Y2 Geotechnical, P.C.
Geotechnical, Geologic & Environmental

P.O. Box 983
Layton, UT 84041-0983
Phone: (801) 546-6505 ● Fax: (801) 546-3367
Toll-Free: 1-866-771-4209
E-Mail: y2geo@y2geotech.com

GEOTECHNICAL STUDY
THE ICE SHEET - ADDITION
4390 HARRISON BLVD.
OGDEN, UTAH

Prepared By:

Y^2 GEOTECHNICAL, P.C.
PO BOX 983
LAYTON, UT 84041
(801) 546-6505

Y^2 JOB NUMBER: 12G-019

Prepared for:

TODD FERRARIO
WEBER COUNTY ICE SHEET
4390 HARRISON BLVD.

April 24, 2012

TABLE OF CONTENTS
Y^2 JOB NUMBER: 12G-019

1.0 INTRODUCTION. 1

2.0 PROPOSED CONSTRUCTION. 1

3.0 CONCLUSIONS. 2

4.0 SITE CONDITIONS. 2

5.0 FIELD INVESTIGATION. 2

6.0 LABORATORY TESTING. 3

7.0 SUBSURFACE CONDITIONS.. 3

8.0 SITE GRADING. 4
- 8.1 General Site Grading. 4
- 8.2 Excavations. 4
- 8.3 Structural Fill. 4
- 8.4 Backfill.. 5
- 8.5 Fill Placement and Compaction. 5

9.0 SEISMIC CONSIDERATIONS. 6
- 9.1 Faulting. 6
- 9.2 Seismic Design Criteria. 7
- 9.3 Liquefaction. 7

10.0 FOUNDATIONS. 7
- 10.1 Footing Design. 7
- 10.2 Estimated Settlement. 8

11.0 LATERAL EARTH PRESSURES. 8

12.0 FLOOR SLABS 9

13.0 SURFACE DRAINAGE. 10

14.0 GENERAL CONDITIONS. 10

TABLE OF CONTENTS CONTINUED
Y^2 JOB NUMBER: 12G-019

TABLES

TABLE 1: STRUCTURAL FILL COMPACTION. 5

TABLE 2: LATERAL EARTH PRESSURES 9

FIGURES

FIGURE 1 : VICINITY MAP
FIGURE 2 : SITE PLAN SHOWING BOREHOLE LOCATIONS
FIGURES 3 thru 6: BOREHOLE LOGS

LABORATORY RESULTS

GRAIN SIZE DISTRIBUTIONS
SUMMARY OF LABORATORY TESTING

1.0 INTRODUCTION

This report presents the results of a geotechnical investigation for the proposed building addition at the Weber County Ice Sheet located at 4390 Harrison Blvd. in Ogden, Utah. The general location of the site, with respect to existing roadways, is shown on Figure No. 1, *Vicinity Map*, at the end of this report.

This investigation was done to assist in evaluating the subsurface conditions and engineering characteristics of the foundation soils and in developing our opinions and recommendations concerning appropriate foundation types and floor slabs. This report presents the results of our geotechnical investigation including field exploration, laboratory testing, engineering analysis, and our opinions and recommendations. Data from the study is summarized on Figures 3 thru 6, and in the Laboratory Results.

2.0 PROPOSED CONSTRUCTION

We understand that the proposed project will consist of an addition to the existing sheet facility. The proposed building is expected to be a multi-story structure with a basement approximately 310 by 225 feet in size. We estimate that the maximum loads for the proposed structures will not exceed 8 kips per linear foot for bearing walls, 150 kips for columns, and 150 to 200 pounds per square foot for floor slabs.

It is anticipated that utilities may be constructed to service the building and that exterior concrete flatwork may be placed in the form of curb and gutter, and sidewalks.

If structural loads are significantly greater than those discussed herein or if the project is substantially different than described above, our office should be notified so that we may review our recommendations, and if necessary, make modifications.

3.0 CONCLUSIONS

The following is a brief summary of our findings and conclusions:

1. The subject site is suitable for the proposed construction provided the recommendations presented in this report are followed.

2. Based upon the 4 boreholes drilled for this investigation, this site is covered with 3 to 5 inches of asphalt and approximately 12 inches of road base. Up to 25 inches of mixed sand and clay fill was encountered below the road base. The native soil below the pavement section and fill consisted of loose to very dense poorly graded sand with silt (SP-SM) and silty sand (SM) which extended to the maximum depth investigated (16½ ft). Water was not encountered in our boreholes at the time of the investigation.

3. Conventional strip and spread footings are recommended for support of the proposed buildings. Footings founded on the native soils or properly placed, compacted and tested structural fill extending to the undisturbed native soils may be designed for a maximum allowable soil bearing capacity of 2,400 psf. Additional information on footing design is given in Section 10.0 in this report.

