REPORT OF SUBSURFACE EXPLORATION FOR KINNICKINNIC RIVER STABILITY ANALYSIS AND DREDGING STUDY MILWAUKEE COUNTY, WISCONSIN PREPARED FOR: BARR ENGINEERING COMPANY JUNE 9, 2006 CEC PROJECT #GD-06032

Prepared By:

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I. INTRODUCTION

The Wisconsin Department of Natural Resources (WDNR) has proposed sediment removal from a stretch of the Kinnickinnic River, from Becher Street to Kinnickinnic Avenue located in the City of Milwaukee, Wisconsin. As part of this initiative, the U.S. Army Corps of Engineers has determined that certain engineering aspects of the project warrant a subsurface geotechnical investigation to evaluate the stability of the seawalls and unprotected riverbanks along this section of the river prior to sediment removal. This determination will be provided by Barr Engineering Company (Barr) of Minneapolis, Minnesota.

Coleman Engineering Company (CEC) was retained by Barr to perform surveying, field drilling, geotechnical laboratory testing, sheet-pile wall surveying and parallel seismic surveying. These services included field drilling and sampling at boring locations provided by Barr, laboratory testing consisting of visual soil classifications and physical laboratory testing as deemed necessary to correctly classify the soils, surveying the dimensions and elevations of existing structures and boring locations along the river banks, seismic testing to identify the bottom of the existing sheet piles and preparing a summary report describing the activities associated with this project.

CEC is responsible for the above-noted services. Interpretation of the data and all other aspects are the responsibilities of others.

II. FIELD PROCEDURES

Field Drilling and Sampling

The drilling services required for this project consisted of six (6) soil borings located within the site area. At the direction of Barr, all six borings were to be drilled to a depth of fifty (50) feet. Actual completed depths for the six borings range from 42.2 feet to 53.8 feet deep. In addition, three (3) of the borings would be completed with 2 $\frac{1}{2}$ " PVC casing to facilitate the placement of a geophone below the surface for parallel seismic testing.

Drilling was completed by a CEC drill crew present on-site from April 18 to April 27, 2006, using 4¼ inch hollow-stem augers (HSA) powered by a Diedrich D-50 drill. Hollow-stem augers act as continuously-advanced steel casing to prevent soils from collapsing into the open borehole. The hollow augers were advanced to the sampling depth, and sampling tools were then lowered down through the augers to sample undisturbed soils below the tip of the augers. Drilling and field sampling were performed in accordance with ASTM D-1586, "Penetration Test and Split Barrel Sampling of Soils" with a 2-inch O.D. split spoon, and with ASTM D-1587, "Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes". One hundred (100) split-spoon samples and eight (8) thin-walled tube samples were obtained.

Soil cuttings generated from the test drilling were contained in 55-gallon drums and staged on site until they could be picked up for disposal. CEC retained the services of OSI of Milwaukee,

Coleman Engineering Company 1 Subsurface Exploration Kinnickinnic River Barr Engineering Company May 2006 Wisconsin, a licensed waste disposal contractor, to effectuate appropriate disposal.

A field log was prepared for each boring during exploration which contained the work method, standard penetration test (SPT) data, samples recovered and the indication of the presence of various soil types/conditions. Pocket penetrometer and torvane tests were conducted and recorded in the field only for soil samples identified as lean clays (CL), the silts and organic silts (ML and OL) being observed to occur generally in a soft to very soft condition. The field logs were submitted to CEC's Iron Mountain laboratory along with the soil samples for evaluation of the subsurface information and preparation of the final boring logs. Rough field and final typed boring logs are presented in Appendix E.

Three (3) of the test borings (S-1, S-3 and S-5) were completed with $2\frac{1}{2}$ " PVC casing extending to the bottom of the borehole. This casing was grouted in place with neat cement grout to securely anchor the casing and provide a continuous connection to the borehole walls. The casing was filled with water to prevent it from floating out of the borehole before the grout set. The casing was abandoned upon completion of the seismic survey by filling with bentonite chips and cutting the casing off below grade before reclaiming the site.

Access to the test boring locations required that all property owners be notified in advance. Verbal notification was provided at least five days in advance of CEC being on site. Additionally, boring S-1 was located along a steep embankment just west of the Gillen Company parking area. This location required temporary removal of heavy ornamental chain and an elaborate system of cribbing with a drilling platform to safely access the site and complete the drilling. Photographs of this site are presented in the project photographic log in Appendix J.

Tie-back Survey

The tie-backs associated with anchoring the sheet pile wall were surveyed to document the existing condition of the sheet pile wall. Tie-backs were identified on the face of the wall and measurements were taken to locate the horizontal location as well as the vertical placement on the face of the wall. CEC Drawing No. H documenting the existing locations of tie-backs is presented in Appendix H.

Parallel Seismic Survey

After completion of the drilling, three test borings (S-1, S-3 and S-5) were selected for parallel seismic testing to establish the bottom of the sheet-pile wall. Within these borings, a geophone was lowered down each boring and the sheet-pile wall was struck smartly with a sledge hammer. The energy was received by the geophone, recorded, and plotted in order to determine the elevation of the base of the sheet-pile wall. A more detailed description of this activity as well as results of this investigation are included in Appendix I.

The boring locations were selected and established in the field by Barr with direction from the U.S.

2

Coleman Engineering Company

Subsurface Exploration Kinnickinnic River Barr Engineering Company May 2006 Army Corps of Engineers. Figure 1 in Appendix A shows the project location, Figure 2 in Appendix B shows the individual boring locations.

III. LABORATORY PROCEDURES

All field samples collected were visually classified in accordance with ASTM D-2488, "Description and Identification of Soils (Visual-Manual Procedure)". Laboratory testing of collected soil samples was assigned by Barr under the direction of the U.S. Army Corps of Engineers and included tests for moisture content, Atterberg limits for cohesive soils, combined mechanical/hydrometer grain-size analyses, specific gravity, unit dry density, unconfined compression, and CIU triaxial compression with pore pressure. CEC retained the services of Soils Engineering Testing, Inc. (SET) of Bloomington, Minnesota to perform the requested CIU triaxial compression testing of particular undisturbed samples. SET also performed moisture content, dry density, Atterberg limits, and hydrometer grain-size analyses on these same samples. Individual test reports for all laboratory tests are included in Appendix G.

The final boring logs contain both factual and interpretive information. It should be emphasized that any recommendations are based only on the final boring logs. On the final boring logs, horizontal lines designating the interface between differing materials encountered represent approximate boundaries. The transition between soil layers is typically gradual.

IV. SITE CONDITIONS

The predominant soil types disclosed throughout the area of investigation are cohesive soils including silt (ML), organic silt (OL), and clay (CL and CH). Some peat (Pt) was observed in the upper areas of Borings S-4 and S-6, and throughout the site are scattered thin seams of sand (SP-SM) and silty sand (SM). Borings S-1 and S-5 encountered probable bedrock between 42.2 and 46.5 feet deep. We recommend that you review the subsurface soil information presented on the respective boring logs for each section of the site for more in-depth site-specific data.

Groundwater was found between 4.2 feet and 10.1 feet deep. Long-term monitoring of groundwater was not part of the scope of this project; therefore, the water level information indicated on the final logs is accurate at the time of drilling only. Groundwater levels vary greatly depending on meltwater, runoff, time of year, amount of precipitation, and other factors, and are likely directly related to water elevations in the Kinnickinnic River. It should, therefore, be expected that different groundwater levels may be encountered at other times throughout the year.

* * * * * * * *

3

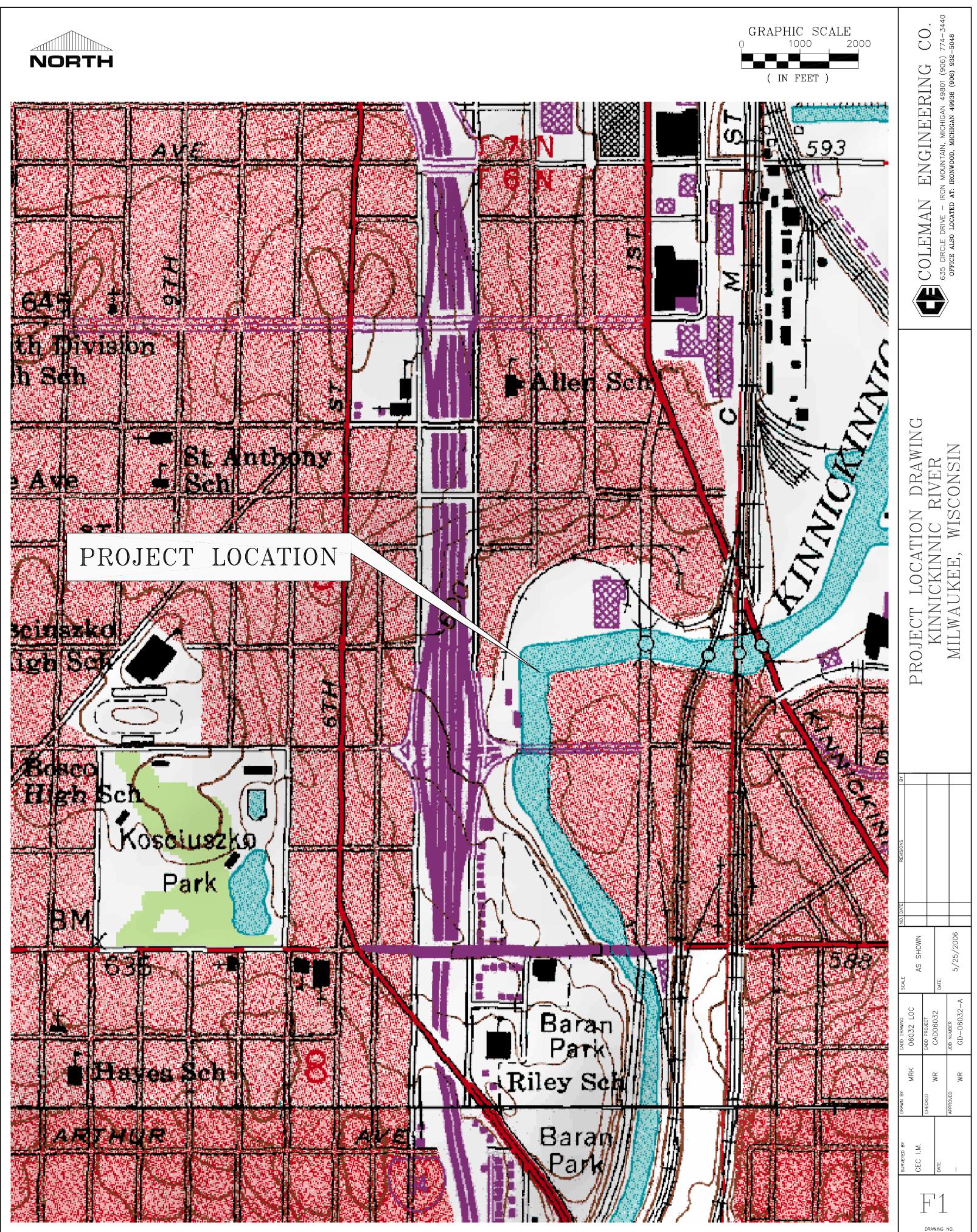
Coleman Engineering Company

Subsurface Exploration Kinnickinnic River Barr Engineering Company May 2006 APPENDIX A

FIGURE 1: PROJECT LOCATION DRAWING



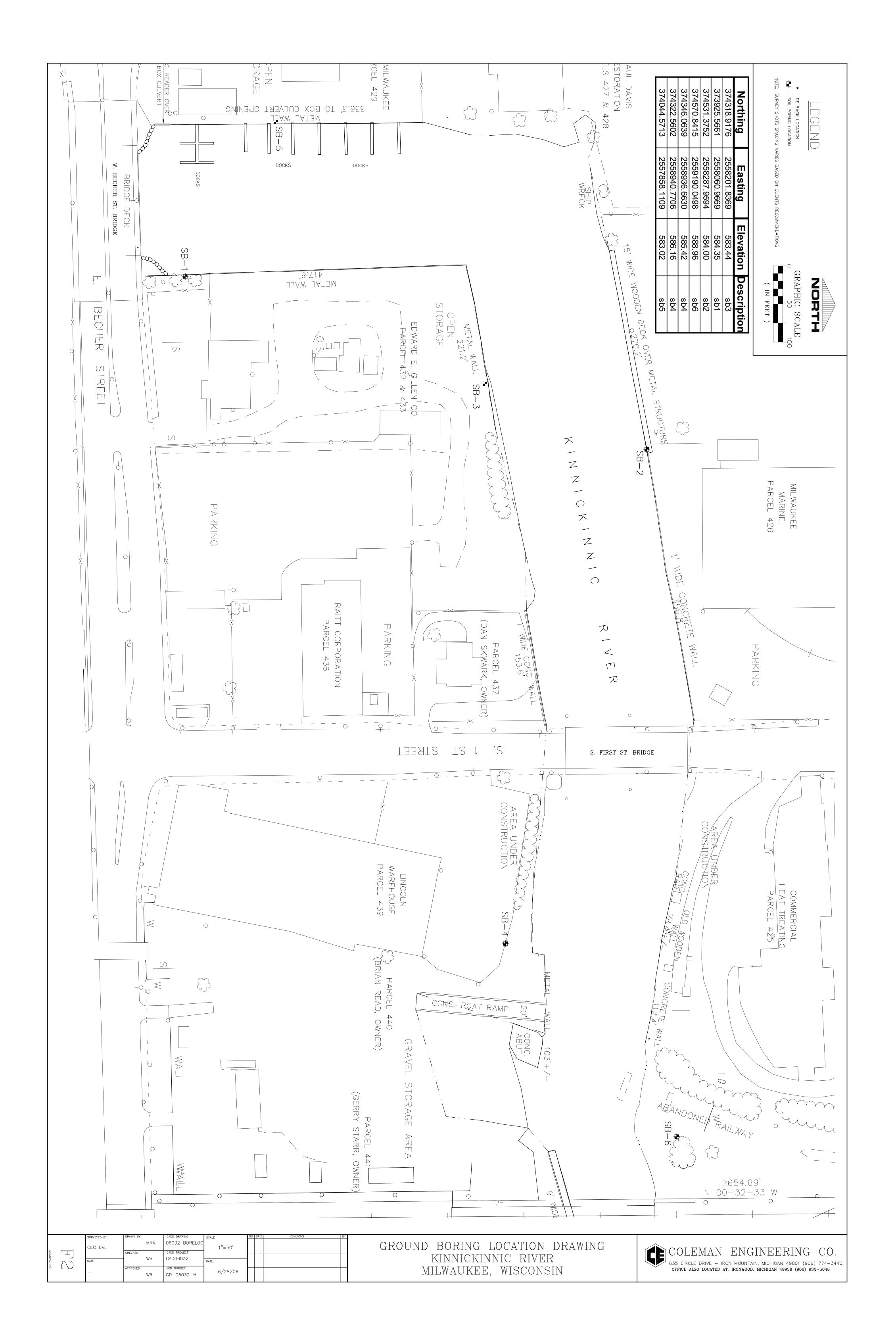
NORTH



1" = 5 MILES

APPENDIX B

FIGURES 2: BORING LOCATION DRAWINGS



APPENDIX C

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES (UNIFIED SOIL CLASSIFICATION SYSTEM)

COLEMAN ENGINEERING COMPANY

635 Circle Drive

Iron Mountain, Michigan 49801

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES ASTM Designation: D-2487-83 (Based on Unified Soil Classification System)

				Soil Classification	
Criter	ia for Assigning Group Symbo	Is and Group Names Using I	Laboratory Tests*	Group Symbol	Group Name ^D
Coarse-Grained Soils	Gravels	Clean Gravels Less than 5 % fines ^C	$Cu \ge 4$ and $1 \le Cc \le 3^{E}$	GW	Well-graded gravel ¹
More than 50 % retained on No. 200 sieve	More than 50 % of coarse fraction retained on No. 4		$Cu < 4$ and/or $1 > Cc > 3^{L}$	GP Poorly graded grave	Poorly graded gravel
	sieve	Gravels with Fines more	Fines classify as ML or MH	GM	Silty gravel ^{FGH}
		than 12 % fines ^c	Fines classify as CL or CH	GC	Claycy gravel ^{E.G.R.}
	Sands 50 % or more of coarse fraction passes No. 4 sieve Sands with Fines More than 12 % fines ^D		$Cu \ge 6$ and $1 \le Cc \le 3^{E}$	SW	Well-graded sand
		Less than 5 % fines ^D	$Cu < 6$ and/or $l > Ce > 3^E$	SP	Poorly graded sand 1
			Fines classify as ML or MH	SM	Silly sand ^{GHJ}
		More than 12 % fines ⁰	Fines classify as CL or CH	SC	Claycy sand ^{GHI}
Fine-Grained Soils	% or more passes the Liquid limit less than 50	inorganic	Pl > 7 and plots on or above "A" line"	CL	Loan clayKLM
50 % or more passes the No. 200 sieve			Pl < 4 or plots below "A" line"	ML	Silt ^{KLM}
		Liquid limit – oven dried < 0.75	ol -	Organic clay KEMN	
			Liquid limit – not dried < 0.75		Organic silt ^{KLMO}
		inorganic	PI plots on or above "A" line	CH	Fat clay ^{KLM}
			Pt plots below "A" line	MH	Elastic silt ^{KLM}
		organic _	Liquid limit – oven dried < 0.75	OH	Organic clay ^{KLMP}
			Liquid limit - not dried < 0.75		Organic silt ^{KLMQ}
Highly organic soils	Primaril	y organic matter, dark in col	or, and organic odor	РТ	Peat

* Based on the material passing the 3-in. (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group

- name. ^C Gravels with 5 to 12 % fines require dual
 - GW-GM well-graded gravel with silt GW-GC well-graded gravel with clay GP-GM poorly graded gravel with silt GP-GC poorly graded gravel with clay
 - ^p Sands with 5 to 12 % fines require dual symbols: SW-SM well-graded sand with silt

SW-SC well-graded sand with clay SP-SM poorly graded sand with silt SP-SC poorly graded sand with clay

- (D₁₀)² L Cu $\sim D_{00}/D_{10}$ -D_{io} x D_{io}
- ^f If soils contains ≥ 15 % sand, add "with sand" to group name.
- ⁶ If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
- " If fines are organic, add "with organic fines" to group name.

¹ If soil contains \geq 15 % gravel, add "with gravel" to group name.

¹ If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29 % plus No. 200,

add "with sand" or "with gravel", whichever is predominant.

^L If soil contains ≥ 30 % plus No. 200,

predominantly sand, add "sandy" to group name. ^M If soil contains \geq 30 % plus No. 200,

predominately gravel, add "gravelly" to group

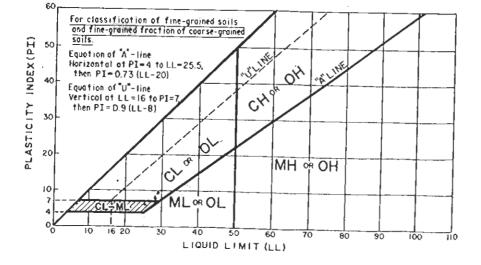
name.

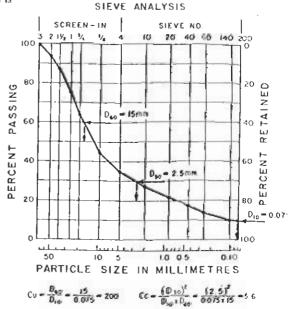
^K $Pl \ge 4$ and plots on or above "A" line.

^o Pl < 4 or plots below "A" line.

^P Pl plots on or above "A" line.

Q PI plots below "A" line.





APPENDIX D

SOIL EXPLORATION-GENERAL NOTES AND LEGEND



SOIL EXPLORATION General Notes and Legend

COLEMAN ENGINEERING COMPANY 635 CIRCLE DRIVE IRON MOUNTAIN, MICHIGAN 49801 Telephone: (906)-774-3440 Fax: (906)-774-7776

Descriptive Soil Classification ASTM D2487/2488 GRAINSIZE TERMINOLOGY

Soll Fra	ction	Particle Size	U.S. Standard Sieve Size
Boulder	19	Larger Than 12"	Largor than 12"
Cobble		3" to 12"	3" to 12"
Gravel:	Coarse	3/4" to 3"	3/4" to 3"
	Fine	4.75mm to 3/4"	#4 to 3/4"
Sand:	Coarse	2.00mm to 4.75mm	#10 to #4
	Medium	0.42mm to 2.00mm	#40 to #10
	Fine	0.075mm to 0.42mm	#200 to #40
Slit		0.005mm to 0.075mm	Smaller than #200
Clay		Smaller than 0.005mm	Smaller than #200

Plaeticity Characterietics differentiate between elit and clay

GENERAL TERMINOLOGY

Physical Characteristics Color, moisture, grain shape, fineness, etc. Major Constituents Ciay, silt, sand, gravel Structure Laminated, varved, fibrous, stratified, cemented, fissured, etc. Geologic Origin

Glacial, alluvial, eolian, residual, etc.

RELATIVE PROPORTIONS OF COHESIONLESS SOILS

Proportional	Defining Range By		
Terms	Percentagee of Weight		
Тласе	0%-5%		
Some	5%-12%		
With	12%-30%		
-Y(ie. silty, sandy)	30%-50%		

ORGANIC CONTENT BY COMBUSTION METHOD

Loss on Ignition	Te
Lese than 4%	N
4%-12%	SI
12%-50%	M
More than 50%	Н
	Lese than 4% 4%-12% 12%-50%

The penetration resistance, N, is the summation of the number of blows required to effect two succesive 6" penetrations of the 2" split-barrel sampler. The sampler is typically driven 18" with a 140 ib. weight falling 30" and is seated to a depth of 6" before commencing the standard penetration tast. When driven 24" the "N" is the aum of the blows of the second and third 6" increment.

RELATIVE DENSITY

lerm	"N" Valuo
Very Loose	0-4
Loose	4-10
Medulm Dense	10-30
Dense	
Very Dense	Over 50

CONSISTENCY

Term	q _a (tons/sq.ft.)
Very Soft	0.0 to 0.25
Soft	
Medium	0.50 to 1.0
	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	Over 4.0

PLASTICITY

Tərm	Plastic Index
None to Slight	0-4
Slight	5-7
Medium	8-22
High to Very High	Over 22

RB-	Roller Bit
RC-	Rock Coring
RQD-	Rock Quality Designator
CW-	Clear Water
DM-	Drilling Mud
HSA-	Hollow Stem Auger
SSA-	Solid Stem Auger
HA-	Hand Auger
SPT-	Standard Penetration Teet
255-	2" Diameter Split-Barrel Sample
385-	3" Diameter Split-Barrel Sample
2ST-	2" Diameter Shelby Tube Semple
3ST-	3" Diameter Shelby Tube Sample
PS-	3" Diameter Piston Tube Sample
AS-	Auger Sample
WS-	Wash Sample
NR-	No Recovery
VS-	Vane Shear Test
T-	Torvane Shear Test
BS-	Bag Sample
GS-	Grab Sample
q	Penetrometer Reading, tsf
\mathbf{q}_{tf}	Unconfined Strength, tsf

LABORATORY TEST

W-	Mols	ture	Content,	%

- LL- Liquid Limit, %
- PL- Plastic Limit, %
- SL- Shrinkage Limit, %
- LI- Loss on Ignition, %
- DD- Dry Density, paf

WATER LEVEL MEASUREMENT

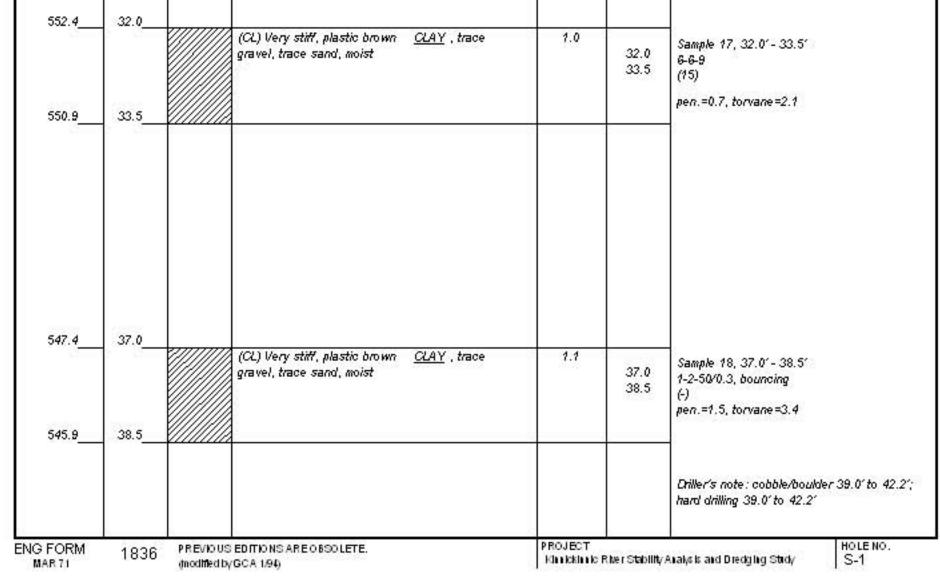
¥	Water Level During Drilling
Ŧ	Water Level After Drilling
¥	Water Level at Time Shown 1
¥	Water Level at Time Shown 2
¥	Water Level at Time Shown 3
¥	Water Level at Time Shown 4
NW-	No Water Encountered
BCR-	Before Casing Removal
ACR-	After Casing Removal

Note: Water level measurements shown on the boring logs represent conditions at the time indicated and may not reflect static levels, especially in cohesive solls.

Symbols DRILLING AND SAMPLING

DRILLI	VG LO	- W -	ision reat Lakes an	d Ohio River	INSTALLATION SHEET 1 Detroit OF 3 SHEET					
PROJECT	P :				10. SEE ANI	D TYPEOF B		4 1/4" HSA	15.5v (3)	2.0
Kinnickinnic		- 85 - 3	lysis and Dree	lging Study	II. DATUM		ION SHOWN ((TBM OF MSL)		
N 373925.5			69			Contractory of the second second	ESIGNATION	OF DRILL		
DRILLING AGE	ICY	122			Diedric					
Coleman Er HOLE NO. (As s		-				O. OF OVER-		DISTURBED	UNDISTUR	BED 1
tttle and file numb		ung .	1	S-1	Control Dispersion of the				5 S	E
NAME OF DRIL						UMBER COP		57	52	
Randy Och	5290 C. W. L. A.				a des trents as as	COMPLETED				
	. 🗆	INCLINED	0.0	DEG, FROM VERT.						06
THICKNESSOF	OVERBUR	DEN		0	17. ELEVAT)	ON TOP OF H	IOLE	584.4	1	
DEPTH DRILLE				0	12202022200	0.000000000	ERY FOR BO	RING		N/A
TOTAL DEPTH	OF HOLE	26		42.2	19. SIGNATU	JREOF INSP	ECTOR			
ELEVATION	DEDTU	LEGEND	cu	ASSIFICATION OF MATERIALS		SAMPLE RECOV-	SAMPLE		EMARIKS he,waterloss,depti	<u>6</u>
a	DEPTH	C		(Description)		ERY	- T		,etc., if significanty	
a			<u>FILL</u> , topsoil,	w gravel, asphalt, silt		0.5		2" SPT, 140# wt., 3	9 Of drop	
							0.0 1.5	Coord, Reference: I South Zone	NI State Plane	
							7.5	NAD 27 grid, Elev.	Datum: IGLD 85	
582.9	1.5							Sample 1, 0.0' - 1.5 1-1-2	,	
302.7	r.3		FILL Soft, slig	htly plastic, medium brown s	andy	0.6		(3)		
		\otimes		el, trace asphalt chunks, tra			1.5 3.0	Sample 2, 1.5' - 3.0 1-1-1		
		\otimes	rooto, motor				5.0	(2)		
		\otimes								
581.2	3.2		M40314		3.2'	0.8	- 6	Sample 3, 3.0' - 4.5	6	
				ML) Very soft, slightly plastic, brown clayey <u>iILT</u> , trace sand, trace gravel, wet			3.0 4.5	1-1-2		
				a na mana sa tang kang kang kang kang kang kang kang k			1000	(3)		
579.9	4.5									
				, slightly plastic, brown clay	ey	0.3		Sample 4, 4.5'-6.0	0	
			<u>SILT</u> , trace si	and, trace gravel, wet			4.5 6.0	1-1-2		
							907547 (s.)	(3)		
578.4	6.0									
				, slightly plastic, brown clay	ey	0.8		Sample 5, 6.0'- 7.5	0	
			<u>SILT</u> , trace si	and, trace gravel, wet			6.0 7.5	2-1-1		
577.4	7.0				7.0'		1000010	(2)		
576.9	7.5			, slightly plastic, dark gray T,some sand, trace gravel	trace					
8) ::		(wood, wet	지 않는 것은 것을 같이 했다.		1.0		Sample 6, 7.5'- 9.0	0	
				, slightly plastic, dark gray T, some sand, trace grave	l, trace		7.5 9.0	WOH-WOH-7		
~		====	wood, wet		-25-7363-44-142		CALOR TO	0		
575.4	9.0									
				, slightly plastic, dark gray T, some sand, trace grave	l trace	0.6	9.0	Sample 7, 9.0'- 10.	51	
			wood, wet	_ , some sand, nace grave	, unoe		10.5	8-2-3 (5)		
574.2	10.2		2		10.21			Layer of wood at 1	0.1°to 10.2°	
573.9	10.5			ark gray, <u>SILTY SAND</u> , fi	ine to			~		
		Unin.	coarse, with g	ravel, trace organics, wet	10.51	1.3	10.5	Sample 8, 10.5' - 12	2.01	
		1000		<u>AC SILT</u> , highly plastic, wi	th sand,		12.0	1-1-1 (2)		
		Valle	some clay					1.5		
572.4	12.0	11/1/1				00000				
5.7			(OL) Very soft ORGANIC SIL	, slightly plastic, dark gray T, trace wood, wet		1.0	12.0	Sample 9, 12.0' - 13	3.51	
							13.5	1-1-1 (2)		
10000000			10					3050		
570.9	13.5						ļ			
1.1				, slightly plastic, dark gray T, trace wood, wet		0.5	13.5	Sample 10, 13.5'-1	5.01	
							15.0	1-1-1 (2)		
100000								2010.2		
569.4	15.0		(01) //							
				, slightly plastic, dark gray T, trace wood, wet		1.0	15.0	Sample 11, 15.0'- 1	6.51	
				8	Alexandra a		16.5	2-2-6 (8)		
568.2	16.2				16.21			1057 A		
567.9	16.5		the second se	e, light brown fine to coarse silt, trace gravel, wet	7	1.0	-	3		
		Valle		12 22 28	16.51	1.0	16.5	Sample 12, 16.51-1 1-1-2	8.01	
		Child.	(OH) <u>ORGAN</u> with clay	<u>ICSILT</u> , highly plastic, wi	th sand,		18.0	(3)		
22203.00	512552	VAM.	1992 (1992) (1997) 1997							
566.4	18.0	1.1111	(OL) Mary and	clightly algetia amonial	av	1.0		3		
				, slightly plastic, greenish gr T, some shells, trace wood		7.0	18.0	Sample 13, 18.01 - 1 WOH-3-3	9.51	
565.5	18.9		-		18.91		19.5	(6)		
624	8 - 83 -			e, light brown, fine to coarse sitt trace argued trace or ar						
564.6	40.0		wet	silt, trace gravel, trace orgai	5398	1.0		3		
564 G	19.8	L. L. L. L.			19.8%	1.4	1	Sample 14, 19.5' - 2	21.01	

DRILLI	NG LO		ovision Great Lai	kes and Ohio Rive	er	INSTALLAT Detroit	N			SHEET OF 3	2 Shee
PROJECT	THE PRO	Contraction of the	or our cu			10.00000000000	DTYPEOFB	п	4 1/4" HSA	Jor 9	SHEE
	c River St	ability Ar	alysis ar	nd Dredging Study	/	and the second se	the second s		(TBM or MSL)		
LOCATION (CO		6.6	25			IGLD 8	5				
N 373925.5	5661, E 25	Contraction of the second	669			12. MANUE	ACTURES'S	ESIGNATION	OFDRILL		
DRILLING AGE		682				Diedric	10.70.00				
Coleman E	((-			1					DISTURBED	UNDISTU	RBED
L HOLE NO. (As title and file numi		wing		S-1		BURDENS	AMPLES TAK	EN	23		1
S. NAMEOF DRI	1			3-1		14. TOTAL I	UMBER CON	REBOXES		0	
Randy Ocł						15. ELEVAT	ONGROUND	WATER		576.2	
DIRECTION OF						Contraction of		ST/	RTED	COMPLETED	
X VERTICA	r 🗆			<u>0.0</u> 0	EG. FROM VERT.	16. DATE H	OLE ION TOP OF 1	101E	Apr 18, 06	4.4 Apr 18	8,06
. THICKNESS O	FOVERBUR	DEN			0			A Dish S	164. 1870 - 1870 - 1870 - 1870 - 1870 - 1870 - 1870 - 1870 - 1870 - 1870 - 1870 - 1870 - 1870 - 1870 - 1870 - 1870 -	4.4	1912
. DEPTH DRILLE	ED INTO ROO	ск			0	THE CONTRACTOR	12 (August 2003)	ERY FOR BO	RING		N/A
. TOTAL DEPTH		9606		40	2.2	19. SIGNAT	UREOF INSP	ECTOR			
		1	1	CLASSIFICATION	100 Correct and a second	1	SAMPLE	SAMPLE	n Decentration	REMARKS	575
ELEVATION	DEPTH	LEGEND	15	(Descri			RECOV- ERY	INTERVAL		g time, water loss, dep ring, etc., if sign filcant	
а	b	c .	1/01 N	d tiff, plastic, brown	<u>CLAY</u> , trace gr	لمبرج	e	Ť	2-3-4	g	
				and, moist	CLAT, LIBCE VI	aver,		19.5	(7)		
		VIIII	1	1999/03/03/03				21.0	pen.=1.25, torva	ne=1.2	
563.4	21.0	<i><u> 111111</u></i>	4			1.2			1		
562.4	22.0	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,									
		V/////		ery stiff, plastic broи trace sand, moist	wn <u>CLAY</u> , trai	ce	NR 0.6	22.0	Sample 15, 22.0	′- 23.5′	
		V/////	gravel,	trace sand, molst			0.0	22.0	5-4-6		
		V/////	1						(10)		
600 0	Cool of	V/////	1						pen.=3.5, torvan	e=1.25 (small whe	el)
560.9	23.5	11111	4						6		
557.4	27.0		,,								
		V/////		ery stiff, plastic broи	wn <u>CLAY</u> , trai	ce	2.1	07.0	Sample 16, 27.0	·- 29.3′	
		V/////	gravel,	trace sand, moist				27.0 29.3	undisturbed		
		V/////						20.0			
		V/////	1						pen.=1.75, torva	ne =3.1	
		V/////	1								
		V/////	1								
555.1	29.3		1						2		
			4			1			1		
	1	1	1				1	1	1		



DRILLI	NG LO		son eat Lakes and Ohio River	INSTALLATIO Detroit	N			SHEET OF 3	3 Shee
PROJECT	1008000 (2004)		www.combustoper.comfit.comfit.com	10. SEE AND	TYPEOF BI	т	4 1/4" HSA	121 1	2004
	c River Sta	ability Analy	sis and Dredging Study	and the second	Carlos and the state of the	ON SHOWN (
LOCATION (Co		- 65. Z	172.75	IGLD 85					
N 373925.5			9	a second second second		ESIGNATION	OFDRILL		
DRILLING AGE	NCY	6945		Diedrich	D-50				
Coleman E				13. TOTAL NO	OF OVER-	<u>i</u>	DISTURBED	UNDISTURBE	D
HOLE NO. (As :		hg		BURDEN SAI	MPLES TAKE	EN	23	1	
title and file numi	and the second sec		S-1	14. TOTAL NUMBER CORE BOXES (
NAMEOFORI									
Randy Och				15. ELEVATIO	NGROUND		20,00	76.2	
DIRECTION OF		INCLINED	0.0 DEG. FROM VERT.	16. DATE HO	LE	STA	RTED Apr 18, 06	COMPLETED Apr 18, 00	3 8
THICKNESSO	FOVERBURG	TEN	0	17. ELEVATIO	NTOPOFH	IOLE	584	.4	
		A (250)		18. TOTAL CO	RERECOV	ERY FOR BOR	RING		N/A
DEPTH DRILLE	ED INTO ROC	ĸ	0	19. SIGNATU	0443672786	20,20,20,20,00	0.00000		102252
TOTAL DEPTH	OF HOLE		42.2		4.1993 A 1993 A 199				
	ŭ		CLASSIFICATION OF MATERIALS		SAMPLE	SAMPLE		REMARKS	
ELEVATION	DEPTH	LEGEND	(Description)		RECOV- ERY	INTERVAL		tme,waterioss,depthi g,etc.,frsignfficanty	
а	b	C S	đ		e	7		g	
							After 24 hours, wa	<i>ter l</i> evel 8.2′	

NG FORM MAR 71	1836	PREVIOUS EDITIONS ARE OBSOLETE. (modified by GCA 1/94)	PROJECT Kunickinic River S	HOLE: Stability Analysis and Dredging Study S-1	NO.

DRILLI	NGL	G	reat Lakes and Ohio River	INSTALLATION SHEET 1 Detroit OF 3 SHEET 10. SIZE AND TYPE OF BIT 4 1/4" HSA					
ROJECT Kinnickinni	c River St	ability Anal	lysis and Dredging Study	and the second se			4 1/4" HSA (TBM of MSL)		
LOCATION (Co	ordinates or :	Station)	d To To Ld	IGLD 8	Zoran and a second second second		1.1003.000		
N 374531.3 DRILLING AGE		558287.781	12	12. MANUF/ Diedric		ESIGNATION	OF DRILL		
Coleman Er	-	-		13. TOTAL N	O.OF OVER		DISTURBED		
HOLE NO. (As a title and file numi		whig	S-2		AMPLES TAK		15 2		
NAMEOF DRI			0. 1 0.0000		IUMBER COF		0 579.8		
Randy Och DIRECTION OF	Children and a star			Constantion of	anco.	1646-RCD	ARTED COMPLETED		
X VERTICA	L 🗆	INCLINED	0.0 DEG. FROM VERT		0365		Apr 27, 06 Apr 27, 06		
THICKNESSO	FOVERBUR	DEN	0		ON TOP OF 1	ERY FOR BO	584.0 RING N/A		
DEPTH DRILLE	<u></u>	ск	0	FR.004.22.20	UREOF INSP	20,20,20,20,20,0	NING NAM		
TOTAL DEPTH	OF HOLE	r -	51.0 CLASSIFICATION OF MATERIALS		SAMPLE	SAMPLE	REMARKS		
ELEVATION a	DEPTH b	LEGEND c	(Description) d	0	RBCOV- ERY e	INTERVAL 7	(Drilling time, water loss, depti weathering, etc., if significant) g		
583.G	0.4	Lini	<u>GRAVEL</u>	0.4%	0.6	0.0	2" SPT, 140# wt., 30" drop Coord. Reference: WI State Plane		
			(FILL) , dark brown, fine to coarse, silty s trace gravel, trace roots, loose, moist			2.0	South Zone NAD 27 grid, Elev. Datum: IGLD 85		
							Sample 1, 0.0'- 2.0' 5-5-3-3		
							(3)		
582.0	2.0	×	<u>FILL</u> , soft, slightly plastic brown silt, with	gravel.	1.2	· · · · ·	Rock stuck in shoe		
			with sand, moist		- 540°	2.0 4.0	Sample 2, 2.0'- 4.0' 6-3-3-4		
						000005	(6)		
580.0	4.0						ene an and an and a second		
	-		<u>FILL</u> , medium dense, brown, fine to coars sand, some gravel, some silt, wet at 5.4'	e	0.9	4.0	Sample 3, 4.0'- 6.0' 8-12-8-10		
						6.0	(20)		
						Rock stuck in shoe			
			12023			Water at 4.2'			
578.0	6.0		(ML) Soft, slightly plastic, brown <u>SILT</u> ,	6.0' trace	1.0		Sample 4, 6.0′- 8.0′		
			sand, trace gravel, wet		10.5.5	6.0 8.0	7-9-8-9 (17)		
577.0	7.0			7.0'		0.0	63		
			(SP-SM) Medium dense, dark black, fine t coarse <u>SAND</u> , some silt, trace gravel, tr						
576.0	8.0		wood, wet						
8	0 8		(SP-SM) Medium dense, greenish-brown, i to coarse <u>SAND</u> , some silt, trace gravel,		1.1	8.0	Sample 5, 8.0′-10.0′ 8-6-4-3		
			to contoe <u>oritop</u> , come ont, trace graver,	, net		10.0	(10)		
			d.						
			1						
574.0	10.0		(SP-SM) Loose, grayish-brown, fine to co	a/5e	0.6		Sample 6, 10.0′- 12.0′		
			<u>SAND</u> , some silt, trace gravel, wet	1211-122	75722	10.0 12.0	5-4-1-1 (5)		
						0.54268	228		
572.0	12.0								
	5 - S		(SP-SM) Very loose, grayish-brown, fine t coarse <u>SAND</u> , some silt, trace gravel, w		1.3	12.0	Sample 7, 12.0'- 14.0' 1/1'-1/1'		
				20.023		14.0	(1)		
570.8	13.2		(ML) Very soft, slightly plastic, dark brow	13.2' n <u>SILT</u> ,					
674 A			trace gravel, trace sand, trace organics, i						
570.0	14.0		(ML) Very soft, slightly plastic, dark brow	n <u>SILT</u> ,	0.5	1 (607-62	Sample 8, 14.0′- 16.0′		
			trace sand, trace wood, wet		61076	14.0 16.0	WOH/1.5-1 (·)		
						10.0593	25011)A		
568.0	16.0			· · · · ·	1200.0				
			(ML) Very soft, slightly plastic, dark brown <u>SANDY SILT</u> , trace wood, wet	î	1.4	16.0	Sample 9, 16.0' - 18.0' WOH'2'		
			Cu)			18.0	Θ		
566.0	18.0			±18.01					
415225	1.10000		(SP-SM) Medium dense, dark brown, fine		2.1	100000	Sample 10, 18.0' - 20.3'		
565.5	18.5	Chinh	coarse <u>SAND</u> , some silt, wet	18.5]		18.0 20.3	Undisturbed		
			(OH) <u>ORGANIC SILT</u> , gray-black, high plastic, with sand, some clay	ly		121320178			
		110h							
		Vallin	1			1	1		

DRILLI	NG LC		ізюм reat Lakes and Oh	io River	INSTALLATI Detroit	ON 3			SHEET OF 3	2 Sheets
1. PROJECT	10760m - 20042				and the second se	DTYPEOFB		4 1/4" HSA		
81		85. 3	ysis and Dredging	Study			ION SHOWN ((TBM of MSL)		
2. LOCATION (Co		N. O. C. M. C. C. M. C. C.			IGLD 8	And the second se		022277		
N 374531.3 3. DRILLING AGE		58287.781	2		Diedrici		DESIGNATION	OFDRILL		
Coleman Er		Co.			CALCENTRAL PROPERTY AND A	IO.OF OVER-		DISTURBED	UNDISTURBED	1
4. HOLE NO. (As s			1			AMPLESTAK		15	2	
title and file numb	C. (1971)			S-2		UMBERCOR	REBOXES	0		
5. NAMEOF DRIL						ONGROUND		579	0	-
Randy Och 6. DIRECTION OF					IS. ELEVATI	ONGROOME		2000-020 CT	COMPLETED	
		INCLINED	0.0	DEG. FROM VERT.		6895		Apr 27, 06	Apr 27, 06	3
7. THICKNESS OF	OVERBURG	DEN		0		ONTOPOFE	A CARLES	584.0		
8. DEPTH DRILLE	D INTO ROC	ĸ		0	FRUCKSZAUC	S. (And S. 1997)	ERY FOR BOI	RING		N/A \$
9. TOTAL DEPTH		5.0		51.0	19. SIGNATU	UREOF INSP	ECTOR			
ELEVATION	DEPTH	LEGEND	CLASSIFI	CATION OF MATERIALS (Description)		SAMPLE Recov- Ery	SAMPLE	(Drilling time	MARKS e,waterioss,depti etc.,ifskjuticantj	
a 563.7	b 20.3	e 1/11/11	5	d	20.31	e	T .	<u>,</u>	g	
559.5 <u></u>	24.5			htly to medium plastic, rey <u>SILT</u> , trace sam	24.5′ d, trace	1.4	24.5 26.5	Sample 11, 24.5'- 20 1/1'-1-1 (1)	3.51	
554.5	29.5			-plastic to slightly plast <u>RGANC SILT</u> , some sand, wet		1.4	29.5 31.5	Sample 12, 29.5'- 31 1-2/1-1 (1)	1.5*	

549.5	34.5	(OL) Very soft, slightly plastic, greenish-brown <u>ORGANIC SILT</u> , some wood, trace shells, trace sand, wet	1.4	34.5 36.5	Sample 13, 34.5' - 36.5' WOH-1-2-1 (3)
547.5	36.5	(OL) Soft, slightly plastic, greenish-brown <u>ORGANIC SILT</u> , trace sand, trace fine gravel, trace shells, wet	2.1	36.5 38.8	Sample 14, 36.51- 38.81 Undisturbed
545.2	38.8				20
544.5	39.5	 (OL) Very soft, non-plastic to slightly plastic,	1.4		Sample 15, 39.5' - 41.5'

DRILLI			ISION		INSTALLAT					3
10-10-10-10-10-10-10-10-10-10-10-10-10-1	NO L	G	reat Lakes and (Dhio River	Detroit			4.4.240.000.4	OF 3	B SHEE
. PROJECT	Diver Of	ability 0 = -	lucio ce d Ducidad	na Chudri	and the second se	D TYPEOF B	IT ION SHOWN	4 1/4" HSA		
		- C.L	lysis and Dredgi	ng Study	IGLD 8		ON SHOWN	(IDM OF MOL)		
LOCATION (Co N 374531.3			12			and the state of the state of the	ESIGNATION	OF DRILL		
DRILLING AGE					10.4940.5246.950	h D-50		10000000000		
Coleman Er	ngineering	g Co.			1.1.1997.02 TZAC 2	O.OF OVER-	-	DISTURBED	UNDISTU	RBED
. HOLE NO. (As s		whg	8	1. 1. 2010 B.1	BURDENS	AMPLES TAK	EN	15	Ĩ.	2
title and file numb	and the second			S-2	14. TOTAL I	UMBER COP	RE BOXES		0	
Randy Och					15 ELEVAT	ONGROUND	WATER		579.8	
DIRECTION OF	Children and State						INTRACIA	RTED	COMPLETED	
		INCLINED	0.0	DEG. FROM VERT	21	6935		Apr 27, 06	Apr 2	7,06
THICKNESS OF	FOVERBUR	DEN		0		ONTOPOFI	A CARLE	16.0	4.0	1232
DEPTH DRILLE	D INTO ROO	ск		0	194.0010.22.00	20.0000000000	ERY FOR BO	RING		N/A
TOTAL DEPTH		9476		51.0	19. SIGNAT	UREOF INSP	ECTOR			
Contraction of the second	and a state	1	CLASS	IFICATION OF MATERIALS		SAMPLE	SAMPLE	C. OKUMUSHO	REMARKS	1955
ELEVATION	DEPTH	LEGEND		(Description)		RECOV- ERY	INTERVAL		g time, water loss, dep ring, etc., hisign frican	
а	b?	c		d		e	T .	weature	nnig,enc.,rrsignimicani g	9
	о»		greenish-brown		wood,			1-2-1-2	00	
			trace shells, traci	e sand, wet			39.5 41.5	(3)		
							76.3			
542.5	41.5		-					8		
							ľ –	ſ		
600.6					44.5					
539.5	44.5	+	(OL) ORCAMO	SILT , sandy, with clay	100000000000000000000000000000000000000	1.3		Sample 16, 44.5	- 4G 51	
			(OL) ORDANCO	<u>Sirriy</u> , seridy, micri cieły	8	(.S	44.5	1-2-2-2	- 46.5	
							46.5	(4)		
537.5	46.5									
8	2 8		()					2		
		1								
		1								
		1								
534.5	49.5	1,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,								
					<u>SILT</u> .	1.3	10.0	Sample 17, 49.5	r- 51.0°	
533.8	50.2		trace wood, trace	sand, wet	50.2'		49.5 51.0	WOH-1-2-1 (3)		
89 	8 8 <u>9</u>		(SM) Very loose.	grayish-brown, fine to co			57.0	(3)		
533.2	50.8		SAND , with silt,							
533.0	51.0		<u></u>	6. LH. 31. H	50.87			-		
87.FVC	0.5570			lightly plastic, grayish-br I, trace wood, wet	own (2		
			Torer, made sand	END OF BORING						
		1					1			

ENG FORM MAR 71	1836	PREVIOUS EDITIONS ARE OBSOLETE. (modified by GCA 1/94)	PROJECT Kinnickinnic Ritter Stability	HOLE NO. Analysis and Dredging Study S-2

DRILLI	AG L	G	reat Lak	es and Ohio River	INSTALLATION SHEET 1 Detroit OF 3 SHEET					
PROJECT Kinnickinnic	River N	ability 0 ac	lysis os	Dredaina Study	and the second se	D TYPEOF B	IT ION SHOWN (4 1/4" HSA TBM of MSD		
LOCATION (Cod		85	แหราร สก(d Dredging Study	IGLD 85		ien onewn (, en ormou		
N 374318.9	176, E 2:		69		1000000000000000		ESIGNATION	OF DRILL		
DRILLING AGEN Coleman En		g Co.			Diedrich 13. TOTAL N	h D-50 IO.OF OVER	-	DISTURBED	UNDISTURI	6 ED
HOLE NO. (As s		whg	8	S-3	BURDEN SA	MPLES TAK	EN	18	1 1	8
ttle and file numb NAME OF DRILI	(175)		1	3-3	14. TOTAL N	UMBERCOR	REBOXES	0		
Randy Och	1200.2.400.00				15. ELEVATI	ONGROUND	16/0120121	RTED 574	COMPLETED	
X VERTICAL		INCLINED	0.	0 DEG. FROM VERT.	16. DATE HO	DLE	342	Apr 19, 06	Apr 20,	06
THICKNESS OF	OVERBUR	DEN		0	17. ELEVATI	ONTOPOFI	IOLE	583.4		
DEPTH DRILLE	D INTO RO	ск		0	18. TOTAL CORE RECOVERY FOR BORING 19. SIGNATURE OF INSPECTOR					N/A
TOTAL DEPTH	OF HOLE			51.5	15.50 1410	4409942702272	47.699.97.) 		2.078-20-024	
ELEVATION a	DEPTH D	LEG EN D C		CLASSIFICATION OF MATERIALS (Description) d		SAMPLE RECOV- ERY e	SAMPLE INTERVAL 7	(Drilling th weathering	EMARIS le,waterioss,deptbi ,etc.,hfsighthicanty g	600
583.0	0.4			y dense, dark brown, fine to coarsi gravel, with silt, trace asphalt, trac		0.3	0.0	2" SPT, 140# wt., 3 Coord, Reference: L		
			concrete		۲ I		1.5	South Zone NAD 27 grid, Elev. (
			CONCR	ETE RUBBLE	0.41			Sample 1, 0.0'-1.5		
					ŀ		- 5	50/0.4'- (-)		
								Note: Did not sample 1.5'-3.0' in concr rubble		c <i>r</i> ete
580.8	2.6				2.6'			9252512		
580.4	3.0			ry soft, slightly plastic, dark brown. ace gravel, trace sand, moist	s .			ette alle sonaranamana		
22	- 0X		(ML) ve	ry soft, slightly plastic, dark brown,	· ·	0.3	3.0	Sample 2, 3.0' - 4.5 1-1-1	**	
			<u> 3/L/</u> , ti	ace gravel, trace sand, moist			4.5	(2)		
670 C	يەر يەر.									
578.9	4.5			ry soft, slightly plastic, dark brown	1	NR	÷	Sample 3, 4.5'- 6.0	25	
				ace gravel, trace sand, moist			4.5 6.0	1-2-2 (4)		
							000006	Note: Pushed rock (in shoe	
577.4	6.0									
02	- 03.			ry soft, slightly plastic, dark brown, ace gravel, trace sand, moist	0	0.5	6.0	Sample 4, 6.0' - 7.5 1-1-1		
			(<u> </u>				7.5	(2)		
575.9	7.5		(ML) soi	ft, slightly plastic, dark brown, 🛛 🖞	JLT.	0.9		Sample 5, 7.5'- 9.0	2	
				avel, trace sand, moist			7.5 9.0	3-3-3 (6)		
574.9	8.5				8.5'		0.0			
574.4	9.0			ose, black, fine to coarse, <u>SILTY</u> avel, trace organics, moist	<u>'SAND</u> ,					
	- 13 - 13		 (OL) 501	t, slightly plastic, dark greenish bro	9.07 wa,	1.0	9.0	Sample 6, 9.0'-10. 4-2-3	51	
		<u> </u>		<u>IC SILT</u> , trace sand, trace organi	- A		10.5	(5)		
572.9	10.5		(OL) 501	t, slightly plastic, dark greenish bro) М П7,	1.3		Sample 7, 10.5' - 12	.01	
100-0-100			ORGAN wet	IC SILT , trace sand, trace organi	cs,		10.5 12.0	17-11-9 (20)		
572.0	11.4		WOOD		11.4		37480	145 V		
571.4	12.0		0.000		12.0'	3244		SZTRAZIO (INDOLANIA) – DA	12.20	
6			and the second se	t, slightly plastic, dark greenish bro <u>IC SILT</u> , trace gravel, trace sand	COLUMN 101	1.0	12.0	Sample 8, 12.0'- 13 4-3-3	.51	
			organics	r, wet			13.5	(6)		
520.0	13.5		1							
569.9	13.5			y soft, slightly plastic, dark greenis		0.9		Sample 9, 13.5'- 15	i.01	
				<u>ORGANIC SILT</u> , trace gravel, tra ace organics, wet	ice		13.5 15.0	2-2-2 (4)		
				-unite 7 - 1993 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 19			0.585	da 563		
568.4	15.0							A 1.4		
No second			brown,	y soft, slightly plastic, dark greenis <u>ORGANIC SILT</u> , trace gravel, tra		0.6	15.0	Sample 10, 15.0'- 1 2-2-2	6.5	
				ace organics, wet			16.5	(4)		
566.9	16.5		1							
366.2	18.5	===		t, slightly plastic, dark greenish bro		0.7	823252	Sample 11, 16.5' - 1	8.01	
		====	ORGAN organics	<u>IC SILT</u> , trace gravel, trace sand 7, wet	, trace		16.5 18.0	2-2-3 (5)		
				1000000			6.680	61907		
565.4	18.0					Jacob Per			0.025.0	
				t, slightly plastic, dark greenish bro <u>IC SILT</u> , sandy, with clay) WR,	1.0	18.0	Sample 12, 18.0'- 1 3-3-4	9.51	
			-				19.5	0		
1000										
563.9	19.5	===	(OL) 501	t, slightly plastic, dark greenish bro) <i>W</i> 7,	1.0		Sample 13, 19.5'-2	1.01	
			and the second		5000012	127,8375	ł	andra wini ang	17.0K	10.

