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April 21, 2015

Paul Borowick
Petersen Kolberg and Associates Architects
6969 Hampton Street
Portland, Oregon 97223

RE: GEOTECHNICAL INVESTIGATION REPORT
CONSTRUCT NEW SPECIALTY CARE (BUILDING 201B)
DVA SOUTHERN OREGON REHABILITATION CENTER & CLINICS
WHITE CITY, OREGON
MAI JOB NO. 15-1017

Dear Mr. Borowick:

Introduction

We are pleased to present our geotechnical investigation report for the proposed Specialty Care (Building 201B) project at the DVA Southern Oregon Rehabilitation Center & Clinics in White City, Oregon. The purpose of this investigation was to evaluate the subsurface conditions at the site and develop earthwork and foundation engineering recommendations for the project design. The proposed development is shown on Drawing 1, Site Plan.

The Specialty Care building (Building 201B) will be adjacent and slightly west of the existing Building 201A to increase and expand access to specialty care at SORCC. The building will be a two-story structure of approximately 15,000 SF and will be similar in design to Building 201A. There will be a basement, probably 10' to 11' deep below existing site grades, under a portion of the building, but its plan dimensions are not yet known. The ground floor of the building is expected to be a raised floor elevated perhaps 1' or so above existing site grades, while the basement will likely have a slab floor.

As part of this project, Building 214 will be demolished and removed to make room for new paved parking adjacent to Building 201B and Avenue N. As shown on Drawing 1, the proposed paving will extend northwesterly from Avenue R West to 91st Avenue.

This report has been prepared for the specific use of Petersen Kolberg and Associates Architects and their consultants in accordance with generally accepted soil and foundation engineering principles and practices. No other warranty, either expressed or implied, is made. In the event that any substantial changes in the nature, design, or locations of the improvements are planned, the conclusions and recommendations of this report shall not be considered valid unless such changes are reviewed and the conclusions of this report modified or verified in writing.

It should be recognized that changes in the site conditions may occur with the passage of time due to environmental processes or man-made changes. Furthermore, building code or state of the practice changes may require modifications in the recommendations presented herein. Accordingly, the recommendations of this report should not be relied on beyond a period of three years without being reviewed by a geotechnical engineer.

Method of Investigation

Four exploratory borings (Borings 1-4) were drilled on February 17, 2015, with a truck-mounted Mobile B59 hollow stem auger at the locations shown on Drawing 1. Two hand-excavated borings (Borings 5-6) were drilled adjacent to Building 214 on February 27, 2015, and their locations are also shown on Drawing 1. The borings were located in the field by taping from the features shown on the site plan provided us. A key describing the soil classification system and soil consistency terms used in this report is presented on Drawing 2 and the boring sampling procedures are presented on Drawing 3. Logs of the exploratory borings are presented on Drawings 5 - 9.

Samples of the soil materials from the exploration were returned to our laboratory for classification and testing. The results of moisture content, percent finer than No. 200 sieve, and free swell are shown on the logs. The laboratory test procedures followed during this investigation are summarized on Drawing 4.

A bibliography of references is included at the end of the text.

Site Conditions

A. Surface

The ground surface at the Building 201B site is relatively flat and mostly paved for parking adjacent to Building 201A.

The ground adjacent to Building 214 is also relatively flat and is mostly grassy with sidewalk slabs and ramps leading to door entrances.

There is a relatively deep sump pump system near the northwest corner of Building 201A that is used to provide deep subdrainage beneath the basement in B201A.

B. Subsurface

Borings 1 and 2 were drilled within the footprint of the proposed Building 201B. Borings 3 and 4 were drilled in Avenue N and Borings 5 and 6 were drilled in the grassy landscaping area between Avenue N and B214. The borings generally encountered three layers of earth materials (though not all three layers in every boring): artificial fill, natural sandy clay, and dense granular alluvium.

Artificial Fill. In Borings 1-4, the artificial fill consisted of asphaltic pavement and baserock materials. These pavement sections varied from 20" thick to 28" thick. Artificial fill was not specifically observed in Boring 5. In Boring 6, the fill soils consisted of mixed clayey sand, sand, and rounded gravels, and were 9" thick.

Natural Sandy Clay. This soil was observed below the fill at Borings 2-4 and at the ground surface at Boring 5 (as clayey sand). This soil was not observed at Boring 1. This material generally consisted of medium stiff to stiff very sandy clay and varied from about 0.7' to 2' thick.

Dense Granular Alluvium. Dense granular alluvium consisting of sandy gravels with varying silt and clay and scattered layers of silty sand were encountered in all borings except Boring 4. These dense soils were encountered in the deeper borings to the maximum depth (19.5 feet at Boring 1).

The surficial clayey soil is considered to be moderately expansive based on our previous work for adjacent structures. The dense granular alluvium is considered to be non-expansive to slightly expansive based on its low fines content.

