GORDON
GEOTECHNICAL
ENGINEERING, INC.

REPORT
GEOTECHNICAL STUDY
PROPOSED
BROOMHEAD FUNERAL HOME ADDITION
12590 SOUTH 2200 WEST
RIVERTON, UTAH

January 23, 2017

Job No. 448-001-17

Prepared for:
Big Bear Electric Inc.
PO Box 1627
Riverton, Utah 84065

Prepared by:
Gordon Geotechnical Engineering, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123
Tel: 801-327-9600
Fax: 801-327-9601
www.gordongeotech.com

OK

January 23, 2017
Job No. 448-001-17

Big Bear Electric Inc.
PO Box 1627
Riverton, Utah 84065

Attention: Mr. John Simonsen

Ladies and Gentlemen:

Re: Report
Geotechnical Study
Proposed Broomhead Funeral Home Addition
12590 South 2200 West
Riverton, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed for the proposed Broomhead Funeral Home addition, which is located at 12590 South 2200 West in Riverton, Utah. A detailed location of the site showing adjoining streets, canal, and structures and photographs of the site area, on an air photograph base, is presented on Figure 1, Area Map. A more detailed layout of the site with regard to existing funeral home and nearby adjacent residential structures and streets is present on Figure 2, Site Plan. The locations of the test pits excavated in conjunction with this study are also presented on Figure 2.

During the course of this study, preliminary information and recommendations were transmitted verbally to representatives of the design team and general contractor.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of our study were planned in discussions between Mr. John Simonsen of Big Bear Electric Inc. and Mr. Bill Gordon of Gordon Geotechnical Engineering, Inc. (G^2).

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, floor slab, earthwork, pavement, lateral pressure and resistance, and geoseismic recommendations and parameters to be utilized in the design and construction of the proposed addition.

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

1. A field program consisting of the excavation, logging, and sampling of four test pits.

2. A laboratory testing program.

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

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of our Professional Services Agreement No.17-0113 dated January 17, 2017 and executed on January 20, 2017.

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 test pits, measured and projected groundwater conditions, and the layout and design data discussed in Section 2., Proposed Construction, of this report. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, G^2 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 proposed one- to two-level slab-on-grade addition will be constructed to the immediate north of the existing facility. The structure will be basically of wood-frame construction with possibly some block and masonry bearing walls and veneer. Structural loads will be transmitted

primarily down trough bearing walls to a few isolated columns to supporting foundations. It is projected that the maximum wall and column loads will be on the order of 3 to 4 kips per lineal foot and 50 to 60 feet, respectively.

To the north of the addition and further to the northeast will be at-grade parking primarily for automobiles.

Site development will initially require the demolition of an older single-family residential structure in the far north-central portion of the site and some earthwork in the form of cuts and fills of approximately one to two feet.

3. INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil and groundwater conditions across the presently proposed addition and parking area site, 4 test pits were excavated to depths ranging from 3 to 12 feet below existing grade. The test pits were excavated using a rubber tire-mounted backhoe. Locations of the test pits 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 excavation operations, a continuous log of the subsurface conditions encountered was maintained. In addition, relatively undisturbed and small disturbed 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 have been supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3D, Log of Test Pits. Soils were classified in accordance with the nomenclature described on Figure 4, Unified Soil Classification System.

Relatively undisturbed samples of the subsurface soils were collected utilizing a 2.42-inch inside diameter thin-wall hand sampler. Disturbed bag samples were also collected from the soils brought up by the backhoe bucket.

Following completion of excavation operations, one and one-quarter-inch diameter slotted PVC pipe was installed in Test Pit TP-1 in order to provide a means of monitoring the groundwater fluctuations.

Following completion of excavating and logging, each test pit was 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.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program was performed. The program included moisture and density, consolidation, and chemical tests

3.2.2 Moisture and Density Tests

To aid in classifying the soils and to help correlate other test data, moisture and density tests were performed on selected undisturbed samples. The results of these tests are presented on the test pit logs, Figures 3A through 3D.

