (Short Period Acceleration)	S_S = *	F_a = *	S_{MS} = *	S_{DS} = *
1.0 Second (Long Period Acceleration)	S_1 = *	F_v = *	S_{M1} = *	S_{D1} = *

* See Section 5.10.3, Site Class

5.10.5 Liquefaction

The site is located in an area that has been identified by the Utah Geological Survey (UGS) as being a "high" liquefaction potential zone. Liquefaction is defined as the condition when saturated, loose, granular soils lose their support capabilities because of excessive pore water pressure, which

develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

Calculations were performed using the procedures described in the 2008 Soil Liquefaction During Earthquakes Monograph by Idriss and Boulanger[3]. Our calculations indicate the very loose to loose, saturated sand layers encountered in Borings B-1, B-2, B-4, and B-12 could liquefy during the design seismic event. Calculated settlement associated with the liquefaction of each layer within the borings was on the order of 1 to 1.5 inches. This magnitude of settlement should be tolerable to design for life safety. Additionally, lateral spread and ground rupture are unlikely to occur.

5.11 SITE VISITS

GSH must verify that all topsoil/disturbed soils and any other unsuitable soils have been removed, that non-engineered fills (if encountered) have been removed and/or properly prepared, and that suitable soils have been encountered prior to placing site grading fills, footings, slabs, and pavements. Additionally, GSH must observe fill placement and verify in-place moisture content and density of fill materials placed at the site.

5.12 CLOSURE

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, Inc.

Nathaniel J. Wulfman
Staff Geologist

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
No. 334228
ALAN D. SPILKER
STATE OF UTAH

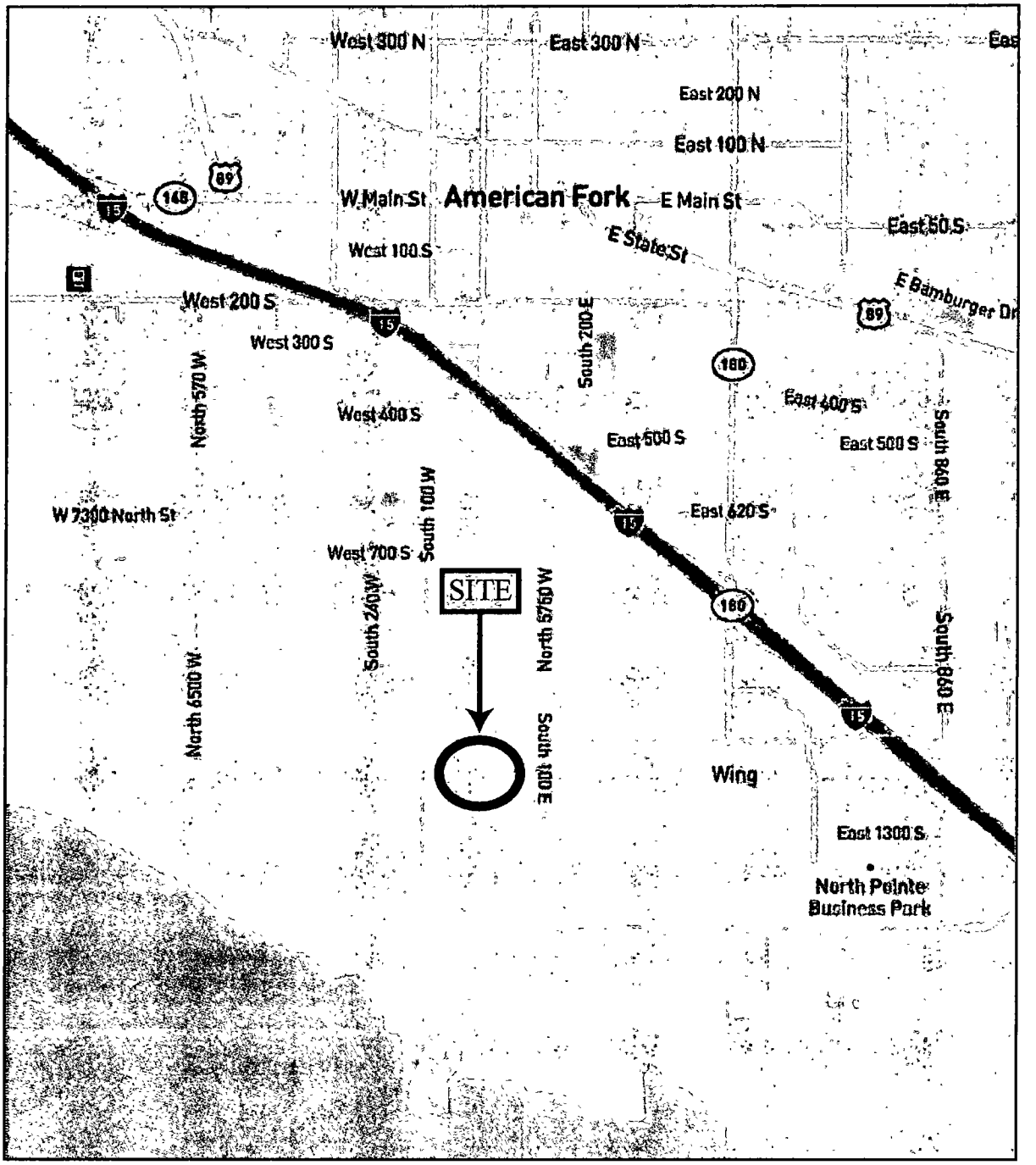
NWU/ADS.sp

Encl. Figure 1, Vicinity Map
Figure 2, Site Plan
Figures 3A through 3O, Boring Logs
Figure 4, Key to Boring Log (USCS)

Addressee (email)

[3] Idriss, I. M., and Boulanger, R. W. (2008), Soil liquefaction during earthquakes: Monograph MNO-12, Earthquake Engineering Research Institute, Oakland, CA, 261 pp.

RED PINE CONSTRUCTION
JOB NO. 2354-003-21



0.5 0 0.5 1 KM 1.5

0.2 0 0.2 0.4 0.6 0.8 1 MI 1.2

FIGURE 1
VICINITY MAP

REFERENCE:
ALL TRAILS - NATIONAL GEOGRAPHIC TERRAIN
DATED 2021

GSH

RED PINE CONSTRUCITON
JOB NO. 2354-003-21

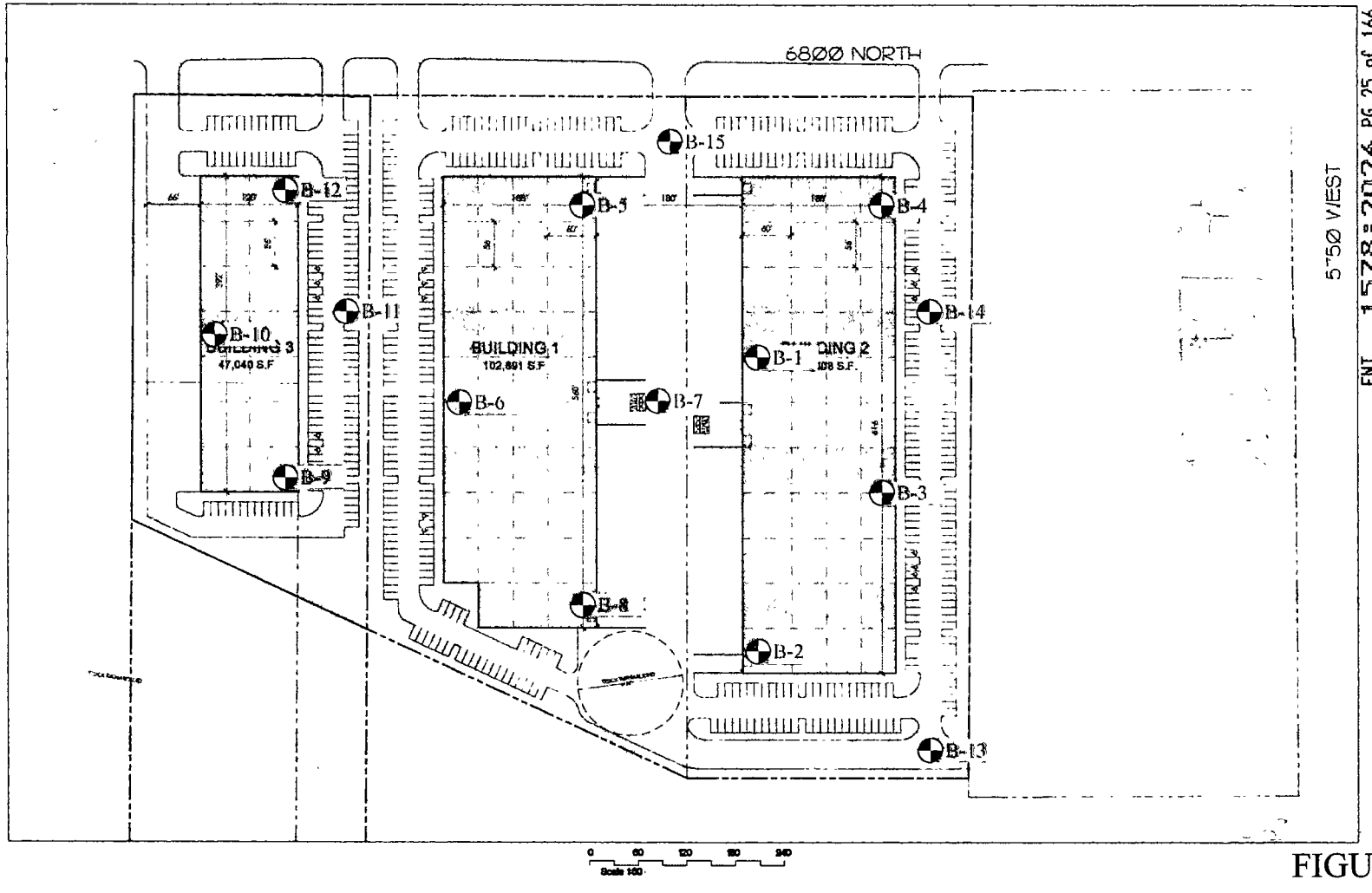


FIGURE 2
SITE PLAN

REFERENCE
ADAPTED FROM DRAWING ENTITLED
"MIKE HORAN - 6800 NORTH INDUSTRIAL AF"
BY AEURBIA, DATED 8 APR 2021

GSH

GSH BORING LOG

Page: 1 of 2

BORING: B-1

CLIENT: Red Pine Construction | PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial | DATE STARTED: 4/22/21 | DATE FINISHED: 4/22/21

LOCATION: 5900 West 6800 North, American Fork, Utah | GSH FIELD REP.: JH

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: 4.8' (5/13/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand and occasional layers of silty fine sand up to 3" major roots (topsoil) to 6"; brown		2							slightly moist soft
▼		grades with trace fine sand	5	3							saturated
		grades with occasional layers of fine to coarse sandy fine gravel up to 6" thick	10	26							
		grades with some fine sand with layers of silty fine sand up to 3" thick	15	2							very soft
		grades fine sandy clay; tan	20	2							
		grades silty clay with some fine sand; gray	25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3A

GSH BORING LOG

Page: 2 of 2

BORING: B-1

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/22/21 — DATE FINISHED: 4/22/21

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		grades silty clay with some fine sand, gray	25	0							
	SP	FINE TO MEDIUM SAND with occasional layers of silty clay up to 3" thick; brown									saturated very loose
			30	3							
	CL	SILTY CLAY with some fine sand; brown									saturated medium stiff
			35	7							
		grades with trace fine sand, gray	40	4							soft
			45	4							
		grades brown	50	3							
		End of Exploration at 51 5' Installed 1 25" diameter slotted PVC pipe to 51 5'									

See Subsurface Conditions section in the report for additional information.

FIGURE 3A
(continued)

GSH	BORING LOG Page: 1 of 1	BORING: B-2

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/22/21 — DATE FINISHED: 4/22/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: JH

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 6.0' (4/22/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand, major roots (topsoil) to 5"; brown									slightly moist medium stiff
				8							
▼			5	3							moist soft
											saturated
	SM	SILTY FINE SAND with numerous layers of clay up to 2" thick, gray	10	3							saturated very loose
	CL	SILTY CLAY with some fine sand, brown									saturated soft
			15	4							
		End of Exploration at 16 0' Installed 1 25" diameter slotted PVC pipe to 16 0'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3B

GSH	BORING LOG Page: 1 of 1	BORING: B-3

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/22/21 — DATE FINISHED: 4/22/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: JH

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 7.8' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 6", brown									slightly moist medium stiff
				8							
			5								
▼		grades fine sandy clay with some fine and coarse gravel		6							saturated
		grades with occasional layers of silty fine sand up to 2" thick	10	2							soft
		grades silty clay with some fine sand	15	3							
		End of Exploration at 16 0' Installed 1 25" diameter slotted PVC pipe to 16 0'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3C

GSH BORING LOG

Page: 1 of 1

BORING: B-4

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/23/21 — DATE FINISHED: 4/23/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: GL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 2.8' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY major roots (topsoil) to 5", brown									slightly moist medium stiff
▼				5							saturated
	SP/SM	FINE TO COARSE SAND with fine gravel and silt, brown	5								saturated dense
				15							
	CL	SILTY CLAY brown									saturated medium stiff
			10	14							saturated
	SM	FINE TO COARSE SAND with silt; brown	15	2							saturated very loose
	CL	SILTY CLAY brown									saturated very soft
		End of Exploration at 16.0'. Installed 1 25" diameter slotted PVC pipe to 16 0'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3D

GSH	BORING LOG Page: 1 of 1	BORING: B-5

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/23/21 — DATE FINISHED: 4/23/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: GL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 5.0' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine gravel, major roots (topsoil) to 6"; brown									moist soft
				4							
▼		fine gravel grades out	5								saturated very soft
				2							
		grades fine to coarse sandy clay with some fine gravel	10	4							soft
		grades fine to medium sandy clay with silt	15	7							medium stiff
		End of Exploration at 16.5'. Installed 1 25" diameter slotted PVC pipe to 16.5'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3E

GSH	BORING LOG Page: 1 of 1	BORING: B-6

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 6.1' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	FINE TO MEDIUM SANDY CLAY major roots (topsoil) to 6"; dark brown		17							slightly moist stiff
▼		grades brown	5	4							medium stiff saturated
	SM	SILTY FINE SAND with occasional layers of silty clay up to 6" thick, gray	10	5							saturated medium dense
	CL	FINE TO MEDIUM SANDY CLAY brown	15	4							saturated medium stiff
		End of Exploration at 16.5'. No groundwater encountered at time of drilling. Installed 1 25" diameter slotted PVC pipe to 16.5'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3F

GSH	BORING LOG Page: 1 of 1	BORING: B-7

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: Not Encountered (4/26/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with fine to medium sand, major roots (topsoil) to 6", brown									slightly moist medium stiff
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3G

GSH	BORING LOG Page: 1 of 1	BORING: B-8

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 7.8' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM/ ML	SILTY FINE SAND/FINE SANDY SILT major roots (topsoil) to 6", brown									slightly moist dense
				13							
			5								
	CL	FINE TO MEDIUM SANDY CLAY brown									slightly moist medium stiff
▼				4							saturated
			10								
				4							
		grades silty clay with some fine sand	15								
				6							
		End of Exploration at 16 5' No groundwater encountered at time of drilling Installed 1.25" diameter slotted PVC pipe to 16 5'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3H

GSH BORING LOG

Page: 1 of 1

BORING: B-9

CLIENT: Red Pine Construction | PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial | DATE STARTED: 4/26/21 | DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: 14.5' (4/26/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine to medium sand and trace fine gravel; major roots to 5", brown									slightly moist stiff
				17							
		grades with occasional layers of silty fine sand up to 6" thick	5								
				41							
	GP	FINE TO COARSE SANDY FINE GRAVEL with some clay, brown									moist medium dense
			10								
				38							
▼	CL	FINE TO MEDIUM SANDY CLAY brown	15								saturated medium stiff
				5							
		End of Exploration at 16 5'. Installed 1.25" diameter slotted PVC pipe to 16 5'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3I

GSH	BORING LOG Page: 1 of 1	BORING: B-10

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 7.1' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM/SC	SILTY/CLAYEY FINE TO MEDIUM SAND with some fine gravel; major roots (topsoil) to 6", brown									dry loose
				16							
			5								
▼	CL	SILTY CLAY with fine to medium sand and trace fine gravel, gray									saturated soft
				2							
		grades fine to medium sandy clay with some fine gravel	10	5							medium stiff
		grades silty clay with some fine to medium sand and trace fine gravel; gray to brown	15	9							
		End of Exploration at 16.5'. No groundwater encountered at time of drilling Installed 1.25" diameter slotted PVC pipe to 16.5'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3J

GSH	BORING LOG Page: 1 of 1	BORING: B-11

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: Not Encountered (4/26/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	FINE TO MEDIUM SANDY CLAY with some fine gravel, major roots (topsoil) to 5"; brown									dry medium stiff
			5								
		End of Exploration at 5 0'. No groundwater encountered at time of drilling									
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3K

GSH	BORING LOG Page: 1 of 1	BORING: B-12

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 4.6' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM/SC	SILTY/CLAYEY FINE TO MEDIUM SAND major roots (topsoil) to 6"; brown									dry loose
				8							
▼			5								saturated
	SP	FINE GRAVELLY FINE TO COARSE SAND with some clay, gray									saturated medium dense
				47							
		grades fine to coarse sand, brown	10	16							loose
		grades fine gravelly fine to coarse sand with trace clay and occasional layers of silty clay up to 6" thick	15	2							very loose
		End of Exploration at 16 5' Installed 1 25" diameter slotted PVC pipe to 16 5'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3L

GSH	BORING LOG Page: 1 of 1	BORING: B-13

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: Not Encountered (4/26/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand and trace fine gravel, major roots (topsoil) to 6", brown									slightly moist medium stiff
			5								
		End of Exploration at 5 0' No groundwater encountered at time of drilling.									
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3M

GSH	BORING LOG Page: 1 of 1	BORING: B-14

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: Not Encountered (4/26/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand, major roots (topsoil) to 5", brown									slightly moist medium stiff
		End of Exploration at 5 0' No groundwater encountered at time of drilling	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3N

GSH	BORING LOG Page: 1 of 1	BORING: B-15

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 3.6' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
▼	GC	FINE SANDY FINE AND COARSE GRAVEL with clay; major roots (topsoil) to 6", brown									slightly moist medium dense saturated
		End of Exploration at 5 0' Installed 1 25" diameter slotted PVC pipe to 5 0'.	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3O

CLIENT: Red Pine Construction
PROJECT: Proposed 6800 North Industrial
PROJECT NUMBER: 2354-003-21

KEY TO BORING LOG

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫

COLUMN DESCRIPTIONS

① **Water Level:** Depth to measured groundwater table. See symbol below.

② **USCS:** (Unified Soil Classification System) Description of soils encountered; typical symbols are explained below.

③ **Description:** Description of material encountered; may include color, moisture, grain size, density/consistency,

④ **Depth (ft.):** Depth in feet below the ground surface.

⑤ **Blow Count:** Number of blows to advance sampler 12" beyond first 6", using a 140-lb hammer with 30" drop.

⑥ **Sample Symbol:** Type of soil sample collected at depth interval shown; sampler symbols are explained below.

⑦ **Moisture (%):** Water content of soil sample measured in laboratory; expressed as percentage of dryweight of

⑧ **Dry Density (pcf):** The density of a soil measured in laboratory; expressed in pounds per cubic foot.

⑨ **% Passing 200:** Fines content of soils sample passing a No 200 sieve, expressed as a percentage.

⑩ **Liquid Limit (%):** Water content at which a soil changes from plastic to liquid behavior.

⑪ **Plasticity Index (%):** Range of water content at which a soil exhibits plastic properties.

⑫ **Remarks:** Comments and observations regarding drilling or sampling made by driller or field personnel. May include other field and laboratory test results using the following abbreviations

CEMENTATION.	MODIFIERS:	MOISTURE CONTENT (FIELD TEST):
Weakly: Crumbles or breaks with handling or slight finger pressure	**Trace** <5%	**Dry:** Absence of moisture, dusty, dry to the touch
Moderately: Crumbles or breaks with considerable finger pressure	**Some** 5-12%	**Moist:** Damp but no visible water.
Strongly: Will not crumble or break with finger pressure	**With** > 12%	**Saturated:** Visible water, usually soil below water table

Descriptions and stratum lines are interpretive. field descriptions may have been modified to reflect lab test results Descriptions on the logs apply only at the specific boring locations and at the time the borings were advanced. they are not warranted to be representative of subsurface conditions at other locations or times

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material is larger than No 200 sieve size	GRAVELS More than 50% of coarse fraction retained on No 4 sieve	CLEAN GRAVELS (little or no fines)	GW	Well-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
			GP	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
		GRAVELS WITH FINES (appreciable amount of fines)	GM	Silty Gravels, Gravel-Sand-Silt Mixtures
			GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS More than 50% of coarse fraction passing through No. 4 sieve	CLEAN SANDS (little or no fines)	SW	Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP	Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (appreciable amount of fines)	SM	Silty Sands, Sand-Silt Mixtures
			SC	Clayey Sands, Sand-Clay Mixtures
FINE-GRAINED SOILS More than 50% of material is smaller than No 200 sieve size.	SILTS AND CLAYS Liquid Limit less than 50%		ML	Inorganic Silts and Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity
			CL	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
			OL	Organic Silts and Organic Silty Clays o f Low Plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%		MH	Inorganic Silts, Micacious or Diatomacious Fine Sand or Silty Soils
			CH	Inorganic Clays of High Plasticity, Fat Clays
			OH	Organic Silts and Organic Clays of Medium to High Plasticity
HIGHLY ORGANIC SOILS			PT	Peat, Humus, Swamp Soils with High Organic Contents

Note Dual Symbols are used to indicate borderline soil classifications

STRATIFICATION:

DESCRIPTION	THICKNESS
Seam	up to 1/8"
Layer	1/8" to 12"
Occasional: One or less per 6" of thickness	
Numerous; More than one per 6" of thickness	

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Bulk/Bag Sample
- Standard Penetration Split Spoon Sampler
- Rock Core
- No Recovery
- 3 25" OD, 2 42" ID D&M Sampler
- 3 0" OD, 2 42" ID D&M Sampler
- California Sampler
- Thin Wall

WATER SYMBOL

- Water Level

FIGURE 4

GSH

GSH

REPORT
SITE-SPECIFIC SEISMIC STUDY
PROPOSED 6800 NORTH INDUSTRIAL
5900 WEST 6800 NORTH
AMERICAN FORK, UTAH

Submitted To:

Red Pine Construction
520 South 850 East, Suite A4
Lehi, Utah 84043

Submitted By:

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123

July 28, 2021

Job No. 2354-004-21

GSH

July 28, 2021
Job No. 2354-004-21

Mr. Mike Horan
Red Pine Construction
520 South 850 East, Suite A4
Lehi, Utah 84043

Mr. Horan:

Re: Summary Report
Site-Specific Seismic Study
Proposed 6800 North Industrial
5900 West 6800 North
American Fork, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our site-specific seismic study performed at the site of the proposed 6800 North Industrial to be located near 5900 West 6800 North in American Fork, Utah. GSH Geotechnical, Inc (GSH) completed a geotechnical study[1] for the site. Data from the geotechnical study along with a geophysical survey was used for this site-specific seismic study.

The shear-wave velocity profile for the upper 350 feet at the site (including $\overline{v}_{s30}$ for the upper 100 feet) was determined utilizing boring data from our geotechnical study and a geophysical survey consisting of Refraction Microtremor (ReMi) testing.

The ground motion hazard and design ground motion response spectra at the site were developed utilizing a site-specific site response analysis (SRA). The analysis was completed in accordance with the procedures presented in ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16) and Supplement 1 to ASCE 7-16.

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[1] "Report, Geotechnical Study, Proposed 6800 North Industrial, 5900 West 6800 North, American Fork, Utah." GSH Job No. 2093-004-19. Dated May 14, 2021.

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1.2 OBJECTIVES AND SCOPE

The objectives and scope of the study were planned in discussions between Mr. Mike Horan of Red Pine Construction and Mr. Alan Spilker, PE of GSH.

In general, the objectives of this study were to:

1. Further define the subsurface conditions at the site, including a shear-wave profile to a depth of 350 feet.

2. Develop site-specific and design ground motion response spectra for the site.

In accomplishing these objectives, our scope has included the following:

1. A review of available subsurface information from the geotechnical study completed for the site.

2. A field program consisting of the completion of a Refraction Microtremor (ReMi) geophysical exploration to a depth of 350 feet including the development of $\overline{v}_{s30}$ for the upper 100 feet.

3. Performance of a site-specific site response analysis (SRA) in accordance with the ASCE 7-16 Section 21.1, Site Response Analysis.

4. Development of site-specific and design ground motion response spectra for the site in accordance with the ASCE 7-16 Section 21.3, Design Response Spectrum.

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of the Professional Services Agreement No. 21-0434 dated April 12, 2021.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the geophysical testing, exploration borings, and projected groundwater conditions. If subsurface conditions other than those described in this report are encountered, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The site is proposed to be developed with 3 warehouse structures and associated pavements. The structures are anticipated to be one extended level, constructed slab-on-grade, have footprints of 47,040 square feet to 115,808 square feet, and be supported upon conventional spread and continuous wall footings. Paved parking areas and drive lanes are planned around the structure.

Based on information provided by the structural engineer the structure's fundamental period will be approximately 0.4 seconds.

3. SITE CONDITIONS

3.1 SURFACE

The site is located at approximately 5900 West 6800 North in American Fork, Utah. The topography of the site is relatively flat, grading down to the south with a total relief of approximately 6 to 9 feet. Site vegetation consists of agricultural grass fields with undeveloped/vacant grass land in the western portion of the site.

The site is bounded to the north by 6800 North Street followed by agricultural fields; to the east by single-family residential structures along with agricultural fields; to the south by agricultural fields and vacant/undeveloped brush/grass land; and to the west by vacant/undeveloped brush/grass land followed by 100 West Street and a single-family residential structure adjacent to the northwest corner of the site.

3.2 SUBSURFACE SOIL AND GROUNDWATER

The following paragraphs provide generalized descriptions of the subsurface profiles and soil conditions encountered within the borings conducted during the geotechnical study. As previously noted, soil conditions may vary in unexplored locations.

The borings were completed to depths ranging from 5.0 to 51.5 feet. The soil conditions encountered in each of the borings, to the depths completed, were generally similar across the boring locations.

- Natural soils were encountered below the non-engineered fill or the ground surface in each boring. The natural soils consisted primarily of clay with varying silt, sand, and gravel content and sand with varying clay, silt, and gravel content.

The natural clay soils were very soft to stiff, dry to saturated, brown, dark brown, gray, and tan in color. The natural sand soils were very loose to medium dense, dry to saturated, and gray and brown in color.

Groundwater was measured as shallow as 2.8 feet below the existing ground surface during the geotechnical study for the site.

For a more descriptive interpretation of subsurface conditions, please refer our geotechnical report completed for the site (GSH Job No. 2354-003-21).

3.3 SHEAR WAVE VELOCITY PROFILE

The site shear-wave velocity profile was completed utilizing geophysical exploration. The testing consisted of Refraction Microtremor (ReMi) testing. Testing is performed at the surface using a series of geophone sensors and a seismic source. A wavefield transformation is performed on the recorded geophone movements. The transformation is then utilized to create a shear-wave dispersion curve to model the subsurface shear-wave velocity profile.

The location of the ReMi line on the site is presented on Figure 1, Site Plan. The borings completed in conjunction with the geotechnical study are also shown on Figure 1.

The site classification for ASCE 7-16 was Site Class F in the geotechnical report due to potentially liquefiable soils at the site. As a follow up to the geotechnical report the ReMi testing results were analyzed to a depth of 350 feet with a resulting $\overline{v}_{s30}$ value of 653 ft/s. This characterizes the site as a Site Class D, Stiff Soil Profile as defined in Chapter 20 of ASCE 7-16.

The shear-wave velocity results are provided on attached Figure 2, Shear-Wave Velocity Profile.

3.4 GEOLOGIC SETTING

The site is located in the Utah Valley, which is in the Basin and Range Physiographic Province. The Utah Valley is near (west of) the transition between the Basin and Range Physiographic Province to the west and the Middle Rocky Mountain Physiographic Province to the east. The Basin and Range Province is characterized by generally north-trending valleys and mountain ranges that have formed by displacement along normal faults. The Wasatch Fault forms the boundary between the 2 provinces and has been active for approximately 10 million years. The Middle Rocky Mountains were formed during a period of regional compression that occurred in Cretaceous time, about 75 to 70 million years ago (Hunt, 1967). The surficial geology of the area is characterized by materials deposited within the past 30,000 years by late Pleistocene Lake Bonneville (Currey and Oviatt, 1985), and young lacustrine and deltaic deposits (Holocene to upper Pleistocene) deposited on delta margins as the lake receded to its present Great Salt Lake levels (Hylland et al., 2014). As the ancient lake(s) receded, streams began to regrade through shoreline deltas formed at the mouths of major Wasatch Range canyons and the eroded material was deposited in the basin as a series of recessional deltas, alluvial fans, and shoreline sequences. Toward the east-central portion of the valley where the site is located, shallow-water sediments of clay, silt, and sand predominate.

The primary surficial geology of most of the site as interpreted by Solomon and others (2009) primarily consists of "Lacustrine silt and clay" (**Qlmp**). Most of the west and some of the east perimeter of the site consists of "Younger alluvial-fan deposits, undivided" (**Qafy**).

3.5 FAULTING

There are a number of mapped faults near the site. The faults are primarily normal mechanism. Some of the faults included are the Utah Lake Faults (mapped 1.22 miles south of the site), the Provo section of the Wasatch fault zone (mapped 4.13 miles northeast of the site), the Salt Lake City section of the Wasatch fault zone (mapped 9.79 miles north of the site), and the Nephi section of the Wasatch fault zone (mapped 18.91 miles south-southeast of the site).

4. SITE RESPONSE ANALYIS

A soil model was developed from the boring, laboratory, and ReMi data from this study and the geotechnical study for the site.

A series of earthquake time histories were selected and scaled to match the MCE_R response spectrum at the base of the soil column. Histories were selected from events with similar magnitudes, distances and spectral shape in the period ranges of significance for the proposed structure (approximately 0.4 seconds). These ground motion time histories were input at the base of the soil column model as outcrop motions, propagated through the soil column model, and calculated as surface ground motions. The results of the SRA analysis are presented in the table in the following section.

5. DESIGN RESPONSE SPECTRUM

The response spectrum produced from the site-specific seismic analysis was compared with the minimum code spectrum values per ASCE 7-16 Section 21.3, including updates presented in Supplement 1 to ASCE 7-16. This process includes taking the 2014 mapped values from the USGS and utilizing F_a from Table 11.4-1 and 2.5 as F_v to obtain the modified accelerations, then reducing them by 20 percent to obtain the code minimum spectral accelerations.

The site-specific response spectrum is lower than the minimum code spectrum at select periods; therefore, the minimum code spectrum governs the design spectrum for the site at these periods. These values are presented in the table on the following page:

Period (sec)	Code 80% Minimum Spectral Acceleration (g)	Site-Specific Spectral Acceleration (g)	Code Modified* Site-Specific Spectral Acceleration (g)	Design Spectral Acceleration (2/3 of Code Modified Site-Specific Acceleration) (g)
0.05	0.572	0.445	0.572	0.381
0.1	0.739	0.476	0.739	0.493
0.2	1.010	0.694	1.010	0.673
0.3	1.010	1.027	1.027	0.685
0.4	1.010	0.937	1.010	0.673
0.5	1.010	1.027	1.027	0.685
0.6	1.010	1.148	1.148	0.766
0.8	1.010	1.046	1.046	0.698
1.0	0.914	0.992	0.992	0.662
1.2	0.762	0.967	0.967	0.645
1.4	0.653	0.755	0.755	0.503
1.6	0.572	0.606	0.606	0.404
1.8	0.508	0.480	0.508	0.339
2.0	0.457	0.390	0.457	0.305
3.0	0.305	0.214	0.305	0.203
4.0	0.229	0.125	0.229	0.153
5.0	0.183	0.080	0.183	0.122

*The greater of the site-specific and the code minimum spectral acceleration.

6. DESIGN ACCERATION PARAMETERS

The site-specific response spectrum was analyzed in accordance with the procedure outlined in ASCE 7-16 Section 21.4 to produce the design acceleration parameters presented in the table below:

Site-Specific Parameter	Spectral Acceleration Value (g)
S_{DS}	0.689
S_{D1}	0.774

7. CLOSURE

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, In

LICENSED PROFESSIONAL ENGINEER
No. 343650
MICHAEL S. HUBER
STATE OF UTAH

Michael S. Huber, P.E.
State of Utah No. 343650
Vice President/Senior Geotechnical Engineer

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

MSH/ADS ea

Encl.