4.0 SITE CONDITIONS

The project area is currently developed as a parking lot adjacent to the existing building. The proposed building is located south and west of the existing building. The majority of the project area is relatively level with a 2 to 4 percent grade downward to the west. The western edge of the project area slopes off steeply downward at roughly 25 percent. The project area is mostly covered with asphalt pavement and concrete flat-work. There are some areas of landscaped lawn and planting beds. The project area site is bound to the north by the existing building, to the south and east by parking lot, and to the west by the slope and then an apartment complex. No surface water sources were observed on the site during our investigation.

5.0 FIELD INVESTIGATION

The field investigation consisted of drilling 4 boreholes to depths of 11½ tp 16½ feet below current site grades at the approximate locations shown on Figure 2, at the end of this report. The soils

encountered at the site were continuously logged by a professional engineer from our office. Due to the granular nature of the soils only disturbed samples were obtained and returned to our laboratory for testing.

6.0 LABORATORY TESTING

The samples obtained during the field investigation were sealed and returned to our laboratory where samples were selected for laboratory testing. Laboratory tests included natural moisture determinations and grain size distribution analyses. The results of these tests are shown at the end of this report.

Samples will be retained in our laboratory for 30 days following the date of this report at which time they will be disposed of unless a written request for additional holding time is received prior to the disposal date.

7.0 SUBSURFACE CONDITIONS

Based upon the 4 boreholes drilled for this investigation, this site is covered with 3 to 5 inches of asphalt and approximately 12 inches of road base. Up to 25 inches of mixed sand and clay fill was encountered below the road base. The native soil below the pavement section and fill consisted of loose to very dense poorly graded sand with silt (SP-SM) and silty sand (SM) which extended to the maximum depth investigated (16½ ft). Water was not encountered in our boreholes at the time of the investigation.

Graphical representations of the soil conditions encountered are shown on the Borehole Logs, Figure 3 thru 6. The stratification lines shown on the Borehole Log represent the approximate boundaries between soil units; the actual transition may be gradual.

8.0 SITE GRADING

8.1 General Site Grading

Prior to construction unsuitable soils and vegetation should be removed from below areas which will ultimately support structural loads. This includes areas below foundations, floor slabs, and concrete flatwork. Unsuitable soils consist of topsoil, organic soils, undocumented fill, soft, loose or disturbed native soils, material associated with demolition of the existing building, and any other deleterious materials. Up to 3½ feet of sandy fill was encountered in our boreholes. All topsoil, uncontrolled fill, or other unsuitable soils should be completely removed.

8.2 Excavations

Due to the nature of the soils at this site, we recommend that temporary construction slopes for excavations into the native soils and onsite fill, less than five feet in depth, not be made steeper than ½ :1 (horizontal:vertical). Excavations deeper than 5 feet should be sloped at 1:1 or be shored prior to anyone entering the excavation. If unstable conditions or groundwater seepage are encountered, flatter slopes or shoring and bracing may be required. All excavations should meet applicable OSHA[1] Health and Safety Standards for type C soils.

8.3 Structural Fill

All fill placed below the structure should be compacted structural fill. All other fills should be considered as backfill. All structural fill should meet the requirements of the agency under which approval will be granted. Unless more restrictive criteria are given, structural fill may consist of the native sand soils or imported structural fill. Imported structural fill material should consist of well-graded sandy gravels to silty sands with a maximum particle size of 4 inches and 5 to 20 percent fines (materials passing the No. 200 sieve). The liquid limit of the fines should not exceed 35 and the plasticity index should be below 15. Clean gravel ranging from pea gravel to 6 inches with less

[1] Occupational Safety and Health Administration

than 5 percent fines and sand combined may also be used as structural fill. All fill soils should be free from topsoils, highly organic material, frozen soil, and other deleterious materials.

8.4 Backfill

The native soils may be used as backfill in utility trenches and against outside foundation walls as long as they are properly moisture conditioned, placed, and compacted. Backfill, not under structural elements, should be placed in lift heights suitable to the compaction equipment used and compacted to at least 90 percent of the maximum dry density (ASTM D-1557).

8.5 Fill Placement and Compaction

The thickness of each lift should be appropriate for the compaction equipment that is used. We recommend a maximum lift thickness of 6 inches for hand operated equipment, 8 inches for most "trench compactors", and 12 inches for larger rollers, unless it can be demonstrated by in-place density tests that the required compaction can be obtained throughout a thicker lift. The full thickness of each lift of structural fill placed should be compacted to at least the percentages of the maximum dry density, shown in Table 1 below, as determined by ASTM D-1557:

TABLE 1: STRUCTURAL FILL COMPACTION

Structural fill	Percent of Maximum Dry Density
Below foundations, flatwork, and pavements:	95%
For fills thicker than 6 feet:	98%
In landscape areas not supporting structural loads:	90%

Generally, placing and compacting fill at a moisture content within 2% of the optimum moisture content, as determined by ASTM D-1557, will facilitate compaction. The further the moisture

content is from the optimum, the more difficult it will generally be to achieve the required compaction.

