Geotechnical Evaluation Report

Proposed Garden City Meetinghouse
129 South 100 West
Garden City, Utah
LDS Property Number: 501-5833

Prepared for:
The Church of Jesus Christ of Latter-day Saints
Idaho & North America Central Project Management Group
50 East North Temple Street COB12
Salt Lake City, Utah 84150

GSH

Prepared by
GSH Geotechnical
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The Church of Jesus Christ of Latter-day Saints
Idaho & North America Central Project Management Group
50 East North Temple Street COB12
Salt Lake City, Utah 84150

Attention: Mr. Allan Christean

Mr. Christean:

Re: Geotechnical Evaluation Report
Proposed Garden City Meetinghouse
129 South 100 West
Garden City, Utah
LDS Property Number: 501-5833

1. EXECUTIVE SUMMARY

This report presents the results of our geotechnical study performed at the site of the proposed Garden City Meetinghouse to be located at 129 South 100 West in Garden City, Utah.

The soils across the site were generally similar at the test pit locations. The test pit excavations typically encountered fine-grained soils extending to depths varying from 0.5 to 4.5 feet overlying gravels with varying silt, clay, and sand content extending to the maximum depths explored.

The natural fine-grained soils (silts and clays) were medium stiff to stiff, dry, and light brown and brown in color. The natural clay soils contained trace to numerous pinholes. Soils with a pinhole structure are indicative of soils that are moisture sensitive and potentially collapsible. These soils are anticipated to exhibit very low strength and very high compressibility characteristics when wetted.

The natural gravel soils were medium dense to dense, dry to moist, and light brown and brown in color. The natural gravel soils are anticipated to exhibit relatively high strength and low compressibility characteristics under the anticipated load range.

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The most significant geotechnical aspects of the site are the fine-grained soils encountered in Test Pits TP-1, TP-6, TP-9, and TP-10 that exhibited a 'pinhole' structure and contained 'floating' gravels. The 'pinhole' and 'floating' gravel are indicative of moisture sensitive and potentially collapsible soils. These soils are anticipated to exhibit very low strength and very high compressibility characteristics when wetted.

The results of the study indicate that the proposed structure may be supported upon conventional spread and continuous wall foundations established upon suitable natural granular soils or granular structural fill extending to suitable natural granular soils. Under no circumstance shall footings, floor slabs, or rigid pavements be placed upon topsoil, potentially collapsible soils, loose/disturbed soils, or non-engineered fill (if encountered).

Prior to proceeding with construction, removal of all topsoil, potentially collapsible soils, non-engineered fills (if encountered), loose/disturbed soil, surface vegetation, root systems, and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed building foundations and 3 feet beyond pavements and exterior flatwork areas will be required. All footing excavations must extend to undisturbed natural soils.

In flexible pavement areas, the in situ, potentially collapsible soils may remain if free of any deleterious materials and if properly prepared, as discussed later in this report. Even with subgrade preparation, some settlement and differential settlement may occur over thicker sequences of potentially collapsible soils unless they are completely removed.

Based upon our review of available literature, no active faults are known to pass through or immediately adjacent to the site.

2. INTRODUCTION

This report presents the results of our geotechnical study performed at the site of the proposed Garden City Meetinghouse to be located at 129 South 100 West in Garden City, Utah. The general location of the site with respect to existing roadways, as of 2018, is presented on Figure 1, Vicinity Map. A more detailed layout of the site showing proposed facilities, existing roadways, and the test pits excavated in conjunction with this study is presented on Figure 2, Site Plan.

3. AUTHORIZATION

Authorization was provided by the client returning a signed "Agreement Between Client and Geotechnical Consultant" in accordance with our Professional Services Agreement No. 18-1133.

4. PROJECT DESCRIPTION, PURPOSE OF EVALUATION, & SCOPE OF WORK

The objectives and scope of our study were planned in discussions among Mr. Allan Christean of The Church of Jesus Christ of Latter-day Saints and Mr. Mike Huber, P.E. of GSH Geotechnical, Inc. (GSH).

In general, the objectives of this study were to:

1. Define and evaluate the subsurface soil and groundwater conditions at the proposed site.

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

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

1. A field program consisting of the drilling, logging, and sampling of 11 excavation test pits, as well as the performance of an infiltration test.

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.

5. 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 test pits, projected groundwater conditions, and the layout and design data discussed in Section 6, Design Criteria, of this report. 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.

6. DESIGN CRITERIA

The meetinghouse will be constructed on an approximately 7-acre parcel. The structure will be 1 to 1-extended level in height and of wood-frame construction established slab on grade supported over conventional spread and continuous wall foundations.

Maximum real column and wall loads are anticipated to be 120 kips and 5 kips per lineal foot, respectively. Real loads are defined as the total of all dead plus frequently applied (reduced) live loads.

Extensive at-grade paved parking will be part of the overall site development. Projected traffic in the parking areas is anticipated to consist of a light volume of automobiles and light trucks with occasional medium-weight trucks and no heavyweight trucks. In primary drive areas within the church parking lot, traffic is projected to consist of a moderate volume of automobiles and light trucks, a light volume of medium-weight trucks, and occasional heavyweight trucks (primarily garbage trucks).