Figure 1, Site Plan
Figure 2, Shear-Wave Velocity Profile

Addressee (email)

Geologic References

Currey, D.R., and Oviatt, C.G., 1985, Durations, average rates, and probable causes of Lake Bonneville expansion, still-stands, and contractions during the last deep-lake cycle, 32,000 to 10,000 years ago, in Kay, P.A., and Diaz, H.F., (eds.), Problems of and prospects for predicting Great Salt Lake levels - Processing of a NOAA Conference, March 26-28, 1985: Salt Lake City, Utah.

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Hylland, M. D., DuRoss, C.B., McDonald, G.N., Olig, S.S., Oviatt, C.G., Mahan, S.A., Crone, A.J., and Personius, S.F., 2014, Late Quaternary paleoseismology of the West Valley fault zone, Utah: Insights from the Baileys Lake trench site, *in* DuRoss, C.B. and Hylland, M.D., Evaluating surface faulting chronologies of graben-bounding faults in Salt Lake Valley, Utah—new paleoseismic data from the Salt Lake City segment of the Wasatch fault zone and the West Valley fault zone—Paleoseismology of Utah, Volume 24: Utah Geological Survey Special Study 149, p. 41–76, 8 appendices, 1 plate.

Solomon, Barry J., Biek, Robert F., and Ritter, Scott M., 2009, Geologic Map of the Pelican Point Quadrangle, Utah County, Utah. Utah Geologic Survey, Plate 1.

RED PINE CONSTRUCITON
JOB NO 2354-004-21

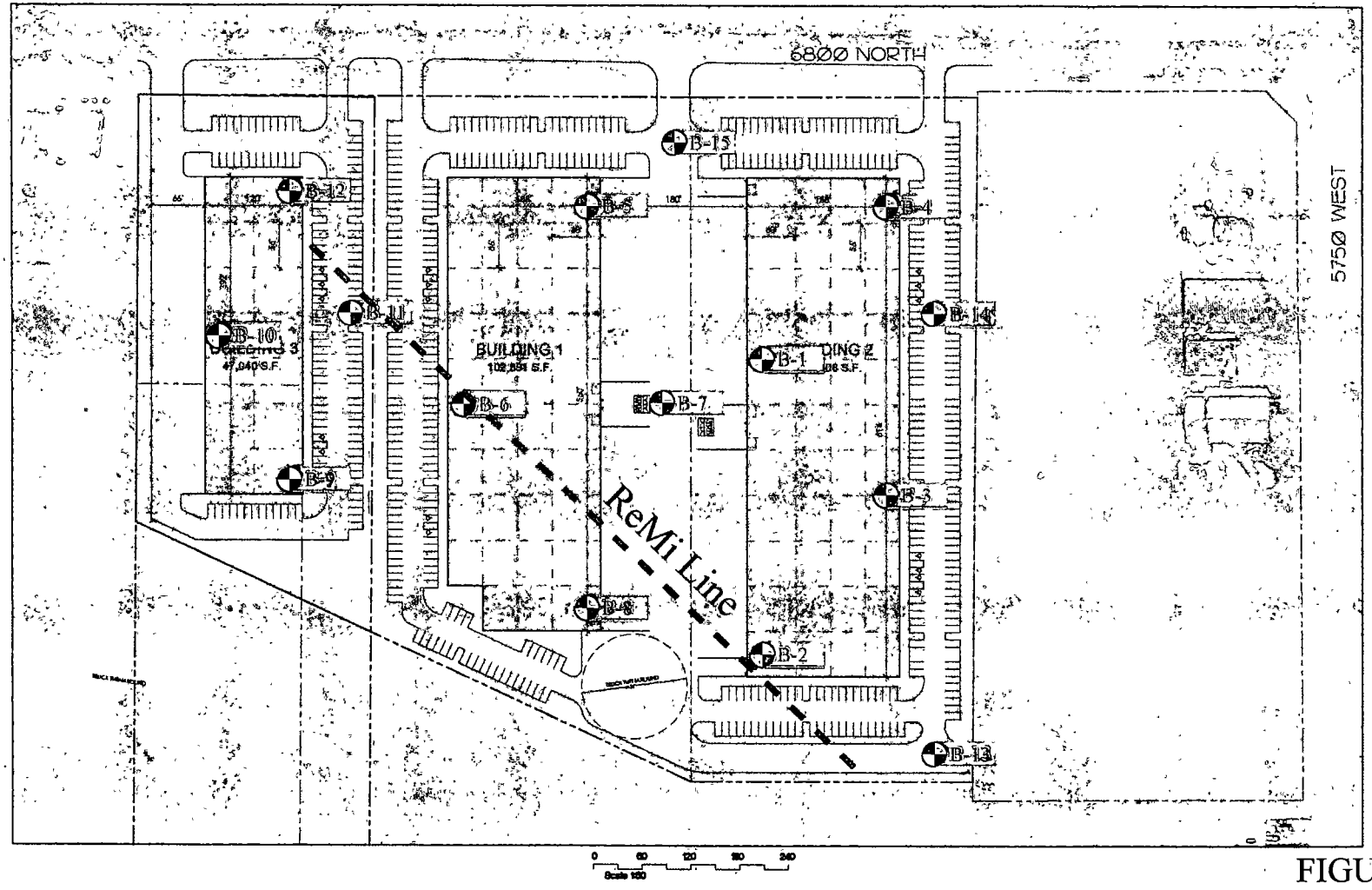

FIGURE 1
SITE PLAN

REFERENCE
ADAPTED FROM DRAWING ENTITLED
"MIKE HORAN - 6800 NORTH INDUSTRIAL AF"
BY AEURBIA, DATED 8 APR 2021

GSH

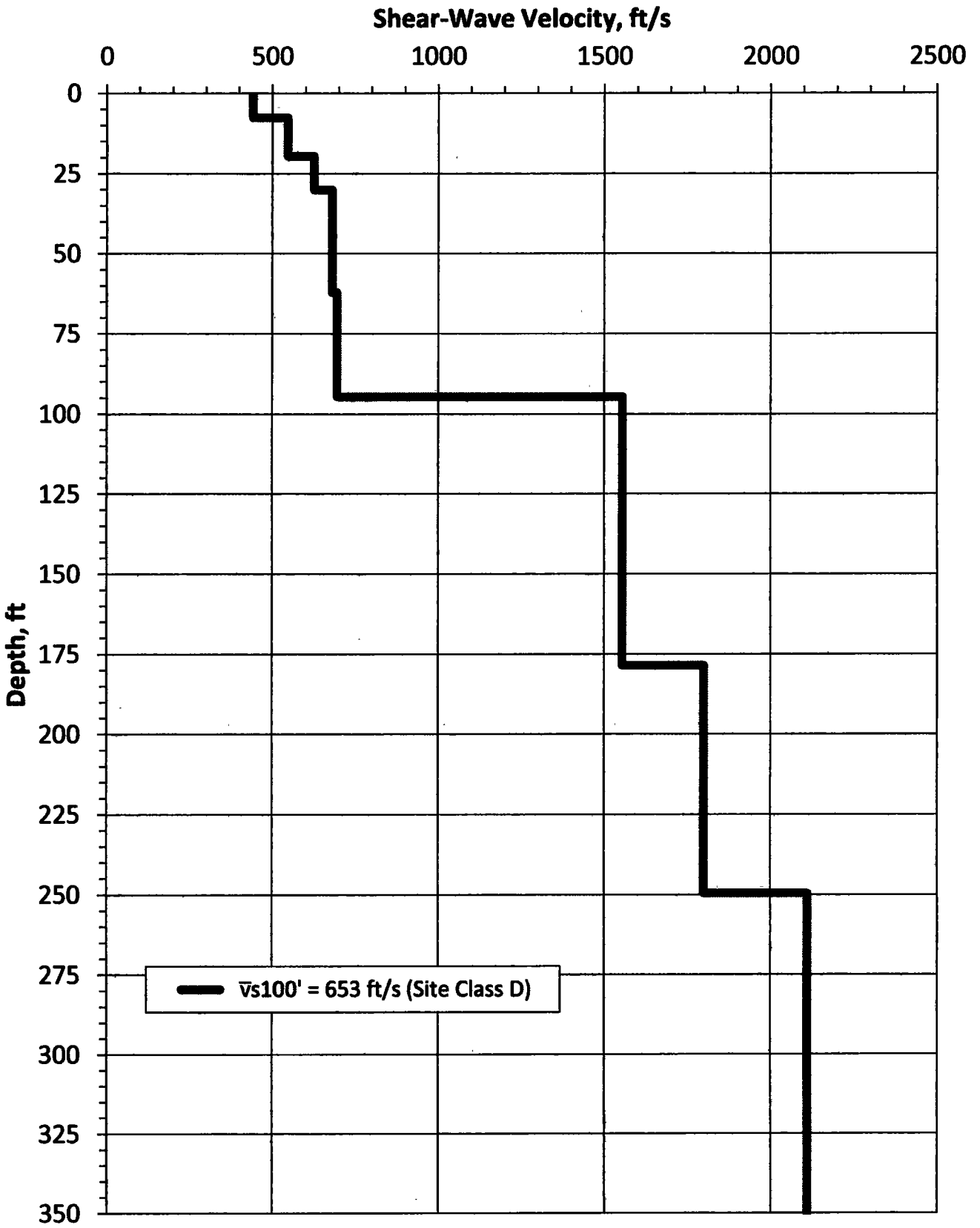

FIGURE 2 6800 North Industrial 2354-004-21

LETTER
ADDENDUM #1 AND REVIEW RESPONSE #1
PROPOSED 6800 NORTH INDUSTRIAL/
PROPOSED DEER PARK INDUSTRIAL
1100 SOUTH 50 WEST
AMERICAN FORK, UTAH

Submitted To:

White Horse Developers
520 South 850 East, Suite A4
Lehi, Utah 84043

Submitted By:

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123

November 22, 2021

Job No. 3388-001-21

GSH

November 22, 2021
Job No. 3388-001-21

Mr. Jake Horan
White Horse Developers
520 South 850 East, Suite A4
Lehi, Utah 84043

Mr. Horan:

Re: Letter
Addendum #1 and Review Response #1
Proposed 6800 North Industrial/Proposed Deer Park Industrial
1100 South 50 West
American Fork, Utah

1. INTRODUCTION

1.1 GENERAL

This letter is to serve as an addendum to the previously completed geotechnical study for the above-mentioned site as well as in response to the review and questions posed by Mr. Alan Taylor, P.E. of Taylor Geotechnical on behalf of the City of American Fork. GSH previously completed a geotechnical study for the site dated May 14, 2021[1]. GSH returned to the site on September 9, 2021, to conduct 4 additional borings and subsequent analysis for this addendum.

Since the issuance of the original report, one warehouse was added to the overall scope of the project on an additional parcel to the west of the original site. This addendum outlines the soil conditions and properties in the additional borings and any applicable recommendation changes. With the exception of the recommendations herein, all recommendations from the original report remain valid.

1.2 SUBSURFACE SOIL

Non-engineered fill soils were encountered in each additional boring, to depths of up to 6.5 feet beneath the existing ground surface. The non-engineered fill soils primarily consisted of clay with

[1] "Geotechnical Study, Proposed 6800 North Industrial, American Fork, Utah" prepared by GSH Geotechnical, Inc., GSH Job No. 2354-003-21.

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varying silt, sand, and gravel content as well as sand with varying clay, silt, and gravel content. Natural soils were encountered below the non-engineered fill or the ground surface in each boring. The natural soils consisted primarily of clay with varying silt, sand, and gravel content as well as sand and gravel with varying clay and silt content.

The following sections provide updated recommendations for the treatment of non-engineered fills.

2. DISCUSSIONS AND RECOMMENDATIONS

2.1 SITE PREPARATION

Initial site preparation will consist of the removal of any existing debris, non-engineered fills, surface vegetation, root systems, topsoil, and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed structure footprint and 3 feet beyond rigid pavements and exterior flatwork areas. All existing utility locations should be reviewed to assess their impact on the proposed construction and abandoned and/or relocated as appropriate.

In situ, non-engineered fills may remain below flexible pavements if free of debris and deleterious materials, less than 3 feet in thickness, and if properly prepared. Proper preparation below pavements will consist of the scarification of the upper 12 inches below asphalt concrete (flexible pavement), followed by moisture preparation and re-compaction to the requirements of structural fill. Even with proper preparation, pavements established overlying non-engineered fills may encounter some long-term movements unless the non-engineered fills are completely removed.

GSH must be notified prior to the placement of structural site grading fills, floor slabs, footings, and pavements to verify that all loose/disturbed soils and non-engineered fills have been completely removed and/or properly prepared.

2.2 STRUCTURAL FILL

On-site soils, including existing non-engineered fills, may be re-utilized as structural site grading fill if they do not contain construction debris or deleterious material and meet the requirements of structural fill. Fine-grained soils will require very close moisture control and may be very difficult, if not impossible, to properly place and compact during wet and cold periods of the year.

2.3 PAVEMENTS

The natural clay soils and non-engineered fills will exhibit poor pavement support characteristics when saturated. All pavement areas must be prepared as previously discussed. Under no circumstances shall pavements be established over unprepared non-engineered fills, loose or disturbed soils, topsoil, surface vegetation, root systems, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. With the subgrade soils and the

projected traffic as discussed in Section 2, Proposed Construction in the original report, the following pavement sections are recommended:

Parking Areas

(Light Volume of Automobiles and Light Trucks,
Occasional Medium-Weight Trucks,
and No Heavy-Weight Trucks)
[1-3 equivalent 18-kip axle loads per day]

Flexible Pavements:
(Asphalt Concrete)

3.0 inches	Asphalt concrete
8.0 inches	Aggregate base
Over	Properly prepared fills, natural subgrade soils, and/or structural site grading fill extending to properly prepared fills and/or natural subgrade soils

Rigid Pavements:
(Non-reinforced Concrete)

5.0 inches	Portland cement concrete (non-reinforced)
5.0 inches	Aggregate base
Over	Properly prepared natural subgrade soils, and/or structural site grading fill extending to properly prepared natural subgrade soils

GSH

Primary Drive Lanes/Loading and Unloading Areas

(Moderate Volume of Automobiles, Light Trucks,
and Medium-Weight Trucks,
with a Light Volume of Heavyweight Trucks)
[18 equivalent 18-kip axle loads per day]

Flexible Pavements:
(Asphalt Concrete)

4.0 inches	Asphalt concrete
8.0 inches	Aggregate base
8.0 inches*	Aggregate subbase
Over	Properly prepared fills, natural subgrade soils, and/or structural site grading fill extending to properly prepared fills and/or natural subgrade soils

* Subbase may consist of granular site grading fills with a minimum California Bearing Ratio (CBR) of 30 percent.

Rigid Pavements:
(Non-reinforced Concrete)

7.0 inches	Portland cement concrete (non-reinforced)
6.0 inches	Aggregate base
Over	Properly prepared natural subgrade soils, and/or structural site grading fill extending to properly prepared natural subgrade soils

In areas with tight maneuvering heavy vehicles, rigid pavements are recommended.

For dumpster pads, we recommend a pavement section consisting of 8.0 inches of Portland cement concrete, 12.0 inches of aggregate base, over properly prepared natural subgrade or site grading structural fills. Dumpster pads should not be constructed overlying non-engineered fills under any circumstances.

These above rigid pavement sections are for non-reinforced Portland cement concrete. Concrete should be designed in accordance with the American Concrete Institute (ACI) and joint details should conform to the Portland Cement Association (PCA) guidelines. The concrete should have a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch and contain 6 percent ±1 percent air-entrainment.

The crushed stone should conform to applicable sections of the current Utah Department of Transportation (UDOT) Standard Specifications. All asphalt material and paving operations should meet applicable specifications of the Asphalt Institute and UDOT. A GSH technician shall observe placement and perform density testing of the base course material and asphalt.

Please note that the recommended pavement section is based on estimated post-construction traffic loading. If the pavement is to be constructed and utilized by construction traffic, the above pavement section may prove insufficient for heavy truck traffic, such as concrete trucks or tractor-trailers used for construction delivery. Unexpected distress, reduced pavement life, and/or premature failure of the pavement section could result if subjected to heavy construction traffic and the owner should be made aware of this risk. If the estimated traffic loading stated herein is not correct, GSH must review actual pavement loading conditions to determine if revisions to these recommendations are warranted.

2.4 SITE VISITS

GSH must verify that all topsoil/disturbed soils and any other unsuitable soils have been removed, that non-engineered fills have been removed and/or properly prepared, and that suitable soils have been encountered prior to placing site grading fills, footings, slabs, and pavements. Additionally, GSH must observe fill placement and verify in-place moisture content and density of fill materials placed at the site.

3. TAYLOR GEOTECHNICAL (TG) REVIEW RESPONSE

TG Comment 1

Section 3.3.1 General (page 4) of the May 14, 2021, GSH document states, "Lab testing was ongoing at the time this report was written. Upon completion, an updated version of this report containing lab results will be sent, along with any revised recommends."

TG recommends American Fork City request GSH provide the updated version of the report with the accompany lab work results (i.e. consolidations, gradations, Atterberg Limits, etc.).

GSH Review Response 1

Lab testing associated with the May 14, 2021, report as well as the additional borings conducted on September 9, 2021 and associated addendum are included as Attachment 1, Laboratory Testing.

TG Comment 2

Section 5.1 Summary of Findings (page 7) of the May 14, 2021, GSH document states, "GSH is currently conducting a site-specific seismic response analysis and the results will be transmitted upon completion."

TG recommends American Fork City request GSH provide the site-specific seismic response analysis.

GSH Review Response 2

The site-specific seismic response analysis completed in association with the May 14, 2021, study is included as Attachment 2, Site-Specific Seismic Study.

TG Comment 3

Section 5.3 Groundwater (page 11) of the May 14, 2021, GSH document states, "Floor slabs must be placed a minimum of 4 feet from the stabilized groundwater elevation."

TG recommends American Fork City request GSH provide the stabilized groundwater elevation as measured from existing grade.

GSH Review Response 3

Stabilized groundwater elevations are presented in the following tables.

Boring No.	Groundwater Depth (feet)
	May 13, 2021
B-1	4.8
B-2	Pipe Damaged
B-3	7.8
B-4	2.8
B-5	5.0
B-6	6.1
B-8	7.8
B-9	Pipe Damaged
B-10	7.1
B-12	4.6
B-15	3.6

Boring No.	Groundwater Depth (feet)
	September 17, 2021
B-1A	7.6
B-3A	9.3
B-4A	9.8

TG Comment 4

Section 5.9 Cement Types (page 17) of the May 14, 2021, GSH document states, "A representative soil sample was collected and sent for laboratory analysis for pH and sulfate content. As of the date of this report, results are still pending and will be transmitted when available and with corresponding cement recommendations, if applicable."

TG recommends American Fork City request GSH provide the laboratory results and corresponding cement recommendations.

GSH Review Response 4

To determine if the site soils will react detrimentally with concrete, chemical tests were performed on a representative sample of the near-surface soil encountered at the site. The results of the chemical tests are tabulated below:

Boring No.	Depth (feet)	Soil Classification	pH	Total Water Soluble Sulfate (mg/kg-dry)
B-1	2.5	CL	7.37	247
B-1A	2.5	CL (Fill)	8.24	158

The laboratory tests indicate that the natural soils tested contain a negligible amount of water soluble sulfates. Based on our test results, concrete in contact with the on-site soil will have a low potential for sulfate reaction (ACI 318, Table 4.3.1). Therefore, all concrete which will be in contact with the site soils may be prepared using Type I or IA cement.

TG Comment 5

Section 4-2-2 of the of the American Fork City Sensitive Land Ordinance sub-item (10), states the report must be in accordance with the guidelines and recommendations of the "American Fork Sensitive Lands Geologic Hazards Study," Chapter 5 titled "Conclusions and Recommendations" prepared by RB&G Engineering, Inc., dated December 2006. The RB&G report specifies for facilities designed according to the IBC seismic provisions and located within the moderate or high liquefaction hazard zones identified on Figure 6 of the RB&G report, that the recommended Site Class be based on a site- specific subsurface investigation to a depth of at least 30 feet, supplemented by at least one investigation to a depth of at least 70 feet and located within 2,000 feet of the site. TG recommends American Fork City request GSH provide the recommended Site Class in accordance the American Fork City Sensitive Land Ordinance.

GSH Review Response 5

GSH completed a site-specific seismic response analysis in association with the May 14, 2021. Per this study, the site has been determined as a Site Class D – Stiff Soil Profile as defined in Chapter 20 of ASCE 7-16 (per Section 1613.3.2, Site Class Definitions, of IBC 2018).

TG Comment 6

TG recommends American Fork City request GSH update their ground motions and liquefaction analysis based on the IBC 2018 or ASCE 7-16.

GSH Review Response 6

An updated ground motion table is presented in the site-specific seismic response analysis completed in association with the May 14, 2021, study. This study is included as Attachment 2, Site-Specific Seismic Study.

An updated liquefaction analysis will be provided to address the following comment "TG Comment 7".

TG Comment 7

Section 5.10.5 Liquefaction (page 19) of the May 14, 2021, GSH document states, "Calculations were performed using the procedures described in the 2008 Soil Liquefaction During Earthquakes Monograph by Idriss and Boulanger3. Our calculations indicate the very, saturated sand layers encountered in Borings B-1, B-2, B-4 and B-12 could liquefy during the design seismic event. Calculated settlement associated with the liquefaction of each layer within the borings was on the order of 1 to 1.5 inches. This magnitude of settlement should be tolerable to design for life safety. Additionally, lateral spread and ground rupture are unlikely to occur."

The subject document did not contain the calculations to substantiate there liquefaction induced settlement analysis. The document also did not substantiate the liquefaction induced lateral spread analysis.

TG recommends the American Fork City request the calculations that substantiate the liquefaction induced settlement and lateral spread analyses.

GSH Review Response 7

Calculations were performed using the procedures described in the 2008 Soil Liquefaction During Earthquakes Monograph by Idriss and Boulanger[2]. Our calculations indicate the very loose to medium dense, saturated sand layers encountered in Borings B-1, B-2, B-6, and B-12 could liquefy during the design seismic event. Calculated settlement associated with the liquefaction of each layer within the borings was on the order of 1.16 to 2.1 inches.

The liquefaction calculations utilized to substantiate the liquefaction induced settlement are included as Attachment 3, Liquefaction Analysis.

Additionally, due to the lack of horizontal relief and change of topography throughout the site, lateral spread is unlikely to occur.

---

2 Idriss, I. M., and Boulanger, R. W. (2008), Soil liquefaction during earthquakes: Monograph MNO-12, Earthquake Engineering Research Institute, Oakland, CA, 261 pp.

TG Comment 8

Based on section 2-7-2 of the American Fork City Sensitive Land Ordinance, GSH should provide the historical high groundwater table for the subject site. TG recommends American Fork City request GSH provide the historical high groundwater table for the subject site and state the reference used.

GSH Review Response 8

GSH utilized waterdata.usgs.gov to review the historical high groundwater table for the subject. Historical high groundwater tables in wells directly adjacent to the northwest and northeast indicated were recorded as shallow as approximately 33 feet below the ground surface.

The historical high groundwater tables are included in Attachment 5, Historical High Groundwater Tables. However, these levels are unrealistically low. GSH recommends designing to an anticipated groundwater elevation of 3.6 feet, 1 foot higher than what was measured in the original study.

TG Comment 9

Since the site is below elevation 4593 feet, TG recommends American Fork City request GSH to address artesian conditions at the site.

GSH Review Response 9

GSH did not encounter artesian conditions within the borings performed in accordance with the May 14, 2021, report, nor within the additional borings performed to the maximum depths explored.

TG Comment 10

TG recommends American Fork City request GSH to provide calculations that substantiate their recommended allowable bearing capacity, estimated settlement, lateral resistance and lateral loading recommendations.

GSH Review Response 10

Calculations to substantiate the recommended allowable bearing capacity, estimated settlement, lateral resistance, and lateral loading recommendations are provided within Attachment 4, Engineering Calculations.

TG Comment 11

In accordance with section 4-2-4 of the of the American Fork City Sensitive Land Ordinance, sub-item (7B), the report should be accompanied with the following Certificate statement sealed by the licensed professional that prepared the report:

I hereby certify that I am a licensed professional engineer or an engineering geologist, as those terms are defined in the "Sensitive Lands Ordinance" Section of the American Fork City Ordinances. I have examined the letter report/geologic report to which this certificate is attached and the information and conclusions contained therein are, without any reasonable reservation not stated therein, accurate and complete. All procedures and tests used in said letter report/geologic report meet minimum applicable professional standards.

The subject document did not contain the required certificate. TG recommends the City of American Fork request the required certificate for the subject document.

GSH Review Response 11

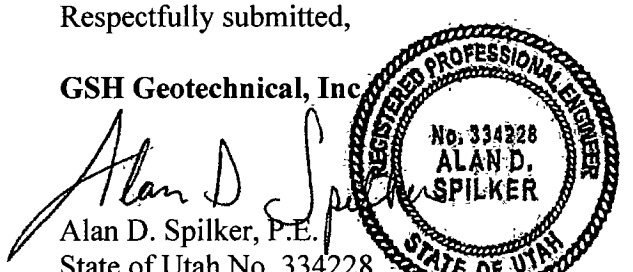
GSH did not encounter artesian conditions within the borings performed in accordance with the May 14, 2021, report, nor within the additional borings performed to the maximum depths explored.

4. CLOSURE

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, Inc.



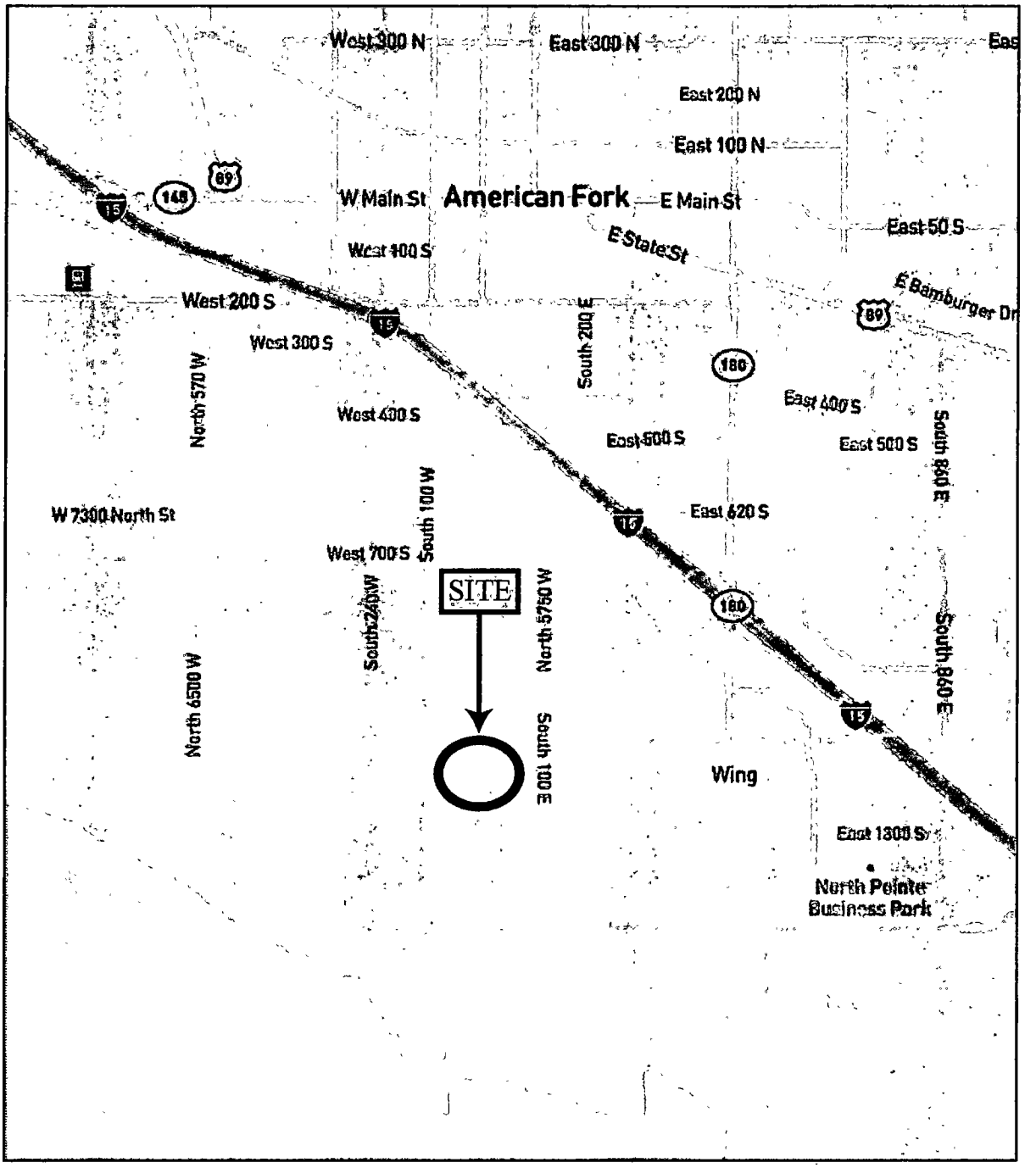
Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

ADS ea

Encl. Figures 1 and 1A, Vicinity Maps
Figures 2, and 2A, Site Plans
Figures 3A through 3O, Boring Logs
Figures 4A through 4D, Additional Boring Logs
Figure 5, Key to Boring Log (USCS)
Attachment 1, Laboratory Testing
Attachment 2, Site-Specific Seismic Study
Attachment 3, Liquefaction Analysis
Attachment 4, Engineering Calculations
Attachment 5, Historical High Groundwater Tables

Addressee (email)

