URBAN ENGINEERS, INC.

GEOTECHNICAL EXPLORATION REPORT

PROPOSED WATER TANK, PUMP HOUSE, AND EMERGENCY GENERATOR BUILDING

VETERANS AFFAIRS MEDICAL CENTER
135 EAST 38TH STREET
ERIE, PENNSYLVANIA

Prepared for:

A|E Works
Pittsburgh, Pennsylvania

May 2014

Urban Project No. 2014620088.000

URBAN ENGINEERS, INC.
Formulating Excellence®
ISO 9001:2008 Certified | Founded 1960 | Employee Owned
1319 Sassafras Street
Erie, PA 16501-1720
(814) 453-5702 Fax (814) 453-2020
www.urbanengineers.com

May 22, 2014

AE Works, Ltd.
6587 Hamilton Avenue
Pittsburgh, Pennsylvania 15206

Attn: Jason Dillaman, AIA
Project Manager

Re: Geotechnical Exploration Report
Proposed Water Tank, Pump House and Emergency Generator Building
Veterans Affairs Medical Center
135 East 38th Street
Erie, Pennsylvania
Urban Project No. 2014620088.000

Gentlemen:

We are pleased to submit herewith our final Geotechnical subsurface exploration report covering field and laboratory services together with our evaluation of subsurface conditions and recommendations for the captioned project. A preliminary evaluation report was previously submitted by email on April 30, 2014.

We wish to thank you for the opportunity of assisting you in this project, and for your cooperation during the course of this exploration. In the event of questions, additional services or information on any of the above, please do not hesitate to contact our office.

Very truly yours,

URBAN ENGINEERS, INC.

David G. Machmer, P.E.
Geotechnical Engineering Practice Leader

DGM:clb

TABLE OF CONTENTS

I. INTRODUCTION

This report presents the results of a Geotechnical exploration performed for the proposed water tank, pump house and generator building to be constructed at the Erie Veterans Affairs Medical Center (Erie VAMC), located at 135 East 38th Street, in Erie, Pennsylvania (see Dwg. 1, appended). The objective of the exploration was to evaluate the subsurface conditions at the site as they relate to construction of the proposed facilities. Specifically, the scope of services was as follows:

1. Review site history,
2. Layout and drill test borings,
3. Coordinate the drilling operations and perform part-time drilling observation,
4. Conduct laboratory testing on selected subsurface samples to determine their engineering properties, and
5. Perform engineering analysis and evaluation, and prepare a written report to include recommendations from the geotechnical engineering viewpoint for the design and construction of the foundations for the proposed facilities.

These services have been performed in accordance with Urban's proposal dated March 18, 2014, and AE Works Consultant Agreement dated March 24, 2014.

II. PROPOSED CONSTRUCTION

The proposed construction will include a 45,000 gallon water storage tank, a 20 ft. x 20 ft. pump house building, a 54 ft. x 43 ft. emergency generator building, and an approximately 15,000 gallon fuel storage tank, as shown on Dwg. 2, appended. The floor of the proposed generator building, the bottom of the water tank, and the floor of the pump house are expected to be set close to the floor of the existing switchgear building, at approximately

Elevation 279. The water tank will be a steel sided, glass lined, tank supported on a ringwall foundation. The dimensions of the tank are not set at this writing, but are expected to range from 21 ft. to 26 ft. tall and 22 ft. to 28 ft. in diameter. The proposed pump house and generator buildings will be single-story masonry block wall structures. Loads from the proposed construction are expected to be "moderate."

III. FIELD AND LABORATORY INVESTIGATION

Four (4) test borings numbered B-1 through B-4 were performed by R. Rindfuss Drilling, L.P., Waterford, Pennsylvania, on April 22, 2014. A track-mounted, diesel-powered drilling rig was used, and split-barrel sampling and penetration tests were performed in accordance with ASTM and other standard procedures. The borings were located in the field and ground surface elevations were obtained by Urban's survey corps. The drilling operations were coordinated by Urban and observed on a part time basis by Urban's drilling technician. The test boring locations are shown on Dwg. 2 and the results are presented on the boring logs included in the appendix.

All recovered subsurface samples were visually inspected in Urban's laboratory and the descriptions are presented on the boring logs. The testing of selected subsurface soil samples was also performed in our laboratory, and included the determination of moisture content, gradation, Atterberg Limits, and classification. The results are included in the appendix and discussed in the following sections.

IV. SITE CONDITIONS

Geologically, the site lies in the "Central Lowland" physiographic province of Pennsylvania. The area was glaciated, and is covered with silty and sandy Ashtabula Moraine

soils deposited during the Pleistocene Era. The underlying bedrock is Girard Shale belonging to the Upper Devonian Period of the Paleozoic Era.

The site is located to the east and north of the existing switchgear building at the Erie VAMC. The proposed construction area is currently covered with grass lawn and landscaping. The site is sloping gently to the north and west away from the existing switchgear building with a relief of about 6 ft. in the project area. Several buried utilities, including electric, sewer, telephone, water, fire control, and abandoned gas lines, are located in the proposed construction area as shown on Dwg. 2, appended. Between 1 in. and 3 in. thick topsoil was found at the ground surface in the borings. The subsurface materials encountered below the topsoil are presented graphically on the subsurface profiles on Dwgs. 3 and 4, appended, and are discussed in the following paragraphs.

The site is covered with a 3 ft. to 10 ft. thick layer of fill, consisting of brown and gray clayey silt, some sand, little gravel, trace concrete and organics. The fill is likely associated with former construction of nearby buildings and with backfilling of the underground utilities located in the area. A possible buried concrete rubble obstruction was encountered a depth of 5.5 ft. in Test Boring B-1. The boring was offset and redrilled 2 more times and similar obstructions were encountered both times. The hole was abandoned after the third attempt. Test Boring B-4 met refusal at a depth of 10.4 ft. on possible buried concrete rubble in fill, and was offset and redrilled to planned depth. Testing performed on some of the cleaner fill indicates a "low" to "moderate" moisture content, and "slight" plasticity. The fill classifies as SM and SC-SM in accordance with the Unified Soil Classification System, and as indicated by the standard penetration test blow counts, the fill is in generally "loose" and "medium dense" condition.

Virgin brown and gray clayey silt and sand, little gravel, was found underlying the fill at depths of 3 ft. to 10 ft. The thickness of the layer found in Boring B-4A is 14 ft., and the layer

was not found in Boring B-1. The moisture content varies from "low " to "high," and the plasticity is "slight." The classifications are ML and SM, and the consistency and relative density are generally "medium stiff" and "medium dense," respectively. Boring B-2 and B-3 were terminated in this layer at depths of 25 ft. and 20 ft., respectively.

Gray shale bedrock in "partially decomposed" condition was encountered at a depth of 24.0 ft. below the ground surface in Boring B-4A, corresponding to Elevation 249.5. High resistance to sampling was experienced, and refusal was met after penetrating a short distance into shale. Boring B-4A was terminated in the shale bedrock.

Water level observations were made at the time of drilling and at the end of the day, and are noted on the logs and profiles. The reading taken at the end of the day in Boring B-3 indicates a depth of 16 ft., corresponding to Elevation 259.8. The other borings were dry at completion. Based on previous explorations performed nearby, we estimate that ground water may be present as high as Elevation 264.4 in the proposed construction area. These observations do not reflect periodic or seasonal variations in the groundwater levels.

