

**APPENDIX 3D**  
**Geotechnical Data**

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## **APPENDIX 3D GEOTECHNICAL DATA**

This appendix represents a compilation of geotechnical and grain size data from samples collected during investigations conducted within the Area of Investigation (AOI) between 1999 and 2009. Several data tables or data packages in this appendix also include total organic carbon and/or total solids data, which are presented in the Appendix 5B data tables. A summary of the geotechnical investigations conducted in the upland and sediment portions of the AOI is provided in Table 3D-1. Locations where geotechnical data were collected are indicated in Figure 3D-1; specific tests by location are summarized in Table 3D-2. A geotechnical evaluation of sediment at the adjacent Northlake Shipyard is also included. Each investigation or data package is bookmarked separately; bookmark titles are provided in Table 3D-1.

**Table 3D-1**  
**Geotechnical Investigations**  
**Gas Works Park Site**  
**Seattle, Washington**

Investigation Year	Report Author/Company	Survey/Report Name	Within the AOI	Outside the AOI	Bookmark
<b>UPLAND</b>					
2006	Floyd Snider	Western Study Area Shoreline Investigation – Soil Grain Size Data	x		Attachment 3D-1; Sub-Attachment 3D-1.1
2007	Floyd Snider	Northeast Corner Investigation – Soil Grain Size and Geotechnical Data	x		Attachment 3D-1; Sub-Attachment 3D-1.2
2007	RETEC	Eastern Shoreline Investigation – Soil Grain Size and Geotechnical Data	x		Attachment 3D-1; Sub-Attachment 3D-1.3
2010	Floyd Snider	Waterway 19 Soil Samples – Soil Grain Size Data	x		Attachment 3D-1; Sub-Attachment 3D-1.4
2013	GeoEngineers	Supplemental Investigation 2013 – Soil Grain Size Data	x		Attachment 3D-1; Sub-Attachment 3D-1.5
<b>SEDIMENT</b>					
1999	RETEC	Phase 1 Sediment Investigation – Sediment Grain Size Data	x		Attachment 3D-2; Subattachment 3D-2.1
2002	Ecology/TAMU	Sediment Toxicity Investigation – Grain Size Data	x	x	Attachment 3D-2; Subattachment 3D-2.2
2002	RETEC	Phase 2 Sediment Investigation – Geotechnical and Grain Size Data	x		Attachment 3D-2; Subattachment 3D-2.3-1 through 3D-2.3-3
2004-2005	RETEC	Phase 3 Eastern Study Area Sediment Investigation – Geotechnical Data	x		Attachment 3D-2; Sub-Aattachment 3D-2.4.1 through 3D-2.4.3
2005	RETEC	Phase 3 Sediment Toxicity Investigation – Sediment Grain Size	x	x	Attachment 3D-2; Subattachment 3D-2.5
2005	Floyd Snider	Western Sediment Area Sediment Investigation – Geotechnical and Grain Size Data	x		Attachment 3D-2; Sub-Attachment 3D-2.6.1 through 3D-6.3
2009	Herrera Environmental Consultants	Northlake Shipyard Investigation – Geotechnical Data	x	x	Attachment 3D-2; Subattachment 3D-2.7

**Table 3D-2**  
**Geotechnical Testing by Location**  
 Gas Works Park Site  
 Seattle, Washington

Sample ID	Location	In-Situ Testing				Other Geotechnical Testing							
		Cone Penetrometer Test (CPT)	Standard Penetration Test (SPT)	Vane Shear	Bearing Plate	Moisture Content	Dry Density	Grain Size/Sieve Analysis	Atterberg Limits (Plasticity)	Total Volatile Solids/ % Organic Matter	Consolidation	Specific Gravity	UU Triaxial/ Strength
<b>UPLAND LOCATIONS</b>													
<b>Floyd Snider 2006 WSA Shoreline Investigation</b>													
TDW1	Upland					x		x					
TDW2	Upland							x					
TDW3	Upland							x					
TSB1	Upland							x					
TSB2	Upland					x		x					
<b>RETEC 2007 Eastern Shoreline Investigation</b>													
GP-02	Upland					x	x	x					
GP-04	Upland					x	x	x					
GP-05	Upland					x	x	x					
GP-09	Upland					x	x	x					
GP-1	Upland							x					
GP-11	Upland					x	x	x					
GP-12	Upland					x	x	x					
GP-13	Upland							x					
<b>Floyd Snider 2007 Northeast Corner Investigation</b>													
SB12A	Upland					x	x	x					
SB2	Upland					x	x	x					
SB2A	Upland					x	x	x					
SB3A	Upland					x	x	x					
<b>Floyd Snider 2010 Waterway 19 Soil Investigation</b>													
WW19-01	Upland							x					
WW19-02	Upland							x					
WW19-03	Upland							x					
WW19-04	Upland							x					
WW19-05	Upland							x					
WW19-06	Upland							x					
<b>GeoEngineers 2013 Supplemental Investigation</b>													
GEO-2	Upland							x					
GEO-3	Upland							x					
MW-32D/GEO-1	Upland							x					
MW-32S	Upland							x					
MW-33S	Upland							x					
MW-34S	Upland							x					
MW-35S	Upland							x					
MW-36D	Upland							x					
MW-36S	Upland							x					
MW-37S	Upland							x					
MW-38S	Upland							x					
MW-39D	Upland							x					
MW-39S	Upland							x					
MW-40S	Upland							x					
<b>SEDIMENT LOCATIONS</b>													
<b>Retec 1999 Phase 1 Sediment Investigation</b>													
CR-01	Lake Bottom							x					
CR-02	Lakeshore							x					
CR-06	Lakeshore							x					
CR-07	Lake Slope							x					
CR-11	Lake Slope							x					
CR-12	Lake Slope							x					
CR-15	Lake Slope							x					
CR-20	Lake Bottom							x					
<b>Ecology/TAMU 2002 Sediment Toxicity Study</b>													
LU-1	Lake Bottom							x		x			
LU-10	Lake Bottom							x		x			
LU-11	Lake Bottom							x		x			
LU-2	Lake Bottom							x		x			
LU-3	Lake Bottom							x		x			
LU-4	Lake Bottom							x		x			
LU-5	Lake Bottom							x		x			
LU-6	Lake Bottom							x		x			
LU-7	Lake Bottom							x		x			
LU-8	Lake Bottom							x		x			
LU-9	Lake Bottom							x		x			
<b>RETEC 2002 Phase 2 Sediment Investigation</b>													
NLU01-SS	Lake Slope							x					
NLU02-SS	Lake Slope							x					
NLU03-US	Lake Slope							x					
NLU04-SS	Lake Bottom							x					
NLU05-SS	Lake Bottom							x					
NLU06-SS	Lake Slope							x					
NLU06-US	Lake Slope							x					
NLU07-SS	Lake Slope							x					
NLU07-US	Lake Slope							x					

Sample ID	Location	In-Situ Testing				Other Geotechnical Testing							
		Cone Penetrometer Test (CPT)	Standard Penetration Test (SPT)	Vane Shear	Bearing Plate	Moisture Content	Dry Density	Grain Size/Sieve Analysis	Atterberg Limits (Plasticity)	Total Volatile Solids/ % Organic Matter	Consolidation	Specific Gravity	UU Triaxial/ Strength
NLU08-SS	Lake Bottom							x					
NLU08-US	Lake Bottom							x					
NLU09-GE	Lake Slope					x	x	x				x	
NLU10-SS	Lake Bottom							x					
NLU10-US	Lake Bottom							x					
NLU117D	Lake Slope							x					
NLU117-TX	Lake Slope							x					
NLU11-US	Lake Slope							x					
NLU12-SS	Lake Bottom							x					
NLU12-US	Lake Bottom							x					
NLU13-SS	Lake Bottom							x					
NLU14-SS	Lake Bottom							x					
NLU14-US	Lake Bottom							x					
NLU15-SS	Lake Bottom							x					
NLU16-SS	Lake Bottom							x					
NLU16-US	Lake Bottom							x					
NLU17-SS	Lake Bottom							x					
NLU18-GE	Lake Slope					x	x	x	x		x	x	x
NLU19-GE	Lake Bottom					x	x	x	x		x	x	x
NLU21-SS	Sediments							x					
NLU22-SS	Sediments							x					
<b>RETEC 2004/2005 Phase 3 Sediment Investigation</b>													
NLU13-TX	Sediments							x					
NLU41-TX	Lake Bottom							x					
NLU43	Lake Bottom							x		x			
NLU48	Lake Bottom							x		x			
NLU51	Sediments							x					
NLU51-TX	Lake Slope							x					
NLU53	Sediments							x					
NLU54	Sediments							x					
NLU55-TX	Sediments							x					
NLU58	Lakeshore							x					
NLU59	Lake Slope							x		x			
NLU60	Lakeshore							x					
NLU61	Lake Bottom							x		x			
NLU62	Lake Slope							x		x			
NLU64	Lake Slope							x					
NLU64-TX	Lake Slope							x					
NLU66	Lake Slope							x					
NLU66-TX	Lake Slope							x					
NLU69-TX	Lake Slope							x					
NLU71	Lake Slope							x		x			
NLU73-TX	Lake Slope							x					
NLU76-TX	Lake Slope							x					
NLU79	Lake Bottom		X			x	x		x	x			
NLU80	Lake Slope		X			x		x	x	x			
NLU81-TX	Lake Slope							x					
NLU82-TX	Sediments							x					
NLU83-TX	Lake Bottom							x					
NLU84-TX	Lake Bottom							x					
NLU85-TX	Lake Bottom							x					
NLU86-TX	Lake Bottom							x					
NLU87-TX	Lake Bottom							x					
NLU89	Sediments							x					
NLU19-TX	Lake Bottom							x					
NLU19-TX	Lake Slope							x					
NLU19-TX	Sediments							x					
NLU19-TX	Sediments							x					
NLU400	Lakeshore	X											
NLU401	Lake Slope		X			x		x					
NLU402	Lake Bottom	X	X			x	x	x		x	x		
NLU403	Lake Slope		X					x					
NLU404	Lake Slope	X		X	X			x					
NLU405	Lake Bottom		X			x	x	x		x			
NLU406	Lake Slope		X			x		x	x				
NLU407	Lake Bottom	X		X				x					
NLU408	Lake Slope		X			x		x					
NLU409	Lake Slope	X											
NLU410	Lake Slope		X			x		x					
NLU411	Lake Slope		X			x		x	x				
NLU412	Lake Slope		X			x		x					
NLU413	Lake Bottom	X		X									
NLU414	Lake Slope	X		X									
NLU415	Lake Bottom	X	X	X	X	x	x			x	x		
NLU416	Lake Bottom	X		X									
NLU417	Lake Bottom	X		X									
NLU418	Lake Bottom		X			x	x	x		x	x		
NLU419	Lake Bottom	X		X									
NLU420	Lake Bottom	X		X									

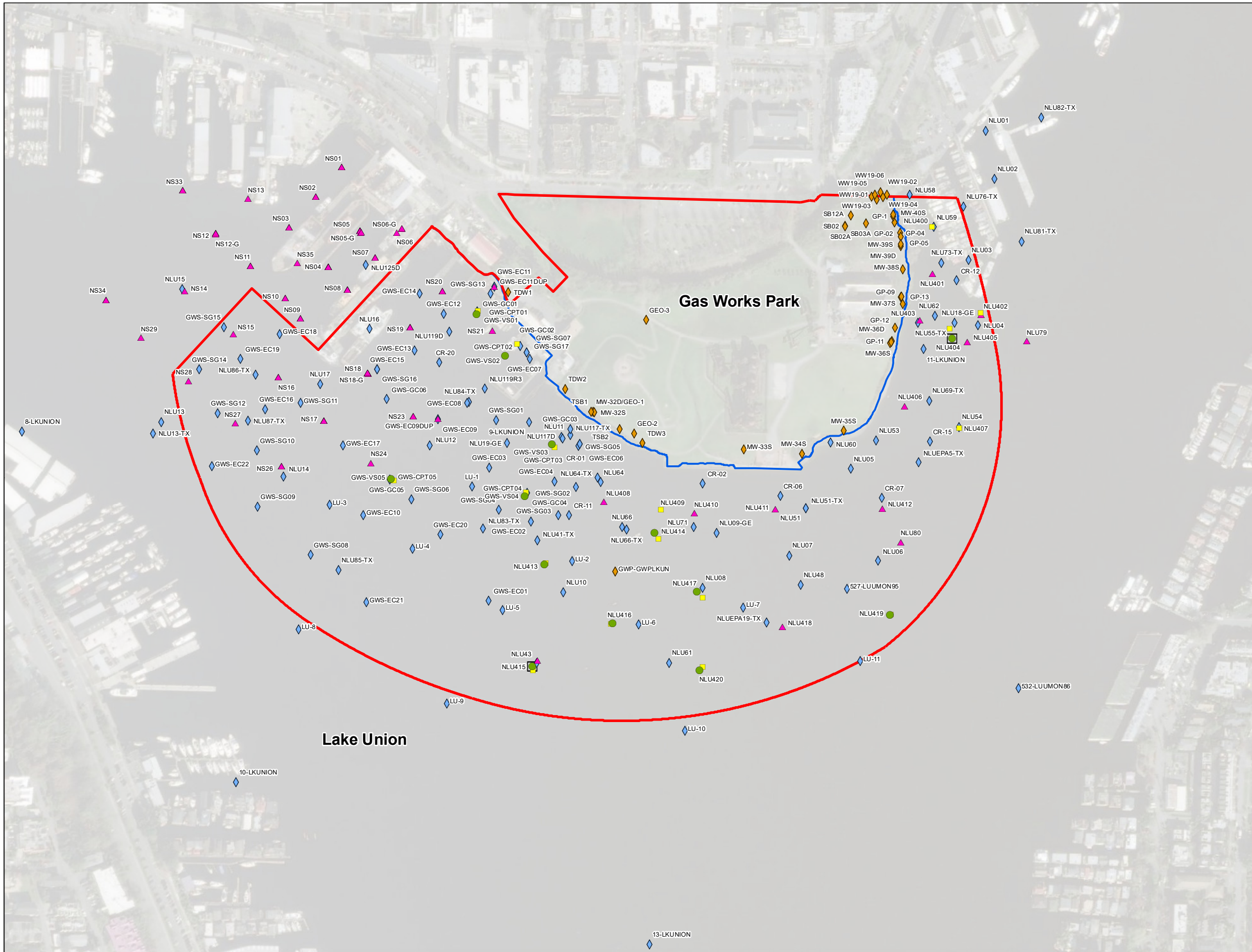
Sample ID	Location	In-Situ Testing				Other Geotechnical Testing						
		Cone Penetrometer Test (CPT)	Standard Penetration Test (SPT)	Vane Shear	Bearing Plate	Moisture Content	Dry Density	Grain Size/Sieve Analysis	Atterberg Limits (Plasticity)	Total Volatile Solids/ % Organic Matter	Consolidation	Specific Gravity
<b>Floyd Snider 2006 Western Study Area Sediment Investigation</b>												
GWS-EC01	Lake Bottom							X		X		
GWS-EC02	Lake Bottom							X		X		
GWS-EC03	Lake Bottom							X		X		
GWS-EC04	Lake Bottom							X		X		
GWS-EC06	Lake Slope							X		X		
GWS-EC07	Lake Slope							X		X		
GWS-EC08	Lake Bottom							X		X		
GWS-EC09	Lake Bottom		X					X		X		
GWS-EC10	Lake Bottom							X		X		
GWS-EC11	Lakeshore		X					X		X		
GWS-EC12	Lake Bottom							X		X		
GWS-EC13	Lake Bottom							X		X		
GWS-EC14	Lake Bottom							X		X		
GWS-EC15	Lake Bottom							X		X		
GWS-EC16	Lake Bottom					X		X		X		
GWS-EC17	Lake Bottom							X		X		
GWS-EC18	Lake Bottom							X		X		
GWS-EC19	Lake Bottom							X		X		
GWS-EC20	Lake Bottom							X		X		
GWS-EC21	Lake Bottom					X		X		X		
GWS-EC22	Lake Bottom							X		X		
GWS-EC24	Sediments							X		X		
GWS-GC01	Lake Slope		X			X		X		X		
GWS-GC02	Lake Slope		X			X	X	X	X	X	X	X
GWS-GC03	Lake Slope		X			X		X		X		
GWS-GC04	Lake Bottom		X			X		X	X	X	X	X
GWS-GC05	Lake Bottom		X			X		X	X	X	X	X
GWS-GC06	Lake Bottom		X			X		X	X	X	X	X
GWS-SG01	Lake Bottom							X		X		
GWS-SG02	Lake Slope							X		X		
GWS-SG03	Lake Bottom							X		X		
GWS-SG04	Lake Bottom							X		X		
GWS-SG05	Lake Slope							X		X		
GWS-SG06	Lake Bottom							X		X		
GWS-SG07	Lake Slope							X		X		
GWS-SG08	Lake Bottom							X		X		
GWS-SG09	Lake Bottom							X		X		
GWS-SG10	Lake Bottom							X		X		
GWS-SG11	Lake Bottom							X		X		
GWS-SG12	Lake Bottom							X		X		
GWS-SG13	Lake Slope							X		X		
GWS-SG14	Lake Bottom							X		X		
GWS-SG15	Lake Bottom							X		X		
GWS-SG16	Lake Bottom							X		X		
GWS-SG17	Lake Slope							X		X		
GWS-CPT01	Lake Slope	X		X								
GWS-CPT02	Lake Slope	X		X								
GWS-CPT03	Lake Slope	X		X								
GWS-CPT04	Lake Bottom	X		X								
GWS-CPT05	Lake Bottom	X		X								
GWS-VS01	Lake Slope			X								
GWS-VS02	Lake Slope			X								
GWS-VS03	Lake Bottom			X								
GWS-VS04	Lake Bottom			X								
GWS-VS05	Lake Bottom			X								
<b>Herrera 2009 NLSY Sediment Investigation</b>												
NS01	Sediments							X				
NS02	Sediments							X				
NS03	Sediments							X				
NS04	Sediments							X				
NS05	Sediments							X				
NS05-G	Sediments			X		X	X	X	X	X	X	X
NS06	Sediments							X				
NS06-G	Sediments			X		X	X	X	X	X	X	X
NS07	Sediments							X				
NS08	Sediments							X				
NS09	Sediments							X				
NS10	Sediments							X				
NS11	Sediments							X				
NS12	Sediments							X				
NS12-G	Sediments			X		X	X	X	X	X	X	X
NS13	Sediments							X				
NS14	Sediments							X				
NS15	Sediments							X				
NS16	Sediments							X				
NS17	Sediments							X				
NS18	Sediments							X				
NS18-G	Sediments			X		X	X	X	X	X	X	X
NS19	Sediments							X				

Sample ID	Location	In-Situ Testing				Other Geotechnical Testing							
		Cone Penetrometer Test (CPT)	Standard Penetration Test (SPT)	Vane Shear	Bearing Plate	Moisture Content	Dry Density	Grain Size/Sieve Analysis	Atterberg Limits (Plasticity)	Total Volatile Solids/ % Organic Matter	Consolidation	Specific Gravity	UU Triaxial/ Strength
NS20	Sediments							x					
NS21	Sediments							x					
NS23	Sediments							x					
NS24	Sediments							x					
NS26	Sediments							x					
NS27	Sediments							x					
NS28	Sediments							x					
NS29	Sediments							x					
NS33	Sediments							x					
NS34	Sediments							x					
NS35	Sediments							x					

**Notes:**

Shading indicates data not provided in this appendix.





### Legend

- Area of Investigation
- Shoreline (OHWM)
- Geotechnical Tests**
- Cone Penetrometer Test
- ▲ Standard Penetration Test
- Vane Shear
- ◆ Other Upland
- ◆ Other Sediment
- Bearing Plate

### Notes:

1. Reference Appendix 3D Table 3D-2 for other sediment geotechnical tests.
2. Buildings depicted north of site do not necessarily reflect present-day conditions.
3. Basemap 2005 USGS aerial photograph. Does not show current conditions.
4. Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

DISCLAIMER: This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. The locations of all features are approximate. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.



### Geotechnical Explorations

Gas Works Park Site  
Seattle, Washington

**ATTACHMENT 3D-1**  
**Upland Geotechnical Data Packages**



**SUB-ATTACHMENT 3D-1.1**  
**Floyd | Snider 2006 WSA Shoreline Investigation**



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants



October 23, 2006

Ms. Jane Fisher  
Floyd/Snider  
Two Union Square  
601 Union Street, Suite 600  
Seattle, WA 98101-2341

**RE: Project: Gas Works Shoreline Investigation**

**ARI Job No: JZ51**

Dear Jane:

Please find enclosed original results for the above referenced project.

A case narrative from the geotechnical laboratory is included.

An electronic copy of the reports and all associated raw data will remain on file with ARI. If you have any questions or require additional information, please contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

Sincerely,

ANALYTICAL RESOURCES, INC.

*Elizabeth Dorn*  
*for*

Susan Dunning  
Client Service Manager  
sue@arilabs.com  
206/695-6207

Enclosures

# Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number: <b>JZ51</b>	Turn-around Requested: <b>TWO WEEK</b>	Page: <b>1</b> of <b>3</b>
ARI Client Company: <b>FLOYD SNIDER</b>	Phone: <b>206-292-2078</b>	Date: <b>OCT 3, 2006</b>
Client Contact: <b>JANE FISHER</b>	No. of Coolers: <b>2</b>	Ice Present? <b>Y-N-I</b>
Client Project Name: <b>GASWORKS PARK SKODZINE INVESTIGATION</b>	Client Project #: <b>COS-GWSA</b>	Cooler Temps: <b>4.0, AMB</b>

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested						Notes/Comments	
					GRAV SIZE ASTM D121/122	MUSTARD CONTAM	ASTM-2216					HOLD
TOW1-9.0	9/19/06		S	1-16oz	X							
TOW1-15.5	↓		S	↓	X							
TOW1-27.5	↓		S	↓	X							
TOW1-43.2	9/20/06		S	1-4oz		X						
TSW1-5.0	9/21/06		S	2-4oz							X	
TSW1-9.0	9/21/06		S	1-4g							X	
TSB2-7.5	9/21/06		↓	1-4g							X	
TSB2-22.5	9/22/06		↓	1-4g							X	
TSB2-49.0	9/22/06		↓	1-4g		X						
TSW1-7.0	9/21/06		↓	1-4oz							X	
Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)		Relinquished by: (Signature)		Received by: (Signature)						
	Printed Name:	Printed Name:		Printed Name:		Printed Name:						
	Company:	Company:		Company:		Company:						
	Date & Time:	Date & Time:		Date & Time:		Date & Time:						

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.



# Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number: <b>J251</b>	Turn-around Requested: <b>TWO WEEK</b>	Page: <b>2</b> of <b>3</b>
ARI Client Company: <b>FLOYD SNIDER</b>	Phone: <b>206-292-2078</b>	Date: <b>Oct 3 2006</b>
Client Contact: <b>JANE FISHER</b>		Ice Present? <b>Y-N-1</b>
Client Project Name: <b>GARWOODS PARK SHORELINE INVESTIG</b>		No. of Coolers: <b>2</b>
Client Project #: <b>COS-GWSA</b>	Samplers: <b>LAMANNA</b>	Cooler Temps: <b>4.0, AMB</b>

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested							Notes/Comments	
					GRAV SIZE ASTM 0421/422	MOISTURE CONTENT ASTM -- 2216							
TSB2-5.5	9/22/06		S	1-16g	X								
TSB2-17.5	9/22/06		S	1-16g	X								
TSB2-39.0	9/22/06		S	1-16g	X								
TSB2-45.0	9/22/06		S	1-40g			X						
TSB2-49.0	9/22/06		S	1-40g 1-16g	X	X							
TSB1-15.0	9/25/06		S	1-16g	X								
TSB1-33.5	9/25/06		S	1-16g	X								
TSB1-47.0	9/25/06		S	1-16g	X								
TOW3-4.5	9/26/06	1256	S	1-40g								X	
TOW3-6.5	"	1255	S	1-40g								X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>JOHN LAMANNA</b>	Printed Name: <b>BOB CONOLEYON</b>	Printed Name:	Printed Name:
	Company: <b>FLOYD SNIDER</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>OCT 3, 2006 1253</b>	Date & Time: <b>10/3/06 1253</b>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.



# Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number: <b>7251</b>	Turn-around Requested: <b>TWO WEEK</b>	Page: <b>3</b> of <b>3</b>
ARI Client Company: <b>FLOYD SNIDER</b>	Phone: <b>206-292-2078</b>	Date: <b>OUT 3, 2006</b>
Client Contact: <b>JANE FISHER</b>	No. of Coolers: <b>2</b>	Ice Present? <b>Y-1</b> <b>N-1</b>
Client Project Name: <b>GASWORKS PARK SUDPHONE INVESTIGATION</b>	Sampler: <b>LAMONNA</b>	Cooler Temps: <b>4.01 AMB</b>

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested							Notes/Comments	
					GRAV SIZE ASTM D421/422	MOISTURE CONTENT ASTM-2216							
TDW3-9.5	9/26		S	1-16g	X								
TDW3-12.0	9/26	1319	S	1-4g								X	"SPLITS"
TDW3-120-R	9/26	1322	S	1-80g								X	
TDW3-29.9	9/26		S	1-16g	X								
TDW3-39.5	9/26		S	1-16g	X								
TDW2-23.0	9/28		S	1-16g	X								
TDW2-30.6	9/28	1416	S	1-4g								X	
TDW2-39.5	9/29	1050	S	1-16g	X								
TSS3-16.5-18	10/2	1250	S	1-4g								X	"SPLITS"
TSS3-16.5-18R	10/2	1250	S	1-8g								X	

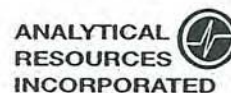
Comments/Special Instructions	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>TBW LAMONNA</b>	Printed Name: <b>BOB CONGLETON</b>	Printed Name:	Printed Name:
	Company: <b>FLOYD SNIDER</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>09/23, 2006 1253</b>	Date & Time: <b>10/03/06 1253</b>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.



# Cooler Receipt Form



ARI Client: FSI Project Name: \_\_\_\_\_  
COC NO.: \_\_\_\_\_ Delivered By: HAND  
Tracking NO.: \_\_\_\_\_ Date: \_\_\_\_\_  
ARI Job No.: \_\_\_\_\_ Lims NO.: \_\_\_\_\_

### Preliminary Examination Phase:

1. Were intact, properly signed and dated custody seals attached  
To the outside of the cooler? ..... YES  NO
2. Were custody papers included with the cooler ..... YES  NO
3. Were custody papers properly filled out (ink, signed etc.)? ..... YES  NO
4. Complete custody forms and attach all shipping documents ..... OK  NA

Cooler Accepted BY: Bob Conley Date: 10/3/06 Time: 1253

### Log-IN Phase:

5. Was a temperature blank include in the cooler? ..... YES  NO
6. Record Cooler Temperature..... 4.0, AMB °C
7. What kind of packing material was used? ..... LEI
8. Was sufficient ice used (if appropriate)? ..... YES  NO
9. Were all bottles sealed in separate plastic bags? ..... YES  NO
10. Did all bottles arrive in good condition (unbroken)? ..... YES  NO
11. Were all bottle labels complete and legible? ..... YES  NO
12. Did all bottle labels and tags agree with custody papers? ..... YES  NO
13. Were all bottles used correct for the requested analyses? ..... YES  NO
14. Do any of the analyses (bottles) require preservative?  
(if so, Preservation checklist must be attached) ..... YES  NO
15. Were all VOA vials free of air bubbles? ..... YES  NO
16. Was sufficient amount of sample sent in each bottle? ..... YES  NO
17. Notify Project Manager of any discrepancies or concerns..... OK  NA

Cooler Opened By: BC Date: 10/3/06 Time: 1253

Explain any discrepancies or negative responses:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



Client: Floyd, Snider

ARI Project No.: JZ51

Client Project: Gasworks Park Shoreline Invest.

Client Project No.: COS-GWSA

#### Case Narrative

1. Seventeen samples were received on October 3, 2006, and were in good condition.
2. Fifteen samples were tested for grain size distribution according to ASTM Method D422.
3. Nine samples appeared to contain less than 15% fines and the sieve portion of the procedure was performed, but not the hydrometer portion. The remaining six samples were prepared according to ASTM Method D421, dry prep method, and run for sieve and hydrometer analysis according to ASTM Method D422.
4. Three samples were submitted for moisture content determination according to ASTM Method D2216.
5. There were no perceived anomalies to the samples or testing.
6. The data is provided in summary tables and plots.

Released by:

Title:

*Shirley Smith*  
Lead Technician

Date:

10/21/06

**GEOTECHNICAL ANALYSIS DATA SHEET**  
**Moisture Content by Method ASTM D2216**

Release Authorized: *gs*  
 Reported: 10/21/06  
 Received: 10/03/06  
 Page 1 of 1

QC Report No: JZ51-Floyd, Snider  
 Project: GASWORKS PARK SHORELINE INVEST.  
 COS-GWSA

Client/ ARI ID	Date Sampled	Matrix	Analysis Date	Result
TDW1-43.2 JZ51D 06-18554	09/20/06	Soil	10/21/06 12:00	17.61
TSB2-45.0 JZ51M 06-18563	09/22/06	Soil	10/21/06 12:00	11.82
TSB2-49.0 JZ51N 06-18564	09/22/06	Soil	10/21/06 12:00	9.13

**Reported in Percent**



Floyd, Snider  
COS-GWSA

Percent Finer Than Indicated Size, By ASTM D422

Sample ID	Depth (ft)	Moisture Content (%)	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
TDW1-9.0	NA	18.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1	96.4	92.2	75.3	40.9	13.9	2.6
TDW1-15.5	NA	7.9	100.0	100.0	100.0	100.0	87.8	78.2	72.4	61.2	52.1	45.6	35.9	20.6	11.1	5.4
TDW1-27.5	NA	9.4	100.0	100.0	100.0	100.0	100.0	90.5	85.4	75.1	62.0	50.0	34.8	16.7	8.4	5.1
TSB2-17.5	NA	33.4	100.0	100.0	100.0	100.0	100.0	100.0	95.0	75.2	62.7	52.4	42.5	30.6	20.5	10.8
TSB2-39.0	NA	15.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.8	93.5	85.2	55.8	18.7	7.3	4.0
TSB1-15.0	NA	26.7	100.0	100.0	100.0	100.0	100.0	97.4	86.1	71.3	56.1	42.9	29.0	17.7	12.6	8.8
TSB1-33.5	NA	10.1	100.0	100.0	100.0	100.0	100.0	96.0	96.0	89.2	73.7	61.3	46.2	24.4	10.2	4.7
TDW3-29.9	NA	9.9	100.0	100.0	100.0	100.0	100.0	91.2	84.9	78.2	69.8	61.0	43.4	22.3	9.7	4.4
TDW2-23.0	NA	5.6	100.0	100.0	100.0	100.0	92.6	75.9	72.7	62.6	55.7	49.7	36.9	17.0	6.1	2.8

Floyd, Snider  
COS-GWSA

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
TSB2-5.5	100.0	100.0	100.0	94.6	86.1	67.9	54.5	41.0	27.8	16.8	10.8	9.7	8.9	7.5	6.8	6.4	5.7	4.3	2.5
TSB2-49	100.0	100.0	100.0	97.5	92.3	89.2	84.6	80.4	73.4	60.2	46.9	34.3	24.0	19.3	15.0	12.0	9.0	4.7	1.7
TSB1-47.0	100.0	100.0	92.9	91.4	91.4	85.8	81.7	77.7	71.2	59.7	47.9	35.8	25.2	20.0	15.9	12.3	9.8	4.1	1.0
TDW3-9.5	100.0	100.0	100.0	94.6	88.9	80.1	66.0	53.3	42.7	33.1	25.9	21.2	19.3	16.8	14.2	11.6	9.0	7.3	3.4
TDW3-39.5	100.0	100.0	94.6	82.2	80.8	74.8	70.3	66.5	60.4	49.6	38.9	28.2	19.3	15.2	11.9	9.5	7.0	2.9	0.8
TDW2-39.5	100.0	100.0	95.0	81.2	78.6	74.3	69.6	64.6	57.5	45.9	35.5	25.7	20.3	16.0	12.6	10.0	8.2	3.9	1.3

Testing performed according to ASTM D421/D422

Floyd, Snider  
COS-GWSA

Percent Retained in Each Size Fraction, By ASTM D422

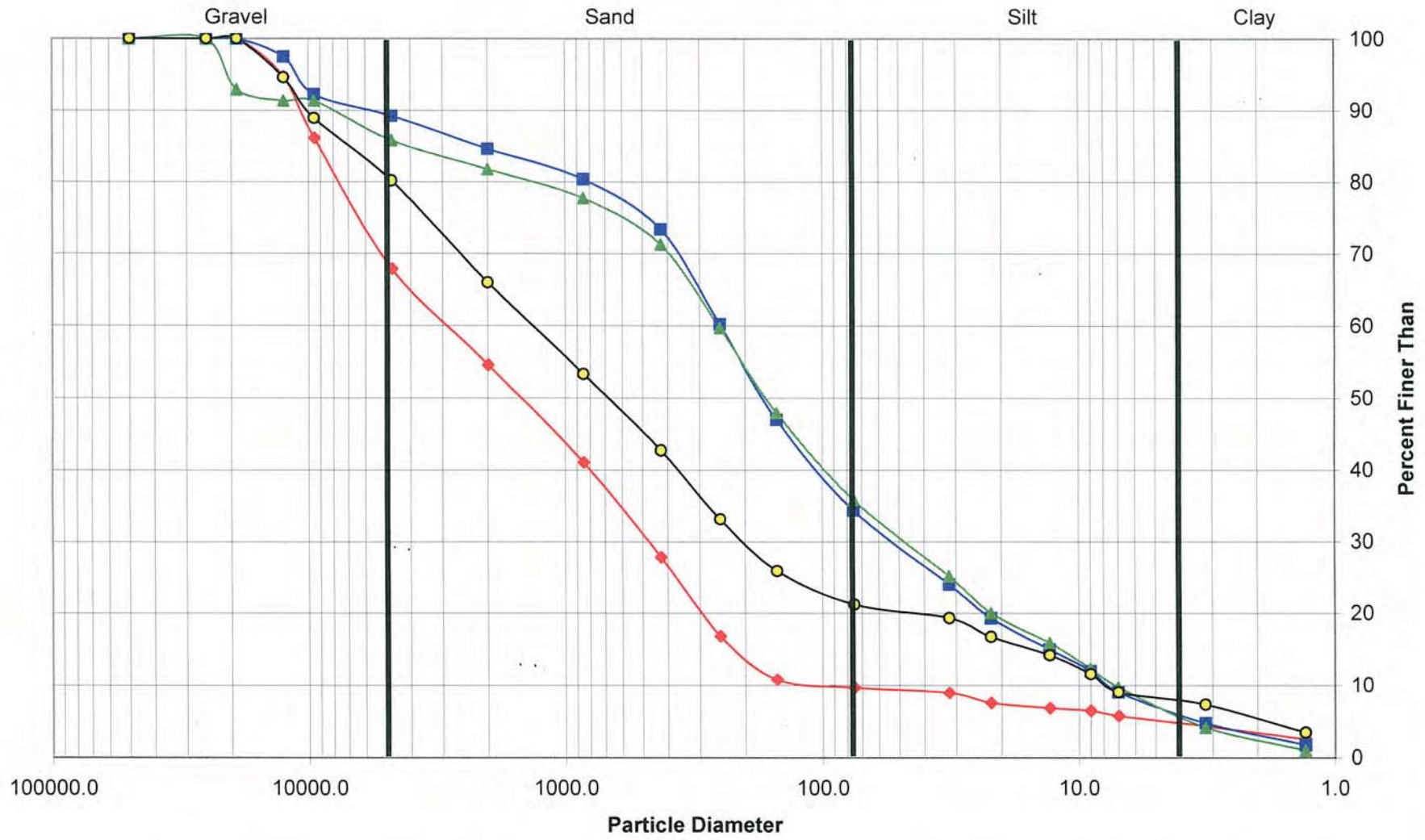
Sieve Size (microns)	3-2"	2-1.5"	1.5-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8-#4	4750-2000	2000-850	850-425	425-250	250-150	150-75	<75
TDW1-9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	2.8	4.1	17.0	34.4	27.0	11.3	2.6
TDW1-15.5	0.0	0.0	0.0	12.2	9.6	5.8	11.2	9.1	6.6	9.7	15.2	9.5	5.7	5.4
TDW1-27.5	0.0	0.0	0.0	0.0	9.5	5.1	10.3	13.1	11.9	15.3	18.0	8.3	3.3	5.1
TSB2-17.5	0.0	0.0	0.0	0.0	0.0	5.0	19.8	12.5	10.3	9.9	11.9	10.1	9.6	10.8
TSB2-39.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	4.2	8.3	29.4	37.1	11.4	3.3	4.0
TSB1-15.0	0.0	0.0	0.0	0.0	2.6	11.3	14.8	15.2	13.2	14.0	11.3	5.1	3.8	8.8
TSB1-33.5	0.0	0.0	0.0	0.0	4.0	0.0	6.8	15.5	12.4	15.1	21.8	14.2	5.5	4.7
TDW3-29.9	0.0	0.0	0.0	0.0	8.8	6.4	6.7	8.4	8.8	17.6	21.0	12.6	5.4	4.4
TDW2-23.0	0.0	0.0	0.0	7.4	16.6	3.2	10.2	6.9	6.0	12.8	19.9	10.9	3.3	2.8

Floyd, Snider  
COS-GWSA

Percent Retained in Each Size Fraction

Description	% Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay
Particle Size (microns)	> 4750	4750-2000	2000-425	425-75	75-32	32-22	22-13	13-9	9-7	7-3.2	<3.2
TSB2-5.5	32.1	13.3	26.7	18.2	0.7	1.4	0.7	0.4	0.7	1.4	4.3
TSB2-49	10.8	4.6	11.2	39.0	10.3	4.7	4.3	3.0	3.0	4.3	4.7
TSB1-47.0	14.2	4.1	10.5	35.4	10.6	5.1	4.1	3.6	2.6	5.7	4.1
TDW3-9.5	19.9	14.1	23.3	21.5	1.9	2.6	2.6	2.6	2.6	1.7	7.3
TDW3-39.5	25.2	4.4	9.9	32.2	8.9	4.1	3.3	2.5	2.5	4.1	2.9
TDW2-39.5	25.7	4.8	12.1	31.8	5.3	4.3	3.5	2.6	1.7	4.3	3.9

### Grain Size Distribution by Hydrometer



◆ TSB2-5.5

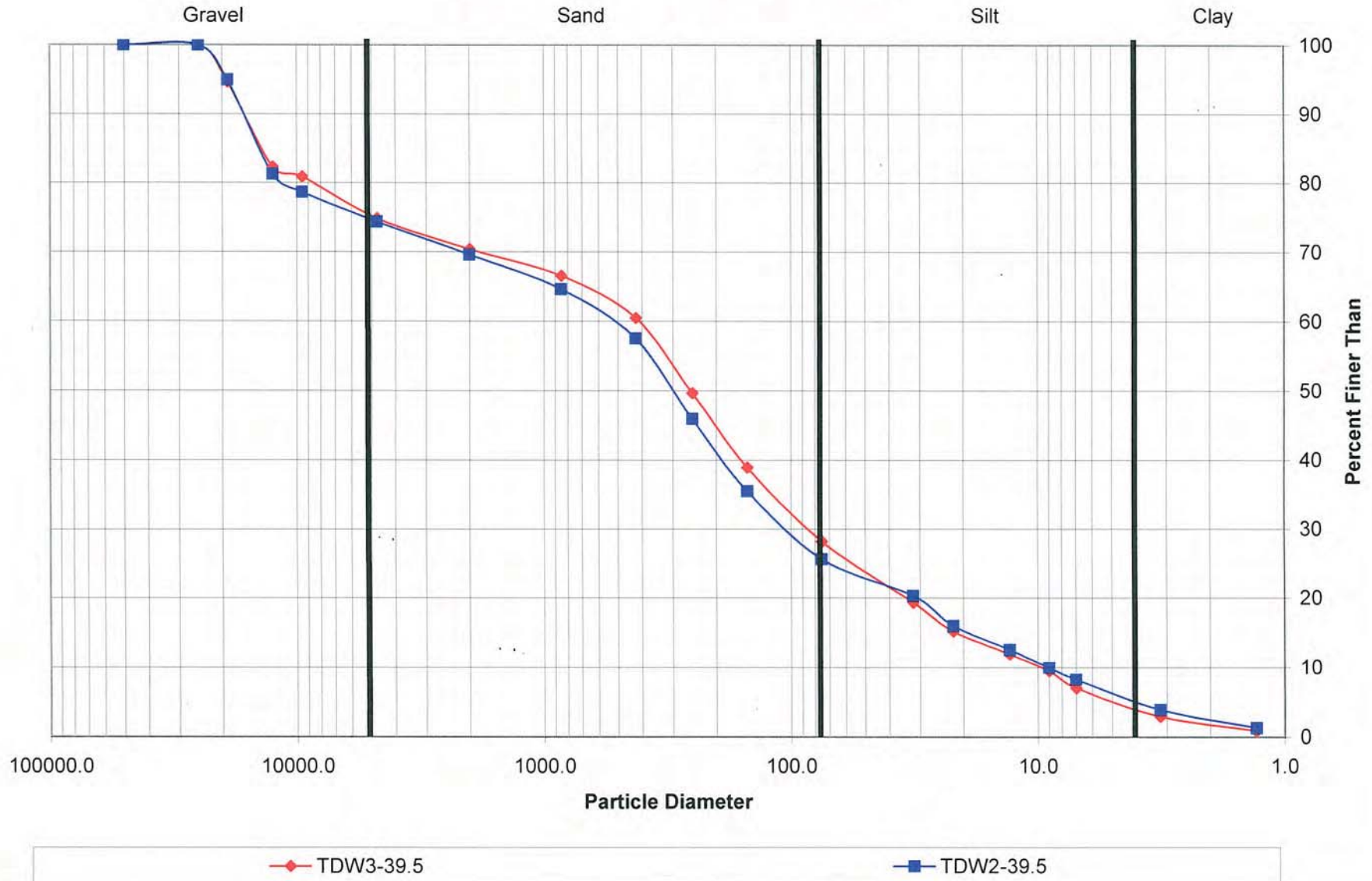
■ TSB2-49

▲ TSB1-47.0

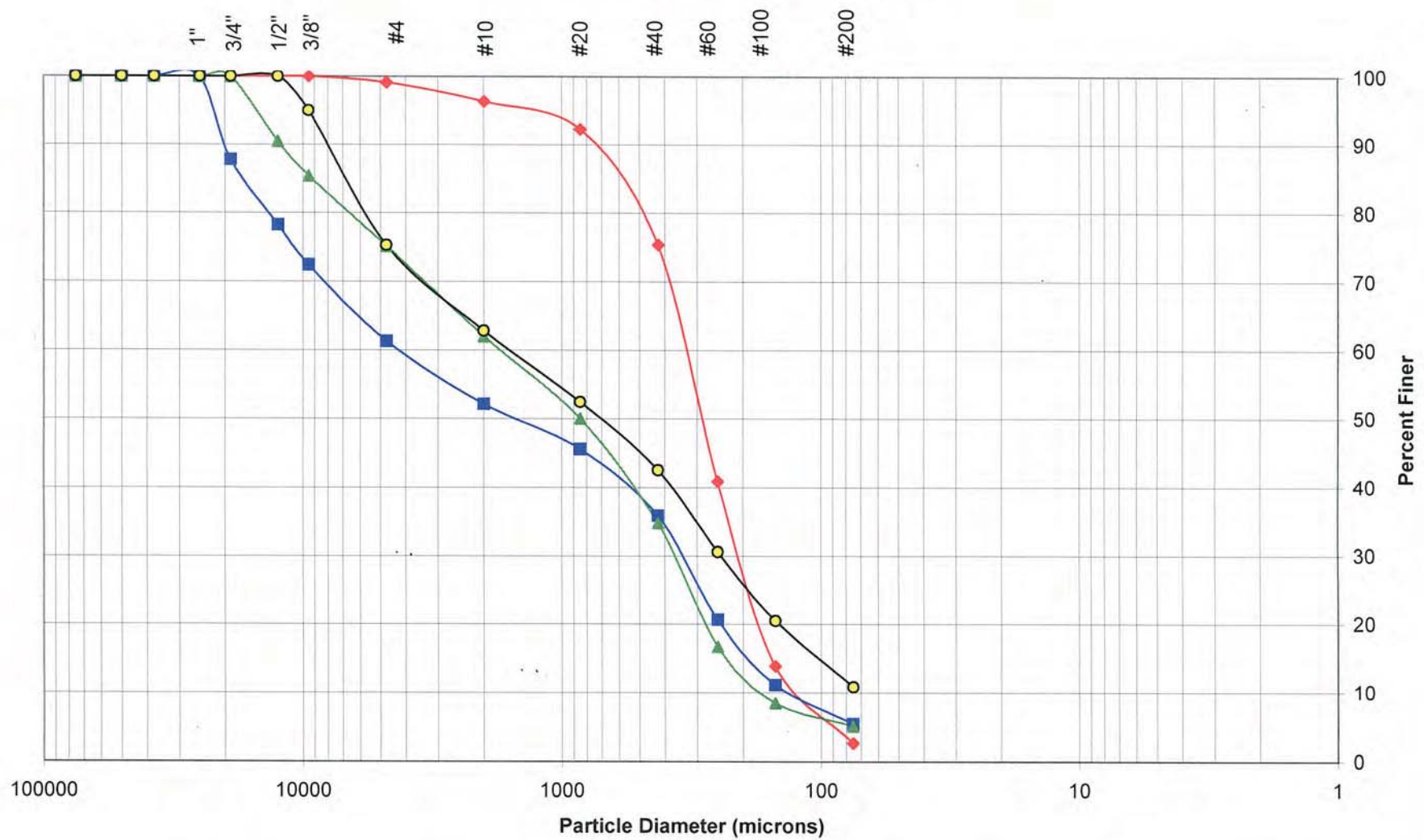
● TDW3-9.5



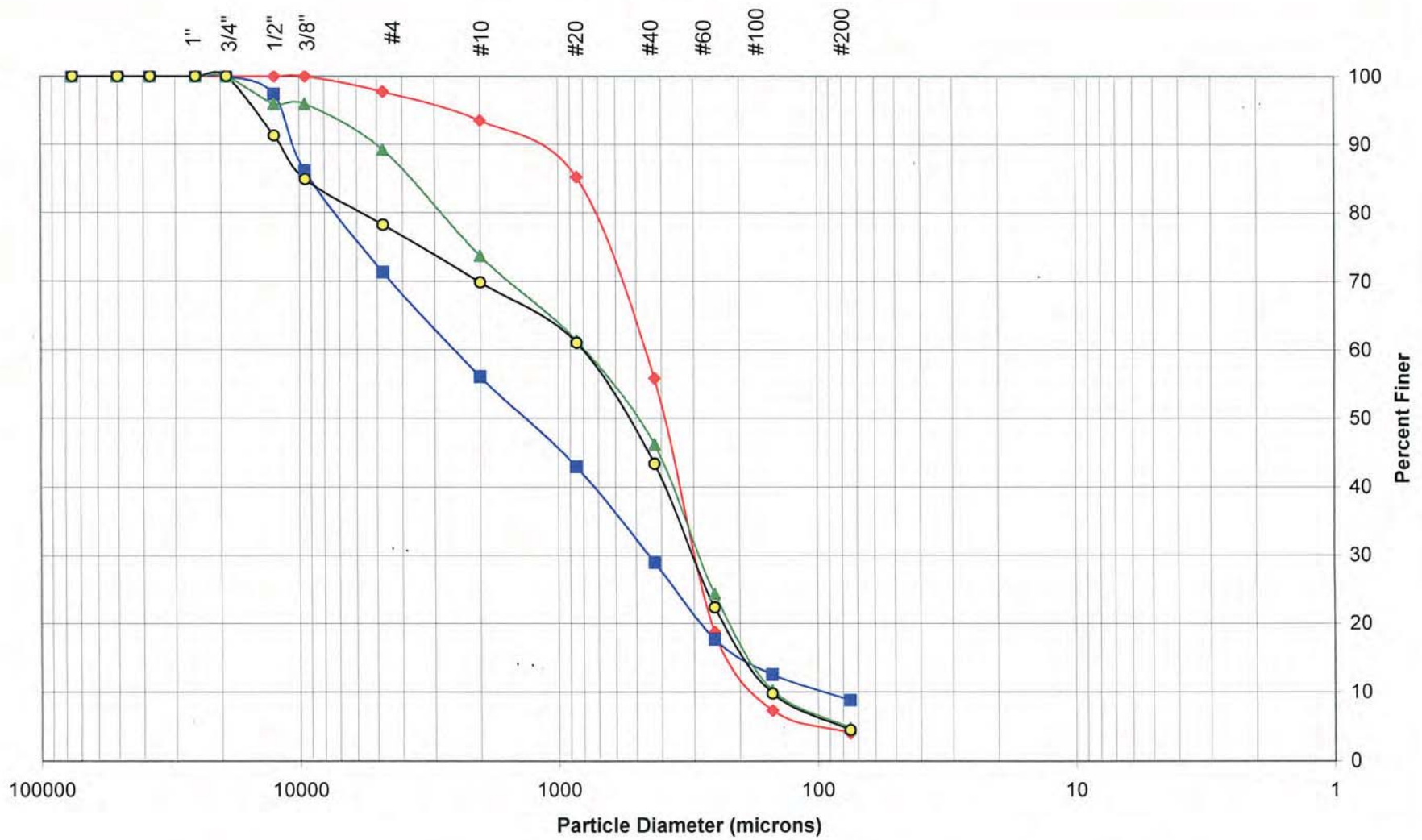
### Grain Size Distribution by Hydrometer



Grain Size Distribution By ASTM D422

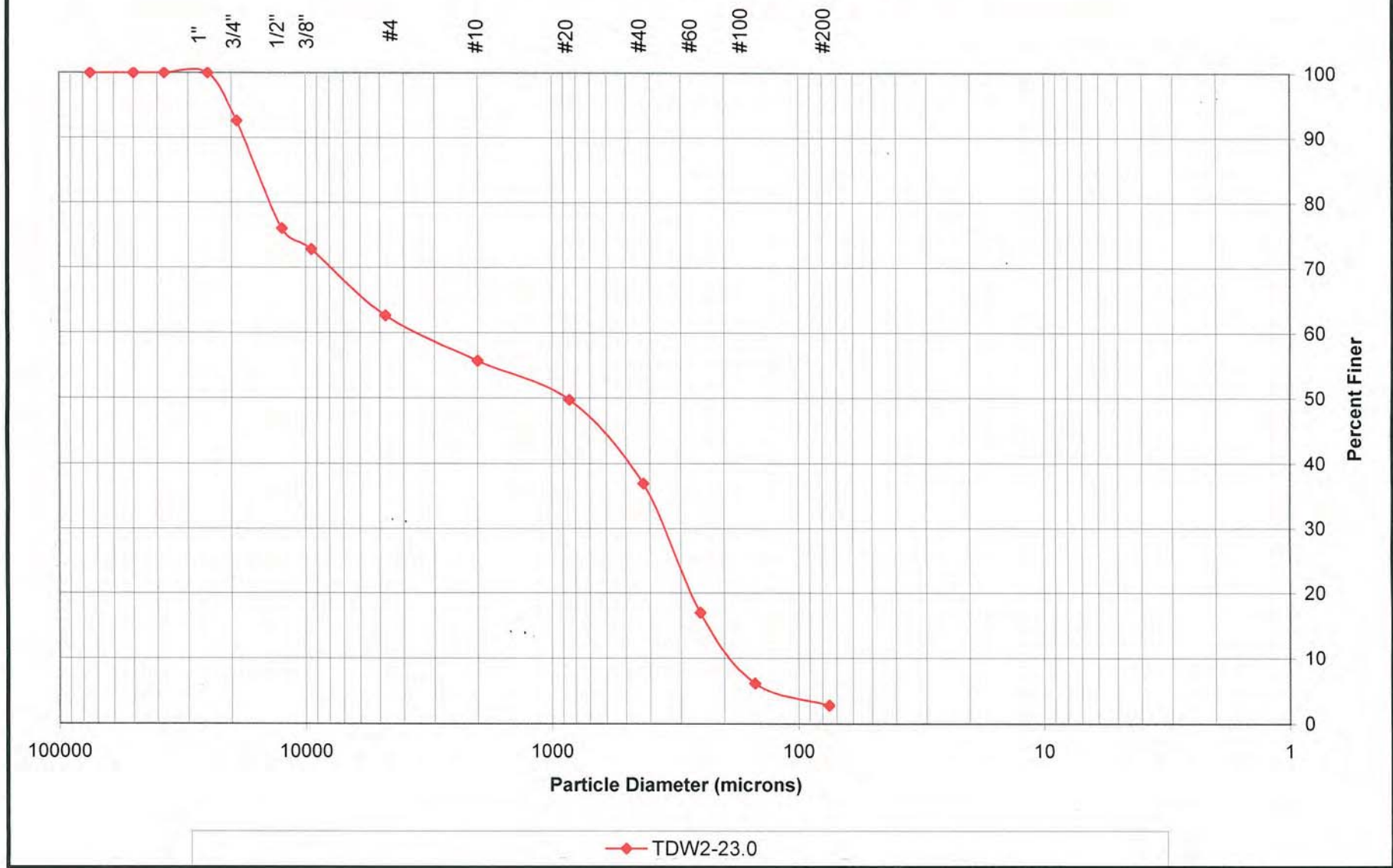


**Grain Size Distribution By ASTM D422**





### Grain Size Distribution By ASTM D422



**SUB-ATTACHMENT 3D-1.2**  
**Floyd | Snider 2007 Northeast Corner Investigation**

**PARTICLE SIZE SUMMARY**  
(METHODOLOGY: ASTM D422/D4464M)

PROJECT NAME: Gas Works NE Corner  
PROJECT NO: T6010 COS-GWSA

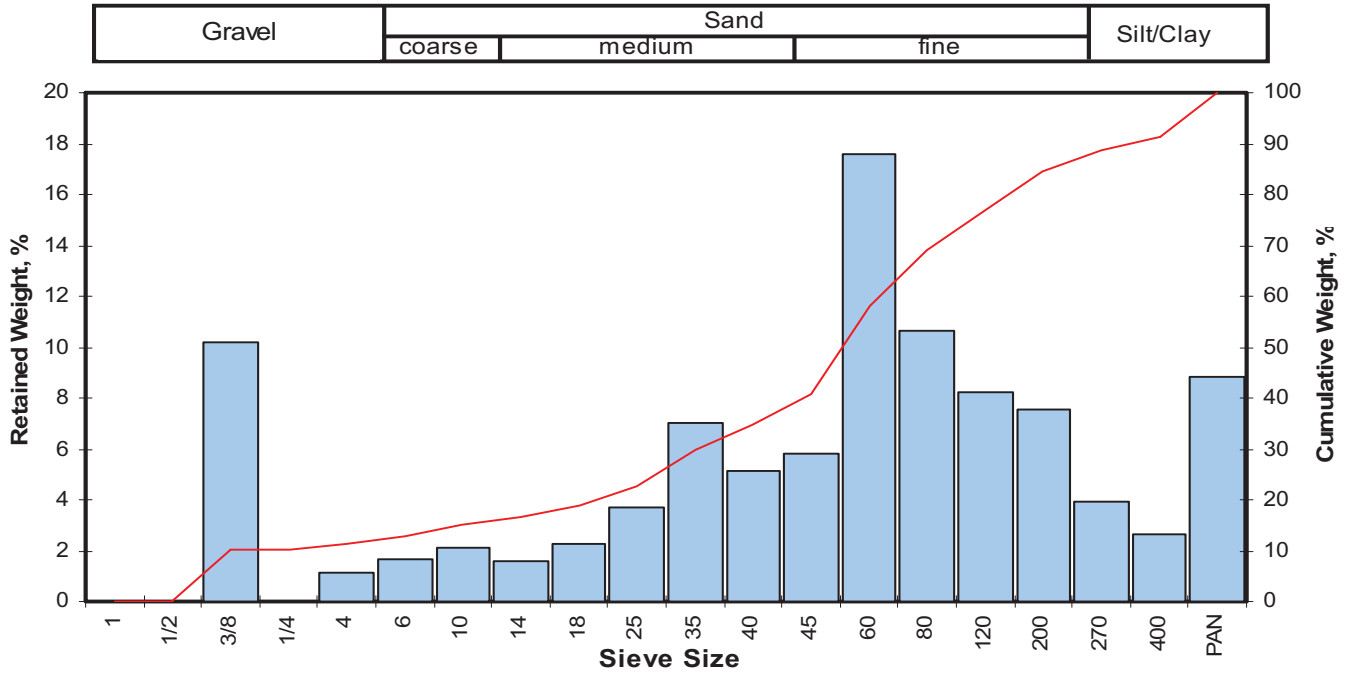
Sample ID	Depth, ft.	Mean Grain Size Description (1)	Median Grain Size mm	Particle Size Distribution, wt. percent						Silt & Clay
				Gravel	Sand Size			Silt	Clay	
					Coarse	Medium	Fine			
SB2-S4	6.85	Fine sand	0.294	11.33	3.78	19.70	49.86	(2)	(2)	15.34
SB2A-S1	8.45	Medium sand	0.725	7.56	17.86	36.43	27.38	(2)	(2)	10.76
SB3A	9.3	Medium sand	0.449	0.00	14.32	37.24	35.63	(2)	(2)	12.81
SB12A-S4	6.85	Medium sand	0.507	21.83	10.17	22.03	31.66	(2)	(2)	14.31
SB12A-S6	10.15	Silt	0.006	0.00	0.00	0.00	0.00	54.85	45.15	100.00

(1) Based on Mean from Trask

(2) Mechanical sieve does not differentiate silt/clay fractions.

**Client:** Floyd Snider  
**Project:** Gas Works NE Corner  
**Project No.:** T6010 COS-GWSA

**PTS File No.:** 37801  
**Sample ID:** SB2-S4  
**Depth, ft.:** 6.85



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent	Cumulative Weight Percent greater than			
Inches	Millimeters						Weight percent	Phi Value	Particle Size	
								Inches	Millimeters	
0.9844	25.002	-4.64	1	0.00	0.00	0.00				
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00				
0.3740	9.500	-3.25	3/8	2.60	10.22	10.22				
0.2500	6.351	-2.67	1/4	0.00	0.00	10.22				
0.1873	4.757	-2.25	4	0.28	1.10	11.33				
0.1324	3.364	-1.75	6	0.42	1.65	12.98				
0.0787	2.000	-1.00	10	0.54	2.12	15.10				
0.0557	1.414	-0.50	14	0.41	1.61	16.71				
0.0394	1.000	0.00	18	0.57	2.24	18.95				
0.0278	0.707	0.50	25	0.94	3.70	22.65				
0.0197	0.500	1.00	35	1.79	7.04	29.69				
0.0166	0.420	1.25	40	1.30	5.11	34.80				
0.0139	0.354	1.50	45	1.48	5.82	40.62				
0.0098	0.250	2.00	60	4.48	17.62	58.24				
0.0070	0.177	2.50	80	2.71	10.66	68.90				
0.0049	0.125	3.00	120	2.10	8.26	77.15				
0.0029	0.074	3.75	200	1.91	7.51	84.66				
0.0021	0.053	4.25	270	0.99	3.89	88.56				
0.0015	0.037	4.75	400	0.67	2.63	91.19				
			PAN	2.24	8.81	100.00				

Measure	Trask	Inman	Folk-Ward
Median, phi	1.77	1.77	1.77
Median, in.	0.0116	0.0116	0.0116
Median, mm	0.294	0.294	0.294
Mean, phi	1.38	1.48	1.58
Mean, in.	0.0151	0.0141	0.0132
Mean, mm	0.383	0.358	0.335
Sorting	2.146	2.202	1.989
Skewness	0.999	-0.129	-0.406
Kurtosis	0.039	0.331	1.091

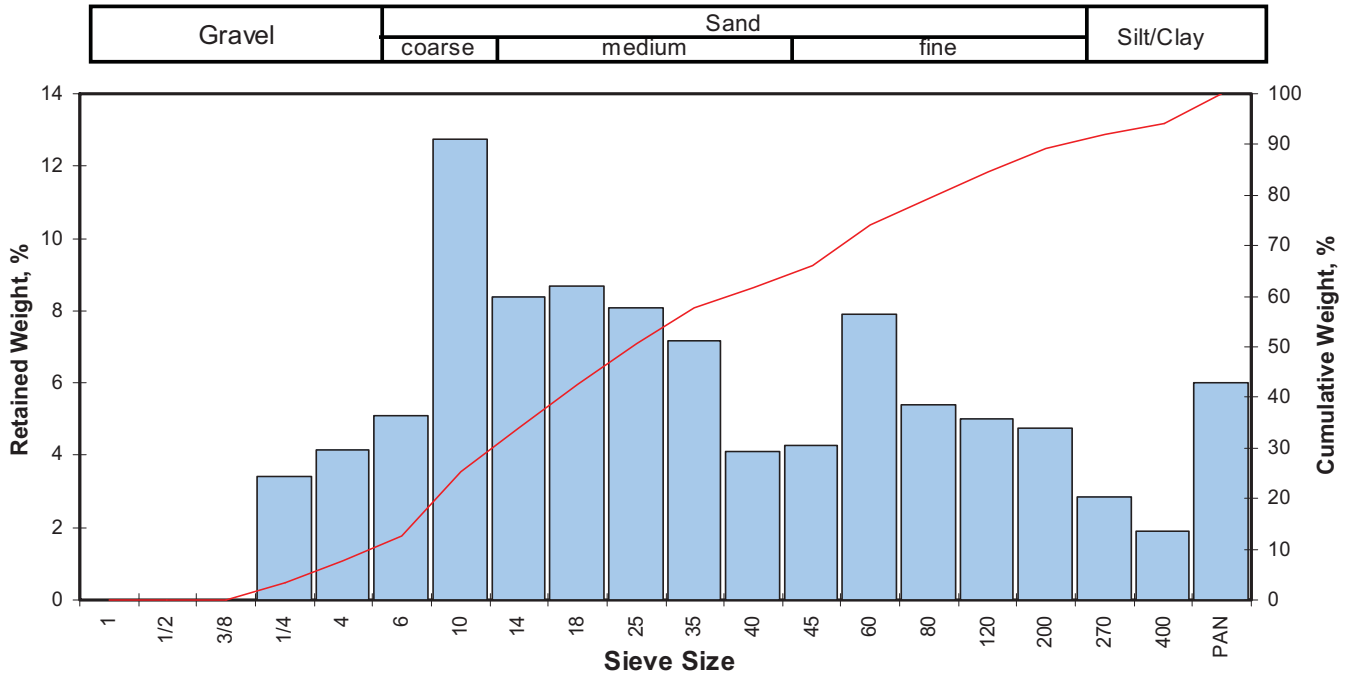
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	11.33
Coarse Sand	10	3.78
Medium Sand	40	19.70
Fine Sand	200	49.86
Silt/Clay	<200	15.34
<b>TOTALS</b>	<b>Total</b>	<b>100</b>

**Client:** Floyd Snider  
**Project:** Gas Works NE Corner  
**Project No.:** T6010 COS-GWSA

**PTS File No.:** 37801  
**Sample ID:** SB2A-S1  
**Depth, ft.:** 8.45



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.96	3.41	3.41
0.1873	4.757	-2.25	4	1.17	4.15	7.56
0.1324	3.364	-1.75	6	1.44	5.11	12.68
0.0787	2.000	-1.00	10	3.59	12.75	25.43
0.0557	1.414	-0.50	14	2.36	8.38	33.81
0.0394	1.000	0.00	18	2.45	8.70	42.51
0.0278	0.707	0.50	25	2.27	8.06	50.57
0.0197	0.500	1.00	35	2.02	7.17	57.74
0.0166	0.420	1.25	40	1.16	4.12	61.86
0.0139	0.354	1.50	45	1.21	4.30	66.16
0.0098	0.250	2.00	60	2.23	7.92	74.08
0.0070	0.177	2.50	80	1.52	5.40	79.47
0.0049	0.125	3.00	120	1.41	5.01	84.48
0.0029	0.074	3.75	200	1.34	4.76	89.24
0.0021	0.053	4.25	270	0.80	2.84	92.08
0.0015	0.037	4.75	400	0.54	1.92	94.00
			PAN	1.69	6.00	100.00
<b>TOTALS</b>				28.16	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-2.51	0.2238	5.686
10	-2.01	0.1588	4.033
16	-1.55	0.1156	2.937
25	-1.03	0.0801	2.035
40	-0.14	0.0435	1.105
50	0.46	0.0285	0.725
60	1.14	0.0179	0.455
75	2.09	0.0093	0.236
84	2.95	0.0051	0.129
90	3.88	0.0027	0.068
95	3.96	0.0025	0.064

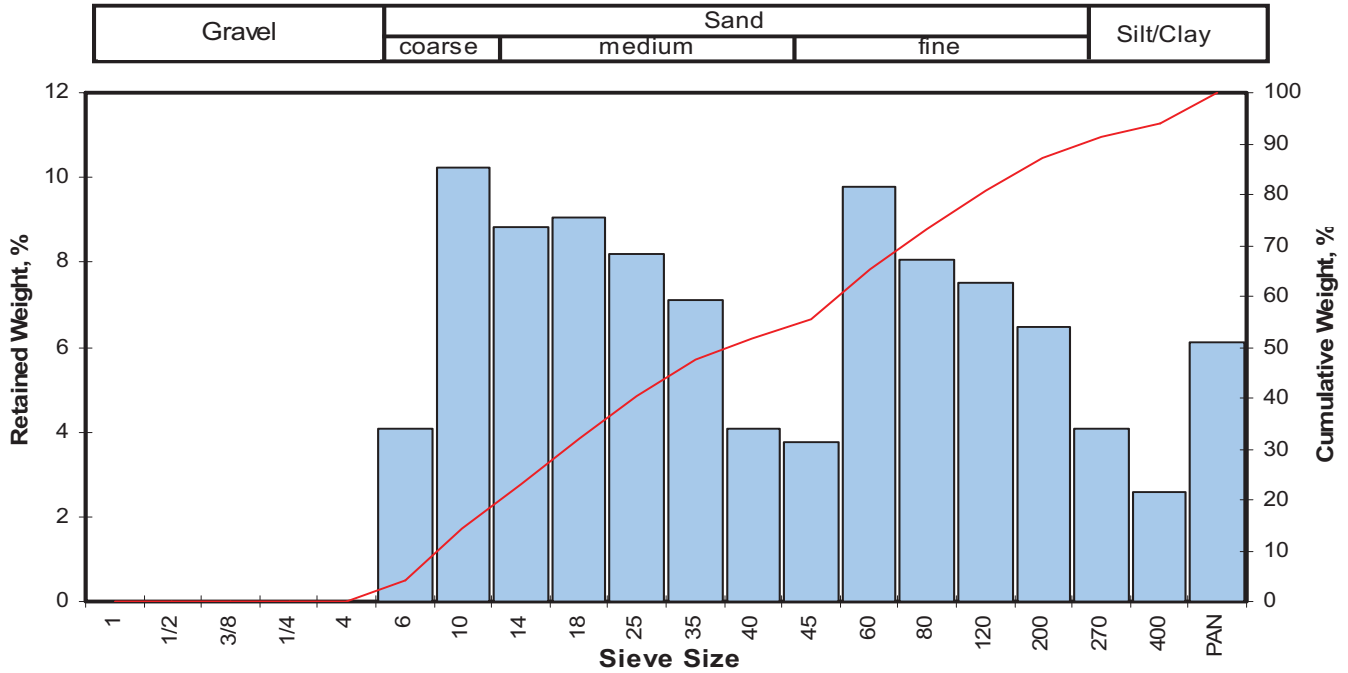
Measure	Trask	Inman	Folk-Ward
Median, phi	0.46	0.46	0.46
Median, in.	0.0285	0.0285	0.0285
Median, mm	0.725	0.725	0.725
Mean, phi	-0.18	0.70	0.62
Mean, in.	0.0447	0.0243	0.0256
Mean, mm	1.135	0.616	0.650
Sorting	2.939	2.253	2.106
Skewness	0.956	0.104	0.092
Kurtosis	0.227	0.435	0.852

**Grain Size Description** (ASTM-USCS Scale) Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	7.56
Coarse Sand	10	17.86
Medium Sand	40	36.43
Fine Sand	200	27.38
Silt/Clay	<200	10.76
<b>Total</b>		<b>100</b>

**Client:** Floyd Snider  
**Project:** Gas Works NE Corner  
**Project No.:** T6010 COS-GWSA

**PTS File No.:** 37801  
**Sample ID:** SB3A  
**Depth, ft.:** 9.3



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.38	4.09	4.09
0.0787	2.000	-1.00	10	0.95	10.23	14.32
0.0557	1.414	-0.50	14	0.82	8.83	23.14
0.0394	1.000	0.00	18	0.84	9.04	32.19
0.0278	0.707	0.50	25	0.76	8.18	40.37
0.0197	0.500	1.00	35	0.66	7.10	47.47
0.0166	0.420	1.25	40	0.38	4.09	51.56
0.0139	0.354	1.50	45	0.35	3.77	55.33
0.0098	0.250	2.00	60	0.91	9.80	65.12
0.0070	0.177	2.50	80	0.75	8.07	73.20
0.0049	0.125	3.00	120	0.70	7.53	80.73
0.0029	0.074	3.75	200	0.60	6.46	87.19
0.0021	0.053	4.25	270	0.38	4.09	91.28
0.0015	0.037	4.75	400	0.24	2.58	93.86
			PAN	0.57	6.14	100.00
<b>TOTALS</b>				9.29	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-1.68	0.1264	3.212
10	-1.32	0.0981	2.491
16	-0.90	0.0737	1.872
25	-0.40	0.0519	1.317
40	0.48	0.0283	0.718
50	1.15	0.0177	0.449
60	1.74	0.0118	0.300
75	2.62	0.0064	0.163
84	3.38	0.0038	0.096
90	4.09	0.0023	0.059
95	3.87	0.0027	0.068

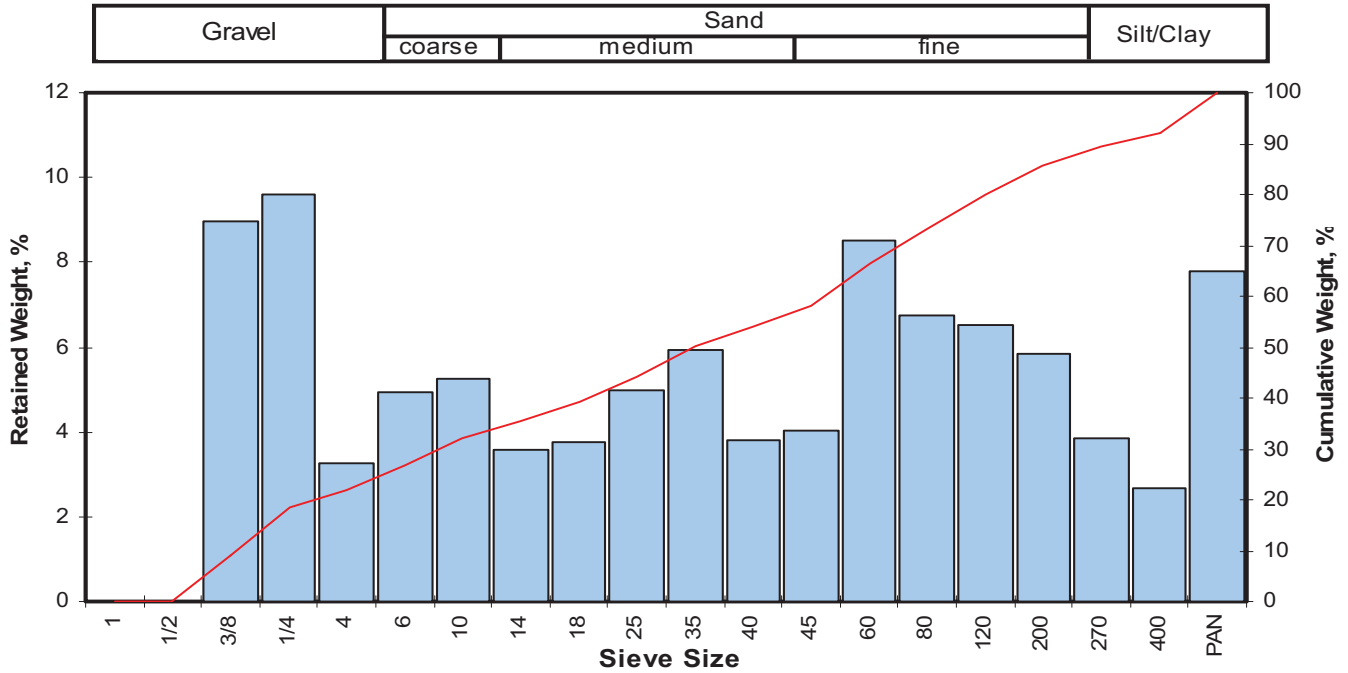
Measure	Trask	Inman	Folk-Ward
Median, phi	1.15	1.15	1.15
Median, in.	0.0177	0.0177	0.0177
Median, mm	0.449	0.449	0.449
Mean, phi	0.43	1.24	1.21
Mean, in.	0.0291	0.0167	0.0170
Mean, mm	0.740	0.424	0.432
Sorting	2.845	2.142	1.913
Skewness	1.031	0.039	0.008
Kurtosis	0.237	0.296	0.754

**Grain Size Description** (ASTM-USCS Scale) Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	14.32
Medium Sand	40	37.24
Fine Sand	200	35.63
Silt/Clay	<200	12.81
<b>Total</b>		<b>100</b>

**Client:** Floyd Snider  
**Project:** Gas Works NE Corner  
**Project No.:** T6010 COS-GWSA

**PTS File No.:** 37801  
**Sample ID:** SB12A-S4  
**Depth, ft.:** 6.85



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	1.80	8.97	8.97
0.2500	6.351	-2.67	1/4	1.93	9.62	18.59
0.1873	4.757	-2.25	4	0.65	3.24	21.83
0.1324	3.364	-1.75	6	0.99	4.94	26.77
0.0787	2.000	-1.00	10	1.05	5.23	32.00
0.0557	1.414	-0.50	14	0.72	3.59	35.59
0.0394	1.000	0.00	18	0.75	3.74	39.33
0.0278	0.707	0.50	25	1.00	4.99	44.32
0.0197	0.500	1.00	35	1.19	5.93	50.25
0.0166	0.420	1.25	40	0.76	3.79	54.04
0.0139	0.354	1.50	45	0.81	4.04	58.08
0.0098	0.250	2.00	60	1.71	8.52	66.60
0.0070	0.177	2.50	80	1.35	6.73	73.33
0.0049	0.125	3.00	120	1.31	6.53	79.86
0.0029	0.074	3.75	200	1.17	5.83	85.69
0.0021	0.053	4.25	270	0.77	3.84	89.53
0.0015	0.037	4.75	400	0.54	2.69	92.22
			PAN	1.56	7.78	100.00
<b>TOTALS</b>				20.06	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-3.42	0.4224	10.728
10	-3.19	0.3583	9.101
16	-2.82	0.2787	7.080
25	-1.93	0.1499	3.809
40	0.07	0.0376	0.955
50	0.98	0.0200	0.507
60	1.61	0.0129	0.327
75	2.63	0.0064	0.162
84	3.53	0.0034	0.086
90	4.34	0.0019	0.049
95	3.05	0.0047	0.120

Measure	Trask	Inman	Folk-Ward
Median, phi	0.98	0.98	0.98
Median, in.	0.0200	0.0200	0.0200
Median, mm	0.507	0.507	0.507
Mean, phi	-0.99	0.35	0.56
Mean, in.	0.0782	0.0308	0.0267
Mean, mm	1.985	0.782	0.677
Sorting	4.852	3.178	2.570
Skewness	1.547	-0.197	-0.278
Kurtosis	0.201	0.019	0.583

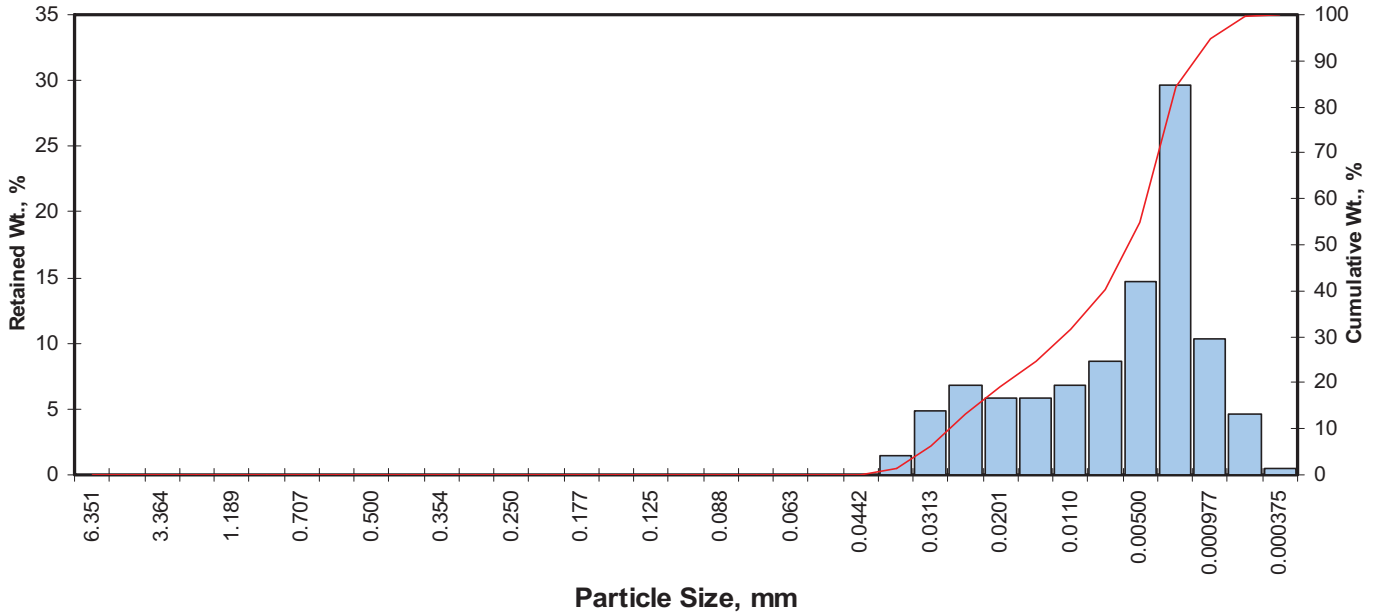
**Grain Size Description** (ASTM-USCS Scale) Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	21.83
Coarse Sand	10	10.17
Medium Sand	40	22.03
Fine Sand	200	31.66
Silt/Clay	<200	14.31
<b>Total</b>		<b>100</b>

**Client:** Floyd Snider  
**Project:** Gas Works NE Corner  
**Project No:** T6010 COS-GWSA

**PTS File No:** 37801  
**Sample ID:** SB12A-S6  
**Depth, ft:** 10.15

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Particle Size, mm

Opening		Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00	0.00
0.0139	0.354	1.50	45	0.00	0.00	0.00
0.0117	0.297	1.75	50	0.00	0.00	0.00
0.0098	0.250	2.00	60	0.00	0.00	0.00
0.0083	0.210	2.25	70	0.00	0.00	0.00
0.0070	0.177	2.50	80	0.00	0.00	0.00
0.0059	0.149	2.75	100	0.00	0.00	0.00
0.0049	0.125	3.00	120	0.00	0.00	0.00
0.0041	0.105	3.25	140	0.00	0.00	0.00
0.0035	0.088	3.50	170	0.00	0.00	0.00
0.0029	0.074	3.75	200	0.00	0.00	0.00
0.0025	0.063	4.00	230	0.00	0.00	0.00
0.0021	0.053	4.25	270	0.00	0.00	0.00
0.00174	0.0442	4.50	325	0.03	0.03	0.03
0.00146	0.0372	4.75	400	1.47	1.47	1.50
0.00123	0.0313	5.00	450	4.91	4.91	6.41
0.000986	0.0250	5.32	500	6.79	6.79	13.20
0.000790	0.0201	5.64	635	5.83	5.83	19.03
0.000615	0.0156	6.00		5.80	5.80	24.83
0.000435	0.0110	6.50		6.75	6.75	31.57
0.000308	0.00781	7.00		8.58	8.58	40.15
0.000197	0.00500	7.65		14.70	14.70	54.85
0.000077	0.00195	9.00		29.70	29.69	84.54
0.000038	0.000977	10.00		10.30	10.30	94.83
0.000019	0.000488	11.00		4.67	4.67	99.50
0.000015	0.000375	11.38		0.50	0.50	100.00
<b>TOTALS</b>				<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	4.93	0.0013	0.033
10	5.17	0.0011	0.028
16	5.47	0.0009	0.023
25	6.01	0.0006	0.015
40	6.99	0.0003	0.008
50	7.43	0.0002	0.006
60	7.88	0.0002	0.004
75	8.56	0.0001	0.003
84	8.98	0.0001	0.002
90	9.53	0.0001	0.001
95	10.04	0.0000	0.001

Measure	Trask	Inman	Folk-Ward
Median, phi	7.43	7.43	7.43
Median, in.	0.0002	0.0002	0.0002
Median, mm	0.006	0.006	0.006
Mean, phi	6.79	7.22	7.29
Mean, in.	0.0004	0.0003	0.0003
Mean, mm	0.009	0.007	0.006
Sorting	2.422	1.751	1.649
Skewness	1.105	-0.119	-0.050
Kurtosis	0.243	0.459	0.820

<b>Grain Size Description</b> (ASTM-USCS Scale)	Silt (based on Mean from Trask)
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Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	0.00
Silt	>0.005 mm	54.85
Clay	<0.005 mm	45.15
<b>Total</b>		<b>100</b>



COMPANY FLOYD SNIDER <hr/> ADDRESS 607 UNION ST. STE 600, SEATTLE, WA 98101 <hr/> PROJECT MANAGER KATE SNIDER / MEGAN KING <hr/> PROJECT NAME <span style="float:right">PHONE NUMBER</span> GAS WORKS NE CORNER <span style="float:right">206-292-2078</span> <hr/> PROJECT NUMBER <span style="float:right">FAX NUMBER</span> T6010 COS-GWSA <hr/> SITE LOCATION GAS WORKS PARK, SEATTLE WA <hr/> SAMPLER SIGNATURE 	ANALYSIS REQUEST <table border="1" style="width:100%; border-collapse: collapse; font-size: 8px;"> <tr><td style="width:10%;">PHYSICAL PROPERTIES PACKAGE, API RP40</td><td style="width:10%;"></td></tr> <tr><td>MOISTURE CONTENT, ASTM D2216</td><td></td></tr> <tr><td>POROSITY, API RP40</td><td></td></tr> <tr><td>GRAIN DENSITY, API RP40</td><td></td></tr> <tr><td>BULK DENSITY, API RP40</td><td></td></tr> <tr><td>AIR PERMEABILITY, API RP40</td><td></td></tr> <tr><td>SPECIFIC RETENTION/YIELD ASTM D425</td><td></td></tr> <tr><td>CAPILLARY PRESSURE, ASTM D425M</td><td></td></tr> <tr><td>SOIL pH, EPA 9045</td><td></td></tr> <tr><td>GRAIN SIZE: DRY, 400 MESH</td><td></td></tr> <tr><td>GRAIN SIZE: SIEVE &amp; LASER</td><td></td></tr> <tr><td>GRAIN SIZE: LASER; 1 MICRON</td><td></td></tr> <tr><td>HYDRAULIC CONDUCTIVITY, EPA 9100, API RP40</td><td></td></tr> <tr><td>TOC: WALKLEY-BLACK</td><td></td></tr> <tr><td>HYDRAULIC CONDUCTIVITY PACKAGE</td><td></td></tr> <tr><td>ATTERBERG LIMITS, ASTM D4318</td><td></td></tr> <tr><td>TNRC PROPERTIES PACKAGE</td><td></td></tr> <tr><td>White light + UV Photography</td><td></td></tr> <tr><td>Digital Imaging - CDs</td><td></td></tr> <tr><td>PORE FLUID SATURATION PACKAGE</td><td></td></tr> </table>	PHYSICAL PROPERTIES PACKAGE, API RP40		MOISTURE CONTENT, ASTM D2216		POROSITY, API RP40		GRAIN DENSITY, API RP40		BULK DENSITY, API RP40		AIR PERMEABILITY, API RP40		SPECIFIC RETENTION/YIELD ASTM D425		CAPILLARY PRESSURE, ASTM D425M		SOIL pH, EPA 9045		GRAIN SIZE: DRY, 400 MESH		GRAIN SIZE: SIEVE & LASER		GRAIN SIZE: LASER; 1 MICRON		HYDRAULIC CONDUCTIVITY, EPA 9100, API RP40		TOC: WALKLEY-BLACK		HYDRAULIC CONDUCTIVITY PACKAGE		ATTERBERG LIMITS, ASTM D4318		TNRC PROPERTIES PACKAGE		White light + UV Photography		Digital Imaging - CDs		PORE FLUID SATURATION PACKAGE		PO#  SPECIAL HANDLING 24 HOURS 72 HOURS <span style="border: 1px solid black; border-radius: 50%; padding: 2px;">5 DAYS NORMAL</span> OTHER <hr/> SAMPLE CONDITIONS RECEIVED ON ICE YES/NO SEALED YES/NO OTHER YES/NO <hr/> COMMENTS
PHYSICAL PROPERTIES PACKAGE, API RP40																																										
MOISTURE CONTENT, ASTM D2216																																										
POROSITY, API RP40																																										
GRAIN DENSITY, API RP40																																										
BULK DENSITY, API RP40																																										
AIR PERMEABILITY, API RP40																																										
SPECIFIC RETENTION/YIELD ASTM D425																																										
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White light + UV Photography																																										
Digital Imaging - CDs																																										
PORE FLUID SATURATION PACKAGE																																										

SAMPLE ID NUMBER	DATE	TIME	DEPTH, FT	PHYSICAL PROPERTIES PACKAGE, API RP40	MOISTURE CONTENT, ASTM D2216	POROSITY, API RP40	GRAIN DENSITY, API RP40	BULK DENSITY, API RP40	AIR PERMEABILITY, API RP40	SPECIFIC RETENTION/YIELD ASTM D425	CAPILLARY PRESSURE, ASTM D425M	SOIL pH, EPA 9045	GRAIN SIZE: DRY, 400 MESH	GRAIN SIZE: SIEVE & LASER	GRAIN SIZE: LASER; 1 MICRON	HYDRAULIC CONDUCTIVITY, EPA 9100, API RP40	TOC: WALKLEY-BLACK	HYDRAULIC CONDUCTIVITY PACKAGE	ATTERBERG LIMITS, ASTM D4318	TNRC PROPERTIES PACKAGE	White light + UV Photography	Digital Imaging - CDs	PORE FLUID SATURATION PACKAGE	NUMBER OF SAMPLES	COMMENTS
SBZ-S4	9/17/07	-	6.5-8.6	✓	✓	✓												✓			✓				HOLD PORE
SB2A-S1	9/17/07	-	8.0-9.5	✓	✓	✓												✓			✓				FLUID SAT. PKG
SB 3A	9/19/07	-	9.0-10.5	✓	✓	✓												✓			✓				→ PHYSICAL
SB5-S5	9/18/07	-	7.5-9.0	✓	✓	✓												✓			✓				PROPERTIES
SB8-S5	9/18/07	-	9.5-10.0	✓	✓	✓												✓			✓				PENDING
SB12A-S4	9/20/07	-	6.5-8.0	✓	✓	✓												✓			✓				RESULTS OF
SB12A-S6	9/25/07	-	10.0-10.2	✓	✓	✓												✓			✓				UV + WHITE LT. PHOTOGRAPHY

1. RELINQUISHED BY  COMPANY FLOYD SNIDER <hr/> DATE <span style="margin-left: 50px;">TIME</span> 9/24/07 <span style="margin-left: 50px;">3:00 PM</span>	2. RECEIVED BY  COMPANY PTE Labs <hr/> DATE <span style="margin-left: 50px;">TIME</span> 9/25/07 <span style="margin-left: 50px;">1310</span>	3. RELINQUISHED BY COMPANY <hr/> DATE <span style="margin-left: 50px;">TIME</span>	4. RECEIVED BY COMPANY <hr/> DATE <span style="margin-left: 50px;">TIME</span>
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PTS File No: 37801  
 Client: Floyd Snider

## PHYSICAL PROPERTIES DATA - PORE FLUID SATURATIONS

PROJECT NAME: Gas Works NE Corner  
 PROJECT NO: T6010 COS-GWSA

SAMPLE ID.	DEPTH, ft.	METHODS: SAMPLE ORIENTATION (1)	API RP 40 / ASTM D2216	API RP 40		API RP 40		API RP 40	
			MOISTURE CONTENT, % weight	DENSITY		POROSITY, %Vb (2)		PORE FLUID SATURATIONS, % Pv (3)	
				BULK, g/cc	GRAIN, g/cc	TOTAL	AIR FILLED	WATER	NAPL
SB2-S4	6.65-6.8	V	19.2	1.59	2.64	39.7	9.0	72.7	4.5
SB2A-S1	8.0-8.15	V	15.0	1.42	2.65	46.4	25.1	41.0	4.9
SB 3A	9.15-9.3	V	41.1	1.09	2.26	51.8	6.4	74.5	13.2
SB12A-S4	6.65-6.8	V	18.8	1.64	2.64	37.8	6.9	76.0	5.8
SB12A-S6	10.2-10.35	V	152.8	0.44	1.55	71.4	0.6	9.9	89.3

(1) Sample Orientation: H = horizontal; V = vertical (2) Total Porosity = no pore fluids in place; all interconnected pore channels; Air Filled = pore channels not occupied by pore fluids (3) Water = 0.9996 g/cc, Hydrocarbon = 0.9600 g/cc; Vb = Bulk Volume, cc; Pv = Pore Volume, cc; ND = Not Detected

**SUB-ATTACHMENT 3D-1.3**  
**RETEC 2007 Eastern Shoreline Investigation**

**PARTICLE SIZE SUMMARY**

(METHODOLOGY: ASTM D422)

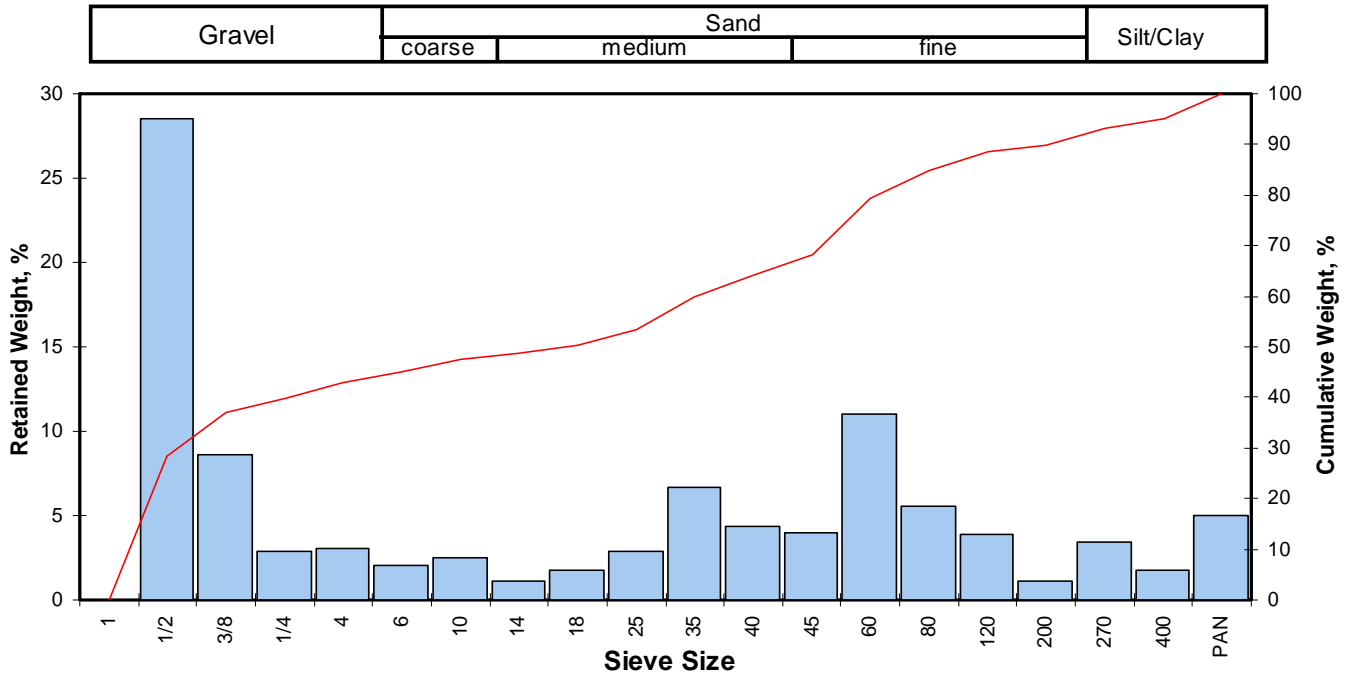
PROJECT NAME: North Lake Union  
PROJECT NO: 05570028-360

Sample ID	Depth, ft.	Description USCS/ASTM (1)	Median Grain Size, mm	Particle Size Distribution, wt. percent				
				Gravel	Sand Size			Silt/Clay
					Coarse	Medium	Fine	
GP-1 GS	14.0-16.0	Gravel	1.093	43.00	4.57	16.77	25.48	10.19
GP-11 GS	28.0-32.0	Fine sand	0.228	8.71	7.62	14.79	49.59	19.29
GP-12 GS	30.0-32.0	Gravel	0.375	38.80	2.33	7.18	32.98	18.71
GP-02 GS	13.0-15.0	Gravel	1.355	36.14	9.81	22.07	26.89	5.09
GP-13 GS	24.0-26.0	Gravel	11.403	64.06	4.82	6.21	15.79	9.12

(1) based on Mean from Trask

Client: RETEC/ENSR  
 Project: North Lake Union  
 Project No: 05570028-360

PTS File No: 37769  
 Sample ID: GP-1 GS  
 Depth, ft: 14.0-16.0



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent	Cumulative Weight Percent greater than			
Inches	Millimeters						Weight percent	Phi Value	Particle Size	
								Inches	Millimeters	
0.9844	25.002	-4.64	1	0.00	0.00	0.00	5	0.8717	22.142	
0.4922	12.501	-3.64	1/2	13.30	28.52	28.52	10	0.7720	19.608	
0.3740	9.500	-3.25	3/8	4.00	8.58	37.10	16	0.6672	16.948	
0.2500	6.351	-2.67	1/4	1.32	2.83	39.93	25	0.5362	13.619	
0.1873	4.757	-2.25	4	1.43	3.07	43.00	40	0.2484	6.310	
0.1324	3.364	-1.75	6	0.96	2.06	45.06	50	0.0430	1.093	
0.0787	2.000	-1.00	10	1.17	2.51	47.57	60	0.0197	0.500	
0.0557	1.414	-0.50	14	0.51	1.09	48.66	75	0.0113	0.286	
0.0394	1.000	0.00	18	0.84	1.80	50.46	84	0.0073	0.186	
0.0278	0.707	0.50	25	1.35	2.90	53.36	90	0.0029	0.073	
0.0197	0.500	1.00	35	3.09	6.63	59.98	95	0.0015	0.037	
0.0166	0.420	1.25	40	2.03	4.35	64.34				
0.0139	0.354	1.50	45	1.86	3.99	68.33				
0.0098	0.250	2.00	60	5.12	10.98	79.31				
0.0070	0.177	2.50	80	2.57	5.51	84.82				
0.0049	0.125	3.00	120	1.81	3.88	88.70				
0.0029	0.074	3.75	200	0.52	1.12	89.81				
0.0021	0.053	4.25	270	1.60	3.43	93.24				
0.0015	0.037	4.75	400	0.82	1.76	95.00				
			PAN	2.33	5.00	100.00				

Measure	Trask	Inman	Folk-Ward
Median, phi	-0.13	-0.13	-0.13
Median, in.	0.0430	0.0430	0.0430
Median, mm	1.093	1.093	1.093
Mean, phi	-2.80	-0.83	-0.60
Mean, in.	0.2737	0.0699	0.0595
Mean, mm	6.952	1.776	1.511
Sorting	6.896	3.254	3.024
Skewness	1.807	-0.215	-0.079
Kurtosis	0.341	0.416	0.678

Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)
Gravel	4
Coarse Sand	10
Medium Sand	40
Fine Sand	200
Silt/Clay	<200

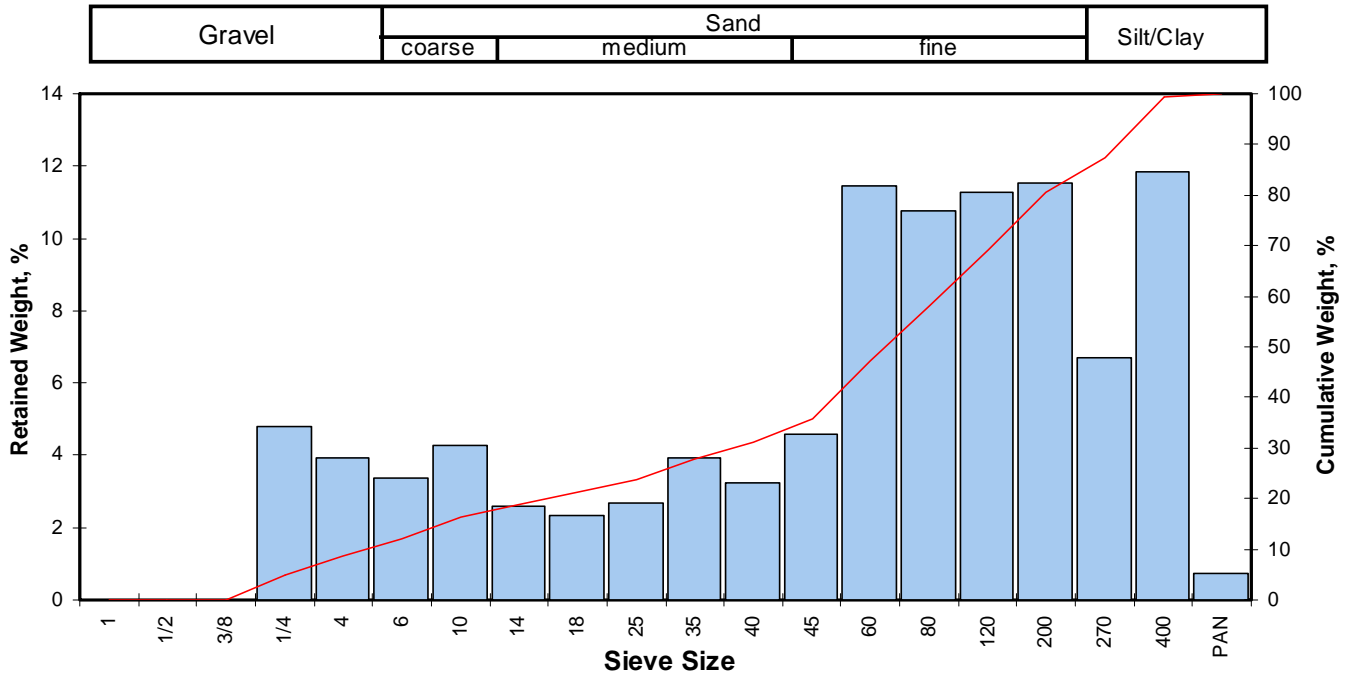
  

Description	Retained on Sieve #	Weight Percent
Gravel	4	43.00
Coarse Sand	10	4.57
Medium Sand	40	16.77
Fine Sand	200	25.48
Silt/Clay	<200	10.19
<b>TOTALS</b>	<b>Total</b>	<b>100</b>



Client: RETEC/ENSR  
 Project: North Lake Union  
 Project No: 05570028-360

PTS File No: 37769  
 Sample ID: GP-11 GS  
 Depth, ft: 28.0-32.0



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	1.62	4.80	4.80
0.1873	4.757	-2.25	4	1.32	3.91	8.71
0.1324	3.364	-1.75	6	1.13	3.35	12.06
0.0787	2.000	-1.00	10	1.44	4.27	16.33
0.0557	1.414	-0.50	14	0.87	2.58	18.91
0.0394	1.000	0.00	18	0.78	2.31	21.22
0.0278	0.707	0.50	25	0.91	2.70	23.92
0.0197	0.500	1.00	35	1.33	3.94	27.86
0.0166	0.420	1.25	40	1.10	3.26	31.12
0.0139	0.354	1.50	45	1.54	4.56	35.68
0.0098	0.250	2.00	60	3.87	11.47	47.15
0.0070	0.177	2.50	80	3.63	10.76	57.91
0.0049	0.125	3.00	120	3.80	11.26	69.18
0.0029	0.074	3.75	200	3.89	11.53	80.71
0.0021	0.053	4.25	270	2.26	6.70	87.40
0.0015	0.037	4.75	400	4.00	11.86	99.26
			PAN	0.25	0.74	100.00
<b>TOTALS</b>				33.74	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-2.65	0.2464	6.259
10	-2.06	0.1639	4.164
16	-1.06	0.0820	2.082
25	0.64	0.0253	0.643
40	1.69	0.0122	0.310
50	2.13	0.0090	0.228
60	2.59	0.0065	0.166
75	3.38	0.0038	0.096
84	4.00	0.0025	0.063
90	4.36	0.0019	0.049
95	4.57	0.0017	0.042

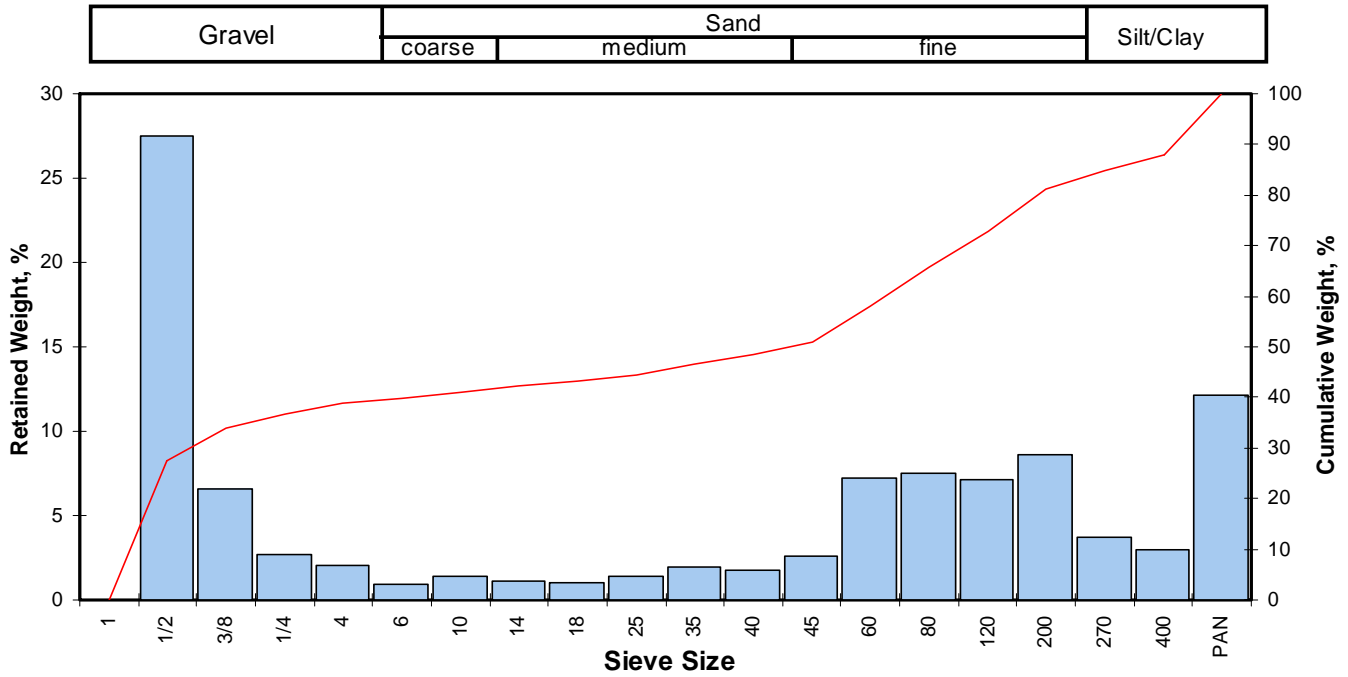
Measure	Trask	Inman	Folk-Ward
Median, phi	2.13	2.13	2.13
Median, in.	0.0090	0.0090	0.0090
Median, mm	0.228	0.228	0.228
Mean, phi	1.44	1.47	1.69
Mean, in.	0.0145	0.0142	0.0122
Mean, mm	0.370	0.361	0.310
Sorting	2.586	2.527	2.357
Skewness	1.090	-0.262	-0.293
Kurtosis	0.066	0.428	1.079

**Grain Size Description** (ASTM-USCS Scale) Fine sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	8.71
Coarse Sand	10	7.62
Medium Sand	40	14.79
Fine Sand	200	49.59
Silt/Clay	<200	19.29
<b>Total</b>		<b>100</b>

Client: RETEC/ENSR  
 Project: North Lake Union  
 Project No: 05570028-360

PTS File No: 37769  
 Sample ID: GP-12 GS  
 Depth, ft: 30.0-32.0



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	9.70	27.53	27.53
0.3740	9.500	-3.25	3/8	2.30	6.53	34.06
0.2500	6.351	-2.67	1/4	0.94	2.67	36.73
0.1873	4.757	-2.25	4	0.73	2.07	38.80
0.1324	3.364	-1.75	6	0.32	0.91	39.71
0.0787	2.000	-1.00	10	0.50	1.42	41.13
0.0557	1.414	-0.50	14	0.38	1.08	42.21
0.0394	1.000	0.00	18	0.36	1.02	43.23
0.0278	0.707	0.50	25	0.48	1.36	44.59
0.0197	0.500	1.00	35	0.70	1.99	46.58
0.0166	0.420	1.25	40	0.61	1.73	48.31
0.0139	0.354	1.50	45	0.91	2.58	50.89
0.0098	0.250	2.00	60	2.55	7.24	58.13
0.0070	0.177	2.50	80	2.63	7.47	65.60
0.0049	0.125	3.00	120	2.51	7.12	72.72
0.0029	0.074	3.75	200	3.02	8.57	81.29
0.0021	0.053	4.25	270	1.30	3.69	84.98
0.0015	0.037	4.75	400	1.03	2.92	87.91
			PAN	4.26	12.09	100.00
<b>TOTALS</b>				35.23	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-4.46	0.8679	22.045
10	-4.28	0.7653	19.438
16	-4.06	0.6580	16.713
25	-3.74	0.5246	13.325
40	-1.60	0.1191	3.025
50	1.41	0.0148	0.375
60	2.13	0.0090	0.229
75	3.20	0.0043	0.109
84	4.12	0.0023	0.058
90	3.93	0.0026	0.066
95	1.96	0.0101	0.256

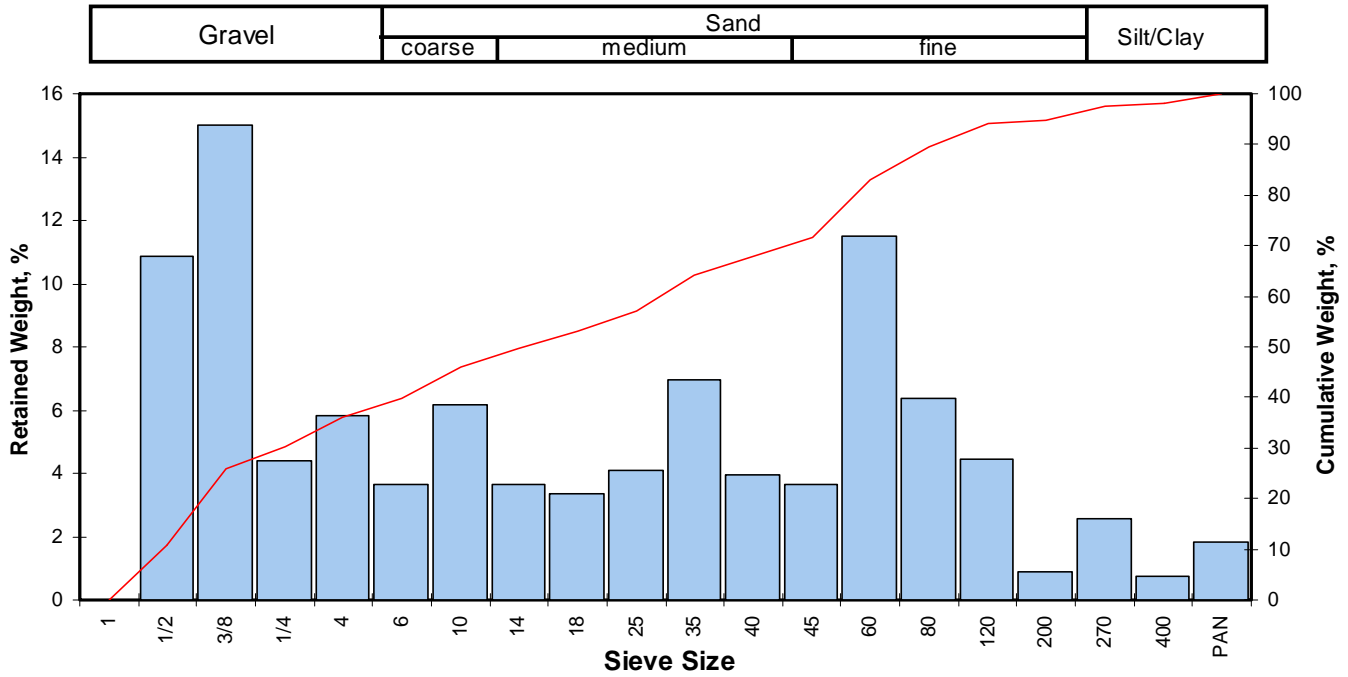
Measure	Trask	Inman	Folk-Ward
Median, phi	1.41	1.41	1.41
Median, in.	0.0148	0.0148	0.0148
Median, mm	0.375	0.375	0.375
Mean, phi	-2.75	0.03	0.49
Mean, in.	0.2644	0.0386	0.0281
Mean, mm	6.717	0.982	0.712
Sorting	11.063	4.090	3.019
Skewness	3.208	-0.339	-0.584
Kurtosis	0.341	-0.214	0.380

**Grain Size Description** (ASTM-USCS Scale) Gravel (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	38.80
Coarse Sand	10	2.33
Medium Sand	40	7.18
Fine Sand	200	32.98
Silt/Clay	<200	18.71
<b>Total</b>		<b>100</b>

Client: RETEC/ENSR  
 Project: North Lake Union  
 Project No: 05570028-360

PTS File No: 37769  
 Sample ID: GP-02 GS  
 Depth, ft: 13.0-15.0



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	5.20	10.86	10.86
0.3740	9.500	-3.25	3/8	7.20	15.03	25.89
0.2500	6.351	-2.67	1/4	2.11	4.41	30.29
0.1873	4.757	-2.25	4	2.80	5.85	36.14
0.1324	3.364	-1.75	6	1.74	3.63	39.77
0.0787	2.000	-1.00	10	2.96	6.18	45.95
0.0557	1.414	-0.50	14	1.74	3.63	49.58
0.0394	1.000	0.00	18	1.62	3.38	52.96
0.0278	0.707	0.50	25	1.97	4.11	57.08
0.0197	0.500	1.00	35	3.34	6.97	64.05
0.0166	0.420	1.25	40	1.90	3.97	68.02
0.0139	0.354	1.50	45	1.75	3.65	71.67
0.0098	0.250	2.00	60	5.51	11.50	83.17
0.0070	0.177	2.50	80	3.06	6.39	89.56
0.0049	0.125	3.00	120	2.14	4.47	94.03
0.0029	0.074	3.75	200	0.42	0.88	94.91
0.0021	0.053	4.25	270	1.22	2.55	97.45
0.0015	0.037	4.75	400	0.35	0.73	98.18
			PAN	0.87	1.82	100.00
<b>TOTALS</b>				47.90	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-4.18	0.7153	18.169
10	-3.72	0.5198	13.203
16	-3.51	0.4480	11.380
25	-3.27	0.3801	9.656
40	-1.72	0.1299	3.299
50	-0.44	0.0533	1.355
60	0.71	0.0241	0.611
75	1.64	0.0126	0.320
84	2.06	0.0094	0.239
90	2.55	0.0067	0.171
95	3.77	0.0029	0.073

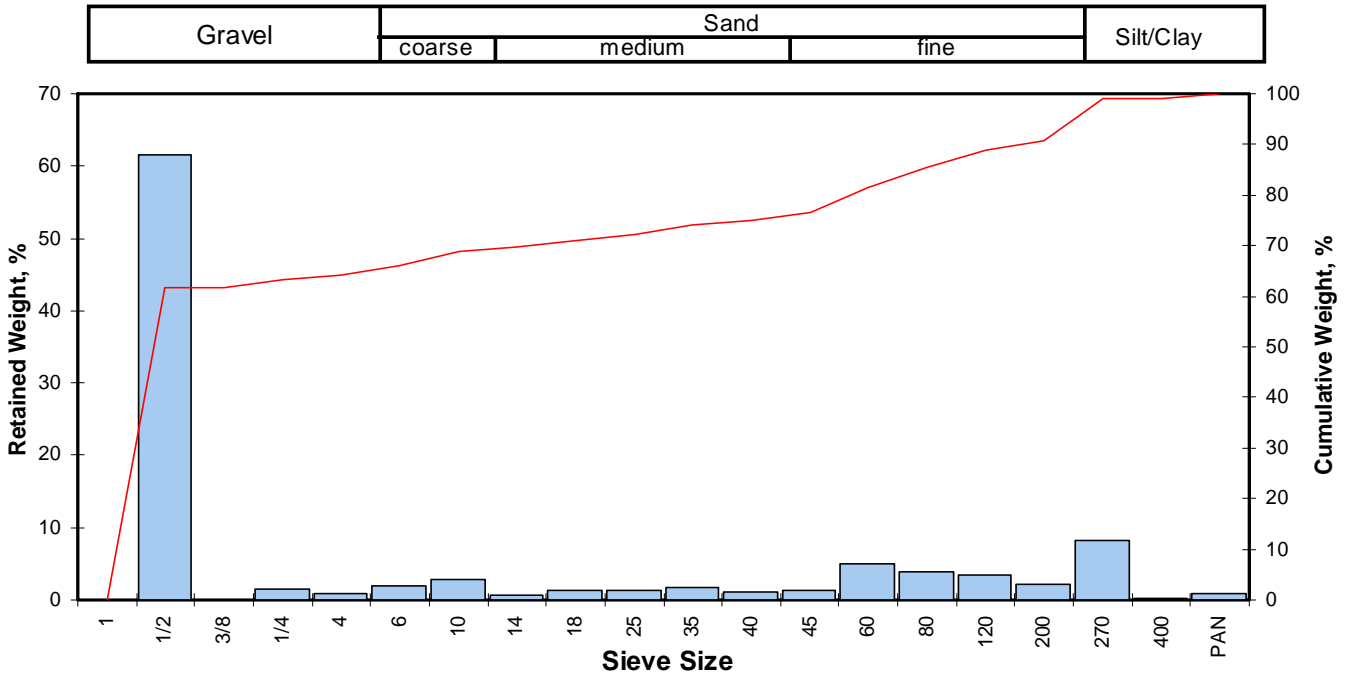
Measure	Trask	Inman	Folk-Ward
Median, phi	-0.44	-0.44	-0.44
Median, in.	0.0533	0.0533	0.0533
Median, mm	1.355	1.355	1.355
Mean, phi	-2.32	-0.72	-0.63
Mean, in.	0.1964	0.0649	0.0608
Mean, mm	4.988	1.649	1.545
Sorting	5.495	2.787	2.598
Skewness	1.297	-0.102	-0.022
Kurtosis	0.358	0.427	0.663

**Grain Size Description** (ASTM-USCS Scale) Gravel (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	36.14
Coarse Sand	10	9.81
Medium Sand	40	22.07
Fine Sand	200	26.89
Silt/Clay	<200	5.09
<b>Total</b>		<b>100</b>

Client: RETEC/ENSR  
 Project: North Lake Union  
 Project No: 05570028-360

PTS File No: 37769  
 Sample ID: GP-13 GS  
 Depth, ft: 24.0-26.0



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent	Cumulative Weight Percent greater than			
Inches	Millimeters						Weight percent	Phi Value	Particle Size	
								Inches	Millimeters	
0.9844	25.002	-4.64	1	0.00	0.00	0.00	5	-4.53	0.9100	23.115
0.4922	12.501	-3.64	1/2	38.60	61.62	61.62	10	-4.42	0.8413	21.369
0.3740	9.500	-3.25	3/8	0.00	0.00	61.62	16	-4.28	0.7657	19.448
0.2500	6.351	-2.67	1/4	0.97	1.55	63.17	25	-4.08	0.6648	16.885
0.1873	4.757	-2.25	4	0.56	0.89	64.06	40	-3.74	0.5252	13.341
0.1324	3.364	-1.75	6	1.22	1.95	66.01	50	-3.51	0.4489	11.403
0.0787	2.000	-1.00	10	1.80	2.87	68.89	60	-3.28	0.3837	9.746
0.0557	1.414	-0.50	14	0.47	0.75	69.64	75	1.23	0.0168	0.426
0.0394	1.000	0.00	18	0.76	1.21	70.85	84	2.32	0.0079	0.200
0.0278	0.707	0.50	25	0.78	1.25	72.09	90	3.43	0.0037	0.093
0.0197	0.500	1.00	35	1.15	1.84	73.93	95	4.00	0.0025	0.062
0.0166	0.420	1.25	40	0.73	1.17	75.10				
0.0139	0.354	1.50	45	0.85	1.36	76.45				
0.0098	0.250	2.00	60	3.16	5.04	81.50				
0.0070	0.177	2.50	80	2.43	3.88	85.38				
0.0049	0.125	3.00	120	2.15	3.43	88.81				
0.0029	0.074	3.75	200	1.30	2.08	90.88				
0.0021	0.053	4.25	270	5.12	8.17	99.06				
0.0015	0.037	4.75	400	0.09	0.14	99.20				
			PAN	0.50	0.80	100.00				

Measure	Trask	Inman	Folk-Ward
Median, phi	-3.51	-3.51	-3.51
Median, in.	0.4489	0.4489	0.4489
Median, mm	11.403	11.403	11.403
Mean, phi	-3.11	-0.98	-1.82
Mean, in.	0.3408	0.0776	0.1393
Mean, mm	8.656	1.972	3.539
Sorting	6.292	3.302	2.944
Skewness	0.235	0.767	0.764
Kurtosis	0.387	0.292	0.659

Description	Retained on Sieve #	Weight Percent
Gravel	4	64.06
Coarse Sand	10	4.82
Medium Sand	40	6.21
Fine Sand	200	15.79
Silt/Clay	<200	9.12
<b>TOTALS</b>	<b>Total</b>	<b>100</b>

**PARTICLE SIZE SUMMARY**  
(METHODOLOGY: ASTM D422/D4464M)

PROJECT NAME: North Lake Union  
PROJECT NO: 05570028-360

Sample ID	Depth, ft.	Mean Grain Size Description (1)	Median Grain Size mm	Particle Size Distribution, wt. percent						Silt & Clay
				Gravel	Sand Size			Silt	Clay	
					Coarse	Medium	Fine			
GP-02-11.5-12.0	11.6	Medium sand	1.407	17.55	23.03	30.46	20.29	(2)	(2)	8.68
GP-04-8.0-10.0	8.5	Medium sand	0.474	15.52	5.63	32.01	30.07	(2)	(2)	16.78
GP-04-10.0-10.5	10.05	Medium sand	0.425	0.00	2.99	47.41	36.00	(2)	(2)	13.61
GP-04-9.25-9.5	9.25	Fine sand	0.365	2.48	2.37	39.46	39.91	(2)	(2)	15.78
GP-05-7.5-8.0	7.5	Fine sand	0.040	0.00	0.00	9.52	30.21	44.65	15.62	60.27
GP-05-7.5-8.0	7.8	Fine sand	0.064	0.00	0.00	17.76	29.87	37.84	14.53	52.36
GP-05-14.5-15.0	14.8	Fine sand	0.360	0.00	0.00	44.83	41.53	11.34	2.30	13.64
GP-09R1-9.0-9.5	9.25	Medium sand	0.509	0.00	9.64	45.51	30.61	(2)	(2)	14.25
GP-09R1-11.0-11.5	11.05	Fine sand	0.390	0.00	0.00	47.42	40.18	10.17	2.24	12.41
GP-09R1-11.0-11.5	11.35	Medium sand	0.642	0.00	0.00	62.64	28.41	7.52	1.42	8.95
GP-11-21.0-21.5	21.05	Fine sand	0.134	0.00	0.00	5.72	67.42	21.71	5.15	26.86
GP-11R3-12.0-12.5	12.05	Medium sand	0.364	0.00	0.00	47.00	32.46	16.04	4.51	20.54
GP-12R1-11.0-11.5	11.05	Fine sand	0.172	0.00	0.00	17.45	56.17	21.13	5.24	26.37
GP-12R1-23.5-24.0	23.8	Fine sand	0.191	0.00	0.00	28.24	48.46	19.28	4.02	23.30

(1) Based on Mean from Trask

(2) Mechanical sieve does not differentiate silt/clay fractions



**PARTICLE SIZE SUMMARY**  
(METHODOLOGY: ASTM D422/D4464M)

PROJECT NAME: North Lake Union  
PROJECT NO: 05570028-360

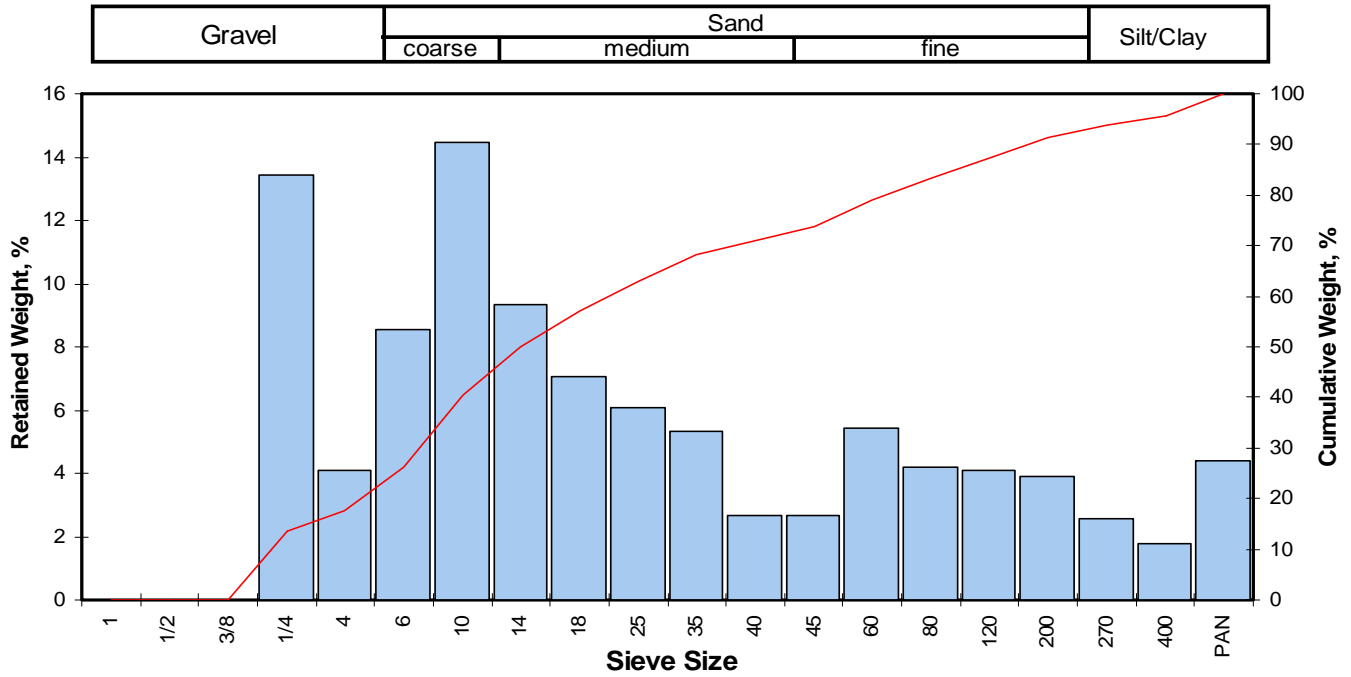
Sample ID	Depth, ft.	Mean Grain Size Description (1)	Median Grain Size mm	Particle Size Distribution, wt. percent						Silt & Clay
				Gravel	Sand Size			Silt	Clay	
					Coarse	Medium	Fine			
GP-12R1-25.0-25.25	25.05	Medium sand	0.543	9.24	14.52	33.40	33.25	(2)	(2)	9.59

(1) Based on Mean from Trask

(2) Mechanical sieve does not differentiate silt/clay fractions

Client: RETEC/ENSR  
 Project: North Lake Union  
 Project No: 05570028-360

PTS File No: 37769  
 Sample ID: GP-02-11.5-12.0  
 Depth, ft: 11.6



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent	Cumulative Weight Percent greater than			
Inches	Millimeters						Weight percent	Phi Value	Particle Size	
								Inches	Millimeters	
0.9844	25.002	-4.64	1	0.00	0.00	0.00	5	-3.03	0.3220	8.178
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00	10	-2.82	0.2772	7.040
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00	16	-2.41	0.2088	5.304
0.2500	6.351	-2.67	1/4	2.06	13.44	13.44	25	-1.81	0.1384	3.516
0.1873	4.757	-2.25	4	0.63	4.11	17.55	40	-1.03	0.0804	2.042
0.1324	3.364	-1.75	6	1.31	8.55	26.09	50	-0.49	0.0554	1.407
0.0787	2.000	-1.00	10	2.22	14.48	40.57	60	0.25	0.0331	0.840
0.0557	1.414	-0.50	14	1.43	9.33	49.90	75	1.62	0.0128	0.326
0.0394	1.000	0.00	18	1.08	7.05	56.95	84	2.59	0.0066	0.167
0.0278	0.707	0.50	25	0.93	6.07	63.01	90	3.50	0.0035	0.089
0.0197	0.500	1.00	35	0.82	5.35	68.36	95	4.57	0.0017	0.042
0.0166	0.420	1.25	40	0.41	2.67	71.04				
0.0139	0.354	1.50	45	0.41	2.67	73.71				
0.0098	0.250	2.00	60	0.83	5.41	79.13				
0.0070	0.177	2.50	80	0.64	4.17	83.30				
0.0049	0.125	3.00	120	0.63	4.11	87.41				
0.0029	0.074	3.75	200	0.60	3.91	91.32				
0.0021	0.053	4.25	270	0.39	2.54	93.87				
0.0015	0.037	4.75	400	0.27	1.76	95.63				
			PAN	0.67	4.37	100.00				
<b>TOTALS</b>				15.33	100.00	100.00				

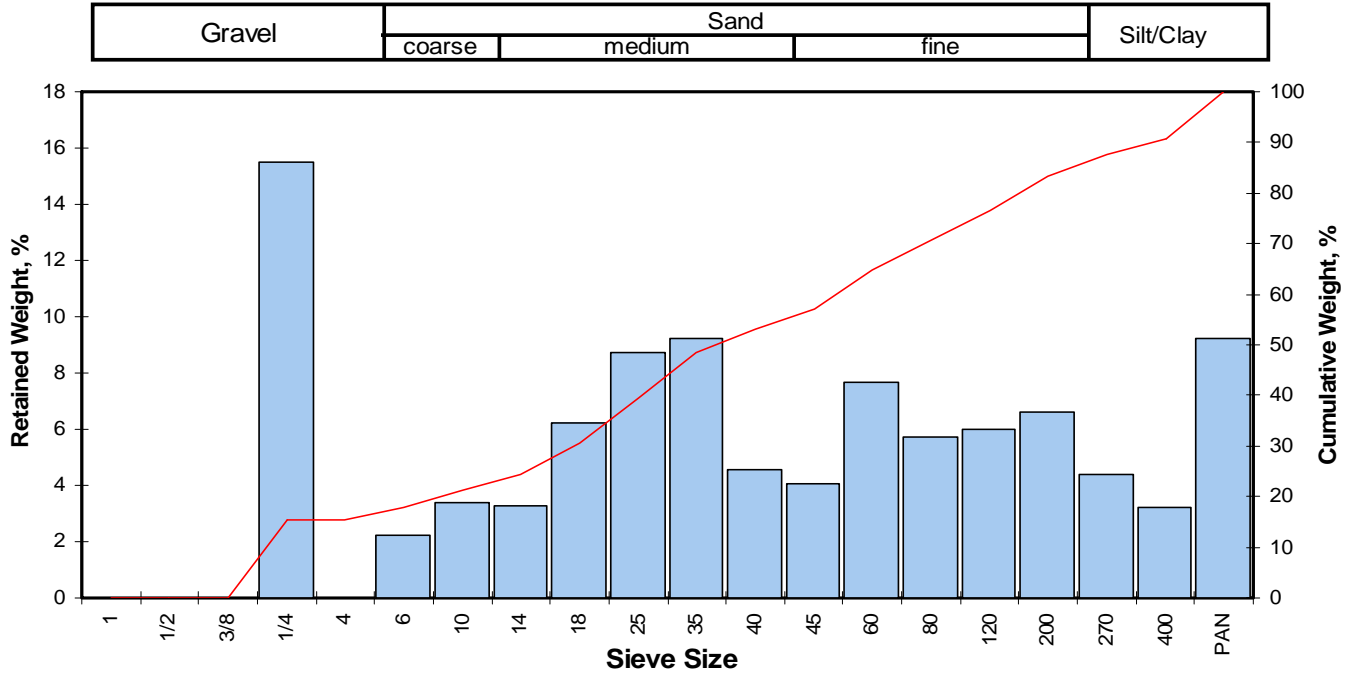
Measure	Trask	Inman	Folk-Ward
Median, phi	-0.49	-0.49	-0.49
Median, in.	0.0554	0.0554	0.0554
Median, mm	1.407	1.407	1.407
Mean, phi	-0.94	0.09	-0.10
Mean, in.	0.0756	0.0370	0.0423
Mean, mm	1.921	0.940	1.075
Sorting	3.286	2.496	2.400
Skewness	0.760	0.233	0.283
Kurtosis	0.229	0.523	0.908

Grain Size Description		Medium sand	
(ASTM-USCS Scale)		(based on Mean from Trask)	
Description	Retained on Sieve #	Weight Percent	
Gravel	4	17.55	
Coarse Sand	10	23.03	
Medium Sand	40	30.46	
Fine Sand	200	20.29	
Silt/Clay	<200	8.68	
Total		100	

Client: RETEC/ENSR  
 Project: North Lake Union  
 Project No: 05570028-360

PTS File No: 37769  
 Sample ID: GP-04-8.0-10.0  
 Depth, ft: 8.5



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	1.60	15.52	15.52
0.1873	4.757	-2.25	4	0.00	0.00	15.52
0.1324	3.364	-1.75	6	0.23	2.23	17.75
0.0787	2.000	-1.00	10	0.35	3.39	21.14
0.0557	1.414	-0.50	14	0.34	3.30	24.44
0.0394	1.000	0.00	18	0.64	6.21	30.65
0.0278	0.707	0.50	25	0.90	8.73	39.38
0.0197	0.500	1.00	35	0.95	9.21	48.59
0.0166	0.420	1.25	40	0.47	4.56	53.15
0.0139	0.354	1.50	45	0.42	4.07	57.23
0.0098	0.250	2.00	60	0.79	7.66	64.89
0.0070	0.177	2.50	80	0.59	5.72	70.61
0.0049	0.125	3.00	120	0.62	6.01	76.62
0.0029	0.074	3.75	200	0.68	6.60	83.22
0.0021	0.053	4.25	270	0.45	4.36	87.58
0.0015	0.037	4.75	400	0.33	3.20	90.79
			PAN	0.95	9.21	100.00
<b>TOTALS</b>				10.31	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-2.93	0.2993	7.602
10	-2.60	0.2395	6.084
16	-2.14	0.1738	4.414
25	-0.46	0.0540	1.371
40	0.53	0.0272	0.691
50	1.08	0.0187	0.474
60	1.68	0.0123	0.312
75	2.86	0.0054	0.137
84	3.84	0.0028	0.070
90	4.63	0.0016	0.040
95	2.58	0.0066	0.168

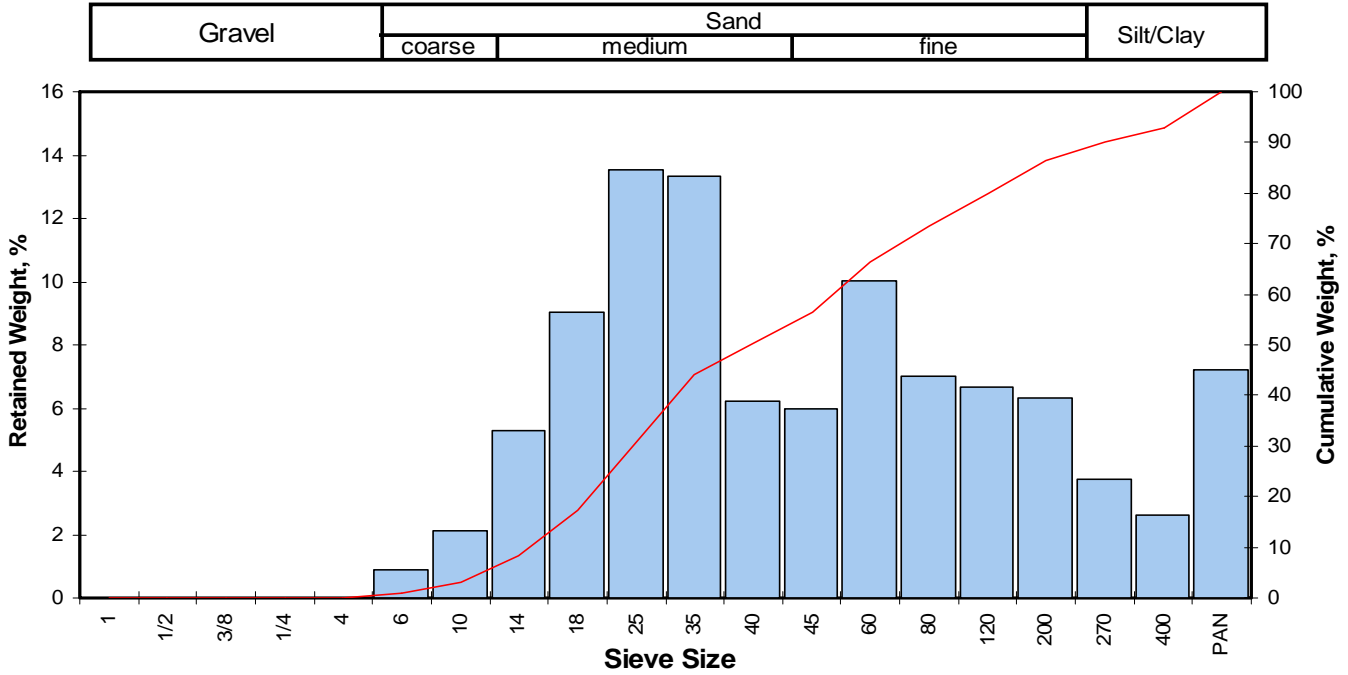
Measure	Trask	Inman	Folk-Ward
Median, phi	1.08	1.08	1.08
Median, in.	0.0187	0.0187	0.0187
Median, mm	0.474	0.474	0.474
Mean, phi	0.41	0.85	0.92
Mean, in.	0.0297	0.0219	0.0207
Mean, mm	0.754	0.555	0.527
Sorting	3.160	2.991	2.329
Skewness	0.915	-0.076	-0.266
Kurtosis	0.102	-0.080	0.679

**Grain Size Description** (ASTM-USCS Scale) Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	15.52
Coarse Sand	10	5.63
Medium Sand	40	32.01
Fine Sand	200	30.07
Silt/Clay	<200	16.78
<b>Total</b>		<b>100</b>

Client: RETEC/ENSR  
 Project: North Lake Union  
 Project No: 05570028-360

PTS File No: 37769  
 Sample ID: GP-04-10.0-10.5  
 Depth, ft: 10.05



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.10	0.88	0.88
0.0787	2.000	-1.00	10	0.24	2.11	2.99
0.0557	1.414	-0.50	14	0.60	5.27	8.25
0.0394	1.000	0.00	18	1.03	9.04	17.30
0.0278	0.707	0.50	25	1.54	13.52	30.82
0.0197	0.500	1.00	35	1.52	13.35	44.16
0.0166	0.420	1.25	40	0.71	6.23	50.40
0.0139	0.354	1.50	45	0.68	5.97	56.37
0.0098	0.250	2.00	60	1.14	10.01	66.37
0.0070	0.177	2.50	80	0.80	7.02	73.40
0.0049	0.125	3.00	120	0.76	6.67	80.07
0.0029	0.074	3.75	200	0.72	6.32	86.39
0.0021	0.053	4.25	270	0.43	3.78	90.17
0.0015	0.037	4.75	400	0.30	2.63	92.80
			PAN	0.82	7.20	100.00
<b>TOTALS</b>				11.39	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-0.81	0.0690	1.752
10	-0.40	0.0521	1.323
16	-0.07	0.0414	1.051
25	0.28	0.0323	0.821
40	0.84	0.0219	0.557
50	1.23	0.0167	0.425
60	1.68	0.0123	0.312
75	2.62	0.0064	0.163
84	3.47	0.0036	0.090
90	4.23	0.0021	0.053
95	3.30	0.0040	0.102

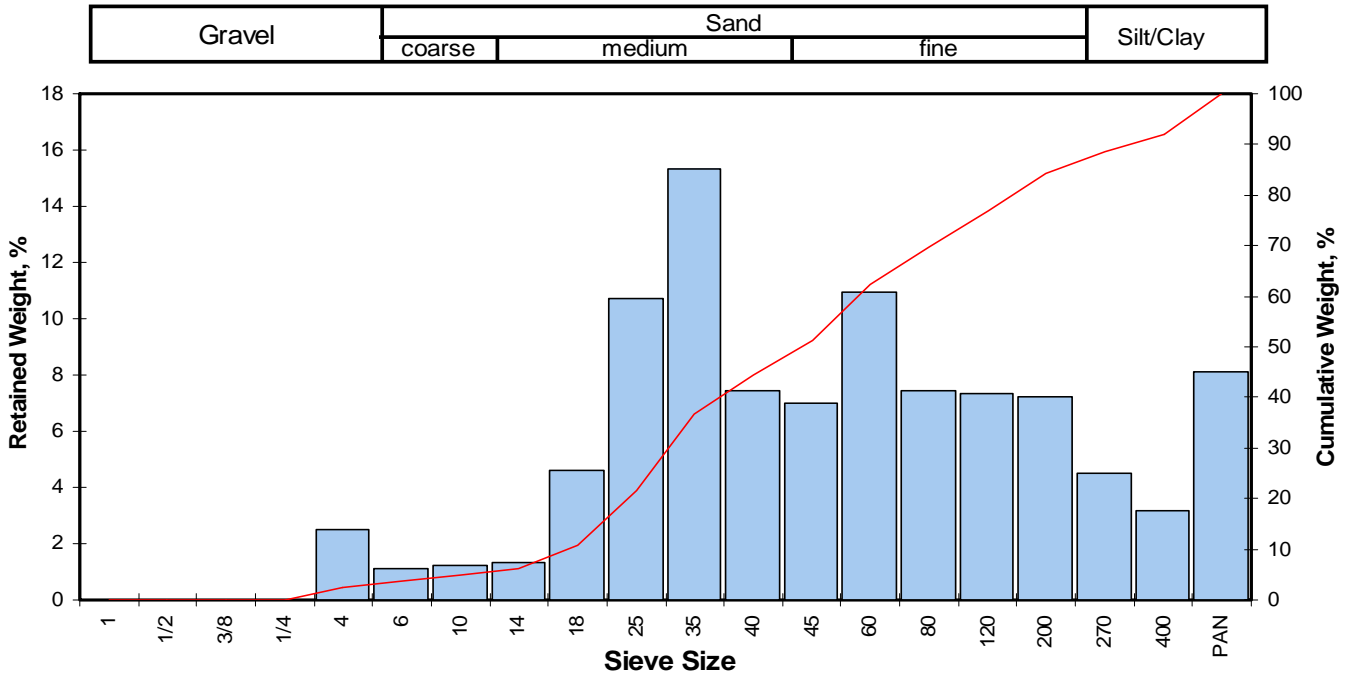
Measure	Trask	Inman	Folk-Ward
Median, phi	1.23	1.23	1.23
Median, in.	0.0167	0.0167	0.0167
Median, mm	0.425	0.425	0.425
Mean, phi	1.02	1.70	1.54
Mean, in.	0.0194	0.0121	0.0135
Mean, mm	0.492	0.308	0.343
Sorting	2.246	1.769	1.507
Skewness	0.860	0.262	0.134
Kurtosis	0.259	0.161	0.721

**Grain Size Description** (ASTM-USCS Scale) Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	2.99
Medium Sand	40	47.41
Fine Sand	200	36.00
Silt/Clay	<200	13.61
<b>Total</b>		<b>100</b>

**Client:** RETEC/ENSR  
**Project:** North Lake Union  
**Project No:** 05570028-360

**PTS File No:** 37769  
**Sample ID:** GP-04-9.25-9.5  
**Depth, ft:** 9.25



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent	Cumulative Weight Percent greater than				
Inches	Millimeters						Weight percent	Phi Value	Particle Size		
								Inches	Millimeters		
0.9844	25.002	-4.64	1	0.00	0.00	0.00	5	-0.94	0.0757	1.924	
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00	10	-0.09	0.0419	1.064	
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00	16	0.24	0.0333	0.846	
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00	25	0.61	0.0257	0.654	
0.1873	4.757	-2.25	4	0.22	2.48	2.48	40	1.11	0.0183	0.465	
0.1324	3.364	-1.75	6	0.10	1.13	3.61	50	1.45	0.0144	0.365	
0.0787	2.000	-1.00	10	0.11	1.24	4.85	60	1.90	0.0106	0.268	
0.0557	1.414	-0.50	14	0.12	1.35	6.20	75	2.86	0.0054	0.137	
0.0394	1.000	0.00	18	0.41	4.62	10.82	84	3.73	0.0030	0.075	
0.0278	0.707	0.50	25	0.95	10.71	21.53	90	4.45	0.0018	0.046	
0.0197	0.500	1.00	35	1.36	15.33	36.87	95	2.93	0.0052	0.132	
0.0166	0.420	1.25	40	0.66	7.44	44.31					
0.0139	0.354	1.50	45	0.62	6.99	51.30					
0.0098	0.250	2.00	60	0.97	10.94	62.23					
0.0070	0.177	2.50	80	0.66	7.44	69.67					
0.0049	0.125	3.00	120	0.65	7.33	77.00					
0.0029	0.074	3.75	200	0.64	7.22	84.22					
0.0021	0.053	4.25	270	0.40	4.51	88.73					
0.0015	0.037	4.75	400	0.28	3.16	91.88					
			PAN	0.72	8.12	100.00					
<b>TOTALS</b>							8.87	100.00	100.00		

Measure	Trask	Inman	Folk-Ward
Median, phi	1.45	1.45	1.45
Median, in.	0.0144	0.0144	0.0144
Median, mm	0.365	0.365	0.365
Mean, phi	1.34	1.98	1.81
Mean, in.	0.0156	0.0099	0.0112
Mean, mm	0.396	0.253	0.286
Sorting	2.181	1.743	1.458
Skewness	0.821	0.305	0.033
Kurtosis	0.254	0.110	0.705

Description	Retained on Sieve #	Weight Percent
Gravel	4	2.48
Coarse Sand	10	2.37
Medium Sand	40	39.46
Fine Sand	200	39.91
Silt/Clay	<200	15.78
<b>Total</b>		<b>100</b>

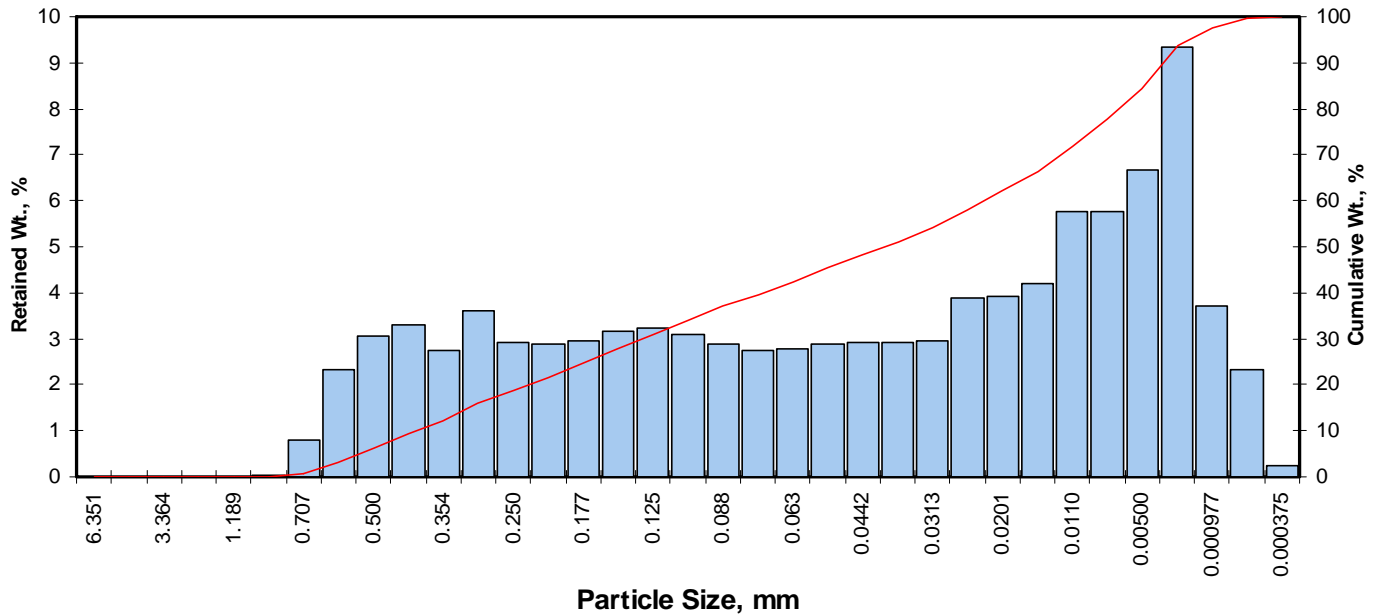
Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)



**Client:** RETEC/ENSR  
**Project:** North Lake Union  
**Project No:** 05570028-360

**PTS File No:** 37769  
**Sample ID:** GP-05-7.5-8.0  
**Depth, ft:** 7.5

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening		Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00	0.00
0.0331	0.841	0.25	20	0.05	0.05	0.05
0.0278	0.707	0.50	25	0.79	0.79	0.84
0.0234	0.595	0.75	30	2.32	2.32	3.16
0.0197	0.500	1.00	35	3.05	3.05	6.21
0.0166	0.420	1.25	40	3.31	3.31	9.52
0.0139	0.354	1.50	45	2.75	2.75	12.27
0.0117	0.297	1.75	50	3.62	3.62	15.89
0.0098	0.250	2.00	60	2.93	2.93	18.82
0.0083	0.210	2.25	70	2.87	2.87	21.69
0.0070	0.177	2.50	80	2.95	2.95	24.64
0.0059	0.149	2.75	100	3.15	3.15	27.79
0.0049	0.125	3.00	120	3.23	3.23	31.02
0.0041	0.105	3.25	140	3.10	3.10	34.12
0.0035	0.088	3.50	170	2.87	2.87	36.99
0.0029	0.074	3.75	200	2.74	2.74	39.73
0.0025	0.063	4.00	230	2.78	2.78	42.51
0.0021	0.053	4.25	270	2.88	2.88	45.39
0.00174	0.0442	4.50	325	2.92	2.92	48.31
0.00146	0.0372	4.75	400	2.90	2.90	51.21
0.00123	0.0313	5.00	450	2.95	2.95	54.16
0.000986	0.0250	5.32	500	3.90	3.90	58.06
0.000790	0.0201	5.64	635	3.93	3.93	61.98
0.000615	0.0156	6.00		4.20	4.20	66.18
0.000435	0.0110	6.50		5.77	5.77	71.95
0.000308	0.00781	7.00		5.75	5.75	77.70
0.000197	0.00500	7.65		6.68	6.68	84.38
0.000077	0.00195	9.00		9.33	9.33	93.71
0.000038	0.000977	10.00		3.70	3.70	97.41
0.000019	0.000488	11.00		2.33	2.33	99.74
0.000015	0.000375	11.38		0.26	0.26	100.00
<b>TOTALS</b>				<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	0.90	0.0211	0.536
10	1.29	0.0161	0.408
16	1.76	0.0116	0.295
25	2.53	0.0068	0.173
40	3.77	0.0029	0.073
50	4.65	0.0016	0.040
60	5.48	0.0009	0.022
75	6.76	0.0004	0.009
84	7.61	0.0002	0.005
90	8.46	0.0001	0.003
95	9.35	0.0001	0.002

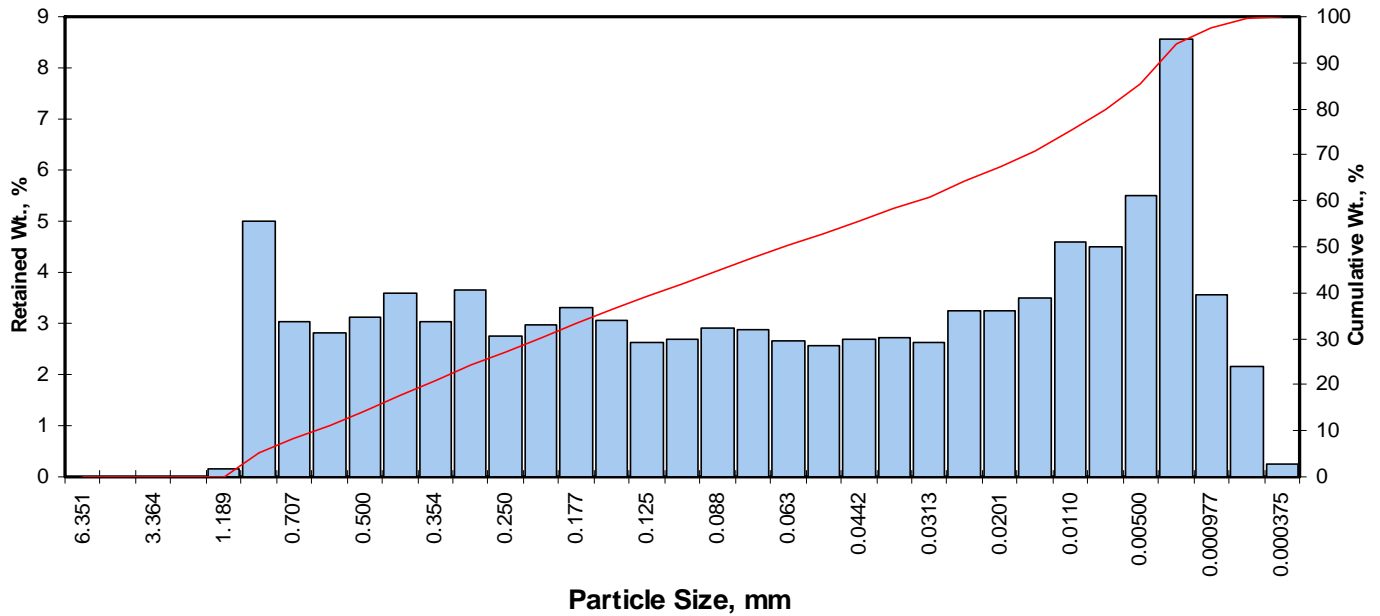
Measure	Trask	Inman	Folk-Ward
Median, phi	4.65	4.65	4.65
Median, in.	0.0016	0.0016	0.0016
Median, mm	0.040	0.040	0.040
Mean, phi	3.45	4.68	4.67
Mean, in.	0.0036	0.0015	0.0015
Mean, mm	0.091	0.039	0.039
Sorting	4.341	2.924	2.742
Skewness	0.999	0.013	0.063
Kurtosis	0.203	0.444	0.817
<b>Grain Size Description</b>		Fine sand	
(ASTM-USCS Scale)		(based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	9.52
Fine Sand	200	30.21
Silt	>0.005 mm	44.65
Clay	<0.005 mm	15.62
<b>Total</b>		<b>100</b>

**Client:** RETEC/ENSR  
**Project:** North Lake Union  
**Project No:** 05570028-360

**PTS File No:** 37769  
**Sample ID:** GP-05-7.5-8.0  
**Depth, ft:** 7.8

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Particle Size, mm

Opening		Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.16	0.16	0.16
0.0331	0.841	0.25	20	5.01	5.01	5.17
0.0278	0.707	0.50	25	3.04	3.04	8.21
0.0234	0.595	0.75	30	2.82	2.82	11.03
0.0197	0.500	1.00	35	3.14	3.14	14.17
0.0166	0.420	1.25	40	3.60	3.60	17.76
0.0139	0.354	1.50	45	3.04	3.04	20.80
0.0117	0.297	1.75	50	3.65	3.65	24.45
0.0098	0.250	2.00	60	2.75	2.75	27.20
0.0083	0.210	2.25	70	2.98	2.98	30.18
0.0070	0.177	2.50	80	3.30	3.30	33.48
0.0059	0.149	2.75	100	3.05	3.05	36.53
0.0049	0.125	3.00	120	2.64	2.64	39.17
0.0041	0.105	3.25	140	2.68	2.68	41.85
0.0035	0.088	3.50	170	2.91	2.91	44.76
0.0029	0.074	3.75	200	2.88	2.88	47.64
0.0025	0.063	4.00	230	2.66	2.66	50.29
0.0021	0.053	4.25	270	2.57	2.57	52.86
0.00174	0.0442	4.50	325	2.68	2.68	55.54
0.00146	0.0372	4.75	400	2.73	2.73	58.27
0.00123	0.0313	5.00	450	2.64	2.64	60.91
0.000986	0.0250	5.32	500	3.24	3.24	64.15
0.000790	0.0201	5.64	635	3.25	3.25	67.40
0.000615	0.0156	6.00		3.51	3.51	70.91
0.000435	0.0110	6.50		4.58	4.58	75.49
0.000308	0.00781	7.00		4.50	4.50	79.99
0.000197	0.00500	7.65		5.49	5.49	85.47
0.000077	0.00195	9.00		8.55	8.55	94.02
0.000038	0.000977	10.00		3.56	3.56	97.58
0.000019	0.000488	11.00		2.17	2.17	99.75
0.000015	0.000375	11.38		0.25	0.25	100.00
<b>TOTALS</b>				<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	0.23	0.0335	0.851
10	0.66	0.0249	0.633
16	1.13	0.0180	0.458
25	1.80	0.0113	0.287
40	3.08	0.0047	0.118
50	3.97	0.0025	0.064
60	4.91	0.0013	0.033
75	6.45	0.0005	0.011
84	7.47	0.0002	0.006
90	8.36	0.0001	0.003
95	9.27	0.0001	0.002

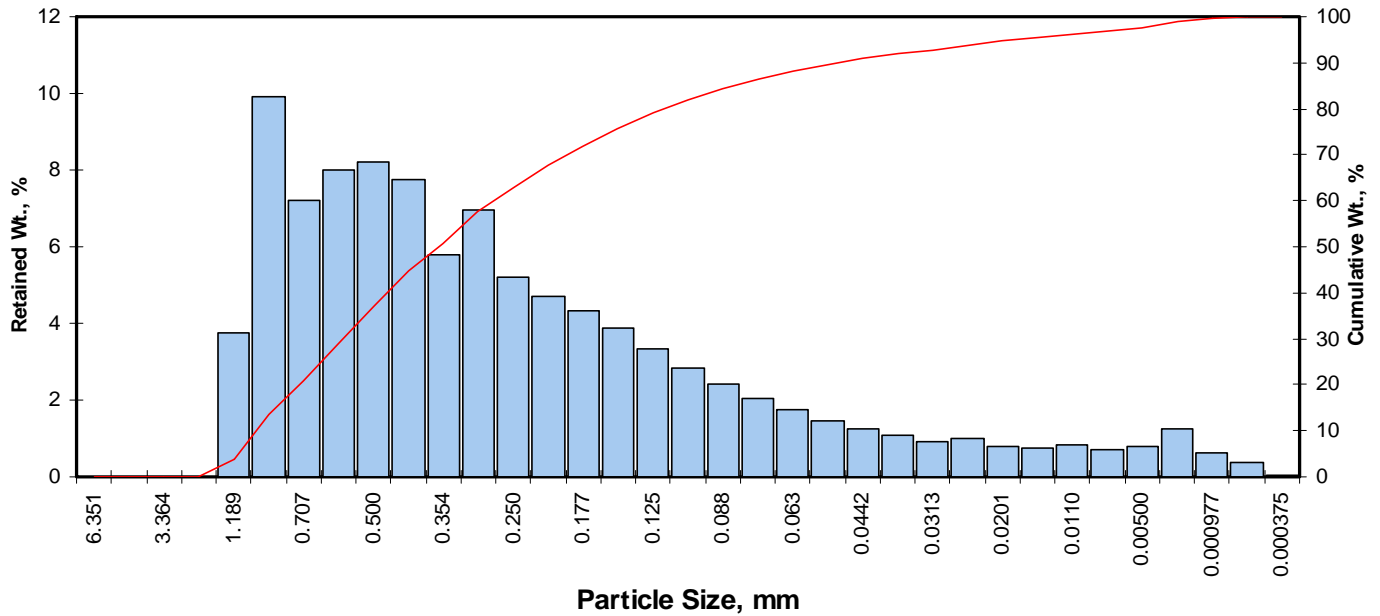
Measure	Trask	Inman	Folk-Ward
Median, phi	3.97	3.97	3.97
Median, in.	0.0025	0.0025	0.0025
Median, mm	0.064	0.064	0.064
Mean, phi	2.74	4.30	4.19
Mean, in.	0.0059	0.0020	0.0022
Mean, mm	0.149	0.051	0.055
Sorting	5.005	3.172	2.956
Skewness	0.901	0.103	0.138
Kurtosis	0.219	0.425	0.797
<b>Grain Size Description</b>		Fine sand	
(ASTM-USCS Scale)		(based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	17.76
Fine Sand	200	29.87
Silt	>0.005 mm	37.84
Clay	<0.005 mm	14.53
<b>Total</b>		<b>100</b>

**Client:** RETEC/ENSR  
**Project:** North Lake Union  
**Project No:** 05570028-360

**PTS File No:** 37769  
**Sample ID:** GP-05-14.5-15.0  
**Depth, ft:** 14.8

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening		Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	3.74	3.74	3.74
0.0331	0.841	0.25	20	9.92	9.92	13.66
0.0278	0.707	0.50	25	7.21	7.21	20.87
0.0234	0.595	0.75	30	8.01	8.01	28.87
0.0197	0.500	1.00	35	8.22	8.22	37.09
0.0166	0.420	1.25	40	7.74	7.74	44.83
0.0139	0.354	1.50	45	5.81	5.81	50.64
0.0117	0.297	1.75	50	6.98	6.98	57.62
0.0098	0.250	2.00	60	5.21	5.21	62.83
0.0083	0.210	2.25	70	4.72	4.72	67.55
0.0070	0.177	2.50	80	4.32	4.32	71.87
0.0059	0.149	2.75	100	3.87	3.87	75.74
0.0049	0.125	3.00	120	3.33	3.33	79.06
0.0041	0.105	3.25	140	2.83	2.83	81.89
0.0035	0.088	3.50	170	2.41	2.41	84.30
0.0029	0.074	3.75	200	2.06	2.06	86.36
0.0025	0.063	4.00	230	1.74	1.74	88.10
0.0021	0.053	4.25	270	1.47	1.47	89.57
0.00174	0.0442	4.50	325	1.25	1.25	90.82
0.00146	0.0372	4.75	400	1.08	1.08	91.90
0.00123	0.0313	5.00	450	0.93	0.93	92.83
0.000986	0.0250	5.32	500	0.99	0.99	93.82
0.000790	0.0201	5.64	635	0.80	0.80	94.62
0.000615	0.0156	6.00		0.74	0.74	95.36
0.000435	0.0110	6.50		0.84	0.84	96.20
0.000308	0.00781	7.00		0.71	0.71	96.91
0.000197	0.00500	7.65		0.79	0.79	97.70
0.000077	0.00195	9.00		1.25	1.25	98.95
0.000038	0.000977	10.00		0.64	0.64	99.59
0.000019	0.000488	11.00		0.37	0.37	99.96
0.000015	0.000375	11.38		0.04	0.04	100.00
<b>TOTALS</b>				<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

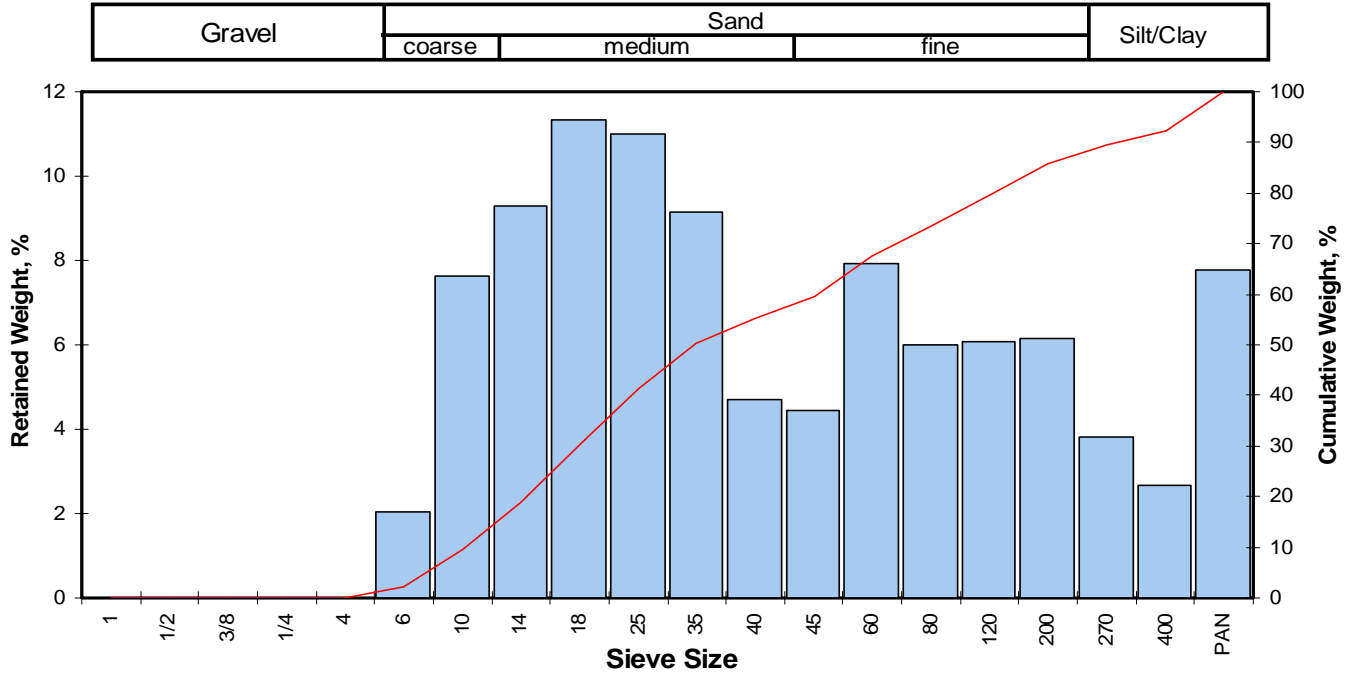
Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-0.19	0.0448	1.138
10	0.07	0.0376	0.956
16	0.33	0.0313	0.795
25	0.63	0.0255	0.647
40	1.09	0.0184	0.468
50	1.47	0.0142	0.360
60	1.86	0.0108	0.275
75	2.70	0.0060	0.154
84	3.47	0.0036	0.090
90	4.34	0.0020	0.050
95	5.82	0.0007	0.018

