MEMO

OLSSON ASSOCIATES
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1111 Lincoln Mall · P.O. Box 84608 · Lincoln, Nebraska 68501-4608 · 402/474-6311

Date: May 16, 2005

To: Chuck Norris
Big Sandy Development LLC.
6801 S. 27th Street
Lincoln, Nebraska 68512

From: Ryan Beckman, Olsson Associates

Re: Lot 41 and Lot 42, Big Sandy Development
OA Project #: 2005-0500

This memo presents the results of the geotechnical subsurface exploration performed for Lot 41 and Lot 42 at the Big Sandy Development, which is located approximately five miles north of Ashland, Nebraska. This memo is provided to address the existing site conditions along with recommendations regarding the placement of structural fill and foundation bearing capacity. This memo should be read in its entirety with the recommendations applied to the construction of the houses at Lot 41 and Lot 42. Although the soil characteristics of the soils at the development are consistent, the condition in which they are placed varies across the site. Additional development of future residential lots should be the responsibility of the individual lot owners to determine acceptable foundation bearing capacity and settlement tolerances.

Site Location and Description

The proposed Lots 41 and Lot 42 in the Big Sandy Development are located approximately five miles north of Ashland, Nebraska. The approximate locations of the lots are depicted on the Boring Location Plan included in Attachment A.

At the time of our field exploration, the proposed construction area had been previously rough graded in the summer of 2004 with Commercial Contractors performing the mass grading operation. Based on our understanding, the grading contractor performed compaction operations but no field density testing services were completed. The rough grading involved placing little to no fill in Lot 41 and approximately 1 to 6 feet of controlled fill in the Lot 42.

Project Description

The proposed construction will consist of a single story structure with associated paved and patio areas. The building walls are anticipated to consist of wood frames and slab on grade concrete floors. Anticipated loading conditions of the continuous footings were not expected to exceed 3 kips per lineal foot. The anticipated loading conditions for any interior column pad footings were not anticipated to exceed 30 kips.

Prior to the grading operations by Commercial Constructors, it is our understanding this development area was formerly used as a mining operation for a sand quarry pit. Typically mining operations segregate the necessary aggregate and deposit the tailing in a loose, water-deposited manner. In addition to the placement of the tailings, the slopes achieved from the mining operation are excavated in a manner that usually equates to a slope stability safety factor of 1.0.

It is our understanding that blasting operations were performed around the entire shoreline of the quarry to improve the existing slope stability along the shoreline of the development. Please note that it was not within our scope of services to evaluate the slope stability conditions along the shoreline of the residential lots.

Field Exploration

The field exploration program consisted of performing two soil test borings at the locations depicted on the Boring Location Plan (Attachment A). The boring locations were determined in the field using the existing reference points. The ground surface elevations provided on the boring logs were interpolated from contours shown on an ***OA*** contour map from the original mass grading operations. The ground surface elevations have been rounded to nearest foot.

The soil test borings were drilled to a depth of twenty feet below the existing ground surface with a trailer-mounted drill rig using continuous-flight augers. Soil samples were obtained at selected intervals in the test borings. Soil samples designated as "SS" samples were obtained in general accordance with ASTM D-1586 (Penetration Test and Split-Barrel Sampling of Soils). Recovered samples were extruded in the field, sealed in plastic containers, labeled, and protected for transportation to the laboratory for testing.

Ground water was encountered at a depth of 12 feet below the ground surface at the time of drilling operations. The boreholes were then backfilled with the native soil auger cuttings. It is important to note based on the sandy soil conditions at the site that the ground water elevation will likely fluctuate with the elevation of the lake.

Laboratory Testing

Descriptions of the soils encountered in the soil test borings were prepared in general accordance with ASTM D-2488 (Visual-Manual Procedure for Description and Identification of Soils). Soil stratification, as shown on the Boring Logs, represent soil conditions at the boring locations; however, variations may occur between or around the boring locations. The lines of demarcation represent the approximate boundary between soil types but the transition may be more gradual.

Laboratory tests were also performed to evaluate the engineering properties of the recovered soil samples. Moisture content tests were used to determine the existing moisture state of the soils. Four mechanical sieve analyses were conducted to aid in the classification of the soils under the Unified Soils Classification System. All tests were conducted in general accordance with current ASTM or other state-of-the-art test procedures. A summary of the laboratory test results is presented in Attachment C.

Site Preparation

Prior to any additional grading operations, it is recommended that any loosely deposited, wind blown materials be removed or reworked within the proposed construction area. After completion of any grading or excavation operations, the building pad subgrade should be properly prepared with vibratory compaction equipment to densify the upper 6 to 8 inches.

Based on the means and methods used to install the foundation system for each residential lot, we recommend any additional fill placed within the construction area be completed prior to the start of framing operations. Based on the standard penetration data, the majority of the settlement of the underlying soils will occur from the placement of any additional fill. Therefore, the elevations of the foundation system should be monitored after completion of any fill placement to determine when and if any settlement occurred. The settlement of the underlying granular material should be complete in 7 days or less but should be monitored and allowed to complete before any construction of the floor slabs or framing of the buildings begins. Any excavated on-site material, not including the developed zone, is suitable for reuse as backfill in the building pad assuming it is placed in compliance with the *Structural Fill* section of this report.

The recommendations and conclusions of our report will be based on the assumption that minimal fill placement of less than four feet above the existing ground surface is to occur within the proposed residential house. The foundation will likely bear at various depths dependent of the site contours but is not anticipated to ever bear any deeper than 5 feet below the finished floor elevation in a medium dense fill and/or alluvial soil.