RED PINE CONSTRUCTION
JOB NO. 2354-003-21



0.5 0 0.5 1 KM 1.5

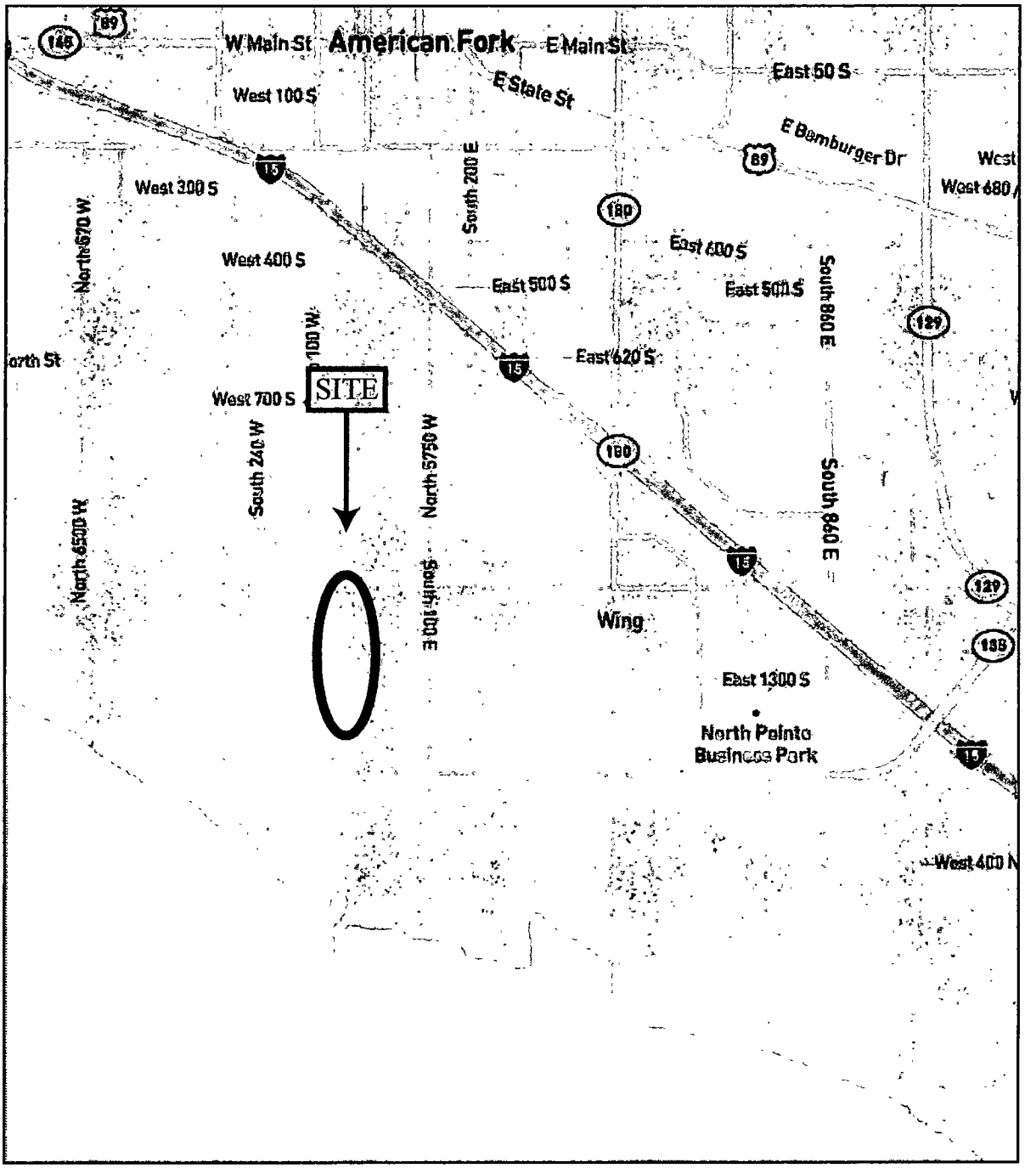
0.2 0 0.2 0.4 0.6 0.8 1 MI 1.2

FIGURE 1
VICINITY MAP

REFERENCE:
ALL TRAILS - NATIONAL GEOGRAPHIC TERRAIN
DATED 2021

GSH

WHITE HORSE DEVELOPERS
JOB NO. 3388-001-21



0.5 0 0.5 1 KM 1.5

0.2 0 0.2 0.4 0.6 0.8 1 MI 1.2

FIGURE 1A
VICINITY MAP

REFERENCE:
ALL TRAILS - NATIONAL GEOGRAPHIC TERRAIN
DATED 2021

GSH

RED PINE CONSTRUCITON
JOB NO 2354-003-21

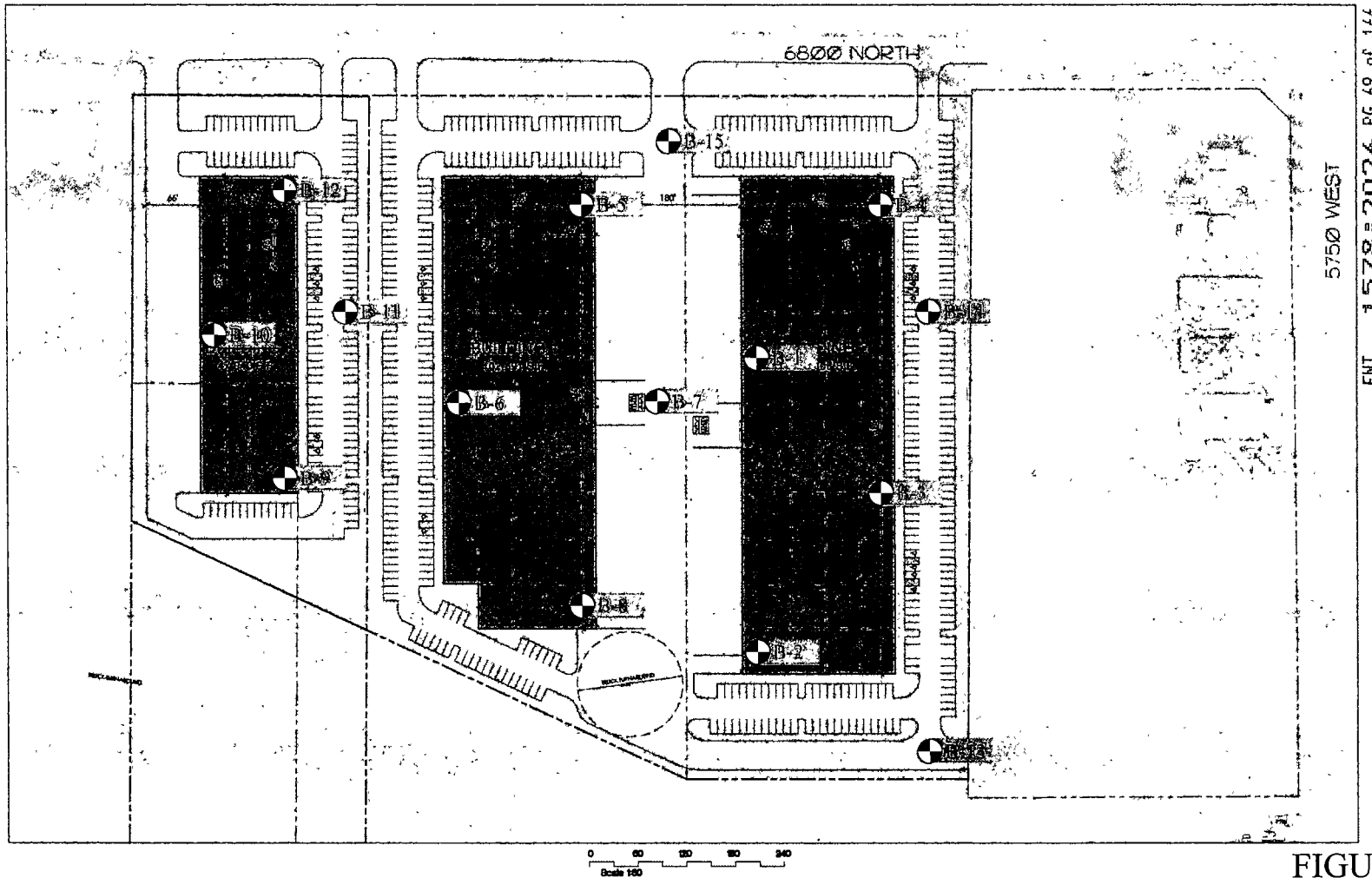
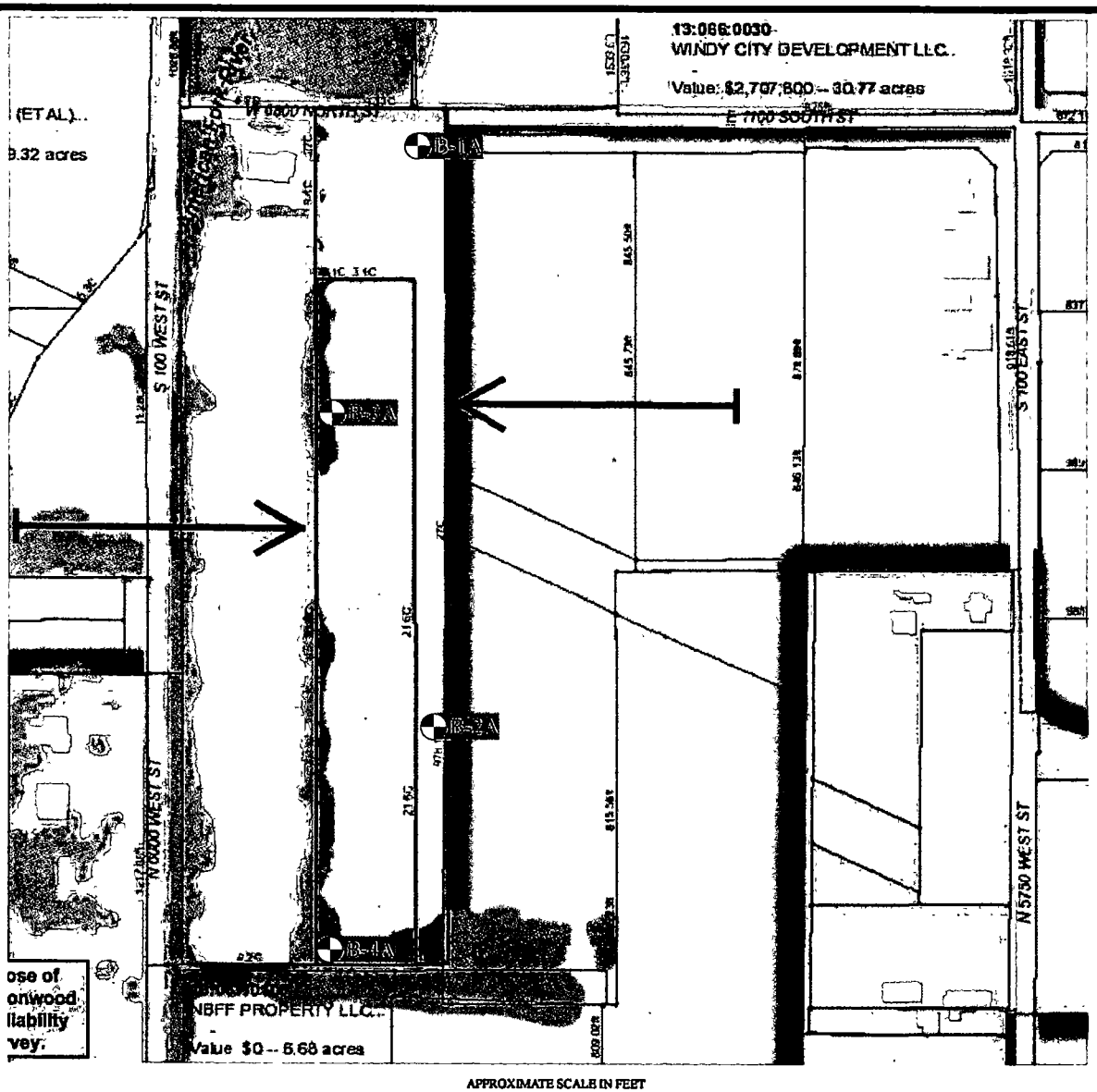


FIGURE 2
SITE PLAN

REFERENCE
ADAPTED FROM DRAWING ENTITLED
"MIKE HORAN - 6800 NORTH INDUSTRIAL AF"
BY AEURBIA, DATED 8 APR 2021

GSH

WHITE HORSE DEVELOPERS
JOB NO. 3388-001-21



REFERENCE
ADAPTED FROM UTAH COUNTY PARCEL MAP
DATED 8/12/21

APPROXIMATE SCALE IN FEET
110 0 110 220

ENT 1578:2024 PG 70 of 166

FIGURE 2A
SITE PLAN

GSH

GSH	BORING LOG Page: 1 of 2	BORING: B-1

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/22/21 — DATE FINISHED: 4/22/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: JH

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 4.8' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand and occasional layers of silty fine sand up to 3" major roots (topsoil) to 6", brown		2							slightly moist soft
▼		grades with trace fine sand	5	3							saturated
		grades with occasional layers of fine to coarse sandy fine gravel up to 6" thick	10	26							
		grades with some fine sand with layers of silty fine sand up to 3" thick	15	2							very soft
		grades fine sandy clay, tan	20	2							
		grades silty clay with some fine sand, gray	25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3A

GSH

BORING LOG

Page: 2 of 2

BORING: B-1

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/22/21 — DATE FINISHED: 4/22/21

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		grades silty clay with some fine sand, gray	25	0							
	SP	FINE TO MEDIUM SAND with occasional layers of silty clay up to 3" thick; brown									saturated very loose
			30	3							
	CL	SILTY CLAY with some fine sand, brown									saturated medium stiff
			35	7							
		grades with trace fine sand; gray	40	4							soft
			45	4							
		grades brown	50	3							
		End of Exploration at 51 5' Installed 1.25" diameter slotted PVC pipe to 51.5'									

See Subsurface Conditions section in the report for additional information.

FIGURE 3A
(continued)

GSH

BORING LOG

Page: 1 of 1

BORING: B-2

CLIENT: Red Pine Construction | PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial | DATE STARTED: 4/22/21 | DATE FINISHED: 4/22/21

LOCATION: 5900 West 6800 North, American Fork, Utah | GSH FIELD REP.: JH

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: 6.0' (4/22/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand, major roots (topsoil) to 5"; brown									slightly moist medium stiff
				8							
			5	3							moist soft
▼											saturated
	SM	SILTY FINE SAND with numerous layers of clay up to 2" thick, gray	10	3							saturated very loose
	CL	SILTY CLAY with some fine sand; brown									saturated soft
			15	4							
		End of Exploration at 16 0'. Installed 1 25" diameter slotted PVC pipe to 16 0'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3B

GSH	BORING LOG Page: 1 of 1	BORING: B-3

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/22/21 — DATE FINISHED: 4/22/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: JH

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 7.8' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand, major roots (topsoil) to 6"; brown		8							slightly moist medium stiff
			5								
▼		grades fine sandy clay with some fine and coarse gravel		6							saturated
		grades with occasional layers of silty fine sand up to 2" thick	10	2							soft
		grades silty clay with some fine sand	15	3							
		End of Exploration at 16 0' Installed 1 25" diameter slotted PVC pipe to 16 0'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3C

GSH	BORING LOG Page: 1 of 1	BORING: B-4

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/23/21 — DATE FINISHED: 4/23/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: GL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 2.8' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY major roots (topsoil) to 5", brown									slightly moist medium stiff
▼				5	X						saturated
	SP/SM	FINE TO COARSE SAND with fine gravel and silt, brown	5								saturated dense
				15	X						
	CL	SILTY CLAY brown									saturated medium stiff
			10	14	X						saturated
	SM	FINE TO COARSE SAND with silt; brown	15	2	X						saturated very loose
	CL	SILTY CLAY brown									saturated very soft
		End of Exploration at 16.0' Installed 1.25" diameter slotted PVC pipe to 16.0'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3D

GSH	BORING LOG Page: 1 of 1	BORING: B-5

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/23/21 — DATE FINISHED: 4/23/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: GL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 5.0' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine gravel; major roots (topsoil) to 6", brown									moist soft
				4							
▼		fine gravel grades out	5								saturated very soft
				2							
		grades fine to coarse sandy clay with some fine gravel	10	4							soft
		grades fine to medium sandy clay with silt	15	7							medium stiff
		End of Exploration at 16.5'. Installed 1.25" diameter slotted PVC pipe to 16 5'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3E

GSH	BORING LOG Page: 1 of 1	BORING: B-6

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 6.1' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	FINE TO MEDIUM SANDY CLAY major roots (topsoil) to 6", dark brown		17							slightly moist stiff
▼		grades brown	5	4							medium stiff saturated
	SM	SILTY FINE SAND with occasional layers of silty clay up to 6" thick, gray	10	5							saturated medium dense
	CL	FINE TO MEDIUM SANDY CLAY brown	15	4							saturated medium stiff
		End of Exploration at 16.5'. No groundwater encountered at time of drilling. Installed 1.25" diameter slotted PVC pipe to 16 5'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3F

GSH	BORING LOG Page: 1 of 1	BORING: B-7

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: Not Encountered (4/26/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with fine to medium sand; major roots (topsoil) to 6"; brown									slightly moist medium stiff
		End of Exploration at 5.0'. No groundwater encountered at time of drilling.	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3G

GSH	BORING LOG Page: 1 of 1	BORING: B-8

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 7.8' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM/ML	SILTY FINE SAND/FINE SANDY SILT major roots (topsoil) to 6", brown									slightly moist dense
				13							
			5								
	CL	FINE TO MEDIUM SANDY CLAY brown									slightly moist medium stiff
▼				4							saturated
			10								
				4							
		grades silty clay with some fine sand	15								
				6							
		End of Exploration at 16.5'. No groundwater encountered at time of drilling Installed 1.25" diameter slotted PVC pipe to 16 5'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3H

GSH	BORING LOG Page: 1 of 1	BORING: B-9

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 14.5' (4/26/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine to medium sand and trace fine gravel; major roots to 5", brown									slightly moist stiff
				17							
		grades with occasional layers of silty fine sand up to 6" thick	5								
				41							
	GP	FINE TO COARSE SANDY FINE GRAVEL with some clay; brown									moist medium dense
			10								
				38							
▼	CL	FINE TO MEDIUM SANDY CLAY brown	15								saturated medium stiff
				5							
		End of Exploration at 16 5' Installed 1.25" diameter slotted PVC pipe to 16.5'.									
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 31

GSH

BORING LOG

Page: 1 of 1

BORING: B-10

CLIENT: Red Pine Construction | PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial | DATE STARTED: 4/26/21 | DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: 7.1' (5/13/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM/SC	SILTY/CLAYEY FINE TO MEDIUM SAND with some fine gravel, major roots (topsoil) to 6", brown									dry loose
				16	X						
			5								
▼	CL	SILTY CLAY with fine to medium sand and trace fine gravel, gray									saturated soft
				2	X						
		grades fine to medium sandy clay with some fine gravel	10	5	X						medium stiff
		grades silty clay with some fine to medium sand and trace fine gravel; gray to brown	15	9	X						
		End of Exploration at 16.5'. No groundwater encountered at time of drilling. Installed 1 25" diameter slotted PVC pipe to 16.5'	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3J

GSH	BORING LOG Page: 1 of 1	BORING: B-11

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: Not Encountered (4/26/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	FINE TO MEDIUM SANDY CLAY with some fine gravel, major roots (topsoil) to 5"; brown									dry medium stiff
		End of Exploration at 5.0'. No groundwater encountered at time of drilling	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3K

GSH BORING LOG

Page: 1 of 1

BORING: B-12

CLIENT: Red Pine Construction | PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial | DATE STARTED: 4/26/21 | DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah | GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger | HAMMER: Automatic | WEIGHT: 140 lbs | DROP: 30"

GROUNDWATER DEPTH: 4.6' (5/13/21) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM/SC	SILTY/CLAYEY FINE TO MEDIUM SAND major roots (topsoil) to 6", brown									dry loose
				8							
▼			5								saturated
	SP	FINE GRAVELLY FINE TO COARSE SAND with some clay, gray									saturated medium dense
				47							
		grades fine to coarse sand, brown	10	16							loose
		grades fine gravelly fine to coarse sand with trace clay and occasional layers of silty clay up to 6" thick	15	2							very loose
		End of Exploration at 16 5' Installed 1 25" diameter slotted PVC pipe to 16.5'.	20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3L

GSH	BORING LOG Page: 1 of 1	BORING: B-13

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs / DROP: 30"

GROUNDWATER DEPTH: Not Encountered (4/26/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand and trace fine gravel, major roots (topsoil) to 6"; brown									slightly moist medium stiff
			5								
		End of Exploration at 5.0'. No groundwater encountered at time of drilling									
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3M

GSH	BORING LOG Page: 1 of 1	BORING: B-14

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: Not Encountered (4/26/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL	SILTY CLAY with some fine sand; major roots (topsoil) to 5"; brown									slightly moist medium stiff
		End of Exploration at 5 0' No groundwater encountered at time of drilling	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3N

GSH	BORING LOG Page: 1 of 1	BORING: B-15

CLIENT: Red Pine Construction — PROJECT NUMBER: 2354-003-21

PROJECT: Proposed 6800 North Industrial — DATE STARTED: 4/26/21 — DATE FINISHED: 4/26/21

LOCATION: 5900 West 6800 North, American Fork, Utah — GSH FIELD REP.: AL

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 3.6' (5/13/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	GC	FINE SANDY FINE AND COARSE GRAVEL with clay, major roots (topsoil) to 6", brown									slightly moist medium dense
▼											saturated
		End of Exploration at 5.0' Installed 1.25" diameter slotted PVC pipe to 5 0'.	5								
			10								
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 3O

GSH	BORING LOG Page: 1 of 1	BORING: B-1

CLIENT: White Horse Developers — PROJECT NUMBER: 3388-001-21

PROJECT: Proposed 6800 North Industrial/ Proposed Deer Park Industrial — DATE STARTED: 9/9/21 — DATE FINISHED: 9/9/21

LOCATION: 1100 South 50 West, American Fork, Utah — GSH FIELD REP.: BH

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 7.6' (9/17/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	CL FILL	FINE TO MEDIUM SANDY CLAY, FILL with silt and some fine gravel; major roots (topsoil) to 5"; brown									slightly moist very stiff
				35							
	GP/ GM	FINE AND COARSE GRAVEL with fine to coarse sand and some silt, brown	5								slightly moist very dense
				51							
▼											saturated
		grades with fine to medium sand and some silt	10	24		3.2		8			medium dense
	CL	SILTY CLAY with some fine to medium sand; gray									saturated medium stiff
			15	6							
		End of Exploration at 16 0' Installed 1 25" diameter slotted PVC pipe to 16 0'.									
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 4A

GSH	BORING LOG Page: 1 of 1	BORING: B-2

CLIENT: White Horse Developers — PROJECT NUMBER: 3388-001-21

PROJECT: Proposed 6800 North Industrial/ Proposed Deer Park Industrial — DATE STARTED: 9/9/21 — DATE FINISHED: 9/9/21

LOCATION: 1100 South 50 West, American Fork, Utah — GSH FIELD REP.: BH

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: Not Encountered (9/9/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM FILL	SILTY FINE SAND, FILL with trace clay and some fine and coarse gravel, major roots (topsoil) to 6"; brown									dry medium dense
				20							
	CL	FINE TO MEDIUM SANDY CLAY with silt and trace fine gravel, brown	5								slightly moist medium stiff
				4							
			10	7					43	21	
		End of Exploration at 11.0'. No groundwater encountered at time of drilling									
			15								
			20								
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 4B

GSH	BORING LOG Page: 1 of 2	BORING: B-3

CLIENT: White Horse Developers — PROJECT NUMBER: 3388-001-21

PROJECT: Proposed 6800 North Industrial/ Proposed Deer Park Industrial — DATE STARTED: 9/10/21 — DATE FINISHED: 9/10/21

LOCATION: 1100 South 50 West, American Fork, Utah — GSH FIELD REP.: BH

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 9.3' (9/17/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM FILL	SILTY FINE TO MEDIUM SAND, FILL with some fine and coarse gravel; major roots (topsoil) to 6"; brown		18							dry medium dense
			5	19							
	GP	FINE AND COARSE GRAVEL with some fine to coarse sand and trace silt, brown									moist loose
▼											saturated
	CL	SILTY CLAY with fine to medium sand; brown	10	10							saturated stiff
			15	0							very soft
			20	0					36	18	
			25								

See Subsurface Conditions section in the report for additional information.

FIGURE 4C

GSH	BORING LOG Page: 2 of 2	BORING: B-3

CLIENT: White Horse Developers PROJECT NUMBER: 3388-001-21

PROJECT: Proposed 6800 North Industrial/ Proposed Deer Park Industrial DATE STARTED: 9/10/21 DATE FINISHED: 9/10/21

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
			25								
		grades with some fine to medium silty sand		1							
		grades with trace fine sand	30	6					33	13	medium stiff
			35	6							
		grades gray	40	0					42	18	very soft
			45	1							
			50	1					46	21	
		End of Exploration at 50 0' Installed 1.25" diameter slotted PVC pipe to 50 0'									

See Subsurface Conditions section in the report for additional information.

FIGURE 4C
(continued)

GSH BORING LOG

Page: 1 of 1

BORING: B-4

CLIENT: White Horse Developers — PROJECT NUMBER: 3388-001-21

PROJECT: Proposed 6800 North Industrial/ Proposed Deer Park Industrial — DATE STARTED: 9/10/21 — DATE FINISHED: 9/10/21

LOCATION: 1100 South 50 West, American Fork, Utah — GSH FIELD REP.: BH

DRILLING METHOD/EQUIPMENT: 3-3/4" ID Hollow-Stem Auger — HAMMER: Automatic — WEIGHT: 140 lbs — DROP: 30"

GROUNDWATER DEPTH: 9.8' (9/17/21) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0								
	SM FILL	FINE TO MEDIUM SAND, FILL with trace fine and coarse gravel, major roots (topsoil) to 6"; brown									slightly moist loose
				13		8.8	110				
	CL	SILTY CLAY with trace fine sand; brown	5	13							slightly moist stiff
▼			10	0							saturated
											very soft
			15	6							medium stiff
			20	9							
		End of Exploration at 21.0'. No groundwater encountered at time of drilling Installed 1 25" diameter slotted PVC pipe to 21.0'.	25								

See Subsurface Conditions section in the report for additional information.

FIGURE 4D

CLIENT: White Horse Developers
PROJECT: Proposed 6800 North Industrial/ Proposed Deer Park Industrial
PROJECT NUMBER: 3388-001-21

KEY TO BORING LOG

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	BLOW COUNT	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫

COLUMN DESCRIPTIONS

① **Water Level:** Depth to measured groundwater table See symbol below.

② **USCS:** (Unified Soil Classification System) Description of soils encountered; typical symbols are explained below

③ **Description:** Description of material encountered; may include color, moisture, grain size, density/consistency,

④ **Depth (ft.):** Depth in feet below the ground surface.

⑤ **Blow Count:** Number of blows to advance sampler 12" beyond first 6", using a 140-lb hammer with 30" drop.

⑥ **Sample Symbol:** Type of soil sample collected at depth interval shown; sampler symbols are explained below

⑦ **Moisture (%):** Water content of soil sample measured in laboratory; expressed as percentage of dryweight of

⑧ **Dry Density (pcf):** The density of a soil measured in laboratory; expressed in pounds per cubic foot.

⑨ **% Passing 200:** Fines content of soils sample passing a No. 200 sieve; expressed as a percentage.

⑩ **Liquid Limit (%):** Water content at which a soil changes from plastic to liquid behavior.

⑪ **Plasticity Index (%):** Range of water content at which a soil exhibits plastic properties.

⑫ **Remarks:** Comments and observations regarding drilling or sampling made by driller or field personnel. May include other field and laboratory test results using the following abbreviations:

CEMENTATION	MODIFIERS	MOISTURE CONTENT (FIELD TEST)
Weakly: Crumbles or breaks with handling or slight finger pressure.	**Trace** <5%	**Dry:** Absence of moisture, dusty, dry to the touch.
Moderately: Crumbles or breaks with considerable finger pressure.	**Some** 5-12%	**Moist:** Damp but no visible water
Strongly: Will not crumble or break with finger pressure	**With** >12%	**Saturated:** Visible water, usually soil below water table.

Descriptions and stratum lines are interpretive, field descriptions may have been modified to reflect lab test results Descriptions on the logs apply only at the specific boring locations and at the time the borings were advanced, they are not warranted to be representative of subsurface conditions at other locations or times

STRATIFICATION:

DESCRIPTION	THICKNESS
Seam	up to 1/8"
Layer	1/8" to 12"

Occasional: One or less per 6" of thickness
Numerous; More than one per 6" of thickness

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material is larger than No 200 sieve size.	GRAVELS More than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS (little or no fines)	GW	Well-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
			GP	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
		GRAVELS WITH FINES (appreciable amount of fines)	GM	Silty Gravels, Gravel-Sand-Silt Mixtures
			GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS More than 50% of coarse fraction passing through No. 4 sieve.	CLEAN SANDS (little or no fines)	SW	Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP	Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (appreciable amount of fines)	SM	Silty Sands, Sand-Silt Mixtures
			SC	Clayey Sands, Sand-Clay Mixtures
FINE-GRAINED SOILS More than 50% of material is smaller than No. 200 sieve size	SILTS AND CLAYS Liquid Limit less than 50%		ML	Inorganic Silts and Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity
			CL	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
			OL	Organic Silts and Organic Silty Clays o f Low Plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%		MH	Inorganic Silts, Micacious or Diatomacious Fine Sand or Silty Soils
			CH	Inorganic Clays of High Plasticity, Fat Clays
			OH	Organic Silts and Organic Clays of Medium to High Plasticity
HIGHLY ORGANIC SOILS			PT	Peat, Humus, Swamp Soils with High Organic Contents

Note Dual Symbols are used to indicate borderline soil classifications.

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Bulk/Bag Sample
- Standard Penetration Split Spoon Sampler
- Rock Core
- No Recovery
- 3 25" OD, 2 42" ID D&M Sampler
- 3 0" OD, 2 42" ID D&M Sampler
- California Sampler
- Thin Wall

WATER SYMBOL

- Water Level

FIGURE 5

GSH

ATTACHMENT 1

Laboratory Testing

200 Wash Results

Date:	9/14/21
Job #:	3388-001-21
Project:	Deer Park Industrial
Analyst:	NLW
Project Engineer:	ADS

Boring #:	B1A							
Sample #:	3							
Depth (ft):	10							
Pan Wt. (gr):	153.6							
Wet Weight Before Washing (Wet Soil + Pan)	369							
Dry Weight Before Washing (Dry Soil + Pan)	362.4							
Weight Retained After Washing (Dry Soil + Pan)	345.6							
Soil Description & Comments:								

% Moisture Content	3.2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
% Retained #200 Sieve	92.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
% Passing #200 Sieve	8.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Soil Classification								

200 Wash Results

Date:	5/11/21
Job #:	2354-003-21
Project:	6800 N Industrial
Analyst:	HB
Project Engineer:	ADS

Boring #:	B1	B2	B4	B6	B12	B12	B1	
Sample #:	7	3	2	3	3	4	3	
Depth (ft):	30	10	5	10	10	15	10	
Pan Wt. (gr):	142.2	124.1	126.3	130.1	128.6	142.2	152.5	
Wet Weight Before Washing (Wet Soil + Pan)	352.7	348.1	354.8	352.2	257.2	353.8	359.5	
Dry Weight Before Washing (Dry Soil + Pan)	308.2	302.9	333.5	312.9	228.6	308.3	318.1	
Weight Retained After Washing (Dry Soil + Pan)	233.7	221.1	299.6	252	217.5	234.8	237.2	
Soil Description & Comments:								

% Moisture Content	26.8	25.3	10.3	21.5	28.6	27.4	25.0	#DIV/0!
% Retained #200 Sieve	55.1	54.3	83.6	66.7	88.9	55.7	51.1	#DIV/0!
% Passing #200 Sieve	44.9	45.7	16.4	33.3	11.1	44.3	48.9	#DIV/0!
Soil Classification								

ATTERBERG LIMITS TEST

GSH

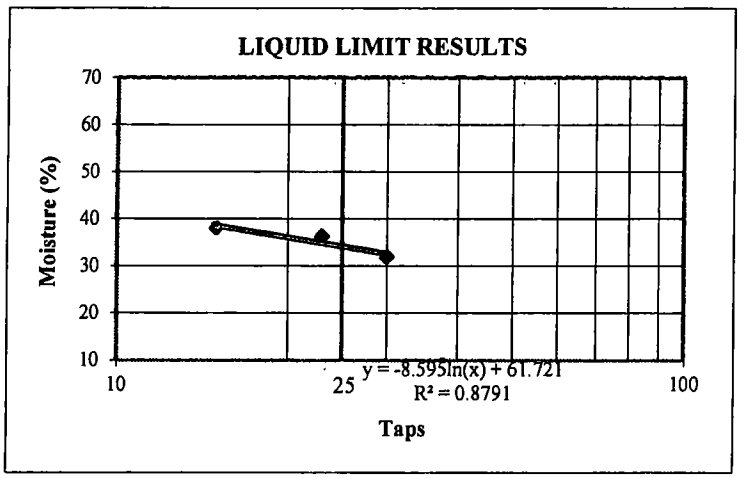
Project:	6800 N. Industrial					Job No.:	2354-003-21	Date:	5/11/21
Boring/TP:	B1	Sample No.:	9	Depth:	40'	Engineer:	ADS	Tester:	HB
Soil Descr.:									

LIQUID LIMIT

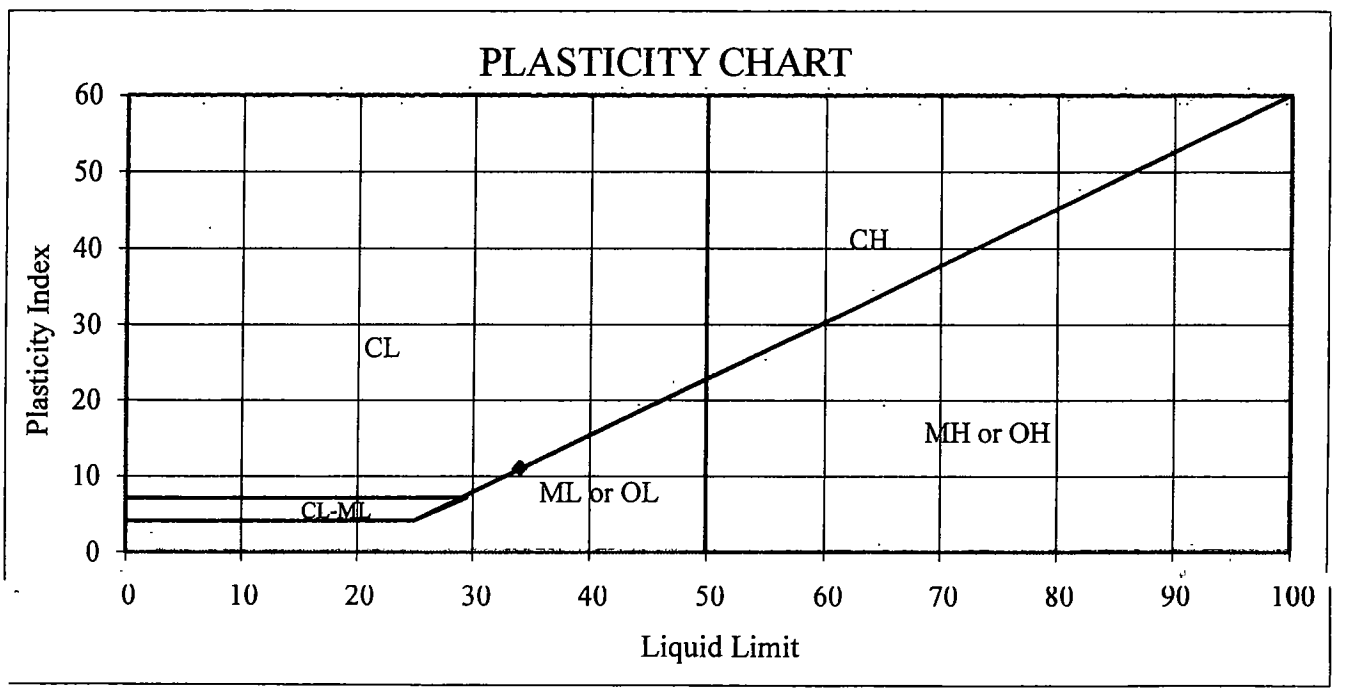
	Can No.	Au	W2	8
Weight (g)	Taps	30	23	15
	Can+wet soil	12.18	12.67	12.65
	Can+dry soil	10.95	11.12	11.09
	Can	7.07	6.82	6.98
	Moisture (%)	31.70	36.05	37.96