Soil Percolation. The clays and dense granular alluvium are very slow (clay) to slow (alluvium) in percolation characteristics. The granular soils are relatively densely packed and generally contain fine sands and 10% to 15% by weight of clay and silt. Almost all of the groundwater movement through the granular soils is through more permeable and discontinuous seams, rather than homogenously through the formation. There are also zones within the alluvium that are partially cemented (see Log of Boring 6) and are very slowly permeable.

The attached boring logs and related information depict subsurface conditions only at the specific locations shown on Drawing 1 and on the dates drilled. Subsurface conditions at other locations may differ from conditions occurring at these locations. Also, the passage of time may result in a change of soil conditions at these locations due to environmental changes.

C. Groundwater

Free groundwater was observed in Boring 1 at a depth of 13 feet and in Boring 2 at a depth of 18 feet. Prior experience at the VA facility has shown that the groundwater has risen to as high as seven to eight feet below the existing ground surface. The relatively high groundwater has been controlled by the installation of basement level underdrain systems and sump pumps in the newer buildings at the facility.

Free groundwater was not observed in the shallow borings drilled in Avenue N or adjacent to B214. Fluctuations in the groundwater level can occur because of variations in rainfall, temperature, runoff, irrigation, and other factors not evident at the time our observations were made and reported herein.

Geology and Seismicity

A. Geology

The VA facility lies within the Rogue Valley. The Rogue Valley is bounded by the Western Cascades physiographic province on the north and east and the Klamath Mountains province on the west and south.

The geologic map of the area (Wiley and Smith, 1993) indicates the site is underlain by Pleistocene Age Older Alluvium. This surface deposit consists of mixtures of gravel, sand, silt, and clay that are locally cemented and the deposit is characteristically at least 30 feet in elevation above major modern stream channels. The Older Alluvium is the oldest of four mapped stages of Quaternary alluvial fans and valley fill in the Rogue Valley.

The geologic map of the area (Wiley and Smith, 1993) also suggests that bedrock underlies the site at a depth of about 40 feet. However, recent drilling by others suggests that bedrock underlies the site at depths greater than 60 feet below existing grade.

B. Seismicity

Southern Oregon is in an area of moderate to potentially high seismic activity. As with the entire Oregon coastal belt, the site is in a region that is dominated seismically by the Cascadia Subduction Zone. The subduction zone is formed by the sinking of the offshore Juan de Fuca Plate beneath the onshore North American Plate. Earthquakes are generated within the subducting Juan de Fuca Plate (intraslab), at the frictional contact between the two plates (interface), and within the upper North American Plate (crustal). From an historical perspective, recorded seismicity in the region has been relatively low in comparison to Northern Oregon and Northern California.

The Cascadia Subduction Zone (CSZ) is capable of great earthquakes with Moment Magnitudes (M_w) of 8.5 plus and lies about 110 miles to the west. The potential ground shaking from the CSZ would likely be of greater severity and duration than earthquakes generated from intraslab and crustal faults.

Intraslab earthquakes of M_w 7.0 plus are capable on the seismogenic part of the subducting plate in the CSZ. These earthquakes typically occur at depths of 40 to 60 km.

Crustal earthquakes of up to M_w 6.5 can occur at relatively shallow depths of 25 km or less. Crustal faults typically produce most of the earthquakes in the region. Historically, crustal earthquakes have not exceeded M_w 6.0 and are usually less than M_w 4.5.

All of the above types of earthquakes are considered potential "design earthquakes" by the building code.

C. Faulting

The nearest mapped (Wiley and Smith 1993) fault lies about four miles to the southeast of the VA facility. This fault, and others in the Rogue Valley, offset pre-Quaternary geologic formations and are not considered active or potentially active.

The nearest known active fault (fault displaying movement within the last 10,000 years) system is the Sky Lakes Fault Zone that lies about 35 miles east of the site.

A few miles east of the Sky Lakes Fault Zone lies the active Klamath Graben faults. The Klamath Falls earthquakes of 1993 (M_w 5.9, M_w 6.0, and several small aftershocks) occurred on the Klamath Graben faults.

Geologic and Seismic Hazards Evaluation

A. Design Earthquake

The design earthquake for the project area is based on methodologies in the Code and was determined from on-line USGS seismic design maps (2012 IBC). The site has a Maximum Considered Earthquake (MCE) spectral response acceleration at 0.2 seconds for Site Class B of S_s=0.600g. The site also has an MCE spectral response acceleration at 1.0 second for Site Class B of S_1=0.324g.

Based on the subsurface boring information and the provisions in the Code, a Site Class C designation may be assumed for this site.

B. Fault Offset

Based on our review of existing geologic information, we conclude that there are no known active or potentially active faults in the vicinity of the project site. Therefore, the hazard resulting from surface rupture or fault offset is considered low.