3.2.3 Consolidation Test

To provide data necessary for our settlement analyses, a consolidation test was performed on a representative sample of the silty clay soils encountered at a depth of five feet from Test Pit TP-2. The results of the tests indicate that the silty clay is over-consolidated and when loaded below the over-consolidation pressure will exhibit relatively low compressibility characteristics. Detailed results of the tests are maintained within our files and can be transmitted to you, at your request.

3.2.4 Chemical Tests

To determine if the site soils will react detrimentally with concrete or ferrous metals, chemical tests were performed on a representative sample of the silty clay soils encountered. The results of the chemical tests are tabulated below:

Test Pit No.	Depth (feet)	Soil Classification	pH	Total Water Soluble Sulfate (ppm)
TP-2	2.5	CL	*	*

* Results not available at time of report; to follow.

4. SITE CONDITIONS

4.1 SURFACE

The site area consists of an existing two-story slab-on-grade funeral home with pavements, sheds, and a small vacant area on the northwest corner.

The expansion of the facility will be to the north of the existing facility and includes flat open undeveloped areas and two residential lots with structures. Both of these existing residential structures will ultimately be torn down. The first home to the north will come down during the initial phase of construction due to financial issues. Although residential lots contain typical residential landscaping with some large deciduous trees. This site is bounded on the west by the Utah and Salt Lake Canal Trail; to the north by single-family residential homes; east by 2200 West Street; and south by 10023 South Street.

Representative photographs of the site area are shown on Figure 5, Photographs.

4.2 SUBSURFACE SOIL AND GROUNDWATER

The subsurface conditions encountered across the site to the depths penetrated were founded to by relatively consist. In all four of the test pits, the surface layer of fill consisting of silty clay and sand and gravel with major roots (topsoil) to six inches was encountered. The soils are dark brown grading to brown, moist, and generally loose. These soils will exhibit relatively poor engineering characteristics. In Test Pit TP-2, the surface fill was found to be 18 inches thick and consist of a loose, moist silty fine to coarse sand and gravel. The fills are, in turn, underlain by a sequence of silty clays with trace fine sand which extended to the depths penetrated, 3 feet, in Test Pits TP-3 and TP-4 and to depths 10 to 6 feet in Test Pits TP-1 and TP-2, respectively. The soils are generally stiff, slightly moist, and grayish-brown in color and will exhibit relatively high strength and low compressibility characteristics.

The silty clays in Test Pits TP-1 and TP-2 are underlain by a layer fine to coarse sandy fine gravels. In Test Pit TP-2 at a depth of 9 feet to the bottom of the test pit, 10 feet, by a brown fine sand. The sandy soils are medium dense to dense, slightly moist, and will exhibit high strength and low compressibility characteristics.

Groundwater was not encountered to the depths penetrated and is projected to be at least 15 to 20 feet below existing grade.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The results of this study show that the proposed addition may be supported upon conventional spread and continuous wall foundations established upon suitable undisturbed natural soils and/or structural fill extending to suitable natural soils. The footings and floor slabs should not be established upon surface non-engineered fills or disturbed soils. Pavements can be established upon suitable natural soils or structural fills to suitable natural soils or properly prepared existing surface fills. Moisture sensitivity soils were not encountered. Groundwater is at significant depth and should not affect design, construction, or performance of the proposed addition.

In the following sections, detailed discussions pertaining to earthwork, foundations, lateral resistance and pressure, floor slabs, pavements, the geoseismic setting of the site, and other geotechnical conditions which could affect the design or construction of the proposed addition are provided.

5.2 EARTHWORK

5.2.1 Site Preparation

Prior to initiation of major construction, existing fill extending out at least five feet from the perimeter of the proposed addition should be removed. This fill will include an upper approximately six inches of topsoil. The surface topsoil, again extending approximately six inches, should be removed from the proposed pavement areas. The topsoil and non-engineered fills will be unsuitable for re-utilization as structural fill and must be stockpiled for subsequent landscaping purposes.

The remaining approximately six inches of non-engineered fills in proposed pavement areas need not be removed but must be recompacted to the requirements for structural fill before additional fill and/or pavements are placed.

5.2.2 Excavations

Temporary construction excavations not exceeding four feet in depth may be constructed with near-vertical sideslopes. Deeper excavations not exceeding eight feet in depth may be constructed with sideslopes no steeper than one-half horizontal to one vertical. Deeper excavations are not anticipated.