PLASTIC LIMIT

	Can No.	Hi
Weight (g)	Can+wet soil	12.62
	Can+dry soil	11.56
	Can	6.96
	Moisture (%)	23.04



	Moisture (%)
LL	34
PL	23
PI	11
USCS	CL



LL	43.49941
L or H	L
PI (A-line)	17.15457
PI (rounded)	21.00000
Above?	C
	CL

Lines for Plasticity Chart

50	0
50	60
0	4
25	4
29.5	7
0	7
100	60
25	4

ATTERBERG LIMITS TEST

Project:	Deer Park Industrial					Job No.:	3388-007	Date:	9/14/21
Boring/TP	B2A	Sample N	3	Depth:	10	Engineer:	ADS	Tester:	NLW
Soil Desc									

LIQUID LIMIT

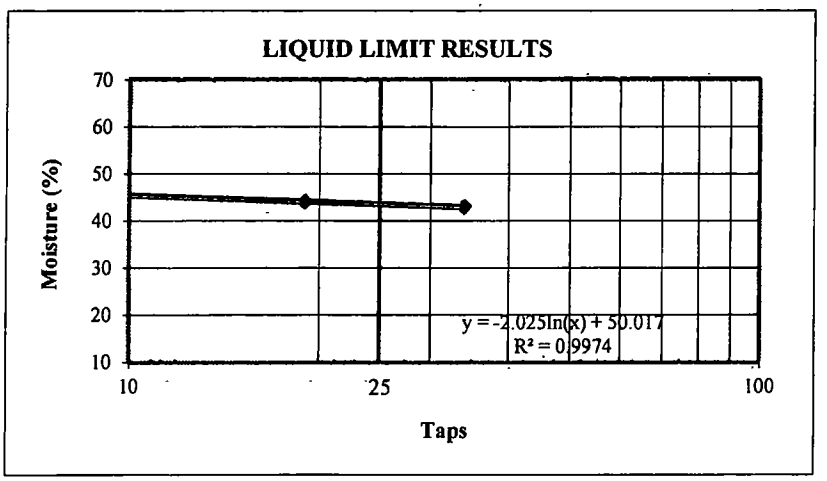
Can No.	6a	10	L7
Taps	34	19	9
Can+wet s	13.28	11.77	11.32
Can+dry s	11.37	10.31	9.92
Can	6.92	6.99	6.85
Moisture (	42.92	43.98	45.60

Weight (g)

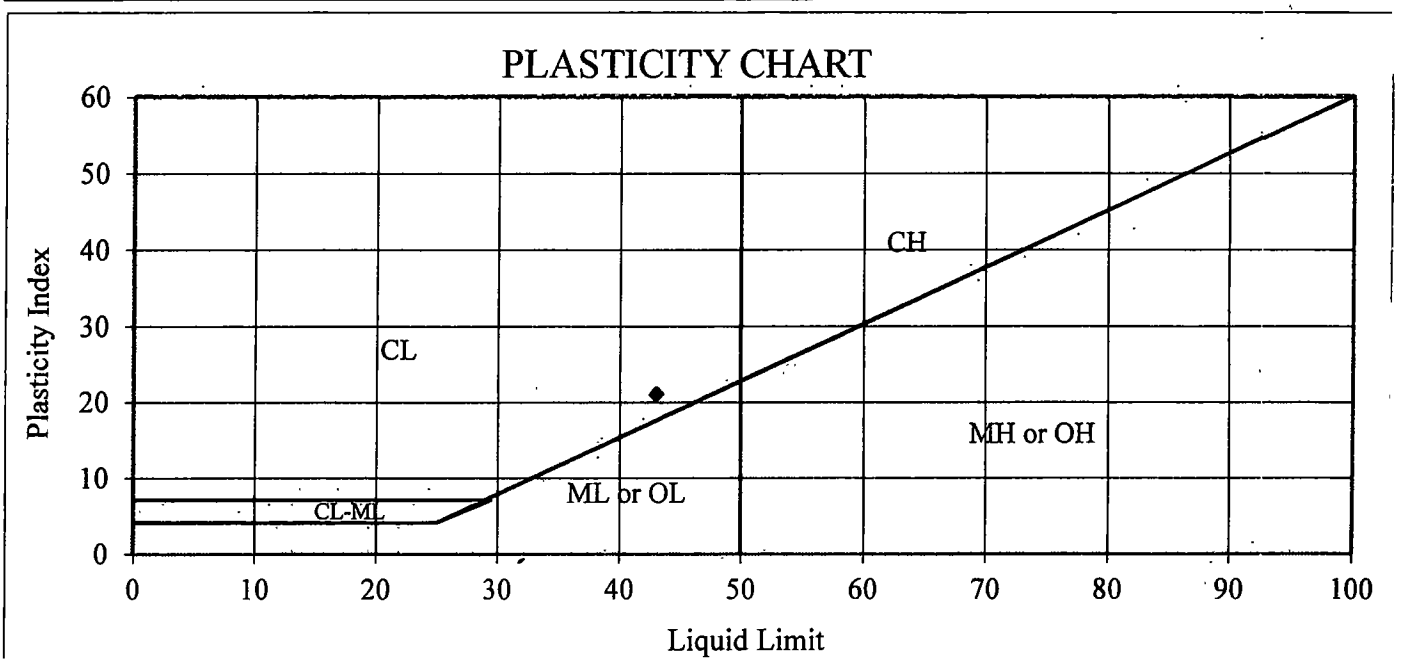
PLASTIC LIMIT

Can No.	A3
Can+wet s	16.52
Can+dry s	14.79
Can	6.91
Moisture (	21.95

Weight (g)



Moisture (%)	
LL	43
PL	22
PI	21
USCS	CL



ATTERBERG LIMITS TEST

GSH

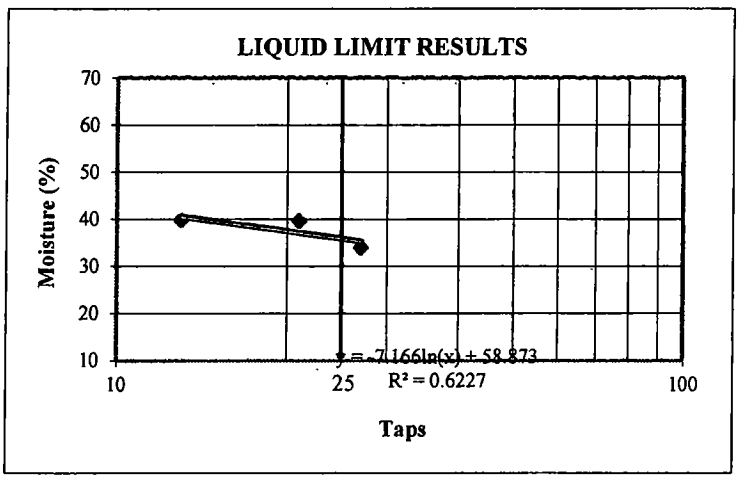
Project:	Deer Park Industrial					Job No.:	3388-007-21	Date:	9/14/21
Boring/TP:	B3A	Sample No.:	5	Depth:	20	Engineer:	ADS	Tester:	NLW
Soil Descr.:									

LIQUID LIMIT

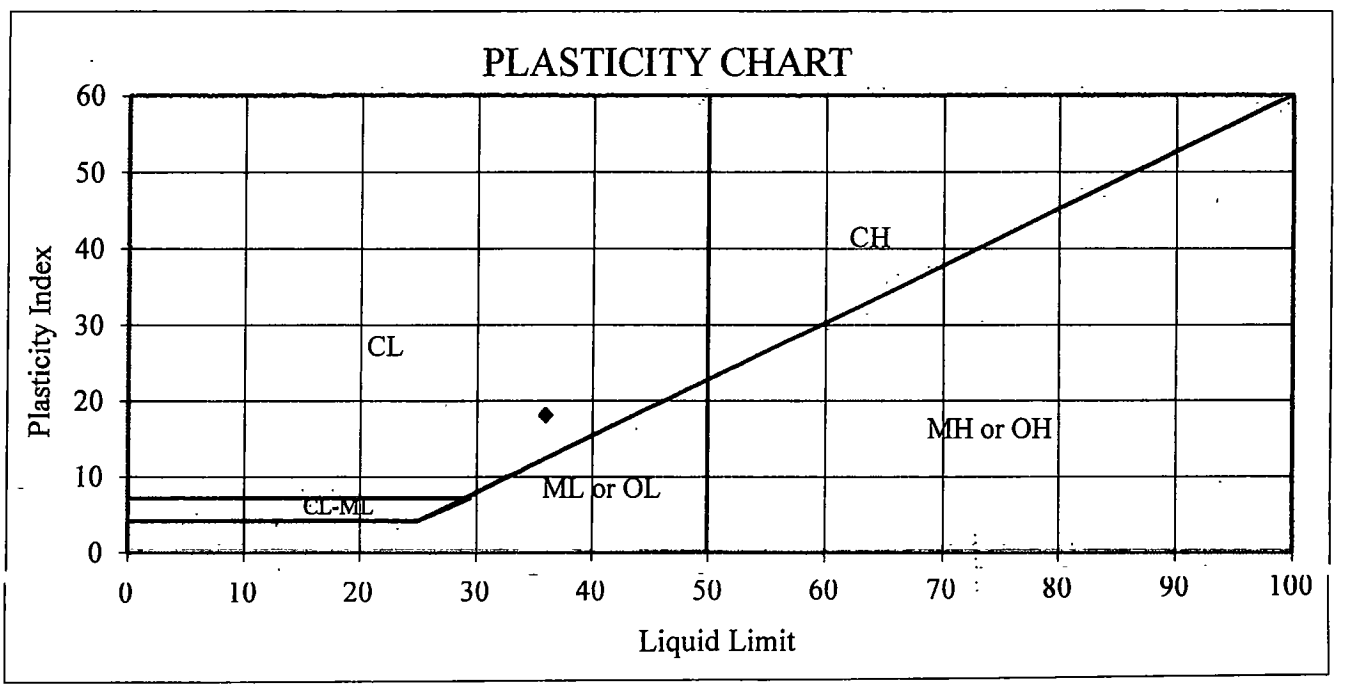
	Can No.	8	A4	Zoo
Weight (g)	Taps	27	21	13
	Can+wet soil	15.40	12.73	14.02
	Can+dry soil	13.31	11.13	12.02
	Can	7.11	7.07	6.98
	Moisture (%)	33.71	39.41	39.68

PLASTIC LIMIT

	Can No.	14
Weight (g)	Can+wet soil	14.00
	Can+dry soil	12.97
	Can	7.16
	Moisture (%)	17.73



	Moisture (%)
LL	36
PL	18
PI	18
USCS	CL



ATTERBERG LIMITS TEST

Project:	Deer Park Industrial					Job No.:	3388-007	Date:	9/14/21
Boring/TP	B3A	Sample N	7	Depth:	30	Engineer:	ADS	Tester:	NLW
Soil Desc									

LIQUID LIMIT

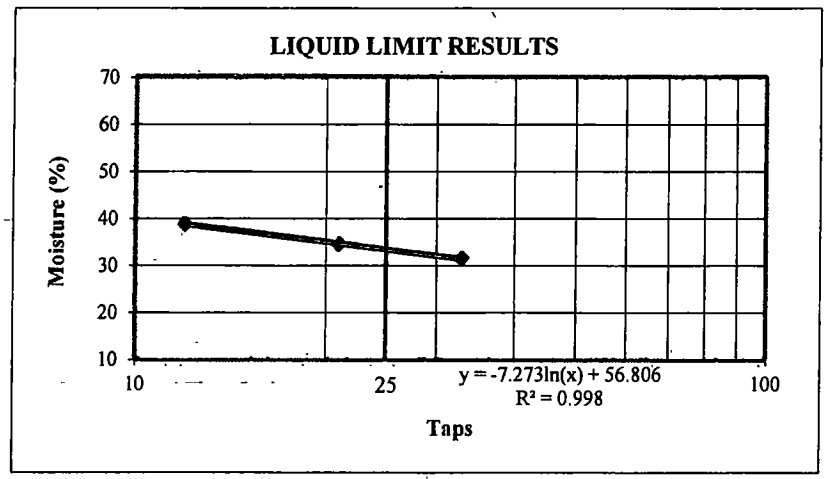
Can No.	W2	YLW	11
Taps	33	21	12
Can+wet s	13.23	12.90	13.44
Can+dry s	11.70	11.39	11.60
Can	6.84	7.01	6.86
Moisture (	31.48	34.47	38.82

Weight (g)

PLASTIC LIMIT

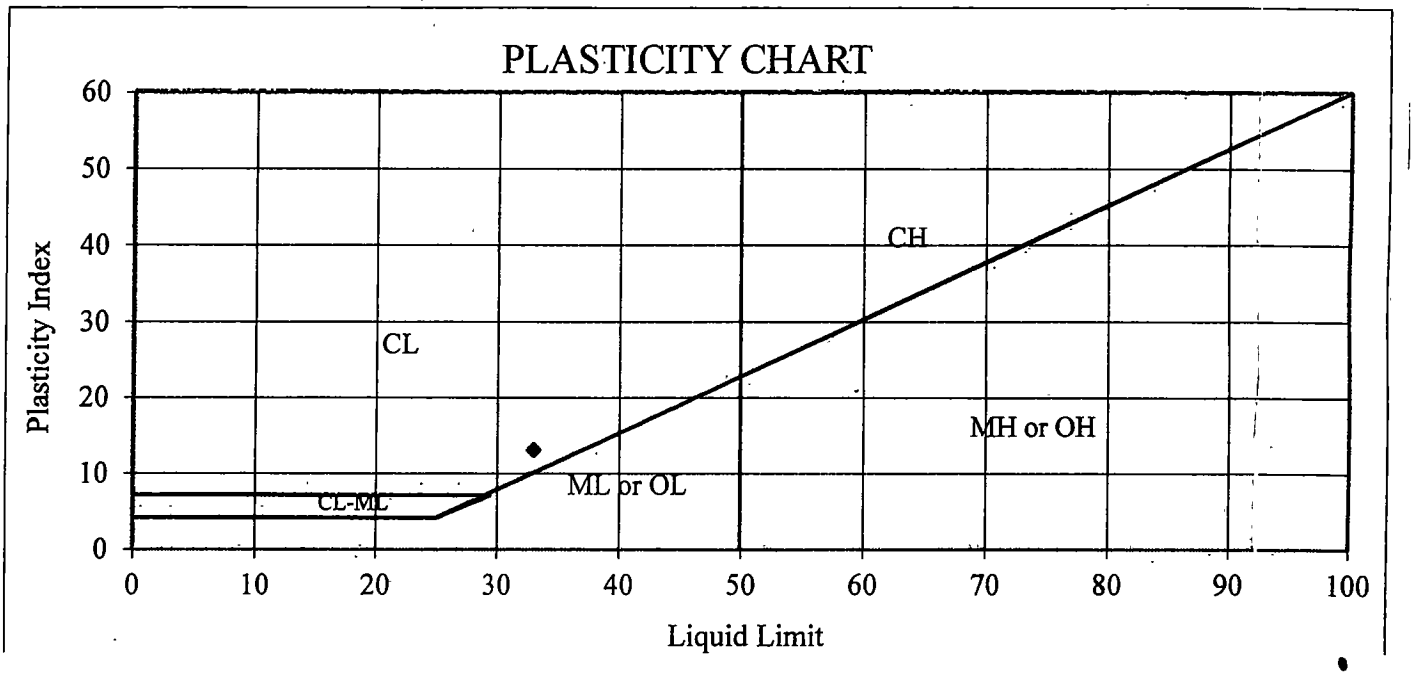
Can No.	BLK
Can+wet s	13.84
Can+dry s	12.68
Can	6.90
Moisture (	20.07

Weight (g)



Moisture (%)

LL	33
PL	20
PI	13
USCS	CL



LL	33.39601
L or H	L
PI (A-line)	9.779085
PI (rounded)	13.00000
Above?	C
	CL

Lines for Plasticity Chart

50	0
50	60
0	4
25	4
29.5	7
0	7
100	60
25	4

ATTERBERG LIMITS TEST

Project:	Deer Park Industrial					Job No.:	3388-007	Date:	9/14/21
Boring/TP	B3A	Sample N	9	Depth:	40	Engineer:	ADS	Tester:	NLW
Soil Desc									

LIQUID LIMIT

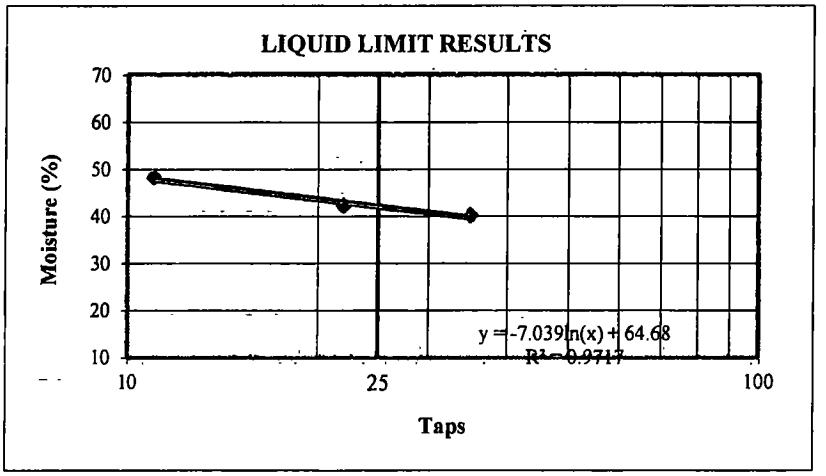
Can No.	QTP	CAT	A2
Taps	35	22	11
Can+wet s	13.30	13.31	13.26
Can+dry s	11.49	11.44	11.21
Can	6.98	7.00	6.95
Moisture (	40.13	42.12	48.12

Weight (g)

PLASTIC LIMIT

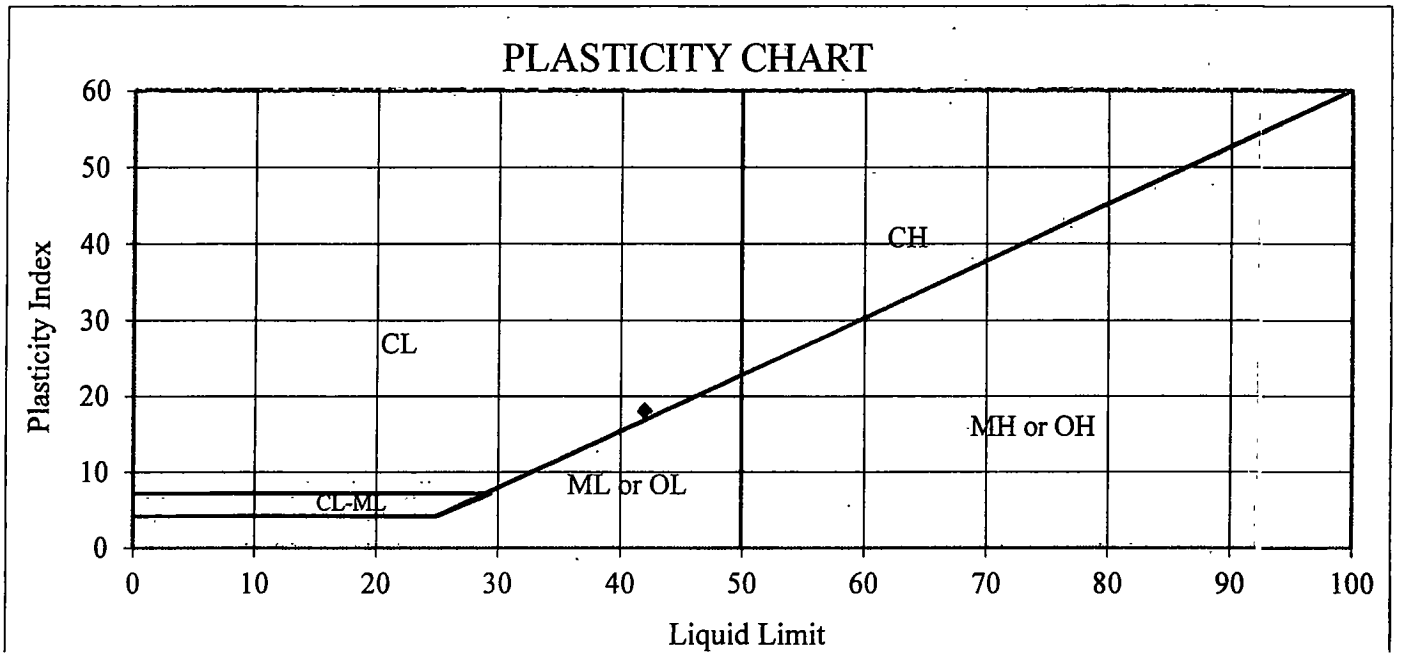
Can No.	B4
Can+wet s	12.95
Can+dry s	11.78
Can	6.94
Moisture (	24.17

Weight (g)



Moisture (%)

LL	42
PL	24
PI	18
USCS	CL



LL	42.02055
L or H	L
PI (A-line)	16.075
PI (rounded)	18.00000
Above?	C
	CL

Lines for Plasticity Chart

50	0
50	60
0	4
25	4
29.5	7
0	7
100	60
25	4

ATTERBERG LIMITS TEST

Project:	Deer Park Industrial					Job No.:	3388-007	Date:	9/14/21
Boring/TP	B3A	Sample N	11	Depth:	50	Engineer:	ADS	Tester:	NLW
Soil Desc									

LIQUID LIMIT

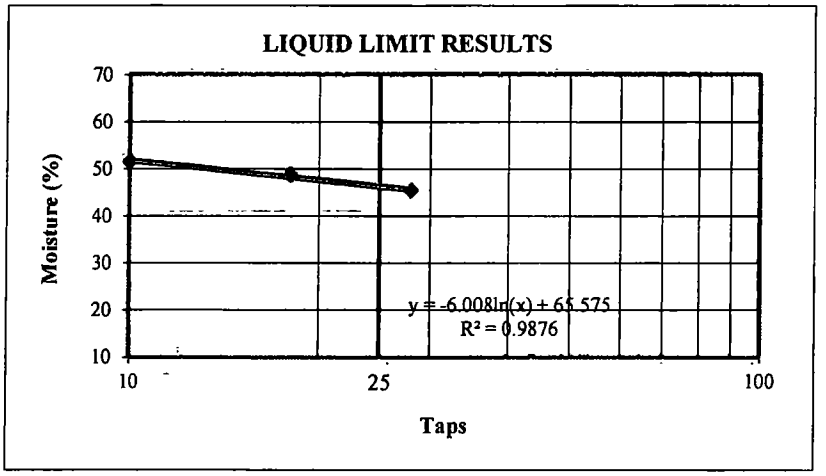
Can No.	116	Hey	SN
Taps	28	18	10
Can+wet s	13.29	13.43	13.65
Can+dry s	11.35	11.33	11.35
Can	7.07	7.01	6.89
Moisture (	45.33	48.61	51.57

Weight (g)

PLASTIC LIMIT

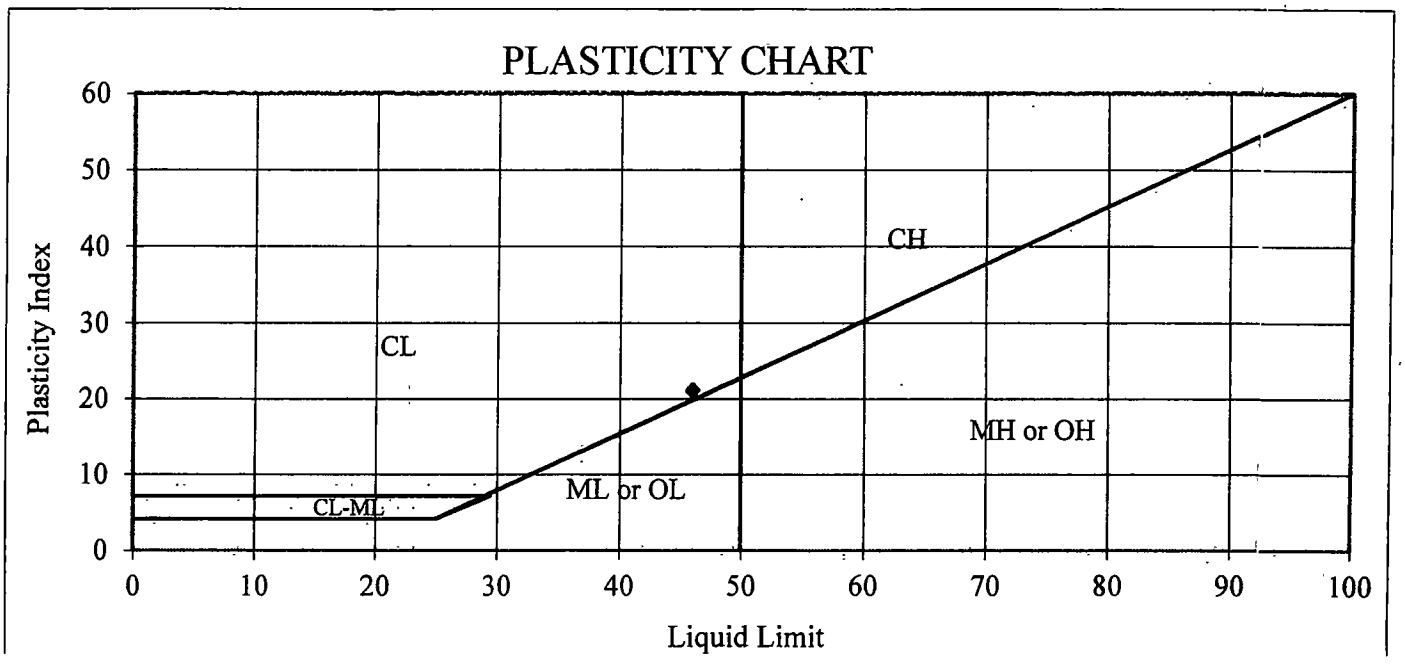
Can No.	16
Can+wet s	13.30
Can+dry s	12.03
Can	6.97
Moisture (	25.10

Weight (g)



Moisture (%)