Maximum site grading cuts and fills are anticipated to be moderate and on the order of 1 to 3 feet.

7. SITE CONDITIONS

The rectangular-shaped site consists of a mostly vacant/undeveloped 7-acre parcel located at 129 South 100 West in Garden City, Utah. The west side of the site consists of an alfalfa field and the east side is utilized as a staging/storage area for farm equipment and agricultural products (hay bales). The site is sparsely vegetated with various weeds and occasional brush along the perimeter. The site slopes downward to the east with total relief of approximately 18 to 20 feet.

The site is bound to the north by a landscaping/nursery retail and storage facility with a go-cart track and a vacant/undeveloped parcel beyond, to the east by 100 West Street followed by a boat trailer storage yard with single-family residences beyond, to the south by an industrial structure currently under construction, and to the west by a gravel access road with a similar vacant/undeveloped agricultural parcel beyond.

8. FIELD STUDY

In order to define and evaluate the subsurface soil and groundwater conditions across the site, 11 excavation test pits were extended to depths ranging from 5 to 20.5 feet below existing grades. These test pits were completed using a moderate-sized trackhoe. The approximate locations of the test pits are presented on Figure 2. Additionally, an infiltration test was performed in Test Pit TP-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 excavation operations, a continuous log of the subsurface conditions encountered was maintained. In addition, samples of the typical soils penetrated were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural properties. These classifications were later supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3K, Log of Test Pits. Soils were classified in accordance with the nomenclature described on Figure 4, Key to Test Pit Log (USCS).

A 2.42-inch inside diameter thin-wall drive sampler was utilized at select locations and depths within the test pit excavations to collect soil samples for further examination and laboratory testing.

Following completion of the excavations, the test pits were then backfilled. Although an effort was made to compact the backfill with the backhoe, backfill was not placed in uniform lifts and compacted to a specific density. Consequently, settlement of the backfill with time is likely to occur.

9. SUBSURFACE CONDITIONS AND GROUNDWATER

The soils across the site were generally similar at the test pit locations. The test pit excavations typically encountered fine-grained soils extending to depths varying from 0.5 to 4.5 feet overlying gravels with varying silt, clay, and sand content extending to the maximum depths explored.

The natural fine-grained soils (silts and clays) were medium stiff to stiff, dry, light brown and brown in color. The natural clay soils contained trace to numerous pinholes. Soils with a pinhole structure are indicative of soils that are moisture sensitive and potentially collapsible. These soils are anticipated to exhibit very low strength and very high compressibility characteristics when wetted.

The natural gravel soils were medium dense to dense, dry to moist, and light brown and brown in color. The natural gravel soils are anticipated to exhibit relatively high strength and low compressibility characteristics under the anticipated load range.

For additional details pertaining to the subsurface conditions encountered, please refer to Figures 3A through 3K, Test Pit Logs. The lines designating the interface between soil types on the test pit logs generally represent approximate boundaries. In situ, the transition between soil types may be gradual.

Groundwater was not encountered and is anticipated to be at significant depth at the site.

Seasonal and longer-term groundwater fluctuations are projected, with the highest seasonal levels generally occurring during the late spring and early summer months. Additional groundwater fluctuations could occur due to snowmelt.

10. LABORATORY TESTING

10.1 General

In order to provide data necessary for our engineering analysis, a laboratory testing program was completed. The program included partial gradation, Atterberg limits, collapse/consolidation, chemical, and topsoil tests. The following paragraphs describe the tests and summarize the test data.

10.2 Partial Gradation Tests

To aid in classifying the granular soils, partial gradation tests were performed. Results of these tests are presented on the following table and on the test pit logs, Figures 3A through 3K.

Test Pit No.	Depth (feet)	Percent Passing No. 200 Sieve	Moisture Content Percent	Soil Classification
TP-1	5.0	18.2	3.6	GM
TP-2	2.5	3.8	2.1	GP
TP-3	5.0	6.9	3.3	GP/GM
TP-4	10.0	32.1	10.1	GM
TP-6	5.0	11.1	2.2	GP/GM
TP-6	10.0	15.1	3.2	GM

10.2.1 Atterberg Limits Test

To aid in classifying the soils, an Atterberg limits test was performed on a sample of the fine-grained cohesive soils. Results of the test are tabulated below and presented on the test pit logs, Figures 3A through 3K:

Test Pit No.	Depth (feet)	Liquid Limit (percent)	Plastic Limit (percent)	Plasticity Index (percent)	Soil Classification
TP-1	2.5	25	21	4	CL

10.2.2 Collapse/Consolidation Tests

To provide data necessary for our settlement analysis, a collapse/consolidation tests was performed upon a representative sample of the natural fine-grained soils obtained at a depth of 2.5 feet in Test Pit TP-10.

The collapse portions of the tests were performed as follows:

1. Load sample at in situ moisture content to specific axial pressure.
2. Measure and record axial deflection.
3. Saturate sample.
4. Measure and record resulting collapse.