C. Shaking

Based on on-line USGS seismic design maps and the previous Code (ASCE 7-10 Standard), the expected peak ground acceleration at this site for the Maximum Considered Earthquake is about 0.28g.

Ground amplification effects at the site are expected to be properly accounted for using the Code seismic design methodology.

Moderate to strong ground shaking could occur at the site as a result of an earthquake in the region. The proposed improvements should be designed and constructed in accordance with current standards of earthquake-resistant construction.

Ground shaking during an earthquake could cause objects within the building which are not rigidly attached to the structure to undergo some movements with respect to the structure. The building should, therefore, include design measures that minimize such potential movements and also minimize the adverse effects of such movements where they cannot be prevented.

D. <u>Soil Liquefaction</u>

Liquefaction is a phenomenon in which saturated cohesionless soils lose strength during strong shaking and experience horizontal and vertical movements. Soils that are most susceptible to liquefaction are clean, loose, saturated, uniformly graded, fine-grained, clay-free sands that lie within 50 feet of the ground surface.

The existing dense granular soils at the site are considered to be resistant to liquefaction. As such, we believe the potential for liquefaction at the site is low.

E. <u>Other Hazards</u>

Due to the relatively strong nature of the dense underlying gravels, the potential for other hazards such as shaking settlement, lateral spreading, and lurching are low. Due to the relatively flat ground in the site vicinity, the risk of landsliding affecting the site is low.

<u>Conclusions and Recommendations</u>

From a soil and foundation engineering standpoint, it is our opinion that the proposed development can be constructed as proposed provided the recommendations contained in this report are incorporated into the design and construction of the project.

<u>Soil Conditions</u>. The site soils can generally be characterized as a thin surficial layer of asphaltic pavement materials or soft natural clayey soil underlain at a shallow depth by dense granular soil. The surficial sandy clay is too soft to provide reliable support for footings.

<u>Foundations</u>. Conventional spread footings bearing on the dense granular soils may be used to support the new building. The footings may either bear directly on the dense soil or on structural fill underlain directly by the dense granular soil.

<u>Groundwater and Subdrainage</u>. Normally long-term monitoring is required to determine the highest groundwater level at a site. This monitoring was not possible for the purpose of this investigation. For the sake of prudent design, we recommend that the high groundwater level at the site be assumed to be nine feet below the ground surface.

Basement slab or gravel floors and basement concrete retaining walls should be protected with subdrainage and membrane protection systems. These measures should include, but not be necessarily limited to, floor underdrains, retaining wall backdrains, and retaining wall waterproofing materials.

Excavation. The dense granular soils are expected to be readily diggable with conventional equipment.

Detailed recommendations for the project design are presented in the remainder of the report. These recommendations are contingent on our review of the construction drawings and observation of the earthwork, foundation, and drainage installation phases of construction.

Recommendations

A. Earthwork

1. The site should be cleared of the building, slabs, footings, curbs, pavement materials, utilities to be abandoned, and any remaining obstructions and stripped of topsoil and surface organics within the work area. Holes resulting from the removal of underground obstructions should be backfilled with suitable material and compacted to the requirements for structural fill given below. The clearing of holes beneath the proposed finished grades and the backfilling operations should be performed under our observation.

2. After the site excavations are completed, the exposed subgrade soils in areas to be filled should be recompacted prior to placing additional fill. The recompaction may be waived by the soil engineer if the subgrade materials are hard and undisturbed. The recompaction should consist of scarifying the upper six inches, moisture conditioning the soils to approximately three percent above optimum, and compacting them to at least 95 percent relative compaction as determined by ASTM Test Method D698. Compaction should be performed using heavy equipment such as a large vibratory roller.

3. In order to achieve satisfactory compaction in the subgrade and fill soils, it may be necessary to adjust the soil moisture content at the time of construction. Soils which are too dry will require the addition of water while scarification and aeration will be required for soils which are too wet.

4. Structural fill may include high quality 3/4"-0 crushed rock or 4"-0 crushed rock beneath footings, slabs, and pavements. The choice of structural fill materials should be compatible with the method of placement and compaction.

5. Structural fill should be compacted to at least 95 percent relative compaction as determined by ASTM Test Method D698. Fill materials should be moisture-conditioned and spread in lifts not exceeding eight inches in uncompacted thickness. Where practical, compaction should be performed with a heavy self-propelled vibratory roller capable of producing at least 24,000 pounds dynamic force. Compaction behind retaining walls should be performed with portable light equipment to prevent overstressing of the wall.

The compaction of the fill, thickness of lifts, and control of the moisture content should be monitored and tested by our field representative. Compaction should be evaluated by the use of nuclear gauge field density testing and, where appropriate, by proofrolling with loaded 10 cy gravel trucks.

6. Utility trenches should be backfilled with compacted fill placed in lifts not exceeding eight inches in uncompacted thickness, except thicker lifts may be used with the approval of the soils engineer provided satisfactory compaction is achieved. The upper three feet of trench backfill should be compacted to at least 95 percent relative compaction (ASTM D698). Jetting of backfill to obtain compaction should not be permitted.