Clean gravel fill used as structural fill may be placed in loose lifts up to 2 feet thick. The gravel will need to be compacted with at least 4 passes of a vibratory plate or slow moving vibratory smooth drum compactor. Typically, the gravel will settle 1 to 3 inches per foot when properly compacted. Gravel compaction should be verified by either an engineer from Y^2 Geotechnical, P.C. or a materials testing technician from Intermountain Testing Inc., trained in proper gravel placement techniques.

We recommend that fill be tested frequently during placement by a qualified materials testing technician from Intermountain Testing Inc. Early testing is recommended to demonstrate that placement and compaction methods are achieving the required compaction for the entire depth of fill. It is the contractor's responsibility to ensure that fill materials and compaction efforts are consistent so that tested areas are representative of the entire fill.

9.0 SEISMIC CONSIDERATIONS

9.1 Faulting

Based on published data, no active faults are known to traverse the site and no faulting was indicated during our field investigation. The nearest known active fault is the Wasatch Fault, located about ½ mile east of the property[2].

---

[2] Black, B.D., DuRoss, C.B., Hylland, M.D., McDonald, G.N., and Hecker, S., compilers, 2004, Fault number 2351e, Wasatch fault zone, Weber section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults

9.2 Seismic Design Criteria

The structures should be designed in accordance with the IBC building codes. According to section 1613.5.2 of the IBC, this site is classified as a Site Class D.

9.3 Liquefaction

Liquefaction is a phenomenon where soils lose their intergranular strength due to an increase of pore pressures during a dynamic event such as an earthquake. The potential for liquefaction is based on several factors, including 1) the grain size distribution of the soil, 2) the plasticity of the fine fraction of the soil (material passing the No. 200 sieve), 3) relative density of the soil, 4) earthquake strength (magnitude) and duration, and 5) overburden pressures. In addition, the soils must be near saturation for liquefaction to occur. According to the Weber County liquefaction map[3], this site is in an area classified as having low potential for liquefaction.

10.0 FOUNDATIONS

10.1 Footing Design

The native soils at this site are capable of supporting the proposed structures if the recommendations presented in this report are followed. The recommendations presented below should be utilized during design and construction of this project:

1. Conventional strip and spread footings are recommended for support of the proposed building. Footings founded on the native soils or properly placed, compacted and tested structural fill extending to the undisturbed native soils may be designed for a maximum allowable soil bearing capacity of 2,400 psf. A one-third increase is allowed for short term transient loads such as wind and seismic events. Footings should be uniformly loaded.

2. Continuous and spot footings should have minimum widths of 18 and 30 inches, respectively.

---

[3] Utah Geologic Survey, Selected Critical Facilities and Geologic Hazards, Weber County, Utah

3. Exterior footings should be placed below frost depth which is determined by local building codes. Generally 30 inches is adequate in this area. Interior footings, not subject to frost, should extend at least 18 inches below the lowest adjacent final grade.

4. Foundation walls on continuous footings should be well reinforced both top and bottom. We suggest a minimum amount of steel equivalent to that required for a simply supported span of 12 feet.

5. Footing excavations should be observed by a geotechnical engineer from Y^2 Geotechnical prior to placement of structural fill and construction of footings to evaluate whether suitable bearing soils have been exposed and verify that excavation bottoms are free of fill, loose, or disturbed soils.

10.2 Estimated Settlement

If footings are designed and constructed in accordance with the recommendations presented above, the risk of total settlement exceeding 1 inch and differential settlement exceeding 0.5 inch for a 25-foot span will be low. Additional settlement may be expected during a strong seismic event.

11.0 LATERAL EARTH PRESSURES

Resistance to lateral loads (including those due to wind or seismic loads) on foundations may be achieved by frictional resistance between the foundations and underlying soils, and by passive earth pressures of backfill soils placed against the sides of foundations. Retaining walls and below grade walls act as soil retaining structures and should be designed to resist pressures induced by the backfill soils.

The lateral pressures imposed on a retaining structure are dependant on the rigidity of the structure and its ability to resist rotation. Retaining walls which are free to rotate at least 0.2 percent of the wall height, develop an active lateral soil pressure condition. Structures that are not allowed to rotate or move laterally, develop an at-rest lateral earth pressure condition. Lateral pressures applied to

structures may be computed by multiplying the vertical depth of backfill material by the appropriate equivalent fluid density. Any surcharge loads in excess of the soil weight applied to the backfill should be multiplied by the appropriate lateral pressure coefficient and added to the soil pressure. The lateral pressures presented in Table 2, *Lateral Earth Pressures* below, are based on drained, horizontally placed soils as backfill material. For computing lateral forces we recommend the following equivalent fluid densities:

TABLE 2: LATERAL EARTH PRESSURES

Condition	Static Lateral Pressure Coefficient	Static Equivalent Fluid Pressure (pcf)	Seismic Equivalent Fluid Pressure (pcf)
Active	**0.31**	**37**	**60**
At-Rest	**0.47**	**56**	**79**
Passive	**3.25**	**391**	**368**

The friction acting along the base of foundations may be computed by using a coefficient of friction of 0.45 for contact with native sand soils. The values presented above are based on drained conditions and are ultimate, therefore, an appropriate factor of safety should be applied to these values for design purposes.