Test Pit No.	Depth (feet)	Soil Type	Natural Dry Density (pcf)	Natural Moisture Content (percent)	Axial Load When Saturated (psf)	Collapse (percent)
TP-10	2.5	ML	TIP	TIP	800	4.0

TIP = Testing in Progress

Upon completion of the collapse portion of the tests, standard consolidation test loading was applied. The current results of the tests indicate that the fine-grained soils encountered in the upper 4.5 feet containing pinholes/rootholes with low density and moisture contents exhibit very low pre-consolidation pressures and are highly compressible when wetted, indicative of a collapsible soil.

Detailed results of these tests are maintained within our files and can be transmitted to you, upon your request.

10.3 Chemical Tests

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.

10.4 Topsoil Tests

A series of topsoil tests were performed on a representative surface sample. The results of these tests are attached to this study as Appendix A, Topsoil Testing Report.

11. INFILTRATION TEST

An infiltration test was performed at depth of 5 feet at Test Pit TP-5 within the natural gravel soils. The measured infiltration rate was 10 minutes per inch, which is typical of the type of soil tested.

12. RECOMMENDATIONS AND CONCLUSIONS

12.1 SUMMARY OF FINDINGS

The results of the study indicate that the proposed structure may be supported upon conventional spread and continuous wall foundations established upon suitable natural granular soils and/or structural fill extending to suitable natural granular soils. The most significant finding is the potentially collapsible soils encountered at the site that extended to depths of 0.5 to 4.5 feet below the existing ground surface. These potentially collapsible soils are likely present in unexplored areas of the site and may extend to greater depths. Under no circumstance shall the footings, floor

slabs, or rigid pavements be placed upon topsoil, potentially collapsible soils, loose/disturbed soils, or non-engineered fill (if encountered).

Prior to proceeding with construction, removal of all topsoil, potentially collapsible soils, loose/disturbed soils, non-engineered fills (if encountered), surface vegetation, root systems, and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed building foundations and 3 feet beyond rigid pavements and exterior flatwork areas will be required. All footing excavations must extend to suitable natural granular soils.

In flexible pavement areas, the in situ, potentially collapsible soils may remain if free of any deleterious materials and if properly prepared, as discussed later in this report. Even with subgrade preparation, some settlement and differential settlement may occur over thicker sequences of potentially collapsible soils unless they are completely removed.

Potentially collapsible soils may be present across some areas of the site to varying depths. Therefore, a geotechnical engineer from GSH must observe all foundation and floor slab excavation to identify that all collapsible/unsuitable soils have been removed.

In the following sections, detailed discussions pertaining to earthwork, foundations, lateral resistance and pressures, floor slabs, pavements, and the geoseismic setting of the site are provided.

12.2 EARTHWORK

12.2.1 Site Preparation

Initial site preparation will consist of the removal of all topsoil, potentially collapsible soils, loose/disturbed soils, surface vegetation, root systems, non-engineered fill, debris, and any deleterious materials from beneath an area extending out at least 5 feet from the perimeter of the proposed building foundations and 3 feet beyond pavements and exterior flatwork areas.

The potentially collapsible soils may remain below flexible pavements if less than 5 feet in thickness, and if properly prepared. Proper preparation below pavements will consist of the scarification of the upper 18 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 potentially collapsible soils may encounter some long-term movements unless they are completely removed. If this is unacceptable, all potentially collapsible soils must be completely removed and replaced with compacted structural fill.

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 the above operations and prior to the placement of footings, structural site grading fill, or floor slabs, the exposed natural subgrade must be proof rolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If any loose, soft, or disturbed zones are encountered, they must be completely removed in footing and floor slab areas and replaced with granular structural fill. 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 soils encountered during compaction and proof rolling must 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.

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

12.2.2 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.

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.

12.2.3 Structural Fill

Structural fill is defined as all fill which will ultimately be subjected to structural loadings, such as those 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 sod, 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.

Only granular soils are recommended as structural fill in confined areas, such as around foundations, within utility trenches, and as replacement fill below foundations.

All imported granular structural fill shall consist of a fairly well graded mixture of sand and gravel containing less than 20 percent fines (percent by weight of material passing the U.S. No. 200 sieve) and no more than 30 percent retained on the three-quarter-inch sieve.

To stabilize soft subgrade conditions 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.

Non-structural site grading fill is defined as all fill material not designated as structural fill and may consist of any cohesive or granular soils not containing excessive amounts of degradable material.

12.2.4 Fill Placement and Compaction

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] T-180 (ASTM[2] D1557) compaction criteria in accordance with the table below:

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 8	95
Site Grading Fills Outside area defined above	0 to 5	90
Site Grading fills Outside area defined above	5 to 8	95
Utility Trenches	--	96
Aggregate base	--	96

Structural fills greater than 8 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 12.2.1, Site Preparation, of this report.

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

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.

Coarse gravel and cobble mixtures (stabilizing fill) 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 fill may be compacted by passing moderately heavy construction equipment or large self-propelled compaction equipment 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.

12.2.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (flatwork, floor slabs, roads, 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.

Most utility companies and City-County governments are now requiring that Type A-1a or A-1b (AASHTO Designation – basically 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 T-180 (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 clays and silts, are not recommended for utility trench backfill.