ORILLIN	IG LC		nsion reat Lakes and	l Ohio River	INSTALLATI Detroit				SHEET OF 3	2 Shee
ROJECT	River Sta	ahility Ana	lysis and Drec	laina Study		D TYPE OF BI	· · · · · · · · · · · · · · · · · · ·	4 1/4" HSA (TBM or MSL)	•	
OCATION (Cool	dhates or S	tation)	2 202	ging orady	IGLD 8	5				
N 374318.91 DRILLING AGEN		58201.83	69		12. MANUFA Diedrici	ACTURES'S D h D-50	ESIGNATION	OFDRILL		
Coleman Eng	gineering		-		13. TOTAL N	O.OFOVER-		DISTURBED	UNDISTUR	6 ED
io LE NO . (As sh te and file numbe		hg		S-3		AMPLES TAKE		18		1
AME OF DRILL	ER			1070.10		IUMBER COR		0		
Randy Ochs					Section of the sectio	ONGROUND	REPAIRS	ARTED	4.4 COMPLETED	
X VERTICAL		INCLINED	0.0	DEG. FROM VERT.	16. DATE HO	DLE		Apr 19, 06	Apr 20,	06
HICKNESSOF	OVERBURG	EN		0	<u></u>	ON TOP OF H	10264 S	583.	4	1212
EPTH DRILLED	INTO ROC	к		0	(FR.000.2220)	ORE RECOV	10.1.1.1.1.1.1.1.1.1	RING		N/A
OTAL DEPTH O	FHOLE	E	1	51.5		SAMPLE	SAMPLE		EMARIES	
LEVATION	DEPTH	LEGEND	0	SSIFICATION OF MATERIALS (Description)		RECOV- ERY	INTERVAL	(Drilling th	ne,waterioss,depta (,etc.,h/skgnifficant)	
a	b?	c	0000000000	d		e	7	2009 Barth	g	
			clay, trace she	[, trace gravel, trace sand lls, wet	y, wan		19.5	5-4-4 (8)		
562.4	21.0						21.0	8790		
		-	2		12		s	8		
559.9	23.5		(OL) soft sliph	tly plastic, dark greenish bri	1442	1.1	ś	Sample 14, 23.5'	25.01	
			ORGAMC SILT	, trace gravel, trace sand		0.0	23.5	7-7-4		
			shells, wet				25.0	(11)		
558.5	24.9				24.9'					
558.4	25.0			medium plastic, medium brov	wa, 1		5	8		
			CLAY, trace g	ravel, trace sand, wet	25.0					
			5							
554.0	0000									
554.9	28.5		(ML) medium st	iff, non to slightly plastic,		NR .		Sample 15, 28.5'	30.01	
			medium brown,		od, wet	0.4	28.5 30.0	15-13-19 (32)		
							50.0	Abte: Went down t	wice with samplin	g
553.4	30.0							spoon		
·····	00.0		()				·	2		
540.0	22 E									
549.9	33.5		(CL) stiff, medi	um plastic, medium brown,		1.3		Sample 16, 33.5'	35.01	
			SILTY CLAY .	with sand, trace gravel, tra-	ce	00/63	33.5	6-4-5	07103	
			organics, wet				35.0	(9) Pen: 0.5		
548.4	35.0	V///////						Tor: 1.0		
-10.7			1				· · · · · ·	5		
544.0	00.5									
544.9	38.5	N.			1	NR	2 9.222.201	Sample 17, 38.5'-	40.81	
-						2012	38.5	3" Thin-walled tube Undisurbed		
		-	1				40.8	ondisarbed		
							040800			
							64,5850			

			ISION	In	ISTALLATION					_	3
DRILLI	NG L		reat Lakes and Ohio River		Detroit				OF		SHEE
I. PROJECT					10. SEZE AND TYPE OF BIT 4 1/4" HSA 11. DATUM FOR ELEVATION SHOWN (TBM of MSL)						
		84. 3	lysis and Dredging Study	1		EVATIO	N SHOWN (TBM or MSL)			
2. LOCATION (Co					IGLD 85 12. MANUFACTURES'S DESIGNATION OF DRILL						
N 374318.9 3. DRILLING AGE		58201.83t	99	1	12. MANUFACTURES'S DESIGNATION OF DRILL Diedrich D-50						
Coleman E		Co.		1	3. TOTAL NO. OF (14		DISTURBED	UNDE	TURBE	D
4. HOLE NO. (As			8		URDEN SAMPLES			18	1	1	
title and file numi	Sec. Pale		S-3	1	A. TOTAL NUMBER	RCORE	BOXES		0		
5. NAMEOF DRI				100					22		
Randy Och 5. DIRECTION OF				15	15. ELEVATION GROUND WATER 574.4						
		INCLINED	0.0 DEG. FRO	OM VERT.	5. DATE HOLE	0.00000		Apr 19, 06		20,0	6
THICKNESS O	FOVERBUR	DEN	0	11	. ELEVATION TO	POFHO	LE	58	3.4		10.50
B. DEPTH DRILLE	ED INTO ROO	0	1.15	3. TOTAL CORE R	2251.738		RING			N/A	
9. TOTAL DEPTH		200	51.5	19	9. SIGNATURE OF	INSPEC	TOR				
a re the Perio		r	CLASSIFICATION OF MAT	TERIAIS	SAM		SAMPLE	n National Anna Anna Anna Anna Anna Anna Anna A	REMARKS	Marine Car	
ELEVATION a	DEPTH b	LEGEND c	(Description) d	TENES	R BC ER e	ov- ty	INTERVAL - 1		g time,water loss, ring,etc.,frisign frik g		
	<i></i>	0	5°			-		<u>`</u>			
542.6 542.4	40.8		5		8			2			
012.T		2			16	R		Sample 18, 41.0			
							41.0	3' Thin-walled tu			
							43.3	17 PARTICIPACIONIS 10 10			
	19/24										
540.1	43.3		N.								
539.9	43.5	111111	(CL) very stiff, medium plastic, med	dium hanwo	1.	3		Sample 19, 43.5	- 45 01		
		V///////	CLAY, with silt, with sand, trace			×	43.5	2-2-5	10.0		
		V///////			2		45.0	(7)			
								Pen: 0.75 Tor: 2.1			
538.4	45.0	V///////						101. 2.1			
		1///////	(CL) very soft, medium plastic, med	dium brown.	2.	1		Sample 20, 45.0	- 47.3		
			CLAY , some silt, trace gravel, we				45.0	Pen: 0.75	A. 49 (1997)		
							47.3	Tor: 1.9			
		V///////									
		V///////									
		V///////									
	1000	V///////									
536.1	47.3	V///////									
	5 - 53	2						2			
534.9	48.5	mmm	(O)	h an sure		-		Camela of to c	EDA		
		V///////	(CL) stiff, medium plastic, medium l <u>CLAY</u> , some silt, some sand, trac		at 1.	4	48.5	Sample 21, 48.5 6-15-20	- 50.0		
		V///////	<u>ouri</u> , some one, some seriu, trec	a graver, m			50.0	(35)			
								Pen: 1.2			
500 A	60.0							Tor: 1.75			
533.4	50.0	111111						1			
524.0	54.6										
531.9	51.5			~							
			END OF BORIN	6							

ENG FORM MAR 71	1836	PREVIOUS EDITIONS ARE OBSOLETE. (modified by GCA 1/94)	PROJECT Kimickimic Riter Sta	bility Analysis and Dredging Study	HOLE NO. S-3
		END OF BORING			

DRILLI	AG L	G	reat Lakes	s and Ohio River	INSTALLATION SHEET 1 Detroit OF 3 SHEET					
PROJECT Kinnickinnic	River St	ability Anal	ysis and	Dredging Study	10. SIZE AND TYPE OF BIT 4 1/4" HSA 11. DATUM FOR ELEVATION SHOWN (TBM or MSL)					
LOCATION (Co	ordinates or S	Station)	6. 200		IGLD 85	5				
N 374346.0 DRILLING AGE		558936.663	30		12. MANUFA Diedrici		ESIGNATION	OF DRILL		
Coleman Er	gineering				13. TOTAL N	O.OF OVER		DISTURBED	UNDISTUR	RBED
HOLE NO. (As s ttle and file numb		ving		S-4		AMPLES TAK		16		2
NAMEOF DRIL	LER			8275.e ¹ .		IUMBER COP		0	0	
Randy Och	5200 Lawrence				George States and Stat	ONGROUND	1649-2012	RTED 579	COMPLETED	
	· 🗆	INCLINED	0.0	DEG, FROM VERT.	16. DATE HO	(2012) (2012)		Apr 26, 06	Apr 26	,06
THICKNESSOF	OVERBUR	DEN		0		ONTOPOFI	Contraction and an operation	585.4	N	b120
DEPTH DRILLE		ск		0	1980000200	JREOF INSP	ERY FOR BOI	RING		N/A
TOTAL DEPTH	OF HOLE	r	6	51.0 CLASSIFICATION OF MATERIALS		SAMPLE	SAMPLE	BI	EMARKS	
ELEVATION a	DEPTH D	LEGEND c		(Description) d		RBCOV- ERY e	INTERVAL - 1	(Drilling tim weathering,	e,waterioss,dept ,etc.,frsignfricanty g	
585.0	0.4	<u>26</u> <u>26 2</u>	<u>TOPSOIL</u>		0.4%	1.1	0.0	2" SPT, 140# wt., 3 Coord, Reference: V		
			(Fill) <u>cot</u>	ICRETE CHUNKS			2.0	South Zone NAD 27 grid, Elev. L		
								Sample 1, 0.0'-2.0'		
								2-4-6-5 (10)		
583.4	2.0		(Fill) media	um dense, yellowish brown, fine b	2.01	1.6		Sample 2, 2.0' - 4.0'		
				itty sand, with broken concrete, ti		1.112	2.0	8-9-5-6 (14)		
22222			10013, 110/	**	0,014		4.0	0.9		
582.1	3.3	I	(ML) soft.	, slightly plastic, dark brown, <u>S</u>	3.3' <u>ILT</u> ,					
581.4	4.0			d, trace roots, moist	1.13 ³ .(\$)					
	s 89 .			, slightly plastic, dark brown, <u>§</u> d, trace roots, trace gravel, wet a	<u>HLT</u> , t56'	1.1	4.0	Sample 3, 4.0'- 6.0' 7-8-3-2		
			oome our	a, nace rooto, nace graver, met a			6.0	(1)		
579.4	6.0									
-	<u>_</u>			soft, slightly plastic, medium broi ce sand, trace wood, wet	W7,	0.4	6.0	Sample 4, 6.0'- 8.0' 1-2-1-2		
50 D			3				8.0	(3)		
677-4	8.0				8.0'					
577.4	8.0	<u> 20 20 8</u>		soft, non to slightly plastic, medic	Illi	1.1		Sample 5, 8.0'- 10.0	r	
		<u>6 86 89</u>		<u>EAT</u> , with silt, trace sand, some , trace shells, wet	wood		8.0 10.0	WOH/2' (0)		
		<u> </u>					14.000 M			
		20 20 2	e.							
575.4	10.0	6 36 36	(11)			0212				
1.1		0 00 00 0	for 17 years	soft, fibrous, medium brown, trace sand, trace shells, wet	<u>PEAT</u> .	1.2	10.0	Sample 6, 10.0'- 12 WOH/1.5'-2	.0'	
		00 00 0					12.0	(0)		
		<u>6 06 04</u>	~							
		<u>80 80 8</u>	et.							
573.4	12.0	<u>6 86 86</u> 86 86 8	(PT) <u>PEA</u>	T		0.8		Sample 7, 12.0'- 14	.0'	
		<u>6 86 86</u>		5.54 F			12.0 14.0	WOH/1-1-1 (1)		
		<u>86 26 8</u> 6 86 86					0.0055	2000		
571.9	13.5	<u>6 86 86</u> 	/48		13.5′					
571.6	13.8			very loose, grayish brown, fine to <u>SAND</u> , some silt, set	1			111 JUL		
		<u>6 86 84</u>	}	soft, fibrous, medium brown to	13.81	1.7	14.0	Sample 8, 14.0'- 16 WOH/1.5'-1	.0'	
		<u>86 86 8</u>		brown, <u>PEAT</u> , with silt, trace s	and,		16.0	(0)		
		<u>6 86 86</u> 86 86 8		204.05780						
g. 2.55.50		0 90 90			(1/202-0					
569.4	16.0	<u> </u>	(OL) verv	soft, slightly plastic, greenish bro	16.0')wa,	1.8	2	Sample 9, 16.0'-18	.0'	
				SILT , trace sand, some wood,		0.722	16.0 18.0	16.0 WOH/2'	9851	
			oneno, ne				10.0	(0)		
		====								
567.4	18.0									
				soft, slightly plastic, greenish bro		1.7	40.0	Sample 10, 18.0'-2	0.01	
		<u> </u>	shells, we	<u>SILT</u> , trace sand, trace wood, t	andCe		18.0 20.0	.0 WOH/1.5-1		
			-				and Particip			
			5							
565.4	20.0	F	2				L	I		

DRILLI	NG LC	W	ViSiON ≩reat Lak	es and Ohio River	INSTALLAT Detroit					EET 3	2 Shee
1. PROJECT			- Cut Lui		10. SIZE AND TYPE OF BIT 4 1/4" HSA						
Kinnickinni	c River Sta	ability An	alysis an	d Dredging Study	11. DATUM	FOR ELEVAT	ION SHOWN	(TBM or MSL)			
LOCATION (Co					IGLD 8	Zorana a series and					
N 374346.0		58936.66	630		12. MANUFACTURES'S DESIGNATION OF DRILL Diedrich D-50						
3. DRILLING AGE Coleman Er		Co			13. TOTAL NO. OF OVER- DISTURBED UNDISTURBED						ED
L HOLE NO. (As :			8		BURDEN SAMPLES TAKEN 16 2						
title and file num			J	S-4					- I	2	
5. NAMEOF DRI					14. TOTAL NUMBER CORE BOXES 0						
Randy Och	- 1.49 (15. ELEVAT	ONGROUND		225	79.0		
DIRECTION OF		INCLINED	0	.0 DEG. FROM VERT.	16. DATE H	10020		Apr 26, 06		r 26, ()6
THICKNESSO	FOVERBURD) EN		0	17. ELEVAT	ION TOP OF 1	HOLE	585	5.4		V 015.00
DEPTH DRILLE		0	18. TOTAL C	CORERECOV	ERY FOR BO	RING			N/A		
TOTAL DEPTH	1000000000000	56 		51.0	19. SIGNAT	UREOF INSP	ECTOR				
CIOTAL DEFTI		6	Ê.	CLASSIFICATION OF MATERIALS	<u>.</u>	SAMPLE	SAMPLE		REMARIS		
ELEVATION a	DEPTH D	LEGEND C	S	(Description) d		RBCOV- ERY e			time,waterloss ng,etc.,h/skgn/ g		
561.4 561.0 559.4	24.0 24.4 26.0		ORGAN shells, (OL) ve ORGAN	ry soft, medium plastic, greenish bri <u>NC SILT</u> , trace wood, some shells	trace [24.4] wm, ; wet	2.3	24.0 26.0 26.0 28.3	Sample 11, 24.0'- WOH/2' (0) Pen: 0.0 Tor: 0.4 Sample 12, 26.0'- 3' thin-walled tube Pen: 0.25 Tor: 1.25	- 28.31		
557.1	28.3						(<u> </u>	3			
556.4	29.0		brown,	ry soft, non to slightly plastic, gree <u>ORGANIC SILT</u> , trace sand, trac		1.0	29.0 31.0	Sample 13, 29.0'- WOH/1'-1-1 (1)	- 31.01		
				race shells, wet			10.000				

551.4	34.0		3	4.01		
			(SP-SM) very loose, grayish brown, fine to coarse, <u>SAND</u> , some silt, trace gravel, wet	1.1	34.0 36.0	Note: Ht gas pocket at 34.0'. Shut down until a gas meter brought on site. Readings from four-gas meter were 0 ppn Sample 14, 34.0' - 36.0' WOH-1-1-2 (2)
549.4	36.0					
546.4	39.0	যানমান	(SM) loose, grayish brown, fine to coarse,	1.3		Oxygen = 20.8%, all other gas readings
			SAND , some silt, trace gravel, wet	1.6	39.0 41.0	Oxygen = 20.8%, an orner gas readings 0.0 ppm Sample 15, 39.0′ - 41.0′
FORM	1836	PREVIOUS	EDITIONS ARE OBSOLETE.	PROJECT		Analysis and Dredging Study S-4

DRILLI	NG LO		ision reat Lakes and Ohio River	Detroit	ON			SHEET OF 3	3 Shee	
PROJECT				10.SIZEAND TYPEOF BIT 4 1/4" HSA						
	River St	ability Anal	lysis and Dredging Study	and the same second and the same	and the second sec		TBM or MSL)			
LOCATION (Co		- 85 X		IGLD 85	5					
N 374346.0		And the Works of Allows	30	12. MANUFACTURES'S DESIGNATION OF DRILL						
DRILLING AGE		622		Diedrich D-50						
Coleman Er	(1997) - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 199				O.OFOVER-		DISTURBED	UNDISTURE	ED	
HOLE NO. (As s		ring	6.1	BURDENSA	MPLES TAKE	EN	16	2		
the and file numbers NAMEOF DRIL	in the second		S-4	14. TOTAL NUMBER CORE BOXES 0						
Randy Och				15. ELEVAT	ONGROUND	WATER	5	79.0		
DIRECTION OF				Construction of	12.22 957.942 988 Maria	District Content	RTED	COMPLETED		
	L [INCLINED	0.0 DEG. FROM VERT.	16. DATE HO	ONTOPOFI	IOLE .	Apr 26, 06	Apr 26,	06	
THICKNESSO	FOVERBUR	DEN	0	1000 0000000		A CARLES A CARGE AND RECARD	1677) 8.55560	0.4	1972	
DEPTH DRILLE	D INTO ROO	ĸ	0	121.000.000	0.040622482	ERY FOR BO	RING		N/A	
TOTAL DEPTH	OF HOLE	67.F	51.0	19. SIGNATU	REOFINSP	ECTOR				
		T	CLASSIFICATION OF MATERIALS	1	SAMPLE	SAMPLE	n DADY 1940A	REMARKS		
ELEVATION	DEPTH	LEGEND	(Description) d		RBCOV- ERY e	INTERVAL - 1		time,waterioss,deptù lug,etc.,frsig∎fficanty g		
545.3	40.1	Vinnin	N	40.17			3444	5		
		V//////	(CL) very stiff, medium plastic, light brown,			39.5	(8)			
544.4	41.0	V///////	<u>CLAY</u> , trace silt, trace sand, trace gravel,	wet ± 41.0'		39.5	Pen: 1.2 Tor: 2.5			
		11/19	(CL) stiff, gray-brown, <u>CLAY</u> , sandy, slig		1.6	Ś	Sample 16, 41.0'- 43.3'			
		14/1/	plastic	1.11 A	1000	41.0	Undisturbed	24.020.0		
		1////				43.3	Pen: 0.5			
		11/1/					Tor: 1.1 Oxygen = 20.8%	all other gas readir	20.5	
542.9	42.5	11/11		42.5'			0.0 ppm	an other gas readi	12.0	
		VIIIII	(CL) stiff, medium plastic, gray brown,	CLAY .						
243.02	19755		sandy							
542.1	43.3	<u> ////////////////////////////////////</u>								
1. I			£				2			
541.4	44.0				-					
8X	5 - 8X			CLAY.	1.7		Sample 17, 44.0'	- 46.01		
			trace silt, trace sand, trace gravel, wet			44.0 46.0	5-4-5-4 (9)			
						10.0	Pen: 0.5			
							Tor: 1.75			
600.4	347.0									
539.4	46.0	1111111	9 2			é	8			
536.4	49.0									
			(CL) very stiff, medium plastic, light brown,		1.5	P	Oxygen = 20.8%.	all other gas readir	195	
		V///////	CLAY , trace silt, trace sand, wet		00326	49.0	0.0 ppm	ne na	100	
		V///////				51.0	Sample 18, 49.0'	- 51.01		
		V///////					3-4-4-5 (8)			
							Pen: 1.1			
		V///////		1.5552862			Tor: 3.1			
534.4	51.0	V///////		51.01			Adda - Marta - Iron I	C 4' - A 40 -		
		120121010101010	End of Boring				noze : Wazer le vel	6.4' after 12 hours		
			end or coring							
		1				1				

14		PROJECT	VAnalysis and Dredging Study S-4

DRILLI	NOL	Gr	eat Lak	es and Ohio River	INSTALLATION SHEET 1 Detroit OF 3 SHEE					
PROJECT Kinnickinnic	River St	ahility Apal	veis en	Dredging Study	10. SIZE AND TYPE OF BIT 4 1/4" HSA 11. DATUM FOR ELEVATION SHOWN (TBM of MSL)					
LOCATION (Co		85. 2	ysis ani	a Dreuging Study	IGLD 8		NH SHOWN	rom of maty		
N 374044.5		57858.110	9		1.1993.2018.2020		DESIGNATION	OFDRILL		,
DRILLING AGE Coleman Er		Co.			Diedric 13. TOTAL N	h D-50 IO.OF OVER-		DISTURBED	UNDISTUR	6 ED
HOLE NO. (As s		ng	1			AMPLES TAK		14	1	
the and file numbers	1		1	S-5	14. TOTAL N	UMBER COP	REBOXES	0	61) 	
Randy Och					15. ELEVAT	ION GROUND	A DESCRIPTION OF THE PARTY OF THE	577	Charles and the second	
DIRECTION OF X VERTICAL		INCLINED	0.	0 DEG. FROM VERT.	16. DATE H	OLE	STA	Apr 25, 06	COMPLETED Apr 25,	06
ter a ner re a	10 No.	COLOUS LINES		n terreturneri	17. ELEVATI	ON TOP OF 1	HOLE	583.0		
HICKNESSOF				0	18. TOTAL C	ORERECOV	ERY FOR BO	RING		N/4
TOTAL DEPTH				46.5	19. SIGNATI	UREOF INSP	ECTOR			
LEVATION	DEPTH	LEGEND		CLASSIFICATION OF MATERIALS (Description) d		SAMPLE RECOV- ERY	SAMPLE INTERVAL - 1	(Drilling time	MARKS e,waterioss,depta etc.,ifsignificanty	
a	b	c A states	CONCR	141903		e 1.0	, as ,	2" SPT, 140# wt., 30	g)* drop	
582.4	0.6				0.61		0.0 2.0	Coord. Reference: W South Zone	Il State Plane	
				k black, fine to coarse, silty sand, some man-made bolts, trace roots,	50me		2.0	NAD 27 grid, Elev. D	atum: IGLD 85	
			moist					Sample 1 Hand dug 2.0' to che	си for electric li	ine <i>s t</i> o
581.0	2.0							marina lights		
				ise, dark black, fine to coarse, silt		1.6		Sample 2, 2.0'- 4.0'		
		\otimes		ace concrete, trace gravel, trace v s, moist	1000		2.0 4.0	7-10-15-14 (25)		
							-22.0			
579.0	4.0							en stransserver		
	5 8 <u>5</u>	\boxtimes		y dense, black, fine to coarse, silt ace gravel, trace wood, wet at 5.2		1.2	4.0	Sample 3, 4.0'- 6.0' 11-33-27-9		
200			38110, LI	ace graver, l'ace wood, wet at 3.2			6.0	(60)		
	2	\otimes								
~		\otimes								
577.0	6.0		š			12040				
0.5				se, black, fine to coarse, silty sam avel, trace brick, wet	4.	1.4	6.0	Sample 4, 6.01 - 8.01 5-2-2-1		
-2012/01/01	-3.78				12101		8.0	(4)		
575.9	7.1		(OL) ver	y soft, slightly plastic, greenish br	7.1'					
			ORGAN	IC SILT , trace sand, trace wood						
575.0	8.0		shells, v			4.0				
			ORGAN	y soft, slightly plastic, greenish br <u>IC SILT</u> , trace sand, trace wood		1.8	8.0	5 5575		
			shells, t	race gravel, wet			10.0	(0)		
573.0	10.0		(OL) ver	y soft, slightly plastic, greenish br	DINN?,	1.2		Sample 6, 10.0'- 12.	0'	
			ORGAN	<u>IC SILT</u> , trace sand, trace wood ace shells, trace gravel, wet		(2.38)	10.0 12.0	1-1-1-1 (2)		
			10013, 11	ace shens, trace graver, met			12.0	(2)		
		<u> </u>								
571.0	12.0									
561.V	12.0			t, slightly plastic, greenish brown,		1.2		Sample 7, 12.0'- 14.	0'	
			<u>ORGAN</u> wood ar	<u>IC SILT</u> , trace sand, trace grave id roots, trace shells, wet	/, trace		12.0 14.0	9-6-2-2 (8)		
							10004935	14 200 MA		
569.0	14.0							111,000 (000) 111,000		
2	5 S	1111		ry soft, slightly plastic, gray, <u>O</u> with sand and shells, some peat a	RGANIC vd	1.7	14.0	Sample 8, 14.0′ - 16. Undisturbed	31	
		Chilles.	wood .	wan oana ana oneno, oome peac a	e4		16.3	3" Thin-walled tube		
		(11)								
		11111								
1216253	2322788									
566.7 566.5	16.3 16.5	1.111/10	2					2		
3	3			y soft, slightly plastic, greenish br <u>IC SILT</u> , trace sand, trace wood		1.8	16.5	Sample 9, 16.5' - 18. woh-woh-1-1	51	
				ace shells, wet			18.5	(1)		
		<u></u>								
564.5	18.5					more			21220	
				y soft, slightly plastic, greenish br I <u>C SILT</u> , trace sand, trace wood		0.7	18.5	Sample 10, 18.5' - 2) 1-1-1-1	0.51	
				ace shells, wet			20.5	(2)		
		[]								
	ia					1	1			

DRILLI	NGLO		/ision reat Lakes an∉	d Ohio River	INSTALLAT Detroit				SHEET OF 3	2 SHEET
PROJECT			Four Editor diff		10.SIZEAND TYPEOF BIT 4 1/4" HSA					
Kinnickinni	c River Sta	ability Ana	lysis and Dred	dging Study		FOR ELEVAT				
LOCATION (CO	ordinates or S	tation)		199-199	IGLD 85					
N 374044.5	5713, E 25	57858.11	09		12. MANUFACTURES'S DESIGNATION OF DRILL					
. DRILLING AGE		1995 1			Diedrich D-50					
Coleman Er	(The second s		201		13. TOTAL NO. OF OVER- DISTURBED UNDISTURBED					
. HOLE NO. (As a		hg	8		BURDENS	AMPLES TAK	EN	14	0	1
title and file numi	a total		4	S-5	14. TOTAL	NUMBERCOR	REBOXES		0	
NAMEOF DRI									2	
Randy Och					15. ELEVAT	ION GROUND		220	77.8	
DIRECTION OF		INCLINED	0.0	DEG. FROM VERT	16. DATE H	OLE	^{ST/}	ARTED Apr 25, 06	COMPLETED Apr 25	5,06
. THICKNESS OF		-		0	17. ELEVAT	ION TOP OF H	IOLE	583	3.0	
		line -	18. TOTAL	CORERECOV	ERY FOR BO	RING		N/A 1		
. DEPTH DRILLE		0	19. SIGNAT	UREOF INSP	ECTOR	22.5.2018		1000145474-01		
. TOTAL DEPTH	OF HOLE			46.5		008-4030 004-1135 	actioner w	22		
			CLA	ASSIFICATION OF MATERIALS	595. 5	SAMPLE RECOV-	SAMPLE	(D cillibra	REMARKS time, water loss, dep	
ELEVATION	DEPTH	LEGEND		(Description)		ERY	-		ng,etc., frsignifican	
a	b b	с		d		e	ť		g	-
									30	
562.5	20.5							-		
559.0	24.0									
82 . -				, slightly plastic, greenish bi <u>7</u> , trace wood and roots,		1.8	24.0 26.0	Sample 11, 24.0'- woh-woh-2-2 (2)	- 26.0'	
557.0	26.0							-		
554.0	29.0			htly plastic, greenish brown, <u>T</u> , trace sand, trace wood rells, wet		1.7	29.0 31.0	Sample 12, 29.0' 2-2-3-5 (5)	- 31.0′	
552.0	31.0		201 					9		

549.0	34.0	 (OL) soft, slightly plastic, greenish brown,	1.3	1 141 m 1 m	Sample 13, 34.0' - 36.0'
		<u>ORGANIC SILT</u> , with sand, with clay, trace wood, trace shells, wet		34.0 36.0	2-3-3-3 (6)
547.0	36.0			6	<u>-</u> 3
2007	2120				
544.0	39.0	(OL) soft, slightly plastic, greenish brown, <u>ORGANIC SILT</u> , some sand, trace wood, tra shells, wet	ce 1.4	39.0 41.0	Sample 14, 39.0' - 41.0' 2-2-5-16 (7)

DRILLI	NGLO		ncia		INSTALLAT	ON			SHEET	3
		G	reat Lał	kes and Ohio River	Detroit oF 3 SHEETS 10.SIZE AND TYPE OF BIT 4 1/4" HSA					
1. PROJECT Kippickippik	Diver Ch	abilitu 10 e al	lucio en	d Drodaina Study	and the same second second second	and a second and a second	IT ION SHOWN (4 1/4" HSA		
80		- 195,	iysis ar	nd Dredging Study	19024232534		on shown ((IDM OF MOL)		
2. LOCATION (Co N 374044.5		A	ng		IGLD 85	And the second se	ESIGNATION	OF DBILL		
3. DRILLING AGE		51050.110	10		Diedric		CAN BE DO			
Coleman Er		Co.			13. TOTAL NO. OF OVER- DISTURBED UNDISTURBED					
4. HOLE NO. (As a	(H) (H) (H) (H)		8		BURDEN SAMPLES TAKEN 14 1					
title and file numb	a track of the local sector of the local secto			S-5						
5. NAMEOF DRIL					14. TOTAL NUMBER CORE BOXES 0					
Randy Och					15. ELEVATI	ONGROUND		577.8	have a second	
6. DIRECTION OF		INCLINED	0).0 DEG. FROM VERT.	r, 16. DATE HOLE STARTED COMPLETED Apr 25, 06 Apr 25, 06					06
7. THICKNESS OF	FOVERBURG	DEN		0	17. ELEVATI	ONTOPOFH	IOLE	583.0		
		1980 19			18. TOTAL C	ORERECOV	ERY FOR BOI	RING		N/A %
8. DEPTH DRILLE		0	19. SIGNATI	JREOF INSP	ECTO R					
9. TOTAL DEPTH	OF HOLE			46.5						
ELEVATION	DEPTH	LEGEND		CLASSIFICATION OF MATERIALS (Description) d		SAMPLE RECOV- ERY e	SAMPLE INTERVAL - 1	(Drilling time, w weathering, etc	ARKS waterioss,depti a.,frskgifficanty 1	
and and a second	Vermanas		1	-	45.41					
542.6	40.4	1000	/08.04	f) loose, grayish brown, fine to coar	40.4'					
542.2	40.8			n) loose, grayish orown, hine to coar , some silt, trace gravel, wet	se,					
542.0	41.0	2			40.81		÷	6		
			WOOD							
			<u>هــــــــــــــــــــــــــــــــــــ</u>		41.01					
539.0	44.0			1947 - 1957 -		14.12		en et samslads ave		
				f) very dense, grayish brown, <u>Si</u> coarse, some silt, trace gravel, wet	<u>400</u> ,	1.0	44.0	Sample 15, 44.0'- 46.0 32-34-50/.3'-	r	
			inte to	contoe, come ont, trace grater, wet			46.0	6		
537.8	45.2				45.2'					
	43.2		LIMES	TONE , weathered	40.2					
				<u>rone</u> , meanined						
537.0	46.0									
536.5	46.5				4G.5'		3	3		
				Auger Refusal and End of Boring						
			I							

·2				
ENG FORM MAR 7.1	1836	PREVIOUS EDITIONS ARE OBSOLETE. (modified by GCA 1/94)	PROJECT Kinnickinnic River Stability	Analysis and Dredging Study S-5

DRILLI	NG LO	JG		Great I	∟akes and Ohio River	INSTALLATI Detroit				SHEET OF 3	SHE	
PROJECT Kinnickinnic	River St	abilito		helusia	and Dredging Study		D TYPEOF B		4 1/4" HSA (TBM of MSD)			
KINNICKINNIC LOCATION (Co		- 85	Aſ	aiysis	and Dredging Study		11. DATUM FOR ELEVATION SHOWN (TEM or MSL) IGLD 85					
N 374570.8	415, E 2	12-20-20	0.0)498		1000000000000		ESIGNATION	OFDRILL			
Coleman Er		g Co.				Diedric 13. TOTAL N	h D-50 IO.OF OVER-		DISTURBED	UNDISTUR	BED	
HOLE NO. (As shown on drawing							AMPLES TAK		19	2		
title and file number) S-6							UMBERCOP	REBOXES	0			
Randy Och						15. ELEVATI	ONGROUND	16992012	57	New York Contract of the State		
DIRECTION OF [X] VERTICAL			INEC	5	0.0 DEG, FROM VER	16. DATE HO	DLE	ST/	ARTED Apr 21, 06	COMPLETED Apr 24,	06	
THICKNESSOF	10 11 	100.20	1.24	60.5 -		No. Constant and some of the	ONTOPOFI	IOLE	589.0)		
DEPTH DRILLE					0	12100000000	0.0000274827	ERY FOR BO	RING		N/A	
TOTAL DEPTH	OF HOLE	55.6			53.8	19. SIGNATI	UREOF INSP	BCTOR				
ELEVATION	DEPTH b	LEG	ENC	D.	CLASSIFICATION OF MATERIALS (Description) d	53 ³ 4	SAMPLE RECOV- ERY e	SAMPLE INTERVAL - 1	(Drilling th	EMARKS he,waterioss,depta ,etc.,frskgiftoanty g	6	
	0	25	<u>24</u>		ISOIL	same	0.6		2" SPT, 140# wt., 3			
588.5	0.5	ĨIII	ΠŤ) very soft, slightly plastic, dark brow	0.5' m,		0.0 1.5	Coord. Reference: I South Zone			
					, trace gravel, trace sand, trace org				NAD 27 grid, Elev. Sample 1, 0.0' - 1.5			
587.5	1.5		Ш					é	1-1-1 (2)			
				SIL) very soft, slightly plastic, dark broм [, trace gravel, trace sand, trace org		0.8	1.5	Sample 2, 1.5' - 3.0	e la		
				mois	ζ.			3.0	3-5-3 (8)			
586.0	3.0											
	<u>.</u>		$\parallel \parallel$	(ML) very soft, slightly plastic, dark brow	Contraction of the second s	0.9		Sample 3, 3.0'- 4.5	25		
				mois	[, trace gravel, trace sand, trace org t	anics,		3.0 4.5	3-3-3 (6)			
584.8	4.2				()	4.2'						
584.5	4.5		T) loose, medium brown, fine to coarse 'Y SAND , trace gravel, moist		₩R.		Sample 4, 4.5'-6.0	25		
) soft, slightly plastic, medium brown,	4.51 <u>SILT</u> ,	0.3	4.5	334			
					e gravel, trace sand, moist	<u>oner</u> ,	1.111	6.0 4.8	(7)			
583.0	6.0							4.8				
····	· · · ·		ĦĦ) soft, slightly plastic, medium brown,	<u>SHLT</u> ,	0.9		Sample 5, 6.0'- 7.5	2		
					e gravel, trace sand, moist	222		6.0 7.5	4-4-5 (9)			
582.0	7.0	111	H	S. (SP-	SM) loose, light brown, fine to coars	7.0' e.						
581.5	7.5		$\left \right $		🖸 , some silt, trace gravel, trace room		1.0	-	Sample 6, 7.5'-9.0			
				(SP-	SM) loose, light brown, fine to coars		1.4	7.5	6-5-4			
				mois	<u>ID</u> , some silt, trace gravel, trace roo t	<i>is</i> ,		9.0	(9)			
580.0	9.0											
	2 18				SM) very loose, light brown, fine to c <u>D</u> , some silt, trace gravel, trace roo		1.1	9.0	Sample 7, 9.0'-10. 2-2-1	51		
-00000-00				mois		82 		10.5	(3)			
578.9	10.1	-] 😂 (PT)	black, <u>PEAT</u> , silty	10.11						
578.5	10.5	ĥĩ	Ĩ	¥4.) loose, grayish brown, fine to coarse	10.5%	1.2		Sample 8, 10.5'- 12	2.01		
					<u>Y SAND</u> , trace gravel, trace organi		12.0000	10.5 12.0	2-1-2 (3)			
								C.F.C.S.	692			
577.0	12.0					12.0'						
1,7) very soft, slightly plastic, grayish bi I <u>DY SILT</u> , trace gravel, trace organi		1.4	12.0	Sample 9, 12.0'- 13 2-1-1	1.51		
3								13.5	(2) Note: Water level a:	ter 48 hrs.: 13.0		
575.5	13.5											
575.5	13.3) very soft, slightly plastic, grayish bi		1.6		Sample 10, 13.5'- 1	5.51		
					I <u>DY SILT</u> , trace gravel, trace wood nics, wet	and		13.5 15.5	woh-1-2-3 (3)			
574.3	14.7					14.7'		000100915				
02) very loose, grayish brown, fine to c 'Y SAND , trace gravel, trace organi							
573.5	15.5					зil,				7.64		
50 C					-SM) very loose, light brown, fine to c I <u>D</u> , some silt, trace gravel, wet	:oa/3e,	0.9	15.5	Sample 11, 15.5'- 1 1-2-1-2	(.5		
					ana 76			17.5	(3)			
				1								
	1220											
571.5	17.5				SM) loose, light brown, fine to coars	Contraction of the second s	0.9	2 225300	Sample 12, 17.5'-1	9.51		
					\underline{D} , some silt, trace gravel, trace wo	Contraction of the second s	196097	17.5 19.5	3-2-2-3 (4)			
								12120	200			
569.5	19.5								2			
000.0			· · · ·		SM) loose, light brown, fine to coars		1.4		Sample 13, 19.5'-2			

DRILLI	NG LO		sion eat Lakes and Ohio	River	INSTALLATI Detroit				SHEET OF 3	2 Sheet	
PROJECT Kinnickinnic	Para	obility of a state	unio and Durateira	Chude	10. SIZE AND TYPE OF BIT 4 1/4" HSA 11. DATUM FOR ELEVATION SHOWN (TBM or MSL)						
KINNICKINNI LOCATION (Co		85. 3	ysis and Dredging :	Study	II. DATUM FOR ELEVATION SHOWN (TBM or MSL) IGLD 85						
N 374570.8	3415, E 25	C - C - C - C - C - C - C - C - C - C -	18		12. MANUFACTURES'S DESIGNATION OF DRILL						
DRILLING AGE Coleman Er		i Co			Diedric	h D-50 10.0F OVER-	2	DISTURBED	UNDISTURBED	e.	
HOLE NO. (As s			8	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	240.00 M 270 - 27	AMPLES TAKE		19	2		
tte and the numb NAMEOF DRIL	and the second			S-6	14. TOTAL N	UMBERCOR	E BOXES	0			
Randy Och					15. ELEVAT	ONGROUND	WATER	570	6.0		
DIRECTION OF	HOLE		-		16. DATE H	DLE	jst/	ARTED	COMPLETED	s	
X VERTICAL		INCLINED	0.0	DEG. FROM VERT.	1944 - 2778 - 277 19 19	6835		Apr 21, 06 589.0	Apr 24, 06	18 1	
THICKNESSOF	FOVERBURI	DEN		0		ON TOP OF H	COLOR STREET	36777636	9	V/A	
DEPTH DRILLE		ĸ		0	198.00.002.000	UREOFINSPI	28.2.3 <u>9</u> .7.2.2.8	ning.	1	week.	
TOTAL DEPTH	OFHOLE	r	01400000	53.8	20 000	SAMPLE	SAMPLE	P	EMARIES		
ELEVATION	DEPTH	LEGEND		ATION OF MATERIALS (Description)		RECOV- ERY	INTERVAL	(Drilling th	e,waterioss,depta ,etc.,hisiga Micanty		
a	, b	c	20 20 10	d	- 26	e	Ť	20 - C - C - C - C - C - C - C - C - C -	g		
567.5	21.5		<u>SANO</u> , some silt, tra	ce gravel, trace clay,	wet		19.5 21.5	3-2-2-3 (4)			
564.5	24.5										
	5 82 		(SP-SM) koose, light <u>SAND</u> , some silt, tra	brown, fine to coarse, ce gravel, wet		1.5	24.5 26.5	Sample 14, 24.5' - 2 2-1-1-2 (2)	6.51		
562.7 562.5	26.3 26.5			o slightly plastic, gray	26.31						
			brown, <u>SANDY SILT</u>	, trace gravel, wet	26.5						
559.5	29.5			grayish brown, fine to e silt, trace gravel, w		1.5	29.5 31.5	Sample 15, 29.51-3 1-1-2-2 (3)	1.5		
557.5	31.5						2				
554.5	34.5			grayish brown, fine to e silt, trace gravel, w		1.8	34.5	Sample 16, 34.5'- 3 3-2-2-2	6.51		
			30 0000 0	56	1111-111		36.5	(4) Pen: 0.25			
553.3	35.7	말만한	(OL) A P P P		35.7′			Tor: 0.5			
553.1 553.0	35.9 <u></u> 36.0	<u></u>	(OL) soft, slightly pla ORGANIC SILT , tri	stic, greenish brown, ace sand, trace shells							
552.5	36.5		21 - 87	grayish brown, fine to	35.91	1911					
552.0	37.0		coarse, <u>SAND</u> , som (OL) soft, slightly pla	e silt, trace gravel, w stic, greenish brown, ace sand, trace shells	et <u>36.01</u> , wet ±36.5	1.3	36.5 38.8	Sample 17, 36.51 - 3 31 thin-walled tube undisturbed	8.8		
550.3	38.7		wet (SC) brown, fine to c wet		±37.0			3			
549.5	39.5		L		±38.71	ingener (1740 °		
			(OH) soft, medium, pl	astic, greenish borwn,		1.1		Sample 18, 39.5'- 4	17.5		
		10 1 1 1 1 1 1 1 1 1 1 1 1									

