1.0 INTRODUCTION

In accordance with URS' proposal dated February 2, 2011, a geotechnical investigation was conducted at the Camp Butler National Cemetery (See Figure 1). A proposed maintenance garage expansion is planned and involves the construction of a 30 foot by 60 foot one-story addition. It will house various types of vehicles and store petroleum tanks and other chemicals. Finish floor grade will watch match the existing building, which will require less than 2 feet of new fill. This letter report transmits the subsurface investigation findings and geotechnical recommendations concerning bearing capacity, settlement, and construction considerations. The building is being designed according to the International Building Code (IBC) 2006.

2.0 FIELD INVESTIGATION & LABORATORY TESTING

On July 20, 2011, URS conducted a geotechnical investigation. SKS Engineering was contracted to drill two borings and perform laboratory testing (See Figure 2). One boring was located 14 feet east and 3.8 feet north of the maintenance garage corner on a concrete pad. The second boring was located in front of a wooden storage shed near the fence line on the eastern end of the maintenance yard. Both borings were drilled using 5.25 inch outer diameter hollow stem augers. Standard Penetration Tests (SPT) were conducted using a safety hammer at 2.5 foot centers to 10 feet below ground surface and then 5 foot centers to depth. Split spoon samples were taken of the soils.

Soil samples were taken to SKS Engineering' geotechnical laboratory in Decatur, Illinois. Moisture contents, Atterberg limits, pocket penetrometer unconfined compression tests, and torvane tests were conducted on the soil samples. The results are found on the borings logs provided.

3.0 SITE & SUBSURFACE CONDITIONS

The site is located in the maintenance yard adjacent to the existing maintenance garage and other storage structures. The proposed expansion sits on a 5-inch thick concrete pad, as seen in Boring B-1. The maintenance yard consists of 1 inch thick asphalt pavement underlain by 4 inches of gravel (Boring B-2). The yard is generally flat.

The subsurfical soils consist of clay fill grading into natural soils of glacial origin. The clay fill is 3.5 to 4 feet thick. It is stiff, silty clay with trace amounts of sand, gravel, and organics. Below the clay fill are Pleistocene clays and sands of glacial lacustrine origin. Stiff to very stiff, silty clays are present from 4 feet to 12.5 feet below ground surface. Underlying the clay is a clayey sand to sand with silt. The density is loose to medium dense.

Groundwater readings were noted at time of drilling and following drilling. Water levels were approximately 18.9 feet in boring B-2 to 19.5 feet in boring B-1 at the time of drilling. The permanent ground water table was not measured as borings were backfilled immediately after completion.

4.0 CONCLUSIONS & RECOMMENDATIONS 4.1

Bearing Capacity

The loads of the structure were unknown at time of the investigation. Bearing capacity of the soil was determined using the N-values from the SPT. A factor of safety of 3 was used and is standard practice for foundations. The bearing capacity of the soil is 2500 psf. Terzaghi's Bearing Capacity equation for strip footings was used. A minimum footing width of 2 feet should be used.

4.2 Settlement

Bearing pressure from the proposed structure will induce settlements in the underlying soils. The Modified Meyerhoff SPT Methodology was used to calculate immediate settlement. Less than one inch of immediate settlement is expected, based upon the boring results. Differential settlement is anticipated to be 1/2 inch. For seismic design, Site Class D should be used.

4.3 Floor Slab

We recommend that the floor slab be underlain by 6 in. of free-draining granular material, such as 3/4-in. "clean" crushed rock having less than 5 percent fines. This material is intended to provide a capillary break and a strong subgrade for the floor slab.
The underslab gravel should be compacted as recommended for fill (See Section 4.4).
We recommend using a modulus of subgrade reaction ("k") of 200 lb/in^3 for design of the floor slabs. A vapor barrier beneath floor slabs is generally recommended, especially where moisture migration through the slab would have an adverse effect on floor coverings. There is some evidence that such a barrier can lead to uneven curing of the concrete and slab curling. We recommend that this detail be considered in the design.