Measure	Trask	Inman	Folk-Ward
Median, phi	1.47	1.47	1.47
Median, in.	0.0142	0.0142	0.0142
Median, mm	0.360	0.360	0.360
Mean, phi	1.32	1.90	1.76
Mean, in.	0.0158	0.0106	0.0116
Mean, mm	0.400	0.268	0.296
Sorting	2.052	1.569	1.695
Skewness	0.875	0.272	0.360
Kurtosis	0.272	0.916	1.188
<b>Grain Size Description</b> (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	44.83
Fine Sand	200	41.53
Silt	>0.005 mm	11.34
Clay	<0.005 mm	2.30
<b>Total</b>		<b>100</b>

Client: RETEC/ENSR  
 Project: North Lake Union  
 Project No: 05570028-360

PTS File No: 37769  
 Sample ID: GP-09R1-9.0-9.5  
 Depth, ft: 9.25



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.25	2.02	2.02
0.0787	2.000	-1.00	10	0.94	7.61	9.64
0.0557	1.414	-0.50	14	1.15	9.31	18.95
0.0394	1.000	0.00	18	1.40	11.34	30.28
0.0278	0.707	0.50	25	1.36	11.01	41.30
0.0197	0.500	1.00	35	1.13	9.15	50.45
0.0166	0.420	1.25	40	0.58	4.70	55.14
0.0139	0.354	1.50	45	0.55	4.45	59.60
0.0098	0.250	2.00	60	0.98	7.94	67.53
0.0070	0.177	2.50	80	0.74	5.99	73.52
0.0049	0.125	3.00	120	0.75	6.07	79.60
0.0029	0.074	3.75	200	0.76	6.15	85.75
0.0021	0.053	4.25	270	0.47	3.81	89.55
0.0015	0.037	4.75	400	0.33	2.67	92.23
			PAN	0.96	7.77	100.00
<b>TOTALS</b>				12.35	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-1.46	0.1081	2.745
10	-0.98	0.0777	1.973
16	-0.66	0.0621	1.578
25	-0.23	0.0463	1.175
40	0.44	0.0290	0.737
50	0.98	0.0200	0.509
60	1.53	0.0137	0.347
75	2.62	0.0064	0.162
84	3.54	0.0034	0.086
90	4.33	0.0020	0.050
95	3.06	0.0047	0.120

Measure	Trask	Inman	Folk-Ward
Median, phi	0.98	0.98	0.98
Median, in.	0.0200	0.0200	0.0200
Median, mm	0.509	0.509	0.509
Mean, phi	0.58	1.44	1.28
Mean, in.	0.0263	0.0145	0.0162
Mean, mm	0.669	0.369	0.410
Sorting	2.690	2.098	1.732
Skewness	0.859	0.221	0.071
Kurtosis	0.263	0.076	0.648

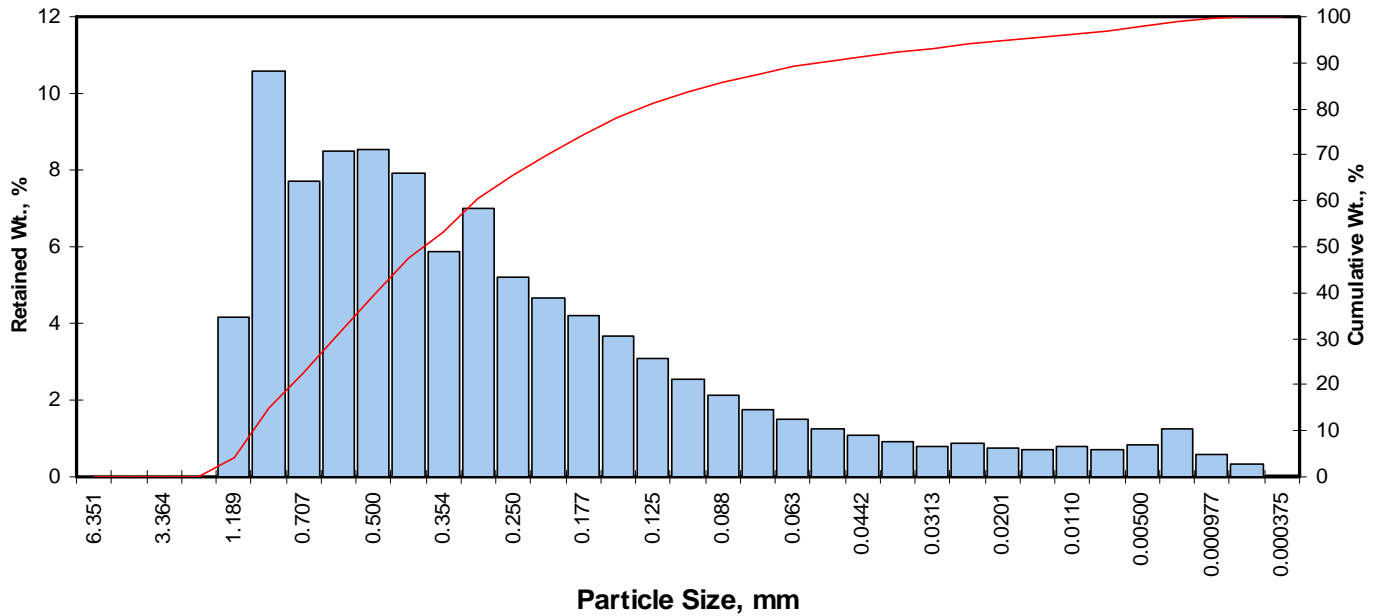
**Grain Size Description** (ASTM-USCS Scale) Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	9.64
Medium Sand	40	45.51
Fine Sand	200	30.61
Silt/Clay	<200	14.25
<b>Total</b>		<b>100</b>

**Client:** RETEC/ENSR  
**Project:** North Lake Union  
**Project No:** 05570028-360

**PTS File No:** 37769  
**Sample ID:** GP-09R1-11.0-11.5  
**Depth, ft:** 11.05

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening		Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	4.17	4.17	4.17
0.0331	0.841	0.25	20	10.60	10.60	14.77
0.0278	0.707	0.50	25	7.71	7.71	22.48
0.0234	0.595	0.75	30	8.48	8.48	30.96
0.0197	0.500	1.00	35	8.54	8.54	39.51
0.0166	0.420	1.25	40	7.91	7.91	47.42
0.0139	0.354	1.50	45	5.87	5.87	53.29
0.0117	0.297	1.75	50	7.01	7.01	60.30
0.0098	0.250	2.00	60	5.21	5.21	65.51
0.0083	0.210	2.25	70	4.68	4.68	70.19
0.0070	0.177	2.50	80	4.21	4.21	74.40
0.0059	0.149	2.75	100	3.67	3.67	78.07
0.0049	0.125	3.00	120	3.08	3.08	81.15
0.0041	0.105	3.25	140	2.55	2.55	83.70
0.0035	0.088	3.50	170	2.12	2.12	85.82
0.0029	0.074	3.75	200	1.77	1.77	87.59
0.0025	0.063	4.00	230	1.49	1.49	89.08
0.0021	0.053	4.25	270	1.26	1.26	90.34
0.00174	0.0442	4.50	325	1.08	1.08	91.42
0.00146	0.0372	4.75	400	0.92	0.92	92.34
0.00123	0.0313	5.00	450	0.79	0.79	93.13
0.000986	0.0250	5.32	500	0.86	0.86	93.99
0.000790	0.0201	5.64	635	0.73	0.73	94.72
0.000615	0.0156	6.00		0.69	0.69	95.41
0.000435	0.0110	6.50		0.81	0.81	96.22
0.000308	0.00781	7.00		0.72	0.72	96.94
0.000197	0.00500	7.65		0.82	0.82	97.76
0.000077	0.00195	9.00		1.26	1.26	99.02
0.000038	0.000977	10.00		0.60	0.60	99.62
0.000019	0.000488	11.00		0.34	0.34	99.96
0.000015	0.000375	11.38		0.04	0.04	100.00
<b>TOTALS</b>				<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-0.21	0.0456	1.157
10	0.02	0.0387	0.983
16	0.29	0.0322	0.818
25	0.57	0.0264	0.672
40	1.02	0.0195	0.495
50	1.36	0.0153	0.390
60	1.74	0.0118	0.300
75	2.54	0.0068	0.172
84	3.29	0.0040	0.103
90	4.18	0.0022	0.055
95	5.78	0.0007	0.018

Measure	Trask	Inman	Folk-Ward
Median, phi	1.36	1.36	1.36
Median, in.	0.0153	0.0153	0.0153
Median, mm	0.390	0.390	0.390
Mean, phi	1.25	1.79	1.64
Mean, in.	0.0166	0.0114	0.0126
Mean, mm	0.422	0.290	0.320
Sorting	1.977	1.498	1.657
Skewness	0.872	0.285	0.381
Kurtosis	0.269	1.002	1.249
<b>Grain Size Description</b> (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

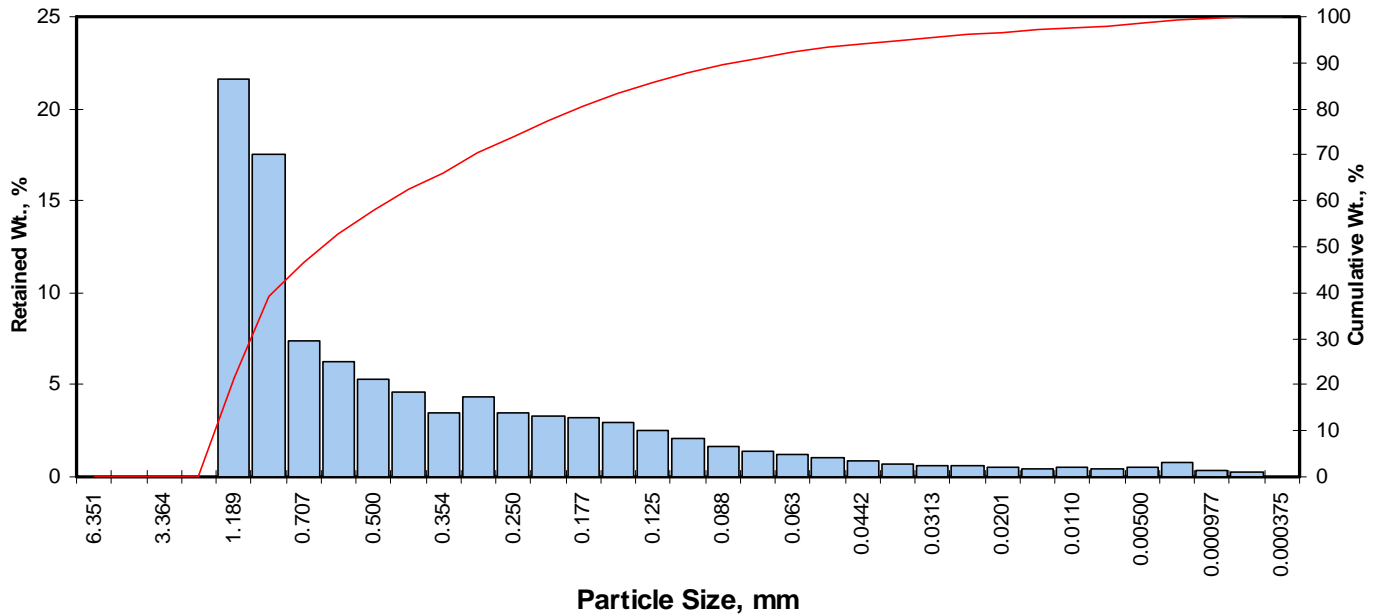
Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	47.42
Fine Sand	200	40.18
Silt	>0.005 mm	10.17
Clay	<0.005 mm	2.24
<b>Total</b>		<b>100</b>



**Client:** RETEC/ENSR  
**Project:** North Lake Union  
**Project No:** 05570028-360

**PTS File No:** 37769  
**Sample ID:** GP-09R1-11.0-11.5  
**Depth, ft:** 11.35

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Particle Size, mm

Opening		Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	21.60	21.61	21.61
0.0331	0.841	0.25	20	17.50	17.51	39.12
0.0278	0.707	0.50	25	7.41	7.41	46.53
0.0234	0.595	0.75	30	6.21	6.21	52.74
0.0197	0.500	1.00	35	5.27	5.27	58.02
0.0166	0.420	1.25	40	4.62	4.62	62.64
0.0139	0.354	1.50	45	3.47	3.47	66.11
0.0117	0.297	1.75	50	4.37	4.37	70.48
0.0098	0.250	2.00	60	3.49	3.49	73.97
0.0083	0.210	2.25	70	3.34	3.34	77.32
0.0070	0.177	2.50	80	3.18	3.18	80.50
0.0059	0.149	2.75	100	2.91	2.91	83.41
0.0049	0.125	3.00	120	2.50	2.50	85.91
0.0041	0.105	3.25	140	2.06	2.06	87.97
0.0035	0.088	3.50	170	1.68	1.68	89.65
0.0029	0.074	3.75	200	1.40	1.40	91.05
0.0025	0.063	4.00	230	1.19	1.19	92.24
0.0021	0.053	4.25	270	1.01	1.01	93.25
0.00174	0.0442	4.50	325	0.85	0.85	94.10
0.00146	0.0372	4.75	400	0.71	0.71	94.81
0.00123	0.0313	5.00	450	0.60	0.60	95.41
0.000986	0.0250	5.32	500	0.65	0.65	96.07
0.000790	0.0201	5.64	635	0.53	0.53	96.60
0.000615	0.0156	6.00		0.47	0.47	97.07
0.000435	0.0110	6.50		0.54	0.54	97.61
0.000308	0.00781	7.00		0.46	0.46	98.07
0.000197	0.00500	7.65		0.51	0.51	98.58
0.000077	0.00195	9.00		0.79	0.79	99.37
0.000038	0.000977	10.00		0.39	0.39	99.76
0.000019	0.000488	11.00		0.22	0.22	99.98
0.000015	0.000375	11.38		0.02	0.02	100.00
<b>TOTALS</b>				<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-0.83	0.0698	1.773
10	-0.65	0.0619	1.572
16	-0.44	0.0536	1.361
25	-0.15	0.0438	1.112
40	0.28	0.0324	0.824
50	0.64	0.0253	0.642
60	1.11	0.0183	0.464
75	2.08	0.0093	0.237
84	2.81	0.0056	0.143
90	3.56	0.0033	0.085
95	4.83	0.0014	0.035

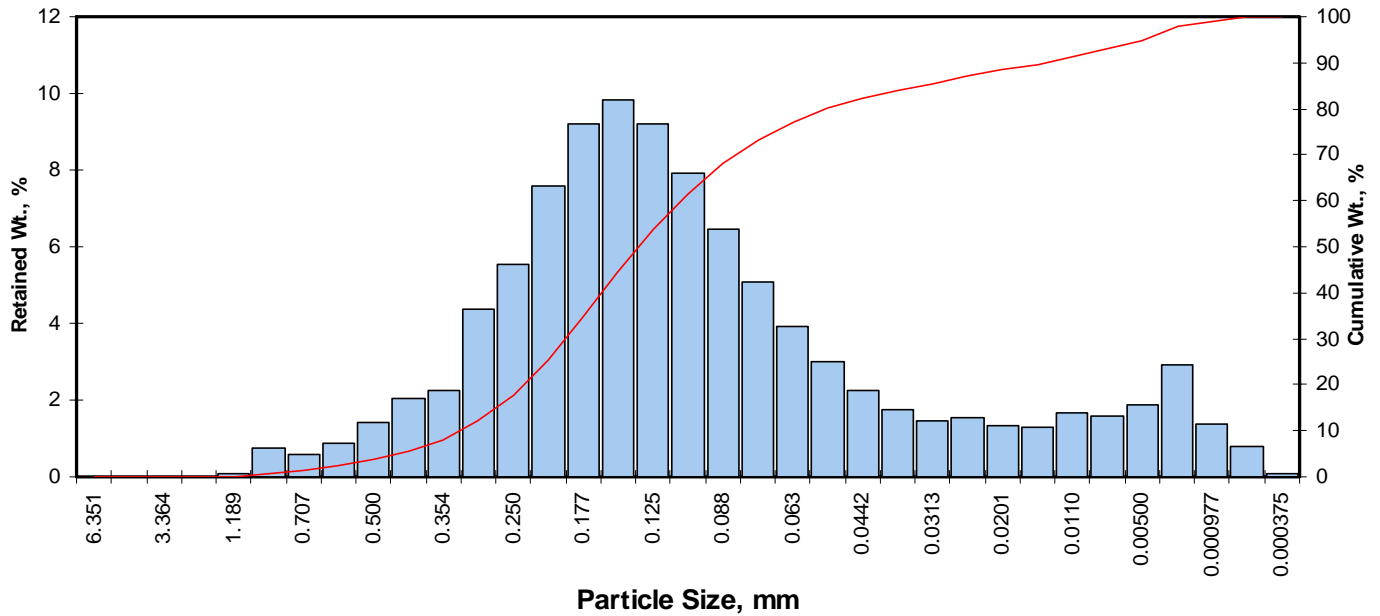
Measure	Trask	Inman	Folk-Ward
Median, phi	0.64	0.64	0.64
Median, in.	0.0253	0.0253	0.0253
Median, mm	0.642	0.642	0.642
Mean, phi	0.57	1.18	1.00
Mean, in.	0.0266	0.0173	0.0197
Mean, mm	0.675	0.441	0.500
Sorting	2.166	1.627	1.670
Skewness	0.800	0.334	0.407
Kurtosis	0.294	0.738	1.039
<b>Grain Size Description</b> (ASTM-USCS Scale)		Medium sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	62.64
Fine Sand	200	28.41
Silt	>0.005 mm	7.52
Clay	<0.005 mm	1.42
<b>Total</b>		<b>100</b>

**Client:** RETEC/ENSR  
**Project:** North Lake Union  
**Project No:** 05570028-360

**PTS File No:** 37769  
**Sample ID:** GP-11-21.0-21.5  
**Depth, ft:** 21.05

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening		Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.07	0.07	0.07
0.0331	0.841	0.25	20	0.76	0.76	0.83
0.0278	0.707	0.50	25	0.58	0.58	1.41
0.0234	0.595	0.75	30	0.86	0.86	2.27
0.0197	0.500	1.00	35	1.42	1.42	3.69
0.0166	0.420	1.25	40	2.03	2.03	5.72
0.0139	0.354	1.50	45	2.24	2.24	7.96
0.0117	0.297	1.75	50	4.36	4.36	12.32
0.0098	0.250	2.00	60	5.54	5.54	17.86
0.0083	0.210	2.25	70	7.57	7.57	25.43
0.0070	0.177	2.50	80	9.22	9.22	34.64
0.0059	0.149	2.75	100	9.85	9.85	44.49
0.0049	0.125	3.00	120	9.22	9.22	53.71
0.0041	0.105	3.25	140	7.91	7.91	61.62
0.0035	0.088	3.50	170	6.44	6.44	68.06
0.0029	0.074	3.75	200	5.08	5.08	73.14
0.0025	0.063	4.00	230	3.93	3.93	77.07
0.0021	0.053	4.25	270	3.00	3.00	80.07
0.00174	0.0442	4.50	325	2.27	2.27	82.34
0.00146	0.0372	4.75	400	1.77	1.77	84.11
0.00123	0.0313	5.00	450	1.46	1.46	85.57
0.000986	0.0250	5.32	500	1.56	1.56	87.13
0.000790	0.0201	5.64	635	1.32	1.32	88.45
0.000615	0.0156	6.00		1.28	1.28	89.73
0.000435	0.0110	6.50		1.66	1.66	91.39
0.000308	0.00781	7.00		1.59	1.59	92.98
0.000197	0.00500	7.65		1.87	1.87	94.85
0.000077	0.00195	9.00		2.91	2.91	97.76
0.000038	0.000977	10.00		1.37	1.37	99.13
0.000019	0.000488	11.00		0.79	0.79	99.92
0.000015	0.000375	11.38		0.08	0.08	100.00
<b>TOTALS</b>				<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	1.16	0.0176	0.447
10	1.62	0.0128	0.326
16	1.92	0.0104	0.265
25	2.24	0.0084	0.212
40	2.64	0.0063	0.161
50	2.90	0.0053	0.134
60	3.20	0.0043	0.109
75	3.87	0.0027	0.068
84	4.73	0.0015	0.038
90	6.08	0.0006	0.015
95	7.72	0.0002	0.005

Measure	Trask	Inman	Folk-Ward
Median, phi	2.90	2.90	2.90
Median, in.	0.0053	0.0053	0.0053
Median, mm	0.134	0.134	0.134
Mean, phi	2.83	3.33	3.18
Mean, in.	0.0055	0.0039	0.0043
Mean, mm	0.140	0.100	0.110
Sorting	1.761	1.409	1.698
Skewness	0.899	0.302	0.386
Kurtosis	0.231	1.326	1.646

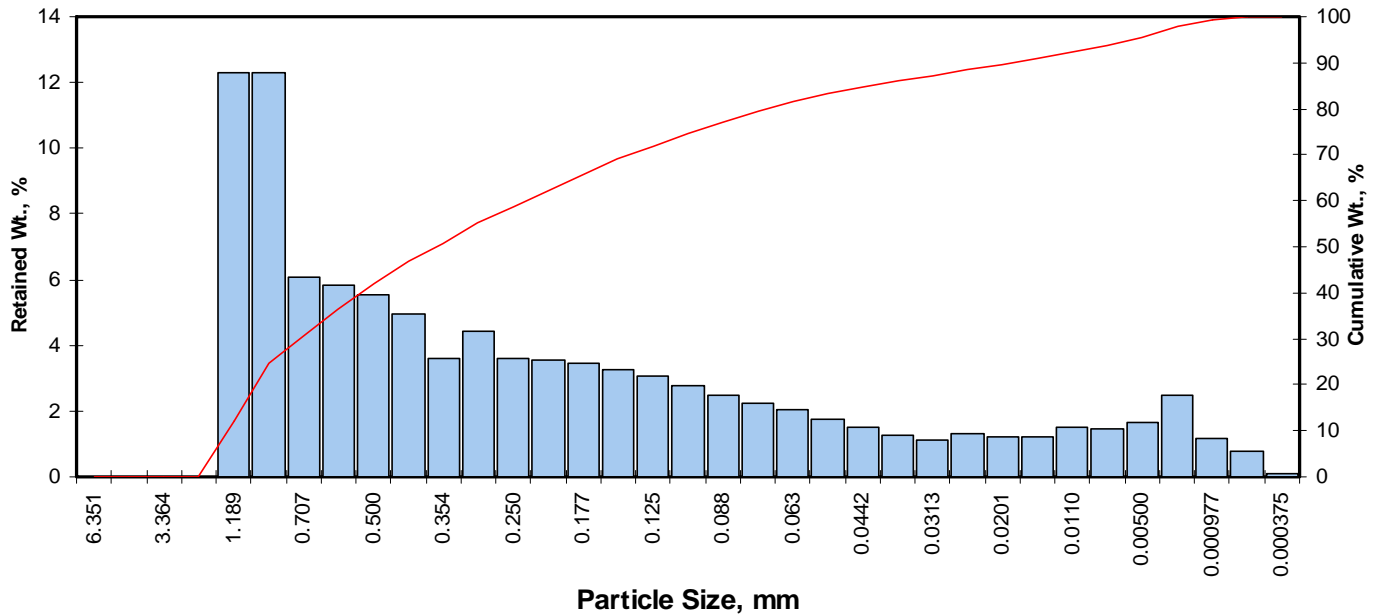
**Grain Size Description** (ASTM-USCS Scale) Fine sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	5.72
Fine Sand	200	67.42
Silt	>0.005 mm	21.71
Clay	<0.005 mm	5.15
<b>Total</b>		<b>100</b>

**Client:** RETEC/ENSR  
**Project:** North Lake Union  
**Project No:** 05570028-360

**PTS File No:** 37769  
**Sample ID:** GP-11R3-12.0-12.5  
**Depth, ft:** 12.05

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Particle Size, mm

Opening		Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	12.30	12.30	12.30
0.0331	0.841	0.25	20	12.30	12.30	24.60
0.0278	0.707	0.50	25	6.09	6.09	30.69
0.0234	0.595	0.75	30	5.82	5.82	36.51
0.0197	0.500	1.00	35	5.52	5.52	42.03
0.0166	0.420	1.25	40	4.97	4.97	47.00
0.0139	0.354	1.50	45	3.62	3.62	50.62
0.0117	0.297	1.75	50	4.44	4.44	55.06
0.0098	0.250	2.00	60	3.62	3.62	58.68
0.0083	0.210	2.25	70	3.56	3.56	62.24
0.0070	0.177	2.50	80	3.43	3.43	65.67
0.0059	0.149	2.75	100	3.26	3.26	68.93
0.0049	0.125	3.00	120	3.06	3.06	71.99
0.0041	0.105	3.25	140	2.78	2.78	74.77
0.0035	0.088	3.50	170	2.47	2.47	77.24
0.0029	0.074	3.75	200	2.22	2.22	79.46
0.0025	0.063	4.00	230	2.02	2.02	81.48
0.0021	0.053	4.25	270	1.77	1.77	83.25
0.00174	0.0442	4.50	325	1.50	1.50	84.74
0.00146	0.0372	4.75	400	1.27	1.27	86.01
0.00123	0.0313	5.00	450	1.13	1.13	87.14
0.000986	0.0250	5.32	500	1.32	1.32	88.46
0.000790	0.0201	5.64	635	1.20	1.20	89.66
0.000615	0.0156	6.00	1.20	1.20	90.86	
0.000435	0.0110	6.50	1.53	1.53	92.39	
0.000308	0.00781	7.00	1.44	1.44	93.83	
0.000197	0.00500	7.65	1.66	1.66	95.49	
0.000077	0.00195	9.00	2.49	2.49	97.98	
0.000038	0.000977	10.00	1.17	1.17	99.15	
0.000019	0.000488	11.00	0.76	0.76	99.91	
0.000015	0.000375	11.38	0.09	0.09	100.00	
<b>TOTALS</b>				<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-0.70	0.0637	1.619
10	-0.39	0.0516	1.311
16	-0.10	0.0422	1.071
25	0.27	0.0327	0.831
40	0.91	0.0210	0.533
50	1.46	0.0143	0.364
60	2.09	0.0092	0.234
75	3.27	0.0041	0.103
84	4.38	0.0019	0.048
90	5.74	0.0007	0.019
95	7.45	0.0002	0.006

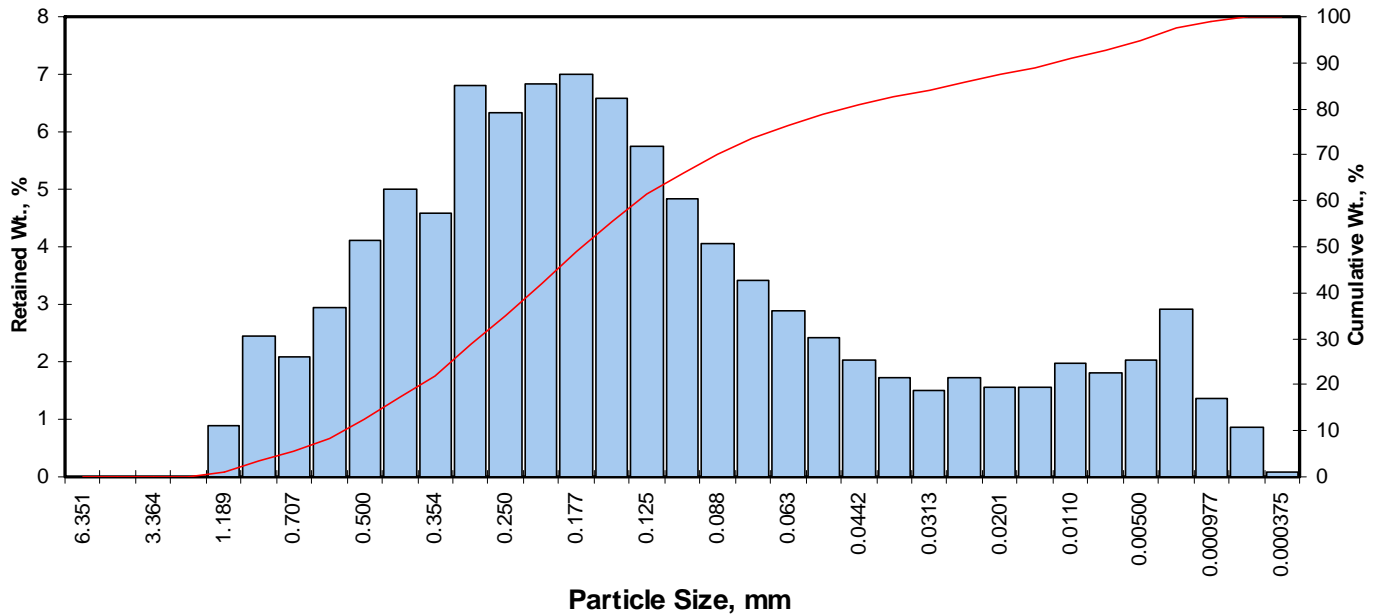
Measure	Trask	Inman	Folk-Ward
Median, phi	1.46	1.46	1.46
Median, in.	0.0143	0.0143	0.0143
Median, mm	0.364	0.364	0.364
Mean, phi	1.10	2.14	1.91
Mean, in.	0.0184	0.0089	0.0105
Mean, mm	0.467	0.227	0.266
Sorting	2.836	2.238	2.353
Skewness	0.805	0.304	0.388
Kurtosis	0.282	0.821	1.110
<b>Grain Size Description</b> (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	47.00
Fine Sand	200	32.46
Silt	>0.005 mm	16.04
Clay	<0.005 mm	4.51
<b>Total</b>		<b>100</b>

**Client:** RETEC/ENSR  
**Project:** North Lake Union  
**Project No:** 05570028-360

**PTS File No:** 37769  
**Sample ID:** GP-12R1-11.0-11.5  
**Depth, ft:** 11.05

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening		Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.88	0.88	0.88
0.0331	0.841	0.25	20	2.45	2.45	3.33
0.0278	0.707	0.50	25	2.08	2.08	5.41
0.0234	0.595	0.75	30	2.95	2.95	8.36
0.0197	0.500	1.00	35	4.10	4.10	12.46
0.0166	0.420	1.25	40	4.99	4.99	17.45
0.0139	0.354	1.50	45	4.59	4.59	22.04
0.0117	0.297	1.75	50	6.80	6.80	28.84
0.0098	0.250	2.00	60	6.33	6.33	35.17
0.0083	0.210	2.25	70	6.82	6.82	41.99
0.0070	0.177	2.50	80	6.99	6.99	48.98
0.0059	0.149	2.75	100	6.59	6.59	55.57
0.0049	0.125	3.00	120	5.74	5.74	61.31
0.0041	0.105	3.25	140	4.83	4.83	66.14
0.0035	0.088	3.50	170	4.06	4.06	70.20
0.0029	0.074	3.75	200	3.42	3.42	73.63
0.0025	0.063	4.00	230	2.88	2.88	76.51
0.0021	0.053	4.25	270	2.42	2.42	78.93
0.00174	0.0442	4.50	325	2.03	2.03	80.96
0.00146	0.0372	4.75	400	1.72	1.72	82.68
0.00123	0.0313	5.00	450	1.49	1.49	84.17
0.000986	0.0250	5.32	500	1.71	1.71	85.88
0.000790	0.0201	5.64	635	1.55	1.55	87.43
0.000615	0.0156	6.00		1.55	1.55	88.98
0.000435	0.0110	6.50		1.96	1.96	90.94
0.000308	0.00781	7.00		1.80	1.80	92.74
0.000197	0.00500	7.65		2.02	2.02	94.76
0.000077	0.00195	9.00		2.93	2.93	97.69
0.000038	0.000977	10.00		1.37	1.37	99.06
0.000019	0.000488	11.00		0.85	0.85	99.91
0.000015	0.000375	11.38		0.09	0.09	100.00
<b>TOTALS</b>				<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	0.45	0.0288	0.732
10	0.85	0.0218	0.555
16	1.18	0.0174	0.442
25	1.61	0.0129	0.328
40	2.18	0.0087	0.221
50	2.54	0.0068	0.172
60	2.94	0.0051	0.130
75	3.87	0.0027	0.068
84	4.97	0.0013	0.032
90	6.26	0.0005	0.013
95	7.76	0.0002	0.005

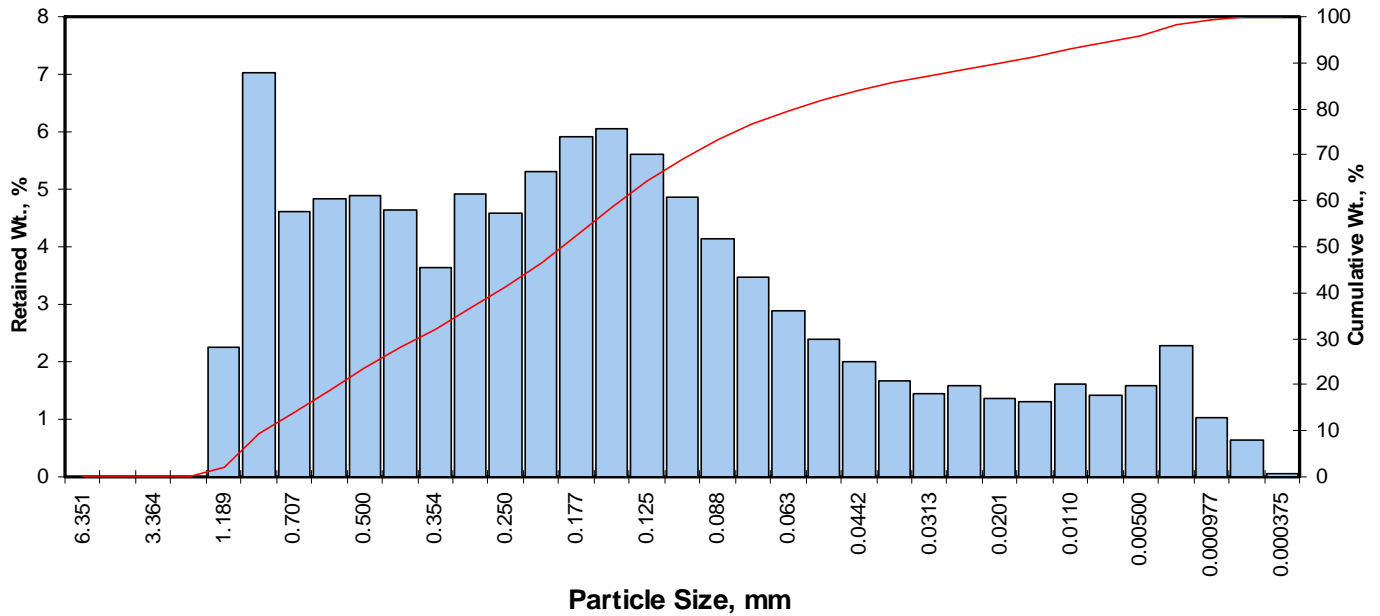
Measure	Trask	Inman	Folk-Ward
Median, phi	2.54	2.54	2.54
Median, in.	0.0068	0.0068	0.0068
Median, mm	0.172	0.172	0.172
Mean, phi	2.34	3.07	2.90
Mean, in.	0.0078	0.0047	0.0053
Mean, mm	0.198	0.119	0.134
Sorting	2.189	1.897	2.056
Skewness	0.870	0.283	0.356
Kurtosis	0.239	0.925	1.325
<b>Grain Size Description</b> (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)		

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	17.45
Fine Sand	200	56.17
Silt	>0.005 mm	21.13
Clay	<0.005 mm	5.24
<b>Total</b>		<b>100</b>

**Client:** RETEC/ENSR  
**Project:** North Lake Union  
**Project No:** 05570028-360

**PTS File No:** 37769  
**Sample ID:** GP-12R1-23.5-24.0  
**Depth, ft:** 23.8

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening		Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	2.24	2.24	2.24
0.0331	0.841	0.25	20	7.02	7.02	9.26
0.0278	0.707	0.50	25	4.60	4.60	13.86
0.0234	0.595	0.75	30	4.84	4.84	18.70
0.0197	0.500	1.00	35	4.89	4.89	23.59
0.0166	0.420	1.25	40	4.65	4.65	28.24
0.0139	0.354	1.50	45	3.63	3.63	31.87
0.0117	0.297	1.75	50	4.91	4.91	36.78
0.0098	0.250	2.00	60	4.59	4.59	41.37
0.0083	0.210	2.25	70	5.30	5.30	46.67
0.0070	0.177	2.50	80	5.91	5.91	52.58
0.0059	0.149	2.75	100	6.05	6.05	58.63
0.0049	0.125	3.00	120	5.60	5.60	64.23
0.0041	0.105	3.25	140	4.87	4.87	69.10
0.0035	0.088	3.50	170	4.13	4.13	73.23
0.0029	0.074	3.75	200	3.47	3.47	76.70
0.0025	0.063	4.00	230	2.90	2.90	79.60
0.0021	0.053	4.25	270	2.40	2.40	82.00
0.00174	0.0442	4.50	325	1.99	1.99	83.99
0.00146	0.0372	4.75	400	1.67	1.67	85.66
0.00123	0.0313	5.00	450	1.44	1.44	87.10
0.000986	0.0250	5.32	500	1.59	1.59	88.69
0.000790	0.0201	5.64	635	1.37	1.37	90.06
0.000615	0.0156	6.00		1.31	1.31	91.37
0.000435	0.0110	6.50		1.60	1.60	92.97
0.000308	0.00781	7.00		1.43	1.43	94.40
0.000197	0.00500	7.65		1.58	1.58	95.98
0.000077	0.00195	9.00		2.28	2.28	98.26
0.000038	0.000977	10.00		1.04	1.04	99.30
0.000019	0.000488	11.00		0.63	0.63	99.93
0.000015	0.000375	11.38		0.07	0.07	100.00
<b>TOTALS</b>				<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-0.05	0.0409	1.038
10	0.29	0.0322	0.818
16	0.61	0.0258	0.655
25	1.08	0.0187	0.474
40	1.93	0.0104	0.263
50	2.39	0.0075	0.191
60	2.81	0.0056	0.142
75	3.63	0.0032	0.081
84	4.50	0.0017	0.044
90	5.63	0.0008	0.020
95	7.24	0.0003	0.007

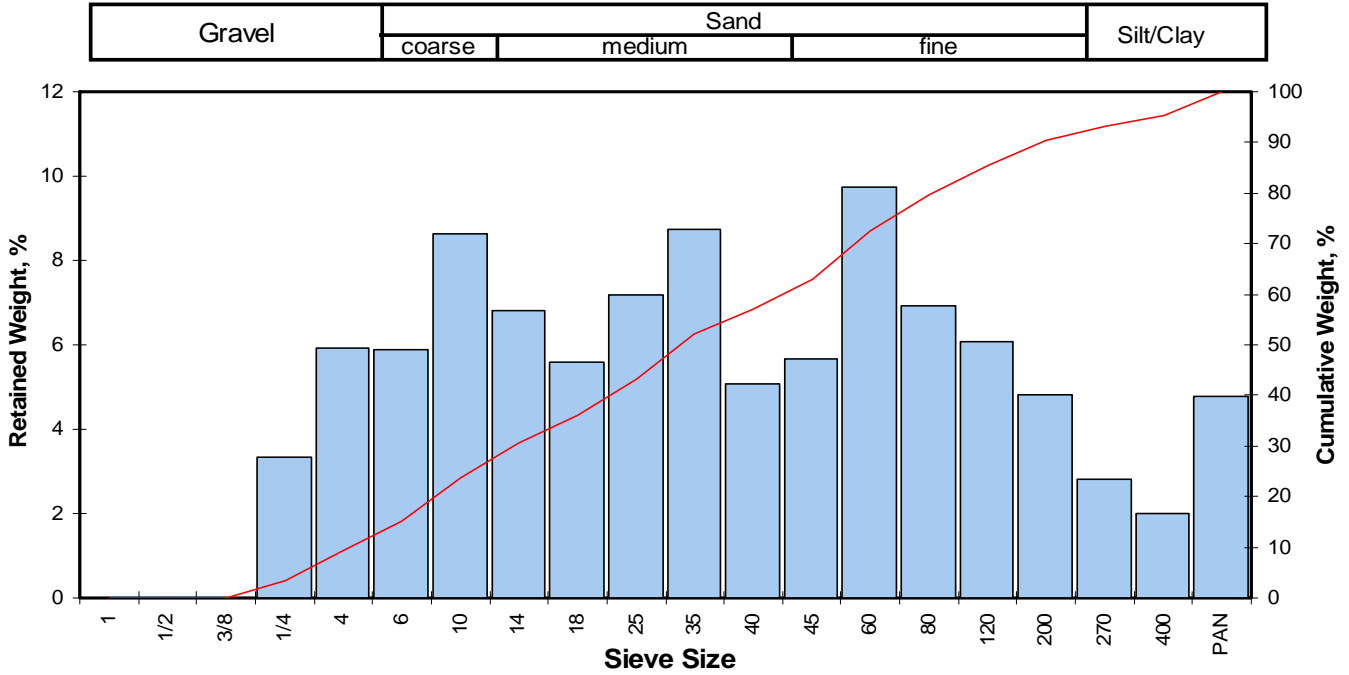
Measure	Trask	Inman	Folk-Ward
Median, phi	2.39	2.39	2.39
Median, in.	0.0075	0.0075	0.0075
Median, mm	0.191	0.191	0.191
Mean, phi	1.85	2.56	2.50
Mean, in.	0.0109	0.0067	0.0070
Mean, mm	0.278	0.170	0.177
Sorting	2.421	1.945	2.078
Skewness	1.028	0.085	0.208
Kurtosis	0.247	0.876	1.172
<b>Grain Size Description</b>		Fine sand	
(ASTM-USCS Scale)		(based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	28.24
Fine Sand	200	48.46
Silt	>0.005 mm	19.28
Clay	<0.005 mm	4.02
<b>Total</b>		<b>100</b>



Client: RETEC/ENSR  
 Project: North Lake Union  
 Project No: 05570028-360

PTS File No: 37769  
 Sample ID: GP-12R1-25.0-25.25  
 Depth, ft: 25.05



Opening		Phi of Screen	U.S. Sieve No.	Sample Weight grams	Incremental Weight, percent	Cumulative Weight, percent
Inches	Millimeters					
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.66	3.31	3.31
0.1873	4.757	-2.25	4	1.18	5.93	9.24
0.1324	3.364	-1.75	6	1.17	5.88	15.12
0.0787	2.000	-1.00	10	1.72	8.64	23.76
0.0557	1.414	-0.50	14	1.36	6.83	30.59
0.0394	1.000	0.00	18	1.11	5.58	36.16
0.0278	0.707	0.50	25	1.43	7.18	43.35
0.0197	0.500	1.00	35	1.74	8.74	52.08
0.0166	0.420	1.25	40	1.01	5.07	57.16
0.0139	0.354	1.50	45	1.13	5.68	62.83
0.0098	0.250	2.00	60	1.94	9.74	72.58
0.0070	0.177	2.50	80	1.38	6.93	79.51
0.0049	0.125	3.00	120	1.21	6.08	85.59
0.0029	0.074	3.75	200	0.96	4.82	90.41
0.0021	0.053	4.25	270	0.56	2.81	93.22
0.0015	0.037	4.75	400	0.40	2.01	95.23
			PAN	0.95	4.77	100.00
<b>TOTALS</b>				19.91	100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Particle Size	
		Inches	Millimeters
5	-2.55	0.2303	5.850
10	-2.19	0.1791	4.549
16	-1.67	0.1256	3.190
25	-0.91	0.0739	1.878
40	0.27	0.0327	0.831
50	0.88	0.0214	0.543
60	1.38	0.0152	0.385
75	2.17	0.0087	0.221
84	2.87	0.0054	0.137
90	3.69	0.0031	0.078
95	4.69	0.0015	0.039

Measure	Trask	Inman	Folk-Ward
Median, phi	0.88	0.88	0.88
Median, in.	0.0214	0.0214	0.0214
Median, mm	0.543	0.543	0.543
Mean, phi	-0.07	0.60	0.69
Mean, in.	0.0413	0.0260	0.0244
Mean, mm	1.050	0.661	0.619
Sorting	2.912	2.272	2.233
Skewness	1.187	-0.124	-0.036
Kurtosis	0.185	0.594	0.962

**Grain Size Description** (ASTM-USCS Scale) Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	9.24
Coarse Sand	10	14.52
Medium Sand	40	33.40
Fine Sand	200	33.25
Silt/Clay	<200	9.59
<b>Total</b>		<b>100</b>



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

16 November 2007

Jason Palmer  
Retec/ENSR, Inc.  
1011 S.W. Klickitat Way  
Suite 207  
Seattle, WA 98134

**RE: Client Project: North Lake Union**  
**ARI Job No. LX86**

Dear Jason:

Please find enclosed the original chain of custody record and the final results for the samples from the project referenced above. Four soil samples were received on November 13, 2007. The samples were analyzed for Grain Size as requested.

A copy of these results will be kept on file at ARI. Should you have any questions, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

A handwritten signature in black ink that reads "Mark D. Harris".

Mark D. Harris  
Project Manager  
[markh@arilabs.com](mailto:markh@arilabs.com)  
206/695-6210

Enclosures

cc: File LX86

MDH/mdh

# Chain of Custody Record & Laboratory Analysis Request



**Analytical Resources, Incorporated**  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number: <i>LX86</i>	Turn-around Requested: <i>RUSH / ASAP</i>	Page: _____ of _____
ARI Client Company: <i>ENSR/RETEL</i>	Phone: <i>206.624.9349</i>	Date: _____ Ice Present? <input type="checkbox"/>
Client Contact: <i>Aaron Jambasic / Jason Palmer</i>		No. of Coolers: _____ Cooler Temps: _____

Client Project Name: <i>NLU</i>					Analysis Requested								Notes/Comments	
Client Project #: <i>05570 028 0360</i>		Samplers: <i>AJIKN</i>			<i>GRAINSIZE Analysis</i>									
Sample ID	Date	Time	Matrix	No. Containers										
<i>GP-02 12-13'</i>	<i>9.19.07</i>		<i>Soil</i>	<i>1</i>	<i>X</i>									
<i>GP-09 10-12'</i>	<i>↓</i>		<i>↓</i>	<i>↓</i>	<i>↓</i>									
<i>GP-11 12-16'</i>	<i>↓</i>		<i>↓</i>	<i>↓</i>	<i>↓</i>									
<i>GP-11 20-24'</i>	<i>↓</i>		<i>↓</i>	<i>↓</i>	<i>↓</i>									

Comments/Special Instructions  <i>NEED to obtain USCS classification</i>	Relinquished by: (Signature) <i>K. Jambasic</i>	Received by: (Signature) <i>Emily Crowdis</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <i>Kristina Jambasic</i>	Printed Name: <i>Emily Crowdis</i>	Printed Name:	Printed Name:
	Company: <i>ENSR</i>	Company: <i>ARI</i>	Company:	Company:
	Date & Time: <i>11.13.07 / 1305</i>	Date & Time: <i>11/13/07 1305</i>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.



Client: The Retec Group, Inc.

Project No.: LX86

Client Project: NLU 05570-028-0360

### Case Narrative

1. Four samples were received on November 13, 2007.
2. The samples were submitted for grain size distribution according to ASTM D422.
3. The samples had a strong fuel odor.
4. The data is provided in summary tables and plots.
5. There were no other noted anomalies in the samples or methods on this project.

Approved by: *Taylor McKenzie*  
Title: Lead Technician

Date: 11/15/07

The Retec Group, Inc.  
NLU 05570-028-0360

Percent Finer Than Indicated Size, By ASTM D422

Sample ID	Depth	Moisture Content (%)	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
GP-02 12-13'	12-13'	51.92	100.0	100.0	100.0	100.0	100.0	91.0	77.8	58.3	39.0	27.1	19.1	13.0	8.5	5.1
GP-09 10-12'	10-12'	44.21	100.0	100.0	100.0	100.0	100.0	93.0	85.3	68.8	49.8	32.7	22.5	15.5	10.3	5.4
GP-11 12-16'	12-16'	75.76	100.0	100.0	100.0	100.0	100.0	100.0	89.1	64.8	45.7	35.0	26.1	18.4	12.4	8.0
GP-11 20-24'	20-24'	23.26	100.0	100.0	100.0	100.0	93.9	70.6	69.0	53.0	43.6	37.0	30.7	21.5	13.3	7.5

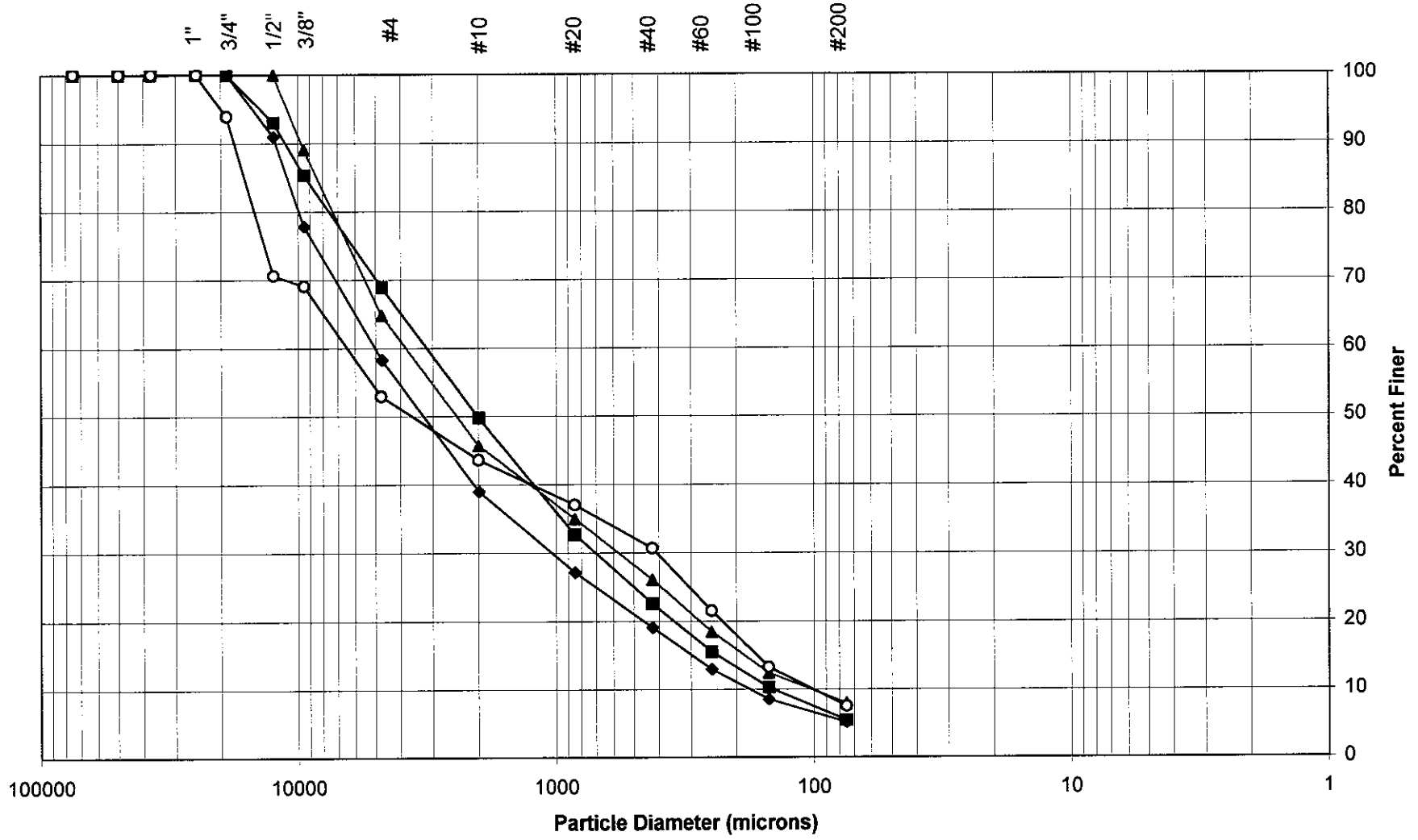


The Retec Group, Inc.  
NLU 05570-028-0360

Percent Retained in Each Size Fraction, By ASTM D422

Sieve Size (microns)	3-2"	2-1.5"	1.5-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8-#4	4750-2000	2000-850	850-425	425-250	250-150	150-75	<75
GP-02 12-13'	0.0	0.0	0.0	0.0	9.0	13.2	19.5	19.3	11.9	8.0	6.1	4.4	3.4	5.1
GP-09 10-12'	0.0	0.0	0.0	0.0	7.0	7.7	16.4	19.1	17.1	10.1	7.0	5.3	4.8	5.4
GP-11 12-16'	0.0	0.0	0.0	0.0	0.0	10.9	24.3	19.1	10.7	8.9	7.6	6.0	4.5	8.0
GP-11 20-24'	0.0	0.0	0.0	6.1	23.3	1.6	16.1	9.4	6.6	6.4	9.1	8.3	5.8	7.5

### Grain Size Distribution By ASTM D422



◆ GP-02 12-13'      ■ GP-09 10-12'      ▲ GP-11 12-16'      ○ GP-11 20-24'

PTS File No: 37769  
 Client: RETEC/ENSR

**PHYSICAL PROPERTIES DATA - AIR/OIL/WATER CAPILLARY PRESSURE**

(ASTM D6836; Drainage Centrifugal Method: native sample, air displacing NAPL and water)

**Final (Post-Test) Saturations**

PROJECT NAME: North Lake Union  
 PROJECT NO: 05570028-360

SAMPLE ID.	DEPTH, ft.	METHODS: SAMPLE ORIENTATION (1)	API RP 40 / ASTM D2216	API RP 40		API RP 40		API RP 40	
			MOISTURE CONTENT, % weight	DENSITY		POROSITY, %Vb (2)		PORE FLUID SATURATIONS, % Pv (3)	
				BULK, g/cc	GRAIN, g/cc	TOTAL	AIR FILLED	WATER	NAPL
GP-05-7.5-8.0	7.6	H	49.6	0.75	1.80	58.3	21.1	25.1	38.8
GP-09RI-9.0-9.5	9.15	H	25.3	0.90	2.25	60.2	37.6	21.4	16.2
GP-11R3-12.0-12.5	12.45	H	26.9	0.97	2.25	57.1	40.9	8.7	19.5
GP-12R1-11.0-11.5	11.2	H	14.9	0.85	2.25	62.1	49.0	18.6	2.4

(1) Sample Orientation: H = horizontal; V = vertical (2) Total Porosity = no pore fluids in place; all interconnected pore channels; Air Filled = pore channels not occupied by pore fluids (3) Water = 0.9996 g/cc, Hydrocarbon = 1.000 g/cc; Vb = Bulk Volume, cc; Pv = Pore Volume, cc; ND = Not Detected

PTS File No: 37769  
 Client: RETEC/ENSR

**PHYSICAL PROPERTIES DATA - AIR/OIL/WATER CAPILLARY PRESSURE**

(ASTM D6836; Imbibition Centrifugal Method: native sample, water displacing air and NAPL)

**Final (Post-Test) Saturations**

PROJECT NAME: North Lake Union  
 PROJECT NO: 05570028-360

SAMPLE ID.	DEPTH, ft.	METHODS: SAMPLE ORIENTATION (1)	API RP 40 / ASTM D2216	API RP 40		API RP 40		API RP 40	
			MOISTURE CONTENT, % weight	DENSITY		POROSITY, %Vb (2)		PORE FLUID SATURATIONS, % Pv (3)	
				BULK, g/cc	GRAIN, g/cc	TOTAL	AIR FILLED	WATER	NAPL
GP-02-12.5-13.0	12.55	H	15.6	1.72	2.62	34.6	7.8	73.3	4.0
GP-09R1-11.0-11.5	11.25	H	77.1	0.71	2.15	66.8	12.1	77.0	4.8
GP-11-21.0-21.5	21.05	H	106.6	0.64	2.05	68.6	0.5	82.9	16.4
GP-11-22.5-23.0	22.7	H	74.9	0.74	2.03	63.4	7.8	80.0	7.7
GP-11R3-12.0-12.5	12.3	H	68.2	0.88	2.12	58.5	0.3	92.7	6.8
GP-12R1-25.0-25.25	25.15	H	18.2	1.71	2.59	34.1	3.3	85.8	4.6

(1) Sample Orientation: H = horizontal; V = vertical (2) Total Porosity = no pore fluids in place; all interconnected pore channels; Air Filled = pore channels not occupied by pore fluids (3) Water = 0.9996 g/cc, Hydrocarbon = 1.000 g/cc; Vb = Bulk Volume, cc; Pv = Pore Volume, cc; ND = Not Detected

PTS File No: 37769  
 Client: RETEC/ENSR

**PHYSICAL PROPERTIES DATA - AIR/WATER CAPILLARY PRESSURE**

PROJECT NAME: North Lake Union  
 PROJECT NO: 05570028-360

SAMPLE ID.	DEPTH, ft.	METHODS: SAMPLE ORIENTATION (1)	API RP 40 /	API RP 40		API RP 40		API RP 40
			ASTM D2216	DENSITY		POROSITY, %Vb (2)		TOTAL PORE FLUID SATURATIONS (3), % Pv
			MOISTURE CONTENT, % weight	BULK, g/cc	GRAIN, g/cc	TOTAL	AIR FILLED	
GP-02-12.0-12.5	12.1	V	51.6	0.87	2.15	59.8	13.6	77.2
GP-04-9.25-9.5	9.35	V	88.6	0.73	2.23	67.2	1.3	98.1
GP-05-7.5-8.0	7.6	H	49.6	0.75	1.80	58.3	21.1	63.9
GP-05-14.5-15.0	14.65	V	103	0.66	2.21	70.2	2.3	96.8
GP-09RI-9.0-9.5	9.15	V	67.2	0.81	2.24	64.0	4.3	93.3
GP-11-21.0-21.5	21.2	V	99.3	0.65	2.11	69.1	2.3	96.7
GP-11R3-12.5-13.0	12.7	V	43.8	1.10	2.38	53.8	4.7	91.3
GP-12R1-25.0-25.25	25.15	H	18.2	1.71	2.59	34.1	3.3	90.4

(1) Sample Orientation: H = horizontal; V = vertical (2) Total Porosity = no pore fluids in place; all interconnected pore channels; Air Filled = pore channels not occupied by pore fluids (3) Water = 0.9996 g/cc; Vb = Bulk Volume, cc; Pv = Pore Volume, cc; ND = Not Detect

**SUB-ATTACHMENT 3D-1.4**  
**Floyd|Snider 2010 Waterway 19 Soil Grain Size Data**





**Client:** Floyd Snider

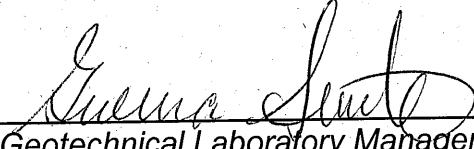
**ARI Job No.:** RC58

**Client Project:** Phase 3

**Client Project No.:** COSGWA6020

### Case Narrative

1. Five samples were submitted for testing on July 1, 2010, and were in good condition.
2. The samples were submitted for grain size distribution according to ASTM D422. The samples were prepared according to ASTM D421.
3. An assumed specific gravity of 2.65 was used in the hydrometer calculations.
4. A standard milkshake mixer type device was used to disperse the fine fraction sample.
5. One sample from another job was chosen for triplicate analysis. The triplicate data can be found on the QA summary.
6. The samples contained high percentages of organic matter which may have broken down during the washing and sieving processes.
7. The data is provided in summary tables and plots.
8. There were no further anomalies in the samples or test method.

Approved by:   
Geotechnical Laboratory Manager

Date: 7/14/10

Floyd/Snider  
Phase 3  
COSGWA6020

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
QV05 A	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.3	97.4	92.2	80.6	65.2	58.2	47.3	41.1	36.5	28.7	20.2
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.7	99.3	97.5	92.9	83.2	67.2	59.5	48.1	43.5	38.2	28.2	19.8
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.6	99.5	99.1	97.2	92.4	81.6	64.0	57.1	45.7	41.9	37.3	27.4	18.3
WW19-01	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	98.2	90.7	80.5	68.2	58.4	48.9	38.4	24.6	20.0	16.1	13.1	6.1	6.1
WW19-03	100.0	100.0	100.0	100.0	100.0	94.4	94.4	85.6	78.8	71.8	61.1	48.7	38.6	30.7	27.7	22.7	17.6	14.6	13.1	5.5	4.5
WW19-05	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.1	95.3	92.4	84.2	70.0	55.4	39.0	30.5	23.1	18.7	15.2	10.3	4.9	3.9
WW19-06	100.0	100.0	100.0	100.0	100.0	100.0	98.8	97.3	93.8	89.9	81.1	66.5	51.0	35.6	27.6	23.2	19.2	16.3	15.3	6.9	5.9
WW19-Dup	100.0	100.0	100.0	100.0	100.0	98.3	98.3	94.1	87.9	79.3	66.5	51.4	39.6	30.5	28.6	23.6	17.6	16.1	13.6	6.0	4.5

Testing performed according to ASTM D421/D422

Floyd/Snider  
Phase 3  
COSGWA6020

Percent Retained in Each Size Fraction

Description	%Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand		% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay
	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3.2	<3.2
Particle Size (microns)																				
QV05 A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	2.0	5.2	11.6	15.4	7.0	10.9	6.2	4.7	7.8	28.7
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.4	1.8	4.6	9.7	16.1	7.6	11.4	4.6	5.3	9.9	28.2
	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.4	1.9	4.8	10.8	17.6	6.9	11.4	3.8	4.6	9.9	27.4
WW19-01	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.3	7.4	10.3	12.3	9.8	9.5	10.5	13.8	4.6	3.8	3.1	6.9	6.1
WW19-03	0.0	0.0	0.0	0.0	5.6	0.0	8.8	6.7	7.1	10.7	12.4	10.1	7.9	3.0	5.0	5.0	3.0	1.5	7.6	5.5
WW19-05	0.0	0.0	0.0	0.0	0.0	0.0	2.9	1.8	2.8	8.2	14.2	14.7	16.4	8.5	7.4	4.4	3.4	4.9	5.4	4.9
WW19-06	0.0	0.0	0.0	0.0	0.0	1.2	1.5	3.5	3.9	8.8	14.6	15.5	15.4	8.0	4.4	3.9	3.0	1.0	8.4	6.9
WW19-Dup	0.0	0.0	0.0	0.0	1.7	0.0	4.2	6.2	8.6	12.8	15.1	11.8	9.1	1.9	5.0	6.0	1.5	2.5	7.5	6.0

Client:	Floyd/Snider	Project No.:	Phase 3
ARI Triplicate Sample ID:	QV05 A	Project:	COSGWA6020
		Batch No.:	RC58-01
		Page:	1 of 1

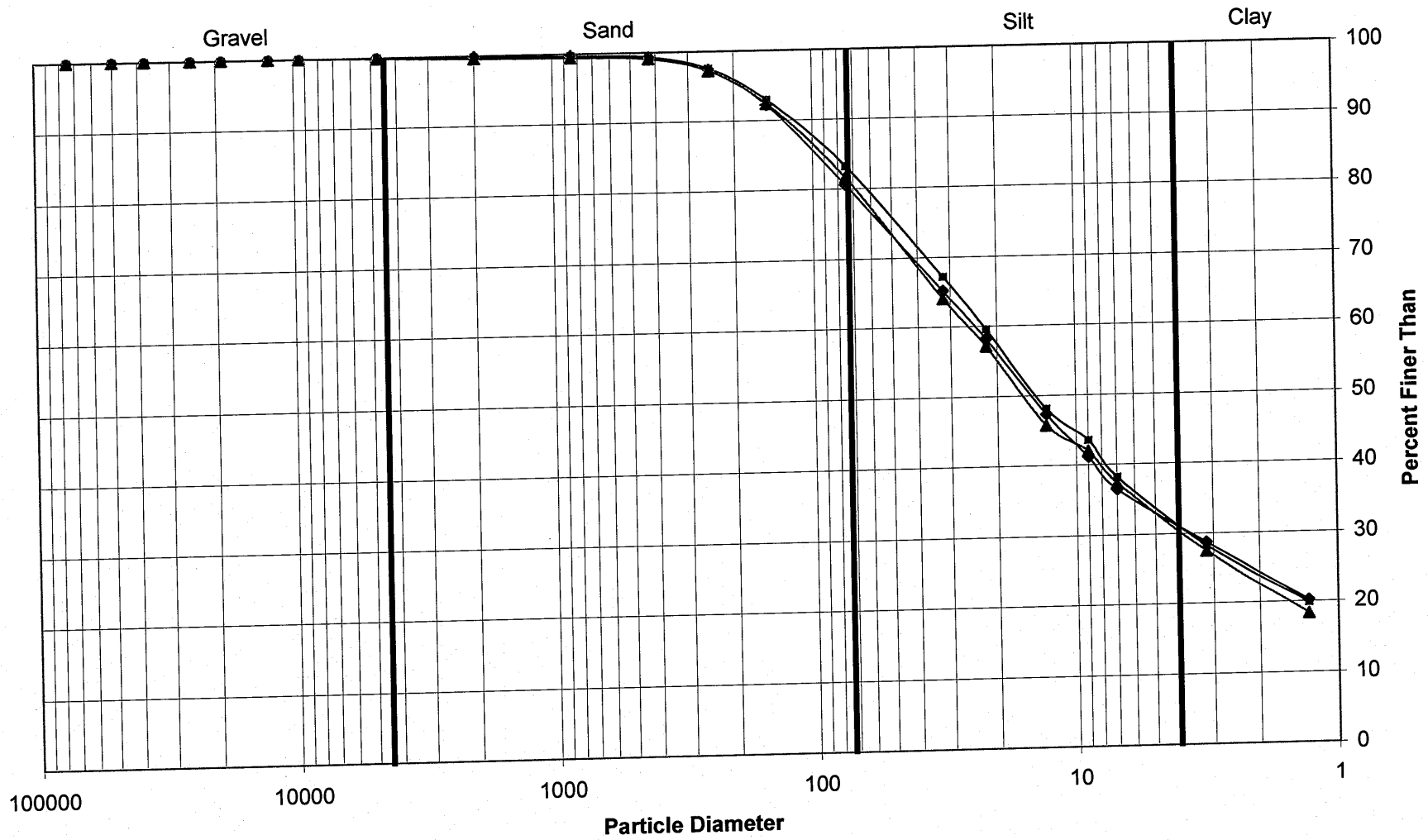
Relative Standard Deviation, By Size

Sample ID	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	32	22	13	9	7	3.2	1.3
QV05 A	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.3	97.4	92.2	80.6	65.2	58.2	47.3	41.1	36.5	28.7	20.2
QV05 A	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.7	99.3	97.5	92.9	83.2	67.2	59.5	48.1	43.5	38.2	28.2	19.8
QV05 A	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.6	99.5	99.1	97.2	92.4	81.6	64.0	57.1	45.7	41.9	37.3	27.4	18.3
AVE	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.96	99.78	99.64	99.24	97.36	92.49	81.79	65.44	58.28	47.04	42.17	37.32	28.12	19.43
STDEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.15	0.16	0.16	0.17	0.39	1.34	1.59	1.19	1.21	1.21	0.85	0.64	1.01
%RSD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.15	0.16	0.16	0.17	0.43	1.64	2.44	2.05	2.56	2.88	2.27	2.29	5.18

This Triplicate applies to the Batch Containing the Following Samples

Sample ID	Date Sampled	Date Set up	Date Started	Date Complete	Data Qualifiers
QV05 A	5/1/2010	5/7/2010	5/17/2010	5/19/2010	
	5/1/2010	5/7/2010	5/17/2010	5/19/2010	
	5/1/2010	5/7/2010	5/17/2010	5/19/2010	
WW19-01	6/30/2010	7/6/2010	7/12/2010	7/14/2010	
WW19-03	6/30/2010	7/6/2010	7/12/2010	7/14/2010	
WW19-05	6/30/2010	7/6/2010	7/12/2010	7/14/2010	
WW19-06	6/30/2010	7/6/2010	7/12/2010	7/14/2010	
WW19-Dup	6/30/2010	7/6/2010	7/12/2010	7/14/2010	

# Grain Size Distribution by Hydrometer

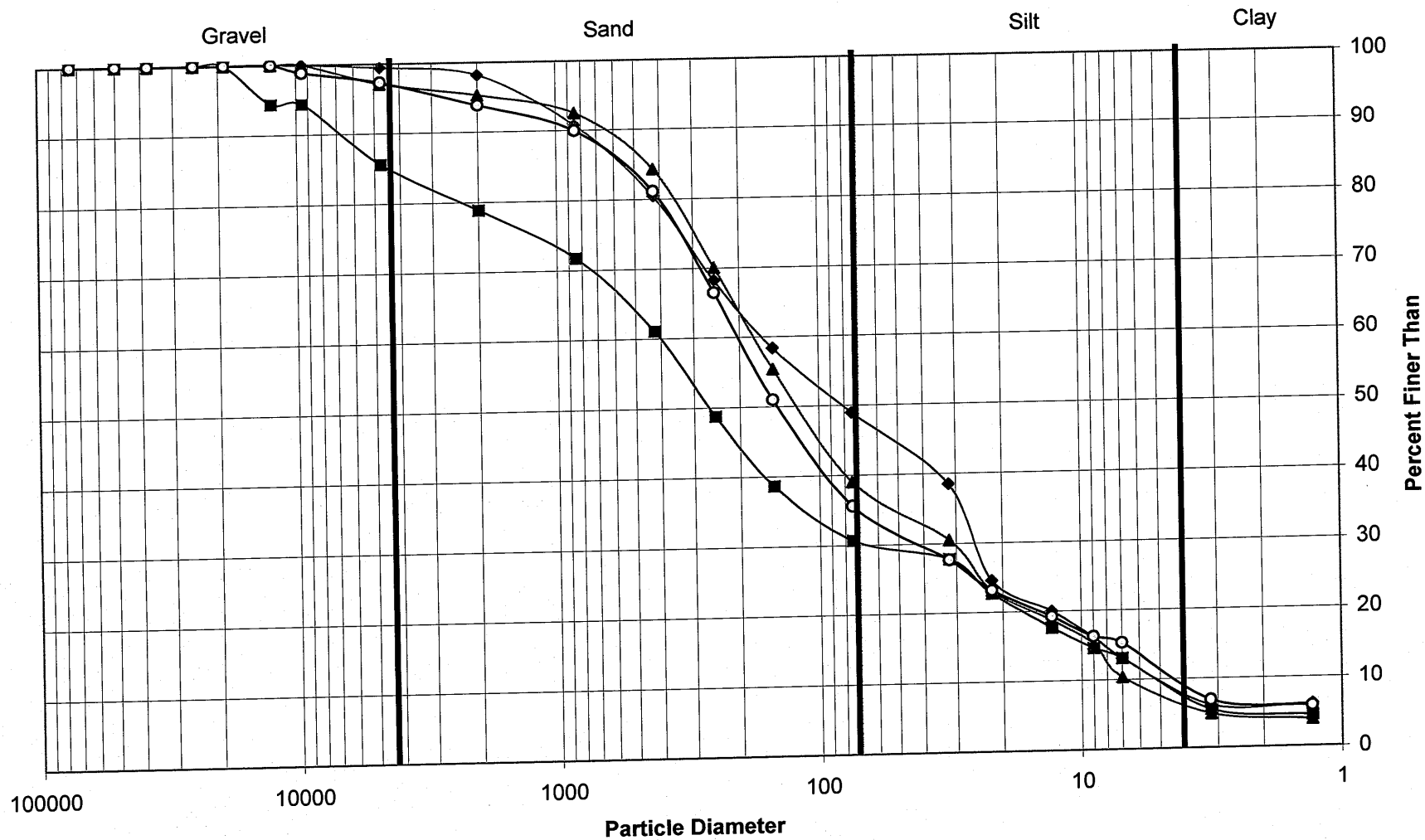


◆ QV05 A

■ QV05 A

▲ QV05 A

### Grain Size Distribution by Hydrometer



—◆— WW19-01

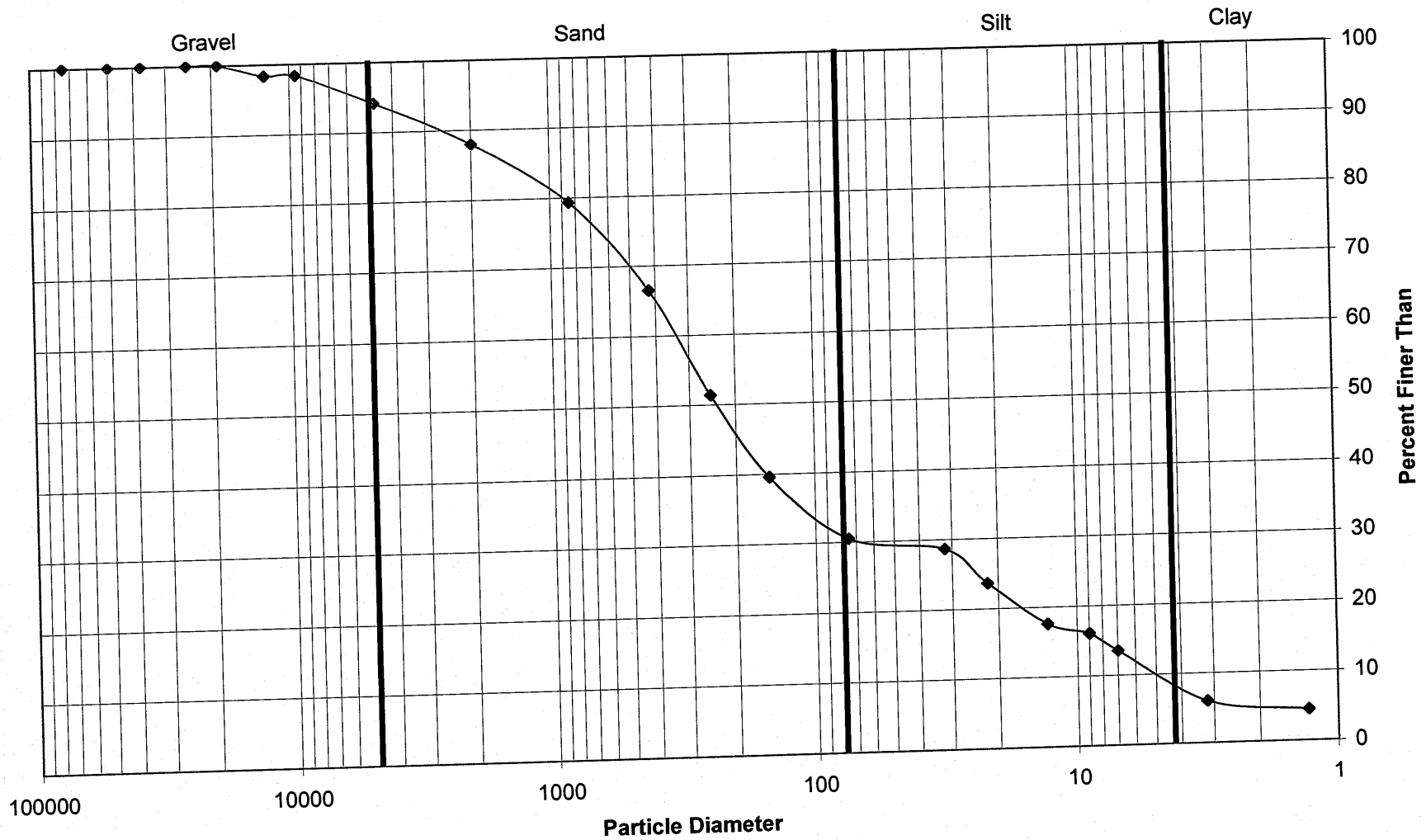
—■— WW19-03

—▲— WW19-05

—○— WW19-06



# Grain Size Distribution by Hydrometer



◆ WW19-Dup



## Analytical Resources, Incorporated

Analytical Chemists and Consultants

September 24, 2010

Allison Geiselbrecht  
Floyd Snider, Inc.  
601 Union Street, Suite 600  
Seattle, WA 98101-2341

**RE: Client Project: Phase 3: COS-GWSA 6020**  
**ARI Job No: RK08**

Dear Ms. Geiselbrecht:

Please find enclosed the Chain-of-Custody (COC) records, receipt documentation, and the final analytical results for the samples from the project referenced above. Analytical Resources, Inc. (ARI) accepted three soil samples on August 23, 2010 under ARI job number RK08. Samples were received within a short time of sampling and transferred to refrigerated storage until they could be logged on 08/24/10. For details regarding sample receipt, refer to the enclosed Cooler Receipt Form.

The samples were analyzed for semivolatiles, TOC, grainsize, metals and aroclor PCBs as requested on the COC.

Due to analyst error, surrogate was not added to the sample aliquots for PCB analysis. All samples were re-extracted and re-analyzed within the recommended holding time for samples stored frozen. Only the results for the re-extract are reported.

A matrix spike (MS) was prepared and analyzed for semivolatiles in conjunction with sample **WW19-04-082310**. Several compounds were outside of advisory control limits. LCS recoveries were within limits. No corrective action is required for matrix QC.

A matrix spike (MS) was prepared and analyzed for total metals with sample **WW19-04-082310**. The percent recovery for zinc was high following the initial analysis of the MS. Since the percent recovery was within acceptable QC limits for the corresponding LCS, it was concluded that the sample matrix was the cause of the high MS recovery. No corrective actions were taken.

There were no further anomalies associated with these analyses.

An electronic copy of this report and all associated raw data will remain on file with ARI. Should you have any questions or problems, feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

Susan D. Dunnihoo  
Director, Client Services  
sue@arilabs.com  
206-695-6207

Enclosures

cc: eFile RK08

SD/esj





# Cooler Receipt Form

ARI Client: Floyd Snider

Project Name: Phase 3

COC No(s): \_\_\_\_\_ (NA)

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: \_\_\_\_\_

Assigned ARI Job No: RK08

Tracking No: \_\_\_\_\_ (NA)

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES (NO)  
 Were custody papers included with the cooler? ..... (YES) NO  
 Were custody papers properly filled out (ink, signed, etc.) ..... (YES) NO  
 Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)..... 13.5  
 If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 90941619

Cooler Accepted by: AV Date: 8/23/10 Time: 1035

**Complete custody forms and attach all shipping documents**

**Log-In Phase:**

Was a temperature blank included in the cooler? ..... YES (NO)  
 What kind of packing material was used? ... Bubble Wrap (Wet Ice) Gel Packs Baggies Foam Block Paper Other: \_\_\_\_\_  
 Was sufficient ice used (if appropriate)? ..... NA YES (NO)  
 Were all bottles sealed in individual plastic bags? ..... YES (NO)  
 Did all bottles arrive in good condition (unbroken)? ..... (YES) NO  
 Were all bottle labels complete and legible? ..... (YES) NO  
 Did the number of containers listed on COC match with the number of containers received? ..... (YES) NO  
 Did all bottle labels and tags agree with custody papers? ..... (YES) NO  
 Were all bottles used correct for the requested analyses? ..... (YES) NO  
 Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... (NA) YES NO  
 Were all VOC vials free of air bubbles? ..... (NA) YES NO  
 Was sufficient amount of sample sent in each bottle? ..... (YES) NO  
 Date VOC Trip Blank was made at ARI..... (NA)  
 Was Sample Split by ARI : (NA) YES Date/Time: \_\_\_\_\_ Equipment: \_\_\_\_\_ Split by: \_\_\_\_\_

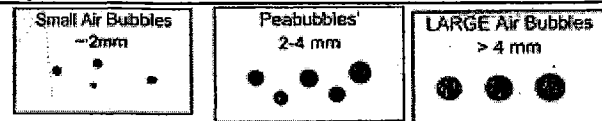
Samples Logged by: AV Date: 8/24/10 Time: 1155

**\*\* Notify Project Manager of discrepancies or concerns \*\***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

**Additional Notes, Discrepancies, & Resolutions:**

By: \_\_\_\_\_ Date: \_\_\_\_\_



Small → "sm"  
 Peabubbles → "pb"  
 Large → "lg"  
 Headspace → "hs"





## Data Reporting Qualifiers

Effective 7/10/2009

### Inorganic Data

- U Indicates that the target analyte was not detected at the reported concentration
- \* Duplicate RPD is not within established control limits
- B Reported value is less than the CRDL but  $\geq$  the Reporting Limit
- N Matrix Spike recovery not within established control limits
- NA Not Applicable, analyte not spiked
- H The natural concentration of the spiked element is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
- L Analyte concentration is  $\leq 5$  times the Reporting Limit and the replicate control limit defaults to  $\pm 1$  RL instead of the normal 20% RPD

### Organic Data

- U Indicates that the target analyte was not detected at the reported concentration
- \* Flagged value is not within established control limits
- B Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.
- J Estimated concentration when the value is less than ARI's established reporting limits
- D The spiked compound was not detected due to sample extract dilution
- E Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.
- Q Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria ( $< 20\%$  RSD,  $< 20\%$  Drift or minimum RRF).
- S Indicates an analyte response that has saturated the detector. The calculated concentration is not valid; a dilution is required to obtain valid quantification of the analyte





## Data Reporting Qualifiers

Effective 7/10/2009

- NA The flagged analyte was not analyzed for
- NR Spiked compound recovery is not reported due to chromatographic interference
- NS The flagged analyte was not spiked into the sample
- M Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters. This flag is used only for GC-MS analyses
- M2 The sample contains PCB congeners that do not match any standard Aroclor pattern. The PCBs are identified and quantified as the Aroclor whose pattern most closely matches that of the sample. The reported value is an estimate.
- N The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification"
- Y The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.
- C The analyte was positively identified on only one of two chromatographic columns. Chromatographic interference prevented a positive identification on the second column
- P The analyte was detected on both chromatographic columns but the quantified values differ by  $\geq 40\%$  RPD with no obvious chromatographic interference

## Geotechnical Data

- A The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.
- F Samples were frozen prior to particle size determination
- SM Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations
- SS Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis
- W Weight of sample in some pipette aliquots was below the level required for accurate weighting



<b>Client:</b> Floyd Snider	<b>ARI Job No.:</b> RK08
<b>Client Project:</b> Phase 3	<b>Client Project No.:</b> COS-GWSA 6020

Case Narrative

1. Two samples were submitted on August 24, 2010, and were in good condition.
2. The samples were submitted for grain size distribution according to ASTM D422. The samples were prepared according to ASTM D421.
3. An assumed specific gravity of 2.65 was used in the hydrometer calculations.
4. A standard milkshake mixer type device was used to disperse the fine fraction sample.
5. One sample from this job, WW19-04-082310 was chosen for triplicate analysis. The triplicate data can be found on the QA summary table.
6. The data is provided in summary tables and plots.
7. There were no further anomalies in the samples or test method.

Approved by: *Guerra Scott*  
Geotechnical Laboratory Manager

Date: 9/9/10

Floyd Snider  
Phase 3  
COS-GWSA 6020

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
WW19-04-082310	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4	97.4	94.2	83.5	68.4	54.9	44.8	39.6	32.5	26.9	22.3	19.3	14.2	6.1
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.0	96.4	93.0	82.2	66.6	53.2	43.0	36.2	31.2	26.6	22.6	18.1	13.6	5.5
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1	97.7	94.6	83.4	67.8	54.0	43.8	36.0	31.0	24.4	22.3	17.3	9.1	5.1
WW19-02-082310	100.0	100.0	100.0	100.0	100.0	100.0	97.5	97.5	97.1	94.7	90.2	83.4	75.4	66.1	50.8	35.2	23.4	20.3	15.6	8.6	5.5

Testing performed according to ASTM D421/D422

RK08

RK08 : 00050

Floyd Snider  
Phase 3  
COS-GWSA 6020

Percent Retained in Each Size Fraction

Description	%Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand		% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay
	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3.2	<3.2
WW19-04-082310	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.0	3.2	10.8	15.1	13.5	10.1	5.2	7.1	5.6	4.6	3.0	5.1	14.2
	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.6	3.4	10.9	15.6	13.5	10.1	6.8	5.0	4.5	4.0	4.5	4.5	13.6
	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.3	3.2	11.2	15.6	13.8	10.2	7.7	5.1	6.6	2.0	5.1	8.1	9.1
WW19-02-082310	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.4	2.3	4.5	6.8	8.0	9.3	15.3	15.6	11.7	3.1	4.7	7.0	8.6

Client:	Floyd Snider	Project No.:	Phase 3
ARI Triplicate Sample ID:	RK08 B	Project:	COS-GWSA 6020
Client Triplicate Sample ID:	WW19-04-082310	Batch No.:	RK08-01
		Page:	1 of 1

Relative Standard Deviation, By Size

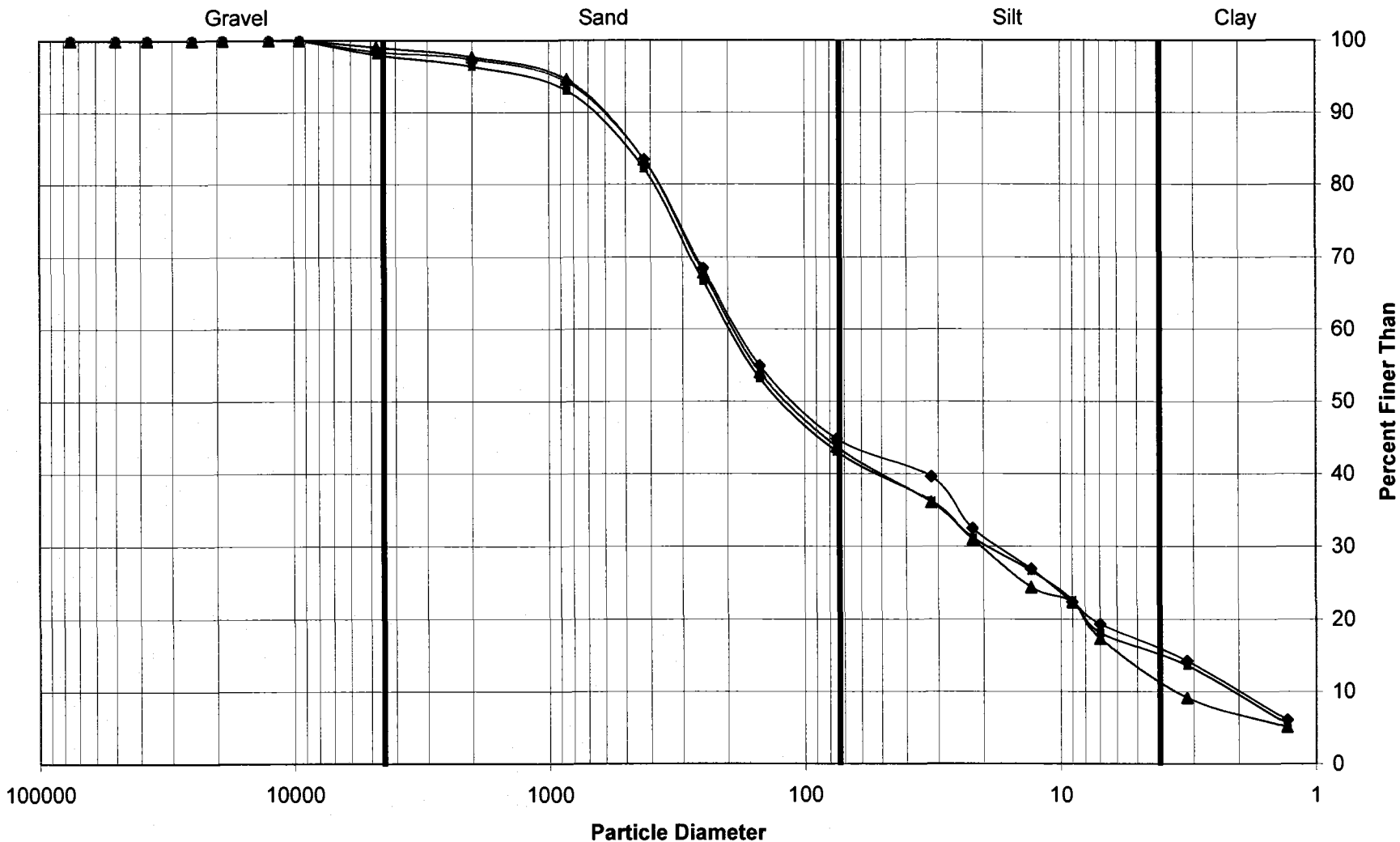
Sample ID	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	32	22	13	9	7	3.2	1.3
VW19-04-08231	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4	97.4	94.2	83.5	68.4	54.9	44.8	39.6	32.5	26.9	22.3	19.3	14.2	6.1
VW19-04-08231	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.0	96.4	93.0	82.2	66.6	53.2	43.0	36.2	31.2	26.6	22.6	18.1	13.6	5.5
VW19-04-08231	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1	97.7	94.6	83.4	67.8	54.0	43.8	36.0	31.0	24.4	22.3	17.3	9.1	5.1
AVE	100.00	100.00	100.00	100.00	100.00	100.00	100.00	98.50	97.18	93.94	83.01	67.61	54.01	43.87	37.27	31.54	25.97	22.43	18.21	12.31	5.57
STDEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.70	0.82	0.74	0.92	0.87	0.90	1.99	0.81	1.39	0.17	1.01	2.76	0.51
%RSD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.72	0.88	0.89	1.36	1.61	2.05	5.34	2.58	5.35	0.76	5.56	22.44	9.10

This Triplicate applies to the Batch Containing the Following Samples

Sample ID	Date Sampled	Date Set up	Date Started	Date Complete	Data Qualifiers
WW19-04-082310	8/23/2010	9/3/2010	9/7/2010	9/9/2010	
	8/23/2010	9/3/2010	9/7/2010	9/9/2010	
	8/23/2010	9/3/2010	9/7/2010	9/9/2010	
WW19-02-082310	8/23/2010	9/3/2010	9/7/2010	9/9/2010	

RK08 : 00052

### Grain Size Distribution by Hydrometer

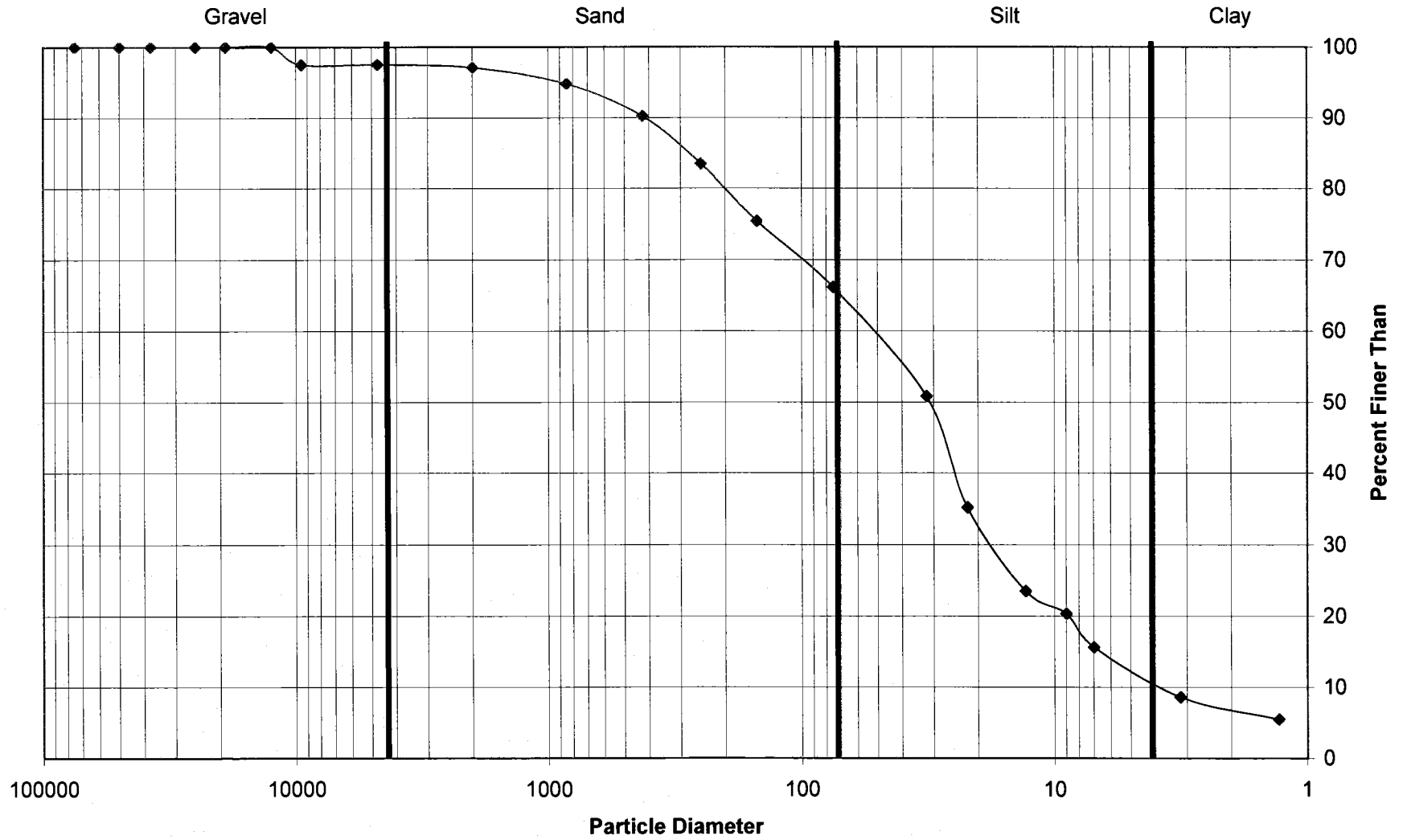


◆ WW19-04-082310      ■ WW19-04-082310      ▲ WW19-04-082310

RK08:00053



### Grain Size Distribution by Hydrometer



—◆— WW19-02-082310

RK08:00054

Floyd Snider  
Phase 3  
COS-GWSA 6020

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
WW19-04-082310	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4	97.4	94.2	83.5	68.4	54.9	44.8	39.6	32.5	26.9	22.3	19.3	14.2	6.1
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.0	96.4	93.0	82.2	66.6	53.2	43.0	36.2	31.2	26.6	22.6	18.1	13.6	5.5
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1	97.7	94.6	83.4	67.8	54.0	43.8	36.0	31.0	24.4	22.3	17.3	9.1	5.1
WW19-02-082310	100.0	100.0	100.0	100.0	100.0	100.0	97.5	97.5	97.1	94.7	90.2	83.4	75.4	66.1	50.8	35.2	23.4	20.3	15.6	8.6	5.5

Testing performed according to ASTM D421/D422

Floyd Snider  
Phase 3  
COS-GWSA 6020

Percent Retained in Each Size Fraction

Description	%Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand			% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay
	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3.2	<3.2	
WW19-04-082310	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.0	3.2	10.8	15.1	13.5	10.1	5.2	7.1	5.6	4.6	3.0	5.1	14.2	
	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.6	3.4	10.9	15.6	13.5	10.1	6.8	5.0	4.5	4.0	4.5	4.5	13.6	
	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.3	3.2	11.2	15.6	13.8	10.2	7.7	5.1	6.6	2.0	5.1	8.1	9.1	
WW19-02-082310	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.4	2.3	4.5	6.8	8.0	9.3	15.3	15.6	11.7	3.1	4.7	7.0	8.6	

Client:	Floyd Snider	Project No.:	Phase 3
ARI Triplicate Sample ID:	RK08 B	Project:	COS-GWSA 6020
Client Triplicate Sample ID:	WW19-04-082310	Batch No.:	RK08-01
		Page:	1 of 1

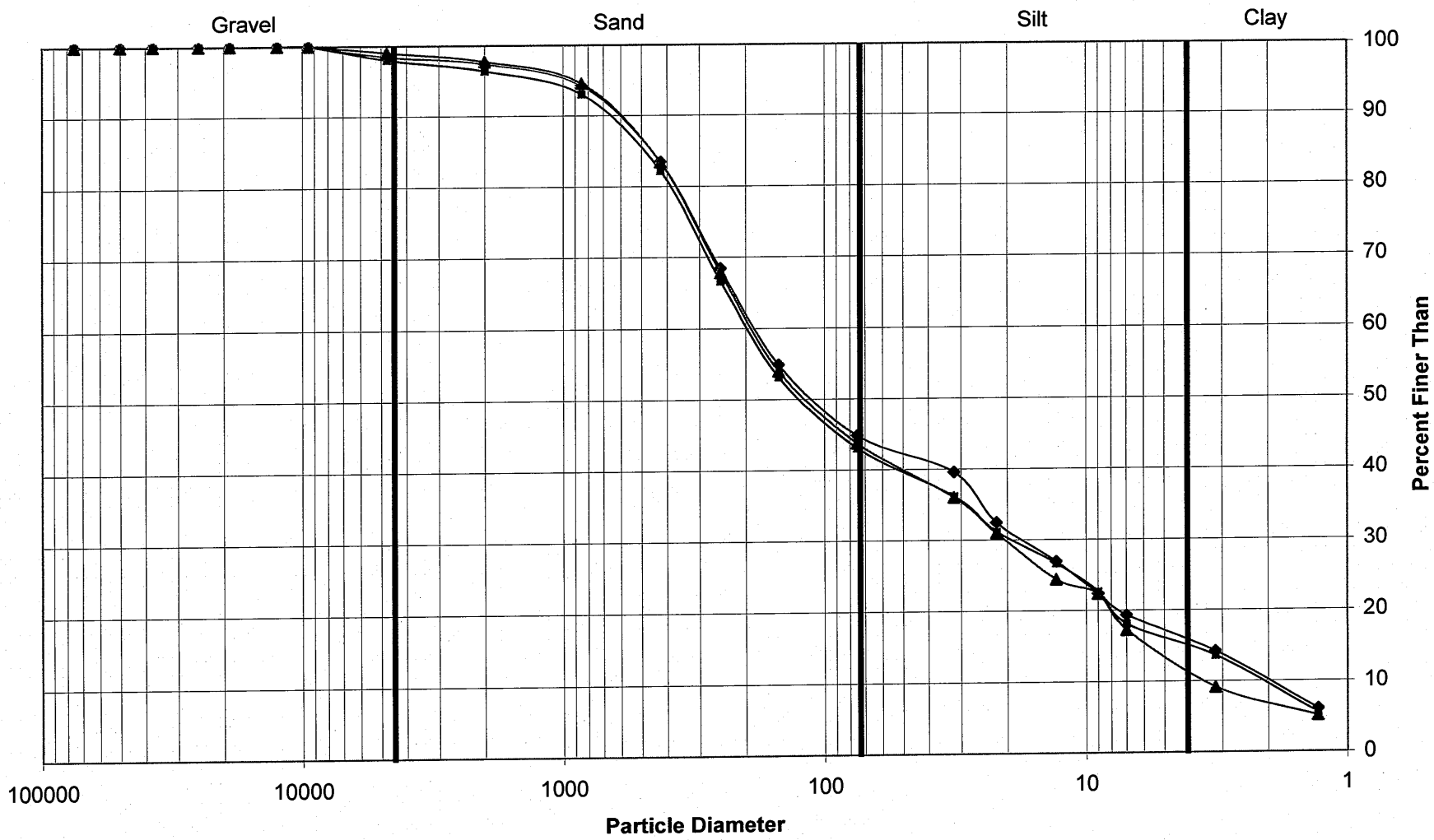
Relative Standard Deviation, By Size

Sample ID	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	32	22	13	9	7	3.2	1.3
VW19-04-08231	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4	97.4	94.2	83.5	68.4	54.9	44.8	39.6	32.5	26.9	22.3	19.3	14.2	6.1
VW19-04-08231	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.0	96.4	93.0	82.2	66.6	53.2	43.0	36.2	31.2	26.6	22.6	18.1	13.6	5.5
VW19-04-08231	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1	97.7	94.6	83.4	67.8	54.0	43.8	36.0	31.0	24.4	22.3	17.3	9.1	5.1
AVE	100.00	100.00	100.00	100.00	100.00	100.00	100.00	98.50	97.18	93.94	83.01	67.61	54.01	43.87	37.27	31.54	25.97	22.43	18.21	12.31	5.57
STDEV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53	0.70	0.82	0.74	0.92	0.87	0.90	1.99	0.81	1.39	0.17	1.01	2.76	0.51
%RSD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.72	0.88	0.89	1.36	1.61	2.05	5.34	2.58	5.35	0.76	5.56	22.44	9.10

This Triplicate applies to the Batch Containing the Following Samples

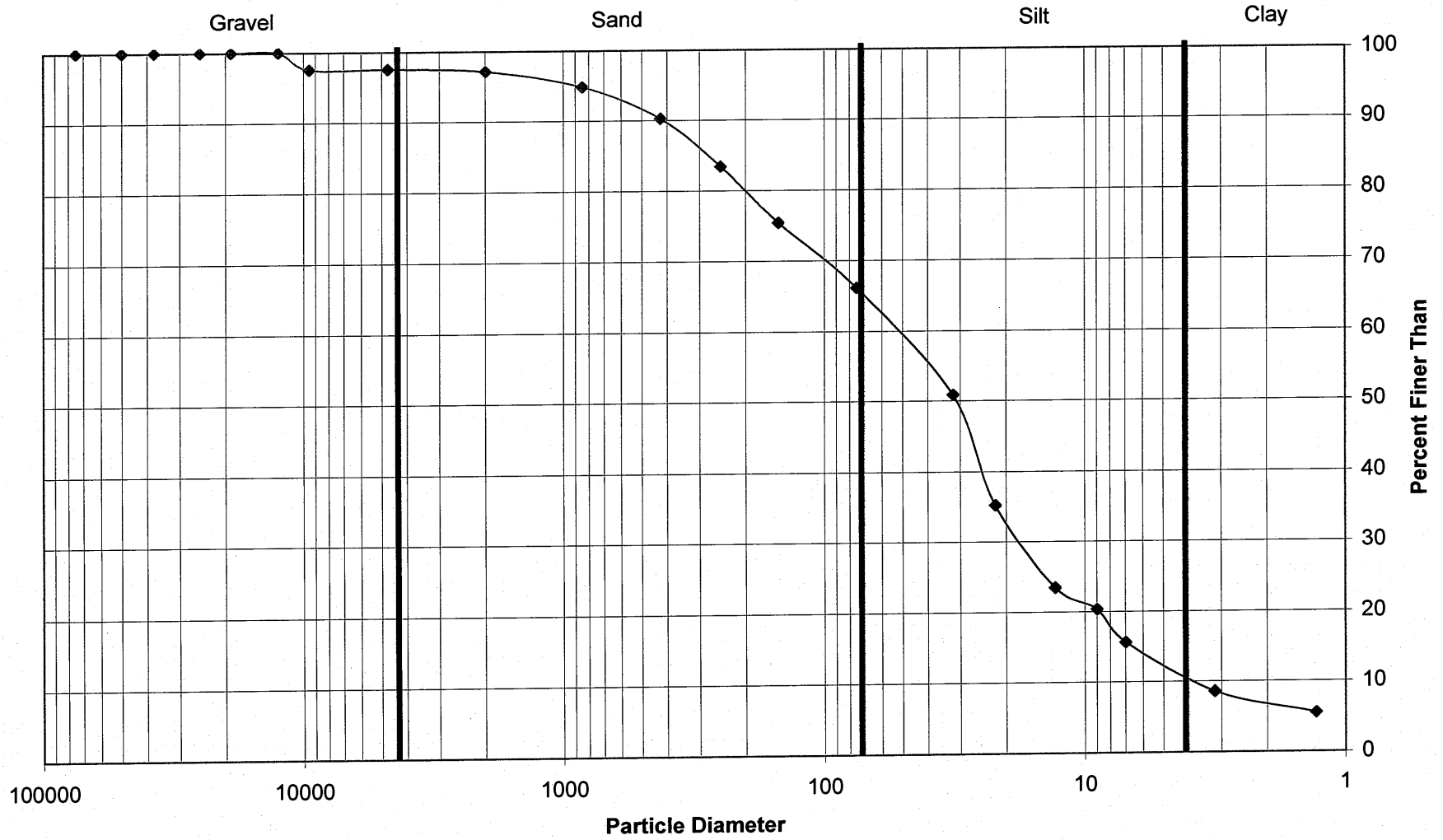
Sample ID	Date Sampled	Date Set up	Date Started	Date Complete	Data Qualifiers
WW19-04-082310	8/23/2010	9/3/2010	9/7/2010	9/9/2010	
	8/23/2010	9/3/2010	9/7/2010	9/9/2010	
	8/23/2010	9/3/2010	9/7/2010	9/9/2010	
WW19-02-082310	8/23/2010	9/3/2010	9/7/2010	9/9/2010	

### Grain Size Distribution by Hydrometer



—◆— WW19-04-082310      —■— WW19-04-082310      —▲— WW19-04-082310

### Grain Size Distribution by Hydrometer



—◆— WW19-02-082310

**SUB-ATTACHMENT 3D-1.5**  
**GeoEngineers 2013 Supplemental Investigation**



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Client: Geoengineers

Project: 0186-846-01, Task 1400 Gas Works Park

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\_\_\_\_\_  
Signature

May-02-2013  
Date



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

May 2, 2013

Zanna Satterwhite  
GeoEngineers, Inc.  
Plaza 600 Building  
600 Stewart Street, Suite 1700  
Seattle, WA 98101

**RE: Client Project: Gas Works Park, 0186-846-01**  
**ARI Job No.: WN09**

Dear Zanna:

Please find enclosed the Chain of Custody records (COCs), sample receipt documentation, and the final data package for samples from the project referenced above.

Sample receipt and details of these analyses are discussed in the Case Narrative.

An electronic copy of this package will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

A handwritten signature in black ink, appearing to read "Cheronne Oreiro", written over a circular stamp or mark.

Cheronne Oreiro  
Project Manager  
(206) 695-6214  
[cheronneo@arilabs.com](mailto:cheronneo@arilabs.com)  
[www.arilabs.com](http://www.arilabs.com)

cc: eFile: WN09

Enclosures

## Chain of Custody Documentation

ARI Job ID: WN09

# Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested: <b>Standard</b>	Date: <b>4/17/13</b>
ARI Client Company: <b>GeoEngineers</b>	Phone: <b>206-239-3258</b>	Page: <b>1</b> of <b>2</b>
Client Contact: <b>Tim Bailey</b>	No. of Coolers:	Cooler Temps:



**Analytical Resources, Incorporated**  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

Client Project Name: <b>Gas Works Park</b>						Analysis Requested							Notes/Comments	
Client Project #: <b>0186-846-01, Task 1400</b>		Samplers: <b>Bag Samples</b>				SIEVE ANALYSIS	PERCENT PASSING #200							
Sample ID	Date	Time	Matrix	No Containers										
MW 320	8.5-10.5'	4/10/13	'	SOIL	BAG		X							
	10.5-12.5					X								
	16.5-18					X								
	18.5-20.5					X								
	20.5-22.5					X								
	22.5-24						X							
	26.5-28						X							
	28.5-30.5					X								
	35.5-37					X								
	42-43						X							

Comments/Special Instructions	Relinquished by (Signature):	Received by (Signature):	Relinquished by (Signature):	Received by (Signature):
	Printed Name: <b>TIM BAILEY</b>	Printed Name: <b>Chris Brown</b>	Printed Name: <b>Chris Brown</b>	Printed Name: <b>A. Volgardsen</b>
	Company: <b>GeoEngineers</b>	Company: <b>GeoEngineers</b>	Company: <b>GeoEngineers</b>	Company: <b>ARI</b>
	Date & Time: <b>1445 4/17/13</b>	Date & Time: <b>1445 4/17/13</b>	Date & Time: <b>1705 4/18/13</b>	Date & Time: <b>4/18/13 1705</b>

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.

# Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: \_\_\_\_\_ Turn-around Requested: **Standard**

ARI Client Company: **GeoEngineers** Phone: **206-239-3258**

Client Contact: **Tim Bailey**

Date: **4/17/13**

Page: **2** of **2**

No. of Coolers: \_\_\_\_\_ Cooler Temps: \_\_\_\_\_



**Analytical Resources, Incorporated**  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

Client Project Name: **Gas Works Park**

Client Project #: **0186-846-01, Task 1400** Samplers: **Bag Samples**

						Analysis Requested						Notes/Comments
Sample ID	Date	Time	Matrix	No Containers	SIEVE ANALYSIS	PERCENT PASSING #20						
GEO-3 15-17'	4/12/13		SOIL	1 BAG	X							
GEO-3 20-21.5'	4/12/13		SOIL	1 BAG	X							
GEO-2 9-10.5'	4/11/13		"	"	X							
GEO-2 14-16'	4/11/13		"	"	X							
GEO-2 19-20.5'	4/11/13		"	"		X						
GEO-2 24-26'	4/11/13		"	"	X							
GEO-2 34-36'	4/11/13		"	"	X							
GEO-2 39-40.5'	4/11/13		"	"	X							
GEO-2 44-44.5'	4/11/13		"	"	X							

Comments/Special Instructions	Relinquished by (Signature)	Received by (Signature)	Relinquished by (Signature)	Received by (Signature)
	Printed Name	Printed Name	Printed Name	Printed Name
	Company	Company	Company	Company
	Date & Time	Date & Time	Date & Time	Date & Time
	Tim Bailey	Chris Broese	Chris Broese	A Volgardsen
	GeoEngineers	Geo	Geo	ARI
	1445 4/17/13	1445 4/17/13	1705 4/18/13	4/18/13 1705

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.



# Cooler Receipt Form

ARI Client GeoEngineers  
COC No(s) \_\_\_\_\_ (NA)  
Assigned ARI Job No WN 29

Project Name Gas works park  
Delivered by Fed-Ex UPS Courier Hand Delivered Other \_\_\_\_\_  
Tracking No: \_\_\_\_\_ (NA)

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES (NO)  
Were custody papers included with the cooler? (YES) NO  
Were custody papers properly filled out (ink, signed, etc) . . . . . (YES) NO

Temperature of Cooler(s) (°C) (recommended 2 0-6 0 °C for chemistry). . . . . 12.3  
If cooler temperature is out of compliance fill out form 00070F Temp Gun ID# 9189792

Cooler Accepted by AV Date: 4/18/13 Time: 1705

*Complete custody forms and attach all shipping documents*

**Log-In Phase:**

Was a temperature blank included in the cooler? . . . . . YES NO  
What kind of packing material was used? Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other \_\_\_\_\_  
Was sufficient ice used (if appropriate)? . . . . . IS NA YES (X)  
Were all bottles sealed in individual plastic bags? . . . . . YES NO  
Did all bottles arrive in good condition (unbroken)? . . . . . YES NO  
Were all bottle labels complete and legible? . . . . . YES NO  
Did the number of containers listed on COC match with the number of containers received? . . . . . YES NO  
Did all bottle labels and tags agree with custody papers? . . . . . YES NO  
Were all bottles used correct for the requested analyses? . . . . . YES NO  
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) (NA) YES NO  
Were all VOC vials free of air bubbles? . . . . . (NA) YES NO  
Was sufficient amount of sample sent in each bottle? . . . . . (YES) NO  
Date VOC Trip Blank was made at ARI. . . . . (NA)  
Was Sample Split by ARI: (NA) YES Date/Time \_\_\_\_\_ Equipment \_\_\_\_\_ Split by: \_\_\_\_\_

Samples Logged by: IS Date: 4-23-13 Time: 930

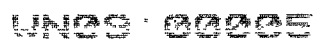
**\*\* Notify Project Manager of discrepancies or concerns \*\***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

**Additional Notes, Discrepancies, & Resolutions:**

By: \_\_\_\_\_ Date: \_\_\_\_\_

<p>Small Air Bubbles ~2mm</p>	<p>Peabubbles 2-4 mm</p>	<p>LARGE Air Bubbles &gt; 4 mm</p>	Small → "sm"
			Peabubbles → "pb"
			Large → "lg"
			Headspace → "hs"



**Case Narrative, Data Qualifiers, Control Limits**

**ARI Job ID: WN09**



<b>Client:</b> GeoEngineers	<b>ARI Job No.:</b> WN09
<b>Client Project:</b> Gas Works Park	<b>Client Project No.:</b> 0186-846-01, Task 1400

### Case Narrative

1. Nineteen samples were submitted for analysis on April 18, 2013.
2. Fourteen samples were submitted for grain size distribution according to ASTM D422. The samples were prepared according to ASTM D421.
3. An assumed specific gravity of 2.65 was used in the hydrometer calculations.
4. A standard milkshake mixer type device was used to disperse the fine fraction sample for one minute.
5. One sample from this job, MW32D 35.5-37', was chosen for triplicate analysis. The triplicate data can be found on the QA summary table.
6. Due to the sandy nature of the samples, there was not enough fine material to acquire accurate hydrometer readings. Samples MW32D 18.5-20.5', MW32D 20.5-22.5' and GEO-2 14-16' required curve fitting between the sand and silt fractions.
7. Five samples were submitted for percent finer than the No. 200 sieve. The samples were run according to ASTM D1140.
8. The data is provided in summary tables and plots.
9. There were no further anomalies in the samples or test method.

Released by: *Elizabeth Woble*  
Technician

Date: May 1, 2013

Reviewed by: *Katherine J Buchanan*  
Technician

Date: May 1, 2013



# Sample ID Cross Reference Report



ARI Job No: WN09  
Client: Geoengineers  
Project Event: 0186-846-01, Task 1400  
Project Name: Gas Works Park

Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1. MW32D 8.5-10.5'	WN09A	13-8517	Soil	04/10/13	04/18/13 17:05
2. MW32D 22.5-24'	WN09B	13-8518	Soil	04/10/13	04/18/13 17:05
3. MW32D 26.5-28'	WN09C	13-8519	Soil	04/10/13	04/18/13 17:05
4. MW32D 42-43'	WN09D	13-8520	Soil	04/10/13	04/18/13 17:05
5. GEO-2 19-20.5'	WN09E	13-8521	Soil	04/11/13	04/18/13 17:05
6. MW32D 10.5-12.5'	WN09F	13-8522	Soil	04/10/13	04/18/13 17:05
7. MW32D 16.5-18'	WN09G	13-8523	Soil	04/10/13	04/18/13 17:05
8. MW32D 18.5-20.5'	WN09H	13-8524	Soil	04/10/13	04/18/13 17:05
9. MW32D 20.5-22.5'	WN09I	13-8525	Soil	04/10/13	04/18/13 17:05
10. MW32D 28.5-30.5'	WN09J	13-8526	Soil	04/10/13	04/18/13 17:05
11. MW32D 35.5-37'	WN09K	13-8527	Soil	04/10/13	04/18/13 17:05
12. GEO-3 15-17'	WN09L	13-8528	Soil	04/12/13	04/18/13 17:05
13. GEO-3 20-21.5'	WN09M	13-8529	Soil	04/12/13	04/18/13 17:05
14. GEO-2 9-10.5'	WN09N	13-8530	Soil	04/11/13	04/18/13 17:05
15. GEO-2 14-16'	WN09O	13-8531	Soil	04/11/13	04/18/13 17:05
16. GEO-2 24-26'	WN09P	13-8532	Soil	04/11/13	04/18/13 17:05
17. GEO-2 34-36'	WN09Q	13-8533	Soil	04/11/13	04/18/13 17:05
18. GEO-2 39-40.5'	WN09R	13-8534	Soil	04/11/13	04/18/13 17:05
19. GEO-2 44-44.5'	WN09S	13-8535	Soil	04/11/13	04/18/13 17:05

**Geotechnical Analysis  
Report and Summary QC Forms**

**ARI Job ID: WN09**

**GEOTECHNICAL ANALYSIS DATA SHEET**  
**Percent Fines by Method ASTM D1140**



Data Release Authorized: *ey*  
Reported: 05/01/13  
Date Received: 04/18/13  
Page 1 of 1

QC Report No: WN09-Geoengineers  
Project: Gas Works Park  
0186-846-01, Task 1400

<b>Client/ ARI ID</b>	<b>Date Sampled</b>	<b>Matrix</b>	<b>Analysis Date</b>	<b>Result</b>
MW32D 8.5-10.5' WN09A 13-8517	04/10/13	Soil	04/24/13 14:45	3.7
MW32D 22.5-24' WN09B 13-8518	04/10/13	Soil	04/24/13 14:45	8.3
MW32D 26.5-28' WN09C 13-8519	04/10/13	Soil	04/24/13 14:45	20.5
MW32D 42-43' WN09D 13-8520	04/10/13	Soil	04/24/13 14:45	6.7
GEO-2 19-20.5' WN09E 13-8521	04/11/13	Soil	04/24/13 14:45	10.8

**Reported in Percent**

GeoEngineers  
Gas Works Park  
0186-846-01, Task 1400

ASTM D1140  
Percentage of Material Finer than #200 Sieve

Sample Identification	Initial Dry Mass of Sample (g)	Percent Fines (<#200 Sieve)
MW32D 8.5-10.5'	279.44	3.7
MW32D 22.5-24'	195.73	8.3
MW32D 26.5-28'	566.47	20.5
MW32D 42-43'	21.33	6.7
GEO-2 19-20.5'	278.47	10.8

WN09

GeoEngineers  
0186-846-01, Task 1400  
Gas Works Park

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
MW32D 35 5-37'	100.0	100.0	100.0	100.0	100.0	92.8	92.0	74.4	64.1	55.8	40.5	18.4	7.0	2.9	1.5	1.5	1.2	0.9	0.6	0.6	0.6
	100.0	100.0	100.0	100.0	100.0	95.5	92.6	75.4	67.9	59.8	44.4	19.8	7.2	2.7	1.5	1.5	1.2	0.9	0.6	0.6	0.6
	100.0	100.0	100.0	100.0	100.0	92.3	88.8	78.9	69.1	61.2	46.3	21.3	7.8	3.0	1.6	1.3	1.3	0.9	0.6	0.6	0.6
MW32D 10 5-12.5'	100.0	100.0	100.0	100.0	97.3	94.5	87.5	59.3	37.8	26.8	16.4	10.4	8.0	5.7	5.1	4.2	2.9	2.4	1.8	0.9	0.4
MW32D 16 5-18'	100.0	100.0	100.0	100.0	91.5	87.3	80.3	66.3	53.4	41.9	34.8	29.3	24.6	18.9	16.9	15.3	13.0	10.7	9.2	6.1	3.4
MW32D 18.5-20 5'	100.0	100.0	100.0	100.0	100.0	95.6	92.0	78.3	54.5	32.5	21.5	15.2	11.4	8.1	7.9	6.7	6.2	5.1	4.2	3.4	2.5
MW32D 20 5-22 5'	100.0	100.0	100.0	97.0	94.0	89.3	87.3	76.3	63.9	47.8	35.0	25.0	17.7	11.1	11.1	9.1	6.8	6.2	4.6	2.9	1.3
MW32D 28 5-30 5'	100.0	100.0	100.0	82.2	67.9	46.6	39.7	30.6	25.5	20.6	14.7	8.5	5.0	3.1	2.6	2.2	1.7	1.3	0.9	0.4	0.3
GEO-3 15-17'	100.0	100.0	100.0	96.1	81.2	64.1	54.2	35.9	22.9	14.1	8.2	4.4	2.5	1.4	1.3	1.2	1.0	0.8	0.5	0.3	0.2
GEO-3 20-21 5'	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.9	85.1	67.2	43.1	21.0	9.4	4.7	3.4	3.0	2.6	2.2	1.7	0.9	0.9
GEO-2 9-10 5'	100.0	100.0	100.0	100.0	95.7	95.0	79.0	54.4	46.0	40.0	33.4	27.2	22.3	17.3	12.8	11.4	8.8	6.8	5.1	2.6	0.9
GEO-2 14-16'	100.0	100.0	100.0	95.2	95.2	90.8	86.3	71.9	55.6	37.9	26.0	17.7	12.1	7.0	6.6	6.0	4.7	3.6	2.7	1.1	0.5
GEO-2 24-26'	100.0	100.0	100.0	100.0	100.0	99.5	95.3	90.4	83.4	77.9	71.3	60.6	44.4	23.2	15.1	11.9	9.2	7.6	5.4	3.2	1.1
GEO-2 34-36'	100.0	100.0	79.6	58.6	55.3	48.8	44.9	41.3	37.1	30.7	22.3	13.6	6.1	2.0	0.8	0.6	0.4	0.4	0.0	0.0	0.0
GEO-2 39-40.5'	100.0	100.0	59.2	53.2	46.0	44.6	42.9	38.4	34.1	30.6	23.0	10.4	4.0	1.8	1.0	0.7	0.7	0.3	0.3	0.0	0.0
GEO-2 44-44 5'	100.0	100.0	100.0	90.7	83.6	73.9	68.1	60.4	53.7	49.1	38.9	18.4	6.5	1.9	0.5	0.3	0.3	0.0	0.0	0.0	0.0

Testing performed according to ASTM D421/D422

27000 6011

GeoEngineers  
0186-846-01, Task 1400  
Gas Works Park

Percent Retained in Each Size Fraction

Description	% Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand			% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay	
	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3 2	3 2-1 3	<1 3	
MW32D 35 5-37'	0.0	0.0	0.0	0.0	7.2	0.8	17.6	10.3	8.3	15.3	22.1	11.4	4.1	1.5	0.0	0.3	0.3	0.3	0.0	0.0	0.6	
	0.0	0.0	0.0	0.0	4.5	2.9	17.2	7.5	8.1	15.4	24.6	12.6	4.5	1.1	0.0	0.3	0.3	0.3	0.0	0.0	0.6	
	0.0	0.0	0.0	0.0	7.7	3.5	10.0	9.8	7.9	14.9	25.0	13.4	4.9	1.4	0.3	0.0	0.3	0.3	0.0	0.0	0.6	
MW32D 10.5-12 5'	0.0	0.0	0.0	2.7	2.8	7.0	28.3	21.4	11.0	10.4	6.0	2.4	2.3	0.6	0.9	1.3	0.6	0.6	0.9	0.6	0.4	
MW32D 16.5-18'	0.0	0.0	0.0	8.5	4.3	6.9	14.0	13.0	11.4	7.2	5.5	4.8	5.6	2.1	1.5	2.3	2.3	1.5	3.1	2.7	3.4	
MW32D 18.5-20 5'	0.0	0.0	0.0	0.0	4.4	3.6	13.7	23.7	22.1	11.0	6.3	3.8	3.3	0.2	1.1	0.6	1.1	0.8	0.8	0.8	2.5	
MW32D 20 5-22 5'	0.0	0.0	3.0	3.0	4.7	2.0	10.9	12.4	16.1	12.8	10.0	7.3	6.5	0.1	2.0	2.3	0.7	1.6	1.6	1.6	1.3	
MW32D 28 5-30 5'	0.0	0.0	17.8	14.4	21.3	6.9	9.2	5.0	5.0	5.9	6.2	3.5	1.9	0.5	0.4	0.5	0.4	0.4	0.5	0.1	0.3	
GEO-3 15-17'	0.0	0.0	3.9	14.9	17.1	10.0	18.2	13.1	8.7	5.9	3.9	1.9	1.1	0.1	0.1	0.1	0.2	0.3	0.1	0.1	0.2	
GEO-3 20-21 5'	0.0	0.0	0.0	0.0	0.0	0.0	2.1	12.8	17.9	24.1	22.1	11.6	4.7	1.2	0.4	0.4	0.4	0.4	0.9	0.0	0.9	
GEO-2 9-10 5'	0.0	0.0	0.0	4.3	0.7	16.0	24.5	8.4	6.0	6.6	6.1	4.9	5.0	4.5	1.4	2.6	2.0	1.7	2.6	1.7	0.9	
GEO-2 14-16'	0.0	0.0	4.8	0.0	4.5	4.4	14.5	16.3	17.7	11.9	8.3	5.6	5.1	0.4	0.5	1.4	1.1	0.8	1.6	0.5	0.5	
GEO-2 24-26'	0.0	0.0	0.0	0.0	0.5	4.1	4.9	7.0	5.6	6.6	10.6	16.3	21.1	8.1	3.2	2.7	1.6	2.2	2.2	2.2	1.1	
GEO-2 34-36'	0.0	20.4	21.0	3.3	6.5	3.9	3.7	4.2	6.4	8.4	8.7	7.4	4.2	1.2	0.2	0.2	0.0	0.4	0.0	0.0	0.0	
GEO-2 39-40.5'	0.0	40.8	6.1	7.2	1.4	1.7	4.6	4.2	3.6	7.6	12.5	6.4	2.2	0.8	0.3	0.0	0.3	0.0	0.3	0.0	0.0	
GEO-2 44-44 5'	0.0	0.0	9.3	7.1	9.6	5.8	7.7	6.7	4.6	10.2	20.5	12.0	4.5	1.4	0.3	0.0	0.3	0.0	0.0	0.0	0.0	

S:\000 : 6014

Client	GeoEngineers	Project No	0186-846-01, Task 14C
ARI Tnplicate Sample ID	WN09K	Project Batch No	Gas Works Park WN09-01
Client Tnplicate Sample ID	MW32D 35 5-37'	Page	1 of 1

Relative Standard Deviation, By Size

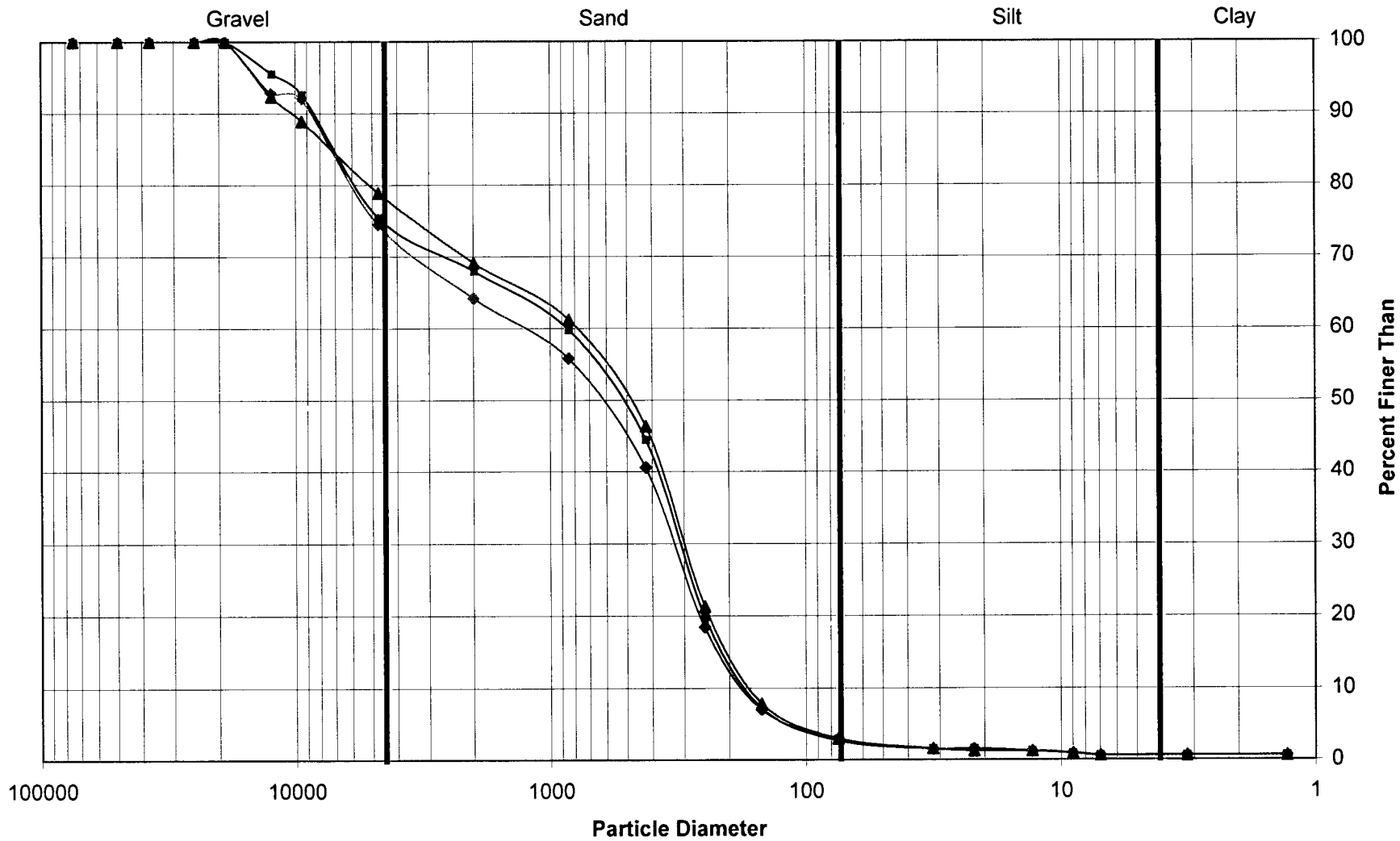
Sample ID	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	32	22	13	9	7	3 2	1 3
MW32D 35 5-37'	100 0	100 0	100 0	100 0	100 0	92 8	92 0	74 4	64 1	55 8	40 5	18 4	7 0	2 9	1 5	1 5	1 2	0 9	0 6	0 6	0 6
MW32D 35 5-37'	100 0	100 0	100 0	100 0	100 0	95 5	92 6	75 4	67 9	59 8	44 4	19 8	7 2	2 7	1 5	1 5	1 2	0 9	0 6	0 6	0 6
MW32D 35 5-37'	100 0	100 0	100 0	100 0	100 0	92 3	88 8	78 9	69 1	61 2	46 3	21 3	7 8	3 0	1 6	1 3	1 3	0 9	0 6	0 6	0 6
AVE	100 00	100 00	100 00	100 00	100 00	93 53	91 13	76 21	67 02	58 90	43 72	19 82	7 33	2 85	1 52	1 42	1 22	0 91	0 61	0 61	0 61
STDEV	0 00	0 00	0 00	0 00	0 00	1 72	2 02	2 35	2 60	2 80	2 94	1 45	0 44	0 17	0 06	0 14	0 05	0 04	0 03	0 03	0 03
%RSD	0 00	0 00	0 00	0 00	0 00	1 84	2 21	3 08	3 88	4 76	6 72	7 31	6 04	5 92	4 26	10 10	4 26	4 26	4 26	4 26	4 26

This Tnplicate applies to the Batch Containing the Following Samples

Sample ID	Date Sampled	Date Set up	Date Started	Date Complete	Data Qualifiers
MW32D 35 5-37'	4/10/2013	4/24/2013	4/29/2013	5/1/2013	
	4/10/2013	4/24/2013	4/29/2013	5/1/2013	
	4/10/2013	4/24/2013	4/29/2013	5/1/2013	
MW32D 10 5-12 5'	4/10/2013	4/24/2013	4/29/2013	5/1/2013	
MW32D 16 5-18'	4/10/2013	4/24/2013	4/29/2013	5/1/2013	
MW32D 18 5-20 5'	4/10/2013	4/24/2013	4/29/2013	5/1/2013	
MW32D 20 5-22 5'	4/10/2013	4/24/2013	4/29/2013	5/1/2013	
MW32D 28 5-30 5'	4/10/2013	4/24/2013	4/29/2013	5/1/2013	
GEO-3 15-17'	4/12/2013	4/24/2013	4/29/2013	5/1/2013	
GEO-3 20-21 5'	4/12/2013	4/24/2013	4/29/2013	5/1/2013	
GEO-2 9-10 5'	4/11/2013	4/24/2013	4/29/2013	5/1/2013	
GEO-2 14-16'	4/11/2013	4/24/2013	4/29/2013	5/1/2013	
GEO-2 24-26'	4/11/2013	4/24/2013	4/29/2013	5/1/2013	
GEO-2 34-36'	4/11/2013	4/24/2013	4/29/2013	5/1/2013	
GEO-2 39-40 5'	4/11/2013	4/24/2013	4/29/2013	5/1/2013	
GEO-2 44-44 5'	4/11/2013	4/24/2013	4/29/2013	5/1/2013	

117000 - 66141

### Grain Size Distribution by Hydrometer



◆ MW32D 35.5-37'

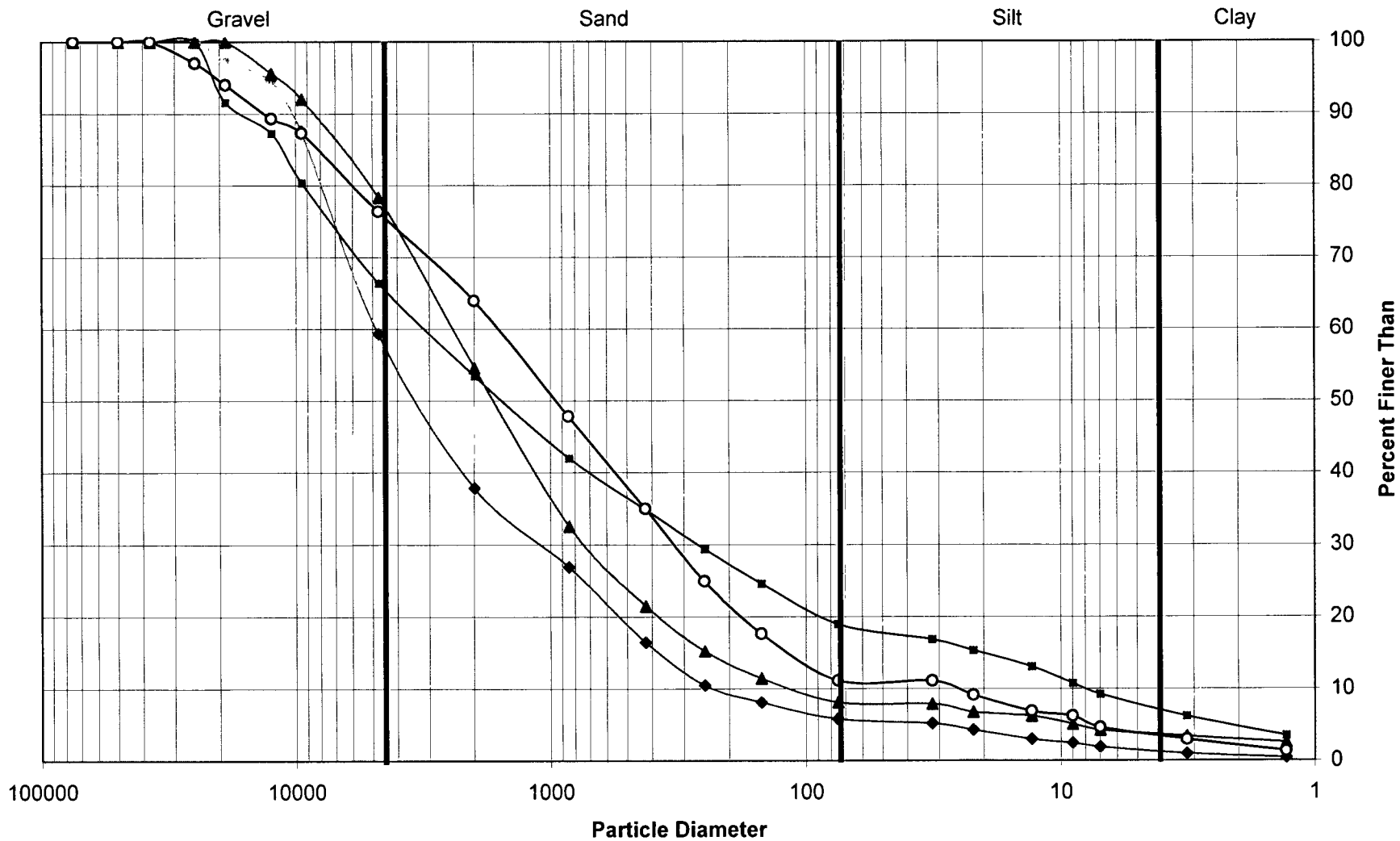
■ MW32D 35.5-37'

▲ MW32D 35.5-37'

57000.60111



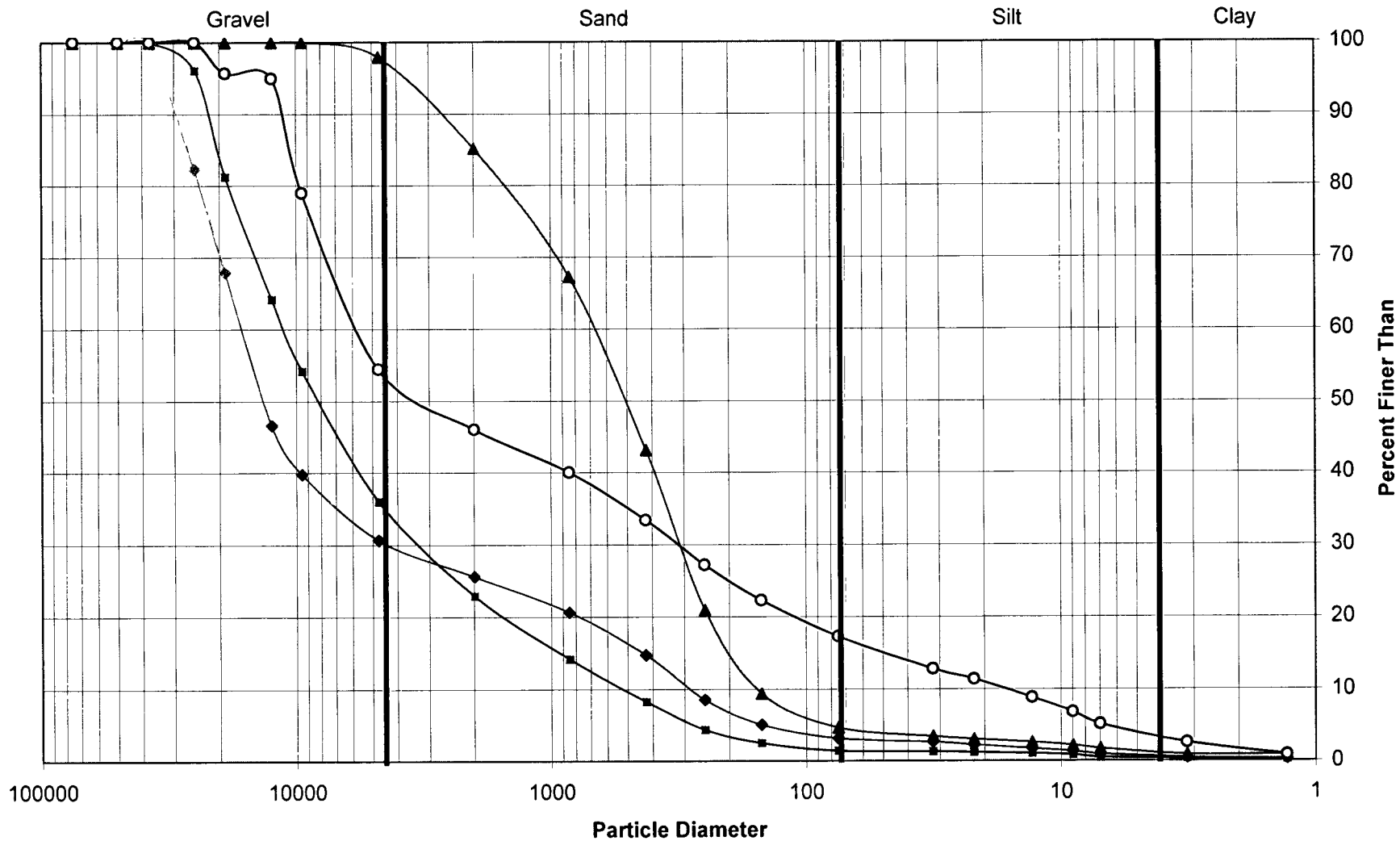
# Grain Size Distribution by Hydrometer



◆ MW32D 10.5-12.5'      ■ MW32D 16.5-18'      ▲ MW32D 18.5-20.5'      ○ MW32D 20.5-22.5'

57000 . 00114

### Grain Size Distribution by Hydrometer



◆ MW32D 28.5-30.5'

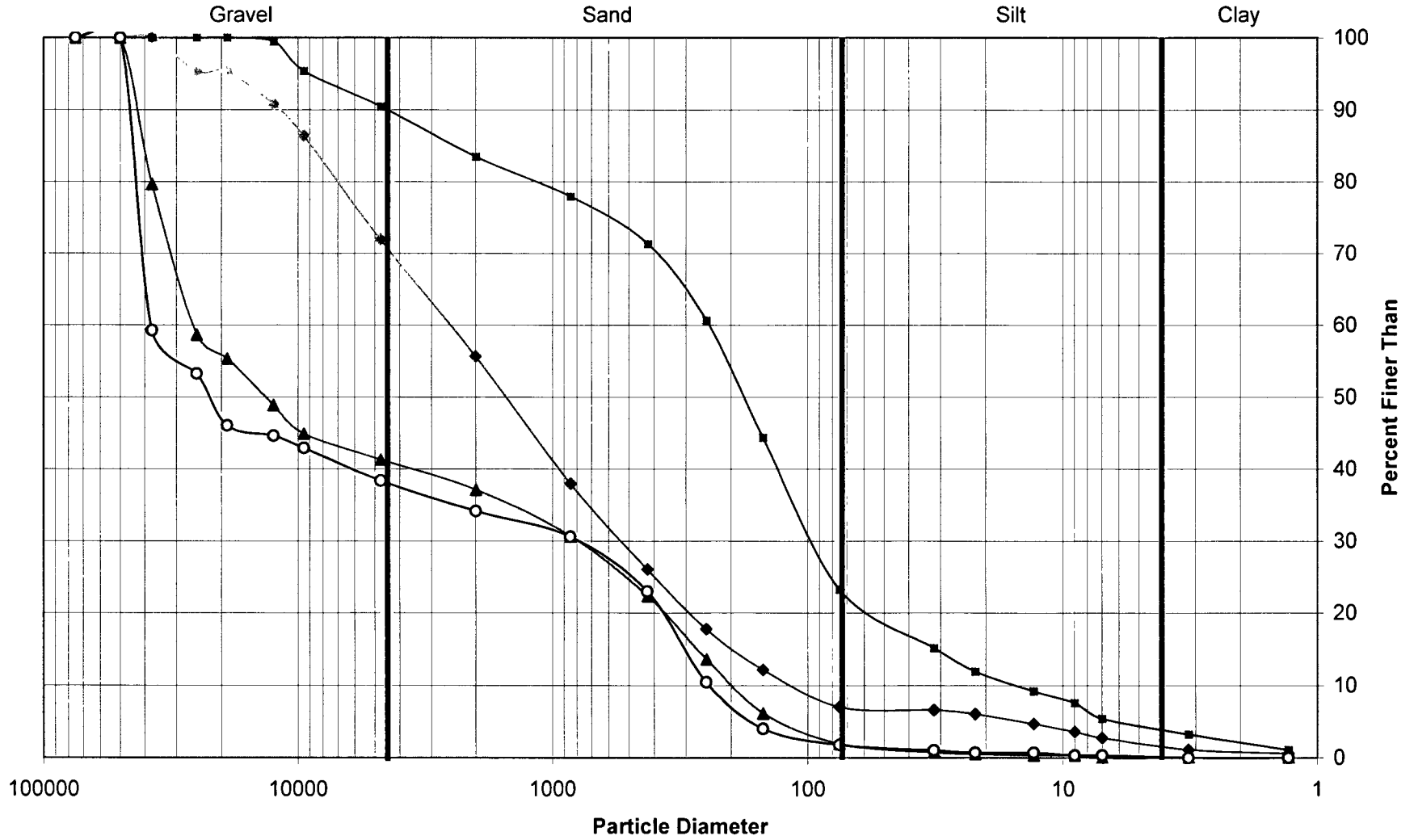
■ GEO-3 15-17'

▲ GEO-3 20-21.5'

○ GEO-2 9-10.5'

UNIVERSITY OF MISSISSIPPI

### Grain Size Distribution by Hydrometer



◆ GEO-2 14-16'

■ GEO-2 24-26'

▲ GEO-2 34-36'

○ GEO-2 39-40.5'

51000 . 60000

**ANALYTICAL RESOURCES INCORPORATED**

**Percent Finer Than the No. 200 Sieve  
ASTM D-1140**

ARI Job No.: WN09

Date Set up: 04.24.2013

Tested by: kb

Notes: SAMPLES A, B, C, AND E CONSUMED. VOLUME ON THESE SAMPLES WAS LOW.

ARI Sample ID	A	B	C	D	E					
Tare Number	A	B	C <sup>Ⓢ</sup>	D	E					
Tare, g	10.33	10.04	749.72	10.21	10.30					
Wet Soil + Tare, g	333.23	283.26	1731.23	35.92	457.03					
Dry Soil + Tare, g	289.77	205.77	1315.66	31.54	288.77					
Dry Soil + Tare after Wash	279.33	189.62	1199.51	30.11	258.63					

ARI Sample ID										
Tare Number										
Tare, g										
Wet Soil + Tare, g										
Dry Soil + Tare, g										
Dry Soil + Tare after Wash										

UNISO 00019

**Geotechnical Raw Data  
Analyst Notes and Raw Data**

**ARI Job ID: WN09**

Sample Number	MW32D 35 5-37	100 00	100 00	100 00	100 00	100 00	100 00	92 80	91 96	74 38	64 09	55 77	40 51	18 38	6 99	2 93	1 45	1 45	1 16	0 87	0 58	0 58	0 58
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	36 7	23 2	13 4	9 5	6 8	3 3	1 4
Test Temperature		21	5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200						
Specific Gravity		2 65																					
		Sieve Analysis Portion										Hydrometer Analysis Portion											
		Sieve Size	Weight of Sol + Tare	Total Weight of Soil		Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a								
		5"	10 13	0 00		0 00	100 00																
		3"	10 13	0 00		0 00	100 00																
		2"	10 13	0 00		0 00	100 00																
Wet Wt & Tare	25 29	1 5"	10 13	0 00		0 00	100 00	1	9	6 0	1 74	14 8	51 78251	0 01345	1 001385								
Dry Wt & Tare	25 23	1	10 13	0 00		0 00	100 00	2	8 5	6 0	1 45	14 9	36 71684	0 01345	1 001385								
Wt Moisture	0 06	3/4	10 13	0 00		0 00	100 00	5	8 5	6 0	1 45	14 9	23 22177	0 01345	1 001385								
Wt Tare	1 57	1/2	25 28	15 15		7 20	92 80	15	8	6 0	1 16	15 0	13 4439	0 01345	1 001385								
Dry Soil	23 66	3/8	27 05	16 92		8 04	91 96	30	7 5	6 0	0 87	15 1	9 532229	0 01345	1 001385								
Moisture Content	0 002535926	4	64 02	53 89		25 62	74 38	60	7	6 0	0 58	15 2	6 758607	0 01345	1 001385								
Air Dry Total Sample	210 72	10	85 67	75 54		35 91	64 09	250	7	6 0	0 58	15 2	3 311026	0 01345	1 001385								
Oven Dry Total Samp	210 3780607	20	100 03	14 36	8 32	44 23	55 77	1440	7	6 0	0 58	15 2	1 379595	0 01345	1 001385								
Air Dry Hydro Sample	110 86	40	126 36	40 69	23 58	59 49	40 51																
Oven Dry Wt Hydro	110 5795764	60	164 54	78 87	45 71	81 62	18 38																
Amount Plus #10	75 54	100	184 19	98 52	57 10	93 01	6 99																
W (14 2) =	172 5283077	200	191 2	105 53	61 17	97 07	2 93																

12000 00001

Sample Number	MW32D 35 5-37"	100 00	100 00	100 00	100 00	100 00	100 00	95 50	92 60	75 39	67 88	59 75	44 38	19 80	7 17	2 66	1 54	1 54	1 23	0 93	0 62	0 62	0 62
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	36 7	23 2	13 4	9 5	6 8	3 3	1 4
Test Temperature		21	5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200						
Specific Gravity		2 65																					
		Sieve Analysis Portion																					
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
		5"	10 06	0 00	0 00	100 00																	
		3"	10 06	0 00	0 00	100 00																	
		2"	10 06	0 00	0 00	100 00																	
		1 5"	10 06	0 00	0 00	100 00	1	9	6	1 85	14 8	51 78251	0 01345	1 001385									
Wet Wt & Tare	30 7	1	10 06	0 00	0 00	100 00	2	8 5	6	1 54	14 9	36 71684	0 01345	1 001385									
Dry Wt & Tare	30 6	3/4	10 06	0 00	0 00	100 00	5	8 5	6	1 54	14 9	23 22177	0 01345	1 001385									
Wt Moisture	0 1	1/2	19 34	9 28	4 50	95 50	15	8	6	1 23	15 0	13 4439	0 01345	1 001385									
Wt Tare	1 56	3/8	25 31	15 25	7 40	92 60	30	7 5	6	0 93	15 1	9 532229	0 01345	1 001385									
Dry Soil	29 04	4	60 77	50 71	24 61	75 39	60	7	6	0 62	15 2	6 758607	0 01345	1 001385									
Moisture Content	0 003443526	10	76 25	66 19	32 12	67 88	250	7	6	0 62	15 2	3 311028	0 01345	1 001385									
Air Dry Total Sample	206 56	20	89 45	13 20	8 13	40 25	59 75	1440	7	6	0 62	15 2	1 379595	0 01345	1 001385								
Oven Dry Total Samp	206 078291	40	114 41	38 16	23 50	55 62	44 38																
Air Dry Hydro Sample	110 59	60	154 31	78 06	48 08	80 20	19 80																
Oven Dry Wt Hydro	110 2104873	100	174 82	98 57	60 71	92 83	7 17																
Amount Plus #10	66 19	200	182 14	105 89	65 22	97 34	2 66																
W (14 2) =	162 3580409																						

22000 60141

Sample Number	MW32D 35 5-37	100 00	100 00	100 00	100 00	100 00	100 00	92 29	88 83	78 86	69 07	61 18	46 28	21 28	7 83	2 97	1 58	1 26	1 26	0 95	0 63	0 63	0 63
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	36 7	23 3	13 4	9 5	6 8	3 3	1 4
Test Temperature		21 5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Specific Gravity		2 65																					
		Sieve Analysis Portion										Hydrometer Analysis Portion											
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
		5"	10 4	0 00	0 00	100 00																	
		3"	10 4	0 00	0 00	100 00																	
		2"	10 4	0 00	0 00	100 00																	
Wet Wt & Tare		32 23	1 1/2"	10 4	0 00	0 00	100 00	1	9	6	1 89	14 8	51 78251	0 01345	1 001385								
Dry Wt & Tare		32 111	1	10 4	0 00	0 00	100 00	2	8 5	6	1 58	14 9	36 71684	0 01345	1 001385								
Wt Moisture		0 119	3/4	10 4	0 00	0 00	100 00	5	8	6	1 26	15 0	23 28552	0 01345	1 001385								
Wt Tare		1 51	1/2	26 16	15 76	7 71	92 29	15	8	6	1 26	15 0	13 4439	0 01345	1 001385								
Dry Soil		30 601	3/8	33 22	22 82	11 17	88 83	30	7 5	6	0 95	15 1	9 532229	0 01345	1 001385								
Moisture Content		0 003888762	4	53 6	43 20	21 14	78 86	60	7	6	0 63	15 2	6 758607	0 01345	1 001385								
Air Dry Total Sample		204 88	10	73 59	63 19	30 93	69 07	250	7	6	0 63	15 2	3 311028	0 01345	1 001385								
Oven Dry Total Samp		204 3311357	20	86 13	12 54	7 90	38 82	1440	7	6	0 63	15 2	1 379595	0 01345	1 001385								
Air Dry Hydro Sample		110 11	40	109 79	36 20	22 80	53 72																
Oven Dry Wt Hydro		109 6834671	60	149 49	75 90	47 80	78 72																
Amount Plus #10		63 19	100	170 84	97 25	61 24	92 17																
W (14 2) =		158 7896207	200	178 55	104 96	66 10	97 03																

20000 . 6011



Sample Number	MW32D 10 5-12 5'	100 00	100 00	100 00	100 00	100 00	97 28	94 50	87 54	59 26	37 82	26 84	16 43	10 43	8 04	5 74	5 14	4 22	2 94	2 38	1 83	0 92	0 37
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	34 3	22 0	13 0	9 3	6 6	3 3	1 4
Test Temperature	21 5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200								
Specific Gravity	2 65																						
		Sieve Analysis Portion										Hydrometer Analysis Portion											
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
		5"	10 25	0 00	0 00	100 00																	
		3"	10 25	0 00	0 00	100 00																	
		2"	10 25	0 00	0 00	100 00																	
Wet Wt & Tare	50 65	1 5"	10 25	0 00	0 00	100 00	1	23	6	6 24	12 5	47 60609	0 01345	1 001385									
Dry Wt & Tare	49 68	1	10 25	0 00	0 00	100 00	2	20	6	5 14	13 0	34 31681	0 01345	1 001385									
Wt Moisture	0 97	3/4	21 81	11 56	2 72	97 28	5	17 5	6	4 22	13 4	22 04273	0 01345	1 001385									
Wt Tare	1 52	1/2	33 67	23 42	5 50	94 50	15	14	6	2 94	14 0	12 99534	0 01345	1 001385									
Dry Soil	48 16	3/8	63 28	53 03	12 46	87 54	30	12 5	6	2 38	14 2	9 269405	0 01345	1 001385									
Moisture Content	0 020141196	4	183 66	173 41	40 74	59 26	60	11	6	1 83	14 5	6 610761	0 01345	1 001385									
Air Dry Total Sample	428 85	10	274 89	264 64	62 18	37 82	250	8 5	6	0 92	14 9	3 284054	0 01345	1 001385									
Oven Dry Total Samp	425 6079137	20	304 85	29 96	10 98	73 16	1440	7	6	0 37	15 2	1 379595	0 01345	1 001385									
Air Dry Hydro Sample	105 31	40	333 28	58 39	21 39	83 57																	
Oven Dry Wt Hydro	103 2308081	60	349 65	74 76	27 39	89 57																	
Amount Plus #10	264 64	100	356 17	81 28	29 78	91 96																	
W (14 2) =	272 9478679	200	362 44	87 55	32 08	94 26																	

12000 5000

Sample Number	MW32D 16 5-18	100 00	100 00	100 00	100 00	100 00	91 54	87 26	80 34	66 35	53 38	41 95	34 78	29 33	24 57	18 94	16 86	15 32	13 03	10 73	9 19	6 13	3 45	
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	32 5	20 9	12 3	8 9	6 3	3 2	1 4	
Test Temperature		21 5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200								
Specific Gravity		2 65																						
		Sieve Analysis Portion										Hydrometer Analysis Portion												
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a										
		5"	10 32	0 00	0 00	100 00																		
		3"	10 32	0 00	0 00	100 00																		
		2"	10 32	0 00	0 00	100 00																		
		1 5"	10 32	0 00	0 00	100 00	1	33	6	20 69	10 9	44 38298	0 01345	1 001385										
Wet Wt & Tare	11 57	1	10 32	0 00	0 00	100 00	2	28	6	16 86	11 7	32 54301	0 01345	1 001385										
Dry Wt & Tare	11 37	3/4	25 44	15 12	8 46	91 54	5	26	6	15 32	12 0	20 86812	0 01345	1 001385										
Wt Moisture	0 2	1/2	33 09	22 77	12 74	87 26	15	23	6	13 03	12 5	12 29184	0 01345	1 001385										
Wt Tare	1 55	3/8	45 45	35 13	19 66	80 34	30	20	6	10 73	13 0	8 860563	0 01345	1 001385										
Dry Soil	9 82	4	70 45	60 13	33 65	66 35	60	18	6	9 19	13 3	6 343745	0 01345	1 001385										
Moisture Content	0 020366599	10	93 62	83 30	46 62	53 38	250	14	6	6 13	14 0	3 183195	0 01345	1 001385										
Air Dry Total Sample	180 61	20	108 56	14 94	11 43	58 05	1440	10 5	6	3 45	14 6	1 353225	0 01345	1 001385										
Oven Dry Total Samp	178 6676846	40	117 92	24 30	18 59	65 22	34 78																	
Air Dry Hydro Sample	71 18	60	125 05	31 43	24 05	70 67	29 33																	
Oven Dry Wt Hydro	69 75924152	100	131 27	37 65	28 81	75 43	24 57																	
Amount Plus #10	83 30	200	138 62	45 00	34 43	81 06	18 94																	
W (14 2) =	130 6912526																							

20200 : 6614

Sample Number	MW32D 18 5-20 5'	100 00	100 00	100 00	100 00	100 00	100 00	95 56	92 00	78 29	54 55	32 49	21 47	15 19	11 42	8 09	7 86	6 74	6 18	5 05	4 21	3 37	2 53
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	34 3	22 0	12 8	9 1	6 5	3 2	1 4
Test Temperature		21	5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200						
Specific Gravity		2 65																					
		Sieve Analysis Portion										Hydrometer Analysis Portion											
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
Wet Wt & Tare		38 28	5"	10 04	0 00	0 00	100 00																
Dry Wt & Tare		36 58	3"	10 04	0 00	0 00	100 00																
Wt Moisture		1 7	2"	10 04	0 00	0 00	100 00																
Wt Tare		1 5	1 5"	10 04	0 00	0 00	100 00	1	27 5	6	12 07	11 8	46 18354	0 01345	1 001385								
Dry Soil		35 08	1	10 04	0 00	0 00	100 00	2	20	6	7 86	13 0	34 31681	0 01345	1 001385								
Moisture Content		0 048460661	3/4	10 04	0 00	0 00	100 00	5	18	6	6 74	13 3	21 97538	0 01345	1 001385								
Air Dry Total Sample		459 33	1/2	29 9	19 86	4 44	95 56	15	17	6	6 18	13 5	12 76515	0 01345	1 001385								
Oven Dry Total Samp		447 5007178	3/8	45 82	35 78	8 00	92 00	30	15	6	5 05	13 8	9 135158	0 01345	1 001385								
Air Dry Hydro Sample		102	4	107 2	97 16	21 71	78 29	60	13 5	6	4 21	14 1	6 516654	0 01345	1 001385								
Oven Dry Wt Hydro		97 28548124	10	213 44	203 40	45 45	54 55	250	12	6	3 37	14 3	3 220236	0 01345	1 001385								
Amount Plus #10		203 40	20	252 78	39 34	22 06	67 51	1440	10 5	6	2 53	14 6	1 353225	0 01345	1 001385								
W (14 2) =		178 3498348	40	272 44	59 00	33 08	78 53																
			60	283 63	70 19	39 36	84 81																
			100	290 35	76 91	43 12	88 58																
			200	296 3	82 86	46 46	91 91																

SC6000 . 60111

Sample Number	MW32D 20 5-22 5'	100 00	100 00	100 00	100 00	97 00	94 01	89 30	87 26	76 32	63 92	47 81	34 96	24 95	17 68	11 13	11 06	9 11	6 83	6 18	4 56	2 93	1 30
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	33 7	21 7	12 8	9 1	6 5	3 2	1 4
Test Temperature	21.5"	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200								
Specific Gravity	2.65																						
		Sieve Analysis Portion										Hydrometer Analysis Portion											
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
		5	10 13	0 00	0 00	100 00	1	26	6	13 02	12 0	46 66254	0 01345	1 001385									
		3	10 13	0 00	0 00	100 00	2	23	6	11 06	12 5	33 66259	0 01345	1 001385									
		2	10 13	0 00	0 00	100 00	5	20	6	9 11	13 0	21 70386	0 01345	1 001385									
		1.5	10 13	0 00	0 00	100 00	15	16 5	6	6 83	13 8	12 8038	0 01345	1 001385									
Wet Wt & Tare		36 62					30	15 5	6	6 18	13 8	9 108071	0 01345	1 001385									
Dry Wt & Tare		36 04					60	13	6	4 56	14 2	6 535584	0 01345	1 001385									
Wt Moisture		0 58					250	10 5	6	2 93	14 6	3 24774	0 01345	1 001385									
Wt Tare		1 52					1440	8	6	1 30	15 0	1 372112	0 01345	1 001385									
Dry Soil		34 52																					
Moisture Content		0 016801854																					
Air Dry Total Sample		284 87																					
Oven Dry Total Samp		281 8429288																					
Air Dry Hydro Sample		100																					
Oven Dry Wt Hydro		98 34757835																					
Amount Plus #10		101 68																					
W (14 2) =		153 8527915																					

2000 : 60M

Sample Number	MW32D 28 5-30 5'	100 00	100 00	100 00	100 00	82 24	67 86	46 58	39 73	30 57	25 54	20 57	14 69	8 50	5 00	3 10	2 58	2 19	1 68	1 29	0 90	0 39	0 26
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	35 2	22 4	13 1	9 3	6 7	3 3	1 4
Test Temperature	21 5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4		10	20	40	60	100	200							
Specific Gravity	2 65																						
		Sieve Analysis Portion										Hydrometer Analysis Portion											
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
		5	10 37	0 00	0 00	100 00																	
		3	10 37	0 00	0 00	100 00																	
		2	10 37	0 00	0 00	100 00																	
		1 5	10 37	0 00	0 00	100 00																	
Wet Wt & Tare	40 46	1	187 34	176 97	17 76	82 24	1	17	6	2 84	13 5	49 4392	0 01345	1 001385									
Dry Wt & Tare	40 14	2	187 34	176 97	17 76	82 24	2	16	6	2 58	13 7	35 17019	0 01345	1 001385									
Wt Moisture	0 32	5	330 72	320 35	32 14	67 86	5	14 5	6	2 19	13 9	22 44263	0 01345	1 001385									
Wt Tare	1 51	15	542 81	532 44	53 42	46 58	15	12 5	6	1 68	14 2	13 10892	0 01345	1 001385									
Dry Soil	38 63	30	611 13	600 76	60 27	39 73	30	11	6	1 29	14 5	9 349028	0 01345	1 001385									
Moisture Content	0 008283717	60	702 37	692 00	69 43	30 57	60	9 5	6	0 90	14 7	6 666587	0 01345	1 001385									
Air Dry Total Sample	998 82	250	752 49	742 12	74 46	25 54	250	7 5	6	0 39	15 1	3 302061	0 01345	1 001385									
Oven Dry Total Samp	996 7110398	1440	771 8	19 31	4 98	79 43	1440	7	6	0 26	15 2	1 379595	0 01345	1 001385									
Air Dry Hydro Sample	99 96		40	794 6	42 11	10 85																	
Oven Dry Wt Hydro	99 13876252		60	818 64	66 15	17 04																	
Amount Plus #10	742 12		100	832 24	79 75	20 55																	
W (14 2) =	388 1232393		200	839 61	87 12	22 45																	

50000 50M

Sample Number	GEO-3 15-17'	100 00	100 00	100 00	100 00	96 08	81 22	64 12	54 16	35 95	22 88	14 14	8 23	4 35	2 49	1 38	1 27	1 16	1 04	0 81	0 46	0 35	0 23
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	36 1	22 9	13 3	9 4	6 7	3 3	1 4
Test Temperature		21 5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Specific Gravity		2 65																					
		Sieve Analysis Portion										Hydrometer Analysis Portion											
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
		5	10 22	0 00	0 00	100 00																	
		3	10 22	0 00	0 00	100 00																	
		2	10 22	0 00	0 00	100 00																	
		1 5	10 22	0 00	0 00	100 00	1	12	6	1 39	14 3	50 91641	0 01345	1 001385									
Wet Wt & Tare		57 25					2	11 5	6	1 27	14 4	36 10613	0 01345	1 001385									
Dry Wt & Tare		56 84					5	11	6	1 16	14 5	22 90035	0 01345	1 001385									
Wt Moisture		0 41					15	10 5	6	1 04	14 6	13 25884	0 01345	1 001385									
Wt Tare		1 49					30	9 5	6	0 81	14 7	9 427978	0 01345	1 001385									
Dry Soil		55 35					60	8	6	0 46	15 0	6 72195	0 01345	1 001385									
Moisture Content		0 007407407					250	7 5	6	0 35	15 1	3 302061	0 01345	1 001385									
Air Dry Total Sample		1132 23					1440	7	6	0 23	15 2	1 379595	0 01345	1 001385									
Oven Dry Total Samp		1130 314191																					
Air Dry Hydro Sample		99 76																					
Oven Dry Wt Hydro		99 02647059																					
Amount Plus #10		871 68																					
W (14 2) =		432 7773698																					

UNES 00000











Sample Number	GEO-2 34-36	100 00	100 00	100 00	79 64	58 63	55 32	48 84	44 91	41 26	37 10	30 65	22 30	13 59	6 14	1 95	0 75	0 56	0 38	0 38	0 00	0 00	0 00			
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	36 8	23 3	13 5	9 6	6 8	3 3	1 4			
Test Temperature		21 5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200										
Specific Gravity		2 65																								
					Sieve Analysis Portion						Hydrometer Analysis Portion															
					Sieve	Weight of	Total	Percent	Percent	Time	Hydro	Comp	Percent	"L"	D	K	a									
					5"	9 72	0 00	0 00	100 00																	
					3"	9 72	0 00	0 00	100 00																	
					2"	9 72	0 00	0 00	100 00																	
Wet Wt & Tare	66 35						1 5"	138 98	129 26	20 36	79 64	1	8 5	6	0 94	14 9	51 92545	0 01345	1 001385							
Dry Wt & Tare	66 21						1	272 3	262 58	41 37	58 63	2	8	6	0 75	15 0	36 81764	0 01345	1 001385							
Wt Moisture	0 14						3/4	293 3	283 58	44 68	55 32	5	7 5	6	0 56	15 1	23 3491	0 01345	1 001385							
Wt Tare	1 46						1/2	334 43	324 71	51 16	48 84	15	7	6	0 38	15 2	13 51721	0 01345	1 001385							
Dry Soil	64 75						3/8	359 38	349 66	55 09	44 91	30	7	6	0 38	15 2	9 558114	0 01345	1 001385							
Moisture Content	0 002162162						4	382 56	372 84	58 74	41 26	60	6	6	0 00	15 3	6 795066	0 01345	1 001385							
Air Dry Total Sample	635 26						10	408 98	399 26	62 90	37 10	250	6	6	0 00	15 3	3 328889	0 01345	1 001385							
Oven Dry Total Samp	634 7508306						20	426 19	17 21	6 45	69 35	30 65	1440	6	6	0 00	15 3	1 387037	0 01345	1 001385						
Air Dry Hydro Sample	99 22						40	448 48	39 50	14 80	77 70	22 30														
Oven Dry Wt Hydro	99 00593312						60	471 72	62 74	23 51	86 41	13 59														
Amount Plus #10	399 26						100	491 6	82 62	30 96	93 86	6 14														
W (14 2) =	266 8643111						200	502 77	93 79	35 15	98 05	1 95														

112000 60111

Sample Number GEO-2 39-40 5' 100 00 100 00 100 00 59 25 53 19 46 02 44 60 42 90 38 35 34 13 30 57 22 97 10 43 4 04 1 79 1 03 0 69 0 69 0 34 0 34 0 00 0 00  
 125000 75000 50000 37500 25000 19000 12500 9500 4750 2000 850 425 250 150 75 36 6 23 3 13 4 9 6 6 8 3 3 1 4  
 Test Temperature 21 5" 3" 2" 1 5" 1" 3/4" 1/2" 3/8" 4 10 20 40 60 100 200  
 Specific Gravity 2 65

Wet Wt & Tare	61 42
Dry Wt & Tare	61 27
Wt Moisture	0 15
Wt Tare	1 51
Dry Soil	59 76
Moisture Content	0 00251004
Air Dry Total Sample	995 59
Oven Dry Total Sam	994 7379489
Air Dry Hydro Sample	99 52
Oven Dry Wt Hydro	99 27082624
Amount Plus #10	655 28
W (14 2) =	290 9004157

Sieve Analysis Portion					Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a
Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing								
5	10 31	0 00	0 00	100 00								
3	10 31	0 00	0 00	100 00								
2	10 31	0 00	0 00	100 00								
1 5	415 71	405 40	40 75	59 25	1	9 5	6	1 20	14 7	51 63916	0 01345	1 001385
1	475 97	465 66	46 81	53 19	2	9	6	1 03	14 8	36 61576	0 01345	1 001385
3/4	547 3	536 99	53 98	46 02	5	8	6	0 69	15 0	23 28552	0 01345	1 001385
1/2	561 37	551 06	55 40	44 60	15	8	6	0 69	15 0	13 4439	0 01345	1 001385
3/8	578 26	567 95	57 10	42 90	30	7	6	0 34	15 2	9 558114	0 01345	1 001385
4	623 54	613 23	61 65	38 35	60	7	6	0 34	15 2	6 758607	0 01345	1 001385
10	665 59	655 28	65 87	34 13	250	6	6	0 00	15 3	3 328889	0 01345	1 001385
20	675 93	10 34	3 55	69 43	1440	6	6	0 00	15 3	1 387037	0 01345	1 001385
40	698 05	32 46	11 16	77 03								
60	734 51	68 92	23 69	89 57								
100	753 11	87 52	30 09	95 96								
200	759 64	94 05	32 33	98 21								

30000 . 60111

Sample Number GEO-2 44-44 5' 100 00 100 00 100 00 100 00 90 88 83 56 73 94 68 13 60 45 53 74 49 11 38 91 18 45 6 48 1 93 0 54 0 27 0 27 0 00 0 00 0 00 0 00  
 Test Temperature 21 5" 3" 2" 1 5" 1" 3/4" 1/2" 3/8" 4 10 20 40 60 100 200  
 Specific Gravity 2.65

Wet Wt & Tare	63 59
Dry Wt & Tare	63 44
Wt Moisture	0 15
Wt Tare	1 51
Dry Soil	61 93
Moisture Content	0
Air Dry Total Sample	709 25
Oven Dry Total Samp	709 25
Air Dry Hydro Sample	99 18
Oven Dry Wt Hydro	99 18
Amount Plus #10	328 13
W (14 2) =	184 5702535

Sieve Analysis Portion					Hydrometer Analysis Portion							
Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a
5	10 51	0 00	0 00	100 00								
3	10 51	0 00	0 00	100 00								
2	10 51	0 00	0 00	100 00								
1 5	10 51	0 00	0 00	100 00	1	7 5	6	0 81	15 1	52 21017	0 01345	1 001385
1	76 59	66 08	9 32	90 68	2	7	6	0 54	15 2	37 01842	0 01345	1 001385
3/4	127 14	116 63	16 44	83 56	5	6 5	6	0 27	15 2	23 47574	0 01345	1 001385
1/2	195 37	184 86	26 06	73 94	15	6 5	6	0 27	15 2	13 55372	0 01345	1 001385
3/8	236 58	226 07	31 87	68 13	30	6	6	0 00	15 3	9 609674	0 01345	1 001385
4	291 02	280 51	39 55	60 45	60	6	6	0 00	15 3	6 795066	0 01345	1 001385
10	338 64	328 13	46 26	53 74	250	6	6	0 00	15 3	3 328889	0 01345	1 001385
20	347 18	8 54	4 63	50 89	1440	6	6	0 00	15 3	1 387037	0 01345	1 001385
40	366 01	27 37	14 83	61 09								
60	403 77	65 13	35 29	81 55								
100	425 86	87 22	47 26	93 52								
200	434 25	95 61	51 80	98 07								

50000 . 50147

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID.: K-1 Setup Date: 04.24.2013 Initials: akb  
 Sample Description: sand, rocks, organic debris  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>K-1</u>
Tare Weight (g)	<u>10.12</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>220.84</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>110.86</u>
Tare + Oven-Dried #10 Washed (g)	<u>85.60</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>191.55</u>

Hygroscopic Moisture Content	
Tare Number	<u>K1</u>
Tare Weight (g)	<u>1.57</u>
Wet Soil + Tare (g)	<u>25.29</u>
Dry Soil + Tare (g)	<u>25.23</u>

Hydro Beaker: BA Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: akb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013	<u>193285</u> Technician: <u>akb</u>			
Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
12:55:00	START			
12:56:00	1	9.0	6	21
12:57:00	2	8.5	6	21
13:00:00	5	8.5	6	21
13:10:00	15	8.0	6	21
13:25:00	30	7.5	6	21
13:55:00	60	7.0	6	21.5
17:05:00	250	7	6	22.0
12:55:00	1440	7	6	21.5

**Sieve Analysis**

Sieve Date: 5/1/13 Sieve Set #: 3 Technician: JG

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.113 Jg</u>
2"	↓
1½"	
1"	
¾"	<u>10.183</u> <i>eg for TA</i>
½"	<u>25.28</u>
3/8"	<u>27.05</u>
#4	<u>64.02</u>
#10	<u>85.67</u>
#20	<u>100.03</u>
#40	<u>126.36</u>
#60	<u>164.584 Jg</u>
#100	<u>184.19</u>
#200	<u>191.15 20 Jg</u>
Pan	<u>191.48</u>

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID.: K-2 Setup Date: 04.24.2013 Initials: kb  
 Sample Description: sand, rocks, organic debris

Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>K-2</u>
Tare Weight (g)	<u>10.05</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>216.61</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>110.59</u>
Tare + Oven-Dried #10 Washed (g)	<u>76.20</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>182.30</u> <i>Ja</i>

Tare Number	<u>K-2</u>
Tare Weight (g)	<u>1.56</u>
Wet Soil + Tare (g)	<u>30.70</u>
Dry Soil + Tare (g)	<u>30.60</u>

Hydro Beaker: AB Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: kb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 193285 Technician: kb

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
13:02:00	START			
13:03:00	1	9.0	6	21
13:04:00	2	8.5	6	21
13:07:00	5	8.5	6	21
13:17:00	15	8.0	6	21
13:32:00	30	7.5	6	21
14:02:00	60	7.0	6	21.5
17:12:00	250	7	6	22.0
13:02:00	1440	7	6	21.5

**Sieve Analysis**

Sieve Date: 5/1/13 Sieve Set #: 4 Technician: Ja

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.06</u>
2"	
1½"	
1"	
¾"	<u>10.06</u>
½"	<u>19.34</u>
3/8"	<u>25.31</u>
#4	<u>50.77</u>
#10	<u>76.25</u>
#20	<u>89.45</u>
#40	<u>114.74</u> <i>Ja</i>
#60	<u>154.31</u>
#100	<u>174.82</u>
#200	<u>182.14</u>
Pan	<u>182.32</u>

ANALYTICAL RESOURCES, INC.