DRILLI	NG LO		ision reat Lakes and	l Ohio River	INSTALLATI Detroit	ON .			SHEET OF 3	3 Shee	
PROJECT	Divor Ct	obilitu () ool	lucia and Drad	aina Studu	10. SIZE AND TYPE OF BIT 4 1/4" HSA 11. DATUM FOR ELEVATION SHOWN (TEM OF MSL) IGLD 85						
KINNICKINNIC		- 65 - X	lysis and Dred	ging study							
N 374570.8	415, E 25	1940 - SO TO USDO	98		12. MANUF	ACTURESSD	ESIGNATION	OFDRILL			
Coleman En		a Co.			Diedric	h D-50 10.0FOVER-		DISTURBED	UNDISTUR	8 ED	
HOLE NO. (As s	hown on draw		8			AMPLESTAKE		19	2		
the and the number NAMEOF DRILL	and the second se		2	S-6	14. TOTAL N	UMBERCOR	EBOXES	0			
Randy Och:					15. ELEVAT	ONGROUND	WATER	576	6.0		
DIRECTION OF			~~~	5-120-1 5 MINU 810	16. DATE H	DLE	STA	RTED	COMPLETED	06	
X VERTICAL		INCLINED		DEG. FROM VERT.	17 ELEVATI	ON TOP OF H		Apr 21, 06 589.0	Apr 24,	06	
THICKNESSOF	OVERBUR	DEN		0		ORERECOV	A CALLS	162177829	S.	N/A	
DEPTH DRILLE		ск		0	166.00 C.27.20	UREOF INSPI	20,2,2,2,2,7,7,7,7,8	11 0 m a		13073	
TOTAL DEPTH (OF HOLE	r -	014	53.8 SSIFICATION OF MATERIALS		SAMPLE	SAMPLE	B	EMARKS		
ELEVATION	DEPTH	LEGEND		(Description)		RECOV- ERY	INTERVAL	(Drilling tim	e,waterioss,depti etc.,hisignificanty		
a	b	c		d		e	Ť.	School and the second	g		
547.5	41.5		ORGAMC SILT	, some clay, moist			39.5 41.5	1-1-2-3 (3)			
544.5	44.5		(OL) soft, slight <u>ORGANIC SILT</u> shells, moist	tly plastic, greenish brown, , trace sand, trace gravel	, <i>tr</i> ace	1.0	44.5 46.5	Sample 19, 44.5' - 4 1-2-3-5 (5)	6.51		
542.5	46.5										
539.5	49.5			tly plastic, greenish brown, , trace shells, moist		1.5	49.5 51.5	Sample 20, 49.5'-5 2-2-4-5	1.5'		
							57.5	(6)			
537.5	51.5		1011					Camela 24 54 51 5	2.01		
537.0	52.0		ORGANIC SILT	tly plastic, greenish brown, , trace shells, trace wooo plastic, greenish brown,	!, moist ±52.0∫ <u>CLAY</u> ,	2.0	51.5 53.8	Sample 21, 51.51-5 31 thin-walled tube undisturbed	3.8		
536.0	53.0	¥///////			± 53.0'						
No. 11 No. 14 No.					and the second sec						
535.2	53.8	- X			53.8′			3			
				End of Boring							
		1									
					12						

APPENDIX E

ROUGH AND FINAL BORING LOGS

DRILL	ING LO	0	REATLANES & OHIO RIVER.	INSTALL DET		DIST	RICT OF 3 SHEET			
			RIVER	10. SIZE AND TYPE OF BIT 444" MSA						
I. LOCATION					85 IG		SHOWN (TDM of MSL)			
S. DRILLING	AGENCY			12. MANI	FACTURE	R'S DESIG	SALTION OF DRILL			
• .		COL	EMAN ENGINEERING.CI	our statement of the local division of the l	AL NOLOF	NAME AND POST OFFICE ADDRESS OF TAXABLE PARTY.	and the second se			
A. HOLE NO.		1	3-1			-				
S. NAME OF	ORILLER	LANDY	P.OCHS .	-	AL NUMBE	The second se	the second se			
. DIRECTIO	the second s	International Property in the local division		16. DAT	EHOLE		ATED COMPLETED			
VERTI	CAL X	HCLINED	DEG. FROM YERT.		VATION TO		18-06 4-18-06			
7. THICKNES		State of the owner of the			and the second second		Y'FOR BORING			
9, DEPTH DR 9, TOTAL DE		and the second se	42.2	19. SION	ATURE OF	Redi				
			where the second s	L	x CÓRE		REMARKS			
ELEVATION	DEPTH.	LEGEND	CLASSIFICATION OF MATERIA (Description)		RECOV- ERY	BOX OR SAMPLE	(Drilling lime, water ices, depth of weathering, etc., it significand			
			(F.11) Toppioil, ~ groves, asphalt,				1-1-2 (7)			
	-	55	at aist		0.5		sample 1 0,0-1.5			
	- Trainer	51								
							4 1 2 15 20			
]	("") soft, slightly plastic, med sondy site, trace graviel, , asphalt churks, trace root	heun bräce	0.6	z	Sample 2 1.5-3.0			
		55	asphalt chunks, trace root	Tale s, maist		2	(2)			
			(Fil)	- 12						
	=		the Dalesweatt el un	rown,		30	Sample 3 3.0-4.5			
		55	daycy silt, trace sand, to grave, wet	ace	0.8	3B	1-1-2			
	. =						N N N			
	5-	}	(Mc) Very soft, slightly plastic, b clayers silt, trace sund, the	rown,			Sample 4 4.5-6.0			
		55	wet	ace grower,	0.3	4.	1-1-2			
	540					i (* 1	(3)			
	-		(mc) very soft, stightly plastic, clamen silt, trace sand, trace	brown		SA ·	sample 5 6.0-7.5.			
	-	55	wet	100		,,,,				
			(OL) very soft, slightly plastic, of organic sill, some sand, Trace Trace wood, wel	lark given	Ó. 8	53	2-1-1			
	-	45	A			36				
		V 9.2	(al) very's off, stightly plastse do organic silt, some said, too	isk gray,		6	Sample 6 7.5-9.0			
	-		Tract word, wet	er eprover ;	1.0	U I	WOH - WOH - 7			
		1	(ac) very soft, slightly plastic, da	rk arm			Sample 7 9.0-10.5			
	-	55	requiresilt, some save, trace trace wood, weat	gravel,		7A				
	10-			162	06		8-2-3 (5) Luyer of word @ 10-1-10,2			
,			Spalloose, dark gran, sisty soud, fre, u trace organics, wet	10.0		73	The second se			
		55	(21) very saft, slightly plastic, dur organic silt, track wood, need	k gions,		8	Sample 8 10.5 - 12.0			
	-	11			1.3		(2)			
·	_	1					Sample 9 13.0-13.5			
·.	-	55	(OL) very soft, slightly plastic, gray, organic on it, trace woo	d wet		g	Joing			
	-	27		1	1.0		1-1-			
	-]					Sumple 10 13.5-15,0			
	-	1	(2) very soft, slightly plastic, do a organic silt, truct mood, wet	ask gray,	ar		1-1-1			
	=	\$\$			0.5	10	(2)			
:	15-						•			
	:	3	OLT very soft, slightly plastic, dar organic silt, frace ward,	k yray,			sample 11 15.0-16.5			
	-	55		10 7	1-	(1A	2-2-6			
		1	JEM) 10050, light brown, f.e, rand, so trace grand, wet	ome so it ,	I.D	11 13	. (8)			
	-	-	(a) voru soft, slightly plashe, a gian, organic silt, some shell	reenish			12 19 0			
	-	55	wood, wet	s, trace	ų.Ø	12	Sample 12 116.5- 10.0			
	-	1			l.		(3)			
		1	(OL) were soft, slightly plastic, give	in shares.		-	Sample 13 18.0-19.5			
	6	44	organis silt, some shally, trace	wood, wer		13A	WH - 3-3			
	-	- Artim	(5m) louse, light brown, fr, scoud,	48.0 Hami gilt.	1.0		(6)			
	-	10	tace gravel, frace organics, we	* 19.1		130	Sumple 14 19.5-21.0			
	1 18 35		aland, track sound, moist	TIACE	1.0 PROJECT	14 A	2-3-4			

	ING LO	G	REATL	ARES & OHIO RIVER.	DET	rost	DIST	RICT	SHEET 2 OF 3 SHEETS		
KINNICKINDIC RIVER						10. SIZE AND TYPE OF BIT 4/4/" H SA					
COCATION					191	85 IGI	LD		50000 m		
DRILLING	AGENCY	COL	E MADA)	ENGINCERING.CO	12. MANU	EDRIC	H AS	D .			
HOLE NO.	(As show			Contraction of the second second second second			OVER.		UNDISTURBED		
NAME OF	00111 20			5-1	14. TOTA	L NUMBE	R CORE B	and the second of the second sec			
	. /	ANU	9.00	HS "	IS. ELEN	ATION OF	AW DHUOR	0.5	the second se		
VENTI	AL DE		,	DEG. FROM VERT.	16. DATE	HOLE		-18-06	4-18-06		
THICKNES					17. ELEN	ATION TO	OP OF HOL	.ε			
DEPTH OF	ILLED IN	TO ROCH	<			ATURE OF	INSPECT	OR BORING			
TOTAL DE	PTHOF	IOLE	42.2			and the second se	1	erduen	11 4 to 2		
LEVATION	DEPTH	CEGEND C		ASSIFICATION OF MATERIA (Description)		RECOV	BOX OR SAMPLE NO.		EMARKS weler loss, depth of etc., il eignilicent		
	1111	55	(L) 54 tr	uce gravel, trace sand	moist		148	Sample 14 1.25 pm Tor = 1.2	19.5-21.0		
	-										
	-		(LL) ve	systiff, plastic, brown, c and, trace sand, maist	Ing trace			sample 15	22.0-23.3		
	11	55	95	and, trace sand, maist		10,	15	5-4-6	22.0-23.7 pen = 35		
		57				0.6		(10)	Tar = 1.25 small wheel		
	• =										
,	. =										
	25=										
	-					*		¥.			
•											
	=										
								gen - 1	76		
	-	3"	(CL) V	ery stiff, plastic, brow	n, clay,						
	-	ST	11	ace grand, trace sond,	maist			1	1 3.1		
		}		·		2.1	\$16	Sample 10 Undistur	6 27.0-29.3 bed		
							and the	Unutitor			
191	30-	1									
	-	1									
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	-			,					, •		
			(11)	tiff, plastic, brown, cla			17.	5000ple 1	7 32.0-33.5		
•		10	(CCI S	grand, trace sand, my	Mi Trace	1.0		pm : 0	7		
		55						705 : 2	1		
		4									
,	21					•		· *	•		
,	> >							,			
	-	· ·						· ·			
		1		· •		-	-	Sample	18 37.0-38.5		
			KL) U	usy stiff, plastic, brow	n, clay		18	1-2-50	13 Bouncing		
		55	Tr	ace grand, truce sand	, moist	1.1	10	pen = Tor = 3.			
									2		
		-						Driller i note	Boulder @ 39. D-92 Hard drilling		
		1							39.0-42.2		
	10	1									
	M 1836			and the second se		PROJEC	and the second se	the second se	HOLE NO.		

		/ 10	NOISION		INSTALL	ATION		Hole No. 5-1				
	ING LO			ARES & OHIO RIVER		ron		KICI OF 3 SHEETS				
KINNICKINNIC RIVER						10. SIZE AND TYPE OF BIT 44 HSA 11. DATUM FOR ELEVATION SHOWN (TEAF or MSL)						
I. LOCATION	(Coordin	etes of St.	ellory		12. MANU	85 IG	D A'S OESIG	INATION OF ORILL				
S. DRILLING	AGENCY	COL	EMAN	ENGINEENING.C				DISTURBED LUNDISTURBED				
A, HOLE NO.	(As shown	n on drow	ing tille	5-1	BURG	EN SAMPL	ESTAKE	N 23 1				
S. NAME OF	DAILLER,	RANDY	2 00	HS	the second second second second second	ATION OF	all some state of the local division of the	DAES				
I DIRECTIO	1 UT 100	. Ep			16. DATI	and the second second second	1ST A	RTED COMPLETED				
	CAL DE			DEG. FROM VERY		ATION TO						
. THICKNES	and the second second		State of the local division of the local div					Y'FOR BORING				
. TOTAL DE	PTHOF	HOLE	42.2		T C	my S.	No. of Concession, Name of Street, or other Designation, or other					
ELEVATION	DEPTH	LEGEND	c	LASSIFICATION OF MATERI (Description)	ALS	X CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, weter lose, depth of weathering, etc., if significency				
40.	-			۲ ۰				Sample 19, 42 2 - 43 5				
							10	Sample of crushed bediecle				
	-						19	From inside augers				
	-				42.2		-	50/0				
	111			Auger Refusul								
	-											
				EUB 42.2				Level 8.2				
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ENG FOR	H Par	1				PROJEC		HOLE NO.				
MAR 71	10.70	PALVI	205 EQU	NONS ARE QUEQUETE.		Kinnie	chinnic	River 5-1				

	ING LO		REATLANES & OHIO RIVE	and the second s	ron	States of the second	RICT OF 3 SHEETS				
KINK	NCKI	NNIC	RIVER	TI. DATO	10. SIZE AND TYPE OF BIT 444 TO HSA 11. DAYUM FOR ELEVATION SHOWN (TEM or MSL)						
I. LOCATION	(Coordin	ates of Sta	ellon	12. MANU	85 IG	A'S DESIG	INATION OF DRILL				
. DRILLING	AGENCY	COL	EMAN ENGINEERING	Co DI	EDRICI	1.03	50.				
A. HOLE NO.	(As shown			13. TOT	EN SY WEL	ES TAKE	N 15 2				
. NAME OF	ORILLER	2 14705	P.OCHS .		ATION OF						
DIRECTIO	and the second division of the second divisio	Stationers in Concession, Name			anarise increase way	ATE	RTED ICOMPLETED				
VENTI	CAL	NCLINED	DEG. FROM VER				-27-06 4-27-06				
, THICKNES					ATION TO	a strangelyte	Y'FOR BORING				
. DEPTH DR			5/.0	19. SION	ATURE OF	HAPECT	OR				
ELEVATION				RIALS	and the second se	BOX OR SAMPLE	REMARKS				
ø	6	¢	d		ERY	HO.	(Drilling lime, weter lose, depth of weathering, etc., il eignificant				
		1	gravel n	0.4			Sumple 1 0.0-2.0 5-5-3-3				
	-		Fill Loose dark brown, f.c., silly graved, Frace roots, mais	Shut, tisce	11	,	(8)				
					0.6		Rock stuck in shoe				
	=										
	=		(FID SOFT, Slightfolactic, brown gravel, withgard, maist	r, filt, with			Sumple 2 20-40				
			deserves seed wat			Z	6-3-3-4				
	-		,		1.2						
*			(Ku)								
,			(F.II) medium danse, brown, fre, grand, some so it, we t	Shud SING			Sample 3 4.1-60				
	5-		1000	\$ 5,4	10	3	8-12-8-10				
		1.			0.9)	Rock stuck in share				
•			(mi) soft, slightly plastic, brow	6.8							
	=		Sand, trace graves, wet	in, SIIT, TYDEP		YA	Sumple 4 60-80				
		1	Fm) medium donce deck black	76.0	1.6		7-9-8-9				
	-		Em) medium longe, dark black Some gilt, Trace gianoi	FIRE	1.0	4B	(17)				
						1.00					
	-		SM) medlan damae, green at lon SAND, Some all, trace grand,	ing for			Sample 5 8.0-10.0				
			in the state	and a	1.1	5	8-6-4-3				
					111	1	. (10)				
	10-		(SM) louse, grayish brown, fr,	said,			7				
	-]	Some silt, Trace graves	l, wet			40mple 6 10-0-120				
	-	1			0.6	6	5-4-1-1				
		1 .					(5) .:				
·.	-	1	(SM) very losse, granish brown	, f-c,			S . S DAMA				
	-	i i	Samply some si H, truccall		17	7A	Suple 7 120-14.0				
	-	1	(me) von satt, slightly plastic	dark brown	1.3		(J)				
	-	1	silt, trace gravel, there sa	d, trace exposes		73					
	-	ŧ	(ML) very soft, slightly plasse	, dark being	• .	8	Sumple 8-14.0-16.0				
	15-	4	Si It, Trace Sand, +1400	wood, wed	0.5	8	WON				
					0.0	N. Carlos	· (-).				
	-	1.									
		1	(mc) very saft, slight hy plast	- Jusk		G	Sample 9 16.0-18.0				
		3	browin, sundy silt, have	wada,west	1.4	9	WOH MOH WOR MOR 2'				
		-	(Sp) Redin deve dark Brown, F. C., Se	ind,	ie 1	1					
	-		somes, 17, wei		18-0"		0 =				
	11	-	Ques very soft, slight by pla	ce manie	18.5'		Sample 15 180-20.3				
	-	1			20	10	undisturbed				
	-	1	OL) Soft, moderately plastic Brown, organie silt, n	very dark	2.1						
		-	1 1	e/	1	F. C.					

Ē			7 10	IVISION	. ·	INSTALL	TION		Hole		5-2
Ļ		ING LO			ARES & OHIO RIVER.	DET	ron	D 151	RICT	OF	3 SHEETS
1.1	KINK	-			ver				HAY HSA	MSL)	
	LOCATION			ellon		12. MANU	FACTURE	-D R'S OSSI	SO		• •
	BRILLING		COL		ENGINEERING.CI						DISTURDED
	ANDLE NO.				5-2		EN SY WEL		IN I		
8	HANE OF	PAILLER	LAND	9 00	HS	the second se	ATION OR	-	and the second se		
6	DIRECTIO	N OF NOL	. 6			16. DATE	HOLE		27-06	COMP	LETED
			and the second second second		DEG. FROM VERT.		ATION TO				
-	. THICKNES			Contraction of the local division of the loc		the second se		the second s	Y FOR BORING		1
-	. TOTAL DE		the second s			Lan	TURE OF	eiche	OR		
2	LEVATION	DEPTH.	LEGEND	cı	LASSIFICATION OF MATERIA (Deegription) d	ALS	* CORE RECOV ERY	BOX OR SAMPLE NO.	(Drilling time weathering,	ģ	
		-		-	Y .	See.		10	Sample 10	180	1-20.3
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		.=	1	miller	y soft, shally a methodic tic	a100			Sample 11	24.	5-26.5
		25-	1	bre	y sort, shang a approprie	to sand,		11	Sample 11 1-21-1-	1	
		11	1.	troc	own, clayoysilt, tra		1,7		· (4)		
		-		Sec.							
		=	-	1.5	h.						
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		-	1			-28.0					
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I		=	1								
ł	z	30-	1	OLTU	ory soft, non to slightly ph	istic, grounis	h,	17.	Sample 1.2	2 2	9.5-31.5
۱			1	bro	ells, trace sand, wet	lood, some	1.4		(2)		
		_	-	10	ens, Trace sourt, wer						
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		3	3								
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		35-	-	100) 04	ery soft, slightly plastic, q	reinial	· · ·		Lu d		400010
1		55	F	.0(0)	Wa, organic ant, some wood, ells, two saws wet	, 110 00		13	1	13 3	9,50 36 S
							1.4	15	(3)	. 0
			-	-		12			ļ		
			2" 55	OL) sof	Ft, slightly plastic, gree	1			Sample 14	1 36.	5-388
ĺ					own, organic silt traces	e Finegrav	101	1.1.1	Undistur	ued.	
		_			1 22		de	14			
		-	-								
		-	-	- 1	5				-		
			1	_						120	1 411
l	ENG FOR	140 -	1	1					Sample 15	Second Contractor	5- 41.5
	- MILL MILL				TIONS ARE OBSOLETE.		PROJEC	*			NOLE NO.

DDII I	ING LO	G DI	KEATLANES & OHIO RIVER.	INSTALL	ATION	ain	RICT OF 3 SHEET	
				the second se	and the second se	And the second se		\$
			RIVER				SHOWN (TDN & MSL)	-
I. LOCATION	(Coordin	ates or Sta	illon)	12. MANI	85 IG	R'S DESIG	INATION OF BRILL	
S. DRILLING	AGENCY	COL	EMAN ENGINEERING.C.				DIATION OF BRILL	_
A. HOLE NO.	(As show			IJ. TOT	SEN STOR	ES TAKE	N DISTURSED UNDISTURBED	2
				14. TOT	L NUMBE	R CORE B	oxes	•
		KANDY	P.OCHS	IS. ELE	ATION GR			_
DIRECTIO	N OF HOL	NCLINED		16. DAT	HOLE		ATED COMPLETED	
THICKNES				17. ELE	ATION TO	POFHO	LC	
DEPTH DR			Contrast of the second s				Y'FOR BORING	%
. TOTAL DE	PTHOF	HOLE		19. 5104	ATURE OF	INSPECT	V M	
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIA (Deecipilon)	LS	* CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling lime, water loss, depth of weathering, etc., it significant	
	40	and the owner of the owner of the owner.	(CL) very roft, non ro slightly plas	tic,		16	Sample 15 39.5-41.5	-
			allenish brown, organic	510.	1.4	15	1-7-1-2	
			Some wood, trace shells, to sund, net	068	* 1		(>)	
			ALCONTRACTOR					
	-							
	-							
	-		4	13.0×				
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•								
			(ML) soft, slightly plaster, light b	rown			1- 1 11 1110 1110	-
	45-	}	silt, Trace wood, trace sand, v	Jat		16	Sample 16 44.5-46.5	7
		1.			1.3	10	(4)	
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	1,0-			to 1			Sumple 17 49.5-51.0	
	-	3	Smilvery loose, grayise brown, t-c, With silt, wet	50.2 care,	1.3	17A	WOH -1-2-1 (3)	
、	-			60 8	1,)		CH	
	-	1	(mi) very soft slightly plastic, glansh silt, Fract sand, Frace wood	vet,		17B		
	=		EOB 51.0		·		.*	
	-	1				102	water @42	
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In the total worker content of the total content of total content of the total conten	A. HOLE NO.	As shown		a dula				DISTURBED		-	
B. UNCENSITION OF VOL. DOLE FROM VEL. DEC FROM VEL. <					14. TOTA	LNUMBER	CORE B	and some open to the second		- ·	
B. UNCENSION OF VOL DOLE FROM VEL H. DATE HOLE H. D	a nome or	1	ANDY	OCHS .	IS. ELEV	ATION OR		10			
THEORNELL OF OVERNUNCEL Discussion 1. DETAIL CREW TO ALL CALL Discussion 1. DETAIL CREW TO ALL CREW TO ALL CALL Discussion 1. DETAIL CREW TO ALL CALL Discussion 1. DETAIL CREW TO ALL CREW TO ALL CALL Discussion 1. DETAIL CREW TO ALL CREW TO ALL CALL Discussion 1. DETAIL CREW TO ALL CREW TO ALL CALL Discussion 1. DETAIL CREW TO ALL CREW TO ALL CALL Discussion	. DIRECTION	A ON HOL	E,		16. DATE	HOLE	SY AL	- 19-06			
$ \begin{array}{ c c c c c c } \hline Verth Gold X(GOVENTOR EXAMPS) \\ \hline \textbf{Verthallow of the second o$					17. ELEN	ATION TO	the second se	and the second se			
Chair (Status)ReduceConstrained of the S1.5Constrained of the S1.5 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>and the second second second</td> <td></td> <td></td> <td>%</td>							and the second second second			%	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	S. TOTAL DE	PTH OF H	IOLE	51.5	Cry	in S. Re	idie				
$ \begin{array}{c} \begin{array}{c} 110 & 0003 & 00001, dots that of the c adjust (new concrete or prior or prior of the concrete or prior $	ELEVATION	DEPTH b		CLASSIFICATION OF MATERIA	NLS	* CORE RECOV. ERY	BOX OR SAMPLE NO.	(Pelling lime, w weathering, el	AARKS valer loes, depth of e., il elenilitenu g		
$\frac{21}{55}$ 21		111	11	sandy gravel, with sill, 1	Vace	0.3	1		6.0-1.5	HII	
$\frac{24}{55}$ $\frac{2}{55}$		111	5					5			
$ \begin{array}{c} 55 \\ 610 way, 501, frace grand, frace Soud, wai at Soud at Soud, wai at $	•	F.M.			02.6			Did not saindel. 5. rubble	- 3.0 - in concrete	un	
54 Standy woi st 55 (11) very soft, slightly plastic, dark 100 very soft, slightly plastic, dark 100 very soft, slightly plastic, dark 11, 12 - 2, (4) 12, 2 - 2, (4) 12, 2 - 2, (4) 14, 1 - 1, -1, -1, (2) 55 (11, 12 - 2, (4) 14, 1 - 1, -1, (2) 56 (11, 12 - 2, (4) 57 (11, 12 - 2, (4) 58 (11, 12 - 2, (4) 59 (11, 12 - 2, (4) 50 (11, 12 - 2, (4) 50 (11, 12 - 2, (4) 50 (11, 12 - 2, (4) 51 (11, 12 - 2, (4)) 52 (11, 12 - 2, (4)) 53 (11, 12 - 2, (4)) 54 (12 - 2, (4)) 55 (11, 12 - 2, (4)) 55 (11, 12 - 2, (4)) 56 (11, 12 - 2, (4)) 57 (12 - 12 - 3) 57 (12 - 12 - 3) 58 (12 - 12 - 2) 59 (12 - 2 - 2) 59 (12 - 2 - 2) 50 (12 - 2 - 2) 51 (12 - 2 - 2) 52 (13 - 12 - 2) 53 (12 - 2) 54 (12 - 2) 55 (12 - 2) 56 (12 - 2) 57 (12 - 2) 57 (12 - 2) 58 (12 - 2) 59 (13 - 2) 59 (13 - 2) 59 (13 - 2) 50 (12 - 2) 50 (12 - 2) 50 (12 - 2) 50 (12 - 2) 51 (1		111	55	(ne) very soft, slightly plastic brown, silt, trace around.	, dark trace			1-1-1	3.0-4.5	hìm	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			0	sand, moist			2			1111	
		5-	55	brown, silt, trace graves,	truce	Pushed	2	1-2-2 (4)	luu	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		111		(ML) very soft, slightly plasti	ic, dark			poshed rack	in shoe	<u>ilu</u>	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		11	79	brown, silt, frace gravel sand, moist	, truce	0.9	4	1-1-1		ului	
$ \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c} \begin{array}{c}$		111	55	moist moist	85	1	5A	Sumple 5 3-3-3	7.5 - 9.0	ului	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		1 1 1		(OL) soft, slightly plastic, do	ch areemi		58	·	9.0-10.5	Int	
55 brown sequence sith, trace sond, prod organics, cut II.4 1.3 $7-71-9$ (20) 55 -755 55 -7550 55 -750 55 -750 55 -750 55 -750 55 -750 55 -750 55 -750 55 -750 55 -750 55 -750 56 -710 57 -72 57 -72 58 -72 59 -72 59 -72 50 -710 50 -710		10	55	9 3 6	62		6	4-2-3	*	ulu	
$\frac{120}{55}$ 1	6 .			organics, wet	sund, hour		50	17-11-9	10.5-12.0	thu	
Trace sand, trace organics, wether the sample 9 13.5-15.0 15 55 Universe soft, slightly plastic, dark granics 0.9 9 13.5-15.0 255 (4). Universe sound, trace organics 0.9 9 (4). 255 (2). Universe soft, slightly plante, dark organics 0.9 9 (4). 255 (2). Universe soft, slightly plante, dark organics 0.9 9 (4). 255 (2). Soft, slightly plastic, dark granusk 0.6 7 (1). 255 (2). Soft, slightly plastic, dark granusk 0.7 (2). 255 (2). Soft, slightly plastic, dark granusk 0.7 (2). 255 (2). Soft, slightly plastic, dark granusk 0.7 (2). 256 (2). Soft, slightly plastic, dark granusk 0.7 (2). 257 (2). Soft, slightly plastic, dark granusk 0.7 (2). 258 (2). Soft, slightly plastic, dark granusk 0.7 (2). 259 (2). Soft, slightly plastic, dark granusk 0.7 (2). 250 (2). Soft, slightly plastic, dark granusk 0.7 (2). 251 (2). Soft, slightly plastic, dark granusk 0.7 (2). 252 (2). Soft, slightly plastic, dark granusk 0.7 (2). 253 (2). Soft, slightly plastic, dark granusk 0.7 (2). 254 (2). Soft, slightly plastic, dark granusk 0.7 (2). 255 (2). Soft, slightly plastic, dark granusk 0.7 (2). 256 (2). Soft, slightly plastic, dark granusk 0.7 (2). 257 (2). Soft, slightly plastic, dark 9.7 (2). 258 (2). Soft, slightly plastic, dark 9.7 (2). 259 (2). Soft, slightly plastic, dark 9.7 (2). 250 (2). Soft, sl	~					1.8.1	2025	9-3-3	12.0.13.5		
15 15 15 15 15 15 15 15 15 15			75	Trace sand, trace argamic	", weat	A.D	.8	4	13.5-15.0	E	
$\frac{55}{55} = \frac{55}{10000000000000000000000000000000000$	· . ·		\$5	greenish brown, organic gravely trace saws, trace	m p trace	0,9	9	2-2-2		1111	
55 OC) soft, slightly plustic, dark greenish brown, maganic si H, trace organis, and G.7. 11 Z=Z=3 55 OC) soft, slightly plustic, dark greenish brown, organic silt, trace granish 10 12 3-7. 55 OSoft, slightly plustic, dark greenish 10 12 3-7. 55 OSoft, slightly plustic, dark greenish 10 12 3-7. 57 OSoft, slightly plustic, dark greenish 10 13 5-9. 56 Osoft, slightly plustic, dark greenish 56 Osoft, slightly plustic, dark greenish 57 Osoft, slightly plustic, dark greenish 58 Osoft, slightly plustic, dark greenish 59 Osoft, slightly plustic, dark greenish 59 Osoft, slightly plustic, dark greenish 50 Osoft, slightly plustic, dark greenish 50 Osoft, slightly plustic, dark greenish 59 Osoft, slightly plustic, dark greenish 59 Osoft, slightly plustic, dark greenish	×.	-61	.55	gravel, trace saw, from	31 M, 350001	\$ 0.4		Sample 10 Z-Z-Z 14)		mili	
Thace sand, trace organis, and O. 7 11 Z= 65 S.S. OCDISOFT, slightly plastic, dack queenish brown, organic silt, trace granist, with How scood, there is a granist, with S.S. OSSIT, slight by plastic, dack greenish Drown, organic silt, trace granist, with Drown, organic silt, trace granist, with Drown, organic silt, trace granist, with Drown, organic silt, trace granist, with	• •	2	55	(04) softy, slightly plustic, da brown, angionic si My tea	ce cu ann	100		Sample 1	and the second		
S.S. Drown, organic silt, trace gravel, 10 12 3-3-17 Theore sund, there is organist, with 10 12 3-3-17 Theore sund, there is organist, with 10 12 3-3-17 (7) (7) (7) (7) (7) (7) (7) (7				thace sond, trace organ	is, we	O. p		(5)	2 18.0-19.5		
55 Drown, organic silt, trace gravel of 10 13 5-4-4 (8)	·		5.5	blown, organic silt, lide	a groom,	1.0	12	3-3-4			
ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLET C. M. M. Dicking River 5-3	-	25		DEQUIN MADINE SULT TIDLE	greenish gravel	SI SINC	11	- 5-9-4 3-9-4	(8)	EF.	
	ENG FOR	183	6 PIREW	HOUS CONTIONS ARE OBSOLET C.	2u	I IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	innicki	nnic River			

		ING LO		REATLANES & OHIO RIVER	and the second se	AND TYP	and the second second second	RICT OF 3 SHEETS		
			NNIC	River	10. SIZE AND TYPE OF BIT 44" HSA TT. DAYUM FOR ELEVATION SHOWN (TON & MSL) 1985 IGLD					
		AGENCY			12. MANU	FACTURI	TR'S DESIG	DATION OF ARILL		
•			COL	EMAN ENGINEERING.C			OVER			
			n en drewi				A CORE B	di		
5. HAH	EOF	DRILLER	RANDY	P.OCHS .	The state of the s	And in case of the local division of the loc	ROUND WA			
e. OIR	ECTIO.	N OF HOL	RCLINED		16. DATI	E HOLE	STA.	-19-06 9-20-06		
			REURDE		and the second sec	ATION TO	POF HOL	. ٤		
			TO ROCK		the second	the second s	INSPECT	OR BORING		
9. 701	TAL DE	PTH OF	HOLE	5], 5	Cru	45-14	erdre	\sim		
	ATION	DEPTH.	LEGEND	CLASSIFICATION OF MATERI (Deediption)	ALS	* CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Prilling time, water lose, depth of weathering, etc., it elgoillicend		
		- 010	45	(OL) roft, slightly plastic, de	rk greenis	K 25		Sample 13 19.5-21.0 5-4-4		
			7/	brown arganie silt, trace. Trace sand, trace shells, u	ravel,	13		(8)		
l		-								
		-						1		
		-	1							
			6							
		11			0			1 1 1 1 0 0 0 0 0 0 0		
•				(OL) soft, slightly plastic, brown, organic sitt, Tra- trace sand, trace shells,	ce granal	st.		Sample 14 23.1, 25.0		
		. =	45	trace sand, trace shells,	iet	14A	1.1	(11)		
		75=			29.9	1413				
				(CL) Very soft, medium pla medium brown, clay, t	stie					
		-		gravel, trace sand, m	vet					
		-		100 - 200-						
1		-			126.8					
		-								
		-						107 700		
		_	1	(mi) medium stiff, non tos	lightly	15	NR	60mple 15 28.3-30.0 15-13-19 (32)		
	1	5	45	(mi) medium stiff, non tos plastic, medium brom silt, trace wood, we	in, sandy		0.4	(32) went down twice "I goven		
	æ	30-	1					1.0		
		-	1							
	`	-	3	XB	,					
		-			+ 21 -					
· ·		-			±31.7			•		
·.		=	1	Allen .						
		-								
		-								
		-	-	(CL) stiff, medium play medium brown, sifty c with sand, trace grav organics wet	he,			Sample 16 33.5-35.0		
			55	with sound, trace and	lay,	16	1.3	- (6 - 4 - 5 (9) por = 0.5 Tor = 1.0		
		35-		organics, wet	inder			701 = 1.0		
1										
		-	Ξ.							
1			-					· · ·		
			-	- 19						
								· · ·		
			-					2		
		-	3º			17	NR	Sample 17 38.5-40.8		
			7				1.1.4	3" Shelby Tube Undisturbed		
	Ros	40	1			PROVES	1	HOLE NO.		
ENG	POR	11071		OUS EDITIONS ARE OBSOLETE.		1-LONEC	State Street	River 5-3		

the I

Holo No. : 5 - 3 22.4 SHEET 3 PREATLANES & OHIO RIVER. INSTALLATION DETRON DRILLING LOG DISTRICT OF 3 SHEETS KINNICKINDIC RIVER 10. SIZE AND TYPE OF BIT 4 14 " HSA 11. DATUM FOR ELEVATION SHOWN (TON or MSL) 1985 IGLD MANUFACTURER'S DESIGNATION OF DRILL DIEDRICH DJO LOCATION (Coordinates or Station) J. DRILLING AGENCY COLEMAN ENGINEERING.CI DISTURBED UNDISTURBED BURDEN SAMPLES TAKEN 13. HOLE NO. (As shown on drawing lille and lile numbed 21 S. NAME OF BRILLER LANDY OCHS . 14. TOTAL NUMBER CORE BOXES 15. ELEVATION GROUND WATER 17 ARTED 4-19-06 4-20-06 6. DIRECTION OF HOLE 16. DATE HOLE VERTICAL DENCLINED. DEG. FROM VERT 17. ELEVATION TOP OF HOLE 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING . DEPTH DRILLED INTO ROCK 19. SIGNATURE OF INSPECTOR un S. S. TOTAL DEPTH OF HOLE 51.5 * CORE BOX OR RECOV. SAMPLE REMARKS (Drilling time, water lose, depth of weathering, etc., if significent) CLASSIFICATION OF MATERIALS ELEVATION DEPTH LEGEND d 9 38.5-40.8 Sample 17 -NR 51 1.2 41.0- 43. : 3" ST 18 NR 45 Sample 19 43.5-45.0 (CL) very stiff, medium plastic, medium brown, clay, with sill; with sand, trace graved, wet 45 2-2-5 (7) pen= 0.75 Tor= 2.1 19 1.3 (CL) very stiff, medium plustic, medium Sample 20 brown, clay, some silt, some 45.0-47.3 3" sand, trace gravel, wet pen 0.75 Tor = 1.9 20 2.1 ST (CL) stiff, mediumplastic, medium Sample 21 485-50.0 ·.·. 45 brown, clay, some silt, some . Sand, trace growed, wet 21 6-15-20 14 (35) PEN = 1.2 Tai vienne > 50 175 EOB. 51.5 55 1111 HOLE NO. ENG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE. PROJECT Kinnickinnic River 5-3

DRILL	ING LC		VISION REATLASES & OHIO RIVER	DET	RON	DIST	RICT	SHEET (278		
KINK	ICKI	NNIC	River	10. SIZE	AND TYPE	OF BIT	414" HSA	\$L)			
LOCATION				- 19	1985 IGLD						
DRILLING	AGENCY	COL	EMAN ENGINEERING.	DI	EDRIC	HA	DATION OF ORIC	6			
HOLE NO.	(A . show			13. TOTA	EN SAMPI	OVER.	N QI	Q	080		
NAME OF	DRILLER				L NUMBE		the state of the second st				
DIRECTIO	and the second se	Internet Statements	P.OCHS .		ATION OF	the second second second	ATER 6.4	COMPLETED			
VERTI	AL 2	NGLINED	DEG. FROM VER				26-00	4-26-00	0		
THICKNES	and the second sec	Seator Statements			L CORE P		Y'FOR BORING		*		
TOTAL DE			51.0	- 19. SIGN	ATURE OF	INSPECT	OR				
LEVATION		LEGEND	CLASSIFICATION OF MATER (Description)		the second se	BOX OR	(Drilling time, s weathering, e	MARKS weier loss, depth le, II significant	^{ره} ر		
			Topsal N.	0.4		IA	Sampte 1	0.0-2.0			
			(F: 1) concrete chunks,	0,1	1.1		2-4-6-5				
						18 .					
	=					-	:				
	1111		(11) medium der se, yellowish loos Silts and, with broken cond routs, maist	ver fre			Sample 2	- 20 - 40			
			routs, massist	and, finner	1.6	ZA	8-9-5- (14)	6			
	-		(mL) raft sticled plants and	3.3	1.~		(14)				
	-		(nL) saft, stight, plastic, dart silt, 3000 sand, trace roots,	maise		23					
			(ML) soft, slightly plastic, dar sitt, some soud, truce roits grand, wat @ 5.6	k Grawn,			Sample 3	4.0 - 6.0			
	5-		grand, wet @ 5.6	, trace	1.1	3	7-8-3	-2			
	-				{ , I	1	· · · · · · ·				
· · ·	-		(ML) WRALL CAPE of LT LU Obretie	not been				11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	No.		
			(Mi) very soft, slight by plastic sill, trace sand, trace w	med brann			Sample 4	69-80	20		
	-				0.4	4	1-2-1-	2			
						L.					
	-		(PT) very soft north shakely pla	S.D			1 In E	80-10.0			
	-		brown, feat, with silt, truce s wood + costs, trace shells, u	und some		5	Sample 5	Wert 0163	121		
					1.1		(°)			
	10-		(OT)								
	-	1	(PT) very soft, Ebrous, med. brac some silt, trace sund, trac	en Peor				10.0- 12.0			
`	_		wer		1:2	6	Will - worked		E		
	-				1. 2.	9	(10)) .'			
			(BT) Peat						F		
• `		3			0.8	7A		12.0414.13	E		
		-			0.0	·78	LADON HUMA	t = 1	F		
			Sundwary losse grangish brown, Fic, san	-a, some site	.74				1		
		1	(TT) very saft, fibravs, med brav with sill, trace sand, some	wy Peat	12,0	76		140-160			
	15-		Sample asalls Flow bistoria th	a ground the		U	Sample &	1-6-0015-1			
		1	brown		1.7	8	1	0)			
	-		127.00.20	16,0)						
		1.	(OL) very soft, shightly plasti	c, greenish			Sample 9	16.0-18.9			
	-	1	brown organic sith Traces	1	1.8	9	WOH-WALL	-un- 12012	1		
		1			. 0		(0)				
			INTURNES A MAN					184.20	0		
		1	Webuch stands and the trace	sand rioce		. 45	Sample 10 WOH-work-c	>15-1	Q		
		-	wood, trace shells, wet	h	۲,۱	11)	(0)	and a c			
									5		
HAR TOR	20	1	US EDITIONS ARE DESOLETE.		PROJEC	r	25	HOLE	NO.		