7. Grading and earthwork should be monitored and tested by our representative for conformance with the project plans/specifications and our recommendations. This work includes site preparation, selection of satisfactory fill materials, and placement and compaction of the subgrades and fills. Sufficient notification prior to commencement of earthwork is essential to make certain that the work will be properly observed.

B. Foundations

1. Spread footings may bear directly on the underlying dense granular alluvial soils. Footings may also bear on structural fill that is in turn underlain by dense granular alluvial soil. All existing weak soil, including the existing sandy clay and possibly any old fill, must be removed from beneath foundations. The dense granular soils were encountered in Borings 1 and 2 at depths of 1.9 and 3.0 feet below existing grades, respectively.

   The bottoms of all footing excavations should be cleaned of loosened material and checked by our field representative for soft material.

2. Where structural fills are utilized beneath footings, the structural fills should extend laterally at least 1.0 feet beyond the sides of the footings.

3. Footings should bear at least twelve inches below lowest adjacent finished grade. Footings located adjacent to utility trenches should have their bearing surfaces below an imaginary 1.5:1 (horizontal to vertical) plane projected upward from the edge of the bottom of the trench.

4. Footings constructed in accordance with these recommendations can be designed for an allowable bearing pressure of 3000 psf for dead plus live loads. This pressure may be increased by one-third for total loads including wind or seismic. All footings should be provided with sufficient reinforcement to provide structural continuity.

5. Lateral loads can be resisted by friction between the foundation bottoms and the supporting subgrade. A friction coefficient of 0.35 may be used. In addition, a passive pressure equal to an equivalent fluid pressure of 300 pcf may be used starting at a depth of 0.5 feet below finished grade.

6. Foundation settlements are expected to be less than 3/4 inch and within tolerable limits for the proposed construction.

C. <u>Slabs-On-Grade</u>

1. The basement floor, be it gravel or a slab-on-grade, should be protected with a subdrainage system. A basement-level slab should be underlain by at least twelve inches of mechanically tamped free-draining 3/4" crushed rock (no fines, no round rock) over subgrade soil. At least two three-inch diameter perforated rigid PVC pipes should be placed at the bottom of the free-draining crushed rock lengthwise within the basement and the perforated pipes should be placed on ten feet spacings (the actual layout can be established once the floor layout is known). The perforated pipes should drain to drainage facilities, such as the nearby sump pump serving B201A, for pumped discharge into the site drainage system.

   The free-draining crushed rock will act as a capillary moisture break to help decrease moisture through the slab. A vapor barrier should also be incorporated into the design. The vapor barrier may be covered with two inches of sand that is lightly moistened just prior to pouring the slab.

   If the basement floor is solely gravel, the gravel layer should be at least 12" thick and composed of free-draining ¾" crushed rock (no fines, no round rock). The above-mentioned perforated pipe should be placed within the gravel and connected to the existing nearby sump pump system. The subgrade surface should be uniformly excavated to prevent pools from forming within the gravel layer.

2. Slabs should be reinforced in accordance with the anticipated use and loading, but as a minimum, slabs should be reinforced with at least No. 4 rebars on 16-inch centers, both ways.

D. <u>Basement Retaining Walls</u>

1. Basement retaining walls should be supported on foundations designed in accordance with our previous recommendations. Unrestrained walls with level backslopes and backfilled with well-draining backfill may be designed to resist an equivalent fluid pressure of at least 40 pcf. Where restrained, walls should be designed for an equivalent fluid pressure of 60 pcf. The walls should also be designed for a peak horizontal ground acceleration of 0.13 g. These pressures do not account for any surcharge loadings or saturated backfills. Surcharge loadings and saturated backfills should be evaluated on a case-by-case basis.

2. The preceding pressures assume that sufficient drainage is provided behind the walls to prevent the build-up of hydrostatic pressures from surface or subsurface water infiltration. Adequate drainage may be provided by means of 3/4 inch drain rock material enclosed in a filter fabric and a four inch diameter rigid perforated pipe placed at the base of the wall. The drainrock should extend up the walls to within one foot of finished grade. The drain pipes should be tied into closed pipes that discharge into suitable facilities. A detail displaying the recommended backdrainage is shown on Drawing 10, Retaining Wall Detail.

3. The backfill placed behind retaining walls should be granular, free-draining, non-expansive, and compacted to at least 95 percent relative compaction using light compaction equipment. All interior walls should be waterproofed and the waterproofing should be protected with protection boards.