12.0 FLOOR SLABS

The native soils below floor slabs should be proof rolled and a minimum 4 inch thick layer of free-draining gravel or imported structural fill should be placed immediately below the floor slab to help distribute floor loads, break the rise of capillary water, and aid in the concrete curing process. For slab design, we recommend a modulus of subgrade reaction of 200 psi/in be used. Floor slabs should be evaluated by a structural engineer to determine what measures are appropriate to control shrinkage and stress cracking and provide desired support.

Special precautions should be taken during placement and curing of concrete slabs and flatwork. Excessive slump (high water-cement ratios) of the concrete and/or improper finishing and curing procedures used during hot or cold weather conditions may lead to excessive shrinkage, cracking, spalling, or curling of slabs. We recommend all concrete placement and curing operations be performed in accordance with American Concrete Institute (ACI) codes and practices.

13.0 SURFACE DRAINAGE

Wetting of the foundation soils may cause some degree of volume change within the soil should be prevented after construction. We recommend that the following precautions be taken at this site:

1. The ground surface should be graded to drain away from the structures in all directions. We recommend a minimum fall of 6 inches in the first 10 feet for landscaped areas and 1 inch in the first 20 feet for paved surfaces.

2. Roof runoff should be collected in rain gutters with down spouts designed to discharge well outside of the backfill limits.

3. Sprinkler heads, should be aimed away and kept at least 12 inches from foundation walls.

4. Provide adequate compaction of foundation backfill i.e. a minimum of 90% of ASTM D-1557. Water consolidation methods should not be used.

5. Other precautions which may become evident during design and construction should be taken.

14.0 GENERAL CONDITIONS

The exploratory data presented in this report was collected to provide geotechnical design recommendations for this project only and is not intended for application to other sites or projects. Borehole conditions may not be indicative of subsurface conditions outside the study area and thus have limited value in depicting subsurface conditions for contractor bidding. If it is necessary to define subsurface conditions in sufficient detail to allow accurate bidding we recommend an

additional study be conducted which is designed for that purpose. An experienced geotechnical engineer or technician should observe fill placement and conduct testing as required to confirm the use of proper structural fill materials and placement procedures.

Variations from the conditions portrayed in the boreholes may occur and can only be confirmed during earthwork and foundation construction. The topsoil and fill condition indicated in this report represent what was encountered during the site investigation. Subsequent changes to the site may result in fill or topsoil amounts varying from what is represented in this report. If fill, topsoil, or subsurface conditions are found to be different than those presented in this report, we should be notified immediately to determine if changes in the recommendations are required. If Y^2 Geotechnical, P.C., is not contacted about variations in the soil conditions, we cannot be responsible for the impact of those conditions on the performance of the project.

It should be remembered that geotechnical engineering conclusions and recommendations are generated through analytical methods which are not an exact science. Conclusions and recommendations presented in a geotechnical engineering report are not based only on the analytical empirical tools generally used but rely on engineering judgment in conjunction with the tools. The fact that professional judgments must be used in making recommendations means that the conclusions, solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The conclusions and recommendations presented in this report represent the Y^2 Geotechnical, P.C. professional findings regarding the proposed structures and pavements on this project based on the information generated and referenced during this evaluation and Y^2 Geotechnical, P.C.'s experience in working with these conditions.

The geotechnical investigation as presented in this report was conducted within the limits prescribed by our client. The finding and recommendations which have been presented in this report have been

made in accordance with generally accepted professional geotechnical engineering practice in the area at the time of report preparation. Standards of practice are subject to change with time. No other warranty or representation, either expressed or implied is intended in our proposals, contracts or report.

This geotechnical report has been prepared for Weber County for use in the design and construction of the Weber County Ice Sheet Addition project. This report is site specific and should not be relied upon for use in other investigations and is not for the use or benefit of, nor may it be relied upon by any other person or entity, for any purpose without the advance and express written consent of the Weber County and Y^2 Geotechnical, P.C.; therefore, any use or reliance upon this geotechnical evaluation by a party other than the Client shall be solely at the risk of such third party and without legal recourse against Y^2 Geotechnical, P.C., its employees, officers, or directors, regardless of whether the action in which recovery of damages is brought is based upon contract, tort, statue, or otherwise. The client has the responsibility to see that all parties to the project including the designer, contractor, subcontractor, and building official, etc., are aware of the geotechnical report in its complete form. Y^2 Geotechnical, P.C., assumes no responsibility or liability for work or testing performed by others.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;
Y^2 GEOTECHNICAL, P.C.
Not Official Unless Stamped and dated.