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID.: K-3 Setup Date: 04.24.2013 Initials: kb  
 Sample Description: sand, rocks, organic debris

Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>K-3</u>
Tare Weight (g)	<u>10.38</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>215.20</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>110.11</u>
Tare + Oven-Dried #10 Washed (g)	<u>73.63</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>178.86</u>

Tare Number	<u>K-3</u>
Tare Weight (g)	<u>1.51</u>
Wet Soil + Tare (g)	<u>32.23</u>
Dry Soil + Tare (g)	<u>32.11</u>

Hydro Beaker: BF Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: kb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 193285 Technician: kb

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
13:09:00	<b>START</b>			
13:10:00	<u>1</u>	<u>9.0</u>	<u>6</u>	<u>21</u>
13:11:00	<u>2</u>	<u>8.5</u>	<u>6</u>	<u>21</u>
13:14:00	<u>5</u>	<u>8.0</u>	<u>6</u>	<u>21</u>
13:24:00	<u>15</u>	<u>8.0</u>	<u>6</u>	<u>21</u>
13:39:00	<u>30</u>	<u>7.5</u>	<u>6</u>	<u>21</u>
14:09:00	<u>60</u>	<u>7.0</u>	<u>6</u>	<u>21.5</u>
17:19:00	<u>250</u>	<u>7</u>	<u>6</u>	<u>22.0</u>
13:09:00	<u>1440</u>	<u>7</u>	<u>6</u>	<u>21.5</u>

**Sieve Analysis**

Sieve Date: 5/1/13 Sieve Set #: 3 Technician: JA

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.40</u>
2"	
1½"	
1"	
¾"	<u>10.40</u>
½"	<u>26.16</u>
3/8"	<u>33.22</u>
#4	<u>53.60</u>
#10	<u>73.59</u>
#20	<u>86.83</u> <u>JA</u>
#40	<u>109.79</u>
#60	<u>149.49</u>
#100	<u>170.84</u>
#200	<u>178.55</u>
Pan	<u>178.84</u> <u>JA</u>



**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID.: F Setup Date: 04.24.2013 Initials: lab

Sample Description: rocks, Sand, Silt

Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>F</u>
Tare Weight (g)	<u>10.24</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>439.09</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>105.31</u>
Tare + Oven-Dried #10 Washed (g)	<u>279.54</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>363.31</u>

★ SAMPLE CONSUMED

Hygroscopic Moisture Content	
Tare Number	<u>152 F</u>
Tare Weight (g)	<u>50.52</u>
Wet Soil + Tare (g)	<u>50.65</u>
Dry Soil + Tare (g)	<u>49.68</u>

Hydro Beaker: DR Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: lab  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 193285 Technician: lab

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
13:16:00	START			
13:17:00	1	23.0	6	21
13:18:00	2	20.0	6	21
13:21:00	5	17.5	6	21
13:31:00	15	14.0	6	21
13:46:00	30	12.5	6	21.5
14:16:00	60	11.0	6	21.5
17:26:00	250	8.5	6	22.0
13:16:00	1440	7	6	21.5

**Sieve Analysis**

Sieve Date: 5/1/13 Sieve Set #: 4 Technician: lab

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.25</u>
2"	<u>↕</u>
1½"	<u>↕</u>
1"	<u>10.25</u>
¾"	<u>21.81</u>
½"	<u>33.67</u>
3/8"	<u>63.28</u>
#4	<u>123.66</u>
#10	<u>274.84</u>
#20	<u>304.85</u>
#40	<u>333.28</u>
#60	<u>349.65</u>
#100	<u>356.17</u>
#200	<u>362.44</u>
Pan	<u>363.80</u>

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WNO9 ARI Sample ID.: G Setup Date: 04.24.2013 Initials: klb  
 Sample Description: sand, rocks, silt, organic debris  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>G</u>
Tare Weight (g)	<u>10.29</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>190.90</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>71.18</u>
Tare + Oven-Dried #10 Washed (g)	<u>98.45</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>140.60</u>

★ SAMPLE CONSUMED

Hygroscopic Moisture Content	
Tare Number	<u>G</u>
Tare Weight (g)	<u>1.55</u>
Wet Soil + Tare (g)	<u>11.57</u>
Dry Soil + Tare (g)	<u>11.37</u>

Hydro Beaker: G Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: klb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013	<u>193285</u>	Technician: <u>klb</u>		
Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
13:23:00	START			
13:24:00	1	33.0	6	21
13:25:00	2	28.0	6	21
13:28:00	5	26.0	6	21
13:38:00	15	23.0	6	21
13:53:00	30	20.0	6	21.5
14:23:00	60	18.0	6	21.5
17:33:00	250	14	6	22.0
13:23:00	1440	10.5	6	21.5

**Sieve Analysis**

Sieve Date: 5/1/13 Sieve Set #: 3 Technician: Ja

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.32</u>
2"	↑
1½"	↓
1"	<u>10.32</u>
¾"	<u>25.44</u>
½"	<u>33.09</u>
3/8"	<u>45.45</u>
#4	<u>70.45</u>
#10	<u>93.62</u>
#20	<u>106.56</u>
#40	<u>117.92</u>
#60	<u>125.05</u>
#100	<u>131.27</u>
#200	<u>138.62</u>
Pan	<u>140.81</u>

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID.: H Setup Date: 04.24.2013 Initials: kb

Sample Description: clayey, coarse sand, rocks

Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

\*SAMPLE CONSUMED

Tare Number	<u>H</u>
Tare Weight (g)	<u>9.95</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>469.28</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>99.59</u> * 102.00
Tare + Oven-Dried #10 Washed (g)	<u>229.18</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>298.25</u>

Hygroscopic Moisture Content	
Tare Number	<u>H</u>
Tare Weight (g)	<u>1.50</u>
Wet Soil + Tare (g)	<u>38.28</u>
Dry Soil + Tare (g)	<u>36.58</u>

Hydro Beaker: BH Calgon Batch #: 284 Calgon Date: 4/28/13 Technician: kb  
Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 193285 Technician: kb

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
13:30:00	START			
13:31:00	1	27.5	6	21
13:32:00	2	20.0	6	21
13:35:00	5	18.0	6	21
13:45:00	15	17.0	6	21.5
14:00:00	30	15.0	6	21.5
14:30:00	60	13.5	6	21.5
17:40:00	250	12	6	22.0
13:30:00	1440	10.5	6	21.5

**Sieve Analysis**

Sieve Date: 5/1/13 Sieve Set #: 4 Technician: Jca

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.04</u>
2"	
1½"	
1"	
¾"	<u>10.04</u>
½"	<u>29.90</u>
3/8"	<u>45.82</u>
#4	<u>106.84</u>
#10	<u>213.44</u>
#20	<u>252.78</u>
#40	<u>272.44</u>
#60	<u>283.63</u>
#100	<u>290.35</u>
#200	<u>296.30</u>
Pan	<u>298.49</u>

107.20 Jca

\* curve fitting was applied

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WND9 ARI Sample ID.: I Setup Date: 04.24.2013 Initials: kb  
 Sample Description: silty, coarse sand, rocks, rubbery particles, debris  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>I</u>
Tare Weight (g)	<u>10.09</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>294.76</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>* 99.35 - 100.00 g</u>
Tare + Oven-Dried #10 Washed (g)	<u>122.02</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>195.76</u>

Hygroscopic Moisture Content	
Tare Number	<u>I</u>
Tare Weight (g)	<u>1.52</u>
Wet Soil + Tare (g)	<u>36.62</u>
Dry Soil + Tare (g)	<u>36.04</u>

Hydro Beaker: I Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: kb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 193285 Technician: kb

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
13:37:00	<b>START</b>			
13:38:00	<u>1</u>	<u>26.0</u>	<u>6</u>	<u>21</u>
13:39:00	<u>2</u>	<u>23.0</u>	<u>6</u>	<u>21</u>
13:42:00	<u>5</u>	<u>20.0</u>	<u>6</u>	<u>21</u>
13:52:00	<u>15</u>	<u>16.5</u>	<u>6</u>	<u>21.5</u>
14:07:00	<u>30</u>	<u>15.5</u>	<u>6</u>	<u>21.5</u>
14:37:00	<u>60</u>	<u>13.0</u>	<u>6</u>	<u>21.5</u>
17:47:00	<u>250</u>	<u>10.5</u>	<u>6</u>	<u>22.0</u>
13:37:00	<u>1440</u>	<u>8</u>	<u>6</u>	<u>21.5</u>

Sieve Date: 5/1/13 **Sieve Analysis** Sieve Set #: 3 Technician: Jc

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.13</u>
2"	<u>19.13</u>
1½"	<u>10.13</u>
1"	<u>18.59</u>
¾"	<u>27.01</u>
½"	<u>40.29</u>
3/8"	<u>46.04</u>
#4	<u>76.897 Jc</u>
#10	<u>111.81</u>
#20	<u>136.60</u>
#40	<u>156.37</u>
#60	<u>171.77</u>
#100	<u>182.96</u>
#200	<u>193.03</u>
Pan	<u>196.04</u>

\*curve fitting was applied.

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID.: J Setup Date: 04.24.2013 Initials: kb  
 Sample Description: rocks, sand

Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>J</u>
Tare Weight (g)	<u>10.36</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>1009.18</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>99.96</u>
Tare + Oven-Dried #10 Washed (g)	<u>754.84</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>840.66</u>

Tare Number	<u>J</u>
Tare Weight (g)	<u>1.51</u>
Wet Soil + Tare (g)	<u>40.46</u>
Dry Soil + Tare (g)	<u>40.14</u>

Hydro Beaker: J Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: kb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 193285 Technician: kb

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
13:44:00	<b>START</b>			
13:45:00	<u>1</u>	<u>17.0</u>	<u>6</u>	<u>21.5</u>
13:46:00	<u>2</u>	<u>16.0</u>	<u>6</u>	<u>21.5</u>
13:49:00	<u>5</u>	<u>14.5</u>	<u>6</u>	<u>21.5</u>
13:59:00	<u>15</u>	<u>12.5</u>	<u>6</u>	<u>21.5</u>
14:14:00	<u>30</u>	<u>11.0</u>	<u>6</u>	<u>21.5</u>
14:44:00	<u>60</u>	<u>9.5</u>	<u>6</u>	<u>21.5</u>
17:54:00	<u>250</u>	<u>7.5</u>	<u>6</u>	<u>22.0</u>
13:44:00	<u>1440</u>	<u>7</u>	<u>6</u>	<u>21.5</u>

**Sieve Analysis**

Sieve Date: 5/1/13 Sieve Set #: 4 Technician: Jc

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.37</u>
2"	<u>10.37</u>
1½"	<u>187.34</u>
1"	<u>320.72</u>
¾"	<u>330.72</u>
½"	<u>542.81</u>
3/8"	<u>611.13</u>
#4	<u>702.37</u>
#10	<u>752.49</u>
#20	<u>771.80</u>
#40	<u>794.60</u>
#60	<u>818.64</u>
#100	<u>832.24</u>
#200	<u>837.61</u>
Pan	<u>840.63</u>

10.37  
187.34 Jc

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID.: L Setup Date: 04.24.2013 Initials: ab  
 Sample Description: rocks, sand  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>L</u>
Tare Weight (g)	<u>10.20</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>1142.43</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>99.76</u>
Tare + Oven-Dried #10 Washed (g)	<u>889.49</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>975.78</u>

Tare Number	<u>L</u>
Tare Weight (g)	<u>1.49</u>
Wet Soil + Tare (g)	<u>57.25</u>
Dry Soil + Tare (g)	<u>56.84</u>

Hydro Beaker: L Calgon Batch #: 284 Calgon Date: 04/26/13 Technician: ab  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 193285 Technician: ab

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
13:51:00	START			
13:52:00	1	12.0	6	21.5
13:53:00	2	11.5	6	21.5
13:56:00	5	11.0	6	21.5
14:06:00	15	10.5	6	21.5
14:21:00	30	9.5	6	21.5
14:51:00	60	8.0	6	21.5
18:01:00	250	7.5	6	22.0
13:51:00	1440	7	6	21.5

Sieve Date: 5/1/13 **Sieve Analysis** Sieve Set #: 3 Technician: JG

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.22</u>
2"	<u>10.22</u>
1½"	<u>10.22</u>
1"	<u>54.57</u>
¾"	<u>222.47</u>
½"	<u>415.74</u>
3/8"	<u>528.31</u>
#4	<u>734.23</u>
#10	<u>881.90</u>
#20	<u>919.73</u>
#40	<u>945.32</u>
#60	<u>962.10</u>
#100	<u>970.13</u>
#200	<u>974.94</u>
Pan	<u>975.82</u>

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WV09 ARI Sample ID.: M Setup Date: 04.24.2013 Initials: bb  
 Sample Description: sand

Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>M</u>
Tare Weight (g)	<u>10.44</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>323.32</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>99.37</u>
Tare + Oven-Dried #10 Washed (g)	<u>57.38</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>150.67</u>

Tare Number	<u>M</u>
Tare Weight (g)	<u>1.47</u>
Wet Soil + Tare (g)	<u>57.98</u>
Dry Soil + Tare (g)	<u>57.70</u>

Hydro Beaker: M Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: bb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 193285 Technician: bb

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
13:58:00	<b>START</b>			
13:59:00	<u>1</u>	<u>10.0</u>	<u>6</u>	<u>21.5</u>
14:00:00	<u>2</u>	<u>10.0</u>	<u>6</u>	<u>21.5</u>
14:03:00	<u>5</u>	<u>9.5</u>	<u>6</u>	<u>21.5</u>
14:13:00	<u>15</u>	<u>9.0</u>	<u>6</u>	<u>21.5</u>
14:28:00	<u>30</u>	<u>8.5</u>	<u>6</u>	<u>21.5</u>
14:58:00	<u>60</u>	<u>8.0</u>	<u>6</u>	<u>21.5</u>
18:08:00	<u>250</u>	<u>7</u>	<u>6</u>	<u>22.0</u>
13:58:00	<u>1440</u>	<u>7</u>	<u>6</u>	<u>21.5</u>

Sieve Date: 5/1/13 **Sieve Analysis** Sieve Set #: 4 Technician: JG

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.45</u>
2"	
1½"	
1"	
¾"	
½"	
3/8"	<u>10.45</u>
#4	<u>16.92</u>
#10	<u>56.84</u>
#20	<u>77.62</u>
#40	<u>105.63</u>
#60	<u>131.36</u>
#100	<u>144.83</u>
#200	<u>150.31</u>
Pan	<u>150.51</u>

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID.: N Setup Date: 04.24.2013 Initials: akb  
 Sample Description: rocks, rusty-colored clayey sand, debris, organic debris  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>N</u>
Tare Weight (g)	<u>10.10</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>267.53</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>83.24</u>
Tare + Oven-Dried #10 Washed (g)	<u>150.39</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>200.37</u>

Hygroscopic Moisture Content	
Tare Number	<u>N</u>
Tare Weight (g)	<u>1.46</u>
Wet Soil + Tare (g)	<u>9.89</u>
Dry Soil + Tare (g)	<u>9.68</u>

Hydro Beaker: DN Calgon Batch #: 284 Calgon Date: 04/23/13 Technician: akb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 193285 Technician: akb

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
14:05:00	<b>START</b>			
14:06:00	<u>1</u>	<u>34.0</u>	<u>6</u>	<u>21.5</u>
14:07:00	<u>2</u>	<u>28.5</u>	<u>6</u>	<u>21.5</u>
14:10:00	<u>5</u>	<u>26.0</u>	<u>6</u>	<u>21.5</u>
14:20:00	<u>15</u>	<u>21.5</u>	<u>6</u>	<u>21.5</u>
14:35:00	<u>30</u>	<u>18.0</u>	<u>6</u>	<u>21.5</u>
15:05:00	<u>60</u>	<u>15.0</u>	<u>6</u>	<u>22.0</u>
18:15:00	<u>250</u>	<u>10.5</u>	<u>6</u>	<u>22.0</u>
14:05:00	<u>1440</u>	<u>7.5</u>	<u>6</u>	<u>21.5</u>

**Sieve Analysis**

Sieve Date: 5/1/13 Sieve Set #: 3 Technician: Ja

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.09</u>
2"	<u>21.06</u> 10.09
1½"	<u>22.92</u> 10.09
1"	<u>10.09</u>
¾"	<u>21.06</u>
½"	<u>22.92</u>
3/8"	<u>63.54</u>
#4	<u>125.99</u>
#10	<u>147.38</u>
#20	<u>158.02</u>
#40	<u>169.72</u>
#60	<u>180.56</u>
#100	<u>189.22</u>
#200	<u>198.06</u>
Pan	<u>200.38</u>

Ja



**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID: 0 Setup Date: 04.24.2013 Initials: kb  
 Sample Description: silty sand, rocks  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>0</u>
Tare Weight (g)	<u>9.96</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>441.02</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>99.65</u> 103.00
Tare + Oven-Dried #10 Washed (g)	<u>229.27</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>292.60</u>

Tare Number	<u>0</u>
Tare Weight (g)	<u>1.46</u>
Wet Soil + Tare (g)	<u>41.81</u>
Dry Soil + Tare (g)	<u>41.22</u>

Hydro Beaker: 0 Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: kb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013	<u>193285</u>	Technician: <u>kb</u>		
Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
14:13:00	START			
14:14:00	<u>1</u>	<u>22.0</u>	<u>6</u>	<u>21.5</u>
14:15:00	<u>2</u>	<u>18.0</u>	<u>6</u>	<u>21.5</u>
14:18:00	<u>5</u>	<u>17.0</u>	<u>6</u>	<u>21.5</u>
14:28:00	<u>15</u>	<u>14.5</u>	<u>6</u>	<u>21.5</u>
14:43:00	<u>30</u>	<u>12.5</u>	<u>6</u>	<u>21.5</u>
15:13:00	<u>60</u>	<u>11.0</u>	<u>6</u>	<u>22.0</u>
18:23:00	<u>250</u>	<u>8</u>	<u>6</u>	<u>22.0</u>
14:13:00	<u>1440</u>	<u>7</u>	<u>6</u>	<u>21.5</u>

**Sieve Analysis**

Sieve Date: 5/1/13 Sieve Set #: 4 Technician: Jca

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.02</u>
2"	<u>10.02</u>
1½"	<u>10.02</u>
1"	<u>30.37</u>
¾"	<u>30.37</u>
½"	<u>49.54</u>
3/8"	<u>68.40</u>
#4	<u>130.26</u>
#10	<u>199.81</u>
#20	<u>232.12</u>
#40	<u>253.85</u>
#60	<u>268.97</u>
#100	<u>279.20</u>
#200	<u>288.57</u>
Pan	<u>292.55</u>

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WNO9 ARI Sample ID.: P Setup Date: 04.24.2013 Initials: kb  
 Sample Description: medium dark-colored sand, fuel-like odor, soft rubber-like particles  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>P</u>
Tare Weight (g)	<u>9.97</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>128.02</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>78.59</u>
Tare + Oven-Dried #10 Washed (g)	<u>30.77</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>88.53</u>

\* SAMPLE CONSUMED

Tare Number	<u>P</u>
Tare Weight (g)	<u>1.54</u>
Wet Soil + Tare (g)	<u>7.05</u>
Dry Soil + Tare (g)	<u>6.96</u>

Hydro Beaker: P Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: kb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 193285 Technician: kb

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
14:20:00	START			
14:21:00	1	31.0	6	21.5
14:22:00	2	20.0	6	21.5
14:25:00	5	17.0	6	21.5
14:35:00	15	14.5	6	21.5
14:50:00	30	13.0	6	21.5
15:20:00	60	11.0	6	22.0
18:30:00	250	9	6	22.0
14:20:00	1440	7	6	21.5

**Sieve Analysis**

Sieve Date: 5/1/13 Sieve Set #: 3 Technician: JCA

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>9.98</u>
2"	
1½"	
1"	
¾"	
½"	<u>10.61</u>
3/8"	<u>15.44</u>
#4	<u>21.13</u>
#10	<u>29.26</u>
#20	<u>34.42</u>
#40	<u>40.54</u>
#60	<u>50.40</u>
#100	<u>65.47</u>
#200	<u>85.06</u>
Pan	<u>88.86</u>

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID.: Q Setup Date: 04.24.2013 Initials: klb  
 Sample Description: Sand, rocks

Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>Q</u>
Tare Weight (g)	<u>9.72</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>644.98</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>99.22</u>
Tare + Oven-Dried #10 Washed (g)	<u>409.35</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>502.96</u>

Tare Number	<u>Q</u>
Tare Weight (g)	<u>1.46</u>
Wet Soil + Tare (g)	<u>66.35</u>
Dry Soil + Tare (g)	<u>66.21</u>

Hydro Beaker: Q Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: klb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 @ 193+21285 Technician: klb

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
14:27:00	START			
14:28:00	1	8.5	6	21.5
14:29:00	2	8.0	6	21.5
14:32:00	5	7.5	6	21.5
14:42:00	15	7.0	6	21.5
14:57:00	30	7.0	6	21.5
15:27:00	60	6.0	6	22.0
18:37:00	250	6	6	21.5
14:27:00	1440	6	6	21.5

**Sieve Analysis**

Sieve Date: 5.1.13 Sieve Set #: 4 Technician: ey

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>9.72</u>
2"	
1½"	<u>138.98</u>
1"	<u>272.30</u>
¾"	<u>293.30</u>
½"	<u>334.43</u>
3/8"	<u>359.38</u>
#4	<u>382.56</u>
#10	<u>409.98</u>
#20	<u>426.19</u>
#40	<u>448.48</u>
#60	<u>471.72</u>
#100	<u>491.60</u>
#200	<u>502.77</u>
Pan	<u>503.11</u>

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID.: R Setup Date: 04.24.2013 Initials: kb

Sample Description: sand, large rocks

Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>R</u>
Tare Weight (g)	<u>10.30</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>1005.89</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>99.52</u>
Tare + Oven-Dried #10 Washed (g)	<u>666.80</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>759.82</u>

★SAMPLE CONSUMED

Hygroscopic Moisture Content	
Tare Number	<u>R</u>
Tare Weight (g)	<u>151</u>
Wet Soil + Tare (g)	<u>61.42</u>
Dry Soil + Tare (g)	<u>61.27</u>

Hydro Beaker: CR Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: kb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 1931285 Technician: kb

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
14:34:00	START			
14:35:00	1	9.5	6	21.5
14:36:00	2	9.0	6	21.5
14:39:00	5	8.0	6	21.5
14:49:00	15	8.0	6	21.5
15:04:00	30	7.0	6	22.0
15:34:00	60	7.0	6	22.0
18:44:00	250	6	6	22.0
14:34:00	1440	6	6	21.5

**Sieve Analysis**

Sieve Date: 5.1.13 Sieve Set #: 3 Technician: ey

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.31</u>
2"	
1½"	<u>415.71</u>
1"	<u>475.97</u>
¾"	<u>547.30</u>
½"	<u>561.37</u>
3/8"	<u>578.26</u>
#4	<u>623.54</u>
#10	<u>665.59</u>
#20	<u>675.93</u>
#40	<u>698.05</u>
#60	<u>734.51</u>
#100	<u>753.11</u>
#200	<u>759.64</u>
Pan	<u>759.88</u>

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WN09 ARI Sample ID.: S Setup Date: 04.24.2013 Initials: leb  
 Sample Description: Sand, rocks

Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>S</u>
Tare Weight (g)	<u>10.46</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>719.71</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>99.18</u>
Tare + Oven-Dried #10 Washed (g)	<u>339.21</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>434.59</u>

\*SAMPLE CONSUMED

Hygroscopic Moisture Content	
Tare Number	<u>S</u>
Tare Weight (g)	<u>1.51</u>
Wet Soil + Tare (g)	<u>63.59</u>
Dry Soil + Tare (g)	<u>63.44</u>

Hydro Beaker: BS Calgon Batch #: 284 Calgon Date: 04/28/13 Technician: leb  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/29/2013 193285 Technician: leb

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
14:41:00	START			
14:42:00	1	7.5	6	21.5
14:43:00	2	7.0	6	21.5
14:46:00	5	6.5	6	21.5
14:56:00	15	6.5	6	21.5
15:11:00	30	6.0	6	22.0
15:41:00	60	6	6	22.0
18:51:00	250	6	6	22
14:41:00	1440	6	6	21.5

**Sieve Analysis**

Sieve Date: 5.1.13 Sieve Set #: 4 Technician: ey

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.51</u>
2"	
1½"	
1"	<u>76.59</u>
¾"	<u>127.14</u>
½"	<u>195.37</u>
3/8"	<u>236.58</u>
#4	<u>291.02</u>
#10	<u>338.64</u>
#20	<u>347.18</u>
#40	<u>366.01</u>
#60	<u>403.77</u>
#100	<u>425.86</u>
#200	<u>434.25</u>
Pan	<u>434.59</u>

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Project: 186-846-01 Gas Works Park

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BC  
Signature

April-05-2013  
Date



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

April 9, 2013

Zanna Satterwhite  
GeoEngineers, Inc.  
Plaza 600 Building  
600 Stewart Street, Suite 1700  
Seattle, WA 98101

**RE: Client Project: Gas Works Park, 186-846-01**  
**ARI Job No.: WJ09**

Dear Zanna:

Please find enclosed the Chain of Custody records (COCs), sample receipt documentation, and the final data package for samples from the project referenced above.

Sample receipt and details of these analyses are discussed in the Case Narrative.

An electronic copy of this package will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

A handwritten signature in black ink, appearing to read "Cheronne Oreiro", written over a horizontal line.

Cheronne Oreiro  
Project Manager  
(206) 695-6214  
[cheronneo@arilabs.com](mailto:cheronneo@arilabs.com)  
[www.arilabs.com](http://www.arilabs.com)

cc: eFile: WJ09

Enclosures

## Chain of Custody Documentation

ARI Job ID: WJ09



# Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: <i>W309</i>	Turn-around Requested: <i>Standard</i>	Page: <i>1</i> of <i>2</i>
ARI Client Company: <i>GeoEngineers</i>	Phone: <i>206 499 7588</i>	Date: _____ Ice Present? _____
Client Contact: <i>Zanna Sattenwhite</i>	No. of Coolers: _____	Cooler Temps: _____



Analytical Resources, Incorporated  
Analytical Chemists and Consultants  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

Client Project Name: <i>Gas Works Park</i>					Analysis Requested							Notes/Comments	
Client Project #: <i>186-846-01</i>		Samplers: <i>Zanna Sattenwhite; Paul Robinson</i>			Assem C EPA Method 200.8	PAHS EPA 8270 SIM low level	BTEX EPA 8260 low level	Sieve ASTM D422					
Sample ID	Date	Time	Matrix	No. Containers									
<i>MW39D-0.5-1.5</i>	<i>3/25/13</i>	<i>0938</i>	<i>Soil</i>	<i>1</i>	<i>X</i>								
<i>MW39D-08-10</i>	<i>3/25/13</i>	<i>1119</i>	<i>Soil</i>	<i>5</i>	<i>X</i>	<i>X</i>	<i>X</i>						
<i>MW39D-14-15</i>	<i>3/25/13</i>	<i>1209</i>	<i>Soil</i>	<i>4</i>									<i>HOLD</i>
<i>Rinse-032513</i>	<i>3/25/13</i>	<i>1302</i>	<i>Water</i>	<i>5</i>		<i>X</i>	<i>X</i>						
<i>MW39S-3.5-13.5</i>	<i>3/25/13</i>	<i>1419</i>	<i>Soil</i>	<i>1</i>				<i>X</i>					<i>Composite</i>
<i>MW37S-19.5-20</i>	<i>3/26/13</i>	<i>1535</i>	<i>Soil</i>	<i>4</i>		<i>X</i>	<i>X</i>						
<i>MW37S-8-9</i>	<i>3/26/13</i>	<i>1453</i>	<i>Soil</i>	<i>4</i>		<i>X</i>	<i>X</i>						
<i>MW37S-0.5-1</i>	<i>3/26/13</i>	<i>1411</i>	<i>Soil</i>	<i>1</i>	<i>X</i>								
<i>MW37S-13.5-14.5</i>	<i>3/26/13</i>	<i>1619</i>	<i>Soil</i>	<i>4</i>									<i>HOLD</i>
Comments/Special Instructions <i>*Retain for possible alkyl PAH suite analysis.</i>				Relinquished by (Signature) <i>[Signature]</i>	Received by (Signature) <i>[Signature]</i>			Relinquished by (Signature)	Received by (Signature)				
				Printed Name <i>Andrew Johnson</i>	Printed Name <i>Rich Hudson</i>			Printed Name	Printed Name				
				Company <i>GeoEngineers</i>	Company <i>ARI</i>			Company	Company				
				Date & Time <i>3/26/13 1635</i>	Date & Time <i>3/26/13 1635</i>			Date & Time	Date & Time				

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# Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested: <i>Standard</i>	Page: <i>2</i> of <i>2</i>	
ARI Client Company: <i>GEOENGINEERS</i>	Phone: <i>206 494 7588</i>	Date: <i>3/26/13</i>	Ice Present?
Client Contact: <i>Zanna Sattenwala</i>	No. of Coolers:	Cooler Temps:	

Client Project Name: <i>Gas Works Park</i>					Analysis Requested					Notes/Comments	
Client Project #: <i>186-846-01</i>		Samplers: <i>Paul Robinson, John Peter B, Andrew Johnson</i>			<i>PAHs</i>	<i>BTEX</i>	<i>AV</i>	<i>SIEVE</i>			
Sample ID	Date	Time	Matrix	No Containers							
<i>MW39D-17-18</i>	<i>3/26/13</i>	<i>0830</i>	<i>S</i>	<i>2</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>			<i>same composite</i>
<i>MW385-0.5-1</i>	<i>3/26/13</i>	<i>1037</i>	<i>S</i>	<i>1</i>			<i>X</i>				
<i>MW385-5-15</i>	<i>3/26/13</i>	<i>1200</i>	<i>S</i>	<i>1</i>			<i>X</i>				<i>Composite</i>
<i>MW385-8-9</i>	<i>3/26/13</i>	<i>1200</i>	<i>S</i>	<i>4</i>	<i>X</i>	<i>X</i>					
<i>MW385-10-11</i>	<i>3/26/13</i>	<i>1200</i>	<i>S</i>	<i>1</i>			<i>X</i>				
<i>Rinse-032613</i>	<i>3/26/13</i>	<i>1348</i>	<i>W</i>	<i>5</i>							
<i>Trip Blank-032613</i>	<i>3/26/13</i>		<i>W</i>	<i>2</i>		<i>X</i>					
<i>MW39D-16-19</i>	<i>3/26/13</i>	<i>0830</i>	<i>S</i>	<i>1</i>			<i>X</i>				<i>Composite</i>
<i>MW375-7.5-8</i>	<i>3/26/13</i>	<i>1535</i>	<i>S</i>	<i>1</i>			<i>X</i>				
<i>MW375-7.5-20</i>	<i>3/26/13</i>	<i>1535</i>	<i>S</i>	<i>1</i>			<i>X</i>				<i>Composite</i>
Comments/Special Instructions <i>* Retain for possible alkyl PAH suite analysis</i>		Relinquished by: (Signature) <i>[Signature]</i>		Received by: (Signature) <i>[Signature]</i>		Relinquished by: (Signature)		Received by: (Signature)			
		Printed Name: <i>Andrew Johnson</i>		Printed Name: <i>Rich Hudson</i>		Printed Name:		Printed Name:			
		Company: <i>GEOENGINEERS, INC</i>		Company: <i>ARI</i>		Company:		Company:			
		Date & Time: <i>3/26/13 1635</i>		Date & Time: <i>3/26/13 1635</i>		Date & Time:		Date & Time:			

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10000.6010



# Cooler Receipt Form

ARI Client Geo Engineers  
COC No(s) \_\_\_\_\_ (NA)  
Assigned ARI Job No WJ09

Project Name Gas Works Park  
Delivered by Fed-Ex UPS  Courier  Hand Delivered  Other \_\_\_\_\_  
Tracking No. \_\_\_\_\_ NA

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES  NO

Were custody papers included with the cooler? YES  NO

Were custody papers properly filled out (ink, signed, etc.) YES  NO

Temperature of Cooler(s) (°C) (recommended 2 0-6 0 °C for chemistry) \_\_\_\_\_ 2.1

If cooler temperature is out of compliance fill out form 00070F

Cooler Accepted by [Signature] Date 3/26/13 Time 1625 Temp Gun ID# 90277952

*Complete custody forms and attach all shipping documents*

**Log-In Phase:**

Was a temperature blank included in the cooler? YES  NO

What kind of packing material was used? Bubble Wrap  Wet Ice  Gel Packs  Baggies  Foam Block  Paper  Other: \_\_\_\_\_

Was sufficient ice used (if appropriate)? NA  YES  NO

Were all bottles sealed in individual plastic bags? YES  NO

Did all bottles arrive in good condition (unbroken)? YES  NO

Were all bottle labels complete and legible? YES  NO

Did the number of containers listed on COC match with the number of containers received? YES  NO

Did all bottle labels and tags agree with custody papers? YES  NO

Were all bottles used correct for the requested analyses? YES  NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) NA  YES  NO

Were all VOC vials free of air bubbles? NA  YES  NO

Was sufficient amount of sample sent in each bottle? YES  NO

Date VOC Trip Blank was made at ARI. NA 3/20/13

Was Sample Split by ARI: NA  YES  Date/Time: \_\_\_\_\_ Equipment: \_\_\_\_\_ Split by \_\_\_\_\_

Samples Logged by: AV Date: 3/27/13 Time: 1006

**\*\* Notify Project Manager of discrepancies or concerns \*\***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

**Additional Notes, Discrepancies, & Resolutions:**

TB = 2PB

Rinse - 032613 has NO analysis requested  
logged for BETX + PATHs - same as  
Rinse - 032513 + only ambers + vials provided.

By: AV/AD Date: 3/27/13

			Small → "sm"
			Peabubbles → "pb"
			Large → "lg"
			Headspace → "hs"



**Subject:** GWP - WJ09 COC markup

**From:** "Zanna A. Satterwhite" <zsatterwhite@geoengineers.com>

**Date:** 3/27/2013 5:09 PM

**To:** "Cheronne Oreiro (cheronneo@arilabs.com)" <cheronneo@arilabs.com>

**CC:** "Sue Dunnihoo (sue@arilabs.com)" <sue@arilabs.com>, "Mark J. Lybeer" <mlybeer@geoengineers.com>, "Paul D. Robinette" <probinette@geoengineers.com>, "Dan M. Baker" <dbaker@geoengineers.com>, Claudia De La Via <cdelavia@geoengineers.com>, "John T. Peters" <jpeters@geoengineers.com>, Andrew Johnson <ajohnson@geoengineers.com>

Cheronne,

Here is the COC markup for the first Gas Works Park sample shipment on 3-26-13 (WJ09).

Please send me copies of the COC whenever there is a cooler pickup from the site and I will review and make changes. Next cooler pickup is scheduled for tomorrow (Thursday) at 4:30.

It is our understanding that if we need to ask ARI to analyze any of the soil samples that are listed as "hold" on the COC, we must do so within 14 days of sampling to stay within the hold time for BTEX & PAHs.

Thank you,

Zanna

**Confidentiality:** This message is confidential and intended solely for use of the individual or entity to whom it is addressed. If you are not the person for whom this message is intended, please delete it and notify me immediately, and please do not copy or send this message to anyone else.

Attachments

WJ09 COC markup 3-27-13.pdf

1.4 MB

# Chain of Custody Record & Laboratory Analysis Request

ZAS Markings 3-27-13



Analytical Resources, Incorporated  
Analytical Chemists and Consultants  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

ARI Assigned Number: <b>WJ09</b>	Turn-around Requested: <b>Standard</b>	Page: <b>1</b> of <b>2</b>
ARI Client Company: <b>GeoEngineers</b>	Phone: <b>206 499 7588</b>	Date:
Client Contact: <b>Zanna Sattenwhite</b>	No. of Coolers:	Ice Present? <b>No</b>
Client Project Name: <b>Gas Works Park</b>	Cooler Temps:	

Client Project #: <b>186-846-01</b>	Samplers: <b>Zanna Sattenwhite; Paul Rebinette</b>	Analysis Requested						Notes/Comments
--	---	--------------------	--	--	--	--	--	----------------

Sample ID	Date	Time	Matrix	No. Containers	Assem. C EPA Method 200.8	PATHS EPA 8270 SIM * 10µ level	BTEX EPA 8260 1µ level	Sieve ASTM D422										
MW39D-0.5-1.5	3/25/13	0938	Soil	1	X													
MW39D-08-10	3/25/13	1119	Soil	<del>5</del>	X	X	X											
MW39D-14-15	3/25/13	1209	Soil	4														HOLD
Rinse-032513	3/25/13	1302	Water	5		X	X											
MW39S-3.5-13.5	3/25/13	1419	Soil	1				X										Composite
MW37S-19.5-20	3/26/13	1535	Soil	4		<del>X</del>	<del>X</del>											HOLD
MW37S-8-9	3/26/13	1453	Soil	4		X	X											
MW37S-0.5-1	3/26/13	1411	Soil	1	X													
MW37S-13.5-14.5	3/26/13	1619	Soil	4														HOLD

Comments/Special Instructions <b>*Retain for possible alkyl PATH suite analysis.</b>	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>Andrew Johnson</b>	Printed Name: <b>Rich Hudson</b>	Printed Name:	Printed Name:
	Company: <b>GeoEngineers</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>3/26/13 1635</b>	Date & Time: <b>3/26/13 1635</b>	Date & Time:	Date & Time:

L0000:5011

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# Chain of Custody Record & Laboratory Analysis Request

ZAS workys 3-27-13

ARI Assigned Number:	Turn-around Requested: <b>Standard</b>	Page: <b>2</b> of <b>2</b>
ARI Client Company: <b>GeoEngineers</b>	Phone: <b>206 499 7588</b>	Date: <b>3/26/13</b> Ice Present?
Client Contact: <b>Zanna Sattenwhite</b>	No. of Coolers:	Cooler Temps:



Analytical Resources, Incorporated  
Analytical Chemists and Consultants  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested				Notes/Comments
					PAHs EPA 821-SM	BTEX EPA 821-100 Level	AV EPA 200.8	SIEVE ASTM D422	
MW39D-17-18 <sup>ZAS</sup>	3/26/13	0830	S	<del>25</del> S	X	X	X	X	<del>Soils - composite</del> ZAS
MW385-0.5-1	3/26/13	1037	S	1			X		
MW385-5-15	3/26/13	1200	S	1			X		Composite
MW385-8-9	3/26/13	1200	S	4	X	X			
MW385-10-11	3/26/13	1200	S	1			X		
Rinse-032613	3/26/13	1348	W	5					HU-D
Trip Blank-032613	3/26/13		W	2		X			
MW39D-16-19	3/26/13	0830	S	1			X		Composite
MW375-7.5-8	3/26/13	1535	S	1			X		
MW375-7.5-20	3/26/13	1535	S	1			X		COMPOSITE
Comments/Special Instructions <b>* retain for possible alt PTH suite analysis</b>	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)					
	Printed Name: <b>Andrew Johnson</b>	Printed Name: <b>Rich Hudson</b>	Printed Name:	Printed Name:					
	Company: <b>GEOENGINEERS, INC</b>	Company: <b>ARI</b>	Company:	Company:					
	Date & Time: <b>3/26/13 1635</b>	Date & Time: <b>3/26/13 1635</b>	Date & Time:	Date & Time:					

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00000-0014

Case Narrative, Data Qualifiers, Control Limits

ARI Job ID: WJ09



## **Case Narrative**

**Client: GeoEngineers, Inc.**  
**Project: Gas Works Park, 186-846-01**  
**ARI Job No.: WJ09**

### **Sample Receipt**

Sixteen soil samples, two water samples, and a trip blank were received on March 26, 2013 under ARI job WJ09. Select samples were archived upon receipt. The cooler temperature measured by IR thermometer following ARI SOP was 2.1°C. For further details regarding sample receipt, please refer to the Cooler Receipt Form.

### **BETX by SW8260C**

The samples were analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements. Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blanks were clean at the reporting limits. The LCS and LCSD percent recoveries were within control limits.

### **PAHs by SW8270-SIM**

The samples and associated laboratory QC were extracted and analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements. Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The soil method blank was clean at the reporting limits. Naphthalene was present in the water method blank at a level that was greater than the reporting limit. All detected water results for this compound have been flagged with a "B" qualifier. No further corrective action was taken.

The LCS and LCSD percent recoveries were within control limits.

The matrix spike and matrix spike duplicate percent recoveries were within advisory control limits.





**Arsenic by SW200.8**

The samples and associated laboratory QC were digested and analyzed within recommended holding times.

The method blank was clean at the reporting limit. The LCS percent recovery was within control limits.

The matrix spike percent recovery was within control limits.

The duplicate RPD of arsenic was outside the 20% control limit for sample **MW39D-0.5-1.5**. All relevant data have been flagged with a “\*” qualifier on the Form VI. No further corrective action was taken.

**Geotechnical Parameters**

A laboratory-specific case narrative follows this page.



**Client:** GeoEngineers

**ARI Job No.:** WJ09

**Client Project:** Gas Works Park

**Client Project No.:** 186-846-01

### Case Narrative

1. Four samples were submitted for analysis on March 27, 2013, and were in good condition.
2. The samples were submitted for grain size distribution according to ASTM D422. The samples were prepared according to ASTM D421.
3. An assumed specific gravity of 2.65 was used in the hydrometer calculations.
4. A standard milkshake mixer type device was used to disperse the fine fraction sample for one minute.
5. One sample from this job, MW39S-3.5-13.5, was chosen for triplicate analysis. The triplicate data can be found on the QA summary table.
6. Due to the sandy nature of the samples, there was not enough fine material to acquire accurate hydrometer readings. Sample MW39S-3.5-13.5, required curve fitting between the sand and silt fractions.
7. The samples displayed an oily sheen and all the samples gave off a very strong fuel like odor. The presence of a fuel-like contaminant may have affected the grain size distribution.
8. The data is provided in summary tables and plots.
9. There were no further anomalies in the samples or test method.

Released by: *Guerrina Curtis*  
Geotechnical Laboratory Manager

Date: 4/9/13

Reviewed by: *Robert Hable*  
Technician

Date: April 9, 2013

# Sample ID Cross Reference Report



ARI Job No: WJ09  
 Client: Geoengineers  
 Project Event: 186-846-01  
 Project Name: Gas Works Park

Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1. MW39D-0.5-1.5	WJ09A	13-6319	Soil	03/25/13 09:38	03/26/13 16:35
2. MW39D-08-10	WJ09B	13-6320	Soil	03/25/13 11:19	03/26/13 16:35
3. MW39D-14-15	WJ09C	13-6321	Soil	03/25/13 12:09	03/26/13 16:35
4. MW39S-3.5-13.5	WJ09D	13-6322	Soil	03/25/13 14:19	03/26/13 16:35
5. MW37S-19.5-20	WJ09E	13-6323	Soil	03/26/13 15:35	03/26/13 16:35
6. MW37S-8-9	WJ09F	13-6324	Soil	03/26/13 14:53	03/26/13 16:35
7. MW37S-0.5-1	WJ09G	13-6325	Soil	03/26/13 14:11	03/26/13 16:35
8. MW37S-13.5-14.5	WJ09H	13-6326	Soil	03/26/13 16:19	03/26/13 16:35
9. MW39D-17-18	WJ09I	13-6327	Soil	03/26/13 08:30	03/26/13 16:35
10. MW38S-0.5-1	WJ09J	13-6328	Soil	03/26/13 10:37	03/26/13 16:35
11. MW38S-5-15	WJ09K	13-6329	Soil	03/26/13 12:00	03/26/13 16:35
12. MW38S-8-9	WJ09L	13-6330	Soil	03/26/13 12:00	03/26/13 16:35
13. MW38S-10-11	WJ09M	13-6331	Soil	03/26/13 12:00	03/26/13 16:35
14. MW39D-16-19	WJ09N	13-6332	Soil	03/26/13 08:30	03/26/13 16:35
15. MW37S-7.5-8	WJ09O	13-6333	Soil	03/26/13 15:35	03/26/13 16:35
16. MW37S-7.5-20	WJ09P	13-6334	Soil	03/26/13 15:35	03/26/13 16:35
17. Rinse-032513	WJ09Q	13-6335	Water	03/25/13 13:02	03/26/13 16:35
18. Rinse-032613	WJ09R	13-6336	Water	03/26/13 13:48	03/26/13 16:35
19. Trip Blank-032613	WJ09S	13-6337	Water	03/25/13	03/26/13 16:35



## Geotechnical Data

- A The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.
- F Samples were frozen prior to particle size determination
- SM Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations
- SS Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis
- W Weight of sample in some pipette aliquots was below the level required for accurate weighting

**Geotechnical Analysis  
Report and Summary QC Forms**

**ARI Job ID: WJ09**



GeoEngineers  
 186-846-01  
 Gas Works Park

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
MW39S-3 5-13 5	100.0	100.0	100.0	100.0	100.0	89.6	87.8	69.0	44.0	27.7	18.2	12.6	8.6	4.8	4.8	3.2	2.1	1.6	1.1	1.1	1.1
	100.0	100.0	100.0	100.0	94.3	83.7	77.8	58.9	39.0	24.9	16.1	10.8	7.3	3.8	3.4	2.9	1.7	1.7	0.6	0.6	0.6
	100.0	100.0	100.0	100.0	96.9	87.1	84.1	66.2	43.9	28.0	18.3	12.6	8.5	4.6	4.4	2.7	2.2	1.6	1.1	0.5	0.5
MW38S-5-15	100.0	100.0	100.0	100.0	92.3	86.9	78.1	62.8	44.4	29.2	17.4	10.0	5.6	2.4	2.1	1.1	1.1	1.1	0.7	0.0	0.0
MW39D-16-19	100.0	100.0	100.0	100.0	91.4	81.5	76.4	69.1	63.7	58.3	51.1	40.2	28.7	18.4	10.8	7.6	6.0	4.4	2.8	1.2	0.4
MW37S-7 5-20	100.0	100.0	100.0	100.0	88.7	73.2	69.7	61.2	48.5	37.4	28.9	20.4	13.7	7.9	7.6	5.9	4.5	3.7	2.5	1.7	0.8

Testing performed according to ASTM D421/D422

WJ09

92100:601n

GeoEngineers  
 186-846-01  
 Gas Works Park

Percent Retained in Each Size Fraction

Description	% Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand		% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay	
	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3 2	3 2-1 3	<1 3
MW39S-3 5-13 5	0.0	0.0	0.0	0.0	10.4	1.8	18.9	25.0	16.3	9.5	5.6	4.0	3.8	0.1	1.6	1.1	0.5	0.5	0.0	0.0	1.1
	0.0	0.0	0.0	5.7	10.6	5.8	18.9	19.9	14.1	8.8	5.2	3.5	3.5	0.4	0.6	1.1	0.0	1.1	0.0	0.0	0.6
	0.0	0.0	0.0	3.1	9.7	3.0	17.9	22.2	15.9	9.7	5.7	4.1	3.9	0.2	1.6	0.5	0.5	0.5	0.5	0.0	0.5
MW38S-5-15	0.0	0.0	0.0	7.7	5.4	8.8	15.2	18.4	15.2	11.8	7.4	4.4	3.2	0.3	0.9	0.0	0.0	0.5	0.7	0.0	0.0
MW39D-16-19	0.0	0.0	0.0	8.6	9.9	5.1	7.3	5.4	5.4	7.2	10.9	11.5	10.3	7.6	3.2	1.6	1.6	1.6	1.6	0.8	0.4
MW37S-7 5-20	0.0	0.0	0.0	11.3	15.5	3.5	8.5	12.6	11.1	8.4	8.5	6.7	5.8	0.3	1.7	1.4	0.8	1.1	0.8	0.8	0.8

62700.6014

Client	GeoEngineers	Project No	186-846-01
ARI Tnplicate Sample ID	WJ09D	Project	Gas Works Park
Client Tnplicate Sample ID	MW39S-3 5-13 5	Batch No	WJ09-01
		Page	1 of 1

Relative Standard Deviation, By Size

Sample ID	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	32	22	13	9	7	3.2	1.3
MW39S-3 5-13 5	100.0	100.0	100.0	100.0	100.0	89.6	87.8	69.0	44.0	27.7	18.2	12.6	8.6	4.8	4.8	3.2	2.1	1.6	1.1	1.1	1.1
MW39S-3 5-13 5	100.0	100.0	100.0	100.0	94.3	83.7	77.8	58.9	39.0	24.9	16.1	10.8	7.3	3.8	3.4	2.9	1.7	1.7	0.6	0.6	0.6
MW39S-3 5-13 5	100.0	100.0	100.0	100.0	96.9	87.1	84.1	66.2	43.9	28.0	18.3	12.6	8.5	4.6	4.4	2.7	2.2	1.6	1.1	0.5	0.5
AVE	100.00	100.00	100.00	100.00	97.06	86.82	83.27	64.69	42.30	26.88	17.54	12.03	8.14	4.40	4.19	2.92	2.01	1.65	0.91	0.73	0.73
STDEV	0.00	0.00	0.00	0.00	2.85	2.99	5.05	5.18	2.88	1.72	1.29	1.02	0.71	0.55	0.69	0.23	0.26	0.06	0.29	0.29	0.29
%RSD	0.00	0.00	0.00	0.00	2.94	3.44	6.07	8.01	6.80	6.40	7.33	8.51	8.78	12.41	16.49	7.79	12.85	3.76	32.25	39.80	39.80

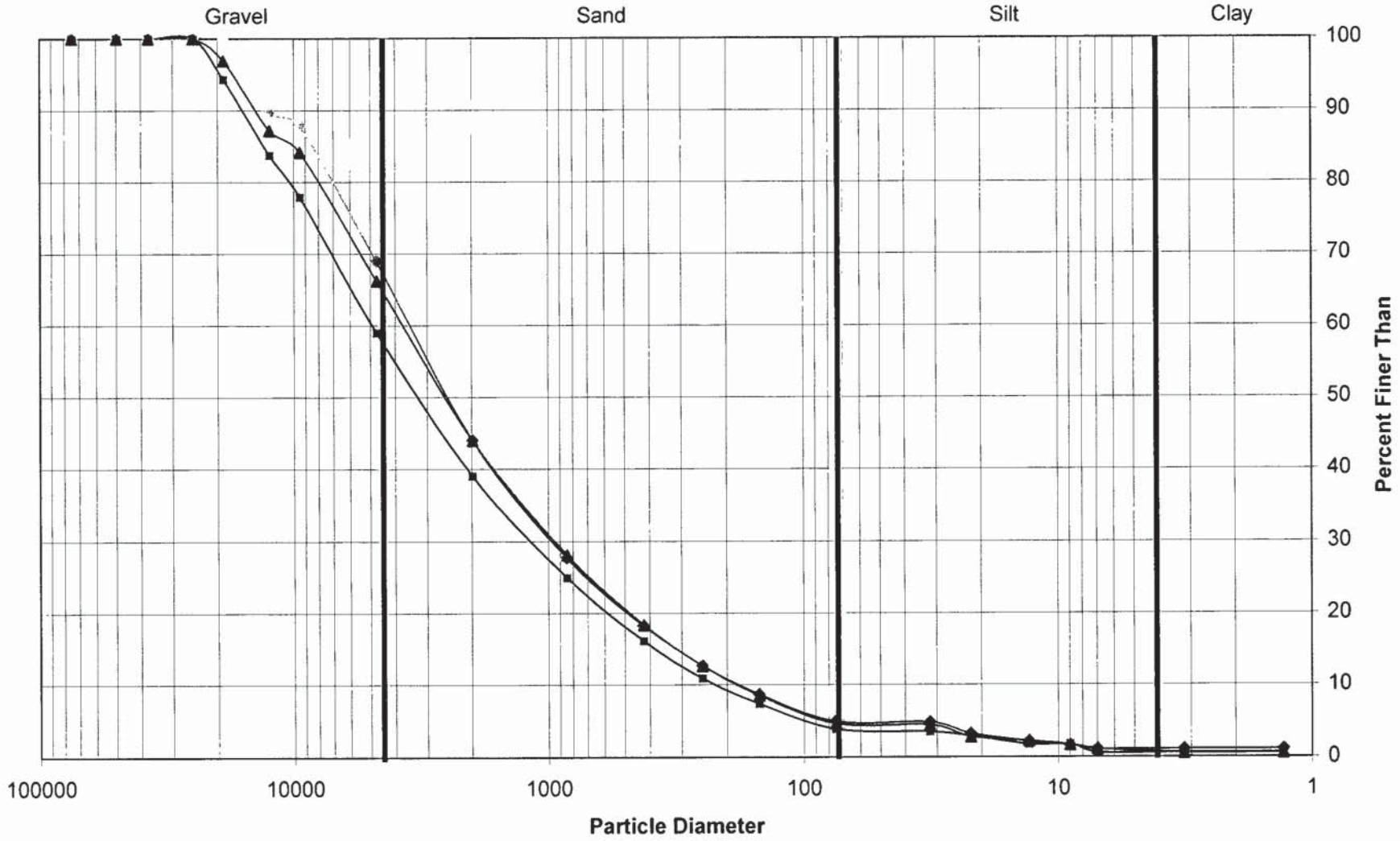
This Tnplicate applies to the Batch Containing the Following Samples

Sample ID	Date Sampled	Date Set up	Date Started	Date Complete	Data Qualifiers
MW39S-3 5-13 5	3/25/2013	4/1/2013	4/4/2013	4/8/2013	
	3/25/2013	4/1/2013	4/4/2013	4/8/2013	
	3/25/2013	4/1/2013	4/4/2013	4/8/2013	
MW38S-5-15	3/26/2013	4/1/2013	4/4/2013	4/8/2013	
MW39D-16-19	3/26/2013	4/1/2013	4/4/2013	4/8/2013	
MW37S-7 5-20	3/26/2013	4/1/2013	4/4/2013	4/8/2013	

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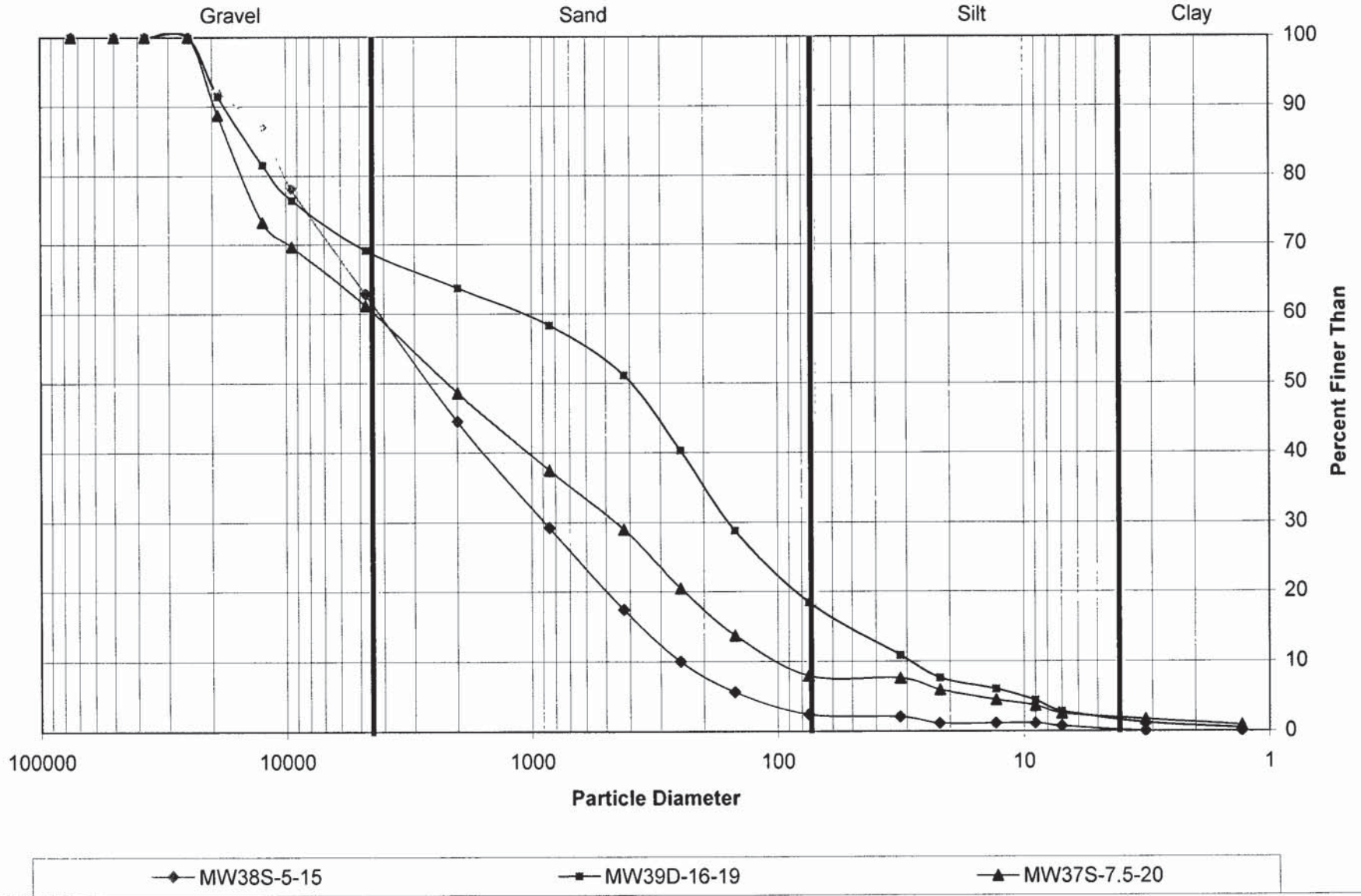
### Grain Size Distribution by Hydrometer



◆ MW39S-3.5-13.5      ■ MW39S-3.5-13.5      ▲ MW39S-3.5-13.5

13100 6017

# Grain Size Distribution by Hydrometer



2010016013

Geotechnical Raw Data  
Analyst Notes and Raw Data

ARI Job ID: WJ09

Sample Number	MW39S-3.5-13 5	100 00	100 00	100 00	100 00	100 00	100 00	89 64	87 84	68 96	43 98	27 69	18 24	12 64	8 63	4 84	4 76	3 17	2 12	1 59	1 06	1 06	1 06
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	36 4	23 2	13 5	9 6	6 8	3 3	1 4
Test Temperature	20 5	5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Specific Gravity	2.65																						

Sieve Analysis Portion						Hydrometer Analysis Portion							
Sieve Size	Weight of Soil + Tare	Total Weight of Soil		Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a
5"	10 28	0 00		0 00	100 00								
3"	10 28	0 00		0 00	100 00								
2"	10 28	0 00		0 00	100 00								
15"	10 28	0 00		0 00	100 00	1	11 5	6.5	5 29	14 4	51 38704	0 013535	1 001385
1	10 28	0 00		0 00	100 00	2	11	6.5	4 76	14 5	36 43927	0 013535	1 001385
3/4	10 28	0 00		0 00	100 00	5	9.5	6.5	3 17	14 7	23 24084	0 013535	1 001385
1/2	21 58	11 30		10 36	89 64	15	8.5	6.5	2 12	14 9	13 4925	0 013535	1 001385
3/8	23 54	13 26		12 16	87 84	30	8	6.5	1 59	15 0	9 566827	0 013535	1 001385
4	44 14	33 86		31 04	68 96	60	7.5	6.5	1 06	15 1	6 783239	0 013535	1 001385
10	71 39	61 11		56 02	43 98	250	7	6.0	1 06	15 2	3 332119	0 013535	1 001385
20	88 8	15 41	16 28	72 31	27 69	1440	7	6 0	1 06	15 2	1 388383	0 013535	1 001385
40	95 75	24 36	25 74	81 76	18 24								
60	101 05	29 66	31 34	87 36	12 64								
100	104 84	33 45	35 35	91 37	8 63								
200	108 43	37 04	39 14	95 16	4 84								

Wet Wt & Tare	3.77
Dry Wt & Tare	3.75
Wt Moisture	0.02
Wt Tare	1.56
Dry Soil	2.19
Moisture Content	0.00913242
Air Dry Total Sample	109.52
Oven Dry Total Samp	109.0819005
Air Dry Hydro Sample	42
Oven Dry Wt Hydro	41.6199095
Amount Plus #10	61.11
W (14.2) =	94.63829413

58600 6014

Sample Number	MW39S-3.5-13 5	100 00	100 00	100 00	100 00	100 00	94 30	83 69	77 84	58 92	38 98	24 90	16 05	10 85	7 32	3 79	3 42	2 85	1 71	1 71	0 57	0 57	0 57	
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	36 7	23 3	13 5	9 6	6 8	3 3	1 4	
Test Temperature	20 5 5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4		10	20	40	60	100	200								
Specific Gravity	2.65																							
Sieve Analysis Portion																								

Sample Number	MW39S-3.5-13 5	100 00	100 00	100 00	100 00	100 00	96 89	87 14	84 11	66 18	43 94	28 04	18 32	12 61	8 47	4 58	4 38	2 74	2 19	1 64	1 09	0 55	0 55
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	36 5	23 3	13 5	9 6	6 8	3 3	1 4
Test Temperature	20 5	5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Specific Gravity	2.65																						
		Sieve Analysis Portion										Hydrometer Analysis Portion											
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
		5"	9.8	0.00	0.00	100.00																	
		3"	9.8	0.00	0.00	100.00																	
		2"	9.8	0.00	0.00	100.00																	
		1 1/2"	9.8	0.00	0.00	100.00	1	11	6.5	4.92	14.5	51.53292	0.013535	1.001385									
		1	9.8	0.00	0.00	100.00	2	10.5	6.5	4.38	14.6	36.54214	0.013535	1.001385									
		3/4	13.12	3.32	3.11	96.89	5	9	6.5	2.74	14.8	23.30535	0.013535	1.001385									
		1/2	23.52	13.72	12.86	87.14	15	8.5	6.5	2.19	14.9	13.4925	0.013535	1.001385									
		3/8	26.75	16.95	15.89	84.11	30	8	6.5	1.64	15.0	9.566827	0.013535	1.001385									
		4	45.88	36.08	33.82	66.18	60	7.5	6.5	1.09	15.1	6.783239	0.013535	1.001385									
		10	69.81	59.81	56.06	43.94	250	6.5	6	0.55	15.2	3.341118	0.013535	1.001385									
		20	84.16	14.55	15.90	71.96	28.04	1440	6.5	6	0.55	15.2	1.392133	0.013535	1.001385								
		40	93.05	23.44	25.62	81.68	18.32																
		60	98.28	28.67	31.33	87.39	12.61																
		100	102.07	32.46	35.47	91.53	8.47																
		200	105.63	36.02	39.36	95.42	4.58																
Wet Wt & Tare	3.81																						
Dry Wt & Tare	3.78																						
Wt Moisture	0.03																						
Wt Tare	1.56																						
Dry Soil	2.22																						
Moisture Content	0.013513514																						
Air Dry Total Sample	107.32																						
Oven Dry Total Samp	106.6865333																						
Air Dry Hydro Sample	40.75																						
Oven Dry Wt Hydro	40.20666667																						
Amount Plus #10	59.81																						
W (14.2) =	91.5065509																						

28600:6014



Sample Number	MW38S-5-15	100 00	100 00	100 00	100 00	100 00	92 28	86 93	78 08	62 83	44 39	29 20	17 37	9 98	5 59	2 36	2 05	1 14	1 14	1 14	0 68	0 00	0 00
Test Temperature	20 5	5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200	36 4	23 3	13 5	9 5	6 8	3 4	1 4
Specific Gravity	2.65																						

Sieve Analysis Portion					Hydrometer Analysis Portion							
Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a
5"	10.32	0 00	0 00	100 00								
3"	10.32	0 00	0 00	100 00								
2"	10.32	0 00	0 00	100 00								
1 5"	10.32	0 00	0 00	100 00	1	13	6 5	2 97	14 2	50 94689	0 013535	1 001385
1	10.32	0 00	0 00	100 00	2	11	6 5	2 05	14 5	36 43927	0 013535	1 001385
3/4	29 87	19 55	7 72	92 28	5	9	6 5	1 14	14 8	23 30535	0 013535	1 001385
1/2	43 42	33 10	13 07	86 93	15	9	6 5	1 14	14 8	13 45535	0 013535	1 001385
3/8	65 83	55 51	21 92	78 08	30	9	6 5	1 14	14 8	9 514371	0 013535	1 001385
4	104 45	94 13	37 17	62 83	60	8	6 5	0 68	15 0	6 764769	0 013535	1 001385
10	151.15	140 83	55 61	44 39	250	6	6	0 00	15 3	3 350094	0 013535	1 001385
20	184.48	33 33	15 19	70 80	1440	6	6	0 00	15 3	1 395872	0 013535	1 001385
40	210 43	59 28	27 02	82 63								
60	226.65	75 50	34 42	90 02								
100	236.28	85 13	38 81	94 41								
200	243 36	92 21	42 04	97 64								

Wet Wt & Tare	9.2
Dry Wt & Tare	9.13
Wt Moisture	0.07
Wt Tare	1.54
Dry Soil	7.59
Moisture Content	0.009222661
Air Dry Total Sample	254.3
Oven Dry Total Samp	253.2630679
Air Dry Hydro Sample	98.28
Oven Dry Wt Hydro	97.3818799
Amount Plus #10	140.83
W (14 2) =	219.3592519

58600 : 601 n





Sample Number	MW37S-7.5-20	100 00	100 00	100 00	100 00	100 00	88 73	73 19	69 66	61 15	48 52	37 39	28 94	20 44	13 71	7 91	7 60	5 91	4 50	3 66	2 53	1 69	0 84
Test Temperature	20.5 5"	125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	34 5	22 3	13 0	9 3	6 7	3 3	1 4
Specific Gravity	2.65				1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200							
Sieve Analysis Portion											Hydrometer Analysis Portion												
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
		5"	10.32	0.00	0.00	100.00																	
		3"	10.32	0.00	0.00	100.00																	
		2"	10.32	0.00	0.00	100.00																	
Wet Wt & Tare	52.21	1 5"	10.32	0.00	0.00	100.00	1	23	6.5	9.29	12.5	47.90934	0	0.13535	1.001385								
Dry Wt & Tare	51.28	1	10.32	0.00	0.00	100.00	2	20	6.5	7.60	13.0	34.53541	0	0.13535	1.001385								
Wt Moisture	0.93	3/4	46.03	35.71	11.27	88.73	5	17	6.5	5.91	13.5	22.25072	0	0.13535	1.001385								
Wt Tare	1.57	1/2	95.25	84.93	26.81	73.19	15	14.5	6.5	4.50	13.9	13.03979	0	0.13535	1.001385								
Dry Soil	49.71	3/8	106.41	96.09	30.34	69.66	30	13	6.5	3.66	14.2	9.301587	0	0.13535	1.001385								
Moisture Content	0.018708509	4	133.37	123.05	38.85	61.15	60	11	6.5	2.53	14.5	6.652871	0	0.13535	1.001385								
Air Dry Total Sample	319.81	10	173.37	163.05	51.48	48.52	250	9	6	1.69	14.8	3.295875	0	0.13535	1.001385								
Oven Dry Total Samp	316.7347867	20	193.17	19.80	11.13	62.61	1440	7.5	6	0.84	15.1	1.384623	0	0.13535	1.001385								
Air Dry Hydro Sample	87.93	40	208.2	34.83	19.58	71.06																	
Oven Dry Wt Hydro	86.3151718	60	223.32	49.95	28.08	79.56																	
Amount Plus #10	163.05	100	235.29	61.92	34.81	86.29																	
W (14.2) =	177.8902005	200	245.61	72.24	40.61	92.09																	

06600.6017

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WJ09 ARI Sample ID: D-1 Setup Date: 04/01/2013 Initials: df  
 Sample Description: ROCKY SAND - FULL COLOR, ORGANIC DEBRIS, BLACK ASPHALT-LIKE MATERIAL  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	D-1
Tare Weight (g)	10.29
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	119.81
Hydro Test Sample Weight (g) (not including beaker weight)	41.16
Tare + Oven-Dried #10 Washed (g)	73.53
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	109.44

Hygroscopic Moisture Content	
Tare Number	D-1
Tare Weight (g)	1.56
Wet Soil + Tare (g)	3.77
Dry Soil + Tare (g)	3.75

Hydro Beaker: DF Calgon Batch #: 282 Calgon Date: 4/3/13 Technician: gc  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/4/2013 193285 Technician: eg

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
8:00:00	START			
8:01:00	1	11.5	6.5	20.5
8:02:00	2	11	6.5	20.5
8:05:00	5	109.5	6.5	20.5
8:15:00	15	85	6.5	20.5
8:30:00	30	8	6.5	20.5
9:00:00	60	75	6.5	21.0
12:10:00	250	6.57	6	21.5
8:00:00	1440	7	6	20

**Sieve Analysis**

Sieve Date: 4.8.13 Sieve Set #: 3 Technician: eg

Sieve Size	Cumulative Weight (g)
Empty Tare	10.28
2"	
1 1/2"	
1"	
3/4"	
1/2"	21.58
3/8"	23.54
#4	44.14
#10	71.39
#20	86.20
#40	95.75
#60	101.05
#100	104.84
#200	108.43
Pan	109.34

\* CURVE FITTING WAS APPLIED

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WJ09 ARI Sample ID.: D-2 Setup Date: 04/01/2013 Initials: Ukt  
 Sample Description: ROCKY SAND - FINE ODOR, ORGANIC DEBRIS, BLACK ASPHALT-LIKE MVA DEBRIS  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	D-2
Tare Weight (g)	10.53
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	116.87
Hydro Test Sample Weight (g) (not including beaker weight)	34.17* 34.50*
Tare + Oven-Dried #10 Washed (g)	77.33
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	107.03

Tare Number	D-2
Tare Weight (g)	1.53
Wet Soil + Tare (g)	4.06
Dry Soil + Tare (g)	4.04

Hydro Beaker: DT Calgon Batch #: 282 Calgon Date: 4/3/13 Technician: gc  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/4/2013 K13285 Technician: ey

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
8:07:00	START			
8:08:00	1	10	6.5	20.5
8:09:00	2	9.5	6.5	20.5
8:12:00	5	9	6.5	20.5
8:22:00	15	8	6.5	20.5
8:37:00	30	8	6.5	20.5
9:07:00	60	7	6.5	21.0
12:17:00	250	6.5	6	121.5*
8:07:00	1440	6.5	6	20

**Sieve Analysis**

Sieve Date: 4-8-13 Sieve Set #: 4 Technician: ey

Sieve Size	Cumulative Weight (g)
Empty Tare	10.52
2"	
1½"	
1"	
¾"	16.56
½"	27.87
3/8"	34.01
#4	54.07
#10	76.21
#20	87.57
#40	95.34
#60	99.91
#100	103.01
#200	106.11
Pan	106.81

\* CURVE FITTING WAS APPLIED



**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WJ09 ARI Sample ID.: D-3 Setup Date: 04/01/2013 Initials: klb  
 Sample Description: ROCKY SAND - FUEL ODOUR ORGANIC DEBRIS BLACK ASPHALT-LIKE MATERIAL  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	D-3
Tare Weight (g)	9.78
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	117.10
Hydro Test Sample Weight (g) (not including beaker weight)	<del>90.106.07</del> <sup>40.75</sup> 40.16
Tare + Oven-Dried #10 Washed (g)	71.62
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	106.59

Tare Number	1-3
Tare Weight (g)	1.56
Wet Soil + Tare (g)	3.81
Dry Soil + Tare (g)	3.78

Hydro Beaker: DX Calgon Batch #: 292 Calgon Date: 4/3/13 Technician: gc  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/4/2013 193285 Technician: ey

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
8:14:00	START			
8:15:00	1	11	6.5	20.5
8:16:00	2	10.5	6.5	20.5
8:19:00	5	9	6.5	20.5
8:29:00	15	8.5	6.5	20.5
8:44:00	30	8	6.5	20.5
9:14:00	60	7.5	6.5	21.0
12:24:00	250	6.5	6	21.5
8:14:00	1440	6.5	6	20

**Sieve Analysis**

Sieve Date: 4-8-13 Sieve Set #: 3 Technician: ey

Sieve Size	Cumulative Weight (g)
Empty Tare	9.80
2"	
1½"	
1"	
¾"	13.12
½"	23.52
3/8"	26.75
#4	45.88
#10	69.61
#20	84.16
#40	93.05
#60	98.28
#100	102.07
#200	105.63
Pan	106.48

\*CURVE FITTING WAS APPLIED

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WJ09 ARI Sample ID.: K Setup Date: 04/01/2013 Initials: kb  
 Sample Description: ROCKY SAND, BLACK ASPHALT-LIKE MATERIAL  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>K</u>
Tare Weight (g)	<u>10.31</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>264.61</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>98.28</u>
Tare + Oven-Dried #10 Washed (g)	<u>155.16</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>245.32</u>

Tare Number	<u>K</u>
Tare Weight (g)	<u>1.54</u>
Wet Soil + Tare (g)	<u>9.20</u>
Dry Soil + Tare (g)	<u>9.13</u>

Hydro Beaker: W Calgon Batch #: 282 Calgon Date: 4/13/13 Technician: gc  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/4/2013 193285 Technician: ey

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
8:21:00	<b>START</b>			
8:22:00	<u>1</u>	<u>13</u>	<u>6.5</u>	<u>20.5</u>
8:23:00	<u>2</u>	<u>11</u>	<u>6.5</u>	<u>20.5</u>
8:26:00	<u>5</u>	<u>9</u>	<u>6.5</u>	<u>20.5</u>
8:36:00	<u>15</u>	<u>859</u>	<u>6.5</u>	<u>20.5</u>
8:51:00	<u>30</u>	<u>9</u>	<u>6.5</u>	<u>20.5</u>
9:21:00	<u>60</u>	<u>8</u>	<u>6.5</u>	<u>21.0</u>
12:31:00	<u>250</u>	<u>6</u>	<u>6</u>	<u>21.5</u>
8:21:00	<u>1440</u>	<u>6</u>	<u>6</u>	<u>20</u>

**Sieve Analysis**

Sieve Date: 4-8-13 Sieve Set #: 4 Technician: ey

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.32</u>
2"	
1½"	
1"	
¾"	<u>29.87</u>
½"	<u>43.42</u>
3/8"	<u>65.83</u>
#4	<u>104.45</u>
#10	<u>151.15</u>
#20	<u>184.48</u>
#40	<u>210.43</u>
#60	<u>226.65</u>
#100	<u>236.28</u>
#200	<u>243.36</u>
Pan	<u>245.07</u>



**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WJ09 ARI Sample ID.: N Setup Date: 04/01/2013 Initials: Sub  
 Sample Description: CLAYEY SAND, ROUNDED ROCKS  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	N
Tare Weight (g)	10.21
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	356.52
Hydro Test Sample Weight (g) (not including beaker weight)	79.58
Tare + Oven-Dried #10 Washed (g)	136.01
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	193.38

Tare Number	N
Tare Weight (g)	1.55
Wet Soil + Tare (g)	72.69
Dry Soil + Tare (g)	72.56

Hydro Beaker: N Calgon Batch #: 282 Calgon Date: 4/3/13 Technician: JK  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/4/2013 193285 Technician: ey

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
8:28:00	START			
8:29:00	1	22	6.5	20.5
8:30:00	2	20	6.5	20.5
8:33:00	5	16	6.5	20.5
8:43:00	15	14	6.5	20.5
8:58:00	30	12	6.5	20.5
9:28:00	60	10	6.5	21.0
12:38:00	250	7.5	6	21.5
8:28:00	1440	6.5	6	20

**Sieve Analysis**

Sieve Date: 4-8-13 Sieve Set #: 3 Technician: ey

Sieve Size	Cumulative Weight (g)
Empty Tare	10.23
2"	
1½"	
1"	
¾"	39.87
½"	74.17
⅜"	91.85
#4 <u>ey</u>	116.72 117.12
#10	135.88
#20	142.58
#40	151.58
#60	165.12
#100	179.47
#200	192.38
Pan	193.30

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WJ09 ARI Sample ID.: P Setup Date: 04/01/2013 Initials: lab  
 Sample Description: ROCKY SAND, OIL-LIKE FILM/SHEEN/ODOR, YELLOWISH COLOR -Hydrophobic  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>P</u>
Tare Weight (g)	<u>10.28</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>329.89</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>87.93</u>
Tare + Oven-Dried #10 Washed (g)	<u>180.12</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>247.44</u>

Tare Number	<u>P</u>
Tare Weight (g)	<u>1.57</u>
Wet Soil + Tare (g)	<u>52.21</u>
Dry Soil + Tare (g)	<u>51.28</u>

Hydro Beaker: QQQ Calgon Batch #: 232 Calgon Date: 4/3/13 Technician: gc  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/4/2013 193285 Technician: ey

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
8:49:00	START			
8:50:00	1	23	6.5	20.5
8:51:00	2	20	6.5	20.5
8:54:00	5	17	6.5	20.5
9:04:00	15	14.5	6.5	20.5
9:19:00	30	13	6.5	20.5
9:49:00	60	11	6.5	21.0
12:59:00	250	9	6	21.5
8:49:00	1440	7.5	6	20

Thick opaque foam formed when mixed for hydro analysis. (gc)

**Sieve Analysis**

Sieve Date: 4.8.13 Sieve Set #: 4 Technician: ey

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.32</u>
2"	
1½"	
1"	
¾"	<u>46.03</u>
½"	<u>95.25</u>
3/8"	<u>106.41</u>
#4	<u>133.37</u>
#10	<u>173.37</u>
#20	<u>193.17</u>
#40	<u>208.20</u>
#60	<u>223.32</u>
#100	<u>235.29</u>
#200	<u>245.61</u>
Pan	<u>247.17</u>

10  
10  
10  
10  
10



Table of Contents: ARI Job WJ66

Client: Geoengineers

Project: 0186-846-01 Gas Works Park

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EC  
Signature

April-09-2013  
Date



Table of Contents: ARI Job WJ66

Client: Geoengineers

Project: 0186-846-01 Gas Works Park

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\_\_\_\_\_  
Signature

April-09-2013  
Date



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

April 18, 2013

Zanna Satterwhite  
GeoEngineers, Inc.  
Plaza 600 Building  
600 Stewart Street, Suite 1700  
Seattle, WA 98101

**RE: Client Project: Gas Works Park, 186-846-01**  
**ARI Job No.: WJ66**

Dear Zanna:

Please find enclosed the Chain of Custody records (COCs), sample receipt documentation, and the final data package for samples from the project referenced above.

Sample receipt and details of these analyses are discussed in the Case Narrative.

An electronic copy of this package will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

A handwritten signature in black ink, appearing to read "Cheronne Oreiro", written over a faint circular stamp or watermark.

Cheronne Oreiro  
Project Manager  
(206) 695-6214  
[cheronneo@arilabs.com](mailto:cheronneo@arilabs.com)  
[www.arilabs.com](http://www.arilabs.com)

cc: eFile: WJ66

Enclosures

**Chain of Custody Documentation**

**ARI Job ID: WJ66**







# Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested: <b>Standard</b>	Page: <b>3</b> of <b>3</b>
ARI Client Company: <b>Geo Engineers</b>	Phone: <b>206-499-7588</b>	Date: <b>3/28/13</b>
Client Contact: <b>Zanno Satterwhite</b>		Ice Present?
Client Project Name: <b>Gas works Park</b>		No. of Coolers:
Client Project #: <b>0186-846-01</b>	Samplers: <b>Andrew Johnson</b>	Cooler Temps:

Sample ID	Date	Time	Matrix	No Containers	Analysis Requested						Notes/Comments	
					PMTS	8270 SIM	PFEX	8260 level	Arsenic	EPA 200.8		Spec Analysis
GEI-3-16-17	3/27/13	1503	S	6								
GEI-3-22-23	↓	1527	↓	6								
GEI-3-24-25	↓	1519	↓	6								
GEI-3-27-28	↓	1545	↓	6								
TRIP BLANK 03-27-13	↓		water	2			X					
Comments/Special Instructions	Relinquished by (Signature): <i>John Peters</i>	Received by: (Signature): <i>Rich Hudra</i>		Relinquished by (Signature):	Received by (Signature):							
	Printed Name: <b>JOHN PETERS</b>	Printed Name: <b>Rich Hudra</b>		Printed Name:	Printed Name:							
	Company: <b>Geoengineers</b>	Company: <b>ARI</b>		Company:	Company:							
	Date & Time: <b>3/28/13 1700</b>	Date & Time: <b>3/28/13 1700</b>		Date & Time:	Date & Time:							

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

0000019910





# Cooler Receipt Form

ARI Client GeoEngineer  
COC No(s) \_\_\_\_\_ (NA)  
Assigned ARI Job No. WJ66

Project Name Gas Works Park  
Delivered by Fed-Ex UPS Courier Hand Delivered Other \_\_\_\_\_  
Tracking No \_\_\_\_\_ (NA)

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES (NO)  
Were custody papers included with the cooler? YES NO  
Were custody papers properly filled out (ink, signed, etc) YES NO  
Temperature of Cooler(s) (°C) (recommended 2 0-6 0 °C for chemistry) 4.7 5.3  
If cooler temperature is out of compliance fill out form 00070F Temp Gun ID# 90877952  
Cooler Accepted by \_\_\_\_\_ Date: 3/28/13 Time: 1700

*Complete custody forms and attach all shipping documents*

**Log-In Phase:**

Was a temperature blank included in the cooler? YES (NO)  
What kind of packing material was used? Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: \_\_\_\_\_  
Was sufficient ice used (if appropriate)? NA YES NO  
Were all bottles sealed in individual plastic bags? YES NO  
Did all bottles arrive in good condition (unbroken)? YES NO  
Were all bottle labels complete and legible? YES NO  
Did the number of containers listed on COC match with the number of containers received? YES NO  
Did all bottle labels and tags agree with custody papers? YES NO  
Were all bottles used correct for the requested analyses? YES NO  
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) (NA) YES NO  
Were all VOC vials free of air bubbles? NA YES (NO)  
Was sufficient amount of sample sent in each bottle? YES NO  
Date VOC Trip Blank was made at ARI.. NA 3/20/13  
Was Sample Split by ARI. (NA) YES Date/Time \_\_\_\_\_ Equipment \_\_\_\_\_ Split by \_\_\_\_\_

Samples Logged by: AV Date: 3/29/13 Time: 1715

**\*\* Notify Project Manager of discrepancies or concerns \*\***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

**Additional Notes, Discrepancies, & Resolutions:**

Rinse -032713 = 1HS

By: AV Date: 3/29/13

			Small → "sm"
			Peabubbles → "pb"
			Large → "lg"
			Headspace → "hs"

**Subject:** GWP - COC markup

**From:** "Zanna A. Satterwhite" <zsatterwhite@geoengineers.com>

**Date:** 3/29/2013 2:06 PM

**To:** "Cheronne Oreiro (cheronneo@arilabs.com)" <cheronneo@arilabs.com>

**CC:** "Sue Dunnihoo (sue@arilabs.com)" <sue@arilabs.com>, "Mark J. Lybeer" <mlybeer@geoengineers.com>, "Paul D. Robinette" <probinette@geoengineers.com>, "Dan M. Baker" <dbaker@geoengineers.com>, Claudia De La Via <cdelavia@geoengineers.com>, "John T. Peters" <jpeters@geoengineers.com>, Andrew Johnson <ajohnson@geoengineers.com>

Cheronne,

Here is the COC markup for the second Gas Works Park sample shipment on 3-28-13.

I plan on dropping off the third sample shipment at ARI this evening before 6pm.

Thank you,

Zanna

Confidentiality: This message is confidential and intended solely for use of the individual or entity to whom it is addressed. If you are not the person for whom this message is intended, please delete it and notify me immediately, and please do not copy or send this message to anyone else.

Attachments

COC markup 3-29-13.pdf

2.0 MB







# Chain of Custody Record & Laboratory Analysis Request

2AS Markups  
3-29-13



Analytical Resources, Incorporated  
Analytical Chemists and Consultant  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested: <b>Standard</b>	Page: <b>2</b> of <b>3</b>
ARI Client Company: <b>GeoEngineers</b>	Phone: <b>206-499-7588</b>	Date: <b>3/28/13</b>
Client Contact: <b>Zanna Sitterwhite</b>	No. of Coolers:	Ice Present? <b>Present?</b>
Client Project Name: <b>Gas Works Park</b>	Cooler Temps:	

Client Project #: <b>0186-846-01</b>	Samplers: <b>Andrew Johnson</b>	Analysis Requested				Notes/Comments
		<b>PATE 8210 SIM</b>	<b>BTEX 8260 lowland</b>	<b>Arsenic EPA 200.8</b>	<b>Gene Analysis ASTM D422</b>	

Sample ID	Date	Time	Matrix	No. Containers	PATE 8210 SIM	BTEX 8260 lowland	Arsenic EPA 200.8	Gene Analysis ASTM D422	Notes/Comments
GEI-4-0.5-1.5	3/27/13	0823	S	1			X		
GEI-4-5.5-7.0		0850	S	6	X	X	X		
GEI-4-10.0-11.0		0924	S	1			X		
GEI-4-15.0-16.0		0940	S	6	X	X			
GEI-4-20.0-21.0		1017	S	6					Hold
GEI-4-28.5-29.0		1054	S	1					Hold
GEI-4-30.0-31.0		1054	S	5	X	X			
GEI-3-2.0-3.0		1435	S	6			X		
GEI-3-8-9		1445	S	6			X		
GEI-3-11.5-12.0		1453	S	6	X	X	X		

Comments/Special Instructions	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>John Peters</b>	Printed Name: <b>Ricky Hudson</b>	Printed Name:	Printed Name:
	Company: <b>GeoEngineers</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>3/28/13 1700</b>	Date & Time: <b>3/28/13 1700</b>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

MISS: 991M



# Chain of Custody Record & Laboratory Analysis Request

AS Markups  
3/28/13



Analytical Resources, Incorporated  
Analytical Chemists and Consultant  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested: <b>Standard</b>	Page: <b>3</b> of <b>3</b>
ARI Client Company: <b>Geo Engineers</b>	Phone: <b>206-499-7588</b>	Date: <b>3/28/13</b>
Client Contact: <b>Zanna Satterwhite</b>	No. of Coolers:	Ice Present? <b>Present?</b>
Client Project Name: <b>Gas works Park</b>	Cooler Temps:	

Client Project #: <b>0186-846-01</b>	Samplers: <b>Andrew Johnson</b>	Analysis Requested						Notes/Comments
---	------------------------------------	--------------------	--	--	--	--	--	----------------

Sample ID	Date	Time	Matrix	No. Containers	PM10 8210 SIM	PM10 8260 Inlevel	Arsenic EPA 200.8	Specific Analysis ASTMD 422										
GEI-3-16-17	3/27/13	1503	S	6	X	X												
GEI-3-22-23	↓	1527	↓	6	X	X												
GEI-3-24-25	↓	1519	↓	6														HELD
GEI-3-27-28	↓	1545	↓	6	X	X												
TRIP BLANK-0327-13	↓		water	2		X												

Comments/Special Instructions	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>John Peters</b>	Printed Name: <b>Rich Madros</b>	Printed Name:	Printed Name:
	Company: <b>Geo Engineers</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>3/28/13 1700</b>	Date & Time: <b>3/28/13 1700</b>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

4156:0010

Case Narrative, Data Qualifiers, Control Limits

ARI Job ID: WJ66



## **Case Narrative**

**Client: GeoEngineers, Inc.**  
**Project: Gas Works Park, 186-846-01**  
**ARI Job No.: WJ66**

### **Sample Receipt**

Twenty-one soil samples, one water sample, and a trip blank were received on March 28, 2013 under ARI job WJ66. Select samples were archived upon receipt. The cooler temperatures measured by IR thermometer following ARI SOP were 4.7 and 5.3°C. For further details regarding sample receipt, please refer to the Cooler Receipt Form.

### **BETX by SW8260C**

The samples and associated laboratory QC were analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements. Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blanks were clean at the reporting limits. The LCS and LCSD percent recoveries were within control limits.

The matrix spike and matrix spike duplicate percent recoveries of Benzene and Toluene fell outside advisory control limits low for sample MW35S-5-6. No corrective action is required for matrix QC.

### **Alkylated PAHs by SW8270-SIM**

The samples and associated laboratory QC were extracted and analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements. Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank was clean at the reporting limits. The LCS percent recoveries were within control limits.





All matrix spike and matrix spike duplicate percent recoveries were outside advisory control limits for sample **GEI-3-16-17** due to interferences. No corrective action is required for matrix QC.

### **PAHs by SW8270-SIM**

The samples and associated laboratory QC were extracted and analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements. Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The water method blank was clean at the reporting limits. Fluoranthene and Pyrene were present in **MB-040813** at levels that were greater than ½ the reporting limits. All detected results for these compounds have been flagged with a “B” qualifier. No further corrective action was taken.

The LCS and LCSD percent recoveries were within control limits.

The matrix spike and matrix spike duplicate percent recoveries of Naphthalene were outside advisory control limits for sample **GEI-3-27-28**. No corrective action is required for matrix QC.

### **Arsenic by SW200.8**

The samples and associated laboratory QC were digested and analyzed within recommended holding times.

The method blank was clean at the reporting limit. The LCS percent recovery was within control limits.

The matrix spike percent recovery of arsenic fell outside the control limits low for sample **MS35S-4.5-5**. A post digestion spike was performed and the recovery was within control limits. All relevant data have been flagged with an “N” qualifier on the Form V. No further corrective action was taken.

The duplicate RPD of arsenic was outside the 20% control limit for sample **MW35S-4.5-5**. All relevant data have been flagged with a “\*” qualifier on the Form VI. No further corrective action was taken.



**Geotechnical Parameters**

A laboratory-specific case narrative follows this page.





**Client:** GeoEngineers

**ARI Job No.:** WJ66

**Client Project:** Gas Works Park

**Client Project No.:** 0186-846-01

### Case Narrative

1. Two samples were submitted for analysis on March 29, 2013, and were in good condition.
2. The samples were submitted for grain size distribution according to ASTM D422. The samples were prepared according to ASTM D421.
3. An assumed specific gravity of 2.65 was used in the hydrometer calculations.
4. A standard milkshake mixer type device was used to disperse the fine fraction sample for one minute.
5. One sample from another job, MW39S-3.5-13.5, was chosen for triplicate analysis. The triplicate data can be found on the QA summary table.
6. The samples displayed an oily sheen and all the samples gave off a very strong fuel like odor. The presence of a fuel-like contaminant may have affected the grain size distribution.
7. One sample contained a tar like material which melted during the oven drying portion of the analysis. Upon cooling in the desiccator, the tar-like material solidified and entrained neighboring particles. Effort was made to separate the particles, but the tar-like material skewed the grain size distribution to appear coarser.
8. The data is provided in summary tables and plots.
9. There were no further anomalies in the samples or test method.

Released by: *Shirley Curtis*  
Geotechnical Laboratory Manager

Date: *4/9/13*

Reviewed by: *Robert White*  
Technician

Date: *April 9, 2013*

# Sample ID Cross Reference Report



ARI Job No: WJ66  
Client: Geoengineers  
Project Event: 0186-846-01  
Project Name: Gas Works Park

Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1. MW35S-5-6	WJ66A	13-6657	Soil	03/27/13 09:00	03/28/13 17:00
2. MW35S-4-7	WJ66B	13-6658	Soil	03/27/13 09:30	03/28/13 17:00
3. MW35S-4.5-5	WJ66C	13-6659	Soil	03/27/13 09:30	03/28/13 17:00
4. MW34S-5-10	WJ66D	13-6660	Soil	03/27/13 12:00	03/28/13 17:00
5. MW34S-7-8	WJ66E	13-6661	Soil	03/27/13 12:00	03/28/13 17:00
6. GEI-4-0.5-1.5	WJ66F	13-6662	Soil	03/27/13 08:23	03/28/13 17:00
7. GEI-4-5.5-7.0	WJ66G	13-6663	Soil	03/27/13 08:50	03/28/13 17:00
8. GEI-4-10.0-11.0	WJ66H	13-6664	Soil	03/27/13 09:24	03/28/13 17:00
9. GEI-4-15.0-16.0	WJ66I	13-6665	Soil	03/27/13 09:40	03/28/13 17:00
10. GEI-4-30.0-31.0	WJ66J	13-6666	Soil	03/27/13 10:54	03/28/13 17:00
11. GEI-3-2.0-3.0	WJ66K	13-6667	Soil	03/27/13 14:35	03/28/13 17:00
12. GEI-3-8-9	WJ66L	13-6668	Soil	03/27/13 14:45	03/28/13 17:00
13. GEI-3-11.5-12.0	WJ66M	13-6669	Soil	03/27/13 14:53	03/28/13 17:00
14. GEI-3-16-17	WJ66N	13-6670	Soil	03/27/13 15:03	03/28/13 17:00
15. GEI-3-22-23	WJ66O	13-6671	Soil	03/27/13 15:27	03/28/13 17:00
16. GEI-3-27-28	WJ66P	13-6672	Soil	03/27/13 15:45	03/28/13 17:00
17. RINSE-032713	WJ66Q	13-6673	Water	03/27/13 16:40	03/28/13 17:00
18. Trip Blank-03-27-13	WJ66R	13-6674	Water	03/27/13	03/28/13 17:00
19. MW35S-0.5-1	WJ66S	13-6675	Soil	03/27/13 08:20	03/28/13 17:00
20. MW35S-9-10	WJ66T	13-6676	Soil	03/27/13 09:30	03/28/13 17:00
21. GEI-4-20.0-21.0	WJ66U	13-6677	Soil	03/27/13 10:17	03/28/13 17:00
22. GEI-4-28.5-29.0	WJ66V	13-6678	Soil	03/27/13 10:54	03/28/13 17:00
23. GEI-3-24-25	WJ66W	13-6679	Soil	03/27/13 15:19	03/28/13 17:00



## Geotechnical Data

- A The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.
- F Samples were frozen prior to particle size determination
- SM Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations
- SS Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis
- W Weight of sample in some pipette aliquots was below the level required for accurate weighting

**Geotechnical Analysis  
Report and Summary QC Forms**

**ARI Job ID: WJ66**



GeoEngineers  
 Gas Works Park  
 0186-846-01

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
MW39S-3 5-13 5	100.0	100.0	100.0	100.0	100.0	89.6	87.8	69.0	44.0	27.7	18.2	12.6	8.6	4.8	4.8	3.2	2.1	1.6	1.1	1.1	1.1
	100.0	100.0	100.0	100.0	94.3	83.7	77.8	58.9	39.0	24.9	16.1	10.8	7.3	3.8	3.4	2.9	1.7	1.7	0.6	0.6	0.6
	100.0	100.0	100.0	100.0	96.9	87.1	84.1	66.2	43.9	28.0	18.3	12.6	8.5	4.6	4.4	2.7	2.2	1.6	1.1	0.5	0.5
MW35S-4-7	100.0	100.0	100.0	100.0	98.2	88.9	84.5	75.4	63.6	51.8	42.5	34.5	27.2	19.7	14.4	11.6	9.8	8.4	6.3	4.2	2.8
MW34S-5-10	100.0	100.0	100.0	100.0	93.7	89.1	82.9	75.5	70.3	65.5	59.1	48.9	36.1	23.5	15.9	12.4	9.9	8.2	6.4	3.9	2.6

Testing performed according to ASTM D421/D422

4166 : 00193

GeoEngineers  
 Gas Works Park  
 0186-846-01

Percent Retained in Each Size Fraction

Description	% Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand		% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay	
	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3 2	3.2-1 3	<1.3
MW39S-3.5-13 5	0.0	0.0	0.0	0.0	10.4	1.8	18.9	25.0	16.3	9.5	5.6	4.0	3.8	0.1	1.6	1.1	0.5	0.5	0.0	0.0	1.1
	0.0	0.0	0.0	5.7	10.6	5.8	18.9	19.9	14.1	8.8	5.2	3.5	3.5	0.4	0.6	1.1	0.0	1.1	0.0	0.0	0.6
	0.0	0.0	0.0	3.1	9.7	3.0	17.9	22.2	15.9	9.7	5.7	4.1	3.9	0.2	1.6	0.5	0.5	0.5	0.5	0.0	0.5
MW35S-4-7	0.0	0.0	0.0	1.8	9.3	4.4	9.1	11.7	11.9	9.3	8.0	7.4	7.5	5.3	2.8	1.8	1.4	2.1	2.1	1.4	2.8
MW34S-5-10	0.0	0.0	0.0	6.3	4.5	6.2	7.4	5.2	4.8	6.4	10.3	12.8	12.6	7.6	3.4	2.6	1.7	1.7	2.6	1.3	2.6

4166 : 00194

Client	GeoEngineers	Project No	Gas Works Park
ARI Triplicate Sample ID	WJ09 D	Project	0186-846-01
Client Triplicate Sample ID	MW39S-3 5-13 5	Batch No	WJ66-01
		Page	1 of 1

Relative Standard Deviation, By Size

Sample ID	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	32	22	13	9	7	3 2	1 3
MW39S-3 5-13 5	100 0	100 0	100 0	100 0	100 0	89 6	87 8	69 0	44 0	27 7	18 2	12 6	8 6	4 8	4 8	3 2	2 1	1 6	1 1	1 1	1 1
MW39S-3 5-13 5	100 0	100 0	100 0	100 0	94 3	83 7	77 8	58 9	39 0	24 9	16 1	10 8	7 3	3 8	3 4	2 9	1 7	1 7	0 6	0 6	0 6
MW39S-3 5-13 5	100 0	100 0	100 0	100 0	96 9	87 1	84 1	66 2	43 9	28 0	18 3	12 6	8 5	4 6	4 4	2 7	2 2	1 6	1 1	0 5	0 5
AVE	100 00	100 00	100 00	100 00	97 06	86 82	83 27	64 69	42 30	26 88	17 54	12 03	8 14	4 40	4 19	2 92	2 01	1 65	0 91	0 73	0 73
STDEV	0 00	0 00	0 00	0 00	2 85	2 99	5 05	5 18	2 88	1 72	1 29	1 02	0 71	0 55	0 69	0 23	0 26	0 06	0 29	0 29	0 29
%RSD	0 00	0 00	0 00	0 00	2 94	3 44	6 07	8 01	6 80	6 40	7 33	8 51	8 78	12 41	16 49	7 79	12 85	3 76	32 25	39 80	39 80

This Triplicate applies to the Batch Containing the Following Samples

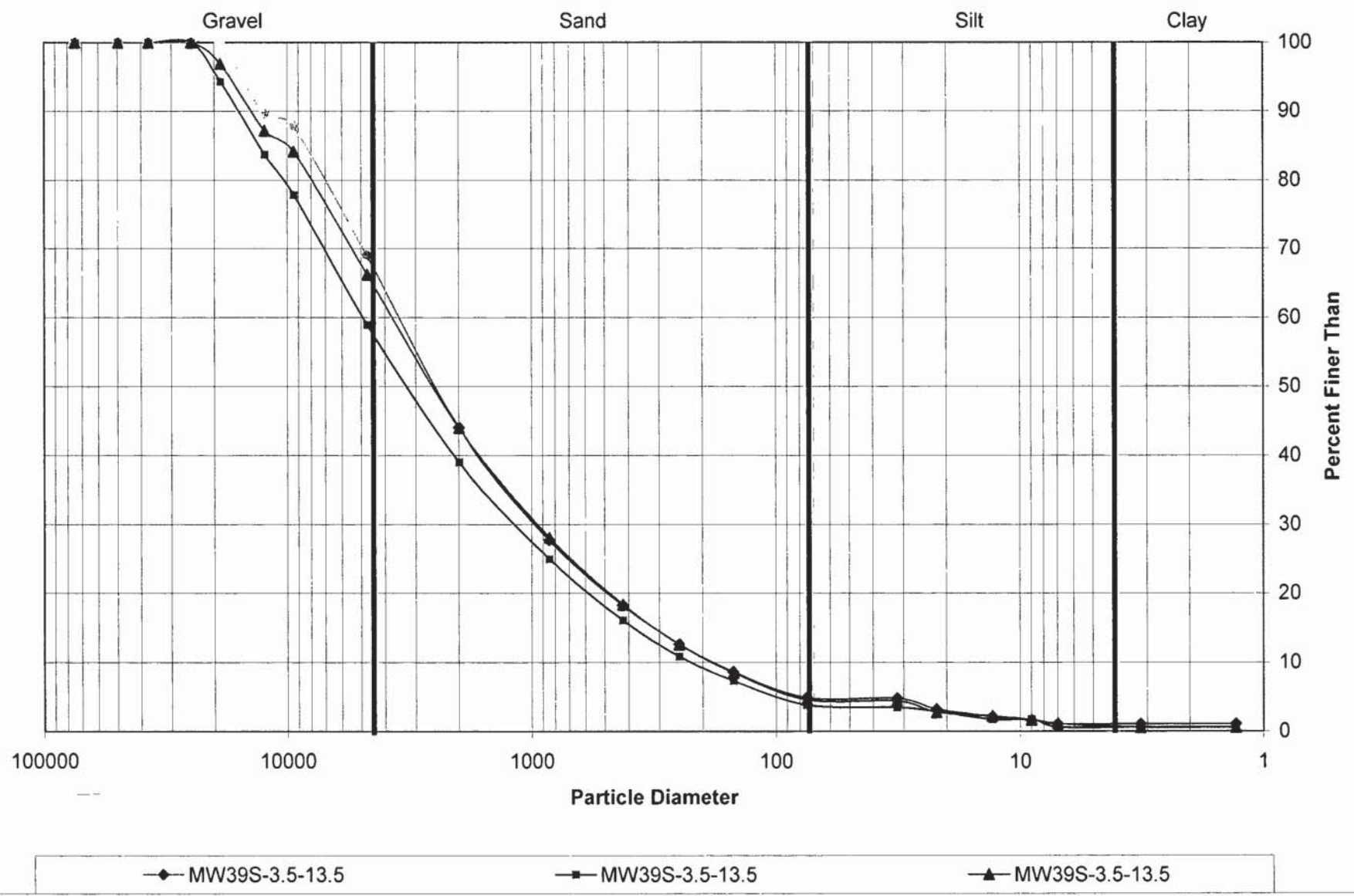
Sample ID	Date Sampled	Date Set up	Date Started	Date Complete	Data Qualifiers
MW39S-3 5-13 5	3/25/2013	4/1/2013	4/4/2013	4/8/2013	
	3/25/2013	4/1/2013	4/4/2013	4/8/2013	
	3/25/2013	4/1/2013	4/4/2013	4/8/2013	
MW35S-4-7	3/27/2013	4/2/2013	4/4/2013	4/8/2013	
MW34S-5-10	3/27/2013	4/2/2013	4/4/2013	4/8/2013	

4366:00195



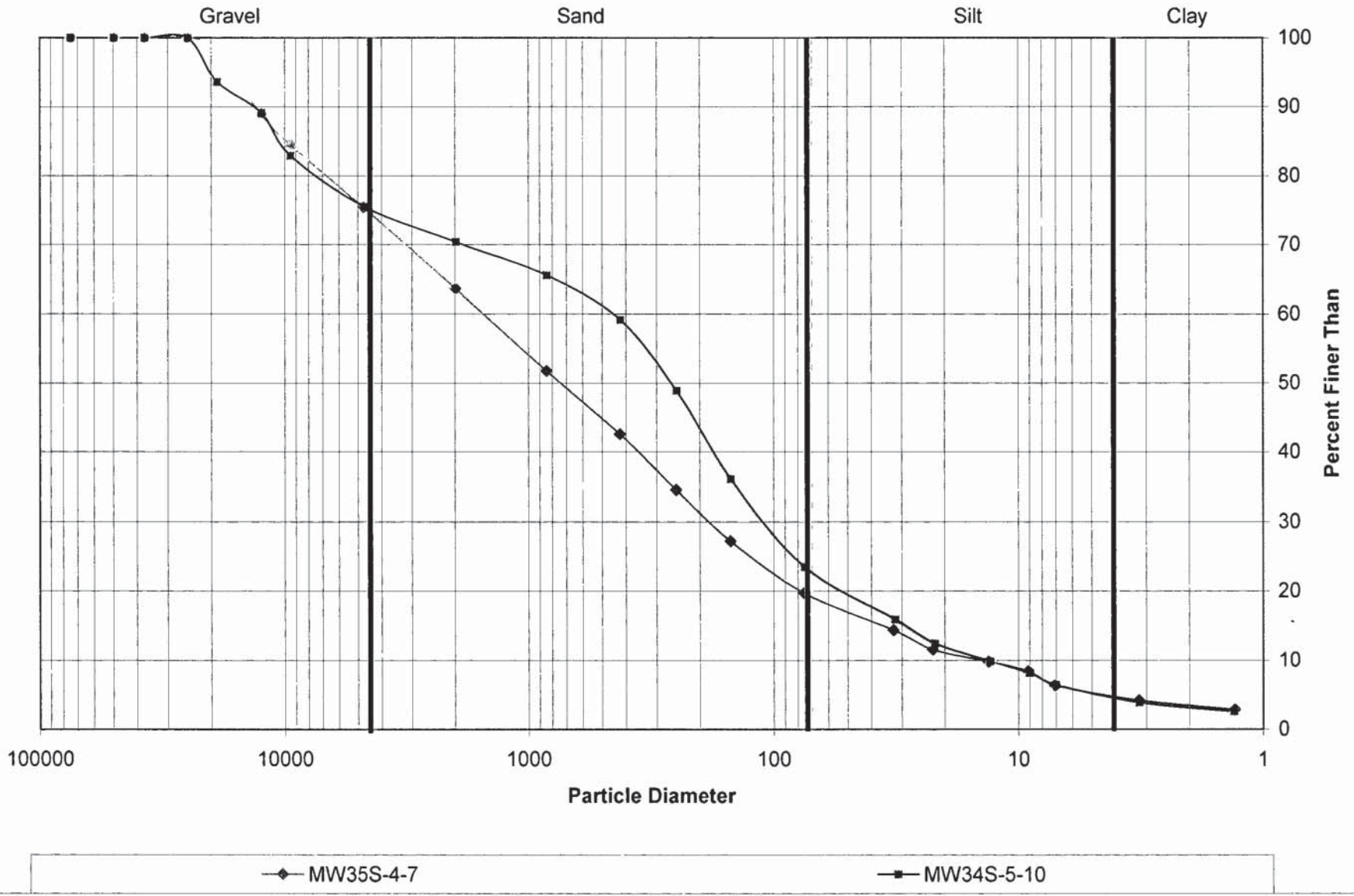
WJSS:00196

### Grain Size Distribution by Hydrometer



16100:991M

### Grain Size Distribution by Hydrometer



**Geotechnical Raw Data  
Analyst Notes and Raw Data**

**ARI Job ID: WJ66**

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WJ66 ARI Sample ID: B Setup Date: 4/2/13 Initials: gc  
 Sample Description: Black sandy gravel, oily shdov, ASPHALT-LIKE MATERIAL, Tar,  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample  fuel-like odor

Tare Number	<u>B</u>
Tare Weight (g)	<u>10.66</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>431.62</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>93.94</u>
Tare + Oven-Dried #10 Washed (g)	<u>164.50</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>225.74</u>

Hygroscopic Moisture Content	
Tare Number	<u>B</u>
Tare Weight (g)	<u>1.52</u>
Wet Soil + Tare (g)	<u>55.41</u>
Dry Soil + Tare (g)	<u>53.72</u>

Hydro Beaker: BC Calgon Batch #: 282 Calgon Date: 4/3/13 Technician: gc  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/4/2013 193285 Technician: ey

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
8:35:00	START			
8:36:00	1	32	6.5	20.5
8:37:00	2	27	6.5	20.5
8:40:00	5	23	6.5	20.5
8:50:00	15	20.5	6.5	20.5
9:05:00	30	18.5	6.5	20.5
9:35:00	60	15.5	6.5	21.0
12:45:00	250	12	6	21.5
8:35:00	1440	10	6	20

**Sieve Analysis**

Sieve Date: 4-8-13 Sieve Set #: 3 Technician: ey

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.68</u>
2"	
1½"	
1"	
¾"	<u>18.15</u>
½"	<u>56.48</u>
3/8"	<u>74.77</u>
#4	<u>112.32</u>
#10	<u>160.73</u>
#20	<u>177.70</u>
#40	<u>190.94</u>
#60	<u>202.35</u>
#100	<u>212.87</u>
#200	<u>223.58</u>
Pan	<u>225.63</u>

\*SOME PARTICLES WERE STUCK TOGETHER BY TAR.



**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WJ66 ARI Sample ID.: D Setup Date: 4/2/12 Initials: gc  
 Sample Description: sandy silt & gravel - nel below  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>D</u>
Tare Weight (g)	<u>10.36</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>447.08</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>12.72</u>
Tare + Oven-Dried #10 Washed (g)	<u>140.77</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>195.03</u>

Tare Number	<u>D</u>
Tare Weight (g)	<u>1.53</u>
Wet Soil + Tare (g)	<u>65.06</u>
Dry Soil + Tare (g)	<u>64.57</u>

Hydro Beaker: DM Calgon Batch #: 282 Calgon Date: 4/3/13 Technician: gc  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/4/2013 193225 Technician: eg

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
8:42:00	START			
8:43:00	1	<u>28</u>	<u>6.5</u>	<u>20.5</u>
8:44:00	2	<u>25</u>	<u>6.5</u>	<u>20.5</u>
8:47:00	5	<u>21</u>	<u>6.5</u>	<u>20.5</u>
8:57:00	15	<u>18</u>	<u>6.5</u>	<u>20.5</u>
9:12:00	30	<u>16</u>	<u>6.5</u>	<u>20.5</u>
9:42:00	60	<u>14</u>	<u>6.5</u>	<u>21.0</u>
12:52:00	250	<u>10.5</u>	<u>6</u>	<u>21.5</u>
8:42:00	1440	<u>9</u>	<u>6</u>	<u>20</u>

**Sieve Analysis**

Sieve Date: 4-8-13 Sieve Set #: 4 Technician: eg

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.39</u>
2"	
1½"	
1"	
¾"	<u>37.96</u>
½"	<u>57.67</u>
3/8"	<u>84.76</u>
#4	<u>116.86</u>
#10	<u>139.24</u>
#20	<u>144.87</u>
#40	<u>152.30</u>
#60	<u>164.31</u>
#100	<u>179.25</u>
#200	<u>193.95</u>
Pan	<u>194.96</u>

-5  
-5  
-5

Sample Number	MW35S-4-7	100 00	100 00	100 00	100 00	100 00	98 19	88 90	84 46	75 36	63 62	51 76	42 50	34 52	27 17	19 68	14 35	11 55	9 80	8 40	6 30	4 20	2 80
Test Temperature	20.5 5"	125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	33 0	21 4	12 6	9 0	6 5	3 2	1 4
Specific Gravity	2.65						1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200					

Sieve Analysis Portion						Hydrometer Analysis Portion							
Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a	
5"	10.68	0 00	0 00	100 00									
3"	10.68	0 00	0 00	100 00									
2"	10.68	0 00	0 00	100 00									
1 1/2"	10.68	0 00	0 00	100 00	1	32	6.5	17 85	11 1	45 00058	0 013535	1 001385	
1"	10.68	0 00	0 00	100 00	2	27	6.5	14 35	11 9	32 97873	0 013535	1 001385	
3/4"	18.15	7 47	1 81	98 19	5	23	6.5	11 55	12 5	21 42571	0 013535	1 001385	
1/2"	56.48	45 80	11 10	88 90	15	20.5	6.5	9 80	12 9	12 5708	0 013535	1 001385	
3/8"	74.77	64 09	15 54	84 46	30	18.5	6.5	8 40	13 3	9 000798	0 013535	1 001385	
4	112 32	101 64	24 64	75 36	60	15.5	6.5	6 30	13 8	6 481403	0 013535	1 001385	
10	160.73	150 05	36 38	63 62	250	12	6	4 20	14 3	3 240749	0 013535	1 001385	
20	177 7	16 97	11 87	48 24	1440	10	6	2 80	14 7	1 365668	0 013535	1 001385	
40	190.94	30 21	21 12	57 50									
60	202.35	41 62	29 10	65 48									
100	212.87	52 14	36 46	72 83									
200	223.58	62 85	43 94	80 32									

Wet Wt & Tare	55.41
Dry Wt & Tare	53.72
Wt Moisture	1.69
Wt Tare	1.52
Dry Soil	52.2
Moisture Content	0.032375479
Air Dry Total Sample	420.96
Oven Dry Total Samp	412 4642141
Air Dry Hydro Sample	93.94
Oven Dry Wt Hydro	90 99402487
Amount Plus #10	150 05
W (14.2) =	143 0249466

M166.01785

Sample Number	MW34S-5-10	100 00	100 00	100 00	100 00	100 00	93 65	89 11	82 88	75 49	70 33	65 51	59 14	48 85	36 05	23 45	15 87	12 44	9 87	8 15	6 44	3 86	2 57
Test Temperature	20 5	5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200			12 8	9 1	6 5	3 3	1 4
Specific Gravity	2 65																						

Sieve Analysis Portion						Hydrometer Analysis Portion							
Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a	
5"	10 39	0 00	0 00	100 00									
3"	10 39	0 00	0 00	100 00									
2"	10 39	0 00	0 00	100 00									
1 5"	10 39	0 00	0 00	100 00	1	28	6.5	18 45	11 7	46 31592	0 013535	1 001385	
1	10 39	0 00	0 00	100 00	2	25	6.5	15 87	12 2	33 43089	0 013535	1 001385	
3/4	37 96	27 57	6 35	93 65	5	21	6.5	12 44	12 9	21 7042	0 013535	1 001385	
1/2	57 67	47 28	10 89	89 11	15	18	6.5	9 87	13 3	12 76831	0 013535	1 001385	
3/8	84 78	74 37	17 12	82 88	30	16	6.5	8 15	13 7	9 138748	0 013535	1 001385	
4	118 86	106 47	24 51	75 49	60	14	6.5	6 44	14 0	6 539059	0 013535	1 001385	
10	139 24	128 85	29 67	70 33	250	10.5	6	3 86	14 6	3 268428	0 013535	1 001385	
20	144 87	5 63	4 82	34 49	1440	9	6	2 57	14 8	1 373281	0 013535	1 001385	
40	152.3	13 06	11 19	40 86									
60	164 31	25 07	21 48	51 15									
100	179.25	40 01	34 28	63 95									
200	193.95	54 71	46 88	76 55									

Wet Wt & Tare	65.06
Dry Wt & Tare	64.57
Wt Moisture	0 49
Wt Tare	1 53
Dry Soil	63 04
Moisture Content	0 007772843
Air Dry Total Sample	436 72
Oven Dry Total Samp	434 3454321
Air Dry Hydro Sample	82.72
Oven Dry Wt Hydro	82 08198961
Amount Plus #10	128 85
W (14.2) =	116 7020305

WJ56:01786





Inquiry Number: NONE  
Analysis Requested: 03/29/13  
Contact: Satterwhite, Zanna  
Client: Geoengineers  
Logged by: AV  
Sample Set Used: Yes-490  
Validatable Package: Lv4

PC: Cheronne  
VTSR: 03/28/13  
Data Due: 04/09/13

Project #: 0186-846-01  
Project: Gas Works Park  
Sample Site:  
SDG No:

X See enclosed instructions  
     No enclosed instructions

*w/hydrometer*

2 Sample(s)

ARI ID Client ID	Matrix	Sampling Date/Time	ASTM GRSZ	Comment
13-6658-WJ66B MW35S-4-7	Soil	03/27/13 09:30 Condition: Okay	X	NONE
13-6660-WJ66D MW34S-5-10	Soil	03/27/13 12:00 Condition: Okay	X	NONE

WJ66 : 01787

PM OK gu Date 4/1/13





**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

April 23, 2013

Zanna Satterwhite  
GeoEngineers, Inc.  
Plaza 600 Building  
600 Stewart Street, Suite 1700  
Seattle, WA 98101

**RE: Client Project: PSE - Gas Works Park, 0186-846-01**  
**ARI Job Nos.: WJ79 & WJ80**

Dear Zanna:

Please find enclosed the Chain of Custody records (COCs), sample receipt documentation, and the final data package for samples from the project referenced above.

Sample receipt and details of these analyses are discussed in the Case Narrative.

An electronic copy of this package will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

Cheronne Oreiro  
Project Manager  
(206) 695-6214  
[cheronneo@arilabs.com](mailto:cheronneo@arilabs.com)  
[www.arilabs.com](http://www.arilabs.com)

cc: eFile: WJ79\_WJ80

Enclosures

## Chain of Custody Documentation

ARI Job ID: WJ79, WJ80

# Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: WJ79 Turn-around Requested: Standard

ARI Client Company: GeoEngineers Phone: 206 499-7588

Client Contact: Zanna Satterwhite

Client Project Name: PSE - Gas Works Park

Client Project #: 0186-846-01 Samplers: Andrew Johnson

Page: 1 of 25

Date: 3/29/13 Ice Present?

No. of Coolers: 3 Cooler Temps: 11.4, 13.5, 3.4



Analytical Resources, Incorporated  
Analytical Chemists and Consultants  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested							Notes/Comments		
					As-Built CMA 200.8	PATHS 8270 SIM LOW LEVEL	BTEX 8260 LOW LEVEL	Sieve	ASTM D422					
GEI-5-1,5-2.0	3/28/13	0814	S	1	X									
GEI-5-5-7	3/28	0826		5	X	X	X							
GEI-5-10-10,5		0838		1										HOLD
GEI-5-15-16		0848		5		X	X							
GEI-5-22-23		0903		5										HOLD
GEI-6-5,5-6.0		1102		1	X									
GEI-6-10,0-12.5		1120		5		X	X							
GEI-6-20-21		1135		5		X	X							
GEI-6-25-26		1205		5		X	X							
GEI-6-30-31		1405		5										HOLD

Comments/Special Instructions	Relinquished by: <u>[Signature]</u> (Signature)	Received by: <u>[Signature]</u> (Signature)	Relinquished by: <u>[Signature]</u> (Signature)	Received by: <u>[Signature]</u> (Signature)
	Printed Name: <u>Paul Robinson</u>	Printed Name: <u>A. Volgardsen</u>	Printed Name:	Printed Name:
	Company: <u>GEI</u>	Company: <u>ARI</u>	Company:	Company:
	Date & Time: <u>3/29 540</u>	Date & Time: <u>3/29/13 1740</u>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

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2009-15-10

# Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number: <b>WJ7A</b>	Turn-around Requested: <b>Standard</b>	Page: <b>2</b> of <b>5</b>
ARI Client Company: <b>Geo Engineers</b>	Phone: <b>206-449-7522</b>	Date: <b>3/28/13</b>
Client Contact: <b>Zanna Sutterwhite</b>		Ice Present? <b>Y</b>
		No. of Coolers: <b>3</b>
		Cooler Temps: <b>11.4, 13.5, 3.4</b>

Client Project Name: <b>Gas Jocks Park</b>	Analysis Requested	Notes/Comments
Client Project #: <b>0186-846-01</b>		
Samplers: <b>Andrew Johnson</b>		

Sample ID	Date	Time	Matrix	No. Containers	Arsenic	DPA 200 B	PAHs	8210 SIM low level	BTEX	8260 low level	Stew	15TH D402							
GEI-7-12-14	3/28/13	1520	S	5			X		X										
GEI-7-15-16	↓	1545	↓	5															Hold
GEI-7-20-21	↓	1552	↓	5			X		X										
Trip Blank-03203 29	3/28/13	-	W	2						X									

Comments/Special Instructions	Relinquished by: <b>[Signature]</b>	Received by: <b>[Signature]</b>	Relinquished by: <b>[Signature]</b>	Received by: <b>[Signature]</b>
	Printed Name: <b>Paul Lobitz</b>	Printed Name: <b>A. Volgardsen</b>	Printed Name: <b>[Signature]</b>	Printed Name: <b>[Signature]</b>
	Company: <b>GEF</b>	Company: <b>ARI</b>	Company: <b>[Signature]</b>	Company: <b>[Signature]</b>
	Date & Time: <b>3/29 540</b>	Date & Time: <b>3/29/13 1740</b>	Date & Time: <b>[Signature]</b>	Date & Time: <b>[Signature]</b>

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**Subject:** GWP - COC markup

**From:** "Zanna A. Satterwhite" <zsatterwhite@geoengineers.com>

**Date:** 4/1/2013 8:54 AM

**To:** "Cheronne Oreiro (cheronneo@arilabs.com)" <cheronneo@arilabs.com>

**CC:** "Sue Dunninghoo (sue@arilabs.com)" <sue@arilabs.com>, "Mark J. Lybeer" <mlybeer@geoengineers.com>, "Paul D. Robinette" <probinette@geoengineers.com>, "Dan M. Baker" <dbaker@geoengineers.com>, Claudia De La Via <cdelavia@geoengineers.com>, "John T. Peters" <jpeters@geoengineers.com>, Andrew Johnson <ajohnson@geoengineers.com>

Cheronne,

Here is the COC markup for the third Gas Works Park sample delivery on Friday 3-29-13.

Can we please schedule a cooler pickup at Gas Works Park for tomorrow, Tuesday at 4:30?

Thank you,

Zanna

Confidentiality: This message is confidential and intended solely for use of the individual or entity to whom it is addressed. If you are not the person for whom this message is intended, please delete it and notify me immediately, and please do not copy or send this message to anyone else.

Attachments.

COC markup 4-1-13.pdf

2.4 MB









# Cooler Receipt Form

ARI Client Geo Engineers  
 COC No(s) \_\_\_\_\_ (NA)  
 Assigned ARI Job No WJ79

Project Name PSE - Gas Works Park  
 Delivered by Fed-Ex UPS Courier Hand Delivered Other \_\_\_\_\_  
 Tracking No \_\_\_\_\_ (NA)

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES  NO   
 Were custody papers included with the cooler? YES  NO   
 Were custody papers properly filled out (ink, signed, etc) YES  NO   
 Temperature of Cooler(s) (°C) (recommended 2 0-6 0 °C for chemistry) 11.4 13.5 3.4  
 If cooler temperature is out of compliance fill out form 00070F Temp Gun ID# 90077952  
 Cooler Accepted by AV Date: 3/29/13 Time: 1740

**Complete custody forms and attach all shipping documents**

**Log-In Phase:**

Was a temperature blank included in the cooler? YES  NO   
 What kind of packing material was used? Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: \_\_\_\_\_  
 Was sufficient ice used (if appropriate)? NA YES  NO   
 Were all bottles sealed in individual plastic bags? YES  NO   
 Did all bottles arrive in good condition (unbroken)? YES  NO   
 Were all bottle labels complete and legible? YES  NO   
 Did the number of containers listed on COC match with the number of containers received? YES  NO   
 Did all bottle labels and tags agree with custody papers? YES  NO   
 Were all bottles used correct for the requested analyses? YES  NO   
 Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) NA  YES  NO   
 Were all VOC vials free of air bubbles? NA YES  NO   
 Was sufficient amount of sample sent in each bottle? YES  NO   
 Date VOC Trip Blank was made at ARI... NA 3/20/13  
 Was Sample Split by ARI: NA  YES  Date/Time: \_\_\_\_\_ Equipment \_\_\_\_\_ Split by: \_\_\_\_\_  
 Samples Logged by: JM Date: 4/1/13 Time: 1245

**\*\* Notify Project Manager of discrepancies or concerns \*\***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

**Additional Notes, Discrepancies, & Resolutions:**

One 4 oz jar received, that was not on COC, jar was not labeled "GEI-5-12.0" on lid.

By JM Date 4/1/13 Trip Blank = 032913 = sm in 1 of 2

			Small → "sm"
			Peabubbles → "pb"
			Large → "lg"
			Headspace → "hs"

# Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number: <b>W340</b>	Turn-around Requested: <b>Standard</b>	Page: <b>3</b> of <b>5</b>
ARI Client Company: <b>Geo Engineers</b>	Phone: <b>206-499-7588</b>	Date: <b>3/29/13</b>
Client Contact: <b>Zana Satterwhite</b>		Ice Present? <b>4</b>
Client Project Name: <b>Gas Works Park</b>		No. of Coolers: <b>3</b>
Client Project #: <b>0186-846-01</b>	Samplers: <b>Andrew Johnson</b>	Cooler Temps: <b>11.4, 13.5, 3.4</b>

Sample ID	Date	Time	Matrix	No Containers	Analysis Requested						Notes/Comments	
					BTEX	8260 (w/br)	PAHs	8270 SIM (w/br)				
GEI-11-5.0-7.0	3/29/13	0830	S	4	X	X						GEI-12
GEI-11-11.0-15.0		0859		4	X	X						↓
GEI-12-15.0-17.0		0915		4	X	X						↓
GEI-12-25.0-26.0		0950		1	X	X						↓
GEI-11-16.0-17.0		1138		4								GEI-11
GEI-11-21.5-22.5		1200		4	X	X						↓
GEI-11-26.0-26.5		1215		4								↓
GEI-11-27.5-28.0		1230		4								↓
GEI-10-2-3		1408		4								GEI-10
GEI-10-6.5-7.5	↓	1423	↓	4								↓

Comments/Special Instructions	Relinquished by: <b>[Signature]</b>	Received by: <b>[Signature]</b>	Relinquished by: <b>[Signature]</b>	Received by: <b>[Signature]</b>
	Printed Name: <b>PAZ ROBINETTE</b>	Printed Name: <b>A. Volgardsen</b>	Printed Name:	Printed Name:
	Company: <b>Geo Engineers</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>3/29 540</b>	Date & Time: <b>3/29/13 1740</b>	Date & Time:	Date & Time:

0186-846-01

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

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# Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number: <b>WJ80</b>	Turn-around Requested: <b>Standard</b>	Page: <b>4</b> of <b>5</b>
ARI Client Company: <b>GED ENGINEERS, INC</b>	Phone: <b>206 499 7588</b>	Date: <b>3/28/13</b>
Client Contact: <b>ZANNA SATTERWAITE</b>	No. of Coolers: <b>3</b>	Ice Present? <b>4</b>
Client Project Name: <b>GAS WORKS PARK</b>	Cooler Temps: <b>11.4, 13.5, 3.4</b>	

Sample ID	Date	Time	Matrix	No Containers	Analysis Requested						Hold	Notes/Comments	
					PAHs EPA 270 SIM	BTEX EPA 8260 Low Link	ARSENIC EPA 200.8	SIEVE ASTM D422					
MW335-17-17.5	3/28/13	0900	S	5	X	X	X						
MW335-20-21	3/28/13	0930	S	5							X	HOLD	
DUP 1-032813	3/28/13	1030	S	5	X	X							
MW335-13-14	3/28/13	1030	S	5	X	X							
MW335-12-22	3/28/13	1030	S	18 <sup>sp</sup>				X					Composite
MW36D-12-13	3/28/13	1450	S	5							X	HOLD	
MW36D-23-24	3/28/13	1530	S	5	X	X							
DUP-2-032813	3/28/13	1515	S	5	X	X							
RINSE-032813	3/28/13	1610	W	5							X	HOLD	
Comments/Special Instructions	Relinquished by: (Signature) <i>Paul Roberts</i>		Received by: (Signature) <i>A. Volgardsen</i>		Relinquished by: (Signature)				Received by: (Signature)				
	Printed Name: <b>Paul Roberts</b>		Printed Name: <b>A. Volgardsen</b>		Printed Name:				Printed Name:				
	Company: <b>GED ENGINEERS, INC</b>		Company: <b>ARI</b>		Company:				Company:				
	Date & Time: <b>3/29 540</b>		Date & Time: <b>3/29/13 1740</b>		Date & Time:				Date & Time:				

01000:514

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# Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number: <b>W36D</b>	Turn-around Requested: <b>Standard</b>	Page: <b>5</b> of <b>5</b>
ARI Client Company: <b>GEOENGINEERS, INC</b>	Phone: <b>206 499 7588</b>	Date: <b>3/29/13</b>
Client Contact: <b>ZANNA SATTERWAITE</b>		Ice Present? <b>4</b>
Client Project Name: <b>GAS WORKS PARK</b>		No. of Coolers: <b>3</b>
Client Project #: <b>080-846-01</b>	Samplers: <b>John Peters</b>	Cooler Temps: <b>11.4, 13.5, 13.4</b>

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested					Notes/Comments
					8270 SIM PATTs low lead	8260 low lead BTEX	EPA 200.8 ARSENIC	ASTM D422 SIEVE		
MW36D-31-32	3/29/13	0820	S	5	X	X	X			
MW36D-29-33		0820	S	1				X		Composite
MW36S-14-15		1200	S	5	X	X	X			
MW36S-225-23		1200	S	5					X	HOLD
MW36S-14-21		1200	S	1				X		Composite
RINSE - 032913		1300	SP SW	5	X	X				
Comments/Special Instructions										
Relinquished by: (Signature) <i>[Signature]</i>			Received by: (Signature) <i>[Signature]</i>			Relinquished by: (Signature)			Received by: (Signature)	
Printed Name: <b>Paul Roberts</b>			Printed Name: <b>A. Volgardsen</b>			Printed Name:			Printed Name:	
Company: <b>GEOENGINEERS, INC</b>			Company: <b>ARI</b>			Company:			Company:	
Date & Time: <b>3/29 540</b>			Date & Time: <b>3/29/13 1740</b>			Date & Time:			Date & Time:	

11000:6151

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**Subject:** GWP - COC markup

**From:** "Zanna A. Satterwhite" <zsatterwhite@geoengineers.com>

**Date:** 4/1/2013 8:54 AM

**To:** "Cheronne Oreiro (cheronneo@arilabs.com)" <cheronneo@arilabs.com>

**CC:** "Sue Dunnihoo (sue@arilabs.com)" <sue@arilabs.com>, "Mark J. Lybeer" <mlybeer@geoengineers.com>, "Paul D. Robinette" <probinette@geoengineers.com>, "Dan M. Baker" <dbaker@geoengineers.com>, Claudia De La Via <cdelavia@geoengineers.com>, "John T. Peters" <jpeters@geoengineers.com>, Andrew Johnson <ajohnson@geoengineers.com>

Cheronne,

Here is the COC markup for the third Gas Works Park sample delivery on Friday 3-29-13.

Can we please schedule a cooler pickup at Gas Works Park for tomorrow, Tuesday at 4:30?

Thank you,

Zanna

Confidentiality: This message is confidential and intended solely for use of the individual or entity to whom it is addressed. If you are not the person for whom this message is intended, please delete it and notify me immediately, and please do not copy or send this message to anyone else.

Attachments.

COC markup 4-1-13.pdf

2.4 MB



# Chain of Custody Record & Laboratory Analysis Request

2AS mark-ups  
4-1-13



Analytical Resources, Incorporated  
Analytical Chemists and Consultants  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested: <i>Standard</i>	Page: <i>3</i> of <i>5</i>
ARI Client Company: <i>Geo Engineers</i>	Phone: <i>206-489-7588</i>	Date: <i>3/29/13</i>
Client Contact: <i>Zanna Satterwhite</i>	No. of Coolers:	Ice Present? <i>✓</i>
Client Project Name: <i>Gas Works Park</i>	Sampler:	Cooler Temps:

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested				Notes/Comments
					BTEX	8260 (incl. nPah)	PAHs	8270 SIM (incl. nPah)	
GEI-11-5.0-7.0	3/29/13	0830	S	4	X	X			GEI-12
GEI-12-11.0-15.0		0859		4	X	X			↓
GEI-12-15.0-17.0		0915		4	X	X			↓
GEI-12-25.0-26.0		0950		1	X	X			↓
GEI-11-16.0-17.0		1138		4	X	X			GEI-11
GEI-11-21.5-22.5		1200		4	X	X			↓
GEI-11-26.0-26.5		1215		4	X	X			↓
GEI-11-27.5-28.0		1230		4					↓ HOLD
GEI-10-2-3		1408		4	X	X			GEI-10
GEI-10-6.5-7.5	↓	1423	↓	4	X	X			↓

Comments/Special Instructions	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <i>PAZ LOBWINETSE</i>	Printed Name: <i>A. Volgardsen</i>	Printed Name:	Printed Name:
	Company: <i>Geo Engineers</i>	Company: <i>ARI</i>	Company:	Company:
	Date & Time: <i>3/29 540</i>	Date & Time: <i>3/29/13 1740</i>	Date & Time:	Date & Time:

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4173:60013

# Chain of Custody Record & Laboratory Analysis Request

215 markups  
4-1-13



Analytical Resources, Incorporated  
Analytical Chemists and Consultants  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested: <b>Standard</b>	Page: <b>4</b> of <b>5</b>
ARI Client Company: <b>GED ENGINEERS, INC</b>	Phone: <b>206 499 7588</b>	Date: <b>3/28/13</b> Ice Present?
Client Contact: <b>ZANNA SATTERWAITE</b>	No. of Coolers:	Cooler Temps:

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested					Hold	Notes/Comments
					PAHs 8/270 SIM	BTEX EPA 8260 LOW	ARSENIC EPA 200.8	SIEVE ASTM D422			
MW335-17-17.5	3/28/13	0900	S	5	X	X	X				
MW335-20-21	3/28/13	0930	S	5						X	HOLD
DVP 1-032813	3/28/13	1030	S	5	X	X					
MW335-13-14	3/28/13	1030	S	5	X	X					
MW335-12-22	3/28/13	1030	S	18 <sup>5</sup>				X			Composite
MW360-12-13	3/28/13	1450	S	5						X	HOLD
MW360-23-24	3/28/13	1530	S	5	X	X					
DVP-2-032813	3/28/13	1515	S	5	X	X					
RINSE-032813	3/28/13	1610	W	5						X	HOLD

Comments/Special Instructions	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>Paul Robinson</b>	Printed Name: <b>A. Volgardsen</b>	Printed Name:	Printed Name:
	Company: <b>GED ENGINEERS, INC</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>3/29 5:40</b>	Date & Time: <b>3/29/13 1740</b>	Date & Time:	Date & Time:

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1000-001-001

# Chain of Custody Record & Laboratory Analysis Request

24s markups  
4-1-13



Analytical Resources, Incorporated  
Analytical Chemists and Consultants  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested: <b>Standard</b>	Page: <b>5</b> of <b>5</b>
ARI Client Company: <b>CRE ENGINEERS, INC</b>	Phone: <b>206 499 7588</b>	Date: <b>3/29/13</b> Ice Present?
Client Contact: <b>ZANNA SATERWAITE</b>	No. of Coolers:	Cooler Temps:

Client Project Name: <b>GAS WORKS PARK</b>	Analysis Requested								Notes/Comments	
	8270 SIM PATTS low level	8260 low level BTEX	EPA 200.8 ARSENIC	ASTM D122 SIEVE						
Client Project #: <b>082-846-01</b>	Samplers: <b>JOHN PERZLS</b>									
Sample ID	Date	Time	Matrix	No. Containers						
MW36D-31-32	3/29/13	0820	S	5	X	X	X			
MW36D-29-33		0820	S	1				X		Composite
MW36S-14-15		1200	S	5	X	X	X			
MW36S-225-23		1200	S	5					X	HOLD
MW36S-14-21		1200	S	1				X		Composite
RINSE - 032913		1300	SW	5	X	X				

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>Paul Robinson</b>	Printed Name: <b>A. Volgardsen</b>	Printed Name:	Printed Name:
	Company: <b>CRE ENGINEERS, INC</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>3/29 540</b>	Date & Time: <b>3/29/13 1740</b>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

173:0000



# Cooler Receipt Form

ARI Client: Geo Engineers

Project Name: \_\_\_\_\_

COC No(s): \_\_\_\_\_ (NA)

Delivered by: Fed-Ex UPS Courier Hand Delivered Other \_\_\_\_\_

Assigned ARI Job No WJ79

Tracking No \_\_\_\_\_ (NA)

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES  NO

Were custody papers included with the cooler? YES  NO

Were custody papers properly filled out (ink, signed, etc) . . . . . YES  NO

Temperature of Cooler(s) (°C) (recommended 2 0-6 0 °C for chemistry) . . . . . 11.4 13.5 3.4

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID# 90077952

Cooler Accepted by: AV Date: 3/29/13 Time: 1740

**Complete custody forms and attach all shipping documents**

**Log-In Phase:**

Was a temperature blank included in the cooler? YES  NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: \_\_\_\_\_

Was sufficient ice used (if appropriate)? NA YES  NO

Were all bottles sealed in individual plastic bags? YES  NO

Did all bottles arrive in good condition (unbroken)? YES  NO

Were all bottle labels complete and legible? YES  NO

Did the number of containers listed on COC match with the number of containers received? YES  NO

Did all bottle labels and tags agree with custody papers? YES  NO  JM

Were all bottles used correct for the requested analyses? YES  NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) .. NA  YES  NO

Were all VOC vials free of air bubbles? NA YES  NO

Was sufficient amount of sample sent in each bottle? YES  NO

Date VOC Trip Blank was made at ARI... NA 3/28/13

Was Sample Split by ARI  YES Date/Time: \_\_\_\_\_ Equipment: \_\_\_\_\_ Split by: \_\_\_\_\_

Samples Logged by: JM Date: 4/1/13 Time: 1305

**\*\* Notify Project Manager of discrepancies or concerns \*\***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC
GEI-12-5-7	GEI-12-5.0-7.0	<del>GEI-12-25-26</del>	
GEI-12-11-15	GEI-12-11.0-15.0	GEI-11-16-17	GEI-11-16.0-17.0
GEI-12-15-17	GEI-12-15.0-17.0		
GEI-12-25-26	GEI-12-25.0-26.0		

**Additional Notes, Discrepancies, & Resolutions:**  
 One 4 oz jar received, that was not on COC, jar was not labeled "GEI-5-12.0" on lid. Rinse-032813=pb in 3083  
 Rinse = 032913=pb in 2083

By: JM Date: 4/1/13

<b>Small Air Bubbles</b> ~2mm	<b>Peabubbles</b> 2-4 mm	<b>LARGE Air Bubbles</b> > 4 mm
----------------------------------	-----------------------------	------------------------------------

Small → "sm"  
 Peabubbles → "pb"  
 Large → "lg"  
 Headspace → "hs"

PAH & BTEX requested for Sample GEI-12-25.0-26.0, Only 8 oz jar received, logged for PAH per client e-mail





# Cooler Temperature Compliance Form

Cooler#: 1 Temperature(°C): 13.5

Sample ID	Bottle Count	Bottle Type
GEI-12-25-26	1	8 oz WMG
GEI-10-2-3	4	8 oz WMG, 3-VOA Vials
GEI-11-16-17	4	↓ ↓ ↓ ↓ ↓
GEI-12-5-7	4	
GEI-11-26-26.5	4	
GEI-11-27.5-28.0	4	
GEI-12-15-17	4	
GEI-11-21.5-22.5	4	

Cooler#: 1 Temperature(°C): 13.5

Sample ID	Bottle Count	Bottle Type
GEI-10-6.5-7.5	4	8 oz WMG, 3-VOA Vials
GEI-12-11-15	4	↓ ↓

JM 4/1/13

Cooler#: 2 Temperature(°C): 11.4

Sample ID	Bottle Count	Bottle Type
Rinse - 032913	5	2-500 mL AG, 3-VOA Vials
MW36D-29-33	1	16 oz WMP
MW368-14-21	1	↓
MW36D-31-32	5	1-8oz WMG, 1-4oz WMG, 3-VOA Vials
MW368-22.5-23	5	↓ ↓ ↓
MW368-14-15	5	

JM 4/1/13

Cooler#: - Temperature(°C): -

Sample ID	Bottle Count	Bottle Type

Completed by: JM Date: 4/1/13 Time: 1215

**Case Narrative, Data Qualifiers, Control Limits**

**ARI Job ID: WJ79, WJ80**



## Case Narrative

**Client: GeoEngineers, Inc.**  
**Project: Gas Works Park, 0186-846-01**  
**ARI Job Nos.: WJ79 & WJ80**

### Sample Receipt

Thirteen soil samples and a trip blank were received on March 29, 2013. Select samples were archived upon receipt. The cooler temperatures measured by IR thermometer following ARI SOP were 3.4, 11.4, and 13.5°C. For further details regarding sample receipt, please refer to the Cooler Receipt Form.

Twenty-four soil samples, two water samples, and a trip blank were received on March 29, 2013. Select samples were archived upon receipt. The cooler temperatures measured by IR thermometer following ARI SOP were 3.4, 11.4, and 13.5°C. For further details regarding sample receipt, please refer to the Cooler Receipt Form.

### BETX by SW8260C

The samples and associated laboratory QC were initially analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements. Internal standard areas were within limits.

The surrogate percent recovery of d4-1,2-Dichloroethane was outside the control limits high for sample **GEI-12-5.0-7.0**. The sample was re-analyzed and all surrogate percent recoveries were within control limits. No corrective action was taken.

The method blanks were clean at the reporting limits. The LCS and LCSD percent recoveries were within control limits.

The matrix spike and matrix spike duplicate percent recoveries were within advisory control limits.

### PAHs by SW8270-SIM

The samples and associated laboratory QC were extracted and analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements. Internal standard areas were within limits.





The surrogate percent recoveries were within control limits.

Naphthalene was present in **MB-041113** and **MB-040913** at levels that were greater than the reporting limit. Detected results associated with these method blanks for Naphthalene have been flagged with a “B” qualifier. No further corrective action was taken.

The LCS percent recovery of Naphthalene was outside the control limits high for **LCS-040813**. All other LCS percent recoveries were within control limits. No corrective action was taken.

The matrix spike and matrix spike duplicate percent recoveries of Naphthalene were outside advisory control limits with a wide RPD for sample **GEI-5-15-16**. No corrective action is required for matrix QC.

Several matrix spike and matrix spike duplicate percent recoveries were outside advisory control limits, with a wide RPD for Naphthalene for sample **GEI-10-6.5-7.5**. No corrective action is required for matrix QC.

### **Arsenic by SW200.8**

The samples and associated laboratory QC were digested and analyzed within recommended holding times.

The method blank was clean at the reporting limit. The LCS percent recovery was within control limits.

The matrix spike percent recovery and duplicate RPD were within control limits.

### **Geotechnical Parameters**

A laboratory-specific case narrative follows this page.



<b>Client:</b> GeoEngineers	<b>ARI Job No.:</b> WJ80
<b>Client Project:</b> PSE-Gas Works Park	<b>Client Project No.:</b> 0186-846-01

### Case Narrative

1. Three samples were submitted for analysis on April 1, 2013, and were in good condition.
2. The samples were submitted for grain size distribution according to ASTM D422. The samples were prepared according to ASTM D421.
3. An assumed specific gravity of 2.65 was used in the hydrometer calculations.
4. A standard milkshake mixer type device was used to disperse the fine fraction sample for one minute.
5. One sample from another job, MW39S-3.5-13.5, was chosen for triplicate analysis. The triplicate data can be found on the QA summary table.
6. The samples displayed an oily sheen and all the samples gave off a very strong fuel like odor. The presence of a fuel-like contaminant may have affected the grain size distribution.
7. One sample contained a tar like material which melted during the oven drying portion of the analysis. Upon cooling in the desiccator, the tar-like material solidified and entrained neighboring particles. Effort was made to separate the particles, but the tar-like material skewed the grain size distribution to appear coarser.
8. The data is provided in summary tables and plots.
9. There were no further anomalies in the samples or test method.

Released by: *Robert Cole*  
Technician

Date: April 15, 2013

Reviewed by: *Shirley Curtis*  
Geotechnical Laboratory Manager

Date: 4/15/13

# Sample ID Cross Reference Report



ARI Job No: WJ79  
Client: Geoengineers  
Project Event: 0186-846-01  
Project Name: PSE-Gas Works Park

Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1. GEI-5-5-7	WJ79A	13-6833	Soil	03/28/13 08:26	03/29/13 17:40
2. GEI-5-15-16	WJ79B	13-6834	Soil	03/28/13 08:48	03/29/13 17:40
3. GEI-6-10.0-12.5	WJ79C	13-6835	Soil	03/28/13 11:20	03/29/13 17:40
4. GEI-6-20-21	WJ79D	13-6836	Soil	03/28/13 11:35	03/29/13 17:40
5. GEI-6-25-26	WJ79E	13-6837	Soil	03/28/13 12:05	03/29/13 17:40
6. GEI-7-12-14	WJ79F	13-6838	Soil	03/28/13 15:20	03/29/13 17:40
7. GEI-7-20-21	WJ79G	13-6839	Soil	03/28/13 15:52	03/29/13 17:40
8. Trip Blank-032913	WJ79H	13-6840	Water	03/28/13	03/29/13 17:40
9. GEI-5-1.5-2.0	WJ79I	13-6841	Soil	03/28/13 08:14	03/29/13 17:40
10. GEI-6-5.5-6.0	WJ79J	13-6842	Soil	03/28/13 11:02	03/29/13 17:40
11. GEI-5-10-10.5	WJ79K	13-6843	Soil	03/28/13 08:35	03/29/13 17:40
12. GEI-5-22-23	WJ79L	13-6844	Soil	03/28/13 09:03	03/29/13 17:40
13. GEI-6-30-31	WJ79M	13-6845	Soil	03/28/13 14:05	03/29/13 17:40
14. GEI-7-15-16	WJ79N	13-6846	Soil	03/28/13 15:45	03/29/13 17:40

# Sample ID Cross Reference Report



ARI Job No: WJ80  
 Client: Geoengineers  
 Project Event: 0186-846-01  
 Project Name: PSE-Gas Works Park

Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1. GEI-12-5.0-7.0	WJ80A	13-6847	Soil	03/29/13 08:30	03/29/13 17:40
2. GEI-12-11.0-15.0	WJ80B	13-6848	Soil	03/29/13 08:59	03/29/13 17:40
3. GEI-12-15.0-17.0	WJ80C	13-6849	Soil	03/29/13 09:15	03/29/13 17:40
4. GEI-12-25.0-26.0	WJ80D	13-6850	Soil	03/29/13 09:50	03/29/13 17:40
5. GEI-11-16.0-17.0	WJ80E	13-6851	Soil	03/29/13 11:38	03/29/13 17:40
6. GEI-11-21.5-22.5	WJ80F	13-6852	Soil	03/29/13 12:00	03/29/13 17:40
7. GEI-11-26.0-26.5	WJ80G	13-6853	Soil	03/29/13 12:15	03/29/13 17:40
8. GEI-10-2-3	WJ80H	13-6854	Soil	03/29/13 14:08	03/29/13 17:40
9. GEI-10-6.5-7.5	WJ80I	13-6855	Soil	03/29/13 14:23	03/29/13 17:40
10. DUP1-032813	WJ80J	13-6856	Soil	03/28/13 10:30	03/29/13 17:40
11. MW-33S-13-14	WJ80K	13-6857	Soil	03/28/13 10:30	03/29/13 17:40
12. MW36D-23-24	WJ80L	13-6858	Soil	03/28/13 15:30	03/29/13 17:40
13. DUP-2-032813	WJ80M	13-6859	Soil	03/28/13 15:15	03/29/13 17:40
14. MW33S-17-17.5	WJ80N	13-6860	Soil	03/28/13 09:00	03/29/13 17:40
15. MW36D-31-32	WJ80O	13-6861	Soil	03/29/13 08:20	03/29/13 17:40
16. MW-36S-14-15	WJ80P	13-6862	Soil	03/29/13 12:00	03/29/13 17:40
17. RINSE-032913	WJ80Q	13-6863	Water	03/29/13 13:00	03/29/13 17:40
18. Trip Blank	WJ80R	13-6864	Water	03/28/13	03/29/13 17:40
19. MW-33S-12-22	WJ80S	13-6865	Soil	03/28/13 10:30	03/29/13 17:40
20. MW36D-29-33	WJ80T	13-6866	Soil	03/29/13 08:20	03/29/13 17:40
21. MW36S-14-21	WJ80U	13-6867	Soil	03/29/13 12:00	03/29/13 17:40
22. MW33S-20-21	WJ80V	13-6868	Soil	03/28/13 09:30	03/29/13 17:40
23. MW36D-12-13	WJ80W	13-6869	Soil	03/28/13 14:50	03/29/13 17:40
24. RINSE-032813	WJ80X	13-6870	Water	03/28/13 16:10	03/29/13 17:40
25. GEI-11-27.5-28.0	WJ80Y	13-6871	Soil	03/29/13 12:30	03/29/13 17:40
26. MW36S-22.5-23	WJ80Z	13-6872	Soil	03/29/13 12:00	03/29/13 17:40
27. GEI-5-12.0	WJ80AA	13-6873	Soil	03/29/13	03/29/13 17:40



## Geotechnical Data

- A The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.
- F Samples were frozen prior to particle size determination
- SM Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations
- SS Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis
- W Weight of sample in some pipette aliquots was below the level required for accurate weighting

**Geotechnical Analysis  
Report and Summary QC Forms**

**ARI Job ID: WJ79, WJ80**

GeoEngineers  
0186-846-01  
PSE-Gas Works Park

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	3"	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
MW39S-3.5-13.5	100.0	100.0	100.0	100.0	100.0	89.6	87.8	69.0	44.0	27.7	18.2	12.6	8.6	4.8	4.8	3.2	2.1	1.6	1.1	1.1	1.1
	100.0	100.0	100.0	100.0	94.3	83.7	77.8	58.9	39.0	24.9	16.1	10.8	7.3	3.8	3.4	2.9	1.7	1.7	0.6	0.6	0.6
	100.0	100.0	100.0	100.0	96.9	87.1	84.1	66.2	43.9	28.0	18.3	12.6	8.5	4.6	4.4	2.7	2.2	1.6	1.1	0.5	0.5
MW-33S-12-22	100.0	100.0	100.0	93.8	89.1	71.3	65.4	47.8	33.6	23.4	15.1	9.2	6.2	4.1	3.8	3.1	2.6	2.1	1.9	1.0	0.7
MW36D-29-33	100.0	100.0	100.0	100.0	100.0	96.6	94.9	91.6	87.3	78.4	65.1	49.4	35.5	23.3	15.1	13.1	9.8	7.9	6.6	3.9	2.0
MW36S-14-21	100.0	100.0	100.0	90.3	83.6	71.5	64.4	48.1	35.4	25.9	19.3	13.1	7.9	4.1	4.0	3.3	2.0	1.6	1.1	0.4	0.0

Testing performed according to ASTM D421/D422

00000 : 02/08



GeoEngineers  
0186-846-01  
PSE-Gas Works Park

Percent Retained in Each Size Fraction

Description	% Coarse Gravel				% Gravel			% Coarse Sand	% Medium Sand			% Fine Sand			% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay	
	3-2"	2-1 1/2"	1 1/2"-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8"-4750	4750-2000	2000-850	850-425	425-250	250-150	150-75	75-32	32-22	22-13	13-9	9-7	7-3.2	3 2-1 3	<1 3	
MW39S-3 5-13 5	0.0	0.0	0.0	0.0	10.4	1.8	18.9	25.0	16.3	9.5	5.6	4.0	3.8	0.1	1.6	1.1	0.5	0.5	0.0	0.0	1.1	
	0.0	0.0	0.0	5.7	10.6	5.8	18.9	19.9	14.1	8.8	5.2	3.5	3.5	0.4	0.6	1.1	0.0	1.1	0.0	0.0	0.6	
	0.0	0.0	0.0	3.1	9.7	3.0	17.9	22.2	15.9	9.7	5.7	4.1	3.9	0.2	1.6	0.5	0.5	0.5	0.5	0.0	0.5	
MW-33S-12-22	0.0	0.0	6.2	4.7	17.8	5.8	17.6	14.2	10.2	8.3	5.9	3.0	2.1	0.3	0.7	0.5	0.5	0.2	0.9	0.3	0.7	
MW36D-29-33	0.0	0.0	0.0	0.0	3.4	1.8	3.3	4.3	8.9	13.4	15.6	13.9	12.3	8.2	2.0	3.3	2.0	1.3	2.6	2.0	2.0	
MW36S-14-21	0.0	0.0	9.7	6.8	12.1	7.1	16.3	12.7	9.5	6.5	6.2	5.2	3.9	0.1	0.7	1.3	0.4	0.5	0.7	0.4	0.0	

9999 : 6213

Client	GeoEngineers	Project No	0186-846-01
ARI Triplicate Sample ID	WJ09D	Project Batch No	PSE-Gas Works Park WJ80-01
Client Triplicate Sample ID	MW39S-3 5-13 5	Page	1 of 1

Relative Standard Deviation, By Size

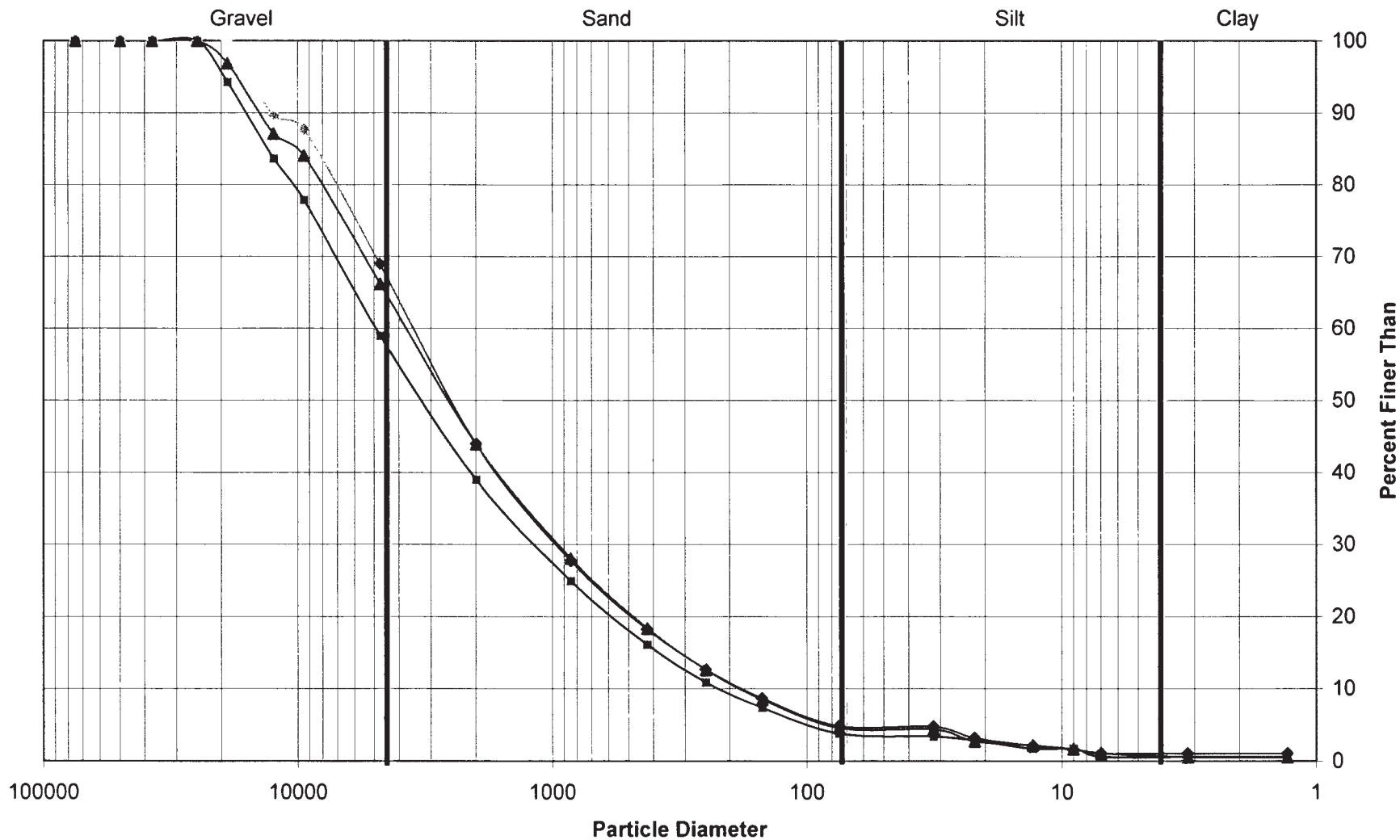
Sample ID	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	32	22	13	9	7	3 2	1 3
MW39S-3 5-13 5	100 0	100 0	100 0	100 0	100 0	89 6	87 8	69 0	44 0	27 7	18 2	12 6	8 6	4 8	4 8	3 2	2 1	1 6	1 1	1 1	1 1
MW39S-3 5-13 5	100 0	100 0	100 0	100 0	94 3	83 7	77 8	58 9	39 0	24 9	16 1	10 8	7 3	3 8	3 4	2 9	1 7	1 7	0 6	0 6	0 6
MW39S-3 5-13 5	100 0	100 0	100 0	100 0	96 9	87 1	84 1	66 2	43 9	28 0	18 3	12 6	8 5	4 6	4 4	2 7	2 2	1 6	1 1	0 5	0 5
AVE	100 00	100 00	100 00	100 00	97 06	86 82	83 27	64 69	42 30	26 88	17 54	12 03	8 14	4 40	4 19	2 92	2 01	1 65	0 91	0 73	0 73
STDEV	0 00	0 00	0 00	0 00	2 85	2 99	5 05	5 18	2 88	1 72	1 29	1 02	0 71	0 55	0 69	0 23	0 26	0 06	0 29	0 29	0 29
%RSD	0 00	0 00	0 00	0 00	2 94	3 44	6 07	8 01	6 80	6 40	7 33	8 51	8 78	12 41	16 49	7 79	12 85	3 76	32 25	39 80	39 80

This Triplicate applies to the Batch Containing the Following Samples

Sample ID	Date Sampled	Date Set up	Date Started	Date Complete	Data Qualifiers
MW39S-3 5-13 5	3/25/2013	4/1/2013	4/4/2013	4/8/2013	
	3/25/2013	4/1/2013	4/4/2013	4/8/2013	
	3/25/2013	4/1/2013	4/4/2013	4/8/2013	
MW-33S-12-22	7/27/2011	4/4/2013	4/8/2013	4/15/2013	
MW36D-29-33	7/27/2011	4/4/2013	4/8/2013	4/15/2013	
MW36S-14-21	7/27/2011	4/4/2013	4/8/2013	4/15/2013	

20130327 10:00:00

### Grain Size Distribution by Hydrometer



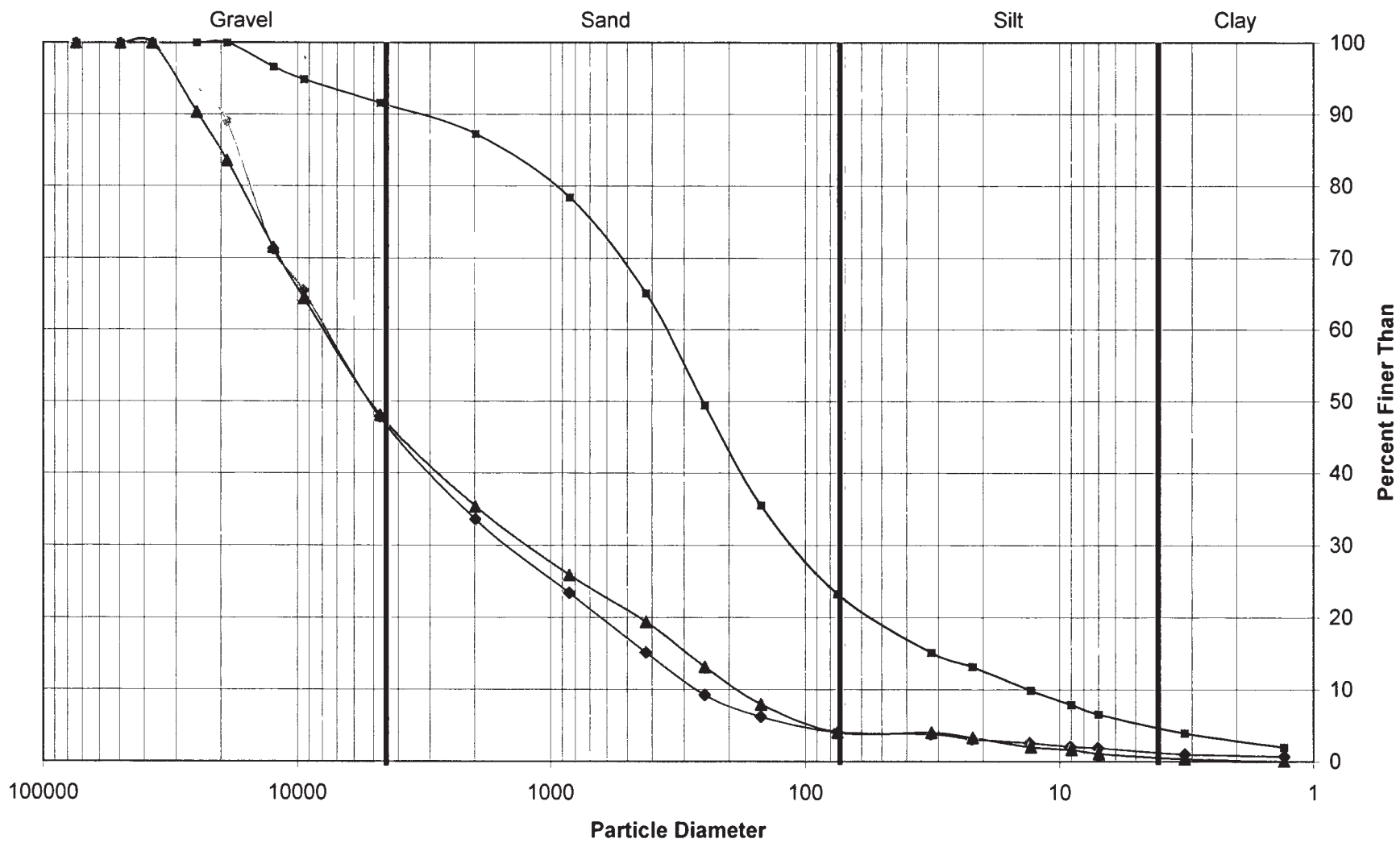
◆ MW39S-3.5-13.5

■ MW39S-3.5-13.5

▲ MW39S-3.5-13.5

00000 : 51.1 m

### Grain Size Distribution by Hydrometer



◆ MW-33S-12-22

■ MW36D-29-33

▲ MW36S-14-21

60000 50000 40000 30000 20000 10000 0

**Geotechnical Raw Data  
Analyst Notes and Raw Data**

**ARI Job ID: WJ79, WJ80**

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WJ80 ARI Sample ID: S\* Setup Date: 4/4/13 Initials: gc  
 Sample Description: sandy Gravel oily sheen fuel-like odor  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>S</u>
Tare Weight (g)	<u>10.64</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>750.20</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>98.51</u>
Tare + Oven-Dried #10 Washed (g) <sup>4.36</sup>	<u>251.35</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>585.82</u>

Tare Number	<u>S</u>
Tare Weight (g)	<u>1.51</u>
Wet Soil + Tare (g)	<u>26.03</u>
Dry Soil + Tare (g)	<u>25.68</u>

Hydro Beaker: CS Calgon Batch #: 283 Calgon Date: 04.05.13 Technician: ab  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/8/2013 ro #: 193285 Technician: ab

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
11:30:00	START			
11:31:00	1	19	<u>6.7</u>	20
11:32:00	2	18	7	20
11:35:00	5	16	7	20
11:45:00	15	14 <sup>5</sup>	7	20
12:00:00	30	13	7	20
12:30:00	60	11 <sup>5</sup>	6	20 <sup>5</sup>
15:40:00	250	9	6	21 <sup>5</sup>
11:30:00	1440	8 <sup>5</sup>	6 <sup>5</sup>	20 <sup>5</sup>

**Sieve Analysis**

Sieve Date: 4.15.13 Sieve Set #: 3 Technician: eg

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.65</u>
2"	
1½"	
1"	<u>516.17</u>
¾"	<u>90.98</u>
½"	<u>222.09</u>
3/8"	<u>265.04</u>
#4	<u>394.81</u>
#10	<u>499.98</u>
#20	<u>529.00</u>
#40	<u>552.95</u>
#60	<u>569.97</u>
#100	<u>578.72</u>
#200	<u>584.82</u>
Pan	<u>586.05</u>

\* Sample consumed

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WJ80 ARI Sample ID.: T Setup Date: 4/4/13 Initials: gc  
 Sample Description: Grey Clayey Sand, only shoen extremely strong fire odor  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>T</u>
Tare Weight (g)	<u>10.23</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>477.37</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>66.75</u>
Tare + Oven-Dried #10 Washed (g)	<u>70.00</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>118.84</u>

Tare Number	<u>T</u>
Tare Weight (g)	<u>1.51</u>
Wet Soil + Tare (g)	<u>28.11</u>
Dry Soil + Tare (g)	<u>28.05</u>

Hydro Beaker: BT Calgon Batch #: 283 Calgon Date: 04-05-13 Technician: gab  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/8/2013 ro #: 193285 Technician: lkt

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
11:37:00	START			
11:38:00	1	20 <sup>5</sup>	7	20
11:39:00	2	18 <sup>5</sup>	7	20
11:42:00	5	17	7	20
11:52:00	15	14 <sup>5</sup>	7	20
12:07:00	30	13	7	20
12:37:00	60	11	6	20 <sup>5</sup>
15:47:00	250	9	6	21 <sup>5</sup>
11:37:00	1440	8	6 <sup>5</sup>	20 <sup>5</sup>

**Sieve Analysis**

Sieve Date: 4-15-13 Sieve Set #: 4 Technician: ey

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.24</u>
2"	
1½"	
1"	
¾"	
½"	<u>25.88</u>
3/8"	<u>34.08</u>
#4	<u>49.55</u>
#10	<u>69.60</u>
#20	<u>76.36</u>
#40	<u>86.55</u>
#60	<u>98.45</u>
#100	<u>109.09</u>
#200	<u>118.45</u>
Pan	<u>118.88</u>



**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WJ80 ARI Sample ID.: U\* Setup Date: 4/4/13 Initials: gc  
 Sample Description: Black sandy gravel oily smell extremely strong fuel-like odor  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample  Tar-like substance, organic debris

Tare Number	<u>U</u>
Tare Weight (g)	<u>10.57</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>526.53</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>99.00</u>
Tare + Oven-Dried #10 Washed (g)	<u>351.35</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>430.99</u>

Hygroscopic Moisture Content	
Tare Number	<u>U</u>
Tare Weight (g)	<u>1.55</u>
Wet Soil + Tare (g)	<u>21.85</u>
Dry Soil + Tare (g)	<u>21.48</u>

Hydro Beaker: CU Calgon Batch #: 283 Calgon Date: 04.05.13 Technician: ab  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

**Hydrometer Analysis**

4/8/2013 ) #: 193285 Technician: ab

Time	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
11:44:00	START			
11:45:00	1	21	7	20
11:46:00	2	18	7	20
11:49:00	5	16	7	20
11:59:00	15	12 <sup>5</sup>	7	20
12:14:00	30	11 <sup>5</sup>	7	20
12:44:00	60	9	6	20 <sup>5</sup>
15:54:00	250	7	6	21 <sup>5</sup>
11:44:00	1440	6 <sup>5</sup>	6 <sup>5</sup>	20 <sup>5</sup>

**Sieve Analysis**

Sieve Date: 4.15.13 Sieve Set #: 3 Technician: gc

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.67</u>
2"	
1½"	
1"	<u>60.27</u>
¾"	<u>94.96</u>
½"	<u>156.90</u>
3/8"	<u>193.15</u>
#4	<u>276.76</u>
#10	<u>341.77</u>
#20	<u>367.96</u>
#40	<u>385.85</u>
#60	<u>402.98</u>
#100	<u>417.16</u>
#200	<u>427.79</u>
Pan	<u>430.57</u>

\*sample consumed.