V. ANALYSIS AND RECOMMENDATIONS

A. Foundations

Spread Footings on Full Soil Replacement

The proposed construction area is covered with fill containing concrete fragments and organic matter. The fill may be associated with former construction of nearby buildings and with backfilling of the underground utilities located in the area. We recommend that the fill be removed completely from the areas of the proposed construction and replaced with engineered fill. We are anticipating that the existing underground utilities in the area of the proposed construction will need to be relocated. Any resulting excavations from removal of abandoned

utilities must be backfilled with engineered fill. Upward to 6 ft. of filling will be required to achieve grades in the proposed construction areas, and also must be performed with engineered fill. The engineered fill will be comprised of select granular off-site borrow material, placed and compacted in thin lifts as outlined in the following sections.

The proposed water tank, pump house, generator building, and fuel tank, may then be supported on spread footings constructed on 'firm' virgin soil and engineered fill, and designed for net bearing pressures not exceeding 2,500 psf. The footings should be placed a minimum of 4 ft. beneath the adjacent grades to provide adequate protection against frost heave. The proposed floor slabs may be supported on-grade, and a modulus of subgrade reaction of 100 pci may be used for design of the slabs. A vapor barrier should be provided beneath the floor slab of the buildings to help protect against water vapor migration from the subsoils, and a layer of washed gravel should be provided beneath the vapor barrier to provide a capillary block between the vapor barrier and the subgrade. The floor of the water tank will be subjected to frost. In order to protect the tank floor from frost heave, the tank floor should be provided with frost-free select fill beneath the floor, extending to a depth of 4 ft. below the floor surface. Recommendations regarding the frost-free select fill are provided in the following Site Work section. Total and differential settlements are estimated not to exceed ½ in. and ¼ in., respectively, for the foundations so constructed. Based on the test boring results the site is estimated to have a building "Seismic Site Classification" of "D" (reference 2009 International Building Code).

Spread Footings on Partial Fill Replacement

Alternately, we have also evaluated supporting the proposed structures on spread footings after site work involving partial soil replacement. With partial soil replacement, the fill stratum is removed to a minimum depth of 1.5 ft. below the proposed foundations and replaced with

engineered fill. This scheme is expected to reduce the amount of fill replacement in the areas of Borings B-1 and B-4, where the fill was found extending down to an elevation of about 263. It should be pointed out that there is an element of risk in this scheme, and some settlements may occur due to decomposition of the organics and consolidation of the "loose" fill materials left in place, but the savings will be considerable when compared with complete fill removal. If the partial replacement scheme is used, the proposed structures may be supported on minimum 1.5 ft. thick pads of engineered fill and designed for net bearing pressures not exceeding 1,500 psf. It will be difficult to estimate possible settlements where the existing fill is left in place because they will be due in part to consolidation from organic decomposition, although total and differential settlements of ¾ in. or more could occur over the long term. Frost protection and floor slab recommendations provided previously may be used for this scheme.

B. Site Work

The existing vegetation and topsoil should be removed from the proposed construction area and areas to receive fill. The existing fill must be removed from the propose foundation areas. If the partial removal scheme is used, the existing fill must be excavated a minimum distance of 1.5 ft. beneath the bottom of the proposed footings. The excavations to remove the existing fill must extend horizontally beyond the sides of the footings a distance of 1 ft. for every 2 ft. of depth - for example, if a 3 ft. thick layer of existing fill is excavated, the width of the excavation must extend a minimum 1.5 ft. wider on both sides of the footing. Existing fill material excavated from the site should not be used for backfilling in the proposed foundation and building areas. The resulting excavations must be backfilled with engineered fill comprised of select granular off-site borrow material, free of deleterious matter and conforming to the following specifications.

Gradation Requirements

Particle/Sieve Size	Percent Passing By Weight
3"	100
3/8"	35 - 95
No. 4	25 - 90
No. 10	15 - 80
No. 40	10 - 45
No. 200	3 - 15
Liquid Limit, 25, max.	Plasticity Index, 7, max.

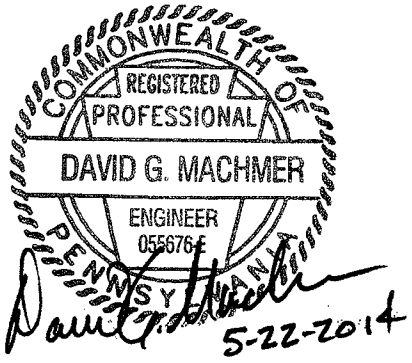
Material conforming to these specifications is available in the region as run-of-bank gravel, and is generally suitable without processing. The frost-free select fill should be granular material with less than 3% material finer than 0.02 mm. Material meeting PennDOT No. OGS Subbase grain size specification will be suitable for this purpose, or a stone aggregate such as AASHTO No. 57 or No. 67 Stone may be used. The filling must be in nearly horizontal layers not exceeding a loose thickness of 9 inches, and each layer must be compacted to a minimum 95% compaction as determined by ASTM D698 (Standard Proctor) method of compaction test. The in-place density of the compacted fill must be tested, and the ASTM D6938 (nuclear density gauge) method of in-place density measurement can be used. We recommend that representative testing be performed at minimum rates of 1 in-place density test on every 30 cu.yds. of engineered fill placed, and no fewer than 2 tests per lift. Coarser materials, such as AASHTO No. 57 or No. 67 Stone, may be compacted to non-movement criteria under the observation of an experienced soils field technician.

Proper drainage should be maintained during construction so that storm water is removed quickly from the site. In contact with water and the movement of construction machinery, the siltier on-site materials may lose their strength and become soft. In the event of this occurrence, the softened soil will have to be over-excavated to 'firm' soil. Ground water is estimated to be

present as high as Elevation 264.4. Based on this, ground water is not expected to be encountered during construction.

VI. GENERAL

The recommendations and conclusions contained in this report are based on the information revealed in the course of our study and exploration. Any changes in the proposed construction or location must be brought to our attention. Unexpected conditions may be encountered during construction, because the site is a filled area, and any deviation may necessitate re-evaluation of our recommendations and changes may have to be considered. The report has been prepared based on the structural properties of the subsurface materials and does not address environmental aspects. Furthermore, we cannot be responsible for any conclusions drawn from the data included in this report other than those specifically stated. The report has not been prepared to be used directly as construction specifications. This report is intended for use with regards to the specific project discussed herein.