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

5.2.3 Structural Fill

All structural fill must be free of sod, rubbish, construction debris, topsoil, frozen soil, and other deleterious materials. We recommend that granular soils be utilized as structural fills considering the time of year. Maximum particle size within structural site grading fill; that is, fill placed over large areas in order of raise overall grade should generally not exceed three inches. In confined areas, the maximum particle size should generally be redistricted to two inches. The granular fill can be mixtures of sands and gravels but should not contain more than 20 percent fines; that is, material passing the No. 200 sieve. The silty clays removed from excavation at the site will not be suitable for utilization as structural fill.

Prior to the placement of structural fill, all loose and disturbed soils which may be encountered, should be removed and replaced with structural fill.

5.2.4 Fill Placement and Compaction

All structural fill should be placed in lifts not exceeding eight inches in loose thickness. Fill placed within the building area should be compacted to at least 95 percent of the maximum dry density as determined by the AASHTO[1] T-180 (ASTM[2] D-1557) compaction criteria. In pavement areas, the structural fills should be compacted to at least 90 percent of the above-defined criteria.

5.2.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (flatwork, floor slabs, roads, etc.) should 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 should be proofrolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proofrolling may 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 proofrolling, they should be removed to a maximum depth of two feet below design finish grade and replaced with structural fill.

Most utility companies and City-County governments are now requiring that Type A-1 or A-1-a (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 D-1557) method of compaction. We recommend that as the major utilities continue onto the site that these compaction specifications are followed.

The natural fine-grained cohesive soils are not recommended for use as trench backfill.

5.3 SPREAD AND CONTINUOUS WALL FOUNDATIONS

5.3.1 Design Data

The proposed addition may be supported upon conventional spread and continuous wall foundations established upon suitable undisturbed natural soils and/or structural fills extending to suitable natural soils. Under no circumstances should the footings be established upon non-engineered fill, loose, sod, rubbish, ponded water, or other deleterious materials.

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

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 Pressure for Real Load Conditions	- 2,000 pounds per square foot
Bearing Pressure Increase for Seismic Loading	- 50 percent

The term "net bearing pressure" refers to the 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.

5.3.2 Installation

Under no circumstances should the footings be installed upon loose or disturbed soils, construction debris, frozen soil, or within ponded water.

If the natural soils upon which the footings are to be established become loose or disturbed, they must be removed and replaced with granular structural fill. If the natural granular soils or granular structural fill upon which the footings are to be established become disturbed, they should be recompacted to the requirements for structural fill or be removed and replaced with structural fill.

The width of structural replacement fill, as required below footings, should be extended laterally at least six inches beyond the edges of the footings in all directions for each foot of fill thickness beneath the footings. For example, if the width of the footing is two feet and the thickness of the structural fill beneath the footing is one foot, the width of the structural fill at the base of the footing excavation would be a total of three feet.

5.3.3 Settlements

Settlements of foundations designed and installed in accordance with the above recommendations and supporting maximum anticipated loads should generally not exceed three-eighths to one-half of an inch. Settlements will occur rapidly with approximately 60 to 70 percent of the quoted settlement occurring during construction.

5.4 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 0.40 should be utilized. 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.

5.5 LATERAL PRESSURES

For more rigid walls that are not more than six feet in height, such as loading dock bulkhead, elevator pits, etc., three-quarter- to one-inch minus clean gap-graded gravel should be used as backfill extending out at least 18 inches back of the wall. The gravel should be procedurally compacted and may be considered equivalent to a lateral pressure with an equivalent fluid density of 45 pounds per cubic foot.

For seismic loading, a uniform pressure of 50 pounds per square foot should be added.

5.6 FLOOR SLABS

To facilitate construction, we recommend that the at-grade floor slabs be underlain by a minimum of four inches of aggregate base material placed directly upon undisturbed natural soils and/or structural fill extending to natural soils. Because of the lack of depth of groundwater table, a capillary break material underneath the floor slabs is not required.

Settlements of at-grade floor slabs should be negligible.