Sample Number	MW-33S-12-22	100 00	100 00	100 00	100 00	93 82	89 09	71 27	65 44	47 80	33 57	23 40	15 12	9 23	6 21	4 10	3 81	3 12	2 60	2 08	1 90	1 04	0 69
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	35 1	22 4	13 1	9 3	6 7	3 3	1 4
Test Temperature		20 3	5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200						
Specific Gravity		2 65																					
		Sieve Analysis Portion										Hydrometer Analysis Portion											
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
		5"	10 65	0 00	0 00	100 00																	
		3"	10 65	0 00	0 00	100 00																	
		2"	10 65	0 00	0 00	100 00																	
		1 5"	10 65	0 00	0 00	100 00	1	19	7	4 15	13 2	49 27402	0 013571	1 001385									
Wet Wt & Tare		26 03					2	18	7	3 81	13 3	35 0579	0 013571	1 001385									
Dry Wt & Tare		25 68					5	16	7	3 12	13 7	22 44317	0 013571	1 001385									
WT Moisture		0 35					15	14 5	7	2 60	13 9	13 07352	0 013571	1 001385									
WT Tare		1 51					30	13	7	2 08	14 2	9 325647	0 013571	1 001385									
Dry Soil		24 17					60	11 5	6	1 90	14 4	6 651198	0 013571	1 001385									
Moisture Content		0 014480761					250	9	6	1 04	14 8	3 3044	0 013571	1 001385									
Air Dry Total Sample		739 56					1440	8 5	6 5	0 69	14 9	1 380634	0 013571	1 001385									
Oven Dry Total Samp		735 9824918																					
Air Dry Hydro Sample		98 51																					
Oven Dry Wt Hydro		97 10386215																					
Amount Plus #10		488 93																					
W (14 2) =		289 2775616																					

Sample Number	MW36D-29-33	100 00	100 00	100 00	100 00	100 00	100 00	96 65	94 89	91 57	87 27	78 41	65 06	49 43	35 52	23 26	15 09	13 12	9 84	7 87	6 56	3 94	1 97
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	35 0	22 3	13 1	9 3	6 7	3 3	1 4
Test Temperature		20 3	5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200						
Specific Gravity		2 65																					
Sieve Analysis Portion											Hydrometer Analysis Portion												
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
		5"	10 24	0 00	0 00	100 00																	
		3"	10 24	0 00	0 00	100 00																	
		2"	10 24	0 00	0 00	100 00																	
		1 5"	10 24	0 00	0 00	100 00	1	20 5	7	17 71	12 9	48 81243	0 013571	1 001385									
Wet Wt & Tare	28 11	1	10 24	0 00	0 00	100 00	2	18 5	7	15 09	13 3	34 95011	0 013571	1 001385									
Dry Wt & Tare	28 05	3/4	10 24	0 00	0 00	100 00	5	17	7	13 12	13 5	22 30828	0 013571	1 001385									
Wt Moisture	0 06	1/2	25 88	15 64	3 35	96 65	15	14 5	7	9 84	13 9	13 07352	0 013571	1 001385									
Wt Tare	1 51	3/8	34 08	23 84	5 11	94 89	30	13	7	7 87	14 2	9 325647	0 013571	1 001385									
Dry Soil	26 54	4	49 55	39 31	8 43	91 57	60	11	6	6 56	14 5	6 67008	0 013571	1 001385									
Moisture Content	0 002260739	10	69 6	59 36	12 73	87 27	250	9	6	3 94	14 8	3 3044	0 013571	1 001385									
Air Dry Total Sample	467 14	20	76 36	6 76	8 86	21 59	1440	8	6 5	1 97	15 0	1 384424	0 013571	1 001385									
Oven Dry Total Samp	466 2201955	40	86 55	16 95	22 21	34 94																	
Air Dry Hydro Sample	66 75	60	98 48	28 88	37 84	50 57																	
Oven Dry Wt Hydro	66 59943609	100	109 09	39 49	51 75	64 48																	
Amount Plus #10	59 36	200	118 45	48 85	64 01	76 74																	
W (14 2) =	76 31614608																						

Sample Number	MW36S-14-21	100 00	100 00	100 00	100 00	90 32	83 56	71 47	64 40	48 09	35 41	25 87	19 35	13 11	7 94	4 07	4 01	3 28	2 01	1 64	1 09	0 36	0 00
		125000	75000	50000	37500	25000	19000	12500	9500	4750	2000	850	425	250	150	75	35 1	22 4	13 2	9 4	6 7	3 3	1 4
Test Temperature		20 3	5"	3"	2"	1 5"	1"	3/4"	1/2"	3/8"	4	10	20	40	60	100	200						
Specific Gravity		2 65																					
		Sieve Analysis Portion										Hydrometer Analysis Portion											
		Sieve Size	Weight of Soil + Tare	Total Weight of Soil	Percent Retained	Percent Passing	Time	Hydro Reading	Comp Correct	Percent Finer	"L"	D	K	a									
		5"	10 67	0 00	0 00	100 00																	
		3"	10 67	0 00	0 00	100 00																	
		2"	10 67	0 00	0 00	100 00																	
		1 5"	10 67	0 00	0 00	100 00	1	21	7	5 11	12 9	48 6576	0 013571	1 001385									
Wet Wt & Tare	21 85	1	60 27	49 60	9 68	90 32	2	18	7	4 01	13 3	35 0579	0 013571	1 001385									
Dry Wt & Tare	21 48	3/4	94 96	84 29	16 44	83 56	5	16	7	3 28	13 7	22 44317	0 013571	1 001385									
Wt Moisture	0 37	1/2	156 9	146 23	28 53	71 47	15	12 5	7	2 01	14 2	13 22655	0 013571	1 001385									
Wt Tare	1 55	3/8	193 15	182 48	35 60	64 40	30	11 5	7	1 64	14 4	9 406214	0 013571	1 001385									
Dry Soil	19 93	4	276 76	266 09	51 91	48 09	60	9	6	1 09	14 8	6 745079	0 013571	1 001385									
Moisture Content	0 018564977	10	341 77	331 10	64 59	35 41	250	7	6	0 38	15 2	3 340738	0 013571	1 001385									
Air Dry Total Sample	515 96	20	367 96	26 19	9 54	74 13	1440	6 5	6 5	0 00	15 2	1 395734	0 013571	1 001385									
Oven Dry Total Samp	512 5906305	40	385 85	44 08	16 06	80 65																	
Air Dry Hydro Sample	99	60	402 98	61 21	22 30	86 89																	
Oven Dry Wt Hydro	97 1955665	100	417 16	75 39	27 46	92 06																	
Amount Plus #10	331 10	200	427 79	86 02	31 34	95 93																	
W (14 2) =	274 5129859																						

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Client: Geoengineers

Project: 0186-846-01 Gas Works Park

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BC  
Signature

April-23-2013  
Date

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Client: Geoengineers

Project: 0186-846-01 Gas Works Park

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                    BC                      
Signature

April-23-2013  
Date



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

April 23, 2013

Zanna Satterwhite  
GeoEngineers, Inc.  
Plaza 600 Building  
600 Stewart Street, Suite 1700  
Seattle, WA 98101

**RE: Client Project: Gas Works Park, 0186-846-01**  
**ARI Job No.: WJ66**

Dear Zanna:

Please find enclosed the Chain of Custody records (COCs), sample receipt documentation, and the final data package for samples from the project referenced above.

Sample receipt and details of these analyses are discussed in the Case Narrative.

An electronic copy of this package will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

Cheronne Oreiro  
Project Manager  
(206) 695-6214  
[cheronneo@arilabs.com](mailto:cheronneo@arilabs.com)  
[www.arilabs.com](http://www.arilabs.com)

cc: eFile: WK21

Enclosures



## Chain of Custody Documentation

ARI Job ID: WK21









**Subject:** GWP - COC markup

**From:** "Zanna A. Satterwhite" <zsatterwhite@geoengineers.com>

**Date:** 4/2/2013 8:28 PM

**To:** "Cheronne Oreiro (cheronneo@arilabs.com)" <cheronneo@arilabs.com>

**CC:** "Sue Dunning (sue@arilabs.com)" <sue@arilabs.com>, "Mark J. Lybeer" <mlybeer@geoengineers.com>, "Paul D. Robinette" <probinette@geoengineers.com>, "Dan M. Baker" <dbaker@geoengineers.com>, Claudia De La Via <cdelavia@geoengineers.com>, "John T. Peters" <jpeters@geoengineers.com>, Andrew Johnson <ajohnson@geoengineers.com>

Cheronne,

Here is the COC markup for the fourth Gas Works Park sample shipment on Tuesday 4-2-13.

We won't have any more samples for you until Wednesday of next week (4-10-13).

Thank you,

Zanna

**Confidentiality:** This message is confidential and intended solely for use of the individual or entity to whom it is addressed. If you are not the person for whom this message is intended, please delete it and notify me immediately, and please do not copy or send this message to anyone else.

Attachments

COC markup 4-2-13.pdf

27 bytes



# Chain of Custody Record & Laboratory Analysis Request

ZAS markups  
4-2-13



Analytical Resources, Incorporated  
Analytical Chemists and Consultants  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

ARI Assigned Number: WJ 21	Turn-around Requested: Standard	Page: 1 of 5
ARI Client Company: GEOENGINEERS, INC	Phone: 206 444 7588	Date: 4/2/13 Ice Present? 5
Client Contact: ZANNA SATTLEWHITE		No. of Coolers: Cooler Temps:

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested				Hold	Notes/Comments
					BTEX 8260 level	PAHs 8230 SEM	ARSENIC EPA 200.8	SIEVE ASTM D422		
MW405-5-6	4/1/13	0940	S	5	X	X	X			
MW405-5-10	4/1/13	0940	S	1				X		COMPOSITE
MW405-9.5-20	4/1/13	1000	S	4					X	HOLD
RINSE-040113	4/1/13	1030	W	5					X	HOLD
MW405-17.5-18	4/1/13	1010	S	4	X	X				
MW405-15-15.5	4/1/13	1015	S	4					X	HOLD
TRIPBLANK-040113	4/01/13	-	W	2	X					

Comments/Special Instructions	Relinquished by: (Signature) <i>Zanna Sattlerwhite</i>	Received by: (Signature) <i>A. Volgardsen</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Zanna Sattlerwhite	Printed Name: A. Volgardsen	Printed Name:	Printed Name:
	Company: GEOENGINEERS, INC	Company: ARI	Company:	Company:
	Date & Time: 4/2/2013	Date & Time: 4/2/13 11:06	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

WJ21:00007



# Chain of Custody Record & Laboratory Analysis Request

ZAS markups  
4-2-13



Analytical Resources, Incorporated  
Analytical Chemists and Consultants  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested: <i>Standard</i>	Page: <i>2</i> of <i>5</i>
ARI Client Company: <i>GeoEngineers</i>	Phone: <i>206-499-7588</i>	Date: <i>4/2/13</i> Ice Present?
Client Contact: <i>Zanna Satterwhite</i>	No. of Coolers:	Cooler Temps:

Client Project Name: <i>Gas Works Park</i>	Analysis Requested				Notes/Comments
Client Project #: <i>0186-846-01</i>	Samplers: <i>Andrew Johnson</i>	<i>BTX</i>	<i>PAHs</i>	<i>PCBs</i>	<i>2082 low level</i>

Sample ID	Date	Time	Matrix	No. Containers	<i>BTX</i>	<i>PAHs</i>	<i>PCBs</i>	<i>2082 low level</i>											
<i>GEI-9-20-3.0</i>	<i>4/1/13</i>	<i>0825</i>	<i>S</i>	<i>4</i>															<i>HOLD</i>
<i>GEI-9-11.0-11.5</i>		<i>0855</i>		<i>4</i>	<i>X</i>	<i>X</i>													
<i>GEI-9-16.0-17.0</i>		<i>0905</i>		<i>4</i>	<i>X</i>	<i>X</i>													
<i>GEI-2-0.0-3.0</i>		<i>1030</i>		<i>4</i>	<i>X</i>	<i>X</i>													<i>COMPOSITE</i>
<i>GEI-2-5.0-6.0</i>		<i>1000</i>		<i>4</i>	<i>X</i>	<i>X</i>													
<i>GEI-2-16.0-17.0</i>		<i>1015</i>		<i>4</i>	<i>X</i>	<i>X</i>													
<i>GEI-8-4-4.5</i>		<i>1133</i>		<i>4</i>	<i>X</i>	<i>X</i>													
<i>GEI-8-5-6</i>		<i>1140</i>		<i>4</i>	<i>X</i>	<i>X</i>													
<i>GEI-8-8.5-9.5</i>		<i>1153</i>		<i>4</i>	<i>X</i>	<i>X</i>													
<i>DUP3-040113</i>	<i>↓</i>	<i>1345</i>	<i>↓</i>	<i>4</i>	<i>X</i>	<i>X</i>													

Comments/Special Instructions	Relinquished by: (Signature) <i>ZS</i>	Received by: (Signature) <i>A. Volgardsen</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <i>Zanna Satterwhite</i>	Printed Name: <i>A. Volgardsen</i>	Printed Name:	Printed Name:
	Company: <i>GeoEngineers</i>	Company: <i>ARI</i>	Company:	Company:
	Date & Time: <i>4/2/2013</i>	Date & Time: <i>4/2/13 1146</i>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

00000 : 1234



# Chain of Custody Record & Laboratory Analysis Request

ZAS markups  
4-2-13



Analytical Resources, Incorporated  
Analytical Chemists and Consultants  
4611 South 134th Place, Suite 100  
Tukwila, WA 98168  
206-695-6200 206-695-6201 (fax)

ARI Assigned Number:	Turn-around Requested: <i>Standard</i>	Page: <i>3</i> of <i>5</i>
ARI Client Company: <i>GeoEngineers</i>	Phone: <i>206-499-7588</i>	Date: <i>4/1/13</i> Ice Present?
Client Contact: <i>Zanna Satterwhite</i>	No. of Coolers:	Cooler Temps:

Client Project Name: <i>Gas works park</i>	Analysis Requested				Notes/Comments
Client Project #: <i>0196-846-D1</i>	Samplers: <i>Andrew Johnson</i>	<i>BTX</i>	<i>PAHs</i>	<i>PCBs</i>	<i>8082 low level</i>

Sample ID	Date	Time	Matrix	No. Containers	<i>BTX</i>	<i>PAHs</i>	<i>PCBs</i>	<i>8082 low level</i>										
<i>GEI-13-8-9.5</i>	<i>4/1/13</i>	<i>1345</i>	<i>S</i>	<i>4</i>	<i>X</i>	<i>X</i>												
<i>GEI-13-13-16</i>		<i>1415</i>		<i>4</i>	<i>X</i>	<i>X</i>												
<i>GEI-13-23.5-24.5</i>		<i>1500</i>		<i>4</i>	<i>X</i>	<i>X</i>												
<i>GEI-13-25.0-25.5</i>		<i>1530</i>		<i>4</i>	<i>X</i>	<i>X</i>												
<i>GEI-1-0.0-3.0</i>		<i>1615</i>		<i>1</i>				<i>X</i>										
<i>GEI-1-7.0-7.5</i>		<i>1630</i>		<i>1</i>				<i>X</i>										
<i>GEI-1-12.0-12.5</i>		<i>1635</i>		<i>1</i>		<i>X</i>	<i>X</i>											
<i>GEI-1-17.0-17.5</i>		<i>1638</i>		<i>1</i>				<i>X</i>										
<i>GEI-1-16.5-17.0</i>		<i>1645</i>		<i>4</i>	<i>X</i>	<i>X</i>	<i>X</i>											
<i>GEI-1-23.0-24.0</i>	<i>✓</i>	<i>1650</i>	<i>✓</i>	<i>4</i>	<i>X</i>	<i>X</i>	<i>X</i>											

Comments/Special Instructions	Relinquished by: (Signature) <i>ZS</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <i>Zanna Satterwhite</i>	Printed Name: <i>A. Volgardsen</i>	Printed Name:	Printed Name:
	Company: <i>GeoEngineers</i>	Company: <i>ARI</i>	Company:	Company:
	Date & Time: <i>4/2/2013</i>	Date & Time: <i>4/2/13 1616</i>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

60000 1221



# Cooler Receipt Form

ARI Client Geo Engineers

Project Name Gas Works Park

COC No(s) \_\_\_\_\_ (NA)

Delivered by Fed-Ex UPS Course Hand Delivered  Other \_\_\_\_\_

Assigned ARI Job No WK21

Tracking No \_\_\_\_\_ (NA)

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES  NO

Were custody papers included with the cooler? YES  NO

Were custody papers properly filled out (ink, signed, etc.) YES  NO

Temperature of Cooler(s) (°C) (recommended 2-6 °C for chemistry) ... 2.0 0.8

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID# 90877952

Cooler Accepted by AV Date 4/2/13 Time 1616

**Complete custody forms and attach all shipping documents**

**Log-In Phase:**

Was a temperature blank included in the cooler? ... YES  NO

What kind of packing material was used? ... Bubble Wrap  Wet Ice  Gel Packs  Baggies  Foam Block  Paper  Other: \_\_\_\_\_

Was sufficient ice used (if appropriate)? ... NA  YES  NO

Were all bottles sealed in individual plastic bags? ... YES  NO

Did all bottles arrive in good condition (unbroken)? ... YES  NO

Were all bottle labels complete and legible? ... YES  NO

Did the number of containers listed on COC match with the number of containers received? ... YES  NO

Did all bottle labels and tags agree with custody papers? ... YES  NO

Were all bottles used correct for the requested analyses? ... YES  NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ... (NA)  YES  NO

Were all VOC vials free of air bubbles? ... NA  YES  NO

Was sufficient amount of sample sent in each bottle? ... YES  NO

Date VOC Trip Blank was made at ARI.. ... NA 3/20/13

Was Sample Split by ARI  YES  Date/Time: \_\_\_\_\_ Equipment: \_\_\_\_\_ Split by: \_\_\_\_\_

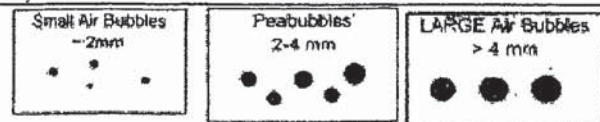
Samples Logged by AV Date 4/3/13 Time: 1428

**\*\* Notify Project Manager of discrepancies or concerns \*\***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

**Additional Notes, Discrepancies, & Resolutions:**

By \_\_\_\_\_ Date \_\_\_\_\_



Small → "sm"  
Peabubbles → "pb"  
Large → "lg"  
Headspace → "hs"



**Case Narrative, Data Qualifiers, Control Limits**

**ARI Job ID: WK21**



## Case Narrative

**Client: GeoEngineers, Inc.**  
**Project: Gas Works Park, 0186-846-01**  
**ARI Job No.: WK21**

### Sample Receipt

Twenty-five soil samples, one water sample, and a trip blank were received on April 2, 2013 under ARI job WK21. Select samples were archived upon receipt. The cooler temperatures measured by IR thermometer following ARI SOP were 0.8 and 2.0°C. For further details regarding sample receipt, please refer to the Cooler Receipt Form.

### BETX by SW8260C

The samples and associated laboratory QC were initially analyzed within the method recommended holding times.

Samples **GEI-13-13-16**, **GEI-13-23.5-24.5**, **GEI13-25.0-25.5**, and **GEI-1-16.5-17.0** were analyzed outside the twelve-hour calibration window. These samples were re-analyzed one day outside the method recommend holding time. Both sets of data have been reported. No further corrective action was taken.

Initial and continuing calibrations were within method requirements.

The internal standard areas of d-1,4-Dichlorobenzene fell outside the control limits low for samples **DUP3-040113** and **GEI-13-8-9.5**. This internal standard is not associated with requested compounds. No corrective action was taken.

The surrogate percent recoveries of Bromofluorobenzene and d4-1,2-Dichlorobenzene were outside the control limits for sample **DUP3-040113**. The sample was re-analyzed and all surrogate percent recoveries were within control limits. No further corrective action was taken.

The surrogate percent recovery of d4-1,2-Dichlorobenzene was outside the control limit for sample **GEI-13-8-9.5**. The sample was re-analyzed and all surrogate percent recoveries were within control limits. No corrective action was taken.

The method blanks were clean at the reporting limits. The LCS and LCSD percent recoveries were within control limits.

The matrix spike and matrix spike duplicate percent recoveries were within advisory control limits.



### Alkylated PAHs by SW8270-SIM

The samples were extracted and analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements. Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank was clean at the reporting limits. The LCS percent recoveries were within control limits.

### PAHs by SW8270-SIM

The samples and associated laboratory QC were extracted and analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements. Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank was clean at the reporting limits. The LCS percent recoveries were within control limits.

Several matrix spike and matrix spike duplicate percent recoveries were outside advisory control limits for sample **GEI-2-16.0-17.0**. No corrective action is required for matrix QC.

### Aroclor PCBs by SW8082

The samples and associated laboratory QC were extracted and analyzed within the method recommended holding times.

Initial and continuing calibrations were within method requirements. Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank was clean at the reporting limit. The LCS percent recoveries were within control limits.

The matrix spike and matrix spike duplicate percent recoveries were within advisory control limits.



**Arsenic by SW200.8**

The sample and associated laboratory QC were digested and analyzed within recommended holding times.

The method blank was clean at the reporting limit. The LCS percent recovery was within control limits.

The matrix spike percent recovery and duplicate RPD were within control limits.

**Geotechnical Parameters**

A laboratory-specific case narrative follows this page.





<b>Client:</b> GeoEngineers	<b>ARI Job No.:</b> WK21
<b>Client Project:</b> Gas Works Park	<b>Client Project No.:</b> 0186-846-01

Case Narrative

1. One sample was submitted for analysis on April 3, 2013, and was in good condition.
2. The sample was submitted for grain size distribution according to ASTM D422. The sample was prepared according to ASTM D421. Upon preparation, not enough sample passed the prep sieve to set up a sample for the hydrometer portion of the analysis. The amount of fines in the hydrometer portion of the analysis would not have been adequate for accurate hydrometer readings. The entire sample had been set up, so no more sample could be added. The sample was run by mechanical analysis only (sieve only). There was not adequate sample for triplicate analysis.
3. The sample displayed an oily sheen and gave off a very strong fuel like odor. The presence of a fuel-like contaminant may have affected the grain size distribution.
4. The data is provided in summary tables and plots.
5. There were no further anomalies in the sample or test method.

Released by: *Shirley Curtis*  
Geotechnical Laboratory Manager

Date: 4/15/13

Reviewed by: *Robert Noble*  
Lead Technician

Date: April 15, 2013

# Sample ID Cross Reference Report



ARI Job No: WK21  
Client: Geoengineers  
Project Event: 0186-846-01  
Project Name: Gas Works Park

Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1. MW40S-5-6	WK21A	13-7071	Soil	04/01/13 09:40	04/02/13 16:16
2. MW40S-5-10	WK21B	13-7072	Soil	04/01/13 09:40	04/02/13 16:16
3. MW40S-17.5-18	WK21C	13-7073	Soil	04/01/13 10:10	04/02/13 16:16
4. GEI-9-11.0-11.5	WK21D	13-7074	Soil	04/01/13 08:55	04/02/13 16:16
5. GEI-9-16.0-17.0	WK21E	13-7075	Soil	04/01/13 09:05	04/02/13 16:16
6. GEI-2-0.0-3.0	WK21F	13-7076	Soil	04/01/13 10:30	04/02/13 16:16
7. GEI-2-5.0-6.0	WK21G	13-7077	Soil	04/01/13 10:00	04/02/13 16:16
8. GEI-2-16.0-17.0	WK21H	13-7078	Soil	04/01/13 10:15	04/02/13 16:16
9. GEI-8-4-4.5	WK21I	13-7079	Soil	04/01/13 11:33	04/02/13 16:16
10. GEI-8-5-6	WK21J	13-7080	Soil	04/01/13 11:40	04/02/13 16:16
11. GEI-8-8.5-9.5	WK21K	13-7081	Soil	04/01/13 11:53	04/02/13 16:16
12. DUP3-040113	WK21L	13-7082	Soil	04/01/13 13:45	04/02/13 16:16
13. GEI-13-8-9.5	WK21M	13-7083	Soil	04/01/13 13:45	04/02/13 16:16
14. GEI-13-13-16	WK21N	13-7084	Soil	04/01/13 14:15	04/02/13 16:16
15. GEI-13-23.5-24.5	WK21O	13-7085	Soil	04/01/13 15:00	04/02/13 16:16
16. GEI-13-25.0-25.5	WK21P	13-7086	Soil	04/01/13 15:30	04/02/13 16:16
17. GEI-1-16.5-17.0	WK21Q	13-7087	Soil	04/01/13 16:45	04/02/13 16:16
18. GEI-1-23.0-24.0	WK21R	13-7088	Soil	04/01/13 16:50	04/02/13 16:16
19. GEI-1-0.0-3.0	WK21S	13-7089	Soil	04/01/13 16:15	04/02/13 16:16
20. GEI-1-7.0-7.5	WK21T	13-7090	Soil	04/01/13 16:30	04/02/13 16:16
21. GEI-1-12.0-12.5	WK21U	13-7091	Soil	04/01/13 16:35	04/02/13 16:16
22. GEI-1-17.0-17.5	WK21V	13-7092	Soil	04/01/13 16:38	04/02/13 16:16
23. Trip Blank-040113	WK21W	13-7093	Water	04/01/13	04/02/13 16:16
24. MW40S-19.5-20	WK21X	13-7094	Soil	04/01/13 10:00	04/02/13 16:16
25. MW40S-15-15.5	WK21Y	13-7095	Soil	04/01/13 10:15	04/02/13 16:16
26. GEI-9-2.0-3.0	WK21Z	13-7096	Soil	04/01/13 08:35	04/02/13 16:16
27. RINSE-040113	WK21AA	13-7097	Water	04/01/13 10:30	04/02/13 16:16



## Geotechnical Data

- A The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.
- F Samples were frozen prior to particle size determination
- SM Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations
- SS Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis
- W Weight of sample in some pipette aliquots was below the level required for accurate weighting

**Geotechnical Analysis  
Report and Summary QC Forms**

**ARI Job ID: WK21**

GeoEngineers  
0186-846-01  
Gas Works Park

Percent Finer Than Indicated Size, By ASTM D422

Sample ID	5"	3"	2"	1.5"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
MW40S-5-10	100.00	100.0	100.0	100.0	78.7	60.1	36.9	28.0	15.9	9.4	5.8	4.0	2.8	2.0	1.1

WK21

WK21 00247

GeoEngineers  
0186-846-01  
Gas Works Park

Percent Retained in Each Size Fraction, By ASTM D422

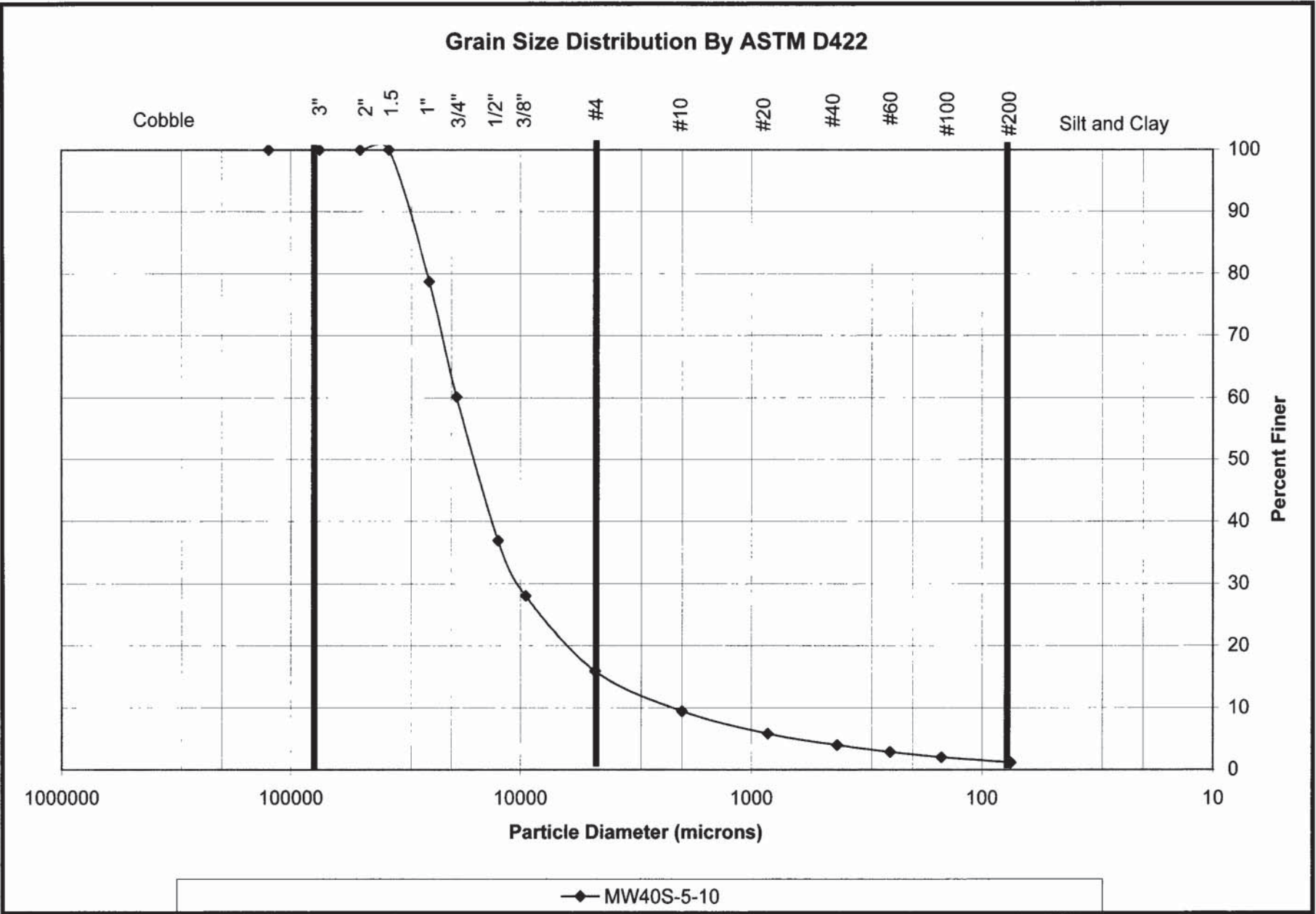
Sieve Size (microns)	5"-3"	3-2"	2-1.5"	1.5-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8-#4	4750-2000	2000-850	850-425	425-250	250-150	150-75	<75
MW40S-5-10	0.0	0.0	0.0	21.3	18.6	23.2	8.9	12.1	6.4	3.6	1.8	1.1	0.8	0.9	1.1

WK21

WK21 06248



WK21:00249



Geotechnical Raw Data  
Analyst Notes and Raw Data

ARI Job ID: WK21

**Sieve/Hydrometer Particle Size Analysis - ASTM D421/422**

ARI Job No.: WK21 ARI Sample ID.: B Setup Date: 04.07.13 Initials: lel  
 Sample Description: rocks sand, oil-like odor/sheen  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

Tare Number	<u>B</u>
Tare Weight (g)	<u>10.50</u>
Tare + Air-Dried Sample Weight (g) (before #10 preparation)	<u>314.24</u>
Hydro Test Sample Weight (g) (not including beaker weight)	<u>24.73</u>
Tare + Oven-Dried #10 Washed (g)	<u>310.09</u>
Tare + Oven-Dried #200 Washed (g) (including plus #10 material)	<u>308.17</u>

Hygroscopic Moisture Content	
Tare Number	<u>B</u>
Tare Weight (g)	
Wet Soil + Tare (g)	
Dry Soil + Tare (g)	

Hydro Beaker: BK Calgon Batch #: \_\_\_\_\_ Calgon Date: \_\_\_\_\_ Technician: \_\_\_\_\_  
 Method of size reduction: Sample Splitter  Quartering  Stockpile  Whole Sample

AL OVEN DRY NT

**Hydrometer Analysis**

Hydro #: \_\_\_\_\_ Technician: \_\_\_\_\_

Place Date/Time sticker here	Δ Time	Test Cylinder	Calgon Blank	Temp (°C)
	<b>START</b>			
<u>1</u>				
<u>2</u>				
<u>5</u>				
<u>15</u>				
<u>30</u>				
<u>60</u>				
<u>250</u>				
<u>1440</u>				

Not enough fine material provided to run hydrometer analysis. Sample recombined & sieve analysis run  
 (gc) 4/10/13

**Sieve Analysis**

Sieve Date: 4.15.13 Sieve Set #: 4 Technician: ly

Sieve Size	Cumulative Weight (g)
Empty Tare	<u>10.49</u>
2"	
1½"	
1"	<u>74.17</u>
¾"	<u>130.01</u>
½"	<u>199.55</u>
3/8"	<u>226.10</u>
#4	<u>262.46</u>
#10	<u>281.77</u>
#20	<u>292.65</u>
#40	<u>298.19</u>
#60	<u>301.95</u>
#100	<u>304.05</u>
#200	<u>306.64</u>
Pan	<u>308.09</u>

\* volume not adequate for a triplicate  
 WK21: 02467

\* sample consumed \*

**ATTACHMENT 3D-2**  
**Sediment Geotechnical Data Packages**

**SUB-ATTACHMENT 3D-2.1**  
**RETEC 1999 Phase 1 Sediment Investigation**  
**Grain Size Data**

July 31, 2001

Ms. Anne Fitzpatrick  
ThermoRetec Corp.  
1011 S.W. Klickitat Way, Suite 207  
Seattle, WA 98134

**Re: GJRW-04403-860, REGL Project, No. 1003-107**

Dear Ms. Fitzpatrick,

Samples from the referenced project were received for testing on July 17, 2001. The results of the analyses are reported on the following pages.

Please call me to discuss any questions, or comments you may have on the data or its presentation. Thank you for selecting REG Lab to perform this analysis for you.

Best Regards,  
Rosa Environmental & Geotechnical Laboratory, LLC.

  
Harold Benny  
Laboratory Manager



Client: ThermoRetec Corp.	REGL Project No.: 1003-107
Client Project No.: GJRW-04403-860	Sample Batch No.: N/A

Case Narrative

1. Eight samples were received on July 17, 2001.
2. All samples were tested according to ASTM D-422 for grain size distribution.
3. Curve fitting was used on sample, CR-01A to match the sieve portion to the hydrometer plot.  
This may be due to a difference in specific gravity between the fine fraction and the coarse fraction of the samples.
4. There were no further anomalies in the samples or test method.

Released by: *Sandra Davis*  
Title: Laboratory Lead

Date: 7/31/01

Approved by: *Harold Benz*  
Title: Laboratory Manager

Date: 7/31/01

ROSA ENVIRONMENTAL AND GEOTECHNICAL LABORATORY, LLC

ThermoRetec  
GJRW-04403-860

Percent Retained in Each Size Fraction

Sieve Size (microns)	>4750	4750-2000	2000-850	850-425	425-250	250-125	125-75	<75
CR-2A	54.9	18.4	8.3	6.6	4.9	2.2	1.4	3.2
CR-6A	24.2	7.9	10.6	21.7	16.1	7.7	4.5	7.4
CR-7A	31.0	5.6	4.3	5.9	9.4	10.5	10.5	22.9
CR-11B	0.3	3.5	11.7	27.4	35.6	15.0	5.0	1.7
CR-12B	66.7	10.7	4.6	4.1	5.5	3.8	1.9	2.7

ThermoRetec  
GJRW-04403-860

Moisture Content

Sample Identification	Moisture Content (%)
CR-2A	5.1
CR-6A	11.0
CR-7A	8.6
CR-11B	33.6
CR-12B	6.4

Tests conducted according to ASTM D-2216

ROSA ENVIRONMENTAL AND GEOTECHNICAL LABORATORY, LLC

ThermoRetec  
GJRW-04403-860

Percent Finer Than Indicated Size

Sieve Size (microns)	2"	1"	3/4"	1/2"	3/8"	#4	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)
CR-2A	100.0	100.0	93.6	78.2	67.0	45.1	26.7	18.3	11.7	6.8	4.6	3.2
CR-6A	100.0	100.0	93.6	86.4	82.7	75.8	67.9	57.3	35.6	19.6	11.8	7.4
CR-7A	100.0	89.3	85.0	76.5	75.5	69.0	63.4	59.2	53.3	43.9	33.4	22.9
CR-11B	100.0	100.0	100.0	100.0	100.0	99.7	96.3	84.6	57.2	21.6	6.6	1.7
CR-12B	100.0	93.3	82.9	59.5	54.1	33.3	22.6	18.0	13.9	8.4	4.6	2.7

Rosa Environmental Geotechnical Laboratory, LLC

ThermoRetec  
GJRW-04403-860

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	1"	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (125)	#200 (75)	32	22	13	9	7	3.2	1.3
CR-01A	100.0	100.0	95.4	85.4	78.6	69.3	60.3	46.6	29.9	20.3	15.3	15.2	14.8	13.8	10.1	8.3	5.1	2.8
CR-15A	100.0	95.9	88.1	84.5	79.0	75.3	71.8	67.4	61.2	55.8	51.6	47.2	44.4	39.4	34.4	30.0	18.9	7.2
CR-20A	100.0	100.0	100.0	100.0	100.0	99.6	98.2	95.8	94.5	93.2	90.0	83.8	78.5	74.5	67.8	59.9	30.6	18.6

Testing performed according to ASTM D421/D422

ROSA ENVIRONMENTAL AND GEOTECHNICAL LABORATORY

ThermoRetec  
GJRW-04403-860

Percent Retained in Each Size Fraction

Sample No.	% Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Total Sand	% Silt	% Clay
Size (microns)	> 4750	4750-2000	2000-425	425-75	4750-75	75-3	<3
CR-01A	21.4	9.3	22.7	31.3	63.3	10.3	5.1
CR-15A	21.0	3.7	7.9	15.8	27.3	32.8	18.9
CR-20A	0.0	0.4	3.8	5.8	10.0	59.4	30.6

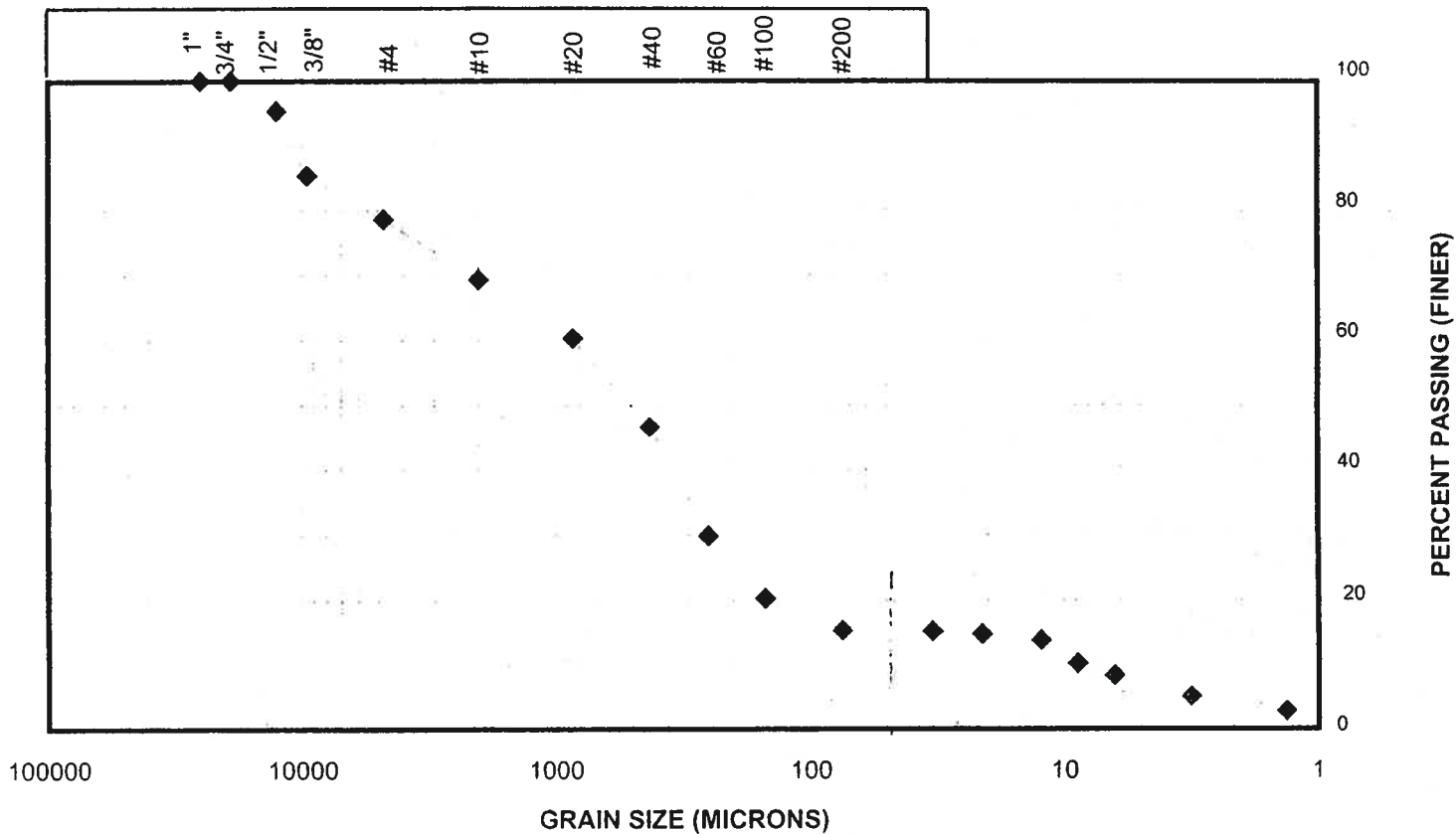


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: GJRW-04403-860

Sample No.: CR-01A



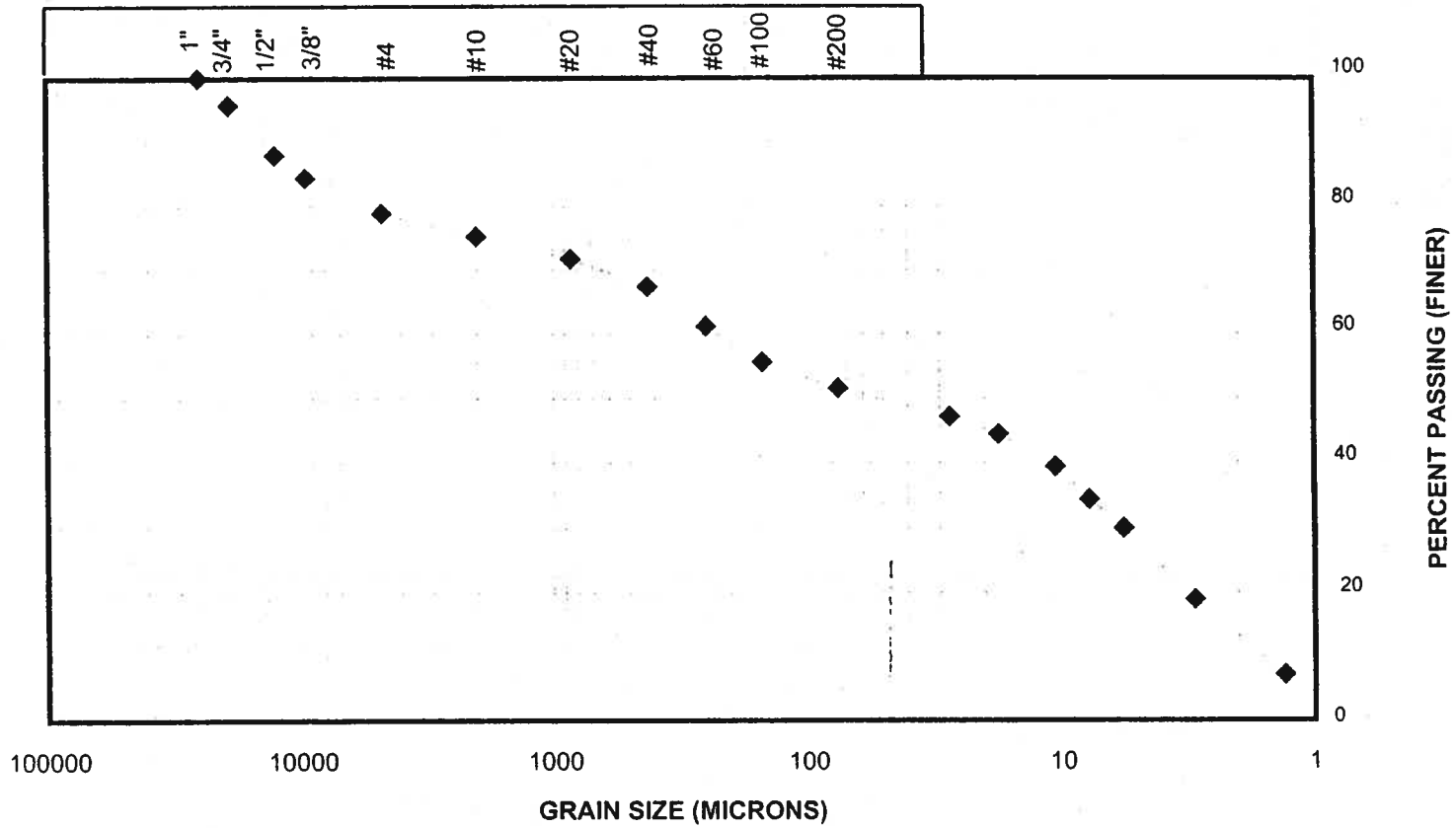
1003-107

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: GJRW-04403-860

Sample No.: CR-15A



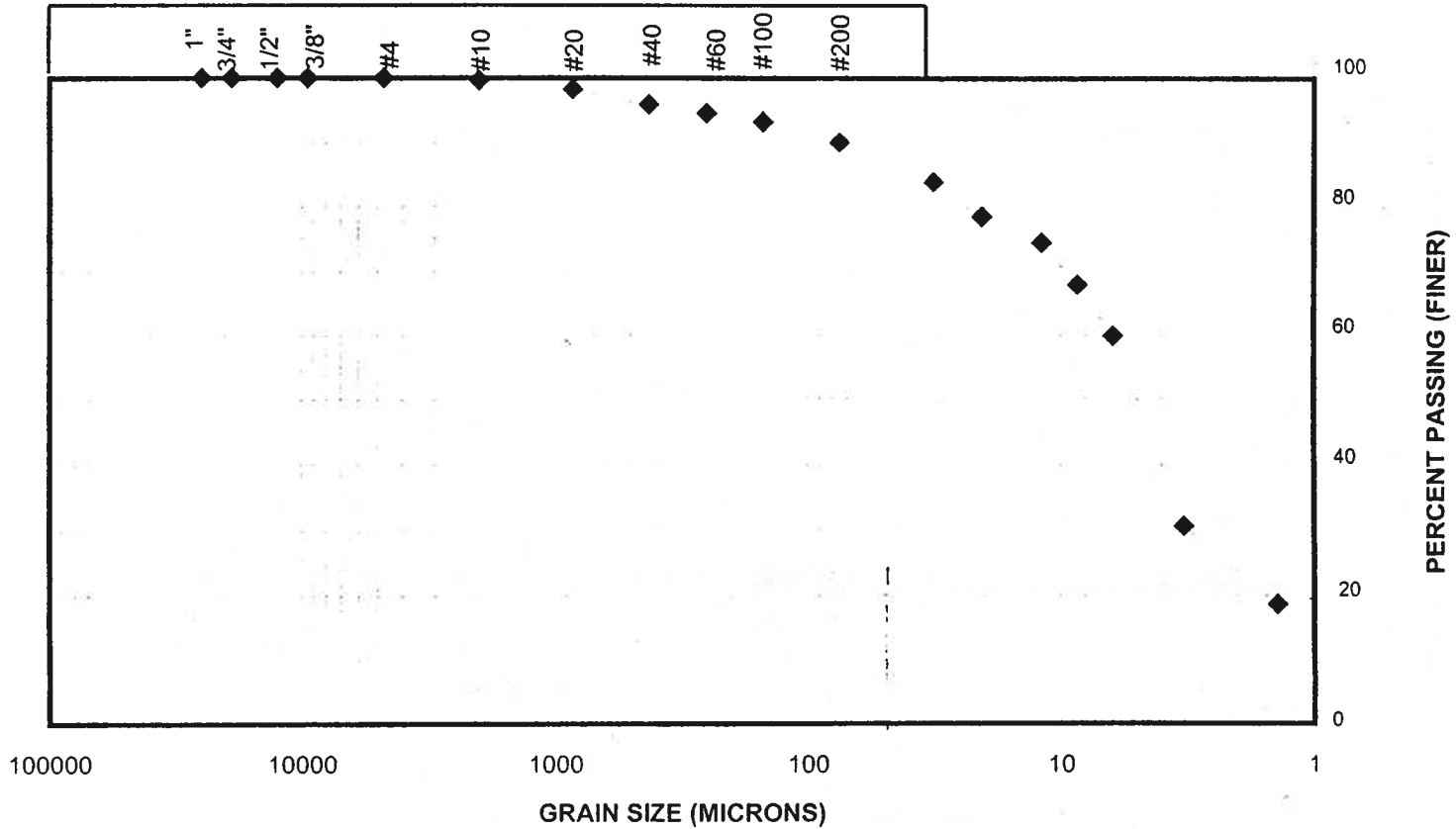
1003-107

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: GJRW-04403-860

Sample No.: CR-20A



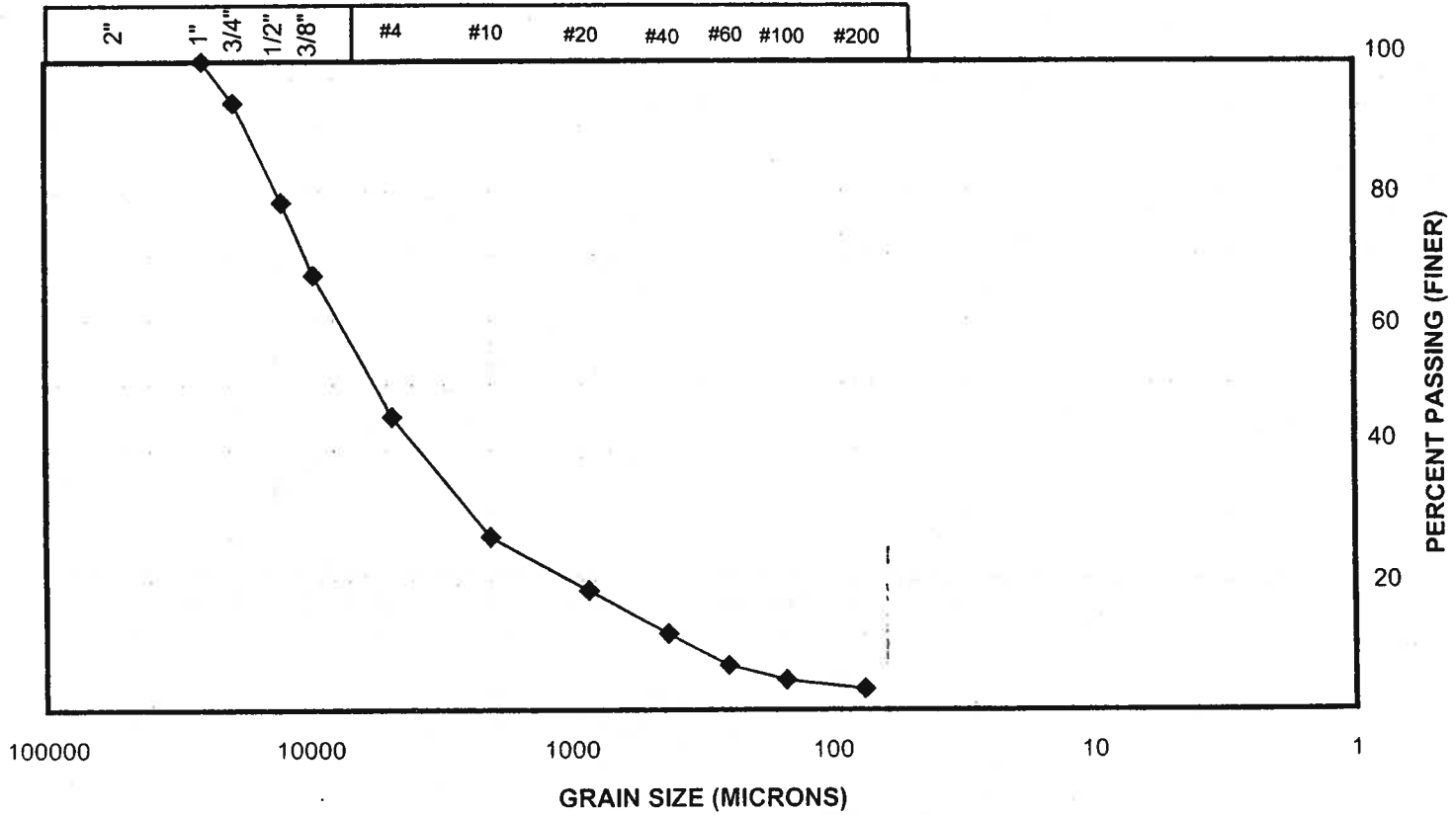
1003-107

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: GJRW-04403-860

Sample No.: CR-2A

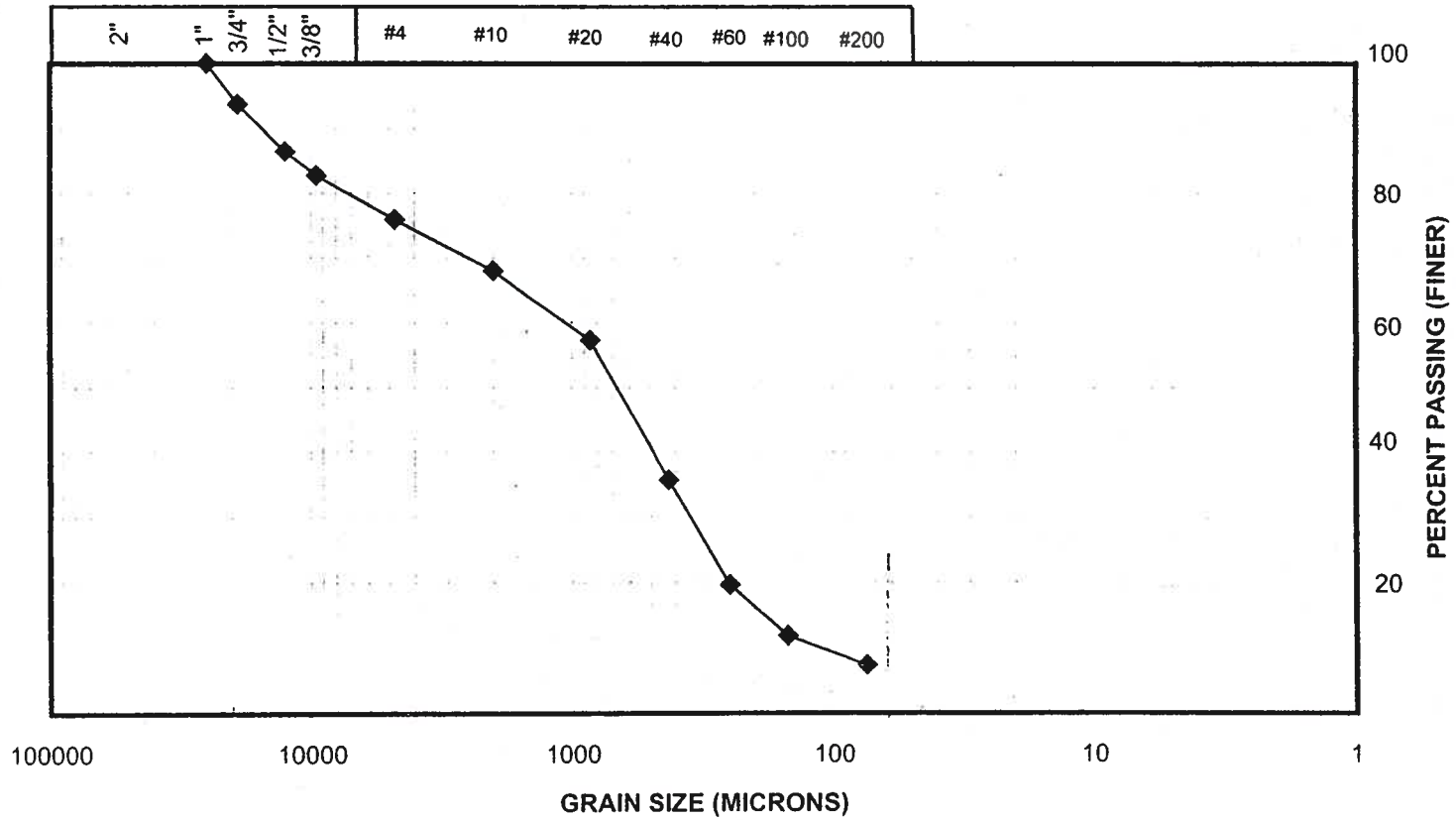


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: GJRW-04403-860

Sample No.: CR-6A



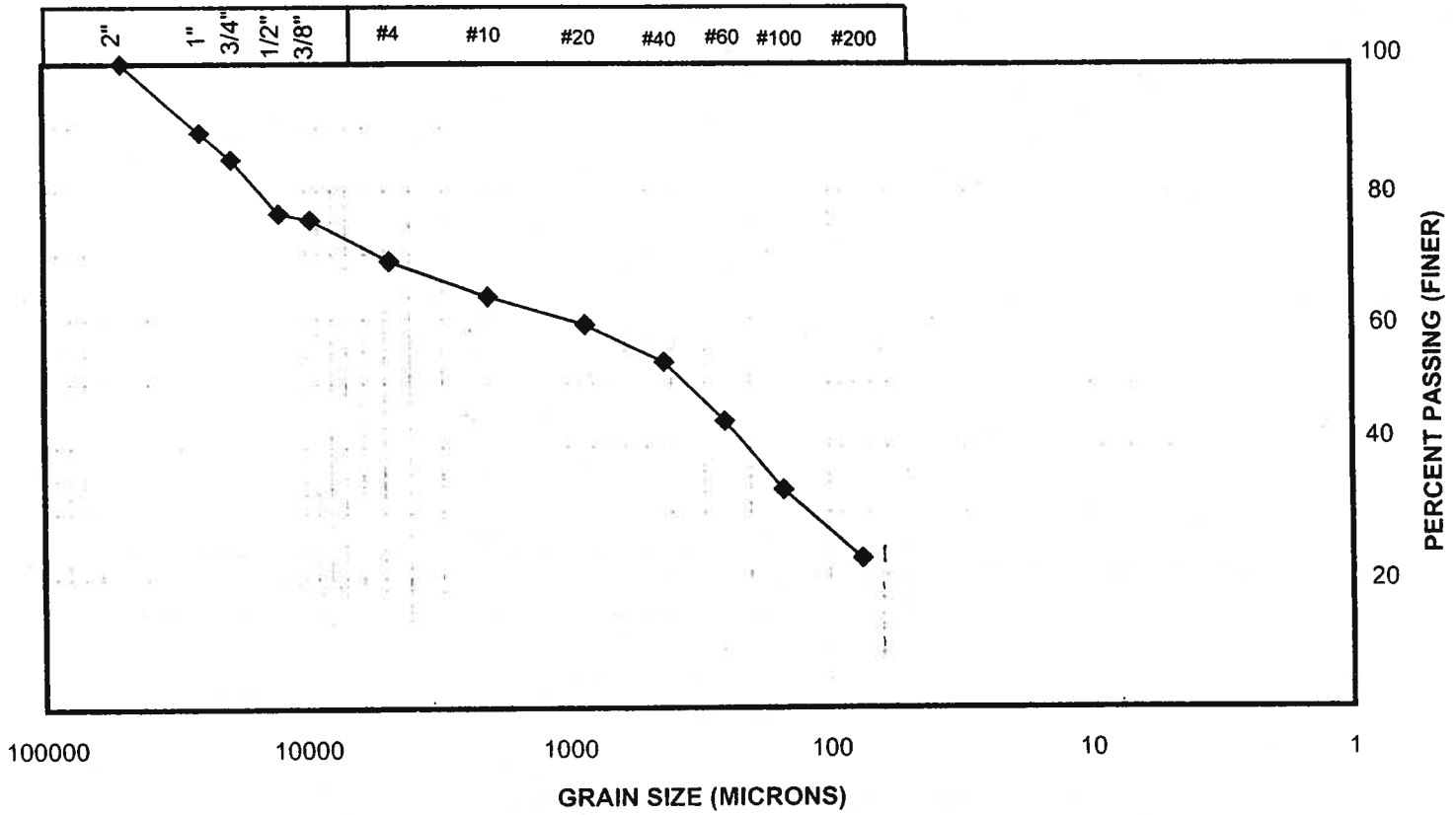
1003-107

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: GJRW-04403-860

Sample No.: CR-7A



1003-107

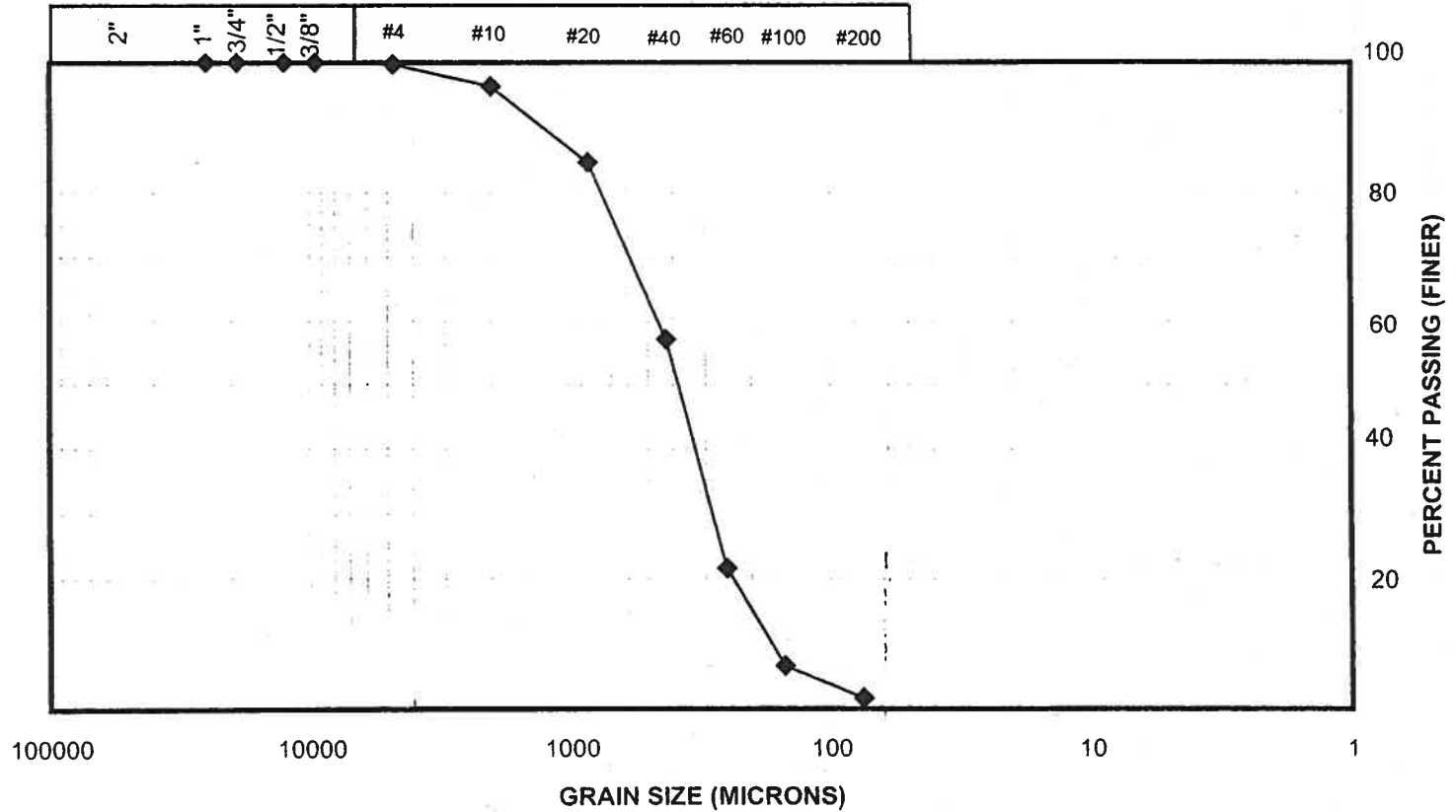


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: GJRW-04403-860

Sample No.: CR-11B



1003-107

11274

CHAIN OF CUSTODY RECORD

PROJ. NO. GJRW-04403 -860		PROJECT NAME Lake Union Sediments		NO. OF CONTAINERS	Grain Size					SEND RESULTS TO: Anne Fitzpatrick	
SAMPLERS:											
RECEIVING LABORATORY: Rosa Environmental											
LAB I.D. NO.	DATE	TIME	SAMPLE NO.							REMARKS	
	7/17/01	3:20pm	CR-1A	1	1						
	7/17/01	3:20pm	CR-2A	1	1						
	7/17/01	3:20pm	CR-6A	1	1						
	7/17/01	3:20pm	CR-7A	1	1						
	7/17/01	3:20pm	CR-11B	1	1						
	7/17/01	3:20pm	CR-12B	1	1						
	7/17/01	3:20pm	CR-15A	1	1						
	7/17/01	3:20pm	CR-20A	1	1						
Relinquished by: (Signature)		Date / Time	Received by: (Signature)		Relinquished by: (Signature)		Date / Time	Received by: (Signature)			
			[Signature]		[Signature]		7/17/01 15:35				
Relinquished by: (Signature)		Date / Time	Received for Laboratory by: (Signature)		Date / Time						
			[Signature] (Rosa)		7/17/01 15:35						
Shipper Information											



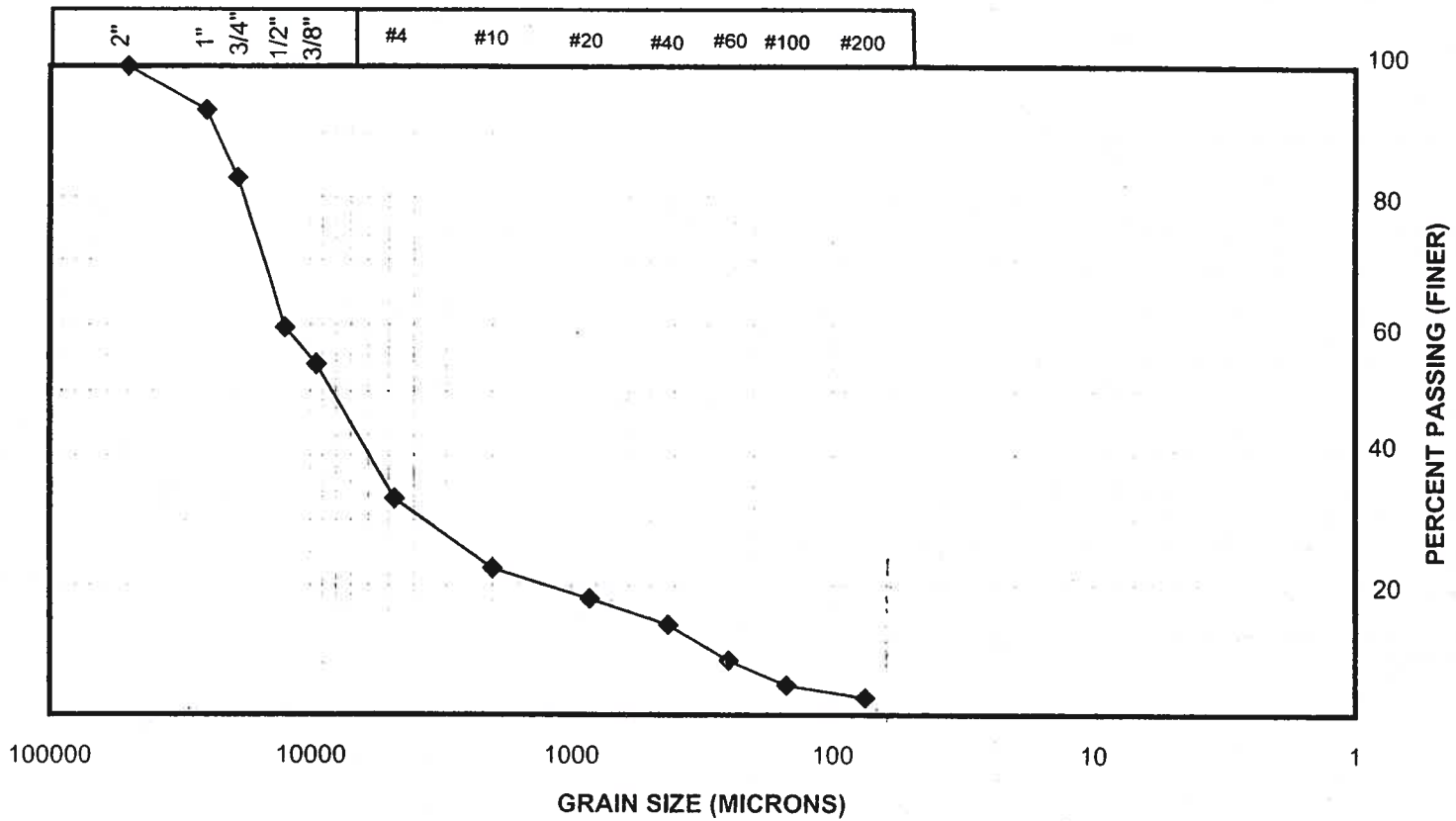
REMEDICATION TECHNOLOGIES  
1011 S.W. Klickitat Way  
Suite 207  
Seattle, WA 98134  
(206) 624-9349

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: GJRW-04403-860

Sample No.: CR-12B



1003-107

**SUB-ATTACHMENT 3D-2.2**  
**Ecology/TAMU 2002 Sediment Toxicity Investigation**  
**Surface Sediment Grain Size Data**

## Appendix C

### Sediment Grain Size

Table C-1. Lake Union sediment grain size (in %).

Site Name	Gravel (>2,000 um)	Sand (2,000<X <62.5 um)	Silt (62.5<X <4 um)	Clay (<4 um)	70°C TOC	104°C TOC	Solids
Ref 1	10.2	60.5	24.8	4.6	4.05	4.16	33.2
Ref 2	17.6	51.4	26	5	25.1	25.5	10.4
LU-H-1	8.1	27.8	38.8	25.2	15.6	15.5	17
LU-H-2	1.8	42.6	43.6	12	14	14.2	19.6
LU-M-3	8.8	12.8	48.9	29.5	13.7	13.7	15.1
LU-M-4	5.8	8	52.7	33.6	10.5	10.6	14.8
LU-M-5	10	16.8	48.6	24.6	13.4	13.6	11
LU-M-6	3.6	8.5	68.5	19.4	15.1	15.3	10.8
LU-M-7	17.8	6.7	51.4	24	15.1	15.3	10.9
LU-L-8	4.9	8	50.7	36.4	10.1	10.1	14.8
LU-L-9	3	6.7	62.8	27.4	12.4	12.6	12.1
LU-L-10	4.4	10	64.9	20.6	14.1	13.8	12
LU-L-11	10.1	11.4	57.8	20.7	13.2	13.5	11.8

**Table 3-4 Ecology/TAMU Surface Sediment Grain Size, Solids and TOC**

Sample ID	Ecology Analyses						RETEC Analyses	
	% Gravel	% Sand	% Silt	% Clay	Solids	% TOC	Solids	% TOC
	>2,000 $\mu\text{m}$	2,000 < X < 62.5 $\mu\text{m}$	62.5 < X < 4 $\mu\text{m}$	<4 $\mu\text{m}$	%	(104°C)	%	(104°C)
LU-1	8.1	27.8	38.8	25.2	16.9	15.5	16.2	5.8
LU-2	1.8	42.6	43.6	12.0	19.6	14.2	18.2	9.3
LU-3	8.8	12.8	48.9	29.5	15.1	13.7	14.3	6.6
LU-4	5.8	8.0	52.7	33.6	14.8	10.6	14.0	6.7
LU-5	10.0	16.8	48.6	24.6	11.0	13.6	12.4	6.7
LU-6	3.6	8.5	68.5	19.4	10.8	15.3	10.5	8.3
LU-7	17.8	6.7	51.4	24.0	10.9	15.3	10.4	9.1
LU-8	4.9	8.0	50.7	36.4	14.8	10.1	15.3	8.1
LU-9	3.0	6.7	62.8	27.4	12.1	12.6	12.4	8.8
LU-10	4.4	10.0	64.9	20.6	12.0	13.8	11.2	8.4
LU-11	10.1	11.4	57.8	20.7	11.8	13.5	12.3	7.1
Ref-1	10.2	60.5	24.8	4.6	33.2	4.2	34.7	4.2
Ref-2	17.6	51.4	26.0	5.0	10.4	25.5	10.6	13.0

**Notes:**

Results are for samples collected by Ecology in March 2002 and analyzed by Ecology (using Manchester and Rosa) and analyzed by RETEC (using ARI and Rosa).

Grain size analyses conducted according to methods specified in Table 2-1.

TOC analyzed according to PSEP (1996) for Ecology analysis and according to Plumb, 1981 for RETEC analysis.

Ref - Reference samples collected from Webster Point.

**SUB-ATTACHMENT 3D-2.3**  
**RETEC 2002 Phase 2 Investigation -**  
**Geotechnical and Grain Size Data**



**SUB-ATTACHMENT 3D-2.3.1**  
**RETEC 2002 Phase 2 Investigation -**  
**Grain Size Data Package 1**

## North Lake Union Phase 2 Investigation: Surface Grab Sample Grain Size Summary

Percent Retained in Each Size Fraction	Gravel	Sand					Silt				Clay		
		Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt			
Phi Size	> -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	< 10
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0
NLU01-SS-0010A	2.3	3.1	5.6	21.8	21.2	7.9	6.5	9.4	8.1	7.2	3.0	1.4	2.4
NLU01-SS-0010B	1.6	3.5	6.2	21.3	21.2	8.0	6.8	9.4	8.0	6.7	2.8	1.8	2.7
NLU01-SS-0010C	1.5	3.4	6.2	22.5	21.1	8.1	5.2	9.8	7.9	6.8	3.0	2.0	2.5
NLU02-SS-0010	6.2	8.2	4.0	6.2	13.5	9.2	17.2	10.2	7.0	7.8	4.2	2.3	3.9
NLU04-SS-0010	1.9	11.4	8.4	4.9	4.5	5.7	20.4	10.9	8.4	9.7	5.0	2.5	6.2
NLU05-SS-0010	27.5	8.2	17.3	31.1	13.2	1.5	0.8	0.1	0.1	0.1	0.0	0.0	0.1
NLU06-SS-0010	0.1	12.4	14.2	10.8	9.6	9.4	5.6	10.6	7.7	8.2	4.5	2.8	4.1
NLU07-SS-0010	0.1	1.1	18.1	13.8	12.8	11.3	3.6	10.3	8.2	8.0	4.8	3.1	4.9
NLU08-SS-0010	2.8	16.6	8.2	5.1	5.1	5.5	6.4	15.3	10.9	9.5	5.0	3.0	6.5
NLU100-SS-0010	4.4	5.3	6.7	8.9	16.2	13.0	5.3	11.6	8.9	8.4	4.9	2.3	4.0
NLU10-SS-0010	1.0	7.8	9.7	7.7	7.4	7.9	4.2	16.3	11.4	10.3	5.7	2.5	8.0
NLU12-SS-0010	0.6	15.6	9.6	6.2	6.2	6.8	3.1	13.3	12.3	11.4	5.4	2.2	7.3
NLU13-SS-0010	0.1	1.2	1.5	2.4	7.3	5.8	2.7	16.3	15.8	17.3	12.1	7.8	9.7
NLU14-SS-0010	1.6	6.4	8.0	7.3	8.4	5.9	12.6	8.5	10.0	12.1	6.0	4.8	8.4
NLU15-SS-0010	0.3	2.1	10.3	7.6	8.5	11.2	5.3	17.5	12.8	10.0	4.8	3.5	6.4
NLU16-SS-0010	0.5	10.2	9.2	6.9	8.5	8.3	2.3	10.4	12.8	13.1	5.8	3.9	8.1
NLU17-SS-0010	0.2	0.4	0.7	1.1	7.0	7.6	4.0	12.4	17.1	17.6	12.0	7.1	12.8
NLU21-SS-0010	21.3	12.4	11.8	19.8	14.6	4.7	-3.2	3.5	3.9	4.5	2.9	1.4	2.5
NLU22-SS-0010	25.5	16.6	11.9	12.9	9.2	3.9	-0.3	3.6	4.1	5.5	3.2	1.2	2.7

**Rosa Environmental & Geotechnical Laboratory, LLC**

1001 SW Klickitat Way, Suite 107

Seattle, WA 98134

206.287.9122 P

206.264.1995 F

November 1, 2002

Ms. Kristin Cunningham  
The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134


Subject: Project No.: GJRW1-04403-961; REGL Project No.: 1003-646

Dear Ms. Cunningham

Samples from the referenced project were received for testing on October 16, 2002.  
The results of the testing are discussed on the attached tables and narrative.

Please call me to discuss any questions, or comments you may have on the data or its presentation.

Best Regards,  
Rosa Environmental & Geotechnical Laboratory, LLC.

  
Harold Benny  
Laboratory Manager

**Rosa Environmental & Geotechnical Laboratory, LLC**

1001 SW Klickitat Way, Suite 107

Seattle, WA 98134

206.287.9122 P

206.264.1995 F

Client: The RETEC Group, Inc.

REGL Project No.: 1003-646

Client Project: GJRW1-04403-961

Case Narrative

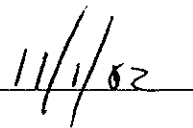
1. Samples were received on September 15 and 16, 2002 in good condition, for grain size analysis.
2. All samples were tested according to PSEP methodology.
3. One sample in the batch was run in triplicate and is reported on the QA summary.
4. There were no perceived anomalies in the samples or test method.

Approved by:

Title:

  
Laboratory Manager

Date:



100 5-076

# Chain of Custody Record

N<sup>o</sup> 100203

The Retec Group

1011 S.W. Klickitat Way, Suite 207 • Seattle, WA 98134-1162  
(206) 624-9349 Phone • (206) 624-2839 Fax  
www.retec.com



"NLU Phase 2"

Project Name: <u>North Lake Union</u>	Project Number: <u>GTJW1-05403-961</u>
Send Report To: <u>R. Cunningham</u>	Sampler (Print Name): <u>Nik Sacher</u>
Address: <u>See above</u>	Sampler (Print Name): <u>K. Rose</u>
	Shipment Method: <u>Hand-delivered</u>
	Airbill Number:
Phone:	Laboratory Receiving: <u>RDSA</u>
Fax:	

Page 1 of 1

Purchase Order #: ROSA - Seal #2

Analysis Requested  
GRAIN SIZE - (PS) 100

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)
NLU02-SS-0010	10/15/02	1415	sediment	1		
NLU04	}	1121	}	1		
NLU05		1529		1		
NLU08		1023		1		
NLU10		0947		1		
NLU12		0855		1		
NLU16		0920		1		
NLU21		1702		1		
NLU22		1750		1		
NLU100		1424		1		
Total (10)						

Testing per WD & 21087  
SAP / QAPP 21088  
21089  
16 oz jar each suppl. 21090  
21091  
21092  
21093  
21094  
21095  
21096

Relinquished by: (Signature) <u>[Signature]</u>	Received by: (Signature) <u>[Signature]</u>	Date: <u>10/16/02</u>	Time: <u>11:50</u>	Sample Custodian Remarks (Completed By Laboratory):		
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:	QA/QC Level	Turnaround	Sample Receipt
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:	Level I <input type="checkbox"/>	Routine <input type="checkbox"/>	Total # Containers Received?
				Level II <input type="checkbox"/>	24 Hour <input type="checkbox"/>	COC Seals Present?
				Level III <input type="checkbox"/>	1 Week <input type="checkbox"/>	COC Seals Intact?
				Other <input type="checkbox"/>	Other _____	Received Containers Intact?
						Temperature?



The Retec Group  
GJRW1-04403-961

PSEP Total Solids Analysis  
Percent of Wet Weight

Sample No.	Total Solids (%)
NLU01-SS-0010A	42.2
NLU01-SS-0010B	42.9
NLU01-SS-0010C	42.0
NLU06-SS-0010	10.7
NLU07-SS-0010	10.6
NLU15-SS-0010	12.4
NLU13-SS-0010	19.8
NLU14-SS-0010	15.0
NLU17-SS-0010	15.2
NLU02-SS-0010	14.8
NLU04-SS-0010	10.7
NLU05-SS-0010	83.4
NLU08-SS-0010	10.2
NLU10-SS-0010	10.7
NLU12-SS-0010	10.3
NLU16-SS-0010	13.5
NLU21-SS-0010	18.2
NLU22-SS-0010	11.7
NLU100-SS-0010	14.8

Triplicate Average	42.3
Standard Deviation	0.45
%RSD	1.07



QA SUMMARY

PROJECT:	The Retec Group	Project No.:	GJRW1-04403-961
REGL Triplicate Sample ID:	21080	Batch No.:	1003-646 -01
Client Triplicate Sample ID:		Page:	1 of 1

Relative Standard Deviation, By Phi Size

Sample ID	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
U01-SS-001	100.0	100.0	97.7	94.6	89.0	67.1	45.9	38.0	31.6	22.1	14.0	6.8	3.8	2.4
U01-SS-001	100.0	99.9	98.4	94.9	88.6	67.4	46.2	38.2	31.4	22.0	14.0	7.3	4.5	2.7
U01-SS-001	100.0	99.2	98.5	95.1	89.0	66.4	45.4	37.2	32.0	22.2	14.3	7.5	4.5	2.5
AVE	NA	99.70	98.20	94.87	88.87	66.99	45.82	37.81	31.63	22.10	14.12	7.21	4.27	2.54
STDEV	NA	0.41	0.44	0.27	0.19	0.48	0.42	0.53	0.29	0.07	0.13	0.34	0.38	0.12
%RSD	NA	0.41	0.45	0.28	0.21	0.71	0.92	1.41	0.93	0.34	0.92	4.76	8.87	4.54

The Triplicate Applies To The Following Samples

REGL ID	Client ID	Date Sampled	Date Extracted	Date Complete	QA*
21080	NLU01-SS-0010A	10/14/02	10/18/02	10/31/02	99.6
21080	NLU01-SS-0010B	10/14/02	10/18/02	10/31/02	103.0
21080	NLU01-SS-0010C	10/14/02	10/18/02	10/31/02	99.7
21081	NLU06-SS-0010	10/14/02	10/18/02	10/31/02	98.6
21082	NLU07-SS-0010	10/14/02	10/18/02	10/31/02	96.5
21083	NLU15-SS-0010	10/14/02	10/18/02	10/31/02	102.9
21084	NLU13-SS-0010	10/14/02	10/18/02	10/31/02	102.1
21085	NLU14-SS-0010	10/14/02	10/18/02	10/31/02	99.7
21086	NLU17-SS-0010	10/14/02	10/18/02	10/31/02	102.7
21087	NLU02-SS-0010	10/15/02	10/18/02	10/31/02	102.6
21088	NLU04-SS-0010	10/15/02	10/18/02	10/31/02	100.4
21089	NLU05-SS-0010	10/15/02	10/18/02	10/31/02	100.7
21090	NLU08-SS-0010	10/15/02	10/18/02	10/31/02	100.3
21091	NLU10-SS-0010	10/15/02	10/18/02	10/31/02	98.1
21092	NLU12-SS-0010	10/15/02	10/18/02	10/31/02	101.0
21093	NLU16-SS-0010	10/15/02	10/18/02	10/31/02	103.1
21094	NLU21-SS-0010	10/15/02	10/18/02	10/31/02	94.6
21095	NLU22-SS-0010	10/15/02	10/18/02	10/31/02	98.3
21096	NLU100-SS-0010	10/15/02	10/18/02	10/31/02	100.5

\* REGL Internal QA limits = 95-105%

Notes to the Testing:

1. See narrative for discussion of testing.

The Retec Group  
GJRW1-04403-961

Apparent Grain Size Distribution Summary  
Percent Retained in Each Size Fraction

Sample No.	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay		
											Phi Size	8 to 9	9 to 10
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0
NLU01-SS-0010A	2.3	3.1	5.6	21.8	21.2	7.9	6.5	9.4	8.1	7.2	3.0	1.4	2.4
NLU01-SS-0010B	1.6	3.5	6.2	21.3	21.2	8.0	6.8	9.4	8.0	6.7	2.8	1.8	2.7
NLU01-SS-0010C	1.5	3.4	6.2	22.5	21.1	8.1	5.2	9.8	7.9	6.8	3.0	2.0	2.5
NLU06-SS-0010	0.1	12.4	14.2	10.8	9.6	9.4	5.6	10.6	7.7	8.2	4.5	2.8	4.1
NLU07-SS-0010	0.1	1.1	18.1	13.8	12.8	11.3	3.6	10.3	8.2	8.0	4.8	3.1	4.9
NLU15-SS-0010	0.3	2.1	10.3	7.6	8.5	11.2	5.3	17.5	12.8	10.0	4.8	3.5	6.4
NLU13-SS-0010	0.1	1.2	1.5	2.4	7.3	5.8	2.7	16.3	15.8	17.3	12.1	7.8	9.7
NLU14-SS-0010	1.6	6.4	8.0	7.3	8.4	5.9	12.6	8.5	10.0	12.1	6.0	4.8	8.4
NLU17-SS-0010	0.2	0.4	0.7	1.1	7.0	7.6	4.0	12.4	17.1	17.6	12.0	7.1	12.8
NLU02-SS-0010	6.2	8.2	4.0	6.2	13.5	9.2	17.2	10.2	7.0	7.8	4.2	2.3	3.9
NLU04-SS-0010	1.9	11.4	8.4	4.9	4.5	5.7	20.4	10.9	8.4	9.7	5.0	2.5	6.2
NLU05-SS-0010	27.5	8.2	17.3	31.1	13.2	1.5	0.8	0.1	0.1	0.1	0.0	0.0	0.1
NLU08-SS-0010	2.8	16.6	8.2	5.1	5.1	5.5	6.4	15.3	10.9	9.5	5.0	3.0	6.5
NLU10-SS-0010	1.0	7.8	9.7	7.7	7.4	7.9	4.2	16.3	11.4	10.3	5.7	2.5	8.0
NLU12-SS-0010	0.6	15.6	9.6	6.2	6.2	6.8	3.1	13.3	12.3	11.4	5.4	2.2	7.3
NLU16-SS-0010	0.5	10.2	9.2	6.9	8.5	8.3	2.3	10.4	12.8	13.1	5.8	3.9	8.1
NLU21-SS-0010	21.3	12.4	11.8	19.8	14.6	4.7	-3.2	3.5	3.9	4.5	2.9	1.4	2.5
NLU22-SS-0010	25.5	16.6	11.9	12.9	9.2	3.9	-0.3	3.6	4.1	5.5	3.2	1.2	2.7
NLU100-SS-0010	4.4	5.3	6.7	8.9	16.2	13.0	5.3	11.6	8.9	8.4	4.9	2.3	4.0

Notes to the Testing:

1. Apparent grain size distributions according to PSEP protocols.

The Retec Group  
GJRW1-04403-961

Apparent Grain Size Distribution Summary  
Percent Finer Than Indicated Size

Sample No.	Gravel			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt				Clay	
	Phi Size	Phi Size	Phi Size						Phi Size	Phi Size	Phi Size	Phi Size	Phi Size	Phi Size
Sieve Size (microns)	3/8"	#4	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (62)	31.00	15.60	7.80	3.90	2.00	1.00
NLU01-SS-0010A	100.0	100.0	97.7	94.6	89.0	67.1	45.9	38.0	31.6	22.1	14.0	6.8	3.8	2.4
NLU01-SS-0010B	100.0	99.9	98.4	94.9	88.6	67.4	46.2	38.2	31.4	22.0	14.0	7.3	4.5	2.7
NLU01-SS-0010C	100.0	99.2	98.5	95.1	89.0	66.4	45.4	37.2	32.0	22.2	14.3	7.5	4.5	2.5
NLU06-SS-0010	100.0	100.0	99.9	87.6	73.3	62.6	53.0	43.6	38.0	27.4	19.7	11.5	7.0	4.1
NLU07-SS-0010	100.0	100.0	99.9	98.8	80.8	67.0	54.2	42.9	39.4	29.0	20.8	12.8	8.0	4.9
NLU15-SS-0010	100.0	100.0	99.7	97.6	87.4	79.8	71.3	60.1	54.9	37.4	24.6	14.7	9.9	6.4
NLU13-SS-0010	100.0	100.0	99.9	98.7	97.2	94.9	87.5	81.7	79.0	62.7	46.9	29.6	17.4	9.7
NLU14-SS-0010	100.0	100.0	98.4	92.0	84.1	76.7	68.4	62.5	49.9	41.4	31.4	19.2	13.2	8.4
NLU17-SS-0010	100.0	100.0	99.8	99.4	98.8	97.6	90.6	83.0	78.9	66.6	49.5	31.9	19.9	12.8
NLU02-SS-0010	100.0	100.0	93.8	85.6	81.6	75.4	61.9	52.7	35.5	25.2	18.2	10.4	6.2	3.9
NLU04-SS-0010	100.0	100.0	98.1	86.7	78.3	73.3	68.8	63.1	42.7	31.8	23.4	13.8	8.8	6.2
NLU05-SS-0010	100.0	83.1	72.5	64.3	47.0	15.9	2.7	1.2	0.5	0.4	0.3	0.1	0.1	0.1
NLU08-SS-0010	100.0	100.0	97.2	80.6	72.4	67.3	62.2	56.7	50.2	34.9	24.0	14.5	9.5	6.5
NLU10-SS-0010	100.0	100.0	99.0	91.2	81.4	73.8	66.4	58.4	54.2	37.9	26.5	16.2	10.5	8.0
NLU12-SS-0010	100.0	100.0	99.4	83.8	74.1	68.0	61.8	55.0	51.9	38.7	26.4	15.0	9.6	7.3
NLU16-SS-0010	100.0	100.0	99.5	89.4	80.1	73.3	64.8	56.4	54.2	43.8	30.9	17.8	12.0	8.1
NLU21-SS-0010	100.0	92.9	78.7	66.3	54.5	34.7	20.1	15.3	18.6	15.1	11.2	6.8	3.9	2.5
NLU22-SS-0010	100.0	95.6	74.5	57.9	46.0	33.2	24.0	20.0	20.3	16.7	12.6	7.1	3.9	2.7
NLU100-SS-0010	100.0	100.0	95.6	90.3	83.6	74.7	58.5	45.5	40.2	28.6	19.7	11.3	6.3	4.0

Notes to the Testing:

1. Apparent grain size distributions according to PSEP protocols.

**SUB-ATTACHMENT 3D-2.3.2**  
**RETEC 2002 Phase 2 Investigation -**  
**Grain Size Data Package 2**

## North Lake Union Phase 2 Investigation: Subsurface Core Sample Grain Size Summary

Percent Retained in Each Size Fraction	Gravel	Sand					Silt				Clay				
		Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt					
Phi Size	> -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	< 10		
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0		
NLU03-US-S1B	6.4	5.8	2.8	0.8	3.7	4.0	11.9	17.1	21.5	12.4	5.1	3.1	5.4		
NLU03-US-S2	7.2	9.8	16.5	22.9	13.4	6.8	3.9	4.9	4.3	4.1	2.6	1.6	2.0		
NLU03-US-S3	18.0	6.4	10.3	14.2	14.1	11.0	7.7	4.8	3.9	3.1	2.2	1.6	2.7		
NLU06-US-S1	4.8	7.3	3.9	3.5	3.7	4.7	9.7	12.0	12.2	14.6	9.6	5.7	8.3		
NLU06-US-S2	1.9	3.5	5.4	10.9	10.4	7.8	9.5	9.9	10.0	9.8	8.2	4.9	7.7		
NLU06-US-S3 <sup>(1)</sup>	25.8	7.9	13.5	24.1	21.0	6.4	1.2 -- silt and clay								
NLU06-US-S4 <sup>(1)</sup>	22.7	6.4	10.1	19.6	15.6	9.9	15.8 -- silt and clay								
NLU07-US-S1A	1.3	4.7	4.6	5.4	7.7	10.8	7.6	14.4	11.7	11.2	8.0	7.9	4.7		
NLU07-US-S1B	0.1	2.1	5.7	4.8	4.8	6.6	8.3	14.4	13.8	13.2	10.5	6.1	9.6		
NLU07-US-S3 <sup>(1)</sup>	0.6	6.1	27.4	35.3	20.5	2.7	7.3 -- silt and clay								
NLU08-US-S1B	1.7	4.2	3.4	3.4	3.8	3.5	8.7	13.7	14.9	12.4	11.7	7.7	10.8		
NLU08-US-S2	0.2	4.0	0.9	0.8	0.8	1.1	6.1	9.0	10.9	16.2	17.4	11.6	20.9		
NLU08-US-S3	22.2	14.5	5.5	3.7	3.8	5.0	2.8	8.3	6.5	7.0	7.4	0.6	12.8		
NLU09-GE-S1 <sup>(1)</sup>	1.3	5.3	24.1	43.2	21.2	3.5	1.3 -- silt and clay								
NLU09-GE-S2 <sup>(1)</sup>	2.7	7.6	27.8	45.0	13.9	2.0	0.9 -- silt and clay								
NLU09-GE-S3 <sup>(1)</sup>	12.8	12.6	27.7	34.9	10.0	1.3	0.5 -- silt and clay								
NLU09-GE-S4 <sup>(1)</sup>	19.2	11.0	23.0	32.0	12.1	2.0	0.6 -- silt and clay								
NLU10-US-S1B	11.9	6.0	3.2	2.4	2.1	2.6	7.7	11.0	11.5	13.6	10.5	7.2	10.3		
NLU10-US-S2	5.3	3.4	1.4	0.9	0.6	0.9	6.7	7.7	11.0	17.3	15.4	11.1	18.3		
NLU10-US-S3A	0.0	0.9	2.9	8.4	6.0	10.3	4.3	14.5	10.2	13.5	12.5	7.3	9.0		
NLU10-US-S3B	0.1	1.1	10.7	5.4	4.1	7.3	3.5	15.1	6.6	14.1	13.9	7.6	10.6		
NLU10-US-S3C	0.0	1.0	8.4	4.9	3.5	5.7	10.2	13.7	9.4	9.6	14.3	7.5	11.9		
NLU11-US-S5A <sup>(1)</sup>	17.4	7.7	20.0	32.1	16.7	3.6	2.5 -- silt and clay								
NLU11-US-S5B <sup>(1)</sup>	25.9	6.3	11.6	19.6	11.7	10.1	14.8 -- silt and clay								
NLU12-US-S1	1.4	3.0	1.9	1.6	1.8	2.5	6.6	11.4	13.6	17.9	13.5	9.7	15.1		
NLU12-US-S2	5.1	5.7	2.1	1.3	1.1	1.6	9.8	8.0	12.8	15.6	12.3	9.2	15.3		
NLU14-US-S1	0.1	3.8	4.2	2.9	2.4	3.1	2.7	10.8	12.3	17.8	15.1	9.7	15.3		
NLU14-US-S2	0.1	1.8	10.8	6.4	5.0	8.5	6.3	12.9	8.5	14.4	11.2	4.7	9.4		
NLU16-US-S1	1.8	3.9	2.6	2.1	2.4	3.6	3.0	12.2	16.0	16.4	13.5	5.4	17.2		
NLU16-US-S2	0.0	2.2	0.8	0.6	0.5	1.0	9.8	11.8	13.6	19.1	14.4	9.8	16.4		
NLU16-US-S3	15.5	11.0	4.1	2.1	1.9	3.0	7.1	9.7	4.1	13.2	11.3	5.2	11.7		
NLU18-GE-S1	0.5	1.9	2.8	3.0	3.7	6.8	12.0	14.4	14.4	15.4	9.0	6.7	9.4		
NLU18-GE-S2	0.0	0.4	0.9	1.7	2.2	3.7	6.4	15.3	18.7	22.2	11.6	8.0	9.0		
NLU18-GE-S3A	1.4	3.9	10.4	18.1	11.8	6.4	5.8	9.0	8.6	9.0	5.6	4.0	5.9		
NLU18-GE-S3B	2.0	3.6	11.1	17.6	11.3	6.3	6.5	8.2	8.7	9.2	5.4	4.1	6.1		
NLU18-GE-S3C	5.0	4.0	10.3	18.3	11.5	5.9	3.7	8.5	9.8	8.4	5.0	3.8	5.7		
NLU18-GE-S4	9.8	10.3	18.1	26.8	14.8	6.0	4.4	2.3	2.0	1.5	1.3	1.0	1.7		
NLU19-GE-S1	2.9	5.3	5.5	5.1	6.0	8.9	10.8	12.9	12.2	11.1	7.6	4.8	7.0		
NLU19-GE-S2	0.0	0.5	0.7	1.1	1.7	3.1	8.3	14.6	17.2	16.4	13.8	8.9	13.6		
NLU19-GE-S3	0.2	5.3	5.0	3.3	3.0	4.6	7.2	10.7	13.0	14.2	11.4	8.5	13.6		
NLU19-GE-S4	0.1	1.1	2.8	10.0	8.4	14.1	9.5	12.8	10.9	10.4	7.2	5.1	7.6		

**Notes:**

1) These samples were analyzed using a modified PSEP method.

**Rosa Environmental & Geotechnical Laboratory, LLC**

1001 SW Klickitat Way, Suite 107

Seattle, WA 98134

206.287.9122 P

206.264.1995 F

November 25, 2002

Ms. Kristin Cunningham  
The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134

**Subject: Lake Union Sediments, REGL Project No. 1003-650**

Dear Ms. Cunningham;

Testing on the samples from the referenced project is complete. The results of the analyses are reported on the following pages. Data tables, plots and a narrative are provided.

Please call me to discuss any questions, or comments you may have on the data or its presentation. Thank you for selecting REG Lab to perform this analysis for you.

Best Regards,  
Rosa Environmental & Geotechnical Laboratory, LLC.



Harold Benny  
Laboratory Manager

## Rosa Environmental & Geotechnical Laboratory, LLC

1001 SW Klickitat Way, Suite 107

Seattle, WA 98134

206.287.9122 P

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Client: The RETEC Group, Inc.

REGL Project No.: 1003-650

Client Project: Lake Union Sediments

### Case Narrative

1. Samples were received on October 21 and 22, 2002 and were in good condition. The samples were submitted for grain size analysis. Due to the nature of the samples, discussions were held with Ms. Anne Fitzpatrick regarding the best method to use. Because the samples were very organic with suspected low specific gravity, below ASTM guidelines, the PSEP method was chosen.
2. The samples were run in two batches. One batch was prepared from the gravely and sandy sediments and these were run on the sieves only. The other batch was more normal and was run on the full PSEP method.
3. Sample NLU 14-US-S2 had a QA ratio of 111.7. A QA ratio of 1.00 indicates that the dry sample weight calculated from the moisture content and the after test weight of solids are the same. Rosa uses an internal standard of 0.95 to 1.05 for the acceptable range of this number. When the sample QA ratio exceeds these limits, the grain size distribution data is recalculated and reported using the after dry weight.
4. There were no other apparent anomalies in the samples or method of testing.

Approved by:

Title:

  
Laboratory Manager

Date:

11/25/02



# Chain of Custody Record

To: Rosa

1003-649

subsurface sediment  
cores

N 100219

The Retec Group  
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www.retec.com



Phase 2

Project Name: North Lake Union Project Number: GJRW1-04403-961  
 Send Report To: K. Cunningham Sampler (Print Name): K. Cunningham  
 Address: \_\_\_\_\_ Sampler (Print Name): K. Faccina  
 \_\_\_\_\_ Shipment Method: Hand-delivered  
 \_\_\_\_\_ Airbill Number: \_\_\_\_\_  
 Phone: see above Laboratory Receiving: ROSA  
 Fax: \_\_\_\_\_

Purchase Order #: Rosa-01

Analysis Requested  
 Atterberg Limits  
 UV Transmittance  
 Consolidation  
 Specific Gravity  
 Grain Size Abtm  
 Moisture Content  
 Archimede - in jars

Field Sample ID	To Report	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analysis Requested						Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)		
NLV09-GE-A1	S1	10/19/02	0946	Sediment	1	X	X	X	X	X	X	X	X	Depth = 0-1'	21172
	A2   S2		0948		1	X	X	X	X	X	X	X	X	1-2'	21173
	A3   S3		0950		1	X	X	X	X	X	X	X	X	2-3'	21174
	A4   S4		0952		1	X	X	X	X	X	X	X	X	3-4'	21175
NLV09-GE-B1	S5		0954		1								X	4-5'	
	B2   S6		0956		1								X	5-6'	
	B3   S7		0958		1								X	6-7'	
	B4   S8		0959		1								X	7-8'	
NLV19-GE-A1	S1	10/18/02	0846	Sediment	1	X	X	X	X	X	X	X	X	0-1' <del>8-9'</del>	21176
	A2   S2		0848		1	X	X	X	X	X	X	X	X	1-2' <del>9-10'</del>	21177
	A3   S3		0850		1	X	X	X	X	X	X	X	X	2-3' <del>10-11'</del>	21178
	A4   S4		0852		1	X	X	X	X	X	X	X	X	3-4' <del>11-12'</del>	21179
	B1   S5		0854		1								X	4-5' <del>12-13'</del>	
	B2   S6		0856		1								X	5-6'	
	B3   S7		0858		1								X	6-7'	
	B4   S8		0859		1								X	7-8'	

To report  
 Labeled in field

\* Note any debris type + depth.

Relinquished by: (Signature) <u>[Signature]</u> 10/21/02 1308	Received by: (Signature) <u>[Signature]</u> 10/21/02 1308	Date: _____	Time: _____	Sample Custodian Remarks (Completed By Laboratory):		
Relinquished by: (Signature) <u>[Signature]</u> 10/21/02 1420	Received by: (Signature) <u>[Signature]</u> 10/21/02	Date: _____	Time: <u>M20</u>	QA/QC Level	Turnaround	Sample Receipt
Relinquished by: (Signature) _____	Received by: (Signature) _____	Date: _____	Time: _____	Level I <input type="checkbox"/>	Routine <input checked="" type="checkbox"/>	Total # Containers Received?
				Level II <input checked="" type="checkbox"/>	24 Hour <input type="checkbox"/>	COC Seals Present?
				Level III <input type="checkbox"/>	1 Week <input type="checkbox"/>	COC Seals Intact?
				Other LI	Other _____	Received Containers Intact?
						Temperature?



# Chain of Custody Record

No 100223

The Retec Group  
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 www.retec.com

Subsurface Sediment



Phase 2 - Subsurface

Project Name: <b>North Lake Union</b>	Project Number: <b>GW1-04403-961</b>	Analysis Requested <b>Grain Size - ASTM</b>
Send Report To: <b>K. Cunningham</b>	Sampler (Print Name): <b>K. Cunningham</b>	
Address: <b>see above</b>	Sampler (Print Name): <b>N. Barker</b>	
	Shipment Method: <b>Hand delivered</b>	
Phone:	Airbill Number:	
Fax:	Laboratory Receiving: <b>ROSA</b>	

Page 1 of 1

Purchase Order #: \_\_\_\_\_

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analysis Requested	Lab Sample ID (to be completed by lab)	Comments, Special Instructions, etc.
NLV06-US-S1	10/21/02	1055	Sediment	1	X	21184	TEST per WD + SAMP/QUICK
NLV06-US-S2	}	1105	}	1	X	21185	
NLV06-US-S3		1110		1	X	21186	
NLV06-US-S4		1130		1	X	21187	
NLV07-US-S1a		1400		1	X	21188	
NLV07-US-S1b		1405		1	X	21189	
NLV07-US-S3	1415	1	X	21190			
NLV14-US-S1	10/22/02	1000	✓	1	X	21191	
NLV14-US-S2	10/22/02	1010	✓	1	X	21192	
Total				(9)			

Relinquished by: (Signature)	Received by: (Signature)	Date: 10/22/02	Time: 1230	Sample Custodian Remarks (Completed By Laboratory):
Relinquished by: (Signature)	Received by: (Signature)	Date: 10/22/02	Time: 1340	
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:	

QA/QC Level	Turnaround	Sample Receipt
Level I <input type="checkbox"/>	Routine <input checked="" type="checkbox"/>	Total # Containers Received?
Level II <input checked="" type="checkbox"/>	24 Hour <input type="checkbox"/>	COC Seals Present?
Level III <input type="checkbox"/>	1 Week <input type="checkbox"/>	COC Seals Intact?
Other <input type="checkbox"/>	Other _____	Received Containers Intact?
		Temperature?

# Chain of Custody Record

10: KOSA

1003-650

Sediment Cores

N: 100225

The Retec Group  
1011 S.W. Klickitat Way, Suite 207 • Seattle, WA 98134-1162  
(206) 624-9349 Phone • (206) 624-2839 Fax  
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Project Name: <b>NLU Phase 2</b>	Project Number: <b>GJRWI-4403-961</b>
Send Report To: <b>K. Cunningham</b>	Sampler (Print Name): <b>A. Fitzpatrick</b>
Address: <b>RETEC - Seattle</b>	Sampler (Print Name): <b>N. Bachler</b>
	Shipment Method: <b>hand-deliver</b>
	Airbill Number: _____
Phone: <b>206-624-9349</b>	Laboratory Receiving: <b>Rosa</b>
Fax: _____	

Page 2 of 2

Analysis Requested  
Grain Size ASTM  
Archive

Purchase Order #: \_\_\_\_\_

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analysis Requested										Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)		
NLU12-US-51	10/17/02	0830	sediment	1	X												1/2 Full	21167
-52		0840		1	X													21168
-53		0850		1					X									
-54		<del>0910</del> 0920		1					X									
-55		0910		1					X									
NLU16-US-51	10/17/02	1550		1	X												1/2 Full	21169
-52		1601		1	X												"	21170
-53		1607		1	X												"	21171
-54		1612		1					X									
-55		1620		1					X									
Total = 10																		

Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Date: 10/21/02	Time: 1420	Sample Custodian Remarks (Completed By Laboratory):			
Relinquished by: (Signature) <i>Anne Fitzpatrick</i>	Received by: (Signature) <i>Harold Berg</i>	Date: 10/21/02	Time: 1420	QA/QC Level	Turnaround	Sample Receipt	
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:	Level I <input type="checkbox"/>	Routine ( )	Total # Containers Received?	
				Level II <input type="checkbox"/>	24 Hour ( )	COC Seals Present?	
				Level III <input type="checkbox"/>	1 Week ( )	COC Seals Intact?	
				Other ( )	Other _____	Received Containers Intact?	
						Temperature?	

# Chain. of Custody Record

To: Kosa 1005-650

NO 100253

The Retec Group  
1011 S.W. Klickitat Way, Suite 207 • Seattle, WA 98134-1162  
(206) 624-9349 Phone • (206) 624-2839 Fax  
www.retec.com

Sediment ~~Notes~~



Project Name: <b>NLU Phase 2</b>	Project Number: <b>GJRW1-4403-961</b>
Send Report To: <b>Kristin Cunningham</b>	Sampler (Print Name): <b>Anne Fitzpatrick</b>
Address: <b>see above</b>	Sampler (Print Name): <b>Mik Bachler</b>
	Shipment Method: <b>hand-deliver</b>
	Airbill Number: <b>-</b>
Phone: <b>206-624-9349</b>	Laboratory Receiving: <b>Rosa</b>
Fax:	

Analysis Requested  
Grain Size & ASTM  
Archive

Purchase Order #: \_\_\_\_\_

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Analysis Requested										Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)		
NLU04-US-S1B	10/19/02	1535	Sediment	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1-16 oz jar	21153
-S2	1540	1540		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		21154	
-S3		1545		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Archive only per Linda Mortensen 10/22/02	21155	
NLU10-US-S1B		1305		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		21156	
-S2		1310		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		21157	
-S3		1315		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		21158	
NLU03-US-S1B		0945		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		21159	
NLU03-US-S2		0950		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		21160	
-S3		0955		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		21161	
NLU08-US-S2	10/18/02	1525		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1/2 Full	21162	
NLU08-US-S3		1530		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1/2 Full	21163	
NLU08-US-S1B		1520		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1/2 Full	21164	
NLU11-US-S5A		1235		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		21165	
-S5B		1240		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		21166	
NLU08-US-S4		1535		1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		21167 ce 21168 ce	
				Total = 15														

Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Date: 10/21/02	Time: 1420	Sample Custodian Remarks (Completed By Laboratory):			
Relinquished by: (Signature) Anne Fitzpatrick	Received by: (Signature) <i>[Signature]</i>	Date: 10/21/02	Time: 1420	QA/QC Level	Turnaround	Sample Receipt	
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:	Level I <input type="checkbox"/>	Routine <input type="checkbox"/>	Total # Containers Received?	
				Level II <input type="checkbox"/>	24 Hour <input type="checkbox"/>	COC Seals Present?	
				Level III <input type="checkbox"/>	1 Week <input type="checkbox"/>	COC Seals Intact?	
				Other <input type="checkbox"/>	Other _____	Received Containers Intact?	
						Temperature?	

# GRAIN SIZE DISTRIBUTIONS

PSEP

SET 1

QA SUMMARY

PROJECT:	The Retec Group	Project No.:	Lake Union Sediment
REGL Triplicate Sample ID:	21157A	Batch No.:	1003-649/650 -01
Client Triplicate Sample ID:	NLU10-US-S3	Page:	1 of 1

Relative Standard Deviation, By Phi Size

Sample ID	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
LU10-US-S3	100.0	100.0	100.0	99.1	96.3	87.9	81.8	71.5	67.2	52.7	42.4	28.9	16.3	9.0
LU10-US-S3	100.0	100.0	99.9	98.8	88.1	82.7	78.6	71.3	67.9	52.8	46.2	32.1	18.2	10.6
LU10-US-S3	100.0	100.0	100.0	99.0	90.7	85.7	82.2	76.5	66.4	52.7	43.3	33.8	19.4	11.9
AVE	NA	100.00	99.97	98.99	91.68	85.44	80.89	73.14	67.15	52.72	43.97	31.58	17.98	10.52
STDEV	NA	0.00	0.04	0.19	4.19	2.57	1.99	2.95	0.75	0.08	1.96	2.48	1.55	1.46
%RSD	NA	0.00	0.04	0.19	4.57	3.01	2.46	4.03	1.11	0.14	4.46	7.84	8.64	13.88

The Triplicate Applies To The Following Samples

REGL ID	Client ID	Date Sampled	Date Extracted	Date Complete	QA*
21157A	NLU10-US-S3A	10/19/02	10/25/02	11/4/02	100.2
21157B	NLU10-US-S3B	10/19/02	10/25/02	11/4/02	102.0
21157C	NLU10-US-S3C	10/19/02	10/25/02	11/4/02	100.7
21156	NLU10-US-S1B	10/19/02	10/25/02	11/4/02	99.1
21158	NLU10-US-S2	10/19/02	10/25/02	11/4/02	100.0
21159	NLU03-US-S1B	10/19/02	10/25/02	11/4/02	100.2
21162	NLU08-US-S2	10/18/02	10/25/02	11/4/02	103.2
21163	NLU08-US-S3	10/18/02	10/25/02	11/4/02	97.6
21164	NLU08-US-S1-B	10/18/02	10/25/02	11/4/02	102.5
21167	NLU12-US-S1	10/18/02	10/25/02	11/4/02	100.4
21168	NLU12-US-S2	10/18/02	10/25/02	11/4/02	97.7
21169	NLU16-US-S1	10/17/02	10/25/02	11/4/02	101.7
21170	NLU16-US-S2	10/17/02	10/25/02	11/4/02	101.9
21171	NLU16-US-S3	10/17/02	10/25/02	11/4/02	98.5
21184	NLU06-US-S1	10/21/02	10/25/02	11/4/02	101.4
21185	NLU06-US-S2	10/21/02	10/25/02	11/4/02	100.4
21188	NLU07-US-S1a	10/21/02	10/25/02	11/4/02	100.7
21189	NLU07-US-S1b	10/21/02	10/25/02	11/4/02	102.5
21191	NLU14-US-S1	10/22/02	10/25/02	11/4/02	111.7
21192	NLU14-US-S2	10/22/02	10/25/02	11/4/02	99.5

\* REGL Internal QA limits = 95-105%

Notes to the Testing:

1. Sample NLU14-US-S1 has a QA ratio above 1.05. The data has been recalculated using the "after" moisture content.
2. See narrative for discussion of testing.



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Apparent Grain Size Distribution Summary  
Percent Finer Than Indicated Size

Sample No.	Gravel			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt				Clay	
	-3	-2	-1						0	1	2	3	4	5
Phi Size	3/8"	#4	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (62)	31.00	15.60	7.80	3.90	2.00	1.00
NLU10-US-S3A	100.0	100.0	100.0	99.1	96.3	87.9	81.8	71.5	67.2	52.7	42.4	28.9	16.3	9.0
NLU10-US-S3B	100.0	100.0	99.9	98.8	88.1	82.7	78.6	71.3	67.9	52.8	46.2	32.1	18.2	10.6
NLU10-US-S3C	100.0	100.0	100.0	99.0	90.7	85.7	82.2	76.5	66.4	52.7	43.3	33.8	19.4	11.9
NLU10-US-S1B	100.0	98.7	88.1	82.1	78.9	76.5	74.4	71.8	64.1	53.2	41.7	28.1	17.5	10.3
NLU10-US-S2	100.0	100.0	94.7	91.3	89.9	89.0	88.4	87.5	80.9	73.1	62.1	44.9	29.5	18.3
NLU03-US-S1B	100.0	99.1	93.6	87.8	85.0	84.3	80.6	76.5	64.6	47.5	26.0	13.6	8.5	5.4
NLU08-US-S2	100.0	100.0	99.8	95.8	95.0	94.2	93.3	92.3	86.2	77.1	66.2	50.0	32.6	20.9
NLU08-US-S3	100.0	100.0	77.8	63.3	57.8	54.1	50.4	45.4	42.6	34.3	27.8	20.8	13.4	12.8
NLU08-US-S1-B	100.0	100.0	98.3	94.2	90.8	87.3	83.5	80.0	71.3	57.6	42.7	30.2	18.5	10.8
NLU12-US-S1	100.0	100.0	98.6	95.6	93.7	92.1	90.3	87.8	81.2	69.8	56.2	38.3	24.7	15.1
NLU12-US-S2	100.0	100.0	94.9	89.3	87.1	85.8	84.7	83.1	73.3	65.2	52.4	36.8	24.5	15.3
NLU16-US-S1	100.0	100.0	98.2	94.3	91.7	89.6	87.3	83.7	80.7	68.5	52.4	36.1	22.6	17.2
NLU16-US-S2	100.0	100.0	100.0	97.8	97.0	96.4	95.9	94.9	85.1	73.4	59.8	40.6	26.2	16.4
NLU16-US-S3	100.0	100.0	84.5	73.5	69.4	67.3	65.4	62.4	55.3	45.5	41.4	28.2	16.9	11.7
NLU06-US-S1	100.0	100.0	95.2	87.9	84.0	80.5	76.8	72.1	62.3	50.4	38.1	23.6	14.0	8.3
NLU06-US-S2	100.0	100.0	98.1	94.6	89.2	78.3	67.9	60.1	50.5	40.6	30.6	20.8	12.7	7.7
NLU07-US-S1a	100.0	99.2	98.7	94.0	89.4	84.0	76.3	65.6	58.0	43.5	31.8	20.6	12.6	4.7
NLU07-US-S1b	100.0	100.0	99.9	97.8	92.1	87.4	82.5	76.0	67.7	53.2	39.5	26.2	15.7	9.6
NLU14-US-S1	100.0	100.0	99.9	96.1	91.9	89.0	86.7	83.6	80.9	70.2	57.9	40.0	25.0	15.3
NLU14-US-S2	100.0	100.0	99.9	98.2	87.4	81.0	76.0	67.5	61.2	48.3	39.7	25.3	14.1	9.4

Notes to the Testing:

1. Apparent grain size distributions according to PSEP protocols.

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Apparent Grain Size Distribution Summary  
Percent Retained in Each Size Fraction

Sample No.	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay		
Phi Size	> -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	-5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	< 10
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0
NLU10-US-S3A	0.0	0.9	2.9	8.4	6.0	10.3	4.3	14.5	10.2	13.5	12.5	7.3	9.0
NLU10-US-S3B	0.1	1.1	10.7	5.4	4.1	7.3	3.5	15.1	6.6	14.1	13.9	7.6	10.6
NLU10-US-S3C	0.0	1.0	8.4	4.9	3.5	5.7	10.2	13.7	9.4	9.6	14.3	7.5	11.9
NLU10-US-S1B	11.9	6.0	3.2	2.4	2.1	2.6	7.7	11.0	11.5	13.6	10.5	7.2	10.3
NLU10-US-S2	5.3	3.4	1.4	0.9	0.6	0.9	6.7	7.7	11.0	17.3	15.4	11.1	18.3
NLU03-US-S1B	6.4	5.8	2.8	0.8	3.7	4.0	11.9	17.1	21.5	12.4	5.1	3.1	5.4
NLU08-US-S2	0.2	4.0	0.9	0.8	0.8	1.1	6.1	9.0	10.9	16.2	17.4	11.6	20.9
NLU08-US-S3	22.2	14.5	5.5	3.7	3.8	5.0	2.8	8.3	6.5	7.0	7.4	0.6	12.8
NLU08-US-S1-B	1.7	4.2	3.4	3.4	3.8	3.5	8.7	13.7	14.9	12.4	11.7	7.7	10.8
NLU12-US-S1	1.4	3.0	1.9	1.6	1.8	2.5	6.6	11.4	13.6	17.9	13.5	9.7	15.1
NLU12-US-S2	5.1	5.7	2.1	1.3	1.1	1.6	9.8	8.0	12.8	15.6	12.3	9.2	15.3
NLU16-US-S1	1.8	3.9	2.6	2.1	2.4	3.6	3.0	12.2	16.0	16.4	13.5	5.4	17.2
NLU16-US-S2	0.0	2.2	0.8	0.6	0.5	1.0	9.8	11.8	13.6	19.1	14.4	9.8	16.4
NLU16-US-S3	15.5	11.0	4.1	2.1	1.9	3.0	7.1	9.7	4.1	13.2	11.3	5.2	11.7
NLU06-US-S1	4.8	7.3	3.9	3.5	3.7	4.7	9.7	12.0	12.2	14.6	9.6	5.7	8.3
NLU06-US-S2	1.9	3.5	5.4	10.9	10.4	7.8	9.5	9.9	10.0	9.8	8.2	4.9	7.7
NLU07-US-S1a	1.3	4.7	4.6	5.4	7.7	10.8	7.6	14.4	11.7	11.2	8.0	7.9	4.7
NLU07-US-S1b	0.1	2.1	5.7	4.8	4.8	6.6	8.3	14.4	13.8	13.2	10.5	6.1	9.6
NLU14-US-S1	0.1	3.8	4.2	2.9	2.4	3.1	2.7	10.8	12.3	17.8	15.1	9.7	15.3
NLU14-US-S2	0.1	1.8	10.8	6.4	5.0	8.5	6.3	12.9	8.5	14.4	11.2	4.7	9.4

Notes to the Testing:

1. Apparent grain size distributions according to PSEP protocols.

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PSEP Total Solids Analysis  
Percent of Wet Weight

Sample No.	Total Solids (%)
NLU10-US-S3A	10.3
NLU10-US-S3B	10.2
NLU10-US-S3C	10.4
NLU10-US-S1B	19.3
NLU10-US-S2	22.2
NLU03-US-S1B	20.9
NLU08-US-S2	26.0
NLU08-US-S3	11.0
NLU08-US-S1-B	18.7
NLU12-US-S1	20.8
NLU12-US-S2	18.9
NLU16-US-S1	18.7
NLU16-US-S2	31.3
NLU16-US-S3	9.7
NLU06-US-S1	19.5
NLU06-US-S2	29.0
NLU07-US-S1a	18.9
NLU07-US-S1b	17.2
NLU14-US-S1	23.4
NLU14-US-S2	9.8

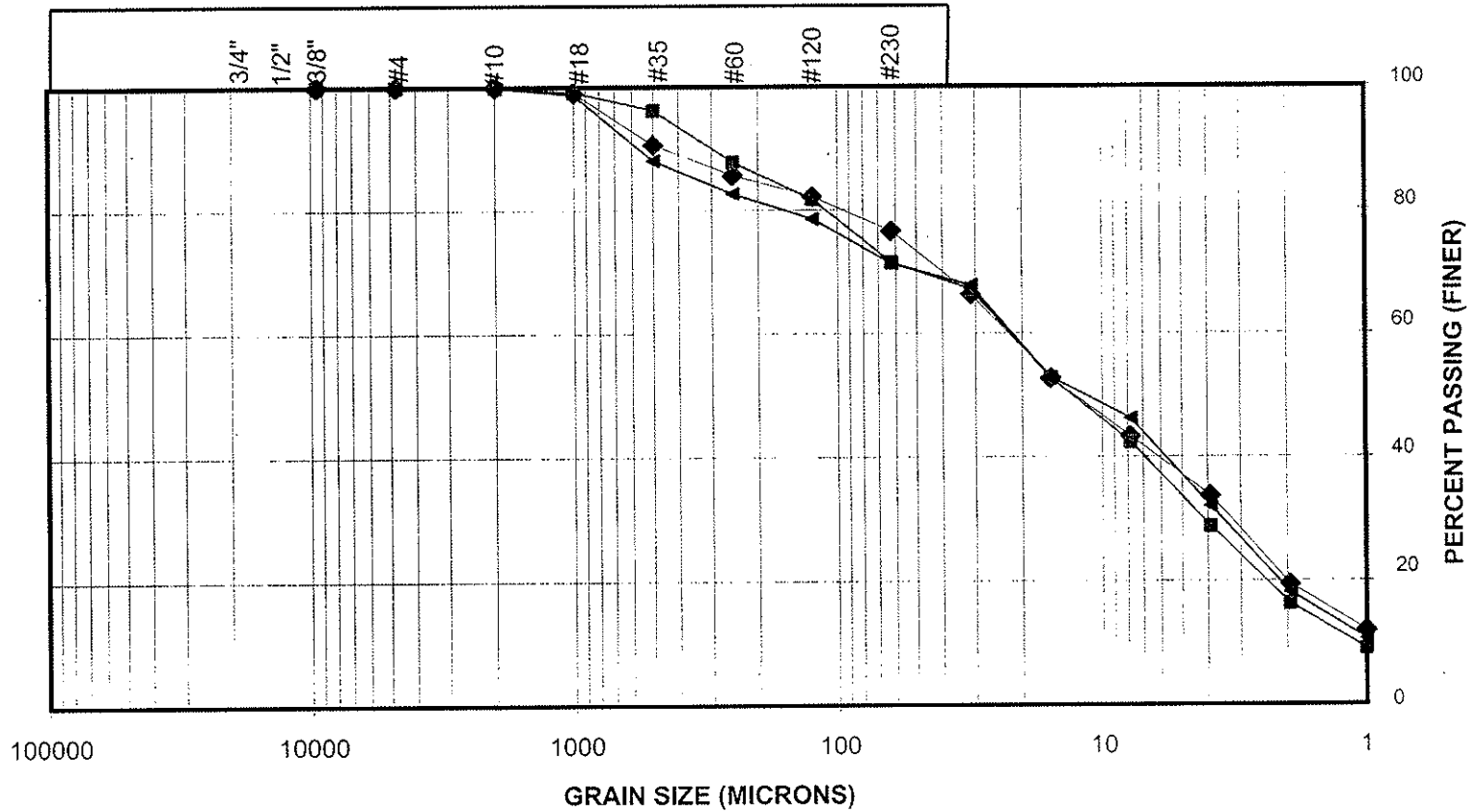
Triplicate Average	10.3
Standard Deviation	0.08
%RSD	0.76

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU10-US-S3 (in triplicate)

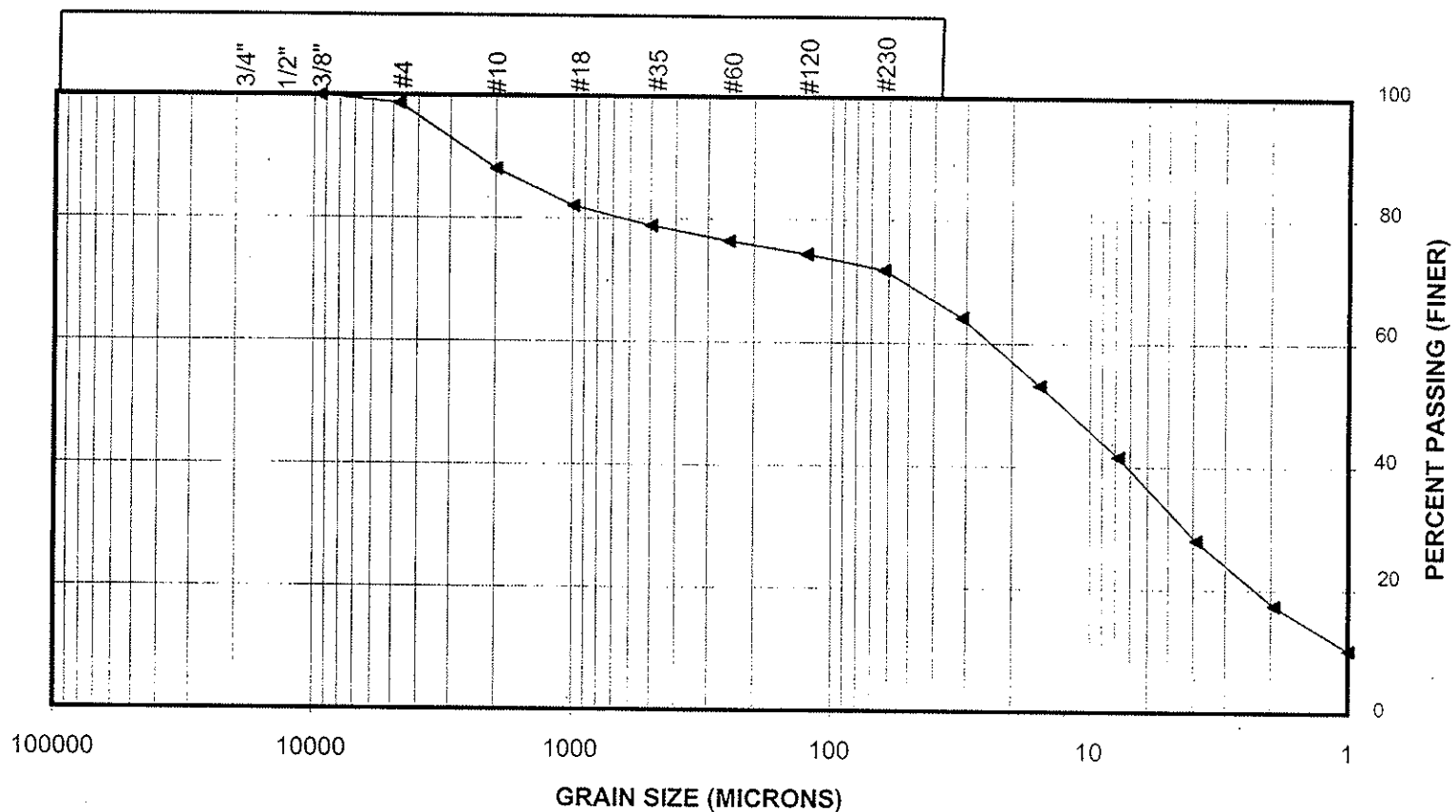


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU10-US-S1B

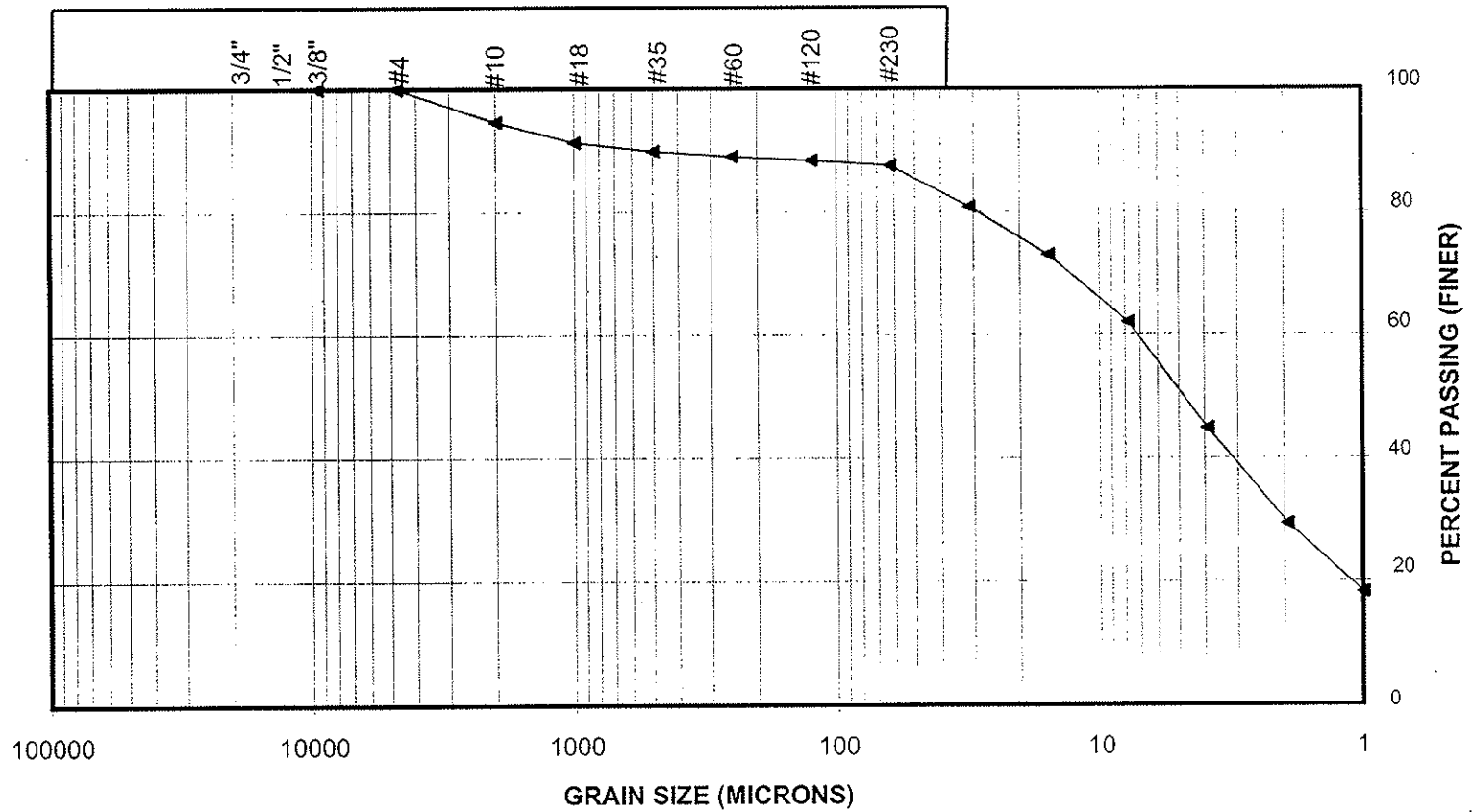


**ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY**

**PSEP APPARENT GRAIN SIZE DISTRIBUTION**

Project No.: Lake Union Sediments

Sample No.: NLU10-US-S2





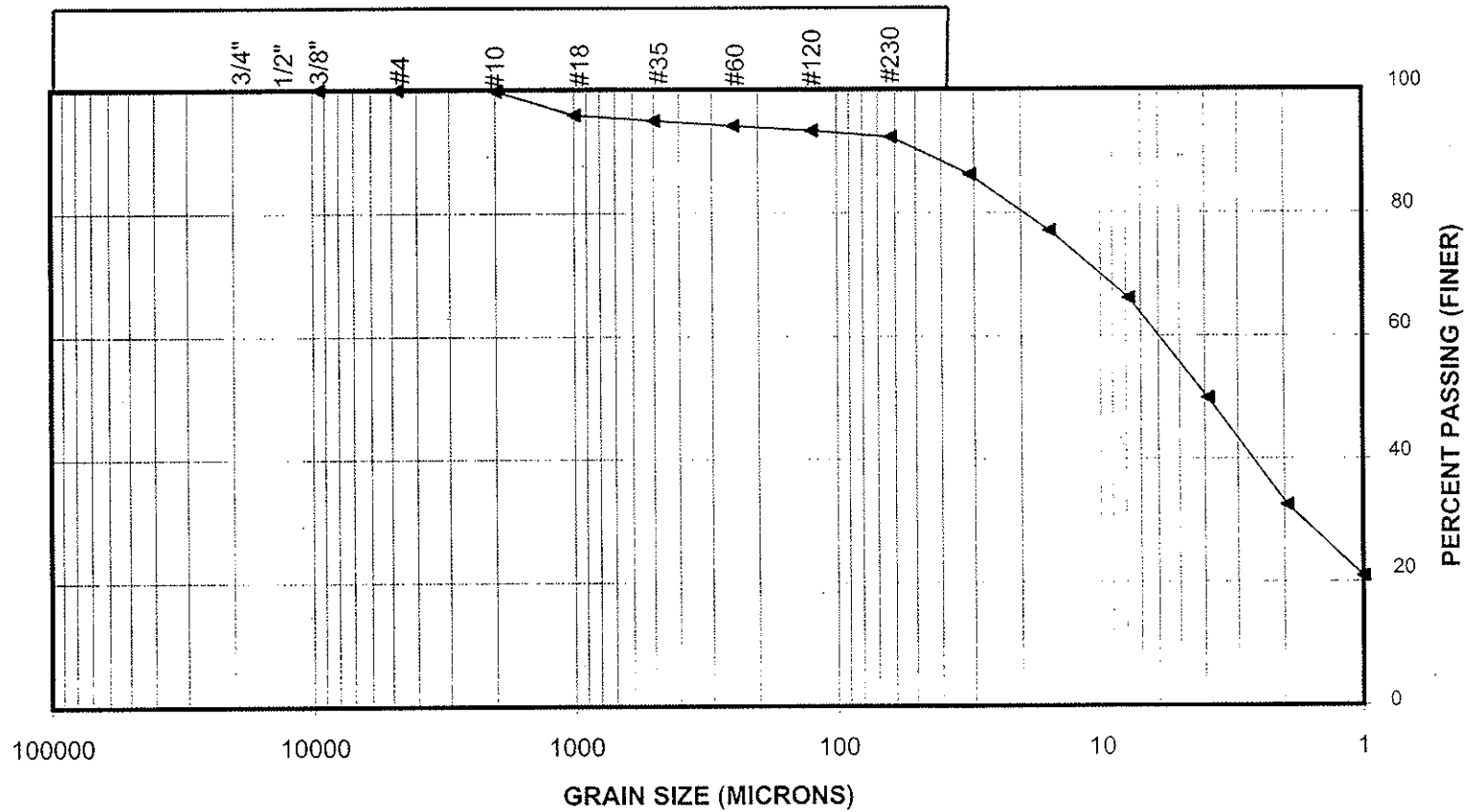


**ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY**

**PSEP APPARENT GRAIN SIZE DISTRIBUTION**

Project No.: Lake Union Sediments

Sample No.: NLU08-US-S2

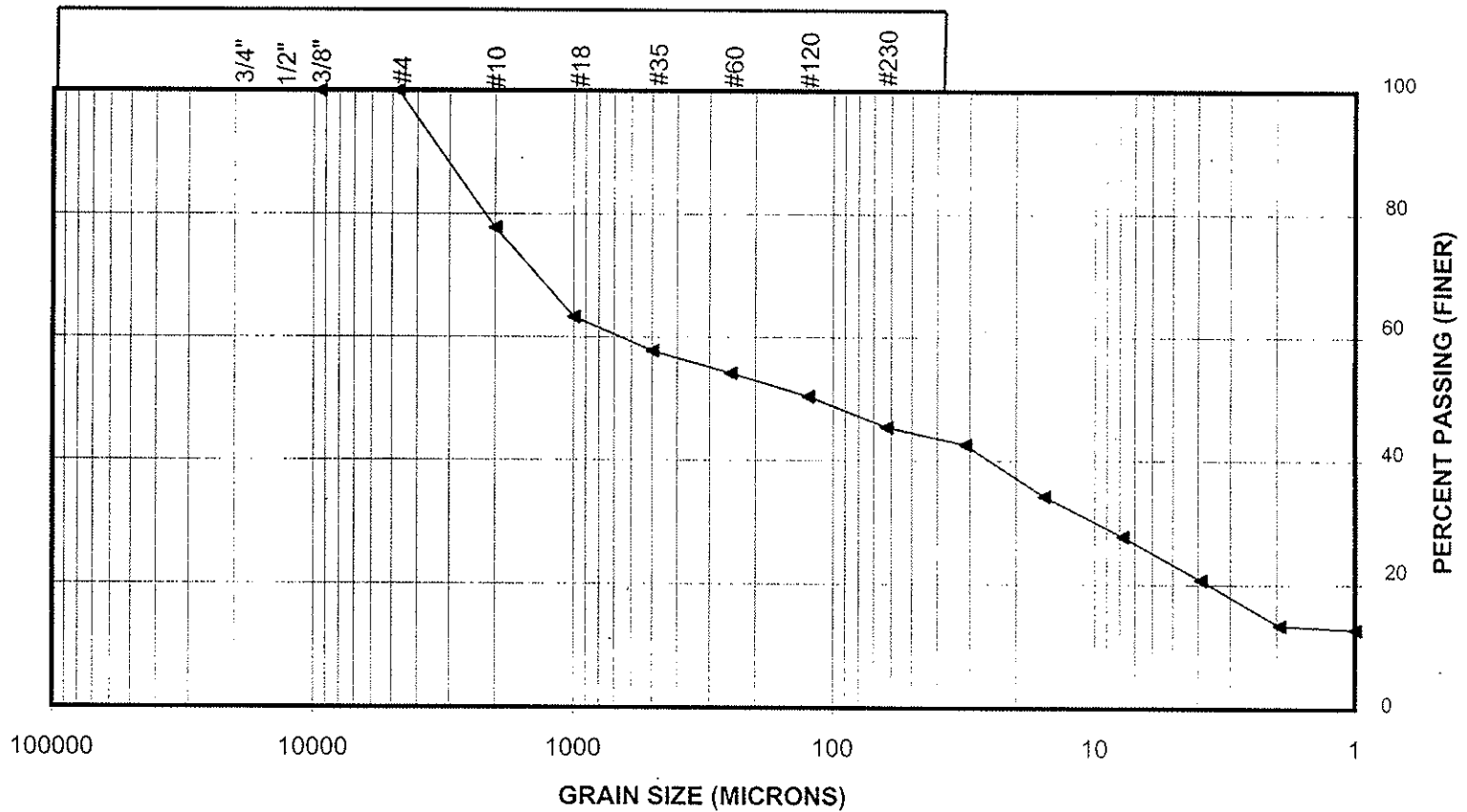


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU08-US-S3

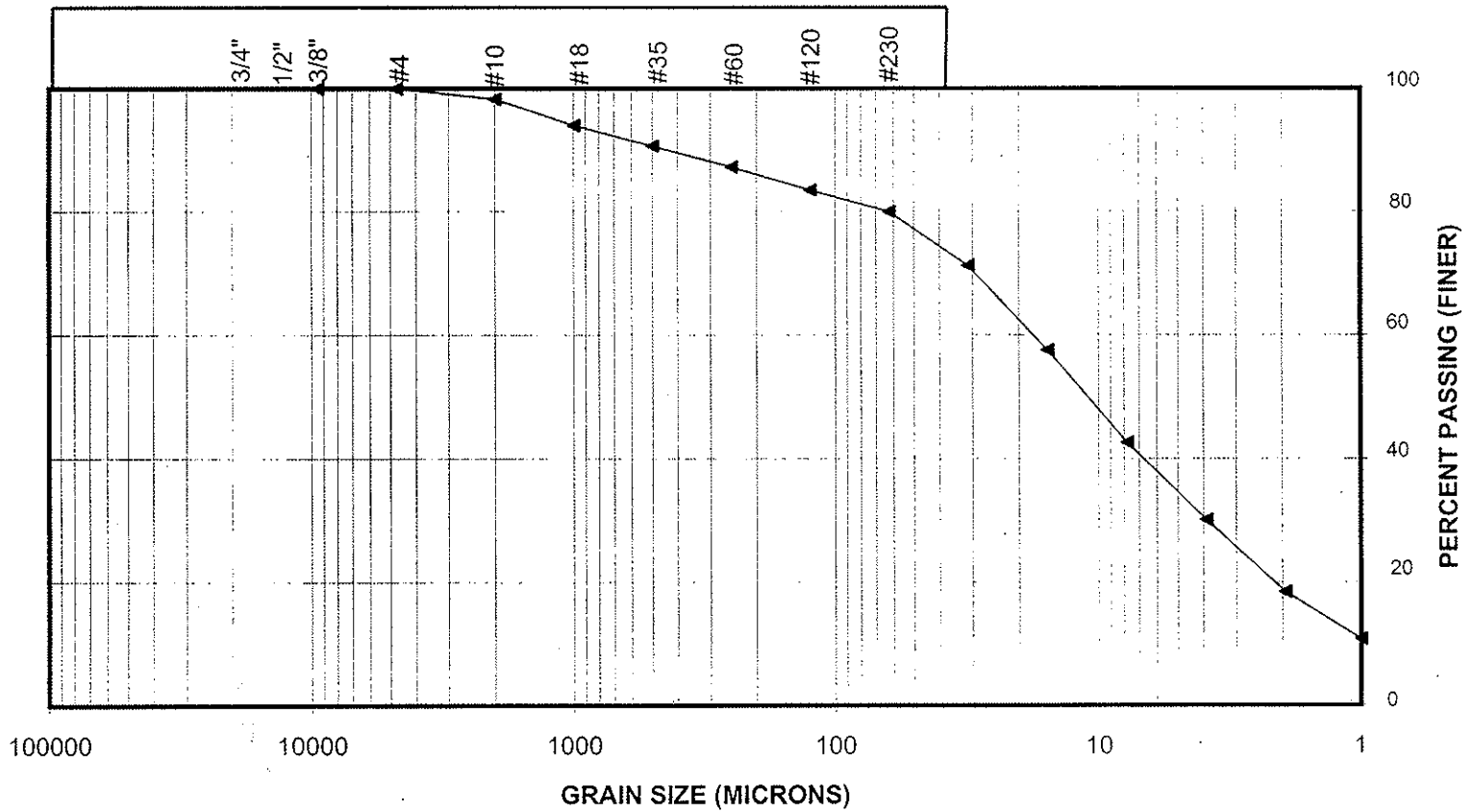


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU08-US-S1-B

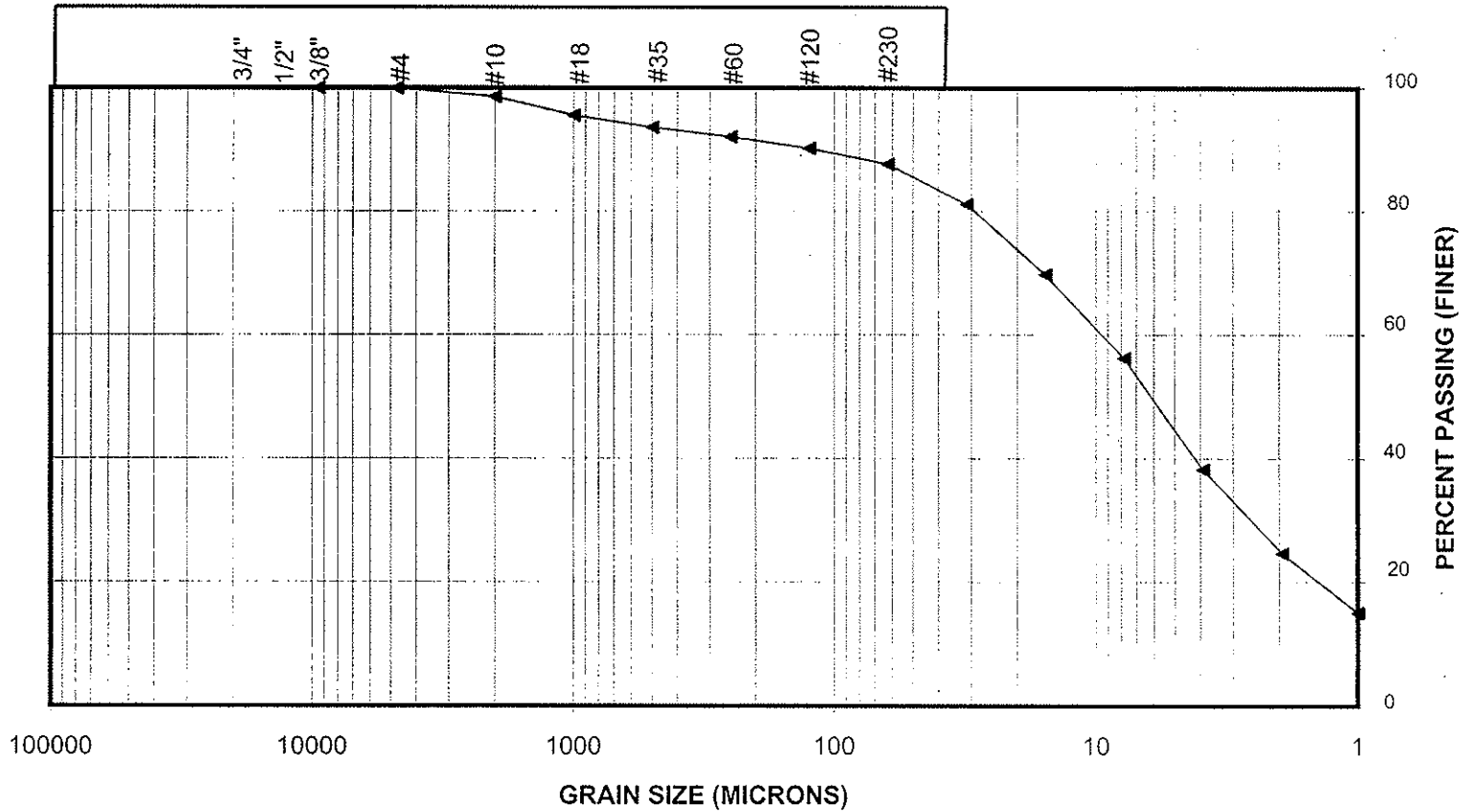


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PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU12-US-S1