						•. •			Hole	No.: S	
DRILL	ING LO	G C	VISION EATLA	INES I OF	to Rive	ER. DE	LOI	DIST	RICT		SHEET
KINK	ICKI					10. 5122	AND TYPE	C OF BIT		ISA	
LOCATION				· · · ·		19	85 IG	LD		lenner og kanner og k	
. DRILLING	AGENCY	Cal	(wAAA)	EVEINE	eenink		EDRIC	H A	DATION OF OF	ince	
HOLE NO.	(As show			The second se	Contraction of the local division of the loc	A PARTY AND A PART	AL NOLOF	Contractory of the Owner of the	Name of Street o	UNC	TURBED
AN INA NU	0111 /0			5-	9	14. TOT	AL NUMBE	R CORE B	OXES		
	. /	LANUT	P.OC	HS		15, 262	VATION G		TER	COMPL	
VERTI					FROM VE	AT. 16. DAT	EHOLE		26-06	426	
. THICKNES						17. ELE	VATION TO				
DEPTH OR	ILLEO IN	TO ROCK				19. 5101	ATURE OF		YFOR BORING		
. TOTAL DE	PTHOF	HOLE	The second se	1.0			LANY S.	Reid	the second s	REMARKS	
ELEVATION	•		GL	ASSIFICATIO		ERIALS	& CORE RECOV. ERY	BOX OR SAMPLE NO.	(Drilling tim weathering	e, water los , etc., il eli	e, depth of inilicent
6	300	6		n	d					9	
									:		
	-										
	-										
•	. =		(01)	and a strate	the about						•
	-		brow	n, organic = , trace shell	ilt, frace s	ind, traces			Sur ale in	-	
	0-=		(OL) VESA	soft, medium	n plastic.	areanish	c	11/3	Sample 11 WOR1-000		2F0
	25-		6 Marin	d, some she	ells wet	ill, trace	1.4		pen= 00.0	207	2
•	-			1. Ibilli - N. Mellow	,			113.	TOC : 0 4		
	-		iow were	soft, wed in	m plastic,	greenish			26.0 . 2	8.3	
		3"51	brun	or, cluyen o	510000	eilt ense			3" shell	yTube	
	-			o, nace sh	clas, we		2.3	12	pen: 0.25		
	-	1							10		
	-			•		128.6					
	-		-	·	1	0.0.9			· · · .		
	=	1	(CL) ver	ry soft, no.	nto slight	tly plustic,		13	-Sample 13	3 24.0	- 11
	30-	3	san	enish brow M, Trace wood,	, trace she	els wet	1.0	13	WOH -000		
	-	1					1.0) .	
、	-		-			•					
										.'	
	-									,	
· ·	-	1				t32.	5		Hit gas poel down until	het @ 34.	O. Shut
	-	1							ON SITE, I	Readings fro	in year
		1							metter work	0	
		1-	-								
	3	-	(SM) ve	me silt, ta	wyish brow ace glavel	m, f-c, sand	• .	4.8	Scomple 14 Wolt - 1-	340	- 36.0
V :	35-						1.1	14	. (z)		
	-	3					1.4				
	-							-			
		3		·			ŀ		· ·		,
	-										
	-	3									
	-										
	11	-							02:20.8	0.0 00	o others
	-		(SM) IDA	se, arongish be	cown, F-c.	sand, some			Sample 1	5 39.0	-41.0
	-		Sil	r, tract grows	el, wet		13	ISA	3-4-4	-4	
	UD-										

5-4". Hole No. . GREATLANES & OHIO RIVER. DETROST SHEET 2 DRILLING LOG DISTRICT 013 SHEETI 10. SIZE AND TYPE OF BIT 4 MAR MSA KINNICKINNIC RIVER 1985 IGLD 12. MANUFACTUREATS DESIGNATION OF DRILL DIEDRICH DSO LOCATION (Coordinates or Station) S. DRILLING AGENCY COLEMAN ENGINEENING.CO UNDISTURBED 13. TOTAL NO. OF OVER. BURDEN SAMPLES TAKEN HOLE NO. (As shown on drawing tills and life numbed 6-4 0 S. HAME OF DRILLER RANDY OCHS . 14. TOTAL NUMBER CORE BOXES 16. ELEVATION GROUND WATER 994-26-06 . DIRECTION OF HOLE STARTED 16. DATE HOLE 4-26-06 VERTICAL MINCLINED. DEG. FROM YERT. 17. ELEVATION TOP OF HOLE 7. THICKNESS OF OVERBURDEN 18. TOTAL CORE RECOVERY FOR BORING 19. SIGNATURE OF INSPECTOR 8. DEPTH DRILLED INTO ROCK Rece S. TOTAL DEPTH OF HOLE 51.0 Aller 5 0 A CORE RECOV. BOX OR SAMPLE REMARKS (Prilling lime, water isse, depin, of weathering, etc., if eignificent 9 CLASSIFICATION OF MATERIALS ELEVATION DEPTH LEGEND nb d * Sample 15 3-4-4-4 (c) very Stiff, medium prestic, light brown, clay truce silttrace saw, trace grand, wer so trace grayist Br. clayer and pine, wer 39.0-41.0 55 (8) 111 1.6 ISB pen: 1.2 Tor = 2.5 41.0' (L) Stiff, medium plashic, light blow clum, trace with trace sand, Teace grand, wes • Soumple lie 41.0-43.3 Undietstbeck pen= 0.5 Tor= 1.1 3 "51 16 1.6 060 pipm others 02-20.8 (CL) Stiff, medium plastic, light brown, 45 Sample 17 44.0-46.0 eluy, roce sill, trace sand, trace 5-4-5-6 45 gravel, wet 1.7 17 pen= 0.5 Tor = 1.75 Oz= 20.8 000 ppm others (CL) very shift, pied plashe, hight broch. Sample 18 49.0-51.0 claytrace silt, trace sand wet 45 3-4-4-5 50 1.5 18 pen : hi Tor: 3.1 EOB 51.0 •• water level @ 6.4' afrer 12 his MOLE NO. Kinnickianic River ENG FORM 18 36 PREVIOUS EDITIONS ARE OBSOLETE. 5-4

DRILI	ING LC		REATLANES & OHIO RIVER	DET	ron	Dist	RICT OF 3 SHEETS
KINI	UCKI	NNIC	RIVER		AND TYPE	and the second second second second	HOWH (TOM & MSL)
2. LOCATION	(Coordin	ales or Sid	allon	19	85 IG1	-D	
S. DRILLING	AGENCY	COL	EMAN ENGINEERING.C.		EDRICI	1 A	SO .
A, HOLE NO.	(As show			13. TOTA	EN SAMPL	OVER.	N DISTURBED UNDISTURBED
. NAME OF	DRILLER				L NUMBE	-	
. DIRECTIC		KANDY	P.OCHS .	15. ELEN	ATION GR	and a standard or standard	ATER -5.2 ATED COMPLETED
			DEG. FROM VERT.	16. DATI	HOLE	4-	25-06 4-25-06
THICKNES				- 17. ELE	ATION TO		the second s
. DEPTH DA	ILLED IN	TO ROCK		the second se	ATURE OF	and places and a sub-	Y'FOR BORING %
. TOTAL DI	PTH OF	HOLE	46.5	-	ang S.	Reich	
ELEVATION C	DEPTH b	LEGENO	CLASSIFICATION OF MATERI (Description)	ALS	CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, weiter idee, depth of weathering, etc., is significent) 9
	-		concrete .	0.4			Sample 1
		-	(Fill) dark black Silly san som some manmade bolts trace h	e granel			Hand dug 2.0 to check For electric to Morina
			Same wantmake guily Truce h		1	1 .	Lights
	-						1
	-		(til) dense, duric black, fre, silty Trace concrete, Frece grand	Sand			
	-		wood + reats, maist		1.6	2	Sample 2 2.0-4.0
	-						7-10-15-14 (25)
•	-						•
	-		(Fill) very dense, black, fe, silt trace growed, trace wood, we	y soud,		3	Sample 3 4.0-6.0
	-=		tuace gravel, trace wood, we	@ 5.2	1.2	-	11-33-27-9 (40)
	5-	}			1		(40)
	-		(Fill) loose, black, f.c., silly soul.	Trace grand			Sumple 4 6.0-8.0
			trace brick, wer				5-2-2-1 (4)
	-		(DL) very soft dightly placed and	7.1	1.4	ЧA	(1)
	-		(DL) very soft, shightly plassic, areen organic 5: 11, truce sond, trace i shells, wet	road, Frace		48	
				aniat			Sumple 5 8.0-10.
	-		(OL) very soft slightly plastic, cu brown, organic sill, trace an wood, trace shells, trace gras	d trees	1		1- WOH- WOH -!
			Trace grad	net wet	,8	5	(0)
	10-	1	OL) very soft, slight ly plastic,	arrenish			Sample 6 1019-12.0
	-	1	brown, organic sill, Hace &	and. Trace		6	Sample 6 1010-12.0 1-1-1-1
		1	what costs, teach shells, trace	gravel,	1.2		(2)
	-		Mar she	•••	3.0	•	
	-	1	(OL) soft, slightly plastic, green	sish hran		du -	1 1 7 100-140
		1	gravel, trace woods roots	71369	i.		Sample 7 10-170
			grave, more worst stors,		1.2.	1	(8)
		3					
.[5.		(b) as a child whether a	reenish	-		Sample . 8 14.0-16.3
		-	(OC) very soft, shaktly plastic, 9 bruyen, dogunic sill, trace	sand,	- 10-	0	sample is undisturbed
	5-	3"55	Truck grassel, Trock wood a cust chells, wet	, Trace	1.7	8	
		1					
	-						Sample 9 16-5-18.5
		-	bed very soft, shightly plastic, you	Casish		9	WOH - WOH - 1 - 1
1			trace wood rosts, reace shalls	surer,	1.8	1	(1)
]		-					
ļ	-	-					
			ODvery soft, slightly Plastic, gree	nish baw		T	Sample 10 19.5-20.5
1	-	1	OCNESS Soft, Slighing Interior, gree Organic sill, Trace sand, trace , trace shells, wet	and + souts	0.7	10	1-1-1-3
		100	Trace sheds, we				(2)
	20	-			1	1	

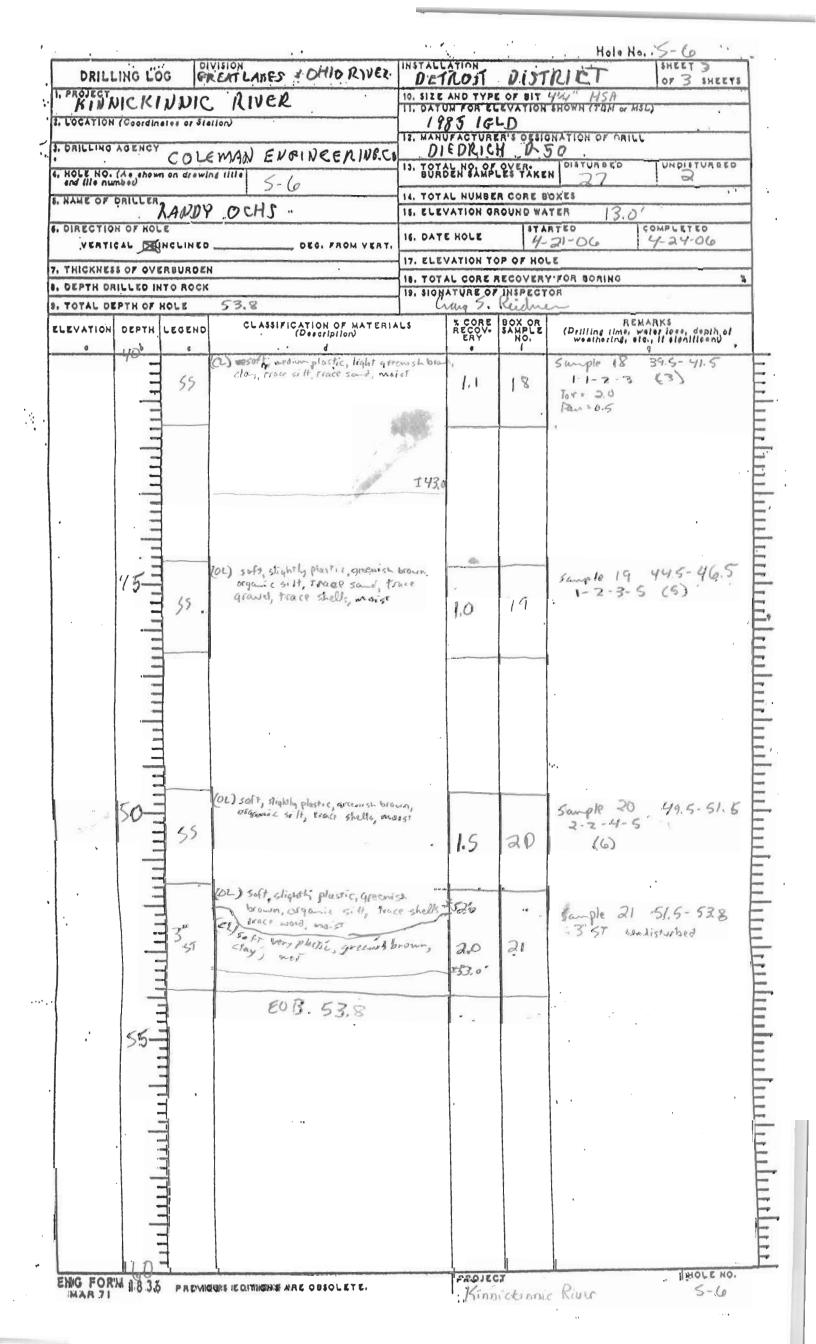
<u>.</u>			- Territor of Address		·· *.			Hole No.	55	
	ING LO			INES & ONID KIVER	DET	ROIT	DIST	RICT	SHEET Q	
KINK	NCKI	NNIC	RI	ver	10. SIZE	AND TYPE	OF BIT	SHOWN (TON or MS	L)	7
I. LOCATION				k _{en} r	19	85 IGI	-D			
S. DRILLING	AGENCY	CAL	mada)	EVEINCERING.C.	12. MANU	EDRICI	H D	DATION OF BRILL		
A. HOLE NO.				5-5	Name of Concession, Name of Concession, Name of Street, or other Division, Name of Str	L NO. OF	where the owner of the second second	the state of the second st	20	1
					14. TOT	L NUMBE	R CORE B	oxes		-
S. NAME OF	λ	ANDY	.ocl	НГ	15. ELEN	ATION OF				
. DIRECTIO	N OF HOL	E,		DEG. FROM VERT.	16. DATI	HOLE	14-		4-25-06	
THICKNES					17. ELEN	ATION TO	POFHO	LE		_
. DEPTH OF	Statement of the local division in the local	TO ROCK				L CORE P		Y FOR BORING		5
TOTAL DI	PTHOFH	IOLE 4	6.5			rangs	> Reie	he		_
ELEVATION	DEPTH	ECEND	ÇL	ASSIFICATION OF MATERIA (Description)	LS	K CORE RECOV. ERY	BOX OR SAMPLE NO.	(Drilling time, w weathering, etc	ARKS eler loss, depth of s., if significent g	
	-			n			10			
	F									
	=									
	-							1		
	-									
	=									
•	. =									
	. =	6	bc) veri	n soft, slightly plassic, gil un organic sitt, trace we shells, wit	an ish			Sample 11	24.0-26.0	
	25-3		troce	shells wet		1.8	11	wari-wart. 2		
	~ I							: (2)		
•	Ξ									
	-									
	-									1
	-									
	-									ł
	=									ł
	Ξ							۰		ł
	3	K	OL) so	ft, slightly plastic, green own, organic silt, tra	e sand.			Sample 12	29.0-30.0	E
	30-		tro	ice wood a that's trace s	hells,	1	12	2-2-3-5		
	-		w	t.		1.7	10	(5)		E
•	=				,					E
	-									E
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1	F				brand				21111-21-0	,
			OL) Sofi	t, slightly plastic, greenis jamic silt, trace sand, i	sace wood,	• .		Sample, 13	34.0-36.0	
:	35-		tica	ce shells, wet		1.3	13	2-3-3-3		
						1, 3				
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	-	}						,		
100	-		1						39.0-400	
	=		org	t slightly plastic greenist anic silt, some sund, t	lace word	1	140	Sample 14		Į
		1	tru	ce shells, wet	- 11	1,4	14A	2-2-5-16	(7) .	-
ENC FOR	11836	PREVIOL	JS EDITI	ONS ARE OBSOLETE.		PROJEC	Y	c River	S-5	

			River	TI, DAT	10. SIZE AND TYPE OF BIT 414 HSA 11. DAYUM FOR ELEVATION SHOWN (TOM or MSL)						
LOCATION				12. MAN	85 IG	A'S DESIO	D				
DRILLING	•		EMAN ENGINEERIN		E DRIC			UNDISTURBE	D		
end lile nu					AL NUMBE		1	20	-		
NAME OF	ORILLER X	ANDY	P.OCHS .	THE OWNER WHEN THE OWNER	VATION OF	(sector in the local division in the local	and the second se				
DIRECTIO	CAL DE	÷		16. DAT	EHOLE	STAI 4-	25.06	4-25.06			
THICKNES				17. ELE	VATION TO						
DEPTH DE				19. 5101	ATURE OF	INSPECT	OR BORING		-		
TOTAL DI	T	1	46.5		CORE			EMARKS			
d devation	UND	EGEND	CLASSIFICATION OF MAT (Description)		ERY	BOX OR SAMPLE NO.	(Drilling time, weathering,	EMARKS weler lose, depin of elo,, 11 eigni/iceni) q			
			(OL) N KM LOOSE ARMISE BILMA, For ED-	40.4	1.00	14A	Sample 14 2-2-5-	390-41.0			
	-		Barless and house the sand	40.1		143	273				
	Ξ						1				
6	-										
10	E										
	-										
	E										
			(5 ~) very dense, glayish brown, f. s. gill, trace growed, wet	, sand, some							
	F		sin, have graver, we		1.D	15A	Janpla 15	440.440			
	42		meathered limestone	45.2			32-34-	44.0-460 50/.3 -			
· .	-	•				153 .					
	=			46.5					,		
	-		EOB 46.5								
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	NI 1836		k		IPROJEC	1) _[MOLE NO.			

DRILL	ING LO	G	KEATLANES & OHIO RIVER.	DETRON DISTRICT OF 3 SHEETS						
			RIVER	10. SIZE AND TYPE OF BIT 414 " 45A 11. DAYUM FOR ELEVATION SHOWN (TDAI or MSL)						
LOCATION					RJ IG		SHOWN (TOH or MSL)			
. DRILLING				12, MANU	FACTURE	R'S OFSIC	INATION OF DRILL			
• .	•	core	EMAN ENGINEERING.CO	And in case of the local division of the loc	EDRIC	H D J	DISTURBED UNDISTURBED			
end lile nun							31 1 1 4			
NAME OF	PRILLER	2 41204	· OCHS ··	A Design of the Owner, Spinster, Spi	Statement of the local division of the local	R CORE B				
DIRECTION	N OF HOL	E	.0 0115			1 STA	ATED COMPLETED			
VENTIC	AL DE	NCLINED	DEG. FROM VERT.	16. DATE			21-06 4-24-06			
THICKNES	S OF OVE	REUROEN	· ·			POF HO	Y FOR BORING %			
. DEPTH OR		Name of Street, or other			TURE OF	INSPECT	OR-			
, TOTAL DE		HOLE	63.8		A DESCRIPTION OF THE OWNER OWNER OF THE OWNER OWNER OF THE OWNER OF THE OWNER OWNE	BOX OR	REMARKS			
BLEVATION	рертн. 5	LEGEND	CLASSIFICATION OF MATERIA (Deedription)		RECOV. ERY	BOX OR SAMPLE	(Delling lime, weler loss, depth of weathering, etc., il elentiticent			
1	-		Topsoit				sample 1 0.0-1.5			
		55	(ML) your soft the http: alastic	durk	0.6		(2)			
	-		provens silt, trace grousel, t trace organics, moist	race said,						
			(m) and the second				Sumple 2 1.5-3.0			
		55	(mc) very soft, slightly plastic, due silt, trace growel, trace sund,	trace	A		3-5.3			
	11		Decionics, maist		0.8	Z	(8)			
			(M) a start the large b	is here						
	-		(MC) very soft, slightly plastic, du silt, trace gravel, trace saws, t	AUC6 DHIMIN			bample 3 3.d - 4			
		55	organnies, moist	4.2	0.9	3A	3-7:3			
			(GM) lovie; med, brown, 6-6; 4ilthy trace grawd, maist	110	1	3B	(6)			
	5-		(mc) Soft slightly plastic night he	AT	NR	4	sumple 4 4.5-60			
	-	55	Trace grand, trace sund , A	TRIOM	0.3	1	3-3-4			
•	-	· ·					(7)			
	-		(ml) soft, slightly plastic, med bra prace gravel, trace saw, moi st	wa, silt,						
		55	race grave, frace sand, moi st	7.0	0.9	SA	Sample 5 6.0-7.5			
			(3m) louse, light brown, fre, sand	50000	0.4		4-4-5 (4)			
	-		(3m) louse light brown, fre, sand sitt, trace grand, trace to oth,	phoist	Propagation of the local distance of the	53				
		55	(Sm) mose, light brown des, sound, s trace growed, trace roots, n	owe silt,		6	Sample to 7.5-90			
		22		10157	1.0		6-5-4 (4)			
			(2M) when had all because of a second	4						
		55	Sim) using longing to brown, for, sound, s there is a reveal, trace roots, more si	t some sing		7A	Sample 7 9.0-10.5			
	10-		(PT) Peak, Black, silty	10.1	Pa U		2-2-1			
		1		10.5		78	(5)			
	-		(Sm) house, grayish brown, Fe, Sand, trace graved, trace	Sility			Sample 8 10.5-12.0			
	-	55	wet	indervis?	1.Z	.8	a-1-2 (3)			
				12.0		-10				
· ·			(mc) wang soft, slightly plastic, que	· ··		9	Sample 9 12.0-13.5			
48 hrs	5-	55	brown sands with trace grave	, Theee	1.4		2-1-1			
1000	V -	3					12) water herel after 48 hrs. = 13.0			
	-		(me) very soft, slightly places, grang soundy site, rece ground, time wood	sh brown		-	Sample 10 13.5-15.5			
4			"	14.7	1.10	HOM	(J) -1-2,3 (3)			
	15-		tim ween loss groushbrown fre si trace growed, true argumés, wet	Thy sand						
		3	- Handy the organies, wet			10B				
	-		(3 m) very loose, fight brown, f-c, 5	and,			Sample 11 15.5-17.5			
I		•	some silt, trace gravel, wet	181 - 2018 -	0.9	11	(3)			
		E	· •				(5)			
		1								
		-	(SM illupose, light brown, 4-2, samd,	Same			Sumple 12 17.5-19.5			
		Ť,	silt, trace graved, there wood, u	et	2.0	11.2	3-2-2-3			
					D.9		(4)			
		-								
			(from) Hoose, light brown, fre, sound, so	me gitt	1.18	13	- Surpla 13 19.5-215 3-2-2-3 (4)			
ENG FOR	120	1	Troce gravel mex		I APRICOULES	an .	INOLE NO.			
SUA I AUN	110.56	D D F VAM	E OTHIGHIS ARE O'ESCOL ETTE.				River 5-6			

			, I	1000000	17101	-	Hole N	0. 5-10
	LING LC		REATLANES & OHIO RIVER		ron		RICT	SHEET Z OF 3 SHEETS
KINK	VICKI	NNIC	2 River	10. SIZE	AND TYPE	EVATION	HOWN (TON or H	(SL)
LOCATION				- 19	85 IG	LD		
DRILLING	AGENCY	COL	EMAN ENGINEERING.		EDRIC	HA		6
HOLE NO.	(As show			- 13. TOT	DEN SAMPI	OVER.	N 27	Z
			8 .OCHS	Contraction of the local division of the loc	AL NUMBE	other Designation of the local division of t	NAME AND ADDRESS OF TAXABLE PARTY.	
DIRECTIO	N OF HOL	AADU'	Y OCHS "		VATION OF		ATED	COMPLETED
VERTI	CAL S	-	DEG. FROM VER				7-21-06	4-24-06
THICKNES	S OF OVE	RSURDE	N ·		AL CORE P		Y'FOR BORING	
TOTAL DI			53.8	19. SION	ATURE OR	INSPECT	OR	
LEVATION	1		1		and some diversity of		RE	MARKS
4	200	6	· · · d		ERY	No.	weathering, e	water loss, depth of is., if eignificand
	-		(Sm) Loog light blown, fee san sill trace gravel, we	d, some			Sample 13 3-2-2-3	19.5-21.5
	-	{			1.4	13	3-2-2-5	
	-							
	-						с.	
	=							
	-	1						
	=]		
	-							
		-	4.21					
	25-		(EM) LOOSE, light brown, f.e. 3. SI It, trace gravel, wet	nd, some	14.4		Sample 14 2-1-1-2	24.5-265
	-					1.5	~ (2)	
· .	-			212				
			ML) very-soft, non toslightly plastic	26.3	1 11.13			
			brown, scundy silt, Tract ,	ravel, we				
		1						
	-	1		=28.0				
	-	1		.•				
		1					•••	
			Repaired and said so	6				29.5-31.5
	30-		(3m) beigloose, glagish brown some sitt, trace graved	, wet	Λ		Sampt 15 1-1-2-2 (3)	0112-212
`	=	3			15	1.5	(3)	
							8	
,								. •
		4						.•
•	-							
	÷							
		1						
		T	. utoria n				an di	
	20	-	Emploose, gray, sh brown, f-e, yand, s Troce grave, wet	Some So Wa	116A		Sample 16	- 34.5-36.5
	35-					1.8	3.2.2.2 (4)	
		Ξ	OLT soft, ships plastic, greenish brown, org	SS. 71	163	an o	pen=0.25	
		"	Chivery loss grayist brown, the a	1	II D			
			Take and they shalls wet	1 365	A I		Sample 17 3" shally To Undistu	365-38.8
			(So) brong F-C, Sank, T. Mue Silt, U.	137.00	1	1.3	Undistu	rbed
			Seberann, E-E Clayey sandy in	shelle wet	17			
l.		-	Chayley Sandy w	et ± 38.7	-3			
		-		Accession of the second se		Com. 1		
			arth for	1 731,2	*	and the second	1 1 10	39.5-41.5
	113	-	((2))		11.8		Sample 18	-3 (3)
and the second se	1:8 3 6	and some division of the local division of t					nic River	HHOLE NO.

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APPENDIX F

FIELD REPORT NOTES

	COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906) 774-3440 Fax: (906) 774-7776	DATE 4-17-06 GD-06032 PROJECT KINNIC RIVER STABILITY/DREDGES LOCATION MILWAUKEE, WISCONSIN							
TO:	BARR ENGINEERING CO.	CONTRACTOR	OWNER U.S.ARMY CORPSOFEND.						
	4700 W, 77th St.	WEATHER	TEMP. ° at AM ° at PM						
	EDINA MINN 55435-4803	$\begin{array}{c} \text{present at site} \\ C \in C \end{array}$							
	Report No/ Page _/_ of /								

Purpose of site visit: COLEMAN ENGINEERING Co. (CEC) mobi KIMMICKIMMIC River projec The day hear at 6:30 Am h the loading oday. of Eguinmen CULW 4 hA D.VVIV? ano Milwa 14 150 On O Pm. Uti ~ charance 14 thun Took the even 10 were cleared Services completed: 11 tilities U. MOR a at was parked The semi Doring dar m

Outcome of the site visit or services completed:

Other observations, additional services requested or next scheduled visit:

FIELD REPORT SIGNED Craig Reidner

Iro	IAN ENGINEERING COMPANY 635 Circle Drive n Mountain, Michigan 49801 (906) 774-3440 Fax: (906) 774-7776	DATE 4-18-06 GD-06032 PROJECT KINNIC RIVER STABILITY/DREDGESTUMP LOCATION MILWAUKEE, WISCONSIN						
TO:		CONTRACTOR	C	OWNER	ANA12 (CARMAGER		
DARR	ENGINEERING CO.		ENG. Co			corps of end.		
4700	W, 77+4 St.	WEATHER		TEMP.	• at	AM PM		
	A MINN 55435-4803	PRESENT AT SIT	re					
Report N	No Page of /				_			
the drillin safety w drill beg Services completed until a Refusal The ere at 7:15	1: Drilling of Boring 13-1 uger drilling refusa Doccurred at 42.2	B-1 and fuel # su ng of Bos Degan a l was l was	held +1 upplies ring B-1 t 12:4 eucoun in B-1	the the bigo 5 pm	first set v in, n i ar	1 continued		
Other observation	s, additional services requested or n	ext scheduled	l visit:					
СОРУ ТО:		FIELD SIGNED				dner		

COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906) 774-3440 Fax: (906) 774-7776	PROJECT	GD- 06032 GD- 06032 SR STABILITY/DREDGE STUD VISCONSIN
TO: BARR ENGINEERING CO.	CONTRACTOR	OWNER U.S. ARMY CORPSOFEND.
4700 W, 77th St.	WEATHER	TEMP. ° at AM ° at PM
EDINA MINN 554354803	PRESENT AT SITE C E C	
Report No. 3 Page 1 of 4		

Purpose of site visit: The crew sta VIO ş at m 280 0 the m 0 5 ca whi Services completed: 00 ions th NI VS 7, 2: m n no oting V & COV COMN un pm i. +h. 6

Other observations, additional services requested or next scheduled visit:

FIELD REPORT maight SIGNED dues

	COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906) 774-3440 Fax: (906) 774-7776	PROJECT	GD- DGD32. ER STABILITY/DREDGESTUN VISCONSIN
TO:	BARR ENGINEERING CO.	CONTRACTOR	OWNER U.S.ARMY CORPSOFEND.
	4700 W, 77th St.	WEATHER	TEMP. ° at AM ° at PM
	EDINA MINN 55435-4803	PRESENT AT SITE C E C	
	Report No Page of /		

Purpose of site visit: 12.2 + h P CEMAN an Site UN IN drilling Dri 3 0 an wa 10 pic The Services completed: now O) trees av This were comp al 2 at 0 pm 24

Other observations, additional services requested or next scheduled visit:

FIELD REPORT

eidner SIGNED Graig

	COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906) 774-3440 Fax: (906) 774-7776	DATE 4-21-06 PROJECT KINDICKINDIC AND LOCATION MILWANKEE, U	ER ST	- 06 Гавілн	Y /DREDGE STUD
TO:	BARR ENGINEERING CO.	CONTRACTOR COLEMAN ENO. CO	OWNER U.S.		CORPS OF END
	4700 W, 77th St.	WEATHER	TEMP.	ē at	t AM PM
	EDINA MINN 55435-4803	PRESENT AT SITE C E C			
	Report No. <u>5</u> Page / of /				

Purpose of site visit: 7:30 Am T 0 at Ara MA On m D ina a i S Am Services completed: a the ave th m \$ pm OVO

Other observations, additional services requested or next scheduled visit:

СОРУ TO:

FIELD REPORT eidner

SIGNED Chaig

	COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906) 774-3440 Fax: (906) 774-7776	DATE 4-2 PROJECT KIDVICKII LOCATION MILWAU	VPIC AIVE	ER STABI		
TO:	BARR ENGINEERING CO.	CONTRACTOR LOLEMAN		OWNER U.S.ARM	y Corpso	FENB
	4700 W, 77th St.	WEATHER		TEMP.		AM
	EDINA MINN 55435-4803	PRESENT AT SI C C C	<u>re</u>			
	Report No. 6 Page / of /					

Purpose of site visit: began The crew a SUDI E arrivin her 144 Services completed: etion was h rmin in t A ONE as botween 45 Ś 4: Pm 4 Outcome of the site visit or services completed: thd us 3 C use ve complet. 0 o. Recov ad crew et Pm

Other observations, additional services requested or next scheduled visit:

COPY TO:

FIELD REPORT

ner

SIGNED Craig.

	COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906) 774-3440 Fax: (906) 774-7776	DATE 4-25-06 GD-06032. PROJECT KINNIC RIVER STABILITY/DREDGESTWI LOCATION MILWAWKEE, WISCONSIN CONTRACTOR						
TO:	BARR ENGINEERING Co.	522	U.S. ARMY CORPSOFEND					
	4700 W, 77th St.	WEATHER	TEMP. ° at AM					
	EDINA MINN 55435-4803	PRESENT AT SITE C E C						
	Report No7 Page / of /							
Purpose Supj Ov-e Bor	rto Boring 125. The setup 1 ing 12-5 was drilled and s	safet, meet	ing and moving					
an		1 /.						
Services	all record Reeping, Eleft	the site at	6:30 pm					
Services	P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-		6:30 pm					

Other observations, additional services requested or next scheduled visit:

FIELD REPORT SIGNED Chaig Reiding

	COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906) 774-3440 Fax: (906) 774-7776	PROJECT	GD- DGO32_ CR STABILITY/DREDGE STUD VISCONSIN
TO:	BARR ENGINEERING CO.	1916	OWNER U.S. ARMY CORPS OF END.
	4700 W, 77th St.	WEATHER	TEMP. ° at AM ° at PM
	EDINA MINN 55435-4803	PRESENT AT SITE C E C	244
	Report No. <u>}</u> Page / of /		

Purpose of site visit: 30 Degan Am 01 CIAPU) auges L. a 1.0 5 0 n 9.4 mb Services completed: con 600 wer 84 abou MAC NA OV con NTIO Once o otina C 10 Outcome of the site visit or services completed: 40 R 0.00 compl 12 Na the comp ning -0 pm an

Other observations, additional services requested or next scheduled visit:

FIELD REPORT SIGNED Chaig K Ridner

	COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906) 774-3440 Fax: (906) 774-7776	DATE 4-27-06 PROJECT KINDICKINDIC RIVE LOCATION MILWAWKEE, U	ER. STABI	LITY /DREDGE STUN
TO:	BARR ENGINEERING CO.	CONTRACTOR COLEMAN END. CO	U.S.ARM	Y CORPSOFEND.
		WEATHER	темр.	° at AM
	4700 W, 77th St.		° a	t PM
	EDINA MINN 554354803	PRESENT AT SITE C E C		
	Report No. <u>9</u> Page <u>/</u> of]			

Purpose of site visit: 0 Ch eu) CYM avin ma ins AM to wors al Services completed: 01 B 8 Com th on

Other observations, additional services requested or next scheduled visit:

FIELD REPORT

SIGNED Craig Reidner

	COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906) 774-3440 Fax: (906) 774-7776	DATE 4 -28 - 1 PROJECT KINDICKINDIC LOCATION MILWAWKEE CONTRACTOR	RIVE , W	R. STAB	IL TTY	DREDGE STUNP
TO:	BARR ENGINEERING CO.	COLEMAN ENO.			1Y C	ORPSOFENS
	DAILLE OF OTHE CICIND CO.	WEATHER		TEMP.	• at	AM
	4700 W, 77th St.			0	at	PM
	EDINA, MINN 55435-4803	PRESENT AT SITE C E C				
	Report No. <u>/0</u> Page <u> </u> of /					
Service	to Iron Mountain at 4:15 pm. Samples were secured,	14 1 0 0 0	- w lat	es st	Du-	ed the all records the 45 Pw
Other of	observations, additional services requested or n	ext scheduled visit:				
СОРУ ТО:		FIELD RE	EPC	ORT	1	
		SIGNED G	aig	/(lid	nn

APPENDIX G

LABORATORY TEST RESULTS

Geotechnical Samples for Analysis

Boring	Sample #	Bottom Depth	Туре	Recovery [ft] (und.)	Moisture Content	Grain Size	Atterberg Limits	Dry Density	Unconfined Compression	Specific Gravity	CIU Triaxial Compression w/ Pore Pressure
S-1	8 8	12.0	SS	(unu.)				Dry Density	Compression	x (OL)	r die riessuie
S-1 S-1	<u>9</u>	12.0	<u> </u>		X	х	Х	~		X (OL)	
S-1	9 10	15.0	SS		v			X			
S-1	10	18.0	SS		X	х	×				
S-1	12	21.0	SS		X	X	Х				
S-1	14	21.0	Und.	2.1	Х	Y	×	×			~
S-1	17	<u> </u>	SS	2.1	v	х	Х	X			Х
S-1	17	38.5	SS		X			X			
S-1	10	20.0	Und.	2	Х	N.	Y	X	X	x (ML)	
S-2 S-2	10	38.5	Und.	2.1		Х	X	X	<u>X</u>	X (IVIL)	
S-2 S-2	14	46.5	SS	2.1	v	N/	Х	Х	Х		
S-2 S-3	9	46.5	SS SS		X	Х					
<u>S-3</u>	9 12	15.0 19.5	<u> </u>		X				UN DRY DENSI	TV TEOTO	AT C O
S-3	13	21.0	SS	FUUR SAIVIPL			VAIENT) C			11 123137	41 5-3
	-	-			X	Х					
S-3	16	35.0	SS Und.	0.1	Х		X				
S-3 S-4	20	47.0		2.1			Х	Х	Х		
S-4 S-4	6	12.0	Peat	0.0	Х						
	12	28.0	Und.	2.3		X	X	X			X
S-4	16	43.0	Und.	1.6		X	X	X	Х		
S-5	8	16.5	Und.	1.7		Х	Х	Х			Х
S-5	13	36.0	SS		Х	Х				x (OL)	
S-6	13	21.5	SS	1.0							TO
S-6	17	38.5	Und.	1.3	SAND & G	KAVEL IN	I SHELBY (INABLE TO F	PERFORM PROF		15
<u>S-6</u>	18	41.5	SS				 			x (CL)	
S-6	21	54.0	Und.	2.0	10		X	X	<u>×</u>		
		() ()		Total	12	11	11	11	5	4	3
	Inorganic Silt			Budgeted	12	12	12	12	6	0	3

Organic Silt (OL) Till (CL)

SS=Split Spoon Und.=Undisturbed

					Iron M	I ENGINEE 635 Circle ountain, Mic 5) 774-3440	e Drive chigan 49	9801	76			
		PAR	TICLE-	SIZE		'SIS OF S STM D422)		HYDRO	METER	ł		
Project Name:	Kinnickinnic	River S	tability A	nalysis				Job I	Number:	GD-06	6032	
Client:	Barr Engine	ering Co	mpany									
Address:	4700 West	77th Stre	et, Edina	a, Mn 5	5435-48	03						
	(OH) ORGA some clay	ANIC SIL	T, gray-b	olack, hi	gh plasti	city, with sa	and,		ring No: nple No:	S-′ 8	1	
	some clay							Jan	•	10.5-12.0		
Dispersir	ng Agent:		So	dium Hex	ametapho	sphate		Date R	eceived:	4/18/2	006	
	Amount: ter Number:			2H	1		For Hy	iginal Samp /drometer /	Analysis:		98.2 %	
	• • •	Ū					/eight of	Sample Dis	spersed:	50.0	<u>)0 </u>	•
Starting Time: 9:31:00												
	Time	Elapsed Time Minutes (T)	Hydrometer Reading	Temperature [°] C	Correction (DR)	Corr. Hydrometer Reading (R)	Percent Soil in Suspension (P)	K, Values from Table III	L, Values from Table II	Calculated Grain Diameter, mm (d)	Percent of Total Sample C.G.D.	
	9:31:30	0.5	40	20	4	36	74.2	0.01426	9.7	0.0628	72.8	
	9:32:00	1.0	38	20	4	34	70.0	0.01426	10.1	0.0453	68.8	
	9:33:00	2.0	36	20	4	32	65.9	0.01426	10.4	0.0325	64.7	
	9:36:00	5.0	26	20	4	22	45.3	0.01426	12.0	0.0221	44.5	
	9:46:00	15.0	12	20	4	8	16.5	0.01426	14.3	0.0139	16.2	
	10:01:00	30.0	9	20	4	5	10.3	0.01426	14.8	0.0100	10.1	
	10:31:00	60.0	8	20	4	4	8.2	0.01426	15.0	0.0071	8.1	
	11:31:00	120.0	7	20	4	3	6.2	0.01426	15.2	0.0051	6.1	
	13:31:00	240.0	6	20	4	2	4.1	0.01426	15.3	0.0036	4.0	
	8:12:00	1361.0	5	20	4	1	2.1	0.01426	15.5	0.0015	2.0	

Tested By: R Backlund
Submitted By:

Date: 5/11/06
Date:

					Iron M	I ENGINEE 635 Circle ountain, Mi 6) 774-3440	e Drive chigan 49	9801	76		
		PAR	TICLE-	SIZE		'SIS OF S STM D422)		HYDRO	METER	1	
Project Name:	Kinnickinnic	River St	tability A	nalysis				Job I	Number:	GD-06	6032
Client:	Barr Engine	ering Co	mpany								
Address:	4700 West	77th Stre	et, Edina	a, Mn 5	5435-48	03					
Remarks:	(OH) ORGA clay						and, with		ring No: nple No:	S- 12	1
	ametapho	snhate			Depth:	16.5-18.0					
Dispersir	ng Agent:				anotapilo			Date R	eceived:	4/18/2	006
Hydrome Specific St:			2H 39		N	For Hy	ginal Samp /drometer <i>F</i> Sample Dis	Analysis:	<u> </u>		
00	arting Time:		9.19	.00							
	Time	Elapsed Time Minutes (T)	Hydrometer Reading	Temperature [°] C	Correction (DR)	Corr. Hydrometer Reading (R)	Percent Soil in Suspension (P)	K, Values from Table III	L, Values from Table II	Calculated Grain Diameter, mm (d)	Percent of Total Sample C.G.D.
	9:19:30	0.5	41	20	4	37	74.0	0.01348	9.6	0.0591	72.4
	9:20:00	1.0	38	20	4	34	68.0	0.01348	10.1	0.0428	66.6
	9:21:00	2.0	36	20	4	32	64.0	0.01348	10.4	0.0307	62.7
	9:24:00	5.0	32	20	4	28	56.0	0.01348	11.1	0.0201	54.8
	9:34:00	15.0	27	20	4	23	46.0	0.01348	11.9	0.0120	45.0
	9:49:00	30.0	22	20	4	18	36.0	0.01348	12.7	0.0088	35.2
	10:19:00	60.0	18	20	4	14	28.0	0.01348	13.3	0.0063	27.4
	11:19:00	120.0	15	20	4	11	22.0	0.01348	13.8	0.0046	21.5
	13:19:00	240.0	12	20	4	8	16.0	0.01348	14.3	0.0033	15.7
	8:08:00	1369.0	9	20	4	5	10.0	0.01348	14.8	0.0014	9.8
											<u>.</u>

Tested By: R Backlund
Submitted By:

Date: 5/11/06
Date:

					Iron M	I ENGINEE 635 Circle ountain, Mic 5) 774-3440	e Drive chigan 49	9801	776			
		PAR	TICLE-	SIZE		'SIS OF S STM D422)		HYDRO	METER	ł		
Project Name: Client:	Kinnickinnic Barr Engine			nalysis	and Dree	dging Study	1	Job	Number:	GD-06	6032	
	4700 West			a. Mn 5	5435-48	03						
	(CL) LEAN								oring No:		1	
								Sar	nple No: Depth:	<u>16</u> 27.0' - 29.	.3'	
Dispersir	ng Agent:		So	dium Hex	ametapho	sphate		Date R	eceived:			
	Amount: ter Number:			2H			For Hy	, drometer A	al Sample Used meter Analysis:			
Specific Gravity (G): 2.74 Weight of Sample Dispersed: 40.54 Starting Time: 8:51:00									<u>54</u> g.			
	- -		1				1	[
	Time	Elapsed Time Minutes (T)	Hydrometer Reading	Temperature ^o C	Correction (DR)	Corr. Hydrometer Reading (R)	Percent Soil in Suspension (P)	K, Values from Table III	L, Values from Table II	Calculated Grain Diameter, mm (d)	Percent of Total Sample C.G.D.	
	8:53:00	2.0	32	23	6.3	26	62.8	0.01426	11.1	0.0336	62.4	
	8:56:00	5.0	27	23	6.3	21	50.6	0.01426	11.9	0.0220	50.3	
	9:06:00	15.0	23	23	6.3	17	40.8	0.01426	12.5	0.0130	40.6	
	9:25:00	34.0	20	23	6.3	14	33.5	0.01426	13.0	0.0088	33.3	
	9:51:00	60.0	19	23	6.3	13	31.0	0.01426	13.2	0.0067	30.9	
	13:01:00	250	16	23	6.3	10	23.7	0.01426	13.7	0.0033	23.6	
	8:51:00	1440	14	23	6.3	8	18.8	0.01426	14.0	0.0014	18.7	

 Tested By:
 J. Whelan (SET)
 Date:
 5/16/06

 Submitted By:
 Date:
 Date:

					Iron M	I ENGINEE 635 Circle ountain, Mic 5) 774-3440	e Drive chigan 49	9801	776			
		PAR	TICLE-	SIZE		'SIS OF S STM D422)		HYDRO	METER	ł		
Project Name:	Kinnickinnic	River S	tability A	nalysis				Job	Number:	GD-06	6032	
Client:	Barr Engine	ering Co	mpany									
	4700 West			a, Mn 5	5435-48	03						
Remarks:	(OH) ORGA						and,		oring No:		2	
	some clay							Sar	nple No: Depth:	10 18.0-20.3		
Dispersir	ng Agent:		So	dium Hex	ametapho	sphate		Date R	eceived:			
	Amount: ter Number:			2H	1		% of Original Sample Used For Hydrometer Analysis:99.6					6
	Gravity (G): arting Time:		2.5 9:14			<u> </u>	/eight of	Sample Dis	50.0	<u>00</u> g.	•	
36			9.14	.00								
	Time	Elapsed Time Minutes (T)	Hydrometer Reading	Temperature [°] C	Correction (DR)	Corr. Hydrometer Reading (R)	Percent Soil in Suspension (P)	K, Values from Table III	L, Values from Table II	Calculated Grain Diameter, mm (d)	Percent of Total Sample C.G.D.	
	9:14:30	0.5	40	20	3	37	76.2	0.01426	9.7	0.0628	75.9	
	9:15:00	1.0	38	20	3	35	72.1	0.01426	10.1	0.0453	71.8	
	9:16:00	2.0	35	20	3	32	65.9	0.01426	10.6	0.0328	65.7	
	9:19:00	5.0	30	20	3	27	55.6	0.01426	11.4	0.0215	55.4	
	9:29:00	15.0	18	20	3	15	30.9	0.01426	13.3	0.0134	30.8	
	9:44:00	30.0	12	20	3	9	18.5	0.01426	14.3	0.0098	18.5	
	10:14:00	60.0	10	20	3	7	14.4	0.01426	14.7	0.0071	14.4	
	11:14:00	120.0	8	20	3	5	10.3	0.01426	15.0	0.0050	10.3	
	13:14:00	240.0	6	20	3	3	6.2	0.01426	15.3	0.0036	6.2	
	8:17:00	1383.0	5	20	3	2	4.1	0.01426	15.5	0.0015	4.1	
		-			-	-	-	•		-	I	

Tested By: R Backlund
Submitted By:

Date: 5/10/06
Date:

					Iron M	1 ENGINEE 635 Circle ountain, Mi 6) 774-3440	e Drive chigan 4	9801	76			
		PAR	TICLE-	SIZE		(SIS OF S STM D422)		HYDRO	METER			
Project Name:	Kinnickinnic	River St	tability A	nalysis	and Dre	dging Study	/	Job	Number:	GD-06	6032	
Client:	Barr Engine	ering Co	mpany									
Address:	4700 West	77th Stre	et, Edina	a, Mn 5	5435-48	03						
Remarks:	(OL) ORGA	NIC SIL	Г, gray-b	lack, sa	ndy, wit	h clay			ring No:		2	
								San	nple No:			
Dispersir	ng Agent:		So	dium Hex	ametapho	sphate		Date R	•	44.5-46.5 4/27/2006		
	Amount:		125 ml @4					iginal Samp				
Hydrome	ter Number:		152	2H		-	For Hydrometer Analysis: 99. Weight of Sample Dispersed: 50					%
	Gravity (G): arting Time:					<u> </u>	leight of	Sample Dis	spersea:	50)(g.
			0.02	.00		-						
	Time	Elapsed Time Minutes (T)	Hydrometer Reading	Temperature [°] C	Correction (DR)	Corr. Hydrometer Reading (R)	Percent Soil in Suspension (P)	K, Values from Table III	L, Values from Table II	Calculated Grain Diameter, mm (d)	Percent of Total Sample C.G.D.	
	9:02:30	0.5	32	20	3	29	59.7	0.01	11.1	0.0672	59.6	
	9:03:00	1.0	27	20	3	24	49.4	0.01426	11.9	0.0492	49.3	
	9:04:00	2.0	23	20	3	20	41.2	0.01426	12.5	0.0357	41.1	
	9:07:00	5.0	19	20	3	16	33.0	0.01426	13.2	0.0232	32.9	
	9:17:00	15.0	15	20	3	12	24.7	0.01426	13.8	0.0137	24.7	
	9:32:00	30.0	13	20	3	10	20.6	0.01426	14.2	0.0098	20.6	
	10:02:00	60.0	11	20	3	8	16.5	0.01426	14.7	0.0071	16.4	
	11:02:00	120.0	10	20	3	7	14.4	0.01426	14.7	0.0050	14.4	
	13:02:00	240.0	8	20	3	5	10.3	0.01426	15.0	0.0036	10.3	
	8:15:00	1393.0	7	20	3	4	8.2	0.01426	15.2	0.0015	8.2	

Tested By: R Backlund
Submitted By:

Date: 5/10/06
Date:

					Iron M	1 ENGINEE 635 Circle ountain, Mic 6) 774-3440	e Drive chigan 4	9801	76			
		PAR	TICLE-	SIZE		SIS OF S		HYDRO	METER	1		
						STM D422)						
Project Name:				nalysis	and Dre	dging Study	/	Job I	Number:	GD-06	6032	-
	Barr Engine											-
Address:	4700 West	77th Stre	et, Edina	a, Mn 58	5435-48	03						
Remarks:	(OL) ORGA	NIC SIL	Г, gray-b	lack, sa	ndy, wit	h clay		Во	ring No:	S-:	3	
								San	nple No:	13 19.5-21.0		-
Dispersir	ng Agent:		So	dium Hex	ametapho	sphate		Date R	eceived:			•
	Amount:		125 ml @4	%solution			% of O-	ginal Samp				
Hydrome			152	2H				• •		90.	7	%
Hydrometer Number:152HFor Hydrometer Analysis:90.7Specific Gravity (G):2.51Weight of Sample Dispersed:50.00Starting Time:8:50:00							00	g.				
Sta	arting Time:		8:50	:00								
	Time	Elapsed Time Minutes (T)	Hydrometer Reading	Temperature ° C	Correction (DR)	Corr. Hydrometer Reading (R)	Percent Soil in Suspension (P)	K, Values from Table III	L, Values from Table II	Calculated Grain Diameter, mm (d)	Percent of Total Sample C.G.D.	
	8:50:30	0.5	35	20	3	32	65.9	0.01426	10.6	0.0657	59.8	
	8:51:00	1.0	33	20	3	30	61.8	0.01426	10.9	0.0471	56.1	
	8:52:00	2.0	29	20	3	26	53.6	0.01426	11.5	0.0342	48.6	
	8:55:00	5.0	25	20	3	22	45.3	0.01426	12.2	0.0223	41.1	
	9:05:00	15.0	21	20	3	18	37.1	0.01426	12.9	0.0132	33.6	
	9:20:00	30.0	17	20	3	14	28.8	0.01426	13.5	0.0096	26.2	
	9:50:00	60.0	14	20	3	11	22.7	0.01426	14.0	0.0069	20.6	
	10:50:00	120.0	12	20	3	9	18.5	0.01426	14.3	0.0049	16.8	
	12:50:00	240.0	10	20	3	7	14.4	0.01426	14.7	0.0035	13.1	
	8:13:00	1403.0	8	20	3	5	10.3	0.01426	15.0	0.0015	9.3	
											•	a

					Iron M	I ENGINEE 635 Circle ountain, Mic 5) 774-3440	e Drive chigan 49	9801	776			
		PAR	TICLE-	SIZE		'SIS OF S STM D422)		HYDRO	METER			
Project Name:	Kinnickinnic	River S	tability A	nalysis	and Dree	dging Study	1	Job	Number:	GD-06	6032	
Client:	Barr Engine	ering Co	mpany									
Address:	4700 West	77th Stre	et, Edina	a, Mn 58	5435-48	03						
Remarks:	(CH) FAT C	LAY, gra	ay, with s	hells, tr	ace orga	anic matter		Bc	oring No:	S-4	4	
								Sar	nple No:			
Dispersir	ng Agent:		So	dium Hex	ametapho	sphate		Date R	•	26.0-28.3 4/18/2		
	Amount:		125 ml @4	%solution	I		% of Ori	iginal Samp	le Used			
	ter Number:						-	/drometer A	-			%
•	Gravity (G):		2.6			. N	/eight of	Sample Dis	spersed:	62.3	39	g.
56	arting Time:		10:32	2.00								
	Time	Elapsed Time Minutes (T)	Hydrometer Reading	Temperature [°] C	Correction (DR)	Corr. Hydrometer Reading (R)	Percent Soil in Suspension (P)	K, Values from Table III	L, Values from Table II	Calculated Grain Diameter, mm (d)	Percent of Total Sample C.G.D.	
	10:34:00	2.0	58	23	6.3	52	83.7	0.01426	6.8	0.0263	83.7	
	10:37:00	5.0	53	23	6.3	47	75.6	0.01426	7.6	0.0176	75.6	
	10:47:00	15.0	46	23	6.3	40	64.3	0.01426	8.8	0.0109	64.3	
	11:02:00	30.0	42	23	6.3	36	57.8	0.01426	9.4	0.0080	57.8	
	11:32:00	60.0	37	23	6.3	31	49.7	0.01426	10.2	0.0059	49.7	
	44:00 00	0.40.0										
	14:32:00	240.0	30	23	6.3	24	38.4	0.01426	11.4	0.0031	38.4	
	10:32:00	1440.0	21	23	6.3	15	23.8	0.01426	12.9	0.0013	23.8	

Tested By: J.Whelan (SET) Submitted By:

Date: 5/16/06 Date: _____

					Iron M	635 Circle 635 Circle ountain, Mi 6) 774-3440	e Drive chigan 4	9801	776			
		PAR	TICLE-	SIZE		(SIS OF S STM D422)		HYDRO	METER			
Project Name:	Kinnickinnic	River S	tability A	nalysis	and Dre	dging Study	/	Job	Number:	GD-06	6032	
Client:	Barr Engine	ering Co	mpany									
Address:	4700 West	77th Stre	et, Edina	a, Mn 5	5435-48	03						
Remarks:	(CL) LEAN	CLAY, g	ray-brow	n, sand	y, low pl	asticity			oring No:		4	
								San	nple No: Depth:	16 41.0-43.3		
Dispersir	ng Agent:		So	dium Hex	ametapho	sphate		Date R	eceived:			
Hydrome	Amount: ter Number:		125 ml @4 152					iginal Samp /drometer <i>A</i>			1 %	%
Specific	Gravity (G):		2.74				Weight of Sample Dispersed: 50					j .
St	arting Time:		9:25	:00								
	Time	Elapsed Time Minutes (T)	Hydrometer Reading	Temperature ° C	Correction (DR)	Corr. Hydrometer Reading (R)	Percent Soil in Suspension (P)	K, Values from Table III	L, Values from Table II	Calculated Grain Diameter, mm (d)	Percent of Total Sample C.G.D.	
	9:25:30	0.5	31	20	4	27	53.5	0.01329	11.2	0.0629	51.9	
	9:26:00	1.0	28	20	4	24	47.5	0.01329	11.7	0.0455	46.1	
	9:27:00	2.0	25	20	4	21	41.6	0.01329	12.2	0.0328	40.4	
	9:30:00	5.0	22	20	4	18	35.6	0.01329	12.7	0.0212	34.6	
	9:40:00	15.0	17	20	4	13	25.7	0.01329	13.5	0.0126	25.0	
	9:55:00	30.0	16	20	4	12	23.8	0.01329	13.7	0.0090	23.1	
	10:25:00	60.0	14	20	4	10	19.8	0.01329	14.0	0.0064	19.2	
	11:25:00	120.0	13	20	4	9	17.8	0.01329	14.2	0.0046	17.3	
	13:25:00	240.0	12	20	4	8	15.8	0.01329	14.3	0.0032	15.4	
	8:10:00	1365.0	10	20	4	6	11.9	0.01329	14.7	0.0014	11.5	
		•				•		•	-			

Tested By: R Backlund
Submitted By:

Date: 5/11/06
Date:

					Iron M	I ENGINEE 635 Circle ountain, Mic 5) 774-3440	e Drive chigan 49	9801	76		
		PAR	TICLE-	SIZE		'SIS OF S STM D422)		HYDRO	METER		
Project Name:	Kinnickinnic	River St	tability A	nalysis	and Dree	dging Study	1	Job	Number:	GD-06	032
Client:	Barr Engine	ering Co	mpany								
Address:	4700 West	77th Stre	et, Edina	a, Mn 5	5435-48	03					
	(OH) ORGA	NIC CL	λY, gray,	with sa	ind and s	shells, som	e peat		ring No:		5
	and wood							San	nple No:		
Dispersir	ng Agent:		So	dium Hex	ametapho	sphate		Date R	eceived:	14.0-16.3 4/18/2	
Hydrome Specific	Amount: ter Number: Gravity (G):		125 ml @4 152 2.4	2H		Ň	% of Original Sample Used For Hydrometer Analysis: 95.3 Weight of Sample Dispersed: 60.7				
	arting Time:		10:37				-	·			<u>2</u> g.
	Time	Elapsed Time Minutes (T)	Hydrometer Reading	Temperature ° C	Correction (DR)	Corr. Hydrometer Reading (R)	Percent Soil in Suspension (P)	K, Values from Table III	L, Values from Table II	Calculated Grain Diameter, mm (d)	Percent of Total Sample C.G.D.
	10:39:00	2.0	38	23	6.3	32	54.8	0.01426	10.1	0.0320	52.2
	10:42:00	5.0	33	23	6.3	27	46.2	0.01426	10.9	0.0211	44.0
	10:52:00	15.0	26	23	6.3	20	34.1	0.01426	12.0	0.0128	32.5
	11:07:00	30.0	22	23	6.3	16	27.1	0.01426	12.7	0.0093	25.9
	11:37:00	60.0	18	23	6.3	12	20.2	0.01426	13.3	0.0067	19.3
	14:37:00 10:37:00	240.0 1440.0	12 8	23 23	6.3 6.3	6 2	9.9 2.9	0.01426 0.01426	14.3 15.0	0.0035 0.0015	9.4 2.8

					Iron M	1 ENGINEE 635 Circle ountain, Mic 6) 774-3440	e Drive chigan 4	9801	776		
		PAR	TICLE-	SIZE		(SIS OF S STM D422)		HYDRO	METER	1	
Project Name:	Kinnickinnic	: River S	tability A	nalysis				Job I	Number:	GD-06	6032
	Barr Engine										
	4700 West			a, Mn 5:	5435-48	03					
	(OL) ORGA								oring No: nple No:		5
								Jan	•	34.0-36.0	
Dispersir	ng Agent:		So	dium Hex	ametapho	sphate		Date R		4/25/2	
Amount:125 ml @4%solution% of Original Sample UsedHydrometer Number:152HFor Hydrometer Analysis:99.9											
	Gravity (G): arting Time:		2.6 8:56			<u> </u>	/eight of	Sample Dis	spersed:	50.0	<u>)0 </u>
			0.00			-					
	Time	Elapsed Time Minutes (T)	Hydrometer Reading	Temperature [°] C	Correction (DR)	Corr. Hydrometer Reading (R)	Percent Soil in Suspension (P)	K, Values from Table III	L, Values from Table II	Calculated Grain Diameter, mm (d)	Percent of Total Sample C.G.D.
	8:56:30	0.5	33	20	3	30	60.0	0.01348	10.9	0.0629	59.9
	8:57:00	1.0	30	20	3	27	54.0	0.01348	11.4	0.0455	53.9
	8:58:00	2.0	27	20	3	24	48.0	0.01348	11.9	0.0329	48.0
	9:01:00	5.0	23	20	3	20	40.0	0.01348	12.5	0.0213	40.0
	9:11:00	15.0	17	20	3	14	28.0	0.01348	13.5	0.0128	28.0
	9:26:00	30.0	15	20	3	12	24.0	0.01348	13.8	0.0091	24.0
	9:56:00	60.0	12	20	3	9	18.0	0.01348	14.3	0.0066	18.0
	10:56:00	120.0	11	20	3	8	16.0	0.01348	14.7	0.0047	16.0
	12:56:00	240.0	9	20	3	6	12.0	0.01348	14.8	0.0033	12.0
	8:14:00	1398.0	7	20	3	4	8.0	0.01348	15.2	0.0014	8.0

Form #: 0422B Revision Date: 1/17/05 Tested By: <u>Ryan Backlund</u> Submitted By:

					Iron M	I ENGINEE 635 Circle ountain, Mic 6) 774-3440	e Drive chigan 49	9801	76			
PARTICLE-SIZE ANALYSIS OF SOILS - HYDROMETER (ASTM D422)												
Project Name:	Kinnickinnic	River S	tability A	nalysis	and Dre	dging Study	1	Job	Number:	GD-06	6032	-
Client:	Barr Engine	ering Co	mpany									-
Address:	4700 West	77th Stre	et, Edina	a, Mn 5	5435-48	03						_
Remarks:	(SP-SM) sa	nd, brow	n, fine to	coarse	, some s	silt, trace cla	ay		ring No:	S-(6	_
								San	nple No: Depth:	13 19.5-21.5		-
Dispersir	ng Agent:		So	dium Hex	ametapho	sphate		Date R	eceived:	4/24/2		-
Hydrome	Amount: ter Number:		125 ml @4 152		l			iginal Samp /drometer /		66.	0	%
	Gravity (G):		2.6				-	Sample Dis				g.
St	arting Time:		9:08	:00								-
	Time	Elapsed Time Minutes (T)	Hydrometer Reading	Temperature [°] C	Correction (DR)	Corr. Hydrometer Reading (R)	Percent Soil in Suspension (P)	K, Values from Table III	L, Values from Table II	Calculated Grain Diameter, mm (d)	Percent of Total Sample C.G.D.	
	9:08:30	0.5	10	20	3	7	14.0	0.01352	14.7	0.0733	9.2	
	9:09:00	1.0	9	20	3	6	12.0	0.01352	14.8	0.0520	7.9	
	9:10:00	2.0	8	20	3	5	10.0	0.01352	15.0	0.0370	6.6	
	9:13:00	5.0	8	20	3	5	10.0	0.01352	15.0	0.0234	6.6	
	9:23:00	15.0	7	20	3	4	8.0	0.01352	15.2	0.0136	5.3	
	9:38:00	30.0	6	20	3	3	6.0	0.01352	15.3	0.0097	4.0	
	10:08:00	60.0	6	20	3	3	6.0	0.01352	15.3	0.0068	4.0	
	11:08:00	120.0	5	20	3	2	4.0	0.01352	15.5	0.0049	2.6	
	13:08:00	240.0	5	20	3	2	4.0	0.01352	15.5	0.0034	2.6	
	8:16:00	1388.0	5	20	3	2	4.0	0.01352	15.5	0.0014	2.6	
		-		-	•	-	•	-	-		-	-

Form #: 0422B Revision Date: 1/17/05 

REPORT OF: PARTICLE-SIZE ANALYSIS OF SOILS - MECHANICAL (ASTM D422)

Job Name: Kinnickinnic River Stability Analysis and Dredging Study C.E.C. Job #: GD-06032

Client: Barr Engineering Company

Address: 4700 West 77th Street, Edina, Mn 55435-4803

Soil Description: (OL) ORGANIC SILT, gray-black, with sand,

with clay

Boring No. S-5 Sample No. 13

Remarks:

					Depth	: 34.0-36.0
					Date Rec'd	: 4/25/2006
	Sieve Size	Grain Diameter (mm)	Weight Retained	Percent Retained	Percent Fine	r
	3"	76.2				
	2"	50.8				
	1 1/2"	37.5				
	1	25.4				
	3/4	19.1		0.0	100.0	
	1/2	12.7	0.00	0.0	100.0	
	4M	4.76	0.07	0.0	100.0	
	10M	2.00	0.26	0.1	99.9	
SIS TTER	40M	0.42	0.72	1.4	98.6 /* 98.5	5
NALY DROME	100M	0.149	4.95	9.9	88.7 / * 88.6	6
MECHANICAL ANALYSIS PORTION OF HYDROMETER ANALYSIS	200M	0.074	6.61	13.2	75.4 / * 75.4	L
ECHAN TION (Pan					
POR						

*Percent Based on Total Sample

Original Sample:

Material retained on No. 10 mesh: weight = 0.33 gm = 0.1% % Material passing No. 10 mesh: weight = 268.4 gm = 99.9% %

Weight of Total Sample = <u>268.73</u> gm

Tested By: R Backlund
Submitted By:



REPORT OF: PARTICLE-SIZE ANALYSIS OF SOILS - MECHANICAL (ASTM D422)

Job Name: Kinnickinnic River Stability Analysis and Dredging Study C.E.C. Job #: GD-06032

Client: Barr Engineering Company

Address: 4700 West 77th Street, Edina, Mn 55435-4803

with sand, some clay

Soil Description: (OH) ORGANIC SILT, gray-black, high plasticity,

Shape:

Remarks:

Boring No. S-1 Sample No. 8

Depth: 10.5-12.0

Date Rec'd: 4/18/2006

	Sieve Size	Grain Diameter (mm)	Weight Retained	Percent Retained	Percent Finer
	3"	76.2			
	2"	50.8			
	1 1/2"	37.5			
	1	25.4			
	3/4	19.1		0.0	100.0
	1/2	12.7	0.00	0.0	100.0
	4M	4.76	0.61	0.5	99.5
	10M	2.00	1.69	1.3	98.2
SIS	40M	0.42	0.91	1.8	98.2 / * 96.4
NALY: ROME IS	100M	0.149	2.79	5.6	92.6 / * 90.9
NICAL AN	200M	0.074	4.49	9.0	83.6 / * 82.1
MECHANICAL ANALYSIS PORTION OF HYDROMETER ANALYSIS	Pan				
POR					·

*Percent Based on Total Sample

Original Sample:

Material retained on No. 10 mesh: weight = 2.3 gm = 1.8% % Material passing No. 10 mesh: weight = 123.54 gm = 98.2% %

Weight of Total Sample = <u>125.84</u> gm

Form: <u>D422A</u> Revision Date: <u>1/17/05</u> Tested By: R Backlund
Submitted By:

Date: <u>5/11/2006</u> Date: ____



REPORT OF: PARTICLE-SIZE ANALYSIS OF SOILS - MECHANICAL (ASTM D422)

Job Name: Kinnickinnic River Stability Analysis and Dredging Study C.E.C. Job #: GD-06032

Client: Barr Engineering Company

Address: 4700 West 77th Street, Edina, Mn 55435-4803

Soil Description: (OH) ORGANIC SILT, gray-black, high plasticity,

with sand, with clay

Boring No. S-1

Sample No. 12

Remarks:

Depth: <u>16.5-18.0</u> Date Rec'd: <u>4/18/2006</u>

	Sieve Size	Grain Diameter (mm)	Weight Retained	Percent Retained	Percent Finer
	3"	76.2			
	2"	50.8			
	1 1/2"	37.5			
	1	25.4			
	3/4	19.1		0.0	100.0
	1/2	12.7	0.00	0.0	100.0
	4M	4.76	0.70	0.8	99.2
	10M	2.00	1.19	1.3	97.9
SIS	40M	0.42	1.67	3.3	96.7 / * 94.6
NALY: ROME IS	100M	0.149	5.41	10.8	85.8 / * 84.0
MECHANICAL ANALYSIS PORTION OF HYDROMETER ANALYSIS	200M	0.074	4.75	9.5	76.3 / * 74.7
CHAN TION C	Pan				
POR					

*Percent Based on Total Sample

Original Sample:

Material retained on No. 10 mesh: weight = 1.89 gm = 2.1% % Material passing No. 10 mesh: weight = 89.23 gm = 97.9% %

Weight of Total Sample = _____91.12 ___gm

Form: <u>D422A</u> Revision Date: <u>1/17/05</u> Tested By: R Backlund
Submitted By:

Date: <u>5/11/2006</u> Date: ____



COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801

Telephone: (906) 774-3440 Fax: (906) 774-7776

REPORT OF: PARTICLE-SIZE ANALYSIS OF SOILS - MECHANICAL (ASTM D422)

Job Name: Kinnickinnic River Stability Analysis and Dredging Study C.E.C. Job #: GD-06032

Client: Barr Engineering Company

Address: 4700 West 77th Street, Edina, Mn 55435-4803

Soil Description: (CL) LEAN CLAY, brownish gray, a few silt laminations

Boring No. S-1

Sample No. 16

Remarks:

Depth: 27.0' - 29.3' Date Rec'd: 4/24/2006

	Sieve Size	Grain Diameter (mm)	Weight Retained	Percent Retained	Percent Finer
	3"	76.2			
	2"	50.8			
	1 1/2"	37.5			
	1	25.4			
	3/4	19.1	0.0	0.0	100.0
	1/2	12.7	0.0	0.0	100.0
	4M	4.76	1.3	0.4	99.6
	10M	2.00	0.2	0.1	99.5
SIS ETER	40M	0.42	0.3	0.7	99.3 / * 98.8
NALY SROME	100M	0.149	1.3	3.2	96.1 / * 95.6
MECHANICAL ANALYSIS PORTION OF HYDROMETER ANALYSIS	200M	0.074	3.2	7.9	88.2 / * 87.7
ECHAN TION C	Pan			0.0	
ME POR					

*Percent Based on Total Sample

Original Sample:

Material retained on No. 10 mesh: weight = 1.46 gm = 0.5% %

Material passing No. 10 mesh: weight = 316.94 gm = 99.5 %

Weight of Total Sample = 318.4 gm

Form: D422A Revision Date: 1/17/05

Tested By: J. Whelan (SET) Submitted By:



REPORT OF: PARTICLE-SIZE ANALYSIS OF SOILS - MECHANICAL (ASTM D422)

Job Name: Kinnickinnic River Stability Analysis and Dredging Study C.E.C. Job #: GD-06032

Client: Barr Engineering Company

Address: 4700 West 77th Street, Edina, Mn 55435-4803

Soil Description: (OH) ORGANIC SILT, gray-black, high plasticity,

with sand, some clay

Boring No.S-2Sample No.10

Remarks:

Depth: 18.0-20.3 Date Rec'd: 4/27/2006

	Sieve Size	Grain Diameter (mm)	Weight Retained	Percent Retained	Percent Finer
	3"	76.2			
	2"	50.8			
	1 1/2"	37.5			
	1	25.4			
	3/4	19.1		0.0	100.0
	1/2	12.7	0.00	0.0	100.0
	4M	4.76	0.23	0.3	99.7
	10M	2.00	0.11	0.1	99.6
SIS	40M	0.42	1.93	3.9	96.1 / * 95.8
NALY: ROME IS	100M	0.149	4.38	8.8	87.4 / * 87.0
NICAL AN	200M	0.074	4.66	9.3	78.1 / * 77.7
MECHANICAL ANALYSIS PORTION OF HYDROMETER ANALYSIS	Pan				
POR					

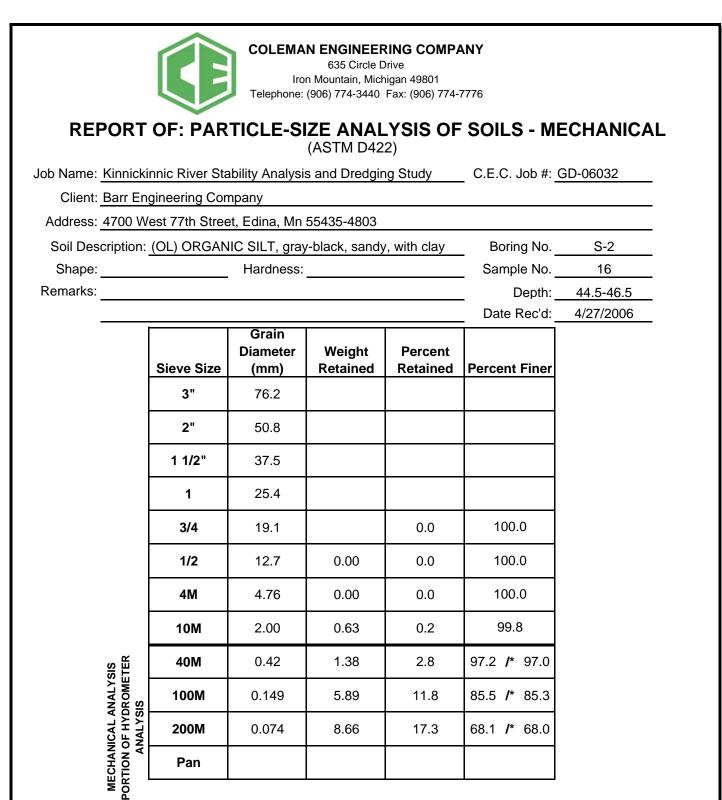
*Percent Based on Total Sample

Original Sample:

Material retained on No. 10 mesh: weight =0.34gm =0.4%Material passing No. 10 mesh: weight =77.42gm =99.6%

Weight of Total Sample = 77.76 gm

Tested By: R Backlund
Submitted By:



*Percent Based on Total Sample

Original Sample:

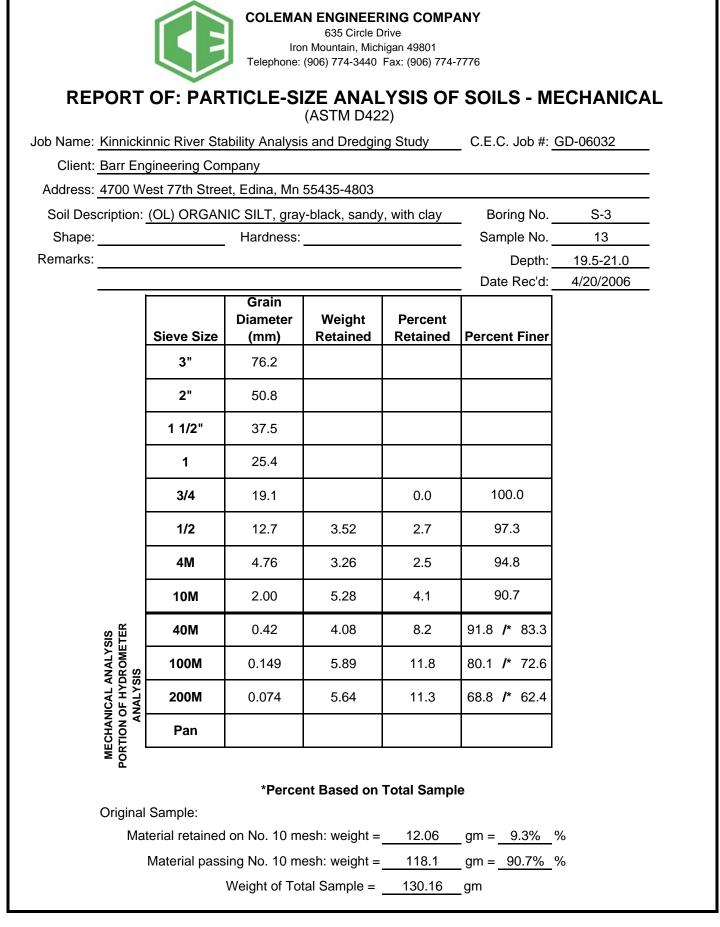
Pan

Material retained on No. 10 mesh: weight = 0.63 gm = 0.2% % Material passing No. 10 mesh: weight = <u>284.84</u> gm = <u>99.8%</u> %

Weight of Total Sample = <u>285.47</u> gm

Form: D422A Revision Date: 1/17/05

Tested By: R Backlund Submitted By:



Tested By: R Backlund
Submitted By:



COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801

Telephone: (906) 774-3440 Fax: (906) 774-7776

REPORT OF: PARTICLE-SIZE ANALYSIS OF SOILS - MECHANICAL (ASTM D422)

Job Name: Kinnickinnic River Stability Analysis and Dredging Study C.E.C. Job #: GD-06032

Client: Barr Engineering Company

Address: 4700 West 77th Street, Edina, Mn 55435-4803

Soil Description: (CH) FAT CLAY, gray, with shells, trace organic matter

Boring No. S-4

Sample No. 12

Remarks:

Depth: 26.0' - 28.3' Date Rec'd: 4/24/2006

	Sieve Size	Grain Diameter (mm)	Weight Retained	Percent Retained	Percent Finer
	3"	76.2			
	2"	50.8			
	1 1/2"	37.5			
	1	25.4			
	3/4	19.1	0.0	0.0	100.0
	1/2	12.7	0.0	0.0	100.0
	4M	4.76	0.0	0.0	100.0
	10M	2.00	0.0	0.0	100.0
SIS	40M	0.42	0.14	0.2	99.8
NALY: ROME	100M	0.149	0.23	0.4	99.4
MECHANICAL ANALYSIS PORTION OF HYDROMETER ANALYSIS	200M	0.074	0.30	0.5	98.9
ECHAN TION C	Pan		61.72	98.9	0.0
ME POR					

*Percent Based on Total Sample

Original Sample:

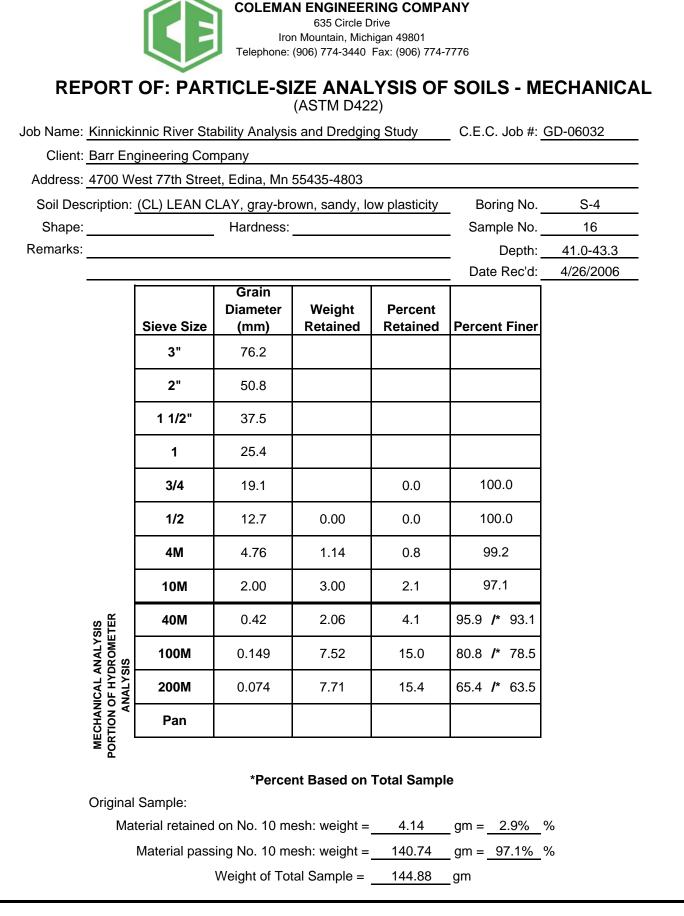
Material retained on No. 10 mesh: weight = 0.00 gm = 0.00 %

Material passing No. 10 mesh: weight = 0.00 gm = 100.0% %

Weight of Total Sample = 62.39 gm

Form: D422A Revision Date: 1/17/05

Tested By: J.Whelan (SET) Submitted By:



Form: <u>D422A</u> Revision Date: <u>1/17/05</u> Tested By: R Backlund
Submitted By:

Date: <u>5/11/2006</u> Date:



COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801

Telephone: (906) 774-3440 Fax: (906) 774-7776

REPORT OF: PARTICLE-SIZE ANALYSIS OF SOILS - MECHANICAL

(ASTM D422)

Job Name: Kinnickinnic River Stability Analysis and Dredging Study C.E.C. Job #: GD-06032

Client: Barr Engineering Company

Address: 4700 West 77th Street, Edina, Mn 55435-4803

Soil Description: (OH) ORGANIC CLAY, gray, with sand and shells, some peat and wood

Boring No. S-5

Sample No. 8

Remarks:

Depth:	14.0' - 16.3'
Date Rec'd:	4/24/2006

	Sieve Size	Grain Diameter (mm)	Weight Retained	Percent Retained	Percent Finer
	3"	76.2			
	2"	50.8			
	1 1/2"	37.5			
	1	25.4			
	3/4	19.1	0.0	0.0	100.0
	1/2	12.7	0.0	0.0	100.0
	4M	4.76	2.9	2.9	97.1
	10M	2.00	1.7	1.7	95.3
SIS	40M	0.42	3.41	3.4	96.6 / * 92.0
NALY: ROME IS	100M	0.149	4.22	4.3	92.3 / * 88.0
MECHANICAL ANALYSIS PORTION OF HYDROMETER ANALYSIS	200M	0.074	4.75	4.8	87.5 / * 87.1
TION C	Pan		86.74	87.5	0.0
ME POR					

*Percent Based on Total Sample

Original Sample:

Material retained on No. 10 mesh: weight = 4.64 gm = 4.7 % Material passing No. 10 mesh: weight = <u>94.48</u> gm = <u>95.3</u> %

Weight of Total Sample = 99.12 gm

Tested By: J. Whelan (SET) Submitted By:

REPORT OF: PARTICLE-SIZE ANALYSIS OF SOILS - MECHANICAL (ASTM D422)

Job Name: Kinnickinnic River Stability Analysis and Dredging Study C.E.C. Job #: GD-06032

Client: Barr Engineering Company

Address: 4700 West 77th Street, Edina, Mn 55435-4803

Soil Description: (SP-SM) SAND, brown, fine to coarse, some silt,

trace clay

Boring No. S-6 Sample No. 13

Remarks:

Depth: <u>19.5-21.5</u> Date Rec'd: <u>4/24/2006</u>

	Sieve Size	Grain Diameter (mm)	Weight Retained	Percent Retained	Percent Finer
	3"	76.2			
	2"	50.8			
	1 1/2"	37.5			
	1	25.4			
	3/4	19.1	0.00		100.0
	1/2	12.7	0.00		100.0
	4M	4.76	40.75	8.1	91.9
	10M	2.00	129.82	25.9	66.0
SIS	40M	0.42	25.06	50.1	49.9 / * 32.9
NALY: ROME IS	100M	0.149	13.85	27.7	22.2 / * 14.6
MECHANICAL ANALYSIS PORTION OF HYDROMETER ANALYSIS	200M	0.074	3.69	7.4	14.8 / * 9.8
ECHAN TION C AN	Pan				
POR			-	-	·1

*Percent Based on Total Sample

Original Sample:

Material retained on No. 10 mesh: weight = <u>170.57</u> gm = <u>34.0%</u> % Material passing No. 10 mesh: weight = <u>331.26</u> gm = <u>66.0%</u> %

Weight of Total Sample = 501.83 gm

Form: <u>D422A</u> Revision Date: <u>1/17/05</u> Tested By: R Backlund
Submitted By:

REPORT OF UNCONFINED COMPRESSION

Project: Kinnickinnic River Stability Analysis and Dredging Study

Job No.: GD-06032

Date: 5/4/06

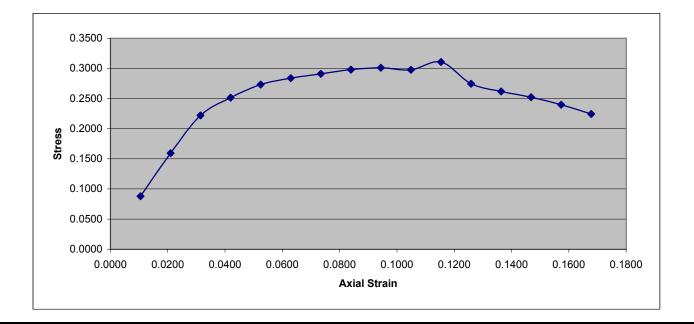
Client: Barr Engineering Co., 4700 West 77th St., Edina Mn 55435-4803

Boring No: S-2

Sample No: 10

Depth: 18.0'-20.3'

	No.				1			
Туре	of Specimen				Thin Wall			
	Water Content			Wo	80.6			
Initial	Void Ratio			eo	2.054			
Saturation				So	100.0			
Ī	Dry Density, lb/cu	ft		7 _d	52.1			
Time	to Failure, min			t _f	5.5			
Unco	onfined Compressi	ve Strength	, T/sq ft	q _u	0.31			
Undı	ained Shear Stren	gth, T/sq ft		s _u				
Sens	sitivity Ratio			S _t				
Initia	I Specimen Diame	ter, in		Do	2.82			
Initia	I Specimen Height	, in		Ho	5.72			
Clas	sification (OL)Org	anic Silt						
LL	75.0	PL	36.0		PI	39.0	Gs	*2.55
Rem	arks: * Assumed \	/alue			-		•	



REPORT OF: UNCONFINED COMPRESSIVE STRENGTH

Client: Project:	Barr Engir Kinnickinn	ieering Co ic River Stat	bilty Analysis	6	Date: Job No.	GD-06032	5/4/06	
pan no.		63		Diameter (in./cm)	2.82	7.16	
wet soil +	tare	1222.5		length (in	./cm)		5.72	14.53
tare		340.6		area	(sq.cm)		40.26	
dry soil		488.40		volume (c	,		585.0	
water		393.50		volume of	solids (cc)		191.5	
moisture	(%)	80.6		void ratio			2.054	
spec. gr.	assumed	2.55		saturation	((%)		100.0	
				dry density	′ (pcf)		52.1	
Sample:	Retest S-2	2, Sample #1	0	USCS:	(OL) Peat			
	18.0'-20.3'	1						
elapsed	dial rdg	change	load rdg	load	axial strain	1-E	corrected	qu(tsf)
time (min)	. ,	(0.01 in.)	(0.0001in.)	. ,	E		area (scm)	
0.5	1.94	0.06	24	7.7				0.0878
1.0	1.88	0.12		14.1	0.0210			0.1592
1.5	1.82	0.18	62	19.8				0.2219
2.0	1.76	0.24	71	22.7	0.0420			0.2514
2.5	1.70	0.30	78	25.0	0.0524	0.9476	42.49	0.2732
3.0	1.64	0.36	82	26.2	0.0629	0.9371	42.96	0.2840
3.5	1.58	0.42	85	27.2	0.0734	0.9266	43.45	0.2911
4.0	1.52	0.48	88	28.2	0.0839	0.9161	43.95	0.2980
4.5	1.46	0.54	90	28.8	0.0944	0.9056	44.46	0.3012
5.0	1.40	0.60	90	28.8	0.1049	0.8951	44.98	0.2977
5.5	1.34	0.66	95	30.4	0.1154	0.8846	45.51	0.3106
6.0	1.28	0.72	85	27.2	0.1259	0.8741	46.06	0.2746
6.5	1.22	0.78	82	26.2	0.1364	0.8636	46.62	0.2617
7.0	1.16	0.84	80	25.6	0.1469	0.8531	47.19	0.2523
7.5	1.10	0.90	77	24.6	0.1573	0.8427	47.78	0.2398
8.0	1.04	0.96	73	23.4				0.2245
8.5	0.98	1.02		0.0				0.0000
9.0 9.5	0.92 0.86	1.08 1.14		0.0 0.0		0.8112 0.8007		0.0000 0.0000
9.5 10.0	0.80	1.14		0.0		0.7902		0.0000
10.5	0.74	1.26		0.0		0.7797		0.0000
11.0	0.68	1.32		0.0		0.7692		
11.5	0.62	1.38		0.0		0.7587		
12.0	0.56	1.44		0.0	0.2517	0.7483		

REPORT OF UNCONFINED COMPRESSION

Project: Kinnickinnic River Stability Analysis and Dredging Study

Job No.: GD-06032

Client: Barr Engineering Co., 4700 West 77th St., Edina Mn 55435-4803

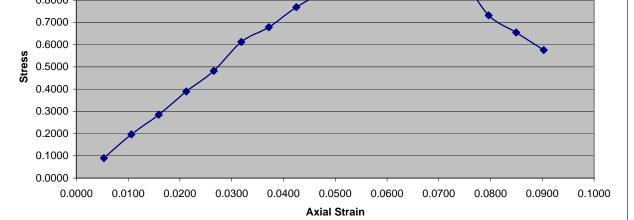
Boring No: S-2

Sample No: 14

Depth: 36.5'-38.8'

Date: 5/3/2006

Tes	t No.		1							
Тур	e of Specimen		3" TWT							
	Water Content	Wo	41.9							
Initial	Void Ratio	eo	1.065							
lni	Saturation	So	102.3							
	Dry Density, lb/cu ft	7 _d	78.6							
Tim	e to Failure, min	t _f	6.5							
Unconfined Compressive Strength, T/sq ft q _u 0.94										
Und	rained Shear Strength, T/sq ft	Su								
Sen	sitivity Ratio	S _t								
Initia	al Specimen Diameter, in	Do	2.85							
Initia	al Specimen Height, in	H _o	5.65							
Clas	ssification									
LL	49.5 PL 34.2		PI	15.3	Gs	*2.60				
Strees	1.0000 0.9000 0.8000 0.7000 0.6000 0.5000	*	***							
	0.4000									



REPORT OF: UNCONFINED COMPRESSIVE STRENGTH

Client: Project:	Barr Engir Kinnickinn	eering Co ic River Stat	oilty Analysi	S	Date: Job No.	GD-06032		
pan no.		65		Diameter (in./cm)		7.24	
wet soil +	tare	1396.5		length (in	./cm)		5.65	14.34
tare		341.6		area	(sq.cm)		41.17	
dry soil		743.4		volume (c	c)		590.4	
water		311.5		volume of	solids (cc)		285.9	
moisture	(%)	41.9		void ratio			1.065	
spec. gr.	Assumed	2.60		saturation	. ,		102.3	
Complex		10#11		dry density USCS:	/ (pcf)		78.6	
Sample:	S-2, Samp 36.5'-38.8'			0303.				
elapsed	dial rdg	change	load rdg	load	axial strain	1-E	corrected	qu(tsf)
time (min)	-	(0.01 in.)	(0.0001in.)	(lbs.)	Е		area (scm)	
0.5	1.97	0.03	25	8.0	0.0053	0.9947	41.39	0.0899
1.0	1.94	0.06	55	17.6	0.0106	0.9894	41.61	0.1967
1.5	1.91	0.09	80	25.6	0.0159	0.9841	41.84	0.2845
2.0	1.88	0.12	110	35.2	0.0212	0.9788	42.06	0.3891
2.5	1.85	0.15	137	43.8	0.0265	0.9735	42.29	0.4820
3.0	1.82	0.18	175	56.0	0.0319	0.9681	42.52	0.6123
3.5	1.79	0.21	195	62.4	0.0372	0.9628	42.76	0.6786
4.0	1.76	0.24	222	71.0	0.0425	0.9575	43.00	0.7683
4.5	1.73	0.27	242	77.4	0.0478	0.9522	43.24	0.8329
5.0	1.70	0.30	253	81.0	0.0531	0.9469	43.48	0.8659
5.5	1.67	0.33	267	85.4	0.0584	0.9416	43.72	0.9086
6.0	1.64	0.36	275	88.0	0.0637	0.9363	43.97	0.9306
6.5	1.61	0.39	279	89.3	0.0690	0.9310	44.22	0.9388
7.0	1.58	0.42	268	85.8	0.0743	0.9257	44.48	0.8966
7.5	1.55	0.45	220	70.4	0.0796	0.9204	44.73	0.7318
8.0	1.52	0.48	198	63.4				0.6548
8.5 9.0	1.49 1.46	0.51 0.54	175	56.0 0.0				0.5754 0.0000
9.0 9.5	1.40	0.54		0.0			45.52	0.0000
10.0	1.40	0.60		0.0				0.0000

REPORT OF UNCONFINED COMPRESSION

Project: Kinnickinnic River Stability Analysis and Dredging Study

Job No.: GD-06032

Client: Barr Engineering Co., 4700 West 77th St., Edina Mn 55435-4803

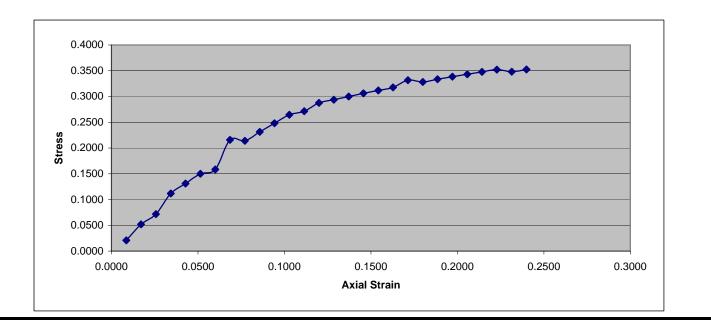
Boring No: S-3

Sample No: 20

Depth: 45.0'-47.3'

Date: 5/4/2006

	al Specimen Heigh			H _o	3.50		
	al Specimen Diam			D _o	1.67		
	sitivity Ratio			S _t			
Unc	Irained Shear Stre	ngth, T/sq ft		s _u			
Unc	onfined Compress	sive Strength	, T/sq ft	q _u	0.31		
Tim	e to Failure, min			t _f	9.0		
	Dry Density, lb/cu	ı ft		7 _d	105.0		
Init	Saturation			So	105.9		
Initial	Void Ratio			eo	0.634		
- 71-	Water Content			Wo	24.4		
τνρ	t No. e of Specimen				1.0 Thin Wall		



REPORT OF: UNCONFINED COMPRESSIVE STRENGTH

Client: Project:	Barr Engir Kinnickinn	neering Co ic River Stat	oilty Analysi	S	Date: Job No.	GD-06032	5/4/2006	
pan no.		59		Diameter (in./cm)	1.67	4.24	
wet soil +	tare	605.2		length (in	./cm)		3.50	8.88
tare		342.6		area	(sq.cm)		14.12	
dry soil		211.10		volume (c	,		125.4	
water		51.50		volume of s	,		76.8	
	(%)	24.4		void ratio			0.634	
spec. gr.	(70)	2.75		saturation	(%)		105.9	
opoo. gr.		2.70		dry density			105.0	
Sample:		3, Sample #2	20	USCS:	(CL) Clay		100.0	
	45.0'-47.3'		L I . I.	11		4 5		
elapsed	dial rdg	change	load rdg	load	axial strain	1-E	corrected	qu(tsf)
time (min)	. ,	(0.01 in.)	(0.0001in.)	· · ·	E		area (scm)	
0.5	1.97	0.03	2	0.6				0.0209
1.0	1.94	0.06	5	1.6	0.0171	0.9829		0.0518
1.5	1.91	0.09	7	2.2	0.0257	0.9743	14.49	0.0719
2.0	1.88	0.12	11	3.5	0.0343	0.9657	14.62	0.1119
2.5	1.85	0.15	13	4.2	0.0429	0.9571	14.75	0.1311
3.0	1.82	0.18	15	4.8	0.0514	0.9486	14.89	0.1499
3.5	1.79	0.21	16	5.1	0.0600	0.9400	15.02	0.1585
4.0	1.76	0.24	22	7.0	0.0686	0.9314	15.16	0.2159
4.5	1.73	0.27	22	7.0	0.0771	0.9229	15.30	0.2140
5.0	1.70	0.30	24	7.7	0.0857	0.9143	15.44	0.2312
5.5	1.67	0.33	26	8.3				0.2482
6.0	1.64	0.36	28	9.0	0.1029	0.8971	15.74	0.2647
6.5	1.61	0.39	29	9.3				0.2716
7.0	1.58	0.42	31	9.9				0.2875
7.5	1.55	0.45	32	10.2			16.20	0.2939
8.0	1.52	0.48	33	10.6				0.3001
8.5	1.49	0.51	34	10.9				0.3061
9.0	1.46	0.54	35	11.2				0.3119
9.5	1.43	0.57	36	11.5	0.1629	0.8371	16.87	0.3176
10.0	1.40	0.60	38	12.2				0.3318
10.5	1.37	0.63	38	12.2				0.3284
11.0	1.34	0.66	39	12.5				0.3335
11.5	1.31	0.69	40 41	12.8		0.8029		0.3384
12.0 12.5	1.28 1.25	0.72 0.75	41	13.1 13.4	0.2057 0.2143			0.3432 0.3478
12.5	1.23	0.75	42	13.4			18.17	0.3478
13.5	1.19	0.81	43	13.8				0.3483
14.0	1.16	0.84	44	14.1				0.3524

REPORT OF UNCONFINED COMPRESSION

Project: Kinnickinnic River Stability Analysis and Dredging Study

Job No.: GD-06032

Date: 5/4/2006

Client: Barr Engineering Co., 4700 West 77th St., Edina Mn 55435-4803

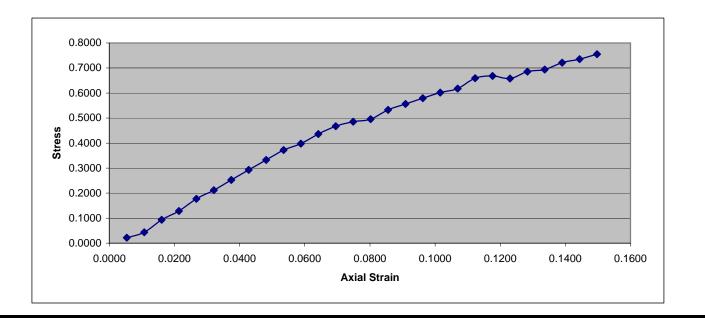
Boring No: <u>S-4</u>

Sample

Sample No: 16

Depth: 41.0'-43.3'

$\begin{array}{ c c c c c } \hline Type \ of Specimen & 3" \ TWT & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & $	Fest	No.		1.0			
Void Ratio e_o 0.472 Saturation S_o 92.5 Dry Density, lb/cu ft T_d 116.60 Time to Failure, min t_f 14.0 Unconfined Compressive Strength, T/sq ft q_u 0.76 Undrained Shear Strength, T/sq ft s_u s_u Sensitivity Ratio S_t s_t Initial Specimen Diameter, in D_o 2 Initial Specimen Height, in H_o 3.74	Гуре	e of Specimen		3" TWT			
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII		Water Content	Wo	15.9			
Dry Density, lb/cu ft 7_d 116.60Time to Failure, min t_f 14.0Unconfined Compressive Strength, T/sq ft q_u 0.76Undrained Shear Strength, T/sq ft s_u Sensitivity Ratio S_t Initial Specimen Diameter, in D_o 2Initial Specimen Height, in H_o 3.74	<u>a</u>	Void Ratio	eo	0.472			
Time to Failure, min t_f 14.0Unconfined Compressive Strength, T/sq ft q_u 0.76Undrained Shear Strength, T/sq ft s_u Sensitivity Ratio S_t Initial Specimen Diameter, in D_o 2Initial Specimen Height, in H_o 3.74Classification (CL) Lean Clay	lDit	Saturation	So	92.5			
Unconfined Compressive Strength, T/sq ft q_u 0.76Undrained Shear Strength, T/sq ft s_u Sensitivity Ratio S_t Initial Specimen Diameter, in D_o 2Initial Specimen Height, in H_o 3.74Classification (CL) Lean Clay		Dry Density, lb/cu ft	7 _d	116.60			
Undrained Shear Strength, T/sq ft s_u s_u Sensitivity Ratio S_t S_t Initial Specimen Diameter, in D_o 2Initial Specimen Height, in H_o 3.74Classification (CL) Lean Clay	Time	e to Failure, min	t _f	14.0			
Sensitivity Ratio S_t Initial Specimen Diameter, in D_o 2Initial Specimen Height, in H_o 3.74Classification (CL) Lean Clay	Jnco	onfined Compressive Strength, T/sq ft	q _u	0.76			
Initial Specimen Diameter, in Do 2 Initial Specimen Height, in Ho 3.74 Classification (CL) Lean Clay	Jnd	rained Shear Strength, T/sq ft	Su				
Initial Specimen Height, in H _o 3.74 Classification (CL) Lean Clay	Sens	sitivity Ratio	S _t				
Classification (CL) Lean Clay	nitia	al Specimen Diameter, in	Do	2			
	nitia	I Specimen Height, in	H₀	3.74			
LL 22.0 PL 13.9 PI 8.1 G _s	Clas	sification (CL) Lean Clay					
	L	22.0 PL 13.9	9	PI	8.1	Gs	2.74
Remarks:	Rem	arks:		•			