12.3 SPREAD AND CONTINUOUS WALL FOUNDATIONS

12.3.1 Design Data

The results of our analysis indicate that the proposed structure may be supported upon conventional spread and continuous wall foundations established upon suitable natural granular soils and/or structural fill extending to suitable natural granular soils. Under no circumstance shall footings be placed overlying potentially collapsible soils. For design, the following parameters are provided with respect to the projected loading discussed in Section 6, Design Criteria of this report:

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 Granular Soils	- 3,000 pounds per square foot
Bearing Capacity Increase for Seismic Loading	- 50 percent

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.

12.3.2 Installation

Under no circumstances shall the footings be established upon potentially collapsible soils, loose or disturbed soil, surface vegetation, root systems, topsoil, rubbish, construction debris, non-engineered fill, frozen soil, or other deleterious materials. If unsuitable soils are encountered, they must be completely removed and replaced with compacted structural fill.

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

12.3.3 Settlements

Based on column loadings, soil bearing capacities, and the foundation recommendations as discussed above, settlements are anticipated 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 one-half to three-quarter-inch. The final deflected shape of the structure will be dependent on actual foundation locations and loading.

12.4 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 0.40 for footing interface with the natural granular soils. 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.

12.5 FLOOR SLABS

Floor slabs may be established upon suitable natural granular soils and/or upon structural fill extending to suitable natural granular soils. Under no circumstances shall floor slabs be established over topsoil, potentially collapsible soils, loose/disturbed soils, non-engineered fills, surface vegetation, root systems, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

In order 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.

In accordance with the Geotechnical Evaluation Report Template, floor slabs are to be constructed without control or construction joints, are reinforced with No. 4 bars at 18 inches on center each way, and shall include a 15-mil vapor retarder placed directly under the concrete with at least 4 inches of "free-draining" fill, described previously, placed below the vapor retarder.

12.6 PAVEMENTS

All pavement areas must be prepared as previously discussed (see Section 12.2.1, Site Preparation). Under no circumstances shall pavements be established over topsoil, unprepared potentially collapsible soils, loose or disturbed soils, non-engineered fills, surface vegetation, root systems, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. With the subgrade soils and the projected traffic (40-year design life) as discussed in Section 6, Design Criteria, the pavement sections on the following pages are recommended.

Parking Areas

(Light Volume of Automobiles and Light Trucks,
Occasional Medium-Weight Trucks,
No Heavyweight Trucks)
[6 equivalent 18-kip axle loads per week]

Flexible:

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

Rigid:

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

Parking Lot Drive Lanes and Access Driveways

(Moderate Volume of Automobiles and Light Trucks,
Light Volume of Medium-Weight Trucks,
and Occasional Heavyweight Trucks)
[15 equivalent 18-kip axle loads per week]

Flexible:

3.0 inches	Asphalt concrete
8.0 inches	Aggregate base

	Over	Properly prepared natural subgrade soils and/or structural site grading fill extending to suitable natural subgrade soils
Rigid:		
	5.5 inches	Portland cement concrete (non-reinforced)
	4.0 inches	Aggregate base
	Over	Properly prepared natural subgrade soils and/or structural site grading fill extending to suitable natural subgrade soils

For trash enclosure approach slabs (one 40,000-pound axel load per week), we recommend a pavement section consisting of 6.5 inches of Portland cement concrete, 6.0 inches of aggregate base, over properly prepared and stabilized natural subgrade or site grading structural fills extending to suitable stabilized natural soils.

The 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 shall have a minimum 28-day unconfined compressive strength of 4,500 pounds per square inch, contain 6 percent ±1 percent air-entrainment, and meet the requirements given below in Section 12.7, Cement Types, of this report. In accordance with the Geotechnical Evaluation Report Template, 25 percent fly ash is required in all concrete exposed to freeze-thaw cycles and deicers.

The crushed stone shall conform to applicable sections of the current Utah Department of Transportation (UDOT) Standard Specifications. All asphalt material and paving operations shall 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.

12.7 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.

12.8 DOWNSPOUTS

It is recommended that all surface water be directed away from the building with positive drainage measures, including downspouts.

12.9 GEOSEISMIC SETTING

12.9.1 General

Utah municipalities adopted the International Building Code (IBC) 2015. The IBC 2015 code determines the seismic hazard for a site based upon 2008 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).

The structure must be designed in accordance with the procedure presented in Section 1613, Earthquake Loads, of the IBC 2015 edition.

12.9.2 Faulting

Based upon our review of available literature, no active faults are known to pass through or immediately adjacent to the site. The nearest active mapped fault is the southern section of the eastern Bear Lake Fault, located about 5.9 miles to the east-southeast of the site.

12.9.3 Soil Class

For dynamic structural analysis, the Site Class D - Stiff Soil Profile as defined in Chapter 20 of ASCE 7 (per Section 1613.3.2, Site Class Definitions, of IBC 2015) can be utilized.