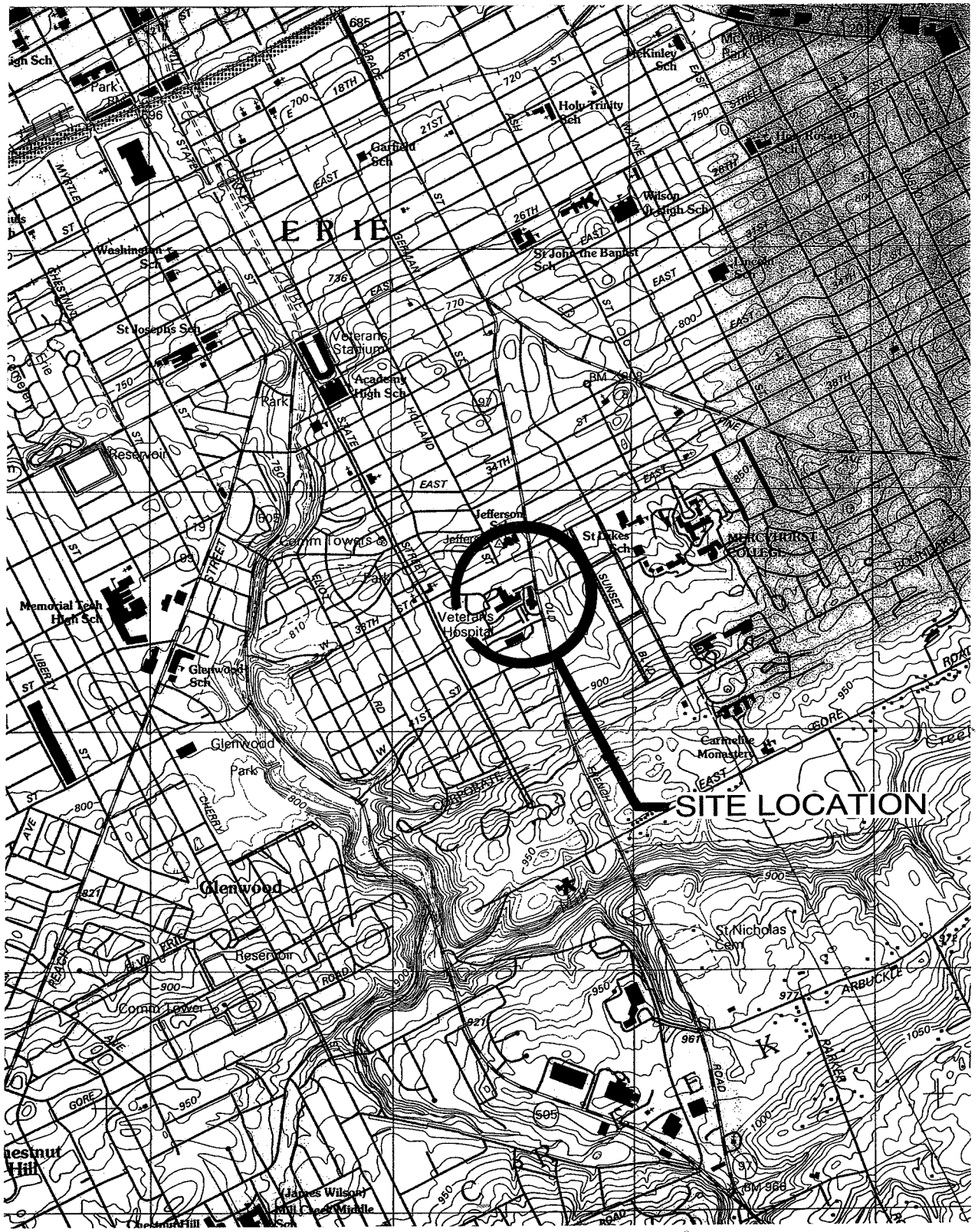


URBAN ENGINEERS, INC.

May 22, 2014

T:\2014\2014620088.000 VAMC WATER TANK, PUMP HOUSE, AND GENERATOR BUIDLING - SOILS\2014620088.000 REPORT.DOC

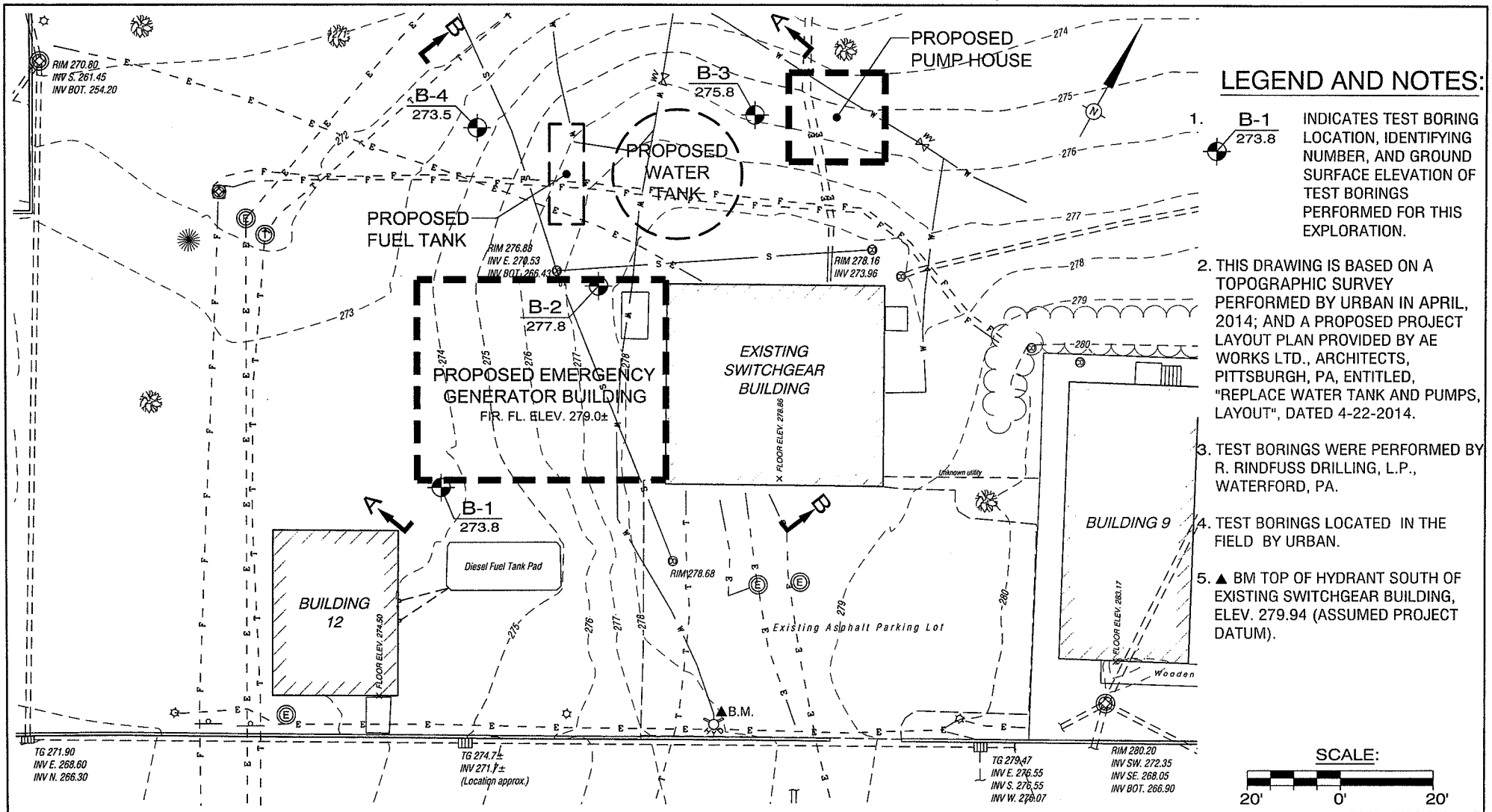
APPENDIX



USGS QUADRANGLE REFERENCED:
ERIE SOUTH, PA.

SCALE: 1" = 2000'

SITE LOCATION MAP	DRAWN BY: J.R.T.	UEI NO. 2014620088.000	URBAN ENGINEERS, INC. 1319 Sassafras Street Erie, Pennsylvania 16501 (814) 453-5702	PROPOSED WATER TANK, PUMP HOUSE, AND EMERGENCY GENERATOR BUILDING VETERANS AFFAIRS MEDICAL CENTER 135 EAST 38th STREET ERIE, PENNSYLVANIA
	CHECKED BY: A.R.K., D.G.M.	CAD NAME: 2014620088000		
	DATE: MAY, 2014	DWG. NO. 1		



LEGEND AND NOTES:

1. B-1 / 273.8 — INDICATES TEST BORING LOCATION, IDENTIFYING NUMBER, AND GROUND SURFACE ELEVATION OF TEST BORINGS PERFORMED FOR THIS EXPLORATION.
2. THIS DRAWING IS BASED ON A TOPOGRAPHIC SURVEY PERFORMED BY URBAN IN APRIL, 2014; AND A PROPOSED PROJECT LAYOUT PLAN PROVIDED BY AE WORKS LTD., ARCHITECTS, PITTSBURGH, PA, ENTITLED, "REPLACE WATER TANK AND PUMPS, LAYOUT", DATED 4-22-2014.
3. TEST BORINGS WERE PERFORMED BY R. RINDFUSS DRILLING, L.P., WATERFORD, PA.
4. TEST BORINGS LOCATED IN THE FIELD BY URBAN.
5. ▲ BM TOP OF HYDRANT SOUTH OF EXISTING SWITCHGEAR BUILDING, ELEV. 279.94 (ASSUMED PROJECT DATUM).