Foundation Design

Based on the results of the soil test borings, laboratory testing and our engineering evaluation, it is our opinion that the subsurface conditions are suitable for supporting the proposed residential house on a conventional shallow foundation. Assuming the recommendations from the *Site Preparation* section are followed, we recommend the footings at Lot 41 and Lot 42 be designed for a maximum net allowable soil bearing pressure of 1,500 psf on the soil. The net allowable bearing pressure refers to the bearing pressure at foundation level in excess of the surrounding overburden pressure.

Footings should have minimum dimensions in accordance with local building codes. Based on regional frost penetration, exterior footings and footings in unheated areas should bear at a minimum depth of 3 ½ feet below the lowest adjacent final ground surface. It was assumed that any interior footings in heated areas would bear at a depth between 1½ and 2 feet below the finished floor elevation to minimize settlement. We recommend utilizing a minimum bearing depth for the residential house foundations due to the soft sandy soils encountered at and below the ground water depth of 12 feet. In our analysis, we utilized a maximum bearing depth of 5 feet below the finished floor elevation of the proposed structures.

After completion of the original mass grading, a 6 to 12 inch layer of loosely deposited, wind blown soil was visually noted throughout both project sites. The 6 to 12 inch layer should be compacted with the application of water or vibration to obtain the recommendations stated in the *Structural Fill* section of this memo. We recommend that the foundations have a bearing depth that penetrates through the 6 to 12 inch layer of loosely deposited soils.

The recommended soil bearing capacity includes a factor of safety of at least 3 against shear failure. Provided the recommendations contained in this report are followed, total post-construction settlements are anticipated to be 1 inch and differential settlements are anticipated to be ½ inch or less.

It is possible that some soils at the site will have an allowable soil bearing pressure less than the recommended design value. Therefore, foundation bearing surface evaluations should be performed by an ***OA*** representative during footing construction to aid in the identification of such soils. After the evaluations and any required remedial measures are performed, concrete should be placed as quickly as possible to avoid exposure of the foundation subsoils to drying. If soils in the area of foundation support are subjected to such conditions, the footings should be re-evaluated.

As stated previously in this memo, although the soil characteristics of the development are consistent, the condition in which they were placed varies across the site. The recommended bearing capacity stated in this memo is site specific for only Lot 41 and Lot 42. Additional site investigations are recommended for the residential houses at other potential lot locations.

Structural Fill

Additional grading operations should have fill materials with a liquid limit of less than 45, and a plasticity index of less than 25. Whenever possible, highly plastic silt (MH) or clay (CH) fill soils should not be placed within the upper 5 feet of the building area. Soils which have a liquid limit greater than 45 and a plasticity index greater than 25 will typically require blending with less plastic materials to result in lower Atterberg limits.

In addition to the plasticity characteristics, the fill soils should also be relatively free of organic materials (less than about two percent by weight) and other deleterious material. Also, the soils should preferably not contain particle sizes larger than three inches.

Laboratory Proctor compaction tests and classification tests should be performed on representative samples obtained from the proposed cut area or imported fill area to provide data necessary to determine acceptability and for quality control. The moisture content of suitable borrow soils should generally be between –3 and +3 percent of the optimum value at the time of compaction. More stringent moisture limits may be necessary with certain soils. Adjustment of moisture content may be necessary on granular soils to allow compaction in accordance with project specifications.

Suitable fill material should be placed in thin lifts (lift thickness depends on type of compaction equipment, but in general, lifts of eight inches loose measurement is recommended). The soil should be compacted by heavy compaction equipment such as a Caterpillar 815 sheepsfoot roller. Within small excavations, such as in utility trenches, around manholes or behind retaining walls, we recommend the use of "wacker packers", "Rammax" compactors or vibrating plate compactors to achieve the specified compaction. Loose lift thicknesses of four inches are recommended in small area fills.

We recommend that structural fill and backfill be compacted to a minimum of 98% of the standard Proctor maximum dry density (ASTM Specification D-698). A representative of ***OA*** should periodically observe fill placement operations and perform field density tests concurrently to indicate if the specified compaction is being achieved.

Floor Slab Subgrade Preparation

The soil subgrade in the areas of concrete slab-on-grade support is often disturbed during foundation and superstructure construction. Additionally, floor slab areas are often disturbed by construction equipment traffic between the time of initial grading and final pavement construction. To prepare the subgrade, the top eight inches of the subgrade should be compacted to a minimum of 98 percent of the maximum dry density as determined by ASTM D698-91, Standard Proctor Moisture-Density Relationship. The moisture content should also be controlled between –3 and +3 percent of the optimum. The final subgrade should be proofrolled and evaluated by a representative of ***OA*** immediately prior to placement of the concrete to detect any localized areas of instability. If unstable soils are encountered which cannot be adequately densified in place, such soils should be removed and replaced with well-compacted fill material placed in accordance with the *Structural Fill* section of this report.

Drainage and Ground Water Considerations

At the time of our field drilling operations, ground water was encountered in the soil test borings at a depth not anticipated to affect construction operations.

In general, water should not be allowed to collect near the surface of the foundation or floor slab areas of the structures during or after construction. Since soils generally tend to soften when exposed to free water, provisions should be made to remove seepage water from excavations, should it occur. Also, undercut or excavated areas should be sloped toward one corner to facilitate the collection and removal of rainwater or surface runoff.