E. Flexible Pavements

1. Based on our previous experience with similar soil conditions, we recommend the following sections:

Recommended Pavement Sections

Traffic Condition	Asphalt Concrete (inches)	3/4"-0 Crushed Rock (inches)	4"-0 Crushed Rock (inches)
Auto Parking Only	2.0	4.0	12.0
Drive Aisles and Heavy Vehicle Lanes	3.0	6.0	12.0

2. The 3/4"-0 crushed rock should meet Section 02630, latest ODOT/APWA Standard Specifications. The crushed rock should be placed in a manner to prevent segregation and should be uniformly moisture-conditioned and compacted to at least 95 percent relative compaction (ASTM D698, Method A) to provide a smooth, unyielding surface.

3. The 4"-0 crushed rock should be high quality, processed 4"-0 crushed rock that is approved for use on City streets. The crushed rock must be dense after compaction and non-deflecting under proofrolling with a fully loaded ten-yard gravel truck.

   The crushed rock should be underlain by a 5 oz/yd minimum non-woven permeable geotextile fabric.

4. The subgrade beneath the 4"-0 crushed rock should be unyielding under the wheels of a fully loaded 10 cu. yd. dump truck and compacted to at least 95 percent

relative compaction (ASTM D698). If the subgrade is not hard and unyielding at the time of construction, the weak subgrade will need to be removed and replaced with structural fill such as compacted 4"-0 crushed rock. All fill placed beneath the pavement section should be compacted to at least 95 percent relative compaction (ASTM D698). Grading for pavements should be performed during the dry and warm months of the year.

F. Drainage

1. Positive surface gradients of at least two percent on paved surfaces and five percent in landscaping areas should be maintained away from the building so that water does not collect in the vicinity of the foundations. Water from roof downspouts should be collected into closed pipes that discharge the water into approved drainage facilities.

2. A foundation drain should be placed adjacent to the perimeter building footings (where retaining wall backdrains are not present) to help control moisture in the crawlspace.

3. If the basement has a gravel floor, please refer to the recommendations for subdrainage presented above under Item C.

G. Construction Observation

1. We should be retained to provide monitoring services during the grading, foundation, and drainage installation phases of the project. This will provide the opportunity for correlation of the soil conditions found in our investigation with those actually encountered in the field, and thus permit any necessary modifications in our recommendations resulting from changes in anticipated conditions.

We have provided our findings and recommendations in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, either expressed or implied, is made.

REGISTERED PROFESSIONAL
ENGINEER
16885
OREGON
SEPT. 21, 1993
ERIC A. SWANSON
EXPIRES: 6-30-2016

Very truly yours,

MARQUESS & ASSOCIATES, INC.

Rick Swanson, P.E., G.E.
Civil Engineer 16885

RS/ler

Copies: Addressee (2), and by email

Attachments: Bibliography
Site Plan, Drawing 1
Key to Boring and Pit Logs, Drawing 2
Boring Sampling Procedures, Drawing 3
Laboratory Testing Procedures, Drawing 4
Logs of Borings 1 -4, Drawings 5-8
Logs of Borings 5 and 6, Drawing 9
Retaining Wall Detail, Drawing 10

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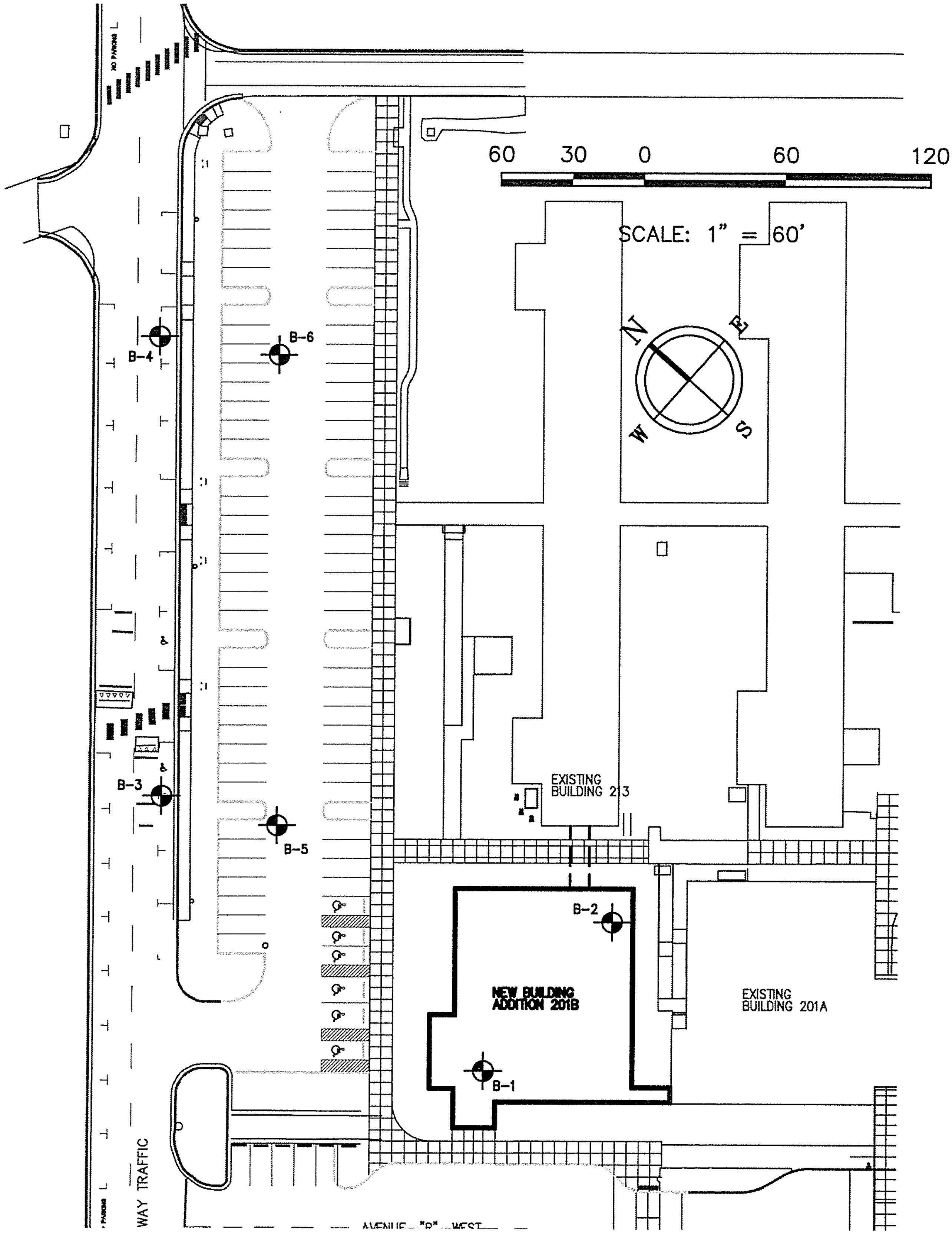