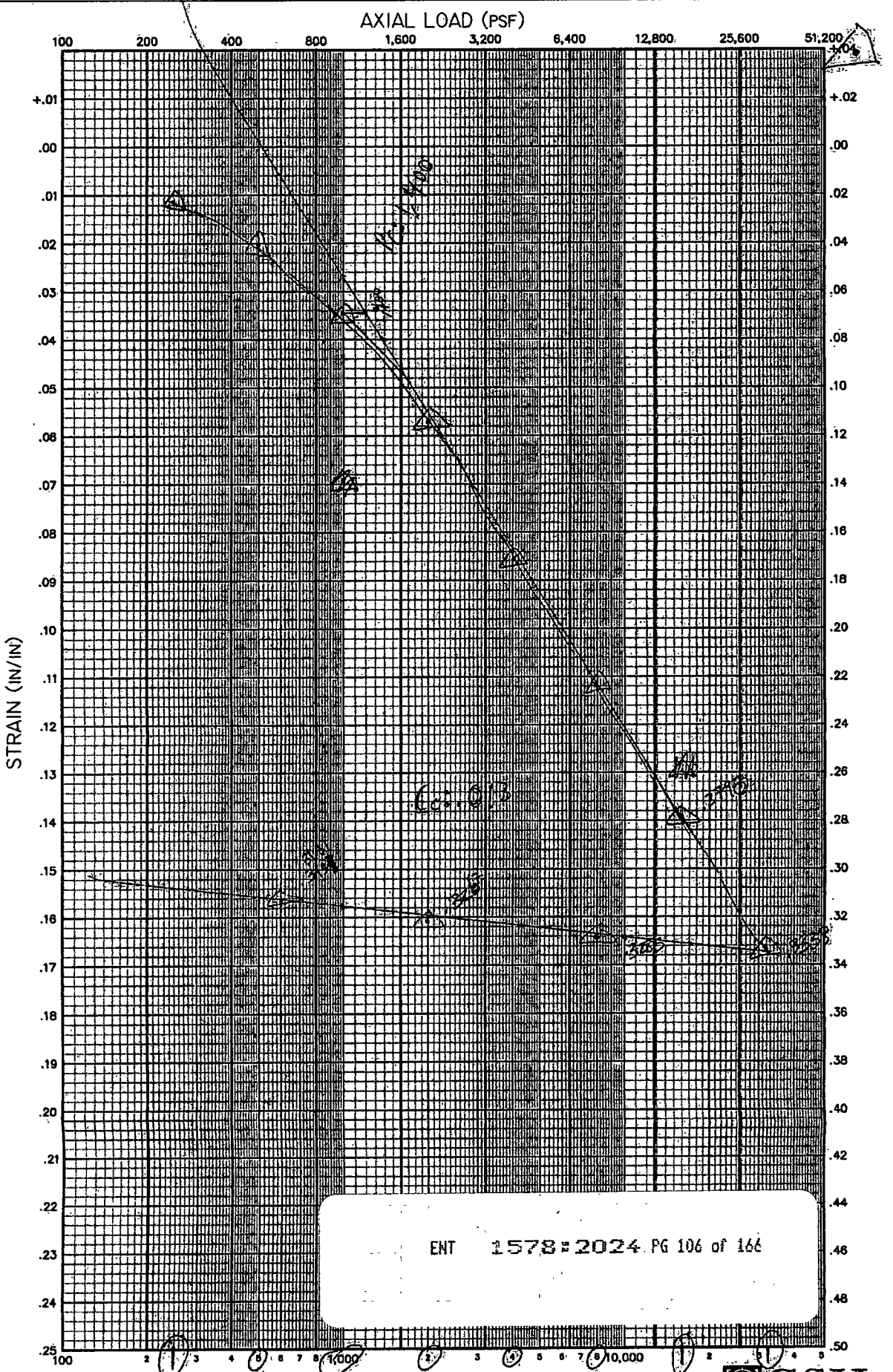
LL	46
PL	25
PI	21
USCS	CL



LL	46.23676
L or H	L
PI (A-line)	19.15283
PI (rounded)	21.00000
Above?	C
	CL

Lines for Plasticity Chart

50	0
50	60
0	4
25	4
29.5	7
0	7
100	60
25	4

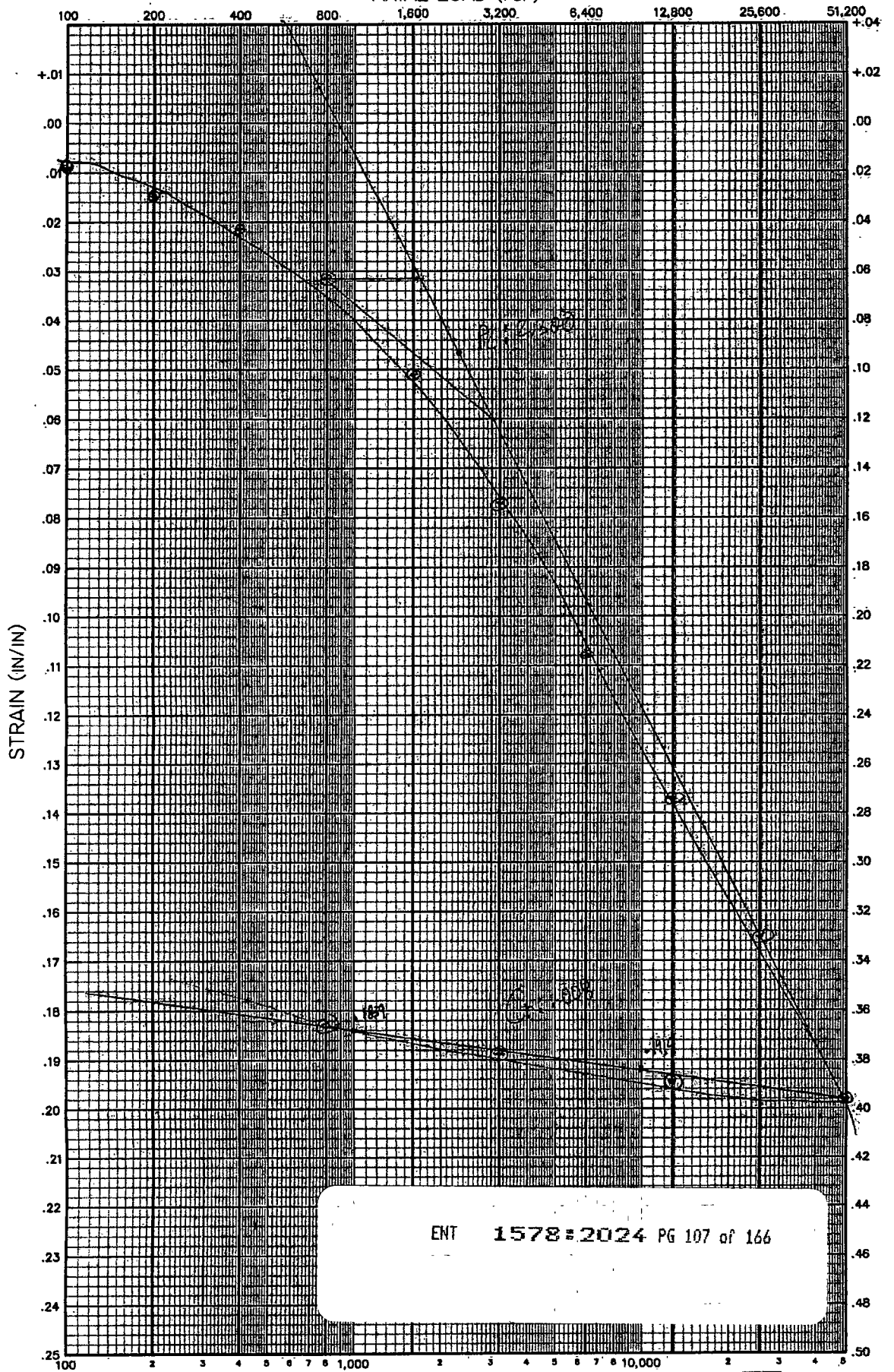


CONSOLIDATION TEST RESULTS

GSH

JOB NO. 2354-003-21 JOB NAME 6800 N. Industrial

BORING NO: B2 DEPTH 2.5 TESTED BY HB DATE 5/11/21

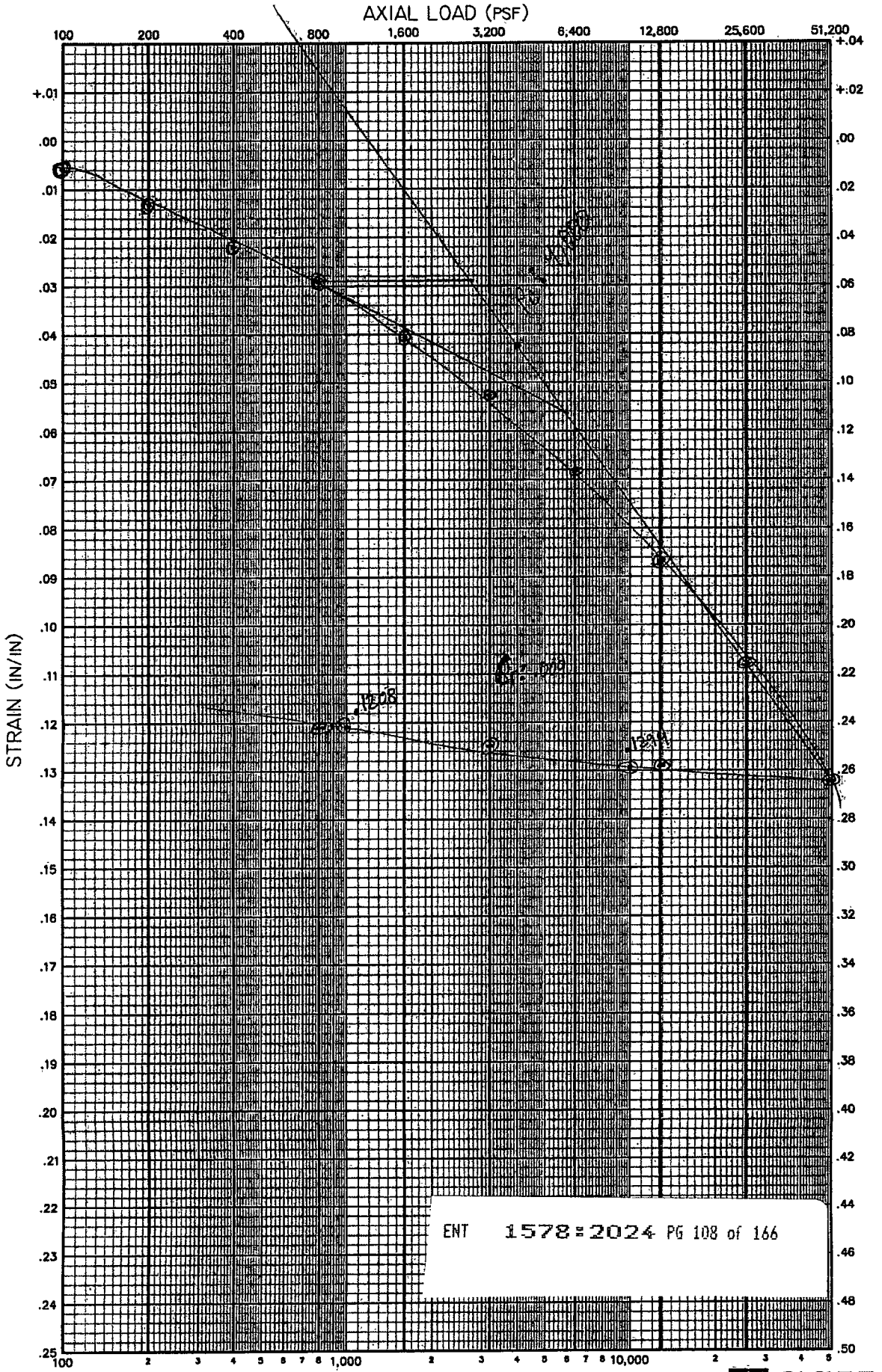


CONSOLIDATION TEST RESULTS

GSH

JOB NO. 2354-003-21 JOB NAME 6800 N Industrial

BORING NO. B2 DEPTH 5 TESTED BY HB DATE 5/11/21

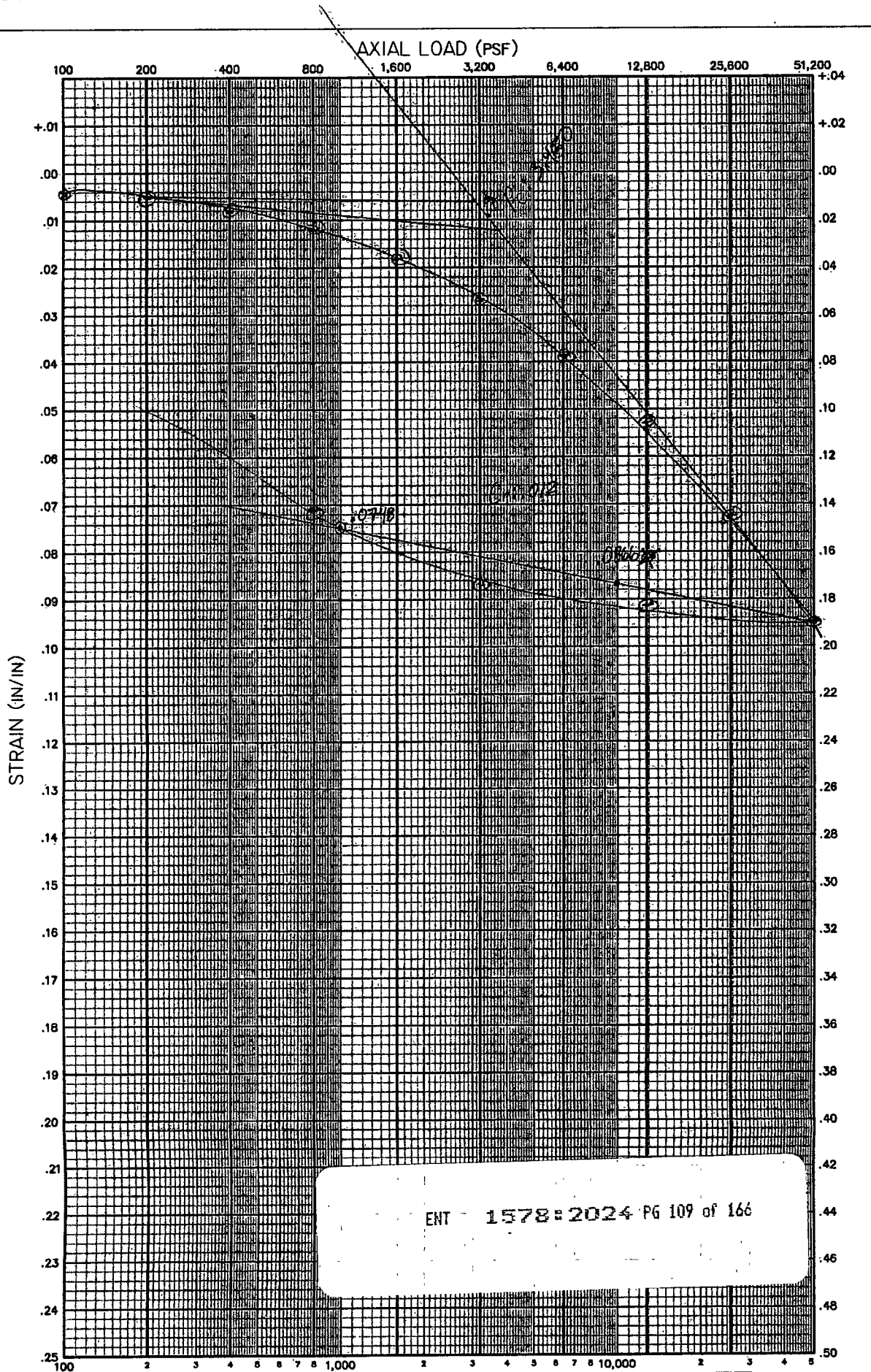


CONSOLIDATION TEST RESULTS

GSH

JOB NO. 2354-003-21 JOB NAME 6800 N. Industrial

BORING NO. B2 DEPTH 10 TESTED BY KB DATE 5/11/21

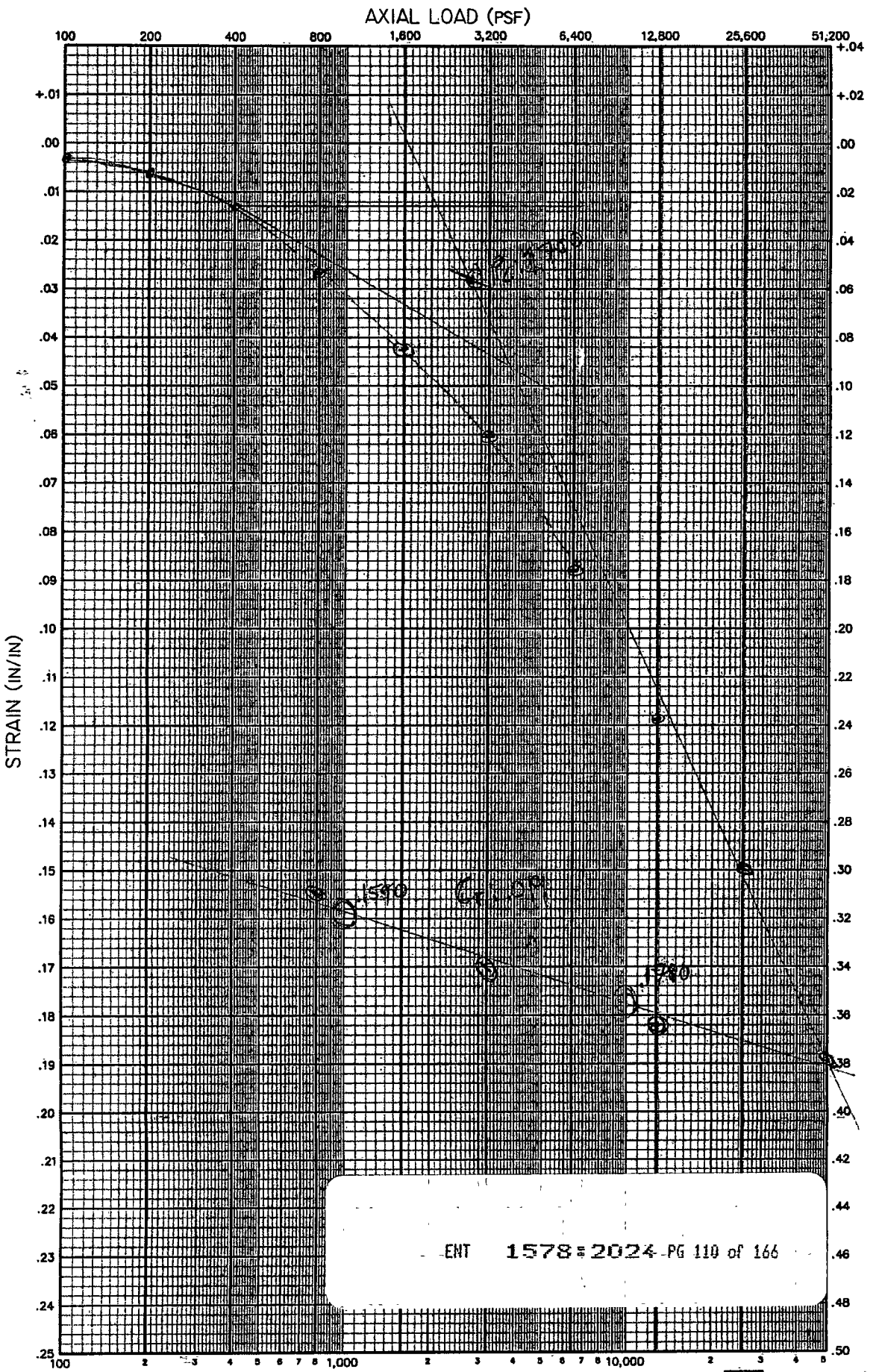


CONSOLIDATION TEST RESULTS

GSH

JOB NO. 2354-003-21 JOB NAME 6800 N. Industrial

BORING NO: B4 DEPTH 15' TESTED BY HB DATE 5/14/21

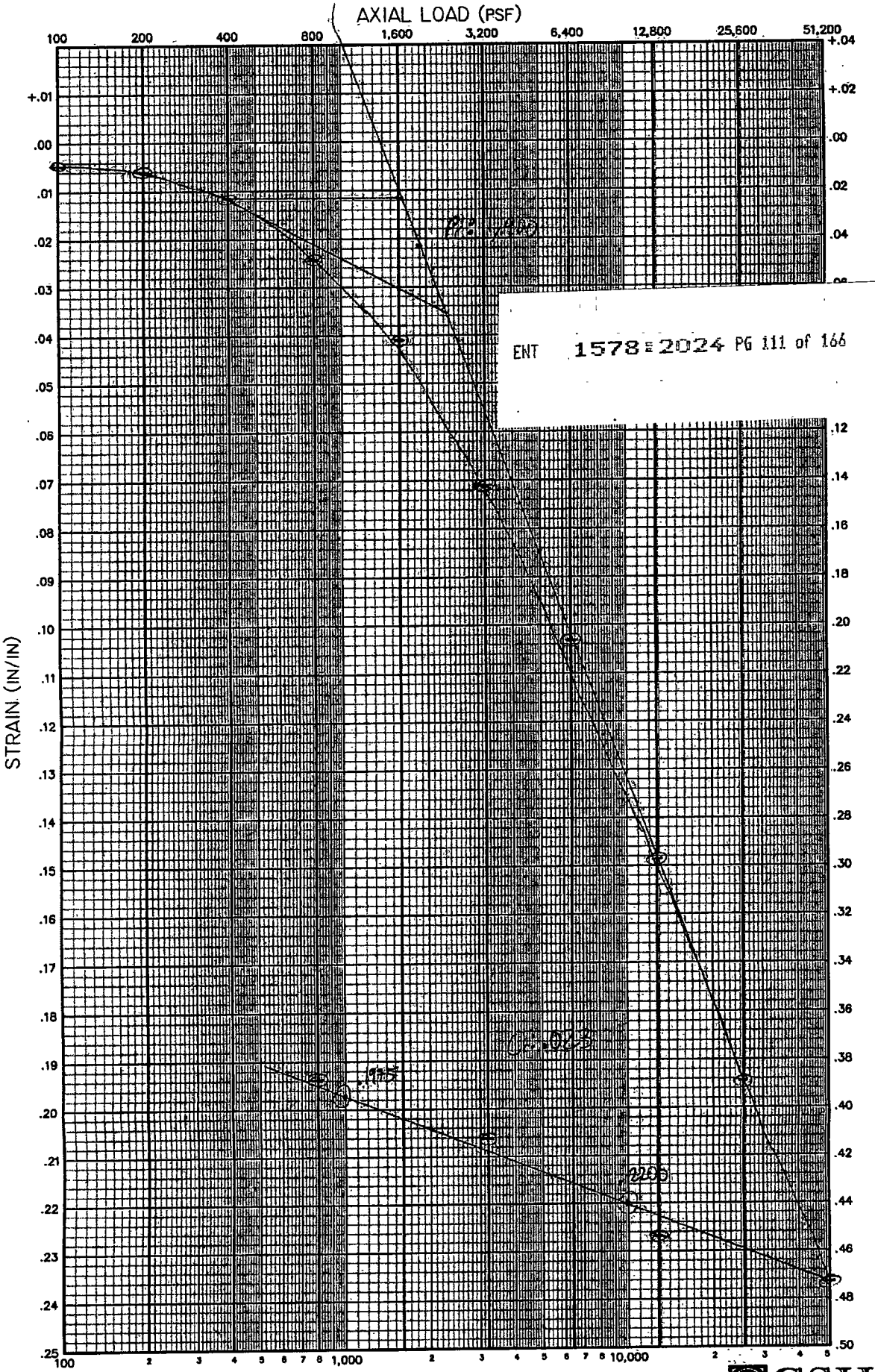


CONSOLIDATION TEST RESULTS

GSH

JOB NO. 3388-007-21 JOB NAME Deer Park Industrial

BORING NO. B4 DEPTH 18 TESTED BY RLW DATE 9/14



CONSOLIDATION TEST RESULTS

GSH

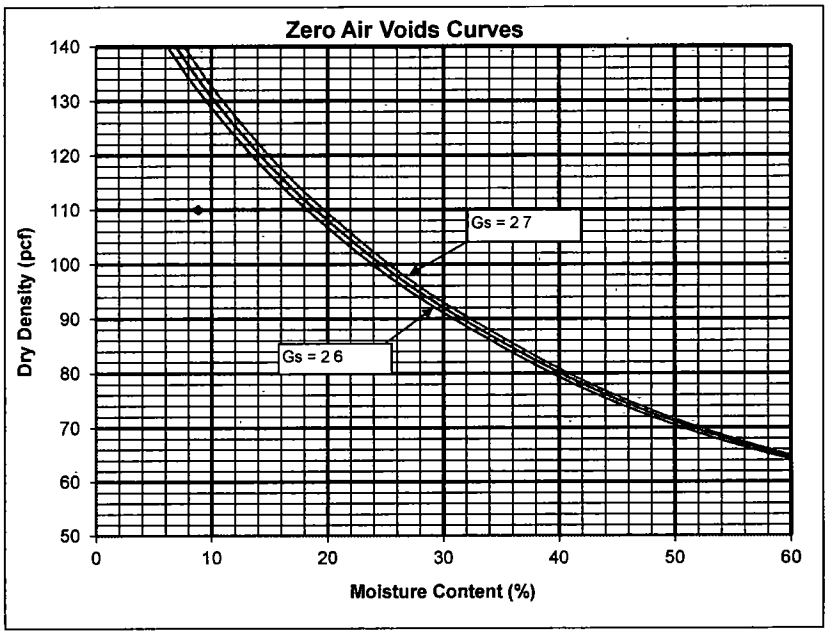
JOB NO. 3386-007-21 JOB NAME Deer park Industrial

BORING NO. B4 DEPTH 20' TESTED BY MW DATE 9/19

Moisture & Density Test Results

Date:	9/14/21		
Job #:	3388-001-21		
Project:	Deer Park Industrial		
Analyst:	NLW		
Project Engineer:	ADS	**Assumed Gs:**	2.7

Boring #:	B4A							
Sample #:	1							
Depth (ft):	2.5							
Pan Wt. (gr):	153.7							
Wet Soil + Rings + Pan Wt (gr):	532.9							
# of rings	2							
Dry Soil + Rings + Pan Wt. (gr):	509.4							
Sample type:	rings				rings	rings	rings	rings
Wet Soil Weight (gr):	289.2	0	0	0	0	0	0	0
Wet Density (pcf):	119.7	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Dry Density (pcf):	110.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Assumed Density (pcf):	136.0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Saturation (%):	44.9	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Dry Wt. (gr):	265.7	0	0	0	0	0	0	0
Wt. Of Water (gr):	23.5	0	0	0	0	0	0	0
Moisture (%):	8.8	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Soil Classification:								
Soil Description & Comments:								
Wet Density (pcf):	**119.7**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Dry Density (pcf):	**110.0**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Moisture (%):	**8.8**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**



Moisture & Density Test Re

Date:	
Job #:	
Project:	
Analyst:	
Project Engineer:	

Boring #:								
Sample #:								
Depth (ft):								
Pan Wt. (gr):								
Wet Soil + Rings + Pan Wt (gr):								
# of rings								
Dry Soil + Rings + Pan Wt. (gr):								
Sample type:	rings	rings	rings	rings	rings	rings	rings	rings
Wet Soil Weight (gr):	0	0	0	0	0	0	0	0
Wet Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Dry Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Assumed Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Saturation (%):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Dry Wt. (gr):	0	0	0	0	0	0	0	0
Wt. Of Water (gr):	0	0	0	0	0	0	0	0
Moisture (%):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Soil Classification:								
Soil Description & Comments:								
Wet Density (pcf):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Dry Density (pcf):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Moisture (%):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**

Moisture & Density Test Re

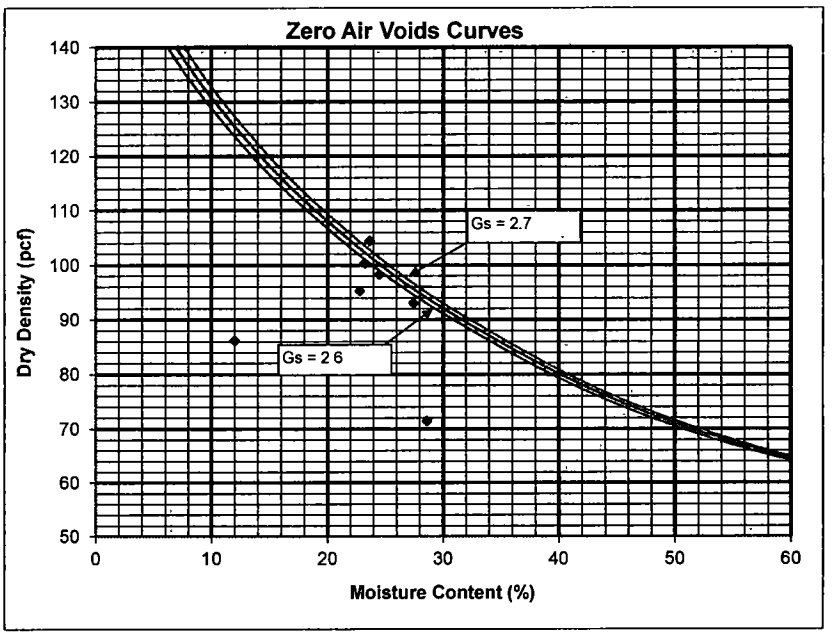
Date:	
Job #:	
Project:	
Analyst:	
Project Engineer:	

Boring #:								
Sample #:								
Depth (ft):								
Pan Wt. (gr):								
Wet Soil + Rings + Pan Wt (gr):								
# of rings								
Dry Soil + Rings + Pan Wt. (gr):								
Sample type:								
Wet Soil Weight (gr):	0	0	0	0	0	0	0	0
Wet Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Dry Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Assumed Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Saturation (%):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Dry Wt. (gr):	0	0	0	0	0	0	0	0
Wt. Of Water (gr):	0	0	0	0	0	0	0	0
Moisture (%):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Soil Classification:								
Soil Description & Comments:								
Wet Density (pcf):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Dry Density (pcf):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Moisture (%):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**

Moisture & Density Test Results

Date:	5/11/21		
Job #:	2354-003-21		
Project:	6800 N Industrial		
Analyst:	HB		
Project Engineer:	ADS	**Assumed Gs:**	2.7

Boring #:	B6	B2	B4	B8	B9	B10	B12	
Sample #:	3	1	1	3	2	3	1	
Depth (ft):	10	2.5	2.5	7.5	5	10	2.5	
Pan Wt. (gr):	129.2	136.1	130.9	126.4	127.8	129.1	137.1	
Wet Soil + Rings + Pan Wt (gr):	531.2	508.7	442.9	515.1	513.5	505.5	460.3	
# of rings	2	2	2	2	2	2	2	
Dry Soil + Rings + Pan Wt. (gr):	471.5	456.2	393.5	458.8	455.3	443.8	435.3	
Sample type:	rings	rings	rings	rings	rings	rings	rings	rings
Wet Soil Weight (gr):	312	282.6	222	298.7	295.7	286.4	233.2	0
Wet Density (pcf):	129.2	117.0	91.9	123.7	122.4	118.6	96.6	#DIV/0!
Dry Density (pcf):	104.5	95.3	71.5	100.4	98.3	93.0	86.2	#DIV/0!
Assumed Density (pcf):	102.8	104.3	95.0	103.5	101.4	96.8	127.2	#DIV/0!
Saturation (%):	104.2	80.2	56.9	92.4	92.7	91.4	34.0	#DIV/0!
Dry Wt. (gr):	252.3	230.1	172.6	242.4	237.5	224.7	208.2	0
Wt. Of Water (gr):	59.7	52.5	49.4	56.3	58.2	61.7	25	0
Moisture (%):	23.7	22.8	28.6	23.2	24.5	27.5	12.0	#DIV/0!
Soil Classification:								
Soil Description & Comments:								
Wet Density (pcf):	**129.2**	**117.0**	**91.9**	**123.7**	**122.4**	**118.6**	**96.6**	**#DIV/0!**
Dry Density (pcf):	**104.5**	**95.3**	**71.5**	**100.4**	**98.3**	**93.0**	**86.2**	**#DIV/0!**
Moisture (%):	**23.7**	**22.8**	**28.6**	**23.2**	**24.5**	**27.5**	**12.0**	**#DIV/0!**



Moisture & Density Test Re

Date:	
Job #:	
Project:	
Analyst:	
Project Engineer:	

Boring #:								
Sample #:								
Depth (ft):								
Pan Wt. (gr):								
Wet Soil + Rings + Pan Wt (gr):								
# of rings								
Dry Soil + Rings + Pan Wt. (gr):								
Sample type:	rings	rings	rings	rings	rings	rings	rings	rings
Wet Soil Weight (gr):	0	0	0	0	0	0	0	0
Wet Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Dry Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Assumed Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Saturation (%):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Dry Wt. (gr):	0	0	0	0	0	0	0	0
Wt. Of Water (gr):	0	0	0	0	0	0	0	0
Moisture (%):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Soil Classification:								
Soil Description & Comments:								
Wet Density (pcf):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Dry Density (pcf):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Moisture (%):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**

Moisture & Density Test Re

Date:	
Job #:	
Project:	
Analyst:	
Project Engineer:	

Boring #:								
Sample #:								
Depth (ft):								
Pan Wt. (gr):								
Wet Soil + Rings + Pan Wt (gr):								
# of rings								
Dry Soil + Rings + Pan Wt. (gr):								
Sample type:								
Wet Soil Weight (gr):	0	0	0	0	0	0	0	0
Wet Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Dry Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Assumed Density (pcf):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Saturation (%):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Dry Wt. (gr):	0	0	0	0	0	0	0	0
Wt. Of Water (gr):	0	0	0	0	0	0	0	0
Moisture (%):	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Soil Classification:								
Soil Description & Comments:								
Wet Density (pcf):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Dry Density (pcf):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Moisture (%):	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**

ATTACHMENT 2

Site-Specific Seismic Study

REPORT
SITE-SPECIFIC SEISMIC STUDY
PROPOSED 6800 NORTH INDUSTRIAL
5900 WEST 6800 NORTH
AMERICAN FORK, UTAH

Submitted To:

Red Pine Construction
520 South 850 East, Suite A4
Lehi, Utah 84043

Submitted By:

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123

July 28, 2021

Job No. 2354-004-21

GSH

July 28, 2021
Job No. 2354-004-21

Mr. Mike Horan
Red Pine Construction
520 South 850 East, Suite A4
Lehi, Utah 84043

Mr. Horan:

Re: Summary Report
Site-Specific Seismic Study
Proposed 6800 North Industrial
5900 West 6800 North
American Fork, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our site-specific seismic study performed at the site of the proposed 6800 North Industrial to be located near 5900 West 6800 North in American Fork, Utah. GSH Geotechnical, Inc (GSH) completed a geotechnical study[1] for the site. Data from the geotechnical study along with a geophysical survey was used for this site-specific seismic study.

The shear-wave velocity profile for the upper 350 feet at the site (including $\overline{v}_{s30}$ for the upper 100 feet) was determined utilizing boring data from our geotechnical study and a geophysical survey consisting of Refraction Microtremor (ReMi) testing.

The ground motion hazard and design ground motion response spectra at the site were developed utilizing a site-specific site response analysis (SRA). The analysis was completed in accordance with the procedures presented in ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16) and Supplement 1 to ASCE 7-16.

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1 "Report, Geotechnical Study, Proposed 6800 North Industrial, 5900 West 6800 North, American Fork, Utah." GSH Job No. 2093-004-19. Dated May 14, 2021.

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1.2 OBJECTIVES AND SCOPE

The objectives and scope of the study were planned in discussions between Mr. Mike Horan of Red Pine Construction and Mr. Alan Spilker, PE of GSH.

In general, the objectives of this study were to:

1. Further define the subsurface conditions at the site, including a shear-wave profile to a depth of 350 feet.

2. Develop site-specific and design ground motion response spectra for the site.

In accomplishing these objectives, our scope has included the following:

1. A review of available subsurface information from the geotechnical study completed for the site.

2. A field program consisting of the completion of a Refraction Microtremor (ReMi) geophysical exploration to a depth of 350 feet including the development of $\overline{v}_{s30}$ for the upper 100 feet.

3. Performance of a site-specific site response analysis (SRA) in accordance with the ASCE 7-16 Section 21.1, Site Response Analysis.

4. Development of site-specific and design ground motion response spectra for the site in accordance with the ASCE 7-16 Section 21.3, Design Response Spectrum.

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of the Professional Services Agreement No. 21-0434 dated April 12, 2021.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the geophysical testing, exploration borings, and projected groundwater conditions. If subsurface conditions other than those described in this report are encountered, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The site is proposed to be developed with 3 warehouse structures and associated pavements. The structures are anticipated to be one extended level, constructed slab-on-grade, have footprints of 47,040 square feet to 115,808 square feet, and be supported upon conventional spread and continuous wall footings. Paved parking areas and drive lanes are planned around the structure.

Based on information provided by the structural engineer the structure's fundamental period will be approximately 0.4 seconds.

3. SITE CONDITIONS

3.1 SURFACE

The site is located at approximately 5900 West 6800 North in American Fork, Utah. The topography of the site is relatively flat, grading down to the south with a total relief of approximately 6 to 9 feet. Site vegetation consists of agricultural grass fields with undeveloped/vacant grass land in the western portion of the site.