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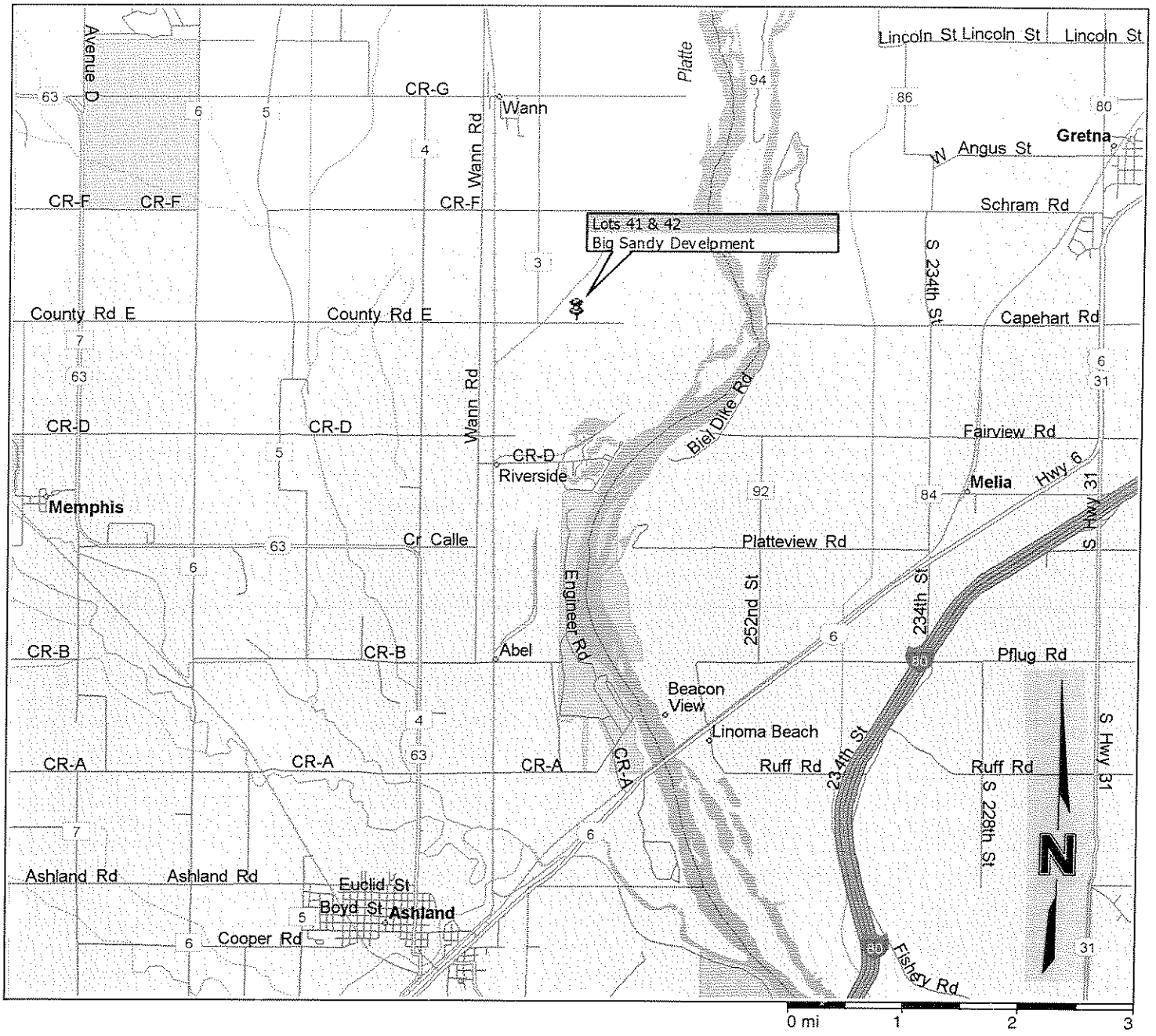
We trust that this memo will assist you in the design and construction of the proposed project. ***OA*** appreciates the opportunity to provide our services on this project and looks forward to working with you during construction and on future projects. Should you have any questions, please do not hesitate to contact us.