SCALE:
20' 0' 20'

DATE	BY	REVISION

TEST BORING LOCATION PLAN

DRAWN BY: J.R.T.	UEI NO. 2014620088.000
CHECKED BY: A.R.K., D.G.M.	CAD NAME: 2014620088000
DATE: MAY, 2014	DWG. NO. 2

URBAN ENGINEERS, INC.
1319 Sassafras Street
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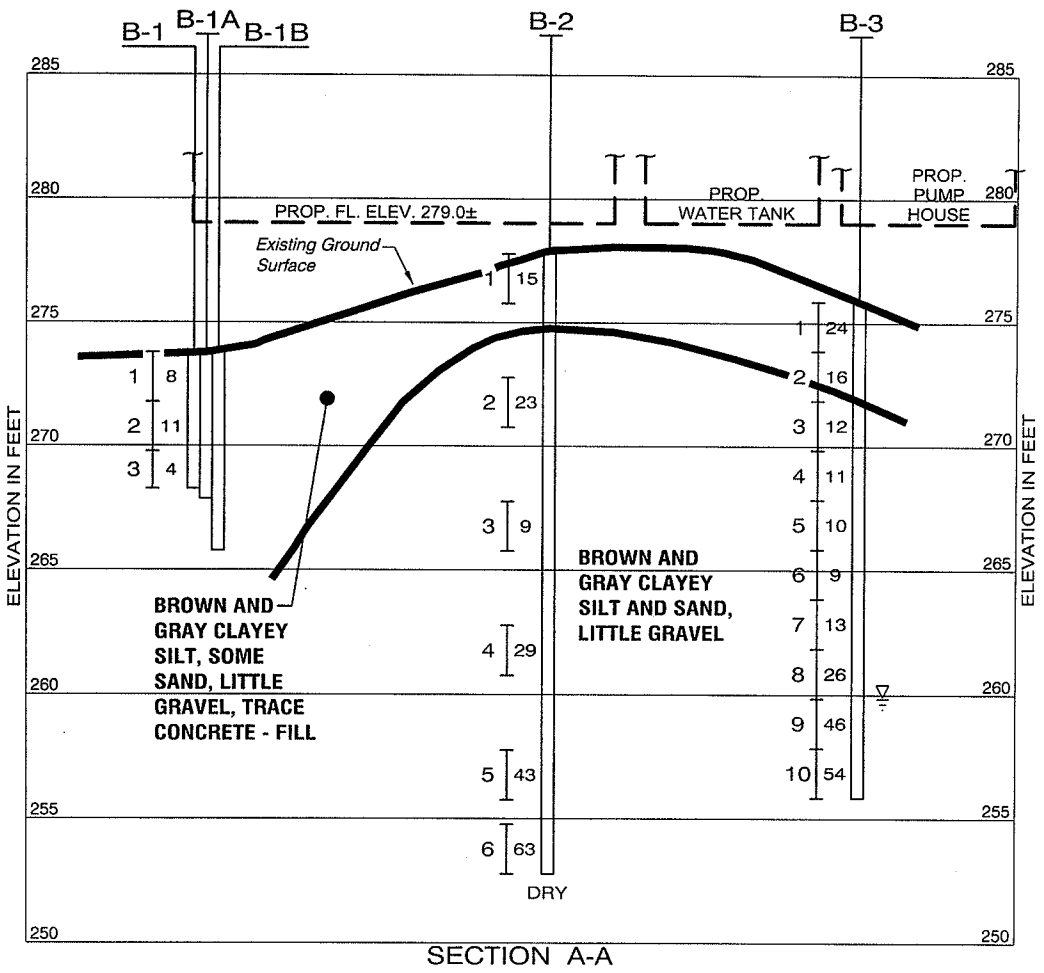
PROPOSED WATER TANK, PUMP HOUSE, AND EMERGENCY GENERATOR BUILDING
VETERANS AFFAIRS MEDICAL CENTER
135 EAST 38th STREET
ERIE, PENNSYLVANIA



SECTION A-A

LEGEND

A - BORING DESIGNATION

B - SAMPLE NUMBER

I - SAMPLE LENGTH AND LOCATION WITH DEPTH

N - STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT

- STRATA CHANGES NOTED ON LOG

- GROUND WATER LEVEL OBSERVED IN BORING

- 24 HR GROUND WATER LEVEL OBSERVED IN BORING

- CAVED-IN AND DRY LEVEL

NOTES:

THESE PROFILES HAVE BEEN DRAWN FOR THE PURPOSE OF ANALYSIS ONLY. THEY ARE BASED ON THE DATA OBTAINED FROM THE BORINGS AND DO NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS. THE DEPTHS AND THICKNESSES OF THE STRATA INDICATED WERE OBTAINED BY INTERPOLATING IN THE AREAS OF THE TEST BORINGS. IT IS POSSIBLE THAT THE CONDITIONS AROUND THE BORINGS MAY VARY FROM THOSE INDICATED.

SCALE:

HORZ. 0' 20' VERT. 0' 5'