12.9.4 Ground Motions

The IBC 2015 code is based on 2008 USGS mapping, which provides values of short and long period accelerations for the Site Class B boundary for the Maximum Considered Earthquake (MCE). This Site Class B boundary represents average bedrock values for the Western United States and must be corrected for local soil conditions. The table on the following page 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 D soil profile. Based on the site latitude and

longitude (41.9449 degrees north and 111.3972 degrees west, respectively), the values for this site are tabulated on the following table:

Spectral Acceleration Value, T	Site Class B Boundary [mapped values] (% g)	Site Coefficient	Site Class D [adjusted for site class effects] (% g)	Design Values (% g)
Peak Ground Acceleration	44.8	F_a = 1.052	47.2	31.5
0.2 Seconds (Short Period Acceleration)	S_S = 112.1	F_a = 1.052	S_{MS} = 117.9	S_{DS} = 78.6
1.0 Second (Long Period Acceleration)	S_1 = 33.9	F_v = 1.722	S_{M1} = 58.4	S_{D1} = 38.9

12.9.5 Liquefaction

The site is located in an area that has been identified by the Utah Geological Survey (UGS) as being a "very low" 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.

Liquefaction is not anticipated to occur due to dense granular soils, and a lack of a shallow groundwater table.

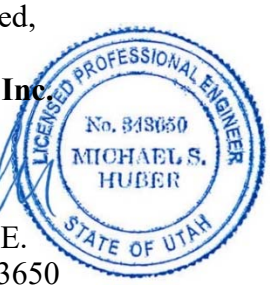
12.10 SITE VISITS

Prior to placement of foundations and site grading fills, GSH must verify that suitable natural soils have been encountered below floor slabs, footings, structural fill, and pavements.

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.



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

Reviewed by:

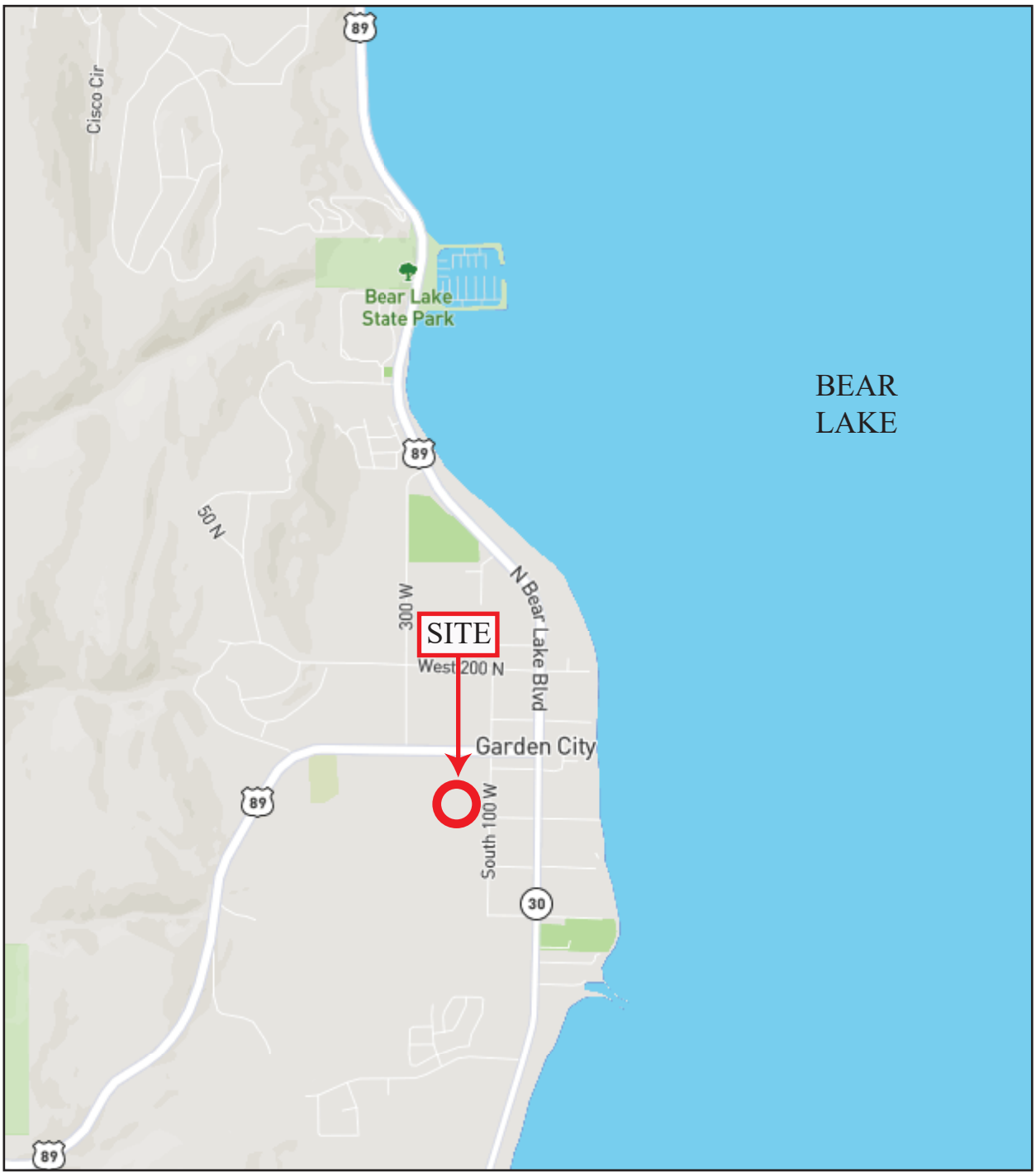
Alan D. Spilker, P.E.
State of Utah No. 334228
President/Senior Geotechnical Engineer