REPORT OF: UNCONFINED COMPRESSIVE STRENGTH

pan no.63Diameter (in./cm)5.1wet soil + tare340.6area (sq.cm).20.43dry soil362.2volume (cc).131.7water57.5volume of solids (cc).131.7moisture (%)15.9void ratio.0.472spec. gr.2.75saturation ((%).92.5sampleS-4, Sample +16
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water57.5volume of solids (cc)131.7moisture (%)15.9void ratio0.472spec. gr.2.75saturation ((%)92.5dry density (pcf)116.6Sample: S-4, Sample #16USCS:41.0'-43.3' Bottomelapseddial rdgchange0.01 in)(0.01 in.)(0.0001in.)(lbs.)Earea (scm)0.51.980.0231.00.00530.994720.540.02171.01.960.0461.90.01070.989320.650.04321.51.940.06134.20.01600.984020.760.09322.01.920.08185.80.02140.978620.880.12832.51.900.10258.00.02670.973320.990.17723.01.880.12309.60.03210.967921.110.21153.51.860.143611.50.03740.962621.220.25244.01.840.164213.40.04810.951921.460.33285.01.800.205417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935521.660.3723 </td
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dry density (pcf) 116.6 Sample: S-4, Sample #16 USCS: 41.0'-43.3' Bottom 1-E corrected qu(tsf) elapsed dial rdg change load rdg load axial strain 1-E corrected qu(tsf) 0.5 1.98 0.02 3 1.0 0.0053 0.9947 20.54 0.0217 1.0 1.96 0.04 6 1.9 0.0107 0.9893 20.65 0.0432 1.5 1.94 0.06 13 4.2 0.0160 0.9840 20.76 0.0932 2.0 1.92 0.08 18 5.8 0.0217 0.9733 20.99 0.1772 3.0 1.88 0.12 30 9.6 0.0321 0.9679 21.11 0.2115 3.5 1.86 0.14 36 11.5 0.0374 0.9626 21.22 0.2524 4.0 1.84 0.16 42 13.4 0.0428 0.9572 <
dry density (pcf)116.6Sample:S-4, Sample #16USCS:116.641.0'-43.3' Bottom41.0'-43.3' Bottom $41.0'-43.3'$ Bottom $1-E$ corrected $qu(tsf)$ elapseddial rdgchangeload rdgloadaxial strain $1-E$ corrected $qu(tsf)$ 0.51.980.0231.00.00530.994720.540.02171.01.960.0461.90.01070.989320.650.04321.51.940.06134.20.01600.984020.760.09322.01.920.08185.80.02170.973320.990.17723.01.880.12309.60.03210.967921.110.21153.51.860.143611.50.03740.962621.220.25244.01.840.164213.40.04280.957221.340.29284.51.820.184815.40.04810.951921.460.33285.01.800.2025417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.6420.935821.830.43626.51.740.266922.10.69550.930521.960.46766.51.740
Sample: S-4, Sample #16 USCS: 41.0'-43.3' Bottom elapsed dial rdg change load rdg load axial strain 1-E corrected qu(tsf) time (min) (0.01 in) (0.0001in.) (lbs.) E area (scm) 0.5 1.98 0.02 3 1.0 0.0053 0.9947 20.54 0.0217 1.0 1.96 0.04 6 1.9 0.0107 0.9893 20.65 0.0432 1.5 1.94 0.06 13 4.2 0.0160 0.9840 20.76 0.0932 2.0 1.92 0.08 18 5.8 0.0217 0.9733 20.99 0.1772 3.0 1.88 0.12 30 9.6 0.0321 0.9679 21.11 0.2115 3.5 1.86 0.14 36 11.5 0.0374 0.9626 21.22 0.2524 4.0 1.84 0.16 42 13.4 0.4048 <t< td=""></t<>
elapsed time (min)dial rdg (0.01 in)load rdg (0.01 in)load rdg (0.001 in)axial strain (lbs.)1-E Ecorrected area (scm)qu(tsf)0.51.980.0231.00.00530.994720.540.02171.01.960.04461.90.01070.989320.650.04321.51.940.06134.20.01600.984020.760.09322.01.920.08185.80.02170.973320.990.17723.01.880.12309.60.03210.967921.110.21153.51.860.143611.50.03740.962621.220.25244.01.840.164213.40.04280.957221.340.29284.51.820.184815.40.04810.951921.460.33285.01.800.205417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.69550.305521.960.46767.01.720.287223.00.07490.925122.080.46851
time (min) (0.01 in) $(0.001 \text{ in}.)$ $(0.0001 \text{ in}.)$ $(lbs.)$ Earea (scm)0.51.980.0231.00.00530.994720.540.02171.01.960.0461.90.01070.989320.650.04321.51.940.06134.20.01600.984020.760.09322.01.920.08185.80.02170.978620.880.12832.51.900.10258.00.02670.973320.990.17723.01.880.12309.60.03210.967921.110.21153.51.860.143611.50.03740.962621.220.25244.01.840.164213.40.04280.957221.340.29284.51.820.184815.40.04810.951921.460.33285.01.800.205417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
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2.01.920.08185.80.02140.978620.880.12832.51.900.10258.00.02670.973320.990.17723.01.880.12309.60.03210.967921.110.21153.51.860.143611.50.03740.962621.220.25244.01.840.164213.40.04280.957221.340.29284.51.820.184815.40.04810.951921.460.33285.01.800.205417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
2.01.920.08185.80.02140.978620.880.12832.51.900.10258.00.02670.973320.990.17723.01.880.12309.60.03210.967921.110.21153.51.860.143611.50.03740.962621.220.25244.01.840.164213.40.04280.957221.340.29284.51.820.184815.40.04810.951921.460.33285.01.800.205417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
2.51.900.10258.00.02670.973320.990.17723.01.880.12309.60.03210.967921.110.21153.51.860.143611.50.03740.962621.220.25244.01.840.164213.40.04280.957221.340.29284.51.820.184815.40.04810.951921.460.33285.01.800.205417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
3.01.880.12309.60.03210.967921.110.21153.51.860.143611.50.03740.962621.220.25244.01.840.164213.40.04280.957221.340.29284.51.820.184815.40.04810.951921.460.33285.01.800.205417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
3.51.860.143611.50.03740.962621.220.25244.01.840.164213.40.04280.957221.340.29284.51.820.184815.40.04810.951921.460.33285.01.800.205417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
4.01.840.164213.40.04280.957221.340.29284.51.820.184815.40.04810.951921.460.33285.01.800.205417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
4.51.820.184815.40.04810.951921.460.33285.01.800.205417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
5.01.800.205417.30.05350.946521.580.37235.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
5.51.780.225818.60.05880.941221.710.39766.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
6.01.760.246420.50.06420.935821.830.43626.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
6.51.740.266922.10.06950.930521.960.46767.01.720.287223.00.07490.925122.080.4851
7.0 1.72 0.28 72 23.0 0.0749 0.9251 22.08 0.4851
7.5 1.70 0.50 74 25.7 0.0002 0.3130 22.21 0.4337
8.0 1.68 0.32 80 25.6 0.0856 0.9144 22.34 0.5328
8.5 1.66 0.34 84 26.9 0.0909 0.9091 22.47 0.5562
9.0 1.64 0.36 88 28.2 0.0963 0.9037 22.61 0.5792
9.5 1.62 0.38 92 29.4 0.1016 0.8984 22.74 0.6020
10.0 1.60 0.40 95 30.4 0.1070 0.8930 22.88 0.6179
10.5 1.58 0.42 102 32.6 0.1123 0.8877 23.01 0.6595
11.0 1.56 0.44 104 33.3 0.1176 0.8824 23.15 0.6684
11.5 1.54 0.46 103 33.0 0.1230 0.8770 23.30 0.6579
12.0 1.52 0.48 108 34.6 0.1283 0.8717 23.44 0.6857 12.5 1.50 0.50 140 25.2 0.4237 0.90002 23.58 0.0014
12.5 1.50 0.50 110 35.2 0.1337 0.8663 23.58 0.6941 12.0 1.48 0.52 115 26.8 0.1200 0.8610 22.72 0.7211
13.01.480.5211536.80.13900.861023.730.721113.51.460.5411837.80.14440.855623.880.7354
13.5 1.40 0.54 110 37.6 0.1444 0.8550 23.66 0.7554 14.0 1.44 0.56 122 39.0 0.1497 0.8503 24.03 0.7555

REPORT OF UNCONFINED COMPRESSION

Project: Kinnickinnic River Stability Analysis and Dredging Study

Job No.: GD-06032

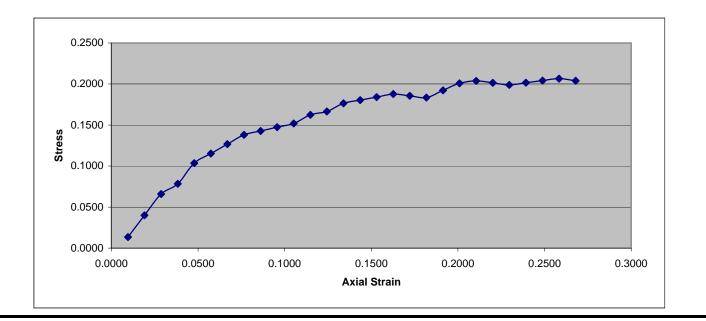
 Client:
 Barr Engineering Co., 4700 West 77th St., Edina Mn 55435-4803
 Date:
 5/4/2006

Boring No: S-6

Sample No: 21

Depth: 51.5'-53.8'

Tes	t No.				1				
Тур	e of Specimen				Thin Wall				
	Water Content			Wo	45.4				
a	Void Ratio			eo	1.079				
Initial	Saturation			So	111.6				
	Dry Density, lb/cu	ft		7 _d	79.5				
Tim	e to Failure, min			t _f	8.0				
Unc	onfined Compressi	ve Strength	, T/sq ft	q _u	0.18				
Und	rained Shear Strer	ngth, T/sq ft		Su					
Sen	sitivity Ratio			S _t					
Initia	al Specimen Diame	eter, in		Do	2.08				
Initia	al Specimen Heigh	t, in		H _o	4.18				
Clas	ssification (OH) Or	ganic Silt				-			
LL	57.5	PL	32.0		PI	25.6	Gs	*2.65	
Ren	narks: * Assumed	Value							



REPORT OF: UNCONFINED COMPRESSIVE STRENGTH

Client: Project:	Barr Engin Kinnickinn	eering Co ic River Stat	oilty Analysi	S	Date: Job No.	GD-06032	5/4/2006	
pan no.		68		Diameter (i	in./cm)	2.08	5.28	
wet soil +	tare	772.3		length (in	./cm)		4.18	10.61
tare		341.7		area	(sq.cm)		21.90	
dry soil		296.10		volume (co	,		232.3	
water		134.50		volume of s			111.7	
moisture	(%)	45.4		void ratio			1.079	
spec. gr.	assumed	2.65		saturation	(%)		111.6	
opeo. gr.	assumed	2.00		dry density	. ,		79.5	
Sample:	Retest S-6	, Sample #2	:1	USCS:	(per)		75.5	
	51.5'-53.8'							
elapsed	dial rdg	change	load rdg	load	axial strain	1-E	corrected	qu(tsf)
time (min)	(0.01 in)	(0.01 in.)	(0.0001in.)	(lbs.)	Е		area (scm)	
0.5	1.96	0.04	2	0.6	0.0096	0.9904	22.11	0.0135
1.0	1.92	0.08	6	1.9	0.0191	0.9809	22.33	0.0400
1.5	1.88	0.12	10	3.2	0.0287	0.9713	22.55	0.0660
2.0	1.84	0.16	12	3.8	0.0383	0.9617	22.77	0.0784
2.5	1.80	0.20	16	5.1	0.0478		23.00	0.1035
3.0	1.76	0.24	18	5.8				0.1153
3.5	1.72	0.28	20	6.4			23.47	0.1268
4.0	1.68	0.32	22	7.0			23.72	0.1380
4.5	1.64	0.36	23	7.4		0.9139	23.96	0.1428
5.0	1.60	0.40	24	7.7	0.0957	0.9043	24.22	0.1475
5.5	1.56	0.44	25	8.0			24.48	0.1520
6.0	1.52	0.48	27	8.6	0.1148	0.8852	24.74	0.1624
6.5	1.48	0.52	28	9.0				0.1666
7.0	1.44	0.56	30	9.6			25.29	0.1765
7.5	1.40	0.60		9.9	0.1435		25.57	0.1804
8.0	1.36	0.64	32	10.2			25.86	0.1841
8.5	1.32	0.68	33	10.6				0.1877
9.0	1.28	0.72	33	10.6	0.1722	0.8278	26.46	0.1856
9.5	1.24	0.76	33	10.6			26.77	0.1835
10.0	1.20	0.80	35	11.2			27.08	0.1923
10.5	1.16	0.84	37	11.8			27.41	0.2009
11.0	1.12	0.88	38	12.2			27.74	0.2038
11.5	1.08	0.92	38	12.2		0.7799	28.08	0.2014
12.0	1.04	0.96	38	12.2			28.43	0.1989
12.5 13.0	1.00 0.96	1.00 1.04	39 40	12.5 12.8			28.79 29.15	0.2016 0.2042
13.0	0.96	1.04	40 41	12.0	0.2466		29.15	0.2042
14.0	0.88	1.12	41	13.1			29.92	0.2000



MOISTURE CONTENT DETERMINATION

ASTM D-2216

Project: Kinnickinnic River Stability Analysis and Dredging Study

Client: Barr Engineering Company

Job No: GD-06032C

Address: 4700 West 77th Street, Edina, MN 55435-4803

Date: 5/4/2006

Boring No.	S-3	S-1	S-1	S-5	S-2
Sample No.	16	8	12	13	16
Depth (ft.)	33.5-35.0	10.5-12.0	16.5-18.0	34.0-36.0	44.5-46.5
Pan No.	64	69	61	77	16
Weight-Wet Sample & Tare (g)	467.9	430.1	404.4	456.9	475.8
Weight-Dry Sample & Tare (g)	447.8	398.3	369.7	372.4	401.4
Weight of Moisture (g)	20.1	31.8	34.7	84.5	74.4
Weight of Tare (g)	341.7	344.1	340.7	104.0	116.2
Weight of Dry Soil (g)	106.1	54.2	29.0	268.4	285.2
Moisture Content (%)	18.9	58.7	119.7	31.5	26.1

Boring No.	S-3		
Sample No.	13		
Depth (ft.)	19.5-21.0		
Pan No.	69		
Weight-Wet Sample & Tare (g)	543.6		
Weight-Dry Sample & Tare (g)	474.4		
Weight of Moisture (g)	69.2		
Weight of Tare (g)	344.1		
Weight of Dry Soil (g)	130.3		
Moisture Content (g)	53.1		

Remarks:_____

Tested By: Ryan Backlund

Submitted By: _____

Date: 5/23/2006

 Date:
 5/4/2006

 Form D2216
 Revised 2/24/09

5		



MOISTURE CONTENT DETERMINATION

ASTM D-2216

Project: Kinnickinnic River Stability Analysis and Dredging Study

Client: Barr Engineering Company

Job No: <u>GD-06032C</u>

Address: 4700 West 77th Street, Edina, MN 55435-4803

Date: 5/3/2006

Boring No.	S-1	S-1	S-1	S-1	S-3
Sample No.	10	14	17	18	9
Depth (ft.)	13.5-15.0	19.5-21.0	32.0-33.5	37.0-38.5	13.5-15.0
Pan No.	61	69	63	59	99
Weight-Wet Sample & Tare (g)	559.4	512.9	440.8	426.1	272.5
Weight-Dry Sample & Tare (g)	496.9	489.2	426.6	415.2	207.6
Weight of Moisture (g)	62.5	23.7	14.2	10.9	64.9
Weight of Tare (g)	340.7	344.0	340.7	342.4	113.1
Weight of Dry Soil (g)	156.2	145.2	85.9	72.8	94.5
Moisture Content (%)	40.0	16.3	16.5	15.0	68.7

Boring No.	S-4		
Sample No.	6		
Depth (ft.)	10.0-12.0		
Pan No.	58		
Weight-Wet Sample & Tare (g)	493.4		
Weight-Dry Sample & Tare (g)	401.8		
Weight of Moisture (g)	91.6		
Weight of Tare (g)	342.2		
Weight of Dry Soil (g)	59.6		
Moisture Content (g)	153.7		

Remarks:

Tested By: Ryan Backlund

Submitted By:

 Date:
 5/3/2006

 Form D2216
 Revised 2/24/05

Date: 5/23/2006



ASTM D-4318

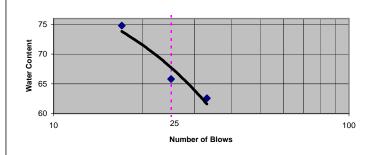
Project:	Kinnickinnic	c River Stability	Analysis and Dre	dging	Study			GD-06032
Client:	t: Barr Engineering Company Date							
Address:	4700 West	77th Street, Edi	na, Mn 55435-48	303				
-	on of Soil:					ith sand and	shells	
Depth of	Sample:	14.0' - 16.3'	_Boring No.:		S-5	5	Sample No.:	8
Liquid Lim	nit Determinat	ion					·	
Can No.								
Wt. of wet	soil +can (g)	18.55						
Wt. of dry	soil + can (g)	10.33						
Wt. of can	(g)	1.52						
Wt of dry s	soil (g)	8.81						
Wt of mois	sture (g)	8.22						
* No of blo	ows, N (g)	28						
*Water co	ntent, w %	94.6						
25						Plas	Liquid limit = Plastic limit = ticity index I _p =	94.6 64.1 30.5
10		25		100				
Plastic Lin	nit Determina	tion					<u>г г</u>	
Can no.								
Wt. of wet	soil + can (g)) 12.62						
Wt. of dry	soil + can (g)	8.28						
Wt. of can	(g)	1.51						
Wt. of dry	soil (g)	6.77						
Wt. of moi		4.34						
Water con	tent, $w\% = w$	[′] p 64.1						
Test Submitted	ed by: _		J. Whelan (SET)			Date:	5/16/2006



ASTM D-4318

Project:	Kinnickinnic R	iver Stability A	nalysis and Dre	Job No.:	GD-06032				
Client:	Barr Engineer	ing Company		Date Received:					
Address:	4700 West 77	4700 West 77th Street, Edina, Mn 55435-4803							
Descriptio	on of Soil:		(OH) Orgar	nic Silt, gray-bla	ack, high plasticity				
Depth of S	Sample:	10.5-12.0	_Boring No.:	S-1	Sample No.:	8			
Liquid Lim	it Determination								
Can No.		8	13	21					
Wt. of wet	soil +can (g)	29.65	30.34	29.46					
Wt. of dry	soil + can (g)	26.86	27.07	26.46					
Wt. of can	(g)	22.38	22.1	22.45					
Wt of dry s	soil (g)	3.85	4.97	4.01					
Wt of mois	ture (g)	2.77	3.27	3					
* No of blo	ws, N (g)	33	25	17					
Water cont	tent, <i>w %</i>	62.6	65.8	74.8					

*Blows for trials must be in the following ranges: (25-35), (20-30), (15-25)



Est. Percentage Retained #40 =

Flow index $F_i =$

- Liquid limit = 67.5
- Plastic limit = 36.2
- Plasticity index $I_p = 31.3$

Can no.	2	7		
Wt. of wet soil + can (g)	29.2	28.89		
Wt. of dry soil + can (g)	27.35	27.18		
Wt. of can (g)	22.22	22.46		
Wt. of dry soil (g)	5.13	4.72		
Wt. of moisture (g)	1.85	1.71		
Water content, $w\% = w_p$	36.1	36.2		

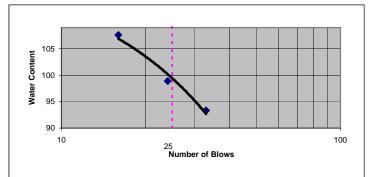
Tested by:	R. Backlund	Date:	5/8/2006
Submitted By:		Date:	



ASTM D-4318

Project:	Kinnickinnio	c River Stability A	Job No.:	GD-06032		
Client:	Barr Engine	ering Company			Date Received:	
Address:	4700 West	77th Street, Edina	a, Mn 55435-48	803		
Descriptio	on of Soil:		(OH) Orgar	nic Silt, gray-bla	ack, high plasticity	
Depth of S	Sample:	16.5-18.0	Boring No.:	S-1	Sample No.:	12
Liquid Lim	it Determinat	ion		<u>_</u>		
Can No.		2	7	29		
Wt. of wet	soil +can (g)	31.54	29.77	32.34		
Wt. of dry	soil + can (g)	26.72	26.14	27.63		
Wt. of can	(g)	22.24	22.47	22.58		
Wt of dry s	soil (g)	4.48	3.67	5.05		
Wt of mois	ture (g)	4.82	3.63	4.71		
* No of blo	ws, N (g)	16	24	33		
Water con	tent, w %	107.6	98.9	93.3		

*Blows for trials must be in the following ranges: (25-35), (20-30), (15-25)



Est. Percentage Retained #40 =

Flow index $F_i =$

- Liquid limit = 99.1
- Plastic limit = **51.6**
- Plasticity index I_p = 47.5

Can no.	1	4
Wt. of wet soil + can (g)	29.53	28.95
Wt. of dry soil + can (g)	27.04	26.69
Wt. of can (g)	22.19	22.33
Wt. of dry soil (g)	4.85	4.36
Wt. of moisture (g)	2.49	2.26
Water content, $w\% = w_p$	51.3	51.8
Tested by:		R. Back
Submitted By:		



ASTM D-4318

7.0" - 29.3' 24.46 20.51 1.51	na, Mn 55435-4	(CL)	Lean Clay S-1	Sample No.:	16
24.46 20.51 1.51	_Boring No.: _	· · · /		Sample No.:	16
24.46 20.51 1.51	_Boring No.: _		<u>S-1</u>	Sample No.: _	16
20.51 1.51					
20.51 1.51					
20.51 1.51					
1.51					
40.00					
19.00					
3.95					
22					
*20.5					
		100		Liquid limit = Plastic limit = Plasticity index I _p =	20.5 12.2 8.3
14.7					
13.27					
1.51					
11.67					
1.43	ļļ				
12.2					
	*20.5 *20.5	*20.5 *20.5 14.7 13.27 1.51 11.67 1.43 12.2	*20.5 *20.5 100 100 14.7 13.27 1.51 11.67 1.43 12.2	*20.5 Est. Percenta	*20.5 Est. Percentage Retained #40 = Flow index F_i = Liquid limit = Plastic limit = Plastic limit = Plasticity index I_p = 100 14.7 13.27 1.51 11.67 11.67 1.43 14.3

Date:	

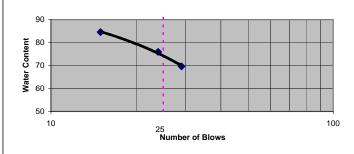
Submitted By:



ASTM D-4318

Project:	Kinnickinnic Ri	ver Stability A	Job No.:	GD-06032		
Client:	Barr Engineerii	ng Company			Date Received:	
Address:	4700 West 77t	n Street, Edina	a, Mn 55435-4	4803		
Descriptio	on of Soil:		(OH) Orga	anic Silt, gray-bla	ick, high plasticity	
Depth of S	Sample:	18.0-20.3	Boring No.:	S-2	Sample No.:	10
Liquid Lim	it Determination	T				
Can No.		8b	20	28		
Wt. of wet	soil +can (g)	27.77	30.55	29.48		
Wt. of dry	soil + can (g)	24.83	27.03	26.51		
Wt. of can	(g)	21.35	22.39	22.29		
Wt of dry s	oil (g)	3.48	4.64	4.22		
Wt of mois	ture (g)	2.94	3.52	2.97		
* No of blo	ws, N (g)	15	24	29		
Water cont	ent, w %	84.5	75.9	69.6		

*Blows for trials must be in the following ranges: (25-35), (20-30), (15-25)



Est. Percentage Retained #40 =

Flow index $F_i =$

- Liquid limit = **75.0**
- Plastic limit = 36.0
- Plasticity index $I_p = 39.0$

Can no.	15	25		
Wt. of wet soil + can (g)	30.11	31.55		
Wt. of dry soil + can (g)	28.07	29.11		
Wt. of can (g)	22.34	22.41		
Wt. of dry soil (g)	5.73	6.7		
Wt. of moisture (g)	2.04	2.44		
Water content, $w\% = w_p$	35.6	36.4		

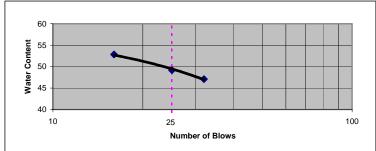
Tested by:	R. Backlund	Date:	5/8/2006
Submitted By:		Date:	



ASTM D-4318

Project:	Kinnickinnic R	iver Stability A	nalysis and D	redging Study	Job No.:	GD-06032
Client:	Barr Engineer	ing Company			Date Received:	
Address:	4700 West 77	th Street, Edin	a, Mn 55435-4	803		
Descriptio	on of Soil:		(OL) Orga	nic Clay,gray, m	oderate plasticity	
Depth of S	Sample:	36.5-38.8	Boring No.:	S-2	Sample No.:	14
Liquid Lim	it Determination	,				
Can No.		6	11	16		
Wt. of wet	soil +can (g)	31.8	35.17	33.5		
Wt. of dry	soil + can (g)	28.56	30.92	29.88		
Wt. of can	(g)	22.42	22.28	22.19		
Wt of dry s	soil (g)	6.14	8.64	7.69		
Wt of mois	sture (g)	3.24	4.25	3.62		
* No of blo	ws, N (g)	16	25	32		
Water cont	tent, <i>w %</i>	52.8	49.2	47.1		

*Blows for trials must be in the following ranges: (25-35), (20-30), (15-25)



Est. Percentage Retained #40 =

Flow index $F_i =$

- Liquid limit = 49.5
- Plastic limit = 34.2
- Plasticity index $I_p =$ 15.3

Can no.	6	11		
Wt. of wet soil + can (g)	35.89	35.78		
Wt. of dry soil + can (g)	32.44	32.34		
Wt. of can (g)	22.4	22.21		
Wt. of dry soil (g)	10.04	10.13		
Wt. of moisture (g)	3.45	3.44		
Water content, $w\% = w_p$	34.4	34.0		

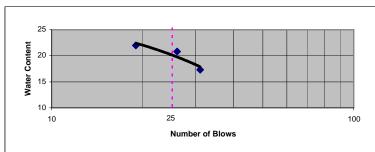
Tested by:	R. Backlund	Date:	5/8/2006
Submitted By:		Date:	



ASTM D-4318

Project:	Kinnickinnic Riv	ver Stability A	nalysis and D	redging Study	Job No.:	GD-06032
Client:	Barr Engineerin	ig Company			Date Received:	
Address:	4700 West 77th	n Street, Edin	a, Mn 55435-4	1803		
Descriptio	on of Soil:		(CL) L	ean Clay, gray,	low plasticity	
Depth of S	Sample:	33.5-35.0	Boring No.:	S-3	Sample No.:	16
Liquid Lim	it Determination					
Can No.		19	14	9		
Wt. of wet	soil +can (g)	33.05	31.65	28.6		
Wt. of dry	soil + can (g)	31.48	30.03	27.51		
Wt. of can	(g)	22.43	22.25	22.55		
Wt of dry s	oil (g)	9.05	7.78	4.96		
Wt of mois	ture (g)	1.57	1.62	1.09		
* No of blo	ws, N (g)	31	26	19		
Water cont	tent, w %	17.3	20.8	22.0		

*Blows for trials must be in the following ranges: (25-35), (20-30), (15-25)



Est. Percentage Retained #40 =

Flow index $F_i =$

- Liquid limit = 21.0
- Plastic limit = 12.2
- Plasticity index I_p = 8.8

Can no.	10	17		
Wt. of wet soil + can (g)	31.11	31.31		
Wt. of dry soil + can (g)	30.16	30.33		
Wt. of can (g)	22.25	22.36		
Wt. of dry soil (g)	7.91	7.97		
Wt. of moisture (g)	0.95	0.98		
Water content, $w\% = w_p$	12.0	12.3		

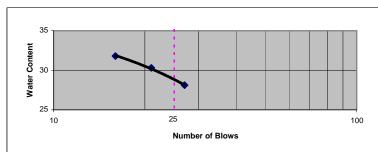
Tested by:	R. Backlund	Date:	5/8/2006
Submitted By:		Date:	



ASTM D-4318

Project: Kinnickinn	ic River Stability A	nalysis and Dr	edging Study	Job No.:	GD-06032
Client: Barr Engir	neering Company			Date Received:	
Address: 4700 Wes	t 77th Street, Edin	a, Mn 55435-4	803		
Description of Soil:		(CL) Lear	n Clay, gray-bro	wn, low plasticity	
Depth of Sample:	45.0-47.3	Boring No.:	S-3	Sample No.:	20
Liquid Limit Determina	ation				
Can No.	10	17	22		
Wt. of wet soil +can (g) 33.2	33.53	33.25		
Wt. of dry soil + can (g	g) 30.57	30.94	30.87		
Wt. of can (g)	22.29	22.38	22.39		
Wt of dry soil (g)	8.28	8.56	8.48		
Wt of moisture (g)	2.63	2.59	2.38		
* No of blows, N (g)	16	21	27		
Water content, w %	31.8	30.3	28.1		

*Blows for trials must be in the following ranges: (25-35), (20-30), (15-25)



Est. Percentage Retained #40 =

Flow index $F_i =$

- Liquid limit = 29.1
- Plastic limit = 15.5
- Plasticity index $I_p =$ **13.6**

Can no.	28	31		
Wt. of wet soil + can (g)	32.37	30.91		
Wt. of dry soil + can (g)	30.99	29.80		
Wt. of can (g)	22.26	22.44		
Wt. of dry soil (g)	8.73	7.36		
Wt. of moisture (g)	1.38	1.11		
Water content, $w\% = w_p$	15.8	15.1		

Tested by:	R. Backlund	Date:	5/8/2006
Submitted By:		Date:	



ASTM D-4318

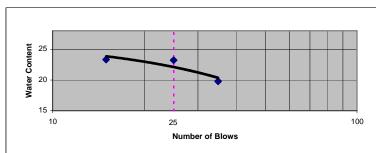
Client: Barr Engineerin		Analysis and Drec			Received:	
Address: 4700 West 77th	Street, Edir	na, Mn 55435-480)3			
Description of Soil:			*	ay with Shel	ls	
Depth of Sample: 26	6.0' - 28.3'	_Boring No.:	S-4	4	Sample No.:	12
Liquid Limit Determination						
Can No.						
Wt. of wet soil +can (g)	20.91					
Wt. of dry soil + can (g)	13.93					
Wt. of can (g)	1.54					
Wt of dry soil (g)	12.39					
Wt of moisture (g)	6.98					
* No of blows, N (g)	22					
Water content, <i>w</i> % ne Point Method	*55.5		Est. F	-	Retained #40 = Flow index F_i = Liquid limit =	55.5
e Point Method	*55.5	1	Est. F	F	Flow index $F_i =$	55.5 22.3 33.2
Point Method	*55.5	1		F	Flow index <i>F</i> _i = Liquid limit = Plastic limit =	22.3
e Point Method	*55.5			F	Flow index <i>F</i> _i = Liquid limit = Plastic limit =	22.3
ne Point Method	*55.5			F	Flow index <i>F</i> _i = Liquid limit = Plastic limit =	22.3
Plastic Limit Determination				F	Flow index <i>F</i> _i = Liquid limit = Plastic limit =	22.3
he Point Method	14.63			F	Flow index <i>F</i> _i = Liquid limit = Plastic limit =	22.3
the Point Method 25 20 15 10 25 Plastic Limit Determination Can no. Wt. of wet soil + can (g) Wt. of dry soil + can (g)	14.63			F	Flow index <i>F</i> _i = Liquid limit = Plastic limit =	22.3
he Point Method 25 20 15 10 25 Plastic Limit Determination Can no. Wt. of wet soil + can (g) Wt. of dry soil + can (g) Wt. of can (g)	14.63 12.24 1.51			F	Flow index <i>F</i> _i = Liquid limit = Plastic limit =	22.3



ASTM D-4318

Project:	Kinnickinnic R	iver Stability A	nalysis and D	Job No.:	GD-06032			
Client:	Barr Engineering Company				Date Received:			
Address:	4700 West 77	77th Street, Edina, Mn 55435-4803						
Descriptio	on of Soil:		(CL) Lea	n Clay, gray-brov	wn, low plasticity			
Depth of Sample:		41.0-43.3	Boring No.: S-4		Sample No.:	16		
Liquid Limit Determination								
Can No.		1	4	31				
Wt. of wet	soil +can (g)	32.06	29.35	35.36				
Wt. of dry s	soil + can (g)	30.19	28.03	33.23				
Wt. of can	(g)	22.18	22.34	22.45				
Wt of dry s	oil (g)	8.01	5.69	10.78				
Wt of mois	ture (g)	1.87	1.32	2.13				
* No of blo	ws, N (g)	15	25	35				
Water cont	tent, w %	23.3	23.2	19.8				

*Blows for trials must be in the following ranges: (25-35), (20-30), (15-25)



Est. Percentage Retained #40 =

Flow index $F_i =$

- Liquid limit = 22.0
- Plastic limit = 13.9
- Plasticity index I_p = 8.1

Can no.	8b	20		
Wt. of wet soil + can (g)	33.23	32.24		
Wt. of dry soil + can (g)	31.79	31.03		
Wt. of can (g)	21.33	22.41		
Wt. of dry soil (g)	10.46	8.62		
Wt. of moisture (g)	1.44	1.21		
Water content, $w\% = w_p$	13.8	14.0		

Tested by:	R. Backlund	Date:	5/8/2006
Submitted By:		Date:	



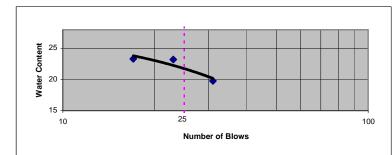
ASTM D-4318

Project:	Kinnickinnic River Stability Analysis and Dredging Study				Job No.:	GD-06032	
Client:	Barr Engineering Company Date Re				e Received:		
Address:	4700 West 77th Street, Edina, Mn 55435-4803						
Descriptio	on of Soil:		(OH)	Organic Silt, gray to bl	ack		
Depth of Sample:		51.5' - 53.8'	_Boring No.:	S-6	Sample No.:	21	

Liquid Limit Determination

Can No.	3	15	25		
Wt. of wet soil +can (g)	31.48	32.05	30.45		
Wt. of dry soil + can (g)	28.03	28.52	27.57		
Wt. of can (g)	22.34	22.38	22.43		
Wt of dry soil (g)	5.69	6.14	5.14		
Wt of moisture (g)	3.45	3.53	2.88		
* No of blows, N (g)	17	23	31		
Water content, w %	60.6	57.5	56.0		

*Blows for trials must be in the following ranges: (25-35), (20-30), (15-25)



Est. Percentage Retained #40 =

Flow index $F_i =$

- Liquid limit = 57.5
- Plastic limit = **32.0**
- Plasticity index $I_p = 25.5$

Can no.	16	3		
Wt. of wet soil + can (g)	31.73	31.69		
Wt. of dry soil + can (g)	29.43	29.40		
Wt. of can (g)	22.16	22.31		
Wt. of dry soil (g)	7.27	7.09		
Wt. of moisture (g)	2.30	2.29		
Water content, $w\% = w_p$	31.6	32.3		

Tested by:	R. Backlund	Date: 5/8/2006
Submitted By:		Date:

		6 Iron Mou	NGINEERING 335 Circle Drive untain, Michigan 4 -774-3440 Fax: (!	9801		
	SPEC		GRAVITY STM D854	OF SOIL		
ject:	Kinnickinnic River Stability	Analysi	s and Dredgin	g Study	Job No:	GL-06032
nt:		Ba	rr Engineering	I Co.		
lress:						
ation:					Received:	4/25/06
nple De	escription:	S-5 Sam	nple 13 34.0'-3	36.0' (CL) Lean	Clay	
Pycno	ole or Specimen No. ometer No. perature ° C		1 1 19.8	2 2 19.8		
Pycno	· · · · · ·					
Pycno Temp	ometer No. perature ° C Dish + Dry Soil (g) Dish (g)		1	2		
Pycno Temp	ometer No. berature ° C Dish + Dry Soil (g) Dish (g) Dry Soil (g)	W _s	1 19.8 52.67	2 19.8 55.37		
Pycno Temp	ometer No. berature ° C Dish + Dry Soil (g) Dish (g) Dry Soil (g) Pycnometer + Water @T (g)	W _s W _{bw}	1 19.8 52.67 673.60	2 19.8 55.37 666.15		
Pycno Temp	ometer No. berature ° C Dish + Dry Soil (g) Dish (g) Dry Soil (g) Pycnometer + Water @T (g) Ws + W _{bw}	W _{bw}	1 19.8 52.67 673.60 726.27	2 19.8 55.37 666.15 721.52		
Pycno	ometer No. berature ° C Dish + Dry Soil (g) Dish (g) Dry Soil (g) Pycnometer + Water @T (g)		1 19.8 52.67 673.60	2 19.8 55.37 666.15		
Meight in grams	ometer No. perature ° C Dish + Dry Soil (g) Dish (g) Dry Soil (g) Pycnometer + Water @T (g) Ws + W _{bw} Pycnometer + Water+dry Soil (g) Displaced Water, W _s +W _{bw} -W _{bws} ection Factor	W _{bw} W _{bws}	1 19.8 52.67 673.60 726.27 706.69 19.58 1.00004	2 19.8 55.37 666.15 721.52 700.95 20.57 1.00004		
Meight in grams	ometer No. perature ° C Dish + Dry Soil (g) Dish (g) Dry Soil (g) Pycnometer + Water @T (g) Ws + W _{bw} Pycnometer + Water+dry Soil (g) Displaced Water, W _s +W _{bw} -W _{bws}	W _{bw} W _{bws}	1 19.8 52.67 673.60 726.27 706.69 19.58	2 19.8 55.37 666.15 721.52 700.95 20.57		
Meight in grams	ometer No. perature ° C Dish + Dry Soil (g) Dish (g) Dry Soil (g) Pycnometer + Water @T (g) Ws + W _{bw} Pycnometer + Water+dry Soil (g) Displaced Water, W _s +W _{bw} -W _{bws} ection Factor	W _{bw} W _{bws}	1 19.8 52.67 673.60 726.27 706.69 19.58 1.00004	2 19.8 55.37 666.15 721.52 700.95 20.57 1.00004		

Tested by:

Submitted by:

Date:

635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906)-774-3440 Fax: (906)-774-7776

SPECIFIC GRAVITY OF SOIL

ASTM D854

Project:	Kinnickinnic River Stability and Dredging Study	Job No:	GL-06032
Client:	Barr Engineering Co.		
Address:			
Location:		Received:	4/18/06
Sample Description	S-1 Sample 8 10.5'-12.0' (OH) Orga	anic Silt	
Sample or Spec	cimen No. 1		
Pycnometer No	. 5		
Temperature ° (C 19.8		

Dish + Dry Soil (g)					
Dish (g)					
Dry Soil (g)	Ws	51.56			
Pycnometer + Water @T (g)	W_{bw}	667.20			
Ws + W _{bw}	-	718.76			
Pycnometer + Water+dry Soil (g)	W_{bws}	698.23			
Displaced Water, W _s +W _{bw} -W _{bws}		20.53			
ction Factor	К	1.00004			
$/ (W_s + W_{bw} - W_{bws})$	Gs	2.51			
	Dish (g) Dry Soil (g) Pycnometer + Water @T (g) Ws + W _{bw} Pycnometer + Water+dry Soil (g)	Dish (g) Ws Dry Soil (g) Ws Pycnometer + Water @T (g) Wbw Ws + Wbw Wbw Pycnometer + Water+dry Soil (g) Wbws Displaced Water, Ws+Wbw-Wbws Wbws Ction Factor K	Dish (g) W_s 51.56Dry Soil (g) W_s 51.56Pycnometer + Water @T (g) W_{bw} 667.20Ws + W_{bw} 718.76Pycnometer + Water+dry Soil (g) W_{bws} 698.23Displaced Water, $W_s+W_{bw}-W_{bws}$ 20.53Ction FactorK1.00004	Dish (g) W_s 51.56Dry Soil (g) W_s 51.56Pycnometer + Water @T (g) W_{bw} 667.20Ws + W_{bw} 718.76Pycnometer + Water+dry Soil (g) W_{bws} 698.23Displaced Water, $W_s+W_{bw}-W_{bws}$ 20.53Ction FactorK1.00004	Dish (g) W_s 51.56Dry Soil (g) W_s 51.56Pycnometer + Water @T (g) W_{bw} 667.20Ws + W_{bw} 718.76Pycnometer + Water+dry Soil (g) W_{bws} 698.23Displaced Water, $W_s+W_{bw}-W_{bws}$ 20.53Ction FactorK1.00004

Tested by: Ryan Backlund

Submitted by:

Date: 5/1/06

		e Iron Mou	NGINEERINC 335 Circle Drive untain, Michigan -774-3440 Fax: (
	SPEC		GRAVITY STM D854	OF SOIL		
oject:	Kinnickinnic River Stability	Analysi	s and Dredgir	ng Study	Job No:	GL-06032
ent:		Ва	rr Engineering	g Co.		
dress:						
cation:					Received:	4/24/06
	escription: S-2 San		(18.0 10 20.			
	ole or Specimen No.		S-2, # 10			
	ometer No.		5			
Temp	perature ° C		20.2			
	Dish + Dry Soil (g) Dish (g)		233.75 168.65			
ams	Dry Soil (g)	Ws	65.10			
u gra	Pycnometer + Water @T (g)	W _{bw}	667.12			
Weight in grams	Ws + W _{bw}	•	732.22			
Veig	Pycnometer + Water+dry Soil (g)	W_{bws}	705.41			
	Displaced Water, W _s +W _{bw} -W _{bws}		26.81			
Corre	ction Factor	К	1.00004			
	$(W_sK) / (W_s + W_{bw} - W_{bws})$		2.43			
		1				

Tested by:

Submitted by:

Date:

		6 Iron Mou	NGINEERING 335 Circle Drive untain, Michigan -774-3440 Fax: (
	SPEC		GRAVITY STM D854	OF SOIL		
oject:	Kinnickinnic River Stability	Analysi	s and Dredgir	ng Study	Job No:	GL-06032
ent:		Ba	rr Engineering	g Co.		
dress:						
cation:					Received:	4/24/06
mple De	scription: S-6 Sar	mple 18	39.5'-41.5' (OH) Organic Silt	, some clay	
Pycno	ole or Specimen No. ometer No. erature ° C		S-6 #18 20.2			
	Dish + Dry Soil (g)	1	237.64			
su	Dish (g) Dry Soil (g)	Ws	175.01 62.63			
Weight in grams	Pycnometer + Water @T (g)	W _{bw}	673.55			
ht in	Ws + W _{bw}	511	736.18			
Veigl	Pycnometer + Water+dry Soil (g)	W_{bws}	712.23			
>	Displaced Water, W _s +W _{bw} -W _{bws}		23.95			
Corre	ction Factor	К	1.00004			
	$(W_sK) / (W_s + W_{bw} - W_{bws})$		2.62			

Tested by:

Submitted by:

Date:



635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906)-774-3440 Fax: (906)-774-7776

UNIT DRY DENSITY

Project: Kinickinnic River StablityAnalysis and Dredging Study

Client: Barr Engineering

Address: 4700 West 77th Street, Edina, Minnesota 55435-4803

Job No: <u>GD-06032C</u> Date: <u>5/3/2006</u>

Boring No.	S-1	S-1	S-1	
Sample No.	9	17	18	
Depth (ft.)	36.5-38.8	32.0-33.5	37.0-38.5	
Pan No.	64	63	59	
Weight-Wet Sample & Tare (g)	452.9	440.8	426.1	
Weight-Dry Sample & Tare (g)	417.5	426.6	415.2	
Weight of Moisture (g)	35.4	14.2	10.9	
Weight of Tare (g)	341.7	340.7	342.4	
Weight of Dry Soil (g)	75.8	85.9	72.8	
Moisture Content (%)	46.7	16.5	15.0	
Sample Length (cm)	6.96	4.26	4.00	
Sample Diameter (cm)	3.43	3.76	3.44	
Cross-Section Area (sq-cm)	9.24	11.10	9.29	
Sample Volume (cc)	64.31	47.30	37.18	
Dry Unit Weight (g/cc)	1.18	1.82	1.96	
Dry Unit Weight (pcf)	73.6	113.4	122.2	

Remarks:_____

Tested By:

 Tested By:
 Ryan Backlund

Date:	5/3/2006
Date:	5/23/2006

Submitted By:



635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906)-774-3440 Fax: (906)-774-7776

UNIT DRY DENSITY

Project: Kinickinnic River StablityAnalysis and Dredging Study

Client: Barr Engineering

Address: 4700 West 77th Street, Edina, Minnesota 55435-4803

Date: 05-03-06 &

Job No: GD-06032C

					5/4/2006
Boring No.	S-2	S-6	S-2	S-3	S-4
Sample No.	14	21	10	20	16
Depth (ft.)	36.5-38.8	51.5-53.8	18.0-20.3	45.0-47.3	41.0-43.3
Pan No.	65	68	63	59	63
Weight-Wet Sample & Tare (g)	1396.5	772.3	1222.5	605.2	760.3
Weight-Dry Sample & Tare (g)	1085.0	637.8	829.0	553.7	702.8
Weight of Moisture (g)	311.5	134.5	393.5	51.5	57.5
Weight of Tare (g)	341.6	341.7	340.6	342.6	340.6
Weight of Dry Soil (g)	743.4	296.1	488.4	211.1	362.2
Moisture Content (%)	41.9	45.4	80.6	24.4	15.9
Sample Length (cm)	14.34	10.61	14.53	8.88	9.49
Sample Diameter (cm)	7.24	5.28	7.16	4.24	5.1
Cross-Section Area (sq-cm)	41.17	21.90	40.26	14.12	20.43
Sample Volume (cc)	590.40	232.30	585.00	125.40	193.90
Dry Unit Weight (g/cc)	1.26	1.27	0.83	1.68	1.87
Dry Unit Weight (pcf)	78.6	79.6	52.1	105.1	116.6

Remarks:_____

Submitted By:

Tested By: Dan Absolon

Date:	5/4/2006
Date:	5/23/2006

Submitted By:



635 Circle Drive Iron Mountain, Michigan 49801 Telephone: (906)-774-3440 Fax: (906)-774-7776

UNIT DRY DENSITY

Project: Kinickinnic River StablityAnalysis and Dredging Study

Client: Barr Engineering

Job No: GD-06032C

Address: 4700 West 77th Street, Edina, Minnesota 55435-4803

Date: 5/16/2006

Boring No.	S-1*	S-4*	S-5*	
Sample No.	16	12	8	
Depth (ft.)	27.0-29.3	26.0-28.3	14.0-16.3	
Pan No.				
Weight-Wet Sample & Tare (g)				
Weight-Dry Sample & Tare (g)				
Weight of Moisture (g)				
Weight of Tare (g)				
Weight of Dry Soil (g)				
Moisture Content (%)	20.5	48.0	95.0	
Sample Length (cm)				
Sample Diameter (cm)				
Cross-Section Area (sq-cm)				
Sample Volume (cc)				
Dry Unit Weight (g/cc)				
Dry Unit Weight (pcf)	124.0	71.0	44.0	

Remarks: * Tests conducted by SET, Inc.