Lori S. Yahne, P.E.
Principal Geotechnical Engineer

Reviewed by,

R. Jay Yahne, P.E.
Principal Geotechnical Engineer

3 copies sent

Y2 Geotechnical, P.C.
Geotechnical, Geologic, & Environmental

NORTH

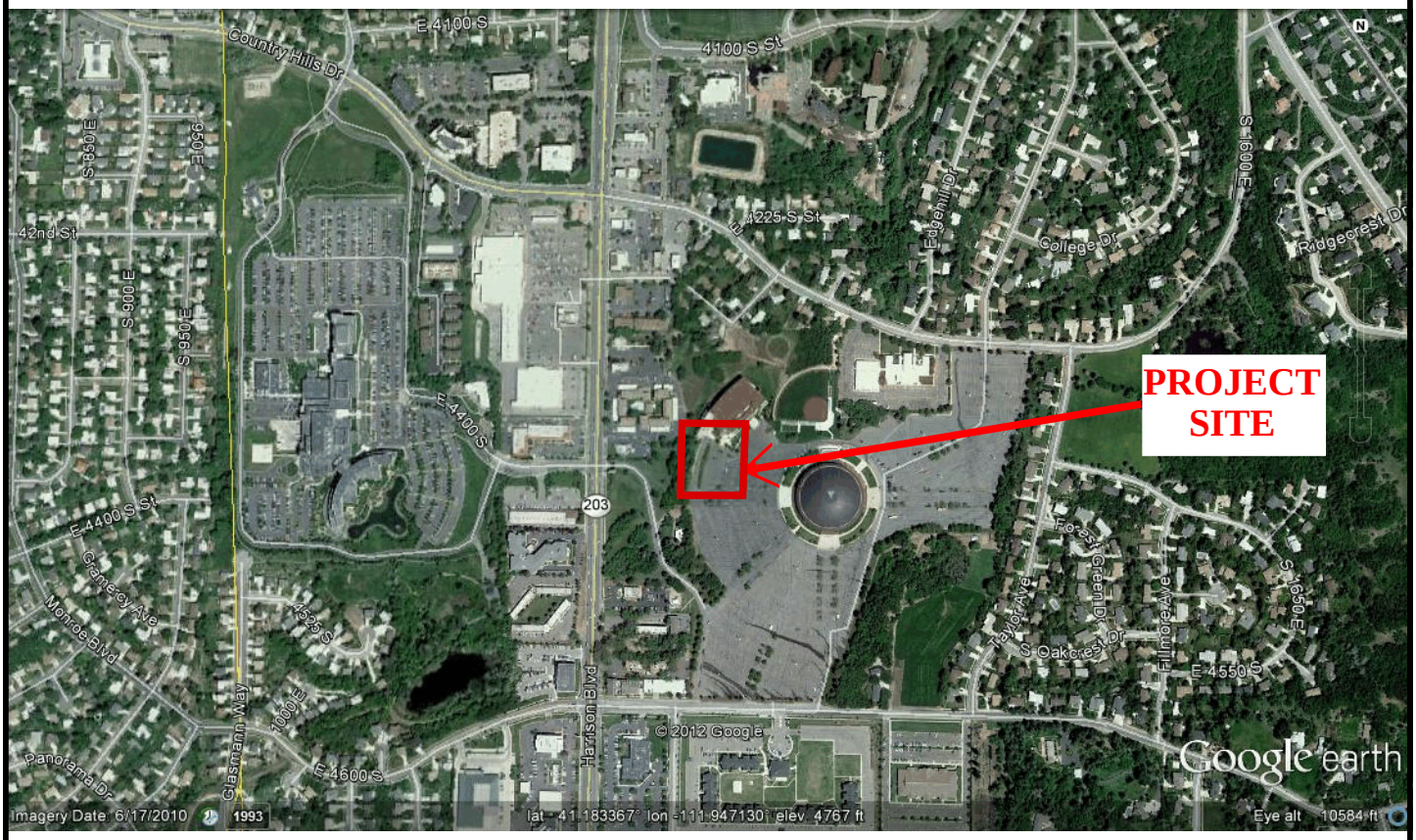


Figure 1: VICINITY MAP

GEOTECHNICAL STUDY
The Ice Sheet Addition
Ogden, Weber County, Utah

Y² Job No. 12G-019

Y2 Geotechnical, P.C.
Geotechnical, Geologic, & Environmental

NORTH

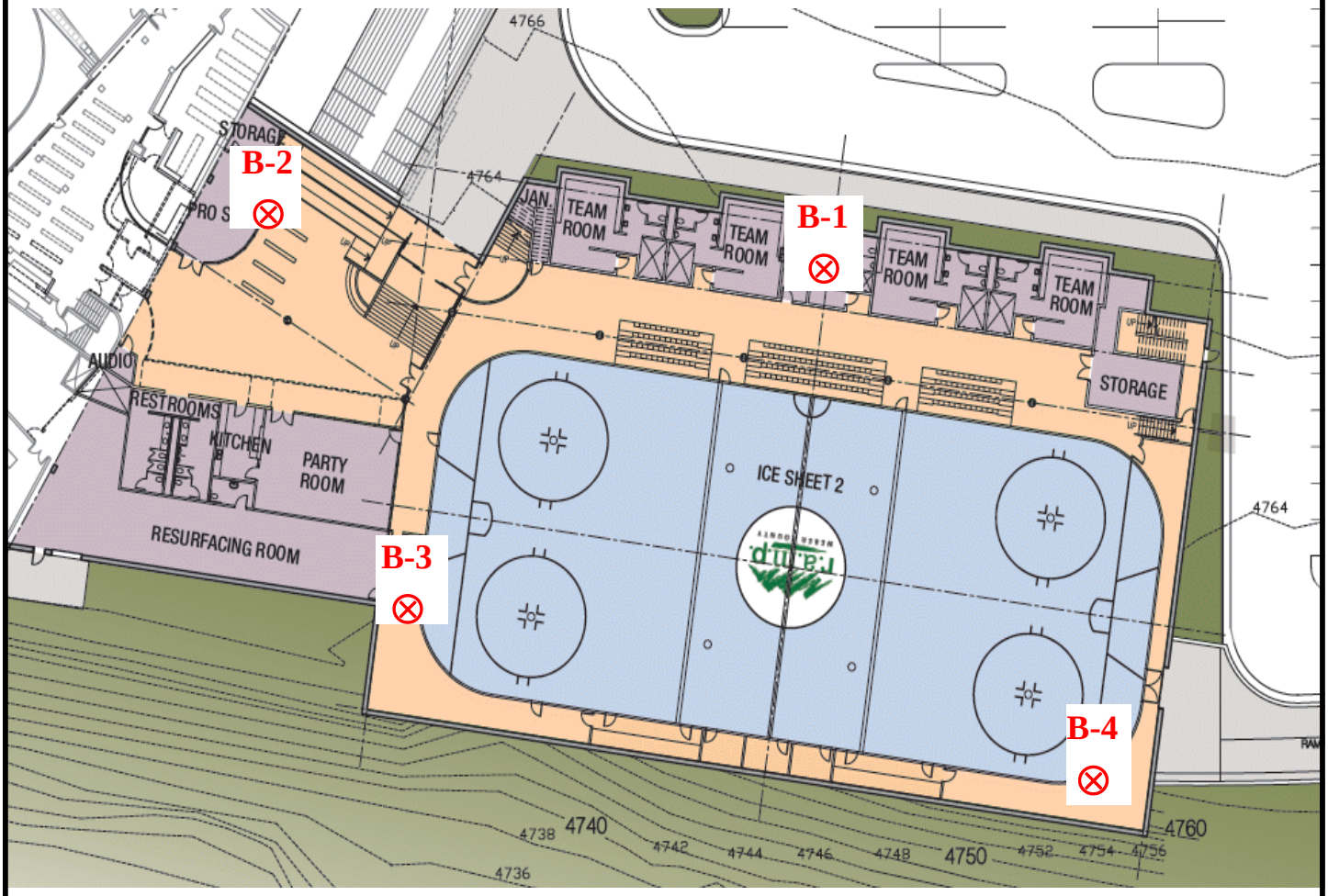


Figure 2: TEST HOLE LOCATIONS

GEOTECHNICAL STUDY
The Ice Sheet Addition
Ogden, Weber County, Utah

Y² Job No. 12G-019

Project No. 12G-019	LOG OF BOREHOLE NO. B-1	Figure 3

PROJECT	CLIENT
The Ice Sheet Addition	Weber County
LOCATION 4390 Harrison Blvd Ogden, UT	Surface Elev.:

Standard Penetration Test | Modified California Sampler

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Liquid Limit, %	Plasticity Index, %	Gravel, %	Sand, %	Fines, %
			3" Asphalt							
			12" Road base.							
			21" Fill - silty sand, medium dense, slightly moist, brown.							
			Poorly Graded Sand with Silt (SP-SM) - loose to medium dense, slightly moist to moist, brown to dark brown.	14						
5				13						
				5	5.9	NP	NP	0.9	89.6	9.5
10			Dark brown to red brown below 10 feet.	12						
			Occasional thin clay seams below 11.5 feet.	8						
			End of borehole at 14 feet.							
15										
20										
25										
30										

Y² Geotechnical, P.C. Geotechnical, Geologic & Environmental	WATER LEVELS	STARTED 4/9/12	FINISHED 4/9/12
	None 4/9/12	DRILL CO. Y-Squared	DRILL RIG AMS VTR 9500
		DRILL TYPE 6" Continuous Flight	
		LOGGED BY Lori S. Yahne, P.E.	