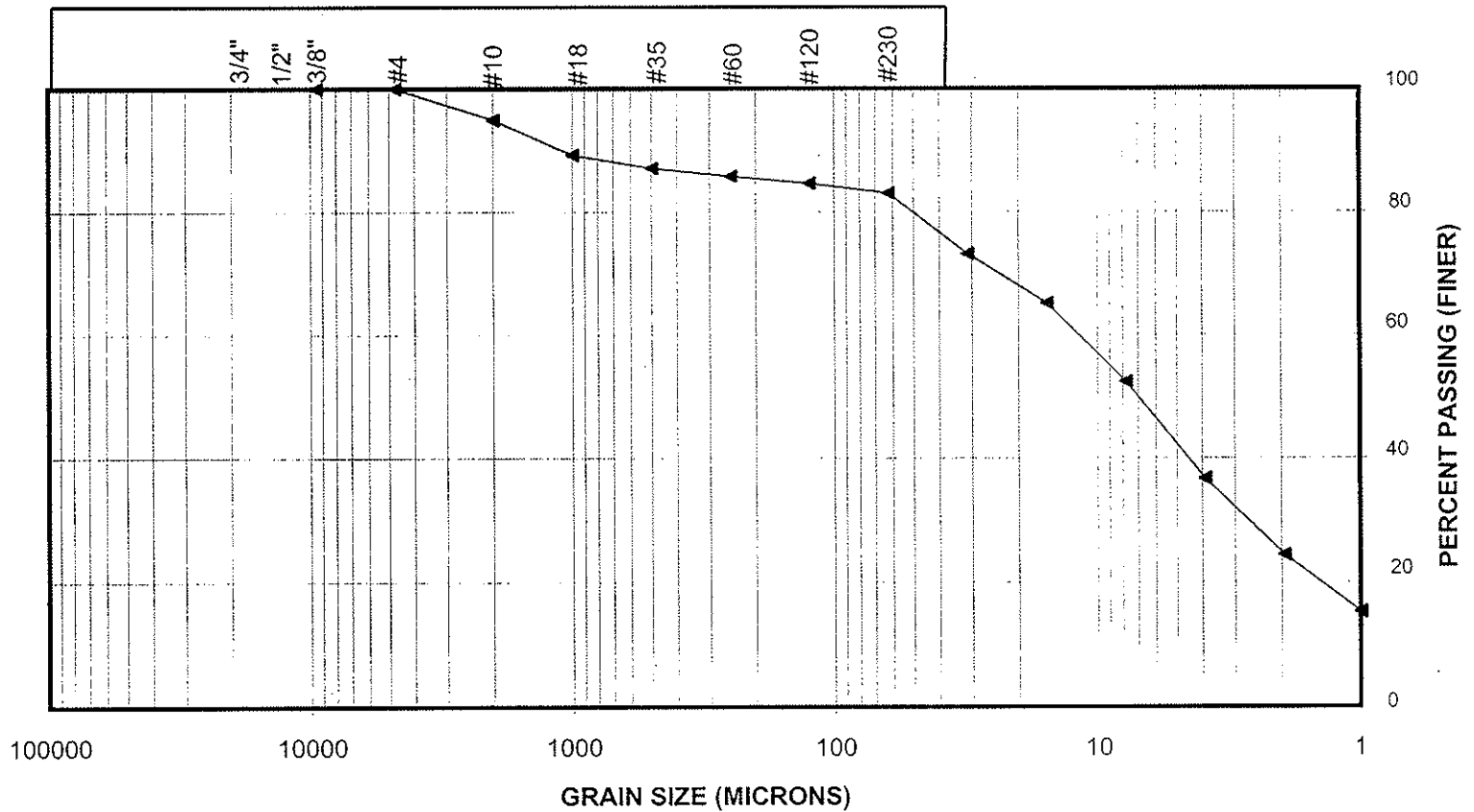


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU12-US-S2

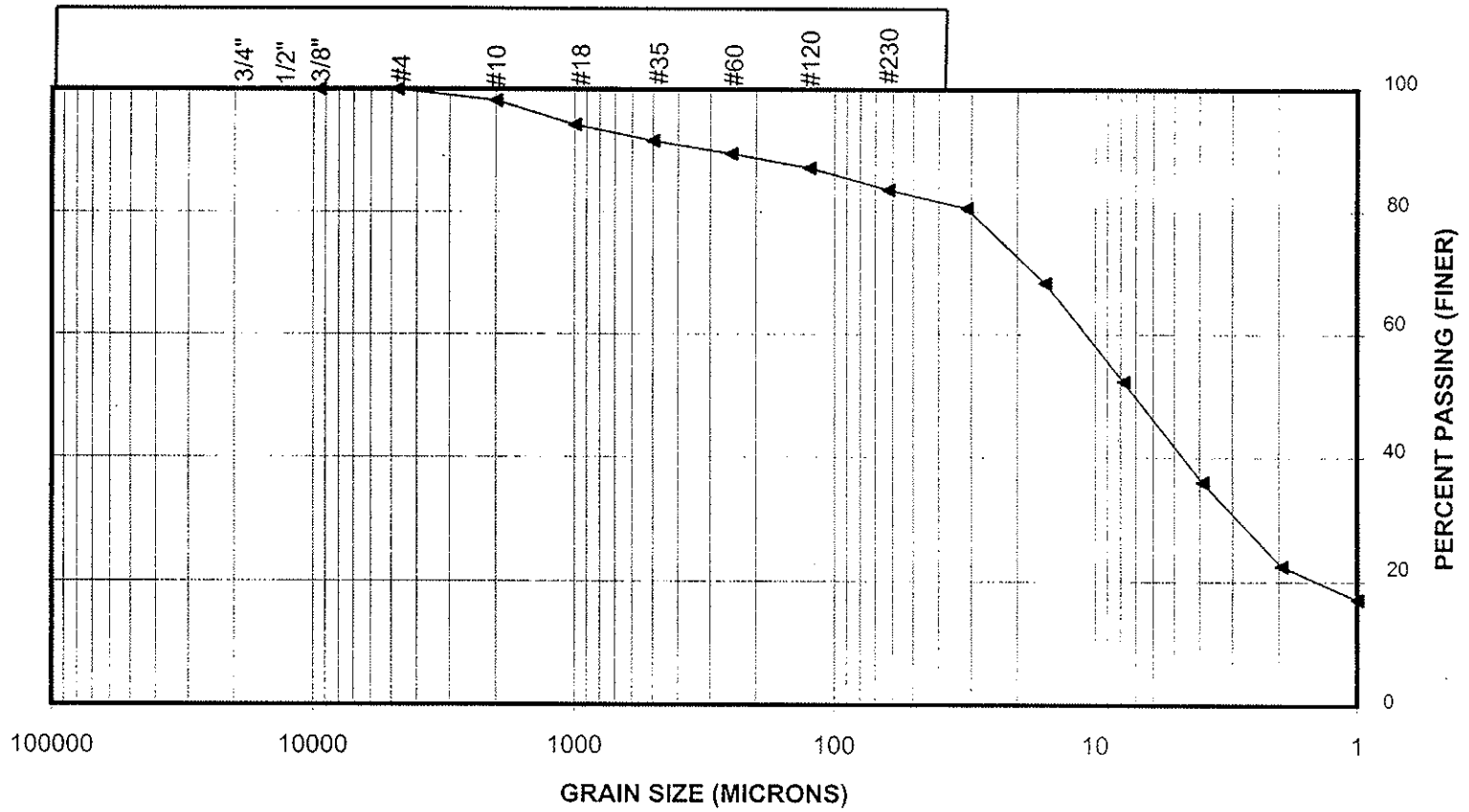


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU16-US-S1

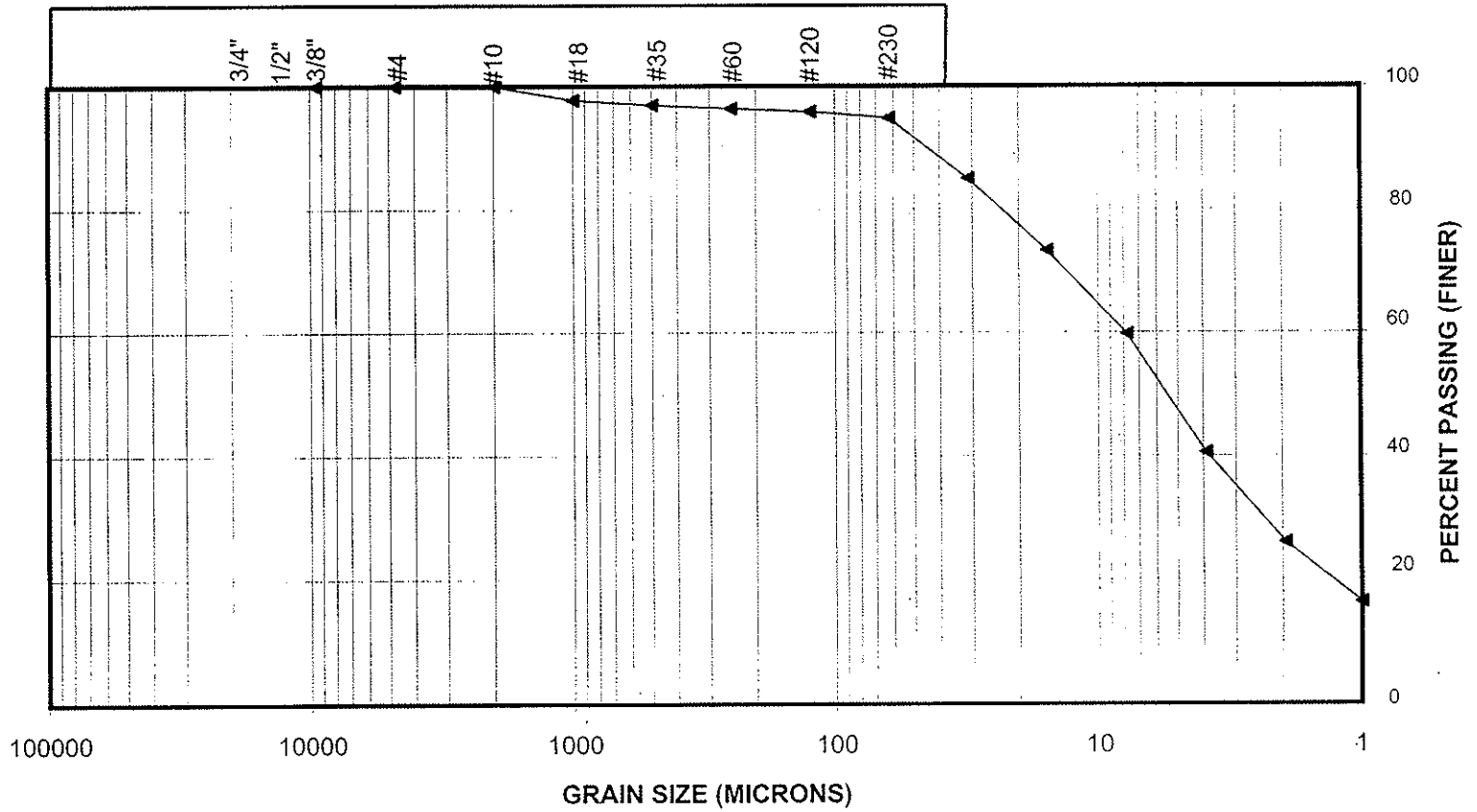


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU16-US-S2



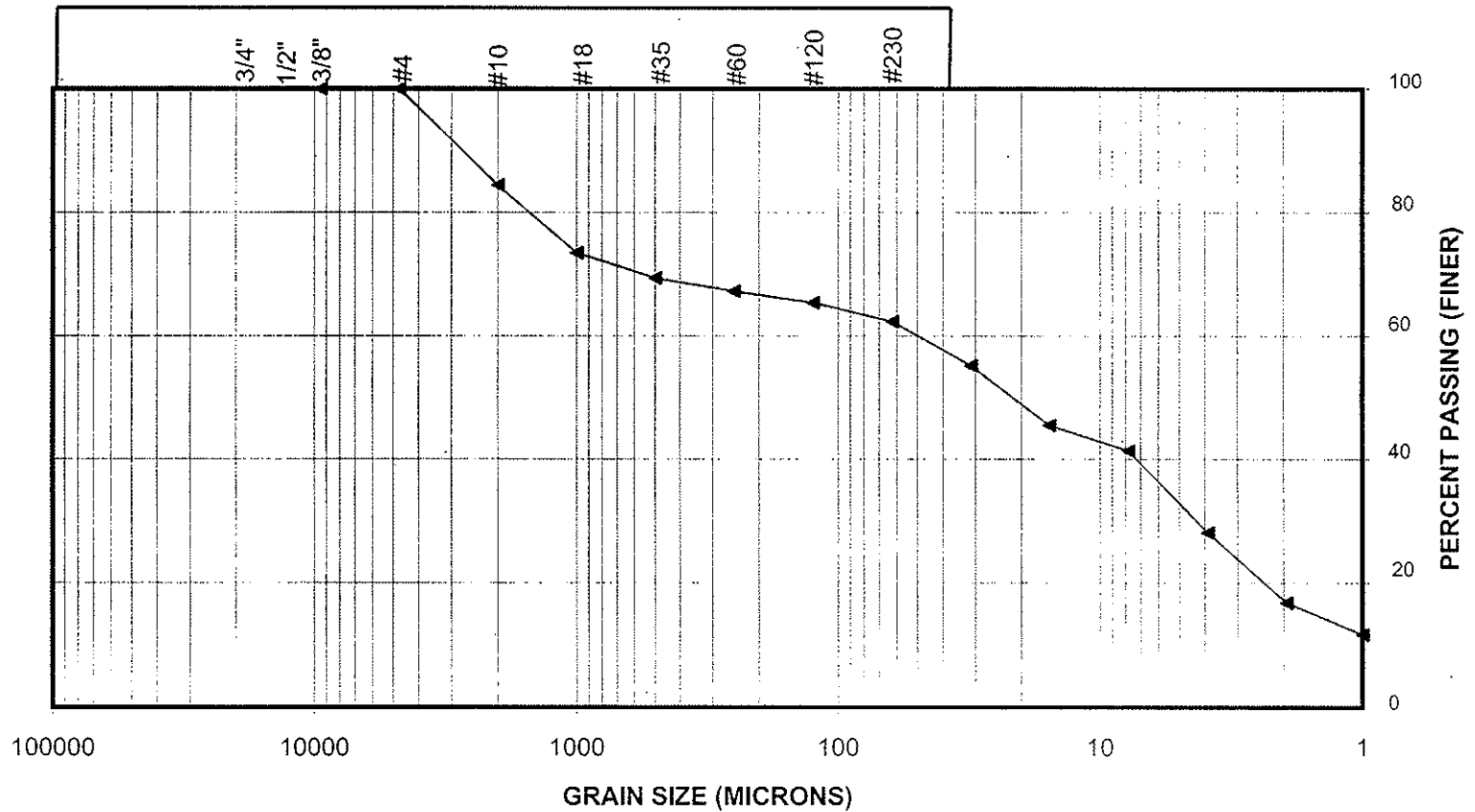


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU16-US-S3

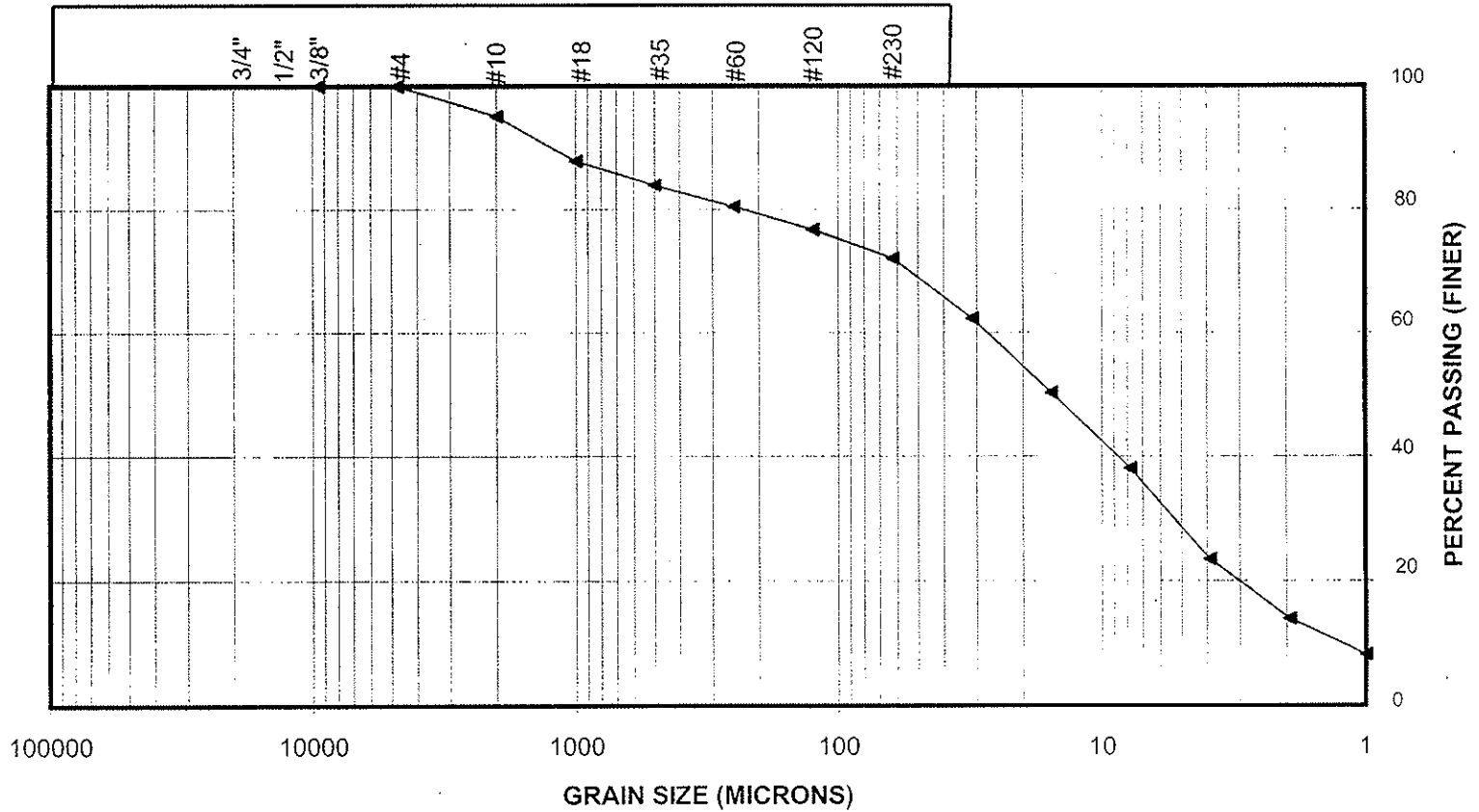


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU06-US-S1

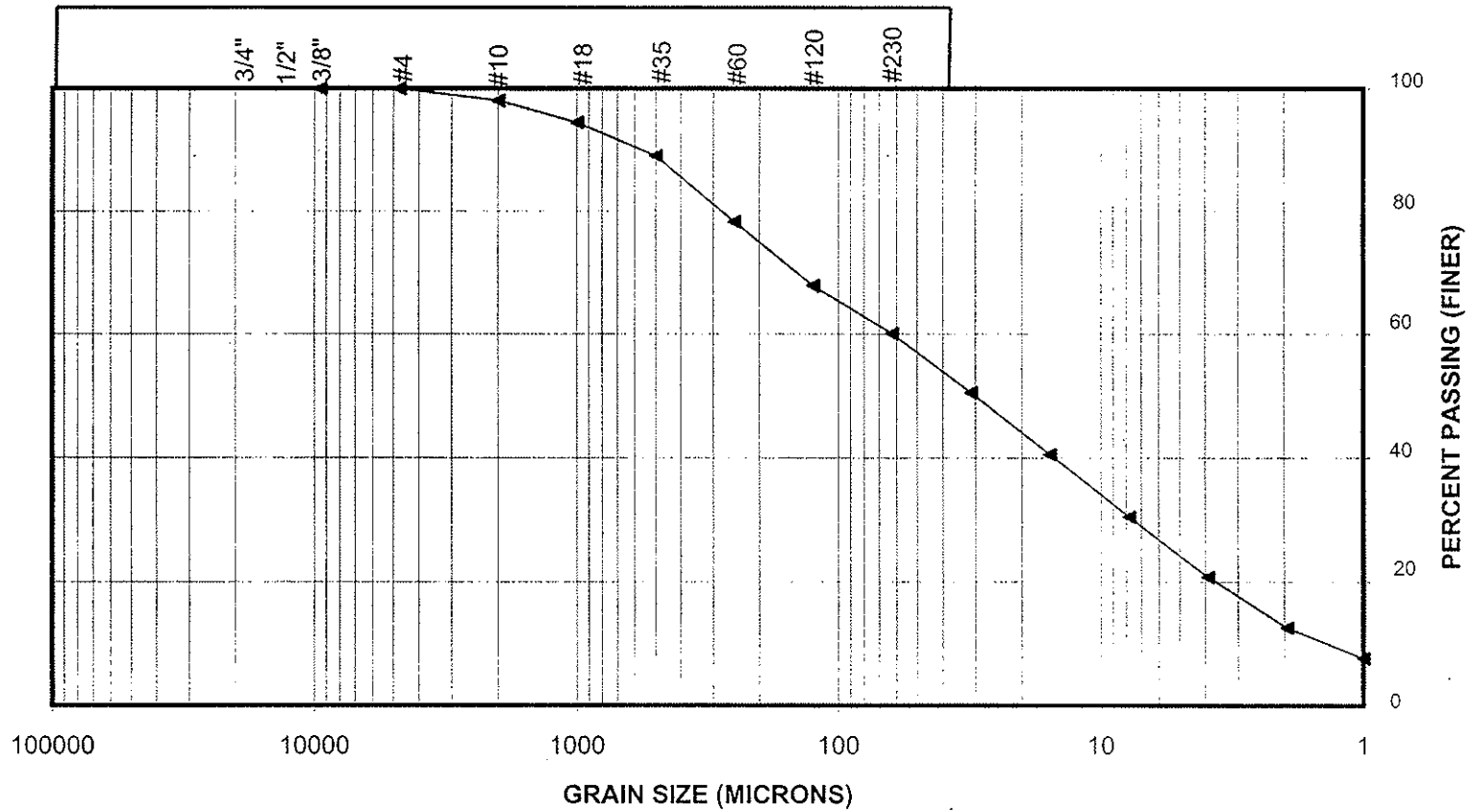


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU06-US-S2

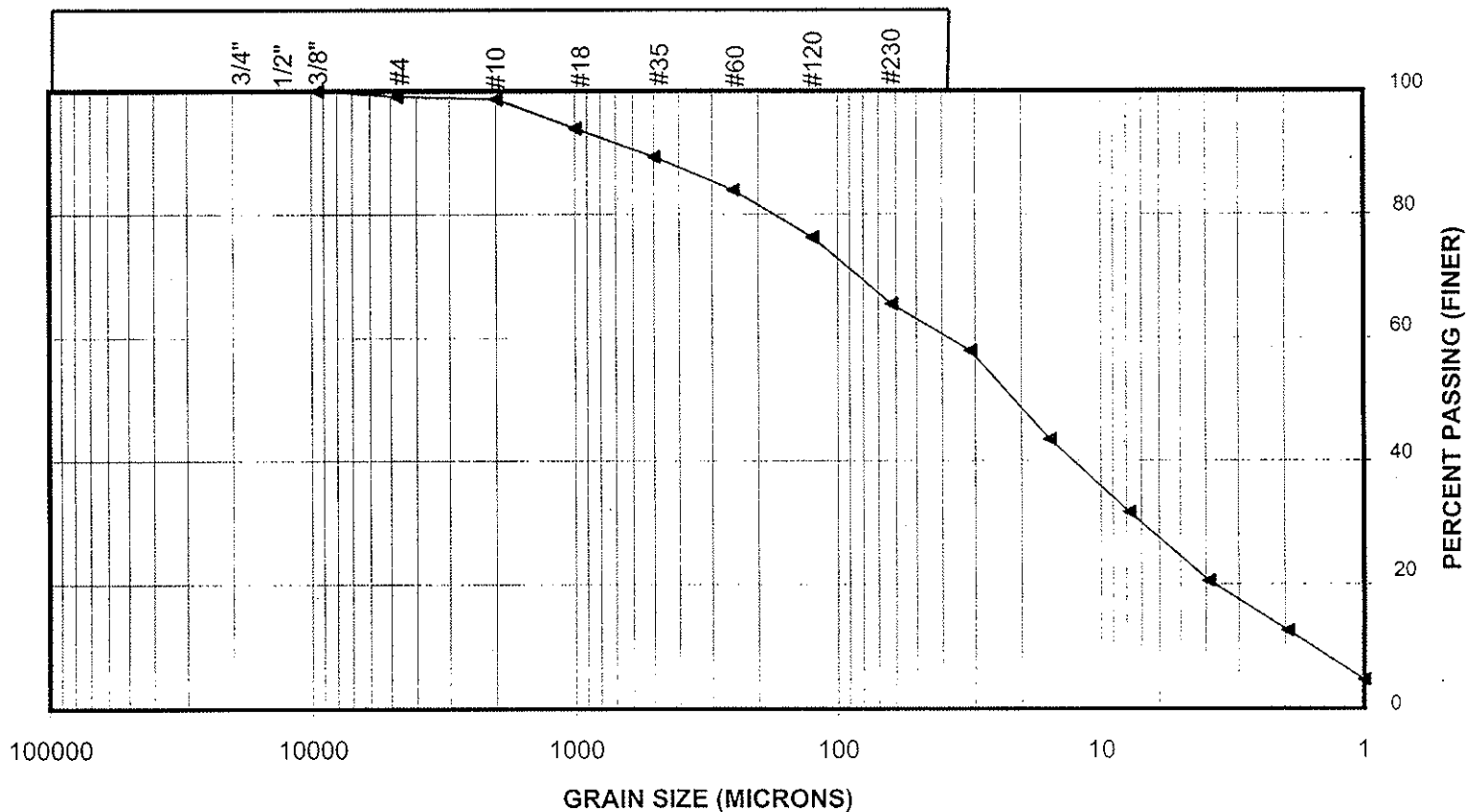


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU07-US-S1A

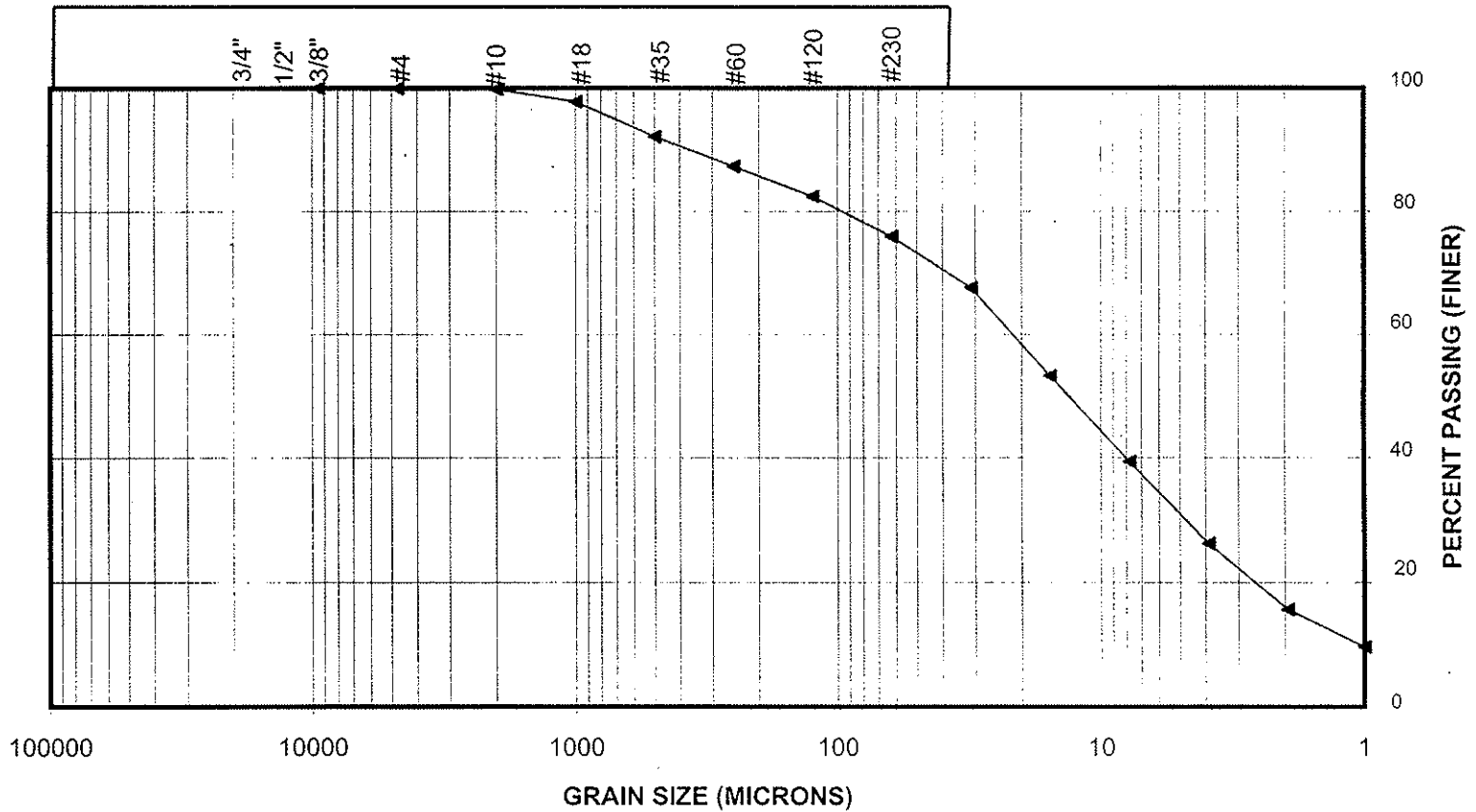


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU07-US-S1B

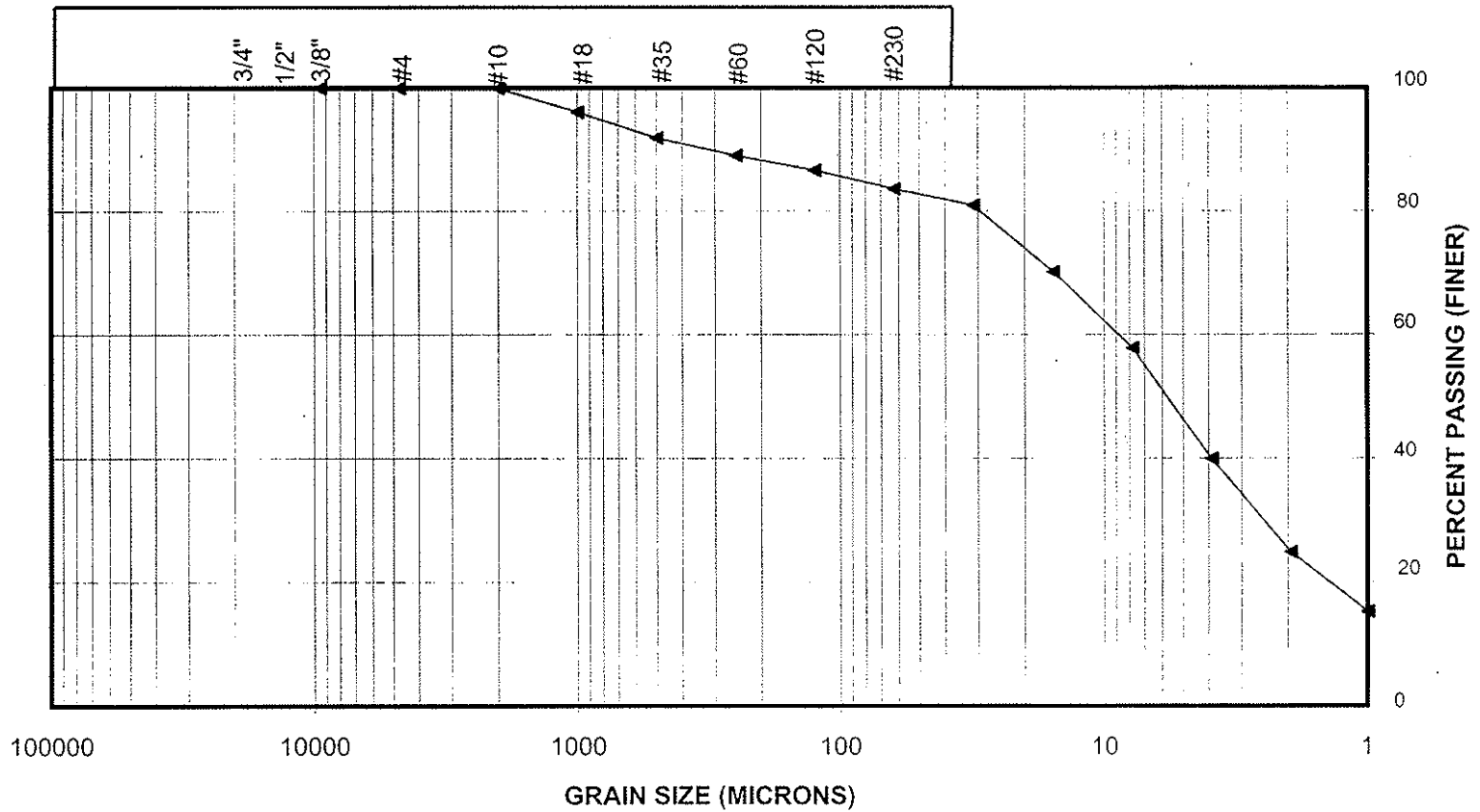


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU14-US-S1

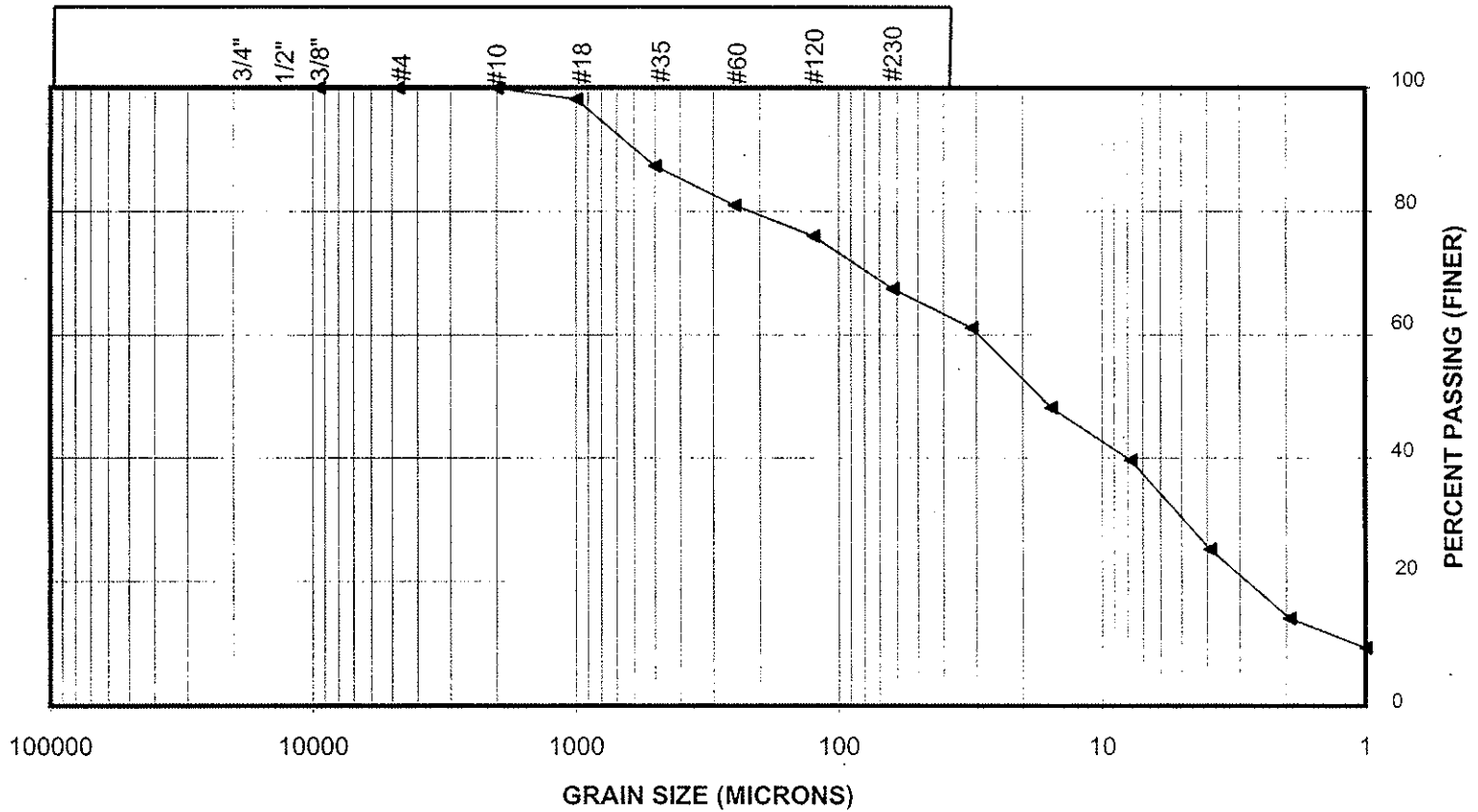


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: Lake Union Sediments

Sample No.: NLU14-US-S2





# GRAIN SIZE DISTRIBUTIONS

PSEP

SET 2

QA SUMMARY

PROJECT:	The Retec Group	Project No.:	Lake Union Sediment
REGL Triplicate Sample ID:	21182	Batch No.:	1003-649/650 -02
Client Triplicate Sample ID:	NLU18-GE-S3	Page:	1 of 1

Relative Standard Deviation, By Phi Size

Sample ID	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
LU18-GE-S3	100.0	100.0	98.6	94.7	84.3	66.2	54.4	48.0	42.2	33.1	24.6	15.5	9.9	5.9
LU18-GE-S3	100.0	99.2	98.0	94.4	83.3	65.8	54.5	48.2	41.7	33.5	24.8	15.6	10.2	6.1
LU18-GE-S3	100.0	95.8	95.0	91.0	80.7	62.3	50.8	44.9	41.2	32.7	22.9	14.5	9.5	5.7
AVE	NA	98.34	97.20	93.35	82.75	64.77	53.23	47.04	41.69	33.11	24.09	15.22	9.87	5.92
STDEV	NA	2.25	1.96	2.08	1.88	2.12	2.09	1.86	0.51	0.42	1.02	0.61	0.36	0.18
%RSD	NA	2.29	2.02	2.23	2.27	3.28	3.93	3.96	1.23	1.28	4.23	4.00	3.66	3.04

The Triplicate Applies To The Following Samples

REGL ID	Client ID	Date Sampled	Date Extracted	Date Complete	QA*
21182A	NLU18-GE-S3A	10/18/2002	11/7/2002	11/13/2002	98.8
21182B	NLU18-GE-S3B	10/18/2002	11/7/2002	11/13/2002	100.0
21182C	NLU18-GE-S3C	10/18/2002	11/7/2002	11/13/2002	97.4
21160	NLU03-US-S2	10/19/2002	11/7/2002	11/13/2002	99.7
21161	NLU03-US-S3	10/19/2002	11/7/2002	11/13/2002	101.3
21180	NLU18-GE-S1	10/18/2002	11/7/2002	11/13/2002	101.3
21181	NLU18-GE-S2	10/18/2002	11/7/2002	11/13/2002	101.4
21183	NLU18-GE-S4	10/18/2002	11/7/2002	11/13/2002	100.8
21176	NLU19-GE-S1	10/18/2002	11/7/2002	11/13/2002	101.8
21177	NLU19-GE-S2	10/18/2002	11/7/2002	11/13/2002	96.7
21178	NLU19-GE-S3	10/18/2002	11/7/2002	11/13/2002	95.3
21179	NLU19-GE-S4	10/18/2002	11/7/2002	11/13/2002	103.8

\* REGL Internal QA limits = 95-105%

Notes to the Testing:

1. See narrative for discussion of testing.

The Retec Group  
Lake Union Sediments

Apparent Grain Size Distribution Summary  
Percent Retained in Each Size Fraction

Sample No.	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay		
Phi Size	> -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	< 10
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0
NLU18-GE-S3A	1.4	3.9	10.4	18.1	11.8	6.4	5.8	9.0	8.6	9.0	5.6	4.0	5.9
NLU18-GE-S3B	2.0	3.6	11.1	17.6	11.3	6.3	6.5	8.2	8.7	9.2	5.4	4.1	6.1
NLU18-GE-S3C	5.0	4.0	10.3	18.3	11.5	5.9	3.7	8.5	9.8	8.4	5.0	3.8	5.7
NLU03-US-S2	7.2	9.8	16.5	22.9	13.4	6.8	3.9	4.9	4.3	4.1	2.6	1.6	2.0
NLU03-US-S3	18.0	6.4	10.3	14.2	14.1	11.0	7.7	4.8	3.9	3.1	2.2	1.6	2.7
NLU18-GE-S1	0.5	1.9	2.8	3.0	3.7	6.8	12.0	14.4	14.4	15.4	9.0	6.7	9.4
NLU18-GE-S2	0.0	0.4	0.9	1.7	2.2	3.7	6.4	15.3	18.7	22.2	11.6	8.0	9.0
NLU18-GE-S4	9.8	10.3	18.1	26.8	14.8	6.0	4.4	2.3	2.0	1.5	1.3	1.0	1.7
NLU19-GE-S1	2.9	5.3	5.5	5.1	6.0	8.9	10.8	12.9	12.2	11.1	7.6	4.8	7.0
NLU19-GE-S2	0.0	0.5	0.7	1.1	1.7	3.1	8.3	14.6	17.2	16.4	13.8	8.9	13.6
NLU19-GE-S3	0.2	5.3	5.0	3.3	3.0	4.6	7.2	10.7	13.0	14.2	11.4	8.5	13.6
NLU19-GE-S4	0.1	1.1	2.8	10.0	8.4	14.1	9.5	12.8	10.9	10.4	7.2	5.1	7.6

Notes to the Testing:

1. Apparent grain size distributions according to PSEP protocols.

The Retec Group  
Lake Union Sediments

Apparent Grain Size Distribution Summary  
Percent Finer Than Indicated Size

Sample No.	Gravel			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt				Clay	
	-3	-2	-1						0	1	2	3	4	5
Phi Size	3/8"	#4	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (62)	31.00	15.60	7.80	3.90	2.00	1.00
NLU18-GE-S3A	100.0	100.0	98.6	94.7	84.3	66.2	54.4	48.0	42.2	33.1	24.6	15.5	9.9	5.9
NLU18-GE-S3B	100.0	99.2	98.0	94.4	83.3	65.8	54.5	48.2	41.7	33.5	24.8	15.6	10.2	6.1
NLU18-GE-S3C	100.0	95.8	95.0	91.0	80.7	62.3	50.8	44.9	41.2	32.7	22.9	14.5	9.5	5.7
NLU03-US-S2	100.0	99.1	92.8	83.0	66.5	43.6	30.2	23.4	19.5	14.6	10.3	6.2	3.6	2.0
NLU03-US-S3	100.0	89.2	82.0	75.6	65.3	51.1	37.0	26.0	18.4	13.5	9.6	6.5	4.4	2.7
NLU18-GE-S1	100.0	99.6	99.5	97.6	94.8	91.9	88.2	81.3	69.3	54.9	40.6	25.2	16.1	9.4
NLU18-GE-S2	100.0	100.0	100.0	99.6	98.7	97.1	94.9	91.2	84.8	69.5	50.8	28.6	17.0	9.0
NLU18-GE-S4	100.0	96.6	90.2	80.0	61.9	35.1	20.3	14.3	10.0	7.6	5.6	4.1	2.7	1.7
NLU19-GE-S1	100.0	98.8	97.1	91.7	86.3	81.2	75.2	66.3	55.5	42.6	30.5	19.4	11.8	7.0
NLU19-GE-S2	100.0	100.0	100.0	99.5	98.8	97.7	96.0	92.9	84.6	70.0	52.7	36.3	22.5	13.6
NLU19-GE-S3	100.0	100.0	99.8	94.5	89.5	86.3	83.3	78.6	71.4	60.8	47.8	33.5	22.1	13.6
NLU19-GE-S4	100.0	100.0	99.9	98.8	96.0	86.0	77.6	63.5	54.0	41.2	30.3	19.9	12.7	7.6

Notes to the Testing:

1. Apparent grain size distributions according to PSEP protocols.

The Retec Group  
Lake Union Sediments

PSEP Total Solids Analysis  
Percent of Wet Weight

Sample No.	Total Solids (%)
NLU18-GE-S3A	55.9
NLU18-GE-S3B	56.5
NLU18-GE-S3C	55.7
NLU03-US-S2	63.9
NLU03-US-S3	87.0
NLU18-GE-S1	22.0
NLU18-GE-S2	34.1
NLU18-GE-S4	86.0
NLU19-GE-S1	30.9
NLU19-GE-S2	29.3
NLU19-GE-S3	18.0
NLU19-GE-S4	12.3

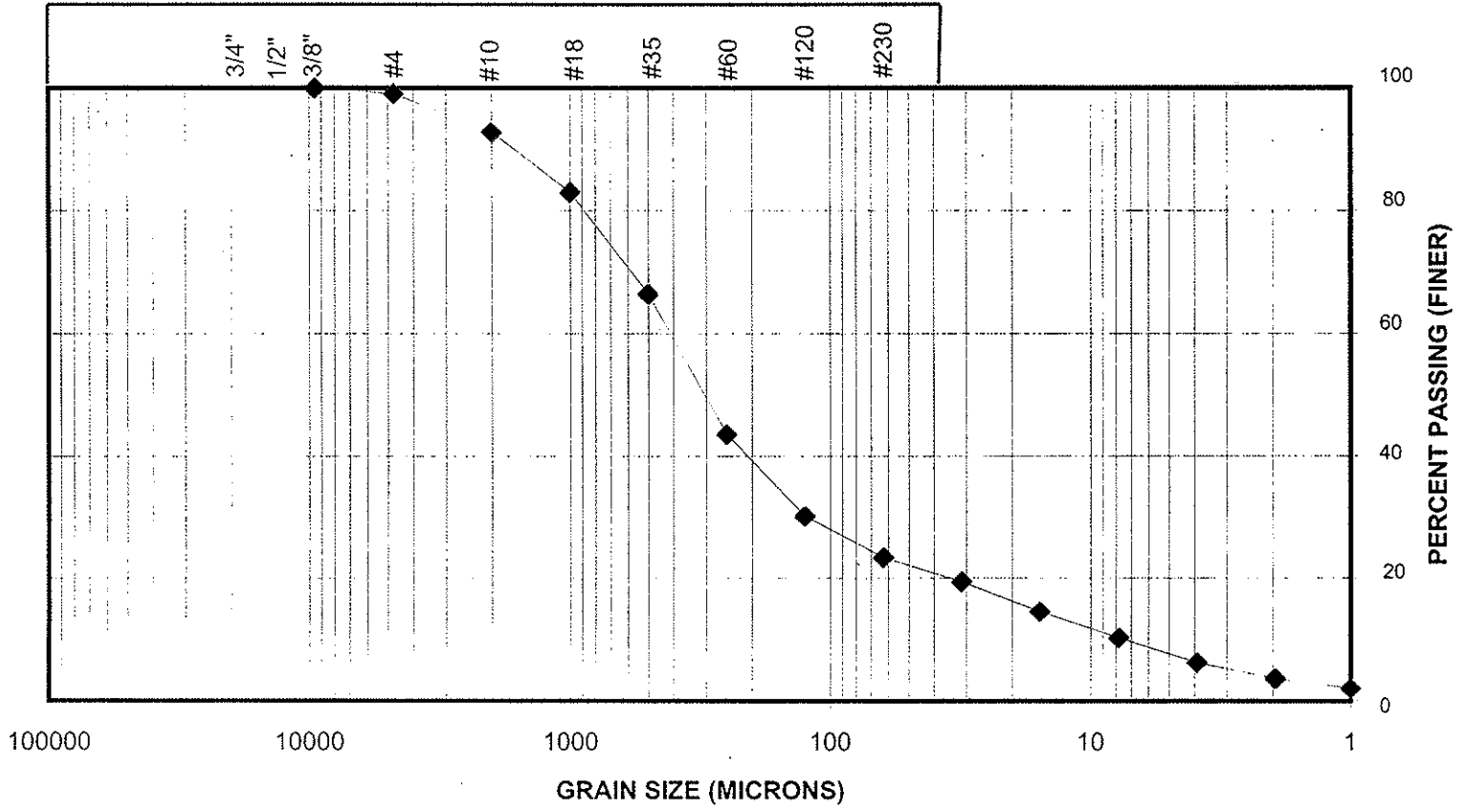
Triplicate Average	56.0
Standard Deviation	0.43
%RSD	0.77

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: North Lake Union

Sample No.: NLU03-US-S2

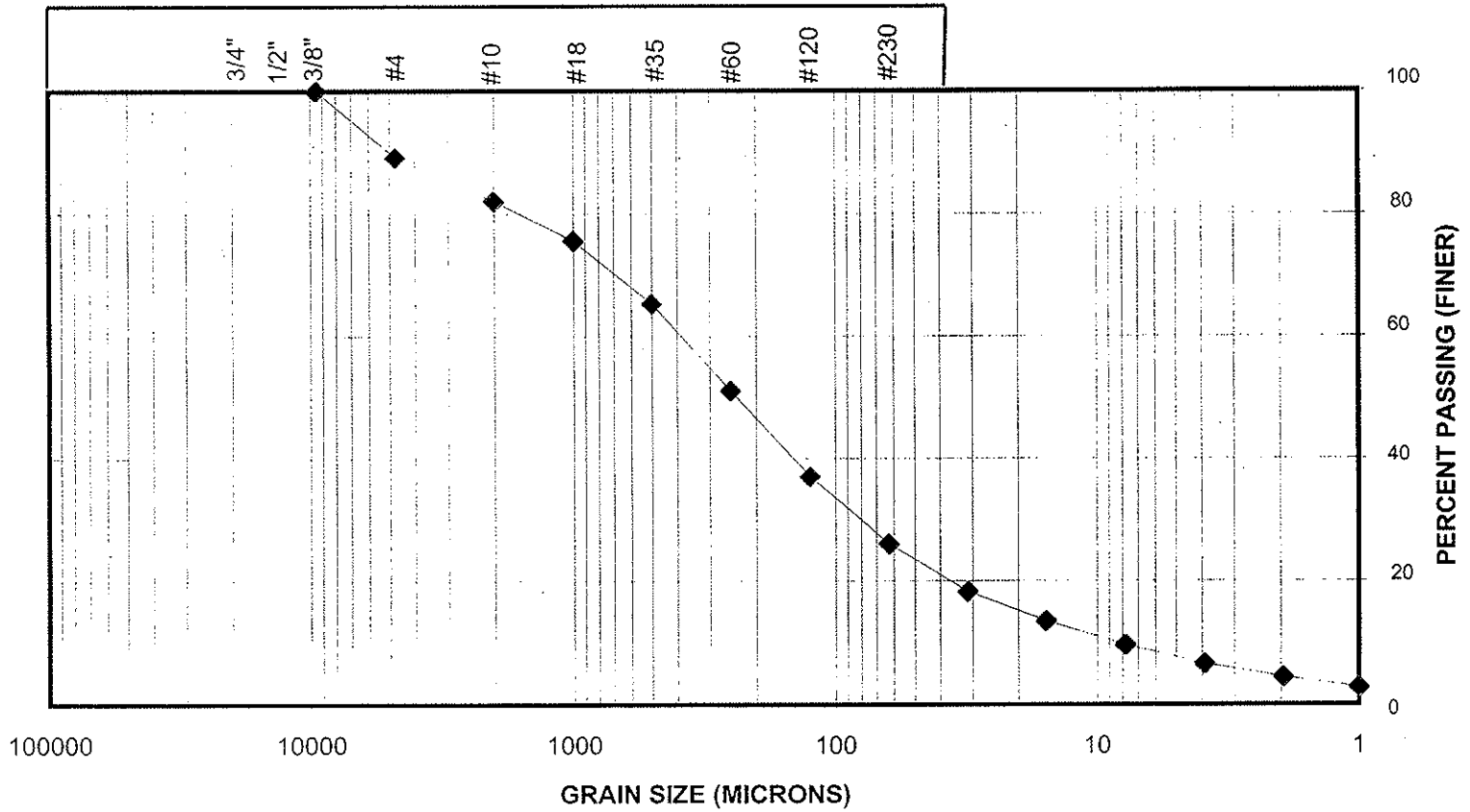


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: North Lake Union

Sample No.: NLU03-US-S3



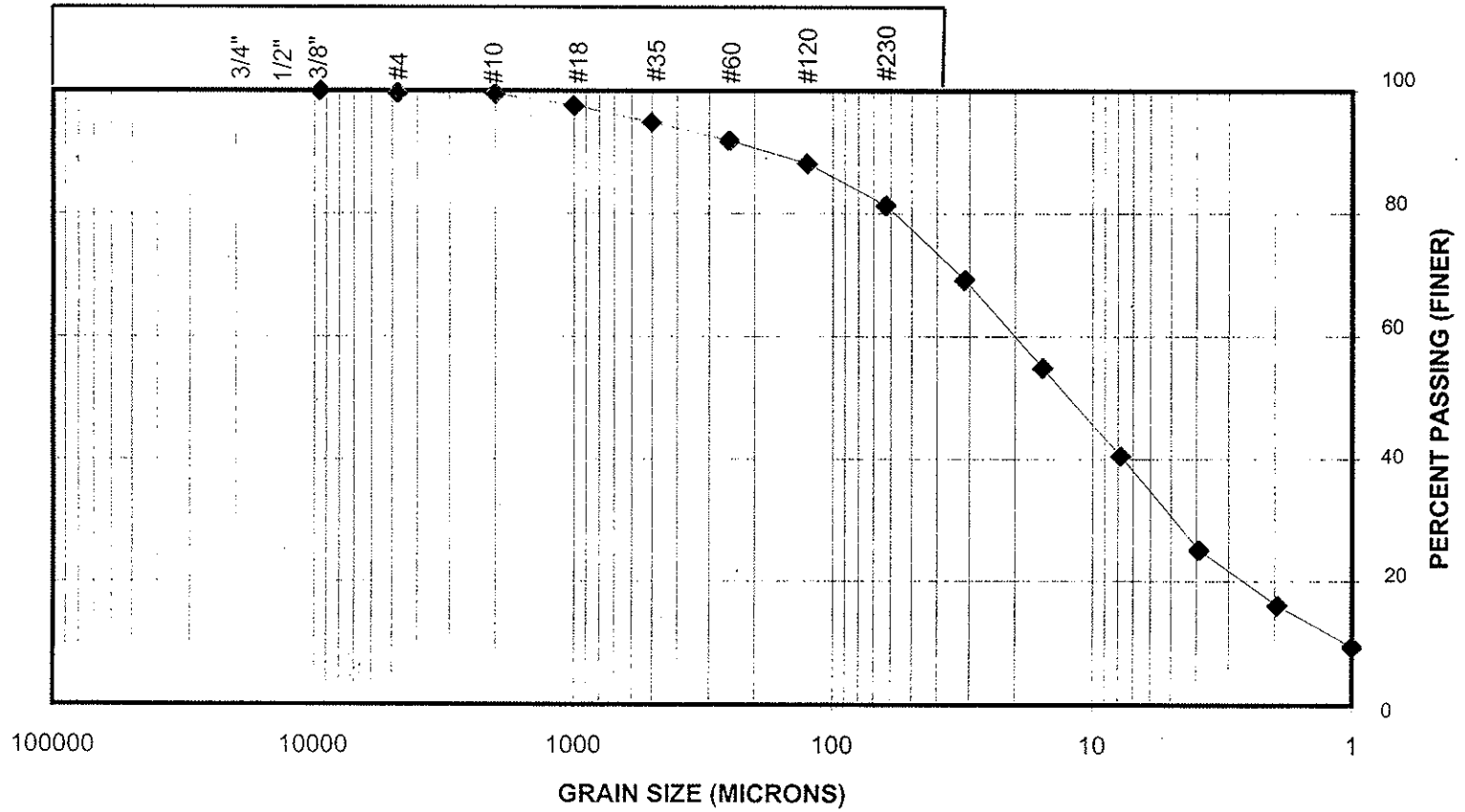


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: North Lake Union

Sample No.: NLU18-GE-S1

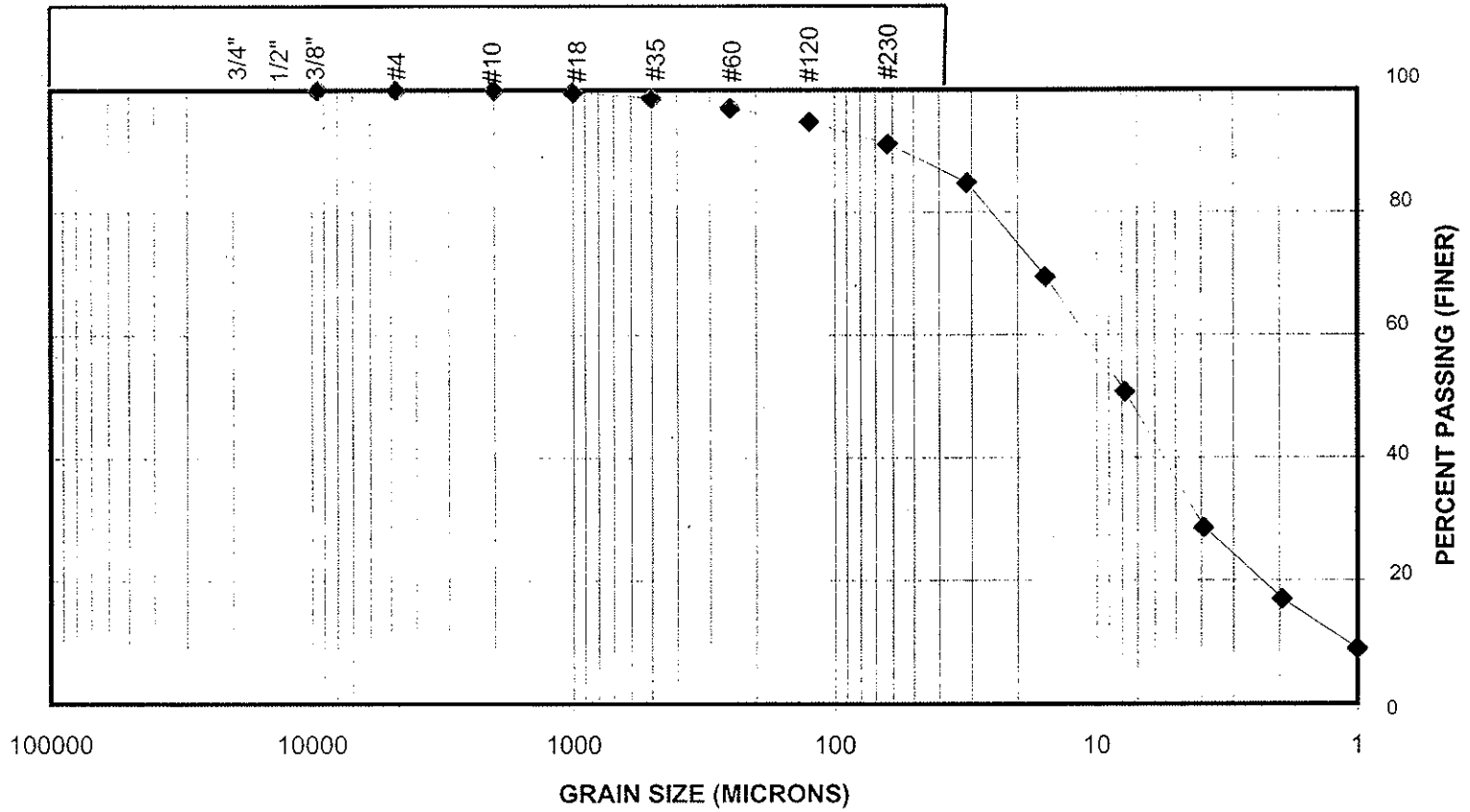


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: North Lake Union

Sample No.: NLU18-GE-S2

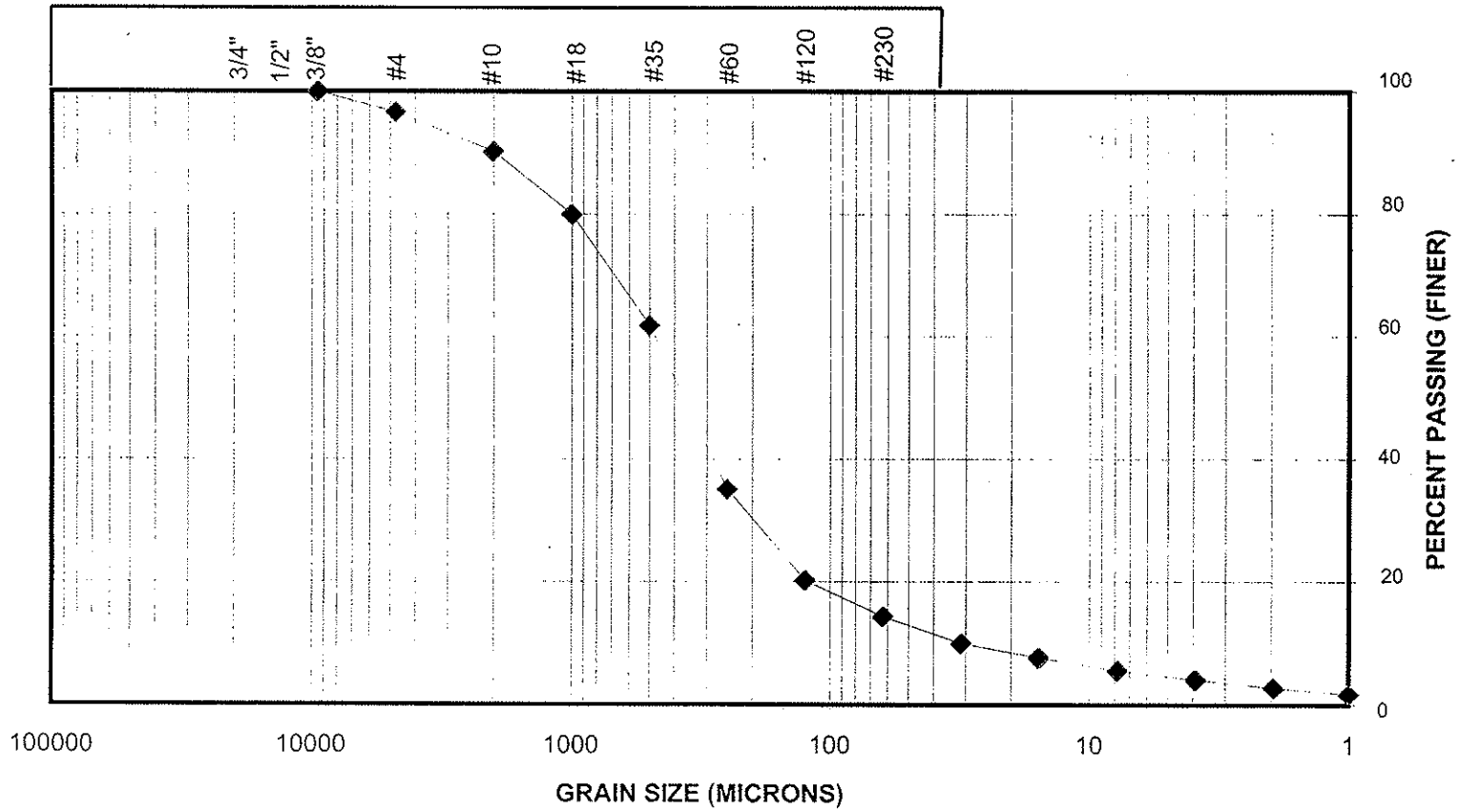


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: North Lake Union

Sample No.: NLU18-GE-S4

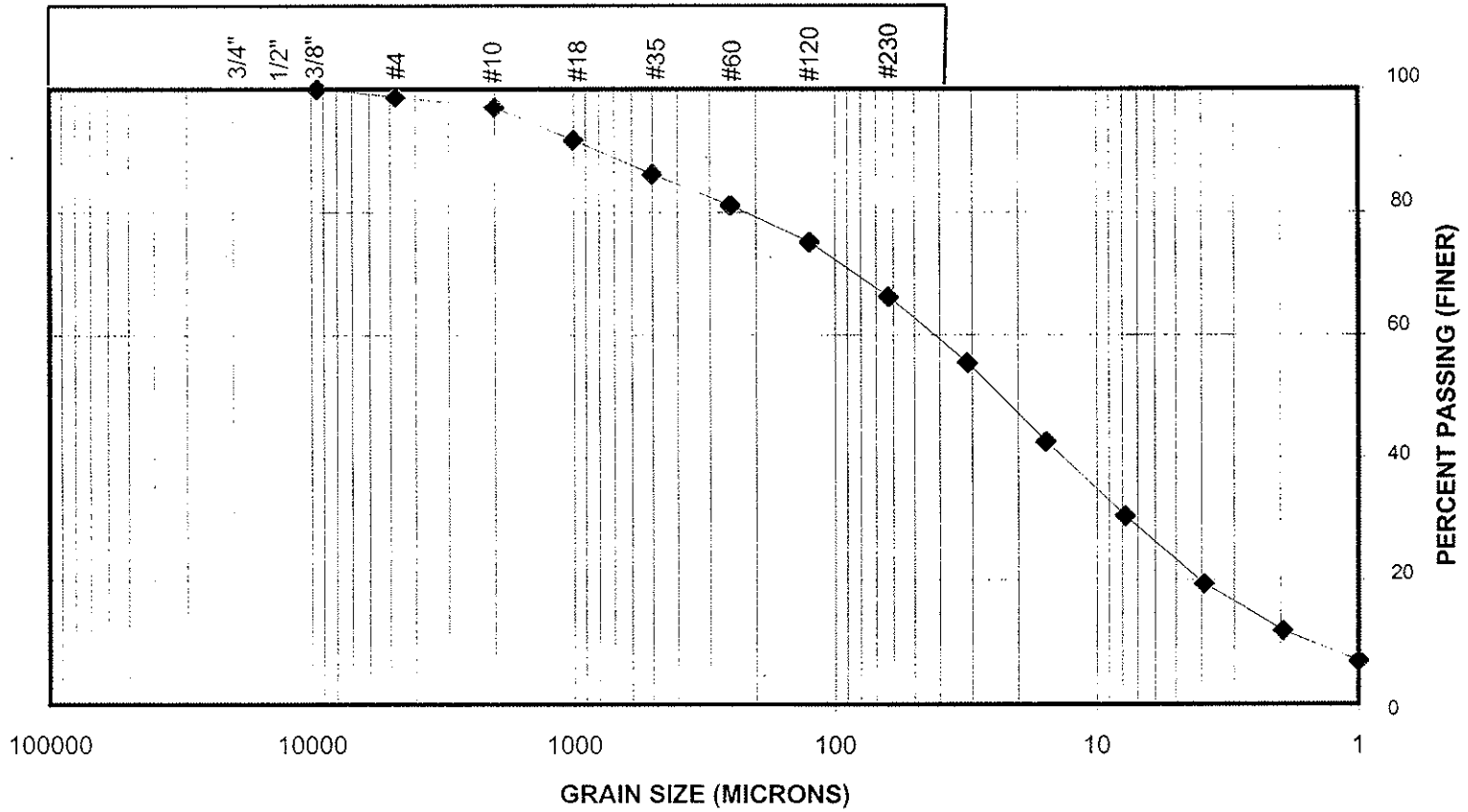


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: North Lake Union

Sample No.: NLU19-GE-S1

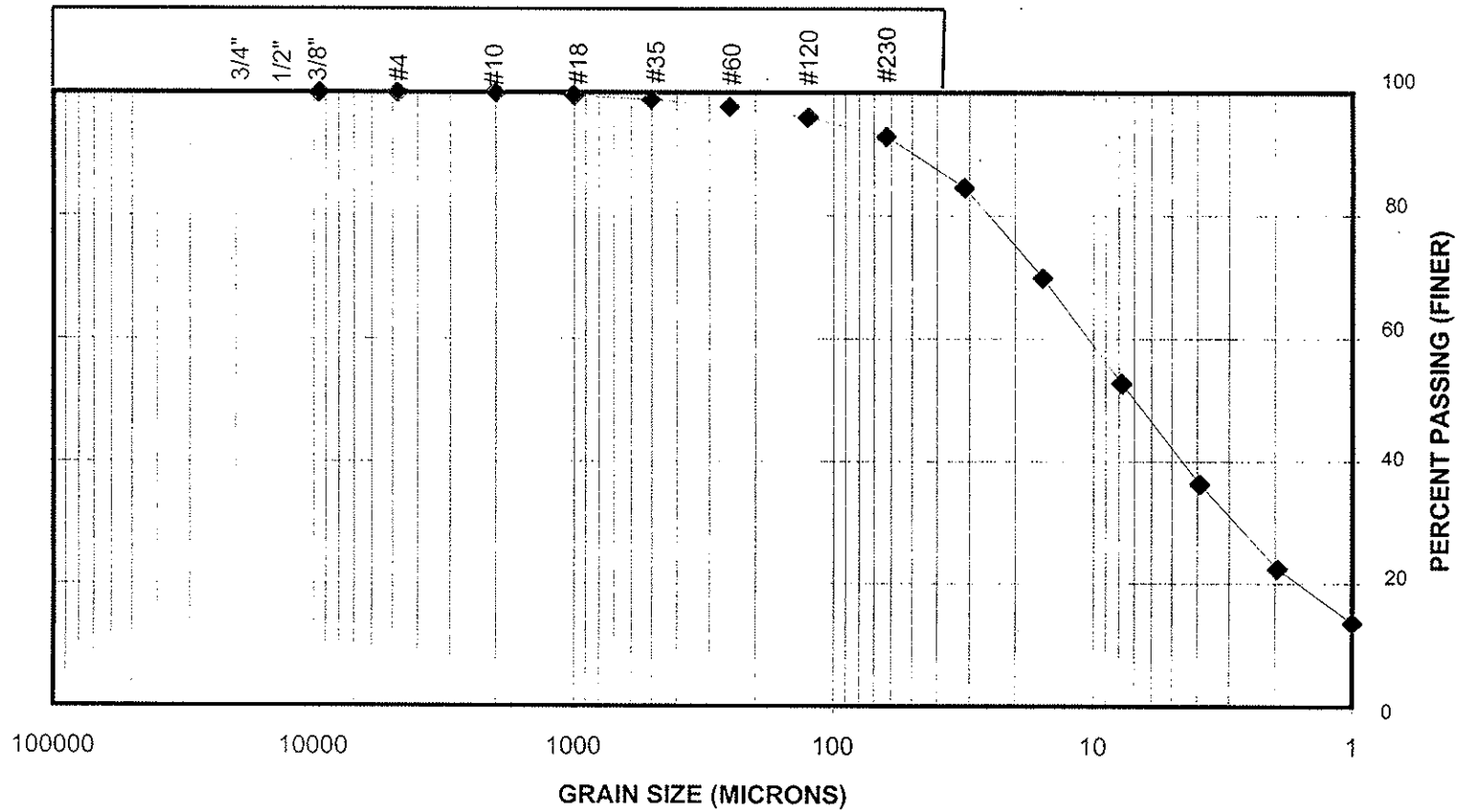


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY

PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: North Lake Union

Sample No.: NLU19-GE-S2



1003-

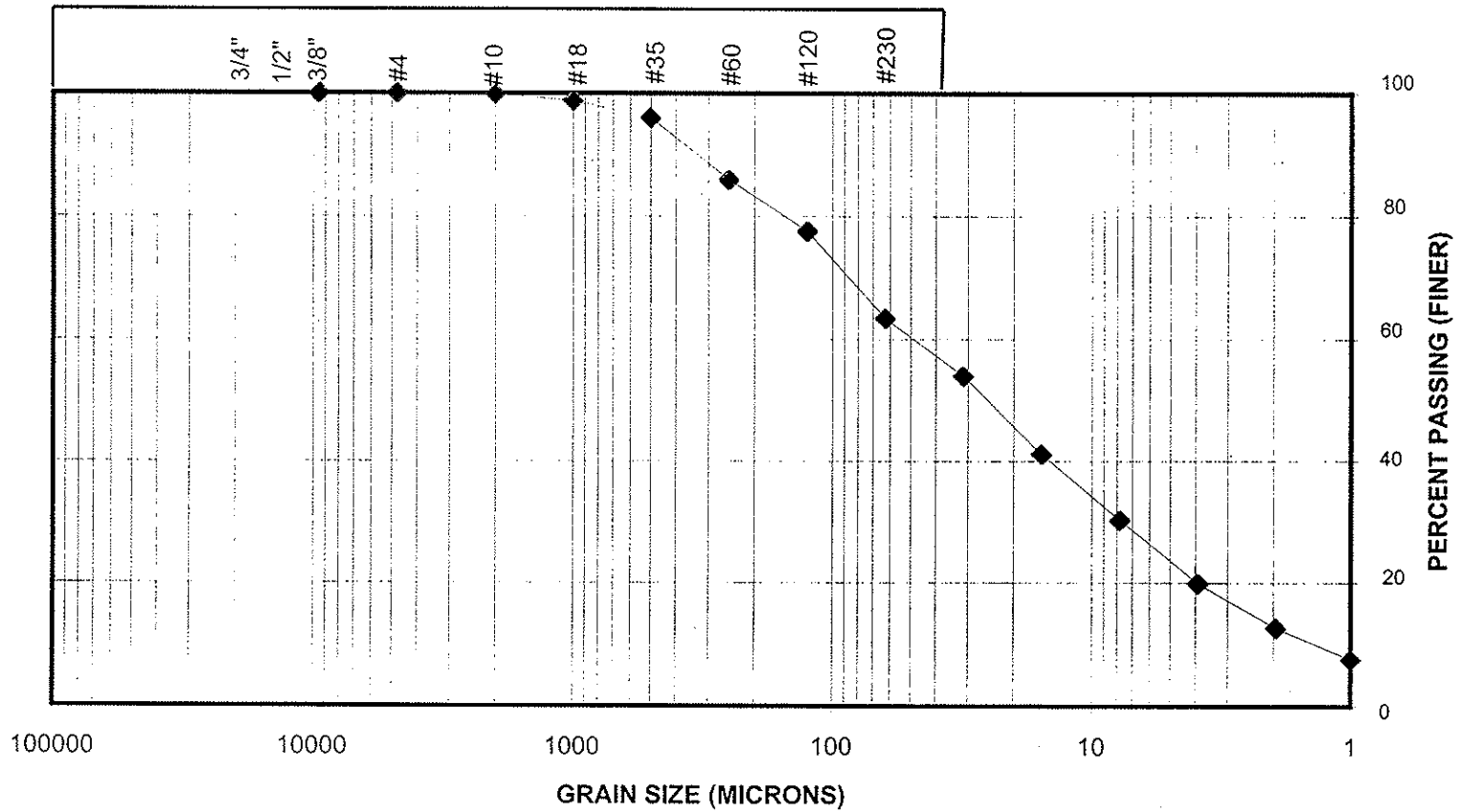


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PSEP APPARENT GRAIN SIZE DISTRIBUTION

Project No.: North Lake Union

Sample No.: NLU19-GE-S4





The Retec Group  
Lake Union Sediments

Percent Finer (Passing) Than Indicated Size

Sieve Size (microns)	Moisture Content	2"	1.5"	1"	3/4"	1/2"	3/8"	#4	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (62.5)
NLU11-US-S5A	6.4	100.0	100.0	100.0	100.0	100.0	98.0	89.3	82.6	74.9	54.9	22.8	6.1	2.5
NLU11-US-S5B	10.4	100.0	100.0	100.0	91.1	89.7	84.9	79.1	74.1	67.8	56.2	36.6	24.9	14.8
NLU09-GE-S1	23.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.7	93.3	69.3	26.0	4.8	1.3
NLU09-GE-S2	20.5	100.0	100.0	100.0	100.0	100.0	99.1	99.1	97.3	89.7	61.9	16.8	2.9	0.9
NLU09-GE-S3	14.8	100.0	100.0	100.0	100.0	100.0	94.9	92.4	87.1	74.5	46.8	11.9	1.9	0.5
NLU09-GE-S4	15.0	100.0	100.0	100.0	100.0	100.0	93.9	88.8	80.7	69.7	46.7	14.7	2.7	0.6
NLU06-US-S3	21.9	100.0	100.0	100.0	100.0	91.4	87.8	81.2	74.1	66.2	52.7	28.6	7.6	1.2
NLU06-US-S4	10.5	100.0	100.0	100.0	100.0	95.1	91.1	84.1	77.4	71.0	60.9	41.3	25.7	15.8
NLU07-US-S3	16.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4	93.3	65.9	30.5	10.1	7.3

Tests conducted according to ASTM D421/D422

1003-649-650

# GRAIN SIZE DISTRIBUTIONS

PSEP MODIFIED FOR SIEVE ONLY

The Retec Group  
Lake Union Sediments

Percent Retained in Each Size Fraction

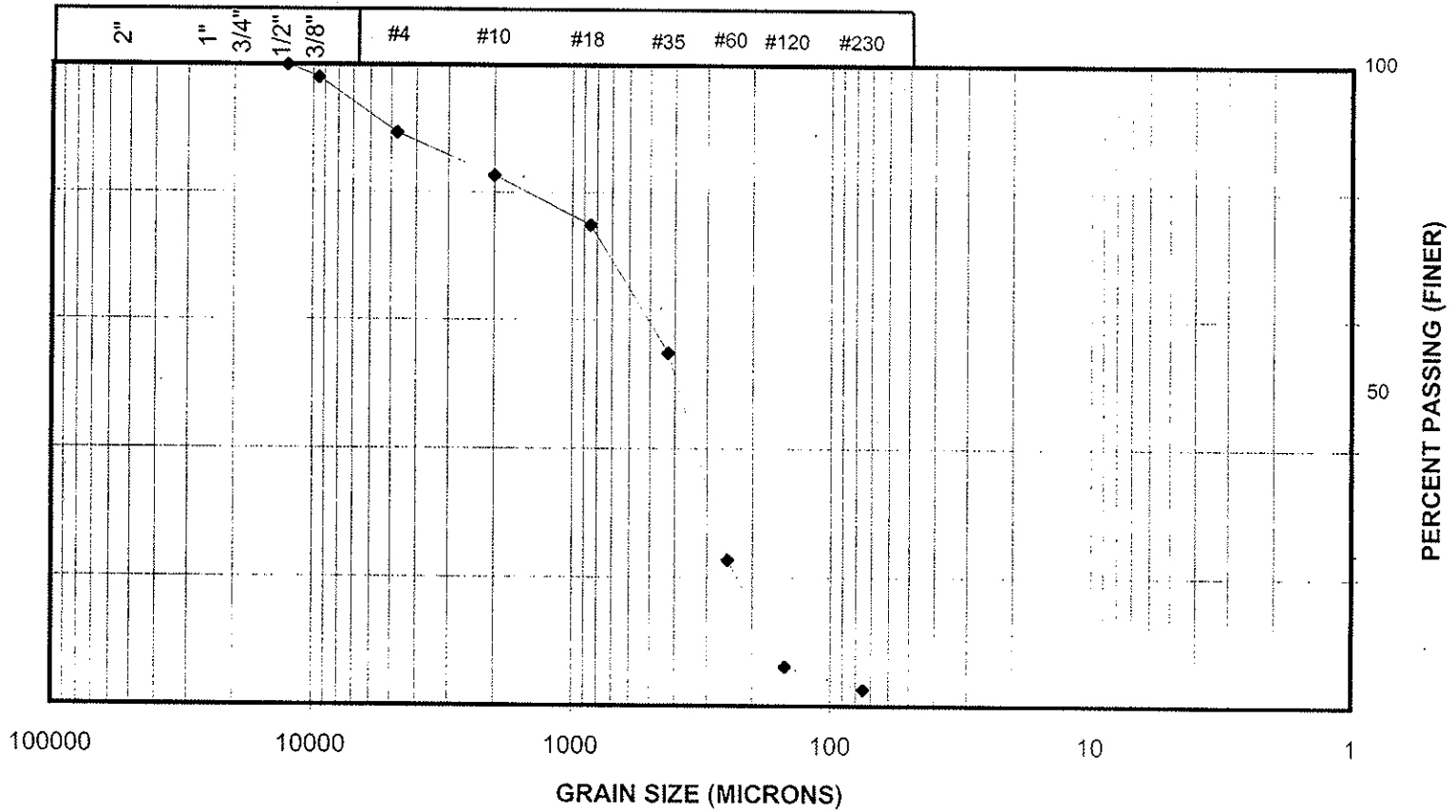
Sieve Size (microns)	1.5 to 1"	1 to 3/4"	3/4 to 1/2"	1/2 to 3/8"	3/8 to #4	#4 to #10	2000- 1000	1000-500	500-250	250-125	125-62.5	<62.5
NLU11-US-S5A	0.0	0.0	0.0	2.0	8.7	6.7	7.7	20.0	32.1	16.7	3.6	2.5
NLU11-US-S5B	0.0	8.9	1.4	4.7	5.9	5.0	6.3	11.6	19.6	11.7	10.1	14.8
NLU09-GE-S1	0.0	0.0	0.0	0.0	0.0	1.3	5.3	24.1	43.2	21.2	3.5	1.3
NLU09-GE-S2	0.0	0.0	0.0	0.9	0.0	1.8	7.6	27.8	45.0	13.9	2.0	0.9
NLU09-GE-S3	0.0	0.0	0.0	5.1	2.4	5.3	12.6	27.7	34.9	10.0	1.3	0.5
NLU09-GE-S4	0.0	0.0	0.0	6.1	5.1	8.0	11.0	23.0	32.0	12.1	2.0	0.6
NLU06-US-S3	0.0	0.0	8.6	3.5	6.7	7.0	7.9	13.5	24.1	21.0	6.4	1.2
NLU06-US-S4	0.0	0.0	4.9	4.0	7.0	6.8	6.4	10.1	19.6	15.6	9.9	15.8
NLU07-US-S3	0.0	0.0	0.0	0.0	0.0	0.6	6.1	27.4	35.3	20.5	2.7	7.3

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: Lake Union Sediments

Sample No.: NLU11-US-S5A



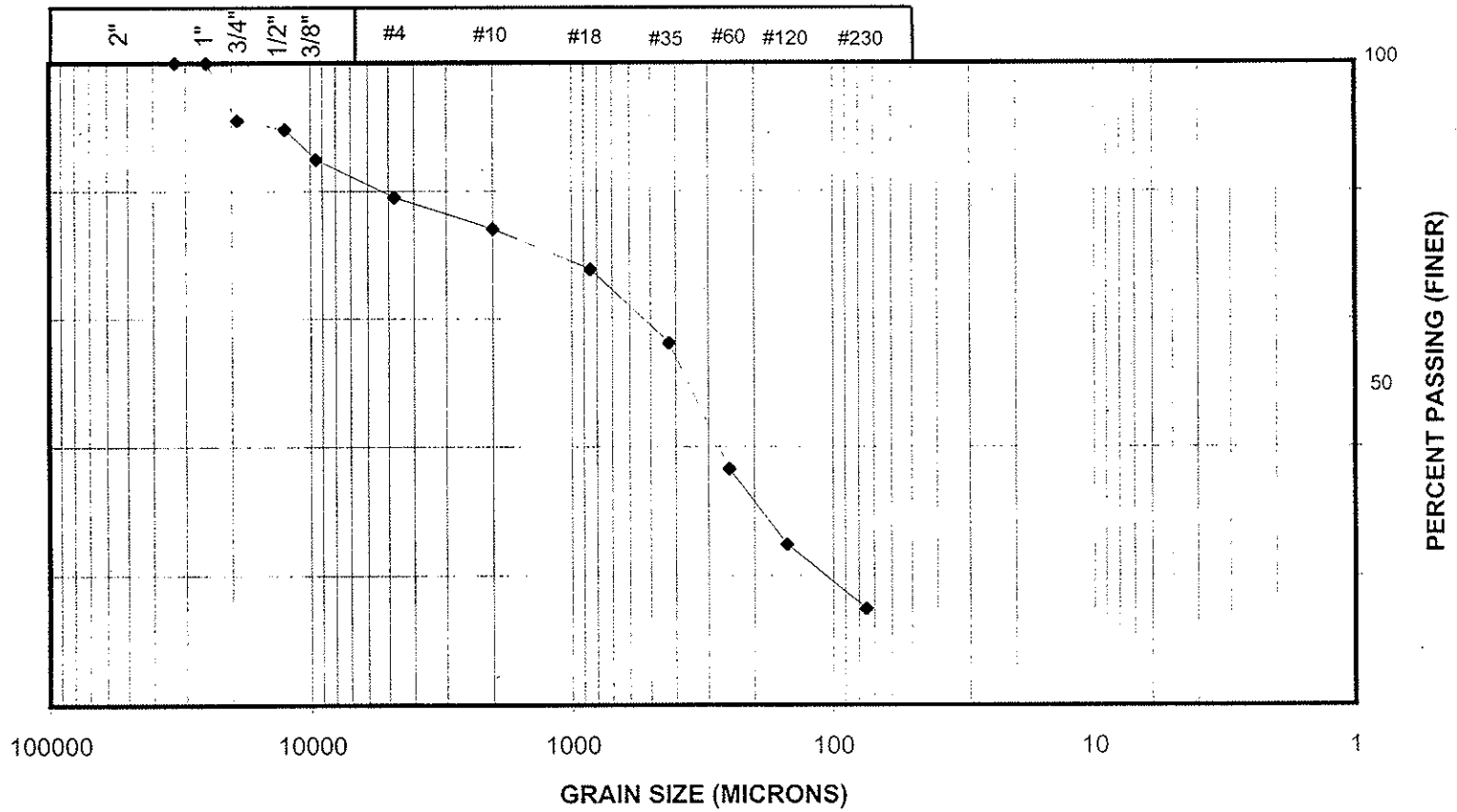
1003-649-650

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: Lake Union Sediments

Sample No.: NLU11-US-S5B



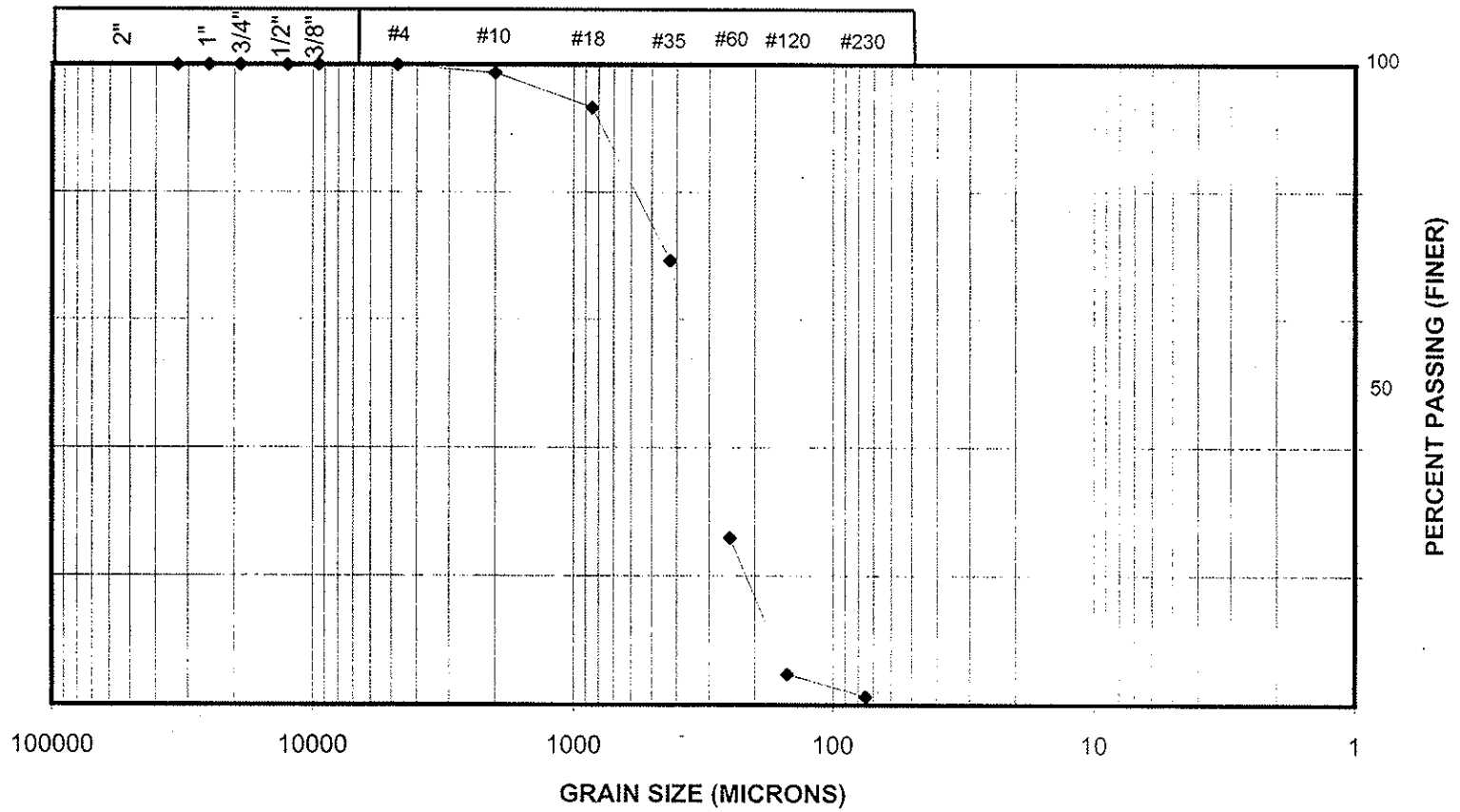
1003-649-650

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: Lake Union Sediments

Sample No.: NLU09-GE-S1



1003-649-650

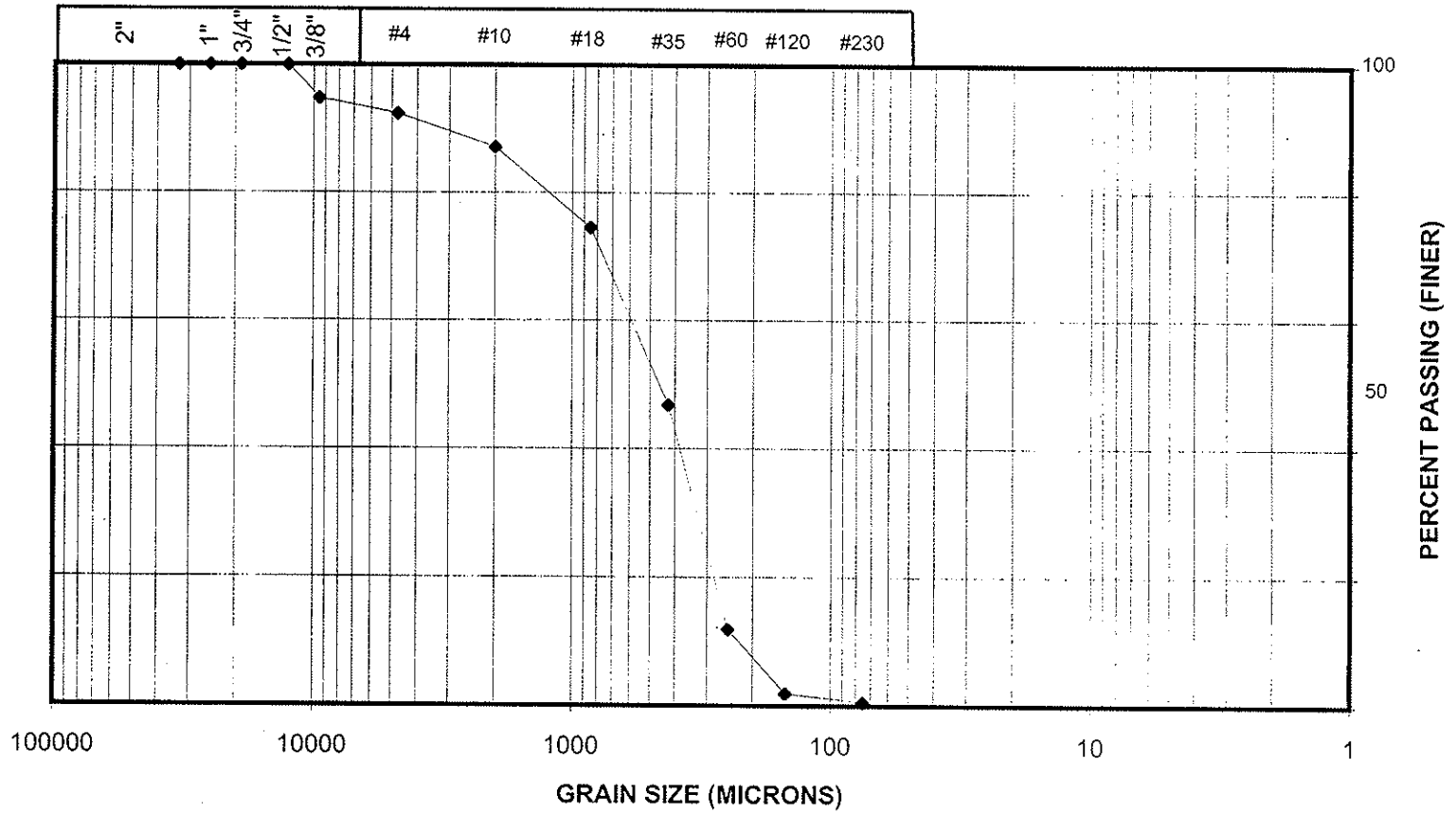


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: Lake Union Sediments

Sample No.: NLU09-GE-S3



1003-649-  
650

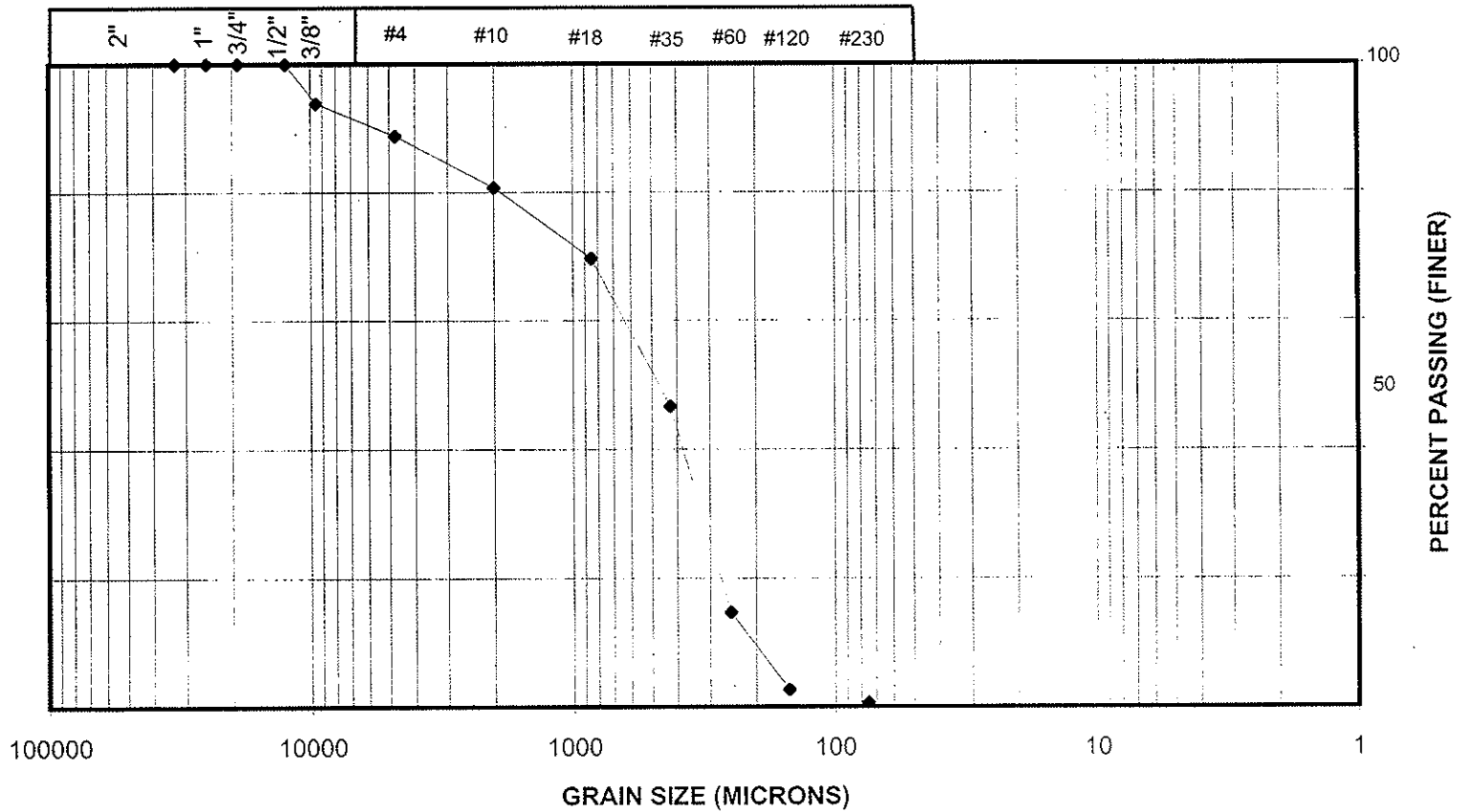


ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: Lake Union Sediments

Sample No.: NLU09-GE-S4



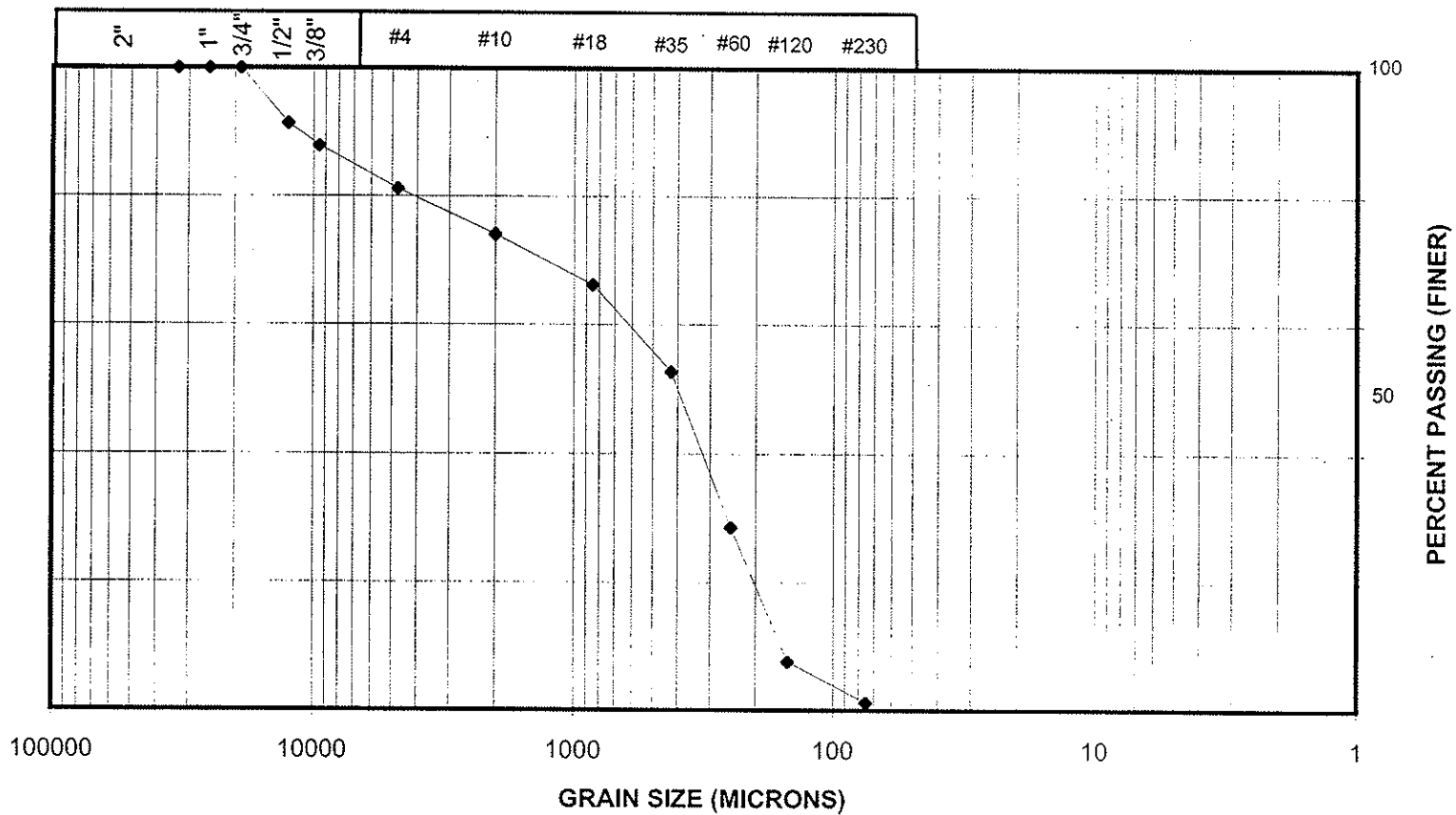
1003-649-650

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: Lake Union Sediments

Sample No.: NLU06-US-S3



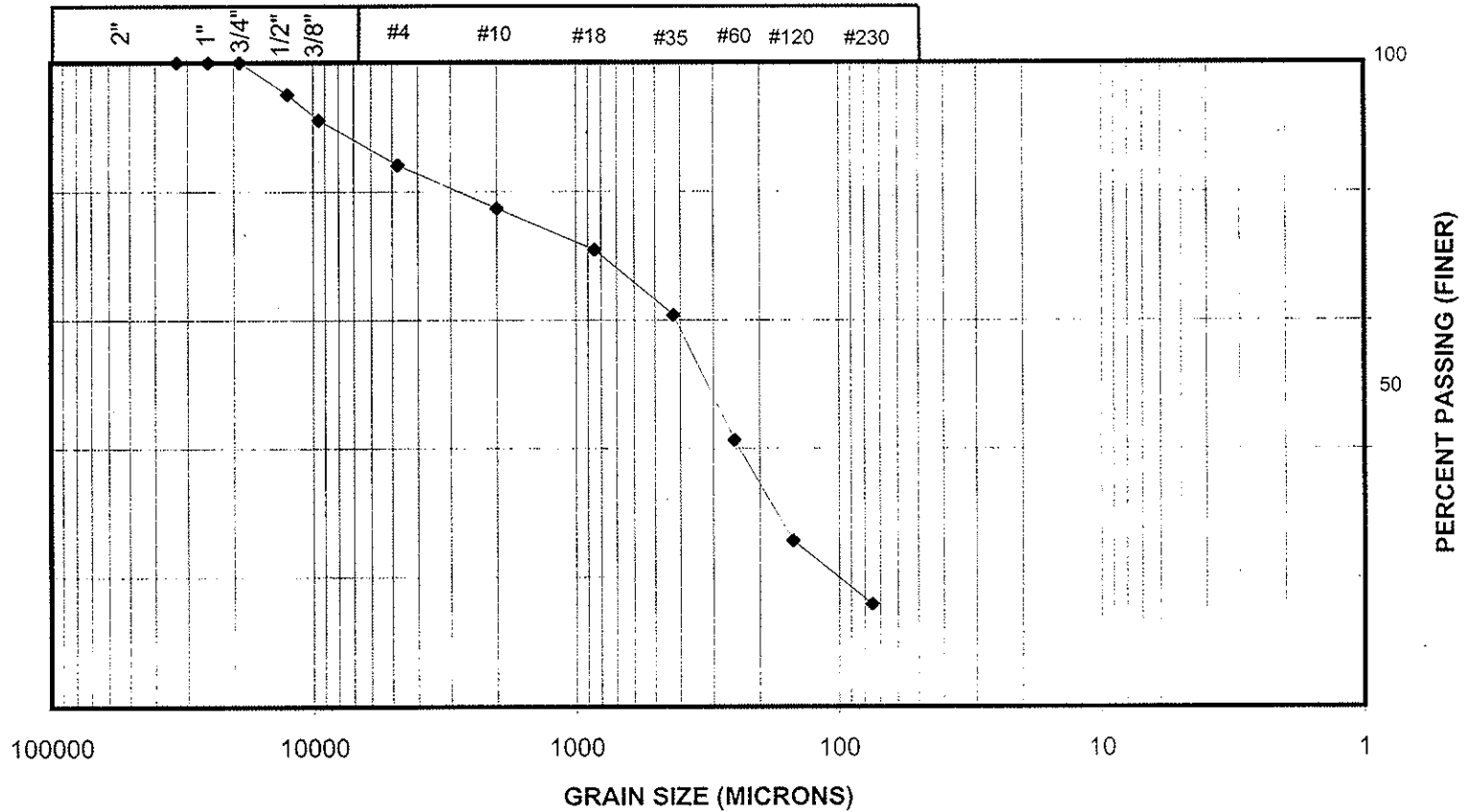
1003-649-  
650

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: Lake Union Sediments

Sample No.: NLU06-US-S4



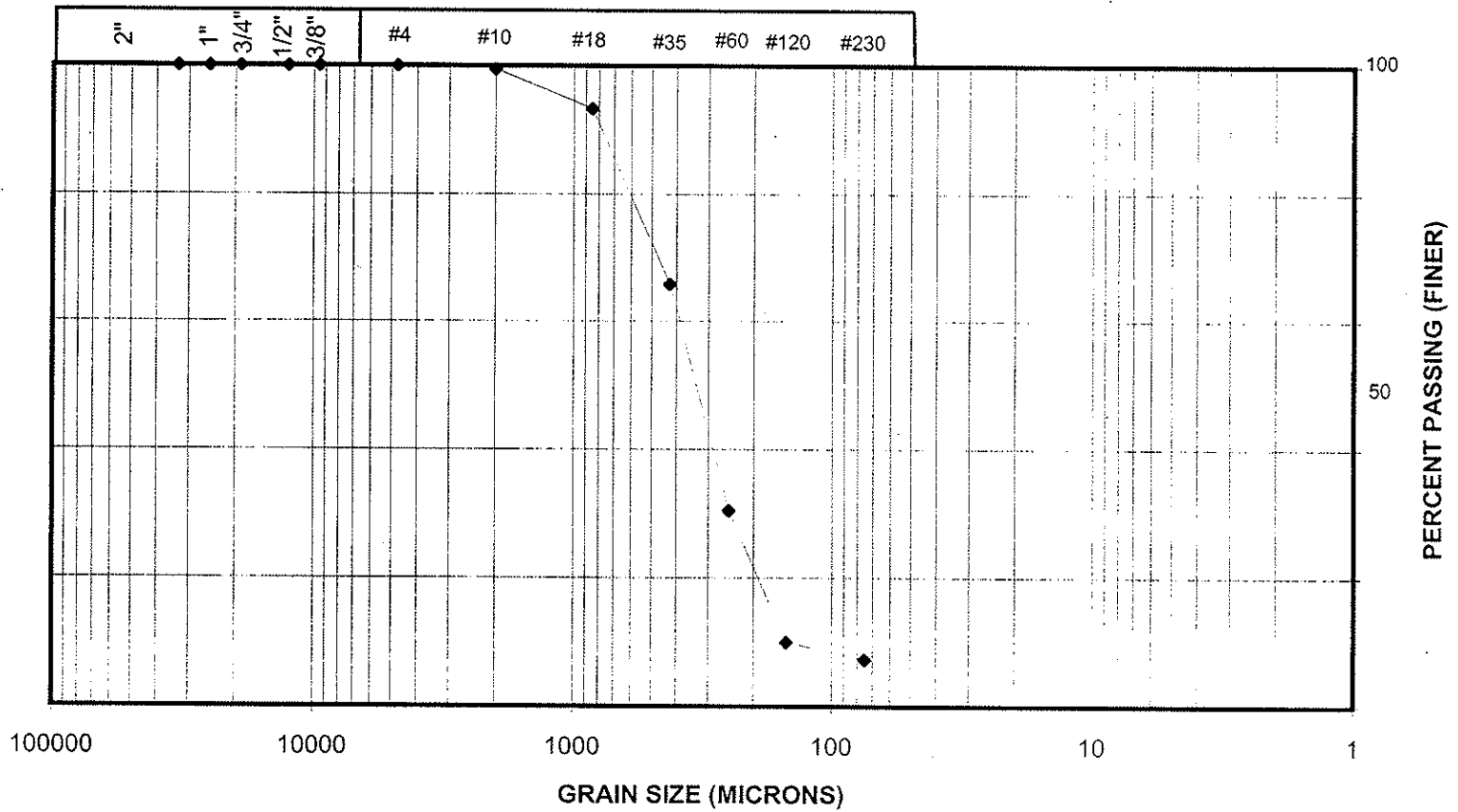
1003-649-650

ROSA ENVIRONMENTAL & GEOTECHNICAL LABORATORY, LLC.

ASTM D-422 GRAIN SIZE DISTRIBUTION

Project: Lake Union Sediments

Sample No.: NLU07-US-S3



1003-649-650

**SUB-ATTACHMENT 3D-2.3.3**  
**RETEC 2002 Phase 2 Investigation -**  
**Geotechnical Data Package 3**

## North Lake Union Phase 2 Investigation - Subsurface Core Sample Geotechnical Testing Results

General Information									UU Strength <sup>(2)</sup>					Consolidation			Atterberg Limits <sup>(7)</sup> (Plasticity)			
Sample ID	Depth (ft) <sup>(1)</sup>	% Moisture	Dry Density (pcf)	Wet Density (pcf)	Total Porosity	Void Ratio of total sample	Specific Gravity <sup>(8)</sup>	Total Solids	Confining Pressure (psi)	Wet density (pcf)	% Moisture	Dry Density (pcf)	Dev. stress (psf) <sup>(3)</sup>	void ratio <sup>(4)</sup>	C <sub>cc</sub> <sup>(5)</sup>	C <sub>v</sub> <sup>(6)</sup> (ft <sup>2</sup> per day)	LL	PL	PI	Classification
NLU09-GE-S1	0 - 1	18.9	106.4	126.5	0.37	0.59	2.69	84.1	--	--	--	--	--	--	--	--	--	--	--	--
NLU09-GE-S2	1 - 2	20.9	106.8	129.1	0.37	0.59	2.72	82.7	--	--	--	--	--	--	--	--	--	--	--	--
NLU09-GE-S3	2 - 3	16.2	101.9	118.4	0.40	0.67	2.74	86.1	--	--	--	--	--	--	--	--	--	--	--	--
NLU09-GE-S4	3 - 4	15.1	111.9	128.8	0.34	0.52	2.72	86.9	--	--	--	--	--	--	--	--	--	--	--	--
NLU18-GE-S1	0 - 2	393.6	13.6	67.1	0.91	10.11	2.35	22.0	5.0	67.1	393.6	13.6	25	7.41	0.369	0.027	non - plastic			
NLU18-GE-S2	2 - 3	191.2	26.8	77.9	0.83	4.88	2.57	34.1	--	--	--	--	--	7.12	0.265	0.042	79.0	69.4	9.6	OH
NLU18-GE-S3	3 - 4	21.3	105.7	128.2	0.36	0.56	2.65	55.9	5.0	128.2	21.3	105.7	21	5.01	0.141	0.055	non - plastic			
NLU18-GE-S4	4 - 5	15.4	114.3	131.9	0.33	0.49	2.74	86.0	5.0	131.9	15.4	114.3	90	0.54	0.023	0.243	--	--	--	--
NLU19-GE-S1	0 - 1	465.1	11.6	65.5	0.92	11.50	2.19	30.9	--	--	--	--	--	9.00	0.360	0.060	non - plastic			
NLU19-GE-S2	1 - 2	256.2	15.5	55.3	0.90	9.00	2.39	29.3	--	--	--	--	--	9.16	0.246	0.043	100.1	81.7	18.4	OH
NLU19-GE-S3	2 - 3	655.5	9.2	69.4	0.93	13.29	2.25	18.0	5.0	69.4	655.5	9.2	7	13.08	0.462	0.181	179.8	111.3	68.5	OH
NLU19-GE-S4	3 - 4	881.2	6.2	60.9	0.95	19.00	1.84	12.3	5.0	60.9	881.2	6.2	7	14.40	0.371	0.069	241.6	205.1	36.5	OH

**Notes:**

- 1) Depths presented above are recovered depths.
- 2) Unconsolidated Undrained test results.
- 3) Deviator stress at 10% (0.1) strain.
- 4) Void ratio prior to test for consolidation sample.
- 5) Modified compression index.
- 6) Coefficient of Consolidation (average for all loading increments).
- 7) Atterberg limits: LL = liquid limit; PL = plasticity limit; PI = plasticity index
- 8) The specific gravity was determined in the lab according to ASTM D-854 Method.

**Rosa Environmental & Geotechnical Laboratory, LLC**

1001 SW Klickitat Way, Suite 107  
Seattle, WA 98134  
206.287.9122 P  
206.264.1995 F

January 22, 2003

Mr. Winston Chen  
The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134

**Subject: Lake Union Sediments,      REGL Project No. 1003-649**

Dear Mr. Chen;

Thank you for pointing out the data entry errors in our original report. The data has been revised and the following pages reflect the correct sample numbers and depths.

Please call me to discuss any questions, or comments you may have on the data or its presentation. Thank you for selecting REG Lab to perform this analysis for you.

Best Regards,  
Rosa Environmental & Geotechnical Laboratory, LLC.

  
Harold Benny  
Laboratory Manager

# Rosa Environmental & Geotechnical Laboratory, LLC

1001 SW Klickitat Way, Suite 107

Seattle, WA 98134

206.287.9122 P

206.264.1995 F

Client: The RETEC Group, Inc.

REGL Project No.: 1003-649


Client Project: Lake Union Sediments

## Case Narrative

1. Samples were received on October 21 and 22, 2002 and were in good condition. Many of the samples had free product in them, which caused some minor variations in testing procedures. Where this was significant, it is noted below. Care should be taken in evaluation of data such as moisture contents, because some of the weight loss during oven drying was due to loss of product, and not entirely water.
2. The samples were submitted for grain size analysis, density and porosity, Atterberg limits, UU triaxial strength, consolidation, and specific gravity.
3. The grain size distribution was measured according to PSEP methodology and was reported previously as job # 1003-650.
4. The Atterberg limits were requested on 12 samples, but this test was only appropriate on eight of them. These were set up according to ASTM D4318. Although every effort was made to complete the test on these eight, only four were actually plastic.
5. The unconsolidated, undrained triaxial strength was measured on five of the samples according to ASTM D2850. A minimal confining pressure of 5 psi was used.
6. The bulk wet density, moisture content, and dry density were measured on all 12 geotech samples. When appropriate, the samples used for triaxial strength testing were used for these measurements. The consolidation samples, taken from elsewhere in the core, have different density and moisture content values.
7. The one-dimensional consolidation was measured on five samples according to ASTM D2435, Method B. Stress-strain plots and void ratio-strain plots are provided. Because some of the samples had oily product in them, some of the saturation values are not typical. The saturation calculation is based on the density of water and not free product. Between tests, the porous stones were washed with acetone and methylene chloride to clean them up and ensure the stones would allow water to flow out for the following test.
8. The specific gravity was measured according to ASTM D854.
9. There were no other apparent anomalies in the samples or method of testing.

Approved by:

Title:

  
Laboratory Manager

Date:

11/28/02









# Core Descriptions

ROSA ENVIRONMENTAL AND GEOTECHNICAL LABORATORY, LLC

The RETEC Group, Inc.  
 North Lake Union Phase Two  
 Archival Samples Core Extrusions and Descriptions

NLU09-GE-S5 4-5'	Dark gray, clean, medium sand with some coarse gravel
NLU09-GE-S6 5-6'	Dark gray, clean, medium sand with some coarse gravel
NLU09-GE-S7 6-7'	Dark gray, clean, medium sand
NLU09-GE-S8 7-8'	Dark gray, clean sand becoming finer at the bottom
NLU18-GE-S5 5-6'	Top half is gray sand with some oily sheen. Bottom half is coarse gravel with oily sheen and strong odor.
NLU18-GE-S6 6-7'	Coarse gravel with sand, oily sheen present, clay/silt ball in middle of core
NLU18-GE-S7 7-8'	Coarse gravel with silt/clay balls in bottom 1/3 of core, oily sheen decreasing toward the bottom
NLU18-GE-S8 8-9'	Sand and gravel with less oily sheen
NLU18-GE-S9 9-10'	Sand and gravel with a sticky, dry ball of finer material near top, 3" thick. Oily sheen and odor still present.
NLU18-GE-S10 10-11'	Top third is coarse sand and gravel with oily sheen. Lower part is sticky, finer material with gravel, no oily sheen.
NLU18-GE-S11 11-12'	Coarse gravel with heavy sheen.
NLU19-GE-S5 4-5'	Brown uniform muck, very lightweight
NLU19-GE-S6 5-6'	Brown uniform muck, very lightweight
NLU19-GE-S7 6-7'	Brown uniform muck, very lightweight
NLU09-GE-S8 7-8'	Brown uniform muck, very lightweight

# Bulk Wet Density, Moisture Content, Dry Density, and Specific Gravity

ROSA ENVIRONMENTAL AND GEOTECHNICAL LABORATORY

The Retec Group  
Lake Union Sediments

Wet and Dry Density, Moisture Content, Porosity and Specific Gravity

Sample Identification	Depth (ft)	Wet Density (lbs/ft <sup>3</sup> )	Moisture Content (%)	Dry Density (lbs/ft <sup>3</sup> )	Total Porosity
NLU09-GE-S1	0-1'	126.5	18.9	106.4	0.37
NLU09-GE-S2	1-2'	129.1	20.9	106.8	0.37
NLU09-GE-S3	2-3'	118.4	16.2	101.9	0.40
NLU09-GE-S4	3-4'	128.8	15.1	111.9	0.34
NLU18-GE-S1	0-2	67.1	393.6	13.6	0.91
NLU18-GE-S2	2-3	77.9	191.2	26.8	0.83
NLU18-GE-S3	3-4	128.2	21.3	105.7	0.36
NLU18-GE-S4	4-5	131.9	15.4	114.3	0.33

Notes:

1. The moisture content was determined in accordance with ASTM D-2216.
2. The wet density was determined from the average length, diameter and wet weight of the sample.
3. The dry density was determined by dividing the wet density by (1+ moisture content).
4. The specific gravity was determined according to ASTM D-854.
5. The porosity was calculated from the bulk density and specific gravity values.

ROSA ENVIRONMENTAL AND GEOTECHNICAL LABORATORY

The Retec Group  
Lake Union Sediments

Wet and Dry Density, Moisture Content, Porosity and Specific Gravity

Sample Identification	Depth (ft)	Wet Density (lbs/ft <sup>3</sup> )	Moisture Content (%)	Dry Density (lbs/ft <sup>3</sup> )	Total Porosity
NLU19-GE-S1	0-1'	65.5	465.1	11.6	0.92
NLU19-GE-S2	1-2'	55.3	256.2	15.5	0.90
NLU19-GE-S3	2-3'	69.4	655.5	9.2	0.93
NLU19-GE-S4	3-4'	60.9	881.2	6.2	0.95

Notes:

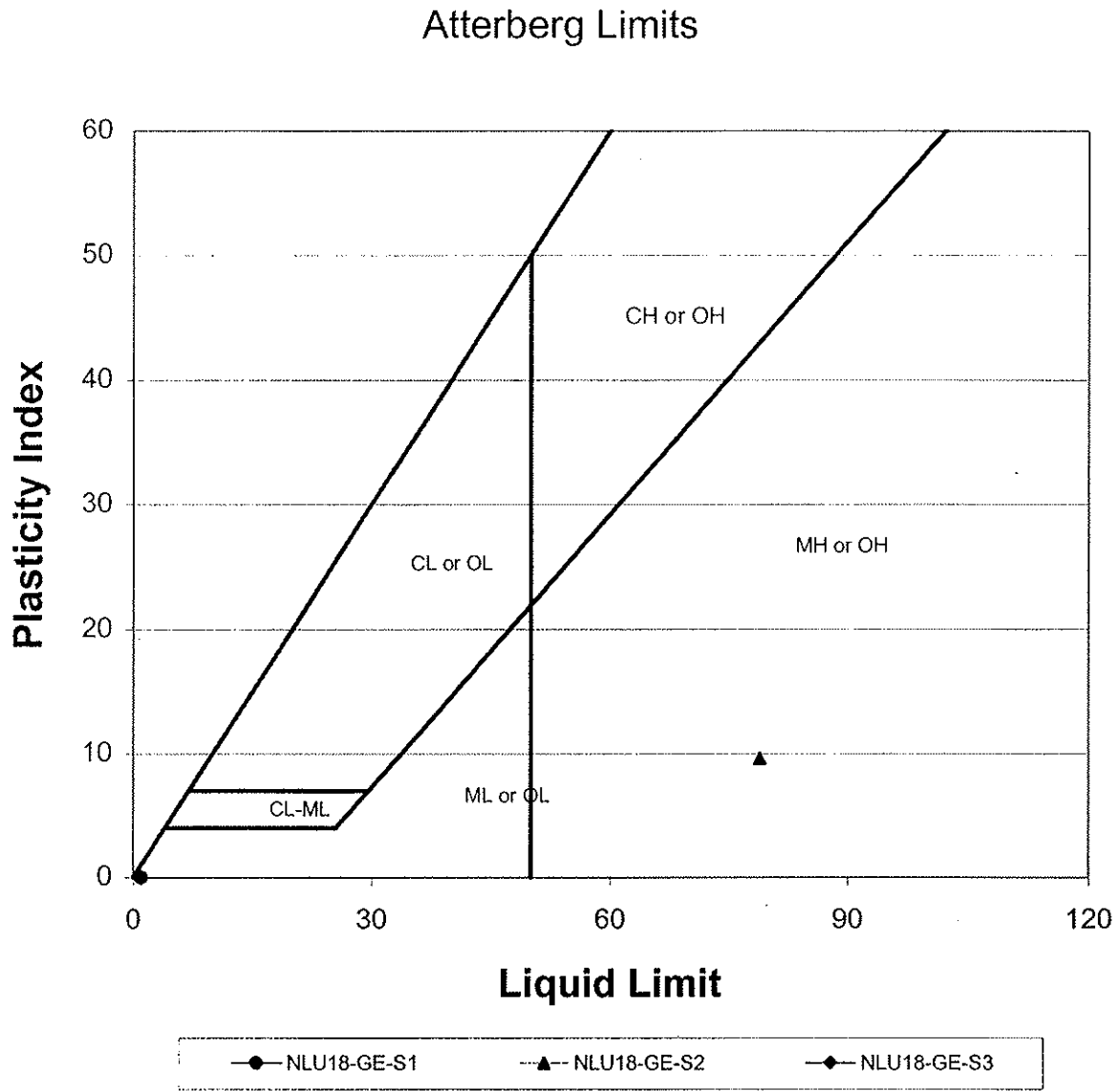
1. The moisture content was determined in accordance with ASTM D-2216.
2. The wet density was determined from the average length, diameter and wet weight of the sample.
3. The dry density was determined by dividing the wet density by (1+ moisture content).
4. The specific gravity was determined according to ASTM D-854.
5. The porosity was calculated from the bulk density and specific gravity values.



Atterberg Limits

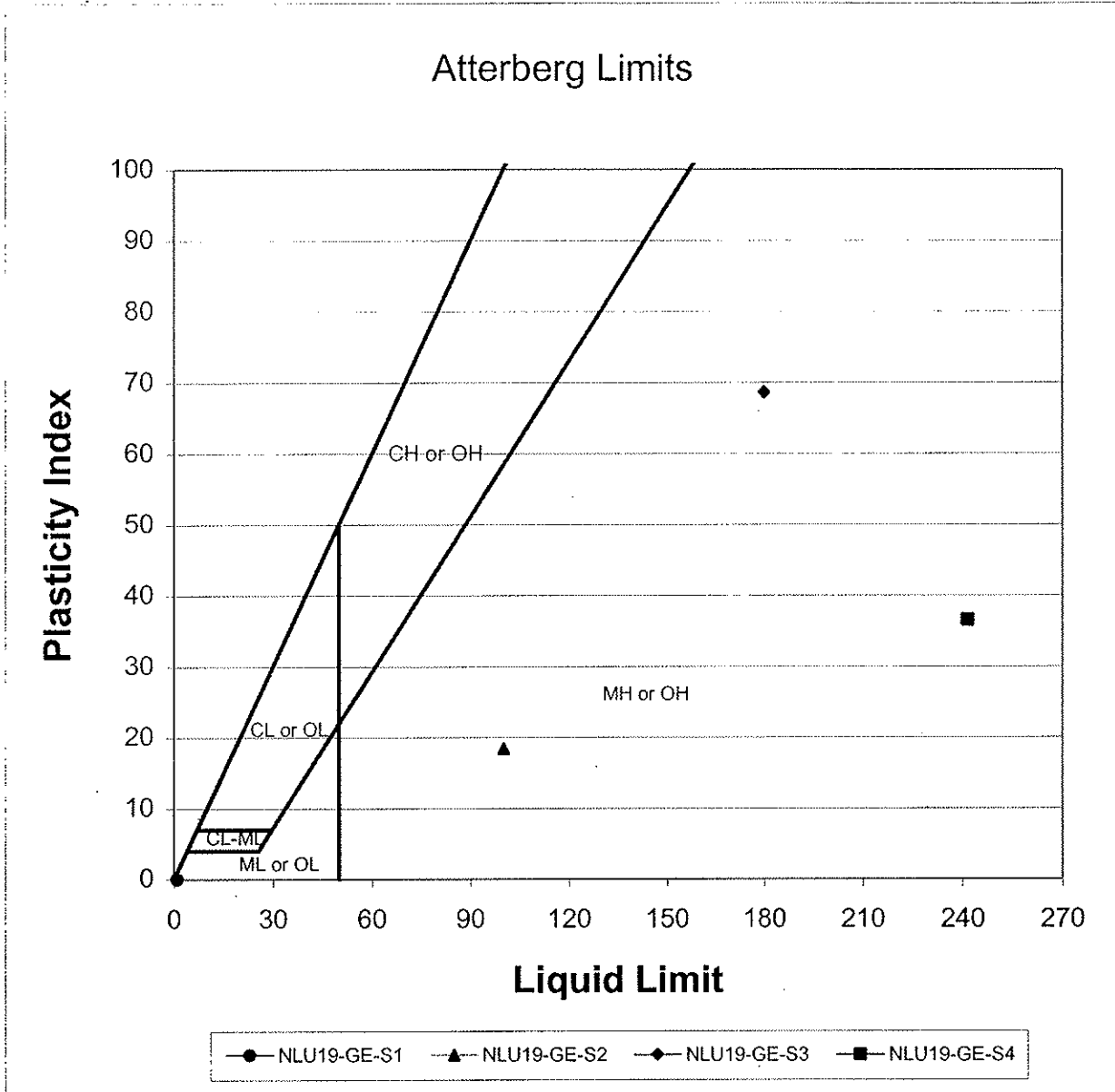
ASTM D4318

The Retec Group  
Lake Union Sediments



Sample Number	Depth	Plasticity Index	Liquid Limit	Plastic Limit	Classification
NLU18-GE-S1	0-2'	NA	NA	NA	Not Plastic
NLU18-GE-S2	2-3'	9.6	79.0	69.4	OH
NLU18-GE-S3	3-4'	NA	NA	NA	Not Plastic

The Retec Group  
Lake Union Sediments

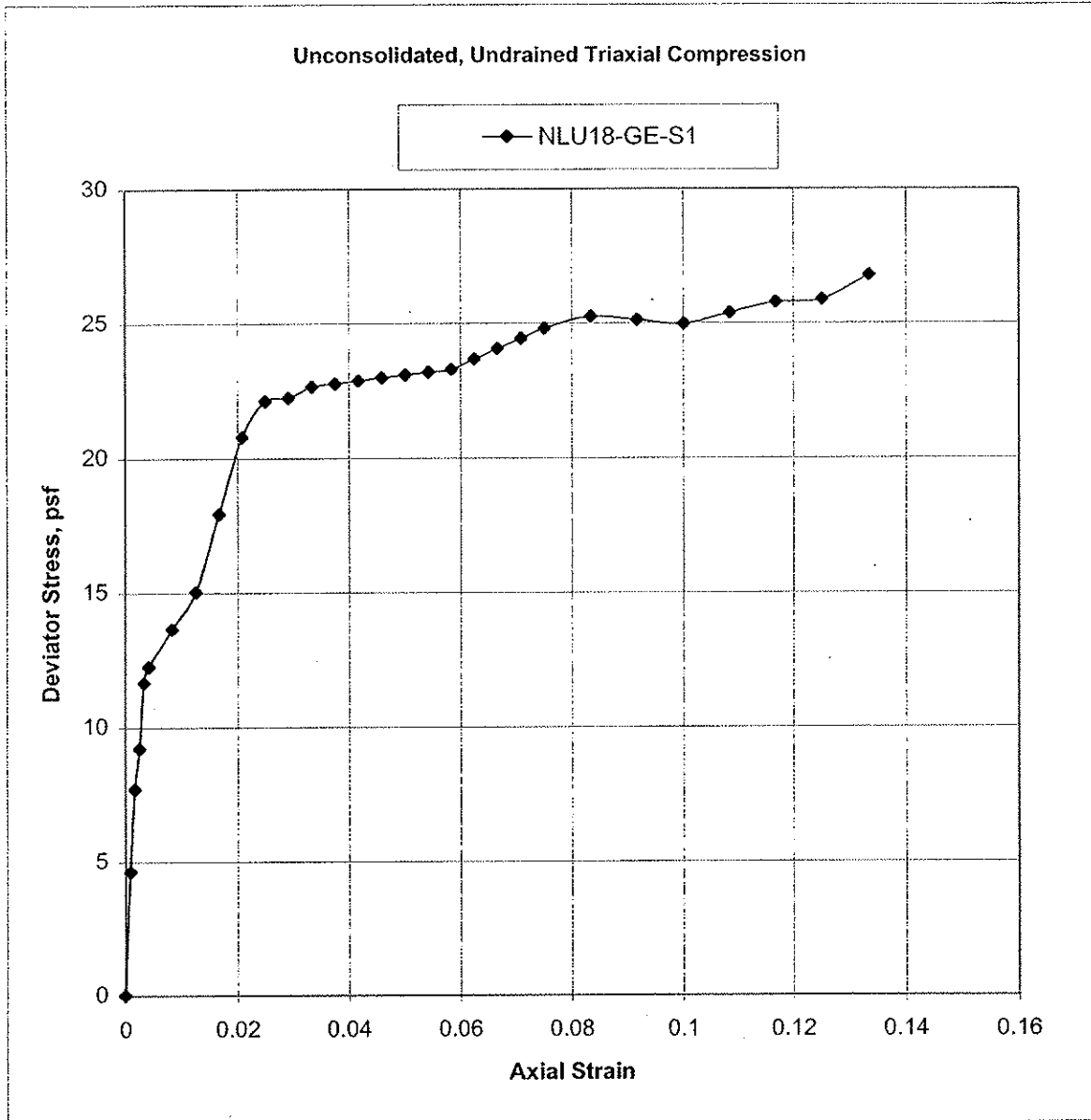


Sample Number	Depth	Plasticity Index	Liquid Limit	Plastic Limit	Classification
NLU19-GE-S1	0-1'	NA	NA	NA	Non-Plastic
NLU19-GE-S2	1-2'	18.4	100.1	81.7	OH
NLU19-GE-S3	2-3'	68.6	179.8	111.3	OH
NLU19-GE-S4	3-4'	36.5	241.6	205.1	OH

Unconsolidated, Undrained Triaxial Strength

ASTM D2850

The Retec Group  
Lake Union Sediments

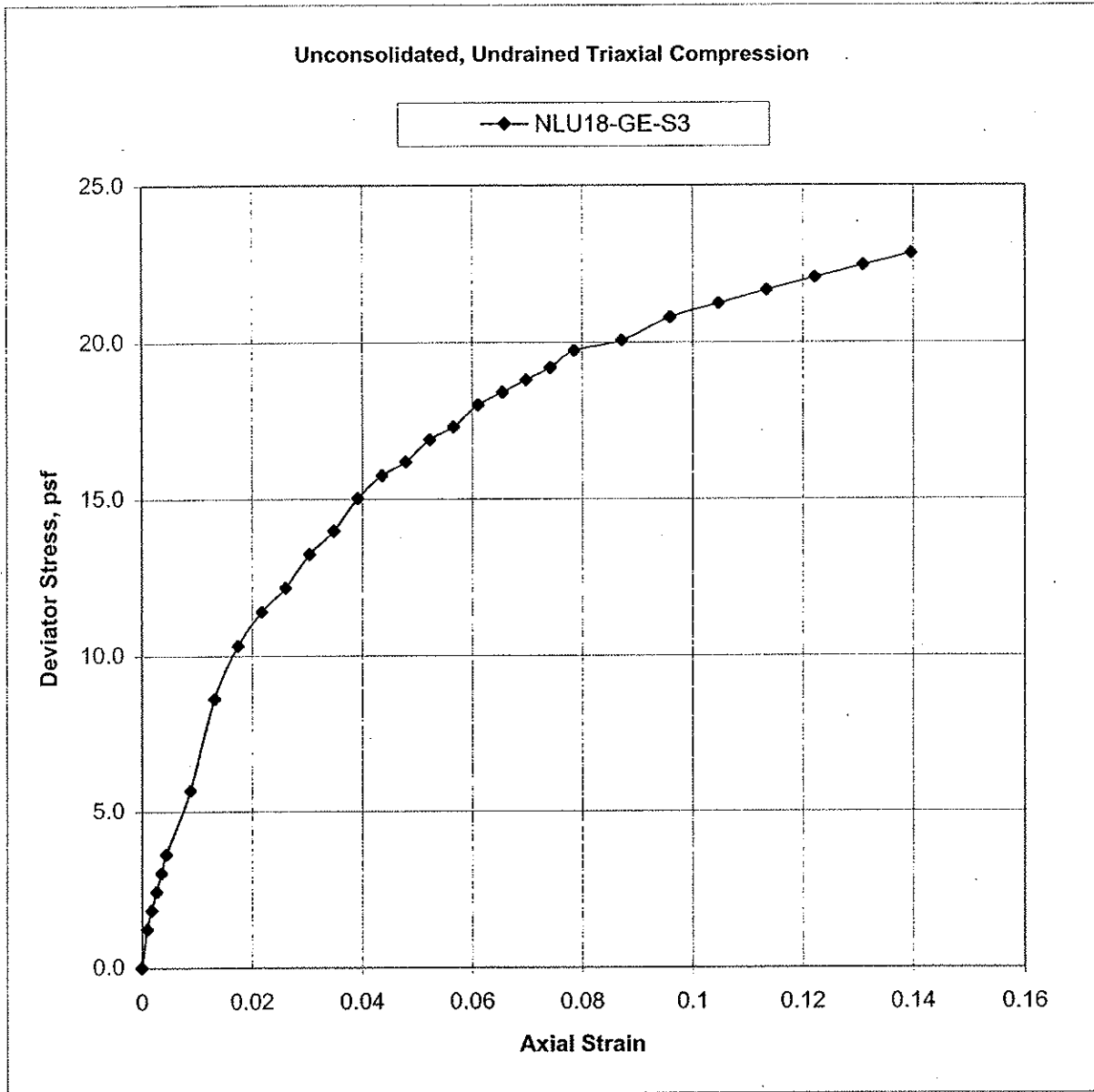


Sample ID	Depth (ft)	Confining Pressure (psi)	Wet Density (pcf)	Moisture Content (%)	Dry Density (pcf)
NLU18-GE-S1	0-2	5.0	67.1	393.6	13.6

Notes to the testing:

1. The testing was performed according to ASTM D-2850.
2. The sample had a bulging failure.

The Retec Group  
Lake Union Sediments

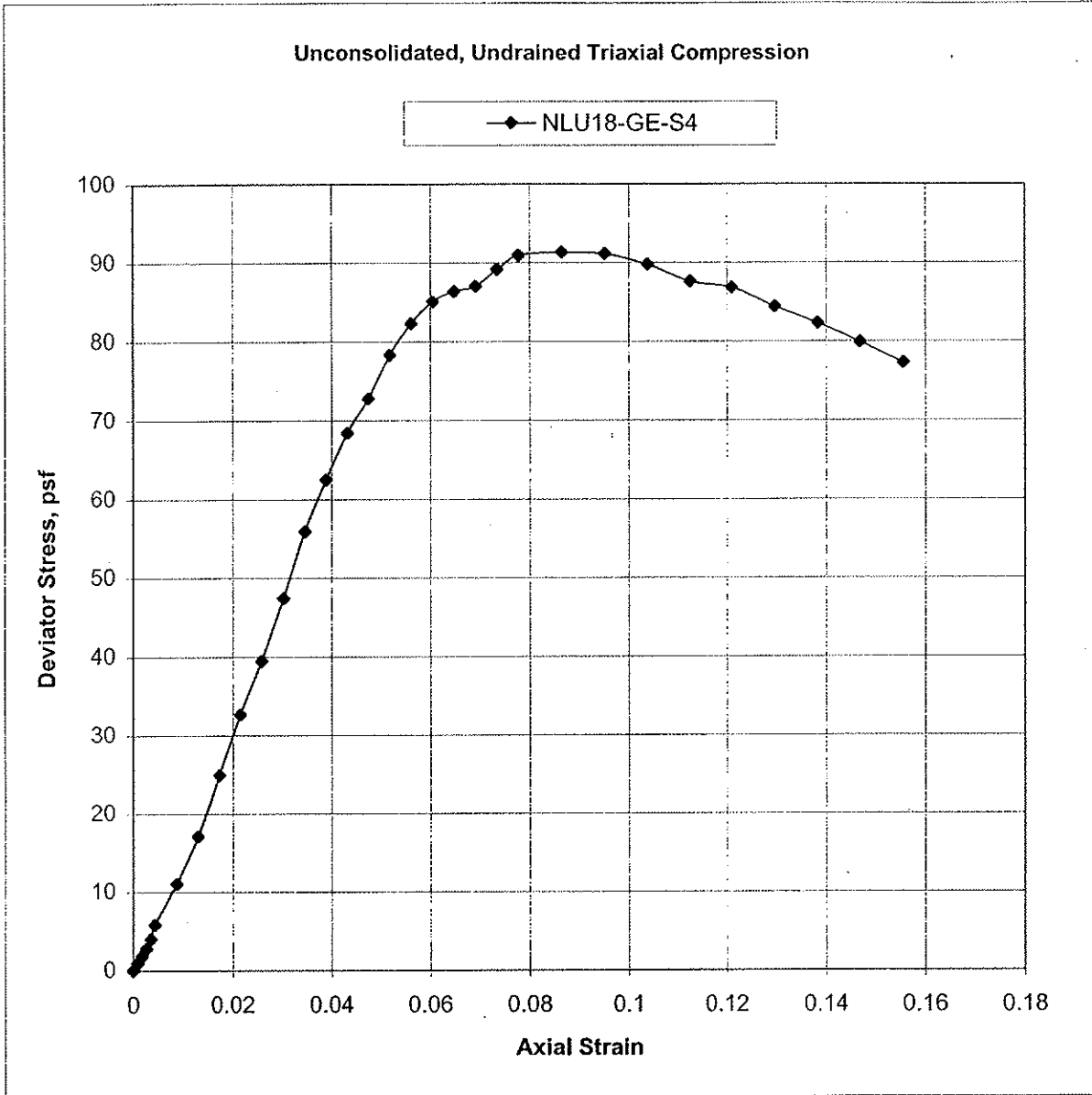


Sample ID	Depth (ft)	Confining Pressure (psi)	Wet Density (pcf)	Moisture Content (%)	Dry Density (pcf)
NLU18-GE-S3	3-4	5.0	128.2	21.3	105.7

Notes to the testing:

1. The testing was performed according to ASTM D-2850.
2. The sample had a bulging failure.

The Retec Group  
Lake Union Sediments

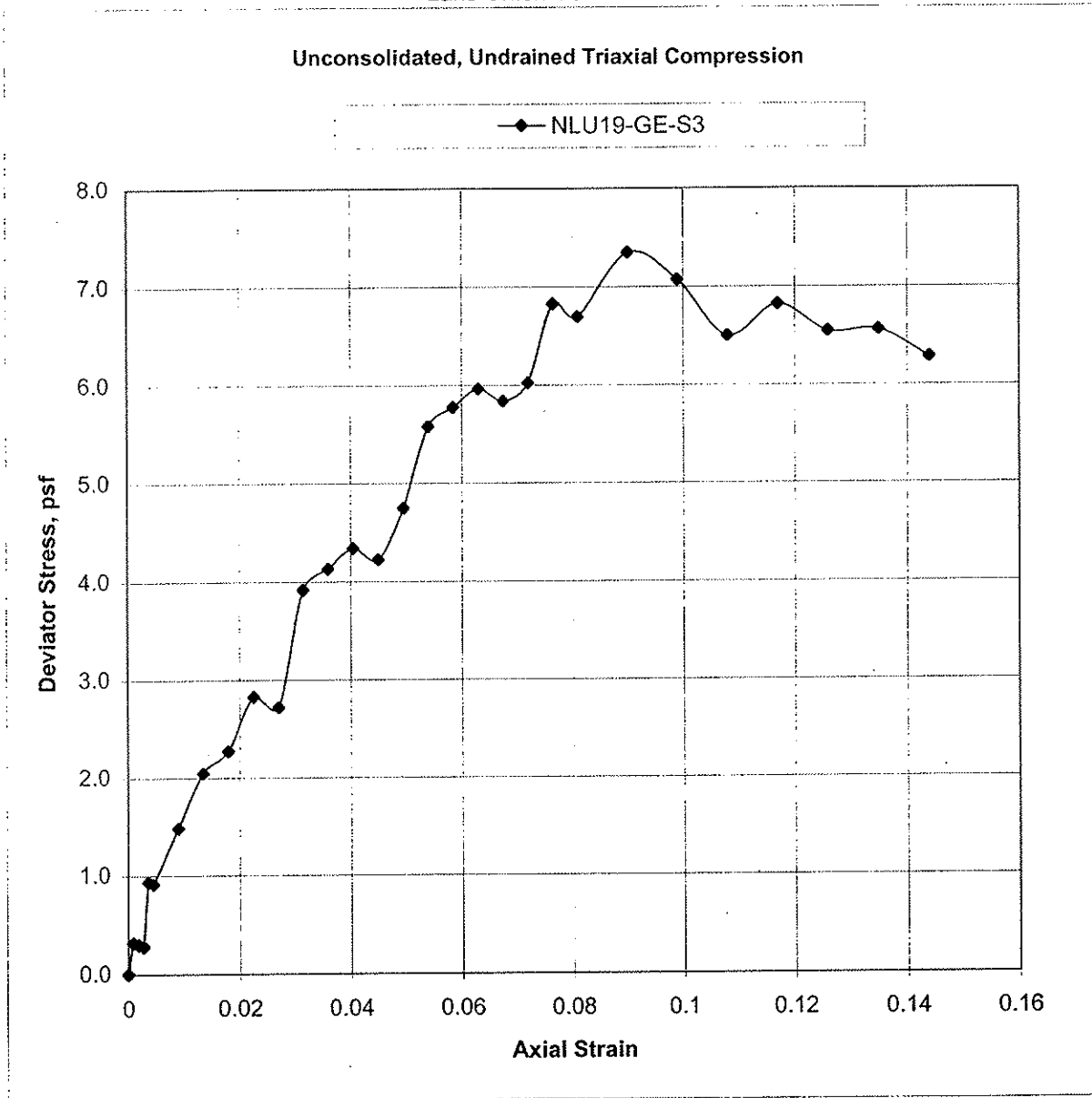


Sample ID	Depth (ft)	Confining Pressure (psi)	Wet Density (pcf)	Moisture Content (%)	Dry Density (pcf)
NLU18-GE-S4	4-5	5.0	131.9	15.4	114.3

Notes to the testing:

1. The testing was performed according to ASTM D-2850.
2. The sample had a bulging failure.

The Retec Group  
Lake Union Sediments



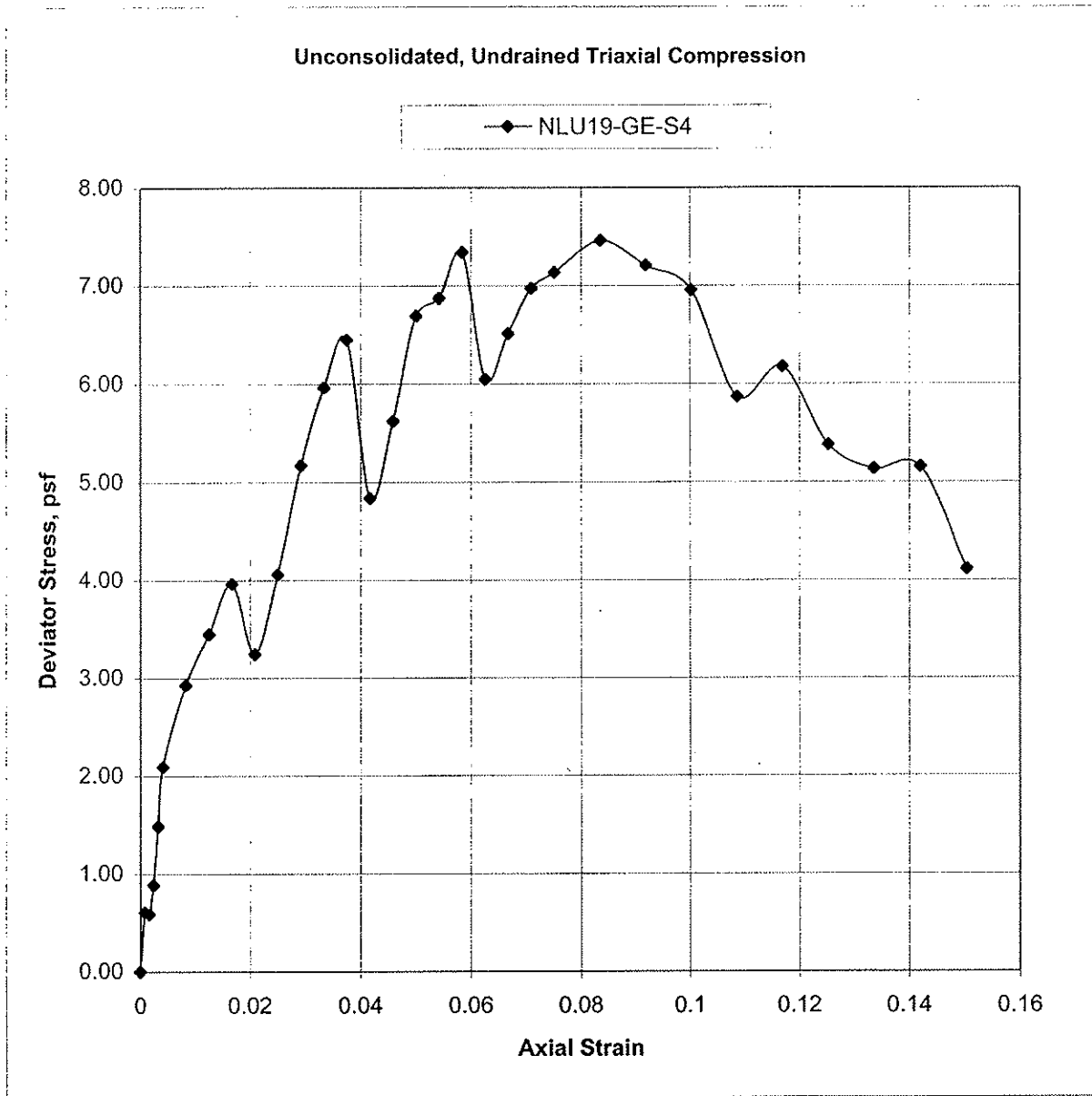
Sample ID	Depth (ft)	Confining Pressure (psi)	Wet Density (pcf)	Moisture Content (%)	Dry Density (pcf)
NLU19-GE-S3	2-3	5.0	69.4	655.5	9.2

Notes to the testing:

1. The testing was performed according to ASTM D-2850.
2. The sample had a bulging failure.



The Retec Group  
Lake Union Sediments



Sample ID	Depth (ft)	Confining Pressure (psi)	Wet Density (pcf)	Moisture Content (%)	Dry Density (pcf)
NLU19-GE-S4	3-4	5.0	60.9	881.2	6.2

Notes to the testing:

1. The testing was performed according to ASTM D-2850.
2. The sample had a bulging failure.

# One Dimensional Consolidation

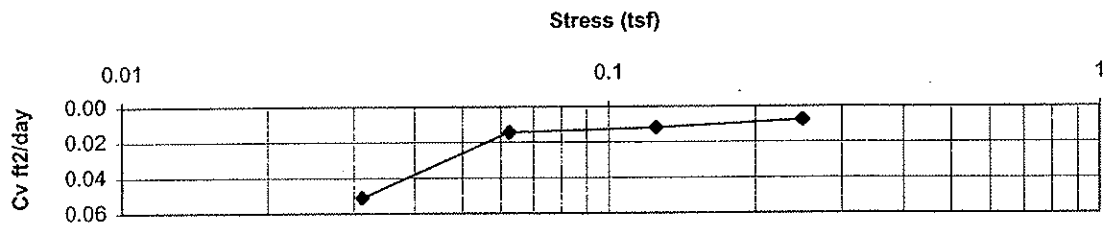
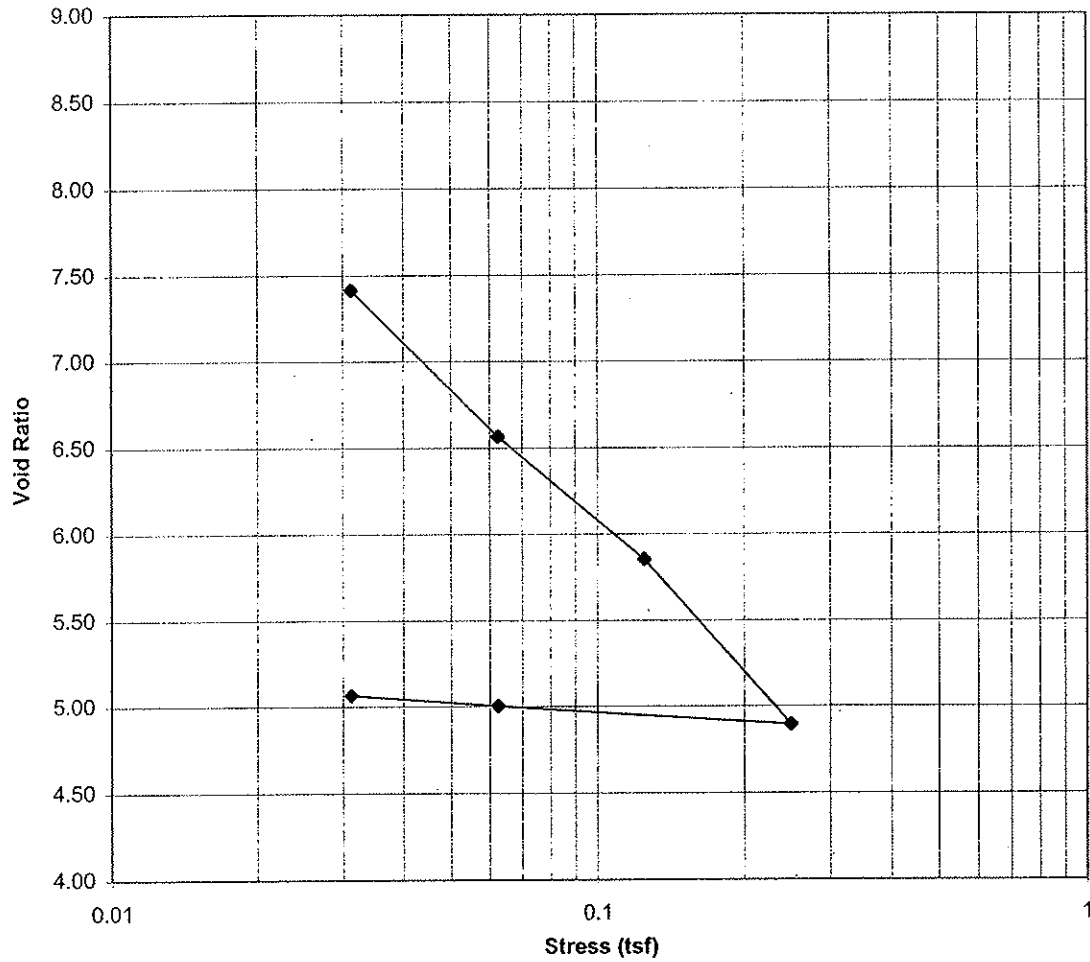
ASTM D2435





### Consolidation Test Results

NLU18-GE-S1 (0-2')

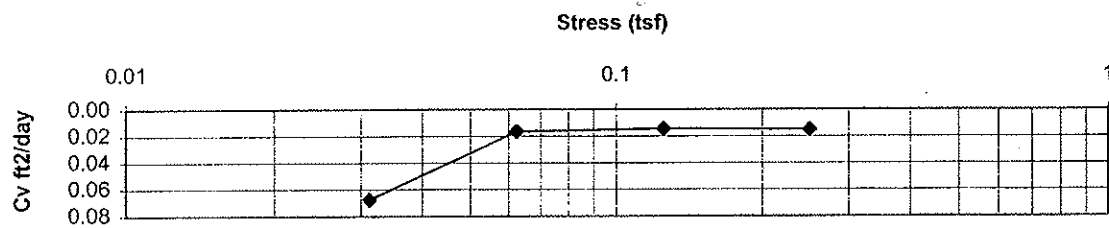
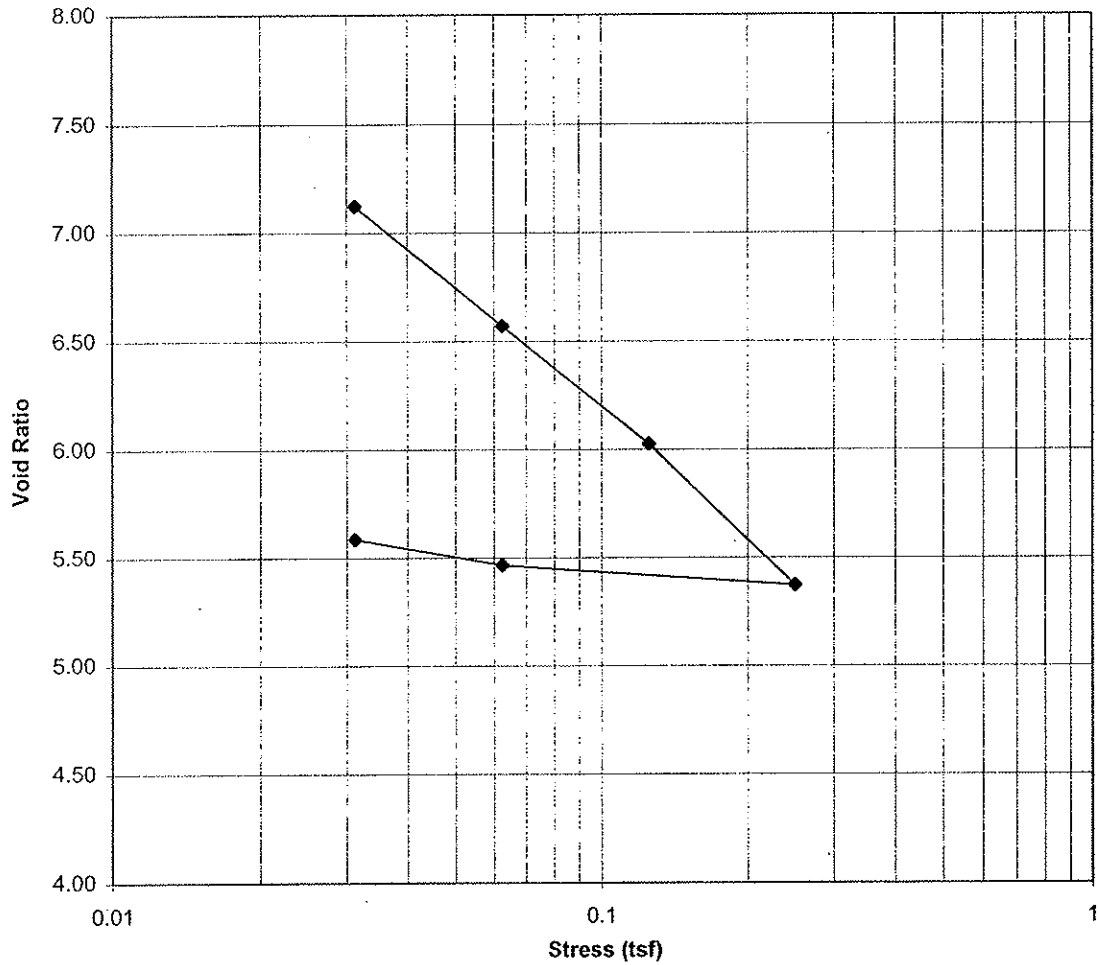






### Consolidation Test Results

NLU18-GE-S2 (2-3')





The Retec Group, Inc.  
GJRW1-04403-961

Project Number:	1003-649	Job Name:	Lake Union
Boring / Sample	NLU18-GE-S3 (3-4')	Job Number	GJRW1-04403-961
Sample Initial Height	0.9925	Job Location	Seattle
Initial Dial Indicator	0.4724	DI after Seating load	0.4549

**Consolidation Test Summary**

S <sub>0</sub>	S <sub>90</sub>	S <sub>100</sub>	S <sub>r</sub>	t <sub>90</sub> (min)	Sample Height	Drainage Path	Cv (ft <sup>2</sup> /day)	Load (tsf)	Strain Ratio
0.4532	0.4462	0.4454	0.4447	3.5	0.9823	0.4912	0.058	0.03125	0.0279
0.4442	0.4225	0.4201	0.4205	6.0	0.9581	0.4791	0.032	0.0625	0.0523
0.4190	0.3630	0.3568	0.3568	14.0	0.8944	0.4472	0.012	0.125	0.1165
0.3565	0.3200	0.3159	0.3159	12.0	0.8535	0.4268	0.013	0.25	0.1577
0.3145	0.2800	0.2762	0.2761	6.3	0.8137	0.4069	0.022	0.5	0.1978
0.2771	0.2799	0.2802	0.2803	0.7	0.8179	0.4090	0.203	0.125	0.1936
0.2815	0.2901	0.2911	0.2918	3.5	0.8294	0.4147	0.042	0.03125	0.1820

**Sample Parameters**

Initial Moisture Content, %	292	Final Moisture Content, %	235
Initial Dry Unit Weight, lb/ft <sup>3</sup>	28	Final Dry Unit Weight, lb/ft <sup>3</sup>	33
Initial Void Ratio	5.01	Final Void Ratio	4.02
Initial Saturation	1.52	Final Saturation	1.55

The following equations were used to calculate the values shown in the table above:

$$C_v = T H^2 / t_{90}$$

Where:

T = the time factor for 90% consolidation

H = average of initial and final heights of the sample at each load, divided by 2

(S<sub>0</sub> + S<sub>100</sub>)/2 (for double drainage paths)

t<sub>90</sub> = the time at which 90% consolidation has occurred, as derived from square root of time plots for each load.

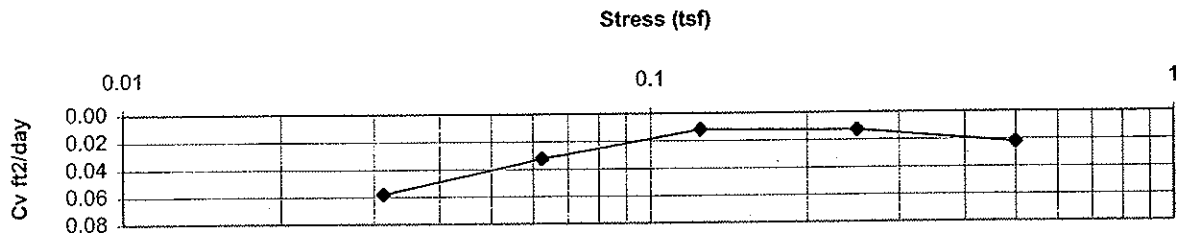
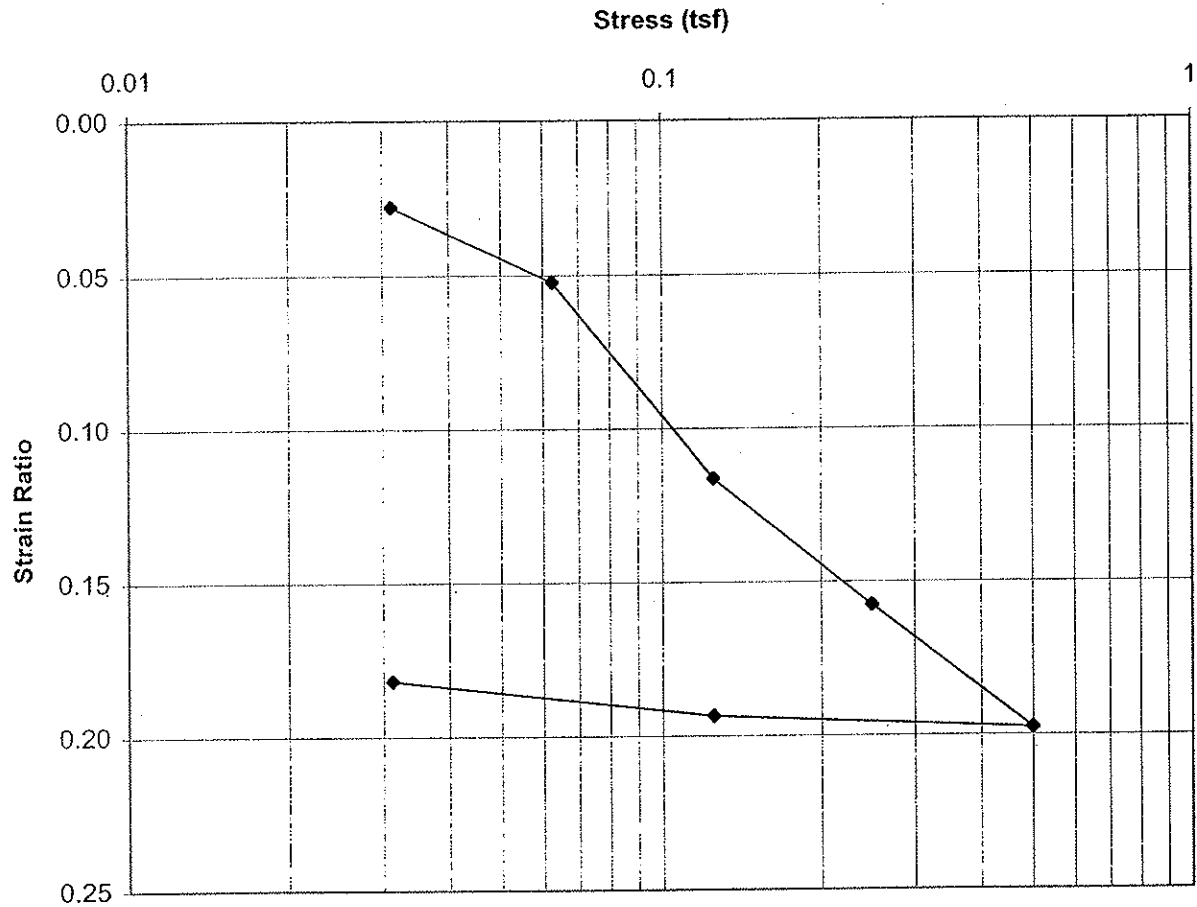
Notes to the Testing:

1. The sample was extruded from the sample tube and trimmed into a consolidation ring. The sample was inundated at the time of the seating load was applied. The test was run according to ASTM D-2435, Method B.

The Retec Group, Inc.  
GJRW1-04403-961

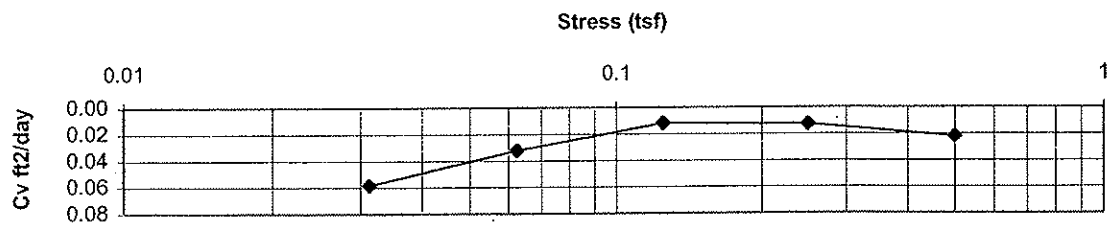
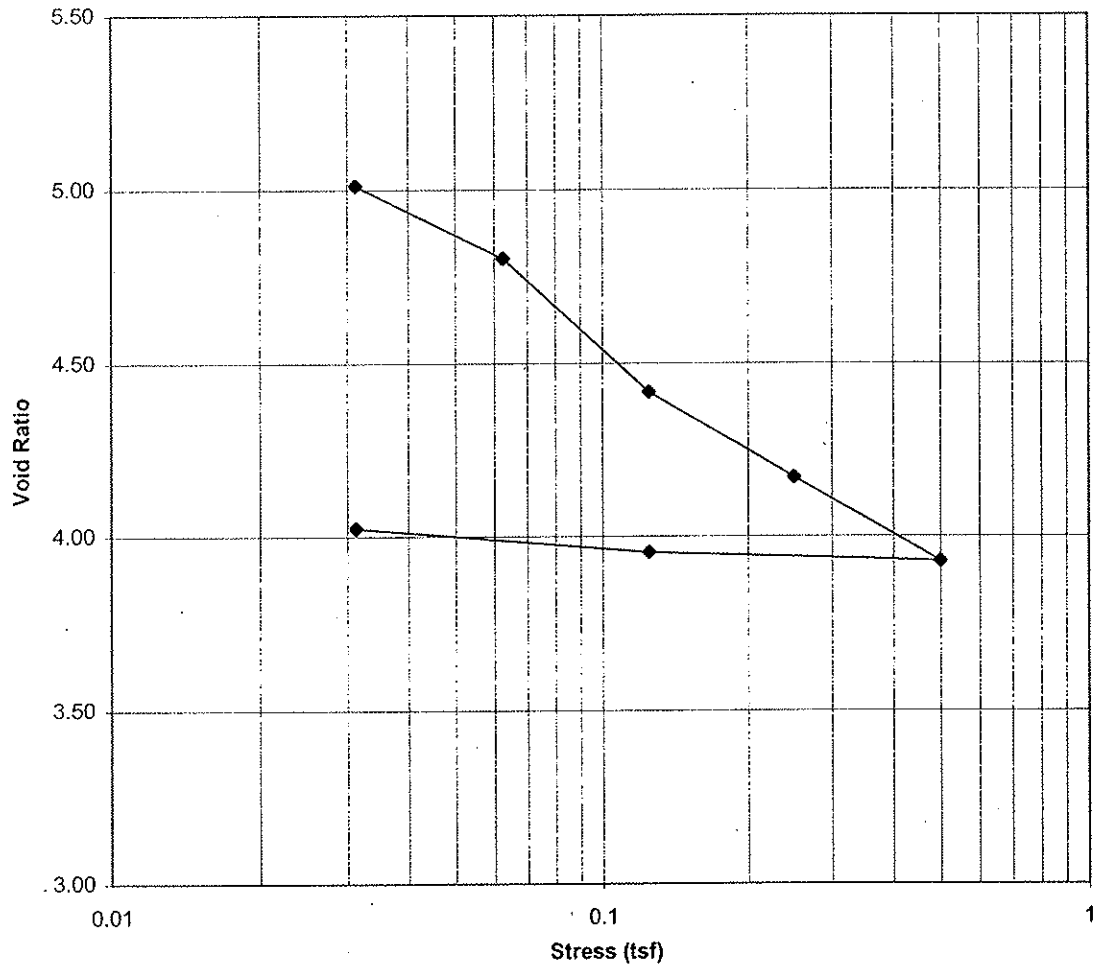
### Consolidation Test Results

NLU18-GE-S3 (3-4')



### Consolidation Test Results

NLU18-GE-S3 (3-4')



The Retec Group, Inc.  
GJRW1-04403-961

Project Number:	1003-649	Job Name:	Lake Union
Boring / Sample	NLU18-GE-S4 (4-5')	Job Number	GJRW1-04403-961
Sample Initial Height	1.0020	Job Location	Seattle
Initial Dial Indicator	0.4135	DI after Seating load	0.4055

**Consolidation Test Summary**

S <sub>0</sub>	S <sub>90</sub>	S <sub>100</sub>	S <sub>r</sub>	t <sub>90</sub> (min)	Sample Height	Drainage Path	Cv (ft <sup>2</sup> /day)	Load (tsf)	Strain Ratio
0.4048	0.4022	0.4019	0.4010	0.6	0.9975	0.4988	0.352	0.03125	0.0125
0.3990	0.3962	0.3959	0.3950	0.5	0.9915	0.4958	0.417	0.0625	0.0185
0.3929	0.3900	0.3897	0.3900	1.5	0.9865	0.4933	0.138	0.125	0.0235
0.3871	0.3859	0.3858	0.3848	1.5	0.9813	0.4907	0.136	0.25	0.0286
0.3808	0.3783	0.3780	0.3785	2.0	0.9750	0.4875	0.101	0.5	0.0349
0.3736	0.3720	0.3718	0.3715	0.6	0.9680	0.4840	0.331	1	0.0419
0.3731	0.3735	0.3735	0.3736	0.8	0.9701	0.4851	0.266	0.25	0.0398
0.3755	0.3762	0.3763	0.3764	1.0	0.9729	0.4865	0.201	0.0625	0.0370

**Sample Parameters**

Initial Moisture Content, %	16	Final Moisture Content, %	14
Initial Dry Unit Weight, lb/ft <sup>3</sup>	111	Final Dry Unit Weight, lb/ft <sup>3</sup>	115
Initial Void Ratio	0.54	Final Void Ratio	0.49
Initial Saturation	0.82	Final Saturation	0.79

The following equations were used to calculate the values shown in the table above:

$$C_v = T H^2 / t_{90}$$

Where:

T = the time factor for 90% consolidation

H = average of initial and final heights of the sample at each load, divided by 2  
(S<sub>0</sub> + S<sub>100</sub>)/2 (for double drainage paths)

t<sub>90</sub> = the time at which 90% consolidation has occurred, as derived from square root of time plots for each load.