Attachments

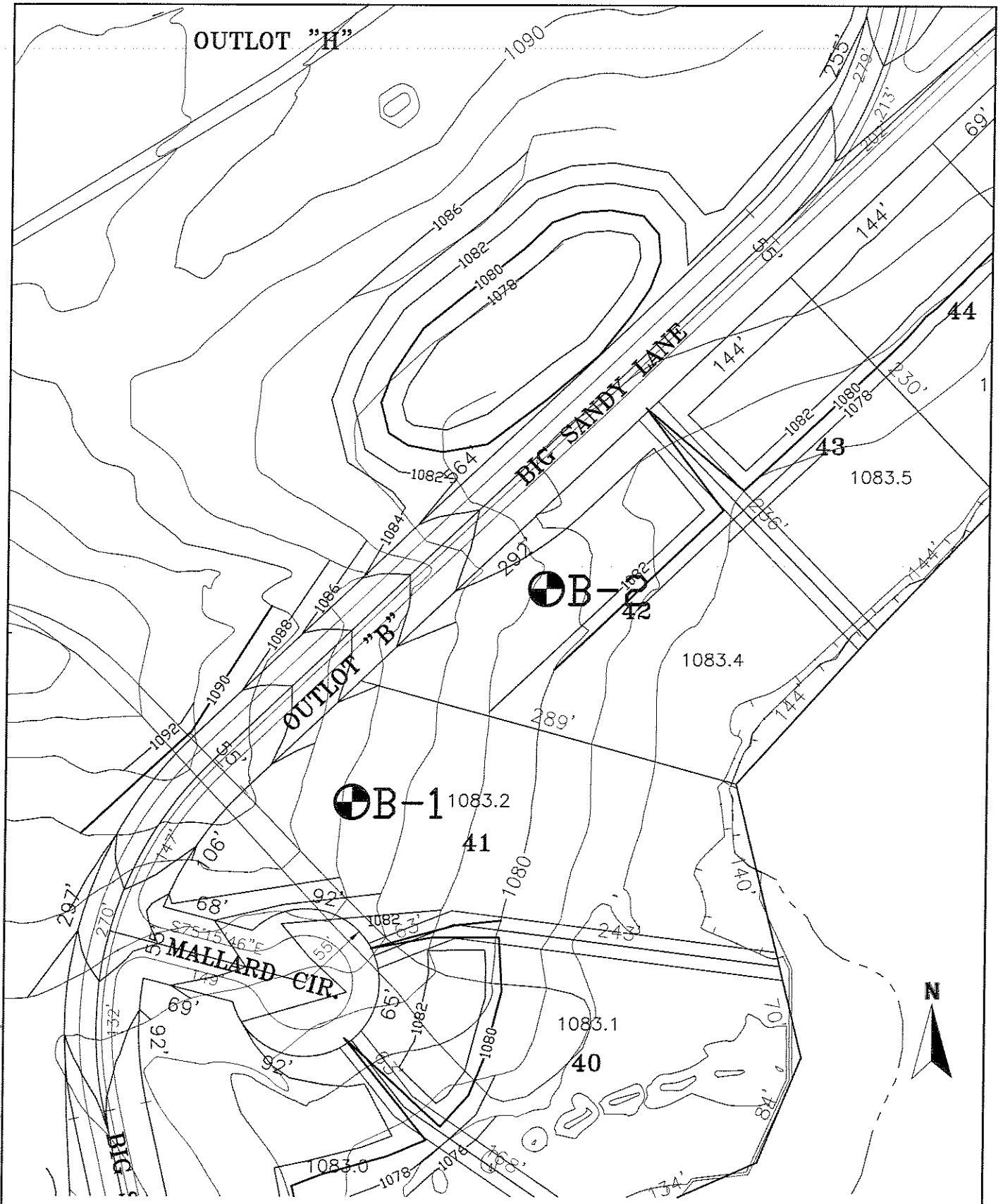
cc:

ATTACHMENT A
SITE LOCATION MAP
BORING LOCATION PLAN



SITE LOCATION PLAN

LOTS 41 & 42, BIG SANDY DEVELOPMENT
NEAR ASHLAND, NEBRASKA
OA PROJECT NO. 2005-0500



LEGEND

SOIL BORING LOCATION

0 50 100 200
SCALE IN FEET

PROJECT: 2005-0500		BORING LOCATION MAP
DRAWN BY: AMP	REVISIONS: XXX	
DATE: 05/11/05		

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1111 LINCOLN MALL - LINCOLN, NEBRASKA 68508
PH. 402-474-5311 - FAX 402-474-5160

F:\Projects\20050500\geotech\dwg\boring_location.dwg

ATTACHMENT B
SYMBOLS & NOMENCLATURE
BORING LOG

SYMBOLS AND NOMENCLATURE

DRILLING NOTES

DRILLING AND SAMPLING SYMBOLS

SS:	Split-Spoon Sample
U:	Thin-walled Tube Sample
% Rec:	Percentage of Thin-walled Tube sample recovered
SPT Blow Counts:	Standard Penetration Test blows per 6" penetration
HSA:	Hollow Stem Auger
CFA:	Continuous Flight Auger
N.E.:	Not Encountered
N.A.:	Not Available

DRILLING PROCEDURES

Soil sampling and standard penetration testing performed in accordance with ASTM D 1586. The standard penetration resistance (SPT) "N" value is the number of blows of a 140 pound hammer falling 30 inches to drive a 2 inch O.D., 1.4 inch I.D. split-spoon sampler one foot. The thin-walled tube sampling procedure is described by ASTM specification D 1587.

WATER LEVEL MEASUREMENTS

Water levels indicated on the boring logs are levels measured in the borings at the times indicated. In relatively high permeable materials, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels is not possible with only short-term observations.

SOIL PROPERTIES & DESCRIPTIONS

Soil descriptions are based on the Unified Soil Classification System (USCS) as outlined in ASTM Designations D-2487 and D-2488. The USCS group symbol shown on the boring logs correspond to the group names listed below.

Group Symbol	*Group Name*	*Group Symbol*	*Group Name*
GW	Well Graded Gravel	CL	Lean Clay
GP	Poorly Graded Gravel	ML	Silt
GM	Silty Gravel	OL	Organic Clay or Silt
GC	Clayey Gravel	CH	Fat Clay
SW	Well Graded Sand	MH	Elastic Silt
SP	Poorly Graded Sand	OH	Organic Clay or Silt
SM	Silty Sand	PT	Peat
SC	Clayey Sand		

PARTICLE SIZE

Boulders	12 in. +	Coarse Sand	4.75mm-2.0mm	Silt	0.075mm-0.005mm
Cobbles	12 in.-3 in.	Medium Sand	2.0mm-0.425mm	Clay	<0.005mm
Gravel	3 in.-4.75mm	Fine Sand	0.425mm-0.075mm		

COHESIVE SOILS

Consistency	Unconfined Compressive Strength (Qu) (psf)
Very Soft	<500
Soft	500 - 1000
Firm	1001 - 2000
Stiff	2001 - 4000
Very Stiff	4001 - 8000
Hard	> 8000