5.7 PAVEMENTS

Pavements in proposed parking lots will be subjected to a light volume of automobiles and light trucks. In the driveway or roadway areas, traffic will consist of a light volume of automobiles,

light to medium-weight trucks, and occasional heavy-weight trucks. For this traffic, the following pavement sections are recommended:

Parking Lots

Flexible Pavements:
(Asphalt Concrete)

2.5 inches	Asphalt concrete
7.0 inches	Aggregate base course
Over	Suitable natural soils or structural site grading fill to suitable soils or recompacted non-engineered fill

Rigid Pavements:
(Non-reinforced Concrete)

5.0 inches	Portland cement concrete (non-reinforced)
4.0 inches	Aggregate base course
Over	Suitable natural soils or structural site grading fill to suitable soils

Roadways

Flexible Pavements:
(Asphalt Concrete)

3.0 inches	Asphalt concrete
7.0 inches	Aggregate base course
Over	Suitable natural soils or structural site grading fill to suitable soils or recompacted non-engineered fill

Rigid Pavements:
(Non-reinforced Concrete)

6.0 inches	Portland cement concrete (non-reinforced)
4.0 inches	Aggregate base course
Over	Suitable natural soils or structural site grading fill to suitable soils

The above rigid pavement sections are for non-reinforced Portland cement concrete. Construction of the rigid pavement should be in sections 10 to 12 feet in width with construction or expansion joints or one-quarter depth saw-cuts on no more than 12-foot centers. Saw-cuts must be completed within 24 hours of the "initial set" of the concrete and should be performed under the direction of the concrete paving contractor. 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.

5.8 GEOSEISMIC SETTING

5.8.1 General

As of July 2016, the State of Utah has 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.

5.8.2 Faulting

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

5.8.3 Soil Class

For dynamic structural analysis, the Site Class D - Stiff Soil Profile as defined in Table 20.3-1, Site Classification, of ASCE 7-10 April 6, 2011 can be utilized.

5.8.4 Liquefaction

The site is located in an area that has been identified by Salt Lake County as having "moderate" liquefaction potential. Liquefaction is defined as the condition when saturated, loose, finer-grained sand-type soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event.

Our analysis indicates that the saturated soils are at least 20 to 30 feet below grade. Therefore, the potential for surface expression of deeper liquefaction is minimal.

5.9 CEMENT TYPES

To follow.

We appreciate the opportunity of providing this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