LOG OF BOREHOLE/TEST PIT 12G-019 GINT.GPJ Y2 GEOTECH.GDT 4/24/12

Project No. 12G-019	LOG OF BOREHOLE NO. B-2	Figure 3

PROJECT	CLIENT
The Ice Sheet Addition	Weber County
LOCATION 4390 Harrison Blvd Ogden, UT	Surface Elev.:

Standard Penetration Test | Modified California Sampler

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Liquid Limit, %	Plasticity Index, %	Gravel, %	Sand, %	Fines, %
			5" Asphalt							
			12" Road base.							
			25" Fill - mixed clay and sand, medium dense, slightly moist, brown.	29						
			Poorly Graded Sand with Silt (SP-SM) - medium dense to dense, slightly moist to moist, brown to dark brown.							
5				44						
10				23	5.4	NP	NP	2.2	89.7	8.1
			End of borehole at 12 feet.							
15										
20										
25										
30										

Y² Geotechnical, P.C. Geotechnical, Geologic & Environmental	WATER LEVELS	STARTED 4/9/12	FINISHED 4/9/12
	None 4/9/12	DRILL CO. Y-Squared	DRILL RIG AMS VTR 9500
		DRILL TYPE 6" Continuous Flight	
		LOGGED BY Lori S. Yahne, P.E.	

LOG OF BOREHOLE/TEST PIT 12G-019 GINT.GPJ Y2 GEOTECH.GDT 4/24/12

Project No. 12G-019	LOG OF BOREHOLE NO. B-3	Figure 3

PROJECT	CLIENT
The Ice Sheet Addition	Weber County
LOCATION 4390 Harrison Blvd Ogden, UT	Surface Elev.:

Standard Penetration Test | Modified California Sampler

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Liquid Limit, %	Plasticity Index, %	Gravel, %	Sand, %	Fines, %
			3" Asphalt							
			12" Road base.							
			33" Fill - with some cobbles, large root encountered at 4 feet, medium dense to very dense, slightly moist, brown.	56						
5			Poorly Graded Sand with Silt (SP-SM) - dense, slightly moist to moist, dark brown to gray.	45	11.4	NP	NP	0.1	89.8	10.1
10			Slightly cemented below 10.5 feet.	53						
			End of borehole at 11.5 feet.							
15										
20										
25										
30										

Y² Geotechnical, P.C. Geotechnical, Geologic & Environmental	WATER LEVELS	STARTED 4/9/12	FINISHED 4/9/12
	None 4/9/12	DRILL CO. Y-Squared	DRILL RIG AMS VTR 9500
		DRILL TYPE 6" Continuous Flight	
		LOGGED BY Lori S. Yahne, P.E.	