COHESIONLESS SOILS

Relative Density	"N" Value
Very Loose	0 - 3
Loose	4 - 9
Medium Dense	10 - 29
Dense	30 - 49
Very Dense	≥ 50

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TEST BORING REPORT

BORING NO. B-1

PROJECT: Lots 41 & 42, Big Sandy Development
CLIENT: Big Sandy Inc.
DRILLING CONTRACTOR: In-Situ Geotechnical
EQUIPMENT USED: Little Moe

JOB NO. 2005-0500
PAGE NO. 1 of 1
LOCATION: See Plans
ELEVATION: 1086.0 (USGS)
DATE START: 5/5/05
DATE FINISH: 5/5/05
DRILLER: T. Strauss
PREPARED BY: A. Phillips

GROUNDWATER		DEPTH TO:			CASING	SAMPLER	CORE BARREL
DATE	HRS AFTER COMP	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE		
5/5/05	0	12.0'	---	20.0'	SIZE ID		
					HAMMER WT		
					HAMMER FALL		

DEPTH IN FEET	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
5	5 6 7	SS-1	3.5' ---- 5.0'	Poorly graded sand (SP) Medium dense, brown, dry, mostly fine to medium sand -ALLUVIUM-
10	5 5 5	SS-2	8.5' ---- 10.0'	Same as SS-1
				Note: Ground water encountered at a depth of 12.0 feet
15	1 1 1	SS-3	13.5' ---- 15.0'	Same as SS-1 except very loose, wet and fine to coarse sand
20	1 1 1	SS-4	18.5' ---- 20.0'	Same as SS-3 Base of boring @ 20.0 feet

BLOWS/FT	DENSITY
0-3	VERY LOOSE
4-9	LOOSE
10-29	MEDIUM DENSE
30-49	DENSE
>49	VERY DENSE

BLOWS/FT	CONSISTENCY
0-1	VERY SOFT
2-4	SOFT
5-8	FIRM
9-15	STIFF
16-30	VERY STIFF
>30	HARD

SAMPLE ID.	
SS	SPLIT SPOON
U	TUBE
CA	CALIFORNIA
G	GRAB SAMPLE
X	OTHER
NR	NO RECOVERY

COMPONENT %	
MOSTLY	50-100 %
SOME	30-45 %
LITTLE	15-25 %
FEW	5-10 %
TRACE	< 5 %

GROUNDWATER ABBREV

WD - WHILE DRILLING
NE - NOT ENCOUNTERED
UR - NOT READ

BORING NO. B-1

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TEST BORING REPORT

BORING NO. B-2

PROJECT: Lots 41 & 42, Big Sandy Development
CLIENT: Big Sandy Inc.
DRILLING CONTRACTOR: In-Situ Geotechnical
EQUIPMENT USED: Little Moe

JOB NO. 2005-0500
PAGE NO. 1 of 1
LOCATION: See Plans
ELEVATION: 1084.0 (USGS)
DATE START: 5/5/05
DATE FINISH: 5/5/05
DRILLER: T. Strauss
PREPARED BY: A. Phillips

GROUNDWATER		DEPTH TO:			CASING	SAMPLER	CORE BARREL
DATE	HRS AFTER COMP	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE		
5/5/05	0	12.0'	---	20.0'	SIZE ID		
					HAMMER WT		
					HAMMER FALL		

DEPTH IN FEET	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	FIELD CLASSIFICATION AND REMARKS
				Poorly graded sand (SP) Medium dense, brown, dry, mostly fine to medium sand -FILL- 2.0
5	5 8 12	SS-1	3.5' ---- 5.0'	Poorly graded sand (SP) Medium dense, brown, dry, mostly fine to medium sand -ALLUVIUM-
10	5 5 6	SS-2	8.5' ---- 10.0'	Same as SS-1
				Note: Ground water encountered at a depth of 12.0 feet
15	1 1 1	SS-3	13.5' ---- 15.0'	Same as SS-1 except very loose, wet and fine to coarse sand
20	1 2 2	SS-4	18.5' ---- 20.0'	Same as SS-1 except loose, wet and fine to coarse sand Base of boring @ 20.0 feet