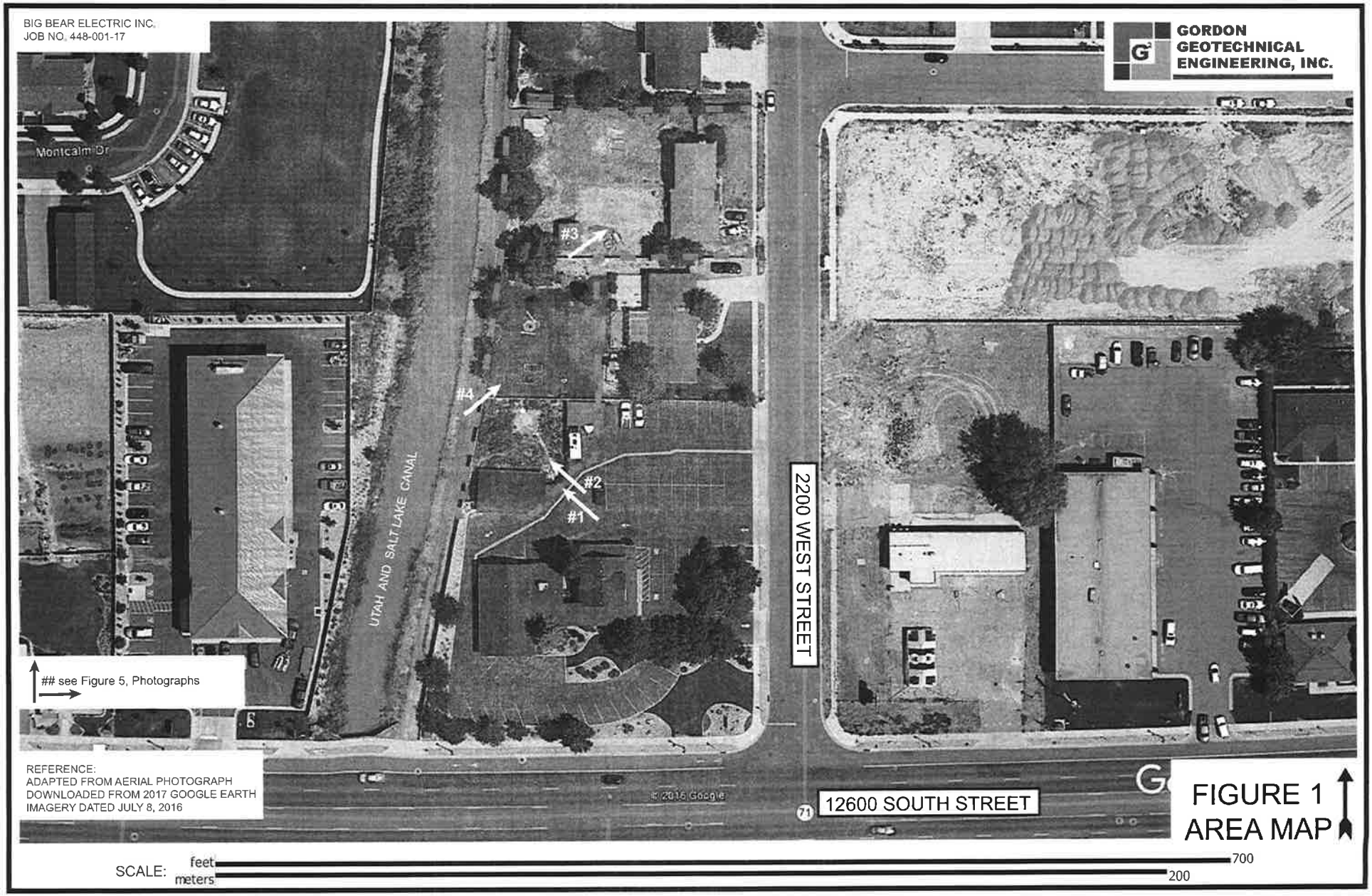
Gordon Geotechnical Engineering, Inc.

William J. Gordon, State of Utah No. 146417
Professional Engineer

WJG:sn

Encl. Figure 1, Area Map
Figure 2, Site Plan
Figures 3A through 3D, Log of Test Pits
Figure 4, Unified Soil Classification System
Figure 5, Photographs

Addressee (3 + email)


BIG BEAR ELECTRIC INC.
JOB NO. 448-001-17
GORDON GEOTECHNICAL ENGINEERING, INC.
Montcalm Dr
#3
#4
#2
#1
UTAH AND SALT LAKE CANAL
2200 WEST STREET
see Figure 5, Photographs
REFERENCE:
ADAPTED FROM AERIAL PHOTOGRAPH
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IMAGERY DATED JULY 8, 2016
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71
12600 SOUTH STREET
FIGURE 1
AREA MAP
SCALE:
feet
meters
700
200