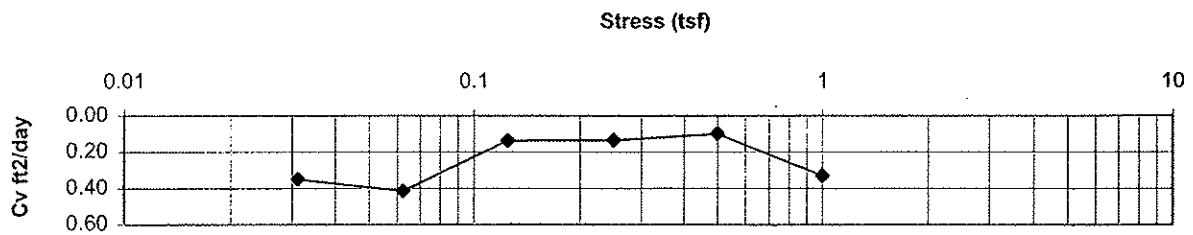
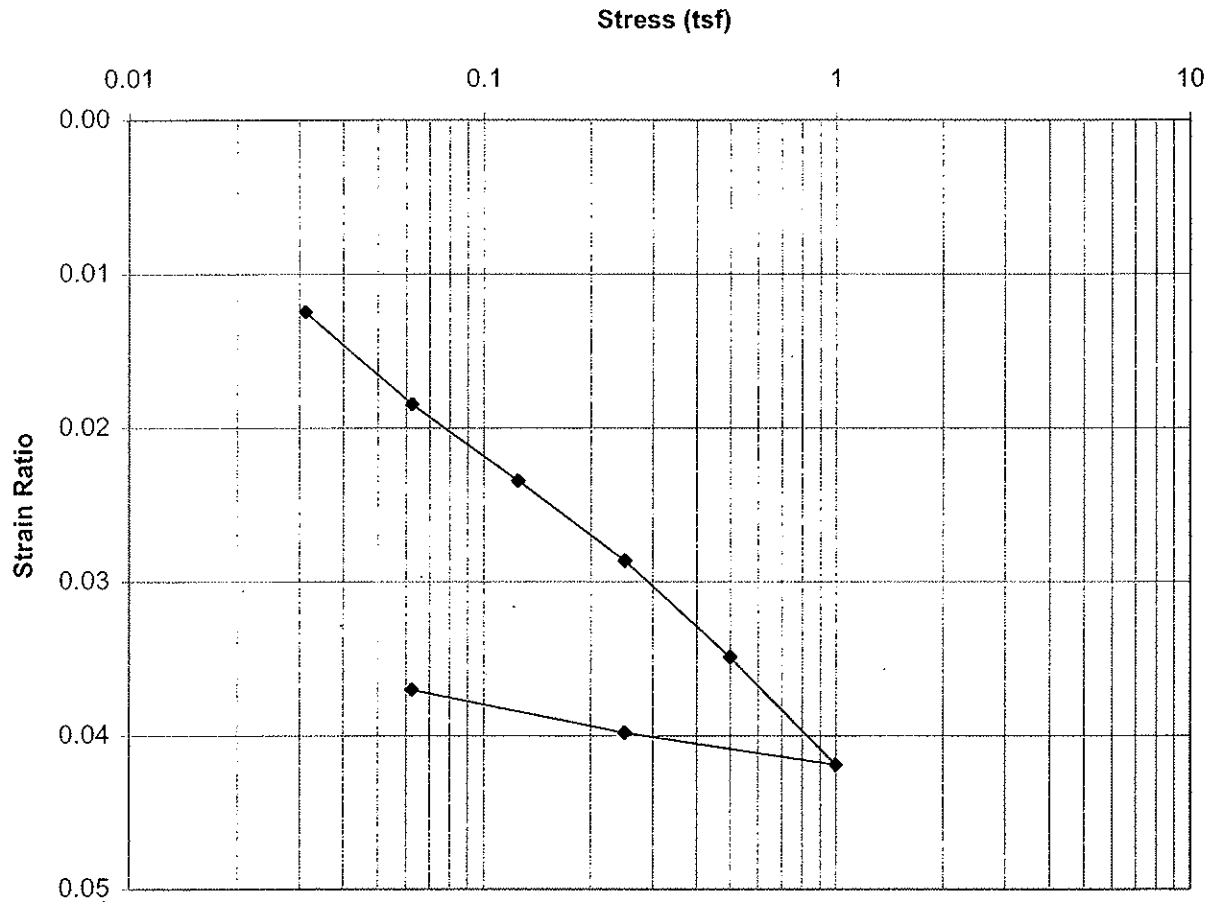
Notes to the Testing:

1. The sample was extruded from the sample tube and trimmed into a consolidation ring. The sample was inundated at the time of the seating load was applied. The test was run according to ASTM D-2435, Method B.

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GJRW1-04403-961

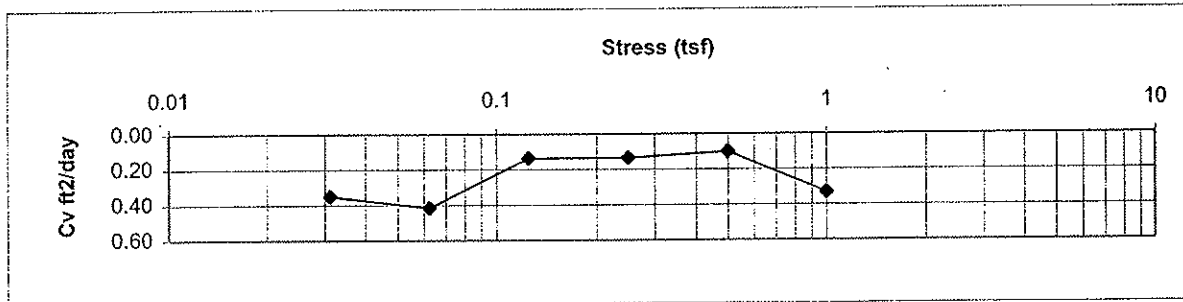
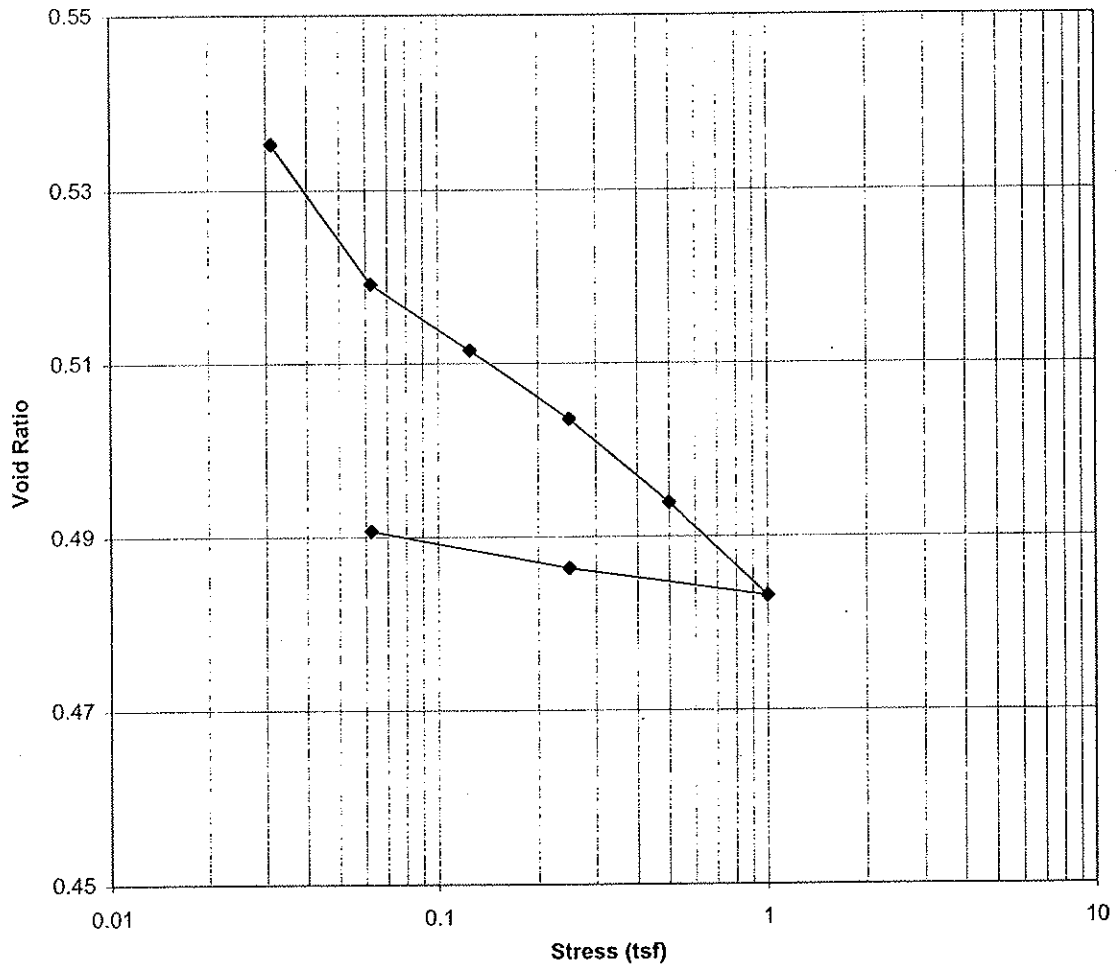
### Consolidation Test Results

NLU18-GE-S4 (4-5')



### Consolidation Test Results

NLU18-GE-S4 (4-5')

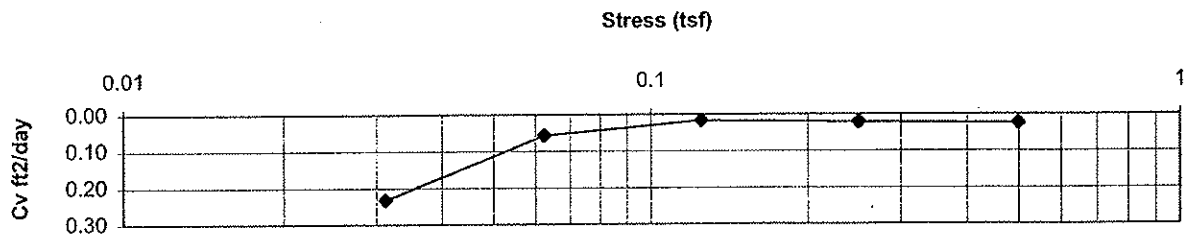
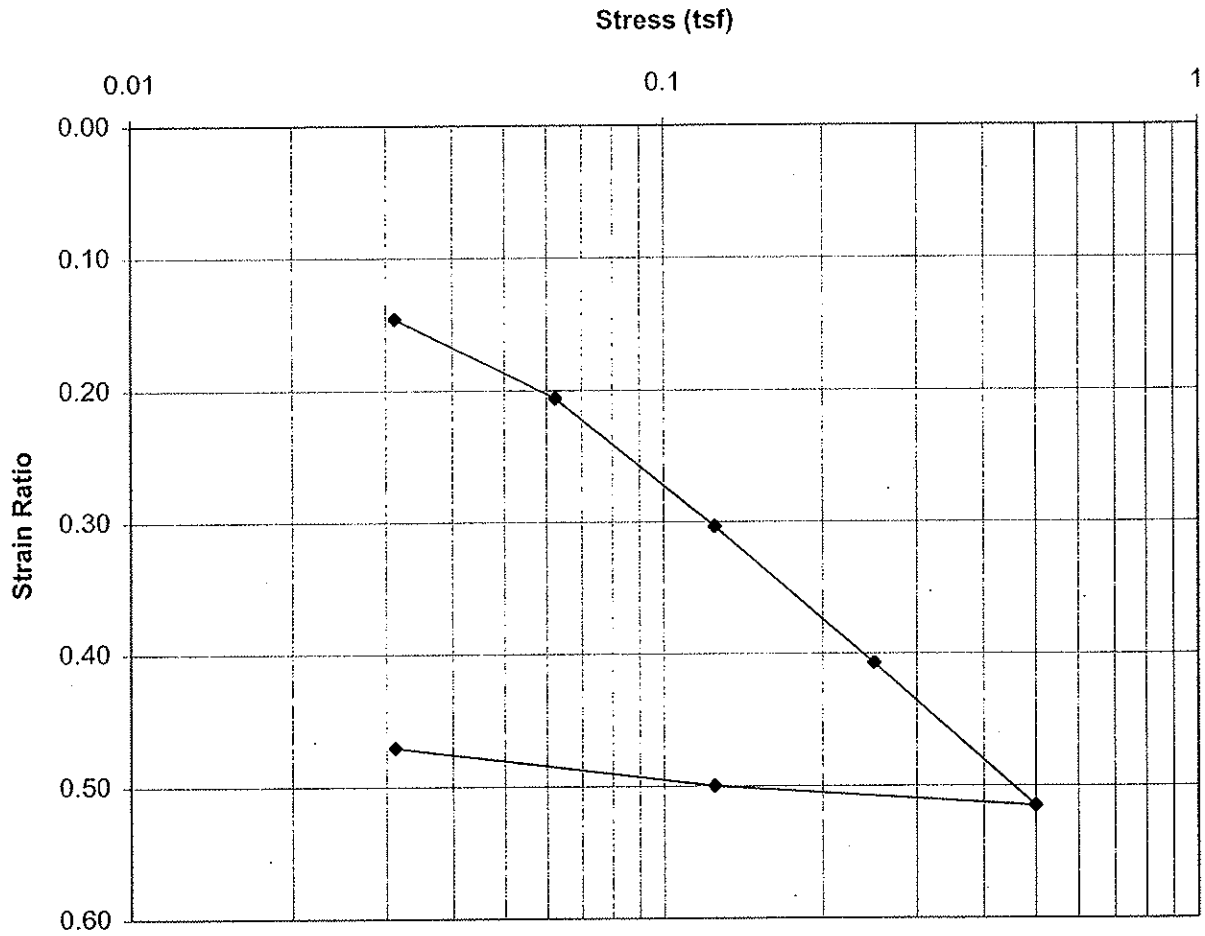




The Retec Group, Inc.  
GJRW1-04403-961

### Consolidation Test Results

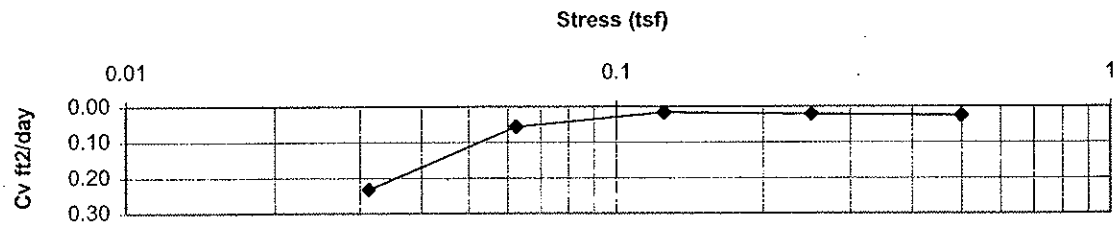
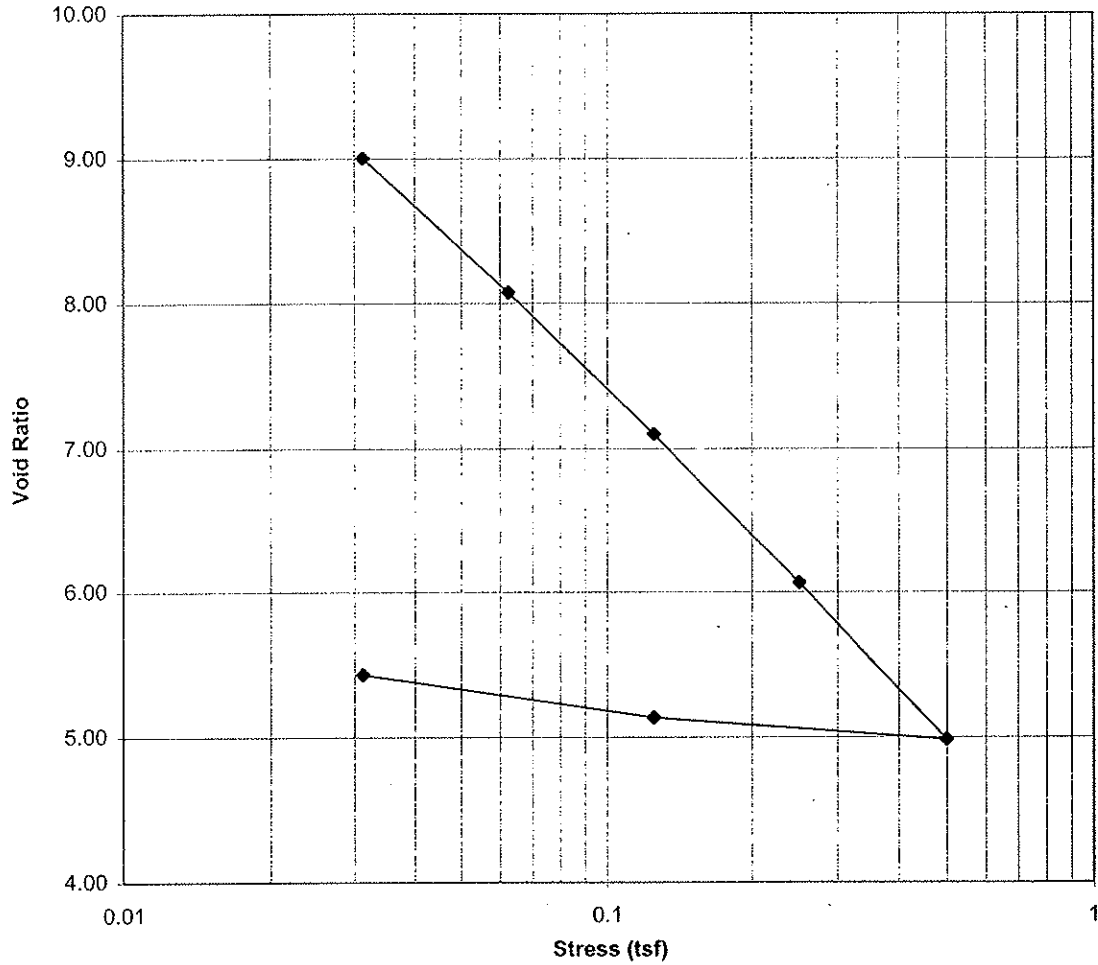
NLU19-GE-S1 (0-1')





### Consolidation Test Results

NLU19-GE-S1 (0-1')

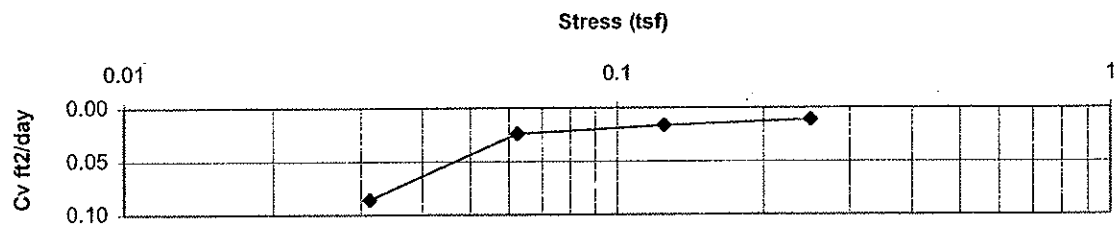
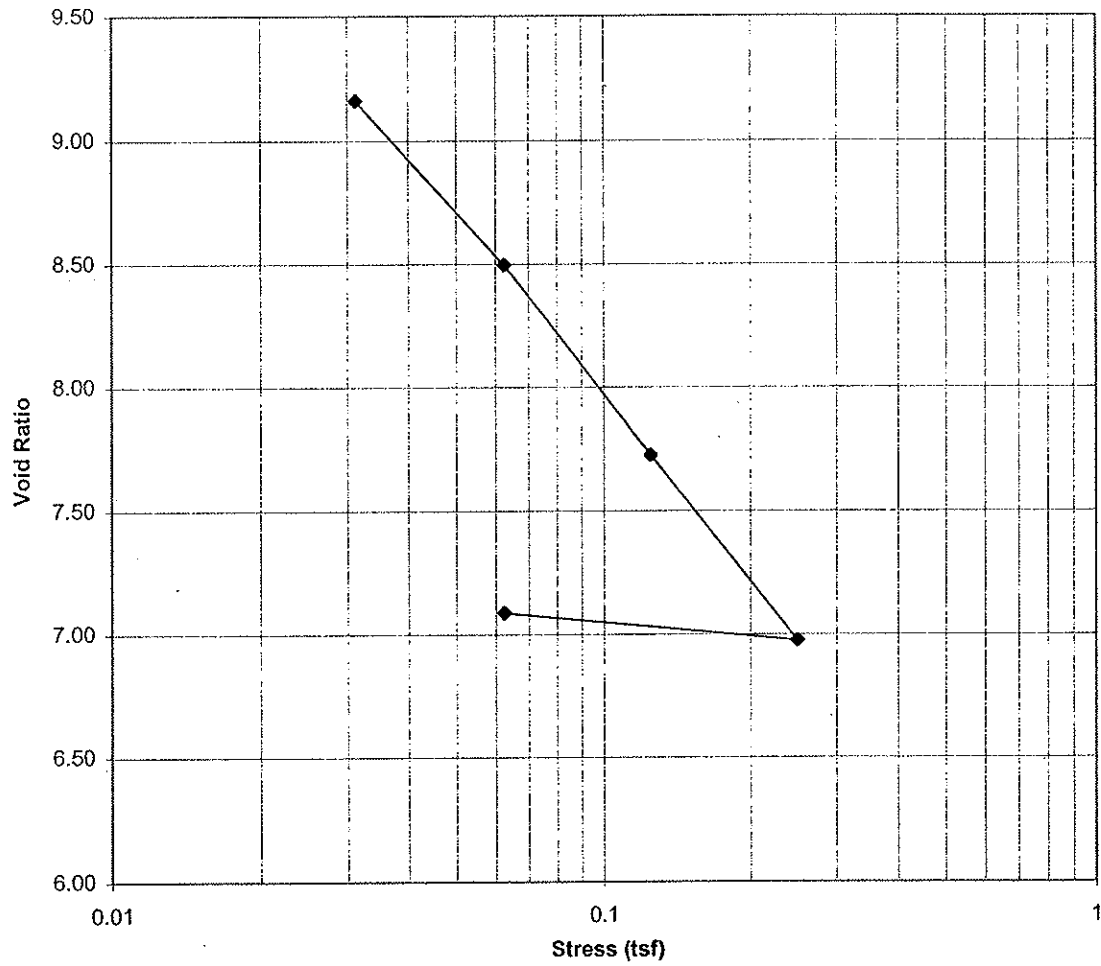






### Consolidation Test Results

NLU19-GE-S2 (1-2')

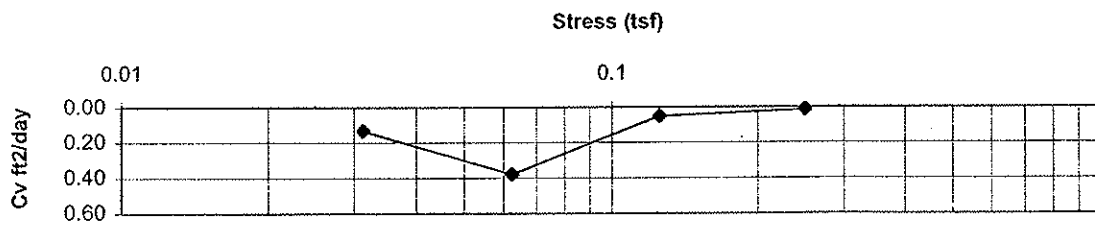
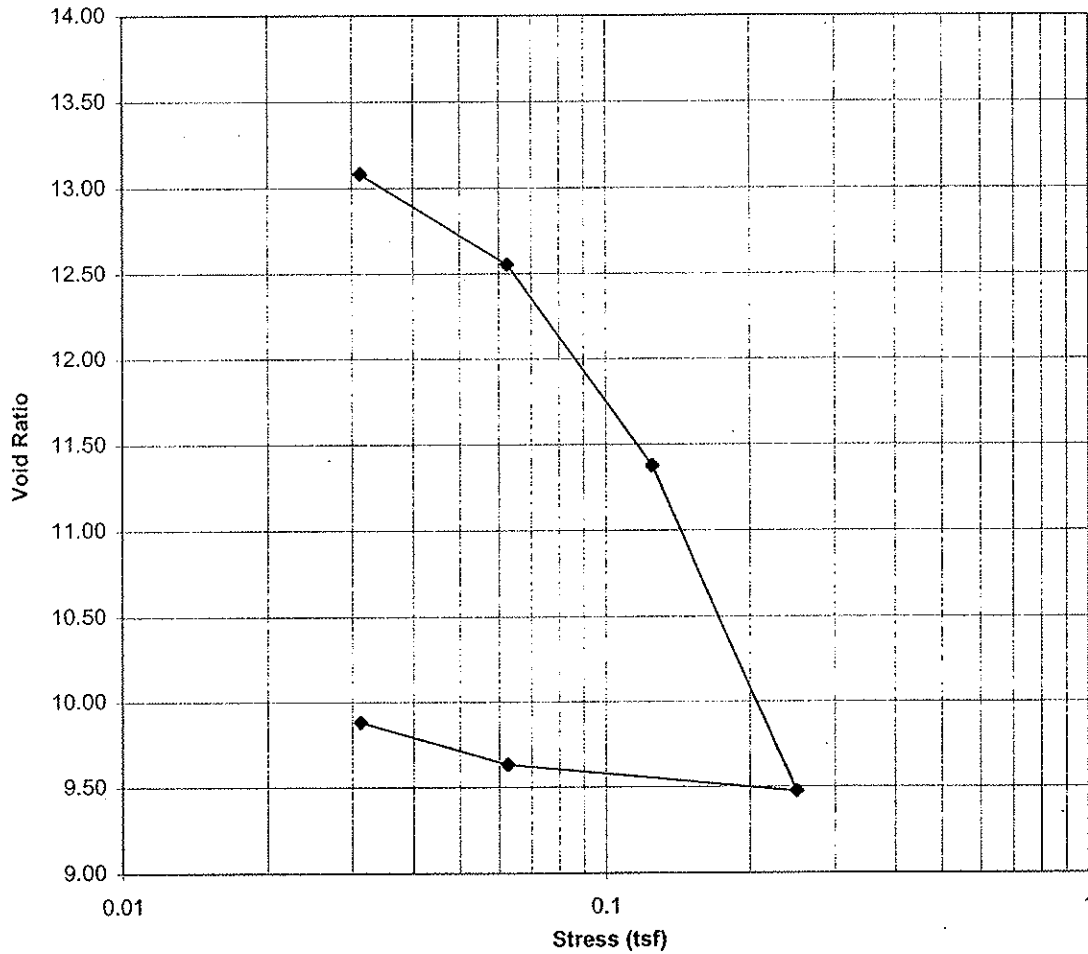






### Consolidation Test Results

NLU19-GE-S3 (2-3')



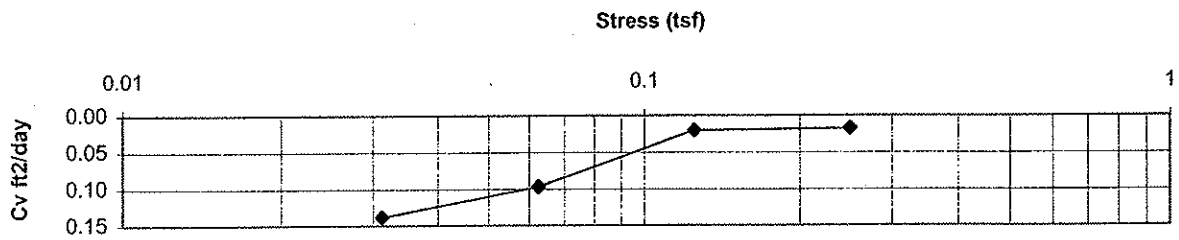
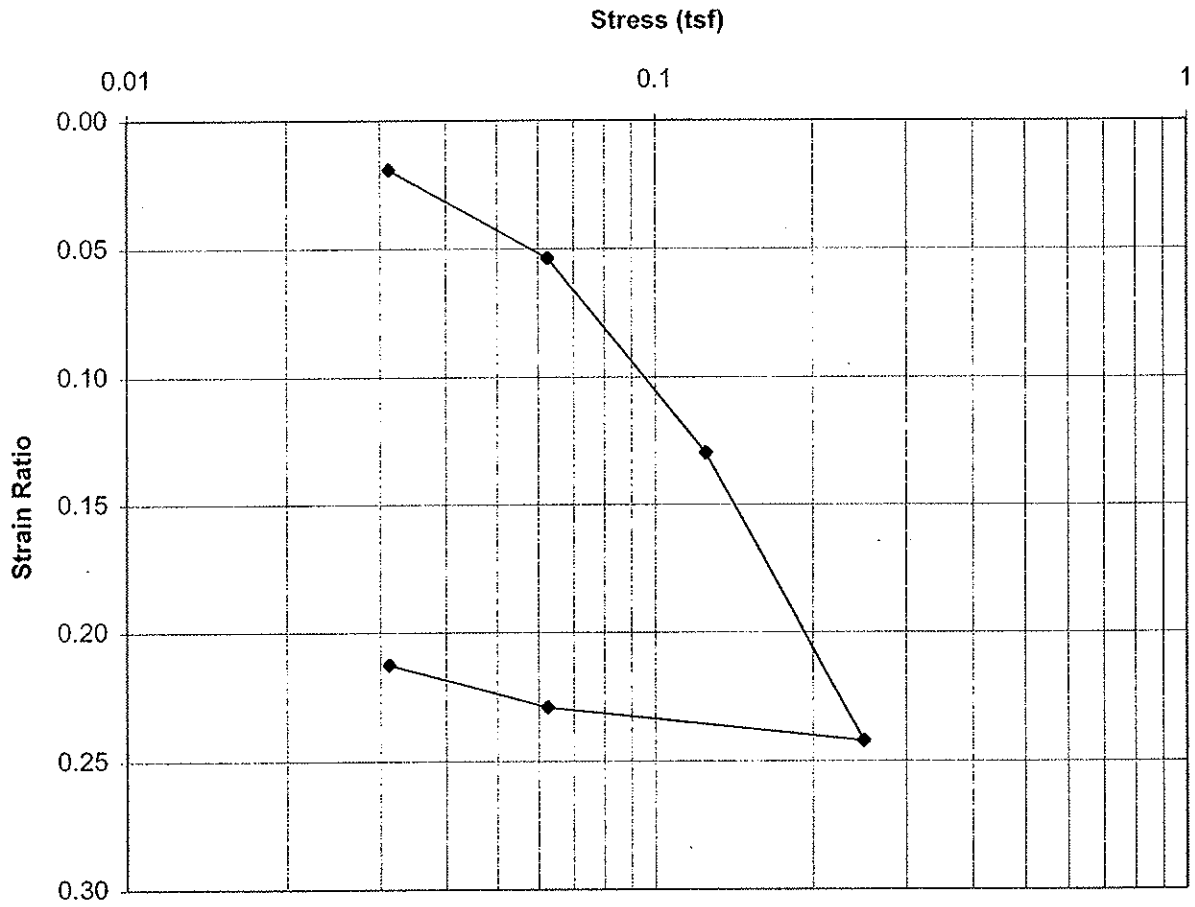




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GJRW1-04403-961

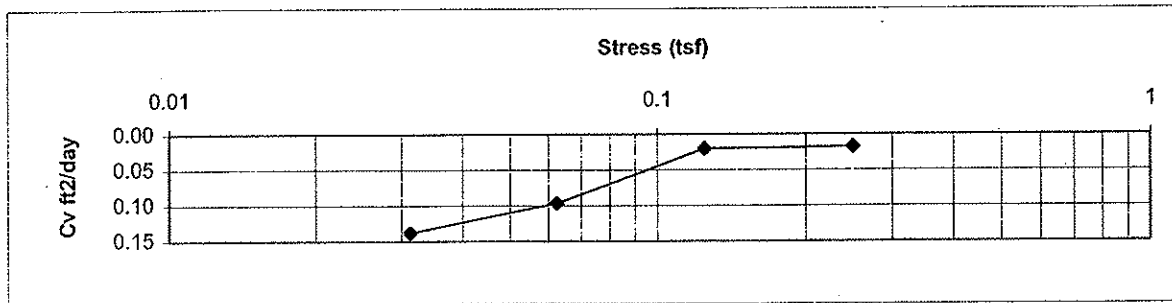
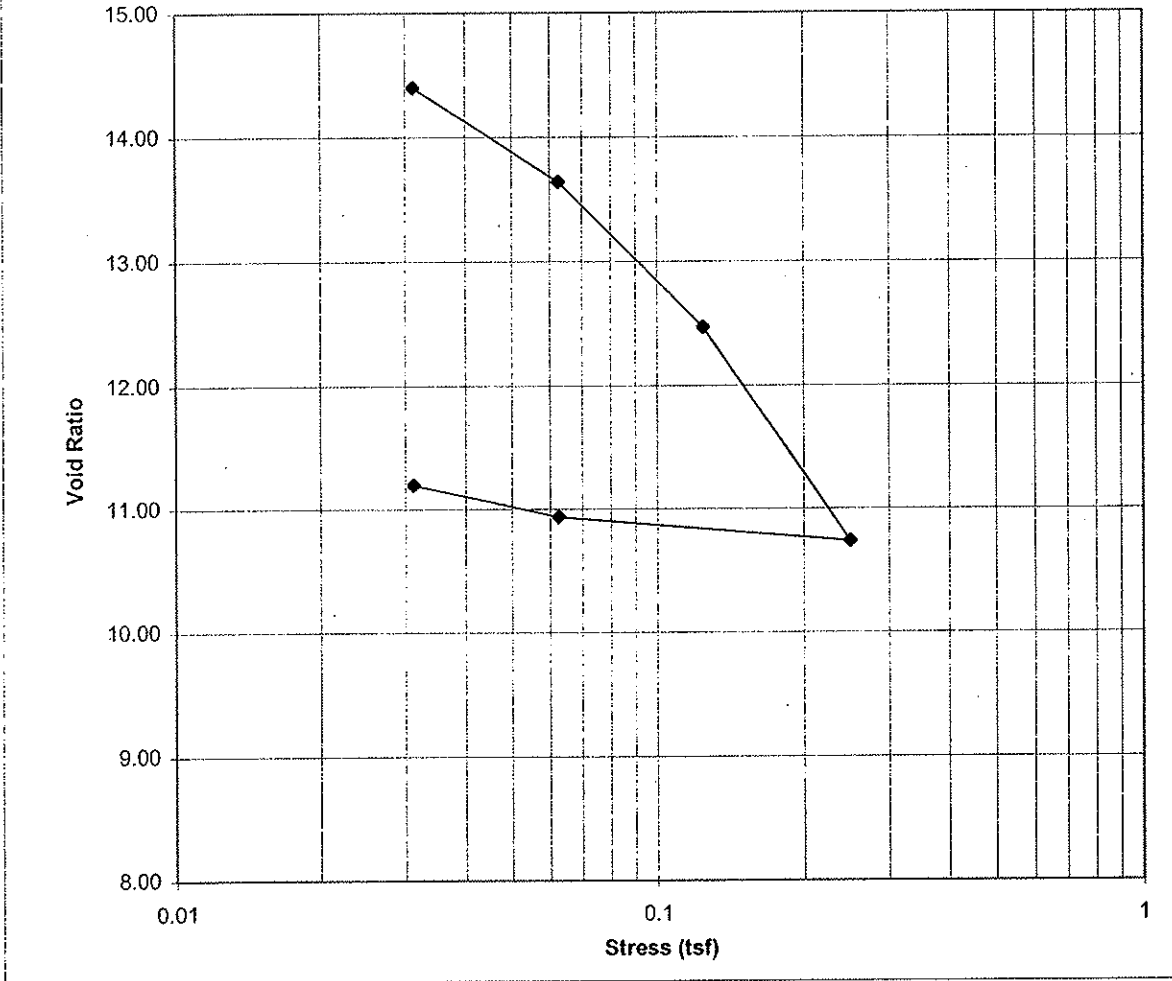
### Consolidation Test Results

NLU19-GE-S4 (3-4')



### Consolidation Test Results

NLU19-GE-S4 (3-4')



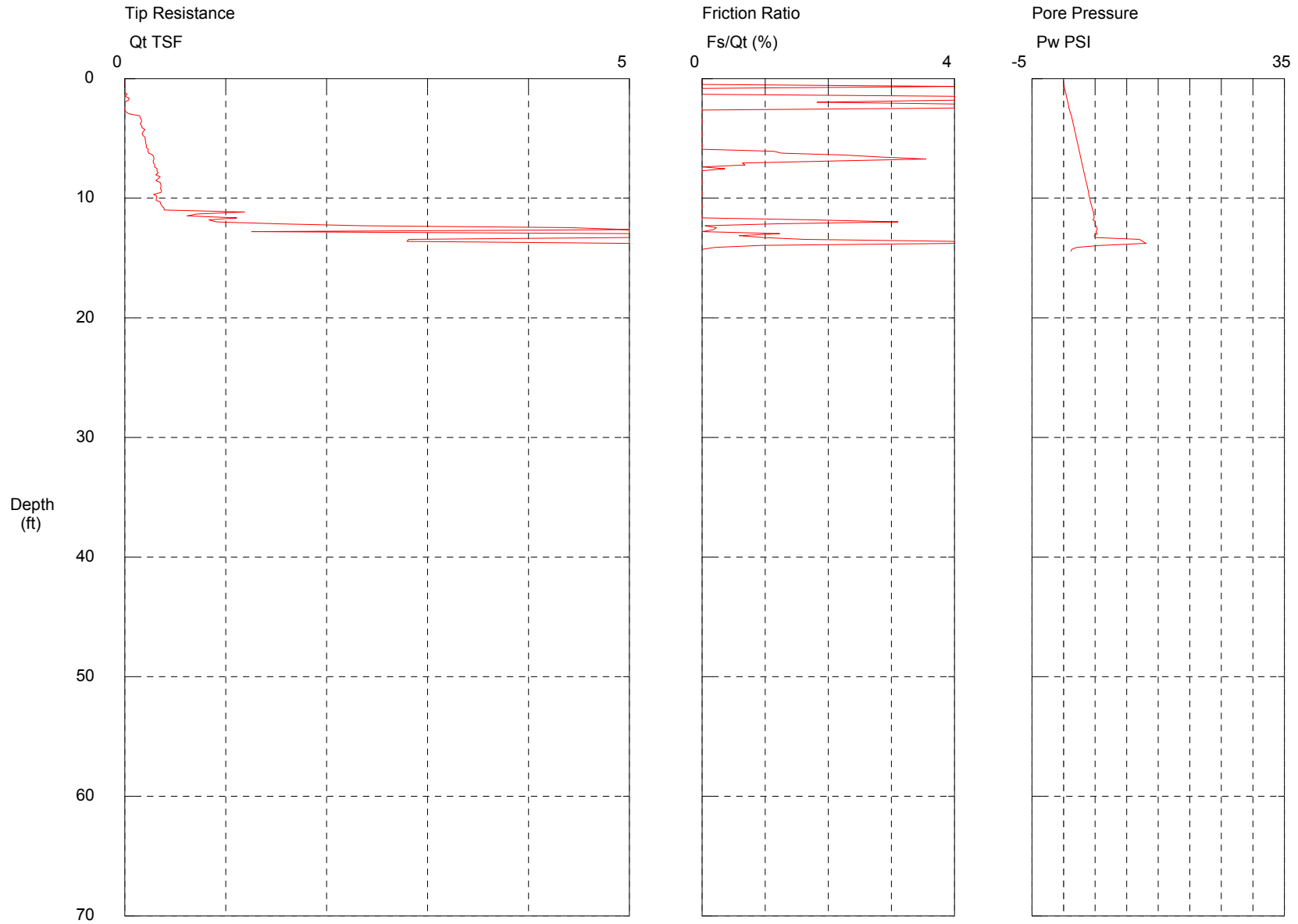
**SUB-ATTACHMENT 3D-2.4**  
**RETEC 2005 ESA Phase 3 Sediment Investigation**

**SUB-ATTACHMENT 3D-2.4.1**  
**RETEC 2005 ESA Phase 3 Sediment Investigation -**  
**Cone Penetration Test Analysis**

# Retec

Operator: Brown & Nowak  
Sounding: NLU400  
Cone Used: DSG0708

CPT Date/Time: 1/7/2005 9:17:46 AM  
Location: North Lake Union Phase III  
Job Number: PSE10-18628



Maximum Depth = 14.44 feet

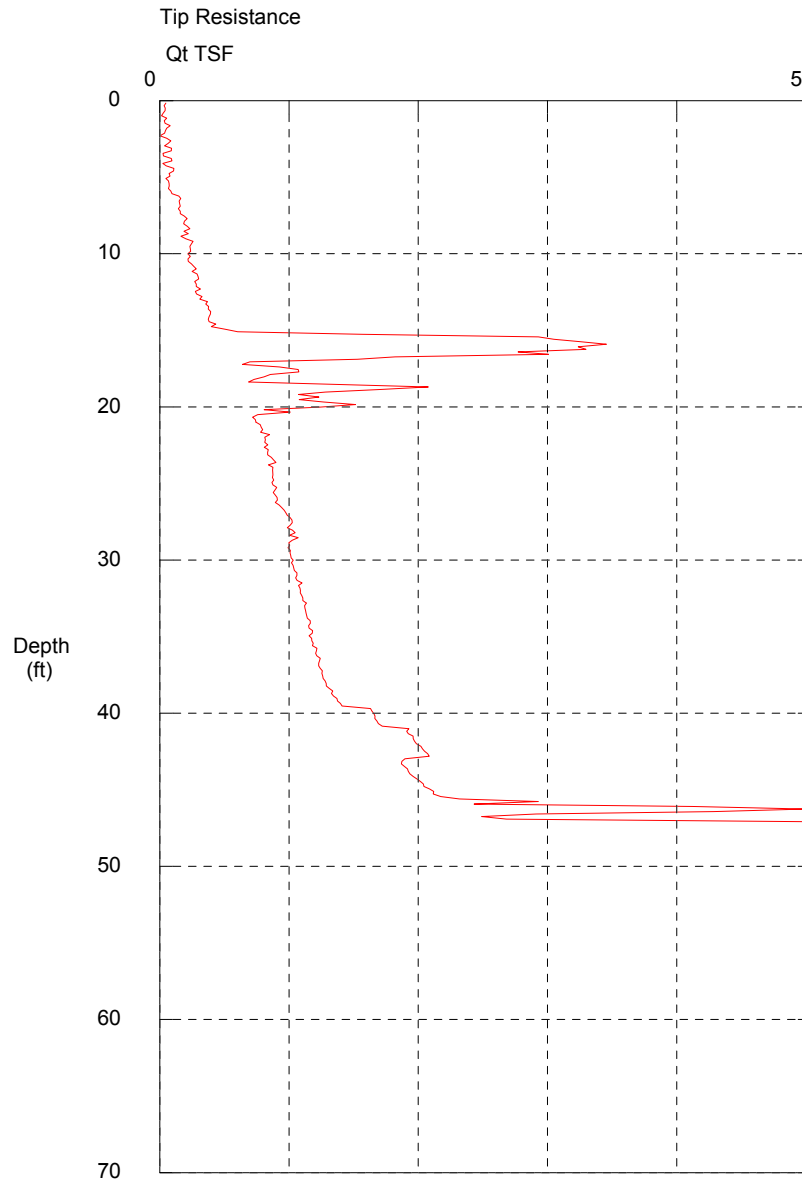
Depth Increment = 0.164 feet

Depth to mudline is 9.5 feet  
Northwest Cone Exploration

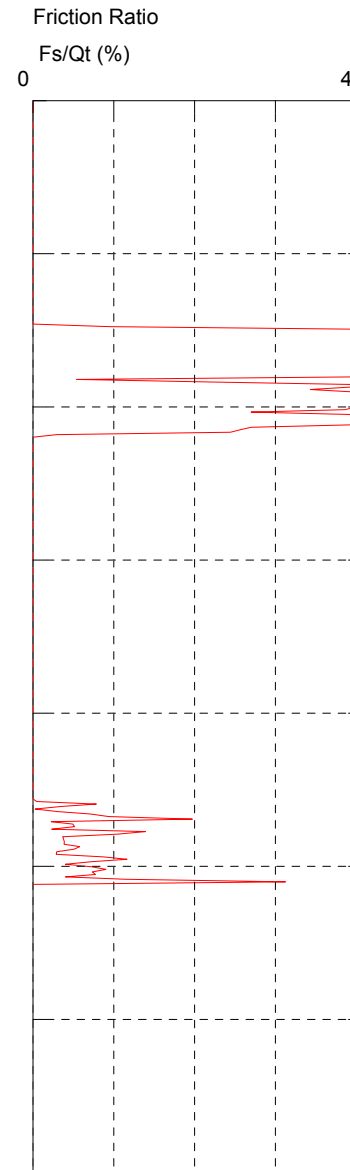
# Retec

Operator: Brown & Nowak  
Sounding: NLU402  
Cone Used: DSG0708

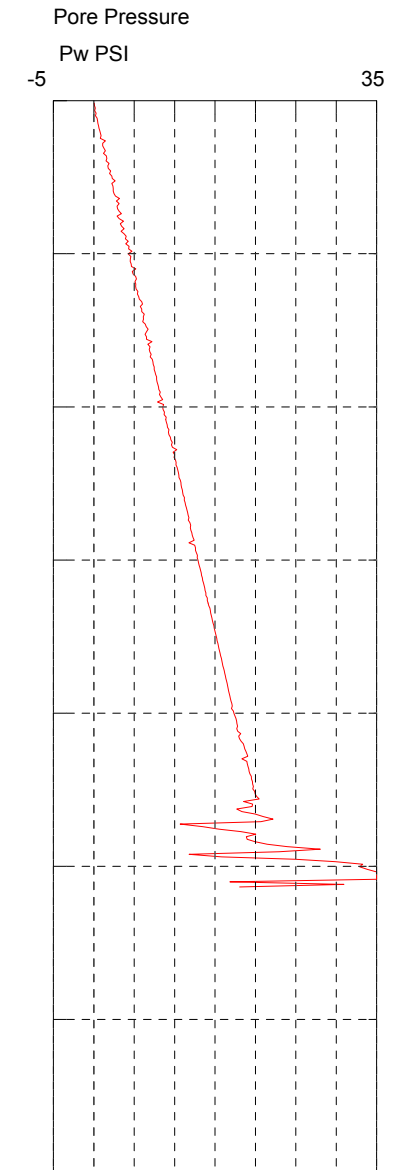
CPT Date/Time: 1/6/2005 2:20:39 PM  
Location: North Lake Union Phase III  
Job Number: PSE10-18628



Maximum Depth = 51.35 feet



Depth Increment = 0.164 feet

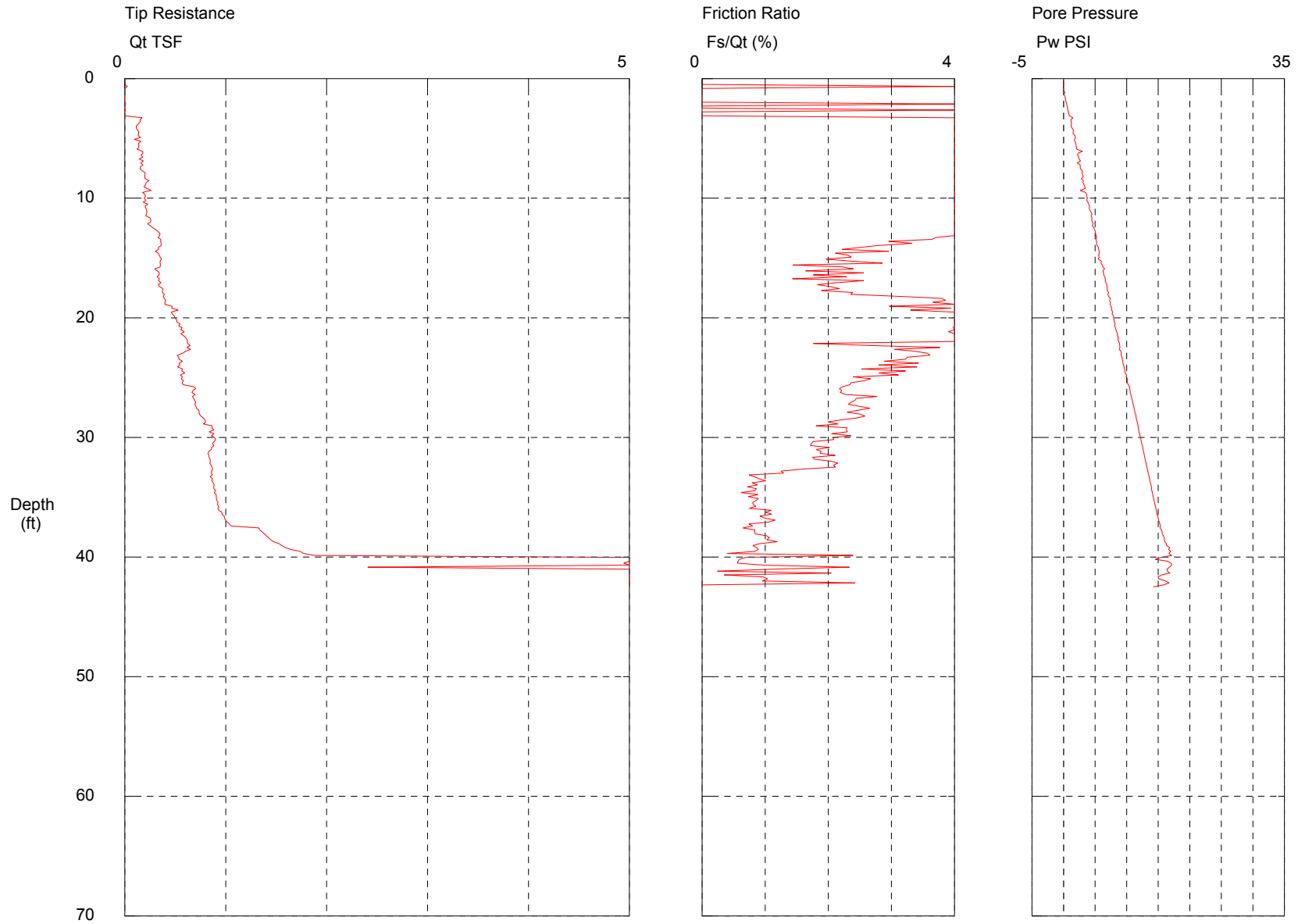


Depth to mudline is 36.8 feet  
Northwest Cone Exploration

# Retec

Operator: Brown & Nowak  
Sounding: NLU404  
Cone Used: DSG0708

CPT Date/Time: 1/7/2005 10:24:55 AM  
Location: North Lake Union Phase III  
Job Number: PSE10-18628



Maximum Depth = 42.49 feet

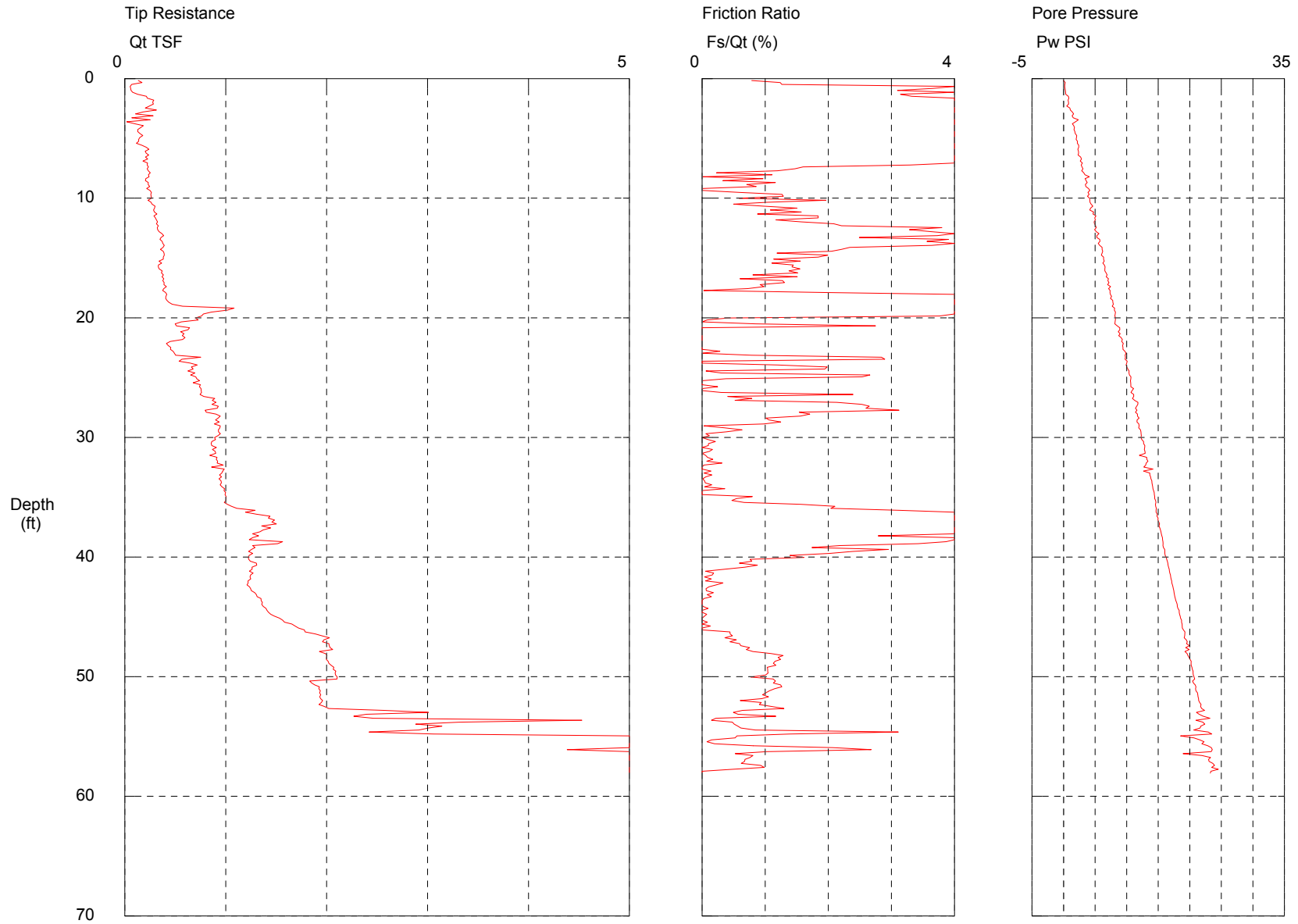
Depth Increment = 0.164 feet

Depth to mudline is 32.0 feet  
Northwest Cone Exploration

# Retec

Operator: Brown & Nowak  
Sounding: NLU407  
Cone Used: DSG0708

CPT Date/Time: 1/6/2005 11:16:22 AM  
Location: North Lake Union Phase III  
Job Number: PSE10-18628



Maximum Depth = 58.07 feet

Depth Increment = 0.164 feet

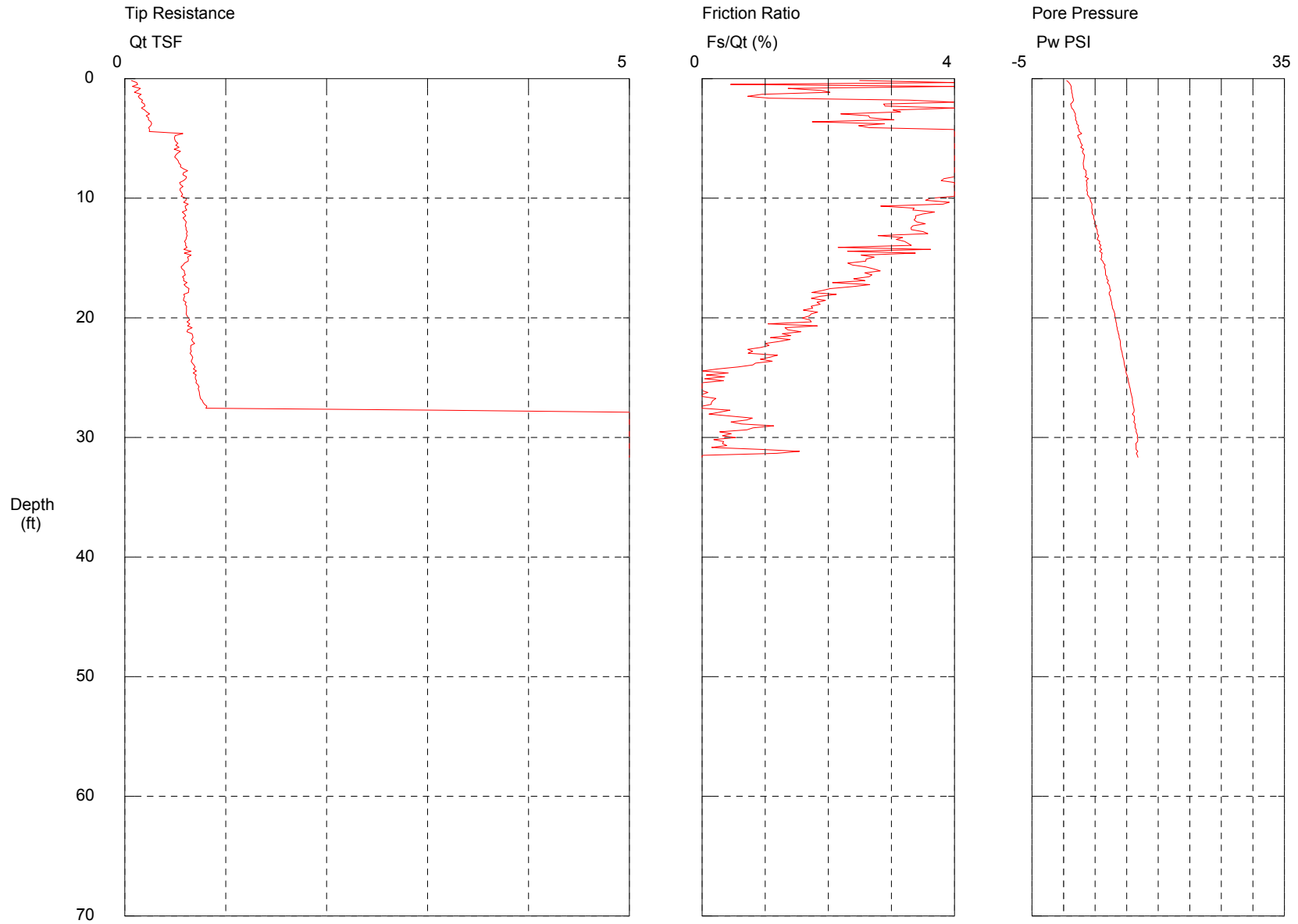
Depth to mudline is 40.5 feet  
Northwest Cone Exploration



# Retec

Operator: Brown & Nowak  
Sounding: NLU409  
Cone Used: DSG0708

CPT Date/Time: 1/5/2005 8:15:05 AM  
Location: North Lake Union Phase III  
Job Number: PSE10-18628



Maximum Depth = 31.66 feet

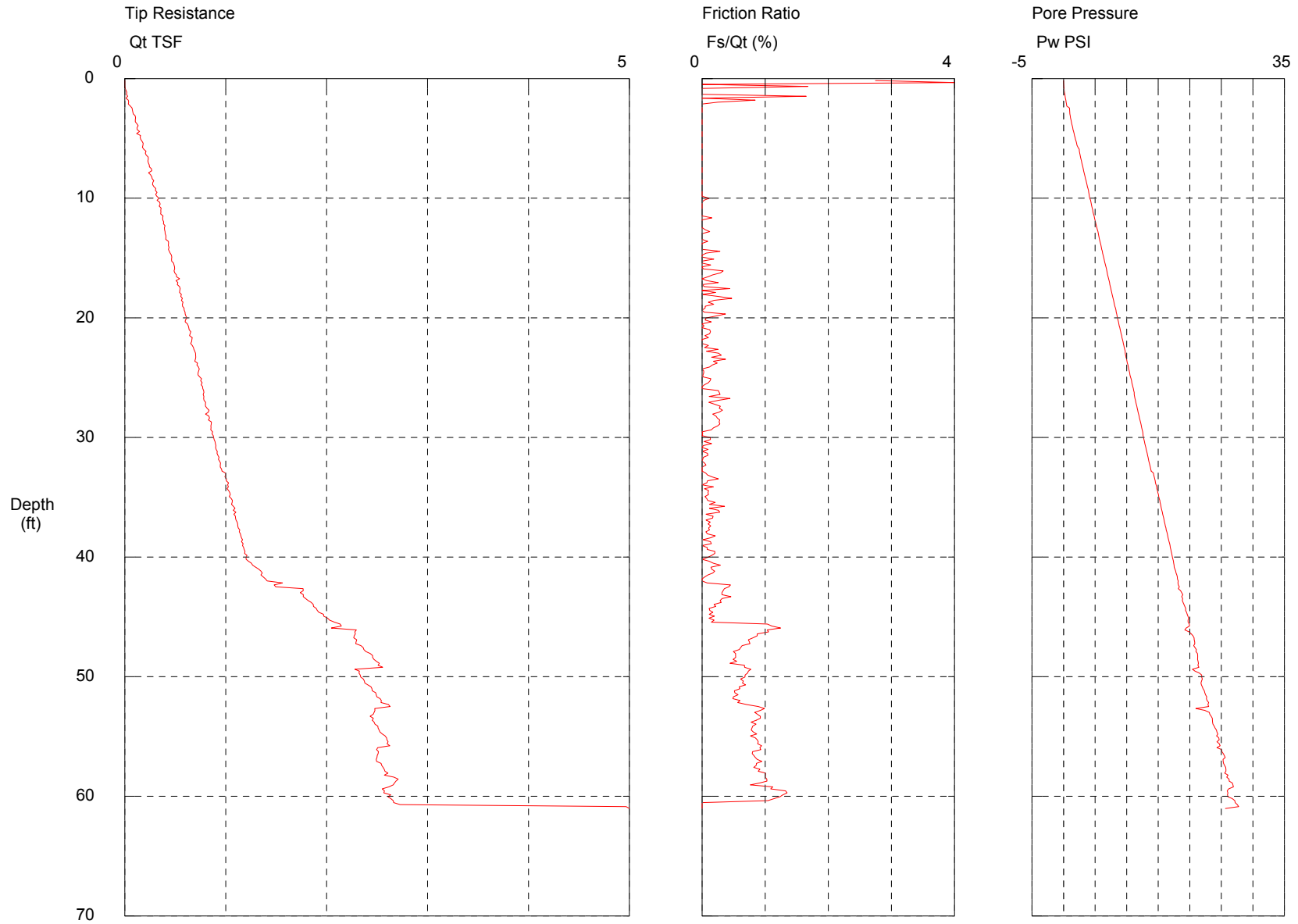
Depth Increment = 0.164 feet

Depth to mudline is 24.9 feet  
Northwest Cone Exploration

# Retec

Operator: Brown & Nowak  
Sounding: NLU413  
Cone Used: DSG0708

CPT Date/Time: 1/5/2005 3:53:01 PM  
Location: North Lake Union Phase III  
Job Number: PSE10-18628



Maximum Depth = 61.02 feet

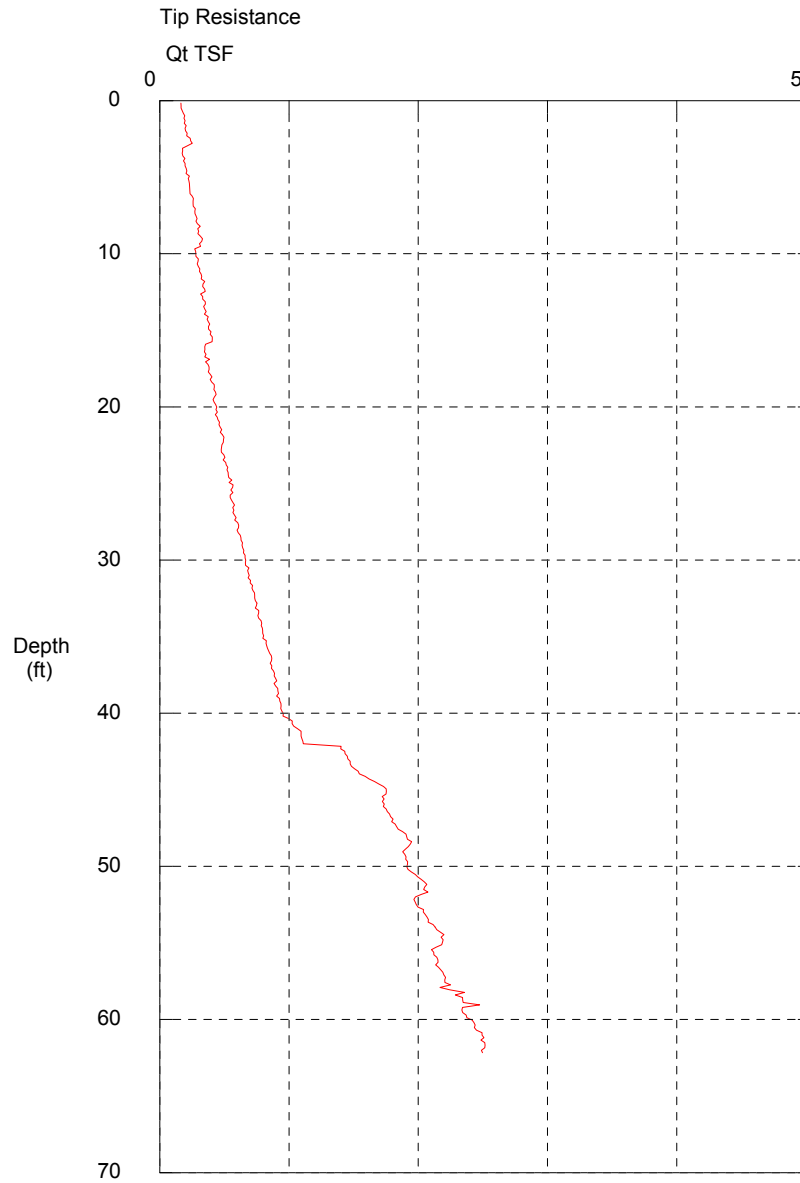
Depth Increment = 0.164 feet

Depth to mudline is 40 feet  
Northwest Cone Exploration

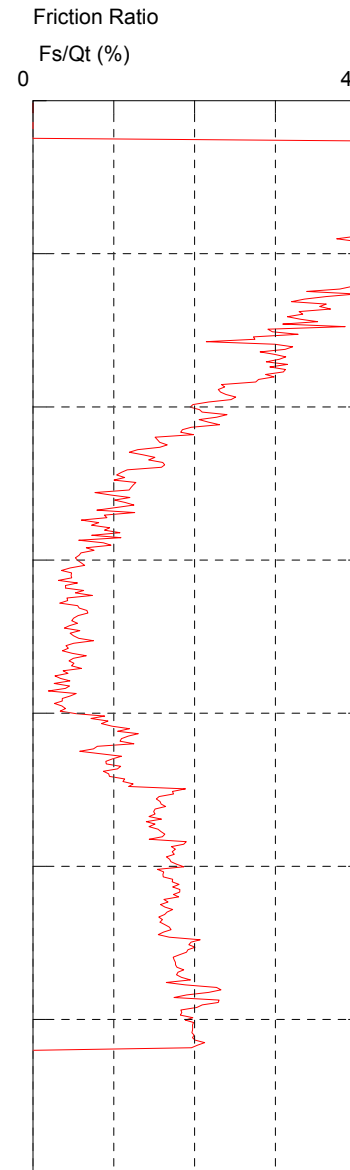
# Retec

Operator: Brown & Nowak  
Sounding: NLU415  
Cone Used: DSG0708

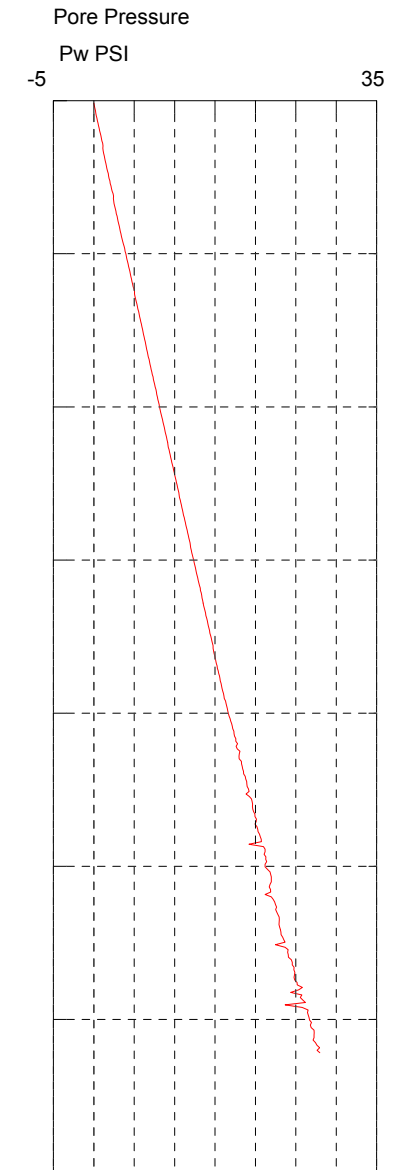
CPT Date/Time: 1/4/2005 3:34:39 PM  
Location: North Lake Union Phase III  
Job Number: PSE10-18628



Maximum Depth = 62.17 feet



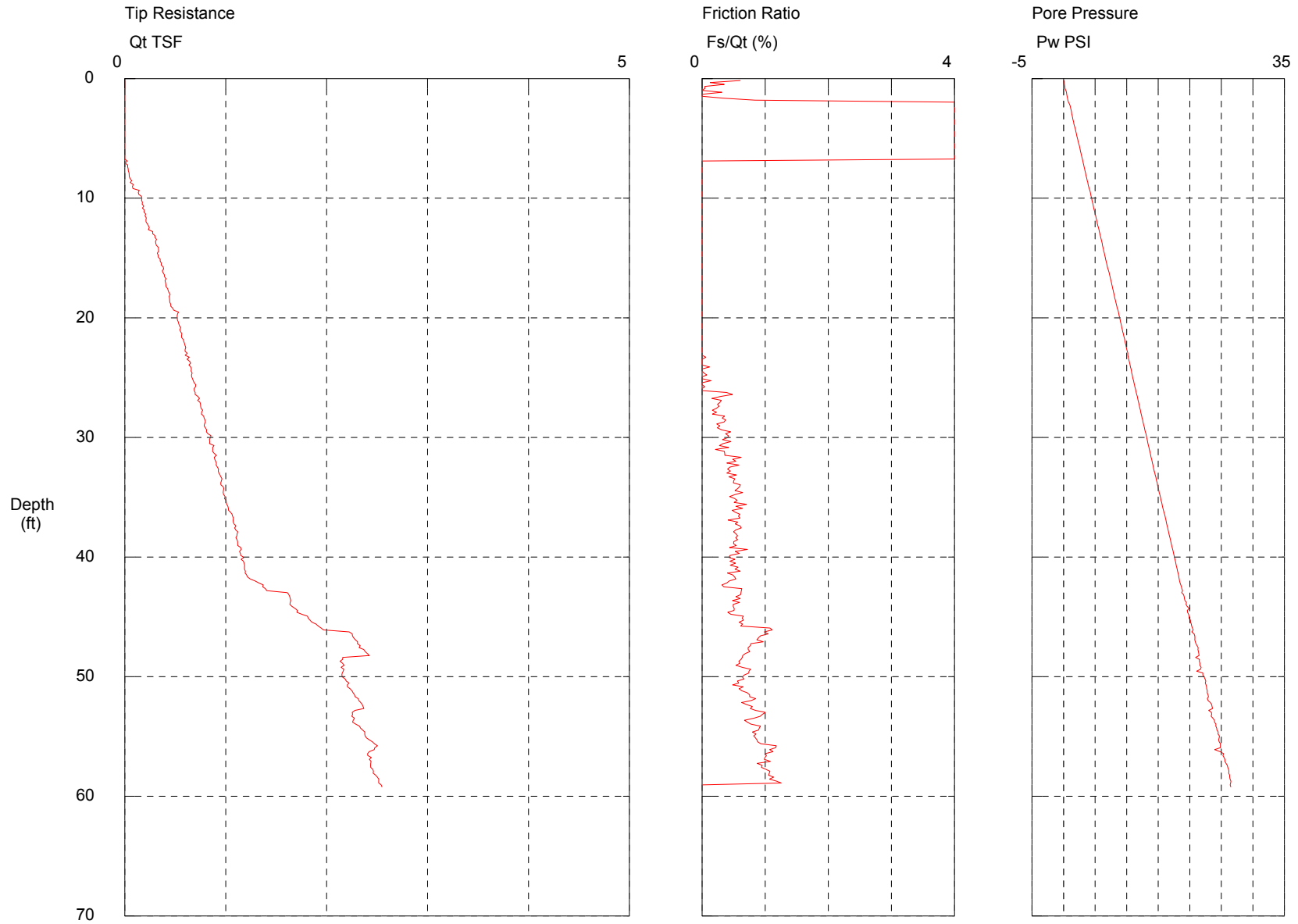
Depth Increment = 0.164 feet



# Retec

Operator: Brown & Nowak  
Sounding: NLU416  
Cone Used: DSG0708

CPT Date/Time: 1/5/2005 10:13:47 AM  
Location: North Lake Union Phase III  
Job Number: PSE10-18628



Maximum Depth = 59.22 feet

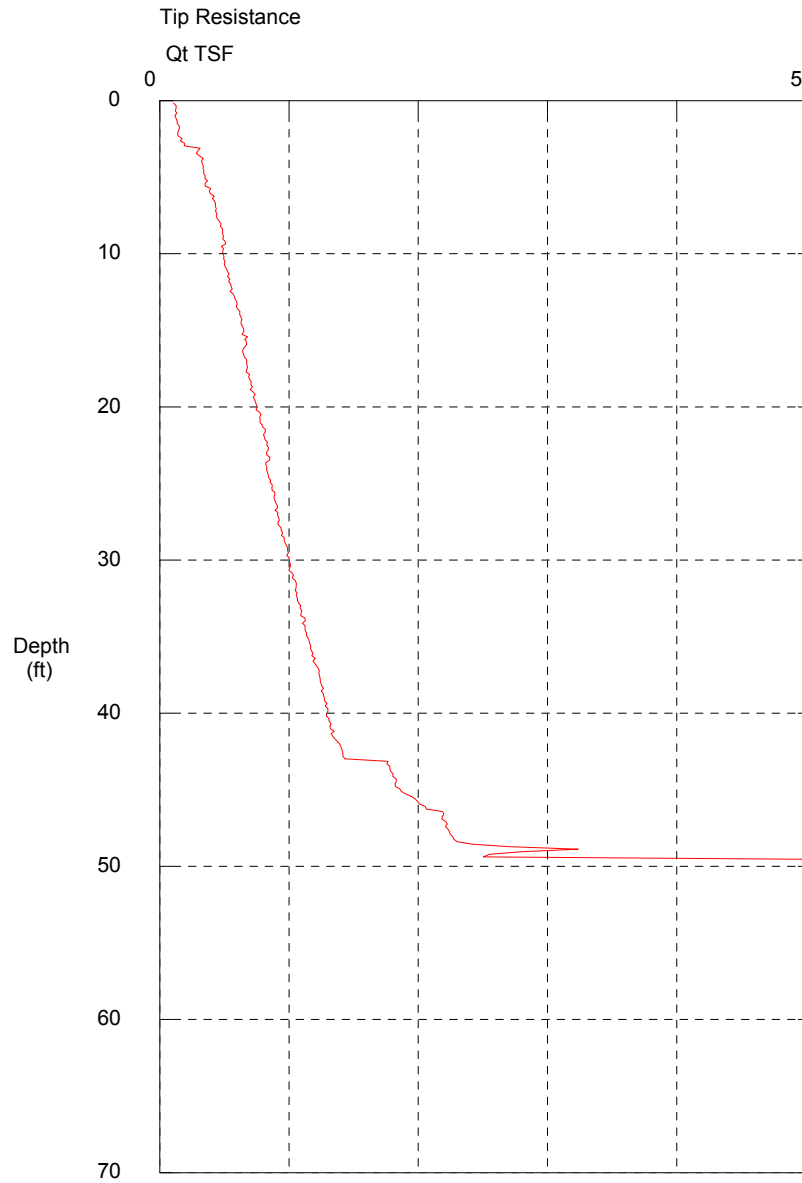
Depth Increment = 0.164 feet

Depth to mudline is 41 feet  
Northwest Cone Exploration

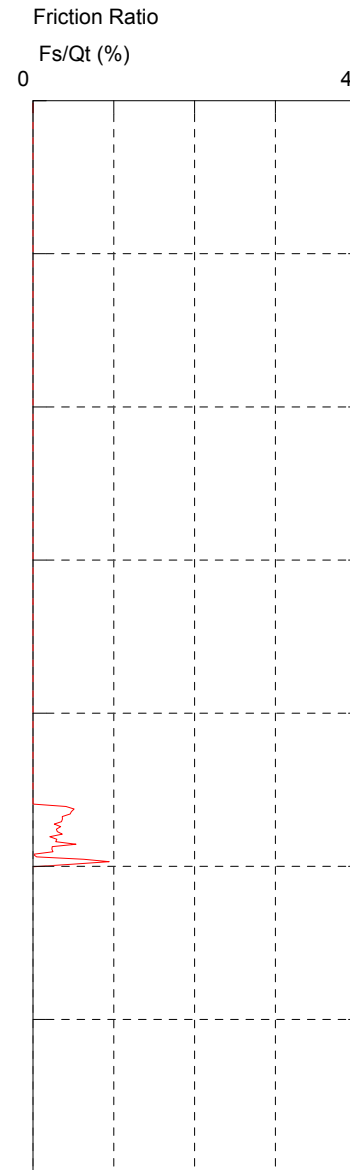
# Retec

Operator: Brown & Nowak  
Sounding: NLU417  
Cone Used: DSG0708

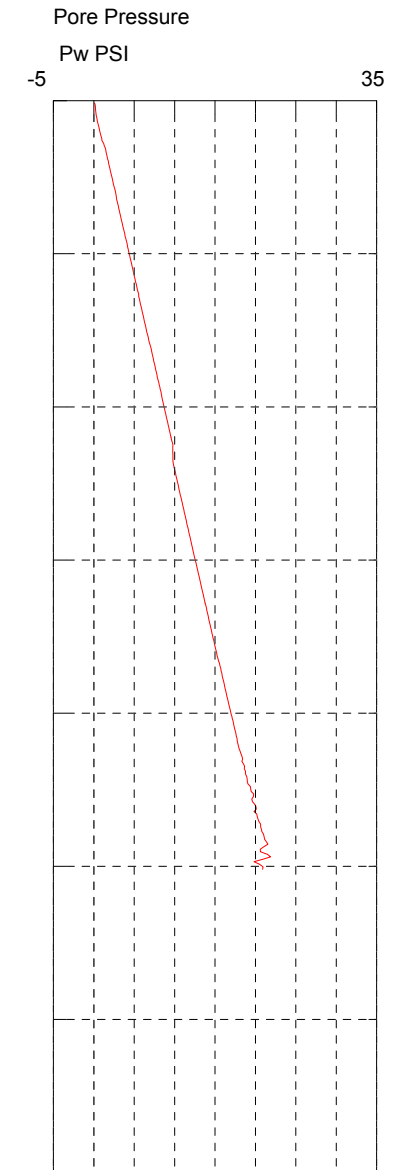
CPT Date/Time: 1/6/2005 8:37:02 AM  
Location: North Lake Union Phase III  
Job Number: PSE10-18628



Maximum Depth = 50.20 feet



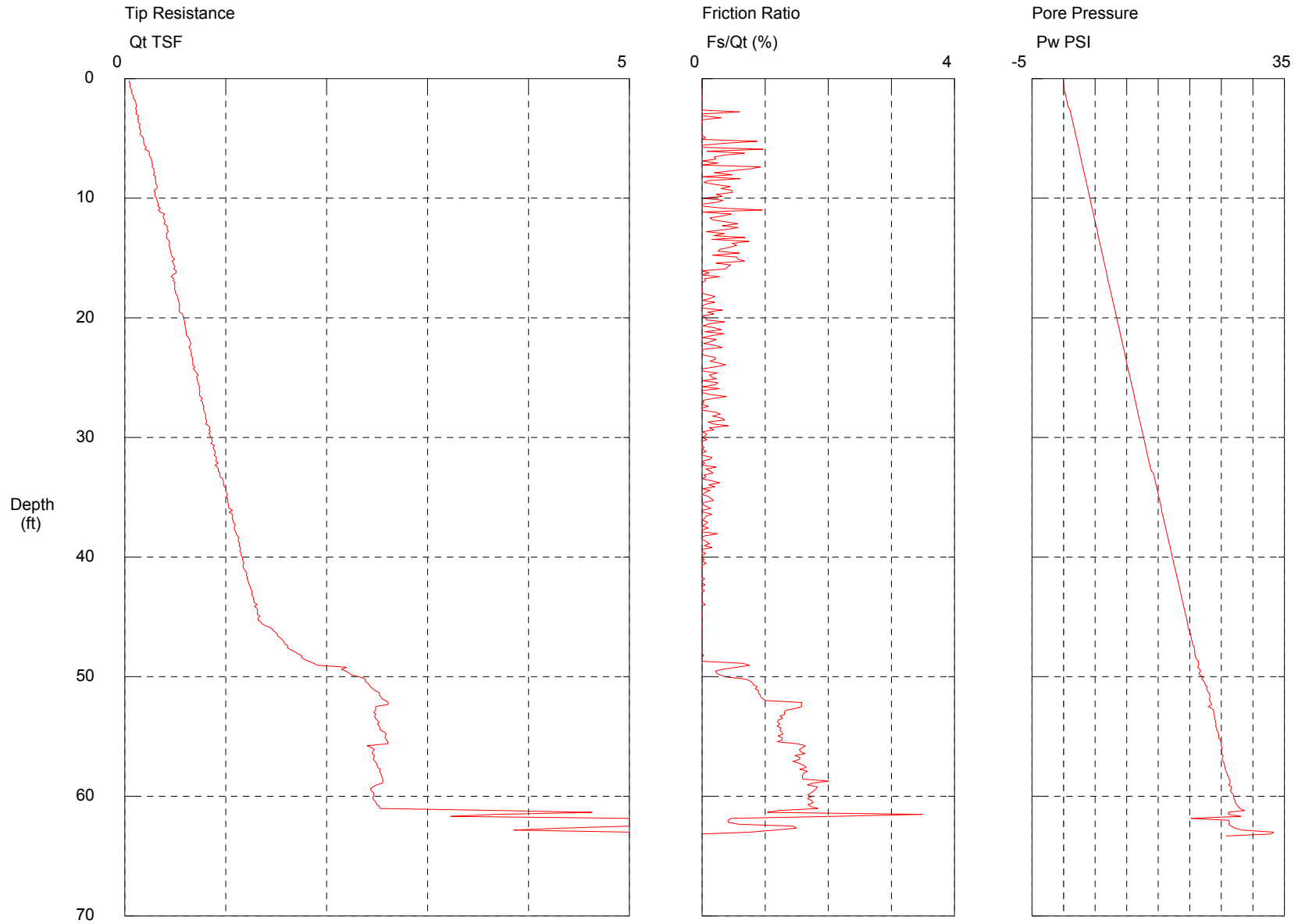
Depth Increment = 0.164 feet



# Retec

Operator: Brown & Nowak  
Sounding: NLU419  
Cone Used: DSG0708

CPT Date/Time: 1/6/2005 9:59:30 AM  
Location: North Lake Union Phase III  
Job Number: PSE10-18628



Maximum Depth = 63.32 feet

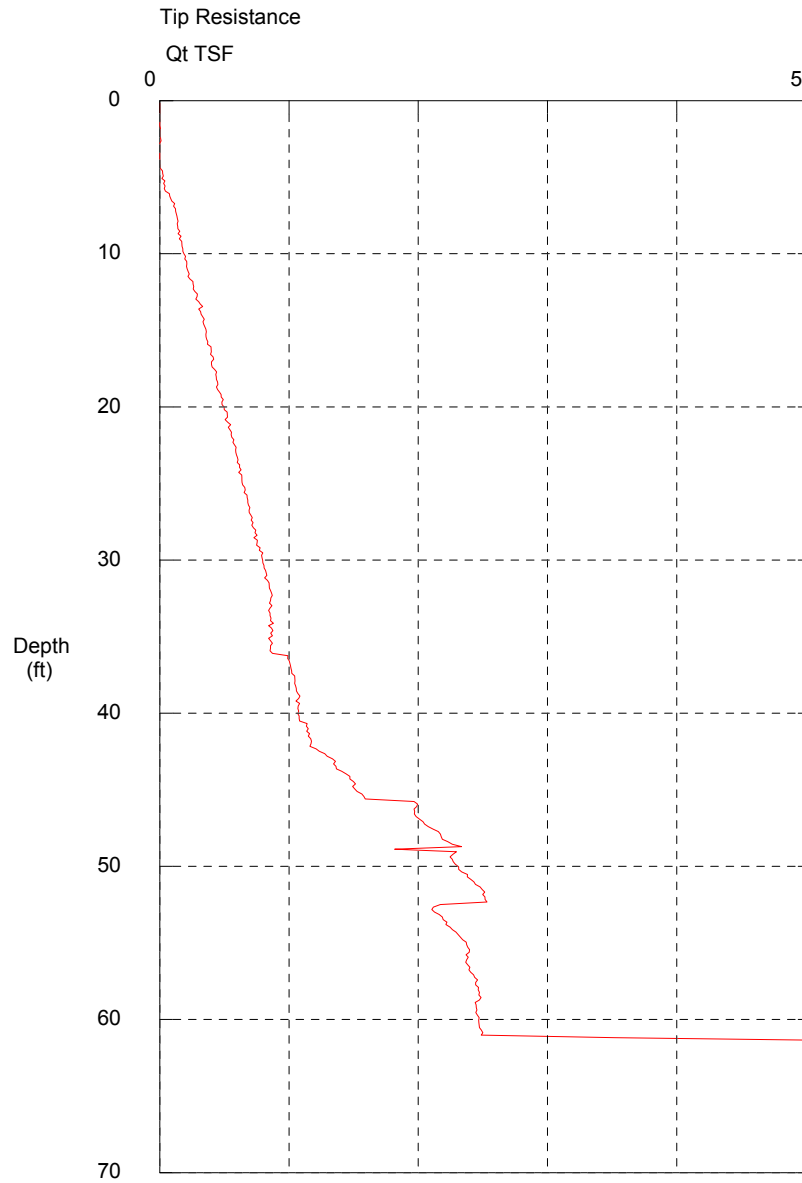
Depth Increment = 0.164 feet

Depth to mudline is 45.5 feet  
Northwest Cone Exploration

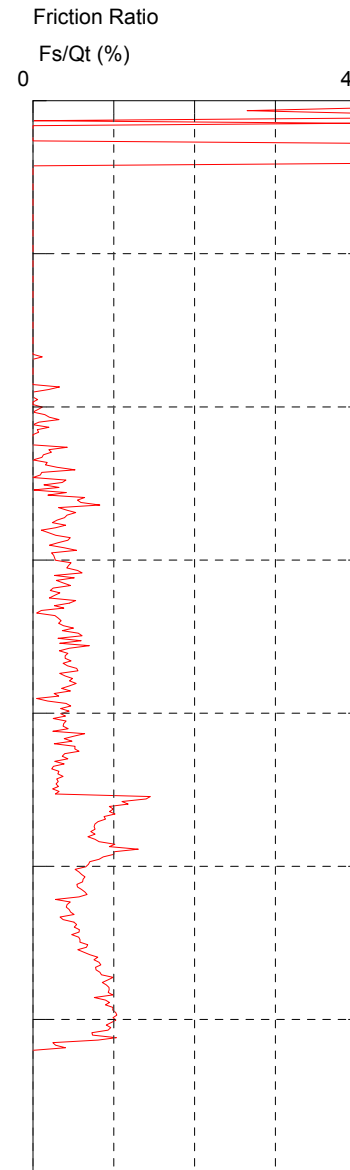
# Retec

Operator: Brown & Nowak  
Sounding: NLU420  
Cone Used: DSG0708

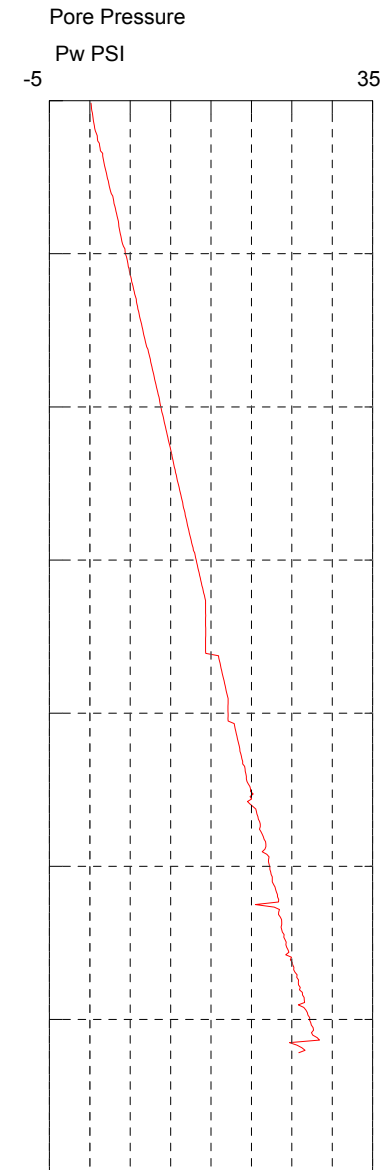
CPT Date/Time: 1/5/2005 2:41:04 PM  
Location: North Lake Union Phase III  
Job Number: PSE10-18628



Maximum Depth = 62.17 feet



Depth Increment = 0.164 feet

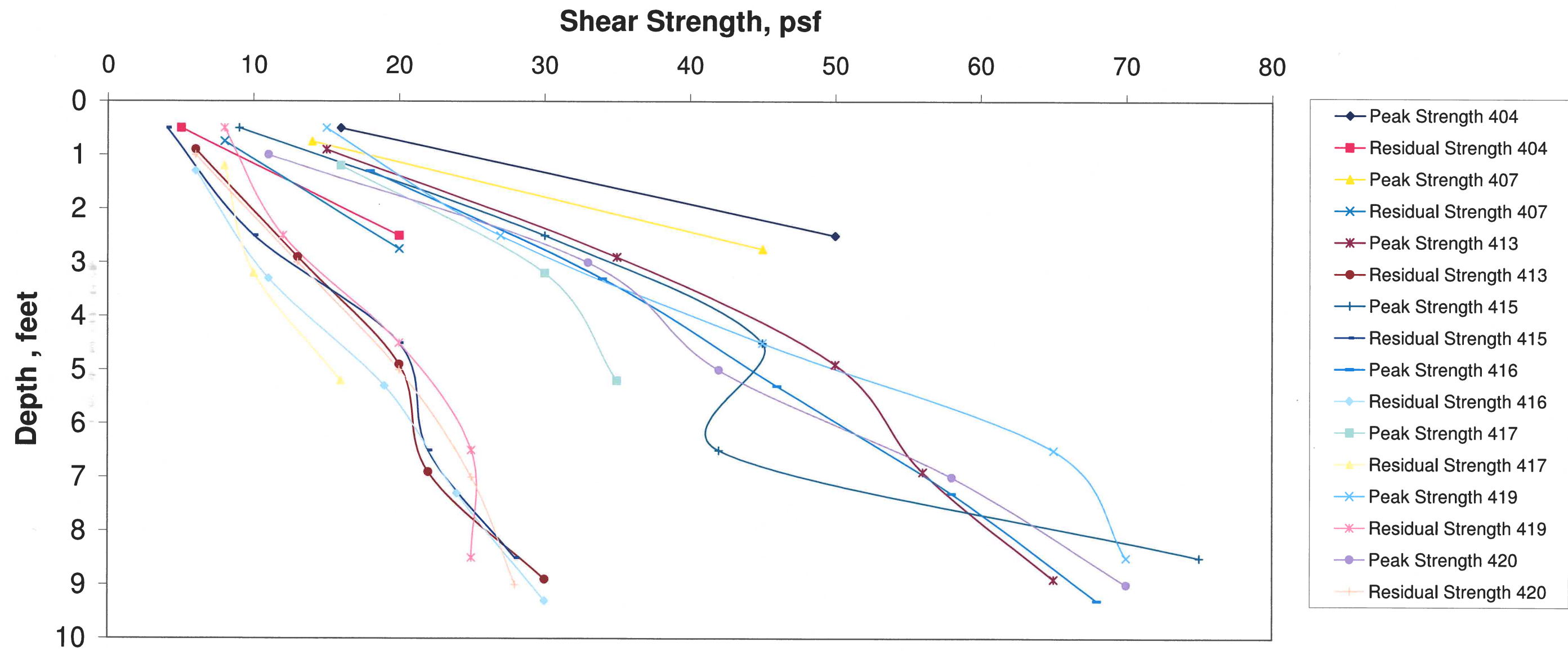


Depth to mudline is 42 feet  
Northwest Cone Exploration

**SUB-ATTACHMENT 3D-2.4.2**  
**RETEC 2005 ESA Phase 3 Sediment Investigation -**  
**Vane Shear Analysis**



# Depth vs. Shear Strength



GAS WORKS SEDIMENT  
EASTERN STUDY AREA

PSE10-18628-630

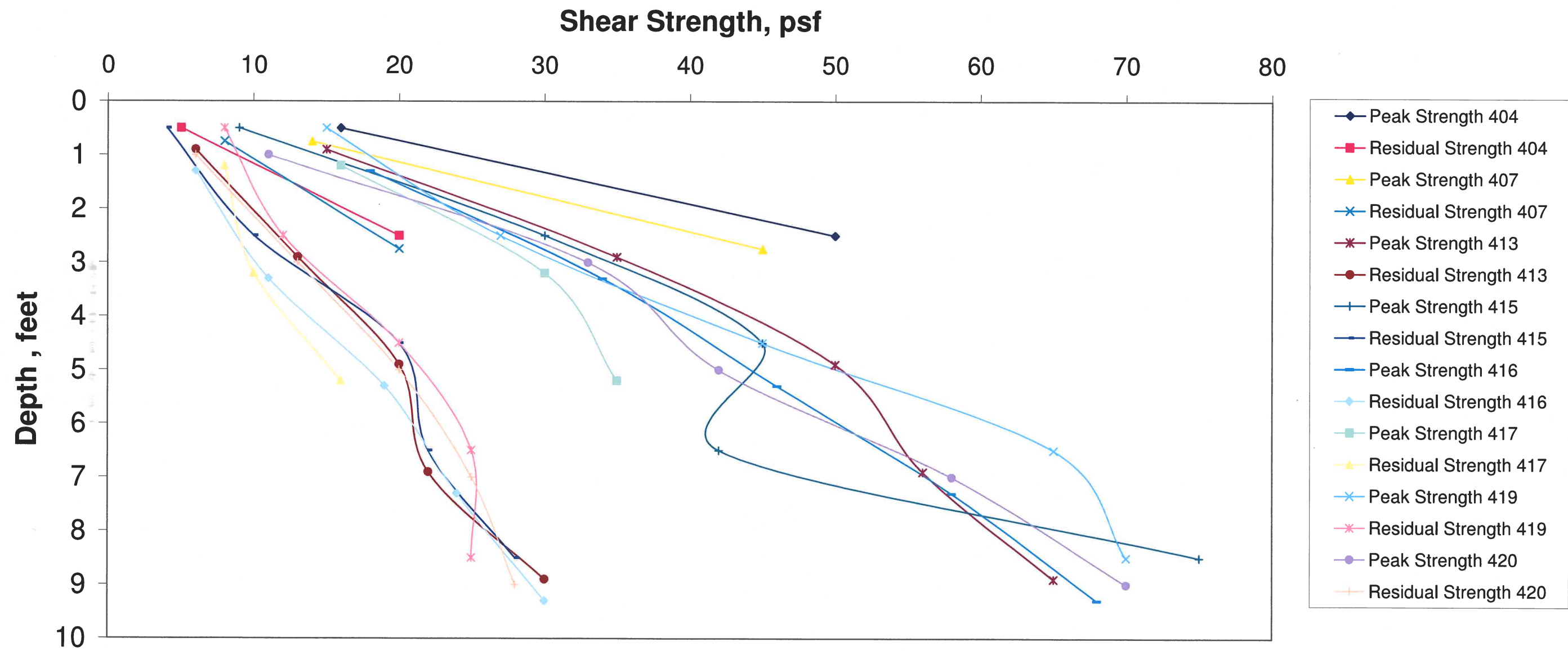
Vane Shear Profiles

DATE: 03/30/06

FIGURE 4-21

**SUB-ATTACHMENT 3D-2.4.2**  
**RETEC 2005 ESA Phase 3 Sediment Investigation -**  
**Vane Shear Analysis**

# Depth vs. Shear Strength



GAS WORKS SEDIMENT  
EASTERN STUDY AREA

PSE10-18628-630

Vane Shear Profiles

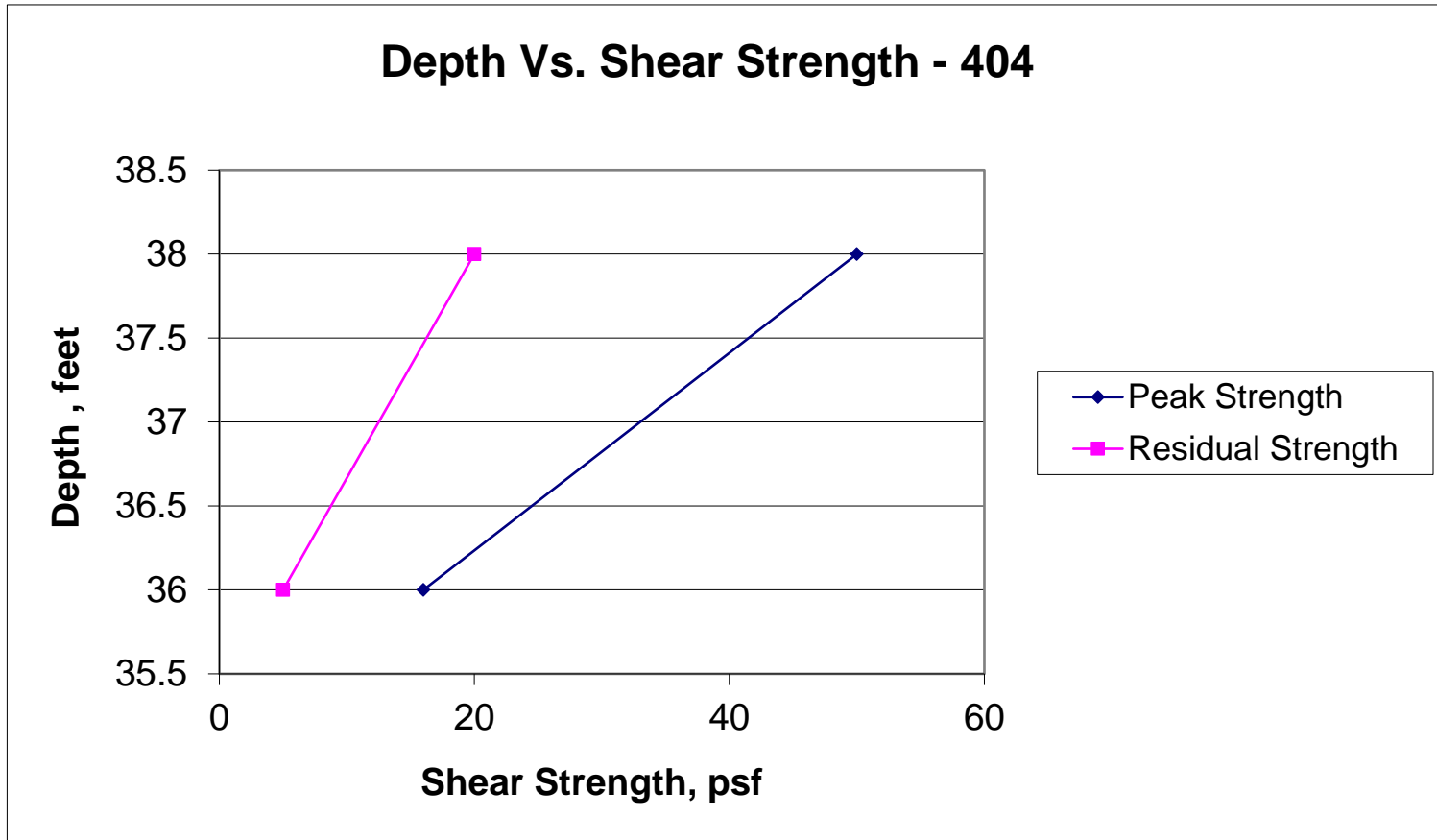


DATE: 03/30/06

FIGURE 4-21

**Vane Shear Summary  
Location 404**

Depth, ft	Shear Strength, psf	
	Peak	Residual
36	16	5
38	50	20



**Vane Shear Raw Data  
Location 404  
36 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/7/05,retec.404/36

zero =

-1295

calib =

0.26 in-lb/unit ft-lb

Shear Strength, psf

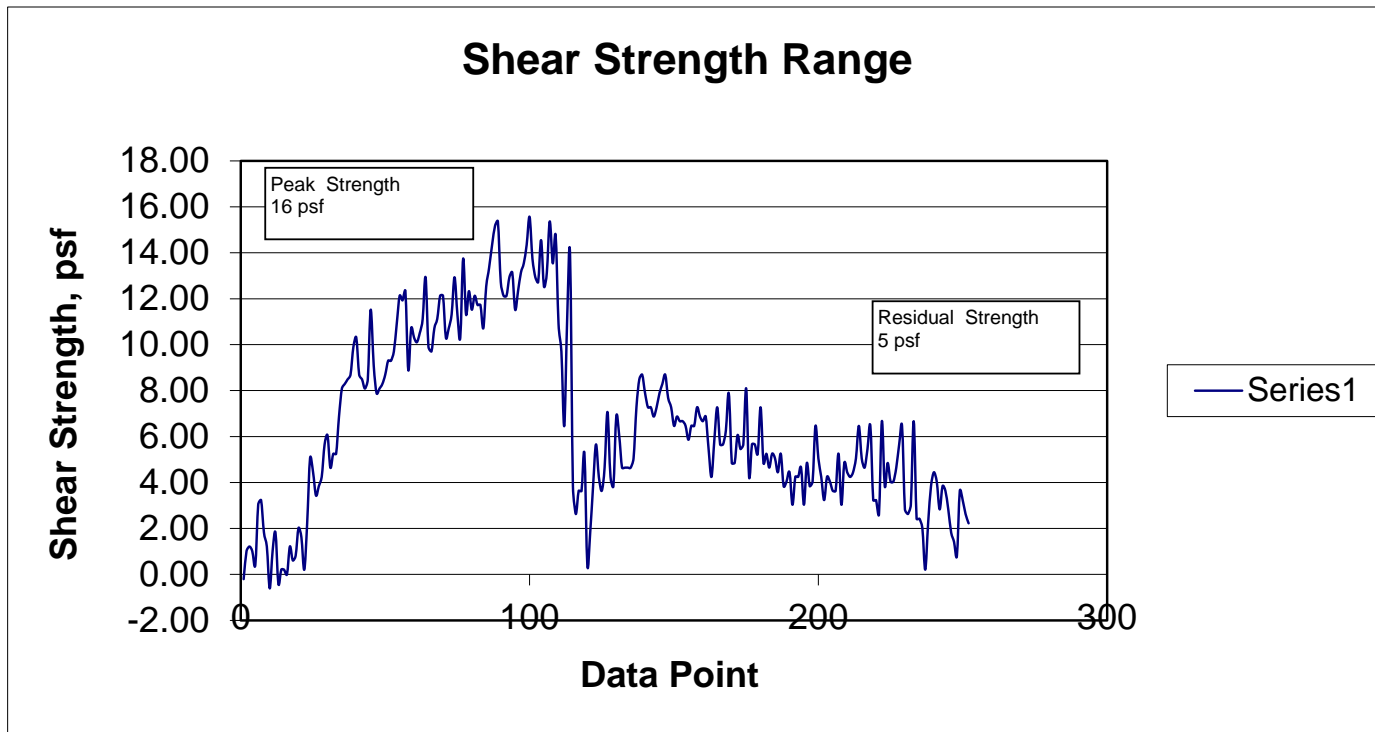
-1296	-1280	-1294	-1289	-1286	-1296	1	-0.26	-0.02	-0.20
-1290	-1293	-1282	-1290	-1288	-1290	2	1.3	0.11	1.01
-1289	-1291	-1282	-1290	-1290	-1289	3	1.56	0.13	1.21
-1290	-1297	-1278	-1290	-1291	-1290	4	1.3	0.11	1.01
-1293	-1294	-1286	-1285	-1300	-1293	5	0.52	0.04	0.40
-1280	-1291	-1291	-1281	-1296	-1280	6	3.9	0.32	3.03
-1279	-1297	-1290	-1287	-1292	-1279	7	4.16	0.35	3.23
-1286	-1291	-1287	-1298	-1290	-1286	8	2.34	0.19	1.82
-1289	-1291	-1281	-1292	-1297	-1289	9	1.56	0.13	1.21
-1298	-1292	-1283	-1295	-1294	-1298	10	-0.78	-0.06	-0.61
-1290	-1298	-1285	-1291	-1298	-1290	11	1.3	0.11	1.01
-1286	-1297	-1290	-1289	-1285	-1286	12	2.34	0.19	1.82
-1297	-1288	-1294	-1299	-1283	-1297	13	-0.52	-0.04	-0.40
-1294	-1286	-1293	-1294	-1285	-1294	14	0.26	0.02	0.20
-1294	-1297	-1287	-1295	-1294	-1294	15	0.26	0.02	0.20
-1295	-1295	-1281	-1294	-1293	-1295	16	0	0.00	0.00
-1289	-1297	-1294	-1281	-1293	-1289	17	1.56	0.13	1.21
-1292	-1278	-1292	-1294	-1291	-1292	18	0.78	0.06	0.61
-1291	-1293	-1289	-1283	-1299	-1291	19	1.04	0.09	0.81
-1285	-1288	-1289	-1289	-1278	-1285	20	2.6	0.22	2.02
-1287	-1277	-1286	-1289	-1280	-1287	21	2.08	0.17	1.62
-1294	-1290	-1271	-1283	-1286	-1294	22	0.26	0.02	0.20
-1284	-1289	-1289	-1273	-1283	-1284	23	2.86	0.24	2.22
-1270	-1284	-1279	-1267	-1282	-1270	24	6.5	0.54	5.05
-1273	-1284	-1285	-1283	-1272	-1273	25	5.72	0.48	4.45
-1278	-1266	-1279	-1279	-1275	-1278	26	4.42	0.37	3.44
-1276	-1279	-1282	-1269	-1272	-1276	27	4.94	0.41	3.84
-1274	-1264	-1269	-1274	-1271	-1274	28	5.46	0.45	4.24
-1267	-1279	-1277	-1258	-1271	-1267	29	7.28	0.61	5.66
-1265	-1272	-1275	-1275	-1261	-1265	30	7.8	0.65	6.06
-1272	-1256	-1274	-1275	-1257	-1272	31	5.98	0.50	4.65
-1269	-1265	-1268	-1275	-1275	-1269	32	6.76	0.56	5.26
-1269	-1269	-1257	-1266	-1269	-1269	33	6.76	0.56	5.26
-1261	-1266	-1267	-1262	-1270	-1261	34	8.84	0.74	6.87
-1255	-1268	-1269	-1251	-1266	-1255	35	10.4	0.87	8.09
-1254	-1265	-1265	-1253	-1267	-1254	36	10.66	0.89	8.29
-1253	-1262	-1260	-1250	-1266	-1253	37	10.92	0.91	8.49
-1252	-1267	-1259	-1246	-1258	-1252	38	11.18	0.93	8.69
-1246	-1260	-1256	-1244	-1256	-1246	39	12.74	1.06	9.90
-1244	-1256	-1254	-1247	-1256	-1244	40	13.26	1.10	10.31
-1252	-1255	-1248	-1254	-1252	-1252	41	11.18	0.93	8.69
-1253	-1254	-1241	-1255	-1253	-1253	42	10.92	0.91	8.49
-1255	-1254	-1242	-1260	-1252	-1255	43	10.4	0.87	8.09
-1253	-1252	-1246	-1247	-1257	-1253	44	10.92	0.91	8.49
-1238	-1255	-1255	-1239	-1256	-1238	45	14.82	1.23	11.52
-1250	-1249	-1254	-1250	-1241	-1250	46	11.7	0.97	9.10
-1256	-1248	-1246	-1252	-1252	-1256	47	10.14	0.84	7.88
-1255	-1255	-1240	-1251	-1254	-1255	48	10.4	0.87	8.09
-1254	-1252	-1239	-1253	-1255	-1254	49	10.66	0.89	8.29
-1252	-1250	-1241	-1250	-1249	-1252	50	11.18	0.93	8.69
-1249	-1246	-1248	-1250	-1243	-1249	51	11.96	1.00	9.30
-1249	-1246	-1249	-1251	-1238	-1249	52	11.96	1.00	9.30
-1247	-1240	-1251	-1246	-1256	-1247	53	12.48	1.04	9.70
-1241	-1251	-1246	-1233	-1249	-1241	54	14.04	1.17	10.92
-1235	-1247	-1248	-1245	-1246	-1235	55	15.6	1.30	12.13
-1236	-1245	-1252	-1247	-1248	-1236	56	15.34	1.28	11.93
-1234	-1251	-1247	-1240	-1241	-1234	57	15.86	1.32	12.33
-1251	-1253	-1241	-1244	-1247	-1251	58	11.44	0.95	8.89
-1242	-1244	-1244	-1243	-1245	-1242	59	13.78	1.15	10.71
-1244	-1247	-1231	-1244	-1250	-1244	60	13.26	1.10	10.31
-1245	-1245	-1234	-1242	-1247	-1245	61	13	1.08	10.11
-1243	-1248	-1232	-1249	-1246	-1243	62	13.52	1.13	10.51
-1240	-1242	-1242	-1235	-1246	-1240	63	14.3	1.19	11.12
-1231	-1240	-1240	-1236	-1239	-1231	64	16.64	1.39	12.94
-1246	-1229	-1245	-1242	-1230	-1246	65	12.74	1.06	9.90
-1247	-1245	-1233	-1240	-1240	-1247	66	12.48	1.04	9.70
-1242	-1246	-1231	-1243	-1246	-1242	67	13.78	1.15	10.71
-1240	-1246	-1239	-1241	-1247	-1240	68	14.3	1.19	11.12
-1235	-1243	-1242	-1232	-1244	-1235	69	15.6	1.30	12.13
-1235	-1242	-1247	-1248	-1231	-1235	70	15.6	1.30	12.13
-1244	-1239	-1245	-1251	-1248	-1244	71	13.26	1.10	10.31
-1242	-1243	-1233	-1241	-1249	-1242	72	13.78	1.15	10.71
-1239	-1248	-1240	-1238	-1249	-1239	73	14.56	1.21	11.32
-1231	-1245	-1243	-1233	-1239	-1231	74	16.64	1.39	12.94
-1239	-1228	-1239	-1240	-1237	-1239	75	14.56	1.21	11.32
-1244	-1246	-1237	-1236	-1239	-1244	76	13.26	1.10	10.31
-1227	-1246	-1244	-1242	-1230	-1227	77	17.68	1.47	13.74
-1239	-1237	-1231	-1239	-1244	-1239	78	14.56	1.21	11.32
-1234	-1242	-1240	-1239	-1241	-1234	79	15.86	1.32	12.33
-1238	-1235	-1236	-1242	-1241	-1238	80	14.82	1.23	11.52
-1235	-1241	-1244	-1231	-1236	-1235	81	15.6	1.30	12.13
-1237	-1225	-1242	-1242	-1225	-1237	82	15.08	1.26	11.72
-1237	-1236	-1229	-1241	-1242	-1237	83	15.08	1.26	11.72
-1242	-1237	-1225	-1245	-1237	-1242	84	13.78	1.15	10.71
-1233	-1235	-1225	-1243	-1245	-1233	85	16.12	1.34	12.53
-1229	-1237	-1243	-1239	-1237	-1229	86	17.16	1.43	13.34
-1224	-1239	-1236	-1226	-1234	-1224	87	18.46	1.54	14.35
-1220	-1233	-1239	-1222	-1239	-1220	88	19.5	1.62	15.16
-1219	-1230	-1231	-1222	-1234	-1219	89	19.76	1.65	15.36
-1232	-1229	-1231	-1230	-1223	-1232	90	16.38	1.36	12.73
-1235	-1222	-1237	-1231	-1221	-1235	91	15.6	1.30	12.13
-1235	-1237	-1222	-1230	-1231	-1235	92	15.6	1.30	12.13
-1231	-1236	-1220	-1232	-1230	-1231	93	16.64	1.39	12.94
-1230	-1231	-1228	-1233	-1233	-1230	94	16.9	1.41	13.14
-1238	-1241	-1227	-1233	-1229	-1238	95	14.82	1.23	11.52
-1234	-1220	-1232	-1234	-1238	-1234	96	15.86	1.32	12.33
-1230	-1228	-1231	-1222	-1234	-1230	97	16.9	1.41	13.14
-1228	-1228	-1236	-1221	-1228	-1228	98	17.42	1.45	13.54
-1224	-1234	-1231	-1219	-1234	-1224	99	18.46	1.54	14.35

-1218	-1237	-1227	-1224	-1229	-1218	100	20.02	1.67	15.56
-1227	-1234	-1219	-1232	-1230	-1227	101	17.68	1.47	13.74
-1231	-1229	-1227	-1231	-1218	-1231	102	16.64	1.39	12.94
-1232	-1227	-1232	-1215	-1233	-1232	103	16.38	1.36	12.73
-1223	-1229	-1219	-1228	-1227	-1223	104	18.72	1.56	14.55
-1233	-1238	-1220	-1234	-1232	-1233	105	16.12	1.34	12.53
-1230	-1234	-1233	-1219	-1233	-1230	106	16.9	1.41	13.14
-1219	-1228	-1226	-1216	-1224	-1219	107	19.76	1.65	15.36
-1228	-1231	-1229	-1219	-1227	-1228	108	17.42	1.45	13.54
-1222	-1228	-1229	-1235	-1235	-1222	109	18.98	1.58	14.76
-1241	-1224	-1251	-1257	-1229	-1241	110	14.04	1.17	10.92
-1247	-1199	-1200	-1197	-1224	-1247	111	12.48	1.04	9.70
-1263	-1248	-1256	-1269	-1199	-1263	112	8.32	0.69	6.47
-1240	-1266	-1265	-1257	-1269	-1240	113	14.3	1.19	11.12
-1226	-1258	-1271	-1269	-1269	-1226	114	17.94	1.49	13.95
-1276	-1235	-1247	-1278	-1274	-1276	115	4.94	0.41	3.84
-1282	-1286	-1276	-1263	-1272	-1282	116	3.38	0.28	2.63
-1277	-1264	-1280	-1275	-1272	-1277	117	4.68	0.39	3.64
-1277	-1274	-1270	-1277	-1281	-1277	118	4.68	0.39	3.64
-1269	-1276	-1276	-1270	-1281	-1269	119	6.76	0.56	5.26
-1293	-1267	-1281	-1278	-1272	-1293	120	0.52	0.04	0.40
-1286	-1283	-1269	-1282	-1280	-1286	121	2.34	0.19	1.82
-1276	-1290	-1284	-1279	-1279	-1276	122	4.94	0.41	3.84
-1267	-1288	-1283	-1266	-1282	-1267	123	7.28	0.61	5.66
-1274	-1278	-1294	-1279	-1276	-1274	124	5.46	0.45	4.24
-1277	-1263	-1278	-1278	-1271	-1277	125	4.68	0.39	3.64
-1272	-1276	-1261	-1277	-1278	-1272	126	5.98	0.50	4.65
-1260	-1274	-1277	-1267	-1267	-1260	127	9.1	0.76	7.07
-1274	-1268	-1270	-1273	-1277	-1274	128	5.46	0.45	4.24
-1276	-1281	-1278	-1267	-1271	-1276	129	4.94	0.41	3.84
-1261	-1279	-1272	-1260	-1274	-1261	130	8.84	0.74	6.87
-1265	-1274	-1282	-1272	-1274	-1265	131	7.8	0.65	6.06
-1272	-1272	-1273	-1271	-1269	-1272	132	5.98	0.50	4.65
-1272	-1271	-1280	-1269	-1270	-1272	133	5.98	0.50	4.65
-1272	-1265	-1274	-1276	-1270	-1272	134	5.98	0.50	4.65
-1272	-1271	-1271	-1264	-1277	-1272	135	5.98	0.50	4.65
-1270	-1272	-1275	-1258	-1271	-1270	136	6.5	0.54	5.05
-1259	-1271	-1272	-1248	-1260	-1259	137	9.36	0.78	7.28
-1253	-1259	-1266	-1252	-1261	-1253	138	10.92	0.91	8.49
-1252	-1260	-1259	-1248	-1260	-1252	139	11.18	0.93	8.69
-1256	-1258	-1259	-1260	-1255	-1256	140	10.14	0.84	7.88
-1259	-1247	-1265	-1261	-1250	-1259	141	9.36	0.78	7.28
-1259	-1250	-1266	-1260	-1255	-1259	142	9.36	0.78	7.28
-1261	-1259	-1248	-1262	-1266	-1261	143	8.84	0.74	6.87
-1259	-1260	-1253	-1265	-1263	-1259	144	9.36	0.78	7.28
-1256	-1262	-1261	-1257	-1265	-1256	145	10.14	0.84	7.88
-1254	-1262	-1261	-1251	-1260	-1254	146	10.66	0.89	8.29
-1252	-1261	-1259	-1259	-1260	-1252	147	11.18	0.93	8.69
-1257	-1259	-1256	-1264	-1269	-1257	148	9.88	0.82	7.68
-1259	-1262	-1252	-1265	-1261	-1259	149	9.36	0.78	7.28
-1263	-1262	-1251	-1265	-1258	-1263	150	8.32	0.69	6.47
-1261	-1262	-1258	-1261	-1253	-1261	151	8.84	0.74	6.87
-1262	-1258	-1258	-1261	-1258	-1262	152	8.58	0.71	6.67
-1262	-1252	-1261	-1264	-1248	-1262	153	8.58	0.71	6.67
-1263	-1254	-1265	-1266	-1252	-1263	154	8.32	0.69	6.47
-1266	-1248	-1265	-1260	-1255	-1266	155	7.54	0.63	5.86
-1263	-1253	-1266	-1258	-1262	-1263	156	8.32	0.69	6.47
-1263	-1263	-1261	-1256	-1261	-1263	157	8.32	0.69	6.47
-1259	-1261	-1250	-1263	-1261	-1259	158	9.36	0.78	7.28
-1261	-1259	-1259	-1261	-1252	-1261	159	8.84	0.74	6.87
-1262	-1252	-1261	-1262	-1252	-1262	160	8.58	0.71	6.67
-1261	-1254	-1267	-1267	-1261	-1261	161	8.84	0.74	6.87
-1268	-1265	-1264	-1268	-1264	-1268	162	7.02	0.58	5.46
-1274	-1273	-1254	-1269	-1268	-1274	163	5.46	0.45	4.24
-1266	-1273	-1272	-1262	-1266	-1266	164	7.54	0.63	5.86
-1259	-1277	-1272	-1267	-1263	-1259	165	9.36	0.78	7.28
-1267	-1257	-1271	-1272	-1268	-1267	166	7.28	0.61	5.66
-1267	-1267	-1256	-1274	-1273	-1267	167	7.28	0.61	5.66
-1264	-1268	-1264	-1270	-1273	-1264	168	8.06	0.67	6.27
-1256	-1271	-1269	-1267	-1268	-1256	169	10.14	0.84	7.88
-1271	-1261	-1266	-1268	-1268	-1271	170	6.24	0.52	4.85
-1271	-1266	-1267	-1263	-1269	-1271	171	6.24	0.52	4.85
-1265	-1268	-1268	-1272	-1256	-1265	172	7.8	0.65	6.06
-1268	-1265	-1268	-1275	-1273	-1268	173	7.02	0.58	5.46
-1267	-1269	-1263	-1266	-1267	-1267	174	7.28	0.61	5.66
-1255	-1268	-1270	-1266	-1269	-1255	175	10.4	0.87	8.09
-1274	-1257	-1270	-1268	-1269	-1274	176	5.46	0.45	4.24
-1267	-1268	-1268	-1257	-1271	-1267	177	7.28	0.61	5.66
-1267	-1264	-1269	-1270	-1257	-1267	178	7.28	0.61	5.66
-1269	-1269	-1261	-1281	-1269	-1269	179	6.76	0.56	5.26
-1259	-1275	-1274	-1277	-1261	-1259	180	9.36	0.78	7.28
-1271	-1272	-1269	-1271	-1264	-1271	181	6.24	0.52	4.85
-1269	-1273	-1260	-1271	-1271	-1269	182	6.76	0.56	5.26
-1272	-1269	-1275	-1259	-1269	-1272	183	5.98	0.50	4.65
-1269	-1275	-1276	-1276	-1262	-1269	184	6.76	0.56	5.26
-1270	-1259	-1276	-1276	-1258	-1270	185	6.5	0.54	5.05
-1273	-1270	-1262	-1275	-1272	-1273	186	5.72	0.48	4.45
-1269	-1273	-1273	-1263	-1271	-1269	187	6.76	0.56	5.26
-1276	-1267	-1273	-1267	-1275	-1276	188	4.94	0.41	3.84
-1275	-1266	-1272	-1272	-1266	-1275	189	5.2	0.43	4.04
-1273	-1259	-1273	-1273	-1262	-1273	190	5.72	0.48	4.45
-1280	-1265	-1272	-1272	-1262	-1280	191	3.9	0.32	3.03
-1274	-1266	-1270	-1273	-1264	-1274	192	5.46	0.45	4.24
-1274	-1262	-1272	-1278	-1265	-1274	193	5.46	0.45	4.24
-1272	-1263	-1271	-1272	-1268	-1272	194	5.98	0.50	4.65
-1280	-1261	-1270	-1271	-1260	-1280	195	3.9	0.32	3.03
-1271	-1270	-1272	-1274	-1269	-1271	196	6.24	0.52	4.85
-1276	-1277	-1260	-1273	-1275	-1276	197	4.94	0.41	3.84
-1275	-1279	-1269	-1269	-1273	-1275	198	5.2	0.43	4.04
-1263	-1274	-1272	-1269	-1273	-1263	199	8.32	0.69	6.47



-1270	-1279	-1266	-1274	-1272	-1270	200	6.5	0.54	5.05
-1274	-1272	-1263	-1272	-1273	-1274	201	5.46	0.45	4.24
-1279	-1274	-1262	-1285	-1273	-1279	202	4.16	0.35	3.23
-1274	-1277	-1264	-1273	-1274	-1274	203	5.46	0.45	4.24
-1275	-1280	-1262	-1277	-1272	-1275	204	5.2	0.43	4.04
-1277	-1276	-1272	-1265	-1279	-1277	205	4.68	0.39	3.64
-1277	-1287	-1284	-1270	-1289	-1277	206	4.68	0.39	3.64
-1269	-1283	-1279	-1277	-1280	-1269	207	6.76	0.56	5.26
-1280	-1279	-1273	-1281	-1262	-1280	208	3.9	0.32	3.03
-1271	-1258	-1271	-1271	-1264	-1271	209	6.24	0.52	4.85
-1273	-1258	-1270	-1270	-1257	-1273	210	5.72	0.48	4.45
-1274	-1269	-1266	-1272	-1268	-1274	211	5.46	0.45	4.24
-1273	-1273	-1260	-1271	-1271	-1273	212	5.72	0.48	4.45
-1270	-1272	-1263	-1271	-1274	-1270	213	6.5	0.54	5.05
-1263	-1275	-1274	-1263	-1270	-1263	214	8.32	0.69	6.47
-1270	-1267	-1279	-1275	-1262	-1270	215	6.5	0.54	5.05
-1272	-1266	-1272	-1271	-1275	-1272	216	5.98	0.50	4.65
-1268	-1275	-1272	-1268	-1271	-1268	217	7.02	0.58	5.46
-1263	-1264	-1275	-1269	-1265	-1263	218	8.32	0.69	6.47
-1279	-1270	-1279	-1272	-1263	-1279	219	4.16	0.35	3.23
-1279	-1279	-1273	-1278	-1275	-1279	220	4.16	0.35	3.23
-1282	-1277	-1267	-1275	-1278	-1282	221	3.38	0.28	2.63
-1262	-1285	-1278	-1275	-1272	-1262	222	8.58	0.71	6.67
-1276	-1265	-1276	-1273	-1262	-1276	223	4.94	0.41	3.84
-1271	-1269	-1282	-1281	-1266	-1271	224	6.24	0.52	4.85
-1275	-1279	-1271	-1277	-1273	-1275	225	5.2	0.43	4.04
-1275	-1277	-1265	-1282	-1283	-1275	226	5.2	0.43	4.04
-1272	-1277	-1271	-1277	-1282	-1272	227	5.98	0.50	4.65
-1267	-1282	-1276	-1276	-1278	-1267	228	7.28	0.61	5.66
-1263	-1278	-1276	-1268	-1281	-1263	229	8.32	0.69	6.47
-1281	-1266	-1277	-1275	-1267	-1281	230	3.64	0.30	2.83
-1282	-1282	-1267	-1277	-1277	-1282	231	3.38	0.28	2.63
-1280	-1280	-1277	-1271	-1277	-1280	232	3.9	0.32	3.03
-1262	-1283	-1278	-1262	-1273	-1262	233	8.58	0.71	6.67
-1283	-1277	-1284	-1292	-1271	-1283	234	3.12	0.26	2.43
-1283	-1276	-1287	-1289	-1273	-1283	235	3.12	0.26	2.43
-1285	-1282	-1285	-1291	-1279	-1285	236	2.6	0.22	2.02
-1294	-1279	-1283	-1287	-1276	-1294	237	0.26	0.02	0.20
-1284	-1277	-1285	-1279	-1287	-1284	238	2.86	0.24	2.22
-1276	-1290	-1286	-1273	-1285	-1276	239	4.94	0.41	3.84
-1273	-1285	-1287	-1276	-1286	-1273	240	5.72	0.48	4.45
-1275	-1290	-1287	-1284	-1289	-1275	241	5.2	0.43	4.04
-1281	-1293	-1282	-1287	-1288	-1281	242	3.64	0.30	2.83
-1276	-1289	-1295	-1276	-1284	-1276	243	4.94	0.41	3.84
-1277	-1287	-1291	-1280	-1287	-1277	244	4.68	0.39	3.64
-1281	-1285	-1279	-1288	-1298	-1281	245	3.64	0.30	2.83
-1286	-1283	-1276	-1286	-1279	-1286	246	2.34	0.19	1.82
-1288	-1278	-1287	-1288	-1281	-1288	247	1.82	0.15	1.41
-1291	-1279	-1288	-1283	-1288	-1291	248	1.04	0.09	0.81
-1277	-1291	-1286	-1282	-1285	-1277	249	4.68	0.39	3.64
-1279	-1283	-1277	-1286	-1284	-1279	250	4.16	0.35	3.23
-1282	-1285	-1273	-1284	-1280	-1282	251	3.38	0.28	2.63
-1284	-1277	-1285	-1286	-1286	-1284	252	2.86	0.24	2.22

K = 0.107148



Reference 1995 Annual Book of ASTM Standards  
Section 4 Volume 04.08  
D 2573

1 inch pound-force = 0.0833 foot pound-force

Shear Strength Calculations

$s = T/K$

s = shear strength, lbf/ft<sup>2</sup>

T = torque, lbf.ft

K = constant, depending on dimensions of vane, ft<sup>3</sup>

Vane used in the field is a tapered vane  
for tapered vane,  $K = 1/1728(\pi \cdot D^3 + 0.37(2D^3 - d^3))$   
where, D = vane diameter = 3.625 in  
d = rod diameter = 0.5 in

Per Contractor, vanes built per ASTM recommended dimension of field vanes, ASTM 1995,  
Section 4, Volume 04.08, D 2573 - 94

For 0.5 in diameter rod, equation reduces to  $K = 0.00225D^3 - 0.00003$

K = 0.107148

**Vane Shear Raw Data  
Location 404  
38 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/7/05,retec,404/38

zero =

-1295

calib =

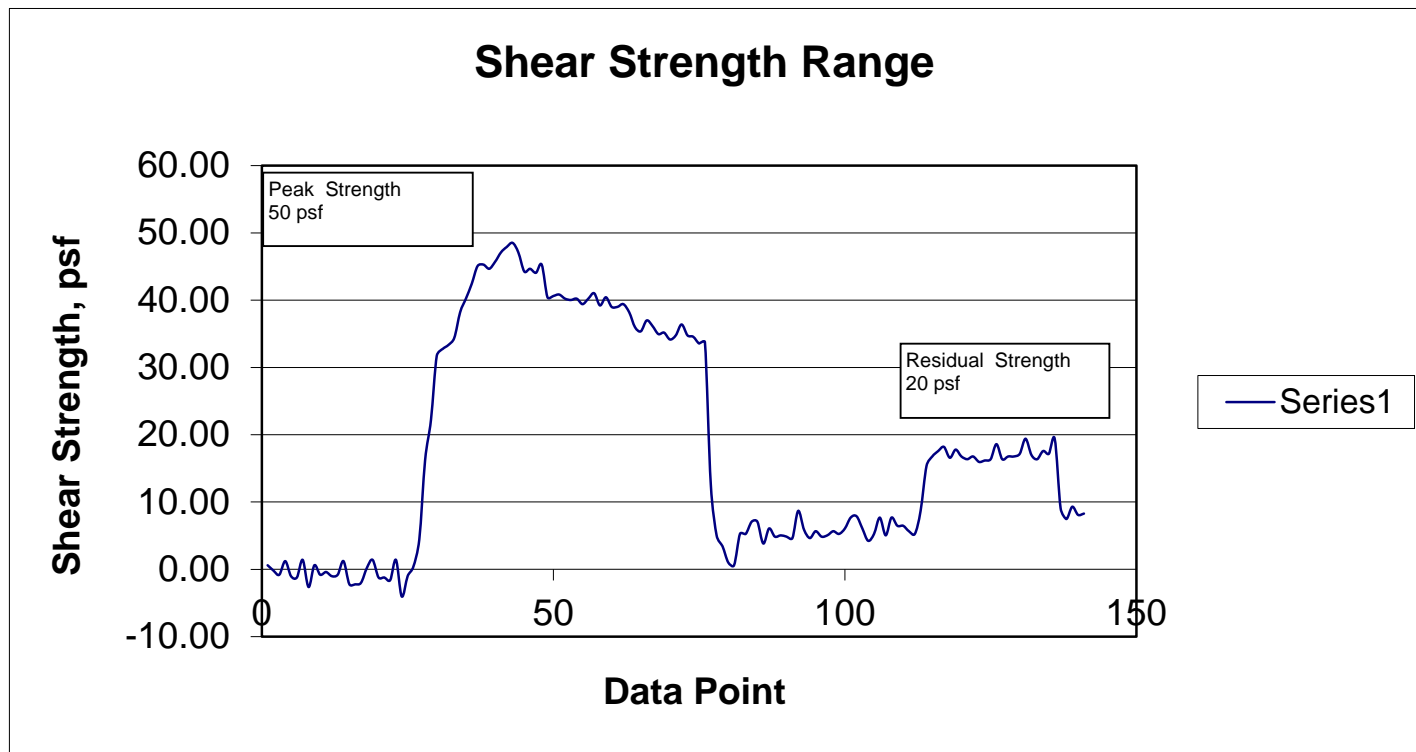
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1292	-1301	-1300	-1294	-1302	-1292	1	0.78	0.06	0.61
-1296	-1299	-1300	-1290	-1300	-1296	2	-0.26	-0.02	-0.20
-1299	-1298	-1303	-1289	-1299	-1299	3	-1.04	-0.09	-0.81
-1289	-1300	-1305	-1290	-1304	-1289	4	1.56	0.13	1.21
-1300	-1296	-1301	-1303	-1304	-1300	5	-1.3	-0.11	-1.01
-1301	-1301	-1293	-1297	-1305	-1301	6	-1.56	-0.13	-1.21
-1288	-1300	-1300	-1294	-1301	-1288	7	1.82	0.15	1.41
-1308	-1306	-1286	-1304	-1298	-1308	8	-3.38	-0.28	-2.63
-1292	-1299	-1304	-1288	-1289	-1292	9	0.78	0.06	0.61
-1299	-1300	-1302	-1307	-1305	-1299	10	-1.04	-0.09	-0.81
-1297	-1305	-1298	-1296	-1296	-1297	11	-0.52	-0.04	-0.40
-1300	-1296	-1286	-1298	-1306	-1300	12	-1.3	-0.11	-1.01
-1299	-1290	-1294	-1307	-1305	-1299	13	-1.04	-0.09	-0.81
-1289	-1300	-1301	-1297	-1297	-1289	14	1.56	0.13	1.21
-1306	-1289	-1300	-1297	-1289	-1306	15	-2.86	-0.24	-2.22
-1306	-1299	-1297	-1300	-1302	-1306	16	-2.86	-0.24	-2.22
-1305	-1305	-1291	-1303	-1299	-1305	17	-2.6	-0.22	-2.02
-1294	-1308	-1306	-1289	-1300	-1294	18	0.26	0.02	0.20
-1288	-1303	-1304	-1296	-1304	-1288	19	1.82	0.15	1.41
-1301	-1299	-1306	-1305	-1290	-1301	20	-1.56	-0.13	-1.21
-1301	-1292	-1307	-1374	-1354	-1301	21	-1.56	-0.13	-1.21
-1303	-1300	-1290	-1310	-1306	-1303	22	-2.08	-0.17	-1.62
-1288	-1301	-1304	-1298	-1317	-1288	23	1.82	0.15	1.41
-1315	-1286	-1295	-1294	-1285	-1315	24	-5.2	-0.43	-4.04
-1300	-1294	-1293	-1298	-1293	-1300	25	-1.3	-0.11	-1.01
-1293	-1299	-1283	-1287	-1276	-1293	26	0.52	0.04	0.40
-1273	-1267	-1239	-1239	-1223	-1273	27	5.72	0.48	4.45
-1215	-1194	-1194	-1183	-1182	-1215	28	20.8	1.73	16.17
-1185	-1168	-1164	-1161	-1148	-1185	29	28.6	2.38	22.23
-1138	-1145	-1140	-1143	-1140	-1138	30	40.82	3.40	31.73
-1133	-1134	-1137	-1119	-1128	-1133	31	42.12	3.51	32.75
-1130	-1117	-1126	-1125	-1113	-1130	32	42.9	3.57	33.35
-1125	-1120	-1106	-1114	-1110	-1125	33	44.2	3.68	34.36
-1106	-1102	-1102	-1090	-1102	-1106	34	49.14	4.09	38.20
-1096	-1085	-1091	-1089	-1079	-1096	35	51.74	4.31	40.22
-1085	-1088	-1082	-1089	-1081	-1085	36	54.6	4.55	42.45
-1072	-1078	-1081	-1077	-1076	-1072	37	57.98	4.83	45.08
-1071	-1074	-1075	-1066	-1075	-1071	38	58.24	4.85	45.28
-1074	-1065	-1075	-1076	-1068	-1074	39	57.46	4.79	44.67
-1069	-1064	-1068	-1070	-1059	-1069	40	58.76	4.89	45.68
-1062	-1068	-1056	-1069	-1063	-1062	41	60.58	5.05	47.10
-1058	-1066	-1055	-1064	-1066	-1058	42	61.62	5.13	47.91
-1055	-1072	-1058	-1070	-1065	-1055	43	62.4	5.20	48.51
-1062	-1076	-1064	-1071	-1061	-1062	44	60.58	5.05	47.10
-1076	-1077	-1066	-1075	-1063	-1076	45	56.94	4.74	44.27
-1074	-1069	-1070	-1068	-1074	-1074	46	57.46	4.79	44.67
-1077	-1073	-1081	-1080	-1081	-1077	47	56.68	4.72	44.06
-1071	-1085	-1073	-1090	-1084	-1071	48	58.24	4.85	45.28
-1095	-1077	-1099	-1089	-1097	-1095	49	52	4.33	40.43
-1094	-1089	-1089	-1089	-1082	-1094	50	52.26	4.35	40.63
-1093	-1100	-1082	-1092	-1080	-1093	51	52.52	4.37	40.83
-1096	-1086	-1094	-1084	-1092	-1096	52	51.74	4.31	40.22
-1097	-1088	-1094	-1085	-1098	-1097	53	51.48	4.29	40.02
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-1100	-1098	-1097	-1094	-1102	-1100	55	50.7	4.22	39.42
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-1092	-1098	-1095	-1104	-1097	-1092	57	52.78	4.40	41.03
-1101	-1096	-1102	-1101	-1105	-1101	58	50.44	4.20	39.21
-1095	-1107	-1092	-1107	-1096	-1095	59	52	4.33	40.43
-1102	-1093	-1110	-1096	-1112	-1102	60	50.18	4.18	39.01
-1102	-1106	-1105	-1114	-1115	-1102	61	50.18	4.18	39.01
-1100	-1107	-1102	-1117	-1110	-1100	62	50.7	4.22	39.42
-1106	-1112	-1112	-1116	-1106	-1106	63	49.14	4.09	38.20
-1117	-1109	-1112	-1114	-1112	-1117	64	46.28	3.86	35.98
-1120	-1112	-1119	-1117	-1113	-1120	65	45.5	3.79	35.37
-1112	-1101	-1119	-1106	-1113	-1112	66	47.58	3.96	36.99
-1116	-1110	-1117	-1105	-1118	-1116	67	46.54	3.88	36.18
-1122	-1113	-1127	-1112	-1121	-1122	68	44.98	3.75	34.97
-1121	-1108	-1120	-1113	-1118	-1121	69	45.24	3.77	35.17
-1126	-1116	-1121	-1125	-1115	-1126	70	43.94	3.66	34.16
-1123	-1121	-1123	-1122	-1117	-1123	71	44.72	3.73	34.77
-1115	-1130	-1113	-1124	-1127	-1115	72	46.8	3.90	36.38
-1123	-1115	-1123	-1115	-1123	-1123	73	44.72	3.73	34.77
-1124	-1117	-1125	-1128	-1117	-1124	74	44.46	3.70	34.56
-1129	-1131	-1116	-1130	-1135	-1129	75	43.16	3.60	33.55
-1128	-1188	-1178	-1205	-1232	-1128	76	43.42	3.62	33.76
-1233	-1260	-1274	-1274	-1277	-1233	77	16.12	1.34	12.53
-1270	-1278	-1286	-1281	-1296	-1270	78	6.5	0.54	5.05
-1278	-1124	-1033	-1098	-1297	-1278	79	4.42	0.37	3.44
-1290	-1308	-1109	-1132	-1239	-1290	80	1.3	0.11	1.01
-1292	-1295	-1292	-1135	-1172	-1292	81	0.78	0.06	0.61
-1269	-1280	-1274	-1273	-1278	-1269	82	6.76	0.56	5.26
-1269	-1257	-1259	-1255	-1265	-1269	83	6.76	0.56	5.26
-1260	-1276	-1268	-1272	-1267	-1260	84	9.1	0.76	7.07
-1260	-1258	-1267	-1270	-1263	-1260	85	9.1	0.76	7.07
-1276	-1263	-1272	-1266	-1259	-1276	86	4.94	0.41	3.84
-1265	-1264	-1269	-1274	-1269	-1265	87	7.8	0.65	6.06
-1271	-1263	-1270	-1264	-1256	-1271	88	6.24	0.52	4.85
-1270	-1262	-1275	-1270	-1257	-1270	89	6.5	0.54	5.05
-1271	-1259	-1263	-1271	-1270	-1271	90	6.24	0.52	4.85
-1272	-1275	-1255	-1264	-1260	-1272	91	5.98	0.50	4.65
-1252	-1273	-1275	-1271	-1266	-1252	92	11.18	0.93	8.69
-1266	-1255	-1261	-1264	-1264	-1266	93	7.54	0.63	5.86
-1272	-1273	-1270	-1273	-1266	-1272	94	5.98	0.50	4.65
-1267	-1268	-1257	-1271	-1271	-1267	95	7.28	0.61	5.66
-1271	-1276	-1253	-1267	-1266	-1271	96	6.24	0.52	4.85
-1270	-1271	-1265	-1270	-1260	-1270	97	6.5	0.54	5.05

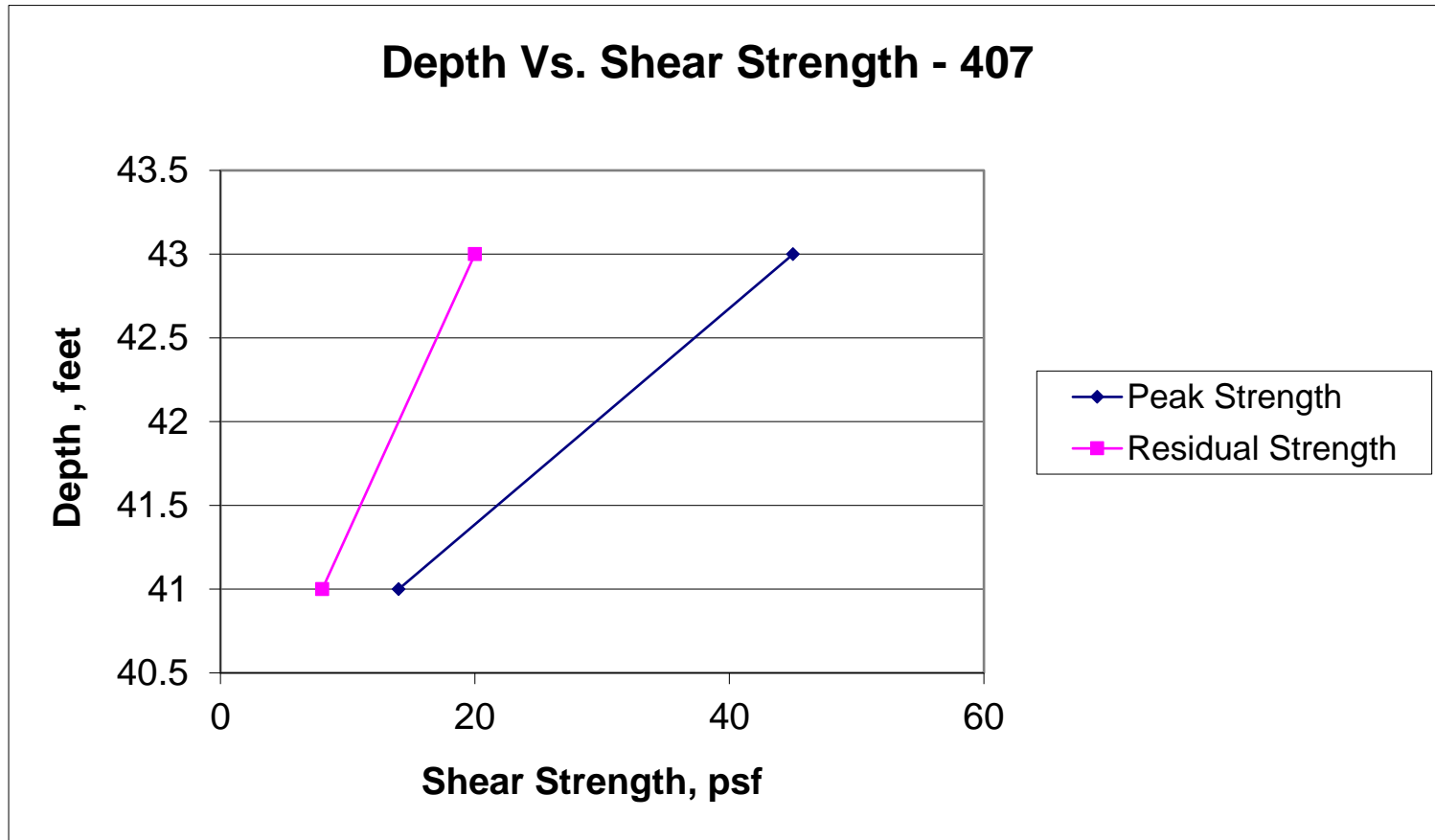
-1267	-1263	-1265	-1272	-1257	-1267	98	7.28	0.61	5.66
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-1265	-1268	-1269	-1257	-1272	-1265	100	7.8	0.65	6.06
-1257	-1268	-1267	-1259	-1269	-1257	101	9.88	0.82	7.68
-1256	-1269	-1270	-1268	-1266	-1256	102	10.14	0.84	7.88
-1265	-1271	-1267	-1256	-1270	-1265	103	7.8	0.65	6.06
-1274	-1266	-1268	-1262	-1269	-1274	104	5.46	0.45	4.24
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-1263	-1269	-1260	-1268	-1270	-1263	110	8.32	0.69	6.47
-1267	-1268	-1254	-1267	-1266	-1267	111	7.28	0.61	5.66
-1269	-1257	-1268	-1264	-1256	-1269	112	6.76	0.56	5.26
-1252	-1235	-1233	-1220	-1235	-1252	113	11.18	0.93	8.69
-1219	-1222	-1218	-1217	-1217	-1219	114	19.76	1.65	15.36
-1212	-1218	-1216	-1212	-1215	-1212	115	21.58	1.80	16.78
-1208	-1212	-1203	-1213	-1213	-1208	116	22.62	1.88	17.59
-1205	-1215	-1207	-1203	-1216	-1205	117	23.4	1.95	18.19
-1213	-1211	-1213	-1207	-1214	-1213	118	21.32	1.78	16.57
-1207	-1215	-1209	-1212	-1217	-1207	119	22.88	1.91	17.79
-1212	-1216	-1205	-1205	-1216	-1212	120	21.58	1.80	16.78
-1214	-1215	-1215	-1209	-1215	-1214	121	21.06	1.75	16.37
-1212	-1211	-1221	-1209	-1206	-1212	122	21.58	1.80	16.78
-1216	-1222	-1204	-1218	-1216	-1216	123	20.54	1.71	15.97
-1215	-1220	-1212	-1210	-1209	-1215	124	20.8	1.73	16.17
-1214	-1211	-1216	-1208	-1222	-1214	125	21.06	1.75	16.37
-1203	-1207	-1213	-1206	-1207	-1203	126	23.92	1.99	18.60
-1214	-1211	-1212	-1207	-1202	-1214	127	21.06	1.75	16.37
-1212	-1217	-1215	-1216	-1213	-1212	128	21.58	1.80	16.78
-1212	-1204	-1222	-1207	-1220	-1212	129	21.58	1.80	16.78
-1210	-1214	-1203	-1212	-1211	-1210	130	22.1	1.84	17.18
-1199	-1209	-1211	-1206	-1214	-1199	131	24.96	2.08	19.40
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-1214	-1202	-1213	-1201	-1216	-1214	133	21.06	1.75	16.37
-1208	-1213	-1208	-1210	-1200	-1208	134	22.62	1.88	17.59
-1210	-1216	-1200	-1211	-1214	-1210	135	22.1	1.84	17.18
-1199	-1212	-1207	-1206	-1227	-1199	136	24.96	2.08	19.40
-1250	-1255	-1244	-1256	-1254	-1250	137	11.7	0.97	9.10
-1258	-1254	-1256	-1251	-1254	-1258	138	9.62	0.80	7.48
-1249	-1253	-1255	-1246	-1255	-1249	139	11.96	1.00	9.30
-1255	-1248	-1260	-1255	-1245	-1255	140	10.4	0.87	8.09
-1254	-1244	-1254	-1256	-1259	-1254	141	10.66	0.89	8.29

K = 0.107148



**Vane Shear Summary  
Location 407**

Depth, ft	Shear Strength, psf	
	Peak	Residual
41	14	8
43	45	20



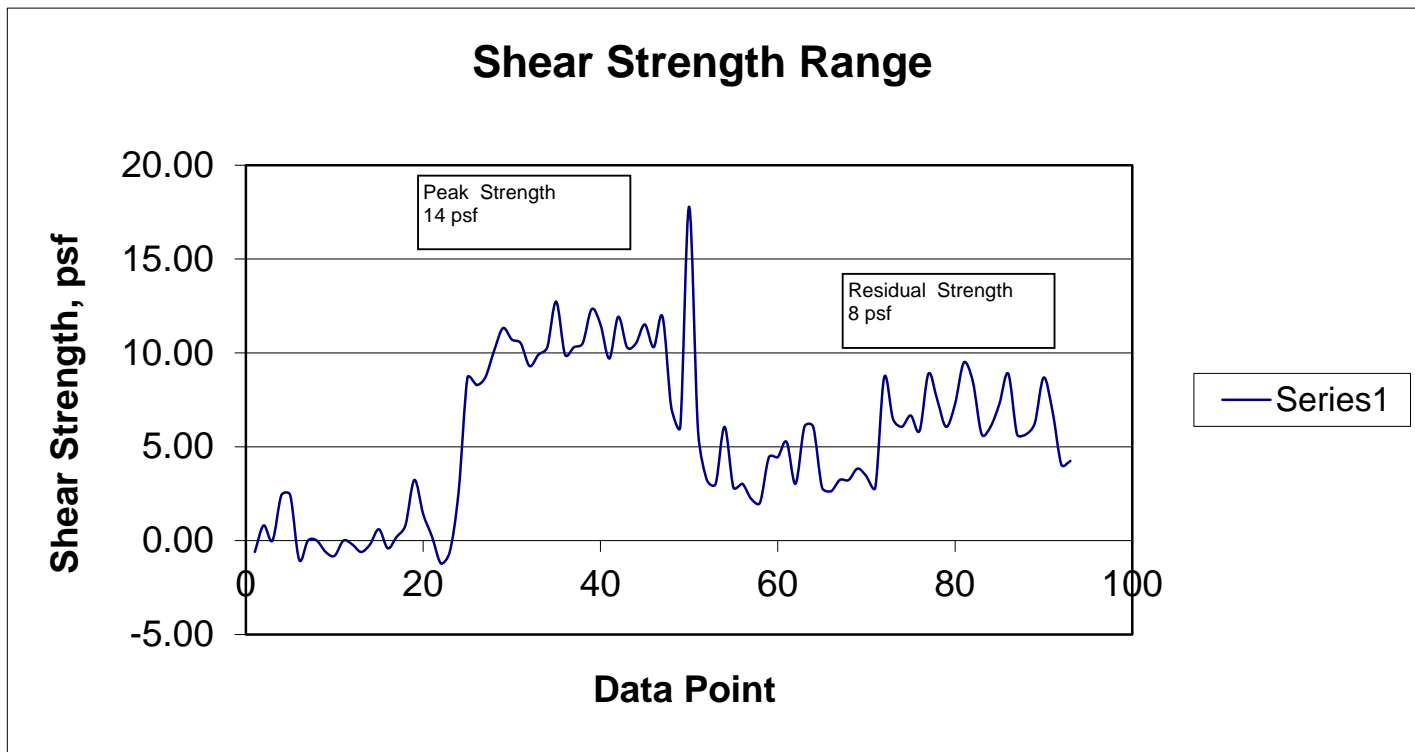
**Vane Shear Raw Data  
Location 407  
41 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**





K =

0.107148



**Vane Shear Raw Data  
Location 407  
43 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,407/43

zero =

-1295

calib =

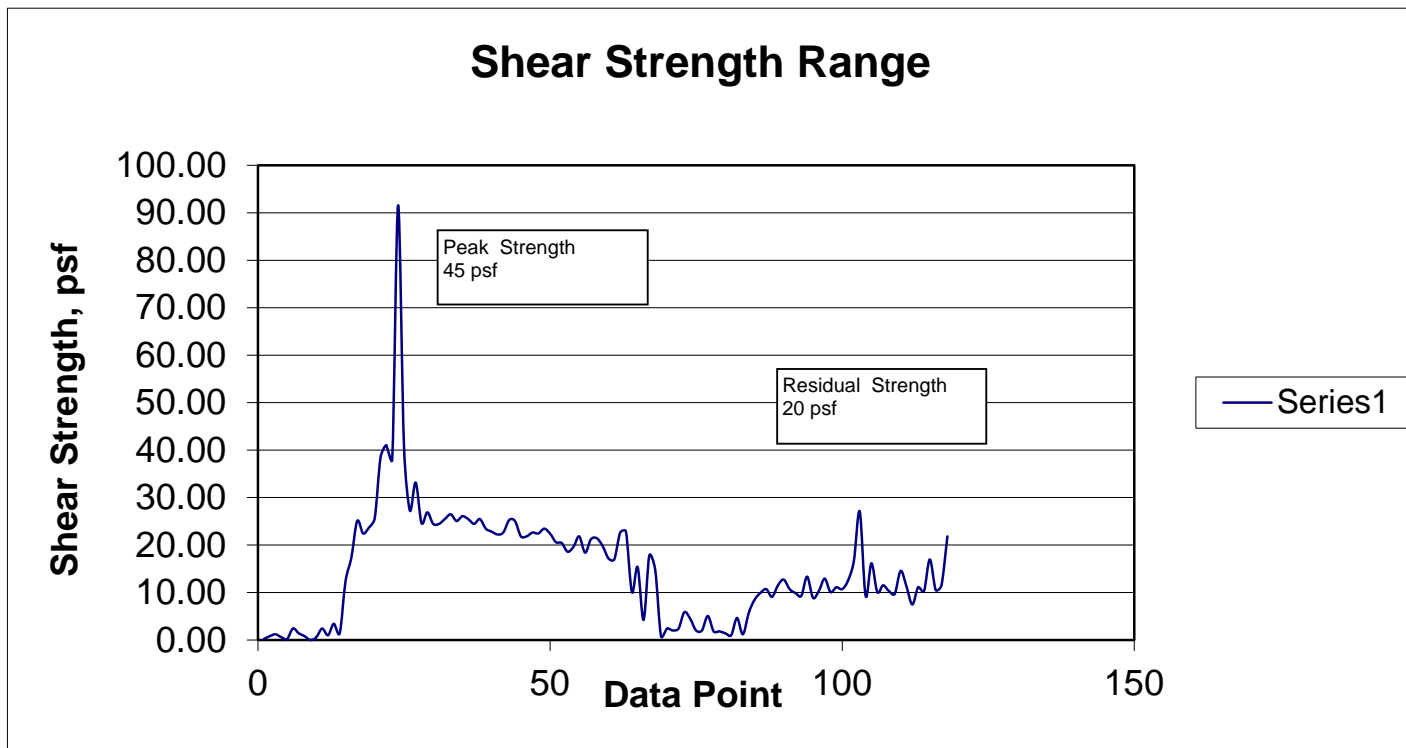
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1294	-1293	-1284	-1291	-1291	-1294	1	0.26	0.02	0.20
-1291	-1278	-1293	-1294	-1277	-1291	2	1.04	0.09	0.81
-1289	-1278	-1290	-1293	-1291	-1289	3	1.56	0.13	1.21
-1292	-1291	-1277	-1294	-1295	-1292	4	0.78	0.06	0.61
-1294	-1291	-1278	-1293	-1292	-1294	5	0.26	0.02	0.20
-1283	-1308	-1291	-1291	-1302	-1283	6	3.12	0.26	2.43
-1288	-1297	-1283	-1291	-1301	-1288	7	1.82	0.15	1.41
-1291	-1294	-1292	-1296	-1294	-1291	8	1.04	0.09	0.81
-1295	-1297	-1287	-1290	-1294	-1295	9	0	0.00	0.00
-1292	-1292	-1287	-1294	-1302	-1292	10	0.78	0.06	0.61
-1283	-1296	-1294	-1281	-1298	-1283	11	3.12	0.26	2.43
-1290	-1295	-1295	-1279	-1294	-1290	12	1.3	0.11	1.01
-1278	-1288	-1237	-1280	-1305	-1278	13	4.42	0.37	3.44
-1288	-1301	-1290	-1272	-1274	-1288	14	1.82	0.15	1.41
-1234	-1245	-1235	-1228	-1203	-1234	15	15.86	1.32	12.33
-1209	-1209	-1180	-1180	-1188	-1209	16	22.36	1.86	17.38
-1171	-1183	-1171	-1165	-1186	-1171	17	32.24	2.69	25.06
-1184	-1177	-1182	-1162	-1177	-1184	18	28.86	2.40	22.44
-1178	-1161	-1163	-1160	-1164	-1178	19	30.42	2.53	23.65
-1168	-1171	-1124	-1176	-1153	-1168	20	33.02	2.75	25.67
-1105	-1153	-1133	-1063	-1152	-1105	21	49.4	4.12	38.41
-1092	-1139	-1085	-1105	-1004	-1092	22	52.78	4.40	41.03
-1107	-976	-1053	-1110	-856	-1107	23	48.88	4.07	38.00
-842	-876	-857	-900	-1157	-842	24	117.78	9.81	91.57
-1094	-953	-960	-1081	-917	-1094	25	52.26	4.35	40.63
-1160	-1057	-998	-899	-1015	-1160	26	35.1	2.92	27.29
-1131	-1172	-1160	-1173	-1172	-1131	27	42.64	3.55	33.15
-1173	-1150	-1166	-1164	-1150	-1173	28	31.72	2.64	24.66
-1162	-1163	-1154	-1168	-1170	-1162	29	34.58	2.88	26.88
-1174	-1161	-1175	-1179	-1159	-1174	30	31.46	2.62	24.46
-1174	-1171	-1164	-1166	-1168	-1174	31	31.46	2.62	24.46
-1169	-1158	-1168	-1168	-1165	-1169	32	32.76	2.73	25.47
-1164	-1168	-1178	-1175	-1175	-1164	33	34.06	2.84	26.48
-1171	-1176	-1176	-1184	-1166	-1171	34	32.24	2.69	25.06
-1166	-1176	-1176	-1159	-1170	-1166	35	33.54	2.79	26.07
-1169	-1166	-1172	-1174	-1160	-1169	36	32.76	2.73	25.47
-1174	-1181	-1167	-1177	-1177	-1174	37	31.46	2.62	24.46
-1169	-1180	-1184	-1171	-1180	-1169	38	32.76	2.73	25.47
-1179	-1166	-1177	-1165	-1179	-1179	39	30.16	2.51	23.45
-1182	-1164	-1176	-1172	-1179	-1182	40	29.38	2.45	22.84
-1185	-1183	-1186	-1185	-1172	-1185	41	28.6	2.38	22.23
-1183	-1189	-1171	-1179	-1169	-1183	42	29.12	2.43	22.64
-1170	-1180	-1169	-1182	-1184	-1170	43	32.5	2.71	25.27
-1171	-1183	-1184	-1185	-1186	-1171	44	32.24	2.69	25.06
-1187	-1190	-1185	-1172	-1186	-1187	45	28.08	2.34	21.83
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-1183	-1183	-1184	-1188	-1173	-1183	47	29.12	2.43	22.64
-1184	-1192	-1178	-1190	-1192	-1184	48	28.86	2.40	22.44
-1179	-1192	-1186	-1189	-1194	-1179	49	30.16	2.51	23.45
-1184	-1191	-1191	-1180	-1192	-1184	50	28.86	2.40	22.44
-1193	-1187	-1189	-1178	-1195	-1193	51	26.52	2.21	20.62
-1194	-1176	-1194	-1188	-1199	-1194	52	26.26	2.19	20.42
-1203	-1183	-1203	-1187	-1205	-1203	53	23.92	1.99	18.60
-1198	-1199	-1195	-1197	-1202	-1198	54	25.22	2.10	19.61
-1187	-1197	-1202	-1208	-1209	-1187	55	28.08	2.34	21.83
-1204	-1206	-1206	-1204	-1204	-1204	56	23.66	1.97	18.39
-1190	-1200	-1197	-1207	-1205	-1190	57	27.3	2.27	21.22
-1189	-1207	-1194	-1206	-1204	-1189	58	27.56	2.30	21.43
-1197	-1217	-1215	-1199	-1213	-1197	59	25.48	2.12	19.81
-1210	-1194	-1209	-1206	-1213	-1210	60	22.1	1.84	17.18
-1211	-1200	-1212	-1207	-1194	-1211	61	21.84	1.82	16.98
-1183	-1201	-1197	-1204	-1204	-1183	62	29.12	2.43	22.64
-1182	-1183	-1242	-1230	-1212	-1182	63	29.38	2.45	22.84
-1245	-1212	-1190	-1225	-1243	-1245	64	13	1.08	10.11
-1219	-1227	-1205	-1256	-1240	-1219	65	19.76	1.65	15.36
-1274	-1254	-1181	-1151	-1146	-1274	66	5.46	0.45	4.24
-1207	-1229	-1217	-1243	-1239	-1207	67	22.88	1.91	17.79
-1222	-1235	-1259	-1295	-1278	-1222	68	18.98	1.58	14.76
-1291	-1271	-1287	-1289	-1278	-1291	69	1.04	0.09	0.81
-1283	-1275	-1289	-1279	-1284	-1283	70	3.12	0.26	2.43
-1285	-1280	-1285	-1285	-1285	-1285	71	2.6	0.22	2.02
-1283	-1284	-1285	-1274	-1263	-1283	72	3.12	0.26	2.43
-1266	-1289	-1288	-1273	-1284	-1266	73	7.54	0.63	5.86
-1273	-1285	-1284	-1284	-1286	-1273	74	5.72	0.48	4.45
-1285	-1281	-1271	-1289	-1280	-1285	75	2.6	0.22	2.02
-1285	-1272	-1285	-1273	-1286	-1285	76	2.6	0.22	2.02
-1270	-1284	-1283	-1283	-1281	-1270	77	6.5	0.54	5.05
-1286	-1284	-1272	-1289	-1289	-1286	78	2.34	0.19	1.82
-1286	-1288	-1283	-1288	-1275	-1286	79	2.34	0.19	1.82
-1288	-1276	-1288	-1283	-1272	-1288	80	1.82	0.15	1.41
-1290	-1281	-1281	-1272	-1283	-1290	81	1.3	0.11	1.01
-1272	-1286	-1283	-1285	-1285	-1272	82	5.98	0.50	4.65
-1289	-1288	-1287	-1286	-1283	-1289	83	1.56	0.13	1.21
-1267	-1279	-1270	-1268	-1256	-1267	84	7.28	0.61	5.66
-1253	-1251	-1236	-1250	-1248	-1253	85	10.92	0.91	8.49
-1246	-1246	-1235	-1247	-1233	-1246	86	12.74	1.06	9.90
-1242	-1232	-1241	-1247	-1236	-1242	87	13.78	1.15	10.71
-1250	-1242	-1250	-1236	-1254	-1250	88	11.7	0.97	9.10
-1238	-1255	-1253	-1248	-1249	-1238	89	14.82	1.23	11.52
-1232	-1246	-1243	-1232	-1247	-1232	90	16.38	1.36	12.73
-1242	-1248	-1231	-1252	-1241	-1242	91	13.78	1.15	10.71
-1246	-1235	-1251	-1251	-1234	-1246	92	12.74	1.06	9.90
-1249	-1233	-1246	-1253	-1245	-1249	93	11.96	1.00	9.30
-1229	-1222	-1207	-1250	-1240	-1229	94	17.16	1.43	13.34
-1251	-1243	-1247	-1230	-1251	-1251	95	11.44	0.95	8.89
-1244	-1251	-1254	-1244	-1249	-1244	96	13.26	1.10	10.31
-1231	-1217	-1258	-1234	-1254	-1231	97	16.64	1.39	12.94