4.4 Construction Considerations

On-site fill materials should consist of natural soils, including silts and clays. Acceptable imported fill materials include soils designated according to the Unified Soil Classification System (ASTM D-2487-00) as CL or CL-ML or gravel (GP, GW, GM). If clayey soils are used for fill, the liquid limit should be less than 40 percent and plasticity index less than 20 percent. Soils shall be free of roots and other organics, rocks larger than 4 inches in diameter, frozen soils, and high plasticity soils.

A sample of the proposed borrow material should be submitted for testing by the geotechnical engineer, at least five days before importing the material. Appropriate soils types can be dependent on weather conditions and applications and, therefore, may require testing to ensure the appropriateness of their use as fill material.

The top 6 inches of soil should be scarified and recompacted. If fill is required, the thickness of the loose, horizontal lifts should be 8 inches before compaction using large self-propelled

compaction equipment. In areas were manual compactors are required; the lifts should not exceed 6 inches.

We recommend the following compaction and water content requirements depending on the location of the fill. Compaction requirements are listed below as a percentage of the maximum dry density determined, according to the Modified Proctor Method (ASTM D-1557) specifications. The range of optimum water contents are also shown in Table 1 below.

Table 1: Compaction Requirements

Recommended Minimum Compaction and Water Content Requirements		
	Fill with 10% or More Fines	
Location	**Relative Compaction (ASTM D-1557)**	**Water Content at Time of Compaction**
Base rock below pavements	98	Optimum -3 to +3
Structural fill consisting of low plastic clay or silt below pavement subgrades and utility trenches	95	Optimum -3 to +3
Landscaped areas	85	Not required

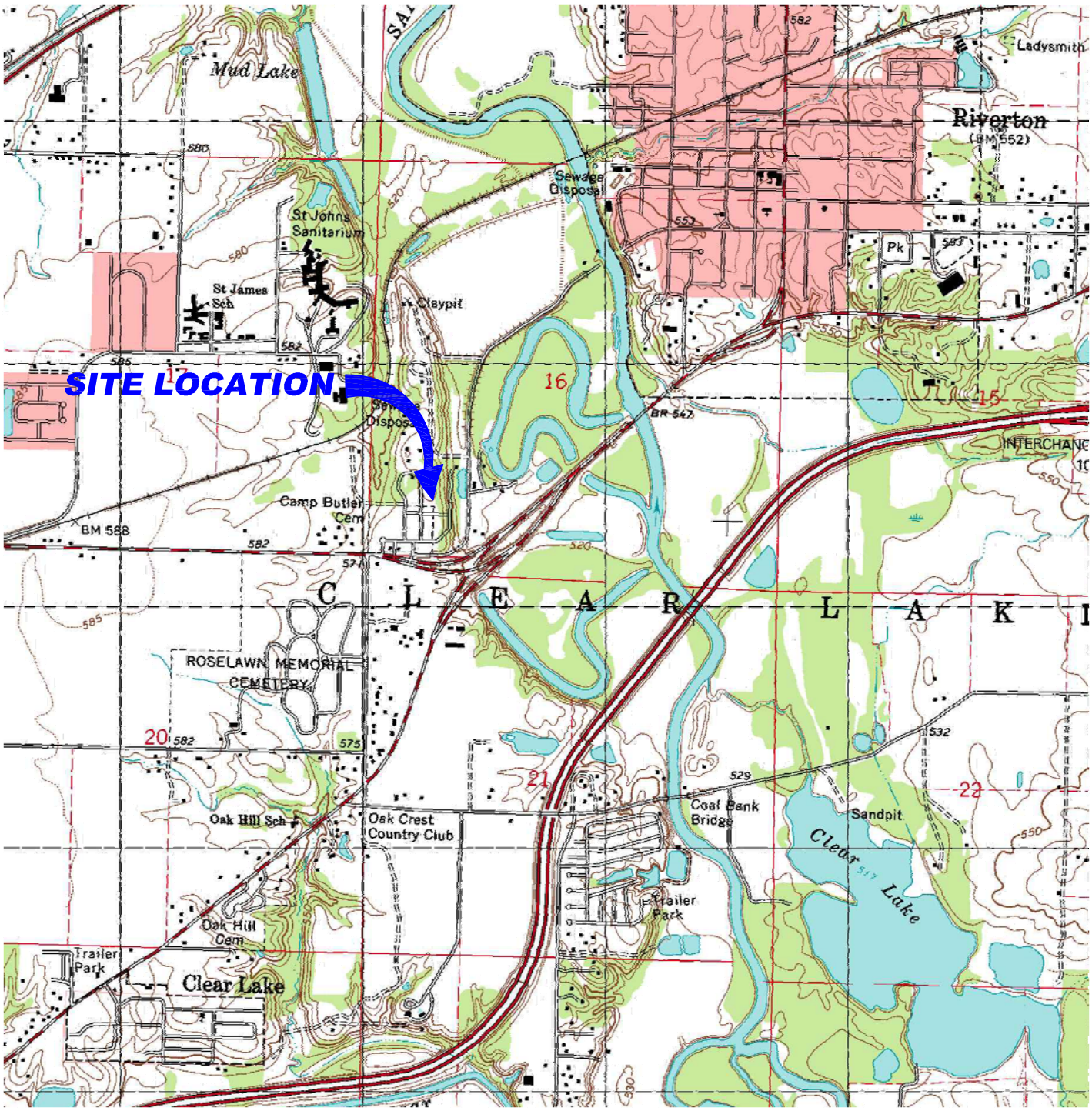
An experienced soils technician should observe the placement and test compaction of each lift.