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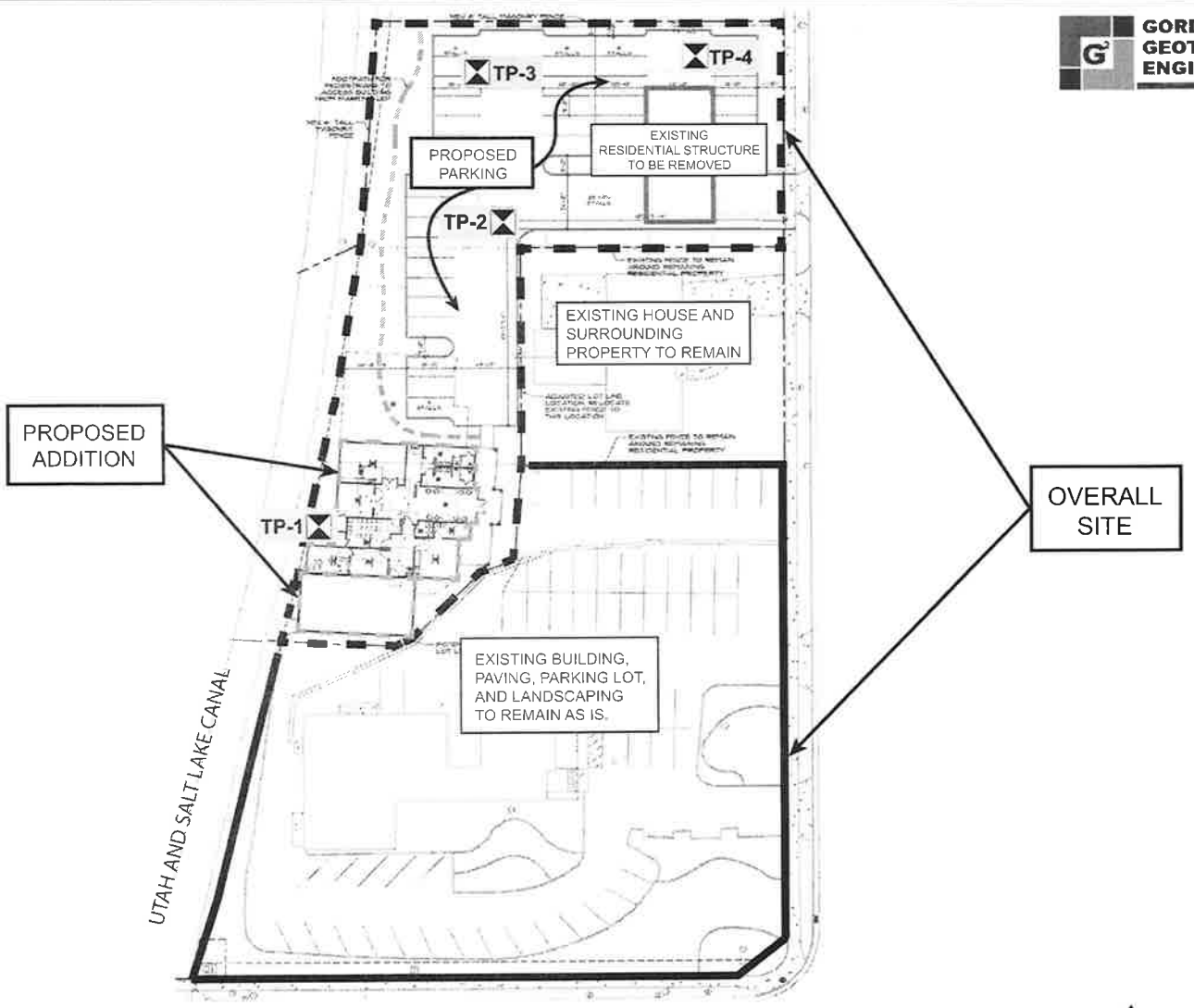


NOT TO SCALE

REFERENCE:
ADAPTED FROM DRAWING ENTITLED
"BROOMHEAD FUNERAL HOME ADDITION",
SITE PLAN
BY CHRIS LAYTON & ASSOCIATES,
DATED NOVEMBER 08, 2016

FIGURE 2
SITE PLAN

Gordon Geotechnical Engineering, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123

TEST PIT TP-1

Project Name: Proposed Broomhead Funeral Home Addition
Project No.: 448-001-17
Location: 12590 South 2200 West, Riverton, Utah
Client: Big Bear Electric Inc.
Excavating Method: Kubota KC 057 Backhoe
Date Excavated: 01-17-17
Elevation: ---
Water Level: No groundwater encountered.
Remarks:

DESCRIPTION	GRAPHIC LOG	WATER LEVEL	DEPTH (FT.)	SAMPLE SYMBOL	SAMPLE TYPE	BLOWS/FT.	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	REMARKS
SILTY CLAY, FILL major roots (topsoil) to 6"; dark brown (CL-FILL)												moist "loose"
SILTY CLAY with trace fine sand; numerous root holes; grayish-brown (CL)					TW							slightly moist "stiff"
grades with signficantly less root mottling below 5.0'			5									
FINE TO COARSE SANDY FINE GRAVEL with trace silt; brown (GP)			10		B							moist "loose"
Stopped excavating at 12.0'. Stopped sampling at 11.5'. No groundwater encountered at time of excavating. No significant sidewall caving. Installed slotted PVC pipe to 12.0'.			15 20 25									