The site is bounded to the north by 6800 North Street followed by agricultural fields; to the east by single-family residential structures along with agricultural fields; to the south by agricultural fields and vacant/undeveloped brush/grass land; and to the west by vacant/undeveloped brush/grass land followed by 100 West Street and a single-family residential structure adjacent to the northwest corner of the site.

3.2 SUBSURFACE SOIL AND GROUNDWATER

The following paragraphs provide generalized descriptions of the subsurface profiles and soil conditions encountered within the borings conducted during the geotechnical study. As previously noted, soil conditions may vary in unexplored locations.

The borings were completed to depths ranging from 5.0 to 51.5 feet. The soil conditions encountered in each of the borings, to the depths completed, were generally similar across the boring locations.

- Natural soils were encountered below the non-engineered fill or the ground surface in each boring. The natural soils consisted primarily of clay with varying silt, sand, and gravel content and sand with varying clay, silt, and gravel content.

The natural clay soils were very soft to stiff, dry to saturated, brown, dark brown, gray, and tan in color. The natural sand soils were very loose to medium dense, dry to saturated, and gray and brown in color.

Groundwater was measured as shallow as 2.8 feet below the existing ground surface during the geotechnical study for the site.

For a more descriptive interpretation of subsurface conditions, please refer our geotechnical report completed for the site (GSH Job No. 2354-003-21).

3.3 SHEAR WAVE VELOCITY PROFILE

The site shear-wave velocity profile was completed utilizing geophysical exploration. The testing consisted of Refraction Microtremor (ReMi) testing. Testing is performed at the surface using a series of geophone sensors and a seismic source. A wavefield transformation is performed on the recorded geophone movements. The transformation is then utilized to create a shear-wave dispersion curve to model the subsurface shear-wave velocity profile.

The location of the ReMi line on the site is presented on Figure 1, Site Plan. The borings completed in conjunction with the geotechnical study are also shown on Figure 1.

The site classification for ASCE 7-16 was Site Class F in the geotechnical report due to potentially liquefiable soils at the site. As a follow up to the geotechnical report the ReMi testing results were analyzed to a depth of 350 feet with a resulting $\overline{v}_{s30}$ value of 653 ft/s. This characterizes the site as a Site Class D, Stiff Soil Profile as defined in Chapter 20 of ASCE 7-16.

The shear-wave velocity results are provided on attached Figure 2, Shear-Wave Velocity Profile.

3.4 GEOLOGIC SETTING

The site is located in the Utah Valley, which is in the Basin and Range Physiographic Province. The Utah Valley is near (west of) the transition between the Basin and Range Physiographic Province to the west and the Middle Rocky Mountain Physiographic Province to the east. The Basin and Range Province is characterized by generally north-trending valleys and mountain ranges that have formed by displacement along normal faults. The Wasatch Fault forms the boundary between the 2 provinces and has been active for approximately 10 million years. The Middle Rocky Mountains were formed during a period of regional compression that occurred in Cretaceous time, about 75 to 70 million years ago (Hunt, 1967). The surficial geology of the area is characterized by materials deposited within the past 30,000 years by late Pleistocene Lake Bonneville (Currey and Oviatt, 1985), and young lacustrine and deltaic deposits (Holocene to upper Pleistocene) deposited on delta margins as the lake receded to its present Great Salt Lake levels (Hylland et al., 2014). As the ancient lake(s) receded, streams began to regrade through shoreline deltas formed at the mouths of major Wasatch Range canyons and the eroded material was deposited in the basin as a series of recessional deltas, alluvial fans, and shoreline sequences. Toward the east-central portion of the valley where the site is located, shallow-water sediments of clay, silt, and sand predominate.

The primary surficial geology of most of the site as interpreted by Solomon and others (2009) primarily consists of "Lacustrine silt and clay" (**Qlmp**). Most of the west and some of the east perimeter of the site consists of "Younger alluvial-fan deposits, undivided" (**Qafy**).

3.5 FAULTING

There are a number of mapped faults near the site. The faults are primarily normal mechanism. Some of the faults included are the Utah Lake Faults (mapped 1.22 miles south of the site), the Provo section of the Wasatch fault zone (mapped 4.13 miles northeast of the site), the Salt Lake City section of the Wasatch fault zone (mapped 9.79 miles north of the site), and the Nephi section of the Wasatch fault zone (mapped 18.91 miles south-southeast of the site).

4. SITE RESPONSE ANALYIS

A soil model was developed from the boring, laboratory, and ReMi data from this study and the geotechnical study for the site.

A series of earthquake time histories were selected and scaled to match the MCE_R response spectrum at the base of the soil column. Histories were selected from events with similar magnitudes, distances and spectral shape in the period ranges of significance for the proposed structure (approximately 0.4 seconds). These ground motion time histories were input at the base of the soil column model as outcrop motions, propagated through the soil column model, and calculated as surface ground motions. The results of the SRA analysis are presented in the table in the following section.

5. DESIGN RESPONSE SPECTRUM

The response spectrum produced from the site-specific seismic analysis was compared with the minimum code spectrum values per ASCE 7-16 Section 21.3, including updates presented in Supplement 1 to ASCE 7-16. This process includes taking the 2014 mapped values from the USGS and utilizing F_a from Table 11.4-1 and 2.5 as F_v to obtain the modified accelerations, then reducing them by 20 percent to obtain the code minimum spectral accelerations.

The site-specific response spectrum is lower than the minimum code spectrum at select periods; therefore, the minimum code spectrum governs the design spectrum for the site at these periods. These values are presented in the table on the following page:

Period (sec)	Code 80% Minimum Spectral Acceleration (g)	Site-Specific Spectral Acceleration (g)	Code Modified* Site-Specific Spectral Acceleration (g)	Design Spectral Acceleration (2/3 of Code Modified Site-Specific Acceleration) (g)
0.05	0.572	0.445	0.572	0.381
0.1	0.739	0.476	0.739	0.493
0.2	1.010	0.694	1.010	0.673
0.3	1.010	1.027	1.027	0.685
0.4	1.010	0.937	1.010	0.673
0.5	1.010	1.027	1.027	0.685
0.6	1.010	1.148	1.148	0.766
0.8	1.010	1.046	1.046	0.698
1.0	0.914	0.992	0.992	0.662
1.2	0.762	0.967	0.967	0.645
1.4	0.653	0.755	0.755	0.503
1.6	0.572	0.606	0.606	0.404
1.8	0.508	0.480	0.508	0.339
2.0	0.457	0.390	0.457	0.305
3.0	0.305	0.214	0.305	0.203
4.0	0.229	0.125	0.229	0.153
5.0	0.183	0.080	0.183	0.122

*The greater of the site-specific and the code minimum spectral acceleration.

6. DESIGN ACCERATION PARAMETERS

The site-specific response spectrum was analyzed in accordance with the procedure outlined in ASCE 7-16 Section 21.4 to produce the design acceleration parameters presented in the table below:

Site-Specific Parameter	Spectral Acceleration Value (g)
S_{DS}	0.689
S_{D1}	0.774

7. CLOSURE

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, In

LICENSED PROFESSIONAL ENGINEER
No. 343650
MICHAEL S. HUBER
STATE OF UTAH

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Vice President/Senior Geotechnical Engineer

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

MSH/ADS ea

Encl.

Figure 1, Site Plan
Figure 2, Shear-Wave Velocity Profile

Addressee (email)

Geologic References

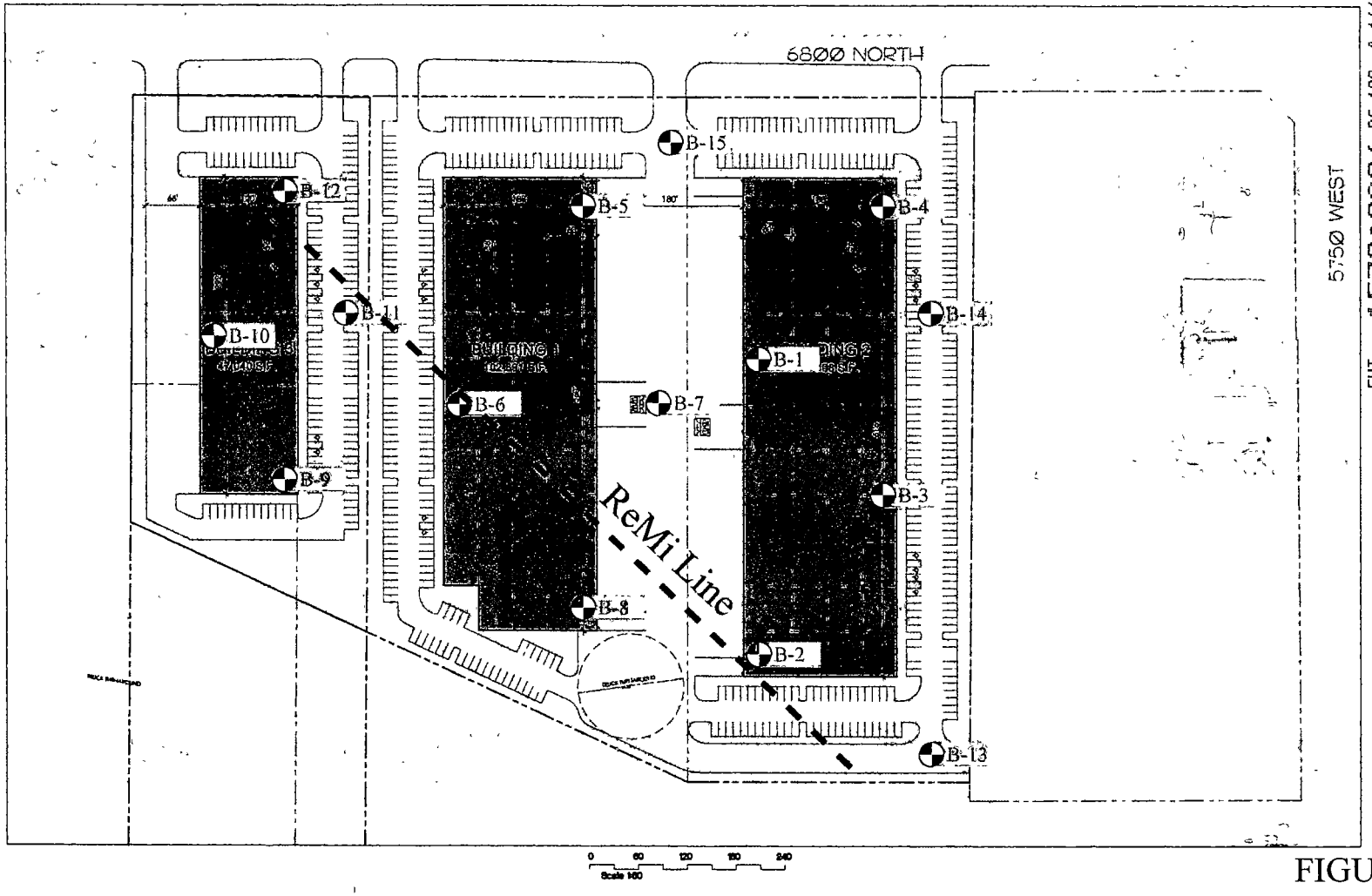
Currey, D.R., and Oviatt, C.G., 1985, Durations, average rates, and probable causes of Lake Bonneville expansion, still-stands, and contractions during the last deep-lake cycle, 32,000 to 10,000 years ago, in Kay, P.A., and Diaz, H.F., (eds.), Problems of and prospects for predicting Great Salt Lake levels - Processing of a NOAA Conference, March 26-28, 1985: Salt Lake City, Utah.

Hunt, C.B., 1967, Physiography of the United States: San Francisco, W.H. Freeman, 480 p.

Hylland, M. D., DuRoss, C.B., McDonald, G.N., Olig, S.S., Oviatt, C.G., Mahan, S.A., Crone, A.J., and Personius, S.F., 2014, Late Quaternary paleoseismology of the West Valley fault zone, Utah: Insights from the Baileys Lake trench site, *in* DuRoss, C.B. and Hylland, M.D., Evaluating surface faulting chronologies of graben-bounding faults in Salt Lake Valley, Utah—new paleoseismic data from the Salt Lake City segment of the Wasatch fault zone and the West Valley fault zone—Paleoseismology of Utah, Volume 24: Utah Geological Survey Special Study 149, p. 41–76, 8 appendices, 1 plate.

Solomon, Barry J., Biek, Robert F., and Ritter, Scott M., 2009, Geologic Map of the Pelican Point Quadrangle, Utah County, Utah. Utah Geologic Survey, Plate 1.

RED PINE CONSTRUCITON
JOB NO 2354-004-21



ENT 1578:2024 PG 128 of 166

FIGURE 1
SITE PLAN

REFERENCE
ADAPTED FROM DRAWING ENTITLED
"MIKE HORAN - 6800 NORTH INDUSTRIAL AF"
BY AEURBIA, DATED 8 APR 2021

GSH

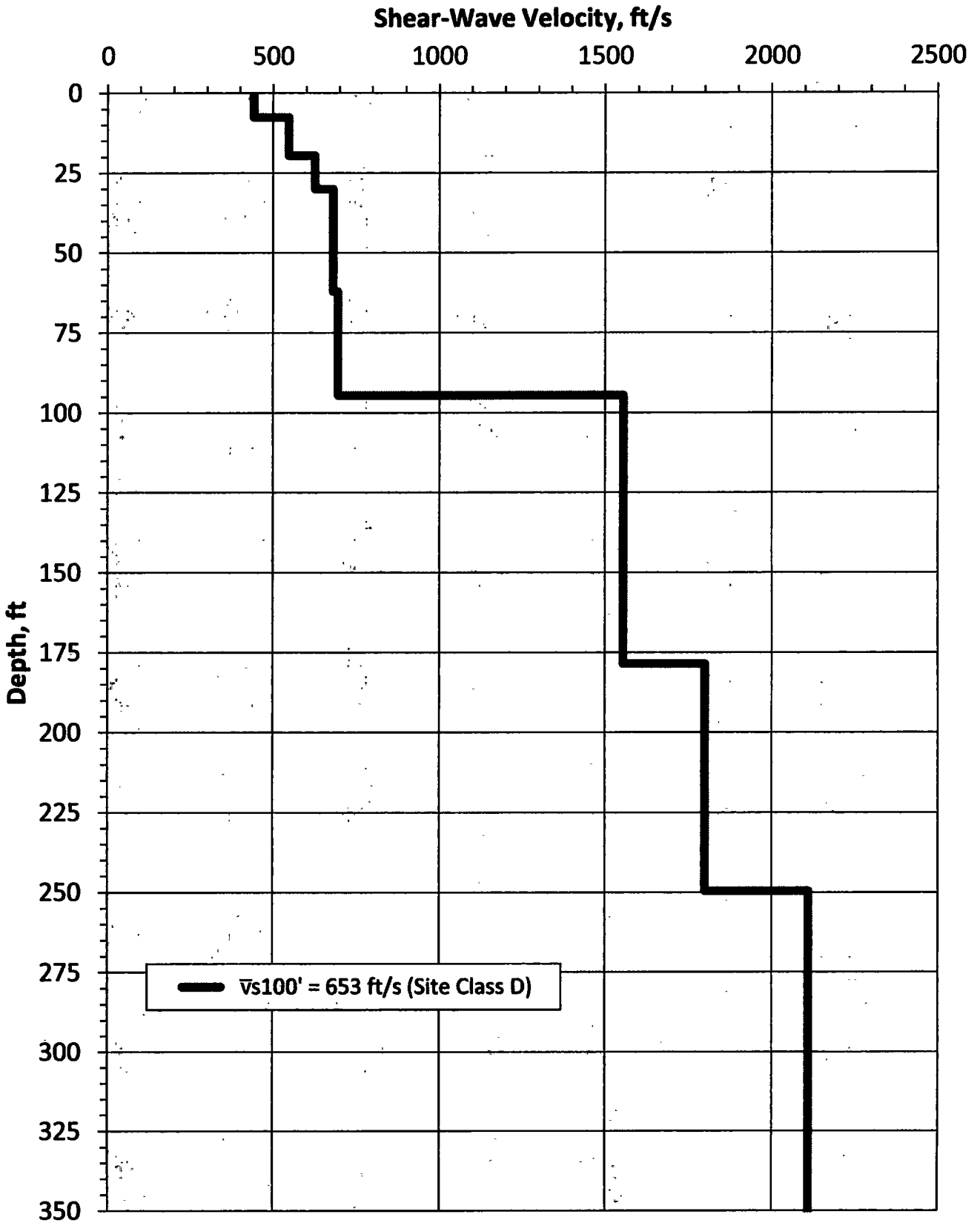


FIGURE 2 6800 North Industrial 2354-004-21

ATTACHMENT 3

Liquefaction Analysis

Project: [redacted] Date [redacted]
Job No [redacted] Engineer [redacted]

Input Parameters
Peak ground accel (g) = [redacted] MCEG per ASCE 7-10 11.8.3-2
Earthquake magnitude, M = [redacted] from USGS Deaggregation of Seismic Hazard for PGA
Water table depth (m) = 0.65344 2.93 ft
Average γ above water table (kN/m³) = 17.3 110 pcf
Average γ below water table (kN/m³) = 18.7 119 pcf
Borehole diameter (mm) = 168.275 [redacted] in
Energy Ratio, ER (%) = [redacted] percent
Requires correction for sampler liners (YES/NO) = [redacted]
Rod lengths assumed equal to the depth plus 1.5 m (for the above ground extension)

FOSmax = [redacted]

Boring	Depth (ft)	Depth (m)	Measured N	Soil Type (USCS)	Flag "Clay" "Unsaturated" "Unreliable"	Fines Content (%)	C_E	C_B	C_R	C_S	N_{60}	σ_{vo} (kPa)	σ_{vo}' (kPa)	C_N	$(N_1)_{60}$	ΔN for fines content	$(N_1)_{60-cs}$	r_d	CSR	MSFmax	MSF for sand	K_σ for sand	CRR for M=7.5 & σ_{vo}' = 1atm	CRR	Factor of Safety	Limiting Shear Strain γ_{lim}	Parameter F_α	Maximum Shear Strain γ_{max}	ΔH_i (ft)	ΔH_i (m)	ΔLD_i (m)	Vertical Reconsol Strain ε_v	ΔS_i (m)	ΔS_i (inch)	ΔS_i (inch) for FOS < FOSmax	$\Sigma\Delta Si$ (inch)
B-1	[redacted]	2.7	[redacted]	[redacted]		[redacted]	1.42	1.15	0.85	1.00	36.0	50	32	1.36	48.9	5.6141	54.5	0.98	0.512	2.200	1.12	1.10	2.000	2.000	[redacted]	0.000	-1.981	0.000	[redacted]	1.524	0.000	0.000	0.000	0.00	[redacted]	0.00
B-1	[redacted]	8.5	[redacted]	[redacted]		44.9	1.42	1.15	1.00	1.00	4.9	158	83	1.13	5.5	5.6057	11.1	0.90	0.670	1.214	1.02	1.02	0.128	0.131	[redacted]	0.419	0.888	0.419	[redacted]	1.524	0.639	0.035	0.053	2.10	[redacted]	2.10
B-2	[redacted]	2.7	[redacted]	[redacted]		45.7	1.42	1.15	0.85	1.00	4.2	50	32	1.70	7.1	5.6082	12.7	0.98	0.560	1.252	1.03	1.10	0.138	0.155	[redacted]	0.354	0.841	0.354	[redacted]	0.914	0.323	0.032	0.030	1.16	[redacted]	1.16
B-5	[redacted]	1.2	[redacted]	[redacted]		10.4	1.42	1.15	0.75	1.00	18.3	22	18	1.70	31.2	3.6905	34.8	1.00	0.393	2.200	1.12	1.10	1.074	1.328	[redacted]	0.023	-0.425	0.000	[redacted]	1.219	0.000	0.000	0.000	0.00	[redacted]	0.00
B-5	[redacted]	2.7	[redacted]	[redacted]		53.5	1.42	1.15	0.85	1.00	6.9	50	32	1.70	11.8	5.4688	17.2	0.98	0.553	1.390	1.04	1.10	0.176	0.202	[redacted]	0.216	0.656	0.216	[redacted]	1.219	0.263	0.026	0.032	1.24	[redacted]	1.24

GSH

ATTACHMENT 4

Engineering Calculations

Inputs	Spot	Strip
nc	5.14	5.14
nq	1	1
ng	0.5	0.5
b (ft)	2	1.5
phi (deg)	34	34
df (ft)	1.5	2.5
c (psf)	1000	1000
fos	3	3
g (pcf)	120	120
Shape		
nc	1.25	1
ng	0.85	1
Calulations		
C	51	45
G	6425	5140
Q	180	300
qult (psf)	6656	5485
qallow (psf)	2219	1828
qdesign (psf)	1500	1500

LATERAL EARTH PRESSURES

Project	Propose 6800 N Industrial AF	Date Printed	5.13.2021
Job No.	2364-003-21	Engineer	ADS

Input parameters:

120.00	Unit Wt of soil, pcf
4	Ht of wall, ft
32	ϕ, Peak soil friction angle, deg
0.00	θ, Wall/slope face inclination from vertical, deg
0.00	β, Backslope angle from horizontal, degree
0.5	Reduction in Horizontal Acceleration (typically 0.5 but can vary from 0.33 to 1.0)
0.330	K_h, Horizontal Seismic Coeff, g (2/3 of MCE) (Design Value)

Results:

Condition	Static	Seismic
	pcf	psf*
Active	37	25
At-Rest	56	79
Mod Yield	47	52

*uniform pressure

Seismic Details.

Method	Force	Uniform Pressure	
M-O	99	25	active
Wood*	317	79	at-rest
Average	208	52	mod yielding

*applicable for for L/H > 4 and u = 0.3 - if not applicable use chart on pg 485 of Kramer

File:Lateral Pressures
Sheet: 4 ft

Square Foundation

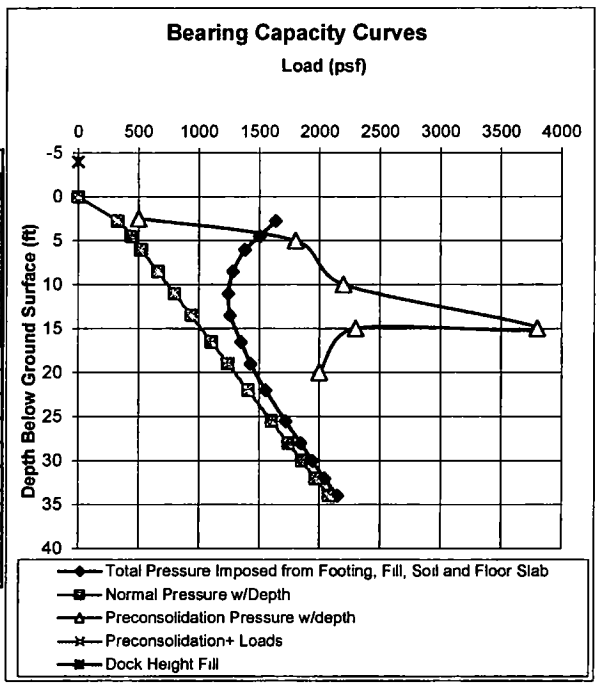
Depth of Footing (ft)= 1.5
Depth of Water (ft) = 3
Note if water table was not encountered this number has to be greater than the maximum depth you are calculating pressures for.

Assumed Bearing Capacity BC= 1500 psf
Column Load L= 220 kips
Width of Footing b= 12.11 feet
Unit Weight γ= 118 pcf

Depth Below Ground Surface	Average Depth Below Ground Surface	Average Depth Below Found * D	D/ width of Found	Influence of found load (from table)	P'o	ΔP+P'o	(ΔP+P'o) / P'o	Log ( )	Cc	Thickness of Depth Increment	Unit Settlement	Total Settlement
Feet	Feet	Feet		%	PSF	PSF				Inches	Inches	Inches
0.0	0.0	0.0	0.00	0.00	0	0	0.00	0.000	0.003	18 0	0.00	0.00
1.5	2.8	1 3	0.10	0.88	325	1637	5.04	0.703	0 003	30.0	0.06	0 06
4.0	4.5	3.0	0.25	0.71	437	1502	3.43	0.536	0.013	12.0	0 08	0 15
5.0	6.0	4 5	0 37	0 58	521	1383	2 66	0.424	0.008	24.0	0 08	0.23
7 0	8.5	7 0	0.58	0.42	660	1282	1 94	0.289	0 008	36 0	0.08	0.31
10 0	11.0	9.5	0.78	0.30	799	1245	1.56	0.193	0.009	24.0	0 04	0.35
12.0	13.5	12.0	0 99	0.22	938	1261	1.34	0.129	0 009	36.0	0 04	0.39
15.0	16 5	15 0	1 24	0 16	1105	1352	1 22	0.088	0.019	36.0	0 06	0.45
18.0	19 0	17.5	1.45	0 12	1244	1431	1 15	0.061	0 019	24.0	0 03	0.48
20.0	22.0	20.5	1 69	0 10	1410	1555	1.10	0.042	0.023	48.0	0.05	0 53
24.0	25.5	24.0	1 98	0 08	1605	1720	1.07	0 030	0.023	36.0	0.02	0 55
27.0	28.0	26.5	2.19	0.07	1744	1845	1.06	0 025	0.023	24.0	0 01	0.57
29 0	30.0	28.5	2.35	0.06	1855	1941	1.05	0.020	0.023	24 0	0.01	0.58
31 0	32 0	30.5	2.52	0.05	1966	2041	1.04	0 016	0.023	24.0	0.01	0.59
33.0	34.0	32 5	2 68	0.05	2078	2147	1.03	0.014	0.023	24.0	0.01	0.60
35.0										Total Settlement	0.60	Inches

Preload 0 psf
Floorslab 0 psf

δP+P'o+Loads	Average Depth Below Ground Surface	P'o	P'o + Loads	Average Depth Below Ground Surface	Preconsolidation Pressures	Depth
PSF	Feet	PSF	PSF	Feet	PSF	Feet
0	-4					
0	0	0	0	0	500	2 5
1637	2.75	325	324.5	2.75	1,800	5
1502	4.5	437	437.4	4.5	2200	10
1383	6	521	520 8	6	3800	15
1282	8.5	660	659.8	8.5	2300	15
1245	11	799	798 8	11	2000	20
1261	13.5	938	937.8	13.5		
1352	16.5	1105	1104.6	16 5		
1431	19	1244	1243 6	19		
1555	22	1410	1410.4	22		
1720	25.5	1605	1605	25.5		
1845	28	1744	1744	28		
1941	30	1855	1855.2	30		
2041	32	1966	1966.4	32		
2147	34	2078	2077.6	34		
0	0	0	0	0		
0	0	0	0	0		



Strip Foundation

Depth of Footing (ft)= 2.5
Depth of Water (ft) = 3
Note if water table was not encountered this number has to be greater than the maximum depth you are calculating pressures for

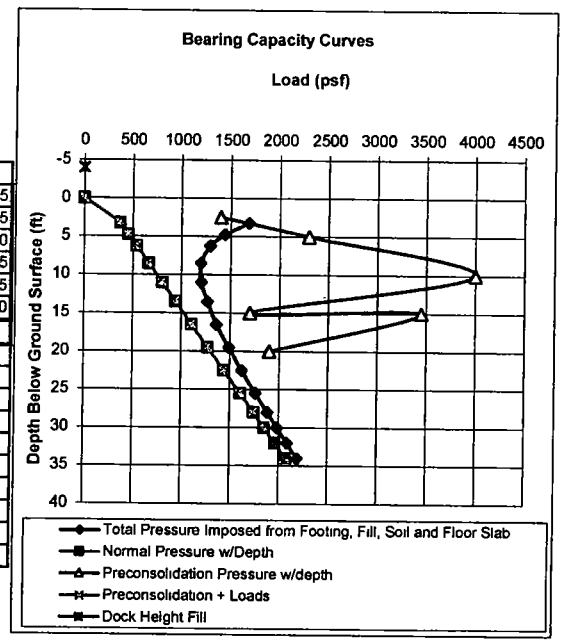
Assumed Bearing Capacity BC= 1500 psf
Wall Load L= 8 kips/ft
Width of Footing b= 5 33 feet
Unit Weight γ= 118 pcf

Depth Below Ground Surface	Average Depth Below Ground Surface	Average Depth Below Found * D	D/ width of Found	Influence of found load (from table)	P'o	ΔP+P'o	(ΔP+P'o) / P'o	Log ( )	Cc	Thickness of Depth Increment	Unit Settlement	Total Settlement
Feet	Feet	Feet		%	PSF	PSF				Inches	Inches	Inches
0.0	0.0	0.0	0 00	0.00	0	0	0.00	0 000	0 003	30 0	0.00	0.00
2.5	3 3	0 8	0.14	0 88	368	1686	4.58	0.661	0.003	18.0	0.04	0 04
4 0	4 8	2 3	0.42	0.66	451	1440	3.19	0.504	0 013	18.0	0 12	0 15
5.5	6.3	3.8	0.70	0.50	535	1291	2 41	0.383	0.008	18.0	0.06	0.21
7 0	8.5	6.0	1.13	0.36	660	1197	1.81	0.259	0 008	36 0	0.07	0.28
10 0	11.0	8.5	1.59	0 27	799	1200	1 50	0.177	0.009	24 0	0.04	0.32
12.0	13.5	11 0	2.06	0.22	938	1266	1.35	0 130	0.009	36.0	0.04	0 36
15.0	16 5	14.0	2.63	0.17	1105	1357	1 23	0.089	0.019	36.0	0 06	0.42
18.0	19 5	17.0	3.19	0.14	1271	1487	1.17	0.068	0.019	36 0	0 05	0.47
21.0	22.5	20.0	3.75	0 12	1438	1620	1.13	0 052	0.023	36.0	0.04	0 51
24.0	25 5	23 0	4.31	0.10	1605	1761	1.10	0.040	0 023	36.0	0.03	0 55
27.0	28.0	25.5	4.78	0 09	1744	1885	1.08	0 034	0 023	24.0	0.02	0 57
29.0	30.0	27.5	5.16	0.09	1855	1985	1.07	0.029	0 023	24.0	0 02	0 58
31.0	32.0	29.5	5.53	0 08	1966	2086	1.06	0.026	0.023	24 0	0 01	0 60
33.0	34 0	31.5	5 91	0.07	2078	2189	1.05	0.023	0 023	24.0	0 01	0.61
										Total settlement	0.61	Inches

35

Preload 0 psf
Floorslab 0 psf

δP+P'o+Loads	Average Depth Below Ground Surface	P'o	P'o + Loads	Average Depth Below Ground Surface	Preconsolidation Pressures	Depth
PSF	Feet	PSF	PSF	Feet	PSF	Feet
0	-4					
0	0	0	0	0	1,400	2 5
1686	3.25	368	367.9	3.25	2,300	5
1440	4.75	451	451.3	4.75	4000	10
1291	6 25	535	534 7	6.25	1700	15
1197	8 5	660	659.8	8.5	3450	15
1200	11	799	798.8	11	1900	20
1266	13.5	938	937.8	13.5		
1357	16 5	1105	1104.6	16.5		
1487	19.5	1271	1271.4	19.5		
1620	22.5	1438	1438.2	22 5		
1761	25.5	1605	1605	25.5		
1885	28	1744	1744	28		
1985	30	1855	1855 2	30		
2086	32	1966	1966.4	32		
2189	34	2078	2077 6	34		
0	0	0	0	0		
0	0	0	0	0		



ATTACHMENT 5

Historical High Groundwater Tables

National Water Information System: Web Interface

USGS Water Resources

Data Category: Groundwater | Geographic Area: United States | GO

Click to hideNews Bulletins

- Explore the *NEW* USGS National Water Dashboard interactive map to access real-time water data from over 13,500 stations nationwide.
- Full News

Groundwater levels for the Nation

Important: Next Generation Monitoring Location Page

Search Results -- 1 sites found

site_no list =

- 402117111474701

Minimum number of levels = 1

Save file of selected sites to local disk for future upload

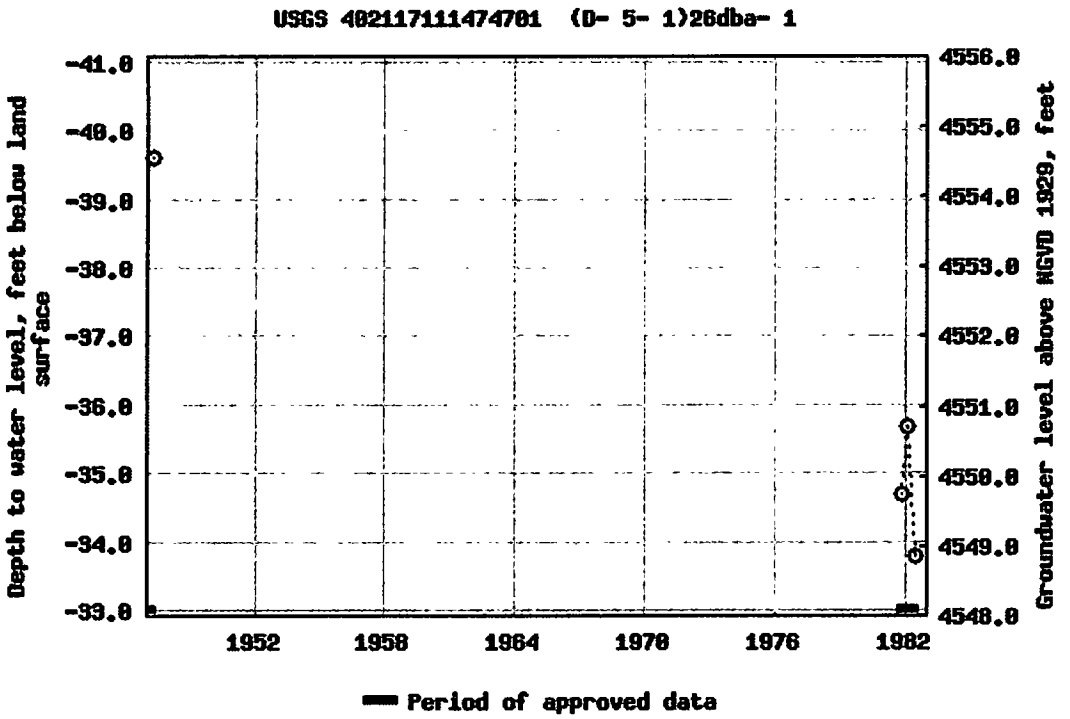
USGS 402117111474701 (D- 5- 1)26dba- 1

Available data for this site Groundwater: Field measurements | GO

Utah County, Utah
Hydrologic Unit Code 16020201
Latitude 40°21'17", Longitude 111°47'47" NAD27
Land-surface elevation 4,515.00 feet above NGVD29
The depth of the well is 160 feet below land surface.
The depth of the hole is 160 feet below land surface.