BLOWS/FT	DENSITY
0-3	VERY LOOSE
4-9	LOOSE
10-29	MEDIUM DENSE
30-49	DENSE
>49	VERY DENSE

BLOWS/FT	CONSISTENCY
0-1	VERY SOFT
2-4	SOFT
5-8	FIRM
9-15	STIFF
16-30	VERY STIFF
>30	HARD

SAMPLE ID.	
SS	SPLIT SPOON
U	TUBE
CA	CALIFORNIA
G	GRAB SAMPLE
X	OTHER
NR	NO RECOVERY

COMPONENT %	
MOSTLY	50-100 %
SOME	30-45 %
LITTLE	15-25 %
FEW	5-10 %
TRACE	< 5 %

GROUNDWATER ABBREV
WD - WHILE DRILLING
NE - NOT ENCOUNTERED
UR - NOT READ

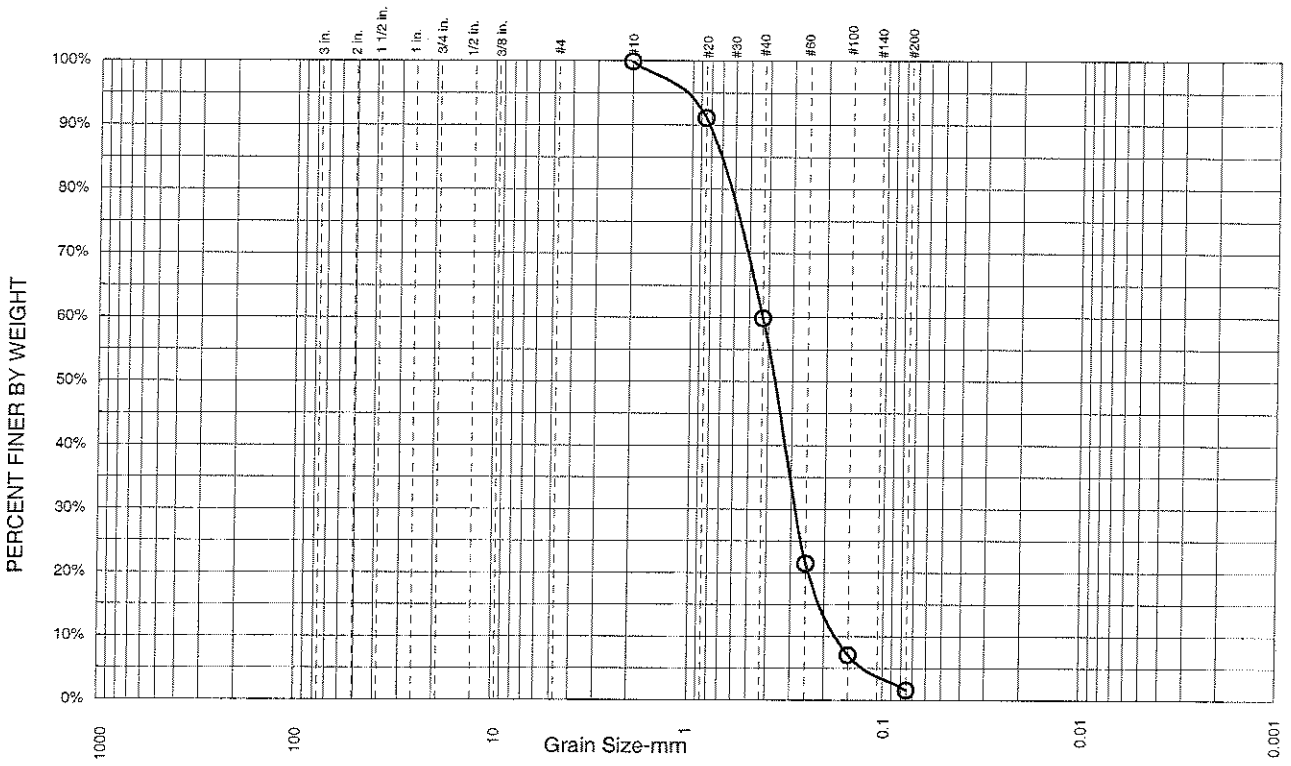
BORING NO. B-2

ATTACHMENT C
SUMMARY OF LABORATORY TEST RESULTS

SUMMARY OF LABORATORY TEST RESULTS
Lots 41 & 42, Big Sandy Development
Near Ashland, Nebraska
OA Project #: 2005-0500

BORING No.	SAMPLE I.D.	SAMPLE DEPTH (ft.)	MOISTURE CONTENT (%)
B-1	U-1	3.5-5'	5.4
	U-2	8.5-10'	10.3
B-2	U-1	3.5-5'	3.7
	U-2	8.5-10'	11.4

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	40.0	58.4	N/A	N/A

SIEVE SIZE	PERCENT FINER	SPEC* PERCENT	PASS? (X=NO)
1			
3/4			
1/2			
1/4			
4			
10	99.9%		
20	91.1%		
40	59.9%		
60	21.4%		
100	7.0%		
200	1.5%		

*-(no specification provided)

Sample No.: B-1 SS-1 (3.5-5')