MSH/ADS:jlh

Encl. Figure 1, Vicinity Map
Figure 2, Site Plan
Figures 3A through 3K Log of Test Pits
Figure 4, Key to Test Pit Logs (USCS)
Appendix A Topsoil Testing Report

Addressee: (email)

THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS
JOB NO. 0153-411-18



0.5 0 0.5 1 1.5 2 KM 2.5

0.5 0 0.5 MI 1

FIGURE 1
VICINITY MAP

REFERENCE:
ALL TRAILS - NATIONAL GEOGRAPHIC TERRAIN
DATED 2018

GSH

THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS
JOB NO. 0153-411-18

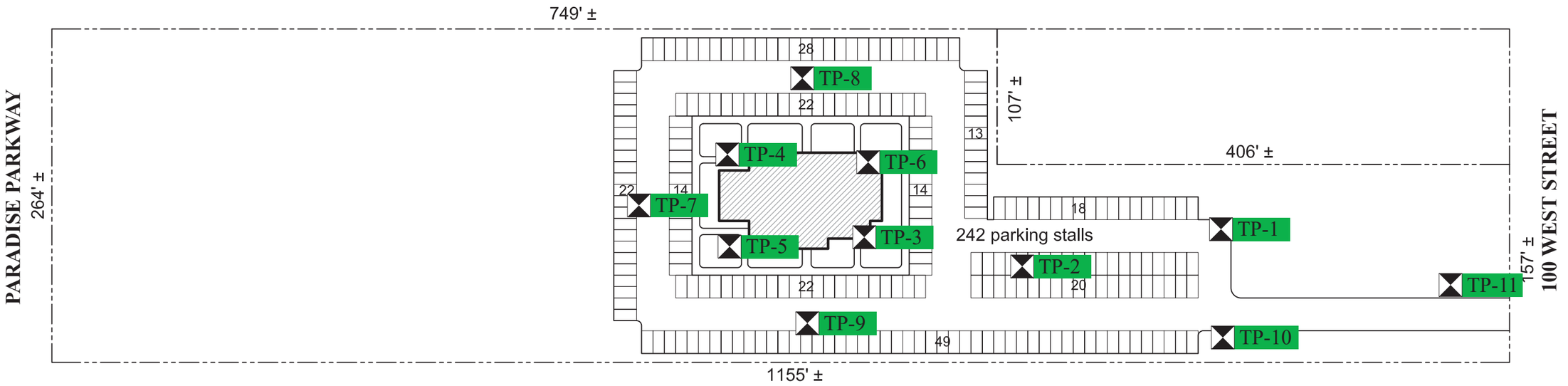


FIGURE 2
SITE PLAN

REFERENCE:
ADAPTED FROM DRAWING ENTITLED
"SITE PLAN" PROVIDED BY CLIENT

APPROXIMATE SCALE IN FEET
45 0 45 90

GSH

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-1

CLIENT: The Church of Jesus Christ of Latter-day Saints | PROJECT NUMBER: 0153-411-18

PROJECT: Prop Garden City Meetinghouse (Property No 501-5833) | DATE STARTED: 12/13/18 | DATE FINISHED: 12/13/18

LOCATION: 129 South 100 West, Garden City, Utah | GSH FIELD REP.: SH

EXCAVATING METHOD/EQUIPMENT: CAT 430D - Backhoe

GROUNDWATER DEPTH: Not Encountered (12/13/18) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	SILTY CLAY with trace fine to coarse sand and gravel; major roots (topsoil) to 12"; pinholes; light brown								dry medium stiff
								25	4	
	GM	SILTY FINE AND COARSE GRAVEL with some fine to coarse sand; light brown	5		3.6		18.2			slightly moist dense
	GP/GM	FINE AND COARSE GRAVEL with some fine to coarse sand, silt, and cobbles; light brown	10							slightly moist dense
			15							
		End of exploration at 15.5'. No significant sidewall caving. No groundwater encountered at time of excavation. Installed 1.25" diameter slotted PVC pipe to 15.5'.	20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 3A

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-2

CLIENT: The Church of Jesus Christ of Latter-day Saints | PROJECT NUMBER: 0153-411-18

PROJECT: Prop Garden City Meetinghouse (Property No 501-5833) | DATE STARTED: 12/13/18 | DATE FINISHED: 12/13/18

LOCATION: 129 South 100 West, Garden City, Utah | GSH FIELD REP.: SH

EXCAVATING METHOD/EQUIPMENT: CAT 430D - Backhoe

GROUNDWATER DEPTH: Not Encountered (12/13/18) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	FINE TO COARSE SANDY CLAY with silt; major roots (topsoil) to 6"; light brown								dry loose
	GP	FINE AND COARSE GRAVEL with some fine to coarse sand, cobbles, and trace silt; light brown								dry dense
					2.1		3.8			
			5							slightly moist
			10							
		End of exploration at 10.5'. No significant sidewall caving. No groundwater encountered at time of excavation. Installed 1.25” diameter slotted PVC pipe to 10.5’.								
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 3B

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-3

CLIENT: The Church of Jesus Christ of Latter-day Saints | PROJECT NUMBER: 0153-411-18

PROJECT: Prop Garden City Meetinghouse (Property No 501-5833) | DATE STARTED: 12/13/18 | DATE FINISHED: 12/13/18