Output formats

Table of data
Tab-separated data
Graph of data
Reselect period



Breaks in the plot represent a gap of at least one year between field measurements.
Download a presentation-quality graph

Questions about sites/data?
Feedback on this web site
Automated retrievals
Help
Data Tips
Explanation of terms
Subscribe for system changes
News

USGS
science for a changing world

USGS Home
Contact USGS
Search USGS

National Water Information System: Web Interface

USGS Water Resources

Data Category: Groundwater | Geographic Area: United States | GO

Click to hideNews Bulletins

- Explore the *NEW* USGS National Water Dashboard interactive map to access real-time water data from over 13,500 stations nationwide.
- Full News

Groundwater levels for the Nation

Important: Next Generation Monitoring Location Page

Search Results -- 1 sites found

site_no list =

- 402118111475901

Minimum number of levels = 1

Save file of selected sites to local disk for future upload

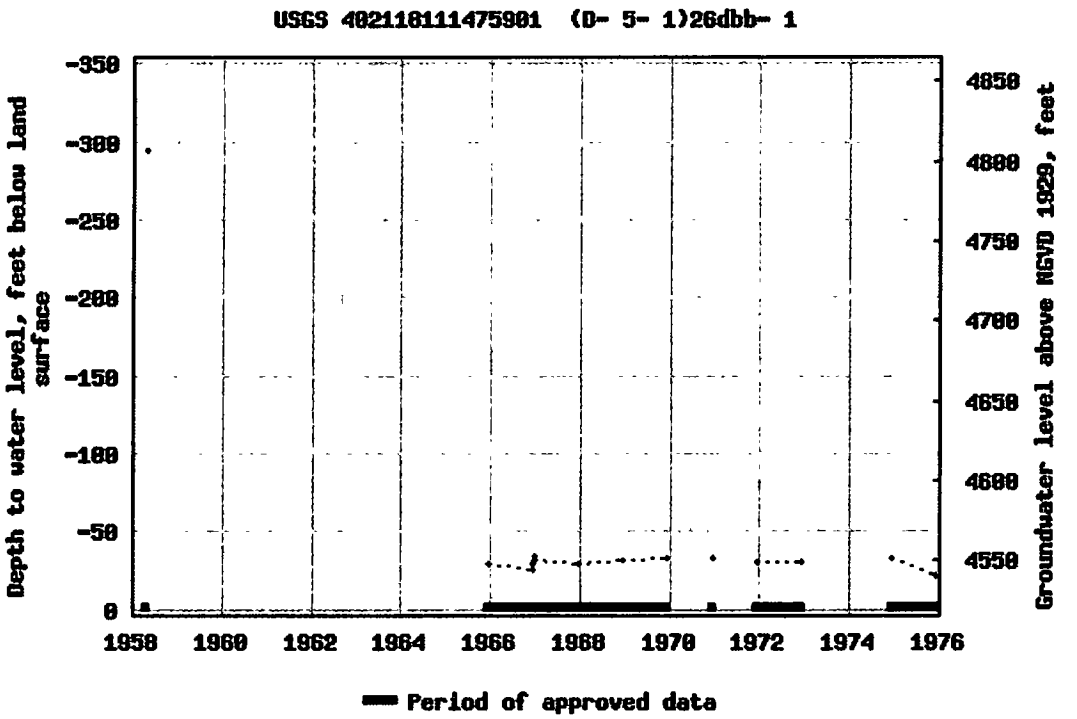
USGS 402118111475901 (D- 5- 1)26dbb- 1

Available data for this site Groundwater: Field measurements | GO

Utah County, Utah
Hydrologic Unit Code 16020201
Latitude 40°21'18", Longitude 111°47'59" NAD27
Land-surface elevation 4,515.00 feet above NGVD29
The depth of the well is 98.0 feet below land surface.

Output formats

Table of data
Tab-separated data
Graph of data
Reselect period



Breaks in the plot represent a gap of at least one year between field measurements.
Download a presentation-quality graph

Questions about sites/data?
Feedback on this web site
Automated retrievals
Help
Data Tips
Explanation of terms
Subscribe for system changes
News

GSH

January 5, 2022
Job No. 3388-001-21

Mr. Jake Horan
White Horse Developers
520 South 850 East, Suite A4
Lehi, Utah 84043

Mr. Horan:

Re: Letter-Addendum
Review Response No. 2
Proposed 6800 North Industrial/Proposed Deer Park Industrial
1100 South 50 West
American Fork, Utah

Introduction

This letter is to serve as an addendum to the previously completed geotechnical study for the above-mentioned site as well as in response to Review No. 2 posed by Mr. Alanson Taylor, P.E. of Taylor Geotechnical on behalf of the City of American Fork. GSH previously completed a geotechnical study for the site dated May 14, 2021[1]. GSH returned to the site on September 9, 2021, to conduct 4 additional borings and subsequent analysis for the first review response letter and addendums.

Taylor Geotechnical (TG) Recommendations

Based on the requirements of the American Fork City Sensitive Land Ordinance and the technical documentation provided by GSH, TG recommends American Fork City not consider the GSH geotechnical submittal complete from a geotechnical perspective until the following items are adequately addressed.

Review Comment 1

In the August 20, 2021, TG review letter, under comment No. 2, TG recommended American Fork City request GSH provide the site-specific seismic response analysis (SRA).

---

1 "Geotechnical Study, Proposed 6800 North Industrial, American Fork, Utah" prepared by GSH Geotechnical, Inc., GSH Job No. 2354-003-21.

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123
Tel: 801.685.9190 Fax: 801.685.2990
www.gshgeo.com

In the November 22, 2021, GSH letter, GSH provided a SRA. However, GSH did not provide the documentation and supporting calculations used for the SRA, which includes the histories selected with similar magnitudes, distances, and spectral shape in the period ranges of significance for the proposed structure (approximately 0.4 seconds).

TG recommends American Fork City request GSH:

a) Provide the documentation and supporting calculations used for the SRA;

b) Clarify if a probabilistic or deterministic peak ground acceleration was used with the supporting documentation in accordance with Sections 21.3, 21.4 and 21.5 of ASEC 7-16; and,

c) Provide the design spectral response curve.

Review Response 1

a) An updated site-specific seismic study report that contains additional documentation and calculations is provided with this letter.

b) Details pertaining to development of base ground motions are provided in the updated report (see Section 4.1 Base Ground Motions).

c) Parameters for the design accelerations are provided in the updated report (see Sections 5. Design Spectral Accelerations and Section 6. Design Acceleration Parameters.

Review Comment 2

In the August 20, 2021, TG review letter, under comment No. 11 TG stated the following:

"In accordance with section 4-2-4 of the of the American Fork City Sensitive Land Ordinance, sub-item (7B), the report should be accompanied with the following Certificate statement sealed by the licensed professional that prepared the report:

> *I hereby certify that I am a licensed professional engineer or an engineering geologist, as those terms are defined in the "Sensitive Lands Ordinance" Section of the American Fork City Ordinances. I have examined the letter report/geologic report to which this certificate is attached and the information and conclusions contained therein are, without any reasonable reservation not stated therein, accurate and complete. All procedures and tests used in said letter report/geologic report meet minimum applicable professional standards."*

The subject document did not contain the required certificate. TG recommends the City of American Fork request the required certificate for the subject document.

ENT 1578:2024 PG 144 of 166

Review Response 2

The following statement is to serve as a Certificate statement for the referenced May 14, 2021, geotechnical report and the November 22, 2021, review response addendum as well as for this response letter:

I hereby certify that I am a licensed professional engineer or an engineering geologist, as those terms are defined in the "Sensitive Lands Ordinance" Section of the American Fork City Ordinances. I have examined the letter report/geologic report to which this certificate is attached and the information and conclusions contained therein are, without any reasonable reservation not stated therein, accurate and complete. All procedures and tests used in said letter report/geologic report meet minimum applicable professional standards.

Closure

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, Inc.

REGISTERED PROFESSIONAL ENGINEER
No. 334228
ALAN D. SPILKER
STATE OF UTAH

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

ADS:ab

Addressee (email)

GSH

January 5, 2022
Job No. 3388-001-21

Mr. Jake Horan
White Horse Developers
520 South 850 East, Suite A4
Lehi, Utah 84043

Mr. Horan:

Re: Letter-Addendum
Review Response No. 2
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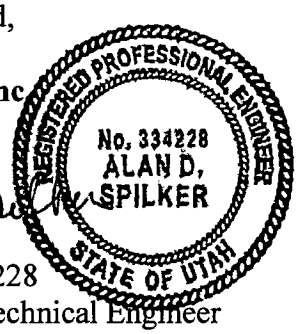
Respectfully submitted,

GSH Geotechnical, Inc.



Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

ADS.ab

Addressee (email)

ProShake 2.0 Report

ProShake 2.0 Input Data

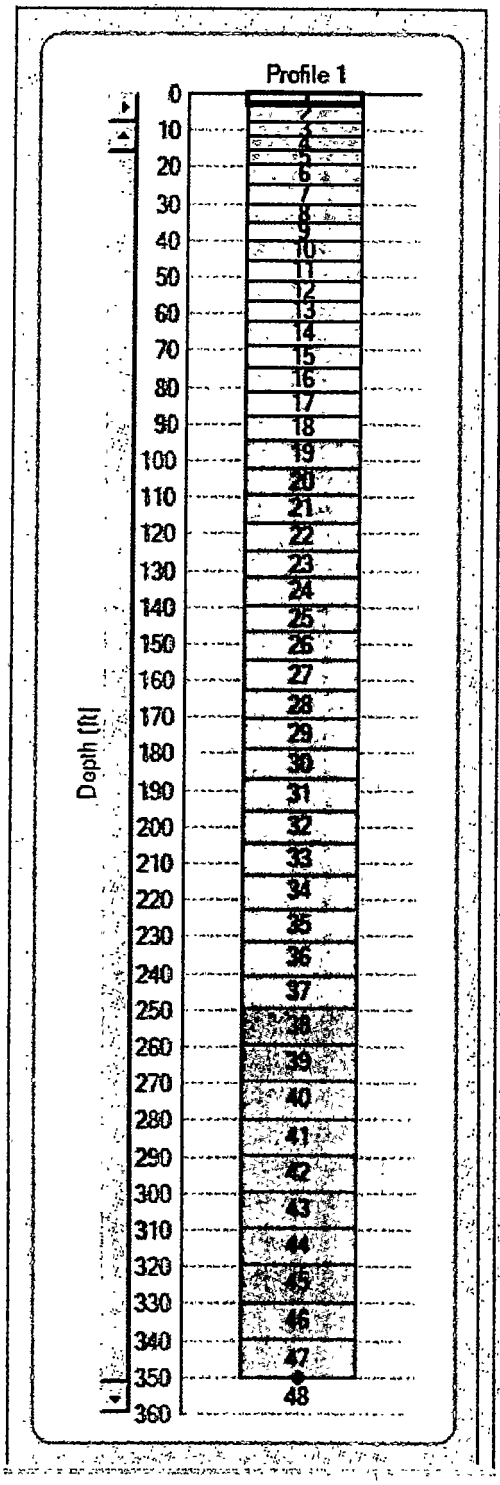
Project Data			
Project Date:	7/27/2021 1:50:34 PM	Unit:	US
Project Identifier:	6800 North Industrial		
Project Description:	2354-004-21		
Number of Profiles:	1	Number of Motions:	12
Motion Group Description:			
Max. Number of Iterations:	200	Strain Ratio:	0.65
Error Tolerance:	1.00%	Analysis Completed:	Yes
Analyst Name:	Mike Huber	Analysis Date:	7/27/2021 2:31:05 PM
Data File Name:			

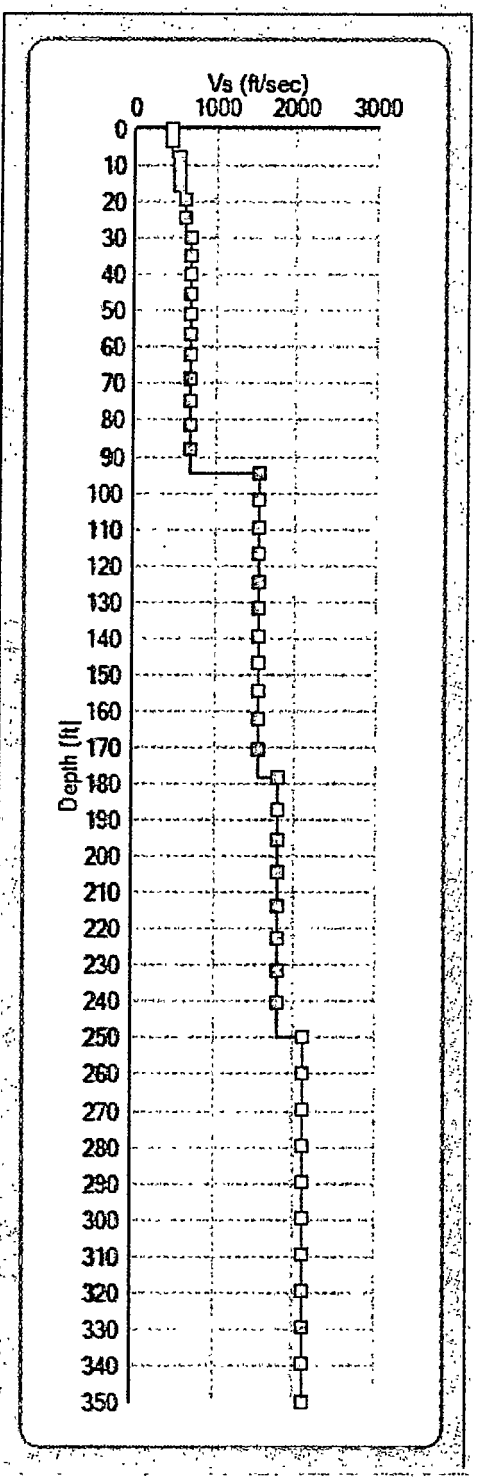
Profile Data				
Profile Number	Profile Description	Water Table Depth	Number of Layers	Object Motion Layer
1	Profile 1	2.80	48	48

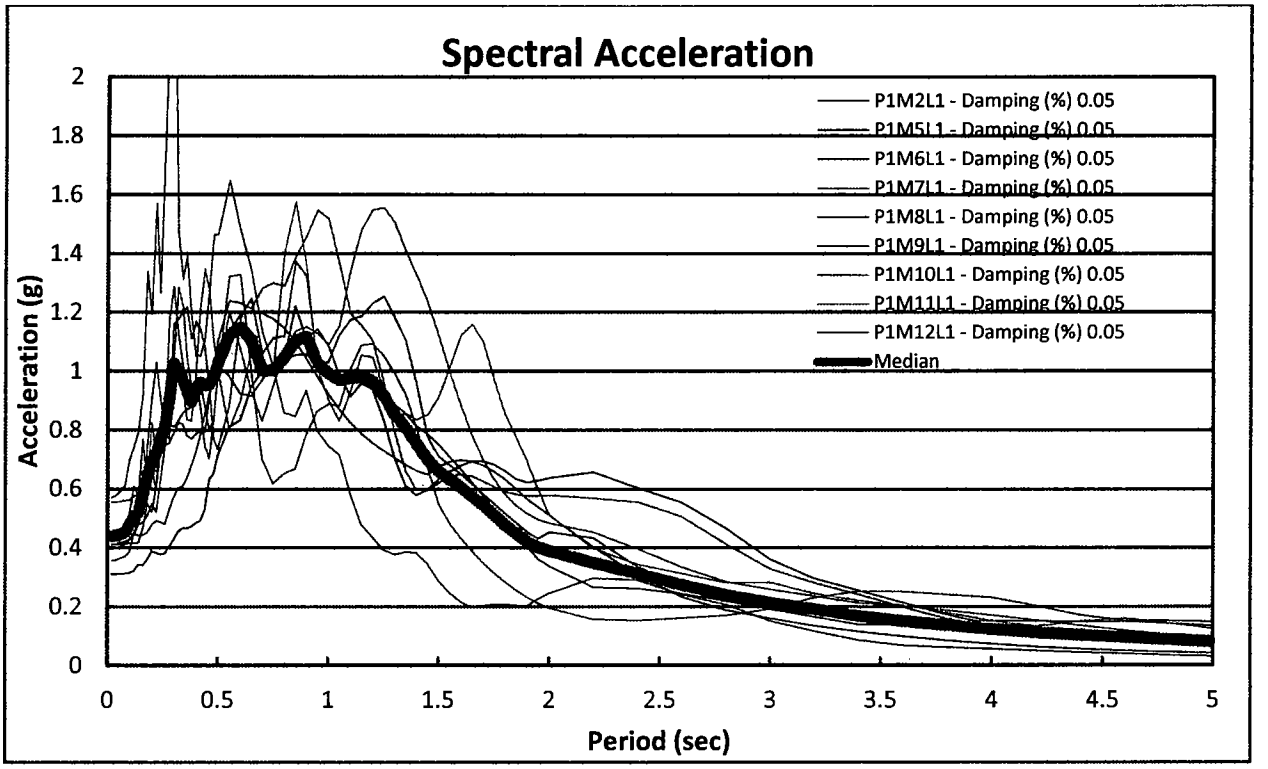
Motion Data				
Motion Number	File Name	Number of Values	Time Step	Peak Acceleration
1	C:\Users\Mike\Documents\ProShake Data Folder\EQS\DIAM.EQ	2000	0.0000	0.000
2	C:\Users\Mike\Documents\ProShake Data Folder\EQS\ELCENTRO.EQ	4187	0.0000	0.000
3	C:\Users\Mike\Documents\ProShake Data Folder\EQS\PETROLIA.eq	5879	0.0000	0.000
4	C:\Users\Mike\Documents\ProShake Data Folder\EQS\RSN143_TABAS_TAB-L1.AT2	1650	0.0000	0.000
5	C:\Users\Mike\Documents\ProShake Data Folder\EQS\RSN496_NAHANNI_S2330.AT2	3991	0.0000	0.000
6	C:\Users\Mike\Documents\ProShake Data Folder\EQS\RSN779_LOMAP_LGP000.AT2	5001	0.0000	0.000
7	C:\Users\Mike\Documents\ProShake Data Folder\EQS\RSN1044_NORTHR_NWH090.AT2	2000	0.0000	0.000
8	C:\Users\Mike\Documents\ProShake Data Folder\EQS\RSN1549_CHICHI_TCU129-E.AT2	18000	0.0000	0.000
9	C:\Users\Mike\Documents\ProShake Data Folder\EQS\RSN5657_IWATE_IWTH25NS.AT2	30000	0.0000	0.000
10	C:\Users\Mike\Documents\ProShake Data Folder\EQS\RSN8164_DUZCE_487-NS.AT2	13751	0.0000	0.000
11	C:\Users\Mike\Documents\ProShake Data Folder\EQS\TAFT.EQ	4220	0.0000	0.000
12	C:\Users\Mike\Documents\ProShake Data Folder\EQS\TOPANGA.eq	5872	0.0000	0.000

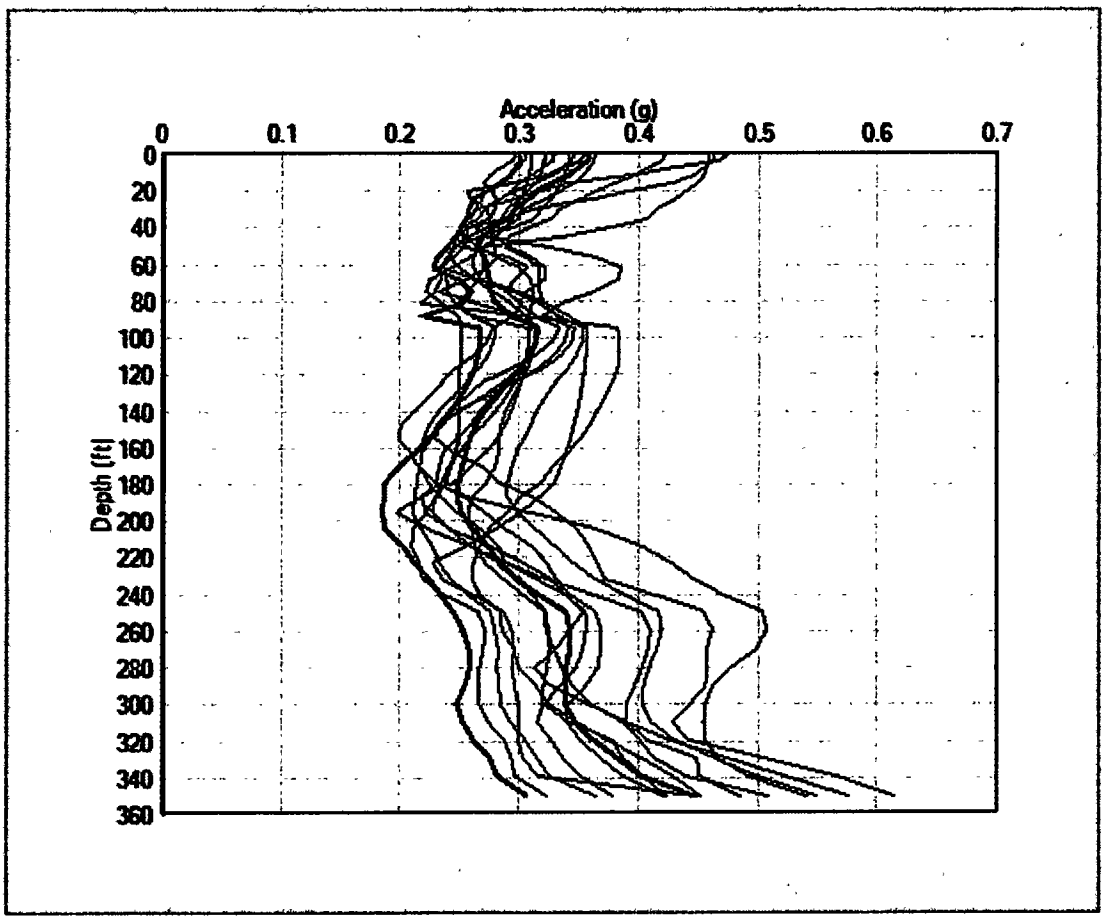
ProShake 2.0 Report

Layer No.	Material Name	Thickness (ft)	Unit Weight (pcf)	Vs (fps)	G Max (ksf)	Soil Model	PI (%)
1	Surface Clays	3.5	113	440	680.0	Darendeli (2001)	15.00
2	Surface Clays	4.0	113	440	680.0	Darendeli (2001)	15.00
3	Upper Sands	4.0	115	545	1061.7	Sand (Seed & Idriss)	-
4	Upper Clays	4.0	115	545	1061.7	Darendeli (2001)	15.00
5	Upper Clays	4.0	115	545	1061.7	Darendeli (2001)	15.00
6	Middle Clays	5.0	115	625	1396.2	Darendeli (2001)	15.00
7	Middle Clays	5.5	115	625	1396.2	Darendeli (2001)	15.00
8	Middle Sands	5.0	120	680	1724.6	Sand (Seed & Idriss)	-
9	Lower Clays	5.0	115	680	1652.8	Darendeli (2001)	11.00
10	Lower Clays	5.5	115	680	1652.8	Darendeli (2001)	11.00
11	Lower Clays	5.5	115	680	1652.8	Darendeli (2001)	11.00
12	Lower Clays	5.5	115	680	1652.8	Darendeli (2001)	11.00
13	Lower Clays	5.5	115	680	1652.8	Darendeli (2001)	11.00
14	Deep Clays	6.5	115	695	1726.5	Darendeli (2001)	11.00
15	Deep Clays	6.5	115	695	1726.5	Darendeli (2001)	11.00
16	Deep Clays	6.5	115	695	1726.5	Darendeli (2001)	11.00
17	Deep Clays	6.5	115	695	1726.5	Darendeli (2001)	11.00
18	Deep Clays	6.5	115	695	1726.5	Darendeli (2001)	11.00
19	Lower Sands	7.5	125	1555	9394.3	Sand (Seed & Idriss)	-
20	Lower Sands	7.5	125	1555	9394.3	Sand (Seed & Idriss)	-
21	Lower Sands	7.5	125	1555	9394.3	Sand (Seed & Idriss)	-
22	Lower Sands	7.5	125	1555	9394.3	Sand (Seed & Idriss)	-
23	Lower Sands	7.5	125	1555	9394.3	Sand (Seed & Idriss)	-
24	Lower Sands	7.5	125	1555	9394.3	Sand (Seed & Idriss)	-
25	Lower Sands	7.5	125	1555	9394.3	Sand (Seed & Idriss)	-
26	Lower Sands	7.5	125	1555	9394.3	Sand (Seed & Idriss)	-
27	Lower Sands	8.0	125	1555	9394.3	Sand (Seed & Idriss)	-
28	Lower Sands	8.0	125	1555	9394.3	Sand (Seed & Idriss)	-
29	Lower Sands	8.0	125	1555	9394.3	Sand (Seed & Idriss)	-
30	Upper Gravels	8.5	130	1800	13091.3	Gravel (Seed et al.)	-
31	Upper Gravels	8.5	130	1800	13091.3	Gravel (Seed et al.)	-
32	Upper Gravels	9.0	130	1800	13091.3	Gravel (Seed et al.)	-
33	Upper Gravels	9.0	130	1800	13091.3	Gravel (Seed et al.)	-
34	Upper Gravels	9.0	130	1800	13091.3	Gravel (Seed et al.)	-
35	Upper Gravels	9.0	130	1800	13091.3	Gravel (Seed et al.)	-
36	Upper Gravels	9.0	130	1800	13091.3	Gravel (Seed et al.)	-
37	Upper Gravels	9.0	130	1800	13091.3	Gravel (Seed et al.)	-
38	Lower Gravels	10.0	135	2110	18680.7	Gravel (Seed et al.)	-
39	Lower Gravels	10.0	135	2110	18680.7	Gravel (Seed et al.)	-
40	Lower Gravels	10.0	135	2110	18680.7	Gravel (Seed et al.)	-
41	Lower Gravels	10.0	135	2110	18680.7	Gravel (Seed et al.)	-
42	Lower Gravels	10.0	135	2110	18680.7	Gravel (Seed et al.)	-
43	Lower Gravels	10.0	135	2110	18680.7	Gravel (Seed et al.)	-
44	Lower Gravels	10.0	135	2110	18680.7	Gravel (Seed et al.)	-
45	Lower Gravels	10.0	135	2110	18680.7	Gravel (Seed et al.)	-
46	Lower Gravels	10.0	135	2110	18680.7	Gravel (Seed et al.)	-
47	Lower Gravels	10.5	135	2110	18680.7	Gravel (Seed et al.)	-
48	Lower Gravels	0.0	135	2110	18680.7	Gravel (Seed et al.)	-









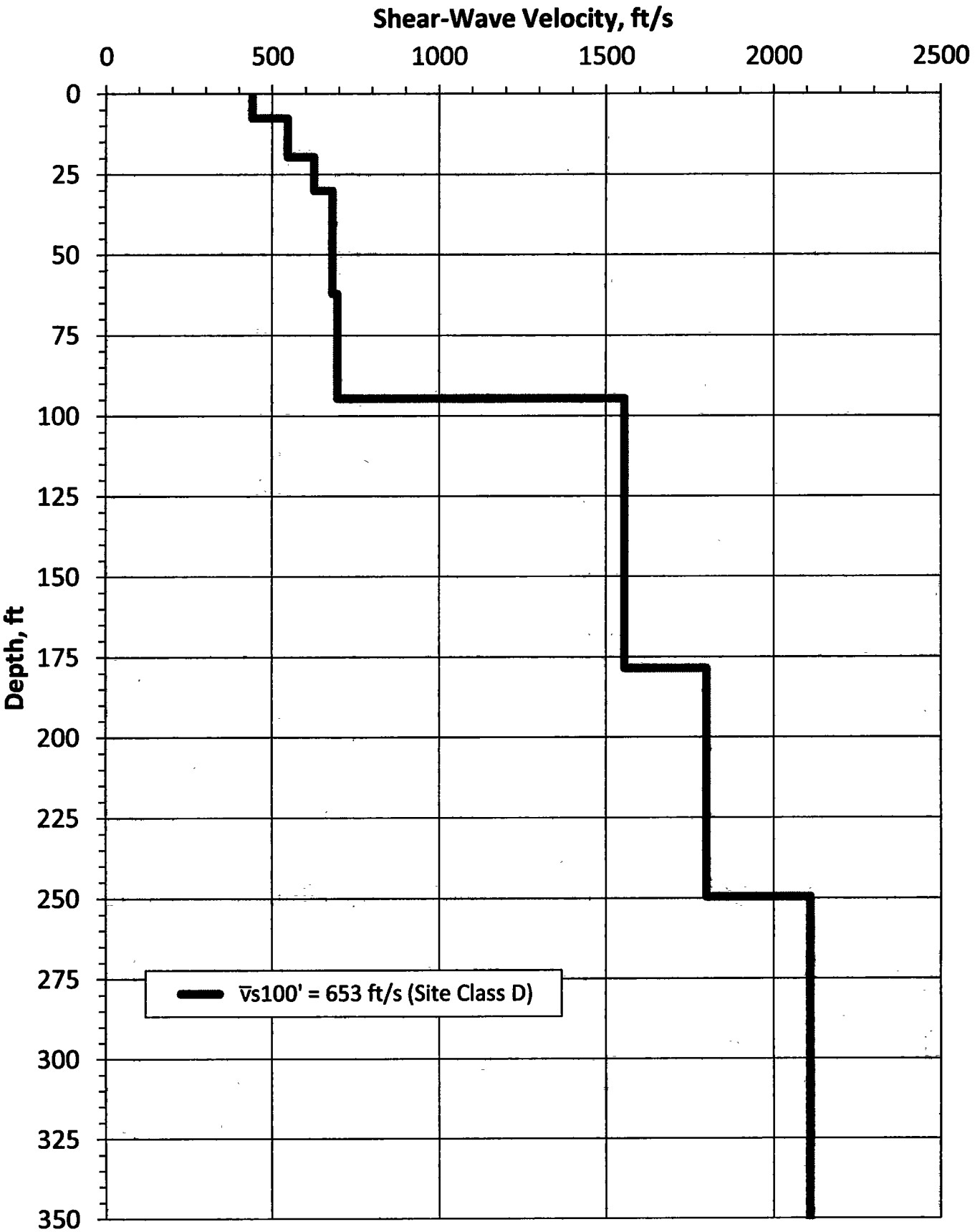


FIGURE 2 6800 North Industrial 2354-004-21

GSH

January 5, 2022
Job No. 2354-004-21

Mr. Mike Horan
Red Pine Construction
520 South 850 East, Suite A4
Lehi, Utah 84043

Mr. Horan:

Re: Report - Updated
Site-Specific Seismic Study
Proposed 6800 North Industrial
5900 West 6800 North
American Fork, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our site-specific seismic study performed at the site of the proposed 6800 North Industrial to be located near 5900 West 6800 North in American Fork, Utah. GSH Geotechnical, Inc (GSH) completed a geotechnical study[1] for the site. Data from the geotechnical study along with a geophysical survey was used for this site-specific seismic study.