DATE	BY	REVISION

SUBSURFACE PROFILES

DRAWN BY: J.R.T.	UEI NO. 2014620088.000
CHECKED BY: A.R.K., D.G.M.	CAD NAME: 2014620088000
DATE: MAY, 2014	DWG. NO. 3

URBAN ENGINEERS, INC.
1319 Sassafras Street
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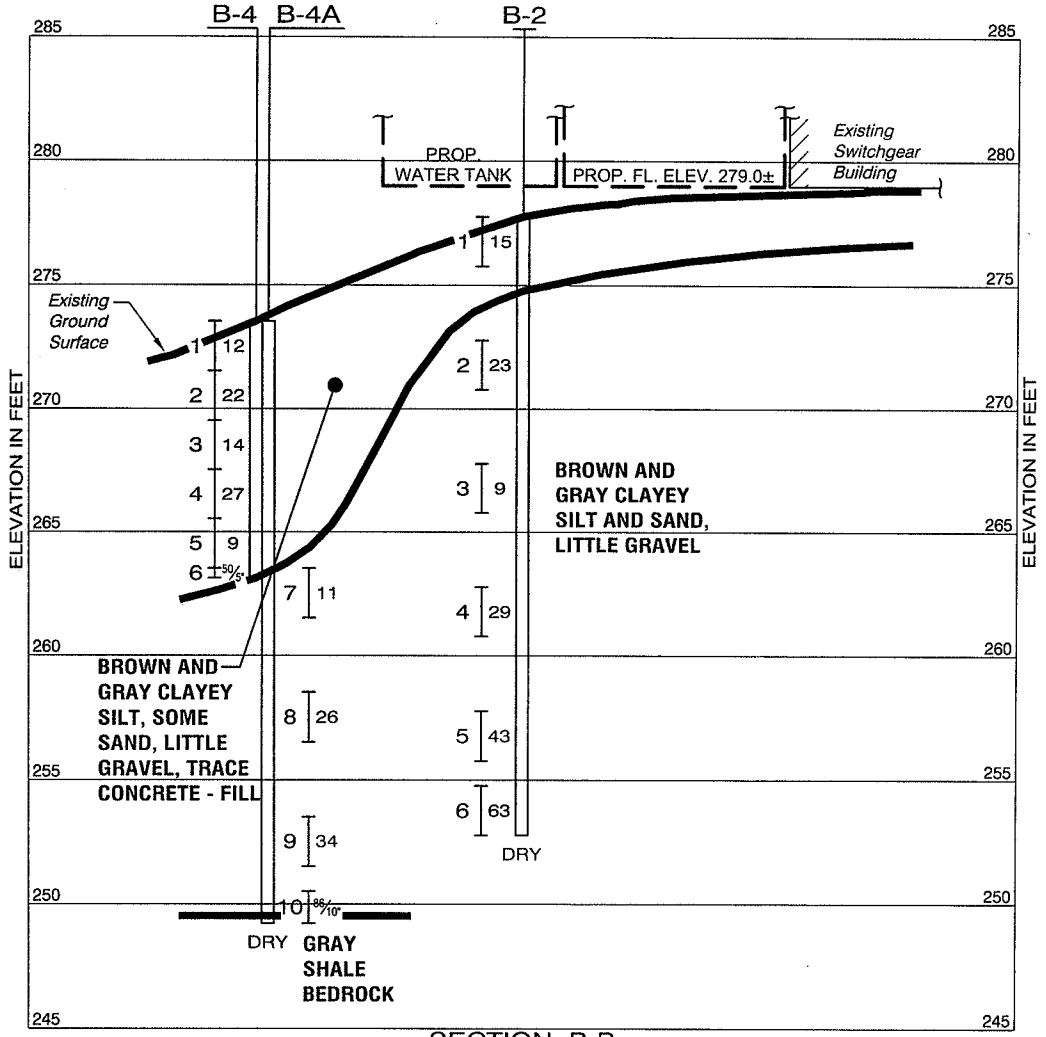
(814) 453-5702

PROPOSED WATER TANK, PUMP HOUSE, AND EMERGENCY GENERATOR BUILDING
VETERANS AFFAIRS MEDICAL CENTER
135 EAST 38th STREET
ERIE, PENNSYLVANIA



SECTION B-B

SEE DWG NO. 3 FOR LEGEND AND NOTES

SCALE:
HORZ. 0' 20' VERT. 0' 5'

DATE	BY	REVISION

SUBSURFACE PROFILES

DRAWN BY: J.R.T. | UEI NO. 2014620088.000
CHECKED BY: A.R.K., D.G.M. | CAD NAME: 2014620088000
DATE: MAY, 2014 | DWG. NO. 4

URBAN ENGINEERS, INC.
1319 Sassafras Street
Erie, Pennsylvania 16501
(814) 453-5702

PROPOSED WATER TANK, PUMP HOUSE, AND EMERGENCY GENERATOR BUILDING
VETERANS AFFAIRS MEDICAL CENTER
135 EAST 38th STREET
ERIE, PENNSYLVANIA

RECORD OF SUBSURFACE EXPLORATION

Project: VAMC Generator Building and Water Tank
Drilling Contractor: R. Rindfuss Drilling
Waterford, PA
Driller: Al & Joe
Drilling Equipment: Track Mounted CME
3.5" HSA with Standard Split Spoon Sampling

Boring Number: B-1
Ground Surface Elevation: 273.8
Date Started: 4-22-14
Date Finished: 4-22-14
Page: 1 of 1

Depth (ft.)	Sample No.	Sample Type	Sample Depth (ft.)	Blow Counts	Soil Descriptions	Remarks
0	1	SS	0.0 - 2.0	1 - 3 - 5 - 4	Topsoil 0.2'	Encountered buried obstruction at 5.5'. Offset boring 4' east and redrilled as B-1A
	2	SS	2.0 - 4.0	3 - 5 - 6 - 5	Brown and gray silt, some sand, little gravel - Fill Brown clayey silt, some sand, little gravel - Fill	
5	3	SS	4.0 - 5.5	2 - 2 - 2	Pea gravel - Fill	
					End of Boring at 5.5 ft.	
10						
15						
20						
25						
30						
35						

Notes:
SS = Split Spoon Sample (ASTM D 1586)
ST = Shelby Tube Sample (ASTM D 1587)
RC = Rock Core Sample (ASTM D 2113)
Blow Counts for 6 in., based on 140 lb. hammer with 30 in. drop
WOH = Weight of Hammer

Ground Water Data:
Dry at completion

URBAN ENGINEERS, INC.
1319 Sassafras Street
Erie, PA 16501

Proposed Water Tank, Pump House and Emergency Generator Building
VA Medical Center
Erie, Pennsylvania

Boring: B-1
Date: April 2014

RECORD OF SUBSURFACE EXPLORATION

Project: VAMC Generator Building and Water Tank
Drilling Contractor: R. Rindfuss Drilling
Waterford, PA
Driller: Al & Joe
Drilling Equipment: Track Mounted CME
3.5" HSA with Standard Split Spoon Sampling

Boring Number: B-1A
Ground Surface Elevation: 273.8
Date Started: 4-22-14
Date Finished: 4-22-14
Page: 1 of 1

Depth (ft.)	Sample No.	Sample Type	Sample Depth (ft.)	Blow Counts	Soil Descriptions	Remarks
0				Auger only	Augerd to 5.9 ft. Encountered buried obstruction (possible concrete rubble). Offset boring 3' south to drill B-1B - Fill materials encountered	
5					End of Boring at 5.9 ft.	
10						
15						
20						
25						
30						
35						

Notes:
SS = Split Spoon Sample (ASTM D 1586)
ST = Shelby Tube Sample (ASTM D 1587)
RC = Rock Core Sample (ASTM D 2113)
Blow Counts for 6 in., based on 140 lb. hammer with 30 in. drop
WOH = Weight of Hammer

Ground Water Data:
Dry at completion

URBAN ENGINEERS, INC.
1319 Sassafras Street
Erie, PA 16501

Proposed Water Tank, Pump House and Emergency Generator Building
VA Medical Center
Erie, Pennsylvania

Boring: B-1A
Date: April 2014

RECORD OF SUBSURFACE EXPLORATION

Project: VAMC Generator Building and Water Tank
Drilling Contractor: R. Rindfuss Drilling
Waterford, PA
Driller: Al & Joe
Drilling Equipment: Track Mounted CME
3.5" HSA with Standard Split Spoon Sampling

Boring Number: B-1B
Ground Surface Elevation: 273.8
Date Started: 4-22-14
Date Finished: 4-22-14
Page: 1 of 1

Depth (ft.)	Sample No.	Sample Type	Sample Depth (ft.)	Blow Counts	Soil Descriptions	Remarks
0				Auger only	Augered to 8'. Encountered buried obstruction (possible concrete rubble). Boring was backfilled and abandoned. Fill materials encountered.	
5						
8					End of Boring at 8 ft.	
10						
15						
20						
25						
30						
35						

Notes:
SS = Split Spoon Sample (ASTM D 1586)
ST = Shelby Tube Sample (ASTM D 1587)
RC = Rock Core Sample (ASTM D 2113)
Blow Counts for 6 in., based on 140 lb. hammer with 30 in. drop
WOH = Weight of Hammer

Ground Water Data:
Dry at completion

URBAN ENGINEERS, INC.
1319 Sassafras Street
Erie, PA 16501

Proposed Water Tank, Pump House and Emergency Generator Building
VA Medical Center
Erie, Pennsylvania