LOCATION: 129 South 100 West, Garden City, Utah | GSH FIELD REP.: SH

EXCAVATING METHOD/EQUIPMENT: CAT 430D - Backhoe

GROUNDWATER DEPTH: Not Encountered (12/13/18) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	FINE TO COARSE SANDY CLAY with silt; major roots (topsoil) to 6"; light brown								dry loose
	GP/GM	FINE AND COARSE GRAVEL with fine to coarse sand, some silt, and cobbles; light brown								dry dense
			5		3.3		6.9			
										slightly moist
			10							
			15							
			20							
		End of exploration at 20.5'. No significant sidewall caving. No groundwater encountered at time of excavation. Installed 1.25" diameter slotted PVC pipe to 20.5'.								
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 3C

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-4

CLIENT: The Church of Jesus Christ of Latter-day Saints
PROJECT NUMBER: 0153-411-18

PROJECT: Prop Garden City Meetinghouse (Property No 501-5833)
DATE STARTED: 12/13/18 DATE FINISHED: 12/13/18

LOCATION: 129 South 100 West, Garden City, Utah
GSH FIELD REP.: SH

EXCAVATING METHOD/EQUIPMENT: CAT 430D - Backhoe

GROUNDWATER DEPTH: Not Encountered (12/13/18)
ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	FINE TO COARSE SANDY CLAY with silt; major roots (topsoil) to 6"; light brown								dry loose
	GP/ GM	FINE AND COARSE GRAVEL with fine to coarse sand, some silt, and trace cobbles; light brown								dry dense
			5							
	GM	SILTY FINE AND COARSE GRAVEL with fine to coarse sand and some cobbles; light brown	10		10.1		32.1			moist dense
	GP/ GC	FINE AND COARSE GRAVEL with some clay, trace fine to coarse sand, and trace silt; light brown	15							moist dense
		End of exploration at 15.5'. No significant sidewall caving. No groundwater encountered at time of excavation. Installed 1.25" diameter slotted PVC pipe to 15.5'.	20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 3D

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-5

CLIENT: The Church of Jesus Christ of Latter-day Saints | PROJECT NUMBER: 0153-411-18

PROJECT: Prop Garden City Meetinghouse (Property No 501-5833) | DATE STARTED: 12/13/18 | DATE FINISHED: 12/13/18

LOCATION: 129 South 100 West, Garden City, Utah | GSH FIELD REP.: SH

EXCAVATING METHOD/EQUIPMENT: CAT 430D - Backhoe

GROUNDWATER DEPTH: Not Encountered (12/13/18) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	FINE TO COARSE SANDY CLAY with silt; major roots (topsoil) to 6"; light brown								dry loose
	GP/ GM	FINE AND COARSE GRAVEL with some fine to coarse sand and silt;light brown								dry medium dense
			5							slightly moist
		grades with some silt	10							dense
		End of exploration at 15.0'. No significant sidewall caving. No groundwater encountered at time of excavation. Installed 1.25” diameter slotted PVC pipe to 15.0’.	15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 3E

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-6

CLIENT: The Church of Jesus Christ of Latter-day Saints — PROJECT NUMBER: 0153-411-18

PROJECT: Prop Garden City Meetinghouse (Property No 501-5833) — DATE STARTED: 12/13/18 — DATE FINISHED: 12/13/18

LOCATION: 129 South 100 West, Garden City, Utah — GSH FIELD REP.: SH

EXCAVATING METHOD/EQUIPMENT: CAT 430D - Backhoe

GROUNDWATER DEPTH: Not Encountered (12/13/18) — ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	ML	CLAYEY SILT with some fine sand and trace fine gravel; major roots (topsoil) to 12"; pinholes; light brown								dry stiff
	GP/GM	FINE AND COARSE GRAVEL with some fine to coarse sand and silt; light brown	5		2.2		11.1			dry medium dense
	GM	SILTY FINE AND COARSE GRAVEL with fine to coarse sand; light brown	10		3.2		15.1			slightly moist dense
		End of exploration at 10.5'. No significant sidewall caving. No groundwater encountered at time of excavation. Installed 1.25” diameter slotted PVC pipe to 10.5’.	15 20 25							

See Subsurface Conditions section in the report for additional information.

FIGURE 3F

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-7

CLIENT: The Church of Jesus Christ of Latter-day Saints | PROJECT NUMBER: 0153-411-18

PROJECT: Prop Garden City Meetinghouse (Property No 501-5833) | DATE STARTED: 12/13/18 | DATE FINISHED: 12/13/18

LOCATION: 129 South 100 West, Garden City, Utah | GSH FIELD REP.: SH

EXCAVATING METHOD/EQUIPMENT: CAT 430D - Backhoe

GROUNDWATER DEPTH: Not Encountered (12/13/18) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	FINE TO COARSE SANDY CLAY with silt; major roots (topsoil) to 6"; light brown								dry loose
	GM	SILTY FINE AND COARSE GRAVEL with some fine to coarse sand; light brown								dry dense
		End of exploration at 5.0'. No significant sidewall caving. No groundwater encountered at time of excavation.	5							
			10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 3G