Soil Description

Atterberg Limits

PL=N/A LL=N/A PI=N/A

Coefficients

D_{85}=0.70 D_{60}=0.42 D_{50}=0.37

D_{30}=0.29 D_{15}=0.22 D_{10}=0.17

C_U= 2.47 C_C= 1.18

Classification

USGS=SP-- Poorly graded fine to medium sand

Remarks

N/A- Not Applicable

Date: 5/9/05

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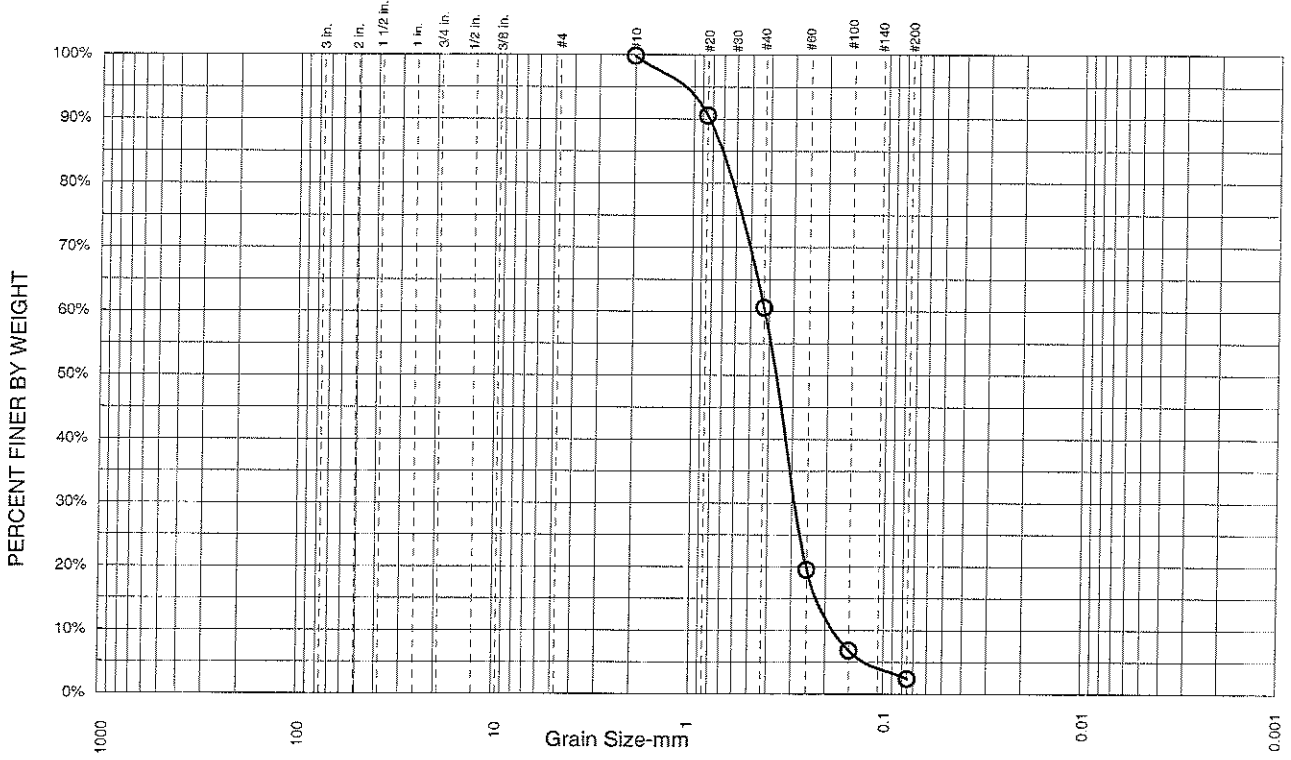
Project: Lots 41 & 42, Big Sandy

Project #: 2005-0500

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.2	39.2	58.2	N/A	N/A

SIEVE SIZE	PERCENT FINER	SPEC* PERCENT	PASS? (X=NO)
1			
3/4			
1/2			
1/4			
4			
10	99.8%		
20	90.5%		
40	60.6%		
60	19.5%		
100	6.8%		
200	2.4%		

*-(no specification provided)

Sample No.: B-1 SS-2 (8.5-10')

Soil Description

Atterberg Limits

PL=N/A LL=N/A PI=N/A

Coefficients

D_{85}=0.70 D_{60}=0.42 D_{50}=0.38

D_{30}=0.29 D_{15}=0.22 D_{10}=0.18

C_U= 2.33 C_C= 1.11

Classification

USGS=SP-- Poorly graded fine to medium sand

Remarks

N/A- Not Applicable

Date: 5/9/05

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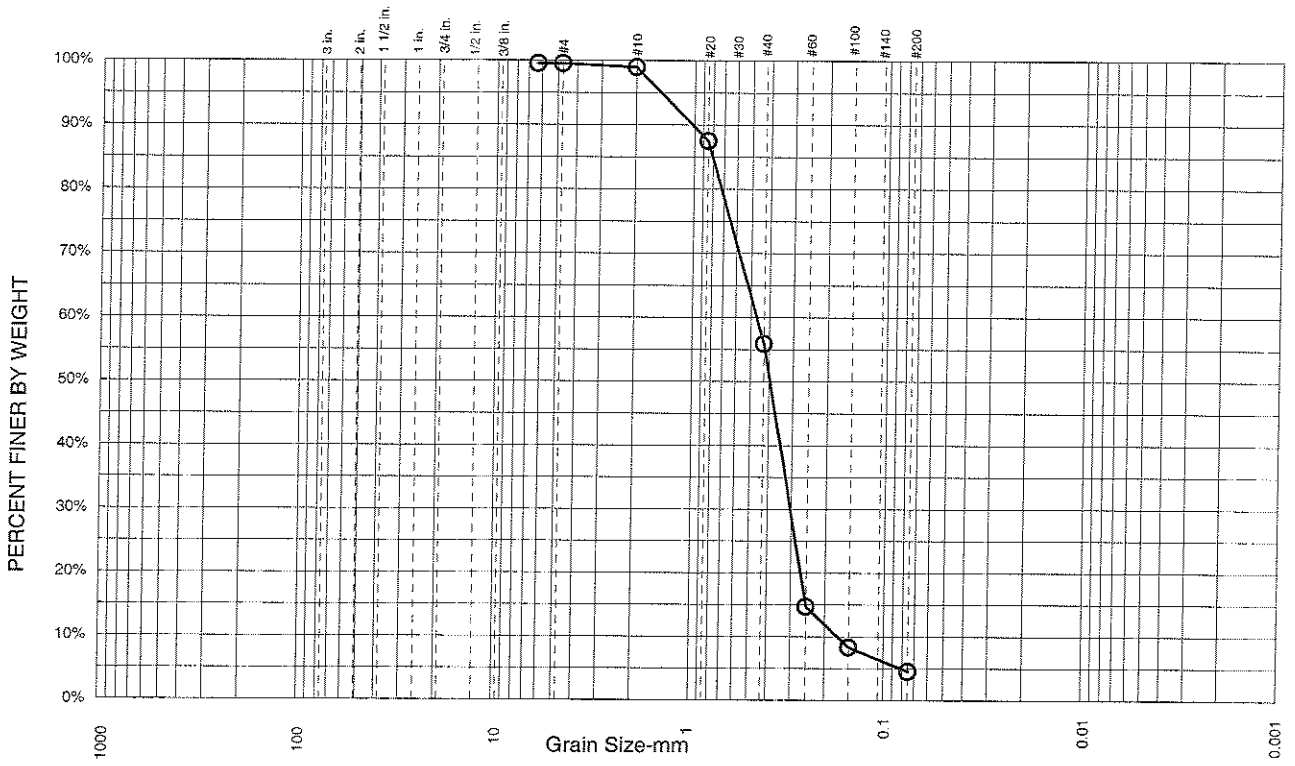
Project: Lots 41 & 42, Big Sandy