LOG OF BOREHOLE/TEST PIT 12G-019 GINT.GPJ Y2 GEOTECH.GDT 4/24/12

Project No. 12G-019	LOG OF BOREHOLE NO. B-4	Figure 3

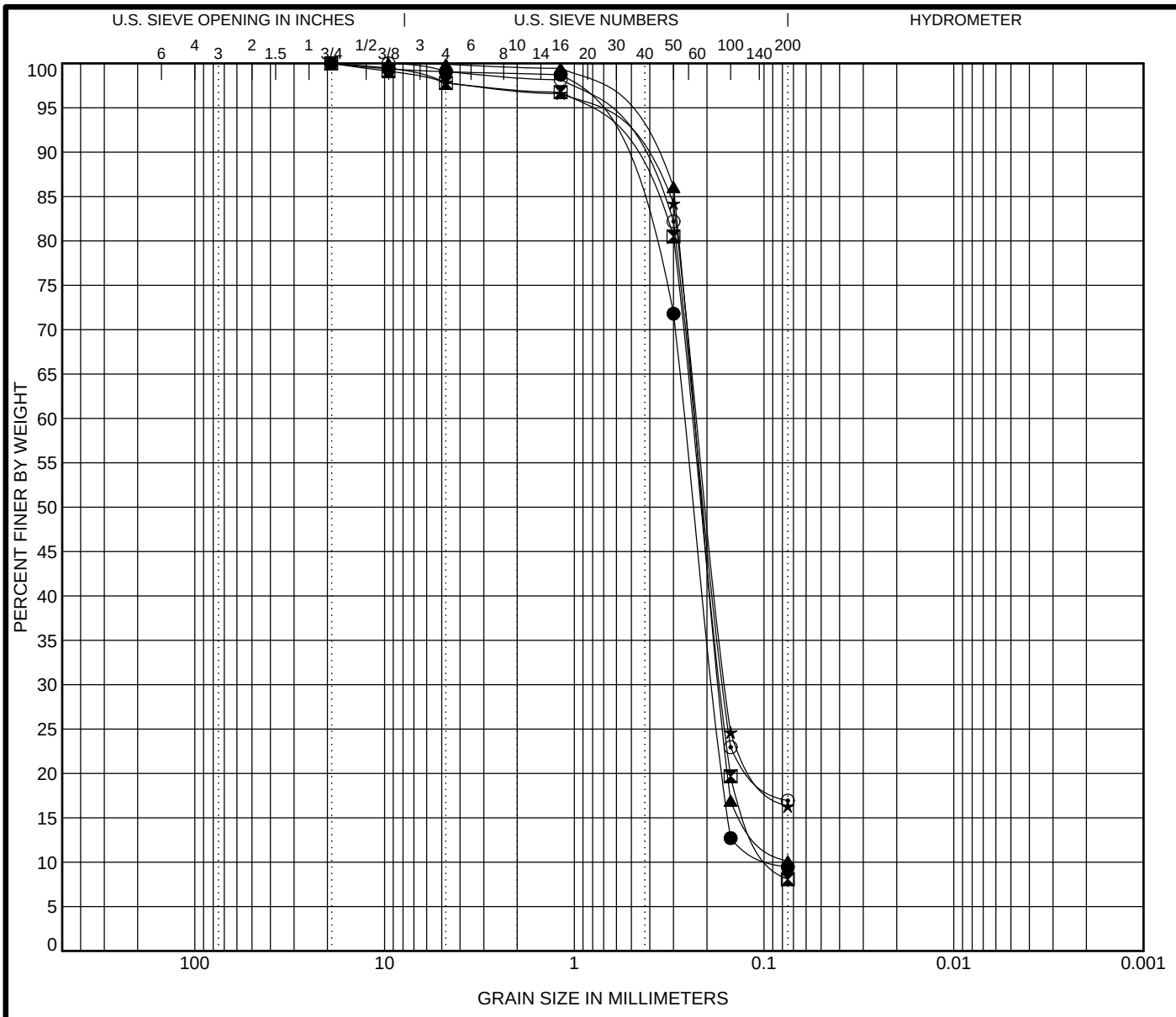
PROJECT	CLIENT
The Ice Sheet Addition	Weber County
LOCATION 4390 Harrison Blvd Ogden, UT	Surface Elev.:

Standard Penetration Test | Modified California Sampler

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	SPT (N) Blows/Foot	Moisture Content, %	Liquid Limit, %	Plasticity Index, %	Gravel, %	Sand, %	Fines, %
			5" Asphalt							
			12" Road base.							
			25" Fill - mixed sand and clay, dense, slightly moist, brown.							
				41	8.8	NP	NP	2.2	81.5	16.3
			Silty Sand (SM) - dense to very dense, slightly moist to moist, brown to dark brown.							
5				53						
10				60						
15				65	8.7	NP	NP	0.9	82.2	16.9
			End of borehole at 16.5 feet.							
20										
25										
30										

Y² Geotechnical, P.C. Geotechnical, Geologic & Environmental	WATER LEVELS	STARTED 4/9/12	FINISHED 4/9/12
	None 4/9/12	DRILL CO. Y-Squared	DRILL RIG AMS VTR 9500
		DRILL TYPE 6" Continuous Flight	
		LOGGED BY Lori S. Yahne, P.E.	

LOG OF BOREHOLE/TEST PIT 12G-019 GINT.GPJ Y2 GEOTECH.GDT 4/24/12



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-1	7.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.54	3.11
⊠	B-2	10.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.42	2.82
▲	B-3	5.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.71	3.12
★	B-4	2.5	SILTY SAND(SM)	NP	NP	NP		
⊙	B-4	15.0	SILTY SAND(SM)	NP	NP	NP		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	7.0	19.1	0.261	0.184	0.084	0.9	89.6	9.5	
⊠	B-2	10.0	19.1	0.237	0.169	0.084	2.2	89.7	8.1	
▲	B-3	5.0	9.53	0.231	0.171		0.1	89.8	10.1	
★	B-4	2.5	19.1	0.226	0.16		2.2	81.5	16.3	
⊙	B-4	15.0	9.53	0.231	0.163		0.9	82.1	16.9	

Y² Geotechnical, P.C.

Geotechnical, Geologic & Environmental

GRAIN SIZE DISTRIBUTION

Project: The Ice Sheet Addition

Location: 4390 Harrison Blvd Ogden, UT

Number: 12G-019

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
B-1	7.0	NP	NP	NP	19.1	10	SP-SM	5.9			
B-2	10.0	NP	NP	NP	19.1	8	SP-SM	5.4			
B-3	5.0	NP	NP	NP	9.53	10	SP-SM	11.4			
B-4	2.5	NP	NP	NP	19.1	16	SM	8.8			
B-4	15.0	NP	NP	NP	9.53	17	SM	8.7			

Y² Geotechnical, P.C.

Geotechnical, Geologic & Environmental

Summary of Laboratory Results

Project: The Ice Sheet Addition

Location: 4390 Harrison Blvd Ogden, UT

Number: 12G-019