Boring: B-1B
Date: April 2014

RECORD OF SUBSURFACE EXPLORATION

Project: VAMC Generator Building and Water Tank
Drilling Contractor: R. Rindfuss Drilling
Waterford, PA
Driller: Al & Joe
Drilling Equipment: Track Mounted CME
3.5" HSA with Standard Split Spoon Sampling

Boring Number: B-2
Ground Surface Elevation: 277.8
Date Started: 4-22-14
Date Finished: 4-22-14
Page: 1 of 1

Depth (ft.)	Sample No.	Sample Type	Sample Depth (ft.)	Blow Counts	Soil Descriptions	Remarks
0	1	SS	0.0 - 2.0	2 - 5 - 10 - 10	Topsoil 0.1' / Brown and gray silt, some sand and gravel - Fill 3.0'	
5	2	SS	5.0 - 7.0	3 - 10 - 13 - 15	Brown sand and silt, some gravel	
10	3	SS	10.0 - 12.0	3 - 5 - 4 - 4	Gray clayey silt, little sand and gravel	
15	4	SS	15.0 - 17.0	8 - 14 - 15 - 14	Ditto	
20	5	SS	20.0 - 22.0	9 - 20 - 23 - 25	Ditto	
	6	SS	23.0 - 25.0	8 - 22 - 41 - 20	Gray sand, silt and gravel	
25					End of Boring at 25 ft.	
30						
35						

Notes:
SS = Split Spoon Sample (ASTM D 1586)
ST = Shelby Tube Sample (ASTM D 1587)
RC = Rock Core Sample (ASTM D 2113)
Blow Counts for 6 in., based on 140 lb. hammer with 30 in. drop
WOH = Weight of Hammer

Ground Water Data:
Dry at completion

URBAN ENGINEERS, INC.
1319 Sassafras Street
Erie, PA 16501

Proposed Water Tank, Pump House and Emergency Generator Building
VA Medical Center
Erie, Pennsylvania

Boring: B-2
Date: April 2014

RECORD OF SUBSURFACE EXPLORATION

Project: VAMC Generator Building and Water Tank
Drilling Contractor: R. Rindfuss Drilling
Waterford, PA
Driller: Al & Joe
Drilling Equipment: Track Mounted CME
3.5" HSA with Standard Split Spoon Sampling

Boring Number: B-3
Ground Surface Elevation: 275.8
Date Started: 4-22-14
Date Finished: 4-22-14
Page: 1 of 1

Depth (ft.)	Sample No.	Type	Depth (ft.)	Blow Counts	Soil Descriptions	Remarks
0	1	SS	0.0 - 2.0	1 - 11 - 13 - 10	Topsoil 0.1' / Brown and gray clayey silt, little sand, gravel and organics - Fill	
	2	SS	2.0 - 4.0	9 - 8 - 8 - 8	Ditto - Fill 4.0'	
5	3	SS	4.0 - 6.0	6 - 5 - 7 - 6	Brown clayey silt, little sand, trace gravel	
	4	SS	6.0 - 8.0	7 - 6 - 5 - 5	Ditto	
	5	SS	8.0 - 10.0	6 - 5 - 5 - 4	Ditto	
10	6	SS	10.0 - 12.0	3 - 4 - 5 - 6	Gray clayey silt, little sand, trace gravel	
	7	SS	12.0 - 14.0	5 - 6 - 7 - 9	Ditto into Gray sand, silt and gravel	
15	8	SS	14.0 - 16.0	6 - 12 - 14 - 16	Gray clayey silt, little sand and gravel	
	9	SS	16.0 - 18.0	12 - 15 - 31 - 29	Ditto	
	10	SS	18.0 - 20.0	12 - 22 - 32 - 22	Gray clayey silt with shale fragments	
20					End of Boring at 20 ft.	
25						
30						
35						

Notes:
SS = Split Spoon Sample (ASTM D 1586)
ST = Shelby Tube Sample (ASTM D 1587)
RC = Rock Core Sample (ASTM D 2113)
Blow Counts for 6 in., based on 140 lb. hammer with 30 in. drop
WOH = Weight of Hammer

Ground Water Data:
Dry at completion 16' at end of day

URBAN ENGINEERS, INC.
1319 Sassafras Street
Erie, PA 16501

Proposed Water Tank, Pump House and Emergency Generator Building
VA Medical Center
Erie, Pennsylvania

Boring: B-3
Date: April 2014

RECORD OF SUBSURFACE EXPLORATION

Project: VAMC Generator Building and Water Tank
Drilling Contractor: R. Rindfuss Drilling
Waterford, PA
Driller: Al & Joe
Drilling Equipment: Track Mounted CME
3.5" HSA with Standard Split Spoon Sampling

Boring Number: B-4
Ground Surface Elevation: 273.5
Date Started: 4-22-14
Date Finished: 4-22-14
Page: 1 of 1

Depth (ft.)	Sample No.	Type	Depth (ft.)	Blow Counts	Soil Descriptions	Remarks
0	1	SS	0.0 - 2.0	2 - 4 - 8 - 6	Topsoil 0.2'	
					Brown silt, some gravel, little sand, trace organics and concrete fragments - Fill	
	2	SS	2.0 - 4.0	8 - 10 - 12 - 14	Brown sand, gravel and silt - Fill	
5	3	SS	4.0 - 6.0	3 - 6 - 8 - 10	Ditto into Gray clayey silt, little sand, trace gravel - Fill	
	4	SS	6.0 - 8.0	5 - 12 - 15 - 8	Gray sand and gravel, some silt - Fill	Spoon refusal with traces of concrete in tip of spoon. Boring offset 3' south and continued drilling as Boring B-4A.
	5	SS	8.0 - 10.0	3 - 4 - 5 - 10	Gray clayey silt, little gravel, trace sand - Fill	
10	6	SS	10.0 - 10.4	50/0.4'	Ditto - Fill	
					End of Boring at 10.4 ft.	
15						
20						
25						
30						
35						

Notes:
SS = Split Spoon Sample (ASTM D 1586)
ST = Shelby Tube Sample (ASTM D 1587)
RC = Rock Core Sample (ASTM D 2113)
Blow Counts for 6 in., based on 140 lb. hammer with 30 in. drop
WOH = Weight of Hammer

Ground Water Data:
Dry at completion

URBAN ENGINEERS, INC.
1319 Sassafras Street
Erie, PA 16501

Proposed Water Tank, Pump House and Emergency Generator Building
VA Medical Center
Erie, Pennsylvania

Boring: B-4
Date: April 2014

RECORD OF SUBSURFACE EXPLORATION

Project: VAMC Generator Building and Water Tank
Drilling Contractor: R. Rindfuss Drilling
Waterford, PA
Driller: Al & Joe
Drilling Equipment: Track Mounted CME
3.5" HSA with Standard Split Spoon Sampling

Boring Number: B-4A
Ground Surface Elevation: 273.5
Date Started: 4-22-14
Date Finished: 4-22-14
Page: 1 of 1

Depth (ft.)	Sample No.	Sample Type	Sample Depth (ft.)	Blow Counts	Soil Descriptions	Remarks
0					Auger only to 10'	
5						
10	7	SS	10.0 - 12.0	3 - 5 - 6 - 5	Gray clayey silt, some gravel, little sand	
15	8	SS	15.0 - 17.0	8 - 12 - 14 - 24	Ditto	
20	9	SS	20.0 - 22.0	7 - 14 - 20 - 32	Ditto	
	10	SS	23.0 - 24.3	9 - 36 - 50/0.3'	24.0'	
25					Gray shale bedrock End of Boring at 24.3 ft.	
30						
35						