The footing foundation should be embedded at least 3 feet below final grade to provide protection from frost action.

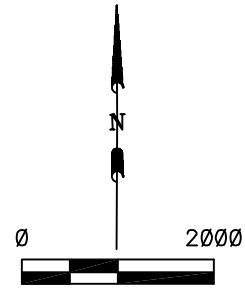
5.0 LIMITATIONS

This study is based on the project description noted in the Introduction, Section 1.0. If project details change from the assumed project description, it will invalidate our recommendations until we have reviewed the changes and modified our finding, if necessary.

The boring logs depict subsurface conditions for the specific locations and dates. The recommendations and observations presented in the report assume that significant variations do not occur. Non-uniform conditions, however, often cannot be determined by the procedures described. These changes and conditions may necessitate additional expenditures to obtain a properly constructed project. We recommend that a contingency fund be budgeted to accommodate such possible expenditures.

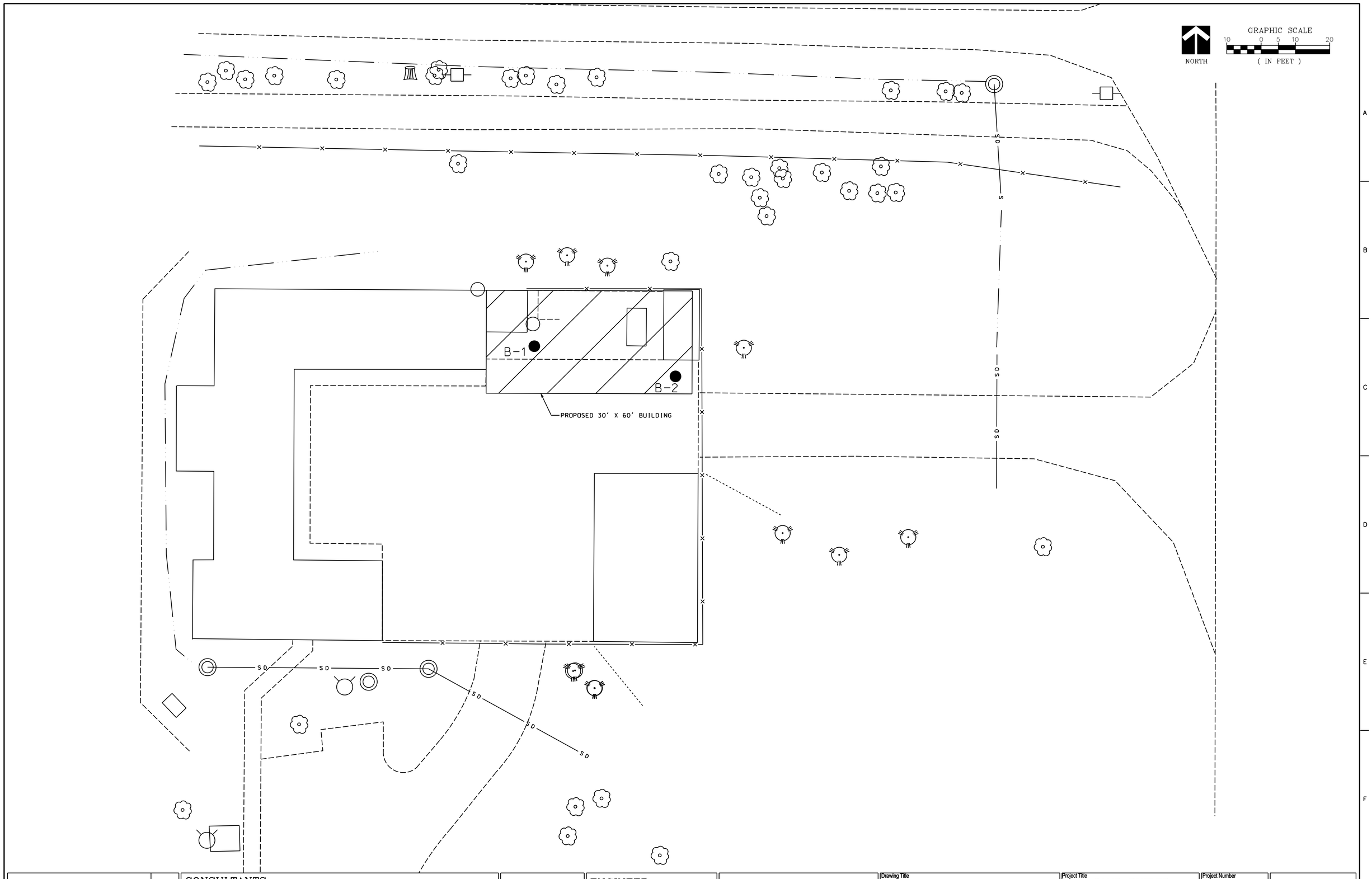