Submitted By: _____

Tested By: John Whelan (SET)

Dated:	5/17/2006	
Dated:	5/23/2006	

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Extrusion Log

Project/Client	Kinnickinnic River Samples / Barr Engineering Company							
Boring #	Sample#	Depth(ft)	<u>Reco</u>	very (in)	Soil Description			
S-1	16	27.0-29.3	BE:	27.5	Note: Damaged TWT, Bottom Crushed & tube is out of round.			
			AE:	22.5	7" Pickup/Disturbed, Organic Clay, Gravel, Stems, Roots, Wood & Wirer.			
					15.5" Lean Clay, Brownish Gray, a few Laminations of Silt (CL)			
S-4	12	26.0-28.3	BE:	27.5	7" Pickup/Disturbed			
			AE:		18" Fat Clay w/some Shells & a trace of Organic Material, Gray (CH)			
S-5	8	14.0-16.3	BE:	20	3 3/4" Pickup/Disturbed			
			AE:	19	15 1/4" Organic Clay w/Sand & Shells, Gray, some Peat & Wood			
					in upper 3 1/2" (OH)			

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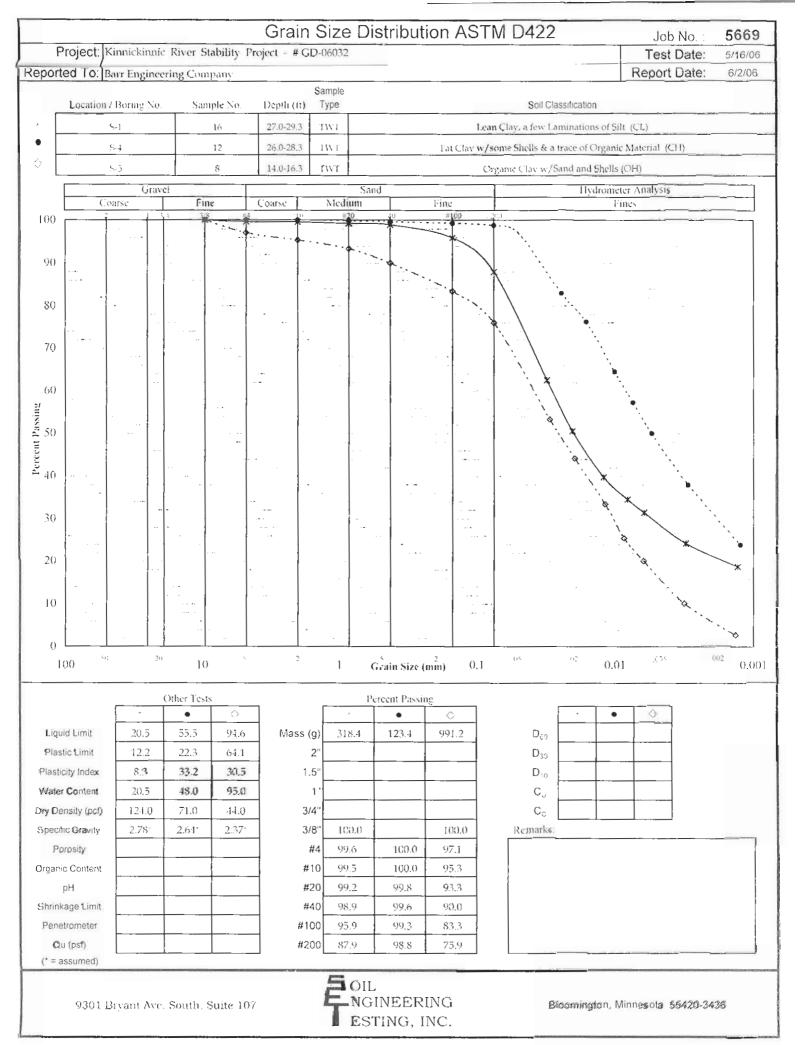
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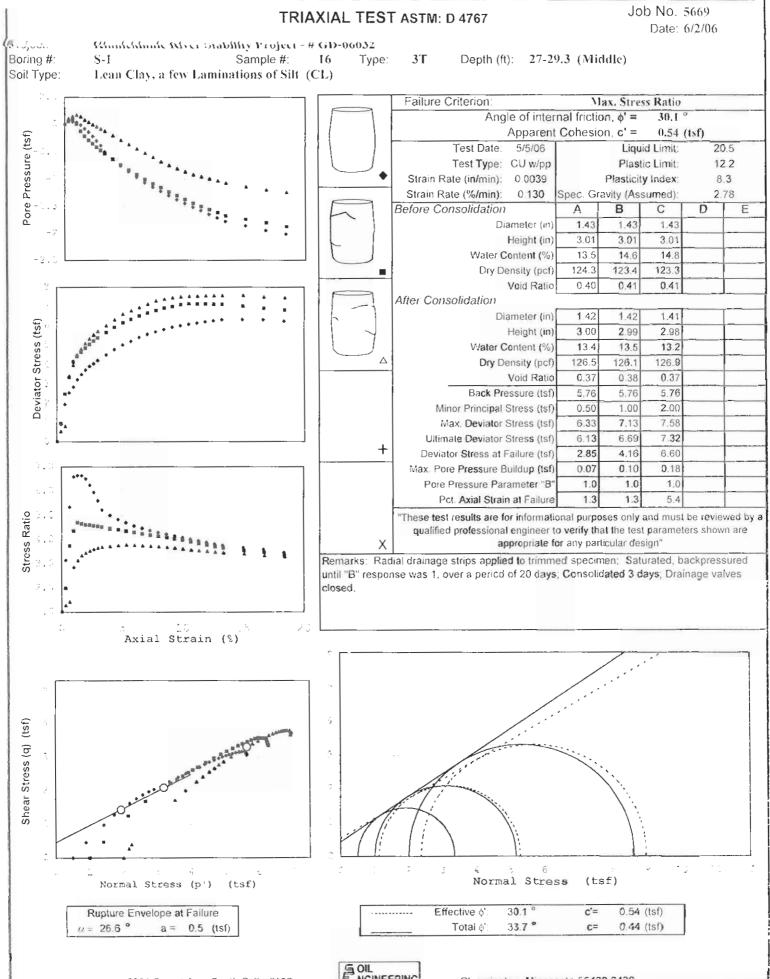
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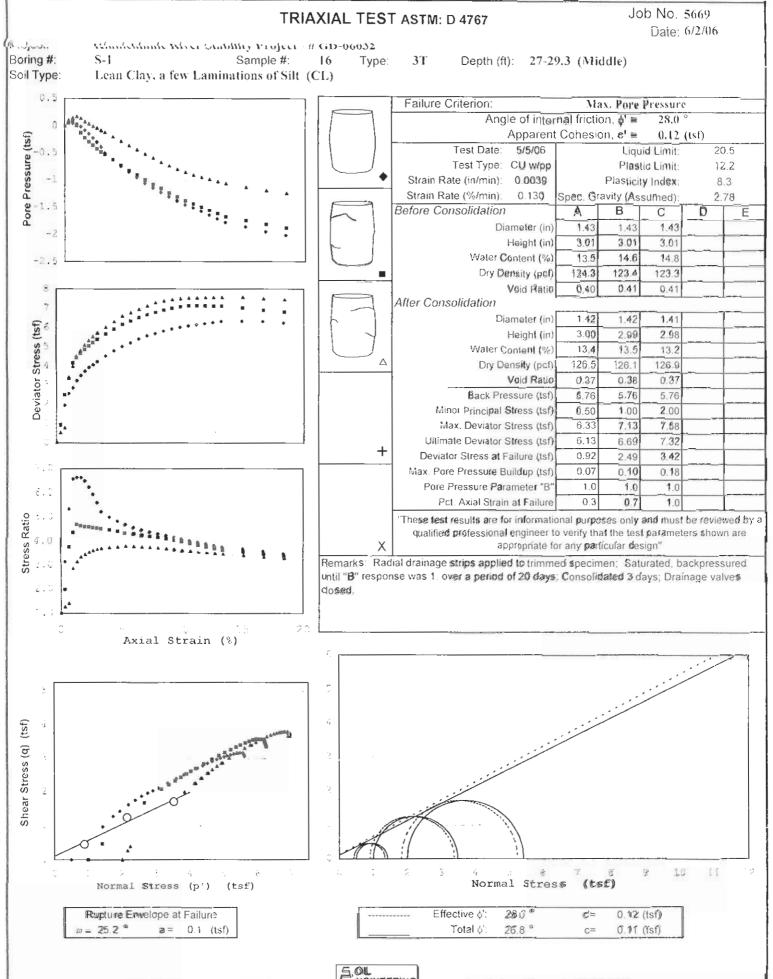




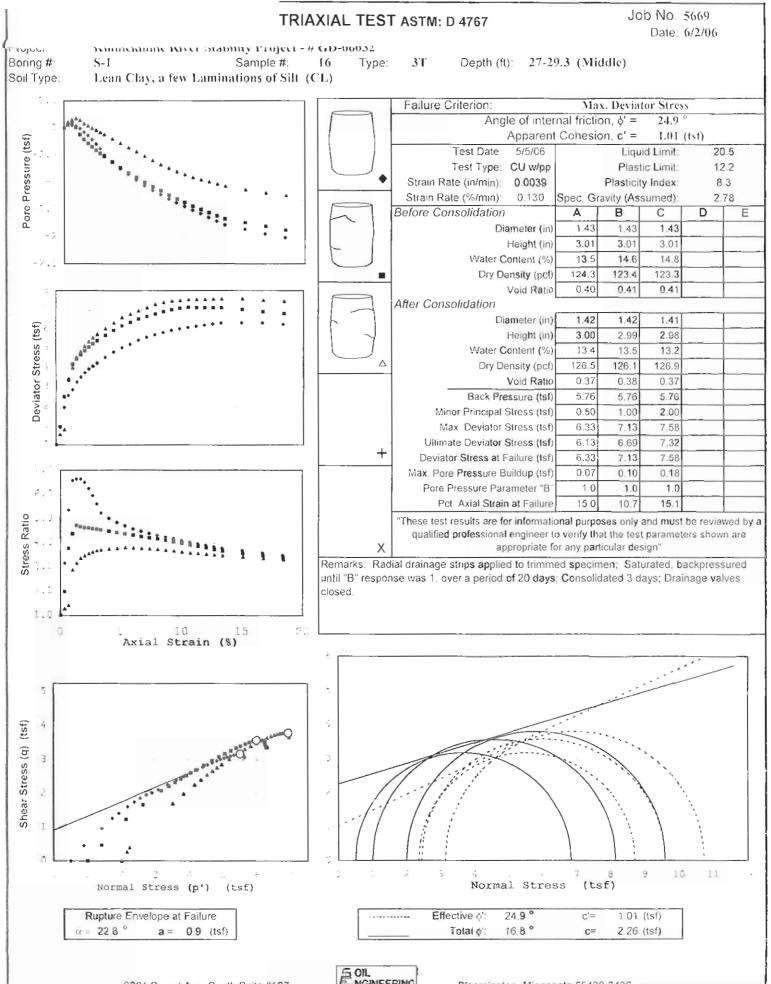
- 9301 Bryant Ave South Suite #107

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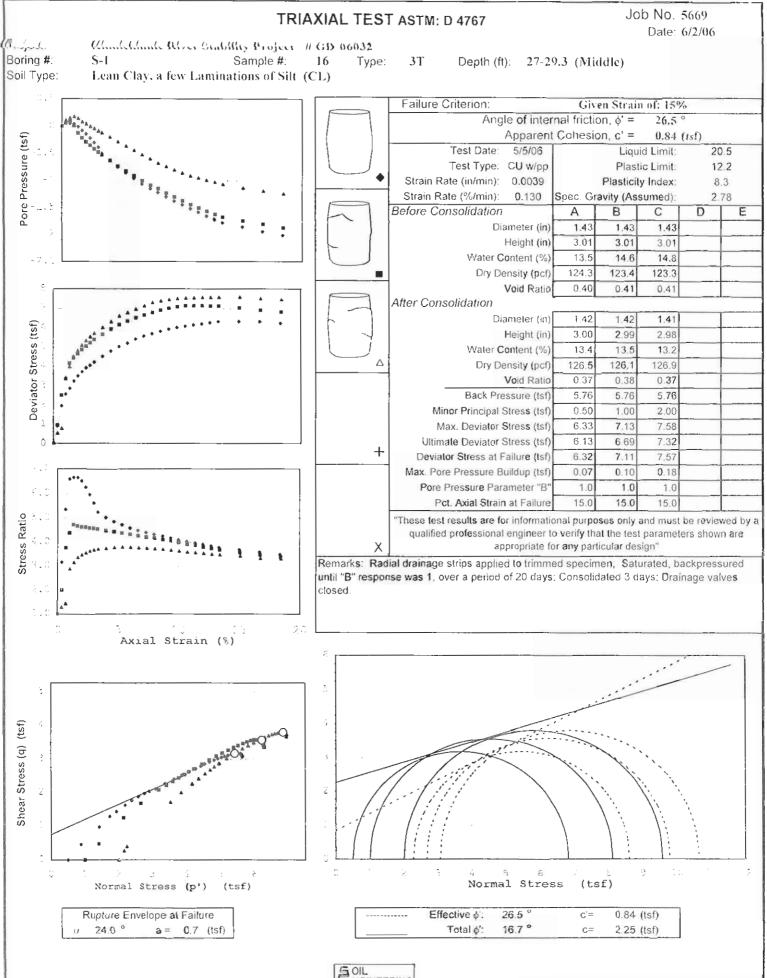
Bloomington, Minnesota 55420-3436



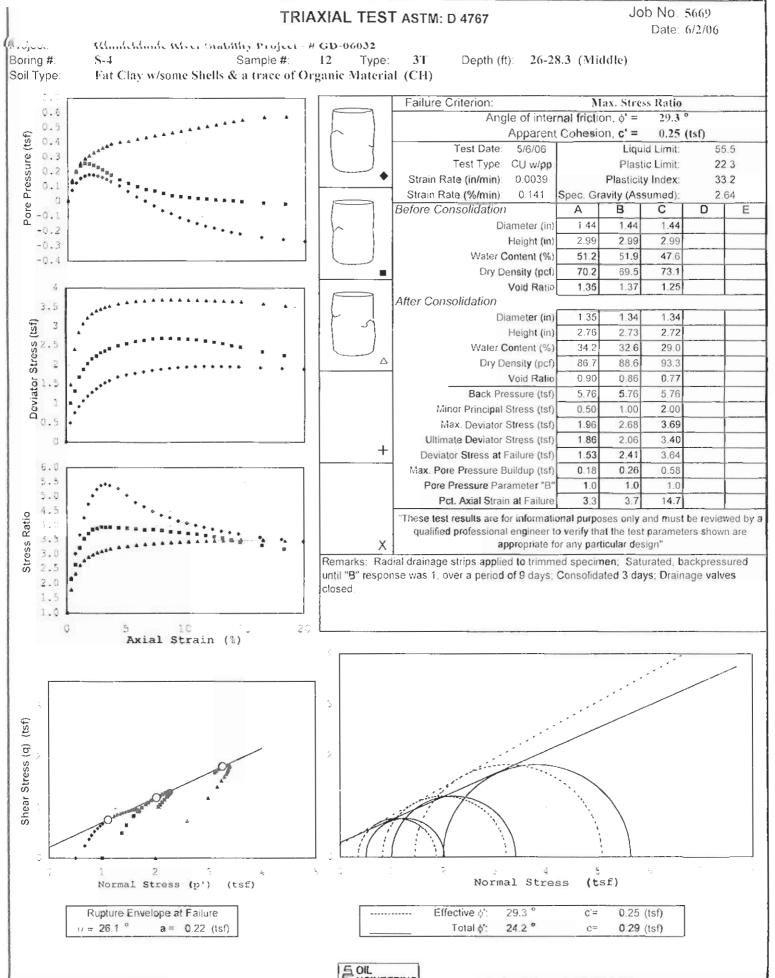




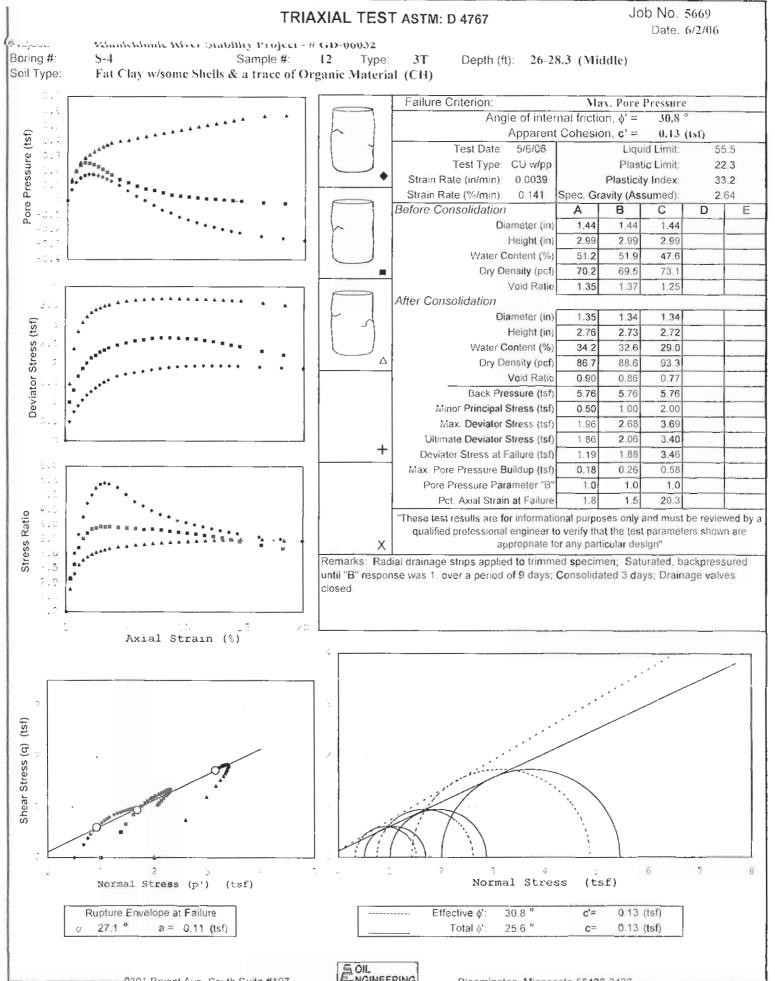




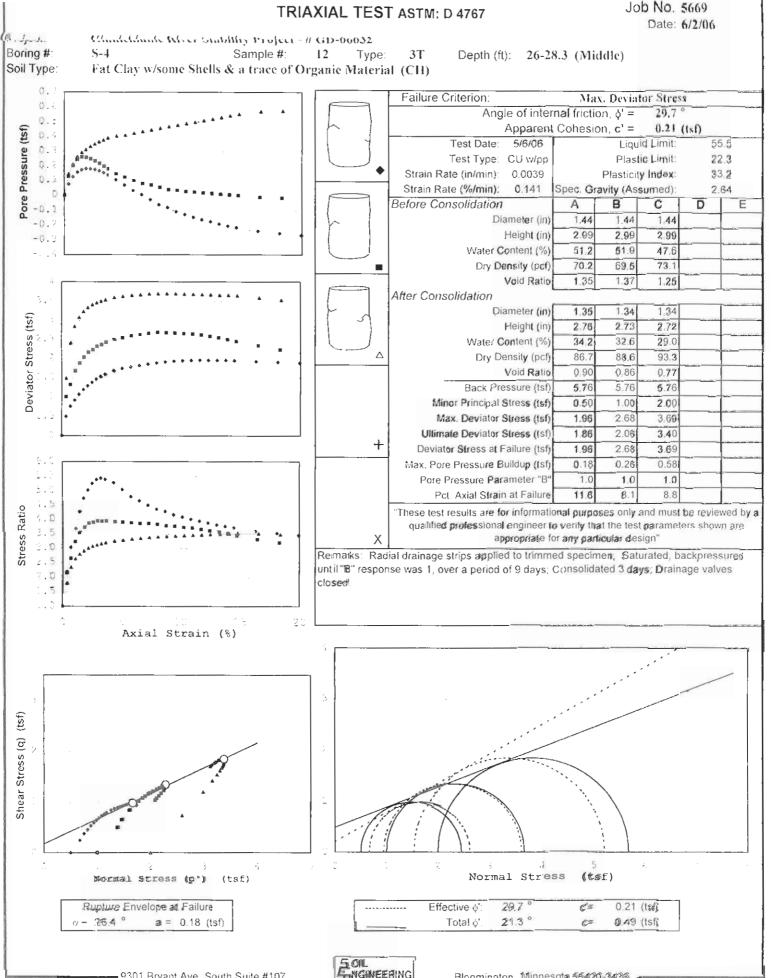








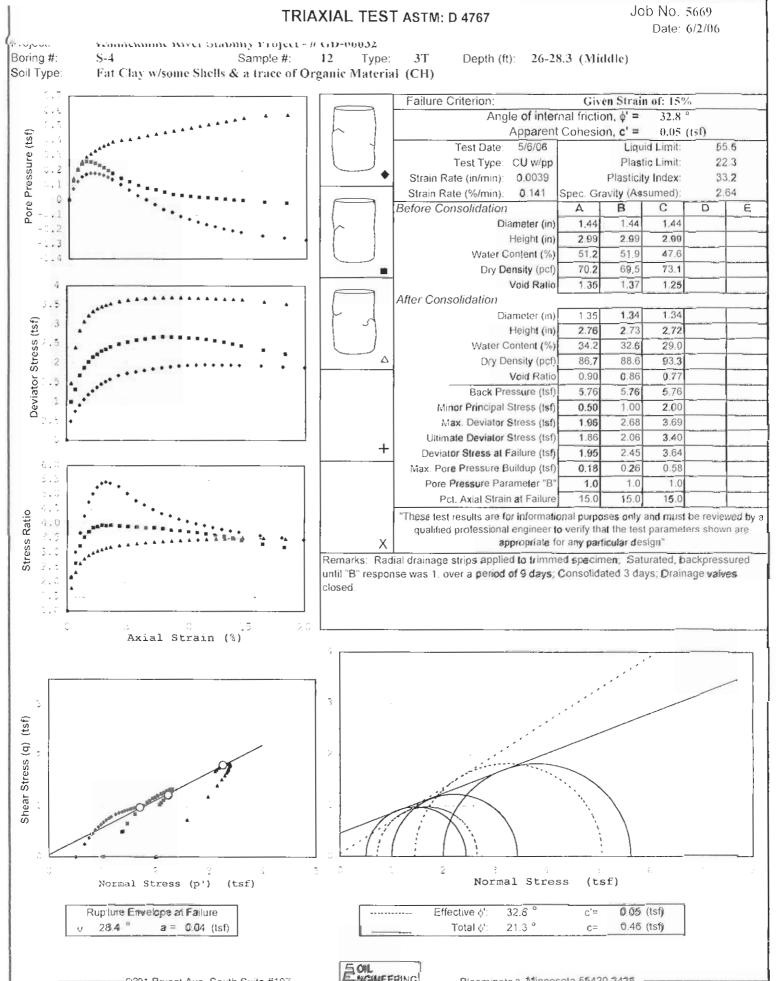




ESTING, INC

9301 Bryant Ave. South Suite #107

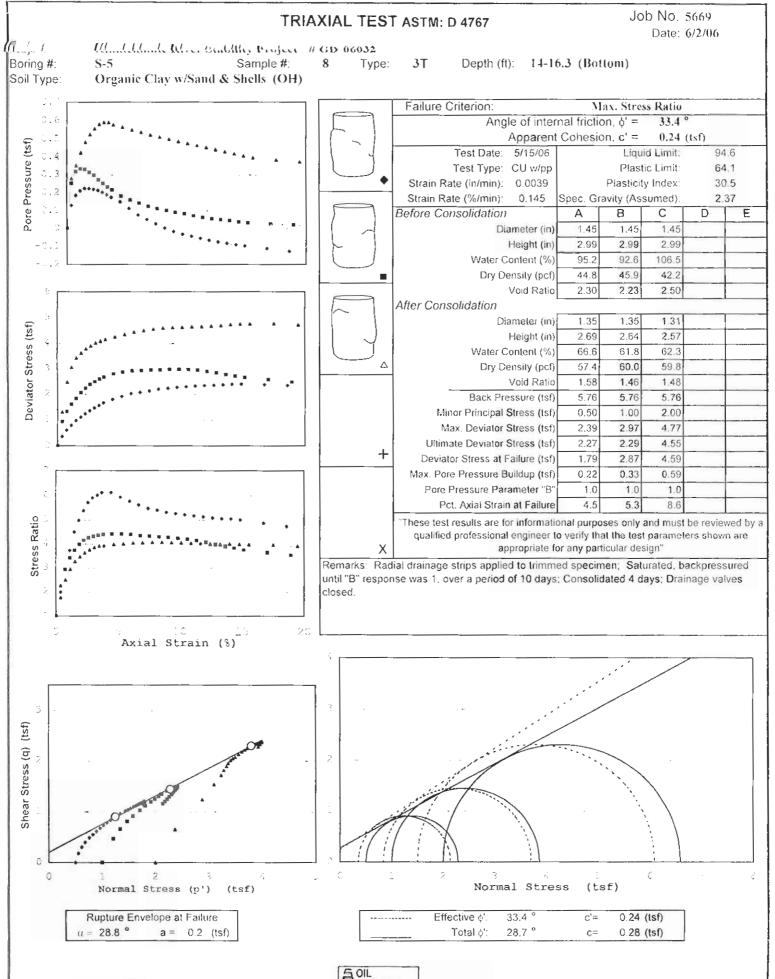
Bloomington, Minnesota 55420-3436



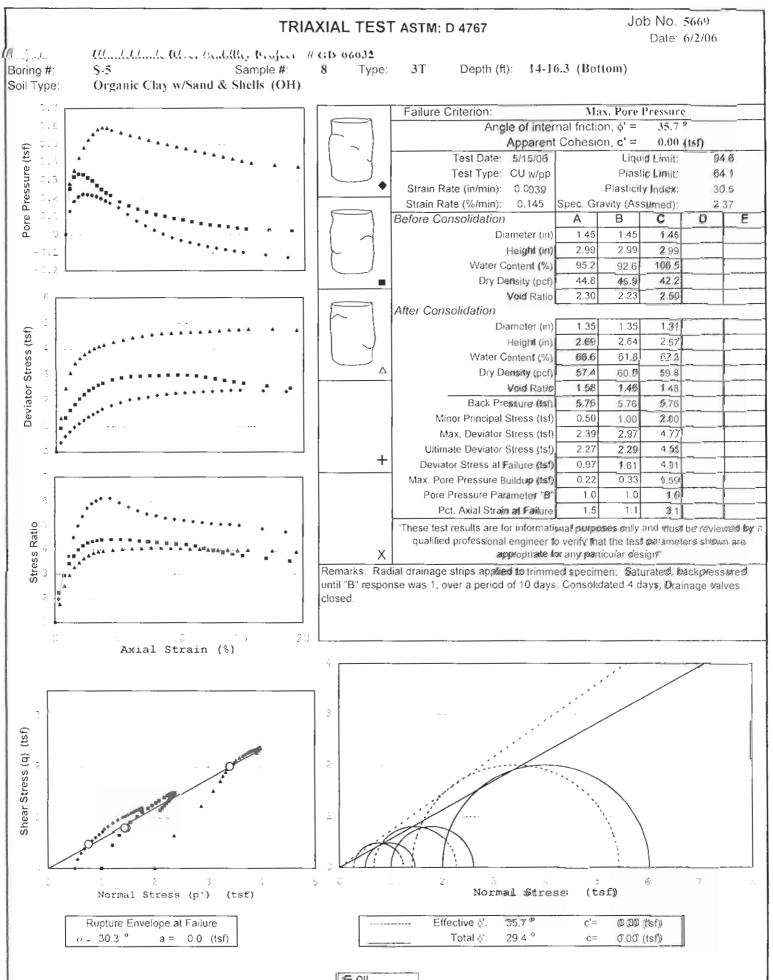
9301 Bryant Ave. South Suite #107

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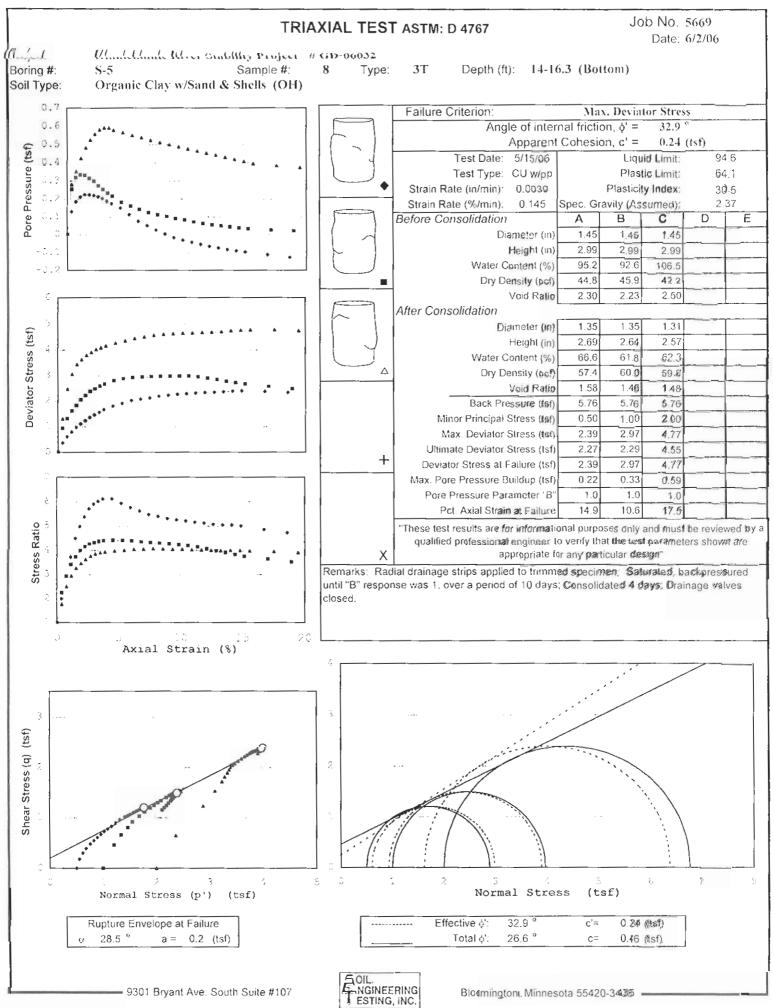
Bloomingto:n, Minnesota 55420-3436



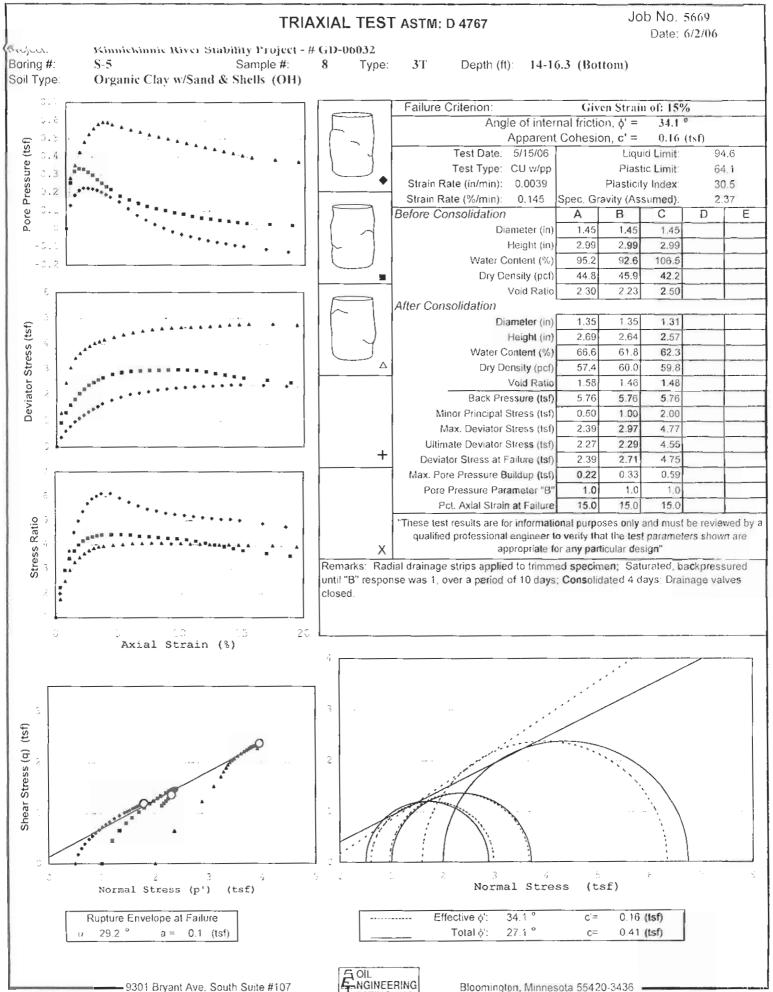








Bloemington, Minnesota 55420-3435

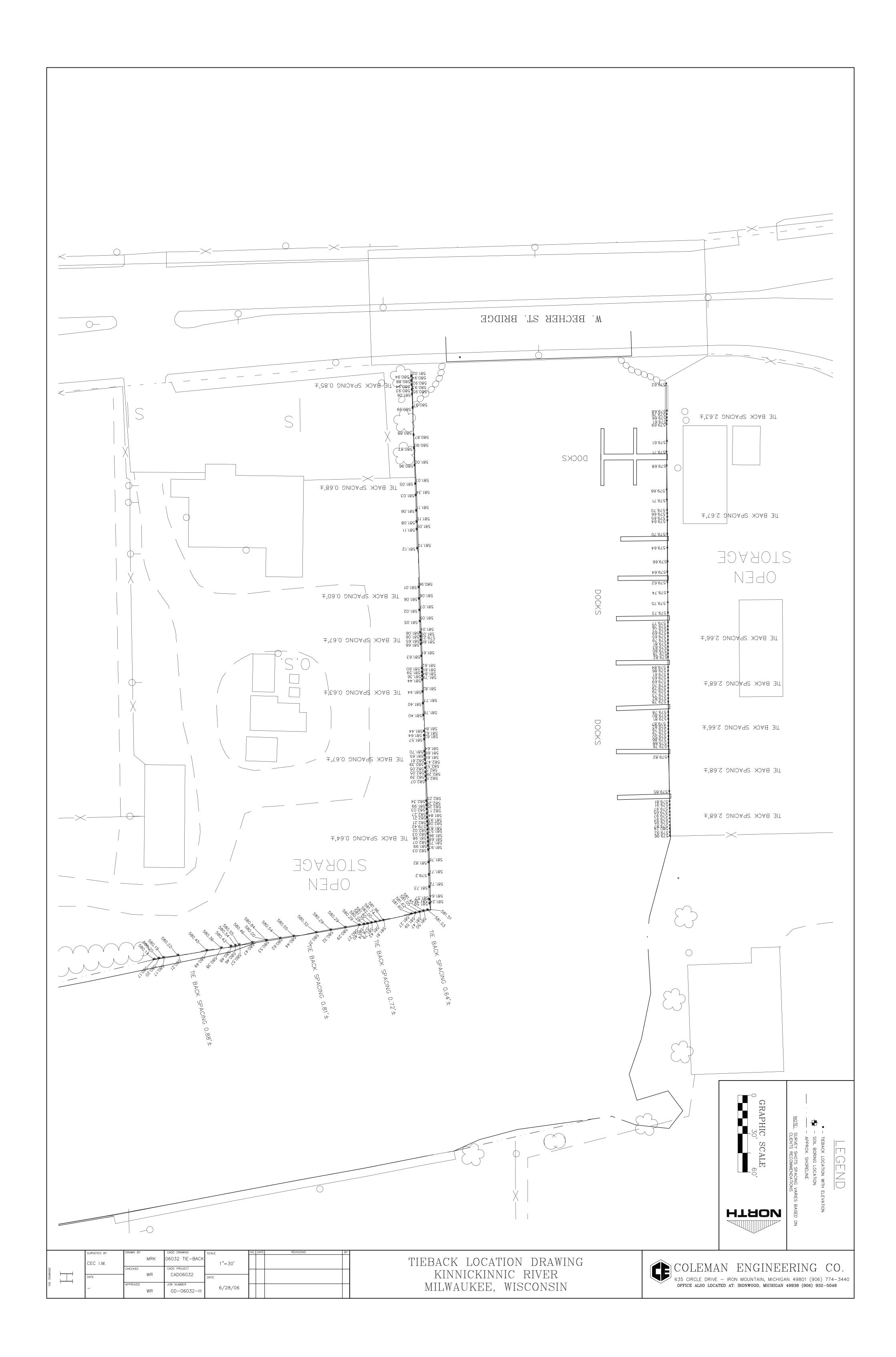


NGINEERING ESTING, INC.

Bloomington, Minnesota 55420-3436

APPENDIX H

TIE-BACK SURVEY



APPENDIX I

PARRALLEL SEISMIC SURVEY

APPENDIX I

REPORT OF PARALLEL SEISMIC SURVEY FOR KINNICKINNIC RIVER STABILITY ANALYSIS AND DREDGING STUDY

MILWAUKEE COUNTY, WISCONSIN

PREPARED FOR: BARR ENGINEERING COMPANY JUNE 2006 CEC PROJECT GD-06032

PARALLEL SEISMIC SURVEY U.S. CORPS OF ENGINEERS KINNICKINNIC RIVER MILWAUKEE, WISCONSIN

June 2006

Prepared by:

COLEMAN ENGINEERING COMPANY 635 Circle Drive Iron Mountain, Michigan 49801 CEC# GD-06032

TABLE OF CONTENTS

I.	Introduction	1
II.	Field Operation	1
III.	Interpretation	1
IV.	Disclaimer	2

ATTACHMENTS

- ATTACHMENT 1 LIST OF FIGURES
- ATTACHMENT 2 INSTRUMENT DETAILS
- ATTACHMENT 3 SURVEY RESULTS
- ATTACHMENT 4 GRAPHS OF SURVEY DATA

I. Introduction

On May 2-3, 2005, Coleman Engineering Company (CEC) conducted a parallel seismic survey at select borehole locations along the Kinnickinnic River (Figure 1) to assess the depth of sheet piling in relation to a proposed dredging operation and sheet pile analysis. The data acquisition platform was a Geotechnics S-12 Seismograph with Geostuff Wall-Lock Borehole Geophone Model BHG-2. The BHG-2 contains three (3) 14 Hz geophones in an X-Y-Z orientation. The geophone is clamped to the wall of the casing by a robust steel spring that is compressed by a DC electric motor. The array has a 100-meter cable and a controller module. Details of the instrumentation are found in Attachment 2.

II. Field Operation

Six (6) soil borings (S-1 through S-6) were advanced by CEC from April 18-25, 2006 and three (3) test wells (S-1, S-3, and S-5) were installed in the designated boreholes within 5 feet of the sheet piling along the Kinnickinnic River. The S-12 Seismograph and BHG-2 were connected and the BHG-2 was set in the well at ground surface (0.0') for the initial test. Several test shots were conducted to set the recording parameters of the seismograph in the optimal range (filters, gain, etc.). The seismograph was also tested without a triggered shot to test background noise and adjust the gain. The extraneous noise was very low due to the geophones being inside the borehole and filtering was set to omit 40-hertz waves, which are typical outside interference. Each test was triggered when the hammer struck the sheet piling. The response was monitored by the geophone array in the borehole and recorded on the seismograph. The test proceeded in 5-foot increments until a general depth of the bottom of the sheet piling was evident. The S-12 seismograph recorded the direct arrival times of compressional and shear waves as well as wave amplitudes. The first arrival times were plotted as a function of depth, and the depth where the change of slope occurred was observed to be the depth of the sheet piling. The sheet piling depth was also determined by the depth where the first arrival signal is significantly reduced. The accuracy of the method depended on the variability of the surrounding soil and the distance between borehole and sheet piling. As the distance from the borehole to the sheet piling increases, the error or the curve becomes more rounded, thus the estimate of the bottom of the sheet piling becomes a range of depth (higher and lower). Results of the survey are found in Attachment 3.

III. Interpretation

The first arrival times were plotted as a function of depth, and the depth where the change of slope occurred was observed to be the depth of the sheet piling. The accuracy of the method depends on the variability of the surrounding soil and the distance between borehole and sheet piling. The estimated depth to the bottom of the sheet piling at soil boring S-1 is 33 feet below ground surface (bgs). The text presentation of S-1 differs from S-3 and S-5 in that all geophone channels were operating at the time of each test. It was subsequently determined that using the three (3) geophones would yield a more aesthetically appealing presentation. The depth of the

Coleman Engineering Company

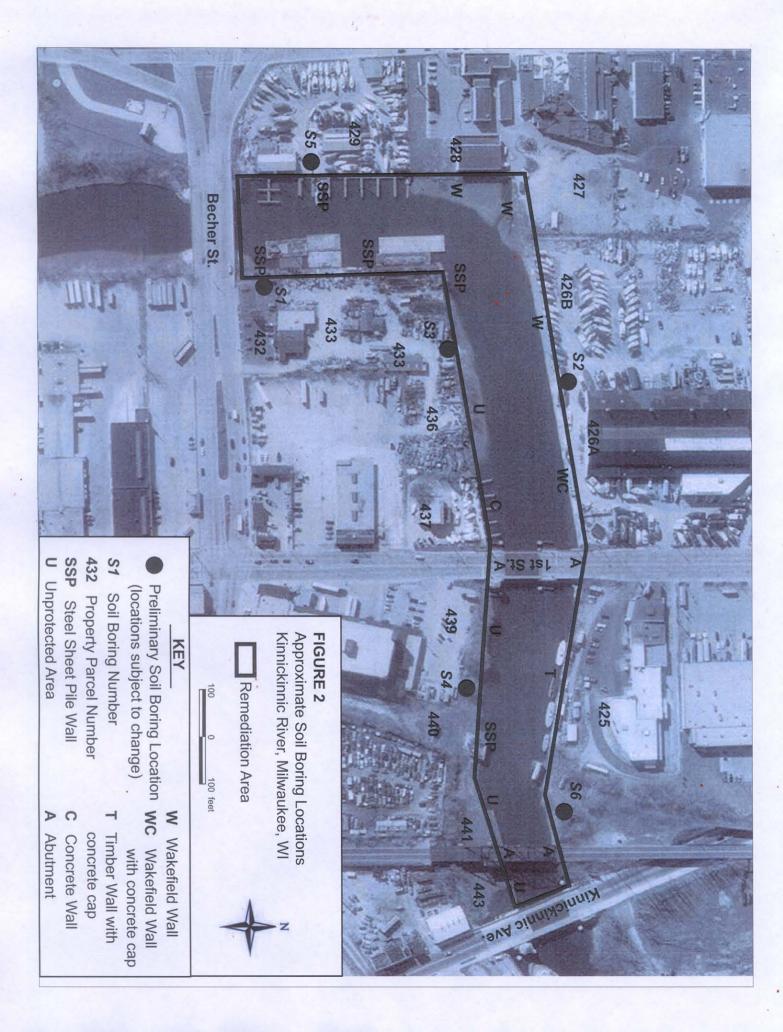
borehole beneath the sheet piling (the borehole was terminated due to auger refusal at 38 feet bgs) reduces the confidence in this interpretation. However, amplitude attenuation of the signal appears in the 35 and 38 foot shot points. It also appears that there is void space between the sheet piling and the soil strata from 21 to 26 feet bgs. This may be the result of channeling or migration of soil through the sheets from water action. The estimated depth to the bottom of the sheet piling in soil boring S-3 is 31.5 feet bgs and in soil boring S-5 is 30 feet bgs. Graphical solutions of the surveys are provided as Attachment 4.

IV. Disclaimer

There are limitations inherent to the geophysical investigation process. No geophysical investigation can wholly eliminate uncertainty regarding actual geophysical conditions of the subject study area(s). When dealing with existing conditions that are hidden from view affected by time, changes in state and other limitations, it would require a substantial level of financial and technical effort in order to remove all of the uncertainty associated with a site evaluation.

It must be understood that the results and the conclusions drawn from the results have inherent limitations and uncertainty. The limitations and uncertainty exist when site refraction samples are collected and analyzed for the purpose of representing existing site conditions. Although special care is taken in the field to assure adequate sampling, the results of those refraction samples are most representative of the exact location of where the samples were collected. The results, however, are used as a basis for demonstrating existing conditions, when in fact the overall actual conditions may vary.

ATTACHMENT 1 LIST OF FIGURES



ATTACHMENT 2 INSTRUMENT DETAILS



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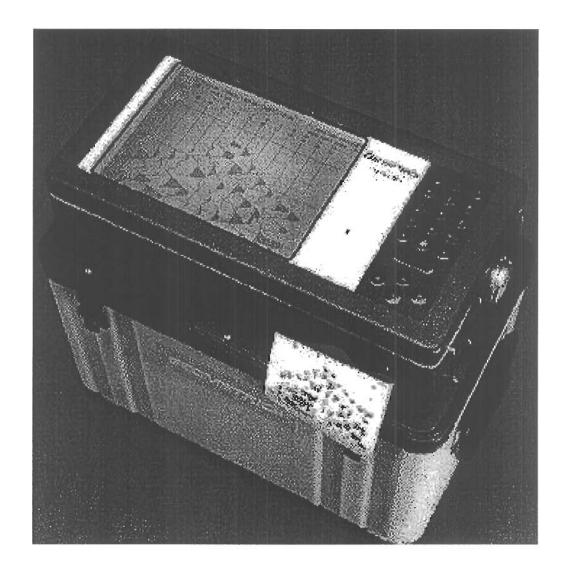
SmartSeis Exploration Seismograph 26325-01 Rev. B

Operation Manual

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GEOMETRICS, INC.

2190 Fortune Drive, San Jose, CA 95131 USA Phone 408-954-0522, Fax: 408-954-0902 E-mail: sales@geom.geometrics.com



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Appendix E. Specifications

Data Acquisition:

Preamplifier:

Input: Floating differential

Gain: 3X (36 dB) 2% accuracy

Differential input impedance: 20,000 ohms

Common mode input impedance: 5,000 ohms

Maximum undistorted differential input signal: 0.312 volts peak-to-peak

Input protected: against static and transient discharge.

Filters:

Acquisition filters:

Anti-alias filter automatically set by sample interval except none at fastest sample rate.

Selectable Lowcut, Notch or Highcut filter. Lowcut frequencies 10, 15, 25, 35, 50, 70, 100, 140, 200, 280, or 400 Hz, attenuation 24 dB/octave. Notch frequencies of 50, 60, 150 or 200 Hz. Highcut frequencies of 250, 500 or 1000 Hz.

Second filter available identical to above.

Display filters:

Two display filters are available, identical to the acquisition filters. Display filters do not alter the raw data stored in memory and saved on disk.

Digitizer: 16-bit (15+sign) analog-to-digital converter, preceded by an automatic 24 dB, single-stage, gain-ranging amplifier.

Summer: Signal is summed into a 32-bit accumulator. Will also subtract for enhancement of shear waves. Maximum signal may be stacked 8000 times without saturation.

Sample intervals: selectable 31.25, 62.5, 125, 250, or 500 microseconds for all channels.

Memory size: 32-bit word per sample, 2048 samples per channel, can be reduced by menu control to 1536, 1024, or 512 samples to save disk storage space.

Record duration: 64, 128, 256, 512 or 1024 milliseconds, depending on sample interval. Length of memory in use may be restricted to ¹/₄, ¹/₂ or ³/₄ of the available amount to reduce amount of data stored.

Memory freeze: selectable memory protection on individual channels to prevent erasure or further stacking.

SmartSeis[™] Operating Manual

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Appendix E-Specifications

Preview: incoming data may be displayed on screen and either selected or rejected at operator's discretion to allow editing of noisy records.

Delay: start of record may be delayed from initiation by selected value from 0 to 999 milliseconds in 1 ms increments. Negative delay may be selected to display a portion of the record prior to the zero time trigger.

Trigger: System triggers from a standard hammer switch, geophone signal, saturated NPN transistor, 5-volt logic level, contact closure, contact open, or +/- voltage. Trigger voltage sensitivity adjustable from 0 to 800 millivolts.

System:

Number of Seismic Channels: 12 (in SmartSeis[™] S12) or 24 (in SmartSeis[™] S24).

Graphics display: liquid crystal, VGA-compatible, with 640 by 480 pixels, 11 inch (28 cm) diagonal viewing area.

Display annotation: data is annotated with acquisition parameters and time-labeled cursors.

Display parameters: data is displayed in variable area, shaded, or wiggle trace, with and without clipping, in fixed gain or AGC, with adjustments for trace amplitude and time scale.

Plotter: Paper copy of record provided by internal, 11-cm wide thermal plotter with 640 dot resolution. Record is annotated with acquisition parameters, other variables, and time lines. Time scale and trace amplitude and format adjustable, controlled by settings on display.

Noise Monitor: Multi-channel, long-persistence, oscillographic noise monitor with trace for each geophone signal. Sensitivity is adjustable with scale factor displayed on screen. Waveform envelope can be observed.

Data storage: Internal 3.5-inch floppy disk drive provides data storage on 1.44-Mbyte, DOS-compatible media. Internal 40-Mbyte hard disk for program and data storage.

Computer: Internal computer with 80386SX processor, IBM AT compatible. Available for use as computer with computer interface option, which includes outputs for an external VGA monitor, parallel printer port, standard keyboard, and RS-232 interface. Programs may be loaded on standard disk drive.

Environmental:

Temperature: operates from 0 to 50 degrees Celsius. Will operate in light rain in vertical position.

Power: External 12-volt power from rechargeable battery or other source. Operates from 10.5 to 15 volts. Current drain approximately 2½ amps for SmartSeis[™] S12 and 3½ amps for SmartSeis[™] S24.

SmartSeis[™] Operating Manual

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Appendix E-Specifications

BHG-2 Borehole Geophone BHG-3 Borehole Geophone BHGC-1 Geophone Controller

Operation Manual

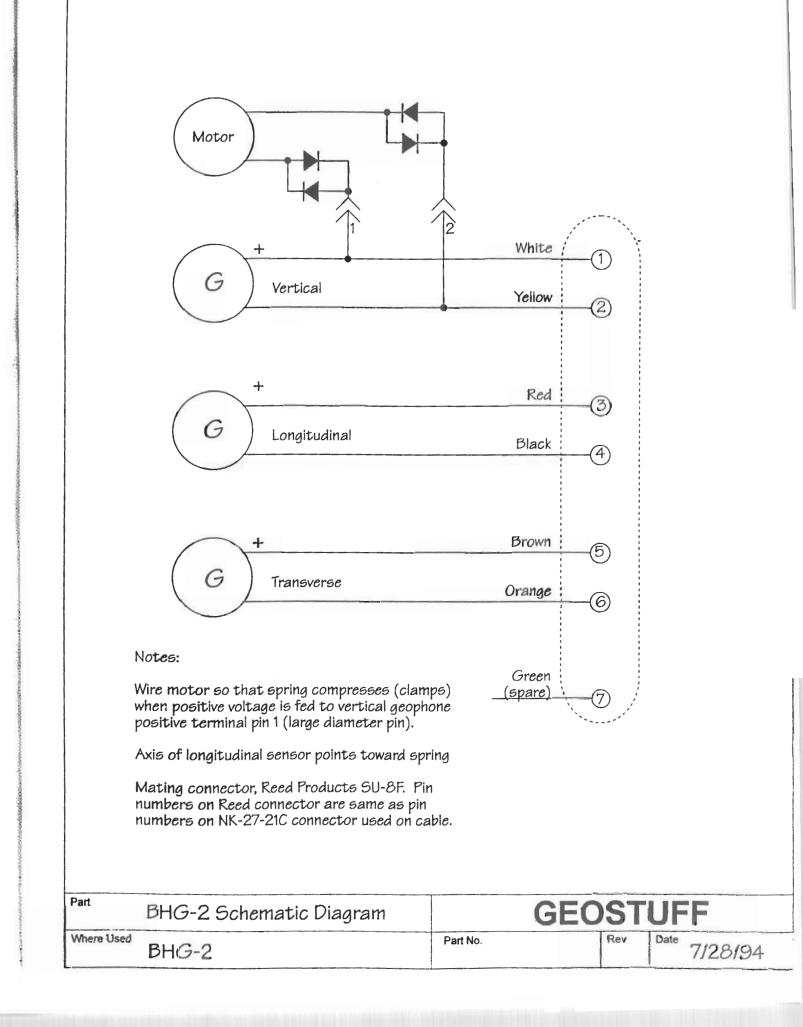
Geostuff 19623 Via Escuela Drive Saratoga, California 95070 U.S.A.