Project #: 2005-0500

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.5	0.5	43.1	51.4	N/A	N/A

SIEVE SIZE	PERCENT FINER	SPEC* PERCENT	PASS? (X=NO)
1			
3/4			
1/2			
1/4	99.5%		
4	99.5%		
10	99.0%		
20	87.5%		
40	55.9%		
60	14.7%		
100	8.3%		
200	4.5%		

*-(no specification provided)

Sample No.: B-2 SS-1 (3.5-5')

Soil Description

Atterberg Limits

PL=N/A LL=N/A PI=N/A

Coefficients

D_{85}=0.80 D_{60}=0.48 D_{50}=0.40

D_{30}=0.30 D_{15}=0.26 D_{10}=0.17

C_U= 2.82 C_C= 1.10

Classification

USGS=SP-- Poorly graded fine to medium sand

Remarks

N/A- Not Applicable

Date: 5/9/05

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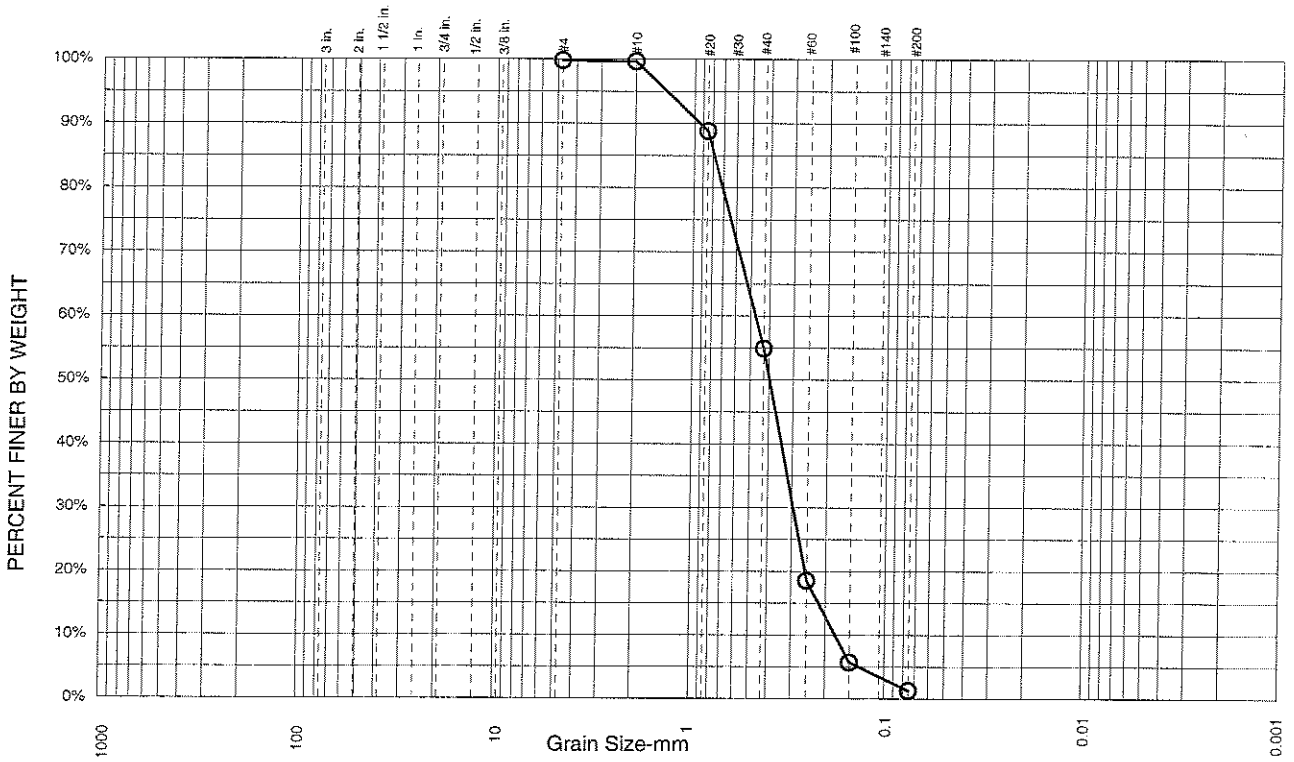
Project: Lots 41 & 42, Big Sandy

Project #: 2005-0500

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.2	0.2	44.7	53.6	N/A	N/A

SIEVE SIZE	PERCENT FINER	SPEC* PERCENT	PASS? (X=NO)
1			
3/4			
1/2			
1/4			
4	99.8%		
10	99.6%		
20	88.8%		
40	54.9%		
60	18.5%		
100	5.7%		
200	1.3%		

*-(no specification provided)

Sample No.: B-2 SS-2 (8.5-10')

Soil Description

Atterberg Limits

PL=N/A LL=N/A PI=N/A

Coefficients

D_{85}=0.79 D_{60}=0.47 D_{50}=0.40

D_{30}=0.29 D_{15}=0.22 D_{10}=0.18

C_U= 2.61 C_C= 0.99

Classification

USGS=SP-- Poorly graded fine to medium sand

Remarks

N/A- Not Applicable

Date: 5/9/05

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