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SITE PLAN
Specialty Care (Building 201B)
DVA Southern Oregon Rehabilitation Center & Clinics
White City Oregon

MAI JOB NO.	15-1017	DRAWN	RS
ISSUE DATE	April 2015	CHECKED	RS

DRAWING **1** OF 10 DWGS

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN No. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN No. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels, or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN No. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN No. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS 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 of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

U.S. STANDARD SERIES SIEVE — CLEAR SQUARE SIEVE OPENINGS

	200	40	10	4	3/4"	3"	12"	
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS	
	FINE	MEDIUM	COARSE	FINE	COARSE			

GRAIN SIZES

SANDS & GRAVELS	BLOWS/FOOT†
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

RELATIVE DENSITY

SILTS & CLAYS	STRENGTH‡	BLOWS/FOOT†
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

CONSISTENCY

† Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).

‡ Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

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KEY TO BORING AND PIT LOGS
Specialty Care (Building 201B)
DVA Southern Oregon Rehabilitation Center & Clinics
White City, Oregon

MAI JOB NO.	15-1017	DRAWN	RS
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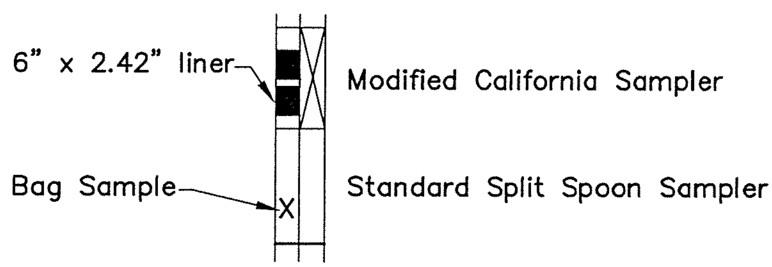
BORING SAMPLING PROCEDURES

The soils encountered in the borings were continuously logged in the field by our representative and described in general accordance with the Unified Soil Classification System (ASTM D-2487).

Representative soil samples were obtained from the borings at selected depths appropriate to the soil investigation. All samples were returned to our laboratory for classification and testing.

The standard penetration resistance blow counts were obtained in general accordance with the ASTM D1586 procedure by dropping a 140 pound hammer through a 30-inch free fall. The 2-inch O.D. split spoon sampler was driven 18 inches or to practical refusal and the number of blows were recorded for each 6-inch penetration interval. The blows per foot recorded on the boring logs represent the accumulated number of blows required to drive the penetration sampler the final 12 inches. In addition, 3.0 inch O.D. x 2.42 inch I.D. drive samples were obtained using a Modified California Sampler and a 140 pound hammer. Blow counts for the Modified California Sampler are shown converted to standard penetration resistance by multiplying by 0.6. The sample type is shown on the logs in accordance with the designation below.



Where obtained, the shear strength of the soil samples using either Torvane (TV) or Pocket Penetrometer (P) devices is shown on the boring logs in the far right hand column.