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-8

CLIENT: The Church of Jesus Christ of Latter-day Saints | PROJECT NUMBER: 0153-411-18

PROJECT: Prop Garden City Meetinghouse (Property No 501-5833) | DATE STARTED: 12/13/18 | DATE FINISHED: 12/13/18

LOCATION: 129 South 100 West, Garden City, Utah | GSH FIELD REP.: SH

EXCAVATING METHOD/EQUIPMENT: CAT 430D - Backhoe

GROUNDWATER DEPTH: Not Encountered (12/13/18) | ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	CL	FINE TO COARSE SANDY CLAY with silt; major roots (topsoil) to 6"; light brown								dry loose
	GM	SILTY FINE AND COARSE GRAVEL with some fine to coarse sand and cobbles; light brown								dry dense
		End of exploration at 5.0'. No significant sidewall caving. No groundwater encountered at time of excavation.	5							
			10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 3H

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-9

CLIENT: The Church of Jesus Christ of Latter-day Saints
PROJECT NUMBER: 0153-411-18

PROJECT: Prop Garden City Meetinghouse (Property No 501-5833)
DATE STARTED: 12/13/18 DATE FINISHED: 12/13/18

LOCATION: 129 South 100 West, Garden City, Utah
GSH FIELD REP.: SH

EXCAVATING METHOD/EQUIPMENT: CAT 430D - Backhoe

GROUNDWATER DEPTH: Not Encountered (12/13/18)
ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	ML	CLAYEY SILT with some fine sand and fine and coarse gravel; major roots (topsoil) to 12"; pinholes; brown								dry stiff
	GM	SILTY FINE AND COARSE GRAVEL with some fine to coarse sand; brown								dry dense
		End of exploration at 5.0'. No significant sidewall caving. No groundwater encountered at time of excavation.	5							
			10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 3I

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-10

CLIENT: The Church of Jesus Christ of Latter-day Saints
PROJECT NUMBER: 0153-411-18

PROJECT: Prop Garden City Meetinghouse (Property No 501-5833)
DATE STARTED: 12/13/18 DATE FINISHED: 12/13/18

LOCATION: 129 South 100 West, Garden City, Utah
GSH FIELD REP.: SH

EXCAVATING METHOD/EQUIPMENT: CAT 430D - Backhoe

GROUNDWATER DEPTH: Not Encountered (12/13/18)
ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	ML	CLAYEY SILT with trace fine sand; major roots (topsoil) to 12"; pinholes; light brown								dry medium stiff
	GP	FINE TO COARSE SANDY FINE AND COARSE GRAVEL with trace silt; brown								dry dense
		End of exploration at 5.0'. No significant sidewall caving. No groundwater encountered at time of excavation.	5							
			10							
			15							
			20							
			25							

See Subsurface Conditions section in the report for additional information.

FIGURE 3J

TEST PIT LOG

Page: 1 of 1

TEST PIT: TP-11

CLIENT: The Church of Jesus Christ of Latter-day Saints
PROJECT NUMBER: 0153-411-18

PROJECT: Prop Garden City Meetinghouse (Property No 501-5833)
DATE STARTED: 12/13/18 DATE FINISHED: 12/13/18

LOCATION: 129 South 100 West, Garden City, Utah
GSH FIELD REP.: SH

EXCAVATING METHOD/EQUIPMENT: CAT 430D - Backhoe

GROUNDWATER DEPTH: Not Encountered (12/13/18)
ELEVATION: ---

WATER LEVEL	USCS	DESCRIPTION	DEPTH (FT.)	SAMPLE SYMBOL	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTICITY INDEX	REMARKS
		Ground Surface	0							
	SM	SILTY FINE TO COARSE SAND with some clay; major roots (topsoil) to 12"; light brown								dry dense
	GM	SILTY FINE AND COARSE GRAVEL with some fine to coarse sand; brown	5							dry dense
		End of exploration at 5.0'. No significant sidewall caving. No groundwater encountered at time of excavation.	10 15 20 25							

See Subsurface Conditions section in the report for additional information.

FIGURE 3K

CLIENT: The Church of Jesus Christ of Latter-day Saints
PROJECT: Prop Garden City Meetinghouse (Property No 501-5833)
PROJECT NUMBER: 0153-411-18

KEY TO TEST PIT LOG

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

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

⑥ **Moisture (%):** Water content of soil sample measured in laboratory; expressed as percentage of dryweight of

⑦ **Dry Density (pcf):** The density of a soil measured in laboratory; expressed in pounds per cubic foot.

⑧ **% Passing 200:** Fines content of soils sample passing a No. 200 sieve; expressed as a percentage.

⑨ **Liquid Limit (%):** Water content at which a soil changes from plastic to liquid behavior.

⑩ **Plasticity Index (%):** Range of water content at which a soil exhibits plastic properties.

⑪ **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:

Weakly: Crumbles or breaks with handling or slight finger pressure.

Moderately: Crumbles or breaks with considerable finger pressure.

Strongly: Will not crumble or break with finger pressure.

MODIFIERS:

Trace <5%

Some 5-12%

With > 12%

MOISTURE CONTENT (FIELD TEST):

Dry: Absence of moisture, dusty, dry to the touch.

Moist: Damp but no visible water.

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

APPENDIX A

Topsoil Testing Report