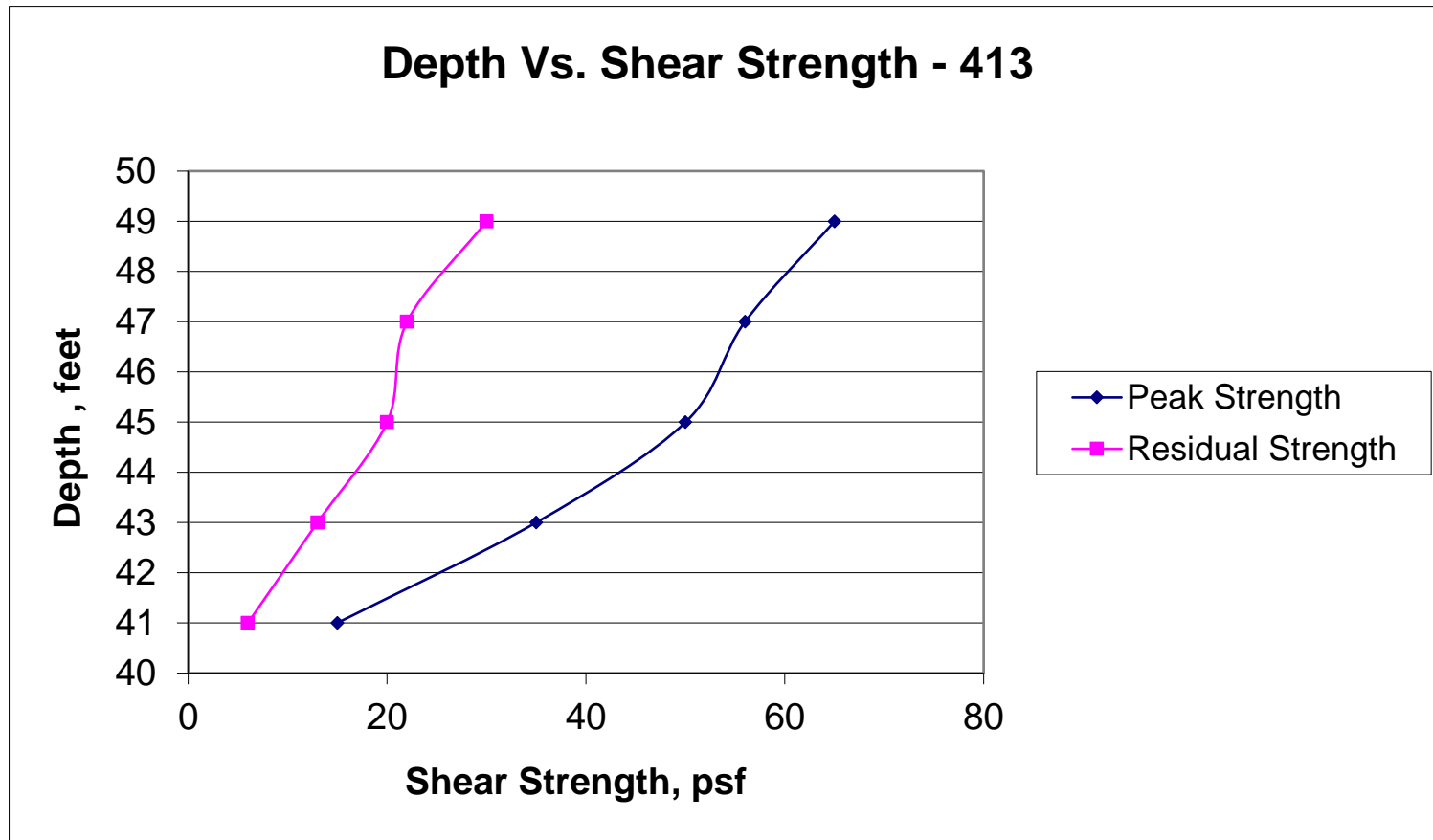
-1245	-1254	-1256	-1251	-1244	-1245	98	13	1.08	10.11
-1240	-1242	-1252	-1231	-1227	-1240	99	14.3	1.19	11.12
-1242	-1249	-1252	-1241	-1249	-1242	100	13.78	1.15	10.71
-1233	-1225	-1222	-1231	-1224	-1233	101	16.12	1.34	12.53
-1213	-1183	-1163	-1198	-1177	-1213	102	21.32	1.78	16.57
-1161	-1157	-1200	-1181	-1153	-1161	103	34.84	2.90	27.09
-1249	-1242	-1257	-1207	-1211	-1249	104	11.96	1.00	9.30
-1215	-1255	-1225	-1226	-1254	-1215	105	20.8	1.73	16.17
-1245	-1252	-1253	-1236	-1253	-1245	106	13	1.08	10.11
-1238	-1251	-1252	-1247	-1251	-1238	107	14.82	1.23	11.52
-1244	-1247	-1264	-1256	-1230	-1244	108	13.26	1.10	10.31
-1247	-1258	-1231	-1239	-1258	-1247	109	12.48	1.04	9.70
-1223	-1249	-1256	-1228	-1257	-1223	110	18.72	1.56	14.55
-1239	-1250	-1254	-1248	-1210	-1239	111	14.56	1.21	11.32
-1258	-1261	-1246	-1255	-1257	-1258	112	9.62	0.80	7.48
-1240	-1257	-1233	-1255	-1257	-1240	113	14.3	1.19	11.12
-1244	-1258	-1251	-1244	-1231	-1244	114	13.26	1.10	10.31
-1211	-1261	-1239	-1221	-1224	-1211	115	21.84	1.82	16.98
-1243	-1220	-1226	-1220	-1241	-1243	116	13.52	1.13	10.51
-1238	-1233	-1225	-1208	-1196	-1238	117	14.82	1.23	11.52
-1187	-1172	-1274	-1272	-1255	-1187	118	28.08	2.34	21.83

K = 0.107148



**Vane Shear Summary  
Location 413**

Depth, ft	Shear Strength, psf	
	Peak	Residual
41	15	6
43	35	13
45	50	20
47	56	22
49	65	30



**Vane Shear Raw Data  
Location 413  
40 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/05,retec,413/40

zero =

-1295

calib =

0.26 in-lb/unit ft-lb

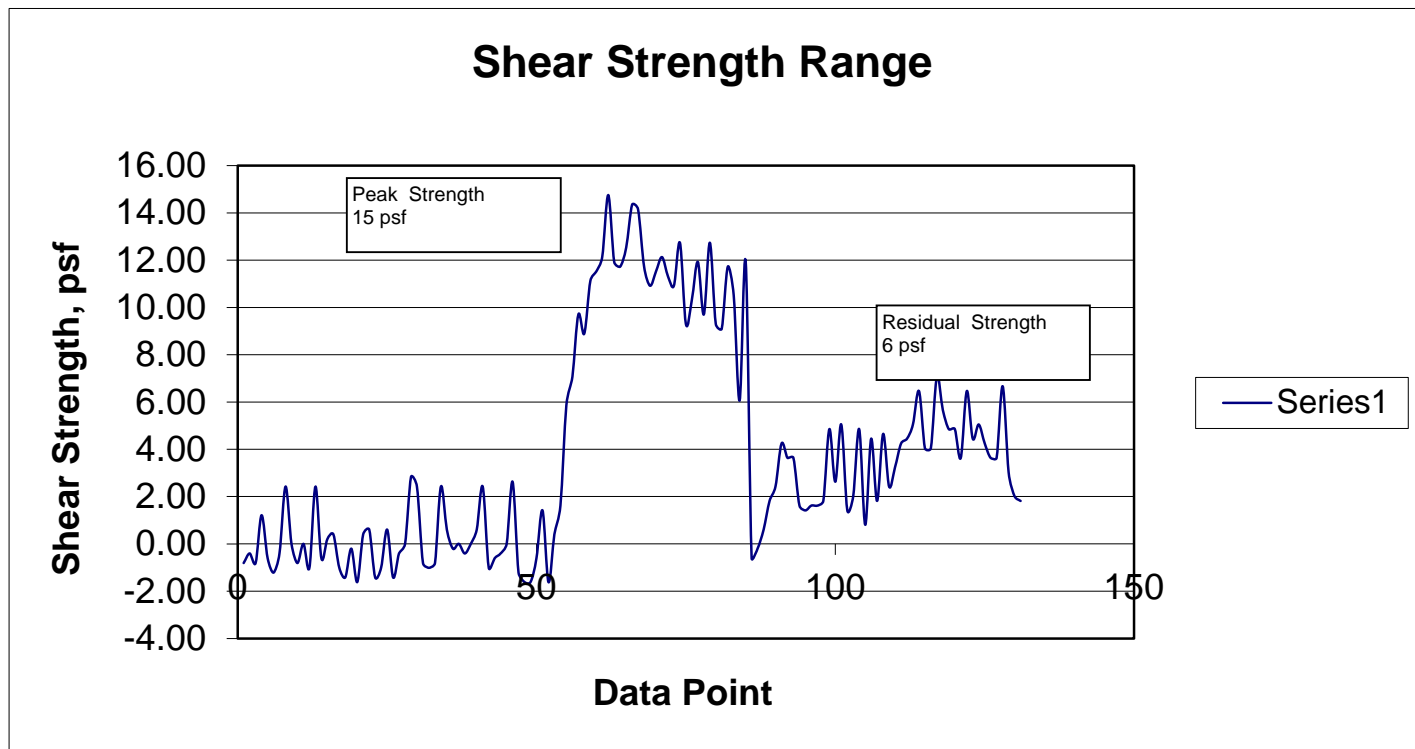
Shear Strength, psf

-1299	-1295	-1290	-1298	-1290	-1299	1	-1.04	-0.09	-0.81
-1297	-1299	-1286	-1301	-1281	-1297	2	-0.52	-0.04	-0.40
-1299	-1292	-1299	-1283	-1297	-1299	3	-1.04	-0.09	-0.81
-1289	-1300	-1283	-1297	-1294	-1289	4	1.56	0.13	1.21
-1298	-1295	-1296	-1297	-1282	-1298	5	-0.78	-0.06	-0.61
-1301	-1283	-1302	-1294	-1300	-1301	6	-1.56	-0.13	-1.21
-1297	-1293	-1302	-1282	-1301	-1297	7	-0.52	-0.04	-0.40
-1283	-1298	-1295	-1298	-1300	-1283	8	3.12	0.26	2.43
-1295	-1293	-1300	-1298	-1292	-1295	9	0	0.00	0.00
-1299	-1297	-1303	-1284	-1299	-1299	10	-1.04	-0.09	-0.81
-1295	-1301	-1283	-1296	-1294	-1295	11	0	0.00	0.00
-1300	-1285	-1297	-1286	-1302	-1300	12	-1.3	-0.11	-1.01
-1283	-1295	-1285	-1304	-1299	-1283	13	3.12	0.26	2.43
-1298	-1284	-1304	-1300	-1295	-1298	14	-0.78	-0.06	-0.61
-1294	-1300	-1300	-1283	-1300	-1294	15	0.26	0.02	0.20
-1293	-1300	-1286	-1296	-1283	-1293	16	0.52	0.04	0.40
-1300	-1299	-1297	-1297	-1300	-1300	17	-1.3	-0.11	-1.01
-1302	-1296	-1296	-1301	-1282	-1302	18	-1.82	-0.15	-1.41
-1296	-1297	-1303	-1291	-1298	-1296	19	-0.26	-0.02	-0.20
-1303	-1301	-1300	-1294	-1300	-1303	20	-2.08	-0.17	-1.62
-1293	-1298	-1296	-1300	-1292	-1293	21	0.52	0.04	0.40
-1292	-1302	-1301	-1295	-1297	-1292	22	0.78	0.06	0.61
-1302	-1302	-1297	-1298	-1283	-1302	23	-1.82	-0.15	-1.41
-1300	-1289	-1299	-1284	-1302	-1300	24	-1.3	-0.11	-1.01
-1292	-1302	-1280	-1302	-1299	-1292	25	0.78	0.06	0.61
-1302	-1287	-1300	-1301	-1292	-1302	26	-1.82	-0.15	-1.41
-1297	-1297	-1302	-1289	-1297	-1297	27	-0.52	-0.04	-0.40
-1295	-1302	-1283	-1287	-1295	-1295	28	0	0.00	0.00
-1281	-1299	-1299	-1287	-1297	-1281	29	3.64	0.30	2.83
-1283	-1301	-1291	-1297	-1299	-1283	30	3.12	0.26	2.43
-1299	-1299	-1290	-1296	-1284	-1299	31	-1.04	-0.09	-0.81
-1300	-1282	-1301	-1296	-1297	-1300	32	-1.3	-0.11	-1.01
-1299	-1294	-1299	-1284	-1301	-1299	33	-1.04	-0.09	-0.81
-1283	-1296	-1296	-1291	-1302	-1283	34	3.12	0.26	2.43
-1292	-1302	-1286	-1301	-1299	-1292	35	0.78	0.06	0.61
-1296	-1297	-1281	-1302	-1297	-1296	36	-0.26	-0.02	-0.20
-1295	-1295	-1291	-1300	-1300	-1295	37	0	0.00	0.00
-1297	-1301	-1282	-1300	-1302	-1297	38	-0.52	-0.04	-0.40
-1295	-1297	-1287	-1299	-1300	-1295	39	0	0.00	0.00
-1292	-1299	-1301	-1283	-1301	-1292	40	0.78	0.06	0.61
-1283	-1295	-1297	-1296	-1281	-1283	41	3.12	0.26	2.43
-1300	-1289	-1298	-1298	-1299	-1300	42	-1.3	-0.11	-1.01
-1298	-1302	-1286	-1297	-1297	-1298	43	-0.78	-0.06	-0.61
-1297	-1302	-1298	-1296	-1299	-1297	44	-0.52	-0.04	-0.40
-1295	-1301	-1296	-1295	-1299	-1295	45	0	0.00	0.00
-1282	-1300	-1299	-1301	-1290	-1282	46	3.38	0.28	2.63
-1301	-1281	-1303	-1302	-1282	-1301	47	-1.56	-0.13	-1.21
-1303	-1289	-1299	-1303	-1282	-1303	48	-2.08	-0.17	-1.62
-1303	-1283	-1301	-1304	-1294	-1303	49	-2.08	-0.17	-1.62
-1298	-1298	-1304	-1285	-1296	-1298	50	-0.78	-0.06	-0.61
-1288	-1301	-1287	-1301	-1297	-1288	51	1.82	0.15	1.41
-1303	-1300	-1295	-1294	-1293	-1303	52	-2.08	-0.17	-1.62
-1293	-1290	-1291	-1281	-1292	-1293	53	0.52	0.04	0.40
-1287	-1287	-1284	-1267	-1281	-1287	54	2.08	0.17	1.62
-1266	-1275	-1262	-1272	-1262	-1266	55	7.54	0.63	5.86
-1260	-1243	-1253	-1243	-1237	-1260	56	9.1	0.76	7.07
-1247	-1253	-1251	-1250	-1250	-1247	57	12.48	1.04	9.70
-1251	-1225	-1242	-1241	-1227	-1251	58	11.44	0.95	8.89
-1240	-1240	-1240	-1229	-1235	-1240	59	14.3	1.19	11.12
-1238	-1235	-1220	-1238	-1237	-1238	60	14.82	1.23	11.52
-1235	-1225	-1238	-1235	-1223	-1235	61	15.6	1.30	12.13
-1222	-1234	-1236	-1223	-1234	-1222	62	18.98	1.58	14.76
-1236	-1237	-1221	-1241	-1237	-1236	63	15.34	1.28	11.93
-1237	-1223	-1234	-1238	-1236	-1237	64	15.08	1.26	11.72
-1233	-1221	-1238	-1240	-1228	-1233	65	16.12	1.34	12.53
-1224	-1236	-1238	-1238	-1219	-1224	66	18.46	1.54	14.35
-1225	-1239	-1239	-1223	-1237	-1225	67	18.2	1.52	14.15
-1237	-1238	-1229	-1241	-1240	-1237	68	15.08	1.26	11.72
-1241	-1223	-1237	-1239	-1224	-1241	69	14.04	1.17	10.92
-1238	-1244	-1233	-1241	-1243	-1238	70	14.82	1.23	11.52
-1235	-1246	-1247	-1222	-1238	-1235	71	15.6	1.30	12.13
-1239	-1223	-1247	-1247	-1237	-1239	72	14.56	1.21	11.32
-1241	-1243	-1243	-1245	-1227	-1241	73	14.04	1.17	10.92
-1232	-1241	-1235	-1247	-1247	-1232	74	16.38	1.36	12.73
-1249	-1240	-1243	-1239	-1226	-1249	75	11.96	1.00	9.30
-1244	-1248	-1230	-1244	-1245	-1244	76	13.26	1.10	10.31
-1236	-1247	-1248	-1231	-1243	-1236	77	15.34	1.28	11.93
-1247	-1231	-1246	-1252	-1237	-1247	78	12.48	1.04	9.70
-1232	-1245	-1241	-1248	-1251	-1232	79	16.38	1.36	12.73
-1249	-1241	-1249	-1235	-1250	-1249	80	11.96	1.00	9.30
-1250	-1257	-1249	-1235	-1249	-1250	81	11.7	0.97	9.10
-1237	-1255	-1255	-1254	-1240	-1237	82	15.08	1.26	11.72
-1243	-1245	-1222	-1238	-1239	-1243	83	13.52	1.13	10.51
-1265	-1292	-1294	-1291	-1302	-1265	84	7.8	0.65	6.06
-1236	-1250	-1269	-1297	-1295	-1236	85	15.34	1.28	11.93
-1298	-1246	-1255	-1288	-1291	-1298	86	-0.78	-0.06	-0.61
-1296	-1287	-1281	-1293	-1286	-1296	87	-0.26	-0.02	-0.20
-1292	-1290	-1288	-1290	-1272	-1292	88	0.78	0.06	0.61
-1286	-1270	-1283	-1282	-1266	-1286	89	2.34	0.19	1.82
-1283	-1270	-1278	-1270	-1282	-1283	90	3.12	0.26	2.43
-1274	-1274	-1276	-1258	-1265	-1274	91	5.46	0.45	4.24
-1277	-1270	-1272	-1276	-1259	-1277	92	4.68	0.39	3.64
-1277	-1261	-1273	-1286	-1272	-1277	93	4.68	0.39	3.64
-1287	-1271	-1286	-1285	-1285	-1287	94	2.08	0.17	1.62
-1288	-1285	-1287	-1283	-1292	-1288	95	1.82	0.15	1.41
-1287	-1288	-1278	-1289	-1275	-1287	96	2.08	0.17	1.62
-1287	-1271	-1293	-1292	-1285	-1287	97	2.08	0.17	1.62



-1286	-1287	-1290	-1273	-1290	-1286	98	2.34	0.19	1.82
-1271	-1290	-1289	-1284	-1288	-1271	99	6.24	0.52	4.85
-1282	-1290	-1288	-1280	-1292	-1282	100	3.38	0.28	2.63
-1270	-1273	-1293	-1287	-1285	-1270	101	6.5	0.54	5.05
-1288	-1275	-1290	-1287	-1282	-1288	102	1.82	0.15	1.41
-1285	-1283	-1294	-1276	-1287	-1285	103	2.6	0.22	2.02
-1271	-1288	-1284	-1286	-1287	-1271	104	6.24	0.52	4.85
-1291	-1283	-1286	-1287	-1289	-1291	105	1.04	0.09	0.81
-1273	-1288	-1279	-1292	-1289	-1273	106	5.72	0.48	4.45
-1286	-1273	-1290	-1287	-1286	-1286	107	2.34	0.19	1.82
-1272	-1287	-1272	-1285	-1282	-1272	108	5.98	0.50	4.65
-1283	-1282	-1270	-1277	-1262	-1283	109	3.12	0.26	2.43
-1279	-1277	-1272	-1273	-1258	-1279	110	4.16	0.35	3.23
-1274	-1268	-1272	-1266	-1272	-1274	111	5.46	0.45	4.24
-1273	-1270	-1278	-1277	-1261	-1273	112	5.72	0.48	4.45
-1270	-1265	-1276	-1259	-1271	-1270	113	6.5	0.54	5.05
-1263	-1274	-1263	-1273	-1269	-1263	114	8.32	0.69	6.47
-1275	-1266	-1273	-1266	-1277	-1275	115	5.2	0.43	4.04
-1275	-1272	-1274	-1277	-1276	-1275	116	5.2	0.43	4.04
-1260	-1273	-1279	-1263	-1275	-1260	117	9.1	0.76	7.07
-1267	-1278	-1260	-1269	-1274	-1267	118	7.28	0.61	5.66
-1271	-1277	-1259	-1273	-1273	-1271	119	6.24	0.52	4.85
-1271	-1278	-1263	-1276	-1276	-1271	120	6.24	0.52	4.85
-1277	-1279	-1261	-1260	-1281	-1277	121	4.68	0.39	3.64
-1263	-1276	-1278	-1270	-1271	-1263	122	8.32	0.69	6.47
-1273	-1272	-1280	-1261	-1278	-1273	123	5.72	0.48	4.45
-1270	-1278	-1276	-1279	-1267	-1270	124	6.5	0.54	5.05
-1274	-1273	-1270	-1278	-1276	-1274	125	5.46	0.45	4.24
-1277	-1276	-1259	-1278	-1277	-1277	126	4.68	0.39	3.64
-1277	-1275	-1258	-1279	-1279	-1277	127	4.68	0.39	3.64
-1262	-1277	-1275	-1275	-1286	-1262	128	8.58	0.71	6.67
-1280	-1284	-1268	-1289	-1288	-1280	129	3.9	0.32	3.03
-1285	-1287	-1269	-1288	-1285	-1285	130	2.6	0.22	2.02
-1286	-1288	-1267	-1288	-1291	-1286	131	2.34	0.19	1.82

K = 0.107148

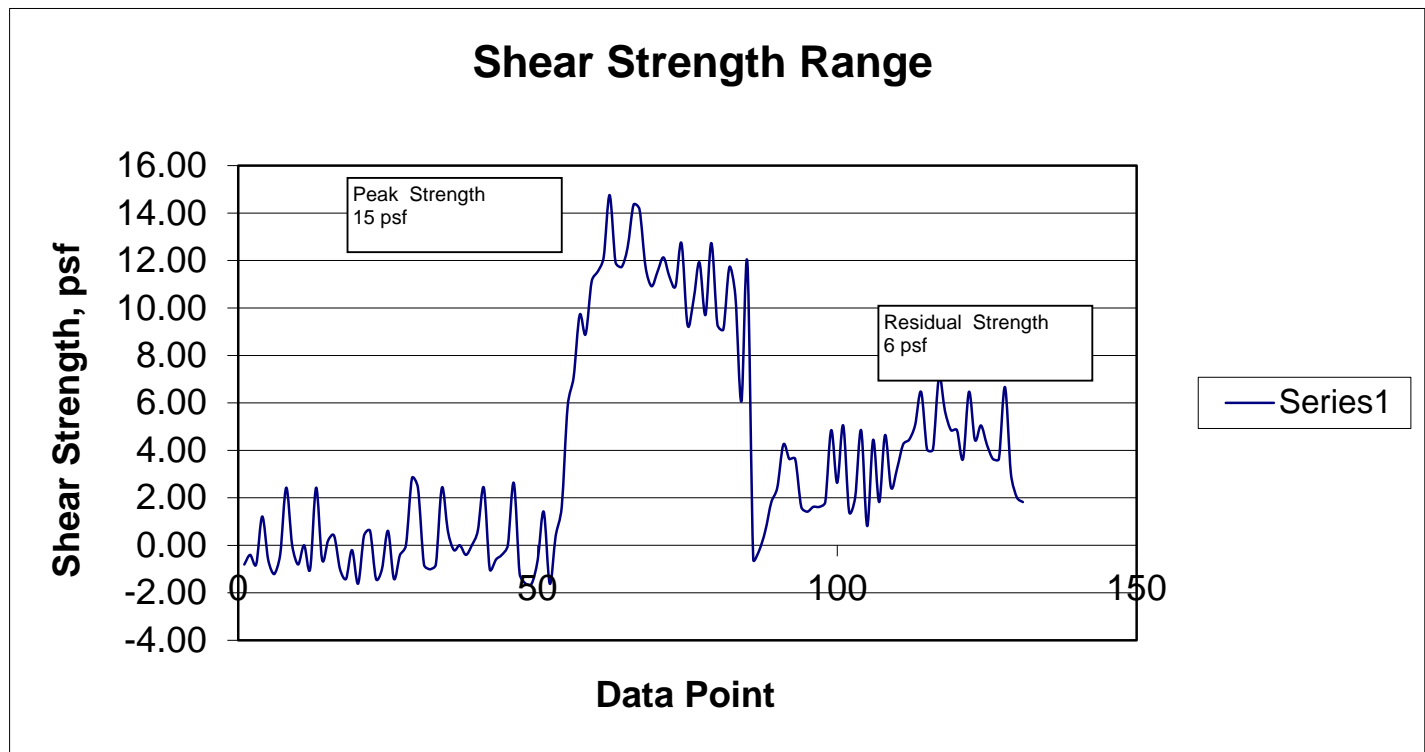


**Vane Shear Raw Data  
Location 413  
41 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/05,retec,413/41					zero =	-1295	calib =	0.26 in-lb/unit	ft-lb	Shear Strength, psf	
-1299	-1295	-1290	-1298	-1290	-1299	-1295	-1299	1	-1.04	-0.09	-0.81
-1297	-1299	-1286	-1301	-1281	-1297	-1295	-1297	2	-0.52	-0.04	-0.40
-1299	-1292	-1299	-1283	-1297	-1299	-1295	-1299	3	-1.04	-0.09	-0.81
-1289	-1300	-1283	-1297	-1294	-1289	-1295	-1289	4	1.56	0.13	1.21
-1298	-1295	-1296	-1297	-1282	-1298	-1295	-1298	5	-0.78	-0.06	-0.61
-1301	-1283	-1302	-1294	-1300	-1301	-1295	-1301	6	-1.56	-0.13	-1.21
-1297	-1293	-1302	-1282	-1301	-1297	-1295	-1297	7	-0.52	-0.04	-0.40
-1283	-1298	-1295	-1298	-1300	-1283	-1295	-1283	8	3.12	0.26	2.43
-1295	-1293	-1300	-1298	-1292	-1295	-1295	-1295	9	0	0.00	0.00
-1299	-1297	-1303	-1284	-1299	-1299	-1295	-1299	10	-1.04	-0.09	-0.81
-1295	-1301	-1283	-1296	-1294	-1295	-1295	-1295	11	0	0.00	0.00
-1300	-1285	-1297	-1286	-1302	-1300	-1295	-1300	12	-1.3	-0.11	-1.01
-1283	-1295	-1285	-1304	-1299	-1283	-1295	-1283	13	3.12	0.26	2.43
-1298	-1284	-1304	-1300	-1295	-1298	-1295	-1298	14	-0.78	-0.06	-0.61
-1294	-1300	-1300	-1283	-1300	-1294	-1295	-1294	15	0.26	0.02	0.20
-1293	-1300	-1286	-1296	-1283	-1293	-1295	-1293	16	0.52	0.04	0.40
-1300	-1299	-1297	-1297	-1300	-1300	-1295	-1300	17	-1.3	-0.11	-1.01
-1302	-1296	-1296	-1301	-1282	-1302	-1295	-1302	18	-1.82	-0.15	-1.41
-1296	-1297	-1303	-1291	-1298	-1296	-1295	-1296	19	-0.26	-0.02	-0.20
-1303	-1301	-1300	-1294	-1300	-1303	-1295	-1303	20	-2.08	-0.17	-1.62
-1293	-1298	-1296	-1300	-1292	-1293	-1295	-1293	21	0.52	0.04	0.40
-1292	-1302	-1301	-1295	-1297	-1292	-1295	-1292	22	0.78	0.06	0.61
-1302	-1302	-1297	-1298	-1283	-1302	-1295	-1302	23	-1.82	-0.15	-1.41
-1300	-1289	-1299	-1284	-1302	-1300	-1295	-1300	24	-1.3	-0.11	-1.01
-1292	-1302	-1280	-1302	-1299	-1292	-1295	-1292	25	0.78	0.06	0.61
-1302	-1287	-1300	-1301	-1292	-1302	-1295	-1302	26	-1.82	-0.15	-1.41
-1297	-1297	-1302	-1289	-1297	-1297	-1295	-1297	27	-0.52	-0.04	-0.40
-1295	-1302	-1283	-1287	-1295	-1295	-1295	-1295	28	0	0.00	0.00
-1281	-1299	-1299	-1287	-1297	-1281	-1295	-1281	29	3.64	0.30	2.83
-1283	-1301	-1291	-1297	-1299	-1283	-1295	-1283	30	3.12	0.26	2.43
-1299	-1299	-1290	-1296	-1284	-1299	-1295	-1299	31	-1.04	-0.09	-0.81
-1300	-1282	-1301	-1296	-1297	-1300	-1295	-1300	32	-1.3	-0.11	-1.01
-1299	-1294	-1299	-1284	-1301	-1299	-1295	-1299	33	-1.04	-0.09	-0.81
-1283	-1296	-1296	-1291	-1302	-1283	-1295	-1283	34	3.12	0.26	2.43
-1292	-1302	-1286	-1301	-1299	-1292	-1295	-1292	35	0.78	0.06	0.61
-1296	-1297	-1281	-1302	-1297	-1296	-1295	-1296	36	-0.26	-0.02	-0.20
-1295	-1295	-1291	-1300	-1300	-1295	-1295	-1295	37	0	0.00	0.00
-1297	-1301	-1282	-1300	-1302	-1297	-1295	-1297	38	-0.52	-0.04	-0.40
-1295	-1297	-1287	-1299	-1300	-1295	-1295	-1295	39	0	0.00	0.00
-1292	-1299	-1301	-1283	-1301	-1292	-1295	-1292	40	0.78	0.06	0.61
-1283	-1295	-1297	-1296	-1281	-1283	-1295	-1283	41	3.12	0.26	2.43
-1300	-1289	-1298	-1298	-1299	-1300	-1295	-1300	42	-1.3	-0.11	-1.01
-1298	-1302	-1286	-1297	-1297	-1298	-1295	-1298	43	-0.78	-0.06	-0.61
-1297	-1302	-1298	-1296	-1299	-1297	-1295	-1297	44	-0.52	-0.04	-0.40
-1295	-1301	-1296	-1295	-1299	-1295	-1295	-1295	45	0	0.00	0.00
-1282	-1300	-1299	-1301	-1290	-1282	-1295	-1282	46	3.38	0.28	2.63
-1301	-1281	-1303	-1302	-1282	-1301	-1295	-1301	47	-1.56	-0.13	-1.21
-1303	-1289	-1299	-1303	-1282	-1303	-1295	-1303	48	-2.08	-0.17	-1.62
-1303	-1283	-1301	-1304	-1294	-1303	-1295	-1303	49	-2.08	-0.17	-1.62
-1298	-1298	-1304	-1285	-1296	-1298	-1295	-1298	50	-0.78	-0.06	-0.61
-1288	-1301	-1287	-1301	-1297	-1288	-1295	-1288	51	1.82	0.15	1.41
-1303	-1300	-1295	-1294	-1293	-1303	-1295	-1303	52	-2.08	-0.17	-1.62
-1293	-1290	-1291	-1281	-1292	-1293	-1295	-1293	53	0.52	0.04	0.40
-1287	-1287	-1284	-1267	-1281	-1287	-1295	-1287	54	2.08	0.17	1.62
-1266	-1275	-1262	-1272	-1262	-1266	-1295	-1266	55	7.54	0.63	5.86
-1260	-1243	-1253	-1243	-1237	-1260	-1295	-1260	56	9.1	0.76	7.07
-1247	-1253	-1251	-1250	-1250	-1247	-1295	-1247	57	12.48	1.04	9.70
-1251	-1225	-1242	-1241	-1227	-1251	-1295	-1251	58	11.44	0.95	8.89
-1240	-1240	-1240	-1229	-1235	-1240	-1295	-1240	59	14.3	1.19	11.12
-1238	-1235	-1220	-1238	-1237	-1238	-1295	-1238	60	14.82	1.23	11.52
-1235	-1225	-1238	-1235	-1223	-1235	-1295	-1235	61	15.6	1.30	12.13
-1222	-1234	-1236	-1223	-1234	-1222	-1295	-1222	62	18.98	1.58	14.76
-1236	-1237	-1221	-1241	-1237	-1236	-1295	-1236	63	15.34	1.28	11.93
-1237	-1223	-1234	-1238	-1236	-1237	-1295	-1237	64	15.08	1.26	11.72
-1233	-1221	-1238	-1240	-1228	-1233	-1295	-1233	65	16.12	1.34	12.53
-1224	-1236	-1238	-1238	-1219	-1224	-1295	-1224	66	18.46	1.54	14.35
-1225	-1239	-1239	-1223	-1237	-1225	-1295	-1225	67	18.2	1.52	14.15
-1237	-1238	-1229	-1241	-1240	-1237	-1295	-1237	68	15.08	1.26	11.72
-1241	-1223	-1237	-1239	-1224	-1241	-1295	-1241	69	14.04	1.17	10.92
-1238	-1244	-1233	-1241	-1243	-1238	-1295	-1238	70	14.82	1.23	11.52
-1235	-1246	-1247	-1222	-1238	-1235	-1295	-1235	71	15.6	1.30	12.13
-1239	-1223	-1247	-1247	-1237	-1239	-1295	-1239	72	14.56	1.21	11.32
-1241	-1243	-1243	-1245	-1227	-1241	-1295	-1241	73	14.04	1.17	10.92
-1232	-1241	-1235	-1247	-1247	-1232	-1295	-1232	74	16.38	1.36	12.73
-1249	-1240	-1243	-1239	-1226	-1249	-1295	-1249	75	11.96	1.00	9.30
-1244	-1248	-1230	-1244	-1245	-1244	-1295	-1244	76	13.26	1.10	10.31
-1236	-1247	-1248	-1231	-1243	-1236	-1295	-1236	77	15.34	1.28	11.93
-1247	-1231	-1246	-1252	-1237	-1247	-1295	-1247	78	12.48	1.04	9.70
-1232	-1245	-1241	-1248	-1251	-1232	-1295	-1232	79	16.38	1.36	12.73
-1249	-1241	-1249	-1235	-1250	-1249	-1295	-1249	80	11.96	1.00	9.30
-1250	-1257	-1249	-1235	-1249	-1250	-1295	-1250	81	11.7	0.97	9.10
-1237	-1255	-1255	-1254	-1240	-1237	-1295	-1237	82	15.08	1.26	11.72
-1243	-1245	-1222	-1238	-1239	-1243	-1295	-1243	83	13.52	1.13	10.51
-1265	-1292	-1294	-1291	-1302	-1265	-1295	-1265	84	7.8	0.65	6.06
-1236	-1250	-1269	-1297	-1295	-1236	-1295	-1236	85	15.34	1.28	11.93
-1298	-1246	-1255	-1288	-1291	-1298	-1295	-1298	86	-0.78	-0.06	-0.61
-1296	-1287	-1281	-1293	-1286	-1296	-1295	-1296	87	-0.26	-0.02	-0.20
-1292	-1290	-1288	-1290	-1272	-1292	-1295	-1292	88	0.78	0.06	0.61
-1286	-1270	-1283	-1282	-1266	-1286	-1295	-1286	89	2.34	0.19	1.82
-1283	-1270	-1278	-1270	-1282	-1283	-1295	-1283	90	3.12	0.26	2.43
-1274	-1274	-1276	-1258	-1265	-1274	-1295	-1274	91	5.46	0.45	4.24
-1277	-1270	-1272	-1276	-1259	-1277	-1295	-1277	92	4.68	0.39	3.64
-1277	-1261	-1273	-1286	-1272	-1277	-1295	-1277	93	4.68	0.39	3.64
-1287	-1271	-1286	-1285	-1285	-1287	-1295	-1287	94	2.08	0.17	1.62
-1288	-1285	-1287	-1283	-1292	-1288	-1295	-1288	95	1.82	0.15	1.41
-1287	-1288	-1278	-1289	-1275	-1287	-1295	-1287	96	2.08	0.17	1.62
-1287	-1271	-1293	-1292	-1285	-1287	-1295	-1287	97	2.08	0.17	1.62

-1286	-1287	-1290	-1273	-1290	-1286	98	2.34	0.19	1.82
-1271	-1290	-1289	-1284	-1288	-1271	99	6.24	0.52	4.85
-1282	-1290	-1288	-1280	-1292	-1282	100	3.38	0.28	2.63
-1270	-1273	-1293	-1287	-1285	-1270	101	6.5	0.54	5.05
-1288	-1275	-1290	-1287	-1282	-1288	102	1.82	0.15	1.41
-1285	-1283	-1294	-1276	-1287	-1285	103	2.6	0.22	2.02
-1271	-1288	-1284	-1286	-1287	-1271	104	6.24	0.52	4.85
-1291	-1283	-1286	-1287	-1289	-1291	105	1.04	0.09	0.81
-1273	-1288	-1279	-1292	-1289	-1273	106	5.72	0.48	4.45
-1286	-1273	-1290	-1287	-1286	-1286	107	2.34	0.19	1.82
-1272	-1287	-1272	-1285	-1282	-1272	108	5.98	0.50	4.65
-1283	-1282	-1270	-1277	-1262	-1283	109	3.12	0.26	2.43
-1279	-1277	-1272	-1273	-1258	-1279	110	4.16	0.35	3.23
-1274	-1268	-1272	-1266	-1272	-1274	111	5.46	0.45	4.24
-1273	-1270	-1278	-1277	-1261	-1273	112	5.72	0.48	4.45
-1270	-1265	-1276	-1259	-1271	-1270	113	6.5	0.54	5.05
-1263	-1274	-1263	-1273	-1269	-1263	114	8.32	0.69	6.47
-1275	-1266	-1273	-1266	-1277	-1275	115	5.2	0.43	4.04
-1275	-1272	-1274	-1277	-1276	-1275	116	5.2	0.43	4.04
-1260	-1273	-1279	-1263	-1275	-1260	117	9.1	0.76	7.07
-1267	-1278	-1260	-1269	-1274	-1267	118	7.28	0.61	5.66
-1271	-1277	-1259	-1273	-1273	-1271	119	6.24	0.52	4.85
-1271	-1278	-1263	-1276	-1276	-1271	120	6.24	0.52	4.85
-1277	-1279	-1261	-1260	-1281	-1277	121	4.68	0.39	3.64
-1263	-1276	-1278	-1270	-1271	-1263	122	8.32	0.69	6.47
-1273	-1272	-1280	-1261	-1278	-1273	123	5.72	0.48	4.45
-1270	-1278	-1276	-1279	-1267	-1270	124	6.5	0.54	5.05
-1274	-1273	-1270	-1278	-1276	-1274	125	5.46	0.45	4.24
-1277	-1276	-1259	-1278	-1277	-1277	126	4.68	0.39	3.64
-1277	-1275	-1258	-1279	-1279	-1277	127	4.68	0.39	3.64
-1262	-1277	-1275	-1275	-1286	-1262	128	8.58	0.71	6.67
-1280	-1284	-1268	-1289	-1288	-1280	129	3.9	0.32	3.03
-1285	-1287	-1269	-1288	-1285	-1285	130	2.6	0.22	2.02
-1286	-1288	-1267	-1288	-1291	-1286	131	2.34	0.19	1.82

K = 0.107148



**Vane Shear Raw Data  
Location 413  
43 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/05,retec,413/43

zero =

-1295

calib =

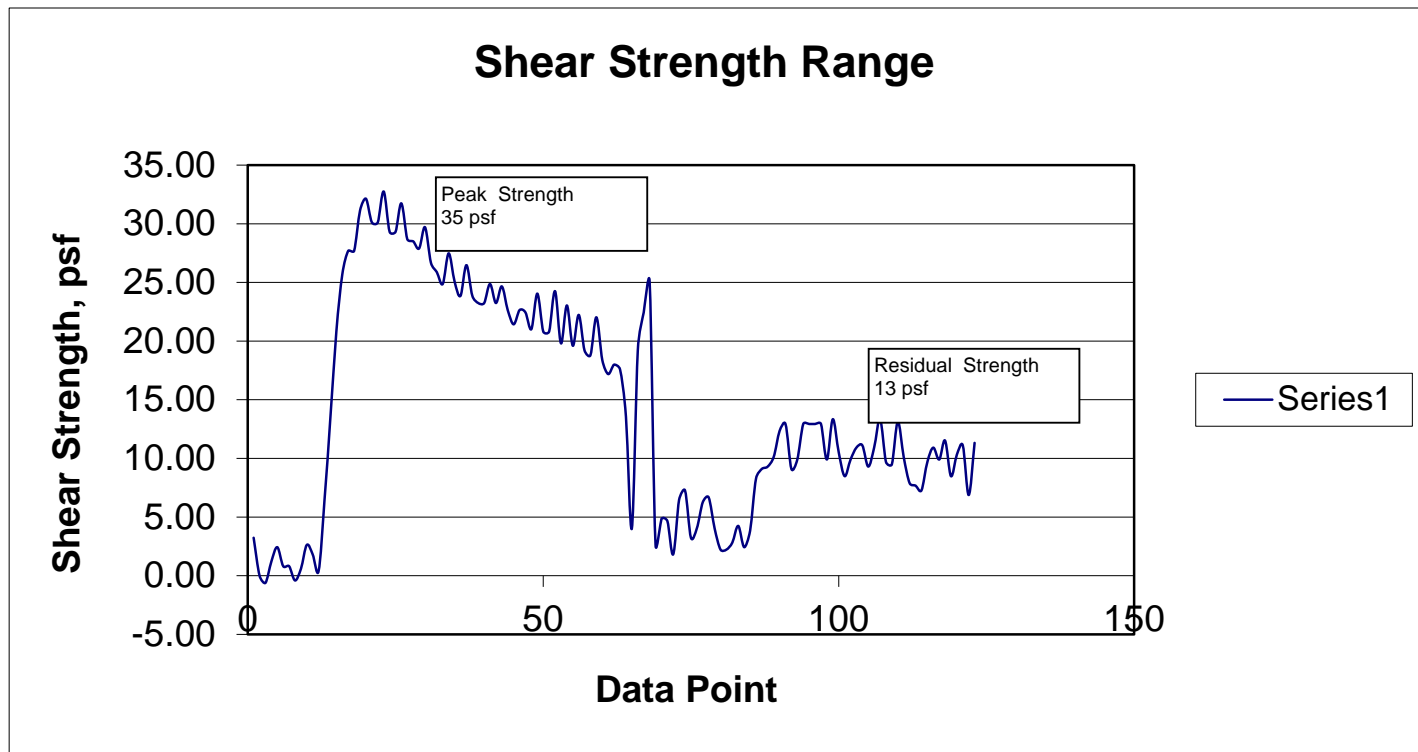
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1279	-1296	-1279	-1294	-1278	-1279	1	4.16	0.35	3.23
-1295	-1281	-1296	-1283	-1303	-1295	2	0	0.00	0.00
-1298	-1292	-1296	-1289	-1294	-1298	3	-0.78	-0.06	-0.61
-1289	-1296	-1294	-1296	-1292	-1289	4	1.56	0.13	1.21
-1283	-1294	-1280	-1299	-1284	-1283	5	3.12	0.26	2.43
-1291	-1294	-1297	-1287	-1292	-1291	6	1.04	0.09	0.81
-1291	-1297	-1281	-1295	-1294	-1291	7	1.04	0.09	0.81
-1297	-1283	-1294	-1291	-1294	-1297	8	-0.52	-0.04	-0.40
-1292	-1293	-1295	-1281	-1302	-1292	9	0.78	0.06	0.61
-1282	-1295	-1291	-1291	-1297	-1282	10	3.38	0.28	2.63
-1286	-1298	-1285	-1296	-1295	-1286	11	2.34	0.19	1.82
-1293	-1294	-1276	-1280	-1280	-1293	12	0.52	0.04	0.40
-1263	-1250	-1242	-1243	-1241	-1263	13	8.32	0.69	6.47
-1228	-1220	-1204	-1180	-1194	-1228	14	17.42	1.45	13.54
-1192	-1167	-1178	-1159	-1169	-1192	15	26.78	2.23	20.82
-1168	-1155	-1141	-1160	-1161	-1168	16	33.02	2.75	25.67
-1158	-1151	-1159	-1140	-1158	-1158	17	35.62	2.97	27.69
-1158	-1157	-1140	-1137	-1157	-1158	18	35.62	2.97	27.69
-1141	-1154	-1150	-1143	-1150	-1141	19	40.04	3.34	31.13
-1136	-1145	-1146	-1150	-1131	-1136	20	41.34	3.44	32.14
-1146	-1143	-1140	-1141	-1144	-1146	21	38.74	3.23	30.12
-1146	-1137	-1147	-1152	-1133	-1146	22	38.74	3.23	30.12
-1133	-1149	-1148	-1143	-1152	-1133	23	42.12	3.51	32.75
-1150	-1134	-1144	-1151	-1136	-1150	24	37.7	3.14	29.31
-1150	-1148	-1136	-1149	-1156	-1150	25	37.7	3.14	29.31
-1138	-1153	-1157	-1153	-1154	-1138	26	40.82	3.40	31.73
-1153	-1158	-1162	-1142	-1158	-1153	27	36.92	3.08	28.70
-1154	-1147	-1161	-1163	-1144	-1154	28	36.66	3.05	28.50
-1157	-1161	-1149	-1167	-1159	-1157	29	35.88	2.99	27.89
-1148	-1162	-1158	-1169	-1171	-1148	30	38.22	3.18	29.71
-1163	-1165	-1167	-1153	-1170	-1163	31	34.32	2.86	26.68
-1167	-1151	-1169	-1164	-1169	-1167	32	33.28	2.77	25.87
-1172	-1174	-1158	-1169	-1162	-1172	33	31.98	2.66	24.86
-1159	-1178	-1167	-1171	-1174	-1159	34	35.36	2.95	27.49
-1171	-1178	-1175	-1157	-1171	-1171	35	32.24	2.69	25.06
-1177	-1168	-1176	-1184	-1163	-1177	36	30.68	2.56	23.85
-1164	-1178	-1171	-1176	-1182	-1164	37	34.06	2.84	26.48
-1177	-1177	-1178	-1164	-1185	-1177	38	30.68	2.56	23.85
-1180	-1166	-1179	-1178	-1179	-1180	39	29.9	2.49	23.25
-1180	-1186	-1166	-1182	-1179	-1180	40	29.9	2.49	23.25
-1172	-1186	-1182	-1167	-1184	-1172	41	31.98	2.66	24.86
-1180	-1167	-1185	-1184	-1168	-1180	42	29.9	2.49	23.25
-1173	-1183	-1177	-1185	-1185	-1173	43	31.72	2.64	24.66
-1183	-1178	-1185	-1177	-1186	-1183	44	29.12	2.43	22.64
-1189	-1188	-1184	-1184	-1169	-1189	45	27.56	2.30	21.43
-1183	-1192	-1173	-1185	-1190	-1183	46	29.12	2.43	22.64
-1184	-1187	-1192	-1182	-1186	-1184	47	28.86	2.40	22.44
-1191	-1185	-1193	-1193	-1177	-1191	48	27.04	2.25	21.02
-1176	-1190	-1195	-1179	-1195	-1176	49	30.94	2.58	24.05
-1192	-1195	-1181	-1197	-1195	-1192	50	26.78	2.23	20.82
-1192	-1183	-1190	-1193	-1182	-1192	51	26.78	2.23	20.82
-1175	-1192	-1193	-1184	-1196	-1175	52	31.2	2.60	24.26
-1197	-1199	-1190	-1197	-1193	-1197	53	25.48	2.12	19.81
-1181	-1200	-1197	-1184	-1195	-1181	54	29.64	2.47	23.04
-1198	-1190	-1198	-1199	-1191	-1198	55	25.22	2.10	19.61
-1185	-1201	-1203	-1197	-1191	-1185	56	28.6	2.38	22.23
-1200	-1203	-1196	-1194	-1202	-1200	57	24.7	2.06	19.20
-1202	-1188	-1201	-1201	-1180	-1202	58	24.18	2.01	18.80
-1186	-1195	-1196	-1196	-1203	-1186	59	28.34	2.36	22.03
-1204	-1185	-1199	-1198	-1208	-1204	60	23.66	1.97	18.39
-1210	-1199	-1201	-1209	-1202	-1210	61	22.1	1.84	17.18
-1206	-1203	-1199	-1203	-1188	-1206	62	23.14	1.93	17.99
-1208	-1205	-1194	-1199	-1185	-1208	63	22.62	1.88	17.59
-1228	-1243	-1233	-1274	-1254	-1228	64	17.42	1.45	13.54
-1275	-1263	-1278	-1152	-1140	-1275	65	5.2	0.43	4.04
-1200	-1268	-1247	-1273	-1266	-1200	66	24.7	2.06	19.20
-1184	-1267	-1275	-1296	-1301	-1184	67	28.86	2.40	22.44
-1171	-1206	-1279	-1282	-1260	-1171	68	32.24	2.69	25.06
-1282	-1275	-1274	-1274	-1282	-1282	69	3.38	0.28	2.63
-1271	-1277	-1277	-1272	-1281	-1271	70	6.24	0.52	4.85
-1272	-1281	-1265	-1280	-1278	-1272	71	5.98	0.50	4.65
-1286	-1280	-1261	-1281	-1280	-1286	72	2.34	0.19	1.82
-1263	-1281	-1281	-1272	-1276	-1263	73	8.32	0.69	6.47
-1259	-1281	-1281	-1279	-1269	-1259	74	9.36	0.78	7.28
-1279	-1269	-1281	-1278	-1277	-1279	75	4.16	0.35	3.23
-1275	-1274	-1281	-1260	-1283	-1275	76	5.2	0.43	4.04
-1264	-1279	-1280	-1266	-1278	-1264	77	8.06	0.67	6.27
-1262	-1282	-1280	-1273	-1280	-1262	78	8.58	0.71	6.67
-1275	-1283	-1262	-1278	-1283	-1275	79	5.2	0.43	4.04
-1284	-1284	-1264	-1278	-1277	-1284	80	2.86	0.24	2.22
-1284	-1283	-1262	-1283	-1279	-1284	81	2.86	0.24	2.22
-1281	-1282	-1279	-1273	-1276	-1281	82	3.64	0.30	2.83
-1274	-1282	-1264	-1280	-1279	-1274	83	5.46	0.45	4.24
-1283	-1282	-1269	-1274	-1259	-1283	84	3.12	0.26	2.43
-1276	-1254	-1243	-1259	-1238	-1276	85	4.94	0.41	3.84
-1254	-1240	-1250	-1249	-1249	-1254	86	10.66	0.89	8.29
-1250	-1248	-1249	-1249	-1252	-1250	87	11.7	0.97	9.10
-1249	-1245	-1228	-1237	-1245	-1249	88	11.96	1.00	9.30
-1245	-1243	-1241	-1248	-1249	-1245	89	13	1.08	10.11
-1234	-1236	-1246	-1247	-1231	-1234	90	15.86	1.32	12.33
-1231	-1232	-1251	-1249	-1251	-1231	91	16.64	1.39	12.94
-1250	-1242	-1226	-1243	-1245	-1250	92	11.7	0.97	9.10
-1246	-1229	-1251	-1251	-1245	-1246	93	12.74	1.06	9.90
-1231	-1246	-1244	-1233	-1250	-1231	94	16.64	1.39	12.94
-1231	-1250	-1249	-1252	-1243	-1231	95	16.64	1.39	12.94
-1231	-1246	-1244	-1232	-1234	-1231	96	16.64	1.39	12.94
-1231	-1239	-1245	-1248	-1248	-1231	97	16.64	1.39	12.94

-1246	-1240	-1231	-1247	-1239	-1246	98	12.74	1.06	9.90
-1229	-1230	-1247	-1243	-1246	-1229	99	17.16	1.43	13.34
-1243	-1244	-1231	-1252	-1246	-1243	100	13.52	1.13	10.51
-1253	-1250	-1234	-1245	-1245	-1253	101	10.92	0.91	8.49
-1246	-1245	-1233	-1238	-1231	-1246	102	12.74	1.06	9.90
-1241	-1247	-1249	-1242	-1249	-1241	103	14.04	1.17	10.92
-1240	-1231	-1248	-1243	-1249	-1240	104	14.3	1.19	11.12
-1249	-1250	-1247	-1230	-1243	-1249	105	11.96	1.00	9.30
-1241	-1244	-1240	-1241	-1234	-1241	106	14.04	1.17	10.92
-1229	-1247	-1253	-1252	-1235	-1229	107	17.16	1.43	13.34
-1247	-1234	-1237	-1242	-1244	-1247	108	12.48	1.04	9.70
-1248	-1229	-1246	-1246	-1229	-1248	109	12.22	1.02	9.50
-1230	-1238	-1248	-1243	-1243	-1230	110	16.9	1.41	13.14
-1245	-1245	-1237	-1247	-1249	-1245	111	13	1.08	10.11
-1256	-1255	-1255	-1249	-1245	-1256	112	10.14	0.84	7.88
-1257	-1254	-1257	-1251	-1249	-1257	113	9.88	0.82	7.68
-1259	-1251	-1243	-1251	-1243	-1259	114	9.36	0.78	7.28
-1247	-1241	-1243	-1245	-1240	-1247	115	12.48	1.04	9.70
-1241	-1243	-1240	-1240	-1255	-1241	116	14.04	1.17	10.92
-1246	-1253	-1250	-1240	-1244	-1246	117	12.74	1.06	9.90
-1238	-1251	-1245	-1239	-1253	-1238	118	14.82	1.23	11.52
-1253	-1249	-1258	-1262	-1237	-1253	119	10.92	0.91	8.49
-1244	-1238	-1238	-1247	-1237	-1244	120	13.26	1.10	10.31
-1240	-1242	-1256	-1252	-1248	-1240	121	14.3	1.19	11.12
-1261	-1259	-1247	-1238	-1248	-1261	122	8.84	0.74	6.87
-1239	-1258	-1249	-1238	-1254	-1239	123	14.56	1.21	11.32

K = 0.107148



**Vane Shear Raw Data  
Location 413  
45 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**



1/8/05,retec,413/45

zero =

-1295

calib =

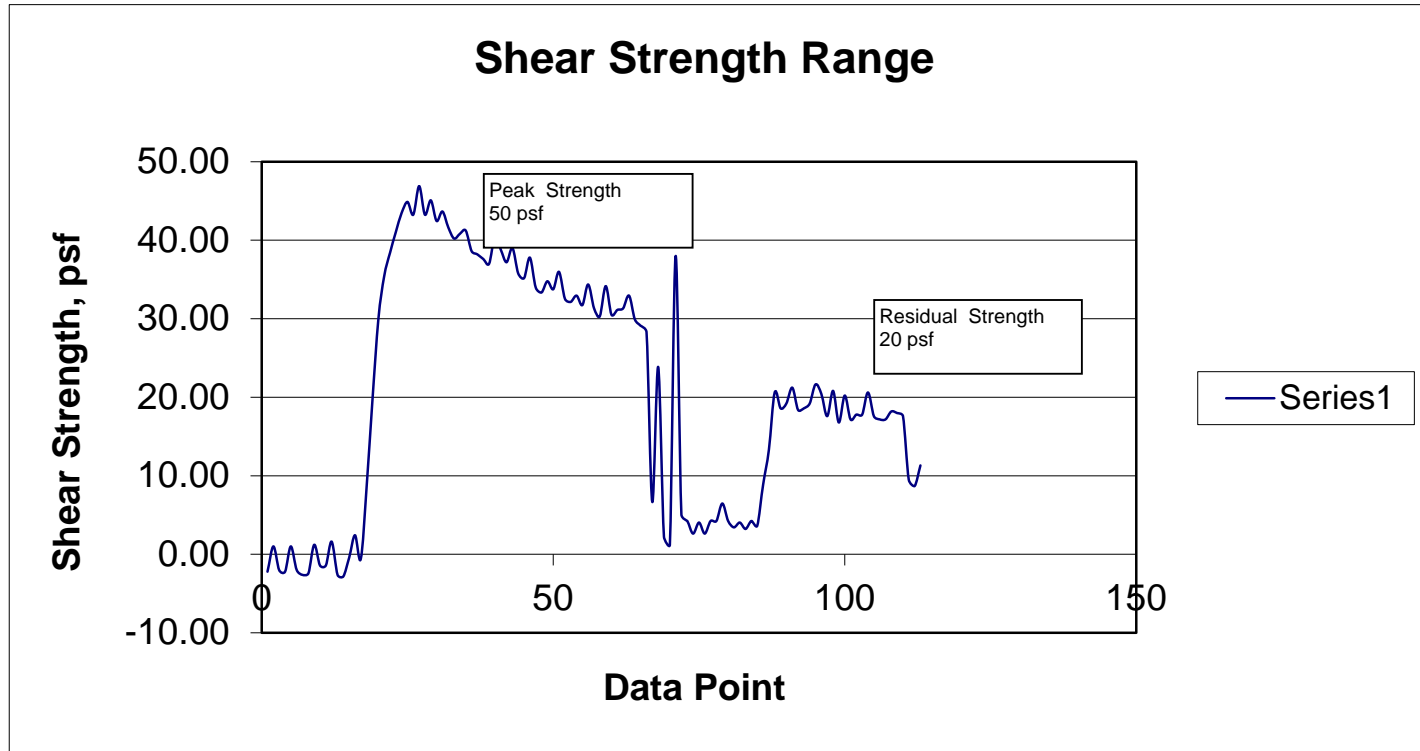
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1306	-1291	-1302	-1306	-1306	-1306	1	-2.86	-0.24	-2.22
-1290	-1304	-1305	-1302	-1296	-1290	2	1.3	0.11	1.01
-1305	-1295	-1303	-1306	-1307	-1305	3	-2.6	-0.22	-2.02
-1306	-1305	-1290	-1301	-1308	-1306	4	-2.86	-0.24	-2.22
-1290	-1307	-1305	-1288	-1307	-1290	5	1.3	0.11	1.01
-1305	-1289	-1310	-1306	-1289	-1305	6	-2.6	-0.22	-2.02
-1308	-1307	-1289	-1302	-1307	-1308	7	-3.38	-0.28	-2.63
-1307	-1305	-1289	-1306	-1308	-1307	8	-3.12	-0.26	-2.43
-1289	-1305	-1303	-1287	-1304	-1289	9	1.56	0.13	1.21
-1302	-1289	-1299	-1305	-1303	-1302	10	-1.82	-0.15	-1.41
-1302	-1308	-1305	-1299	-1303	-1302	11	-1.82	-0.15	-1.41
-1287	-1309	-1306	-1294	-1299	-1287	12	2.08	0.17	1.62
-1308	-1288	-1306	-1308	-1307	-1308	13	-3.38	-0.28	-2.63
-1309	-1307	-1287	-1307	-1307	-1309	14	-3.64	-0.30	-2.83
-1297	-1304	-1305	-1295	-1301	-1297	15	-0.52	-0.04	-0.40
-1283	-1296	-1292	-1296	-1300	-1283	16	3.12	0.26	2.43
-1298	-1289	-1268	-1278	-1270	-1298	17	-0.78	-0.06	-0.61
-1252	-1228	-1232	-1217	-1203	-1252	18	11.18	0.93	8.69
-1198	-1188	-1173	-1169	-1139	-1198	19	25.22	2.10	19.61
-1147	-1142	-1124	-1138	-1129	-1147	20	38.48	3.21	29.92
-1120	-1121	-1119	-1096	-1109	-1120	21	45.5	3.79	35.37
-1105	-1089	-1100	-1084	-1097	-1105	22	49.4	4.12	38.41
-1092	-1088	-1089	-1087	-1067	-1092	23	52.78	4.40	41.03
-1080	-1083	-1066	-1081	-1079	-1080	24	55.9	4.66	43.46
-1073	-1080	-1083	-1065	-1084	-1073	25	57.72	4.81	44.87
-1081	-1077	-1077	-1082	-1072	-1081	26	55.64	4.63	43.26
-1063	-1085	-1085	-1066	-1083	-1063	27	60.32	5.02	46.89
-1081	-1071	-1086	-1087	-1071	-1081	28	55.64	4.63	43.26
-1072	-1083	-1085	-1068	-1089	-1072	29	57.98	4.83	45.08
-1085	-1089	-1072	-1086	-1084	-1085	30	54.6	4.55	42.45
-1079	-1087	-1089	-1084	-1086	-1079	31	56.16	4.68	43.66
-1089	-1090	-1074	-1090	-1093	-1089	32	53.56	4.46	41.64
-1096	-1081	-1096	-1095	-1079	-1096	33	51.74	4.31	40.22
-1093	-1099	-1085	-1100	-1096	-1093	34	52.52	4.37	40.83
-1091	-1099	-1101	-1086	-1101	-1091	35	53.04	4.42	41.23
-1104	-1086	-1105	-1110	-1101	-1104	36	49.66	4.14	38.61
-1106	-1107	-1098	-1108	-1110	-1106	37	49.14	4.09	38.20
-1109	-1095	-1108	-1111	-1101	-1109	38	48.36	4.03	37.60
-1112	-1114	-1098	-1113	-1105	-1112	39	47.58	3.96	36.99
-1095	-1111	-1107	-1109	-1112	-1095	40	52	4.33	40.43
-1103	-1112	-1114	-1109	-1118	-1103	41	49.92	4.16	38.81
-1111	-1117	-1117	-1117	-1122	-1111	42	47.84	3.99	37.19
-1102	-1122	-1100	-1124	-1104	-1102	43	50.18	4.18	39.01
-1118	-1110	-1123	-1112	-1118	-1118	44	46.02	3.83	35.78
-1121	-1118	-1126	-1113	-1121	-1121	45	45.24	3.77	35.17
-1108	-1125	-1109	-1124	-1110	-1108	46	48.62	4.05	37.80
-1127	-1127	-1124	-1125	-1129	-1127	47	43.68	3.64	33.96
-1130	-1124	-1131	-1130	-1122	-1130	48	42.9	3.57	33.35
-1123	-1127	-1134	-1130	-1130	-1123	49	44.72	3.73	34.77
-1128	-1121	-1137	-1129	-1134	-1128	50	43.42	3.62	33.76
-1117	-1133	-1115	-1129	-1116	-1117	51	46.28	3.86	35.98
-1134	-1132	-1136	-1130	-1137	-1134	52	41.86	3.49	32.54
-1136	-1134	-1130	-1137	-1132	-1136	53	41.34	3.44	32.14
-1132	-1138	-1138	-1141	-1139	-1132	54	42.38	3.53	32.95
-1138	-1122	-1137	-1133	-1140	-1138	55	40.82	3.40	31.73
-1125	-1137	-1127	-1142	-1140	-1125	56	44.2	3.68	34.36
-1140	-1122	-1135	-1124	-1142	-1140	57	40.3	3.36	31.33
-1145	-1137	-1138	-1141	-1142	-1145	58	39	3.25	30.32
-1126	-1140	-1129	-1143	-1126	-1126	59	43.94	3.66	34.16
-1144	-1144	-1150	-1146	-1143	-1144	60	39.26	3.27	30.52
-1141	-1130	-1148	-1128	-1141	-1141	61	40.04	3.34	31.13
-1140	-1143	-1148	-1137	-1149	-1140	62	40.3	3.36	31.33
-1132	-1151	-1133	-1146	-1132	-1132	63	42.38	3.53	32.95
-1147	-1154	-1147	-1148	-1145	-1147	64	38.48	3.21	29.92
-1151	-1138	-1147	-1144	-1150	-1151	65	37.44	3.12	29.11
-1155	-1146	-1197	-1277	-1277	-1155	66	36.4	3.03	28.30
-1262	-1273	-1273	-1256	-1275	-1262	67	8.58	0.71	6.67
-1177	-1055	-1068	-1214	-1293	-1177	68	30.68	2.56	23.85
-1284	-1296	-1125	-1102	-1128	-1284	69	2.86	0.24	2.22
-1289	-1291	-1279	-1259	-1121	-1289	70	1.56	0.13	1.21
-1107	-1205	-1280	-1260	-1282	-1107	71	48.88	4.07	38.00
-1270	-1275	-1276	-1267	-1277	-1270	72	6.5	0.54	5.05
-1274	-1272	-1273	-1272	-1272	-1274	73	5.46	0.45	4.24
-1282	-1261	-1275	-1276	-1259	-1282	74	3.38	0.28	2.63
-1275	-1259	-1277	-1279	-1266	-1275	75	5.2	0.43	4.04
-1282	-1281	-1259	-1275	-1274	-1282	76	3.38	0.28	2.63
-1274	-1280	-1266	-1274	-1279	-1274	77	5.46	0.45	4.24
-1274	-1277	-1270	-1269	-1279	-1274	78	5.46	0.45	4.24
-1263	-1282	-1277	-1263	-1274	-1263	79	8.32	0.69	6.47
-1274	-1271	-1279	-1283	-1274	-1274	80	5.46	0.45	4.24
-1278	-1268	-1278	-1278	-1263	-1278	81	4.42	0.37	3.44
-1275	-1259	-1278	-1278	-1259	-1275	82	5.2	0.43	4.04
-1279	-1266	-1275	-1279	-1262	-1279	83	4.16	0.35	3.23
-1274	-1263	-1274	-1278	-1259	-1274	84	5.46	0.45	4.24
-1277	-1257	-1276	-1272	-1253	-1277	85	4.68	0.39	3.64
-1251	-1236	-1239	-1225	-1235	-1251	86	11.44	0.95	8.89
-1229	-1226	-1212	-1214	-1202	-1229	87	17.16	1.43	13.34
-1193	-1206	-1203	-1201	-1205	-1193	88	26.52	2.21	20.62
-1203	-1198	-1204	-1197	-1201	-1203	89	23.92	1.99	18.60
-1200	-1198	-1199	-1207	-1187	-1200	90	24.7	2.06	19.20
-1190	-1202	-1197	-1204	-1205	-1190	91	27.3	2.27	21.22
-1204	-1190	-1202	-1191	-1203	-1204	92	23.66	1.97	18.39
-1203	-1196	-1199	-1202	-1189	-1203	93	23.92	1.99	18.60
-1200	-1201	-1186	-1199	-1193	-1200	94	24.7	2.06	19.20
-1188	-1200	-1198	-1200	-1201	-1188	95	27.82	2.32	21.63
-1194	-1206	-1205	-1197	-1207	-1194	96	26.26	2.19	20.42
-1208	-1197	-1208	-1195	-1206	-1208	97	22.62	1.88	17.59

-1192	-1205	-1210	-1221	-1194	-1192	98	26.78	2.23	20.82
-1212	-1212	-1209	-1208	-1203	-1212	99	21.58	1.80	16.78
-1195	-1212	-1210	-1189	-1204	-1195	100	26	2.17	20.21
-1210	-1204	-1207	-1208	-1200	-1210	101	22.1	1.84	17.18
-1207	-1208	-1203	-1195	-1207	-1207	102	22.88	1.91	17.79
-1207	-1200	-1207	-1208	-1190	-1207	103	22.88	1.91	17.79
-1193	-1206	-1201	-1206	-1207	-1193	104	26.52	2.21	20.62
-1208	-1187	-1205	-1210	-1200	-1208	105	22.62	1.88	17.59
-1210	-1209	-1192	-1206	-1210	-1210	106	22.1	1.84	17.18
-1210	-1195	-1213	-1209	-1194	-1210	107	22.1	1.84	17.18
-1205	-1206	-1198	-1209	-1212	-1205	108	23.4	1.95	18.19
-1206	-1192	-1209	-1210	-1193	-1206	109	23.14	1.93	17.99
-1208	-1208	-1205	-1230	-1246	-1208	110	22.62	1.88	17.59
-1248	-1248	-1249	-1240	-1251	-1248	111	12.22	1.02	9.50
-1252	-1237	-1249	-1241	-1239	-1252	112	11.18	0.93	8.69
-1239	-1252	-1255	-1241	-1239	-1239	113	14.56	1.21	11.32

K = 0.107148



**Vane Shear Raw Data  
Location 413  
47 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/08/05,retec,413/47

zero =

-1295

calib =

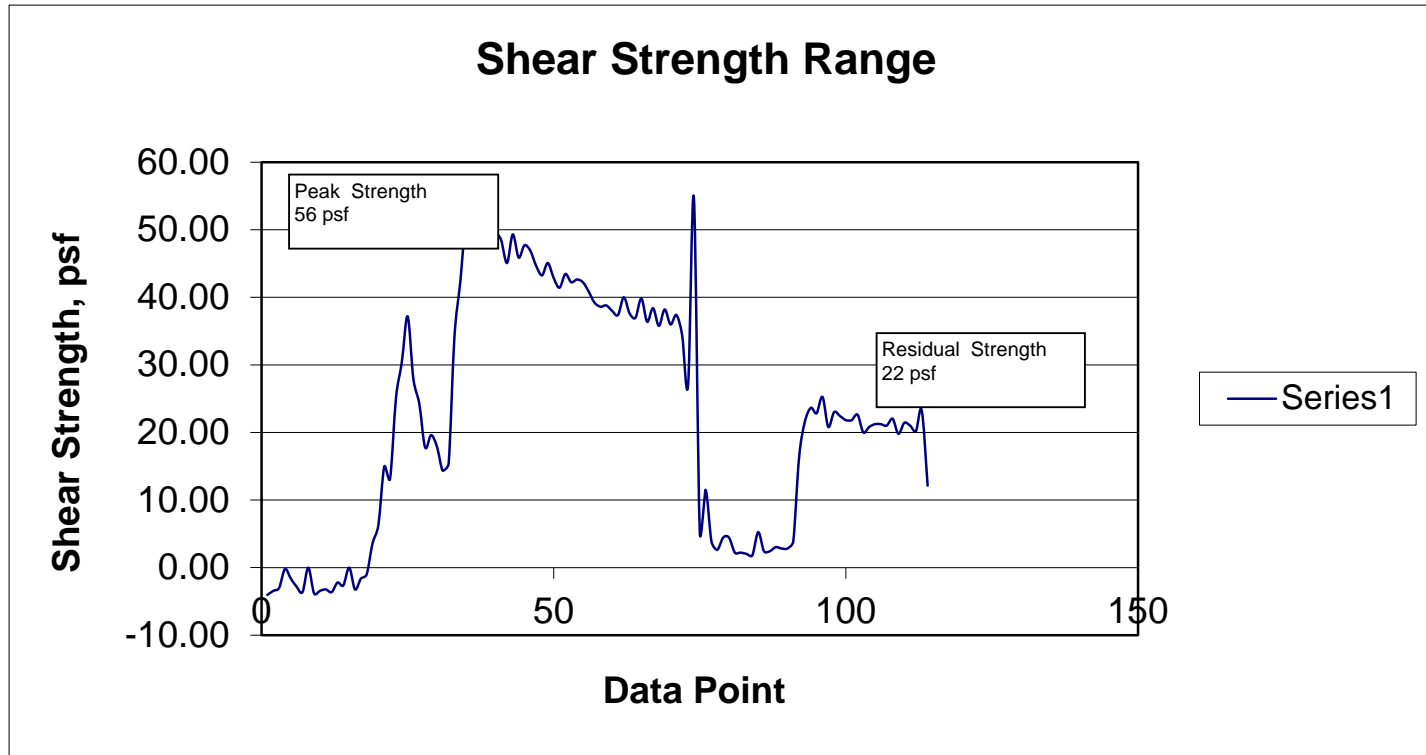
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1315	-1310	-1305	-1309	-1295	-1315	1	-5.2	-0.43	-4.04
-1312	-1296	-1310	-1307	-1307	-1312	2	-4.42	-0.37	-3.44
-1310	-1303	-1313	-1293	-1313	-1310	3	-3.9	-0.32	-3.03
-1296	-1315	-1309	-1300	-1313	-1296	4	-0.26	-0.02	-0.20
-1303	-1309	-1294	-1312	-1314	-1303	5	-2.08	-0.17	-1.62
-1309	-1309	-1293	-1314	-1313	-1309	6	-3.64	-0.30	-2.83
-1313	-1313	-1293	-1314	-1313	-1313	7	-4.68	-0.39	-3.64
-1295	-1309	-1309	-1313	-1293	-1295	8	0	0.00	0.00
-1314	-1296	-1306	-1311	-1311	-1314	9	-4.94	-0.41	-3.84
-1312	-1312	-1311	-1293	-1313	-1312	10	-4.42	-0.37	-3.44
-1311	-1292	-1312	-1310	-1306	-1311	11	-4.16	-0.35	-3.23
-1313	-1312	-1304	-1297	-1312	-1313	12	-4.68	-0.39	-3.64
-1306	-1303	-1309	-1311	-1294	-1306	13	-2.86	-0.24	-2.22
-1308	-1311	-1295	-1309	-1314	-1308	14	-3.38	-0.28	-2.63
-1295	-1306	-1315	-1310	-1293	-1295	15	0	0.00	0.00
-1311	-1313	-1294	-1304	-1309	-1311	16	-4.16	-0.35	-3.23
-1303	-1308	-1308	-1303	-1281	-1303	17	-2.08	-0.17	-1.62
-1300	-1299	-1285	-1296	-1288	-1300	18	-1.3	-0.11	-1.01
-1277	-1277	-1272	-1257	-1274	-1277	19	4.68	0.39	3.64
-1264	-1244	-1259	-1254	-1248	-1264	20	8.06	0.67	6.27
-1221	-1233	-1236	-1230	-1235	-1221	21	19.24	1.60	14.96
-1230	-1229	-1221	-1232	-1211	-1230	22	16.9	1.41	13.14
-1171	-1177	-1156	-1171	-1143	-1171	23	32.24	2.69	25.06
-1145	-1143	-1150	-1141	-1143	-1145	24	39	3.25	30.32
-1111	-1094	-1113	-1100	-1165	-1111	25	47.84	3.99	37.19
-1157	-1178	-1154	-1174	-1158	-1157	26	35.88	2.99	27.89
-1175	-1156	-1179	-1180	-1208	-1175	27	31.2	2.60	24.26
-1207	-1214	-1206	-1213	-1207	-1207	28	22.88	1.91	17.79
-1198	-1211	-1197	-1217	-1194	-1198	29	25.22	2.10	19.61
-1206	-1211	-1207	-1215	-1208	-1206	30	23.14	1.93	17.99
-1224	-1224	-1221	-1223	-1204	-1224	31	18.46	1.54	14.35
-1219	-1201	-1176	-1164	-1144	-1219	32	19.76	1.65	15.36
-1127	-1103	-1121	-1092	-1097	-1127	33	43.68	3.64	33.96
-1086	-1058	-1067	-1058	-1061	-1086	34	54.34	4.53	42.25
-1040	-1027	-1038	-1021	-1034	-1040	35	66.3	5.52	51.54
-1039	-1025	-1037	-1020	-1031	-1039	36	66.56	5.54	51.75
-1031	-1023	-1035	-1036	-1032	-1031	37	68.64	5.72	53.36
-1035	-1036	-1037	-1043	-1026	-1035	38	67.6	5.63	52.55
-1041	-1042	-1040	-1047	-1034	-1041	39	66.04	5.50	51.34
-1049	-1054	-1046	-1059	-1056	-1049	40	63.96	5.33	49.72
-1055	-1062	-1062	-1067	-1059	-1055	41	62.4	5.20	48.51
-1072	-1074	-1070	-1052	-1067	-1072	42	57.98	4.83	45.08
-1051	-1054	-1046	-1063	-1064	-1051	43	63.44	5.28	49.32
-1068	-1069	-1054	-1066	-1054	-1068	44	59.02	4.92	45.88
-1059	-1066	-1063	-1067	-1069	-1059	45	61.36	5.11	47.70
-1063	-1071	-1077	-1061	-1074	-1063	46	60.32	5.02	46.89
-1074	-1064	-1076	-1069	-1080	-1074	47	57.46	4.79	44.67
-1081	-1075	-1076	-1085	-1067	-1081	48	55.64	4.63	43.26
-1072	-1083	-1083	-1088	-1090	-1072	49	57.98	4.83	45.08
-1083	-1083	-1092	-1077	-1095	-1083	50	55.12	4.59	42.85
-1090	-1089	-1093	-1093	-1082	-1090	51	53.3	4.44	41.44
-1080	-1093	-1088	-1092	-1097	-1080	52	55.9	4.66	43.46
-1086	-1094	-1095	-1100	-1098	-1086	53	54.34	4.53	42.25
-1084	-1100	-1096	-1097	-1100	-1084	54	54.86	4.57	42.65
-1086	-1104	-1100	-1104	-1103	-1086	55	54.34	4.53	42.25
-1093	-1104	-1103	-1091	-1100	-1093	56	52.52	4.37	40.83
-1101	-1095	-1103	-1087	-1101	-1101	57	50.44	4.20	39.21
-1104	-1100	-1106	-1106	-1090	-1104	58	49.66	4.14	38.61
-1103	-1105	-1094	-1115	-1110	-1103	59	49.92	4.16	38.81
-1107	-1108	-1109	-1105	-1109	-1107	60	48.88	4.07	38.00
-1110	-1112	-1094	-1108	-1107	-1110	61	48.1	4.01	37.39
-1097	-1109	-1111	-1102	-1109	-1097	62	51.48	4.29	40.02
-1109	-1097	-1112	-1109	-1106	-1109	63	48.36	4.03	37.60
-1112	-1112	-1104	-1114	-1106	-1112	64	47.58	3.96	36.99
-1098	-1115	-1114	-1107	-1114	-1098	65	51.22	4.27	39.82
-1115	-1117	-1100	-1112	-1111	-1115	66	46.8	3.90	36.38
-1105	-1115	-1116	-1099	-1115	-1105	67	49.4	4.12	38.41
-1118	-1122	-1105	-1118	-1113	-1118	68	46.02	3.83	35.78
-1106	-1116	-1118	-1102	-1117	-1106	69	49.14	4.09	38.20
-1117	-1112	-1117	-1116	-1104	-1117	70	46.28	3.86	35.98
-1110	-1120	-1112	-1122	-1119	-1110	71	48.1	4.01	37.39
-1125	-1105	-1118	-1114	-1140	-1125	72	44.2	3.68	34.36
-1161	-1199	-1203	-1227	-1267	-1161	73	34.84	2.90	27.09
-1024	-1027	-1171	-1237	-1233	-1024	74	70.46	5.87	54.78
-1269	-1125	-1081	-1172	-1230	-1269	75	6.76	0.56	5.26
-1238	-1276	-1128	-1110	-1143	-1238	76	14.82	1.23	11.52
-1276	-1266	-1272	-1287	-1268	-1276	77	4.94	0.41	3.84
-1282	-1267	-1287	-1277	-1284	-1282	78	3.38	0.28	2.63
-1273	-1289	-1284	-1275	-1285	-1273	79	5.72	0.48	4.45
-1273	-1287	-1285	-1280	-1284	-1273	80	5.72	0.48	4.45
-1284	-1287	-1266	-1283	-1281	-1284	81	2.86	0.24	2.22
-1284	-1287	-1278	-1281	-1281	-1284	82	2.86	0.24	2.22
-1285	-1287	-1279	-1283	-1268	-1285	83	2.6	0.22	2.02
-1286	-1276	-1284	-1269	-1286	-1286	84	2.34	0.19	1.82
-1269	-1282	-1280	-1279	-1284	-1269	85	6.76	0.56	5.26
-1283	-1280	-1264	-1286	-1284	-1283	86	3.12	0.26	2.43
-1283	-1280	-1276	-1282	-1268	-1283	87	3.12	0.26	2.43
-1280	-1262	-1285	-1286	-1275	-1280	88	3.9	0.32	3.03
-1281	-1280	-1285	-1272	-1281	-1281	89	3.64	0.30	2.83
-1281	-1285	-1271	-1280	-1264	-1281	90	3.64	0.30	2.83
-1276	-1235	-1225	-1226	-1219	-1276	91	4.94	0.41	3.84
-1214	-1190	-1189	-1185	-1179	-1214	92	21.06	1.75	16.37
-1188	-1188	-1166	-1183	-1183	-1188	93	27.82	2.32	21.63
-1178	-1185	-1189	-1168	-1184	-1178	94	30.42	2.53	23.65
-1182	-1181	-1182	-1187	-1180	-1182	95	29.38	2.45	22.84
-1170	-1187	-1187	-1174	-1189	-1170	96	32.5	2.71	25.27
-1192	-1182	-1188	-1187	-1175	-1192	97	26.78	2.23	20.82

-1181	-1191	-1179	-1188	-1189	-1181	98	29.64	2.47	23.04
-1184	-1189	-1191	-1174	-1190	-1184	99	28.86	2.40	22.44
-1187	-1182	-1193	-1197	-1172	-1187	100	28.08	2.34	21.83
-1187	-1190	-1175	-1192	-1194	-1187	101	28.08	2.34	21.83
-1183	-1189	-1191	-1179	-1193	-1183	102	29.12	2.43	22.64
-1196	-1173	-1191	-1184	-1190	-1196	103	25.74	2.14	20.01
-1192	-1190	-1187	-1190	-1175	-1192	104	26.78	2.23	20.82
-1190	-1194	-1181	-1191	-1190	-1190	105	27.3	2.27	21.22
-1190	-1181	-1192	-1191	-1186	-1190	106	27.3	2.27	21.22
-1191	-1192	-1177	-1197	-1196	-1191	107	27.04	2.25	21.02
-1186	-1192	-1194	-1179	-1195	-1186	108	28.34	2.36	22.03
-1197	-1194	-1191	-1195	-1179	-1197	109	25.48	2.12	19.81
-1189	-1196	-1184	-1193	-1195	-1189	110	27.56	2.30	21.43
-1191	-1192	-1195	-1187	-1195	-1191	111	27.04	2.25	21.02
-1195	-1195	-1186	-1197	-1185	-1195	112	26	2.17	20.21
-1180	-1196	-1205	-1232	-1230	-1180	113	29.9	2.49	23.25
-1235	-1233	-1233	-1236	-1218	-1235	114	15.6	1.30	12.13

K = 0.107148



**Vane Shear Raw Data  
Location 413  
49 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/05,retec,413/49

zero =

-1295

calib =

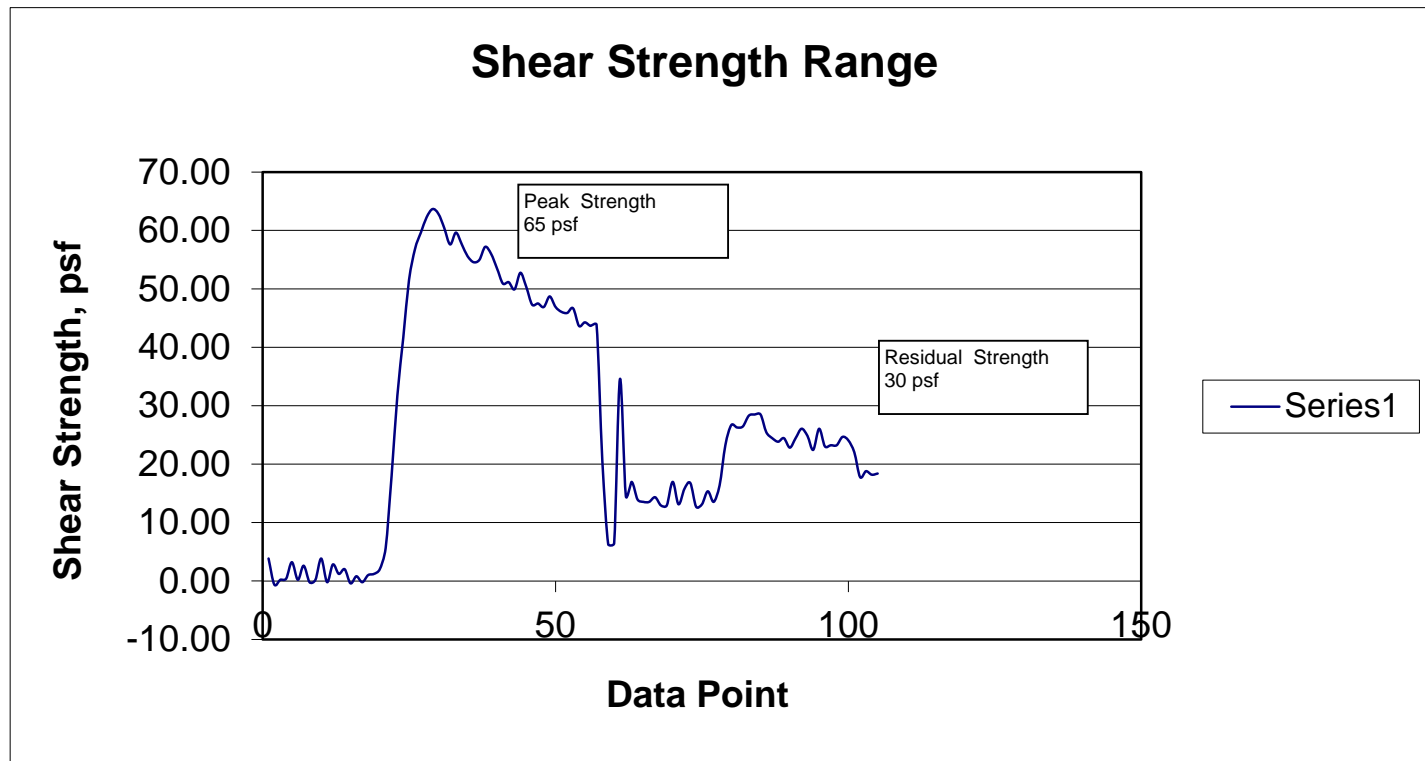
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1276	-1297	-1296	-1276	-1295	-1276	1	4.94	0.41	3.84
-1298	-1276	-1298	-1295	-1276	-1298	2	-0.78	-0.06	-0.61
-1294	-1296	-1287	-1295	-1294	-1294	3	0.26	0.02	0.20
-1293	-1297	-1284	-1290	-1295	-1293	4	0.52	0.04	0.40
-1279	-1293	-1297	-1296	-1277	-1279	5	4.16	0.35	3.23
-1294	-1295	-1279	-1288	-1297	-1294	6	0.26	0.02	0.20
-1282	-1288	-1294	-1295	-1294	-1282	7	3.38	0.28	2.63
-1296	-1297	-1296	-1279	-1290	-1296	8	-0.26	-0.02	-0.20
-1294	-1283	-1286	-1297	-1296	-1294	9	0.26	0.02	0.20
-1276	-1295	-1296	-1294	-1276	-1276	10	4.94	0.41	3.84
-1296	-1291	-1277	-1294	-1295	-1296	11	-0.26	-0.02	-0.20
-1281	-1286	-1293	-1298	-1298	-1281	12	3.64	0.30	2.83
-1289	-1294	-1294	-1277	-1296	-1289	13	1.56	0.13	1.21
-1285	-1290	-1294	-1294	-1295	-1285	14	2.6	0.22	2.02
-1297	-1295	-1294	-1281	-1297	-1297	15	-0.52	-0.04	-0.40
-1291	-1287	-1295	-1295	-1276	-1291	16	1.04	0.09	0.81
-1296	-1297	-1277	-1294	-1296	-1296	17	-0.26	-0.02	-0.20
-1290	-1293	-1289	-1295	-1297	-1290	18	1.3	0.11	1.01
-1289	-1293	-1287	-1294	-1295	-1289	19	1.56	0.13	1.21
-1285	-1295	-1294	-1287	-1294	-1285	20	2.6	0.22	2.02
-1267	-1275	-1260	-1221	-1222	-1267	21	7.28	0.61	5.66
-1206	-1183	-1180	-1152	-1153	-1206	22	23.14	1.93	17.99
-1138	-1120	-1124	-1100	-1101	-1138	23	40.82	3.40	31.73
-1089	-1070	-1065	-1045	-1051	-1089	24	53.56	4.46	41.64
-1040	-1018	-1026	-1016	-1026	-1040	25	66.3	5.52	51.54
-1014	-1012	-1013	-1009	-990	-1014	26	73.06	6.09	56.80
-1000	-1002	-991	-996	-980	-1000	27	76.7	6.39	59.63
-987	-993	-977	-995	-989	-987	28	80.08	6.67	62.26
-980	-996	-992	-995	-998	-980	29	81.9	6.82	63.67
-984	-1000	-994	-1004	-1005	-984	30	80.86	6.74	62.86
-996	-1009	-1007	-993	-1007	-996	31	77.74	6.48	60.44
-1010	-999	-1008	-1010	-992	-1010	32	74.1	6.17	57.61
-1000	-1011	-1005	-1014	-1017	-1000	33	76.7	6.39	59.63
-1010	-1017	-1020	-1006	-1020	-1010	34	74.1	6.17	57.61
-1020	-1009	-1022	-1022	-1019	-1020	35	71.5	5.96	55.59
-1025	-1024	-1028	-1031	-1011	-1025	36	70.2	5.85	54.58
-1023	-1027	-1012	-1031	-1025	-1023	37	70.72	5.89	54.98
-1012	-1031	-1022	-1037	-1032	-1012	38	73.58	6.13	57.20
-1018	-1034	-1022	-1037	-1024	-1018	39	72.02	6.00	55.99
-1030	-1042	-1028	-1041	-1024	-1030	40	68.9	5.74	53.56
-1043	-1040	-1038	-1041	-1030	-1043	41	65.52	5.46	50.94
-1042	-1043	-1044	-1050	-1032	-1042	42	65.78	5.48	51.14
-1048	-1048	-1041	-1051	-1045	-1048	43	64.22	5.35	49.93
-1034	-1048	-1050	-1054	-1057	-1034	44	67.86	5.65	52.76
-1046	-1057	-1060	-1043	-1060	-1046	45	64.74	5.39	50.33
-1061	-1041	-1056	-1051	-1064	-1061	46	60.84	5.07	47.30
-1060	-1054	-1063	-1062	-1057	-1060	47	61.1	5.09	47.50
-1063	-1065	-1053	-1063	-1053	-1063	48	60.32	5.02	46.89
-1054	-1066	-1054	-1066	-1068	-1054	49	62.66	5.22	48.71
-1063	-1068	-1070	-1052	-1069	-1063	50	60.32	5.02	46.89
-1067	-1066	-1072	-1070	-1052	-1067	51	59.28	4.94	46.09
-1068	-1069	-1057	-1072	-1073	-1068	52	59.02	4.92	45.88
-1064	-1072	-1073	-1059	-1074	-1064	53	60.06	5.00	46.69
-1079	-1064	-1075	-1060	-1076	-1079	54	56.16	4.68	43.66
-1076	-1063	-1076	-1067	-1077	-1076	55	56.94	4.74	44.27
-1079	-1074	-1076	-1080	-1066	-1079	56	56.16	4.68	43.66
-1078	-1080	-1123	-1185	-1186	-1078	57	56.42	4.70	43.86
-1193	-1217	-976	-993	-1147	-1193	58	26.52	2.21	20.62
-1264	-1267	-1236	-1040	-1101	-1264	59	8.06	0.67	6.27
-1263	-1287	-1285	-1071	-1074	-1263	60	8.32	0.69	6.47
-1124	-1229	-1226	-1226	-1211	-1124	61	44.46	3.70	34.56
-1223	-1227	-1218	-1229	-1221	-1223	62	18.72	1.56	14.55
-1211	-1229	-1225	-1219	-1225	-1211	63	21.84	1.82	16.98
-1226	-1213	-1226	-1228	-1233	-1226	64	17.94	1.49	13.95
-1228	-1230	-1233	-1226	-1219	-1228	65	17.42	1.45	13.54
-1228	-1229	-1230	-1235	-1214	-1228	66	17.42	1.45	13.54
-1224	-1228	-1214	-1227	-1227	-1224	67	18.46	1.54	14.35
-1231	-1228	-1221	-1226	-1231	-1231	68	16.64	1.39	12.94
-1231	-1227	-1217	-1228	-1221	-1231	69	16.64	1.39	12.94
-1211	-1226	-1229	-1226	-1230	-1211	70	21.84	1.82	16.98
-1230	-1223	-1227	-1226	-1228	-1230	71	16.9	1.41	13.14
-1217	-1234	-1236	-1232	-1217	-1217	72	20.28	1.69	15.77
-1212	-1226	-1220	-1211	-1228	-1212	73	21.58	1.80	16.78
-1232	-1214	-1230	-1230	-1215	-1232	74	16.38	1.36	12.73
-1230	-1230	-1219	-1226	-1232	-1230	75	16.9	1.41	13.14
-1219	-1230	-1232	-1210	-1225	-1219	76	19.76	1.65	15.36
-1228	-1207	-1221	-1200	-1213	-1228	77	17.42	1.45	13.54
-1214	-1196	-1198	-1174	-1189	-1214	78	21.06	1.75	16.37
-1180	-1178	-1175	-1152	-1163	-1180	79	29.9	2.49	23.25
-1163	-1165	-1168	-1148	-1166	-1163	80	34.32	2.86	26.68
-1165	-1175	-1168	-1157	-1167	-1165	81	33.8	2.82	26.28
-1164	-1171	-1173	-1168	-1168	-1164	82	34.06	2.84	26.48
-1155	-1174	-1163	-1169	-1168	-1155	83	36.4	3.03	28.30
-1154	-1173	-1164	-1168	-1168	-1154	84	36.66	3.05	28.50
-1154	-1172	-1156	-1173	-1169	-1154	85	36.66	3.05	28.50
-1169	-1179	-1165	-1171	-1159	-1169	86	32.76	2.73	25.47
-1174	-1172	-1171	-1174	-1164	-1174	87	31.46	2.62	24.46
-1177	-1171	-1171	-1170	-1173	-1177	88	30.68	2.56	23.85
-1174	-1166	-1174	-1172	-1180	-1174	89	31.46	2.62	24.46
-1182	-1164	-1180	-1161	-1178	-1182	90	29.38	2.45	22.84
-1174	-1180	-1175	-1182	-1173	-1174	91	31.46	2.62	24.46
-1166	-1182	-1175	-1182	-1169	-1166	92	33.54	2.79	26.07
-1172	-1161	-1181	-1165	-1175	-1172	93	31.98	2.66	24.86
-1184	-1180	-1183	-1171	-1177	-1184	94	28.86	2.40	22.44
-1166	-1182	-1168	-1173	-1168	-1166	95	33.54	2.79	26.07
-1181	-1181	-1172	-1177	-1178	-1181	96	29.64	2.47	23.04
-1180	-1163	-1174	-1162	-1184	-1180	97	29.9	2.49	23.25

-1180	-1172	-1177	-1175	-1183	-1180	98	29.9	2.49	23.25
-1173	-1176	-1174	-1180	-1185	-1173	99	31.72	2.64	24.66
-1176	-1192	-1189	-1202	-1205	-1176	100	30.94	2.58	24.05
-1186	-1207	-1188	-1206	-1185	-1186	101	28.34	2.36	22.03
-1207	-1203	-1207	-1205	-1204	-1207	102	22.88	1.91	17.79
-1202	-1192	-1208	-1201	-1205	-1202	103	24.18	2.01	18.80
-1205	-1187	-1204	-1194	-1204	-1205	104	23.4	1.95	18.19
-1204	-1193	-1209	-1188	-1205	-1204	105	23.66	1.97	18.39

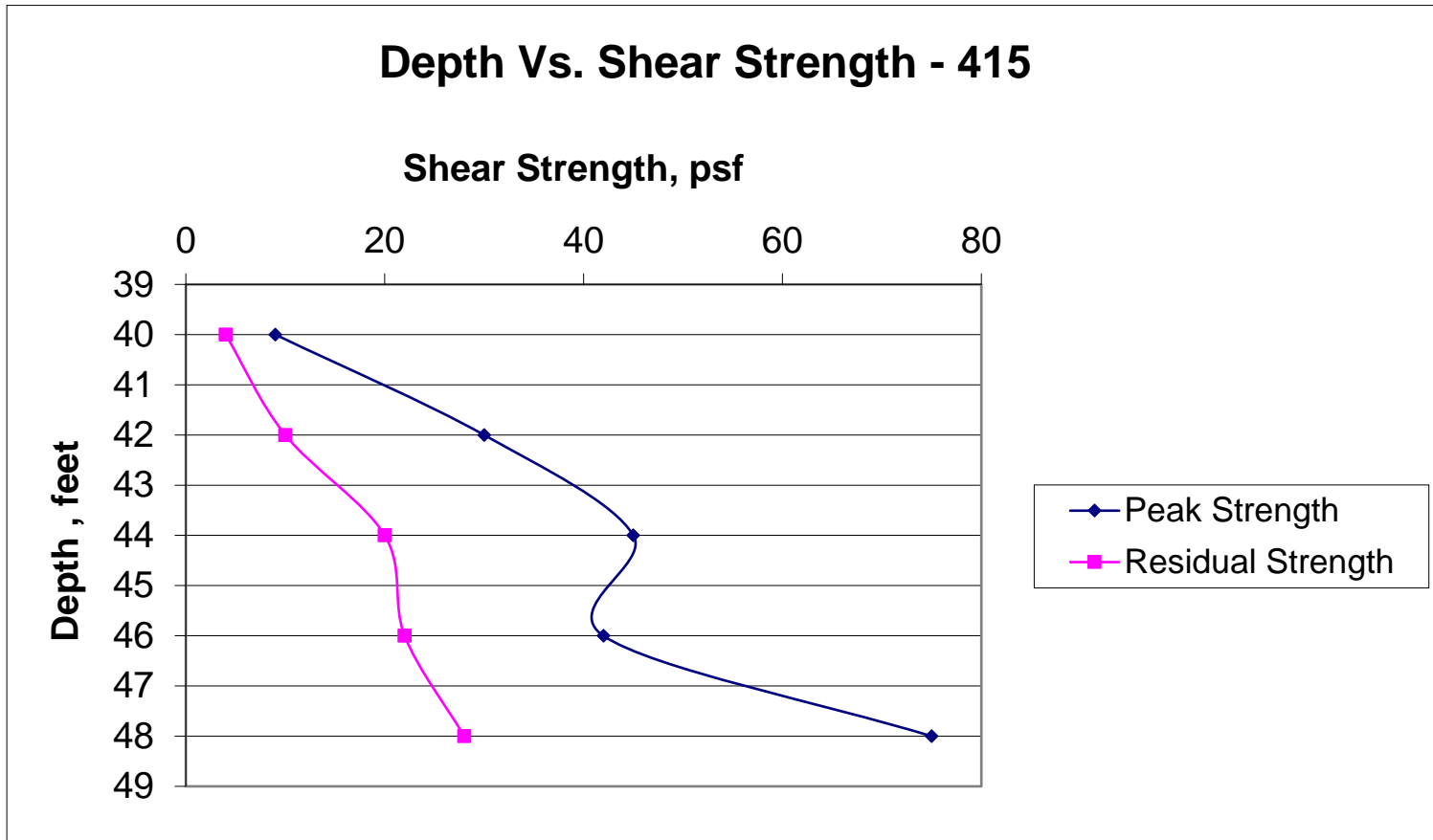
K = 0.107148





**Vane Shear Summary  
Location 415**

Depth, ft	Shear Strength, psf	
	Peak	Residual
40	9	4
42	30	10
44	45	20
46	42	22
48	75	28



**Vane Shear Raw Data  
Location 415  
40 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/7/05,retec,415/40

zero =

-1295

calib =

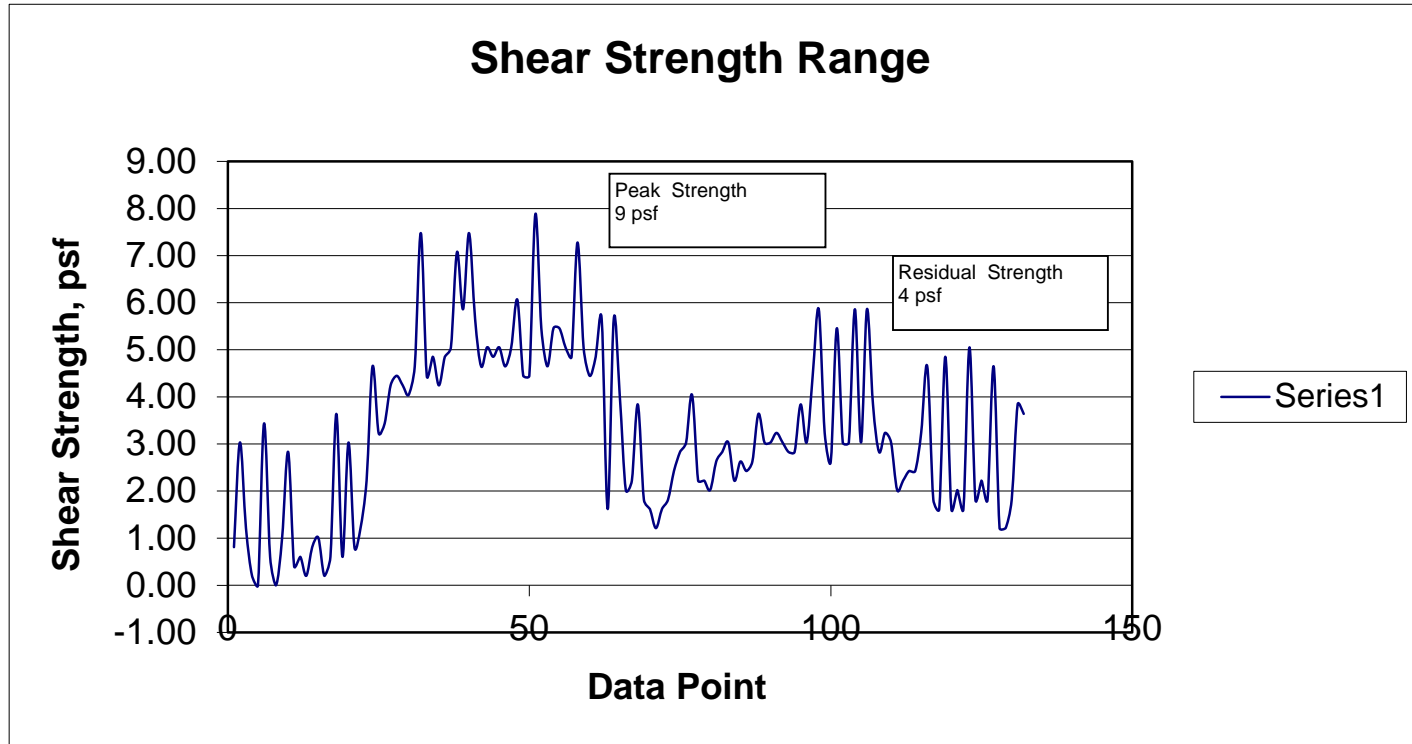
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1291	-1293	-1278	-1294	-1291	-1291	1	1.04	0.09	0.81
-1280	-1294	-1287	-1289	-1292	-1280	2	3.9	0.32	3.03
-1289	-1293	-1283	-1294	-1292	-1289	3	1.56	0.13	1.21
-1294	-1292	-1290	-1292	-1277	-1294	4	0.26	0.02	0.20
-1295	-1278	-1293	-1286	-1293	-1295	5	0	0.00	0.00
-1278	-1292	-1287	-1291	-1294	-1278	6	4.42	0.37	3.44
-1292	-1292	-1283	-1290	-1277	-1292	7	0.78	0.06	0.61
-1295	-1277	-1292	-1291	-1292	-1295	8	0	0.00	0.00
-1290	-1293	-1291	-1277	-1291	-1290	9	1.3	0.11	1.01
-1281	-1294	-1288	-1292	-1293	-1281	10	3.64	0.30	2.83
-1293	-1293	-1277	-1292	-1292	-1293	11	0.52	0.04	0.40
-1292	-1292	-1291	-1291	-1277	-1292	12	0.78	0.06	0.61
-1294	-1278	-1292	-1292	-1289	-1294	13	0.26	0.02	0.20
-1291	-1293	-1292	-1281	-1293	-1291	14	1.04	0.09	0.81
-1290	-1293	-1279	-1292	-1287	-1290	15	1.3	0.11	1.01
-1294	-1280	-1289	-1295	-1282	-1294	16	0.26	0.02	0.20
-1292	-1288	-1294	-1282	-1291	-1292	17	0.78	0.06	0.61
-1277	-1295	-1291	-1293	-1292	-1277	18	4.68	0.39	3.64
-1292	-1281	-1295	-1290	-1292	-1292	19	0.78	0.06	0.61
-1280	-1294	-1285	-1290	-1291	-1280	20	3.9	0.32	3.03
-1291	-1292	-1289	-1288	-1275	-1291	21	1.04	0.09	0.81
-1289	-1274	-1289	-1283	-1289	-1289	22	1.56	0.13	1.21
-1284	-1286	-1286	-1271	-1285	-1284	23	2.86	0.24	2.22
-1272	-1283	-1279	-1280	-1277	-1272	24	5.98	0.50	4.65
-1279	-1282	-1278	-1278	-1281	-1279	25	4.16	0.35	3.23
-1278	-1278	-1267	-1279	-1271	-1278	26	4.42	0.37	3.44
-1274	-1266	-1278	-1276	-1270	-1274	27	5.46	0.45	4.24
-1273	-1275	-1276	-1269	-1275	-1273	28	5.72	0.48	4.45
-1274	-1274	-1272	-1273	-1259	-1274	29	5.46	0.45	4.24
-1275	-1272	-1276	-1270	-1275	-1275	30	5.2	0.43	4.04
-1272	-1271	-1272	-1272	-1274	-1272	31	5.98	0.50	4.65
-1258	-1273	-1261	-1271	-1258	-1258	32	9.62	0.80	7.48
-1273	-1272	-1272	-1273	-1271	-1273	33	5.72	0.48	4.45
-1271	-1258	-1271	-1258	-1271	-1271	34	6.24	0.52	4.85
-1274	-1273	-1269	-1269	-1258	-1274	35	5.46	0.45	4.24
-1271	-1272	-1272	-1270	-1274	-1271	36	6.24	0.52	4.85
-1270	-1259	-1273	-1258	-1270	-1270	37	6.5	0.54	5.05
-1260	-1266	-1255	-1274	-1265	-1260	38	9.1	0.76	7.07
-1266	-1261	-1270	-1270	-1269	-1266	39	7.54	0.63	5.86
-1258	-1269	-1269	-1268	-1268	-1258	40	9.62	0.80	7.48
-1267	-1270	-1263	-1270	-1255	-1267	41	7.28	0.61	5.66
-1272	-1254	-1271	-1268	-1270	-1272	42	5.98	0.50	4.65
-1270	-1270	-1271	-1264	-1268	-1270	43	6.5	0.54	5.05
-1271	-1270	-1270	-1265	-1269	-1271	44	6.24	0.52	4.85
-1270	-1266	-1270	-1267	-1269	-1270	45	6.5	0.54	5.05
-1272	-1261	-1274	-1266	-1264	-1272	46	5.98	0.50	4.65
-1270	-1257	-1270	-1270	-1255	-1270	47	6.5	0.54	5.05
-1265	-1264	-1270	-1271	-1256	-1265	48	7.8	0.65	6.06
-1273	-1267	-1268	-1271	-1269	-1273	49	5.72	0.48	4.45
-1273	-1271	-1256	-1270	-1270	-1273	50	5.72	0.48	4.45
-1256	-1269	-1270	-1255	-1269	-1256	51	10.14	0.84	7.88
-1268	-1267	-1272	-1267	-1256	-1268	52	7.02	0.58	5.46
-1272	-1270	-1258	-1267	-1272	-1272	53	5.98	0.50	4.65
-1268	-1271	-1269	-1257	-1273	-1268	54	7.02	0.58	5.46
-1268	-1261	-1273	-1271	-1258	-1268	55	7.02	0.58	5.46
-1270	-1271	-1257	-1273	-1267	-1270	56	6.5	0.54	5.05
-1271	-1273	-1270	-1270	-1275	-1271	57	6.24	0.52	4.85
-1259	-1271	-1273	-1261	-1273	-1259	58	9.36	0.78	7.28
-1270	-1257	-1274	-1274	-1259	-1270	59	6.5	0.54	5.05
-1273	-1270	-1259	-1269	-1270	-1273	60	5.72	0.48	4.45
-1271	-1274	-1277	-1264	-1275	-1271	61	6.24	0.52	4.85
-1267	-1274	-1276	-1277	-1276	-1267	62	7.28	0.61	5.66
-1287	-1274	-1286	-1288	-1287	-1287	63	2.08	0.17	1.62
-1267	-1268	-1274	-1274	-1286	-1267	64	7.28	0.61	5.66
-1275	-1269	-1284	-1281	-1282	-1275	65	5.2	0.43	4.04
-1285	-1275	-1288	-1275	-1278	-1285	66	2.6	0.22	2.02
-1284	-1286	-1280	-1287	-1283	-1284	67	2.86	0.24	2.22
-1276	-1288	-1287	-1274	-1289	-1276	68	4.94	0.41	3.84
-1286	-1287	-1289	-1289	-1285	-1286	69	2.34	0.19	1.82
-1287	-1291	-1280	-1289	-1291	-1287	70	2.08	0.17	1.62
-1289	-1289	-1283	-1289	-1285	-1289	71	1.56	0.13	1.21
-1287	-1284	-1271	-1284	-1287	-1287	72	2.08	0.17	1.62
-1286	-1283	-1272	-1284	-1286	-1286	73	2.34	0.19	1.82
-1283	-1285	-1282	-1283	-1286	-1283	74	3.12	0.26	2.43
-1281	-1287	-1281	-1284	-1285	-1281	75	3.64	0.30	2.83
-1280	-1285	-1282	-1282	-1286	-1280	76	3.9	0.32	3.03
-1275	-1283	-1281	-1287	-1284	-1275	77	5.2	0.43	4.04
-1284	-1285	-1272	-1285	-1284	-1284	78	2.86	0.24	2.22
-1284	-1285	-1271	-1284	-1287	-1284	79	2.86	0.24	2.22
-1285	-1285	-1272	-1284	-1285	-1285	80	2.6	0.22	2.02
-1282	-1284	-1274	-1283	-1283	-1282	81	3.38	0.28	2.63
-1281	-1283	-1279	-1281	-1281	-1281	82	3.64	0.30	2.83
-1280	-1283	-1278	-1283	-1282	-1280	83	3.9	0.32	3.03
-1284	-1284	-1272	-1283	-1271	-1284	84	2.86	0.24	2.22
-1282	-1270	-1284	-1284	-1271	-1282	85	3.38	0.28	2.63
-1283	-1269	-1279	-1283	-1277	-1283	86	3.12	0.26	2.43
-1282	-1273	-1281	-1271	-1281	-1282	87	3.38	0.28	2.63
-1277	-1278	-1280	-1278	-1278	-1277	88	4.68	0.39	3.64
-1280	-1270	-1277	-1278	-1278	-1280	89	3.9	0.32	3.03
-1280	-1277	-1280	-1277	-1276	-1280	90	3.9	0.32	3.03
-1279	-1268	-1279	-1279	-1265	-1279	91	4.16	0.35	3.23
-1280	-1275	-1279	-1282	-1276	-1280	92	3.9	0.32	3.03
-1281	-1276	-1275	-1280	-1274	-1281	93	3.64	0.30	2.83
-1281	-1282	-1276	-1277	-1268	-1281	94	3.64	0.30	2.83
-1276	-1274	-1280	-1281	-1269	-1276	95	4.94	0.41	3.84
-1280	-1267	-1279	-1273	-1278	-1280	96	3.9	0.32	3.03
-1273	-1282	-1281	-1266	-1281	-1273	97	5.72	0.48	4.45

-1266	-1280	-1279	-1280	-1281	-1266	98	7.54	0.63	5.86
-1279	-1281	-1277	-1281	-1271	-1279	99	4.16	0.35	3.23
-1282	-1266	-1279	-1277	-1282	-1282	100	3.38	0.28	2.63
-1268	-1282	-1276	-1279	-1279	-1268	101	7.02	0.58	5.46
-1280	-1281	-1280	-1282	-1266	-1280	102	3.9	0.32	3.03
-1280	-1268	-1281	-1268	-1284	-1280	103	3.9	0.32	3.03
-1266	-1281	-1269	-1281	-1280	-1266	104	7.54	0.63	5.86
-1280	-1268	-1282	-1269	-1282	-1280	105	3.9	0.32	3.03
-1266	-1280	-1273	-1282	-1280	-1266	106	7.54	0.63	5.86
-1276	-1281	-1266	-1279	-1281	-1276	107	4.94	0.41	3.84
-1281	-1280	-1281	-1283	-1281	-1281	108	3.64	0.30	2.83
-1279	-1283	-1283	-1283	-1284	-1279	109	4.16	0.35	3.23
-1280	-1284	-1271	-1287	-1281	-1280	110	3.9	0.32	3.03
-1285	-1270	-1286	-1285	-1277	-1285	111	2.6	0.22	2.02
-1284	-1272	-1285	-1283	-1276	-1284	112	2.86	0.24	2.22
-1283	-1281	-1285	-1283	-1279	-1283	113	3.12	0.26	2.43
-1283	-1274	-1285	-1281	-1285	-1283	114	3.12	0.26	2.43
-1279	-1283	-1286	-1270	-1285	-1279	115	4.16	0.35	3.23
-1272	-1286	-1284	-1286	-1285	-1272	116	5.98	0.50	4.65
-1286	-1285	-1283	-1284	-1272	-1286	117	2.34	0.19	1.82
-1287	-1272	-1287	-1277	-1285	-1287	118	2.08	0.17	1.62
-1271	-1285	-1283	-1283	-1285	-1271	119	6.24	0.52	4.85
-1287	-1287	-1280	-1285	-1281	-1287	120	2.08	0.17	1.62
-1285	-1284	-1287	-1284	-1285	-1285	121	2.6	0.22	2.02
-1287	-1282	-1287	-1287	-1287	-1287	122	2.08	0.17	1.62
-1270	-1285	-1273	-1285	-1273	-1270	123	6.5	0.54	5.05
-1286	-1283	-1287	-1273	-1287	-1286	124	2.34	0.19	1.82
-1284	-1285	-1282	-1286	-1271	-1284	125	2.86	0.24	2.22
-1286	-1273	-1287	-1280	-1280	-1286	126	2.34	0.19	1.82
-1272	-1286	-1281	-1287	-1283	-1272	127	5.98	0.50	4.65
-1289	-1284	-1288	-1287	-1282	-1289	128	1.56	0.13	1.21
-1289	-1281	-1288	-1285	-1273	-1289	129	1.56	0.13	1.21
-1286	-1275	-1288	-1277	-1287	-1286	130	2.34	0.19	1.82
-1276	-1286	-1281	-1277	-1287	-1276	131	4.94	0.41	3.84
-1277	-1286	-1282	-1284	-1283	-1277	132	4.68	0.39	3.64

K = 0.107148



**Vane Shear Raw Data  
Location 415  
42 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/7/05,retec,415/42

zero =

-1295

calib =

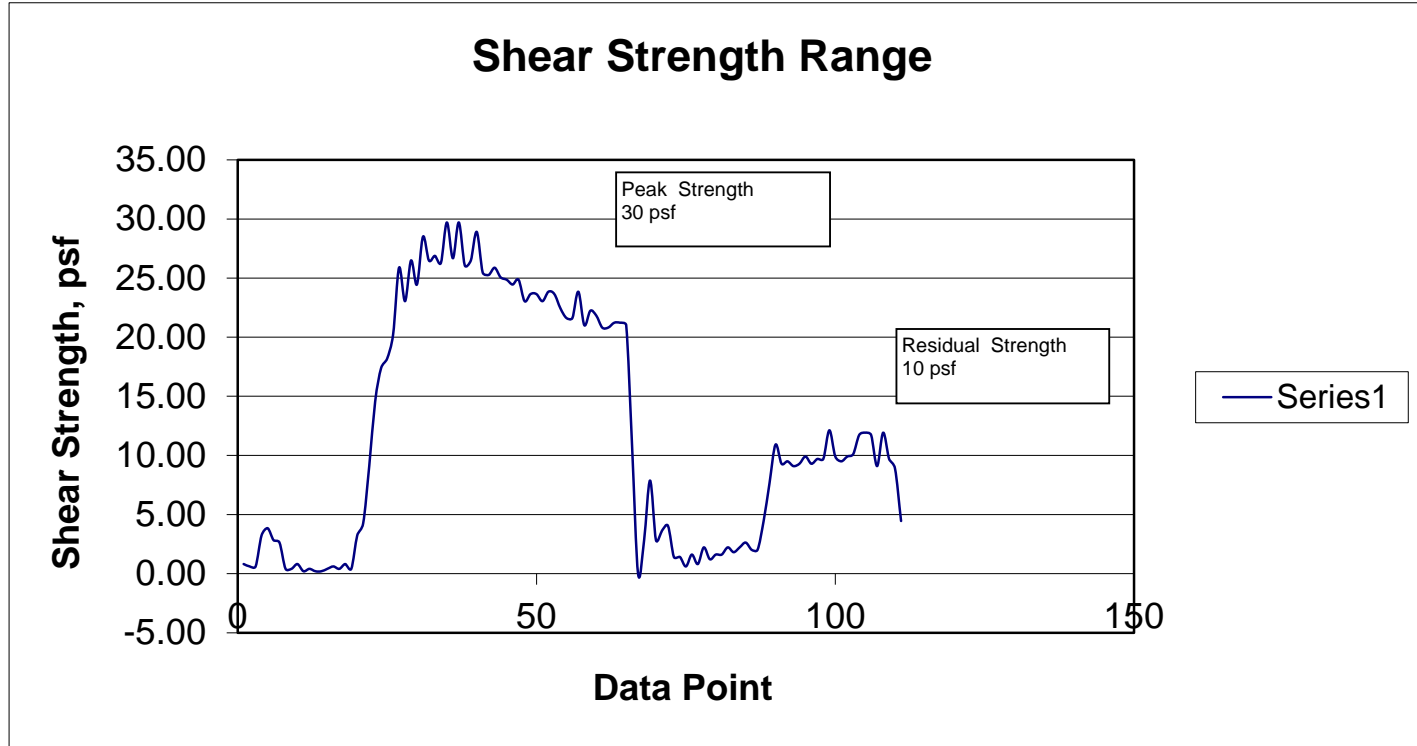
0.26 in-lb/unit ft-lb

Shear Strength, psf

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97
-1291	-1283	-1287	-1292	-1277	-1291	1	1.04	0.09	0.81																																																																																							
-1292	-1292	-1278	-1293	-1294	-1292	2	0.78	0.06	0.61																																																																																							
-1292	-1292	-1289	-1289	-1292	-1292	3	0.78	0.06	0.61																																																																																							
-1279	-1294	-1292	-1279	-1294	-1279	4	4.16	0.35	3.23																																																																																							
-1276	-1295	-1295	-1280	-1294	-1276	5	4.94	0.41	3.84																																																																																							
-1281	-1294	-1294	-1280	-1295	-1281	6	3.64	0.30	2.83																																																																																							
-1282	-1290	-1292	-1293	-1280	-1282	7	3.38	0.28	2.63																																																																																							
-1293	-1291	-1294	-1295	-1287	-1293	8	0.52	0.04	0.40																																																																																							
-1293	-1290	-1288	-1295	-1293	-1293	9	0.52	0.04	0.40																																																																																							
-1291	-1294	-1291	-1295	-1287	-1291	10	1.04	0.09	0.81																																																																																							
-1294	-1292	-1290	-1293	-1289	-1294	11	0.26	0.02	0.20																																																																																							
-1293	-1293	-1281	-1294	-1290	-1293	12	0.52	0.04	0.40																																																																																							
-1294	-1295	-1281	-1293	-1293	-1294	13	0.26	0.02	0.20																																																																																							
-1294	-1293	-1291	-1293	-1284	-1294	14	0.26	0.02	0.20																																																																																							
-1293	-1295	-1289	-1294	-1292	-1293	15	0.52	0.04	0.40																																																																																							
-1292	-1294	-1280	-1296	-1291	-1292	16	0.78	0.06	0.61																																																																																							
-1293	-1295	-1279	-1295	-1294	-1293	17	0.52	0.04	0.40																																																																																							
-1291	-1292	-1292	-1293	-1290	-1291	18	1.04	0.09	0.81																																																																																							
-1293	-1292	-1293	-1282	-1287	-1293	19	0.52	0.04	0.40																																																																																							
-1279	-1276	-1264	-1273	-1259	-1279	20	4.16	0.35	3.23																																																																																							
-1274	-1265	-1266	-1250	-1260	-1274	21	5.46	0.45	4.24																																																																																							
-1250	-1242	-1224	-1235	-1216	-1250	22	11.7	0.97	9.10																																																																																							
-1223	-1207	-1218	-1206	-1198	-1223	23	18.72	1.56	14.55																																																																																							
-1209	-1206	-1203	-1201	-1193	-1209	24	22.36	1.86	17.38																																																																																							
-1205	-1191	-1196	-1199	-1190	-1205	25	23.4	1.95	18.19																																																																																							
-1195	-1190	-1192	-1189	-1170	-1195	26	26	2.17	20.21																																																																																							
-1167	-1184	-1185	-1171	-1184	-1167	27	33.28	2.77	25.87																																																																																							
-1181	-1178	-1180	-1181	-1179	-1181	28	29.64	2.47	23.04																																																																																							
-1164	-1177	-1178	-1162	-1176	-1164	29	34.06	2.84	26.48																																																																																							
-1174	-1169	-1173	-1171	-1159	-1174	30	31.46	2.62	24.46																																																																																							
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-1164	-1168	-1150	-1163	-1166	-1164	32	34.06	2.84	26.48																																																																																							
-1162	-1166	-1168	-1154	-1166	-1162	33	34.58	2.88	26.88																																																																																							
-1165	-1165	-1165	-1167	-1155	-1165	34	33.8	2.82	26.28																																																																																							
-1148	-1163	-1165	-1154	-1165	-1148	35	38.22	3.18	29.71																																																																																							
-1163	-1159	-1164	-1166	-1157	-1163	36	34.32	2.86	26.68																																																																																							
-1148	-1163	-1166	-1153	-1165	-1148	37	38.22	3.18	29.71																																																																																							
-1166	-1166	-1152	-1163	-1166	-1166	38	33.54	2.79	26.07																																																																																							
-1164	-1151	-1164	-1166	-1162	-1164	39	34.06	2.84	26.48																																																																																							
-1152	-1166	-1167	-1158	-1168	-1152	40	37.18	3.10	28.90																																																																																							
-1169	-1171	-1158	-1169	-1173	-1169	41	32.76	2.73	25.47																																																																																							
-1170	-1169	-1170	-1157	-1171	-1170	42	32.5	2.71	25.27																																																																																							
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-1171	-1178	-1174	-1177	-1174	-1171	44	32.24	2.69	25.06																																																																																							
-1172	-1161	-1174	-1174	-1162	-1172	45	31.98	2.66	24.86																																																																																							
-1174	-1171	-1163	-1176	-1178	-1174	46	31.46	2.62	24.46																																																																																							
-1172	-1178	-1178	-1173	-1178	-1172	47	31.98	2.66	24.86																																																																																							
-1181	-1171	-1180	-1175	-1177	-1181	48	29.64	2.47	23.04																																																																																							
-1178	-1175	-1178	-1179	-1167	-1178	49	30.42	2.53	23.65																																																																																							
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-1181	-1180	-1166	-1180	-1168	-1181	51	29.64	2.47	23.04																																																																																							
-1177	-1179	-1166	-1181	-1170	-1177	52	30.68	2.56	23.85																																																																																							
-1178	-1183	-1169	-1184	-1169	-1178	53	30.42	2.53	23.65																																																																																							
-1184	-1187	-1181	-1186	-1175	-1184	54	28.86	2.40	22.44																																																																																							
-1188	-1183	-1188	-1178	-1189	-1188	55	27.82	2.32	21.63																																																																																							
-1188	-1188	-1189	-1186	-1184	-1188	56	27.82	2.32	21.63																																																																																							
-1177	-1188	-1181	-1189	-1182	-1177	57	30.68	2.56	23.85																																																																																							
-1191	-1188	-1188	-1191	-1185	-1191	58	27.04	2.25	21.02																																																																																							
-1185	-1175	-1186	-1180	-1188	-1185	59	28.6	2.38	22.23																																																																																							
-1187	-1175	-1191	-1177	-1188	-1187	60	28.08	2.34	21.83																																																																																							
-1192	-1193	-1194	-1176	-1192	-1192	61	26.78	2.23	20.82																																																																																							
-1192	-1182	-1193	-1189	-1193	-1192	62	26.78	2.23	20.82																																																																																							
-1190	-1179	-1189	-1180	-1191	-1190	63	27.3	2.27	21.22																																																																																							
-1190	-1189	-1193	-1196	-1195	-1190	64	27.3	2.27	21.22																																																																																							
-1191	-1194	-1181	-1196	-1206	-1191	65	27.04	2.25	21.02																																																																																							
-1242	-1271	-1282	-1281	-1274	-1242	66	13.78	1.15	10.71																																																																																							
-1295	-1130	-1148	-1234	-1264	-1295	67	0	0.00	0.00																																																																																							
-1281	-1289	-1168	-1192	-1270	-1281	68	3.64	0.30	2.83																																																																																							
-1256	-1285	-1292	-1230	-1206	-1256	69	10.14	0.84	7.88																																																																																							
-1281	-1283	-1277	-1284	-1290	-1281	70	3.64	0.30	2.83																																																																																							
-1277	-1287	-1289	-1287	-1288	-1277	71	4.68	0.39	3.64																																																																																							
-1275	-1290	-1286	-1283	-1285	-1275	72	5.2	0.43	4.04																																																																																							
-1288	-1269	-1287	-1288	-1287	-1288	73	1.82	0.15	1.41																																																																																							
-1288	-1294	-1293	-1276	-1292	-1288	74	1.82	0.15	1.41																																																																																							
-1292	-1277	-1289	-1290	-1289	-1292	75	0.78	0.06	0.61																																																																																							
-1287	-1289	-1286	-1277	-1290	-1287	76	2.08	0.17	1.62																																																																																							
-1291	-1276	-1289	-1292	-1288	-1291	77	1.04	0.09	0.81																																																																																							
-1284	-1291	-1291	-1275	-1288	-1284	78	2.86	0.24	2.22																																																																																							
-1289	-1279	-1291	-1288	-1276	-1289	79	1.56	0.13	1.21																																																																																							
-1287	-1289	-1276	-1289	-1287	-1287	80	2.08	0.17	1.62																																																																																							
-1287	-1287	-1287	-1273	-1288	-1287	81	2.08	0.17	1.62																																																																																							
-1284	-1287	-1287	-1277	-1286	-1284	82	2.86	0.24	2.22																																																																																							
-1286	-1277	-1289	-1286	-1276	-1286	83	2.34	0.19	1.82																																																																																							
-1284	-1270	-1286	-1287	-1271	-1284	84	2.86	0.24	2.22																																																																																							
-1282	-1272	-1286	-1287	-1270	-1282	85	3.38	0.28	2.63																																																																																							
-1285	-1275	-1285	-1286	-1281	-1285	86	2.6	0.22	2.02																																																																																							
-1285	-1283	-1280	-1274	-1264	-1285	87	2.6	0.22	2.02																																																																																							
-1273	-1264	-1263	-1264	-1259	-1273	88	5.72	0.48	4.45																																																																																							
-1257	-1255	-1254	-1242	-1252	-1257	89	9.88	0.82	7.68																																																																																							
-1241	-1246	-1244	-1247	-1237	-1241	90	14.04	1.17	10.92																																																																																							
-1249	-1237	-1249	-1249	-1246	-1249	91	11.96	1.00	9.30																																																																																							
-1248	-1245	-1241	-1246	-1244	-1248	92	12.22	1.02	9.50																																																																																							
-1250	-1249	-1247	-1250	-1248	-1250	93	11.7	0.97	9.10																																																																																							
-1249	-1247	-1242	-1244	-1241	-1249	94	11.96	1.00	9.30																																																																																							
-1246	-1251	-1238	-1247	-1249	-1246	95	12.74	1.06	9.90																																																																																							
-1249	-1247	-1234	-1244	-1247	-1249	96	11.96	1.00	9.30																																																																																							
-1247	-1247	-1234	-1248	-1250	-1247	97	12.48	1.04	9.70																																																																																							

-1247	-1245	-1241	-1239	-1248	-1247	98	12.48	1.04	9.70
-1235	-1251	-1249	-1237	-1250	-1235	99	15.6	1.30	12.13
-1246	-1232	-1245	-1247	-1232	-1246	100	12.74	1.06	9.90
-1248	-1243	-1246	-1250	-1247	-1248	101	12.22	1.02	9.50
-1246	-1247	-1231	-1251	-1248	-1246	102	12.74	1.06	9.90
-1245	-1249	-1239	-1248	-1252	-1245	103	13	1.08	10.11
-1237	-1247	-1245	-1238	-1248	-1237	104	15.08	1.26	11.72
-1236	-1249	-1248	-1244	-1249	-1236	105	15.34	1.28	11.93
-1237	-1249	-1244	-1248	-1249	-1237	106	15.08	1.26	11.72
-1250	-1246	-1250	-1247	-1248	-1250	107	11.7	0.97	9.10
-1236	-1249	-1244	-1247	-1251	-1236	108	15.34	1.28	11.93
-1247	-1250	-1234	-1251	-1247	-1247	109	12.48	1.04	9.70
-1251	-1265	-1275	-1273	-1270	-1251	110	11.44	0.95	8.89
-1273	-1270	-1267	-1259	-1270	-1273	111	5.72	0.48	4.45

K = 0.107148





**Vane Shear Raw Data  
Location 415  
44 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/7/05,retec,415/44

zero =

-1295

calib =

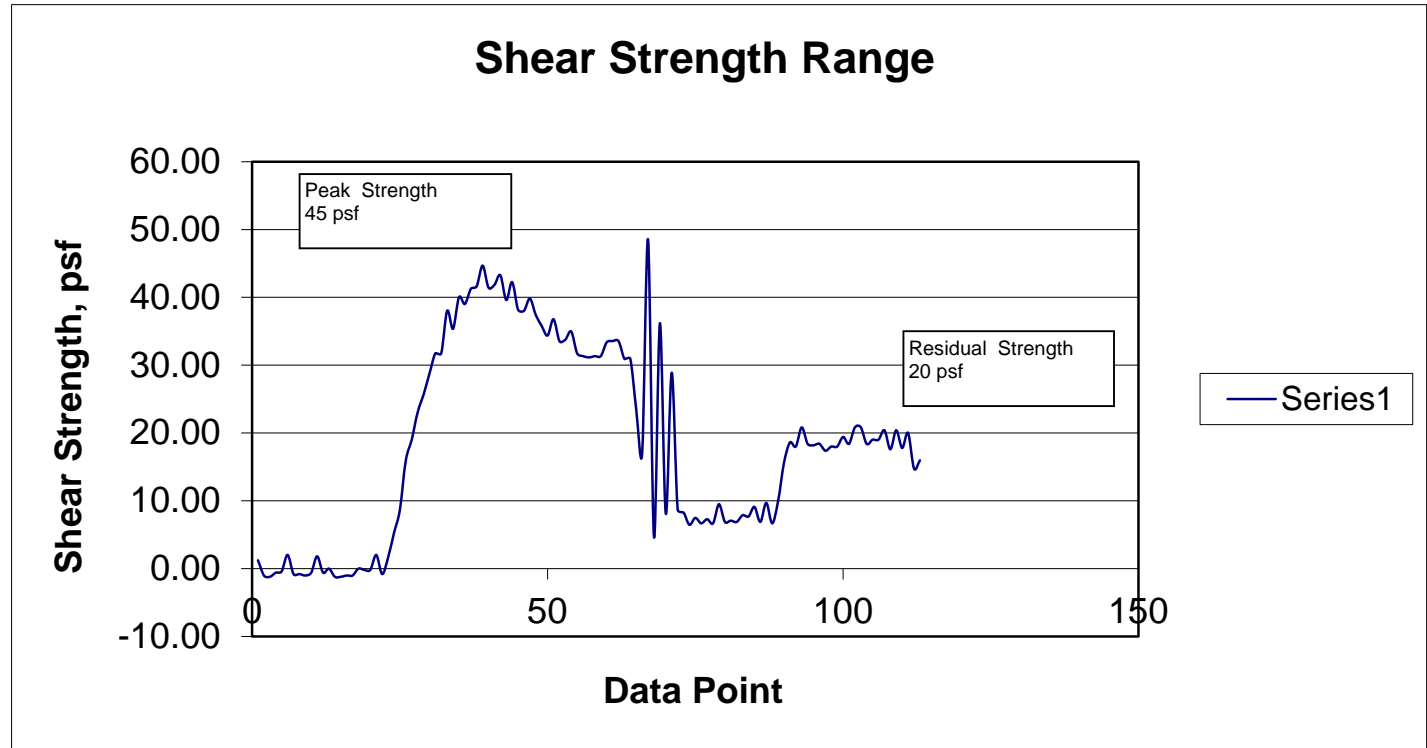
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1289	-1301	-1301	-1286	-1299	-1289	1	1.56	0.13	1.21
-1300	-1284	-1300	-1300	-1289	-1300	2	-1.3	-0.11	-1.01
-1301	-1300	-1289	-1296	-1301	-1301	3	-1.56	-0.13	-1.21
-1298	-1300	-1291	-1301	-1301	-1298	4	-0.78	-0.06	-0.61
-1297	-1300	-1299	-1290	-1299	-1297	5	-0.52	-0.04	-0.40
-1285	-1300	-1301	-1286	-1300	-1285	6	2.6	0.22	2.02
-1299	-1293	-1297	-1298	-1295	-1299	7	-1.04	-0.09	-0.81
-1299	-1287	-1301	-1301	-1300	-1299	8	-1.04	-0.09	-0.81
-1300	-1297	-1302	-1297	-1300	-1300	9	-1.3	-0.11	-1.01
-1298	-1301	-1302	-1288	-1301	-1298	10	-0.78	-0.06	-0.61
-1286	-1301	-1300	-1296	-1301	-1286	11	2.34	0.19	1.82
-1298	-1301	-1287	-1300	-1298	-1298	12	-0.78	-0.06	-0.61
-1295	-1297	-1300	-1301	-1285	-1295	13	0	0.00	0.00
-1301	-1286	-1297	-1302	-1285	-1301	14	-1.56	-0.13	-1.21
-1301	-1295	-1297	-1302	-1300	-1301	15	-1.56	-0.13	-1.21
-1300	-1302	-1299	-1300	-1293	-1300	16	-1.3	-0.11	-1.01
-1300	-1286	-1301	-1299	-1298	-1300	17	-1.3	-0.11	-1.01
-1295	-1301	-1301	-1286	-1299	-1295	18	0	0.00	0.00
-1296	-1300	-1286	-1302	-1286	-1296	19	-0.26	-0.02	-0.20
-1296	-1284	-1302	-1295	-1300	-1296	20	-0.26	-0.02	-0.20
-1285	-1301	-1298	-1299	-1300	-1285	21	2.6	0.22	2.02
-1299	-1282	-1294	-1289	-1295	-1299	22	-1.04	-0.09	-0.81
-1287	-1286	-1280	-1274	-1271	-1287	23	2.08	0.17	1.62
-1269	-1269	-1265	-1267	-1261	-1269	24	6.76	0.56	5.26
-1252	-1246	-1243	-1236	-1238	-1252	25	11.18	0.93	8.69
-1216	-1221	-1216	-1205	-1200	-1216	26	20.54	1.71	15.97
-1201	-1195	-1180	-1189	-1190	-1201	27	24.44	2.04	19.00
-1181	-1182	-1179	-1167	-1165	-1181	28	29.64	2.47	23.04
-1168	-1167	-1161	-1163	-1147	-1168	29	33.02	2.75	25.67
-1153	-1150	-1136	-1140	-1140	-1153	30	36.92	3.08	28.70
-1138	-1134	-1138	-1125	-1136	-1138	31	40.82	3.40	31.73
-1138	-1130	-1119	-1123	-1119	-1138	32	40.82	3.40	31.73
-1107	-1119	-1120	-1110	-1119	-1107	33	48.88	4.07	38.00
-1120	-1101	-1110	-1108	-1091	-1120	34	45.5	3.79	35.37
-1097	-1103	-1099	-1099	-1103	-1097	35	51.48	4.29	40.02
-1102	-1095	-1100	-1101	-1088	-1102	36	50.18	4.18	39.01
-1091	-1101	-1102	-1099	-1095	-1091	37	53.04	4.42	41.23
-1089	-1078	-1092	-1090	-1075	-1089	38	53.56	4.46	41.64
-1074	-1089	-1089	-1072	-1087	-1074	39	57.46	4.79	44.67
-1090	-1089	-1085	-1088	-1091	-1090	40	53.3	4.44	41.44
-1088	-1075	-1088	-1093	-1081	-1088	41	53.82	4.48	41.84
-1081	-1095	-1096	-1082	-1095	-1081	42	55.64	4.63	43.26
-1099	-1096	-1098	-1099	-1095	-1099	43	50.96	4.24	39.62
-1086	-1099	-1101	-1092	-1103	-1086	44	54.34	4.53	42.25
-1106	-1105	-1095	-1106	-1107	-1106	45	49.14	4.09	38.20
-1107	-1095	-1108	-1107	-1092	-1107	46	48.88	4.07	38.00
-1098	-1107	-1110	-1106	-1107	-1098	47	51.22	4.27	39.82
-1110	-1108	-1107	-1116	-1118	-1110	48	48.1	4.01	37.39
-1118	-1119	-1123	-1113	-1126	-1118	49	46.02	3.83	35.78
-1125	-1124	-1125	-1125	-1114	-1125	50	44.2	3.68	34.36
-1113	-1126	-1127	-1126	-1129	-1113	51	47.32	3.94	36.79
-1129	-1121	-1132	-1127	-1124	-1129	52	43.16	3.60	33.55
-1128	-1126	-1119	-1130	-1136	-1128	53	43.42	3.62	33.76
-1122	-1137	-1137	-1133	-1138	-1122	54	44.98	3.75	34.97
-1138	-1130	-1143	-1129	-1141	-1138	55	40.82	3.40	31.73
-1140	-1139	-1142	-1141	-1128	-1140	56	40.3	3.36	31.33
-1141	-1143	-1137	-1142	-1126	-1141	57	40.04	3.34	31.13
-1140	-1144	-1129	-1144	-1130	-1140	58	40.3	3.36	31.33
-1140	-1138	-1128	-1142	-1137	-1140	59	40.3	3.36	31.33
-1130	-1142	-1133	-1143	-1142	-1130	60	42.9	3.57	33.35
-1129	-1142	-1140	-1143	-1143	-1129	61	43.16	3.60	33.55
-1129	-1145	-1134	-1147	-1144	-1129	62	43.16	3.60	33.55
-1142	-1149	-1134	-1148	-1134	-1142	63	39.78	3.31	30.93
-1142	-1148	-1135	-1154	-1146	-1142	64	39.78	3.31	30.93
-1179	-1196	-1205	-1210	-1209	-1179	65	30.16	2.51	23.45
-1211	-1213	-1213	-1211	-1139	-1211	66	21.84	1.82	16.98
-1055	-1081	-1127	-1268	-1259	-1055	67	62.4	5.20	48.51
-1272	-1269	-1264	-1274	-1271	-1272	68	5.98	0.50	4.65
-1116	-1131	-1140	-1166	-1257	-1116	69	46.54	3.88	36.18
-1255	-1248	-1259	-1257	-1248	-1255	70	10.4	0.87	8.09
-1152	-1140	-1159	-1146	-1159	-1152	71	37.18	3.10	28.90
-1252	-1258	-1258	-1248	-1261	-1252	72	11.18	0.93	8.69
-1254	-1259	-1260	-1256	-1256	-1254	73	10.66	0.89	8.29
-1263	-1260	-1261	-1246	-1247	-1263	74	8.32	0.69	6.47
-1258	-1256	-1260	-1262	-1262	-1258	75	9.62	0.80	7.48
-1262	-1257	-1258	-1260	-1249	-1262	76	8.58	0.71	6.67
-1259	-1260	-1263	-1245	-1262	-1259	77	9.36	0.78	7.28
-1262	-1258	-1250	-1251	-1265	-1262	78	8.58	0.71	6.67
-1248	-1259	-1260	-1258	-1257	-1248	79	12.22	1.02	9.50
-1261	-1249	-1258	-1260	-1259	-1261	80	8.84	0.74	6.87
-1260	-1265	-1261	-1261	-1247	-1260	81	9.1	0.76	7.07
-1261	-1263	-1250	-1262	-1258	-1261	82	8.84	0.74	6.87
-1256	-1260	-1262	-1258	-1248	-1256	83	10.14	0.84	7.88
-1257	-1258	-1251	-1263	-1261	-1257	84	9.88	0.82	7.68
-1250	-1260	-1260	-1262	-1246	-1250	85	11.7	0.97	9.10
-1261	-1259	-1252	-1260	-1262	-1261	86	8.84	0.74	6.87
-1247	-1263	-1266	-1250	-1259	-1247	87	12.48	1.04	9.70
-1262	-1245	-1259	-1256	-1248	-1262	88	8.58	0.71	6.67
-1246	-1239	-1240	-1232	-1222	-1246	89	12.74	1.06	9.90
-1218	-1216	-1209	-1191	-1206	-1218	90	20.02	1.67	15.56
-1203	-1199	-1203	-1199	-1198	-1203	91	23.92	1.99	18.60
-1206	-1203	-1206	-1206	-1205	-1206	92	23.14	1.93	17.99
-1192	-1205	-1206	-1201	-1206	-1192	93	26.78	2.23	20.82
-1204	-1202	-1202	-1192	-1205	-1204	94	23.66	1.97	18.39
-1205	-1200	-1204	-1189	-1204	-1205	95	23.4	1.95	18.19
-1204	-1193	-1206	-1196	-1206	-1204	96	23.66	1.97	18.39
-1209	-1195	-1210	-1207	-1207	-1209	97	22.36	1.86	17.38

-1206	-1203	-1208	-1206	-1201	-1206	98	23.14	1.93	17.99
-1206	-1206	-1198	-1208	-1199	-1206	99	23.14	1.93	17.99
-1199	-1207	-1207	-1206	-1207	-1199	100	24.96	2.08	19.40
-1204	-1206	-1207	-1207	-1206	-1204	101	23.66	1.97	18.39
-1192	-1203	-1204	-1207	-1206	-1192	102	26.78	2.23	20.82
-1192	-1208	-1200	-1208	-1206	-1192	103	26.78	2.23	20.82
-1204	-1191	-1206	-1204	-1192	-1204	104	23.66	1.97	18.39
-1201	-1208	-1193	-1201	-1199	-1201	105	24.44	2.04	19.00
-1201	-1206	-1191	-1206	-1203	-1201	106	24.44	2.04	19.00
-1194	-1208	-1206	-1206	-1201	-1194	107	26.26	2.19	20.42
-1208	-1204	-1205	-1205	-1206	-1208	108	22.62	1.88	17.59
-1194	-1207	-1208	-1200	-1206	-1194	109	26.26	2.19	20.42
-1207	-1207	-1193	-1206	-1208	-1207	110	22.88	1.91	17.79
-1196	-1211	-1215	-1214	-1211	-1196	111	25.74	2.14	20.01
-1222	-1225	-1211	-1216	-1227	-1222	112	18.98	1.58	14.76
-1216	-1212	-1218	-1222	-1226	-1216	113	20.54	1.71	15.97

K = 0.107148



**Vane Shear Raw Data  
Location 415  
46 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/7/05,retec,415/46

zero =

-1295

calib =

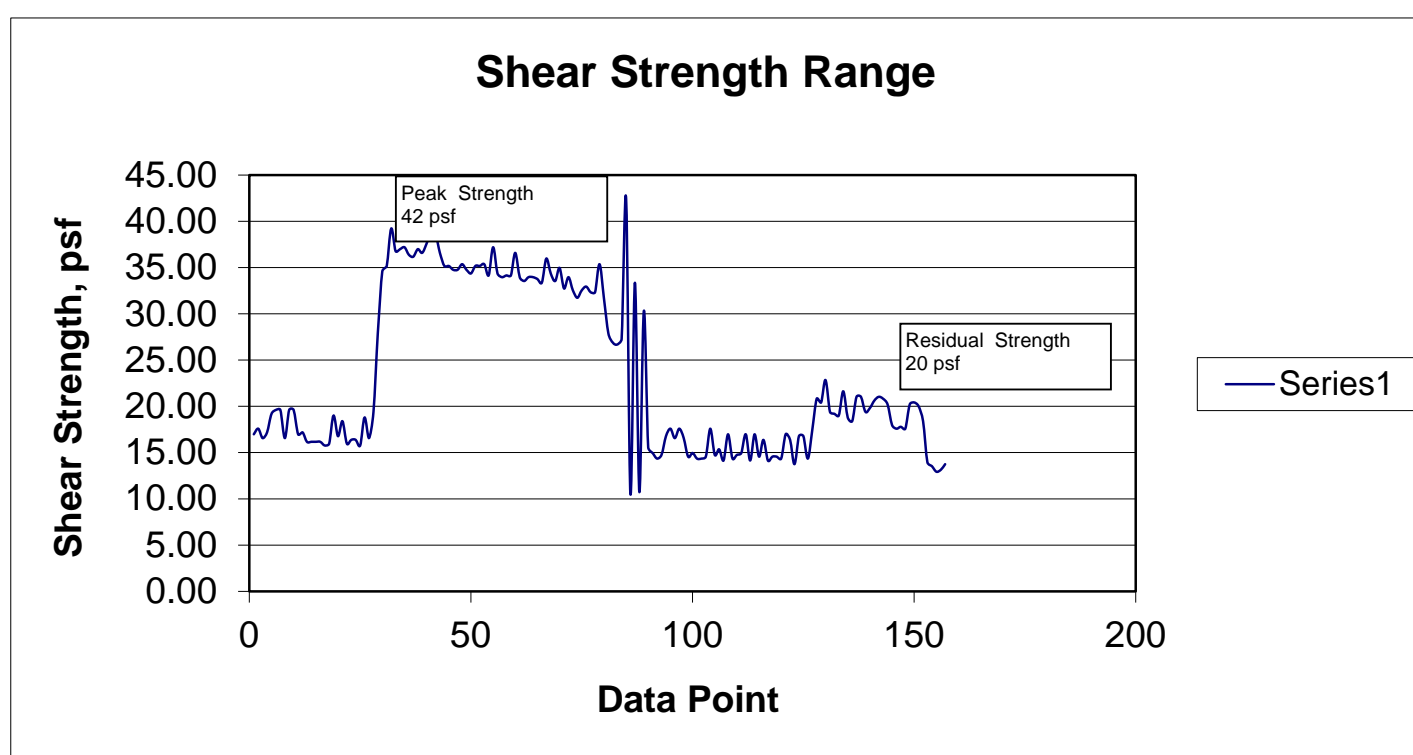
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1211	-1198	-1212	-1213	-1207	-1211	1	21.84	1.82	16.98
-1208	-1210	-1212	-1196	-1211	-1208	2	22.62	1.88	17.59
-1213	-1211	-1211	-1197	-1212	-1213	3	21.32	1.78	16.57
-1210	-1211	-1205	-1210	-1208	-1210	4	22.1	1.84	17.18
-1200	-1196	-1211	-1215	-1198	-1200	5	24.7	2.06	19.20
-1198	-1213	-1212	-1198	-1212	-1198	6	25.22	2.10	19.61
-1198	-1213	-1212	-1213	-1199	-1198	7	25.22	2.10	19.61
-1213	-1211	-1212	-1198	-1197	-1213	8	21.32	1.78	16.57
-1198	-1205	-1211	-1203	-1209	-1198	9	25.22	2.10	19.61
-1198	-1204	-1200	-1211	-1213	-1198	10	25.22	2.10	19.61
-1211	-1212	-1213	-1208	-1212	-1211	11	21.84	1.82	16.98
-1210	-1202	-1215	-1212	-1199	-1210	12	22.1	1.84	17.18
-1215	-1215	-1215	-1214	-1214	-1215	13	20.8	1.73	16.17
-1215	-1214	-1217	-1203	-1215	-1215	14	20.8	1.73	16.17
-1215	-1213	-1213	-1215	-1216	-1215	15	20.8	1.73	16.17
-1215	-1209	-1218	-1205	-1221	-1215	16	20.8	1.73	16.17
-1217	-1214	-1211	-1202	-1215	-1217	17	20.28	1.69	15.77
-1216	-1216	-1213	-1218	-1201	-1216	18	20.54	1.71	15.97
-1201	-1216	-1207	-1210	-1217	-1201	19	24.44	2.04	19.00
-1212	-1216	-1217	-1210	-1202	-1212	20	21.58	1.80	16.78
-1204	-1211	-1216	-1215	-1212	-1204	21	23.66	1.97	18.39
-1216	-1217	-1206	-1202	-1217	-1216	22	20.54	1.71	15.97
-1214	-1215	-1215	-1218	-1212	-1214	23	21.06	1.75	16.37
-1214	-1206	-1216	-1212	-1219	-1214	24	21.06	1.75	16.37
-1217	-1216	-1216	-1218	-1204	-1217	25	20.28	1.69	15.77
-1202	-1219	-1218	-1209	-1213	-1202	26	24.18	2.01	18.80
-1213	-1205	-1210	-1208	-1199	-1213	27	21.32	1.78	16.57
-1199	-1196	-1181	-1179	-1159	-1199	28	24.96	2.08	19.40
-1157	-1162	-1139	-1145	-1128	-1157	29	35.88	2.99	27.89
-1124	-1130	-1119	-1122	-1107	-1124	30	44.46	3.70	34.56
-1121	-1124	-1103	-1111	-1098	-1121	31	45.24	3.77	35.17
-1101	-1108	-1096	-1111	-1097	-1101	32	50.44	4.20	39.21
-1113	-1110	-1106	-1112	-1112	-1113	33	47.32	3.94	36.79
-1112	-1105	-1110	-1113	-1110	-1112	34	47.58	3.96	36.99
-1111	-1105	-1114	-1108	-1110	-1111	35	47.84	3.99	37.19
-1115	-1101	-1115	-1104	-1115	-1115	36	46.8	3.90	36.38
-1116	-1110	-1117	-1102	-1110	-1116	37	46.54	3.88	36.18
-1112	-1115	-1115	-1109	-1115	-1112	38	47.58	3.96	36.99
-1114	-1116	-1116	-1111	-1120	-1114	39	47.06	3.92	36.59
-1109	-1119	-1115	-1113	-1113	-1109	40	48.36	4.03	37.60
-1103	-1118	-1109	-1117	-1118	-1103	41	49.92	4.16	38.81
-1104	-1119	-1106	-1118	-1106	-1104	42	49.66	4.14	38.61
-1114	-1120	-1115	-1115	-1112	-1114	43	47.06	3.92	36.59
-1121	-1115	-1116	-1119	-1123	-1121	44	45.24	3.77	35.17
-1121	-1111	-1125	-1119	-1123	-1121	45	45.24	3.77	35.17
-1123	-1111	-1123	-1117	-1124	-1123	46	44.72	3.73	34.77
-1123	-1111	-1121	-1122	-1122	-1123	47	44.72	3.73	34.77
-1120	-1112	-1124	-1122	-1122	-1120	48	45.5	3.79	35.37
-1123	-1119	-1120	-1120	-1109	-1123	49	44.72	3.73	34.77
-1125	-1123	-1113	-1123	-1109	-1125	50	44.2	3.68	34.36
-1121	-1123	-1112	-1124	-1125	-1121	51	45.24	3.77	35.17
-1121	-1123	-1124	-1110	-1124	-1121	52	45.24	3.77	35.17
-1120	-1109	-1125	-1124	-1124	-1120	53	45.5	3.79	35.37
-1126	-1126	-1110	-1122	-1123	-1126	54	43.94	3.66	34.16
-1111	-1126	-1126	-1124	-1126	-1111	55	47.84	3.99	37.19
-1125	-1116	-1127	-1113	-1126	-1125	56	44.2	3.68	34.36
-1127	-1112	-1126	-1124	-1128	-1127	57	43.68	3.64	33.96
-1126	-1121	-1127	-1129	-1113	-1126	58	43.94	3.66	34.16
-1126	-1128	-1117	-1129	-1116	-1126	59	43.94	3.66	34.16
-1114	-1127	-1118	-1128	-1128	-1114	60	47.06	3.92	36.59
-1127	-1121	-1128	-1116	-1129	-1127	61	43.68	3.64	33.96
-1129	-1125	-1127	-1129	-1116	-1129	62	43.16	3.60	33.55
-1127	-1128	-1126	-1127	-1114	-1127	63	43.68	3.64	33.96
-1127	-1128	-1127	-1130	-1115	-1127	64	43.68	3.64	33.96
-1128	-1129	-1127	-1129	-1114	-1128	65	43.42	3.62	33.76
-1130	-1132	-1116	-1129	-1126	-1130	66	42.9	3.57	33.35
-1117	-1128	-1119	-1130	-1132	-1117	67	46.28	3.86	35.98
-1125	-1132	-1131	-1128	-1131	-1125	68	44.2	3.68	34.36
-1129	-1130	-1131	-1130	-1133	-1129	69	43.16	3.60	33.55
-1122	-1131	-1131	-1119	-1134	-1122	70	44.98	3.75	34.97
-1133	-1119	-1133	-1128	-1133	-1133	71	42.12	3.51	32.75
-1127	-1121	-1132	-1130	-1132	-1127	72	43.68	3.64	33.96
-1134	-1117	-1133	-1121	-1133	-1134	73	41.86	3.49	32.54
-1138	-1129	-1132	-1120	-1134	-1138	74	40.82	3.40	31.73
-1134	-1127	-1134	-1117	-1133	-1134	75	41.86	3.49	32.54
-1132	-1131	-1132	-1120	-1131	-1132	76	42.38	3.53	32.95
-1135	-1120	-1135	-1134	-1129	-1135	77	41.6	3.47	32.34
-1135	-1136	-1129	-1135	-1131	-1135	78	41.6	3.47	32.34
-1120	-1135	-1134	-1122	-1135	-1120	79	45.5	3.79	35.37
-1138	-1121	-1136	-1140	-1141	-1138	80	40.82	3.40	31.73
-1157	-1163	-1162	-1149	-1165	-1157	81	35.88	2.99	27.89
-1162	-1162	-1149	-1160	-1158	-1162	82	34.58	2.88	26.88
-1163	-1160	-1169	-1160	-1160	-1163	83	34.32	2.86	26.68
-1160	-1129	-1089	-1089	-1090	-1160	84	35.1	2.92	27.29
-1085	-1096	-1115	-1248	-1247	-1085	85	54.6	4.55	42.45
-1243	-1246	-1114	-1092	-1099	-1243	86	13.52	1.13	10.51
-1130	-1160	-1206	-1220	-1230	-1130	87	42.9	3.57	33.35
-1242	-1243	-1121	-1131	-1133	-1242	88	13.78	1.15	10.71
-1145	-1200	-1215	-1199	-1214	-1145	89	39	3.25	30.32
-1218	-1215	-1208	-1225	-1225	-1218	90	20.02	1.67	15.56
-1221	-1219	-1218	-1215	-1209	-1221	91	19.24	1.60	14.96
-1224	-1223	-1225	-1212	-1211	-1224	92	18.46	1.54	14.35
-1222	-1220	-1210	-1221	-1220	-1222	93	18.98	1.58	14.76
-1212	-1210	-1210	-1209	-1216	-1212	94	21.58	1.80	16.78
-1208	-1208	-1209	-1223	-1224	-1208	95	22.62	1.88	17.59
-1213	-1210	-1224	-1217	-1214	-1213	96	21.32	1.78	16.57
-1208	-1212	-1220	-1223	-1225	-1208	97	22.62	1.88	17.59

-1213	-1222	-1225	-1211	-1225	-1213	98	21.32	1.78	16.57
-1223	-1225	-1223	-1223	-1227	-1223	99	18.72	1.56	14.55
-1221	-1211	-1223	-1223	-1224	-1221	100	19.24	1.60	14.96
-1224	-1222	-1220	-1223	-1226	-1224	101	18.46	1.54	14.35
-1224	-1219	-1224	-1224	-1224	-1224	102	18.46	1.54	14.35
-1223	-1224	-1210	-1224	-1223	-1223	103	18.72	1.56	14.55
-1208	-1224	-1219	-1223	-1223	-1208	104	22.62	1.88	17.59
-1222	-1225	-1213	-1211	-1210	-1222	105	18.98	1.58	14.76
-1219	-1219	-1224	-1215	-1211	-1219	106	19.76	1.65	15.36
-1225	-1223	-1209	-1224	-1209	-1225	107	18.2	1.52	14.15
-1211	-1224	-1208	-1226	-1213	-1211	108	21.84	1.82	16.98
-1224	-1211	-1209	-1224	-1216	-1224	109	18.46	1.54	14.35
-1222	-1220	-1224	-1209	-1223	-1222	110	18.98	1.58	14.76
-1221	-1213	-1222	-1218	-1225	-1221	111	19.24	1.60	14.96
-1211	-1216	-1224	-1216	-1223	-1211	112	21.84	1.82	16.98
-1225	-1220	-1218	-1223	-1220	-1225	113	18.2	1.52	14.15
-1211	-1220	-1225	-1225	-1209	-1211	114	21.84	1.82	16.98
-1223	-1219	-1222	-1224	-1224	-1223	115	18.72	1.56	14.55
-1214	-1225	-1219	-1210	-1210	-1214	116	21.06	1.75	16.37
-1225	-1210	-1223	-1218	-1221	-1225	117	18.2	1.52	14.15
-1223	-1224	-1225	-1222	-1224	-1223	118	18.72	1.56	14.55
-1223	-1224	-1210	-1213	-1219	-1223	119	18.72	1.56	14.55
-1224	-1225	-1210	-1214	-1212	-1224	120	18.46	1.54	14.35
-1211	-1210	-1224	-1225	-1222	-1211	121	21.84	1.82	16.98
-1214	-1219	-1221	-1226	-1223	-1214	122	21.06	1.75	16.37
-1227	-1223	-1225	-1223	-1226	-1227	123	17.68	1.47	13.74
-1212	-1215	-1221	-1224	-1226	-1212	124	21.58	1.80	16.78
-1212	-1212	-1215	-1221	-1221	-1212	125	21.58	1.80	16.78
-1224	-1223	-1226	-1224	-1208	-1224	126	18.46	1.54	14.35
-1209	-1205	-1213	-1212	-1207	-1209	127	22.36	1.86	17.38
-1192	-1202	-1203	-1203	-1198	-1192	128	26.78	2.23	20.82
-1194	-1198	-1193	-1195	-1198	-1194	129	26.26	2.19	20.42
-1182	-1197	-1198	-1199	-1193	-1182	130	29.38	2.45	22.84
-1199	-1196	-1199	-1196	-1200	-1199	131	24.96	2.08	19.40
-1200	-1188	-1202	-1201	-1200	-1200	132	24.7	2.06	19.20
-1201	-1203	-1192	-1202	-1201	-1201	133	24.44	2.04	19.00
-1188	-1201	-1205	-1201	-1203	-1188	134	27.82	2.32	21.63
-1202	-1190	-1198	-1202	-1205	-1202	135	24.18	2.01	18.80
-1204	-1206	-1199	-1204	-1198	-1204	136	23.66	1.97	18.39
-1191	-1198	-1193	-1204	-1204	-1191	137	27.04	2.25	21.02
-1191	-1204	-1191	-1205	-1194	-1191	138	27.04	2.25	21.02
-1199	-1206	-1192	-1206	-1193	-1199	139	24.96	2.08	19.40
-1197	-1208	-1190	-1205	-1199	-1197	140	25.48	2.12	19.81
-1193	-1207	-1192	-1205	-1202	-1193	141	26.52	2.21	20.62
-1191	-1207	-1195	-1206	-1201	-1191	142	27.04	2.25	21.02
-1192	-1205	-1196	-1205	-1205	-1192	143	26.78	2.23	20.82
-1195	-1207	-1206	-1207	-1210	-1195	144	26	2.17	20.21
-1206	-1207	-1205	-1194	-1209	-1206	145	23.14	1.93	17.99
-1208	-1194	-1208	-1205	-1208	-1208	146	22.62	1.88	17.59
-1207	-1208	-1208	-1208	-1192	-1207	147	22.88	1.91	17.79
-1208	-1209	-1205	-1208	-1208	-1208	148	22.62	1.88	17.59
-1195	-1203	-1204	-1205	-1208	-1195	149	26	2.17	20.21
-1194	-1208	-1200	-1208	-1207	-1194	150	26.26	2.19	20.42
-1196	-1208	-1203	-1209	-1208	-1196	151	25.74	2.14	20.01
-1204	-1209	-1213	-1209	-1225	-1204	152	23.66	1.97	18.39
-1226	-1224	-1234	-1233	-1226	-1226	153	17.94	1.49	13.95
-1228	-1217	-1232	-1228	-1233	-1228	154	17.42	1.45	13.54
-1231	-1229	-1217	-1228	-1216	-1231	155	16.64	1.39	12.94
-1230	-1231	-1231	-1220	-1232	-1230	156	16.9	1.41	13.14
-1227	-1232	-1220	-1231	-1229	-1227	157	17.68	1.47	13.74