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BORING SAMPLING PROCEDURES
Specialty Care (Building 201B)
DVA Southern Oregon Rehabilitation Center & Clinics
White City Oregon

MAI JOB NO.	15-1017	DRAWN	RS
ISSUE DATE	April 2015	CHECKED	RS

LABORATORY TESTING PROCEDURES

The laboratory testing program was directed toward a quantitative and qualitative evaluation of the physical and mechanical properties of the soils underlying the site.

The natural water content was determined on eleven samples of the materials recovered from the borings in general accordance with the ASTM Test Method D2216. These water contents are recorded on the logs at the appropriate sample depths.

The percent soil fraction passing the #200 sieve was determined on two samples of the subsurface soils in general accordance with the ASTM Test Method D1140 to aid in the classification of the soils. The results of these tests are shown on the logs at the appropriate sample depths.

One free swell test was performed on a sample of the soil materials to evaluate the swelling potential of the materials. The test was performed by pouring ten mL of the dry material into a 100 mL graduated cylinder containing about 40 mL of distilled water. The mixture was stirred repeatedly and allowed to equilibrate for 24 hours, then distilled water was added up to the 100 mL mark. The graduated cylinder was left undisturbed to equilibrate. The free swell volume was then noted. The percent free swell was calculated by dividing the free swell volume by ten and multiplying my 100 percent. The result of this test is presented on the log of Boring 2.

EQUIPMENT: Mobile B-59 hollow stem auger	ELEVATION: ---	LOGGED BY: RS
DEPTH TO GROUNDWATER: 13'	DEPTH TO BEDROCK: Not Observed	DATE DRILLED: 2-17-15

DESCRIPTION AND CLASSIFICATION

DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
FILL. 2" AC over 8" 3/4"-0 crushed rock over 12" 4"-0 crushed rock				1					
SILTY SAND, moist, with gravel	Brown	Very Dense	SM	2	X	50/6"	20		
				3					
SANDY GRAVEL, moist, clayey/silty	Brown	Dense	GC	4					
				5					
				6	X	56	12		
				7					
				8					
				9					
@9.5': Finer than #200 = 20 %					X	31	16		
				10					
				11					
				12					
				13			▼	(during drilling)	
				14	X	54	11		
				15					
				16					
				17					
				18					
				19	X	50/6"	15		
Bottom of Boring = 19.5'				20					

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LOG OF BORING 1
Specialty Care (Building 201B)
DVA Southern Oregon Rehabilitation Center & Clinics
White City Oregon

MAI JOB NO.	15-1017	DRAWN	RS
ISSUE DATE	April 2015	CHECKED	RS

DRAWING
5
OF 10 DWGS

EQUIPMENT: Mobile B–59 hollow stem auger	ELEVATION: ---	LOGGED BY: RS
DEPTH TO GROUNDWATER: 18'	DEPTH TO BEDROCK: Not Observed	DATE DRILLED: 2–17–15

DESCRIPTION AND CLASSIFICATION: DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
FILL. 2" AC over 8" 3/4"–0 crushed rock over 12" 4"–0 crushed rock				0–2					
SANDY CLAY, moist	Dark Brown	Stiff	CL	2–3					
SANDY GRAVEL, moist, clayey @3': Finer than #200 = 59 %, clay Free Swell = 55 %	Brown	Dense	GC	3	X	37	15		
				6	X	50/6"	16		
				9	X	50/4"	15		
				13.5	X	50/6"	15		
				18			▼ (during drilling)		
				19	X	50/6"	13		
Bottom of Boring = 19'				20					

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LOG OF BORING 2

Specialty Care (Building 201B)

DVA Southern Oregon Rehabilitation Center & Clinics

White City Oregon

MAI JOB NO.	15-1017	DRAWN	RS
ISSUE DATE	April 2015	CHECKED	RS

DRAWING 6 OF 10 DWGS

EQUIPMENT: Mobile B-59 hollow stem auger	ELEVATION: ---	LOGGED BY: RS
DEPTH TO GROUNDWATER: Not Observed	DEPTH TO BEDROCK: Not Observed	DATE DRILLED: 2-17-15

DESCRIPTION AND CLASSIFICATION				DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE						
FILL. 4" AC over 6" 3/4"-0 crushed rock over 10" crushed rock				1					
SANDY CLAY, moist	Dark Brown	Stiff	CL-SC	2					
				3		14	(no recovery)		
Bottom of Boring = 3.5'				4					
				5					
				6					
				7					
				8					
				9					
				10					
				11					
				12					
				13					
				14					
				15					
				16					
				17					
				18					
				19					
				20					

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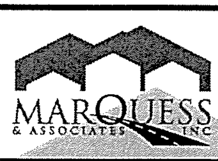
LOG OF BORING 3
Specialty Care (Building 201B)
DVA Southern Oregon Rehabilitation Center & Clinics
White City Oregon