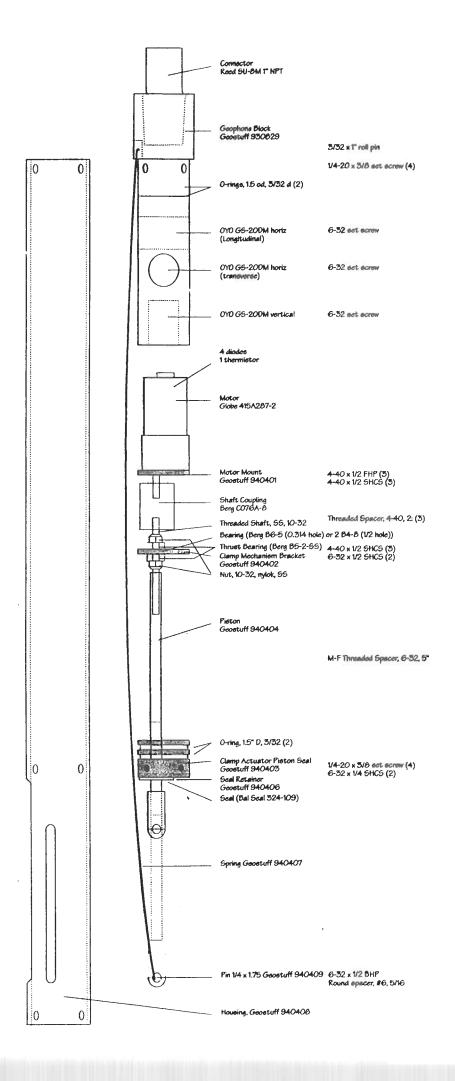
phone 408-867-3792 fax 408-867-4900 The Geostuff family of borehole instruments includes several products.

- The BHG-2 is a wall-lock, 3component geophone.
- The BHG-3 is a wall-lock, 3component geophone which includes a flux-gate compass and servo mechanism to orient the horizontal geophones along any particular azimuth.
- The BHGC-1 is an optional controller which provides power to the clamp, orientation mechanism, and selects seismograph channels.
- The Big Hole kit allows either BHG to operate in very large boreholes.
- The cable includes waterproof connector on the wet end, high strength copperweld conductors, and a Kevlar braid for additional strength beneath a Polyurethane jacket. The cable is also available as as extension cable with waterproof connectors on each end to provide a temporarily longer cable.



This manual describes the operation of all these products.





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BHG-2 Borehole Geophone

The BHG-2 is a 3-component, borehole geophone with a motor-driven clamp to hold the geophone in place against the wall of a borehole. The BHG is used for a variety of borehole seismic surveys, including downhole and crosswell. The geophone elements are oriented in an X-Y-Z pattern. The body of the geophone is 1.75 inches (45 mm) in diameter, so it will fit in boreholes as small as 2 inches (50 mm) diameter.

The clamping mechanism is a steel spring which is compressed and expanded by a piston actuated by a 12-volt DC motor. The motor and the vertical geophone element share a pair of wires. A voltage high enough to overcome the resistance of the cable is applied to the appropriate conductors and the motor turns. Reversing the voltage reverses the motor. The current drain provides the operator with a measurement of how much work the motor is doing, and indicates when the spring is pushing against the wall. This can be confirmed by pulling on the cable.

The geophone cable contains seven conductors of copperweld, a high-strength wire. There is a kevlar braid for even more strength inside the polyurethane jacket. The cable is connected to the borehole geophone with an underwater connector, allowing the cable and geophone to be disconnected for transit. This also allows the use of extension cords so that the system can be configured with various cable lengths appropriate to the survey.

The cable may be supplied with bare wires or a Cannon NK-27-21C. This connector will mate with the BHGC controller, or can be plugged directly into a standard seismograph. In that case, the Vertical component will be connected to pins 1 & 2 (usually channel 1 on a 12-channel seismograph, or channel 12 on a 24-channel seismograph). The Longitudinal geophone will be connected to pins 3 & 4, and the Transverse geophone will be connected to pins 5 & 6.

If there is no connector on the cable, then use the following color code:

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<u>Color</u>	BHG <u>Pin No.</u>	Function
White	1	Vert geophone + and motor power
Yellow	2	Vert geophone - and motor power
Red	3	Longitudinal geophone +
Black	4	Longitudinal geophone -
Brown	5	Transverse geophone +
Orange	6	Transverse geophone -
Green	7	spare wire (no connection)

To operate the clamp mechanism without a controller, apply a DC voltage directly to pins 1 & 2 of the connector. If the positive terminal is connected to pin 1, the spring will expand against the borehole and clamp the geophone in place. Connect the positive lead to pin 2 to compress the spring and release the geophone. Verify proper operation before putting the geophone in the hole. The supply can be any convenient source, including standard flashlight batteries connected in series. The power supply is a nominal 12 volts DC at the geophone, but the voltage will need to be increased to compensate for the voltage drop in the cable. Measure the line resistance (times two) and calculate the voltage drop at 1/2 amp to estimate the amount of excess voltage to apply to the top of the cable. The voltage required will vary from 12 to 48 volts (or even more for long cables) depending on the cable length (see the discussion in the BHGC instructions).

If you wish to construct a motor controller, a schematic diagram for a suitable unit is included with this manual.

Do not leave the power connected after the spring is in position.

When connecting the waterproof connectors between the cable and geophone, it is necessary to lubricate the connector with a silicone-based lubricant. Be careful not to get too much lubricant on the pins or the excess will become trapped inside the connection and might cause a leak. Use a silicone spray lubricant or a very small amount of silicone grease. Do not use petroleum based lubricants, they will eventually damage the rubber. Do not use large amounts of silicone grease, as it will be trapped inside the connector and lessen the seal. Use just enough to moisten the contacts.

The Longitudinal geophone points toward the clamping spring.

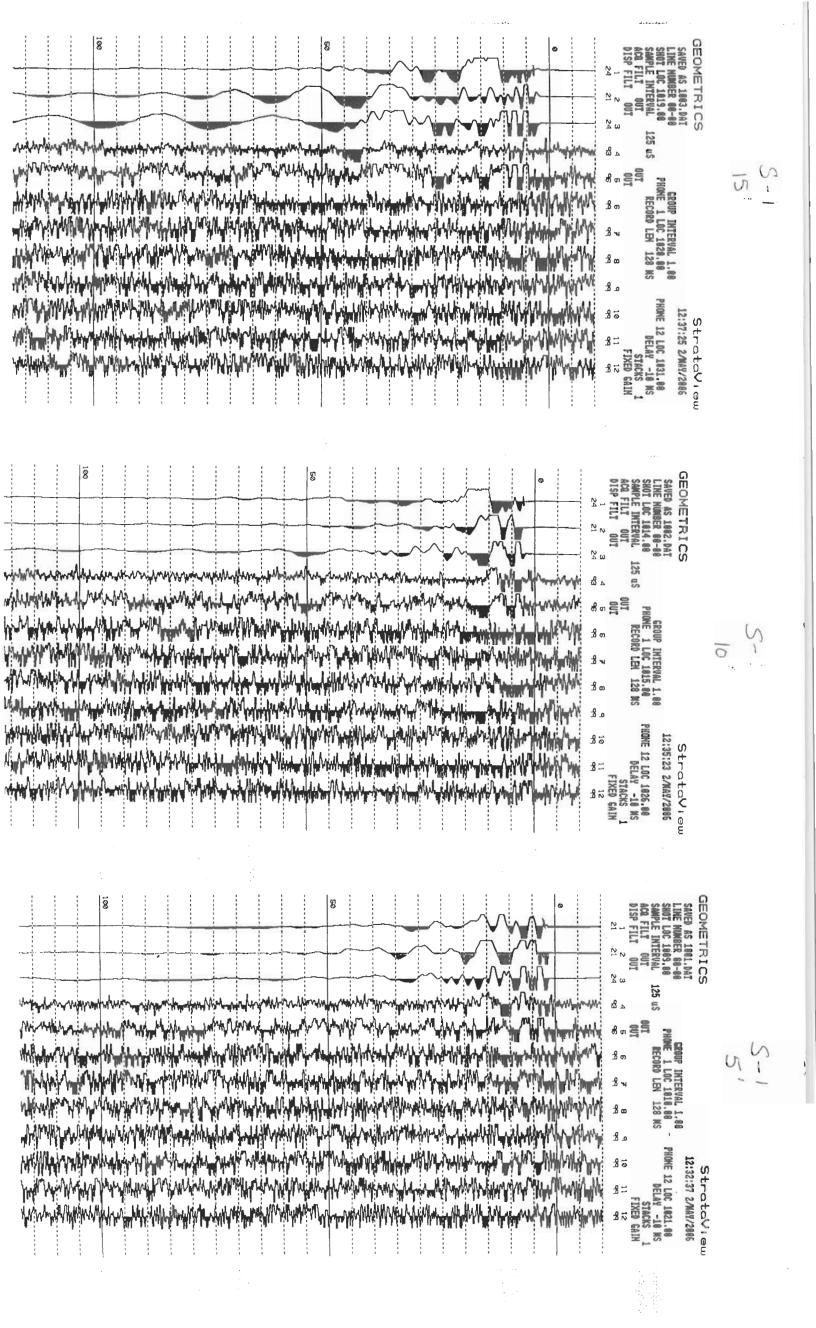
For large diameter boreholes, an optional "big-hole" kit is available. This kit replaces the spring with a set of arms (available in different lengths in the kit). The foot is designed for soft-wall uncased holes, and it can be omitted in cased holes. See the illustration for the proper installation of the kit.

The standard geophone elements are OYO Geospace type GSC-20DM, 14 Hz natural frequency, with a 240 ohm coil. 10, 28 and 40 Hz elements are also available. The geophone elements can be replaced by any reasonably skilled electronics technician.

To service the geophone elements, just remove the 4 screws around the perimeter of the connector end and pull the geophone block out. To service the motor/clamp assembly, you must then remove the four screws near the bottom end. See the drawing for the interior view.

The cable for the BHG has a Reed Products type SU-8F connector molded on Tescorp TL7-1002 cable.

ATTACHMENT 3 SURVEY RESULTS



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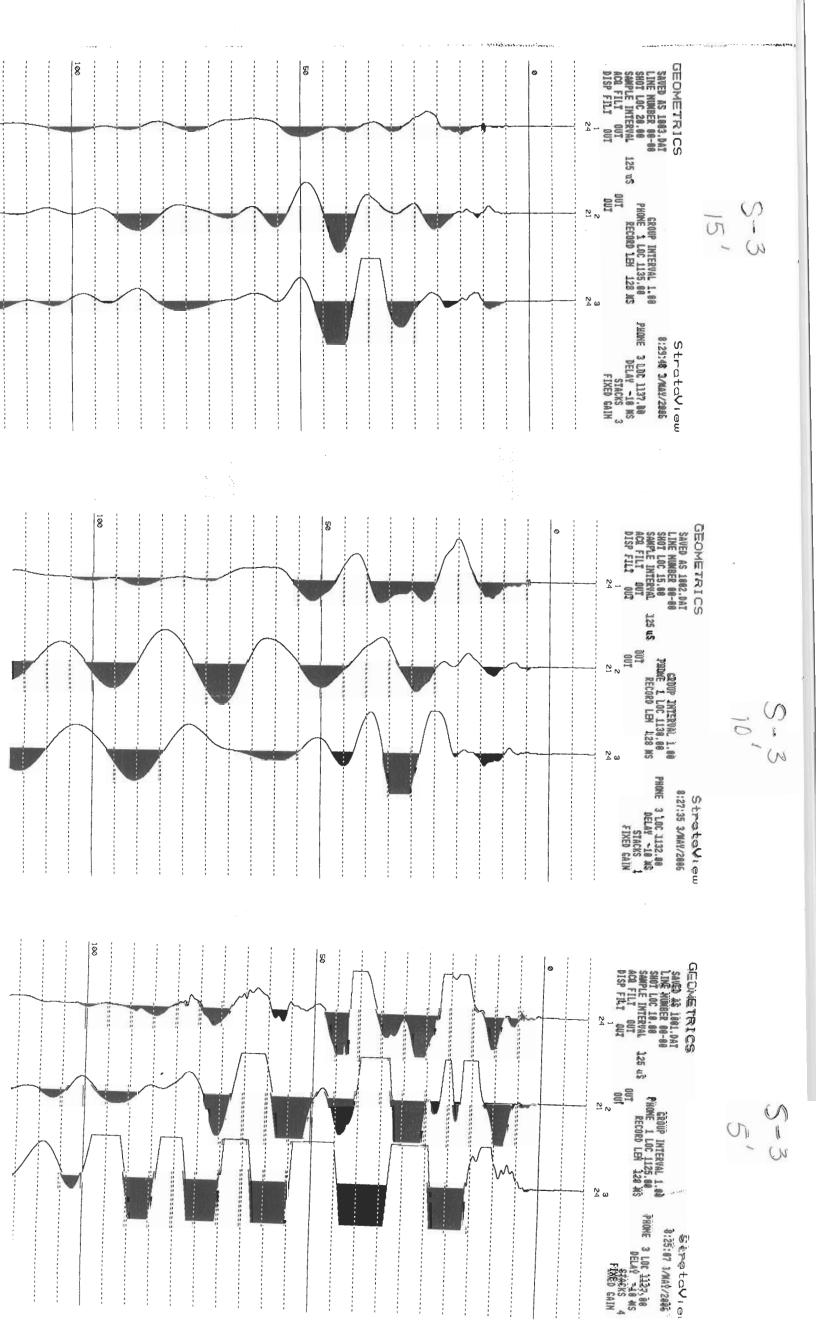
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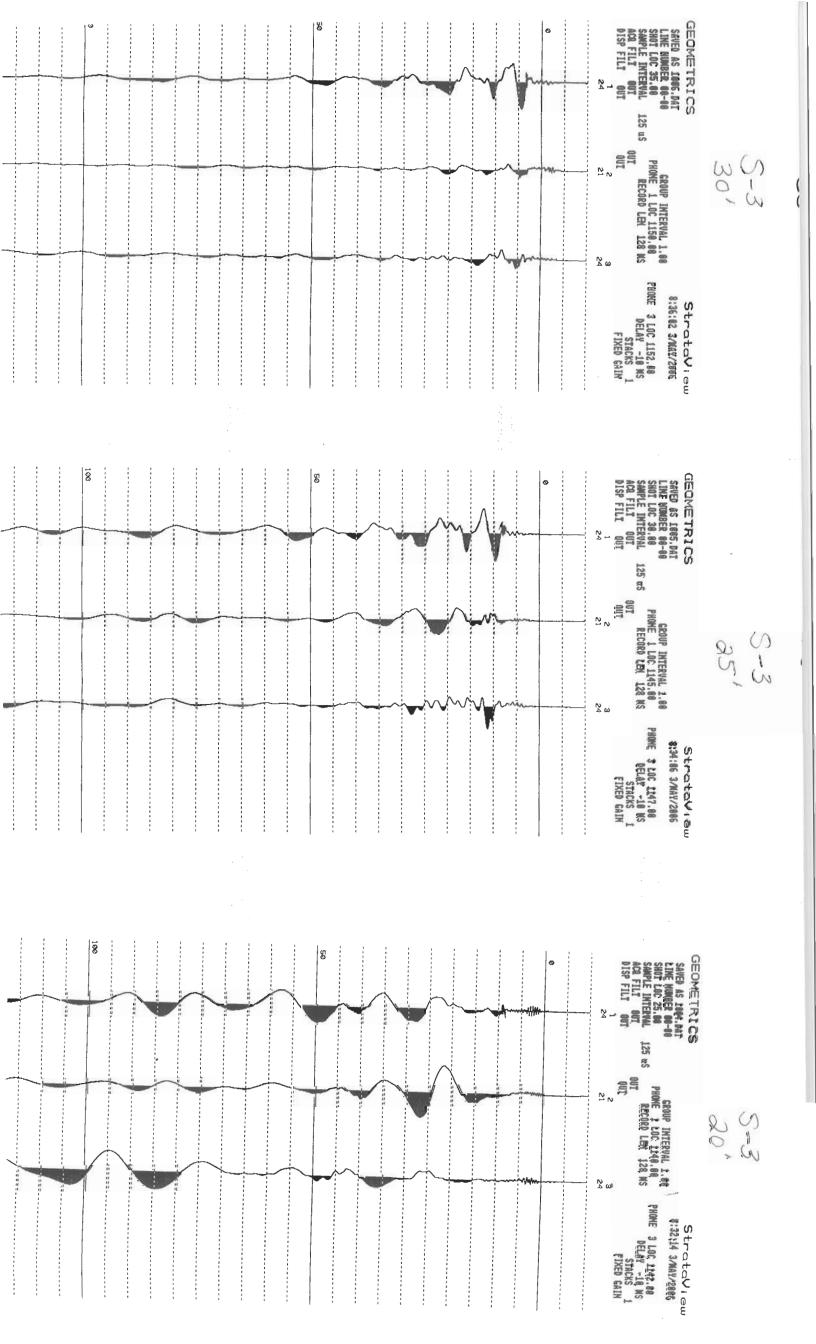
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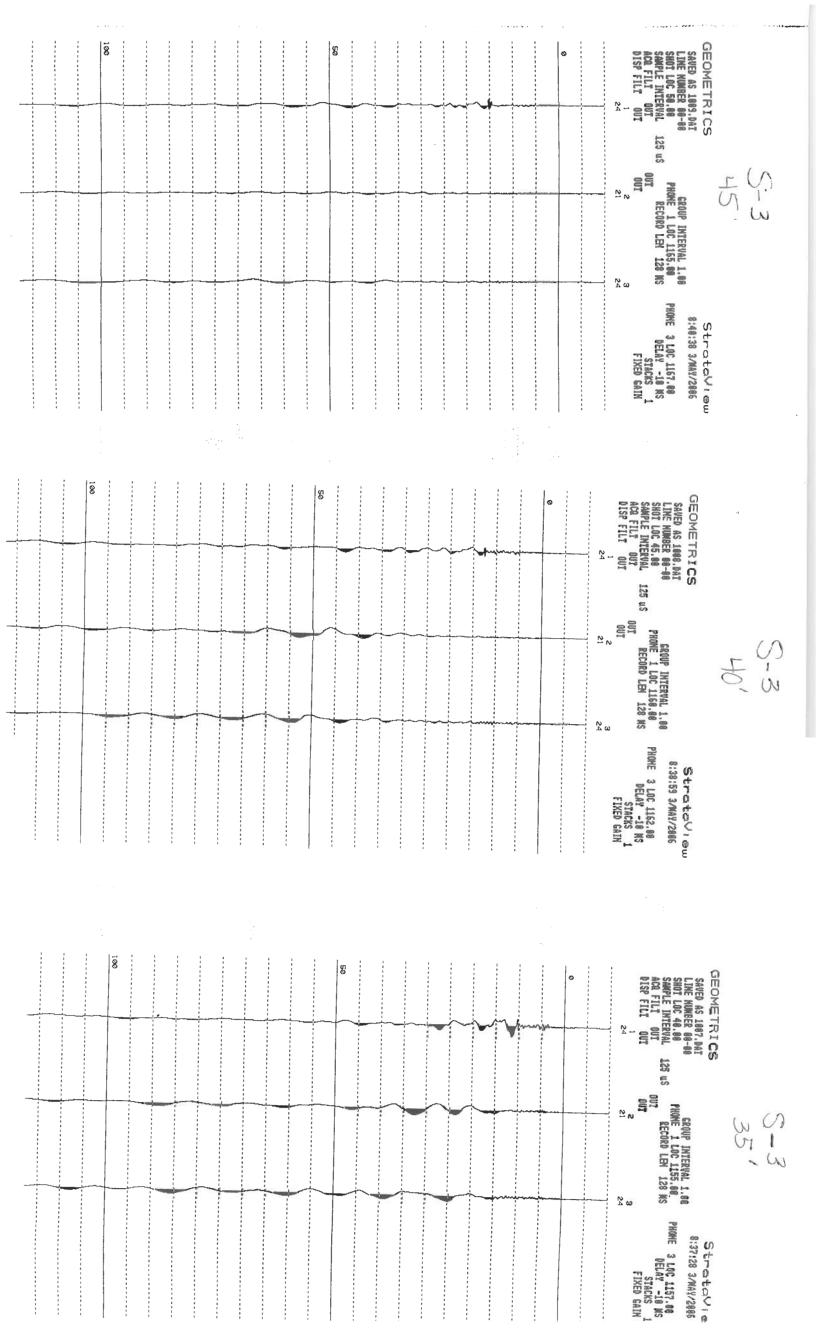
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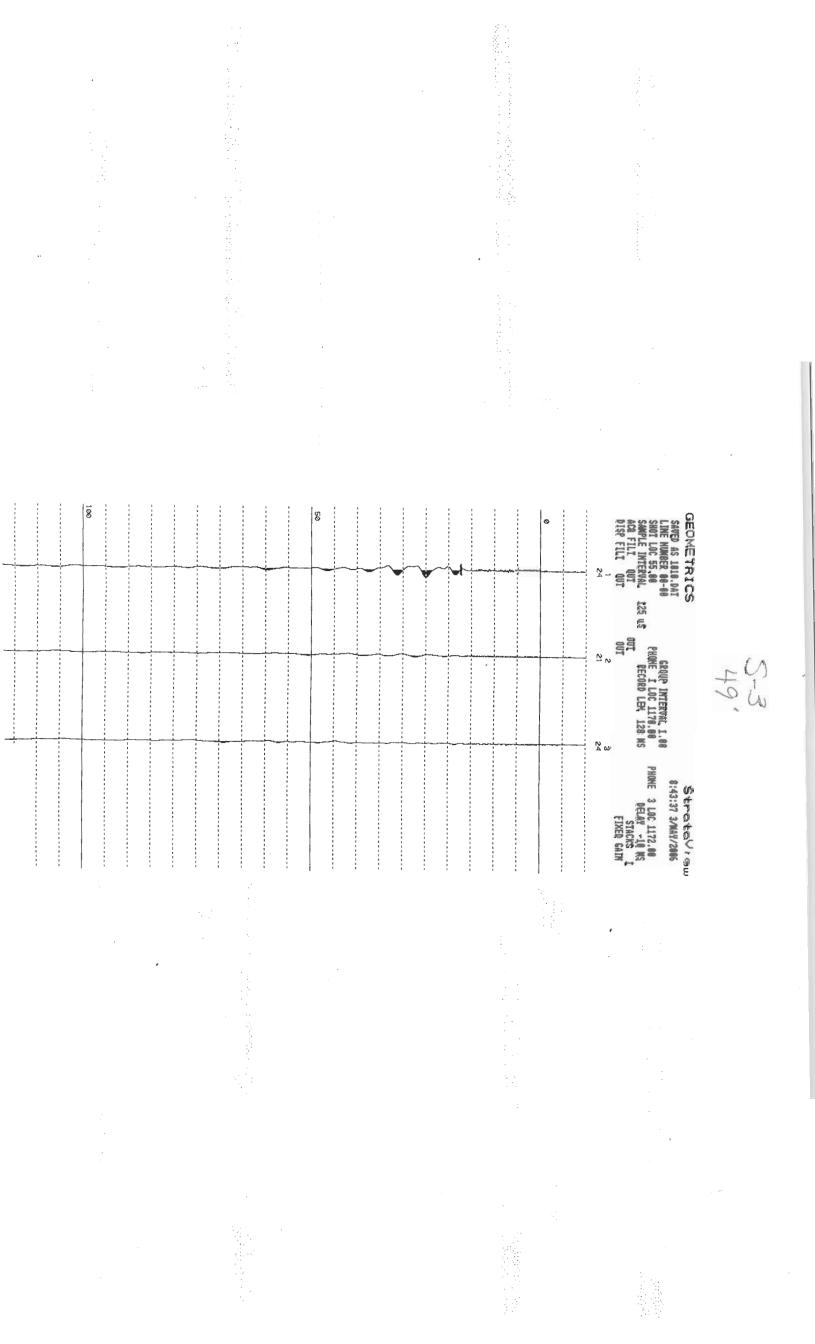
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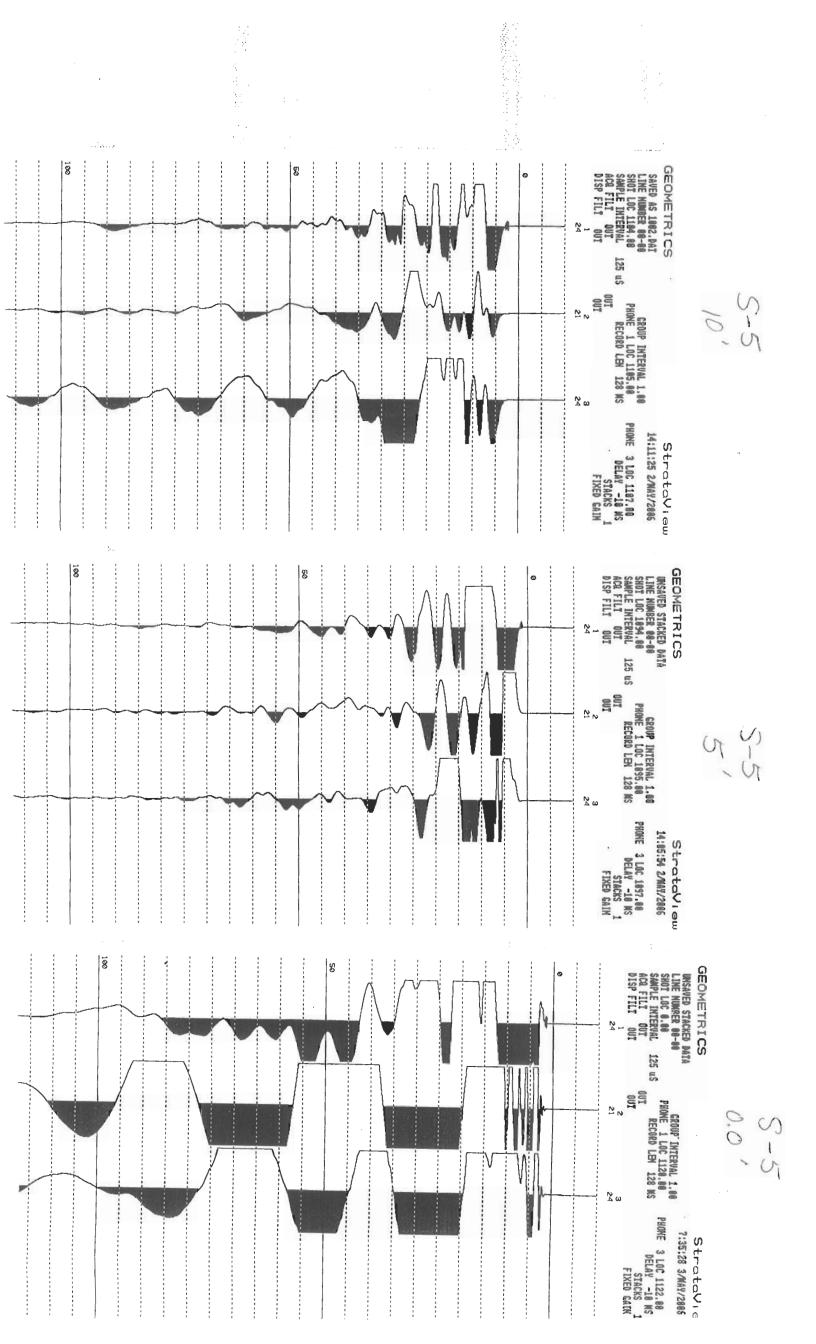
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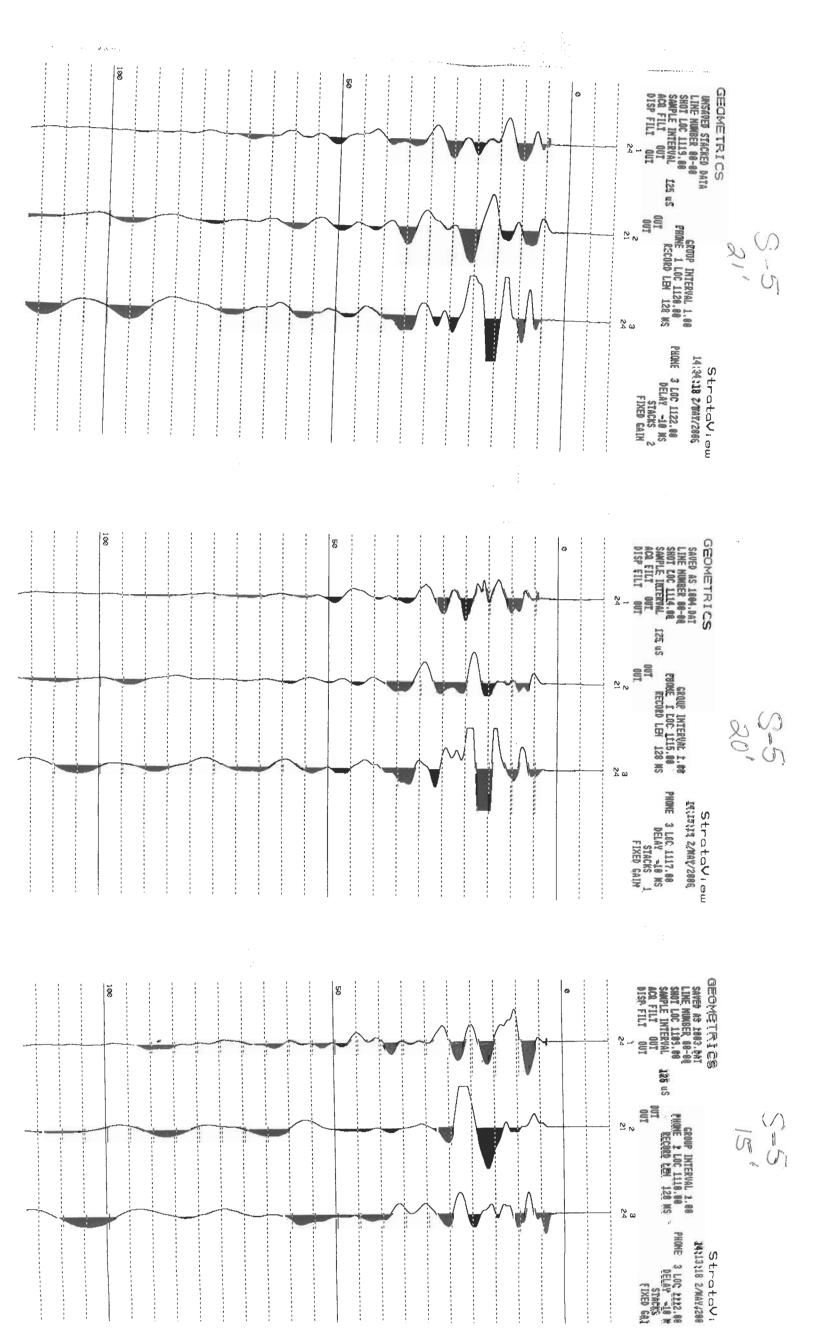


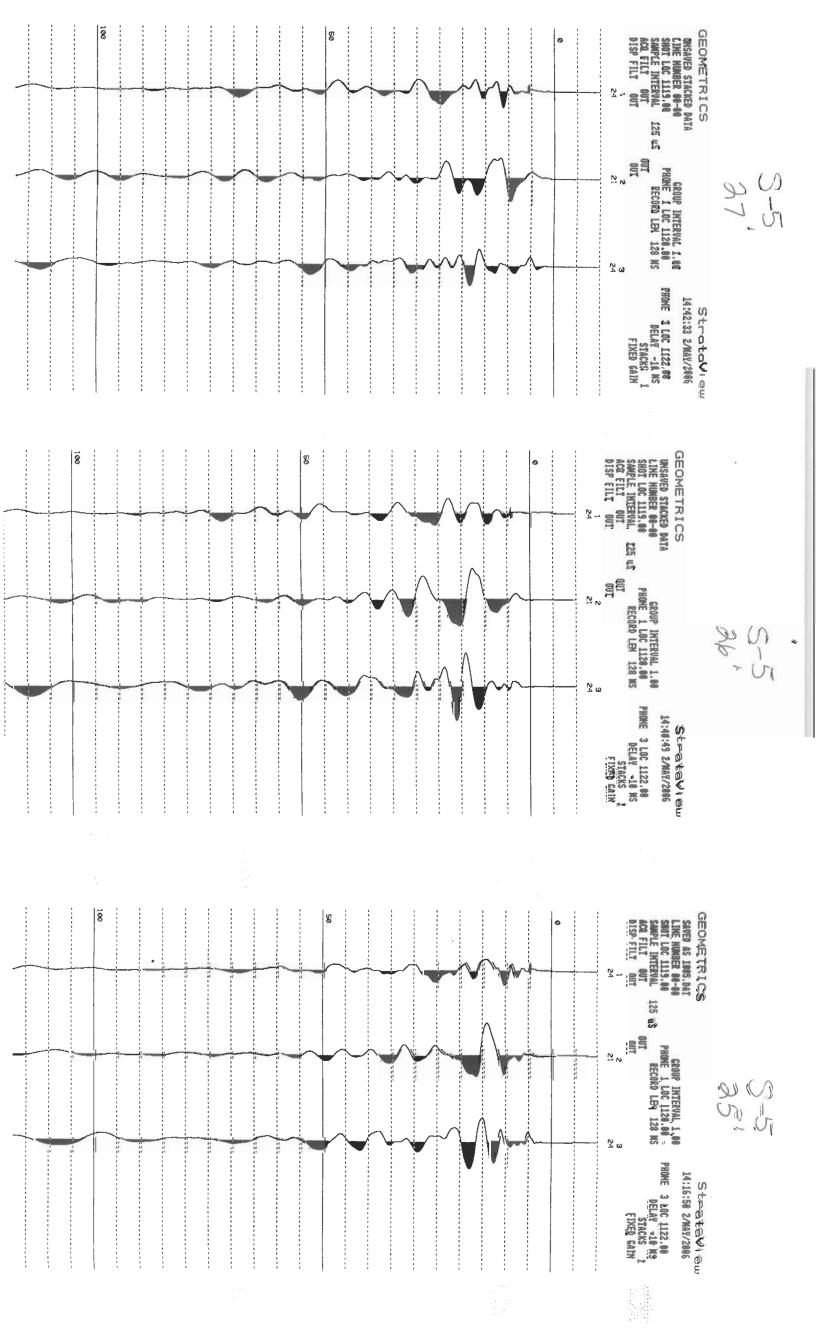


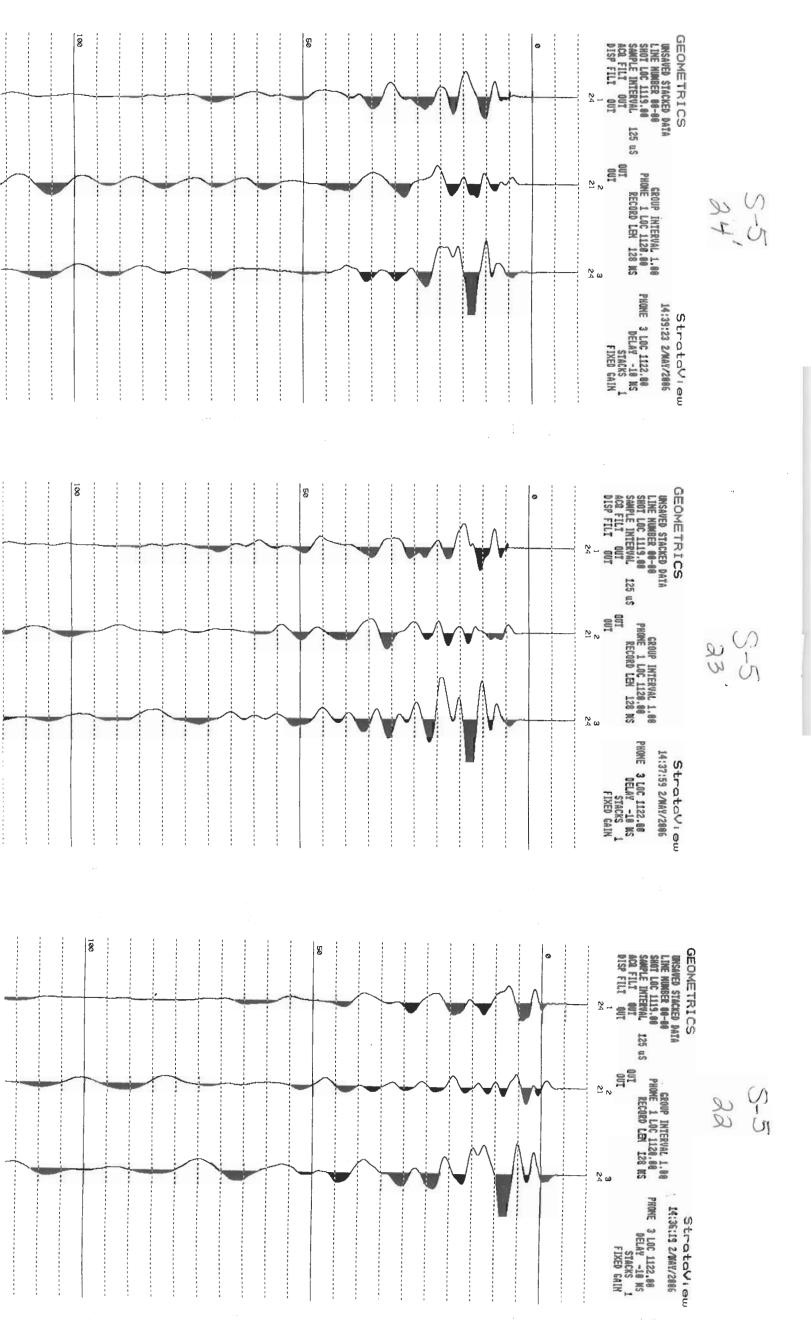


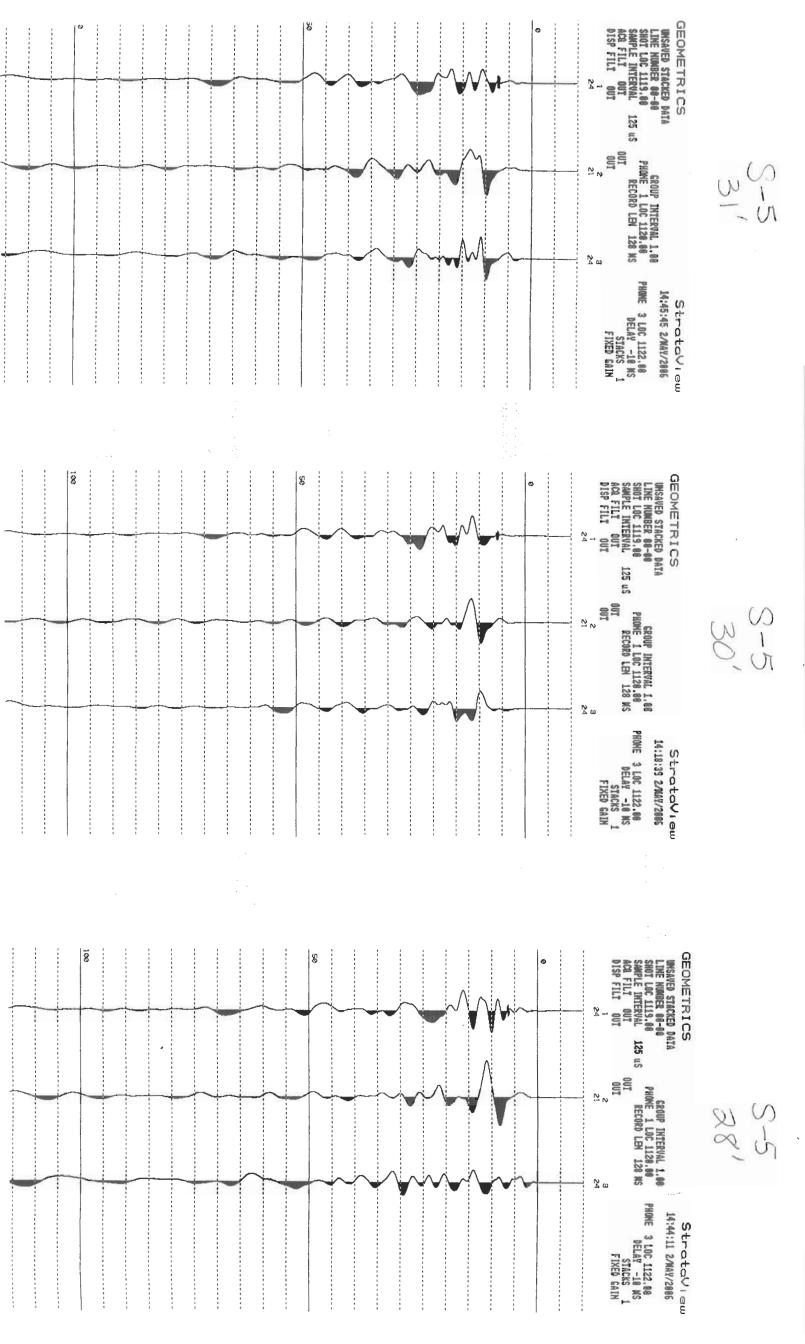


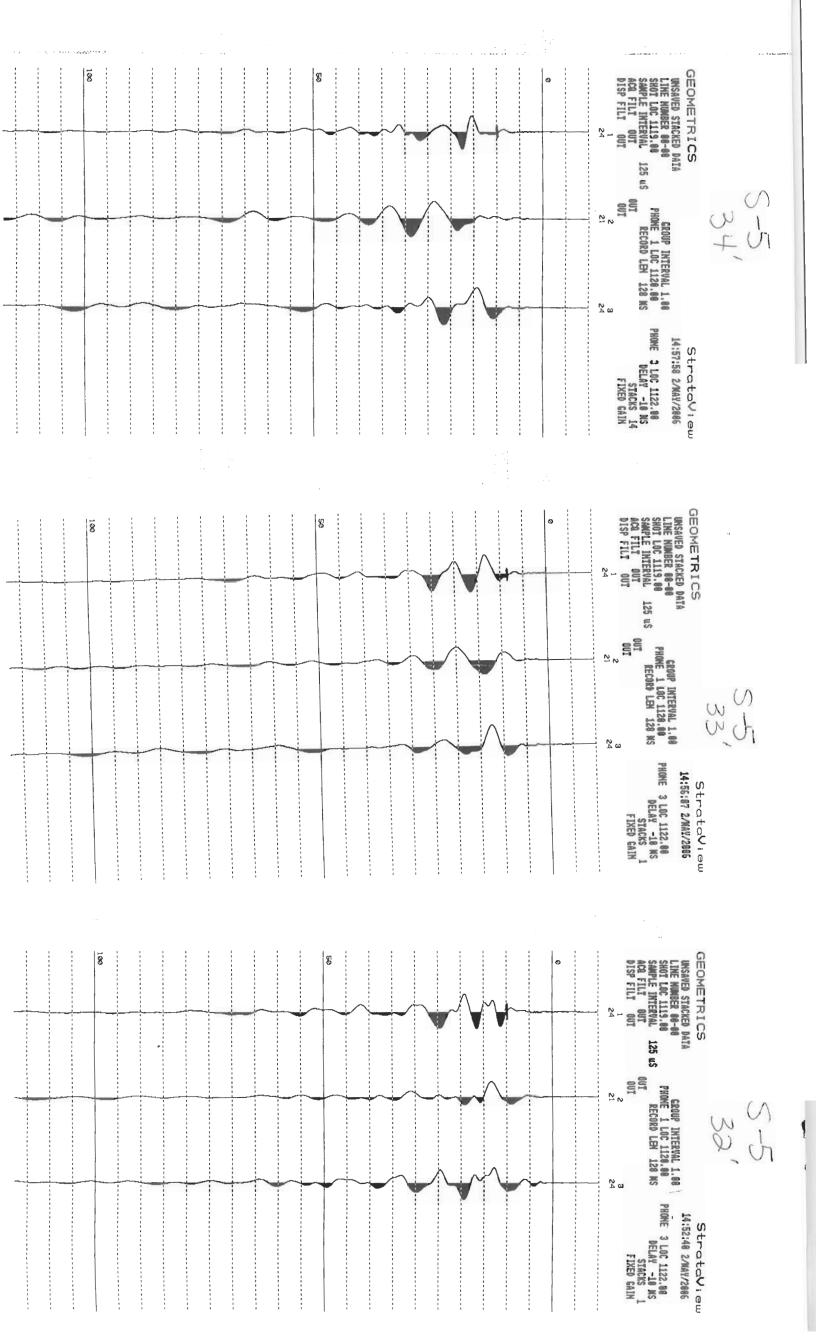


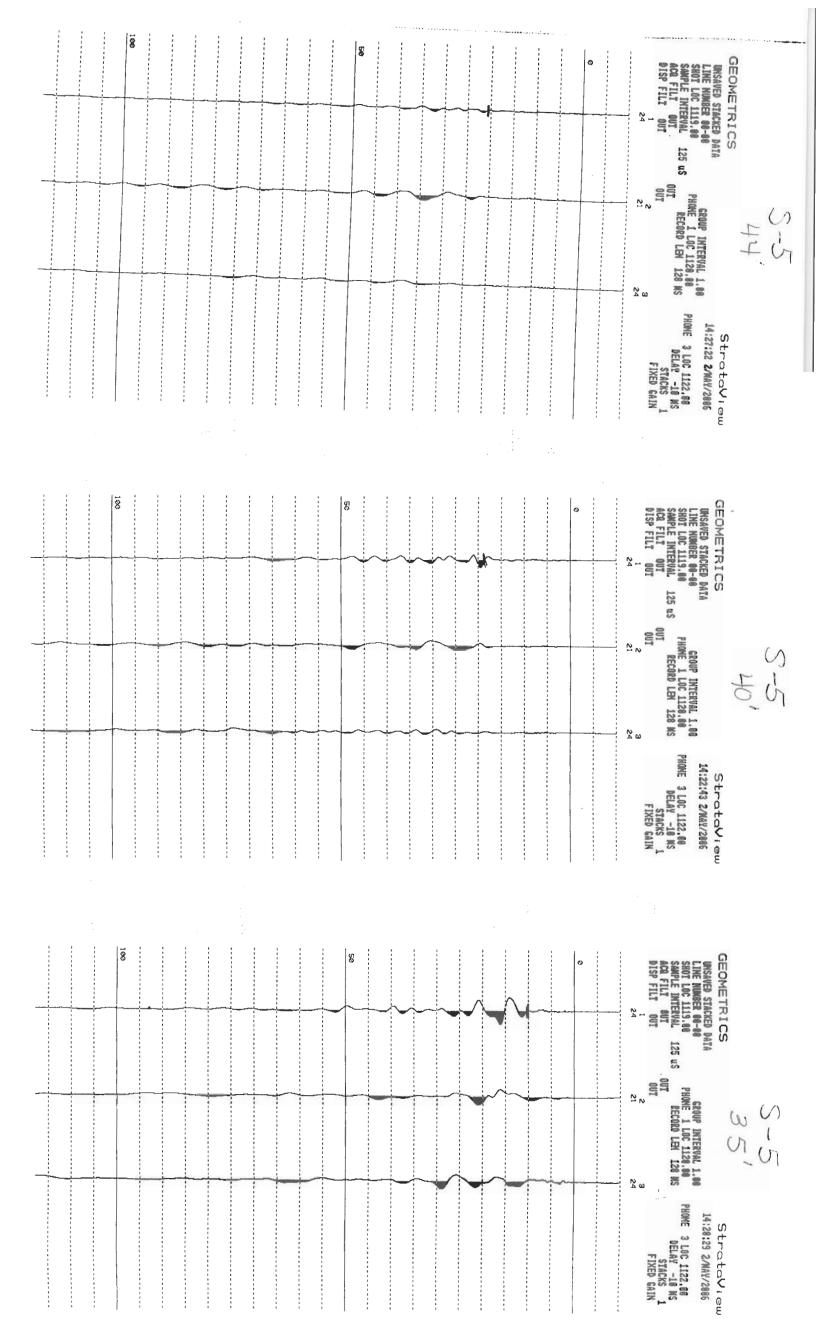












## ATTACHMENT 4 GRAPHS OF SURVEY DATA