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3A

Gordon Geotechnical Engineering, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123

TEST PIT TP-2

Project Name: Proposed Broomhead Funeral Home Addition
Project No.: 448-001-17
Location: 12590 South 2200 West, Riverton, Utah
Client: Big Bear Electric Inc.
Excavating Method: Kubota KC 057 Backhoe
Date Excavated: 01-17-17
Elevation: ---
Water Level: No groundwater encountered.
Remarks:

DESCRIPTION	GRAPHIC LOG	WATER LEVEL	DEPTH (FT.)	SAMPLE SYMBOL	SAMPLE TYPE	BLOWS/FT.	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	REMARKS
SILTY FINE TO COARSE SAND AND GRAVEL, FILL brown (SM/GM-FILL)					B							moist "loose"
SILTY CLAY with trace fine sand; grayish-brown (CL)					TW		12.6	91				slightly moist "very stiff"
			5		TW							
FINE TO COARSE SAND AND GRAVEL brown (SP/GP)					B							slightly moist "medium dense"
FINE SAND with trace silt; brown (SP)			10		B							slightly moist "medium dense"
Stopped excavating at 10.0'. Stopped sampling at 9.5'. No groundwater encountered at time of excavating. No significant sidewall caving.			15 20 25									

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3B

Gordon Geotechnical Engineering, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123

TEST PIT TP-3

Project Name: Proposed Broomhead Funeral Home Addition
Location: 12590 South 2200 West, Riverton, Utah
Excavating Method: Kubota KC 057 Backhoe
Elevation: ---
Remarks:

Project No.: 448-001-17
Client: Big Bear Electric Inc.
Date Excavated: 01-17-17
Water Level: No groundwater encountered.

DESCRIPTION	GRAPHIC LOG	WATER LEVEL	DEPTH (FT.)	SAMPLE SYMBOL	SAMPLE TYPE	BLOWS/FT.	MOISTURE (%)	DRY DENSITY (PCF)	% PASSING 200	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	REMARKS
SILTY CLAY, FILL major roots (topsoil) to 6"; dark brown (CL-FILL)												moist "loose"
SILTY CLAY with trace fine sand; grayish-brown (CL)												slightly moist "stiff"
Stopped excavating at 3.5'. No groundwater encountered at time of excavating. No significant sidewall caving.			5 10 15 20 25									

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3C

GORDON GEOTECHNICAL ENGINEERING, INC.

UNIFIED SOIL CLASSIFICATION SYSTEM

FIELD IDENTIFICATION PROCEDURES				GRAPH SYMBOL	LETTER SYMBOL [1]	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL	CLEAN GRAVELS			GW	
					GP	
		GRAVELS WITH FINES			GM	
					GC	
	SANDS	CLEAN SANDS			SW	
					SP	
		SANDS WITH FINES			SM	
					SC	
FINE GRAINED SOILS	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE					
	SILTS AND CLAYS				ML	
					CL	
					OL	
	SILTS AND CLAYS				MH	
					CH	
					OH	
HIGHLY ORGANIC SOILS					PT	

[1] Boundary classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.
[2] All sieve sizes on this chart are U.S. standard.

GENERAL NOTES

1. In general, Unified Soil Classification Designations presented on the logs were evaluated by visual methods only. There may be actual deviations based on laboratory testing may differ.
2. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
3. Logs represent general soil conditions observed at the point of exploration on the date indicated.
4. No warranty is provided as to the continuity of soil conditions between individual sample locations.

FINE-GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	UNDRAINED SHEAR STRENGTH (tsf)	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches by thumb. Squeezes through fingers.
Soft	2 - 4	0.125 - 0.25	0.25 - 0.5	Easily penetrated 1" by Thumb. Molded by light finger pressure.
Medium Soft	4 - 8	0.25 - 0.5	0.5 - 1.0	Penetrated over 1/2" by Thumb with moderate effort. Molded by strong finger pressure.
Stiff	8 - 15	0.5 - 1.0	1.0 - 2.0	Indented about 1/2" by Thumb but penetrated only with great effort.
Very Stiff	15 - 30	1.0 - 2.0	2.0 - 4.0	Readily indented by Thumbnail.
Hard	>30	>2.0	>4.0	Indented with difficulty by Thumbnail.