MAI JOB NO.	15-1017	DRAWN	RS
ISSUE DATE	April 2015	CHECKED	RS

DRAWING 7 OF 10 DWGS

EQUIPMENT: Mobile B-59 hollow stem auger	ELEVATION: ---	LOGGED BY: RS
DEPTH TO GROUNDWATER: Not Observed	DEPTH TO BEDROCK: Not Observed	DATE DRILLED: 2-17-15

DESCRIPTION AND CLASSIFICATION				DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	DRY DENSITY (PCF)	SHEAR STRENGTH (KSF)
DESCRIPTION AND REMARKS	COLOR	CONSIST.	SOIL TYPE						
FILL. 4" AC over 8" 3/4"-0 crushed rock over 16" mixed crushed rock				1, 2					
SANDY CLAY, moist	Dk Brn	Stiff	CL	3					
GRAVELLY SAND, moist, silty	Brown	Dense	SM	4	X	44	10		
Bottom of Boring = 4'				5–20					



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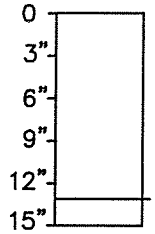
LOG OF BORING 4
Specialty Care (Building 201B)
DVA Southern Oregon Rehabilitation Center & Clinics
White City Oregon

MAI JOB NO.	15-1017	DRAWN	RS
ISSUE DATE	April 2015	CHECKED	RS

DRAWING
8
OF 10 DWGS

Boring 5

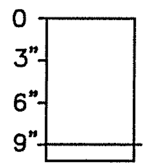


CLAYEY SAND (SC), brown, loose to medium dense, common grass roots to 6" deep, common 3" dia. gravels from 4" to 11"

SANDY GRAVEL (GC), orange–brown, dense to very dense, moist

Bottom of hand dug boring = 15"
Practical excavation refusal at 15" due to packed gravels

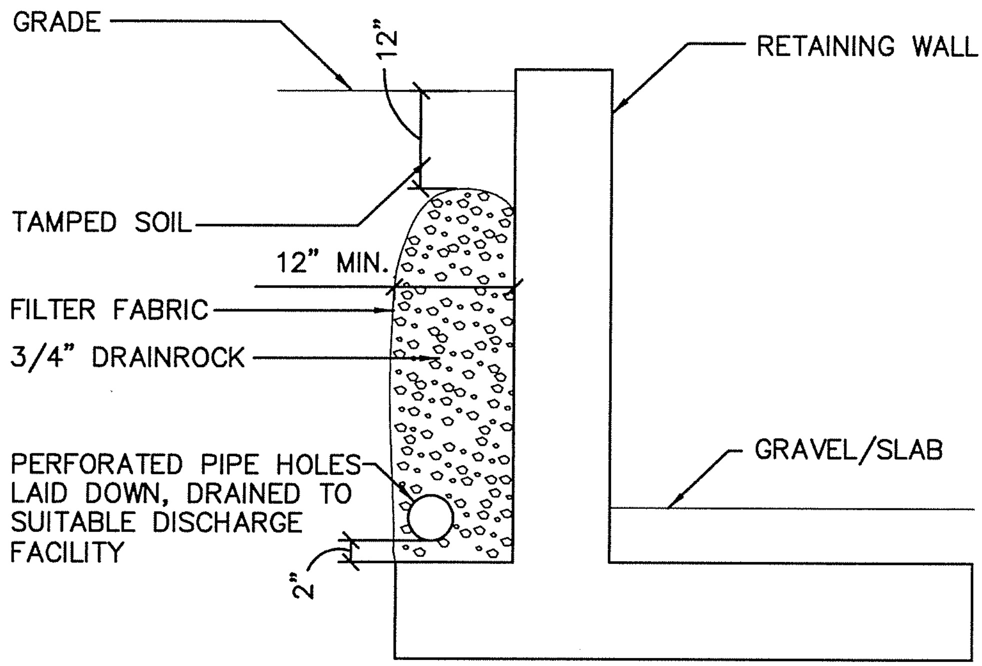
Boring 6



FILL. mostly CLAYEY SAND (SC), brown, medium dense, some intermixed gray SAND fill from 1" to 5" deep, some 3" dia gravels from 5" to 9" deep

SANDY GRAVEL (GP), orange–brown, very dense, moist, seems very hard and partially cemented

Bottom of hand dug boring = 10"
Practical excavation refusal at 10"



Retaining Wall

NOTES:

1. Perforated pipe should be at least 4" diameter and rigid (SDR of 35 or less). Subdrain should be located several inches below adjacent finished grade.

2. Weepholes may be used behind exterior walls where seepage will not detract from the wall's usefullness or create future moisture or drainage problems.

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RETAINING WALL DETAIL
Specialty Care (Building 201B)
DVA Southern Oregon Rehabilitation Center & Clinics
White City Oregon

MAI JOB NO.	15-1017	DRAWN	RS
ISSUE DATE	April 2015	CHECKED	RS