Notes:
SS = Split Spoon Sample (ASTM D 1586)
ST = Shelby Tube Sample (ASTM D 1587)
RC = Rock Core Sample (ASTM D 2113)
Blow Counts for 6 in., based on 140 lb. hammer with 30 in. drop
WOH = Weight of Hammer

Ground Water Data:
Dry at completion

URBAN ENGINEERS, INC.
1319 Sassafras Street
Erie, PA 16501

Proposed Water Tank, Pump House and
Emergency Generator Building
VA Medical Center
Erie, Pennsylvania

Boring: B-4A
Date: April 2014

SUMMARY OF LABORATORY TEST DATA

SAMPLE IDENTIFICATION				SOIL GROUP (UNIFIED SYSTEM, ASTM D2487)	GRAIN SIZE DISTRIBUTION (ASTM D 422)			MOISTURE CONTENT (%)	PLASTICITY (ASTM D 4318)				COMPACTION (ASTM D 698)	
TEST BORING NUMBER	SAMPLE NUMBER	DEPTH (FEET)	ELEVATION (FEET)		GRAVEL (%)	SAND (%)	SILT,CLAY & COLLOIDS (%)		LIQUID LIMIT - W_L (%)	PLASTIC LIMIT - W_P (%)	PLASTICITY INDEX - I_P (%)	LIQUIDITY INDEX - I_L (%)	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
B-2														
	3	10.0-12.0	265.8					10.7						
	5	20.0-22.0	255.8	ML	11	32	57	8.5	18	17	1			
	6	23.0-25.0	252.8					9.0						
B-3														
	2	2.0-4.0	271.8					12.9						
	4	6.0-8.0	267.8	SM	15	36	49	16.6	18	15	3			
	7	12.0-14.0	261.8					13.5						
	9	16.0-18.0	257.8					9.3						
B-4														
	2	2.0-4.0	269.5	SM	19	51	30	9.4	18	17	1			
	5	8.0-10.0	263.5	SC-SM	17	37	47	11.1	19	14	5			
B-4A														
	7	10.0-12.0	261.5					9.8						
	9	20.0-22.0	251.5					8.2						

URBAN ENGINEERS, INC.
1319 Sassafras Street
Erie, Pennsylvania 16501

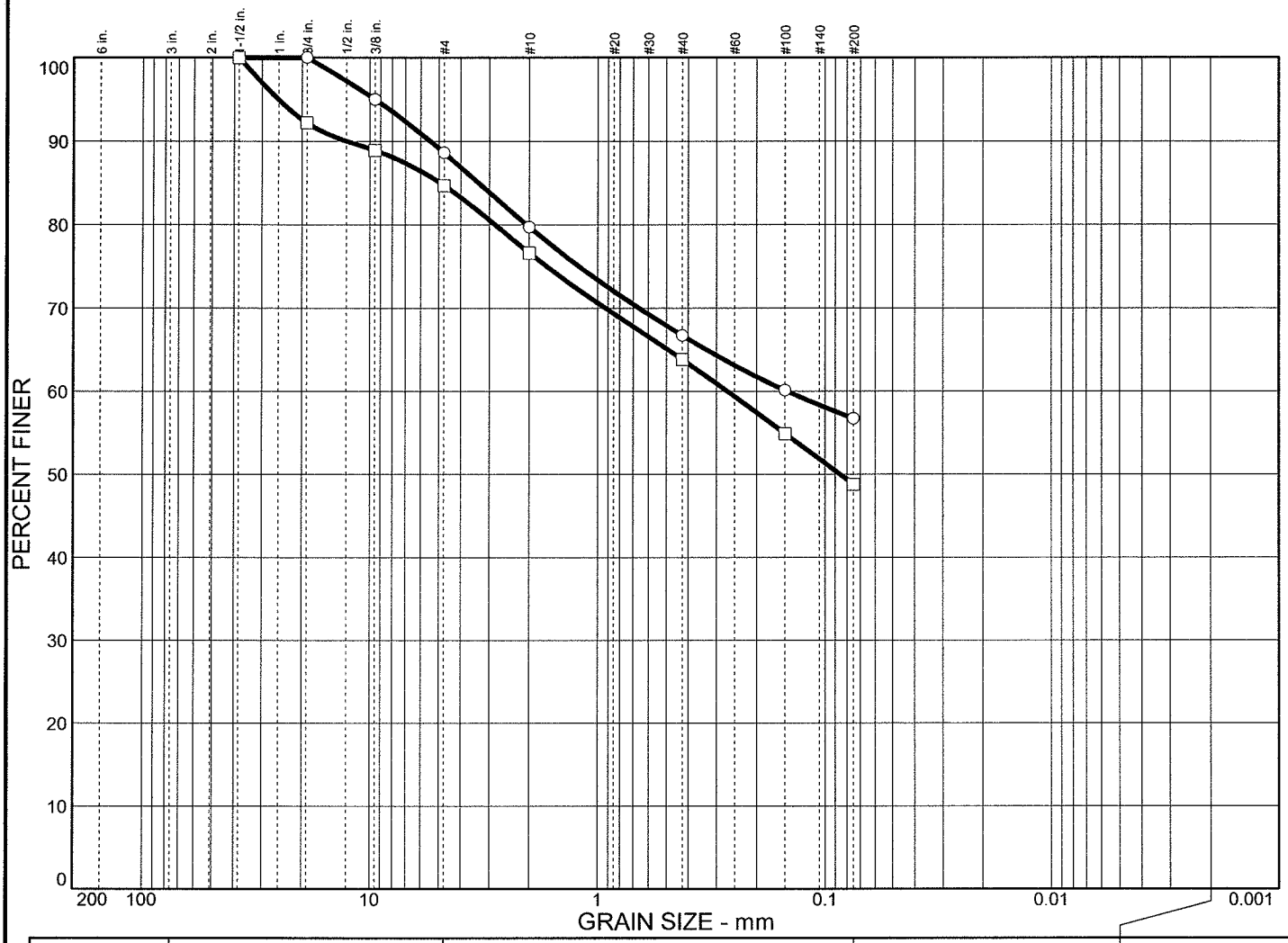
Proposed Generator Building, Water Tank and Pumps
VA Medical Center
135 East 38th Street
Erie, PA

NP=Non-Plastic

Table No. T-1

Date: April 2014

Grain Size Distribution Test Report



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	11.4	31.9	56.7	
□	0.0	15.3	35.9	48.8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	18	17	3.35	0.147						
□	18	15	4.93	0.270	0.0859					

MATERIAL DESCRIPTION	USCS	AASHTO
○ Gray clayey silt, some sand, little gravel	ML	
□ Brown clayey silt and sand, little gravel	SM	

Project No. 2014620088.000 **Client:** AE Works

Project: Proposed Generator Building, Water Tank and Pumps

VA Medical Center

○ **Source:** B-2 **Sample No.:** 5 **Elev./Depth:** 20.0-22.0

□ **Source:** B-3 **Sample No.:** 4 **Elev./Depth:** 6.0-8.0

Remarks:

○

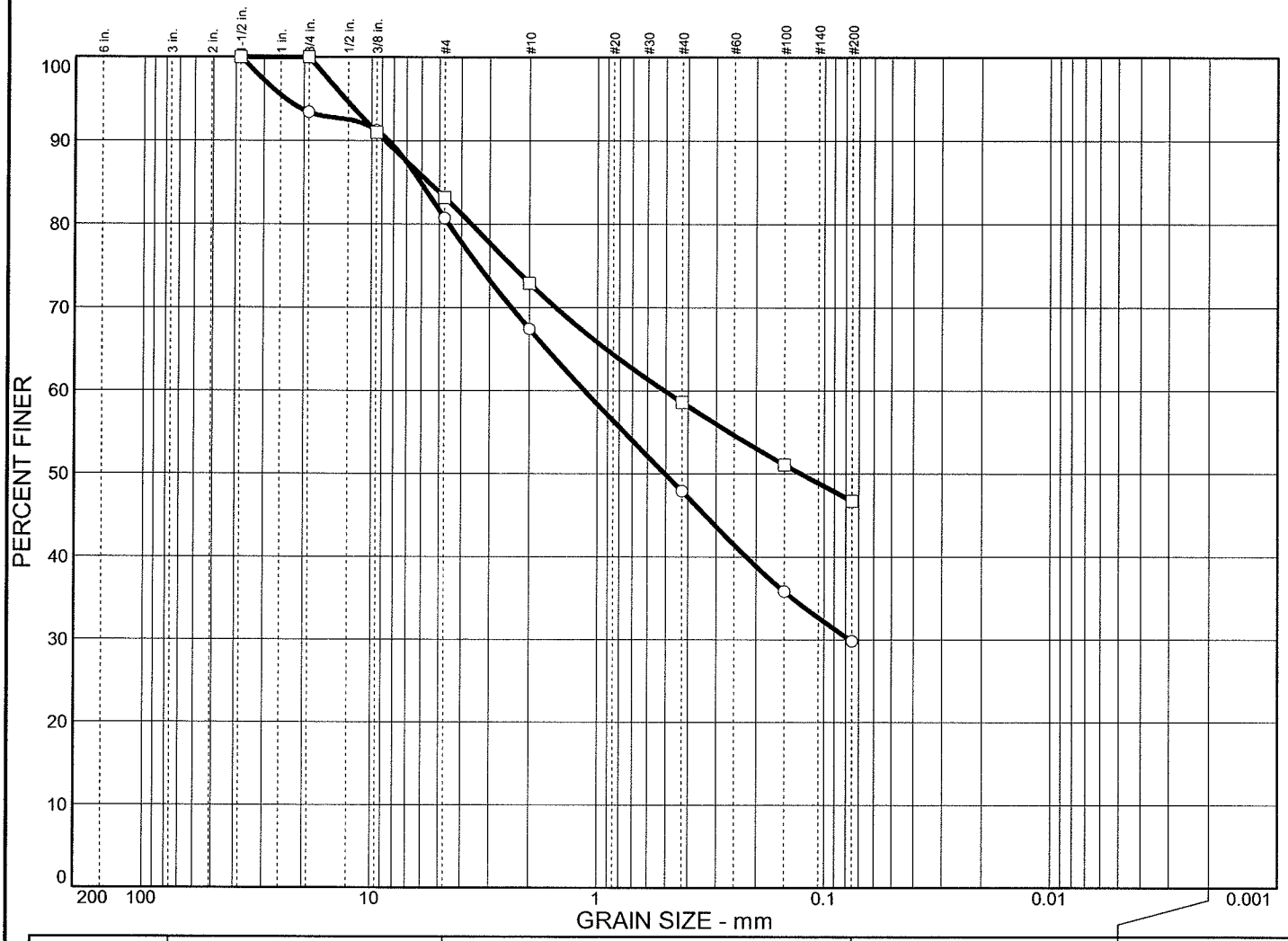
□

Grain Size Distribution Test Report

URBAN ENGINEERS

Figure No. 1

Grain Size Distribution Test Report



	% + 3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	19.3	50.9	29.8	
□	0.0	16.8	36.5	46.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	18	17	6.06	1.14	0.505	0.0769				
□	19	14	5.58	0.508	0.127					

MATERIAL DESCRIPTION	USCS	AASHTO
○ Brown sand, some silt, little gravel - Fill	SM	
□ Gray clayey silt and sand, little gravel - Fill	SC-SM	

Project No. 2014620088.000 **Client:** AE Works

Project: Proposed Generator Building, Water Tank and Pumps

VA Medical Center

○ **Source:** B-4 **Sample No.:** 2 **Elev./Depth:** 2.0-4.0

□ **Source:** B-4 **Sample No.:** 5 **Elev./Depth:** 8.0-10.0

Remarks:

○

□

Grain Size Distribution Test Report

URBAN ENGINEERS

Figure No. 2

SOIL CLASSIFICATION CHART

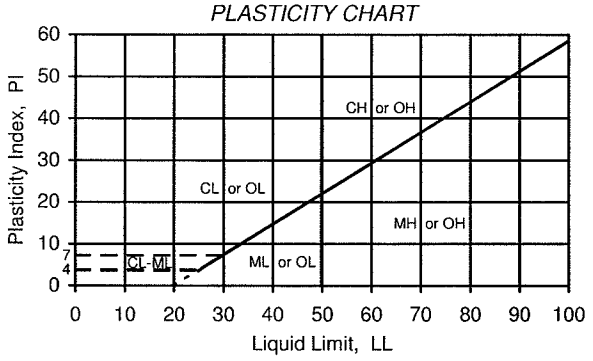
UNIFIED SOIL CLASSIFICATION SYSTEM

Reference: ASTM D 2487

MAJOR DIVISIONS			*LETTER SYMBOL*	*TYPICAL NAMES*
COARSE GRAINED SOILS More than 50% of Material Larger than No. 200 Sieve	GRAVEL AND GRAVELLY SOILS More than 50% of coarse material retained on No. 4 Sieve	CLEAN GRAVELS Little or No Fines	GW	Well graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels and gravel-sand-silt mixtures, little or no fines
			GC	Clayey gravels and gravel-sand-clay mixtures
	SAND AND SANDY SOILS More than 50% of coarse material passing No. 4 Sieve	CLEAN SANDS Little or No Fines	SW	Well graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sand, sand-clay mixtures
FINE GRAINED SOILS More than 50% of Material Smaller than No. 200 Sieve	NON-PLASTIC TO MEDIUM PLASTIC SILTS AND CLAYS Liquid Limit less than 50		ML	Inorganic silts, clayey silts, or rock flour, or sandy and/or gravelly silts, which are non-plastic to medium plastic
			CL	Inorganic clays, lean clays, silty clays, or sandy and/or gravelly clays, which are non-plastic to medium plastic
			OL	Organic silts and organic silty clays, which are non-plastic to medium plastic
	HIGHLY PLASTIC TO VERY HIGHLY PLASTIC SILTS AND CLAYS Liquid Limit greater than 50		MH	Inorganic silts or micaceous sands or silts, with high to very high plasticity
			CH	Inorganic clays or fat clays, with high to very high plasticity
			OH	Organic clays, with high to very high plasticity
HIGHLY ORGANIC SOILS			PT	Peat, humus, swamp soils, muck, and other highly organic soils

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATION

PLASTICITY CHART



URBAN ENGINEERS, INC.

SOIL DESCRIPTION CHART

BASED ON THE SIMPLIFIED BURMISTER'S SYSTEM

OVERALL DESCRIPTIVE TERMS

SOIL COMPONENT	*DESCRIPTIVE TERM*	*RANGE OF PROPORTIONS*
Principal Component	-	Largest Proportion
Minor Components	AND	35% to Largest Proportion
	SOME	20% to 35%
	LITTLE	10% to 20%
	TRACE	1% to 10%

FINE GRAINED SOIL DESCRIPTIVE TERMS

COMPONENT	*DESCRIPTION*	*PLASTICITY INDEX*
SILT	Non-Plastic	0
CLAYEY SILT	Slight Plasticity	1 to 5
SILT & CLAY	Low Plasticity	5 to 10
CLAY & SILT	Medium Plasticity	10 to 20
SILTY CLAY	High Plasticity	20 to 40
CLAY	Very High Plasticity	> 40

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

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