The shear-wave velocity profile for the upper 350 feet at the site (including $\overline{v}_{s30}$ for the upper 100 feet) was determined utilizing boring data from our geotechnical study and a geophysical survey consisting of Refraction Microtremor (ReMi) testing.

The ground motion hazard and design ground motion response spectra at the site were developed utilizing a site-specific site response analysis (SRA). The analysis was completed in accordance with the procedures presented in ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16) and Supplement 1 to ASCE 7-16.

---

[1] "Report, Geotechnical Study, Proposed 6800 North Industrial, 5900 West 6800 North, American Fork, Utah." GSH Job No. 2093-004-19. Dated May 14, 2021.

GSH Geotechnical, Inc.
473 West 4800 South
Salt Lake City, Utah 84123
Tel: 801.685.9190 Fax: 801.685.2990
www.gshgeo.com

1.2 OBJECTIVES AND SCOPE

The objectives and scope of the study were planned in discussions between Mr. Mike Horan of Red Pine Construction and Mr. Alan Spilker of GSH.

In general, the objectives of this study were to:

1. Further define the subsurface conditions at the site, including a shear-wave profile to a depth of 350 feet.

2. Develop site-specific and design ground motion response spectra for the site.

In accomplishing these objectives, our scope has included the following:

1. A review of available subsurface information from the geotechnical study completed for the site.

2. A field program consisting of the completion of a Refraction Microtremor (ReMi) geophysical exploration to a depth of 350 feet including the development of v_{s30} for the upper 100 feet.

3. Performance of a site-specific site response analysis (SRA) in accordance with the ASCE 7-16 Section 21.1, Site Response Analysis.

4. Development of site-specific and design ground motion response spectra for the site in accordance with the ASCE 7-16 Section 21.3, Design Response Spectrum.

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of the Professional Services Agreement No. 21-0434 dated April 12, 2021.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the geophysical testing, exploration borings, and projected groundwater conditions. If subsurface conditions other than those described in this report are encountered, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The site is proposed to be developed with 3 warehouse structures and associated pavements. The structures are anticipated to be one extended level, constructed slab-on-grade, have footprints of 47,040 square feet to 115,808 square feet, and be supported upon conventional spread and continuous wall footings. Paved parking areas and drive lanes are planned around the structure.

Based on information provided by the structural engineer the structure's fundamental period will be approximately 0.4 seconds.

3. SITE CONDITIONS

3.1 SURFACE

The site is located at approximately 5900 West 6800 North in American Fork, Utah. The topography of the site is relatively flat, grading down to the south with a total relief of approximately 6 to 9 feet. Site vegetation consists of agricultural grass fields with undeveloped/vacant grass land in the western portion of the site.

The site is bounded to the north by 6800 North Street followed by agricultural fields; to the east by single-family residential structures along with agricultural fields; to the south by agricultural fields and vacant/undeveloped brush/grass land; and to the west by vacant/undeveloped brush/grass land followed by 100 West Street and a single-family residential structure adjacent to the northwest corner of the site.

3.2 SUBSURFACE SOIL AND GROUNDWATER

The following paragraphs provide generalized descriptions of the subsurface profiles and soil conditions encountered within the borings conducted during this study. As noted in the geotechnical study, soil conditions may vary in unexplored locations.

The borings were completed to depths ranging from 5.0 to 51.5 feet. The soil conditions encountered in each of the borings, to the depths completed, were generally similar across the boring locations.

- Natural soils were encountered below the non-engineered fill or the ground surface in each boring. The natural soils consisted primarily of clay with varying silt, sand, and gravel content and sand with varying clay, silt, and gravel content.

The natural clay soils were very soft to stiff, dry to saturated, brown, dark brown, gray, and tan in color. The natural sand soils were very loose to medium dense, dry to saturated, and gray and brown in color.

Groundwater was measured as shallow as 2.8 feet below the existing ground surface during the geotechnical study for the site.

For a more descriptive interpretation of subsurface conditions, please refer our geotechnical report completed for the site (GSH Job No. 2354-003-21).

3.3 SHEAR WAVE VELOCITY PROFILE

The site shear-wave velocity profile was completed utilizing geophysical exploration. The testing consisted of Refraction Microtremor (ReMi) testing. Testing is performed at the surface using a series of geophone sensors and a seismic source. A wavefield transformation is performed on the recorded geophone movements. The transformation is then utilized to create a shear-wave dispersion curve to model the subsurface shear-wave velocity profile.

The location of the ReMi line on the site is presented on Figure 1, Site Plan. The borings completed in conjunction with the geotechnical study are also shown on Figure 1.

The site classification for ASCE 7-16 was Site Class F in the geotechnical report due to potentially liquefiable soils at the site. As a follow up to the geotechnical report the ReMi testing results were analyzed to a depth of 350 feet with a resulting $\overline{v}_{s30}$ value of 653 ft/s. This characterizes the site as a Site Class D, Stiff Soil Profile as defined in Chapter 20 of ASCE 7-16.

The shear-wave velocity results are provided on attached Figure 2, Shear-Wave Velocity Profile.

3.4 GEOLOGIC SETTING

The site is located in the Utah Valley, which is in the Basin and Range Physiographic Province. The Utah Valley is near (west of) the transition between the Basin and Range Physiographic Province to the west and the Middle Rocky Mountain Physiographic Province to the east. The Basin and Range Province is characterized by generally north-trending valleys and mountain ranges that have formed by displacement along normal faults. The Wasatch Fault forms the boundary between the 2 provinces and has been active for approximately 10 million years. The Middle Rocky Mountains were formed during a period of regional compression that occurred in Cretaceous time, about 75 to 70 million years ago (Hunt, 1967). The surficial geology of the area is characterized by materials deposited within the past 30,000 years by late Pleistocene Lake Bonneville (Currey and Oviatt, 1985), and young lacustrine and deltaic deposits (Holocene to upper Pleistocene) deposited on delta margins as the lake receded to its present Great Salt Lake levels (Hylland et al., 2014). As the ancient lake(s) receded, streams began to regrade through shoreline deltas formed at the mouths of major Wasatch Range canyons and the eroded material was deposited in the basin as a series of recessional deltas, alluvial fans, and shoreline sequences. Toward the east-central portion of the valley where the site is located, shallow-water sediments of clay, silt, and sand predominate.

The primary surficial geology of most of the site as interpreted by Solomon and others (2009) primarily consists of "Lacustrine silt and clay" (**Qlmp**). Most of the west and some of the east perimeter of the site consists of "Younger alluvial-fan deposits, undivided" (**Qafy**).

3.5 FAULTING

There are a number of mapped faults near the site. The faults are primarily normal mechanism. Some of the faults included are the Utah Lake Faults (mapped 1.22 miles south of the site), the Provo section of the Wasatch fault zone (mapped 4.13 miles northeast of the site), the Salt Lake City section of the Wasatch fault zone (mapped 9.79 miles north of the site), and the Nephi section of the Wasatch fault zone (mapped 18.91 miles south-southeast of the site).

4. SITE RESPONSE ANALYSIS

A soil model was developed from the boring, laboratory, and ReMi data from this study and the geotechnical study for the site.

A series of earthquake time histories were selected and scaled to match the MCE_R response spectrum at the base of the soil column. Histories were selected from events with similar magnitudes, distances and spectral shape in the period ranges of significance for the proposed structure (approximately 0.4 seconds). These ground motion time histories were input at the base of the soil column model as outcrop motions, propagated through the soil column model, and calculated as surface ground motions. This analysis was completed utilizing the ProShake 2.0 software and the data from the program is presented as Figure 3, ProShake 2.0 Report.

The details of the SRA analysis are presented in the following sections.

4.1 BASE GROUND MOTION

In accordance with Section 21.1.1 and 21.1.2 of ASCE 7-16, a MCE_R response spectrum was developed at the base of the model soil column. The base of the soils column was chosen as the depth of the results from the ReMi testing, 350 feet. The bedrock and resulting site modified base motions were developed utilizing Section 11.4.6 of ASCE 7-16.

The velocity measured at 350 feet during the ReMi testing was 2110 ft/s therefore a Site Class C, Stiff Soil was utilized. The resulting parameters for the development of the MCE_R response spectrum for the base ground motion were S_{MS} of 1.516 g, S_{MI} of 0.686 g, and T_L of 8 seconds based on USGS gridded values modified for the site soil class conditions.

4.2 SOIL CONDITION MODEL

A soil model was created utilizing data obtained in our borings, laboratory testing as well as ReMi testing. The following table shows the soil model and associated parameters. Soils properties for the soil model were varied during the analyses to evaluate sensitivity and uncertainty as described in Sections 11.4.3 and 21.1.3 of ASCE 7-16.

Material Name	Depth to Bottom of Layer (ft)	Unit Weight (pcf)	PI (%)	Vs (ft/s)	GMAX (ksf)	Soil Model
Surface Clays	7.5	113	15	440	680.0	Darendeli
Upper Sands	11.5	115	NP	545	1,061.7	Seed & Idriss
Upper Clays	19.5	115	15	545	1,061.7	Darendeli
Middle Clays	30	115	15	625	1,396.2	Darendeli
Middle Sands	35	120	NP	680	1,724.6	Seed & Idriss
Lower Clays	62	115	11	680	1,652.8	Darendeli
Deep Clays	94.5	115	11	695	1,726.5	Darendeli
Lower Sands	178.5	125	NP	1,555	9,394.3	Seed & Idriss
Upper Gravels	249.5	130	NP	1,800	13,091.3	Seed, et al.
Lower Gravels	300	135	NP	2,110	18,680.7	Seed, et al.

The depth to groundwater was taken as 2.8 feet below the existing ground surface.

4.3 EARTHQUAKE TIME HISTORIES

A series of earthquake time histories were selected and scaled to match the MCE_R response spectrum at the base of the soil column. Histories were selected from events with similar magnitudes, distances and spectral shape in the period ranges of significance for the proposed structure (approximately 0.4 seconds). Below is a list of the earthquake time histories utilized in the model.

Earthquake	Station	Fault Type	Magnitude (M_w)	V_{S30} (ft/s)	Distance (R_{rup}, km)
Loma Prieta (1989)	Diamond Heights	Reverse Oblique	6.93	1,910	71.33
Imperial Valley (1940)	El Centro	Strike Slip	6.95	700	6.09
Cape Mendocino (1992)	Petrolia	Reverse	7.01	1,385	8.18
Tabas, Iran (1978)	Tabas	Reverse	7.35	2,515	2.05
Nahanni, Canada (1985)	Station 2	Reverse	6.76	1,985	4.93
Loma Prieta (1989)	LGPC	Reverse Oblique	6.93	1,950	3.88
Northridge (1994)	Newhall	Reverse	6.69	885	5.92
Chi-Chi, Taiwan (1999)	TCU129	Reverse Oblique	7.62	1,675	1.83
Iwate, Japan (2008)	IWTH25	Reverse	6.90	1,660	4.80
Duzce, Turkey (1999)	IRIGM487	Strike Slip	7.14	2,265	2.65
Kern County (1952)	Taft Lincoln	Reverse	7.36	1,265	38.89
Northridge (1994)	Topanga Fire Station	Reverse	6.69	1,660	22.28

5. DESIGN SPECTRAL ACCELERATIONS

The response spectra produced from the site-specific seismic analysis was compared with the minimum code spectrum values per ASCE 7-16 Section 21.3, including update presented in Supplement 1 to ASCE 7-16. This process includes taking the 2014 mapped values from the USGS and utilizing F_a from Table 11.4-1 and 2.5 as F_v to get the modified accelerations, then reducing them by 20 percent to obtain the code minimum spectral accelerations. Site Class D was utilized for these calculations as indicated in the exception in Section 21.3 of ASCE 7-16 and Supplement 1 to ASCE 7-16.

The site-specific response spectrum is generally lower than the minimum code spectrum at various periods, including the periods of interest. These values are presented in the table below.

Period (sec)	Code 80% Minimum Spectral Acceleration (g)	Site-Specific Spectral Acceleration (g)	Code Modified* Site-Specific Spectral Acceleration (g)	Design Spectral Acceleration (2/3 of Code Modified Site-Specific Acceleration) (g)
0.05	0.572	0.445	0.572	0.381
0.1	0.739	0.476	0.739	0.493
0.2	1.010	0.694	1.010	0.673
0.3	1.010	1.027	1.027	0.685
0.4	1.010	0.937	1.010	0.673
0.5	1.010	1.027	1.027	0.685
0.6	1.010	1.148	1.148	0.766
0.8	1.010	1.046	1.046	0.698
1.0	0.914	0.992	0.992	0.662
1.2	0.762	0.967	0.967	0.645
1.4	0.653	0.755	0.755	0.503
1.6	0.572	0.606	0.606	0.404
1.8	0.508	0.480	0.508	0.339
2.0	0.457	0.390	0.457	0.305
3.0	0.305	0.214	0.305	0.203
4.0	0.229	0.125	0.229	0.153
5.0	0.183	0.080	0.183	0.122

*The greater of the site-specific and the code minimum spectral acceleration.

6. DESIGN ACCELERATION PARAMETERS

The site-specific response spectrum was analyzed in accordance with the procedure outlined in ASCE 7-16 Section 21.4 to produce the design acceleration parameters presented in the table below:

Site-Specific Parameter	Spectral Acceleration Value (g)
S_{DS}	0.689
S_{D1}	0.774

6.1 CLOSURE

If you have any questions or would like to discuss these items further, please feel free to contact us at (801) 685-9190.

Respectfully submitted,

GSH Geotechnical, Inc.

LICENSED PROFESSIONAL ENGINEER
No. 343650
MICHAEL S. HUBER
STATE OF UTAH

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Vice President/Senior Geotechnical Engineer

Reviewed by:

Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

MSH/ADS:ab

Encl.

Figure 1, Site Plan
Figure 2, Shear-Wave Velocity Profile
Figure 3, ProShake 2.0 Report

Addressee (email)

Geologic References

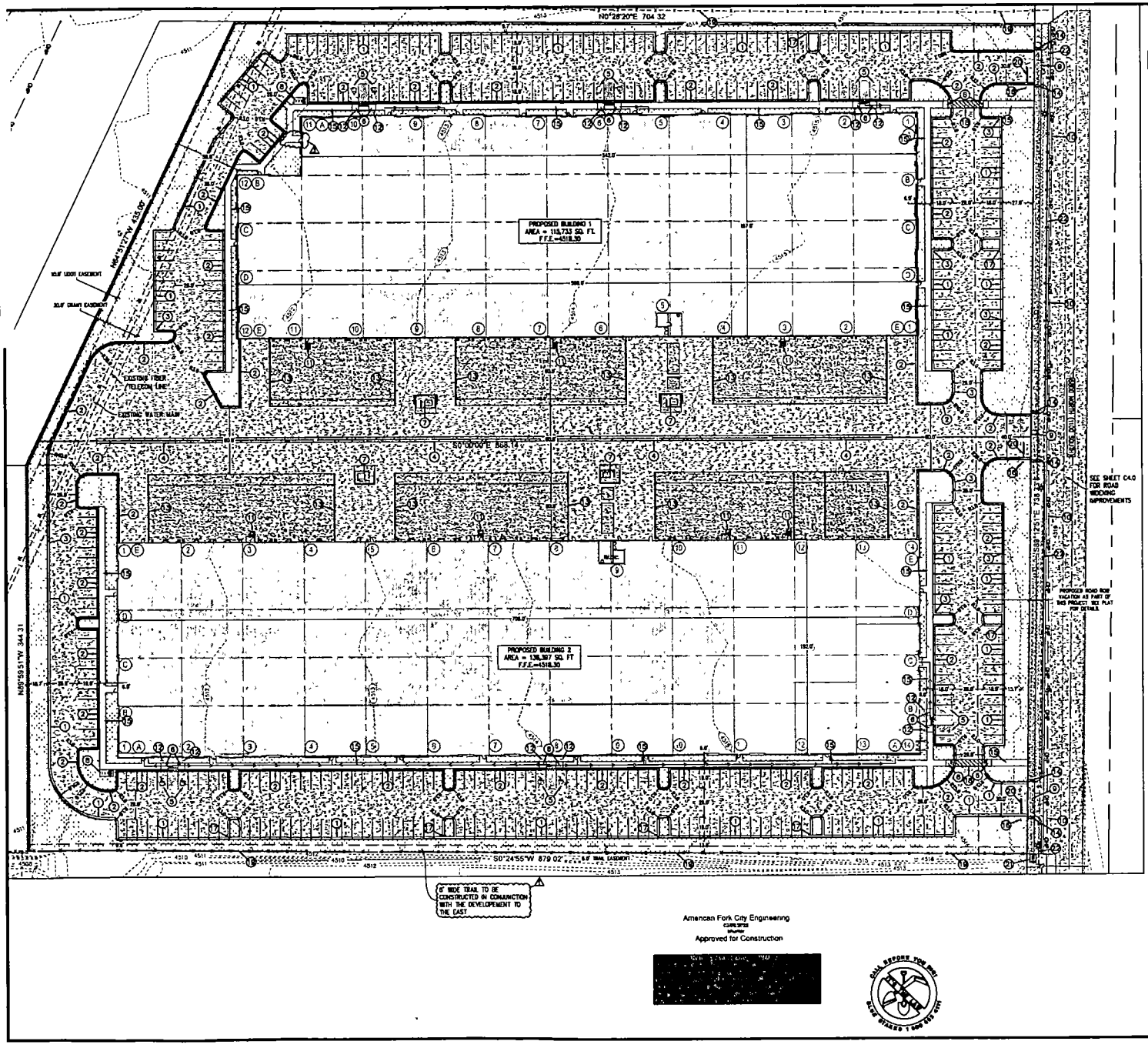
McKean, A.P., 2019, Geologic map of the Salt Lake City South quadrangle, Salt Lake County, Utah: Utah Geological Survey Map 283DM, 13 p., 2 plates, scale 1:24,000, https://doi.org/10.34191/M-283DM.

Currey, D.R., and Oviatt, C.G., 1985, Durations, average rates, and probable causes of Lake Bonneville expansion, still-stands, and contractions during the last deep-lake cycle, 32,000 to 10,000 years ago, in Kay, P.A., and Diaz, H.F., (eds.), Problems of and prospects for predicting Great Salt Lake levels - Processing of a NOAA Conference, March 26-28, 1985: Salt Lake City, Utah

Hunt, C.B., 1967, Physiography of the United States: San Francisco, W.H. Freeman, 480 p.

Hylland, M. D., DuRoss, C.B., McDonald, G.N., Olig, S.S., Oviatt, C.G., Mahan, S.A., Crone, A.J., and Personius, S.F., 2014, Late Quaternary paleoseismology of the West Valley fault zone, Utah: Insights from the Baileys Lake trench site, *in* DuRoss, C.B. and Hylland, M.D., Evaluating surface faulting chronologies of graben-bounding faults in Salt Lake Valley, Utah—new paleoseismic data from the Salt Lake City segment of the Wasatch fault zone and the West Valley fault zone—Paleoseismology of Utah, Volume 24: Utah Geological Survey Special Study 149, p. 41–76, 8 appendices, 1 plate.

Exhibit C-Site Grading Plan



Benchmark Info

The Benchmark for the project is the South Quarter Corner of Section 26 T.5 S. R.1 E. SLB&M
Elevation= 4503.89
Datum is NAVD 88 derived from UTAH TURNGPS System

SHEET LEGEND

ADA ROUTE

Scale in Feet

SEE COVER SHEET FOR PROJECT LEGEND

LOT 1 AREAS:

		SQ. FT. / ACRES
LOT 1		292,035 SQ. FT. / 6.70 ACRES
	BUILDING FOOTPRINT	115,887 SQ. FT / 2.65 ACRES
	ASPHALT	99,262 SQ. FT. / 2.28 ACRES
	LANDSCAPING	33,690 SQ. FT / 0.77 ACRES
	CONCRETE	43,185 SQ. FT / 0.99 ACRES

NOTE:
1 ALL AREA CALCULATIONS ARE APPROXIMATE AND CAN CHANGE DUE TO CONSTRUCTION TOLERANCES.

LOT PARKING REQUIREMENTS:

	SQ. FT.	CITY REQMT.	
OFFICE	20,000 SQ. FT	80	(4/1000)
WAREHOUSE	94,913 SQ. FT	95	(1/1000)
TOTAL REQUIRED:		175	
TOTAL PROVIDED:		187	
ACCESSIBLE SPACES		6 (6 REQ'D 151 TO 200)	
BICYCLE SPACES		8	

NOTES:
1 ALL AREA CALCULATIONS ARE APPROXIMATE AND CAN CHANGE DUE TO CONSTRUCTION TOLERANCES.

LOT 2 AREAS:

		SQ. FT. / ACRES
LOT 2		324,912 SQ. FT. / 7.46 ACRES
	BUILDING FOOTPRINT	136,488 SQ. FT / 3.13 ACRES
	ASPHALT	101,562 SQ. FT. / 2.33 ACRES
	LANDSCAPING	37,571 SQ. FT / 0.86 ACRES
	CONCRETE	49,291 SQ. FT / 1.13 ACRES

NOTE:
1. ALL AREA CALCULATIONS ARE APPROXIMATE AND CAN CHANGE DUE TO CONSTRUCTION TOLERANCES.

LOT 2 PARKING REQUIREMENTS:

	SQ. FT.	CITY REQMT.	
OFFICE	20,000 SQ. FT.	80	(4/1000)
WAREHOUSE	94,913 SQ. FT	85	(1/1000)
TOTAL REQUIRED:		175	
TOTAL PROVIDED:		217	
ACCESSIBLE SPACES		7 (7 REQ'D 201 TO 300)	
BICYCLE SPACES		8	

NOTES:
1 ALL AREA CALCULATIONS ARE APPROXIMATE AND CAN CHANGE DUE TO CONSTRUCTION TOLERANCES.

SITE PLAN NOTES:

1. PROPOSED 24" CURB & GUTTER SEE DETAIL 1/C5.0.
2. PROPOSED 24" REV PAN CURB & GUTTER. SEE DETAIL 3/C5.0.
3. CONTRACTOR TO PROVIDE A SMOOTH TRANSITION BETWEEN PROPOSED CURB & GUTTER AND REV PAN CURB & GUTTER.
4. PROPOSED 4' ROLL GUTTER. SEE DETAIL 2/C5.0.
5. ALL HANDICAP STALLS SHALL HAVE SLOPES OF LESS THAN 2% IN ALL DIRECTIONS. SEE DETAIL 11/C5.0.
6. ADA RAMPS ARE TO BE INSTALLED PER CITY AND ADA STANDARDS AND SPECIFICATIONS. SEE DETAILS 4/C5.0 & 14/C5.0.
7. PROPOSED TRASH ENCLOSURE PER AMERICAN FORK CITY STANDARD DETAIL 17.5.121.B SEE SHEET C5.2 FOR DETAIL.
8. PROPOSED "U" STYLE BICYCLE RACKS. SEE DETAIL 5/C5.0.
9. INSTALL RADIUS DRIVE APPROACH PER APWA STANDARD PLAN 253. SEE DETAIL SHEET, C5.2. SIDEWALK ACROSS DRIVE APPROACHES TO BE 6" (TYP.)
10. EXISTING OVERHEAD POWER TO BE RELOCATED. CONTRACTOR TO COORDINATE WITH ROCKY MOUNTAIN POWER.
11. PROPOSED STAIR SECTION SEE ARCHITECTURAL DRAWINGS FOR DETAILS.
12. PROPOSED ADA SIGN. SEE DETAIL 12/C5.0.
13. DOCK WALL, SEE STRUCTURAL PLANS FOR DETAILS
14. INSTALL DETECTABLE WARNING SURFACE PER APWA STANDARD PLAN NO. 238.
15. PROPOSED SIDEWALK PER APWA STANDARD PLAN NO. 231. SEE DETAIL ON SHEET C5.0.
16. INSTALL STOP SIGN PER MUTCD STANDARD R1-1
17. INSTALL CONCRETE THROUGH GUTTER. SEE DETAIL 13/C5.0.
18. INSTALL PAINTED PEDESTRIAN CROSSWALK HATCHING.
19. EXISTING FENCE, TO REMAIN.
20. INSTALL PAINTED STOP LINE ACCORDING TO MUTCD STANDARDS.
21. EXISTING WELL HEAD.
22. EXISTING FENCE, TO BE REMOVED

STOP

American Fork City Engineering
Approved for Construction

[redacted]

CALL BEFORE YOU DIG
BLUE STAKES 1-800-662-4111

NO	REVISIONS	BY	DATE
1	CITY COMMENTS	BCP	10/16/23
2	ARCHITECTURAL COORDINATION	BCP	12/19/23
3	MUNICIPAL UPDATE	BCP	02/14/24
4	MUNICIPAL UPDATE	BCP	03/19/24
5	MUNICIPAL UPDATE	BCP	05/14/24

DESIGNED: RGW | PROJECT OWNER: SDT

CIVIL ENGINEERING + SURVEYING
3032 SOUTH 1030 WEST, SUITE 202
S.L. Utah 84119 - 801-949-4296

DEER PARK

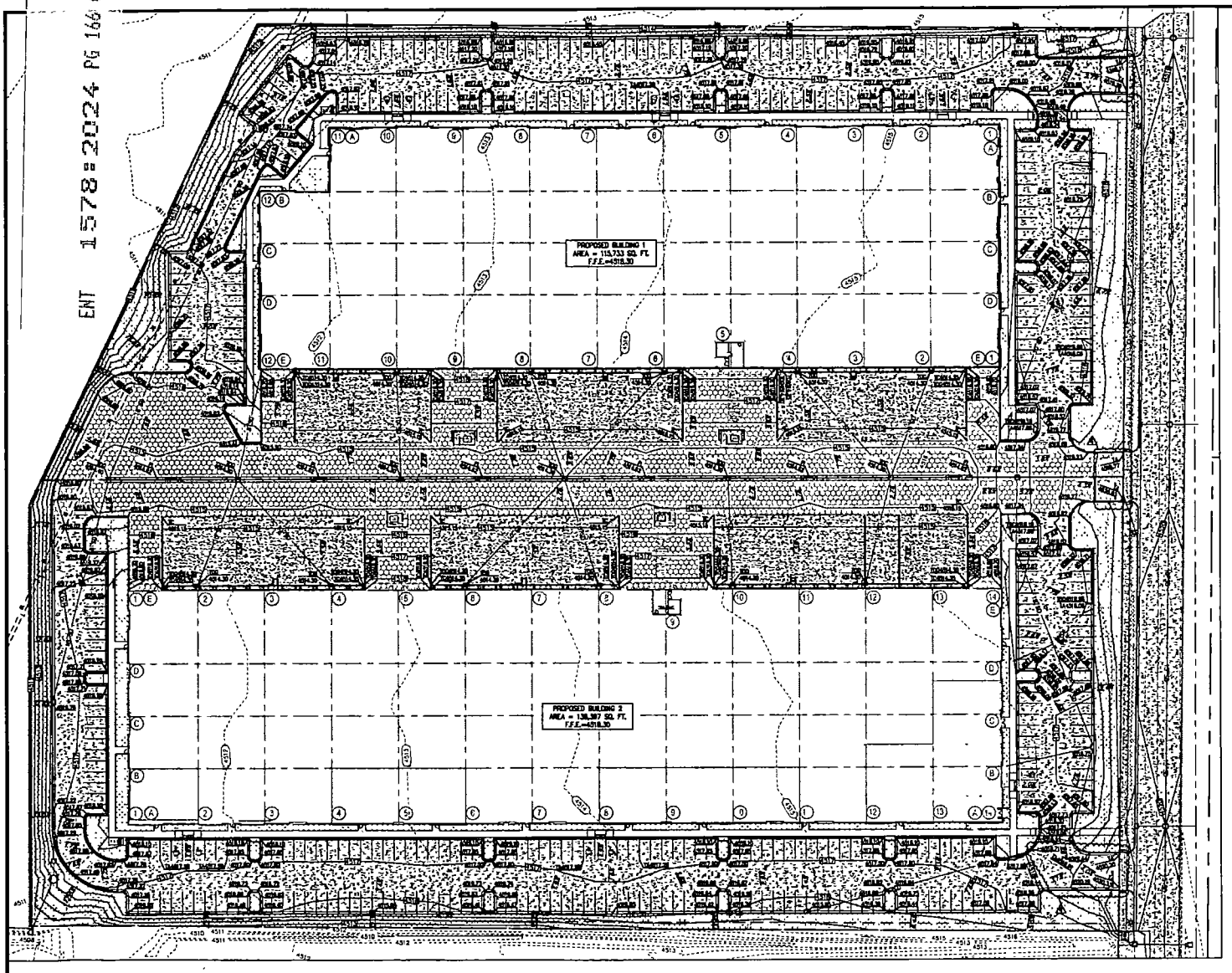
9 WEST & 42 EAST 1100 SOUTH, AMERICAN FORK, UTAH

SITE PLAN

LICENSED PROFESSIONAL ENGINEER
SCOTT D. THORSEN
No. 354291
STATE OF UTAH

SHEET NO
C1.0

PROJECT ID: A1140-01
DATE: 07/26/23
FILE NAME: PRJ-AFH
SCALE: 1"=60'



Benchmark Info

The Benchmark for the project is the South Quarter Corner of Section 26 T5S R1E SLB&M
Elevation= 4503.89'
Datum is NAVD 88 derived from UTAH TURNGPS System

SHEET LEGEND

- PROPOSED LIGHT ASPHALT 128,431 SF
- PROPOSED HEAVY ASPHALT 72,157 SF
- PROPOSED CONCRETE

Scale in Feet

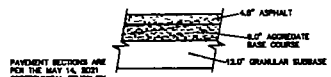
SEE COVER SHEET FOR PROJECT LEGEND

PAVEMENT SECTIONS ARE PER THE MAY 14, 2021 GEOTECHNICAL STUDY BY CGN (JOB NO 3334-003-21), CONTRACTOR TO INSTALL ALL PAVEMENT PER THE GEOTECH REPORT

OVER SUITABLE NATURAL SOILS, PROPERLY PREPARED EXISTING FILLS, AND/OR STRUCTURAL SITE GRADING FILL EXTENDING TO SUITABLE NATURAL SOILS

LIGHT ASPHALT PAVEMENT

N.T.S.



PAVEMENT SECTIONS ARE PER THE MAY 14, 2021 GEOTECHNICAL STUDY BY CGN (JOB NO 3334-003-21), CONTRACTOR TO INSTALL ALL PAVEMENT PER THE GEOTECH REPORT

OVER PROPERLY PREPARED NON-ENGINEERED FILLS, SUITABLE NATURAL SOILS AND/OR STRUCTURAL SITE GRADING FILL EXTENDING TO SUITABLE NATURAL SOILS

HEAVY ASPHALT PAVEMENT

N.T.S.

PAVEMENT SECTIONS ARE PER THE MAY 14, 2021 GEOTECHNICAL STUDY BY CGN (JOB NO 3334-003-21), CONTRACTOR TO INSTALL ALL PAVEMENT PER THE GEOTECH REPORT

OVER SUITABLE NATURAL SOILS, AND/OR STRUCTURAL SITE GRADING FILL EXTENDING TO SUITABLE NATURAL SOILS. (RIGID PAVEMENTS MUST NOT BE ESTABLISHED) OVER NON-ENGINEERED FILLS.

HEAVY CONCRETE PAVEMENT

N.T.S.

American Fork City Engineering

Approved for Construction

CIVIL ENGINEERING + SURVEYING
3032 SOUTH 1030 WEST, SUITE 202
S.L.C. Utah 84119 - 801-449-4286

NO	REVISIONS	BY	DATE
1	CITY COMMENTS	RCH	10/10/23
2	ARCHITECTURAL COORDINATION	RCH	12/20/23
3	SITE PLAN UPDATE	RCH	12/22/23
4	ROAD CROSS SECTION UPDATE	RCH	01/04/24
5	REVISIONS UPDATE	RCH	01/16/24

DESIGNED: RCH PROJECT ENGINEER: SDT

DEER PARK

9 WEST & 42 EAST 1100 SOUTH, AMERICAN FORK, UTAH

GRADING PLAN

SCOTT D. THORSEN No. 3543291 STATE OF UTAH

CALL BEFORE YOU DIG

SHEET NO
C2.0

PROJECT ID: A1140-01
DATE: 07/28/2
FILE NAME: PRJ-APH
SCALE: 1"=40'