LOG KEY SYMBOLS

- Bulk - Bag Sample
- Standard Penetration Split Spoon Sampler
- Rock Core
- Water Level
- Thin Wall
- No Recovery
- 3" I.D. D&M Sampler
- 3" I.D. D&M Sampler
- California Sampler

COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	<4	0 - 15	Easily penetrated with 1/2" reinforcing rod pushed by hand.
Loose	4 - 10	15 - 35	Difficult to penetrated with 1/2" reinforcing rod pushed by hand.
Medium Dense	10 - 30	35 - 65	Easily penetrated a foot with 1/2" reinforcing rod driven with 5-lb hammer.
Dense	30 - 50	65 - 85	Difficult to penetrated a foot with 1/2" reinforcing rod driven with 5-lb hammer.
Very Dense	>50	85 - 100	Penetrated only a few inches with 1/2" reinforcing rod driven with 5-lb hammer.

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"
LAYER	1/2 - 12"

DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness
Frequent	More than one per foot of thickness

CEMENTATION

DESCRIPTION	DESCRIPTION
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

DESCRIPTION	%
Trace	<5
Some	5 - 12
With	>12

MOISTURE CONTENT

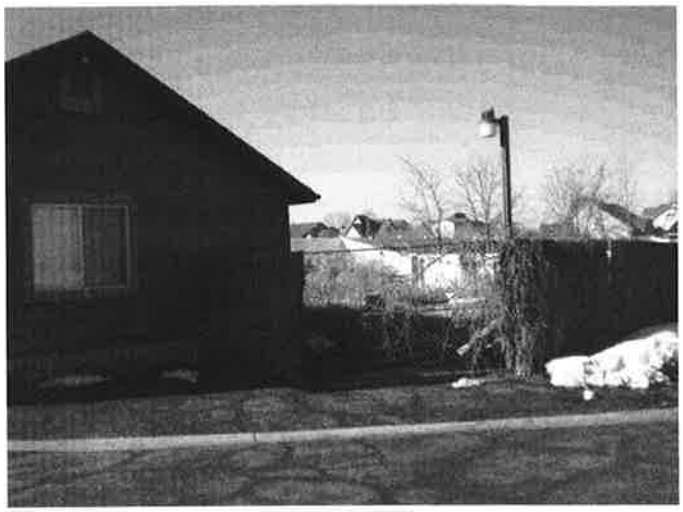
DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually soil below Water Table

FIGURE 4

BIG BEAR ELECTRIC INC.
JOB NO. 448-001-17

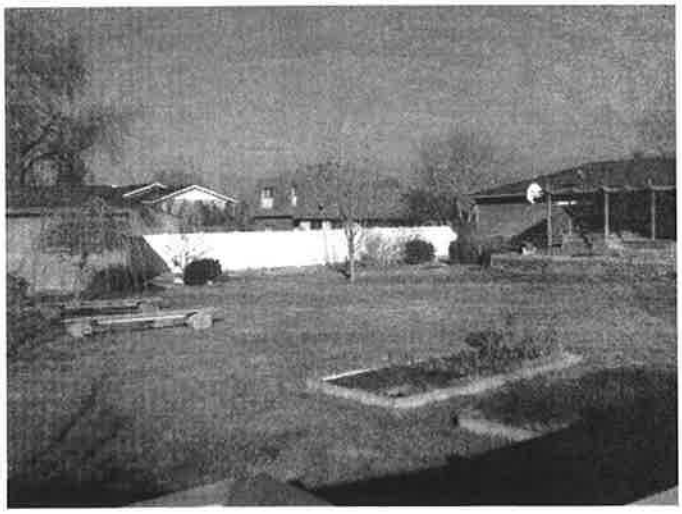
GORDON GEOTECHNICAL ENGINEERING, INC.

#1 Facing northwest.



#2 Facing northwest, north of existing facilities.

#3 View of the backyard of the northern residential property.



#4 Facing northeast across the site.

Locations and direction, see Figure 1, Area Map

FIGURE 5
PHOTOGRAPHS