SOURCE: MAP TAKEN FROM ELECTRONIC USGS DIGITAL RASTER GRAPHIC 7.5 MINUTE TOPOGRAPHIC MAP OF SPRINGFIELD, ILLINOIS. REVISED 1998.



CAMP BUTLER NATIONAL CEMETERY 5063 CAMP BUTLER ROAD SPRINGFIELD, ILLINOIS		PROJECT NO. 03088798
URS		
DRN. BY: djd August 2011 DSGN. BY: sav CHKD. BY: sav	Site Location Map	FIG. NO. 1

File: P:\TRANSPORTATION\CAMP_BUTLER_IDIQ\02_DRAWINGS\FIG-1 SITE LOCATION MAP.DWG Last edited: AUG. 10, 11 @ 10:08 a.m. by: david_deguire



Revisions:	Date

CONSULTANTS:

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NATIONAL CEMETERY ADMINISTRATION

Drawing Title: BORING LOCATION PLAN

Approved: Project Director

Project Title: CAMP BUTLER NATIONAL CEMETERY MAINT. BUILDING

Location: SPRINGFIELD, ILLINOIS

Date: 08/25/11 | Checked: MMM | Drawn: JCM

Project Number: 806CM3022

Building Number: XXX

Drawing Number: Figure 2

Dwg. of

Office of Facilities Management

Department of Veterans Affairs

VA FORM 08-6231, OCT 1978

CONCEPTUAL PLANS

Figure No.

LOG of BORING No. B-1

Sheet 1 of 1

DATE 7/20/11 SURFACE ELEVATION, FT 538.5 DATUM MSL LOCATION N 100012.5, E 99770.6

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	γ_t, PCF	NMC, %	LL	PI	Qu, TSF	NOTES
0				Concrete Pad	538.0								Boring advanced using 5.25" O.D. HSA
				Brown, moist, stiff, Silty CLAY (CL), trace fine sand, trace gravel [FILL]	0.5								
		4 6 7	16				1.5		18				Torvane = 0.875 tsf
					534.5								
				Brown, moist, stiff, Silty CLAY (CL), trace fine sand [LACUSTRINE]	4.0								
5		5 7 8	67				1.5		23				Torvane = 0.75 tsf
		4 9 11	78	Becomes very stiff			3.3		24				Torvane = 2.25 tsf
10		6 9 10	100	Becomes sandy, mottled gray			2.4 0.8		30				Torvane = 0.25 tsf
					526.0								
				Brown, moist, loose, Clayey SAND (SC)	12.5								
15		1 2 2	78						32				
					521.0								
				Brown, wet, medium dense, fine poorly graded SAND with SILT (SP-SM)	17.5								
20		4 5 7	72	Trace medium to coarse sand, trace clay at 21'					22				
					517.5								
				Bottom of boring at 21'	21.0								Boring backfilled with cuttings.
25													

Completion Depth: 21.0'

Project No.: 03088798

Project Name: Camp Butler National Cemetery

Drilling Contractor: SKS Engineering

Logged by: S. Voss

Water Depth: 19.5 ft., After ATD hrs.

_____ ft., After _____ hrs.

_____ ft., After _____ hrs.

8/10/11 URS GEOTECH TEMPLATE 03088798 (CAMP BUTLER NATIONAL CEMETARY).GPJ

URS

Figure No.

LOG of BORING No. B-2

Sheet 1 of 1

DATE **7/20/11** SURFACE ELEVATION, FT **537.5** DATUM **MSL** LOCATION **N 100015.4, E 99827.4**

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	RECOVERY, %	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	PP, TSF	γ_t, PCF	NMC, %	LL	PI	Qu, TSF	NOTES
0				Asphalt pavement and gravel	537.0								Boring advanced using 5.25" O.D. HSA
					0.5								
				Grayish brown, moist, stiff, Silty CLAY (CL), trace organics [FILL]									
		4 7 9	72				2.6 2.0		25	35	22		Torvane = 1.0 tsf
					533.0								
5		5 6 5	78	Grayish brown, moist, stiff, Silty CLAY (CL) [LACUSTRINE]	4.5		2.2 1.8		23	25	10		
		4 5 8	83				2.2		24	38	22		Torvane = 1.0 tsf
10		5 6 6	100				1.8 1.3		25				Torvane = 0.625 tsf
					525.0								
				Brown, moist, loose, fine poorly graded SAND with SILT (SP-SM),	12.5								
15		3 4 5	100	Trace clay, trace medium sand					20				
						▼							
20		3 4 5	100	Becomes wet		▽			25				
25		3 3 4	100	Trace medium sand					18				
					511.5								
				Bottom of boring at 26'	26.0								Boring backfilled with cuttings and patched with cold patch asphalt

Completion Depth: **26.0'**

Project No.: **03088798**

Project Name: **Camp Butler National Cemetery**

Drilling Contractor: **SKS Engineering**

Logged by: **S. Voss**

Water Depth: 19.5 ft., After ATD hrs.

18.9 ft., After _____ hrs.

_____ ft., After _____ hrs.

8/10/11 URS GEOTECH TEMPLATE 03088798 (CAMP BUTLER NATIONAL CEMETARY).GPJ

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