K = 0.107148



**Vane Shear Raw Data  
Location 415  
48 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/7/05,retec,415/48

zero =

-1295

calib =

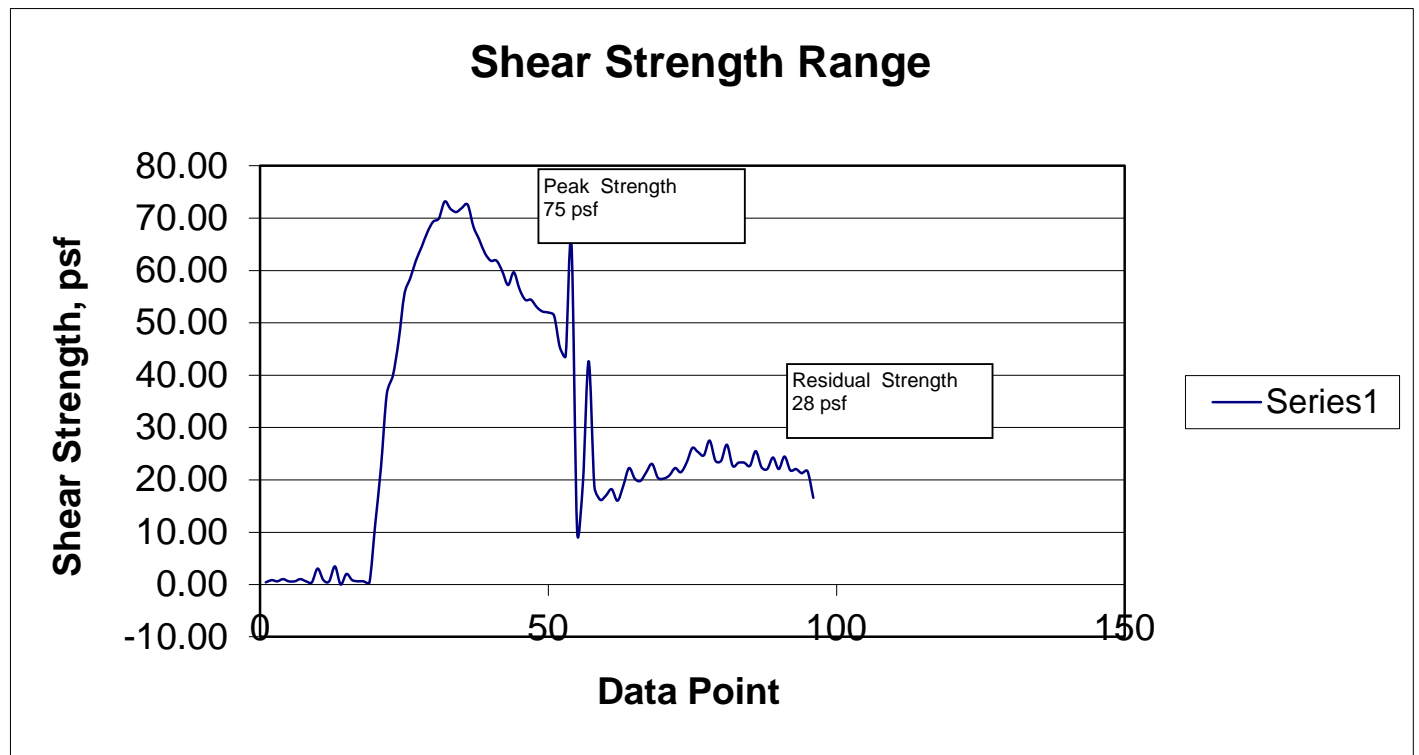
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1293	-1293	-1281	-1294	-1291	-1293	1	0.52	0.04	0.40
-1291	-1290	-1292	-1288	-1290	-1291	2	1.04	0.09	0.81
-1292	-1293	-1293	-1281	-1294	-1292	3	0.78	0.06	0.61
-1290	-1293	-1277	-1291	-1287	-1290	4	1.3	0.11	1.01
-1292	-1290	-1294	-1291	-1290	-1292	5	0.78	0.06	0.61
-1292	-1291	-1294	-1281	-1293	-1292	6	0.78	0.06	0.61
-1290	-1292	-1287	-1289	-1279	-1290	7	1.3	0.11	1.01
-1292	-1293	-1292	-1291	-1291	-1292	8	0.78	0.06	0.61
-1293	-1287	-1291	-1292	-1292	-1293	9	0.52	0.04	0.40
-1280	-1294	-1289	-1288	-1292	-1280	10	3.9	0.32	3.03
-1291	-1291	-1291	-1292	-1280	-1291	11	1.04	0.09	0.81
-1292	-1291	-1291	-1277	-1292	-1292	12	0.78	0.06	0.61
-1278	-1293	-1279	-1288	-1288	-1278	13	4.42	0.37	3.44
-1295	-1285	-1294	-1288	-1294	-1295	14	0	0.00	0.00
-1285	-1294	-1279	-1292	-1275	-1285	15	2.6	0.22	2.02
-1291	-1291	-1292	-1291	-1293	-1291	16	1.04	0.09	0.81
-1292	-1280	-1294	-1290	-1292	-1292	17	0.78	0.06	0.61
-1292	-1276	-1292	-1280	-1291	-1292	18	0.78	0.06	0.61
-1293	-1270	-1275	-1251	-1243	-1293	19	0.52	0.04	0.40
-1238	-1231	-1236	-1222	-1202	-1238	20	14.82	1.23	11.52
-1184	-1152	-1151	-1141	-1120	-1184	21	28.86	2.40	22.44
-1115	-1124	-1119	-1098	-1104	-1115	22	46.8	3.90	36.38
-1098	-1092	-1082	-1063	-1073	-1098	23	51.22	4.27	39.82
-1065	-1057	-1054	-1049	-1036	-1065	24	59.8	4.98	46.49
-1021	-1028	-1022	-996	-1004	-1021	25	71.24	5.93	55.38
-1006	-1001	-987	-997	-991	-1006	26	75.14	6.26	58.42
-989	-973	-983	-981	-968	-989	27	79.56	6.63	61.85
-976	-977	-967	-964	-968	-976	28	82.94	6.91	64.48
-962	-951	-952	-949	-953	-962	29	86.58	7.21	67.31
-952	-947	-948	-943	-936	-952	30	89.18	7.43	69.33
-949	-949	-933	-945	-947	-949	31	89.96	7.49	69.94
-933	-942	-942	-924	-942	-933	32	94.12	7.84	73.17
-940	-937	-942	-939	-929	-940	33	92.3	7.69	71.76
-943	-946	-931	-945	-936	-943	34	91.52	7.62	71.15
-939	-948	-934	-949	-948	-939	35	92.56	7.71	71.96
-936	-953	-955	-943	-958	-936	36	93.34	7.78	72.57
-957	-956	-958	-948	-965	-957	37	87.88	7.32	68.32
-969	-963	-973	-982	-967	-969	38	84.76	7.06	65.89
-982	-982	-969	-984	-987	-982	39	81.38	6.78	63.27
-989	-992	-992	-980	-992	-989	40	79.56	6.63	61.85
-989	-989	-992	-985	-998	-989	41	79.56	6.63	61.85
-999	-992	-1007	-1007	-1003	-999	42	76.96	6.41	59.83
-1012	-1011	-1013	-1015	-998	-1012	43	73.58	6.13	57.20
-1000	-1011	-1008	-1013	-1015	-1000	44	76.7	6.39	59.63
-1016	-1022	-1020	-1009	-1025	-1016	45	72.54	6.04	56.39
-1026	-1028	-1027	-1024	-1028	-1026	46	69.94	5.83	54.37
-1026	-1032	-1032	-1032	-1033	-1026	47	69.94	5.83	54.37
-1033	-1023	-1038	-1033	-1036	-1033	48	68.12	5.67	52.96
-1037	-1024	-1040	-1036	-1040	-1037	49	67.08	5.59	52.15
-1038	-1038	-1042	-1042	-1027	-1038	50	66.82	5.57	51.95
-1041	-1046	-1063	-1091	-1091	-1041	51	66.04	5.50	51.34
-1071	-1076	-1080	-1066	-1077	-1071	52	58.24	4.85	45.28
-1079	-1067	-1080	-1067	-1029	-1079	53	56.16	4.68	43.66
-972	-966	-1154	-1222	-1232	-972	54	83.98	7.00	65.29
-1245	-1237	-1004	-1038	-1155	-1245	55	13	1.08	10.11
-1199	-1213	-1219	-1221	-1033	-1199	56	24.96	2.08	19.40
-1084	-1208	-1203	-1219	-1215	-1084	57	54.86	4.57	42.65
-1203	-1219	-1219	-1222	-1220	-1203	58	23.92	1.99	18.60
-1215	-1221	-1216	-1219	-1214	-1215	59	20.8	1.73	16.17
-1211	-1218	-1207	-1220	-1218	-1211	60	21.84	1.82	16.98
-1205	-1213	-1216	-1212	-1215	-1205	61	23.4	1.95	18.19
-1216	-1213	-1202	-1213	-1207	-1216	62	20.54	1.71	15.97
-1202	-1197	-1195	-1200	-1190	-1202	63	24.18	2.01	18.80
-1185	-1202	-1200	-1201	-1201	-1185	64	28.6	2.38	22.23
-1195	-1190	-1194	-1190	-1197	-1195	65	26	2.17	20.21
-1197	-1196	-1183	-1191	-1180	-1197	66	25.48	2.12	19.81
-1189	-1194	-1177	-1192	-1188	-1189	67	27.56	2.30	21.43
-1181	-1192	-1193	-1190	-1192	-1181	68	29.64	2.47	23.04
-1194	-1178	-1193	-1178	-1195	-1194	69	26.26	2.19	20.42
-1195	-1180	-1192	-1191	-1177	-1195	70	26	2.17	20.21
-1192	-1193	-1180	-1193	-1193	-1192	71	26.78	2.23	20.82
-1185	-1193	-1192	-1181	-1190	-1185	72	28.6	2.38	22.23
-1189	-1188	-1178	-1177	-1184	-1189	73	27.56	2.30	21.43
-1180	-1173	-1166	-1168	-1168	-1180	74	29.9	2.49	23.25
-1166	-1169	-1171	-1168	-1161	-1166	75	33.54	2.79	26.07
-1170	-1172	-1171	-1171	-1171	-1170	76	32.5	2.71	25.27
-1173	-1162	-1174	-1179	-1172	-1173	77	31.72	2.64	24.66
-1159	-1170	-1176	-1162	-1176	-1159	78	35.36	2.95	27.49
-1178	-1174	-1178	-1177	-1166	-1178	79	30.42	2.53	23.65
-1178	-1180	-1166	-1178	-1176	-1178	80	30.42	2.53	23.65
-1163	-1177	-1179	-1172	-1179	-1163	81	34.32	2.86	26.68
-1183	-1166	-1180	-1181	-1169	-1183	82	29.12	2.43	22.64
-1180	-1182	-1170	-1183	-1183	-1180	83	29.9	2.49	23.25
-1180	-1178	-1183	-1182	-1178	-1180	84	29.9	2.49	23.25
-1183	-1182	-1172	-1186	-1180	-1183	85	29.12	2.43	22.64
-1169	-1183	-1183	-1186	-1186	-1169	86	32.76	2.73	25.47
-1184	-1177	-1180	-1182	-1183	-1184	87	28.86	2.40	22.44
-1186	-1184	-1175	-1186	-1185	-1186	88	28.34	2.36	22.03
-1175	-1185	-1186	-1172	-1182	-1175	89	31.2	2.60	24.26
-1186	-1184	-1173	-1181	-1185	-1186	90	28.34	2.36	22.03
-1174	-1185	-1187	-1172	-1187	-1174	91	31.46	2.62	24.46
-1187	-1188	-1183	-1186	-1187	-1187	92	28.08	2.34	21.83
-1186	-1184	-1187	-1186	-1186	-1186	93	28.34	2.36	22.03
-1190	-1191	-1187	-1189	-1188	-1190	94	27.3	2.27	21.22
-1188	-1190	-1186	-1200	-1210	-1188	95	27.82	2.32	21.63
-1213	-1213	-1204	-1212	-1215	-1213	96	21.32	1.78	16.57

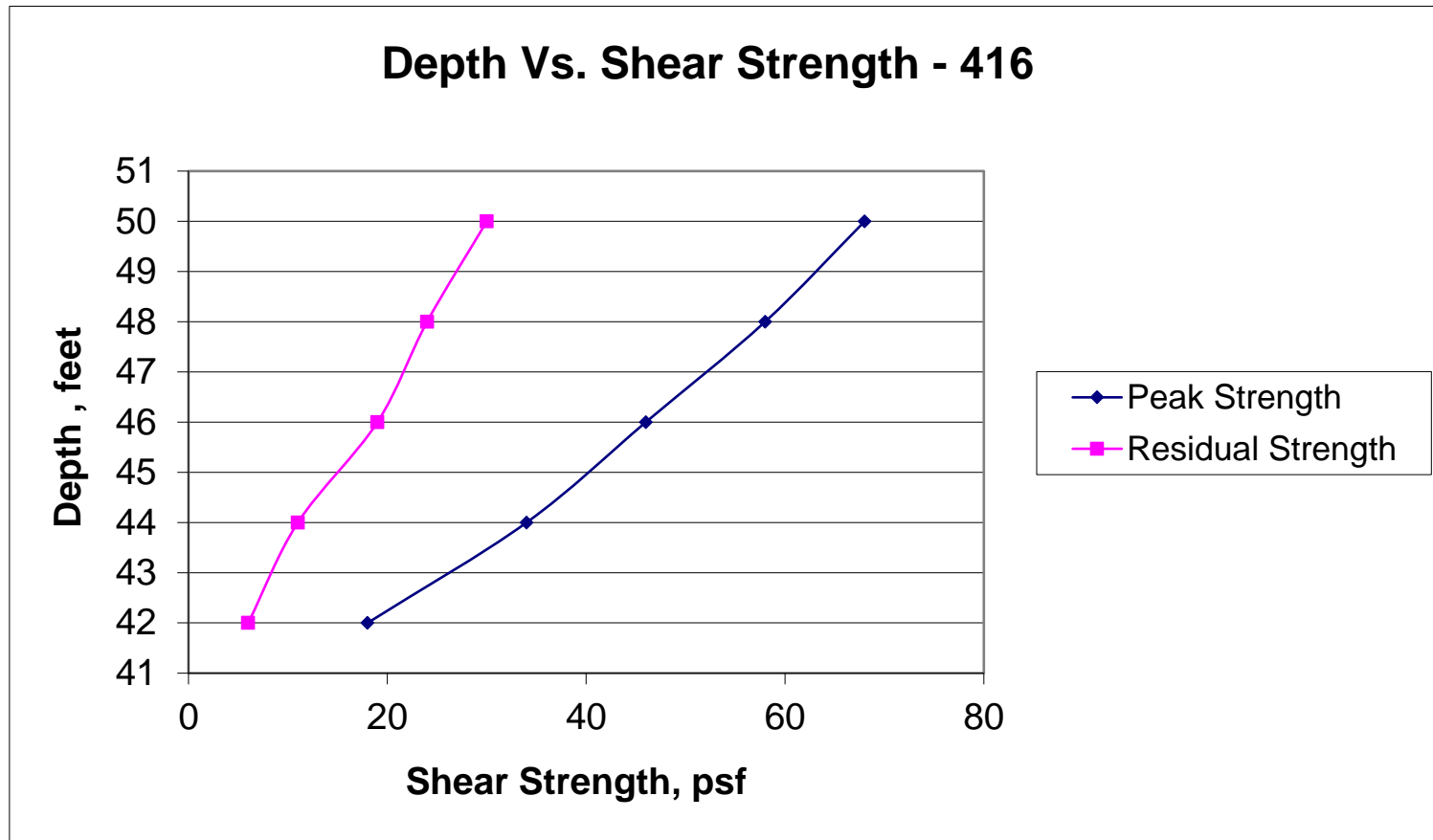


K = 0.107148



**Vane Shear Summary  
Location 416**

Depth, ft	Shear Strength, psf	
	Peak	Residual
42	18	6
44	34	11
46	46	19
48	58	24
50	68	30



**Vane Shear Raw Data  
Location 416  
42 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/05,retec,416/42

zero =

-1295

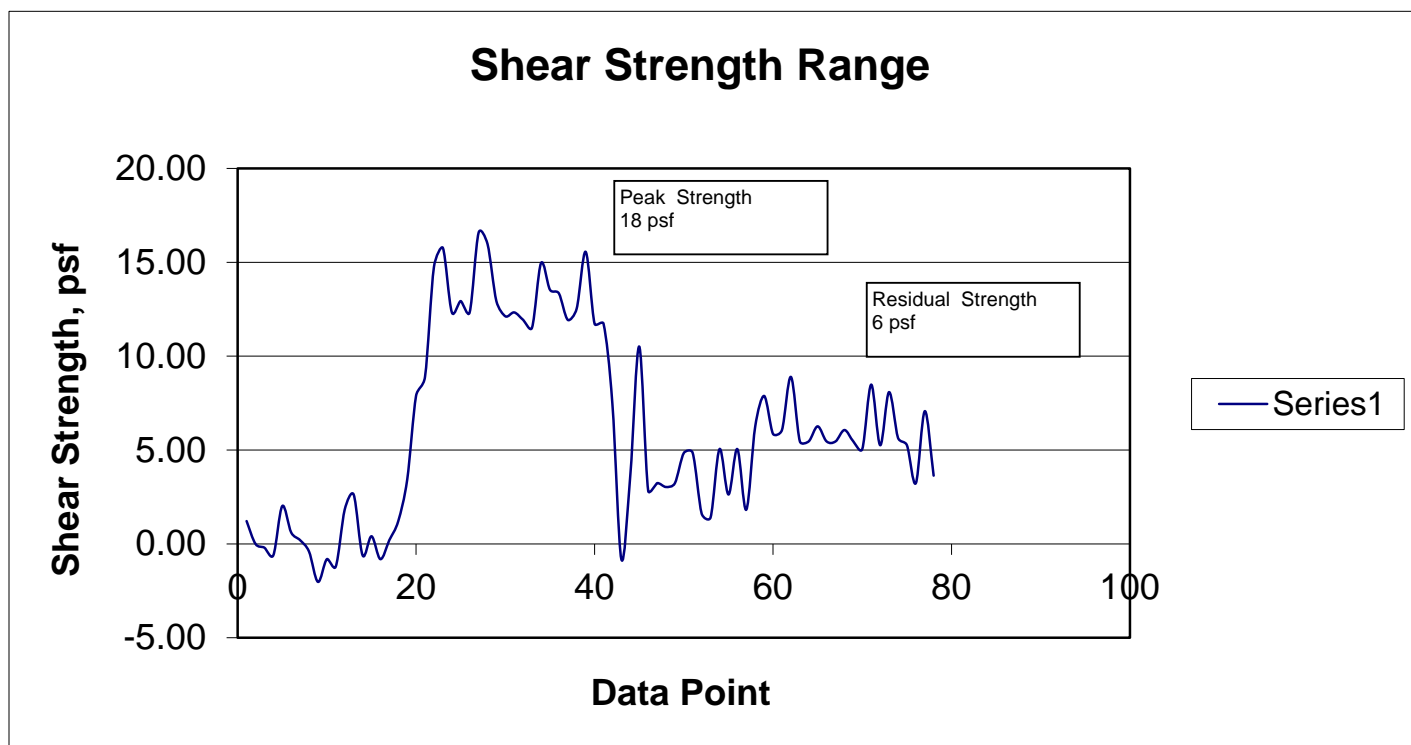
calib =

0.26 in-lb/unit ft-lb

Shear Strength, psf

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
-1289	-1301	-1302	-1292	-1303	-1289	1	1.56	0.13	1.21																																																																				
-1295	-1294	-1303	-1301	-1294	-1295	2	0	0.00	0.00																																																																				
-1296	-1284	-1304	-1300	-1295	-1296	3	-0.26	-0.02	-0.20																																																																				
-1298	-1292	-1300	-1292	-1302	-1298	4	-0.78	-0.06	-0.61																																																																				
-1285	-1307	-1303	-1297	-1295	-1285	5	2.6	0.22	2.02																																																																				
-1292	-1300	-1299	-1291	-1299	-1292	6	0.78	0.06	0.61																																																																				
-1294	-1302	-1291	-1300	-1298	-1294	7	0.26	0.02	0.20																																																																				
-1297	-1301	-1284	-1298	-1296	-1297	8	-0.52	-0.04	-0.40																																																																				
-1305	-1301	-1293	-1298	-1285	-1305	9	-2.6	-0.22	-2.02																																																																				
-1299	-1286	-1298	-1293	-1285	-1299	10	-1.04	-0.09	-0.81																																																																				
-1301	-1288	-1293	-1283	-1300	-1301	11	-1.56	-0.13	-1.21																																																																				
-1286	-1297	-1294	-1281	-1304	-1286	12	2.34	0.19	1.82																																																																				
-1282	-1295	-1280	-1300	-1299	-1282	13	3.38	0.28	2.63																																																																				
-1298	-1298	-1297	-1299	-1283	-1298	14	-0.78	-0.06	-0.61																																																																				
-1293	-1286	-1299	-1297	-1281	-1293	15	0.52	0.04	0.40																																																																				
-1299	-1282	-1299	-1293	-1291	-1299	16	-1.04	-0.09	-0.81																																																																				
-1294	-1298	-1293	-1286	-1290	-1294	17	0.26	0.02	0.20																																																																				
-1289	-1291	-1269	-1280	-1276	-1289	18	1.56	0.13	1.21																																																																				
-1278	-1274	-1265	-1261	-1242	-1278	19	4.42	0.37	3.44																																																																				
-1256	-1237	-1250	-1251	-1244	-1256	20	10.14	0.84	7.88																																																																				
-1251	-1240	-1245	-1227	-1244	-1251	21	11.44	0.95	8.89																																																																				
-1222	-1235	-1235	-1229	-1231	-1222	22	18.98	1.58	14.76																																																																				
-1217	-1230	-1227	-1232	-1236	-1217	23	20.28	1.69	15.77																																																																				
-1234	-1233	-1222	-1230	-1219	-1234	24	15.86	1.32	12.33																																																																				
-1231	-1213	-1230	-1232	-1225	-1231	25	16.64	1.39	12.94																																																																				
-1234	-1225	-1235	-1215	-1233	-1234	26	15.86	1.32	12.33																																																																				
-1213	-1235	-1233	-1225	-1232	-1213	27	21.32	1.78	16.57																																																																				
-1216	-1229	-1232	-1230	-1229	-1216	28	20.54	1.71	15.97																																																																				
-1231	-1235	-1217	-1231	-1228	-1231	29	16.64	1.39	12.94																																																																				
-1235	-1230	-1226	-1231	-1214	-1235	30	15.6	1.30	12.13																																																																				
-1234	-1221	-1235	-1234	-1224	-1234	31	15.86	1.32	12.33																																																																				
-1236	-1223	-1235	-1227	-1234	-1236	32	15.34	1.28	11.93																																																																				
-1238	-1220	-1235	-1229	-1237	-1238	33	14.82	1.23	11.52																																																																				
-1221	-1238	-1233	-1230	-1239	-1221	34	19.24	1.60	14.96																																																																				
-1228	-1237	-1225	-1237	-1236	-1228	35	17.42	1.45	13.54																																																																				
-1229	-1237	-1220	-1235	-1234	-1229	36	17.16	1.43	13.34																																																																				
-1236	-1225	-1238	-1237	-1224	-1236	37	15.34	1.28	11.93																																																																				
-1233	-1226	-1232	-1223	-1241	-1233	38	16.12	1.34	12.53																																																																				
-1218	-1237	-1236	-1234	-1233	-1218	39	20.02	1.67	15.56																																																																				
-1237	-1239	-1225	-1239	-1237	-1237	40	15.08	1.26	11.72																																																																				
-1237	-1242	-1237	-1236	-1231	-1237	41	15.08	1.26	11.72																																																																				
-1258	-1277	-1289	-1286	-1284	-1258	42	9.62	0.80	7.48																																																																				
-1299	-1227	-1199	-1233	-1275	-1299	43	-1.04	-0.09	-0.81																																																																				
-1277	-1287	-1287	-1265	-1228	-1277	44	4.68	0.39	3.64																																																																				
-1243	-1269	-1277	-1263	-1283	-1243	45	13.52	1.13	10.51																																																																				
-1281	-1235	-1280	-1275	-1279	-1281	46	3.64	0.30	2.83																																																																				
-1279	-1279	-1285	-1278	-1281	-1279	47	4.16	0.35	3.23																																																																				
-1280	-1284	-1288	-1270	-1286	-1280	48	3.9	0.32	3.03																																																																				
-1279	-1283	-1288	-1272	-1287	-1279	49	4.16	0.35	3.23																																																																				
-1271	-1288	-1287	-1276	-1284	-1271	50	6.24	0.52	4.85																																																																				
-1271	-1288	-1285	-1282	-1283	-1271	51	6.24	0.52	4.85																																																																				
-1287	-1284	-1277	-1281	-1268	-1287	52	2.08	0.17	1.62																																																																				
-1288	-1273	-1284	-1268	-1287	-1288	53	1.82	0.15	1.41																																																																				
-1270	-1285	-1270	-1285	-1276	-1270	54	6.5	0.54	5.05																																																																				
-1282	-1268	-1287	-1282	-1283	-1282	55	3.38	0.28	2.63																																																																				
-1270	-1286	-1281	-1283	-1283	-1270	56	6.5	0.54	5.05																																																																				
-1286	-1271	-1272	-1272	-1269	-1286	57	2.34	0.19	1.82																																																																				
-1264	-1265	-1270	-1253	-1269	-1264	58	8.06	0.67	6.27																																																																				
-1256	-1269	-1263	-1269	-1266	-1256	59	10.14	0.84	7.88																																																																				
-1266	-1263	-1268	-1267	-1254	-1266	60	7.54	0.63	5.86																																																																				
-1265	-1263	-1271	-1252	-1270	-1265	61	7.8	0.65	6.06																																																																				
-1251	-1262	-1267	-1258	-1268	-1251	62	11.44	0.95	8.89																																																																				
-1268	-1268	-1261	-1268	-1271	-1268	63	7.02	0.58	5.46																																																																				
-1268	-1251	-1271	-1253	-1270	-1268	64	7.02	0.58	5.46																																																																				
-1264	-1264	-1262	-1269	-1255	-1264	65	8.06	0.67	6.27																																																																				
-1268	-1268	-1271	-1262	-1267	-1268	66	7.02	0.58	5.46																																																																				
-1268	-1269	-1267	-1267	-1263	-1268	67	7.02	0.58	5.46																																																																				
-1265	-1267	-1266	-1269	-1267	-1265	68	7.8	0.65	6.06																																																																				
-1268	-1268	-1272	-1270	-1262	-1268	69	7.02	0.58	5.46																																																																				
-1270	-1253	-1268	-1256	-1268	-1270	70	6.5	0.54	5.05																																																																				
-1253	-1269	-1256	-1271	-1268	-1253	71	10.92	0.91	8.49																																																																				
-1269	-1254	-1266	-1268	-1267	-1269	72	6.76	0.56	5.26																																																																				
-1255	-1270	-1264	-1273	-1271	-1255	73	10.4	0.87	8.09																																																																				
-1267	-1263	-1274	-1271	-1263	-1267	74	7.28	0.61	5.66																																																																				
-1269	-1277	-1279	-1272	-1275	-1269	75	6.76	0.56	5.26																																																																				
-1279	-1271	-1274	-1277	-1274	-1279	76	4.16	0.35	3.23																																																																				
-1260	-1277	-1259	-1274	-1262	-1260	77	9.1	0.76	7.07																																																																				
-1277	-1279	-1276	-1275	-1280	-1277	78	4.68	0.39	3.64																																																																				

K = 0.107148



**Vane Shear Raw Data  
Location 416  
44 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/05,retec,416/44

zero =

-1295

calib =

0.26 in-lb/unit ft-lb

Shear Strength, psf

-1300	-1290	-1302	-1304	-1300	-1300	1	-1.3	-0.11	-1.01
-1303	-1293	-1300	-1299	-1286	-1303	2	-2.08	-0.17	-1.62
-1301	-1287	-1300	-1296	-1300	-1301	3	-1.56	-0.13	-1.21
-1295	-1300	-1295	-1282	-1299	-1295	4	0	0.00	0.00
-1282	-1296	-1294	-1299	-1303	-1282	5	3.38	0.28	2.63
-1295	-1302	-1280	-1300	-1296	-1295	6	0	0.00	0.00
-1297	-1289	-1297	-1302	-1281	-1297	7	-0.52	-0.04	-0.40
-1299	-1283	-1300	-1299	-1294	-1299	8	-1.04	-0.09	-0.81
-1285	-1299	-1299	-1284	-1299	-1285	9	2.6	0.22	2.02
-1293	-1298	-1283	-1294	-1294	-1293	10	0.52	0.04	0.40
-1296	-1290	-1295	-1296	-1290	-1296	11	-0.26	-0.02	-0.20
-1295	-1297	-1298	-1281	-1299	-1295	12	0	0.00	0.00
-1289	-1300	-1279	-1299	-1288	-1289	13	1.56	0.13	1.21
-1297	-1283	-1301	-1281	-1294	-1297	14	-0.52	-0.04	-0.40
-1285	-1298	-1283	-1295	-1294	-1285	15	2.6	0.22	2.02
-1293	-1282	-1298	-1282	-1299	-1293	16	0.52	0.04	0.40
-1287	-1297	-1287	-1299	-1299	-1287	17	2.08	0.17	1.62
-1295	-1294	-1281	-1291	-1285	-1295	18	0	0.00	0.00
-1282	-1279	-1272	-1282	-1269	-1282	19	3.38	0.28	2.63
-1256	-1240	-1241	-1229	-1206	-1256	20	10.14	0.84	7.88
-1212	-1207	-1194	-1175	-1180	-1212	21	21.58	1.80	16.78
-1174	-1174	-1171	-1168	-1147	-1174	22	31.46	2.62	24.46
-1160	-1153	-1149	-1151	-1152	-1160	23	35.1	2.92	27.29
-1150	-1132	-1150	-1148	-1139	-1150	24	37.7	3.14	29.31
-1145	-1143	-1131	-1151	-1151	-1145	25	39	3.25	30.32
-1148	-1136	-1149	-1149	-1135	-1148	26	38.22	3.18	29.71
-1147	-1152	-1146	-1134	-1146	-1147	27	38.48	3.21	29.92
-1148	-1149	-1134	-1149	-1153	-1148	28	38.22	3.18	29.71
-1152	-1135	-1156	-1154	-1145	-1152	29	37.18	3.10	28.90
-1138	-1155	-1154	-1140	-1150	-1138	30	40.82	3.40	31.73
-1155	-1161	-1142	-1155	-1161	-1155	31	36.4	3.03	28.30
-1163	-1152	-1165	-1155	-1147	-1163	32	34.32	2.86	26.68
-1159	-1163	-1145	-1155	-1149	-1159	33	35.36	2.95	27.49
-1140	-1156	-1158	-1152	-1164	-1140	34	40.3	3.36	31.33
-1163	-1148	-1160	-1157	-1160	-1163	35	34.32	2.86	26.68
-1166	-1167	-1161	-1168	-1156	-1166	36	33.54	2.79	26.07
-1157	-1168	-1157	-1167	-1172	-1157	37	35.88	2.99	27.89
-1166	-1169	-1166	-1158	-1170	-1166	38	33.54	2.79	26.07
-1172	-1170	-1163	-1170	-1161	-1172	39	31.98	2.66	24.86
-1154	-1170	-1170	-1167	-1172	-1154	40	36.66	3.05	28.50
-1171	-1161	-1173	-1167	-1169	-1171	41	32.24	2.69	25.06
-1177	-1179	-1163	-1177	-1178	-1177	42	30.68	2.56	23.85
-1172	-1174	-1171	-1159	-1181	-1172	43	31.98	2.66	24.86
-1180	-1166	-1182	-1178	-1183	-1180	44	29.9	2.49	23.25
-1183	-1180	-1174	-1181	-1172	-1183	45	29.12	2.43	22.64
-1163	-1180	-1176	-1175	-1178	-1163	46	34.32	2.86	26.68
-1185	-1173	-1185	-1167	-1181	-1185	47	28.6	2.38	22.23
-1179	-1168	-1188	-1181	-1186	-1179	48	30.16	2.51	23.45
-1184	-1180	-1181	-1185	-1165	-1184	49	28.86	2.40	22.44
-1170	-1185	-1185	-1192	-1181	-1170	50	32.5	2.71	25.27
-1176	-1180	-1181	-1172	-1187	-1176	51	30.94	2.58	24.05
-1186	-1178	-1184	-1171	-1187	-1186	52	28.34	2.36	22.03
-1186	-1172	-1187	-1178	-1191	-1186	53	28.34	2.36	22.03
-1192	-1173	-1188	-1178	-1193	-1192	54	26.78	2.23	20.82
-1190	-1172	-1189	-1184	-1191	-1190	55	27.3	2.27	21.22
-1191	-1183	-1193	-1195	-1195	-1191	56	27.04	2.25	21.02
-1196	-1177	-1181	-1169	-1201	-1196	57	25.74	2.14	20.01
-1210	-1208	-1242	-1251	-1248	-1210	58	22.1	1.84	17.18
-1197	-1117	-1195	-1276	-1263	-1197	59	25.48	2.12	19.81
-1290	-1232	-1174	-1200	-1292	-1290	60	1.3	0.11	1.01
-1288	-1293	-1298	-1179	-1196	-1288	61	1.82	0.15	1.41
-1287	-1287	-1269	-1294	-1292	-1287	62	2.08	0.17	1.62
-1290	-1293	-1291	-1296	-1298	-1290	63	1.3	0.11	1.01
-1292	-1293	-1278	-1288	-1286	-1292	64	0.78	0.06	0.61
-1288	-1283	-1290	-1288	-1279	-1288	65	1.82	0.15	1.41
-1287	-1279	-1289	-1273	-1284	-1287	66	2.08	0.17	1.62
-1270	-1292	-1289	-1284	-1284	-1270	67	6.5	0.54	5.05
-1277	-1285	-1280	-1281	-1283	-1277	68	4.68	0.39	3.64
-1278	-1285	-1282	-1280	-1279	-1278	69	4.42	0.37	3.44
-1283	-1284	-1265	-1279	-1282	-1283	70	3.12	0.26	2.43
-1284	-1282	-1276	-1281	-1270	-1284	71	2.86	0.24	2.22
-1284	-1272	-1286	-1282	-1272	-1284	72	2.86	0.24	2.22
-1281	-1266	-1283	-1272	-1280	-1281	73	3.64	0.30	2.83
-1270	-1275	-1274	-1272	-1273	-1270	74	6.5	0.54	5.05
-1274	-1275	-1274	-1275	-1269	-1274	75	5.46	0.45	4.24
-1262	-1271	-1260	-1267	-1265	-1262	76	8.58	0.71	6.67
-1264	-1249	-1256	-1243	-1253	-1264	77	8.06	0.67	6.27
-1238	-1246	-1228	-1244	-1230	-1238	78	14.82	1.23	11.52
-1240	-1225	-1241	-1239	-1240	-1240	79	14.3	1.19	11.12
-1228	-1246	-1243	-1225	-1238	-1228	80	17.42	1.45	13.54
-1231	-1244	-1243	-1242	-1241	-1231	81	16.64	1.39	12.94
-1246	-1240	-1243	-1241	-1241	-1246	82	12.74	1.06	9.90
-1228	-1244	-1230	-1238	-1241	-1228	83	17.42	1.45	13.54
-1246	-1239	-1246	-1244	-1245	-1246	84	12.74	1.06	9.90
-1231	-1242	-1241	-1243	-1242	-1231	85	16.64	1.39	12.94
-1246	-1230	-1245	-1244	-1240	-1246	86	12.74	1.06	9.90
-1239	-1242	-1239	-1247	-1245	-1239	87	14.56	1.21	11.32
-1244	-1243	-1247	-1245	-1240	-1244	88	13.26	1.10	10.31
-1234	-1246	-1245	-1240	-1244	-1234	89	15.86	1.32	12.33
-1242	-1240	-1244	-1243	-1233	-1242	90	13.78	1.15	10.71
-1243	-1236	-1242	-1228	-1241	-1243	91	13.52	1.13	10.51
-1234	-1245	-1227	-1244	-1245	-1234	92	15.86	1.32	12.33
-1244	-1230	-1246	-1236	-1241	-1244	93	13.26	1.10	10.31
-1241	-1237	-1241	-1224	-1246	-1241	94	14.04	1.17	10.92
-1226	-1244	-1243	-1239	-1242	-1226	95	17.94	1.49	13.95
-1238	-1241	-1227	-1245	-1243	-1238	96	14.82	1.23	11.52
-1249	-1244	-1238	-1240	-1242	-1249	97	11.96	1.00	9.30

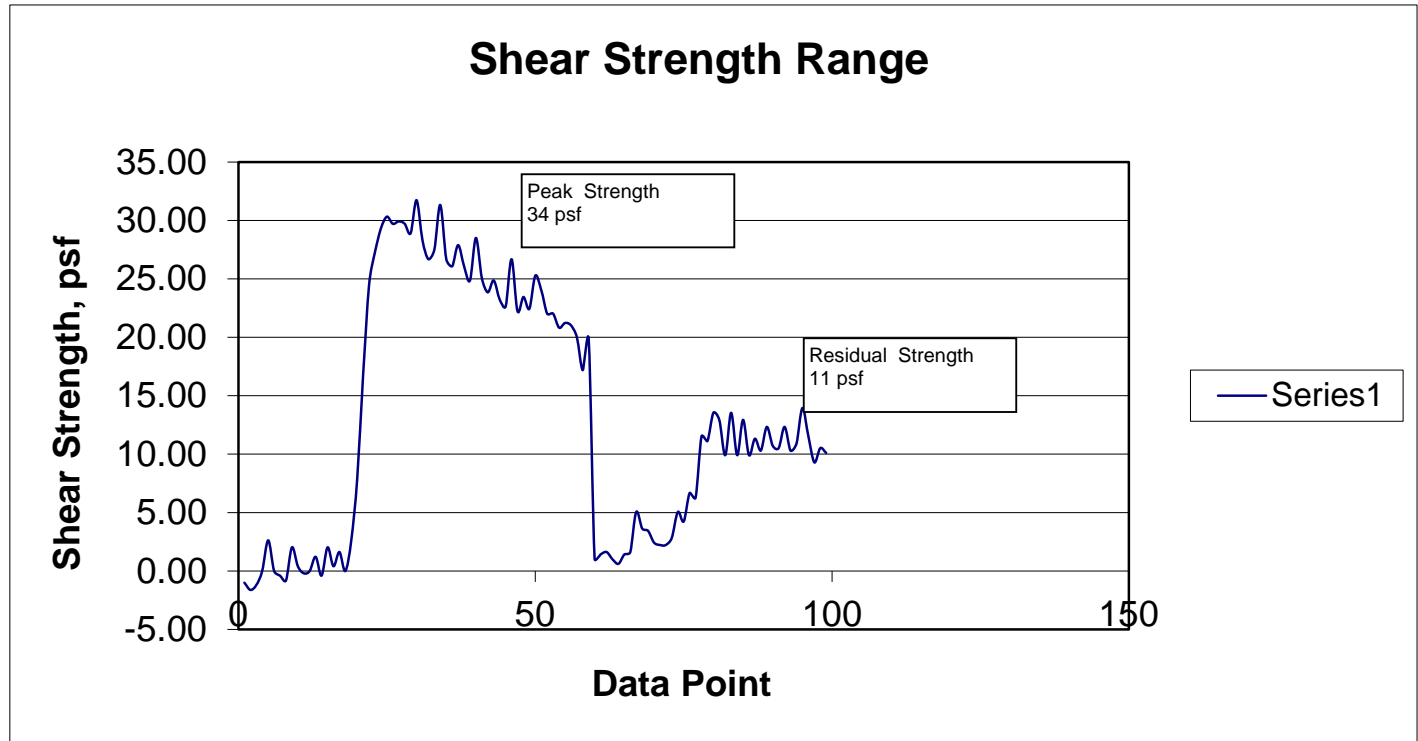


-1243 -1241 -1232 -1238 -1233  
-1245 -1247 -1245 -1241 -1242

-1243 98 13.52 1.13  
-1245 99 13 1.08

10.51  
10.11

K = 0.107148

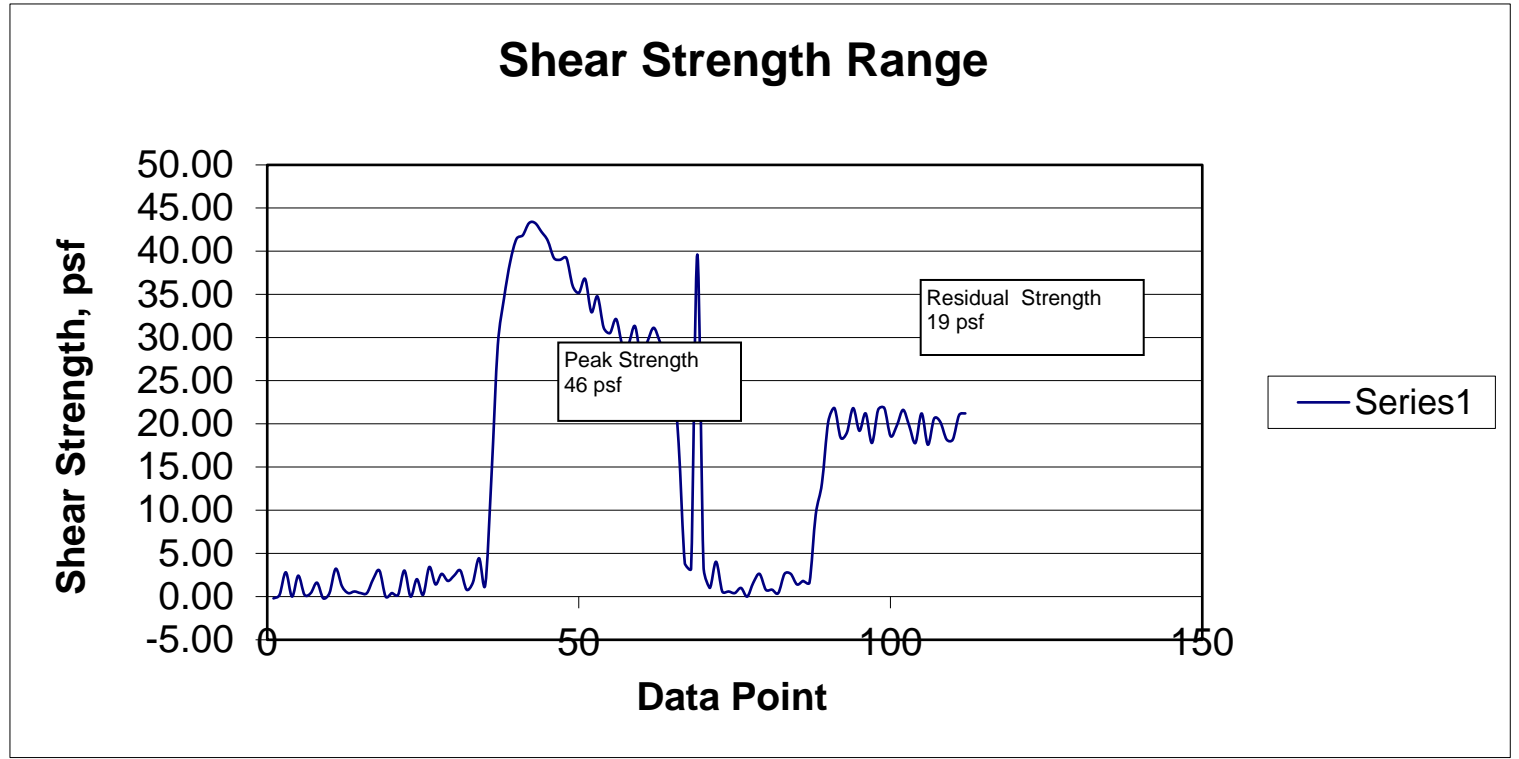


**Vane Shear Raw Data  
Location 416  
46 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/05, re	tec, 416/46		zero =	-1295	calib =	0.26 in-lb/unit	ft-lb	Shear Strength, psf	Location
-1296	-1292	-1296	-1280	-1294	-1296	1	-0.26	-0.02	-0.20
-1294	-1294	-1296	-1278	-1293	-1294	2	0.26	0.02	0.20
-1281	-1294	-1281	-1294	-1295	-1281	3	3.64	0.30	2.83
-1295	-1283	-1297	-1292	-1295	-1295	4	0	0.00	0.00
-1283	-1295	-1297	-1291	-1296	-1283	5	3.12	0.26	2.43
-1294	-1293	-1291	-1300	-1279	-1294	6	0.26	0.02	0.20
-1293	-1278	-1296	-1280	-1292	-1293	7	0.52	0.04	0.40
-1287	-1292	-1285	-1294	-1281	-1287	8	2.08	0.17	1.62
-1296	-1290	-1292	-1290	-1294	-1296	9	-0.26	-0.02	-0.20
-1293	-1287	-1294	-1294	-1295	-1293	10	0.52	0.04	0.40
-1279	-1291	-1278	-1294	-1280	-1279	11	4.16	0.35	3.23
-1289	-1294	-1290	-1295	-1292	-1289	12	1.56	0.13	1.21
-1293	-1285	-1294	-1296	-1296	-1293	13	0.52	0.04	0.40
-1292	-1286	-1294	-1287	-1293	-1292	14	0.78	0.06	0.61
-1293	-1278	-1291	-1281	-1293	-1293	15	0.52	0.04	0.40
-1293	-1289	-1299	-1287	-1294	-1293	16	0.52	0.04	0.40
-1285	-1292	-1287	-1291	-1290	-1285	17	2.6	0.22	2.02
-1280	-1297	-1295	-1289	-1293	-1280	18	3.9	0.32	3.03
-1295	-1296	-1293	-1295	-1287	-1295	19	0	0.00	0.00
-1293	-1291	-1293	-1288	-1294	-1293	20	0.52	0.04	0.40
-1294	-1290	-1292	-1293	-1294	-1294	21	0.26	0.02	0.20
-1280	-1293	-1279	-1294	-1279	-1280	22	3.9	0.32	3.03
-1295	-1283	-1292	-1281	-1298	-1295	23	0	0.00	0.00
-1285	-1290	-1278	-1296	-1287	-1285	24	2.6	0.22	2.02
-1294	-1278	-1297	-1280	-1295	-1294	25	0.26	0.02	0.20
-1278	-1298	-1280	-1294	-1277	-1278	26	4.42	0.37	3.44
-1288	-1268	-1282	-1282	-1280	-1288	27	1.82	0.15	1.41
-1282	-1283	-1283	-1281	-1289	-1282	28	3.38	0.28	2.63
-1286	-1283	-1287	-1287	-1275	-1286	29	2.34	0.19	1.82
-1283	-1284	-1285	-1275	-1285	-1283	30	3.12	0.26	2.43
-1280	-1286	-1271	-1290	-1282	-1280	31	3.9	0.32	3.03
-1291	-1286	-1283	-1286	-1267	-1291	32	1.04	0.09	0.81
-1287	-1272	-1283	-1275	-1291	-1287	33	2.08	0.17	1.62
-1273	-1289	-1284	-1288	-1290	-1273	34	5.72	0.48	4.45
-1288	-1286	-1272	-1265	-1224	-1288	35	1.82	0.15	1.41
-1225	-1187	-1191	-1178	-1159	-1225	36	18.2	1.52	14.15
-1151	-1159	-1138	-1138	-1128	-1151	37	37.44	3.12	29.11
-1124	-1114	-1113	-1095	-1108	-1124	38	44.46	3.70	34.56
-1103	-1090	-1097	-1096	-1078	-1103	39	49.92	4.16	38.81
-1090	-1091	-1075	-1083	-1088	-1090	40	53.3	4.44	41.44
-1088	-1077	-1088	-1084	-1076	-1088	41	53.82	4.48	41.84
-1081	-1082	-1069	-1078	-1084	-1081	42	55.64	4.63	43.26
-1081	-1080	-1086	-1078	-1085	-1081	43	55.64	4.63	43.26
-1086	-1087	-1071	-1090	-1094	-1086	44	54.34	4.53	42.25
-1091	-1084	-1098	-1090	-1105	-1091	45	53.04	4.42	41.23
-1101	-1098	-1107	-1109	-1096	-1101	46	50.44	4.20	39.21
-1102	-1114	-1102	-1115	-1116	-1102	47	50.18	4.18	39.01
-1101	-1117	-1114	-1113	-1118	-1101	48	50.44	4.20	39.21
-1117	-1109	-1117	-1106	-1120	-1117	49	46.28	3.86	35.98
-1121	-1122	-1120	-1127	-1120	-1121	50	45.24	3.77	35.17
-1113	-1129	-1133	-1116	-1131	-1113	51	47.32	3.94	36.79
-1132	-1120	-1134	-1137	-1124	-1132	52	42.38	3.53	32.95
-1123	-1137	-1140	-1136	-1125	-1123	53	44.72	3.73	34.77
-1141	-1138	-1128	-1141	-1141	-1141	54	40.04	3.34	31.13
-1144	-1126	-1149	-1146	-1131	-1144	55	39.26	3.27	30.52
-1136	-1146	-1147	-1131	-1146	-1136	56	41.34	3.44	32.14
-1151	-1151	-1135	-1150	-1150	-1151	57	37.44	3.12	29.11
-1150	-1138	-1158	-1161	-1140	-1150	58	37.7	3.14	29.31
-1140	-1153	-1154	-1138	-1155	-1140	59	40.3	3.36	31.33
-1158	-1150	-1143	-1152	-1154	-1158	60	35.62	2.97	27.69
-1149	-1142	-1156	-1158	-1141	-1149	61	37.96	3.16	29.51
-1141	-1155	-1153	-1150	-1142	-1141	62	40.04	3.34	31.13
-1149	-1158	-1162	-1152	-1156	-1149	63	37.96	3.16	29.51
-1158	-1158	-1161	-1142	-1162	-1158	64	35.62	2.97	27.69
-1165	-1164	-1162	-1145	-1164	-1165	65	33.8	2.82	26.28
-1207	-1250	-1261	-1247	-1261	-1207	66	22.88	1.91	17.79
-1276	-1283	-1283	-1075	-1085	-1276	67	4.94	0.41	3.84
-1279	-1279	-1289	-1278	-1291	-1279	68	4.16	0.35	3.23
-1099	-1131	-1292	-1287	-1296	-1099	69	50.96	4.24	39.62
-1278	-1229	-1110	-1178	-1279	-1278	70	4.42	0.37	3.44
-1290	-1286	-1292	-1274	-1289	-1290	71	1.3	0.11	1.01
-1275	-1290	-1283	-1291	-1290	-1275	72	5.2	0.43	4.04
-1292	-1293	-1283	-1291	-1278	-1292	73	0.78	0.06	0.61
-1292	-1276	-1295	-1291	-1274	-1292	74	0.78	0.06	0.61
-1293	-1278	-1288	-1291	-1277	-1293	75	0.52	0.04	0.40
-1290	-1291	-1282	-1291	-1290	-1290	76	1.3	0.11	1.01
-1295	-1293	-1273	-1290	-1291	-1295	77	0	0.00	0.00
-1287	-1291	-1291	-1285	-1289	-1287	78	2.08	0.17	1.62
-1282	-1293	-1286	-1289	-1294	-1282	79	3.38	0.28	2.63
-1291	-1290	-1281	-1289	-1282	-1291	80	1.04	0.09	0.81
-1291	-1287	-1293	-1290	-1275	-1291	81	1.04	0.09	0.81
-1293	-1276	-1290	-1285	-1292	-1293	82	0.52	0.04	0.40
-1282	-1289	-1289	-1275	-1292	-1282	83	3.38	0.28	2.63
-1282	-1290	-1274	-1295	-1292	-1282	84	3.38	0.28	2.63
-1288	-1289	-1283	-1292	-1276	-1288	85	1.82	0.15	1.41
-1286	-1273	-1292	-1290	-1286	-1286	86	2.34	0.19	1.82
-1287	-1283	-1275	-1255	-1260	-1287	87	2.08	0.17	1.62
-1248	-1254	-1230	-1238	-1228	-1248	88	12.22	1.02	9.50
-1230	-1208	-1215	-1212	-1190	-1230	89	16.9	1.41	13.14
-1195	-1188	-1197	-1201	-1196	-1195	90	26	2.17	20.21

-1187	-1202	-1199	-1190	-1202	-1187	91	28.08	2.34	21.83
-1204	-1201	-1203	-1189	-1201	-1204	92	23.66	1.97	18.39
-1201	-1200	-1205	-1191	-1188	-1201	93	24.44	2.04	19.00
-1187	-1199	-1201	-1205	-1194	-1187	94	28.08	2.34	21.83
-1200	-1191	-1186	-1204	-1198	-1200	95	24.7	2.06	19.20
-1190	-1202	-1195	-1190	-1202	-1190	96	27.3	2.27	21.22
-1207	-1203	-1194	-1185	-1205	-1207	97	22.88	1.91	17.79
-1188	-1199	-1201	-1186	-1190	-1188	98	27.82	2.32	21.63
-1187	-1187	-1203	-1205	-1203	-1187	99	28.08	2.34	21.83
-1203	-1189	-1191	-1191	-1188	-1203	100	23.92	1.99	18.60
-1197	-1204	-1194	-1205	-1208	-1197	101	25.48	2.12	19.81
-1188	-1205	-1203	-1201	-1189	-1188	102	27.82	2.32	21.63
-1197	-1190	-1196	-1189	-1205	-1197	103	25.48	2.12	19.81
-1207	-1205	-1208	-1191	-1208	-1207	104	22.88	1.91	17.79
-1190	-1203	-1208	-1207	-1208	-1190	105	27.3	2.27	21.22
-1208	-1202	-1207	-1199	-1205	-1208	106	22.62	1.88	17.59
-1193	-1202	-1193	-1190	-1192	-1193	107	26.52	2.21	20.62
-1195	-1206	-1206	-1207	-1206	-1195	108	26	2.17	20.21
-1205	-1212	-1205	-1203	-1190	-1205	109	23.4	1.95	18.19
-1205	-1190	-1207	-1204	-1207	-1205	110	23.4	1.95	18.19
-1191	-1205	-1197	-1204	-1206	-1191	111	27.04	2.25	21.02
-1190	-1193	-1204	-1190	-1194	-1190	112	27.3	2.27	21.22

K = 0.107148



**Vane Shear Raw Data  
Location 416  
48 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

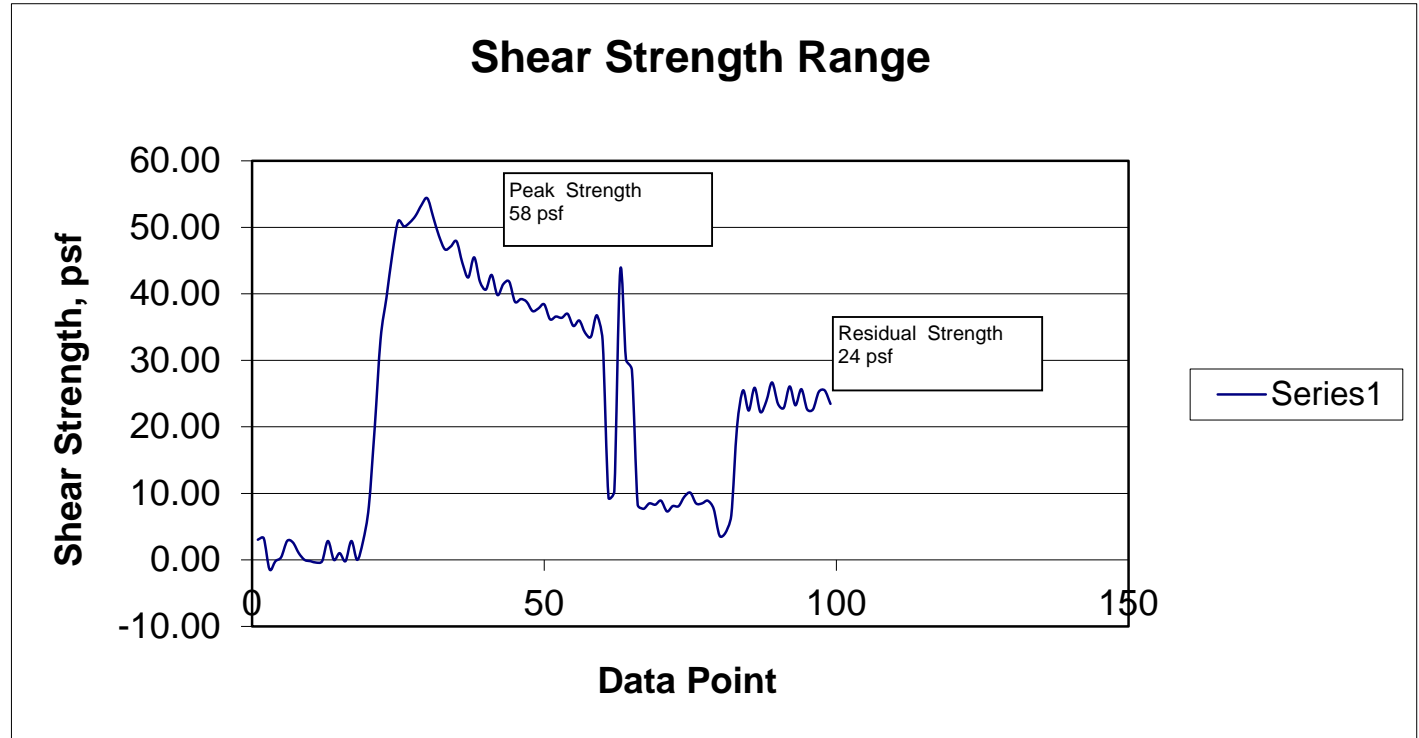
1/8/05,retec,416/48					zero =	-1295	calib =	0.26 in-lb/unit	ft-lb	Shear Strength, psf	
-1280	-1297	-1297	-1291	-1298			-1280	1	3.9	0.32	3.03
-1279	-1301	-1294	-1296	-1300			-1279	2	4.16	0.35	3.23
-1302	-1301	-1287	-1297	-1285			-1302	3	-1.82	-0.15	-1.41
-1296	-1280	-1300	-1297	-1295			-1296	4	-0.26	-0.02	-0.20
-1293	-1297	-1296	-1279	-1299			-1293	5	0.52	0.04	0.40
-1281	-1301	-1298	-1281	-1300			-1281	6	3.64	0.30	2.83
-1282	-1297	-1296	-1291	-1300			-1282	7	3.38	0.28	2.63
-1290	-1296	-1281	-1296	-1296			-1290	8	1.3	0.11	1.01
-1295	-1285	-1293	-1297	-1284			-1295	9	0	0.00	0.00
-1296	-1296	-1298	-1285	-1295			-1296	10	-0.26	-0.02	-0.20
-1297	-1298	-1290	-1296	-1281			-1297	11	-0.52	-0.04	-0.40
-1296	-1291	-1298	-1279	-1295			-1296	12	-0.26	-0.02	-0.20
-1281	-1291	-1288	-1301	-1299			-1281	13	3.64	0.30	2.83
-1295	-1289	-1297	-1298	-1291			-1295	14	0	0.00	0.00
-1290	-1297	-1296	-1294	-1292			-1290	15	1.3	0.11	1.01
-1296	-1292	-1295	-1294	-1298			-1296	16	-0.26	-0.02	-0.20
-1281	-1293	-1278	-1297	-1282			-1281	17	3.64	0.30	2.83
-1295	-1279	-1293	-1276	-1283			-1295	18	0	0.00	0.00
-1281	-1281	-1260	-1266	-1245			-1281	19	3.64	0.30	2.83
-1255	-1231	-1223	-1197	-1197			-1255	20	10.4	0.87	8.09
-1196	-1183	-1167	-1136	-1142			-1196	21	25.74	2.14	20.01
-1131	-1124	-1100	-1114	-1102			-1131	22	42.64	3.55	33.15
-1100	-1075	-1081	-1065	-1059			-1100	23	50.7	4.22	39.42
-1068	-1058	-1043	-1046	-1046			-1068	24	59.02	4.92	45.88
-1043	-1036	-1044	-1039	-1045			-1043	25	65.52	5.46	50.94
-1047	-1041	-1049	-1050	-1034			-1047	26	64.48	5.37	50.13
-1044	-1047	-1030	-1041	-1046			-1044	27	65.26	5.44	50.74
-1039	-1028	-1027	-1017	-1033			-1039	28	66.56	5.54	51.75
-1031	-1027	-1026	-1031	-1016			-1031	29	68.64	5.72	53.36
-1026	-1034	-1027	-1042	-1046			-1026	30	69.94	5.83	54.37
-1040	-1051	-1053	-1053	-1053			-1040	31	66.3	5.52	51.54
-1054	-1054	-1062	-1049	-1061			-1054	32	62.66	5.22	48.71
-1064	-1058	-1067	-1070	-1052			-1064	33	60.06	5.00	46.69
-1062	-1067	-1054	-1072	-1068			-1062	34	60.58	5.05	47.10
-1058	-1076	-1072	-1067	-1077			-1058	35	61.62	5.13	47.91
-1074	-1069	-1076	-1071	-1077			-1074	36	57.46	4.79	44.67
-1085	-1080	-1069	-1083	-1080			-1085	37	54.6	4.55	42.45
-1070	-1085	-1089	-1080	-1087			-1070	38	58.5	4.87	45.48
-1088	-1072	-1089	-1089	-1083			-1088	39	53.82	4.48	41.84
-1094	-1090	-1076	-1091	-1094			-1094	40	52.26	4.35	40.63
-1083	-1092	-1094	-1079	-1095			-1083	41	55.12	4.59	42.85
-1098	-1091	-1093	-1100	-1081			-1098	42	51.22	4.27	39.82
-1090	-1100	-1083	-1097	-1099			-1090	43	53.3	4.44	41.44
-1088	-1100	-1102	-1092	-1099			-1088	44	53.82	4.48	41.84
-1103	-1093	-1100	-1087	-1102			-1103	45	49.92	4.16	38.81
-1101	-1085	-1104	-1101	-1103			-1101	46	50.44	4.20	39.21
-1103	-1101	-1103	-1106	-1095			-1103	47	49.92	4.16	38.81
-1110	-1106	-1108	-1108	-1094			-1110	48	48.1	4.01	37.39
-1108	-1105	-1092	-1108	-1109			-1108	49	48.62	4.05	37.80
-1105	-1110	-1112	-1098	-1115			-1105	50	49.4	4.12	38.41
-1116	-1099	-1112	-1105	-1112			-1116	51	46.54	3.88	36.18
-1114	-1108	-1119	-1117	-1101			-1114	52	47.06	3.92	36.59
-1115	-1114	-1101	-1119	-1119			-1115	53	46.8	3.90	36.38
-1112	-1122	-1123	-1106	-1119			-1112	54	47.58	3.96	36.99
-1121	-1122	-1106	-1128	-1125			-1121	55	45.24	3.77	35.17
-1117	-1122	-1125	-1108	-1126			-1117	56	46.28	3.86	35.98
-1126	-1109	-1128	-1121	-1125			-1126	57	43.94	3.66	34.16
-1129	-1126	-1127	-1128	-1119			-1129	58	43.16	3.60	33.55
-1113	-1126	-1132	-1118	-1133			-1113	59	47.32	3.94	36.79
-1132	-1201	-1233	-1244	-1232			-1132	60	42.38	3.53	32.95
-1249	-1238	-1248	-1230	-1247			-1249	61	11.96	1.00	9.30
-1244	-1256	-1243	-1252	-1099			-1244	62	13.26	1.10	10.31
-1080	-1082	-1099	-1103	-1134			-1080	63	55.9	4.66	43.46
-1146	-1142	-1161	-1166	-1140			-1146	64	38.74	3.23	30.12
-1154	-1138	-1140	-1162	-1177			-1154	65	36.66	3.05	28.50
-1254	-1246	-1260	-1254	-1251			-1254	66	10.66	0.89	8.29
-1257	-1253	-1253	-1249	-1253			-1257	67	9.88	0.82	7.68
-1253	-1252	-1250	-1256	-1242			-1253	68	10.92	0.91	8.49
-1254	-1253	-1255	-1248	-1255			-1254	69	10.66	0.89	8.29
-1251	-1258	-1241	-1254	-1249			-1251	70	11.44	0.95	8.89
-1259	-1246	-1258	-1255	-1240			-1259	71	9.36	0.78	7.28
-1255	-1249	-1257	-1250	-1252			-1255	72	10.4	0.87	8.09
-1255	-1257	-1257	-1241	-1259			-1255	73	10.4	0.87	8.09
-1248	-1253	-1256	-1243	-1257			-1248	74	12.22	1.02	9.50
-1245	-1256	-1254	-1246	-1256			-1245	75	13	1.08	10.11
-1253	-1254	-1240	-1255	-1254			-1253	76	10.92	0.91	8.49
-1253	-1243	-1259	-1257	-1252			-1253	77	10.92	0.91	8.49
-1251	-1258	-1257	-1249	-1254			-1251	78	11.44	0.95	8.89
-1257	-1263	-1262	-1272	-1261			-1257	79	9.88	0.82	7.68
-1277	-1275	-1280	-1274	-1282			-1277	80	4.68	0.39	3.64
-1275	-1275	-1272	-1275	-1259			-1275	81	5.2	0.43	4.04
-1262	-1244	-1242	-1212	-1221			-1262	82	8.58	0.71	6.67
-1196	-1181	-1192	-1192	-1167			-1196	83	25.74	2.14	20.01
-1169	-1182	-1180	-1167	-1180			-1169	84	32.76	2.73	25.47
-1184	-1173	-1183	-1184	-1169			-1184	85	28.86	2.40	22.44
-1167	-1182	-1189	-1167	-1180			-1167	86	33.28	2.77	25.87
-1185	-1186	-1166	-1182	-1181			-1185	87	28.6	2.38	22.23
-1177	-1164	-1181	-1180	-1169			-1177	88	30.68	2.56	23.85
-1163	-1179	-1179	-1174	-1180			-1163	89	34.32	2.86	26.68
-1179	-1181	-1165	-1179	-1181			-1179	90	30.16	2.51	23.45
-1182	-1166	-1182	-1181	-1165			-1182	91	29.38	2.45	22.84
-1166	-1182	-1183	-1166	-1184			-1166	92	33.54	2.79	26.07
-1180	-1168	-1182	-1183	-1167			-1180	93	29.9	2.49	23.25
-1168	-1183	-1183	-1165	-1180			-1168	94	33.02	2.75	25.67
-1183	-1169	-1186	-1187	-1172			-1183	95	29.12	2.43	22.64
-1183	-1182	-1176	-1181	-1168			-1183	96	29.12	2.43	22.64
-1170	-1184	-1172	-1186	-1181			-1170	97	32.5	2.71	25.27

-1169 -1183 -1181 -1185 -1186  
-1179 -1178 -1182 -1169 -1186

-1169 98 32.76 2.73  
-1179 99 30.16 2.51

25.47  
23.45

K = 0.107148



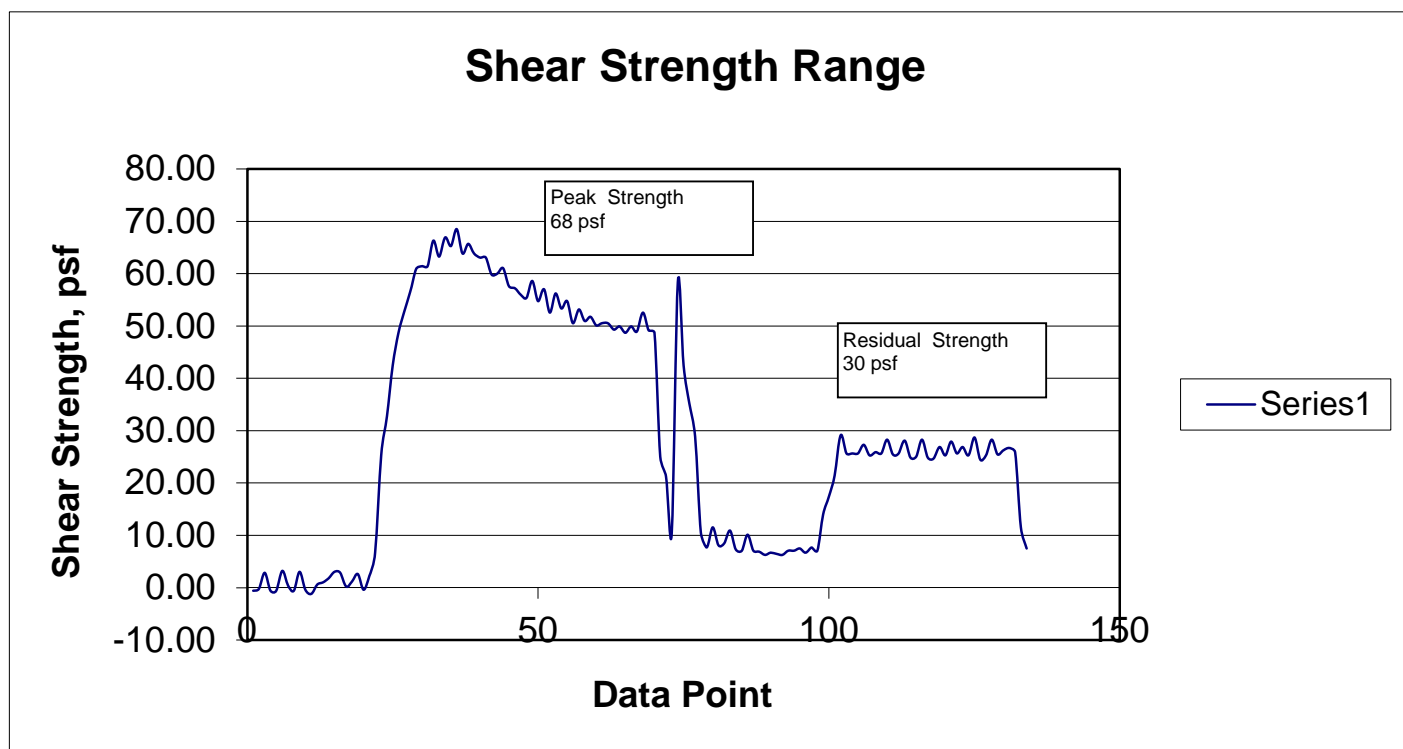
**Vane Shear Raw Data  
Location 416  
50 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**



1/8/5,retec,416/50					zero =	-1295	calib =	0.26 in-lb/unit	ft-lb	Shear Strength, psf
-1298	-1289	-1297	-1286	-1295	-1298	-1298	1	-0.78	-0.06	-0.61
-1296	-1293	-1296	-1281	-1295	-1296	-1296	2	-0.26	-0.02	-0.20
-1281	-1298	-1283	-1297	-1295	-1281	-1281	3	3.64	0.30	2.83
-1298	-1295	-1292	-1292	-1278	-1298	-1298	4	-0.78	-0.06	-0.61
-1298	-1285	-1295	-1284	-1298	-1298	-1298	5	-0.78	-0.06	-0.61
-1279	-1296	-1293	-1295	-1300	-1279	-1279	6	4.16	0.35	3.23
-1293	-1294	-1291	-1299	-1278	-1293	-1293	7	0.52	0.04	0.40
-1298	-1280	-1297	-1295	-1293	-1298	-1298	8	-0.78	-0.06	-0.61
-1280	-1295	-1282	-1297	-1284	-1280	-1280	9	3.9	0.32	3.03
-1297	-1282	-1291	-1282	-1296	-1297	-1297	10	-0.52	-0.04	-0.40
-1301	-1288	-1295	-1284	-1297	-1301	-1301	11	-1.56	-0.13	-1.21
-1292	-1293	-1296	-1293	-1292	-1292	-1292	12	0.78	0.06	0.61
-1290	-1290	-1294	-1294	-1296	-1290	-1290	13	1.3	0.11	1.01
-1286	-1295	-1287	-1293	-1292	-1286	-1286	14	2.34	0.19	1.82
-1280	-1295	-1282	-1295	-1292	-1280	-1280	15	3.9	0.32	3.03
-1281	-1295	-1292	-1296	-1293	-1281	-1281	16	3.64	0.30	2.83
-1294	-1301	-1294	-1287	-1296	-1294	-1294	17	0.26	0.02	0.20
-1289	-1293	-1291	-1298	-1292	-1289	-1289	18	1.56	0.13	1.21
-1282	-1295	-1287	-1294	-1295	-1282	-1282	19	3.38	0.28	2.63
-1297	-1283	-1299	-1293	-1292	-1297	-1297	20	-0.52	-0.04	-0.40
-1284	-1297	-1289	-1280	-1270	-1284	-1284	21	2.86	0.24	2.22
-1262	-1243	-1232	-1218	-1186	-1262	-1262	22	8.58	0.71	6.67
-1170	-1169	-1150	-1147	-1138	-1170	-1170	23	32.5	2.71	25.27
-1133	-1115	-1108	-1095	-1107	-1133	-1133	24	42.12	3.51	32.75
-1085	-1072	-1077	-1081	-1049	-1085	-1085	25	54.6	4.55	42.45
-1054	-1056	-1027	-1038	-1039	-1054	-1054	26	62.66	5.22	48.71
-1034	-1035	-1027	-1004	-1020	-1034	-1034	27	67.86	5.65	52.76
-1016	-999	-1003	-1003	-987	-1016	-1016	28	72.54	6.04	56.39
-994	-1004	-998	-998	-996	-994	-994	29	78.26	6.52	60.84
-991	-984	-992	-987	-992	-991	-991	30	79.04	6.58	61.45
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-967	-984	-983	-969	-983	-967	-967	32	85.28	7.10	66.30
-982	-966	-975	-978	-962	-982	-982	33	81.38	6.78	63.27
-964	-981	-979	-959	-969	-964	-964	34	86.06	7.17	66.91
-972	-963	-979	-974	-963	-972	-972	35	83.98	7.00	65.29
-956	-973	-969	-962	-978	-956	-956	36	88.14	7.34	68.52
-979	-962	-976	-974	-961	-979	-979	37	82.16	6.84	63.87
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-979	-973	-985	-981	-983	-979	-979	39	82.16	6.84	63.87
-983	-987	-971	-995	-993	-983	-983	40	81.12	6.76	63.07
-983	-992	-996	-980	-999	-983	-983	41	81.12	6.76	63.07
-999	-993	-997	-997	-985	-999	-999	42	76.96	6.41	59.83
-998	-999	-989	-1004	-1005	-998	-998	43	77.22	6.43	60.03
-993	-1006	-1009	-995	-1007	-993	-993	44	78.52	6.54	61.04
-1010	-995	-1009	-1005	-1009	-1010	-1010	45	74.1	6.17	57.61
-1012	-1014	-998	-1021	-1022	-1012	-1012	46	73.58	6.13	57.20
-1018	-1017	-1019	-1006	-1022	-1018	-1018	47	72.02	6.00	55.99
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-1005	-1024	-1027	-1008	-1022	-1005	-1005	49	75.4	6.28	58.62
-1024	-1014	-1026	-1029	-1016	-1024	-1024	50	70.46	5.87	54.78
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-1035	-1028	-1031	-1032	-1023	-1035	-1035	52	67.6	5.63	52.55
-1017	-1037	-1038	-1019	-1033	-1017	-1017	53	72.28	6.02	56.19
-1031	-1025	-1038	-1038	-1022	-1031	-1031	54	68.64	5.72	53.36
-1024	-1037	-1036	-1027	-1046	-1024	-1024	55	70.46	5.87	54.78
-1045	-1036	-1040	-1041	-1035	-1045	-1045	56	65	5.41	50.53
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-1043	-1041	-1028	-1048	-1043	-1043	-1043	58	65.52	5.46	50.94
-1039	-1042	-1041	-1038	-1042	-1039	-1039	59	66.56	5.54	51.75
-1047	-1047	-1037	-1046	-1045	-1047	-1047	60	64.48	5.37	50.13
-1045	-1038	-1047	-1047	-1047	-1045	-1045	61	65	5.41	50.53
-1045	-1050	-1045	-1042	-1048	-1045	-1045	62	65	5.41	50.53
-1051	-1049	-1048	-1038	-1046	-1051	-1051	63	63.44	5.28	49.32
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-1054	-1052	-1046	-1051	-1054	-1054	-1054	65	62.66	5.22	48.71
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-1035	-1056	-1056	-1045	-1055	-1035	-1035	68	67.6	5.63	52.55
-1052	-1051	-1038	-1049	-1054	-1052	-1052	69	63.18	5.26	49.12
-1054	-1060	-1108	-1104	-1122	-1054	-1054	70	62.66	5.22	48.71
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-1190	-1179	-1197	-1224	-1240	-1190	-1190	72	27.3	2.27	21.22
-1243	-1246	-1243	-1240	-1161	-1243	-1243	73	13.52	1.13	10.51
-1006	-1007	-1010	-1040	-1070	-1006	-1006	74	75.14	6.26	58.42
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-1257	-1239	-1254	-1245	-1257	-1257	-1257	79	9.88	0.82	7.68
-1238	-1254	-1250	-1251	-1256	-1238	-1238	80	14.82	1.23	11.52
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-1253	-1241	-1257	-1244	-1257	-1253	-1253	82	10.92	0.91	8.49
-1241	-1258	-1249	-1257	-1254	-1241	-1241	83	14.04	1.17	10.92
-1259	-1257	-1255	-1260	-1245	-1259	-1259	84	9.36	0.78	7.28
-1260	-1248	-1261	-1248	-1263	-1260	-1260	85	9.1	0.76	7.07
-1245	-1264	-1258	-1259	-1264	-1245	-1245	86	13	1.08	10.11
-1260	-1260	-1246	-1265	-1263	-1260	-1260	87	9.1	0.76	7.07
-1261	-1265	-1246	-1264	-1264	-1261	-1261	88	8.84	0.74	6.87
-1264	-1260	-1246	-1264	-1264	-1264	-1264	89	8.06	0.67	6.27
-1262	-1261	-1253	-1263	-1265	-1262	-1262	90	8.58	0.71	6.67
-1263	-1265	-1244	-1263	-1264	-1263	-1263	91	8.32	0.69	6.47
-1264	-1263	-1246	-1264	-1264	-1264	-1264	92	8.06	0.67	6.27
-1260	-1258	-1262	-1260	-1251	-1260	-1260	93	9.1	0.76	7.07
-1260	-1260	-1264	-1248	-1260	-1260	-1260	94	9.1	0.76	7.07
-1258	-1261	-1248	-1260	-1243	-1258	-1258	95	9.62	0.80	7.48
-1262	-1255	-1259	-1246	-1259	-1262	-1262	96	8.58	0.71	6.67
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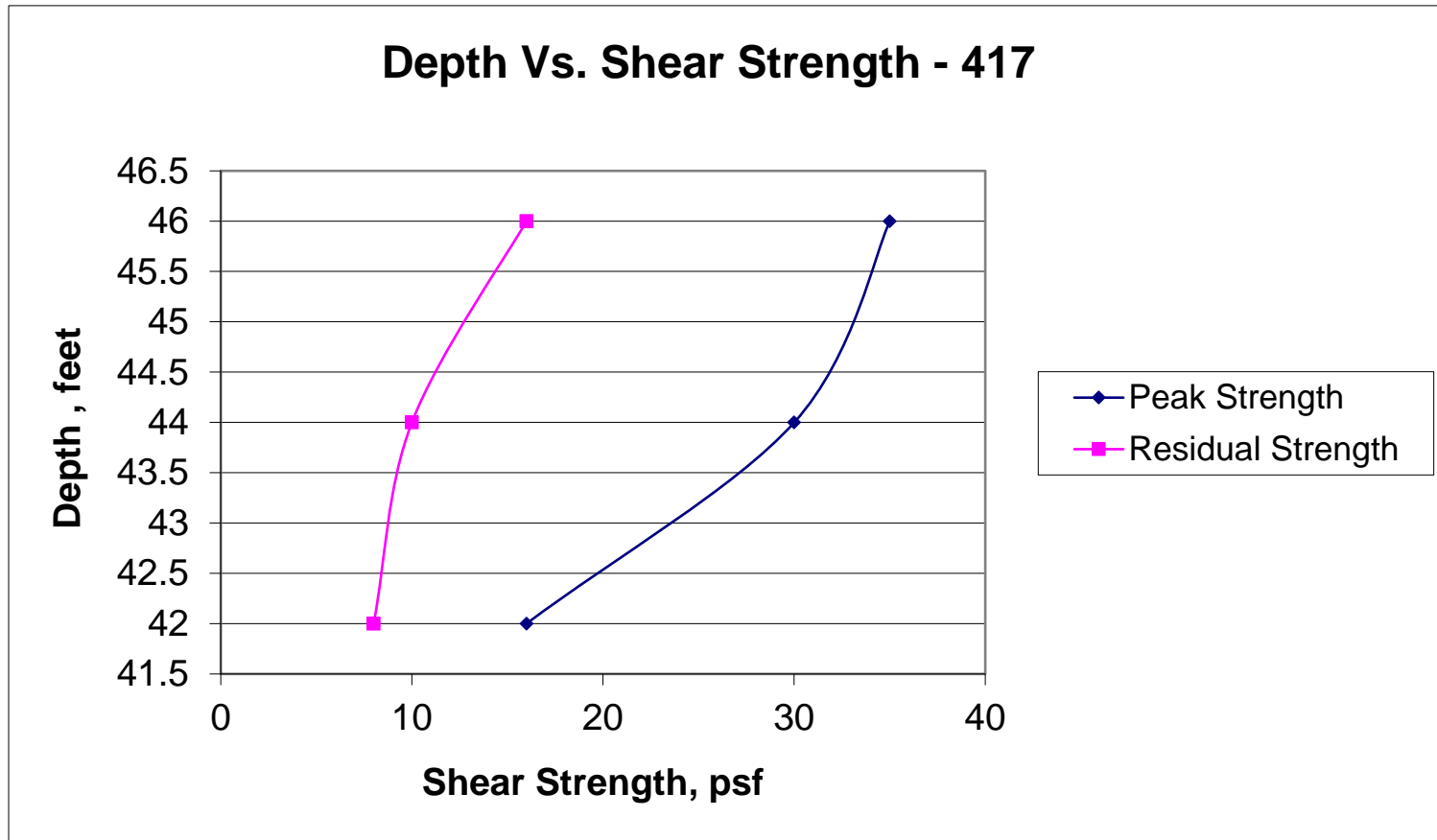
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-1226	-1224	-1213	-1202	-1193	-1226	99	17.94	1.49	13.95
-1209	-1201	-1189	-1188	-1192	-1209	100	22.36	1.86	17.38
-1189	-1151	-1167	-1167	-1152	-1189	101	27.56	2.30	21.43
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-1168	-1171	-1152	-1166	-1166	-1168	103	33.02	2.75	25.67
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-1170	-1174	-1154	-1169	-1168	-1170	107	32.5	2.71	25.27
-1167	-1165	-1161	-1165	-1170	-1167	108	33.28	2.77	25.87
-1168	-1152	-1174	-1173	-1157	-1168	109	33.02	2.75	25.67
-1155	-1168	-1168	-1159	-1170	-1155	110	36.4	3.03	28.30
-1169	-1169	-1165	-1160	-1170	-1169	111	32.76	2.73	25.47
-1168	-1162	-1166	-1165	-1163	-1168	112	33.02	2.75	25.67
-1156	-1167	-1167	-1154	-1173	-1156	113	36.14	3.01	28.10
-1172	-1171	-1154	-1169	-1170	-1172	114	31.98	2.66	24.86
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-1173	-1154	-1170	-1166	-1157	-1173	118	31.72	2.64	24.66
-1162	-1167	-1169	-1160	-1170	-1162	119	34.58	2.88	26.88
-1170	-1165	-1170	-1170	-1164	-1170	120	32.5	2.71	25.27
-1157	-1171	-1169	-1158	-1175	-1157	121	35.88	2.99	27.89
-1168	-1173	-1155	-1171	-1168	-1168	122	33.02	2.75	25.67
-1162	-1172	-1165	-1154	-1169	-1162	123	34.58	2.88	26.88
-1170	-1171	-1160	-1170	-1165	-1170	124	32.5	2.71	25.27
-1153	-1171	-1169	-1161	-1168	-1153	125	36.92	3.08	28.70
-1174	-1153	-1167	-1165	-1169	-1174	126	31.46	2.62	24.46
-1170	-1169	-1161	-1173	-1158	-1170	127	32.5	2.71	25.27
-1155	-1169	-1169	-1166	-1168	-1155	128	36.4	3.03	28.30
-1169	-1155	-1172	-1172	-1155	-1169	129	32.76	2.73	25.47
-1165	-1165	-1160	-1169	-1171	-1165	130	33.8	2.82	26.28
-1163	-1169	-1170	-1153	-1171	-1163	131	34.32	2.86	26.68
-1167	-1216	-1252	-1244	-1255	-1167	132	33.28	2.77	25.87
-1238	-1256	-1245	-1255	-1256	-1238	133	14.82	1.23	11.52
-1258	-1255	-1252	-1253	-1240	-1258	134	9.62	0.80	7.48

K = 0.107148



**Vane Shear Summary  
Location 417**

Depth, ft	Shear Strength, psf	
	Peak	Residual
42	16	8
44	30	10
46	35	16



**Vane Shear Raw Data  
Location 417  
42 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,417/42

zero =

-1295

calib =

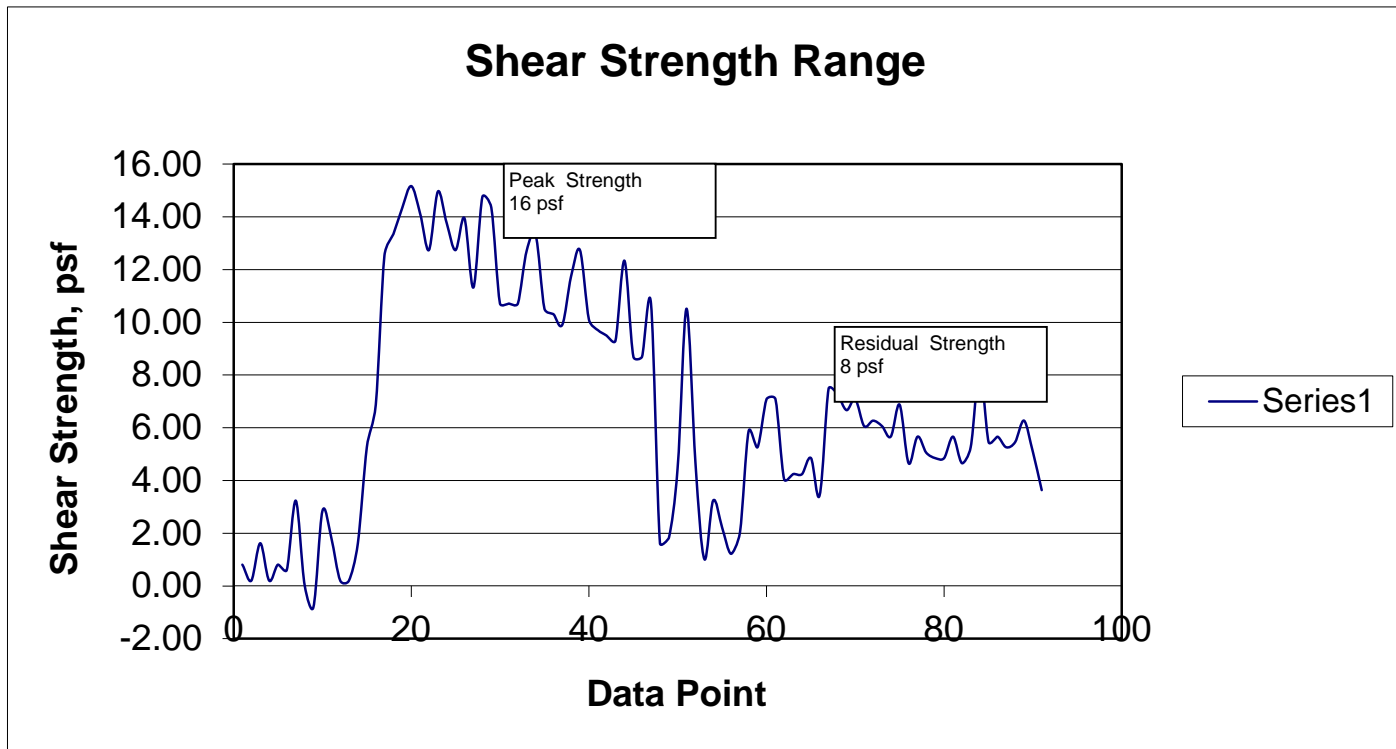
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1291	-1292	-1284	-1297	-1285	-1291	1	1.04	0.09	0.81
-1294	-1293	-1297	-1296	-1289	-1294	2	0.26	0.02	0.20
-1287	-1294	-1289	-1294	-1291	-1287	3	2.08	0.17	1.62
-1294	-1283	-1295	-1295	-1292	-1294	4	0.26	0.02	0.20
-1291	-1296	-1293	-1291	-1298	-1291	5	1.04	0.09	0.81
-1292	-1291	-1294	-1295	-1295	-1292	6	0.78	0.06	0.61
-1279	-1295	-1280	-1294	-1280	-1279	7	4.16	0.35	3.23
-1295	-1292	-1292	-1288	-1295	-1295	8	0	0.00	0.00
-1299	-1285	-1296	-1288	-1295	-1299	9	-1.04	-0.09	-0.81
-1281	-1296	-1285	-1297	-1288	-1281	10	3.64	0.30	2.83
-1286	-1296	-1280	-1295	-1281	-1286	11	2.34	0.19	1.82
-1294	-1296	-1293	-1296	-1289	-1294	12	0.26	0.02	0.20
-1294	-1282	-1296	-1276	-1290	-1294	13	0.26	0.02	0.20
-1287	-1285	-1285	-1285	-1286	-1287	14	2.08	0.17	1.62
-1269	-1281	-1262	-1266	-1249	-1269	15	6.76	0.56	5.26
-1261	-1247	-1255	-1252	-1242	-1261	16	8.84	0.74	6.87
-1233	-1246	-1233	-1237	-1230	-1233	17	16.12	1.34	12.53
-1229	-1219	-1230	-1223	-1223	-1229	18	17.16	1.43	13.34
-1224	-1220	-1228	-1211	-1222	-1224	19	18.46	1.54	14.35
-1220	-1225	-1212	-1228	-1212	-1220	20	19.5	1.62	15.16
-1225	-1206	-1224	-1214	-1214	-1225	21	18.2	1.52	14.15
-1232	-1224	-1228	-1218	-1226	-1232	22	16.38	1.36	12.73
-1221	-1223	-1213	-1231	-1230	-1221	23	19.24	1.60	14.96
-1227	-1223	-1231	-1230	-1223	-1227	24	17.68	1.47	13.74
-1232	-1231	-1236	-1222	-1230	-1232	25	16.38	1.36	12.73
-1226	-1232	-1219	-1233	-1221	-1226	26	17.94	1.49	13.95
-1239	-1219	-1233	-1231	-1239	-1239	27	14.56	1.21	11.32
-1222	-1238	-1238	-1233	-1240	-1222	28	18.98	1.58	14.76
-1224	-1239	-1233	-1236	-1241	-1224	29	18.46	1.54	14.35
-1242	-1234	-1232	-1237	-1227	-1242	30	13.78	1.15	10.71
-1242	-1228	-1241	-1245	-1239	-1242	31	13.78	1.15	10.71
-1242	-1237	-1245	-1236	-1243	-1242	32	13.78	1.15	10.71
-1232	-1245	-1250	-1228	-1239	-1232	33	16.38	1.36	12.73
-1229	-1247	-1240	-1245	-1246	-1229	34	17.16	1.43	13.34
-1243	-1245	-1228	-1245	-1244	-1243	35	13.52	1.13	10.51
-1244	-1241	-1247	-1247	-1241	-1244	36	13.26	1.10	10.31
-1246	-1245	-1244	-1230	-1244	-1246	37	12.74	1.06	9.90
-1237	-1234	-1247	-1232	-1247	-1237	38	15.08	1.26	11.72
-1232	-1250	-1240	-1251	-1250	-1232	39	16.38	1.36	12.73
-1245	-1248	-1232	-1249	-1244	-1245	40	13	1.08	10.11
-1247	-1242	-1249	-1253	-1232	-1247	41	12.48	1.04	9.70
-1248	-1231	-1252	-1251	-1248	-1248	42	12.22	1.02	9.50
-1249	-1247	-1251	-1236	-1246	-1249	43	11.96	1.00	9.30
-1234	-1253	-1250	-1249	-1253	-1234	44	15.86	1.32	12.33
-1252	-1255	-1239	-1251	-1236	-1252	45	11.18	0.93	8.69
-1252	-1239	-1248	-1235	-1250	-1252	46	11.18	0.93	8.69
-1242	-1252	-1266	-1289	-1277	-1242	47	13.78	1.15	10.71
-1287	-1283	-1292	-1273	-1287	-1287	48	2.08	0.17	1.62
-1286	-1294	-1289	-1296	-1289	-1286	49	2.34	0.19	1.82
-1273	-1228	-1229	-1232	-1236	-1273	50	5.72	0.48	4.45
-1243	-1245	-1237	-1253	-1238	-1243	51	13.52	1.13	10.51
-1272	-1275	-1289	-1275	-1291	-1272	52	5.98	0.50	4.65
-1290	-1284	-1287	-1279	-1286	-1290	53	1.3	0.11	1.01
-1279	-1285	-1284	-1289	-1272	-1279	54	4.16	0.35	3.23
-1284	-1283	-1286	-1276	-1287	-1284	55	2.86	0.24	2.22
-1289	-1284	-1289	-1277	-1285	-1289	56	1.56	0.13	1.21
-1285	-1286	-1282	-1287	-1283	-1285	57	2.6	0.22	2.02
-1266	-1268	-1268	-1270	-1274	-1266	58	7.54	0.63	5.86
-1269	-1273	-1272	-1273	-1275	-1269	59	6.76	0.56	5.26
-1260	-1275	-1273	-1273	-1269	-1260	60	9.1	0.76	7.07
-1260	-1275	-1261	-1275	-1262	-1260	61	9.1	0.76	7.07
-1275	-1276	-1274	-1277	-1271	-1275	62	5.2	0.43	4.04
-1274	-1260	-1272	-1259	-1274	-1274	63	5.46	0.45	4.24
-1274	-1278	-1272	-1266	-1276	-1274	64	5.46	0.45	4.24
-1271	-1276	-1262	-1271	-1259	-1271	65	6.24	0.52	4.85
-1278	-1255	-1266	-1263	-1265	-1278	66	4.42	0.37	3.44
-1258	-1265	-1263	-1253	-1271	-1258	67	9.62	0.80	7.48
-1259	-1265	-1250	-1264	-1257	-1259	68	9.36	0.78	7.28
-1262	-1250	-1268	-1254	-1262	-1262	69	8.58	0.71	6.67
-1260	-1262	-1259	-1266	-1258	-1260	70	9.1	0.76	7.07
-1265	-1265	-1265	-1257	-1269	-1265	71	7.8	0.65	6.06
-1264	-1267	-1249	-1267	-1271	-1264	72	8.06	0.67	6.27
-1265	-1261	-1269	-1269	-1254	-1265	73	7.8	0.65	6.06
-1267	-1261	-1265	-1253	-1264	-1267	74	7.28	0.61	5.66
-1261	-1269	-1256	-1269	-1267	-1261	75	8.84	0.74	6.87
-1272	-1271	-1253	-1269	-1267	-1272	76	5.98	0.50	4.65
-1267	-1273	-1263	-1267	-1253	-1267	77	7.28	0.61	5.66
-1270	-1258	-1269	-1268	-1251	-1270	78	6.5	0.54	5.05
-1271	-1253	-1268	-1269	-1263	-1271	79	6.24	0.52	4.85
-1271	-1258	-1267	-1259	-1264	-1271	80	6.24	0.52	4.85
-1267	-1262	-1268	-1266	-1266	-1267	81	7.28	0.61	5.66
-1272	-1258	-1271	-1266	-1266	-1272	82	5.98	0.50	4.65
-1269	-1265	-1270	-1251	-1270	-1269	83	6.76	0.56	5.26
-1254	-1268	-1255	-1270	-1271	-1254	84	10.66	0.89	8.29
-1268	-1269	-1266	-1271	-1265	-1268	85	7.02	0.58	5.46
-1267	-1256	-1270	-1268	-1251	-1267	86	7.28	0.61	5.66
-1269	-1251	-1271	-1269	-1257	-1269	87	6.76	0.56	5.26
-1268	-1258	-1267	-1250	-1266	-1268	88	7.02	0.58	5.46
-1264	-1267	-1256	-1265	-1250	-1264	89	8.06	0.67	6.27
-1270	-1259	-1266	-1256	-1278	-1270	90	6.5	0.54	5.05
-1277	-1280	-1271	-1279	-1268	-1277	91	4.68	0.39	3.64

K =

0.107148



**Vane Shear Raw Data  
Location 417  
44 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**



1/8/5,retec,417/44

zero =

-1295

calib =

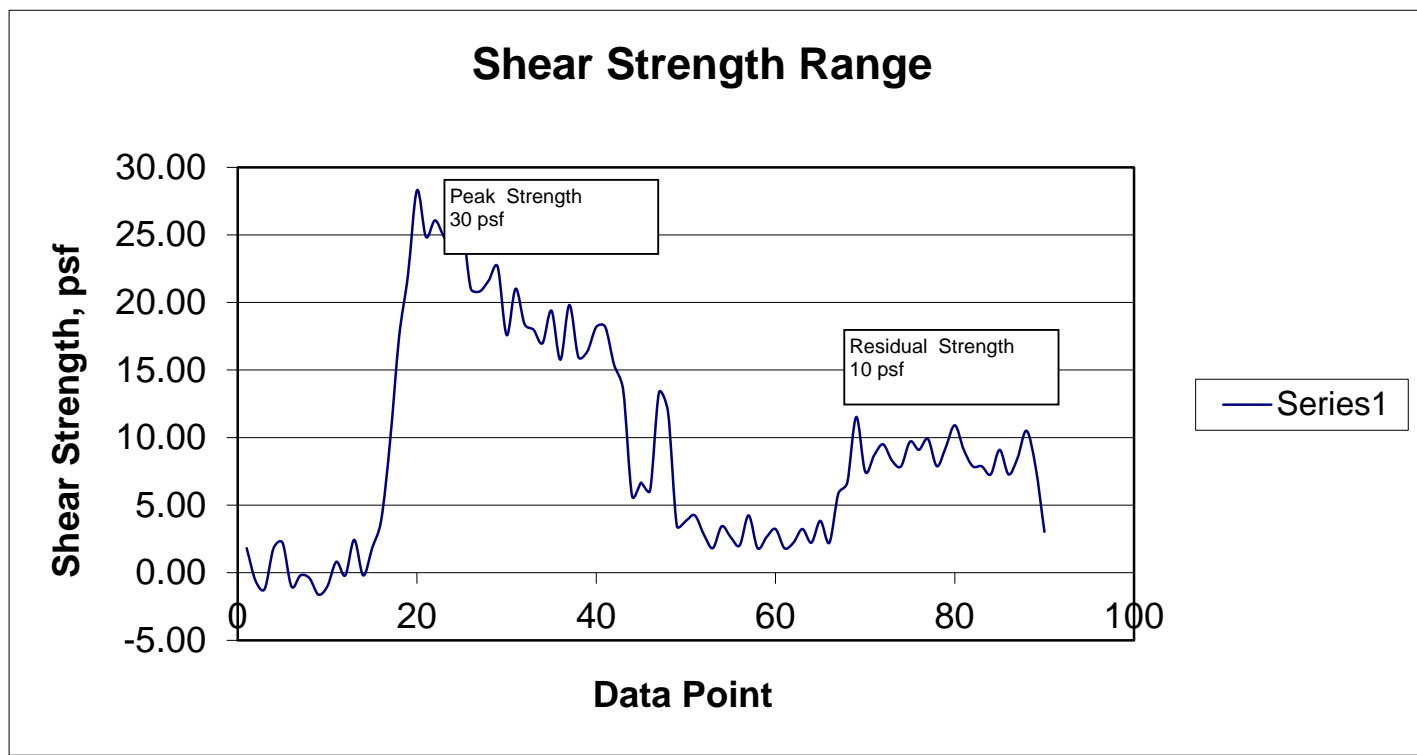
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1286	-1296	-1283	-1297	-1287	-1286	1	2.34	0.19	1.82
-1298	-1297	-1304	-1300	-1284	-1298	2	-0.78	-0.06	-0.61
-1301	-1298	-1286	-1300	-1286	-1301	3	-1.56	-0.13	-1.21
-1286	-1297	-1284	-1297	-1301	-1286	4	2.34	0.19	1.82
-1284	-1298	-1298	-1302	-1296	-1284	5	2.86	0.24	2.22
-1300	-1288	-1296	-1284	-1297	-1300	6	-1.3	-0.11	-1.01
-1296	-1295	-1301	-1300	-1290	-1296	7	-0.26	-0.02	-0.20
-1297	-1292	-1301	-1288	-1296	-1297	8	-0.52	-0.04	-0.40
-1303	-1302	-1297	-1295	-1288	-1303	9	-2.08	-0.17	-1.62
-1300	-1295	-1296	-1284	-1300	-1300	10	-1.3	-0.11	-1.01
-1291	-1298	-1287	-1303	-1286	-1291	11	1.04	0.09	0.81
-1296	-1283	-1298	-1288	-1304	-1296	12	-0.26	-0.02	-0.20
-1283	-1300	-1285	-1298	-1295	-1283	13	3.12	0.26	2.43
-1296	-1284	-1296	-1293	-1298	-1296	14	-0.26	-0.02	-0.20
-1286	-1300	-1297	-1288	-1290	-1286	15	2.34	0.19	1.82
-1276	-1280	-1258	-1263	-1259	-1276	16	4.94	0.41	3.84
-1247	-1239	-1223	-1230	-1202	-1247	17	12.48	1.04	9.70
-1209	-1185	-1191	-1185	-1168	-1209	18	22.36	1.86	17.38
-1186	-1184	-1166	-1179	-1176	-1186	19	28.34	2.36	22.03
-1155	-1172	-1173	-1158	-1168	-1155	20	36.4	3.03	28.30
-1172	-1158	-1173	-1164	-1151	-1172	21	31.98	2.66	24.86
-1166	-1164	-1148	-1166	-1173	-1166	22	33.54	2.79	26.07
-1172	-1164	-1172	-1169	-1172	-1172	23	31.98	2.66	24.86
-1177	-1184	-1165	-1176	-1173	-1177	24	30.68	2.56	23.85
-1168	-1182	-1184	-1172	-1187	-1168	25	33.02	2.75	25.67
-1191	-1190	-1177	-1191	-1192	-1191	26	27.04	2.25	21.02
-1192	-1184	-1191	-1192	-1193	-1192	27	26.78	2.23	20.82
-1188	-1180	-1199	-1199	-1198	-1188	28	27.82	2.32	21.63
-1183	-1185	-1190	-1186	-1196	-1183	29	29.12	2.43	22.64
-1208	-1196	-1190	-1187	-1191	-1208	30	22.62	1.88	17.59
-1191	-1188	-1205	-1197	-1192	-1191	31	27.04	2.25	21.02
-1204	-1190	-1198	-1204	-1201	-1204	32	23.66	1.97	18.39
-1206	-1191	-1192	-1204	-1203	-1206	33	23.14	1.93	17.99
-1211	-1195	-1209	-1212	-1205	-1211	34	21.84	1.82	16.98
-1199	-1200	-1209	-1198	-1211	-1199	35	24.96	2.08	19.40
-1217	-1212	-1214	-1216	-1215	-1217	36	20.28	1.69	15.77
-1197	-1212	-1198	-1217	-1211	-1197	37	25.48	2.12	19.81
-1216	-1200	-1210	-1220	-1218	-1216	38	20.54	1.71	15.97
-1214	-1204	-1208	-1210	-1206	-1214	39	21.06	1.75	16.37
-1205	-1220	-1202	-1215	-1214	-1205	40	23.4	1.95	18.19
-1205	-1209	-1216	-1214	-1216	-1205	41	23.4	1.95	18.19
-1219	-1205	-1223	-1207	-1227	-1219	42	19.76	1.65	15.36
-1228	-1216	-1233	-1214	-1255	-1228	43	17.42	1.45	13.54
-1267	-1265	-1270	-1256	-1266	-1267	44	7.28	0.61	5.66
-1262	-1270	-1273	-1270	-1269	-1262	45	8.58	0.71	6.67
-1265	-1273	-1196	-1192	-1196	-1265	46	7.8	0.65	6.06
-1229	-1234	-1233	-1242	-1229	-1229	47	17.16	1.43	13.34
-1236	-1277	-1279	-1276	-1285	-1236	48	15.34	1.28	11.93
-1278	-1281	-1272	-1279	-1261	-1278	49	4.42	0.37	3.44
-1276	-1271	-1281	-1264	-1280	-1276	50	4.94	0.41	3.84
-1274	-1280	-1266	-1280	-1266	-1274	51	5.46	0.45	4.24
-1281	-1263	-1272	-1281	-1283	-1281	52	3.64	0.30	2.83
-1286	-1284	-1270	-1282	-1277	-1286	53	2.34	0.19	1.82
-1278	-1277	-1280	-1280	-1264	-1278	54	4.42	0.37	3.44
-1282	-1280	-1282	-1285	-1281	-1282	55	3.38	0.28	2.63
-1285	-1287	-1286	-1276	-1286	-1285	56	2.6	0.22	2.02
-1274	-1283	-1271	-1284	-1287	-1274	57	5.46	0.45	4.24
-1286	-1281	-1282	-1284	-1272	-1286	58	2.34	0.19	1.82
-1282	-1282	-1283	-1272	-1280	-1282	59	3.38	0.28	2.63
-1279	-1287	-1269	-1284	-1274	-1279	60	4.16	0.35	3.23
-1286	-1271	-1281	-1283	-1268	-1286	61	2.34	0.19	1.82
-1284	-1279	-1283	-1273	-1285	-1284	62	2.86	0.24	2.22
-1279	-1282	-1281	-1281	-1282	-1279	63	4.16	0.35	3.23
-1284	-1285	-1281	-1285	-1276	-1284	64	2.86	0.24	2.22
-1276	-1284	-1287	-1280	-1280	-1276	65	4.94	0.41	3.84
-1284	-1279	-1280	-1276	-1283	-1284	66	2.86	0.24	2.22
-1266	-1278	-1265	-1269	-1249	-1266	67	7.54	0.63	5.86
-1262	-1243	-1257	-1242	-1256	-1262	68	8.58	0.71	6.67
-1238	-1256	-1253	-1256	-1256	-1238	69	14.82	1.23	11.52
-1258	-1254	-1255	-1254	-1242	-1258	70	9.62	0.80	7.48
-1252	-1241	-1257	-1238	-1255	-1252	71	11.18	0.93	8.69
-1248	-1257	-1247	-1258	-1243	-1248	72	12.22	1.02	9.50
-1254	-1257	-1256	-1253	-1252	-1254	73	10.66	0.89	8.29
-1256	-1251	-1251	-1246	-1247	-1256	74	10.14	0.84	7.88
-1247	-1255	-1255	-1252	-1255	-1247	75	12.48	1.04	9.70
-1250	-1256	-1252	-1252	-1248	-1250	76	11.7	0.97	9.10
-1246	-1255	-1252	-1252	-1251	-1246	77	12.74	1.06	9.90
-1256	-1241	-1255	-1243	-1254	-1256	78	10.14	0.84	7.88
-1249	-1257	-1244	-1252	-1256	-1249	79	11.96	1.00	9.30
-1241	-1255	-1241	-1254	-1241	-1241	80	14.04	1.17	10.92
-1250	-1256	-1237	-1250	-1238	-1250	81	11.7	0.97	9.10
-1256	-1255	-1246	-1256	-1253	-1256	82	10.14	0.84	7.88
-1256	-1252	-1255	-1254	-1254	-1256	83	10.14	0.84	7.88
-1259	-1238	-1254	-1239	-1253	-1259	84	9.36	0.78	7.28
-1250	-1256	-1249	-1253	-1241	-1250	85	11.7	0.97	9.10
-1259	-1248	-1256	-1259	-1253	-1259	86	9.36	0.78	7.28
-1253	-1257	-1259	-1253	-1262	-1253	87	10.92	0.91	8.49
-1243	-1255	-1256	-1253	-1259	-1243	88	13.52	1.13	10.51
-1256	-1255	-1244	-1278	-1278	-1256	89	10.14	0.84	7.88
-1280	-1269	-1278	-1277	-1261	-1280	90	3.9	0.32	3.03

K =

0.107148

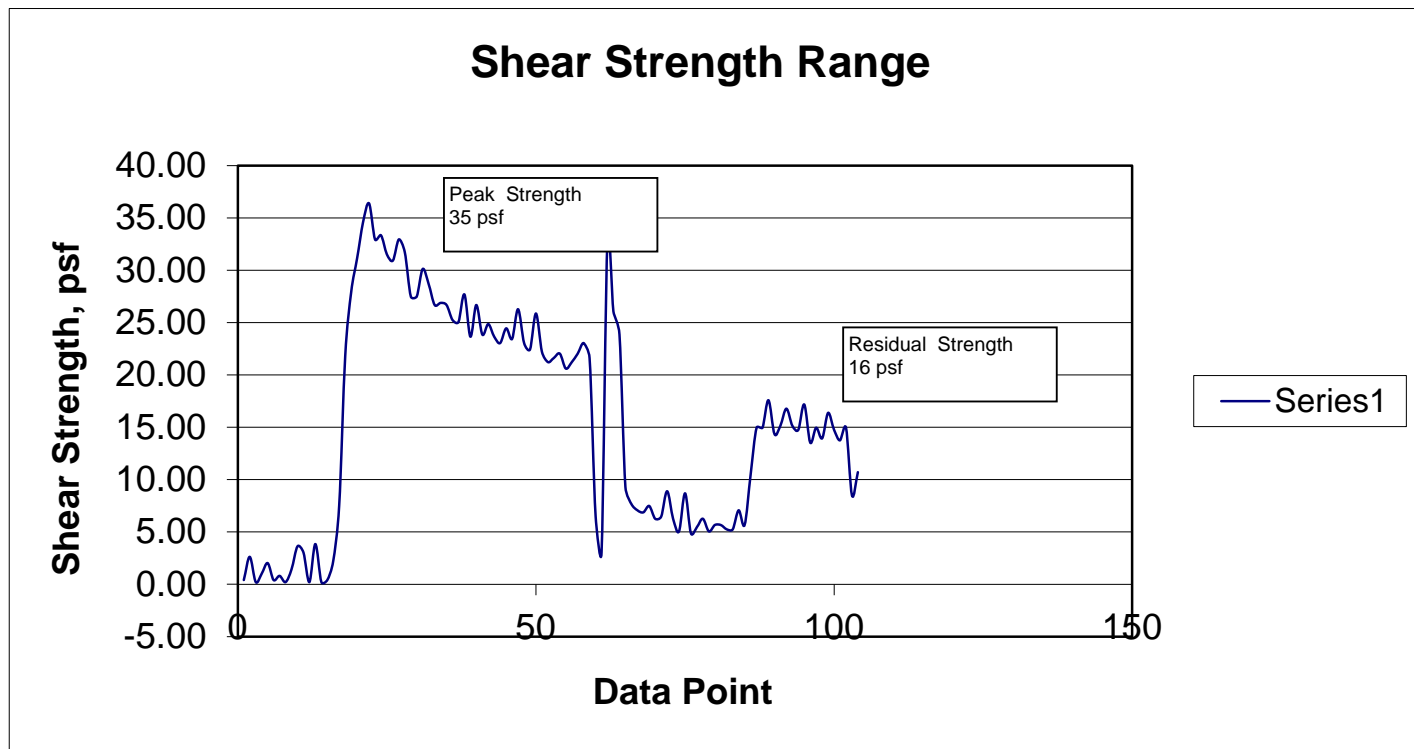


**Vane Shear Raw Data  
Location 417  
46 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,417/46					zero =	-1295	calib =	0.26 in-lb/unit	ft-lb	Shear Strength, psf	
-1293	-1290	-1294	-1277	-1291			-1293	1	0.52	0.04	0.40
-1282	-1294	-1297	-1286	-1293			-1282	2	3.38	0.28	2.63
-1294	-1290	-1287	-1294	-1277			-1294	3	0.26	0.02	0.20
-1290	-1287	-1292	-1277	-1292			-1290	4	1.3	0.11	1.01
-1285	-1290	-1279	-1290	-1277			-1285	5	2.6	0.22	2.02
-1293	-1291	-1293	-1290	-1292			-1293	6	0.52	0.04	0.40
-1291	-1284	-1290	-1288	-1289			-1291	7	1.04	0.09	0.81
-1294	-1277	-1291	-1277	-1297			-1294	8	0.26	0.02	0.20
-1288	-1290	-1292	-1291	-1290			-1288	9	1.82	0.15	1.41
-1277	-1290	-1282	-1290	-1284			-1277	10	4.68	0.39	3.64
-1280	-1292	-1275	-1291	-1276			-1280	11	3.9	0.32	3.03
-1294	-1276	-1295	-1285	-1289			-1294	12	0.26	0.02	0.20
-1276	-1295	-1280	-1293	-1290			-1276	13	4.94	0.41	3.84
-1294	-1289	-1294	-1290	-1286			-1294	14	0.26	0.02	0.20
-1293	-1289	-1292	-1277	-1295			-1293	15	0.52	0.04	0.40
-1284	-1293	-1278	-1285	-1277			-1284	16	2.86	0.24	2.22
-1258	-1237	-1225	-1226	-1196			-1258	17	9.62	0.80	7.48
-1187	-1176	-1179	-1167	-1161			-1187	18	28.08	2.34	21.83
-1157	-1150	-1130	-1146	-1148			-1157	19	35.88	2.99	27.89
-1141	-1146	-1143	-1129	-1126			-1141	20	40.04	3.34	31.13
-1124	-1124	-1112	-1124	-1126			-1124	21	44.46	3.70	34.56
-1115	-1122	-1124	-1109	-1125			-1115	22	46.8	3.90	36.38
-1132	-1114	-1130	-1120	-1131			-1132	23	42.38	3.53	32.95
-1130	-1125	-1134	-1132	-1137			-1130	24	42.9	3.57	33.35
-1139	-1134	-1142	-1141	-1129			-1139	25	40.56	3.38	31.53
-1142	-1144	-1130	-1144	-1139			-1142	26	39.78	3.31	30.93
-1132	-1147	-1137	-1147	-1152			-1132	27	42.38	3.53	32.95
-1138	-1148	-1151	-1141	-1154			-1138	28	40.82	3.40	31.73
-1159	-1143	-1158	-1158	-1151			-1159	29	35.36	2.95	27.49
-1159	-1162	-1146	-1158	-1152			-1159	30	35.36	2.95	27.49
-1146	-1162	-1153	-1159	-1159			-1146	31	38.74	3.23	30.12
-1153	-1160	-1164	-1149	-1166			-1153	32	36.92	3.08	28.70
-1163	-1152	-1168	-1170	-1152			-1163	33	34.32	2.86	26.68
-1162	-1164	-1156	-1166	-1170			-1162	34	34.58	2.88	26.88
-1163	-1168	-1168	-1152	-1171			-1163	35	34.32	2.86	26.68
-1170	-1160	-1172	-1173	-1160			-1170	36	32.5	2.71	25.27
-1171	-1173	-1156	-1173	-1173			-1171	37	32.24	2.69	25.06
-1158	-1174	-1173	-1164	-1175			-1158	38	35.62	2.97	27.69
-1178	-1161	-1176	-1175	-1161			-1178	39	30.42	2.53	23.65
-1163	-1176	-1173	-1166	-1175			-1163	40	34.32	2.86	26.68
-1177	-1170	-1176	-1183	-1179			-1177	41	30.68	2.56	23.85
-1172	-1177	-1180	-1170	-1179			-1172	42	31.98	2.66	24.86
-1178	-1178	-1164	-1183	-1182			-1178	43	30.42	2.53	23.65
-1181	-1165	-1184	-1180	-1167			-1181	44	29.64	2.47	23.04
-1174	-1181	-1178	-1171	-1181			-1174	45	31.46	2.62	24.46
-1179	-1170	-1180	-1183	-1174			-1179	46	30.16	2.51	23.45
-1165	-1182	-1184	-1167	-1179			-1165	47	33.8	2.82	26.28
-1181	-1182	-1170	-1186	-1187			-1181	48	29.64	2.47	23.04
-1184	-1175	-1182	-1185	-1169			-1184	49	28.86	2.40	22.44
-1167	-1191	-1191	-1177	-1183			-1167	50	33.28	2.77	25.87
-1185	-1185	-1182	-1176	-1188			-1185	51	28.6	2.38	22.23
-1190	-1190	-1183	-1175	-1185			-1190	52	27.3	2.27	21.22
-1188	-1187	-1180	-1182	-1192			-1188	53	27.82	2.32	21.63
-1186	-1192	-1173	-1188	-1189			-1186	54	28.34	2.36	22.03
-1193	-1182	-1180	-1189	-1191			-1193	55	26.52	2.21	20.62
-1190	-1179	-1188	-1193	-1194			-1190	56	27.3	2.27	21.22
-1186	-1176	-1187	-1187	-1177			-1186	57	28.34	2.36	22.03
-1181	-1188	-1188	-1175	-1193			-1181	58	29.64	2.47	23.04
-1188	-1185	-1190	-1246	-1267			-1188	59	27.82	2.32	21.63
-1263	-1278	-1262	-1278	-1278			-1263	60	8.32	0.69	6.47
-1280	-1277	-1268	-1278	-1249			-1280	61	3.9	0.32	3.03
-1132	-1147	-1153	-1161	-1164			-1132	62	42.38	3.53	32.95
-1166	-1161	-1178	-1162	-1177			-1166	63	33.54	2.79	26.07
-1177	-1192	-1198	-1213	-1248			-1177	64	30.68	2.56	23.85
-1249	-1258	-1244	-1259	-1261			-1249	65	11.96	1.00	9.30
-1257	-1256	-1244	-1262	-1258			-1257	66	9.88	0.82	7.68
-1260	-1258	-1241	-1259	-1257			-1260	67	9.1	0.76	7.07
-1261	-1256	-1258	-1262	-1247			-1261	68	8.84	0.74	6.87
-1258	-1246	-1261	-1264	-1248			-1258	69	9.62	0.80	7.48
-1264	-1250	-1267	-1269	-1257			-1264	70	8.06	0.67	6.27
-1263	-1259	-1264	-1250	-1267			-1263	71	8.32	0.69	6.47
-1251	-1271	-1268	-1258	-1265			-1251	72	11.44	0.95	8.89
-1264	-1270	-1254	-1267	-1253			-1264	73	8.06	0.67	6.27
-1270	-1254	-1271	-1256	-1271			-1270	74	6.5	0.54	5.05
-1252	-1266	-1266	-1270	-1269			-1252	75	11.18	0.93	8.69
-1271	-1268	-1262	-1268	-1252			-1271	76	6.24	0.52	4.85
-1268	-1254	-1271	-1267	-1267			-1268	77	7.02	0.58	5.46
-1264	-1265	-1271	-1271	-1264			-1264	78	8.06	0.67	6.27
-1270	-1262	-1267	-1255	-1268			-1270	79	6.5	0.54	5.05
-1267	-1267	-1267	-1266	-1265			-1267	80	7.28	0.61	5.66
-1267	-1268	-1253	-1272	-1255			-1267	81	7.28	0.61	5.66
-1269	-1255	-1267	-1265	-1262			-1269	82	6.76	0.56	5.26
-1269	-1262	-1267	-1267	-1267			-1269	83	6.76	0.56	5.26
-1260	-1267	-1265	-1266	-1268			-1260	84	9.1	0.76	7.07
-1267	-1263	-1265	-1255	-1243			-1267	85	7.28	0.61	5.66
-1243	-1238	-1230	-1219	-1223			-1243	86	13.52	1.13	10.51
-1221	-1225	-1206	-1218	-1216			-1221	87	19.24	1.60	14.96
-1221	-1209	-1226	-1208	-1221			-1221	88	19.24	1.60	14.96
-1208	-1221	-1209	-1221	-1223			-1208	89	22.62	1.88	17.59
-1224	-1212	-1224	-1223	-1218			-1224	90	18.46	1.54	14.35
-1220	-1221	-1223	-1207	-1223			-1220	91	19.5	1.62	15.16
-1212	-1223	-1207	-1223	-1210			-1212	92	21.58	1.80	16.78
-1220	-1209	-1220	-1210	-1224			-1220	93	19.5	1.62	15.16
-1222	-1222	-1222	-1216	-1222			-1222	94	18.98	1.58	14.76
-1210	-1220	-1224	-1224	-1220			-1210	95	22.1	1.84	17.18
-1228	-1212	-1223	-1215	-1228			-1228	96	17.42	1.45	13.54
-1221	-1207	-1226	-1207	-1223			-1221	97	19.24	1.60	14.96

-1226	-1220	-1220	-1222	-1223	-1226	98	17.94	1.49	13.95
-1214	-1221	-1208	-1224	-1209	-1214	99	21.06	1.75	16.37
-1222	-1222	-1219	-1222	-1212	-1222	100	18.98	1.58	14.76
-1227	-1219	-1222	-1227	-1215	-1227	101	17.68	1.47	13.74
-1221	-1220	-1227	-1232	-1238	-1221	102	19.24	1.60	14.96
-1253	-1258	-1241	-1260	-1253	-1253	103	10.92	0.91	8.49
-1242	-1257	-1249	-1255	-1259	-1242	104	13.78	1.15	10.71

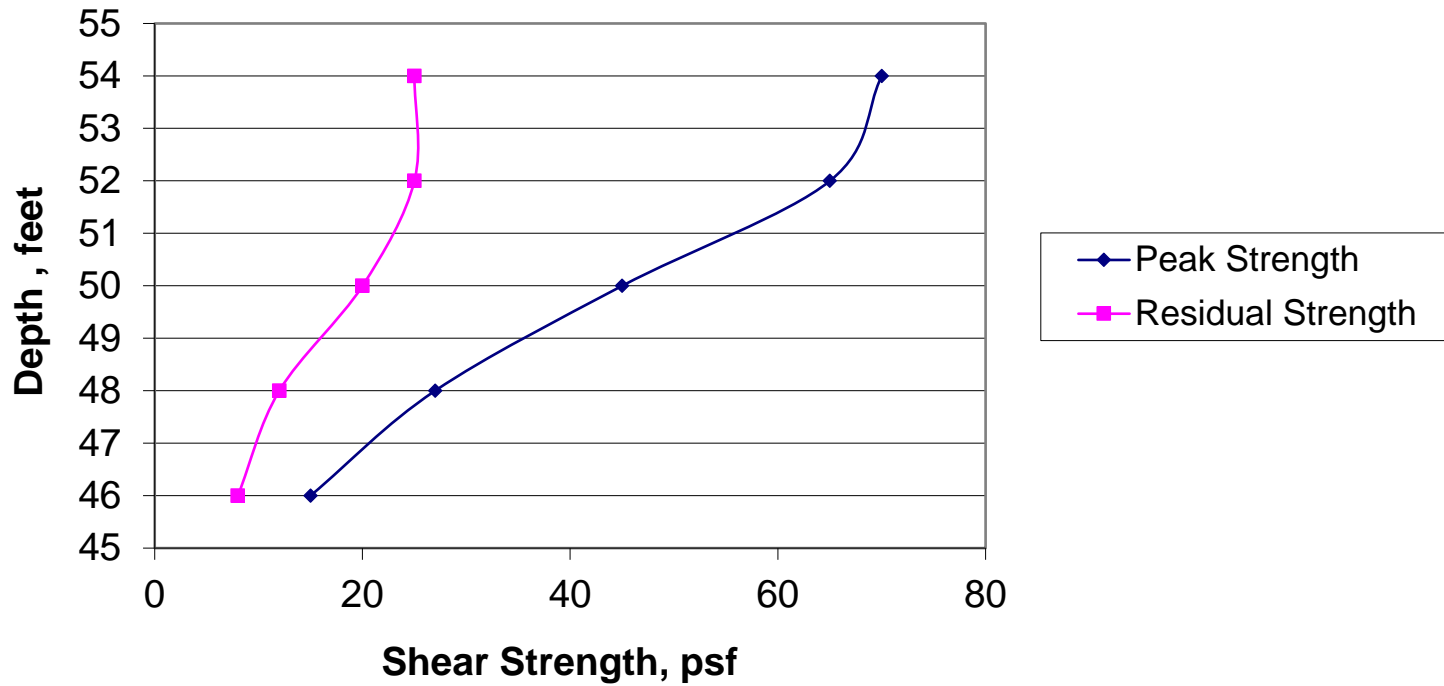
K = 0.107148



**Vane Shear Summary  
Location 419**

Depth, ft	Shear Strength, psf	
	Peak	Residual
46	15	8
48	27	12
50	45	20
52	65	25
54	70	25

**Depth Vs. Shear Strength - 419**



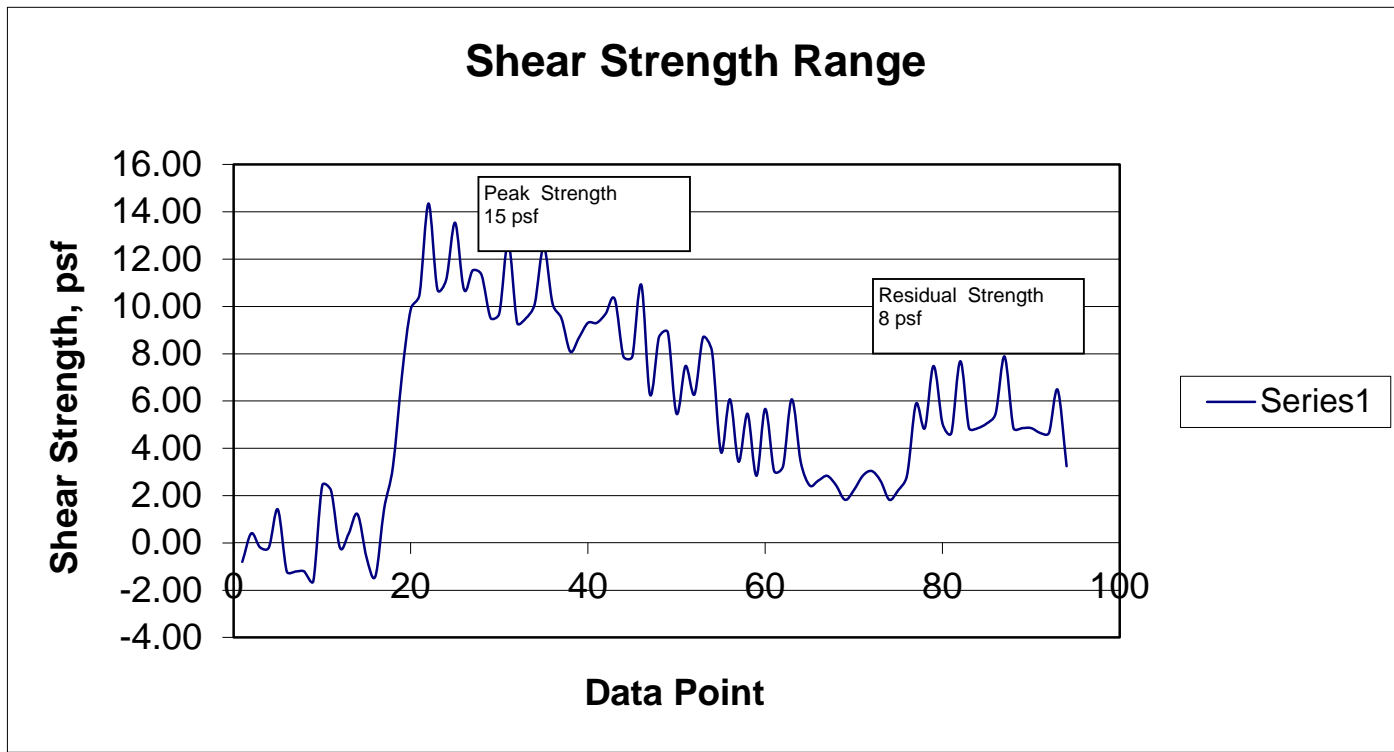
**Vane Shear Raw Data  
Location 419  
46 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**



1/8/5,retec,419/46					zero =	-1295	calib =	0.26 in-lb/unit	ft-lb	Shear Strength, psf
-1299	-1285	-1297	-1285	-1300	-1299	1	-1.04	-0.09	-0.81	
-1293	-1300	-1292	-1300	-1296	-1293	2	0.52	0.04	0.40	
-1296	-1283	-1299	-1301	-1296	-1296	3	-0.26	-0.02	-0.20	
-1296	-1298	-1301	-1286	-1300	-1296	4	-0.26	-0.02	-0.20	
-1288	-1298	-1292	-1299	-1297	-1288	5	1.82	0.15	1.41	
-1301	-1297	-1284	-1303	-1302	-1301	6	-1.56	-0.13	-1.21	
-1301	-1302	-1282	-1300	-1300	-1301	7	-1.56	-0.13	-1.21	
-1301	-1297	-1284	-1301	-1300	-1301	8	-1.56	-0.13	-1.21	
-1303	-1303	-1284	-1297	-1300	-1303	9	-2.08	-0.17	-1.62	
-1283	-1303	-1298	-1284	-1300	-1283	10	3.12	0.26	2.43	
-1284	-1282	-1301	-1300	-1282	-1284	11	2.86	0.24	2.22	
-1296	-1299	-1284	-1304	-1300	-1296	12	-0.26	-0.02	-0.20	
-1293	-1300	-1300	-1283	-1300	-1293	13	0.52	0.04	0.40	
-1289	-1301	-1301	-1285	-1300	-1289	14	1.56	0.13	1.21	
-1298	-1295	-1303	-1297	-1296	-1298	15	-0.78	-0.06	-0.61	
-1302	-1295	-1301	-1295	-1286	-1302	16	-1.82	-0.15	-1.41	
-1288	-1272	-1286	-1283	-1265	-1288	17	1.82	0.15	1.41	
-1279	-1258	-1272	-1265	-1246	-1279	18	4.16	0.35	3.23	
-1260	-1243	-1250	-1251	-1237	-1260	19	9.1	0.76	7.07	
-1246	-1249	-1229	-1240	-1240	-1246	20	12.74	1.06	9.90	
-1243	-1244	-1229	-1237	-1243	-1243	21	13.52	1.13	10.51	
-1224	-1243	-1240	-1231	-1231	-1224	22	18.46	1.54	14.35	
-1242	-1227	-1238	-1243	-1245	-1242	23	13.78	1.15	10.71	
-1240	-1241	-1246	-1233	-1240	-1240	24	14.3	1.19	11.12	
-1228	-1241	-1244	-1243	-1225	-1228	25	17.42	1.45	13.54	
-1242	-1242	-1232	-1243	-1244	-1242	26	13.78	1.15	10.71	
-1238	-1243	-1247	-1229	-1249	-1238	27	14.82	1.23	11.52	
-1239	-1241	-1245	-1248	-1231	-1239	28	14.56	1.21	11.32	
-1248	-1247	-1240	-1249	-1249	-1248	29	12.22	1.02	9.50	
-1247	-1247	-1244	-1242	-1249	-1247	30	12.48	1.04	9.70	
-1232	-1244	-1248	-1244	-1242	-1232	31	16.38	1.36	12.73	
-1249	-1234	-1251	-1249	-1247	-1249	32	11.96	1.00	9.30	
-1248	-1249	-1236	-1250	-1251	-1248	33	12.22	1.02	9.50	
-1245	-1251	-1250	-1244	-1253	-1245	34	13	1.08	10.11	
-1233	-1253	-1253	-1236	-1255	-1233	35	16.12	1.34	12.53	
-1245	-1249	-1252	-1247	-1248	-1245	36	13	1.08	10.11	
-1248	-1235	-1253	-1251	-1237	-1248	37	12.22	1.02	9.50	
-1255	-1253	-1244	-1253	-1251	-1255	38	10.4	0.87	8.09	
-1252	-1247	-1244	-1249	-1244	-1252	39	11.18	0.93	8.69	
-1249	-1248	-1250	-1255	-1238	-1249	40	11.96	1.00	9.30	
-1249	-1237	-1252	-1252	-1248	-1249	41	11.96	1.00	9.30	
-1247	-1247	-1252	-1236	-1252	-1247	42	12.48	1.04	9.70	
-1244	-1250	-1240	-1250	-1252	-1244	43	13.26	1.10	10.31	
-1256	-1247	-1250	-1252	-1239	-1256	44	10.14	0.84	7.88	
-1256	-1240	-1258	-1250	-1251	-1256	45	10.14	0.84	7.88	
-1241	-1257	-1252	-1255	-1254	-1241	46	14.04	1.17	10.92	
-1264	-1262	-1258	-1260	-1243	-1264	47	8.06	0.67	6.27	
-1252	-1247	-1256	-1242	-1255	-1252	48	11.18	0.93	8.69	
-1251	-1255	-1240	-1253	-1241	-1251	49	11.44	0.95	8.89	
-1268	-1261	-1270	-1257	-1275	-1268	50	7.02	0.58	5.46	
-1258	-1271	-1257	-1274	-1274	-1258	51	9.62	0.80	7.48	
-1264	-1236	-1240	-1244	-1241	-1264	52	8.06	0.67	6.27	
-1252	-1249	-1253	-1243	-1261	-1252	53	11.18	0.93	8.69	
-1255	-1273	-1262	-1276	-1268	-1255	54	10.4	0.87	8.09	
-1276	-1264	-1277	-1269	-1281	-1276	55	4.94	0.41	3.84	
-1265	-1279	-1269	-1282	-1278	-1265	56	7.8	0.65	6.06	
-1278	-1274	-1279	-1279	-1278	-1278	57	4.42	0.37	3.44	
-1268	-1283	-1270	-1280	-1277	-1268	58	7.02	0.58	5.46	
-1281	-1267	-1277	-1278	-1281	-1281	59	3.64	0.30	2.83	
-1267	-1280	-1280	-1278	-1280	-1267	60	7.28	0.61	5.66	
-1280	-1280	-1275	-1281	-1267	-1280	61	3.9	0.32	3.03	
-1279	-1276	-1279	-1264	-1279	-1279	62	4.16	0.35	3.23	
-1265	-1279	-1277	-1278	-1284	-1265	63	7.8	0.65	6.06	
-1278	-1281	-1266	-1282	-1283	-1278	64	4.42	0.37	3.44	
-1283	-1283	-1267	-1280	-1280	-1283	65	3.12	0.26	2.43	
-1282	-1281	-1278	-1285	-1268	-1282	66	3.38	0.28	2.63	
-1281	-1274	-1277	-1280	-1280	-1281	67	3.64	0.30	2.83	
-1283	-1267	-1283	-1284	-1266	-1283	68	3.12	0.26	2.43	
-1286	-1265	-1279	-1281	-1277	-1286	69	2.34	0.19	1.82	
-1284	-1282	-1267	-1282	-1281	-1284	70	2.86	0.24	2.22	
-1281	-1284	-1268	-1287	-1287	-1281	71	3.64	0.30	2.83	
-1280	-1281	-1283	-1267	-1285	-1280	72	3.9	0.32	3.03	
-1282	-1272	-1282	-1281	-1269	-1282	73	3.38	0.28	2.63	
-1286	-1270	-1280	-1285	-1282	-1286	74	2.34	0.19	1.82	
-1284	-1280	-1277	-1273	-1282	-1284	75	2.86	0.24	2.22	
-1281	-1266	-1276	-1272	-1269	-1281	76	3.64	0.30	2.83	
-1266	-1270	-1268	-1253	-1267	-1266	77	7.54	0.63	5.86	
-1271	-1272	-1266	-1261	-1273	-1271	78	6.24	0.52	4.85	
-1258	-1268	-1268	-1266	-1254	-1258	79	9.62	0.80	7.48	
-1270	-1268	-1266	-1270	-1272	-1270	80	6.5	0.54	5.05	
-1272	-1274	-1262	-1271	-1269	-1272	81	5.98	0.50	4.65	
-1257	-1273	-1274	-1257	-1275	-1257	82	9.88	0.82	7.68	
-1271	-1268	-1273	-1271	-1258	-1271	83	6.24	0.52	4.85	
-1271	-1256	-1268	-1273	-1255	-1271	84	6.24	0.52	4.85	
-1270	-1271	-1255	-1274	-1273	-1270	85	6.5	0.54	5.05	
-1268	-1275	-1276	-1257	-1275	-1268	86	7.02	0.58	5.46	
-1256	-1273	-1272	-1256	-1277	-1256	87	10.14	0.84	7.88	
-1271	-1265	-1274	-1273	-1256	-1271	88	6.24	0.52	4.85	
-1271	-1256	-1268	-1273	-1257	-1271	89	6.24	0.52	4.85	
-1271	-1257	-1276	-1273	-1258	-1271	90	6.24	0.52	4.85	
-1272	-1258	-1275	-1272	-1271	-1272	91	5.98	0.50	4.65	
-1272	-1267	-1270	-1256	-1271	-1272	92	5.98	0.50	4.65	
-1263	-1284	-1273	-1282	-1285	-1263	93	8.32	0.69	6.47	
-1279	-1279	-1281	-1282	-1273	-1279	94	4.16	0.35	3.23	

K =

0.107148



**Vane Shear Raw Data  
Location 419  
48 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,419/48

zero =

-1295

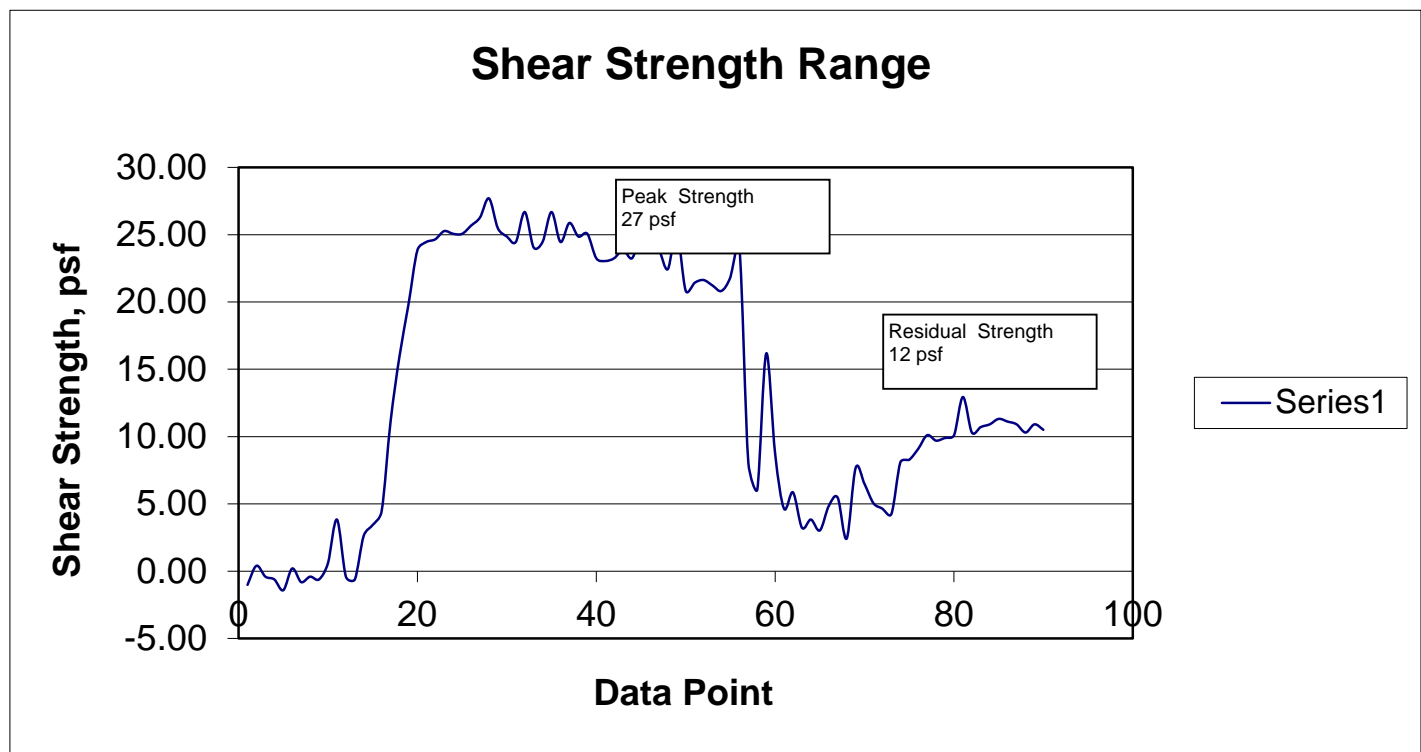
calib =

0.26 in-lb/unit ft-lb

Shear Strength, psf

-1300	-1283	-1300	-1300	-1299	-1300	1	-1.3	-0.11	-1.01
-1293	-1301	-1296	-1282	-1302	-1293	2	0.52	0.04	0.40
-1297	-1295	-1301	-1297	-1286	-1297	3	-0.52	-0.04	-0.40
-1298	-1286	-1299	-1299	-1298	-1298	4	-0.78	-0.06	-0.61
-1302	-1298	-1282	-1299	-1297	-1302	5	-1.82	-0.15	-1.41
-1294	-1296	-1293	-1282	-1299	-1294	6	0.26	0.02	0.20
-1299	-1290	-1300	-1299	-1283	-1299	7	-1.04	-0.09	-0.81
-1297	-1285	-1295	-1297	-1295	-1297	8	-0.52	-0.04	-0.40
-1298	-1296	-1281	-1298	-1300	-1298	9	-0.78	-0.06	-0.61
-1292	-1293	-1284	-1292	-1294	-1292	10	0.78	0.06	0.61
-1276	-1294	-1291	-1281	-1296	-1276	11	4.94	0.41	3.84
-1297	-1282	-1300	-1298	-1281	-1297	12	-0.52	-0.04	-0.40
-1298	-1298	-1280	-1298	-1294	-1298	13	-0.78	-0.06	-0.61
-1282	-1298	-1296	-1276	-1293	-1282	14	3.38	0.28	2.63
-1278	-1280	-1283	-1273	-1275	-1278	15	4.42	0.37	3.44
-1273	-1277	-1276	-1253	-1265	-1273	16	5.72	0.48	4.45
-1240	-1247	-1242	-1227	-1227	-1240	17	14.3	1.19	11.12
-1216	-1224	-1209	-1190	-1201	-1216	18	20.54	1.71	15.97
-1197	-1196	-1184	-1182	-1179	-1197	19	25.48	2.12	19.81
-1177	-1174	-1173	-1160	-1175	-1177	20	30.68	2.56	23.85
-1174	-1155	-1174	-1162	-1172	-1174	21	31.46	2.62	24.46
-1173	-1161	-1171	-1169	-1172	-1173	22	31.72	2.64	24.66
-1170	-1164	-1170	-1171	-1160	-1170	23	32.5	2.71	25.27
-1171	-1171	-1174	-1172	-1157	-1171	24	32.24	2.69	25.06
-1171	-1169	-1160	-1167	-1152	-1171	25	32.24	2.69	25.06
-1168	-1169	-1162	-1167	-1152	-1168	26	33.02	2.75	25.67
-1165	-1169	-1159	-1173	-1170	-1165	27	33.8	2.82	26.28
-1158	-1172	-1180	-1172	-1172	-1158	28	35.62	2.97	27.69
-1169	-1170	-1175	-1159	-1171	-1169	29	32.76	2.73	25.47
-1172	-1166	-1171	-1174	-1162	-1172	30	31.98	2.66	24.86
-1174	-1174	-1159	-1171	-1173	-1174	31	31.46	2.62	24.46
-1163	-1173	-1176	-1160	-1171	-1163	32	34.32	2.86	26.68
-1176	-1159	-1174	-1174	-1172	-1176	33	30.94	2.58	24.05
-1174	-1176	-1163	-1175	-1170	-1174	34	31.46	2.62	24.46
-1163	-1177	-1176	-1160	-1172	-1163	35	34.32	2.86	26.68
-1174	-1174	-1164	-1180	-1174	-1174	36	31.46	2.62	24.46
-1167	-1177	-1175	-1162	-1172	-1167	37	33.28	2.77	25.87
-1172	-1176	-1160	-1172	-1174	-1172	38	31.98	2.66	24.86
-1171	-1178	-1177	-1166	-1177	-1171	39	32.24	2.69	25.06
-1180	-1176	-1180	-1161	-1175	-1180	40	29.9	2.49	23.25
-1181	-1165	-1179	-1167	-1178	-1181	41	29.64	2.47	23.04
-1180	-1164	-1180	-1178	-1180	-1180	42	29.9	2.49	23.25
-1177	-1173	-1180	-1182	-1168	-1177	43	30.68	2.56	23.85
-1180	-1183	-1175	-1176	-1166	-1180	44	29.9	2.49	23.25
-1172	-1184	-1169	-1183	-1182	-1172	45	31.98	2.66	24.86
-1176	-1179	-1180	-1167	-1179	-1176	46	30.94	2.58	24.05
-1177	-1165	-1182	-1183	-1178	-1177	47	30.68	2.56	23.85
-1184	-1183	-1169	-1182	-1178	-1184	48	28.86	2.40	22.44
-1170	-1182	-1181	-1168	-1183	-1170	49	32.5	2.71	25.27
-1192	-1177	-1188	-1173	-1185	-1192	50	26.78	2.23	20.82
-1189	-1173	-1189	-1183	-1184	-1189	51	27.56	2.30	21.43
-1188	-1168	-1186	-1187	-1189	-1188	52	27.82	2.32	21.63
-1190	-1183	-1188	-1190	-1181	-1190	53	27.3	2.27	21.22
-1192	-1191	-1188	-1193	-1177	-1192	54	26.78	2.23	20.82
-1187	-1189	-1176	-1189	-1188	-1187	55	28.08	2.34	21.83
-1176	-1198	-1257	-1264	-1265	-1176	56	30.94	2.58	24.05
-1255	-1272	-1269	-1254	-1269	-1255	57	10.4	0.87	8.09
-1265	-1270	-1157	-1157	-1196	-1265	58	7.8	0.65	6.06
-1215	-1221	-1215	-1229	-1226	-1215	59	20.8	1.73	16.17
-1252	-1253	-1264	-1283	-1273	-1252	60	11.18	0.93	8.69
-1272	-1275	-1274	-1259	-1272	-1272	61	5.98	0.50	4.65
-1266	-1278	-1268	-1277	-1276	-1266	62	7.54	0.63	5.86
-1279	-1279	-1261	-1275	-1267	-1279	63	4.16	0.35	3.23
-1276	-1275	-1276	-1276	-1264	-1276	64	4.94	0.41	3.84
-1280	-1265	-1280	-1274	-1280	-1280	65	3.9	0.32	3.03
-1271	-1273	-1276	-1258	-1281	-1271	66	6.24	0.52	4.85
-1268	-1282	-1281	-1265	-1266	-1268	67	7.02	0.58	5.46
-1283	-1274	-1275	-1267	-1280	-1283	68	3.12	0.26	2.43
-1257	-1267	-1270	-1257	-1264	-1257	69	9.88	0.82	7.68
-1263	-1278	-1268	-1284	-1283	-1263	70	8.32	0.69	6.47
-1270	-1290	-1283	-1274	-1278	-1270	71	6.5	0.54	5.05
-1272	-1279	-1265	-1281	-1281	-1272	72	5.98	0.50	4.65
-1274	-1274	-1273	-1270	-1274	-1274	73	5.46	0.45	4.24
-1255	-1269	-1271	-1269	-1274	-1255	74	10.4	0.87	8.09
-1254	-1263	-1255	-1238	-1250	-1254	75	10.66	0.89	8.29
-1250	-1241	-1242	-1243	-1239	-1250	76	11.7	0.97	9.10
-1245	-1232	-1248	-1246	-1244	-1245	77	13	1.08	10.11
-1247	-1242	-1248	-1231	-1240	-1247	78	12.48	1.04	9.70
-1246	-1239	-1248	-1235	-1243	-1246	79	12.74	1.06	9.90
-1245	-1242	-1247	-1231	-1251	-1245	80	13	1.08	10.11
-1231	-1245	-1238	-1242	-1243	-1231	81	16.64	1.39	12.94
-1244	-1242	-1229	-1239	-1246	-1244	82	13.26	1.10	10.31
-1242	-1242	-1231	-1244	-1241	-1242	83	13.78	1.15	10.71
-1241	-1232	-1247	-1243	-1238	-1241	84	14.04	1.17	10.92
-1239	-1244	-1247	-1235	-1244	-1239	85	14.56	1.21	11.32
-1240	-1244	-1231	-1244	-1237	-1240	86	14.3	1.19	11.12
-1241	-1231	-1249	-1244	-1241	-1241	87	14.04	1.17	10.92
-1244	-1244	-1244	-1237	-1241	-1244	88	13.26	1.10	10.31
-1241	-1243	-1237	-1246	-1230	-1241	89	14.04	1.17	10.92
-1243	-1237	-1245	-1229	-1251	-1243	90	13.52	1.13	10.51

K = 0.107148

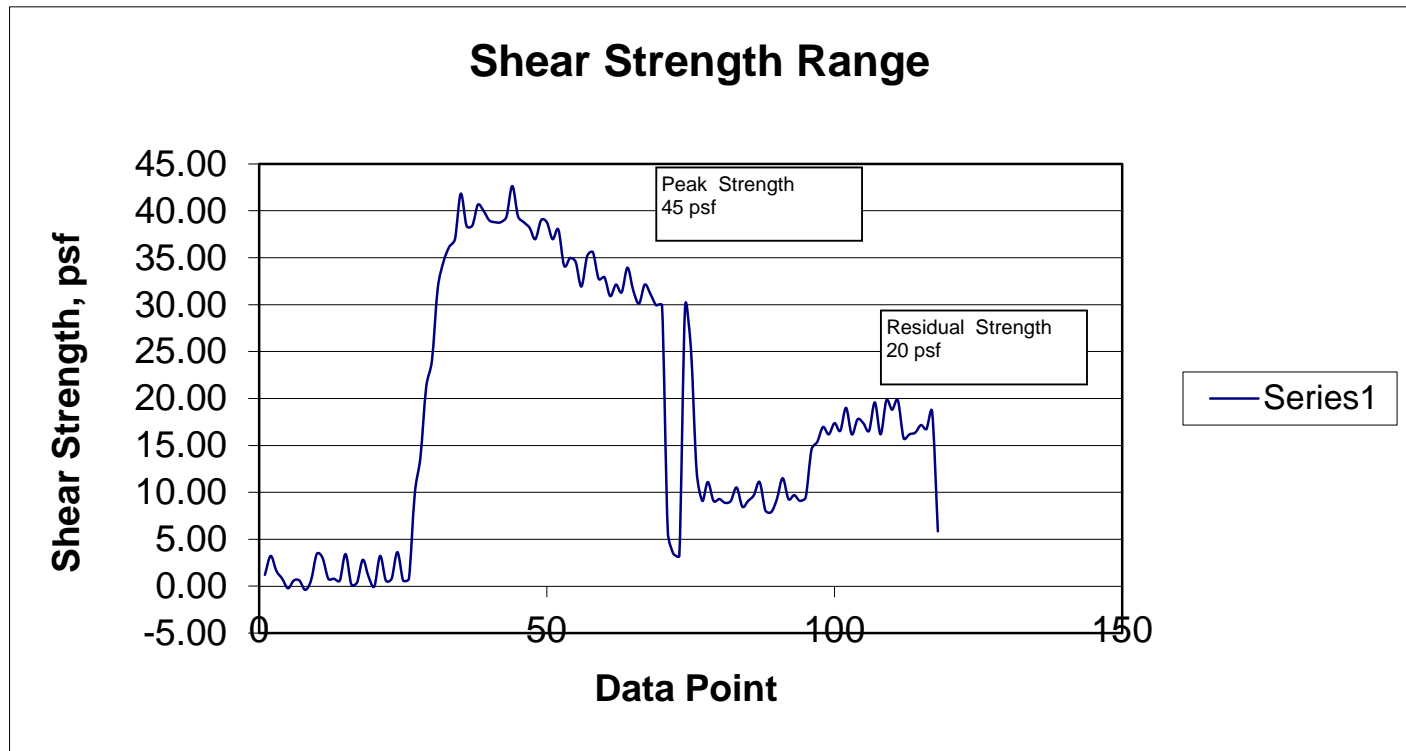


**Vane Shear Raw Data  
Location 419  
50 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,419/50					zero =	-1295	calib =	0.26 in-lb/unit	ft-lb	Shear Strength, psf
-1289	-1294	-1281	-1292	-1290	-1289	-1289	1	1.56	0.13	1.21
-1279	-1294	-1289	-1291	-1291	-1279	-1279	2	4.16	0.35	3.23
-1287	-1290	-1279	-1293	-1294	-1287	-1287	3	2.08	0.17	1.62
-1291	-1295	-1277	-1291	-1293	-1291	-1291	4	1.04	0.09	0.81
-1296	-1295	-1284	-1291	-1286	-1296	-1296	5	-0.26	-0.02	-0.20
-1292	-1289	-1290	-1294	-1278	-1292	-1292	6	0.78	0.06	0.61
-1292	-1277	-1292	-1292	-1276	-1292	-1292	7	0.78	0.06	0.61
-1297	-1276	-1295	-1296	-1287	-1297	-1297	8	-0.52	-0.04	-0.40
-1292	-1283	-1290	-1279	-1293	-1292	-1292	9	0.78	0.06	0.61
-1278	-1292	-1292	-1281	-1294	-1278	-1278	10	4.42	0.37	3.44
-1280	-1293	-1291	-1287	-1293	-1280	-1280	11	3.9	0.32	3.03
-1291	-1294	-1278	-1293	-1291	-1291	-1291	12	1.04	0.09	0.81
-1291	-1292	-1293	-1292	-1278	-1291	-1291	13	1.04	0.09	0.81
-1292	-1277	-1289	-1283	-1292	-1292	-1292	14	0.78	0.06	0.61
-1278	-1291	-1298	-1293	-1295	-1278	-1278	15	4.42	0.37	3.44
-1294	-1293	-1285	-1287	-1278	-1294	-1294	16	0.26	0.02	0.20
-1293	-1277	-1293	-1292	-1289	-1293	-1293	17	0.52	0.04	0.40
-1281	-1294	-1291	-1284	-1295	-1281	-1281	18	3.64	0.30	2.83
-1290	-1290	-1283	-1292	-1278	-1290	-1290	19	1.3	0.11	1.01
-1295	-1278	-1294	-1284	-1292	-1295	-1295	20	0	0.00	0
-1279	-1293	-1284	-1292	-1288	-1279	-1279	21	4.16	0.35	3.23
-1292	-1286	-1292	-1287	-1291	-1292	-1292	22	0.78	0.06	0.61
-1291	-1289	-1294	-1294	-1296	-1291	-1291	23	1.04	0.09	0.81
-1277	-1291	-1288	-1296	-1292	-1277	-1277	24	4.68	0.39	3.64
-1292	-1289	-1293	-1289	-1287	-1292	-1292	25	0.78	0.06	0.61
-1291	-1291	-1277	-1263	-1256	-1291	-1291	26	1.04	0.09	0.81
-1247	-1250	-1238	-1240	-1232	-1247	-1247	27	12.48	1.04	9.70
-1227	-1236	-1222	-1221	-1215	-1227	-1227	28	17.68	1.47	13.74
-1190	-1195	-1192	-1168	-1181	-1190	-1190	29	27.3	2.27	21.22
-1176	-1167	-1167	-1161	-1139	-1176	-1176	30	30.94	2.58	24.05
-1138	-1148	-1133	-1134	-1132	-1138	-1138	31	40.82	3.40	31.73
-1124	-1117	-1119	-1102	-1118	-1124	-1124	32	44.46	3.70	34.56
-1116	-1116	-1119	-1120	-1103	-1116	-1116	33	46.54	3.88	36.18
-1112	-1115	-1097	-1104	-1108	-1112	-1112	34	47.58	3.96	36.99
-1088	-1103	-1104	-1093	-1100	-1088	-1088	35	53.82	4.48	41.84
-1105	-1102	-1104	-1092	-1106	-1105	-1105	36	49.4	4.12	38.41
-1105	-1100	-1103	-1100	-1099	-1105	-1105	37	49.4	4.12	38.41
-1094	-1098	-1098	-1094	-1100	-1094	-1094	38	52.26	4.35	40.63
-1097	-1106	-1106	-1091	-1102	-1097	-1097	39	51.48	4.29	40.02
-1102	-1086	-1095	-1081	-1097	-1102	-1102	40	50.18	4.18	39.01
-1103	-1085	-1095	-1084	-1100	-1103	-1103	41	49.92	4.16	38.81
-1103	-1087	-1104	-1104	-1091	-1103	-1103	42	49.92	4.16	38.81
-1100	-1099	-1084	-1098	-1098	-1100	-1100	43	50.7	4.22	39.42
-1084	-1103	-1099	-1111	-1108	-1084	-1084	44	54.86	4.57	42.65
-1100	-1110	-1108	-1109	-1107	-1100	-1100	45	50.7	4.22	39.42
-1103	-1099	-1105	-1088	-1104	-1103	-1103	46	49.92	4.16	38.81
-1106	-1102	-1111	-1094	-1114	-1106	-1106	47	49.14	4.09	38.20
-1112	-1115	-1113	-1108	-1108	-1112	-1112	48	47.58	3.96	36.99
-1102	-1107	-1108	-1115	-1115	-1102	-1102	49	50.18	4.18	39.01
-1103	-1121	-1109	-1120	-1114	-1103	-1103	50	49.92	4.16	38.81
-1112	-1119	-1096	-1106	-1092	-1112	-1112	51	47.58	3.96	36.99
-1107	-1110	-1108	-1117	-1106	-1107	-1107	52	48.88	4.07	38.00
-1126	-1125	-1126	-1127	-1116	-1126	-1126	53	43.94	3.66	34.16
-1122	-1115	-1120	-1118	-1111	-1122	-1122	54	44.98	3.75	34.97
-1124	-1125	-1126	-1131	-1119	-1124	-1124	55	44.46	3.70	34.56
-1137	-1136	-1122	-1130	-1115	-1137	-1137	56	41.08	3.42	31.94
-1121	-1128	-1109	-1127	-1126	-1121	-1121	57	45.24	3.77	35.17
-1119	-1132	-1133	-1138	-1140	-1119	-1119	58	45.76	3.81	35.58
-1133	-1136	-1135	-1125	-1131	-1133	-1133	59	42.12	3.51	32.75
-1132	-1127	-1134	-1122	-1139	-1132	-1132	60	42.38	3.53	32.95
-1142	-1133	-1147	-1136	-1138	-1142	-1142	61	39.78	3.31	30.93
-1136	-1145	-1142	-1145	-1132	-1136	-1136	62	41.34	3.44	32.14
-1140	-1142	-1129	-1137	-1138	-1140	-1140	63	40.3	3.36	31.33
-1127	-1144	-1141	-1141	-1138	-1127	-1127	64	43.68	3.64	33.96
-1139	-1136	-1138	-1126	-1141	-1139	-1139	65	40.56	3.38	31.53
-1146	-1138	-1149	-1156	-1135	-1146	-1146	66	38.74	3.23	30.12
-1136	-1141	-1142	-1135	-1141	-1136	-1136	67	41.34	3.44	32.14
-1141	-1133	-1141	-1130	-1150	-1141	-1141	68	40.04	3.34	31.13
-1147	-1135	-1151	-1143	-1152	-1147	-1147	69	38.48	3.21	29.92
-1147	-1144	-1220	-1267	-1270	-1147	-1147	70	38.48	3.21	29.92
-1266	-1272	-1255	-1273	-1271	-1266	-1266	71	7.54	0.63	5.86
-1278	-1277	-1276	-1285	-1271	-1278	-1278	72	4.42	0.37	3.44
-1279	-1136	-1086	-1089	-1117	-1279	-1279	73	4.16	0.35	3.23
-1148	-1149	-1163	-1176	-1173	-1148	-1148	74	38.22	3.18	29.71
-1169	-1186	-1230	-1226	-1244	-1169	-1169	75	32.76	2.73	25.47
-1234	-1248	-1241	-1248	-1245	-1234	-1234	76	15.86	1.32	12.33
-1250	-1240	-1249	-1249	-1250	-1250	-1250	77	11.7	0.97	9.10
-1240	-1251	-1251	-1253	-1248	-1240	-1240	78	14.3	1.19	11.12
-1250	-1246	-1252	-1252	-1248	-1250	-1250	79	11.7	0.97	9.10
-1249	-1249	-1251	-1248	-1251	-1249	-1249	80	11.96	1.00	9.30
-1251	-1251	-1246	-1250	-1238	-1251	-1251	81	11.44	0.95	8.89
-1250	-1247	-1250	-1239	-1250	-1250	-1250	82	11.7	0.97	9.10
-1243	-1252	-1246	-1253	-1250	-1243	-1243	83	13.52	1.13	10.51
-1253	-1255	-1246	-1254	-1239	-1253	-1253	84	10.92	0.91	8.49
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-1247	-1252	-1252	-1243	-1253	-1247	-1247	86	12.48	1.04	9.70
-1240	-1255	-1244	-1254	-1253	-1240	-1240	87	14.3	1.19	11.12
-1255	-1251	-1252	-1251	-1237	-1255	-1255	88	10.4	0.87	8.09
-1256	-1244	-1251	-1238	-1249	-1256	-1256	89	10.14	0.84	7.88
-1249	-1252	-1252	-1255	-1252	-1249	-1249	90	11.96	1.00	9.30
-1238	-1250	-1242	-1250	-1243	-1238	-1238	91	14.82	1.23	11.52
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-1250	-1244	-1253	-1251	-1236	-1250	-1250	94	11.7	0.97	9.10
-1248	-1226	-1239	-1239	-1227	-1248	-1248	95	12.22	1.02	9.50
-1223	-1208	-1221	-1214	-1211	-1223	-1223	96	18.72	1.56	14.55
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-1215	-1214	-1213	-1211	-1214	-1215	99	20.8	1.73	16.17
-1209	-1221	-1214	-1196	-1202	-1209	100	22.36	1.86	17.38
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-1209	-1215	-1210	-1199	-1206	-1209	105	22.36	1.86	17.38
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-1215	-1209	-1211	-1211	-1217	-1215	108	20.8	1.73	16.17
-1197	-1199	-1198	-1201	-1204	-1197	109	25.48	2.12	19.81
-1202	-1203	-1206	-1215	-1217	-1202	110	24.18	2.01	18.80
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-1217	-1214	-1199	-1205	-1212	-1217	112	20.28	1.69	15.77
-1215	-1208	-1211	-1216	-1215	-1215	113	20.8	1.73	16.17
-1214	-1214	-1220	-1199	-1208	-1214	114	21.06	1.75	16.37
-1210	-1215	-1215	-1199	-1209	-1210	115	22.1	1.84	17.18
-1212	-1214	-1208	-1213	-1216	-1212	116	21.58	1.80	16.78
-1203	-1230	-1275	-1262	-1279	-1203	117	23.92	1.99	18.60
-1266	-1277	-1278	-1272	-1272	-1266	118	7.54	0.63	5.86

K = 0.107148



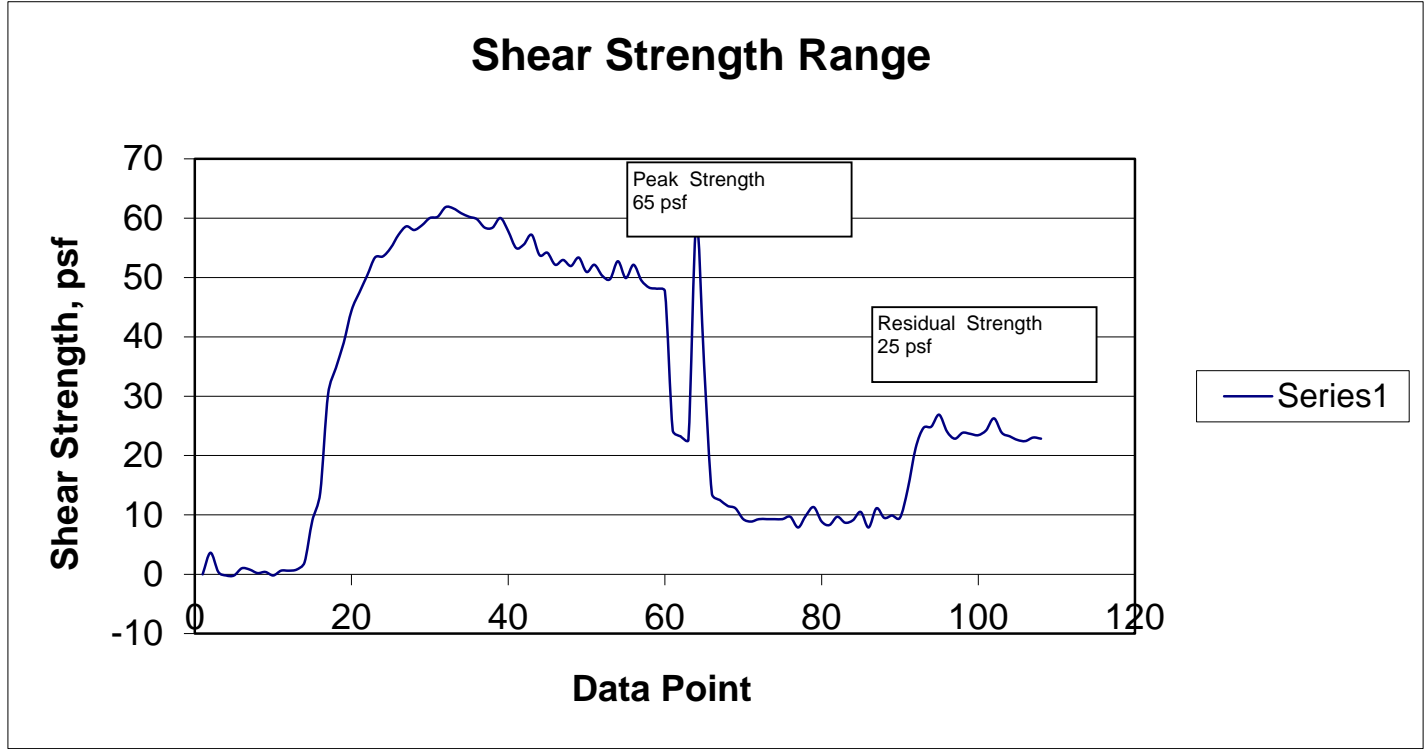


**Vane Shear Raw Data  
Location 419  
52 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,419/52					zero =	-1295	calib =	0.26 in-lb/unit	ft-lb	Shear Strength, psf	
-1295	-1288	-1292	-1279	-1293			-1295	1	0	0.00	0
-1277	-1294	-1280	-1293	-1280			-1277	2	4.68	0.39	3.64
-1293	-1289	-1299	-1287	-1296			-1293	3	0.52	0.04	0.40
-1296	-1296	-1288	-1293	-1281			-1296	4	-0.26	-0.02	-0.20
-1296	-1282	-1294	-1288	-1293			-1296	5	-0.26	-0.02	-0.20
-1290	-1287	-1296	-1286	-1291			-1290	6	1.3	0.11	1.01
-1291	-1281	-1296	-1299	-1286			-1291	7	1.04	0.09	0.81
-1294	-1279	-1299	-1295	-1279			-1294	8	0.26	0.02	0.20
-1293	-1288	-1293	-1295	-1287			-1293	9	0.52	0.04	0.40
-1296	-1287	-1289	-1292	-1282			-1296	10	-0.26	-0.02	-0.20
-1292	-1281	-1299	-1296	-1280			-1292	11	0.78	0.06	0.61
-1292	-1278	-1292	-1297	-1291			-1292	12	0.78	0.06	0.61
-1291	-1292	-1293	-1286	-1294			-1291	13	1.04	0.09	0.81
-1285	-1289	-1290	-1268	-1267			-1285	14	2.6	0.22	2.02
-1250	-1262	-1248	-1235	-1234			-1250	15	11.7	0.97	9.10
-1227	-1222	-1194	-1188	-1155			-1227	16	17.68	1.47	13.74
-1145	-1152	-1143	-1140	-1142			-1145	17	39	3.25	30.32
-1123	-1121	-1113	-1094	-1104			-1123	18	44.72	3.73	34.77
-1102	-1095	-1099	-1096	-1070			-1102	19	50.18	4.18	39.01
-1075	-1068	-1066	-1067	-1052			-1075	20	57.2	4.76	44.47
-1060	-1050	-1056	-1047	-1052			-1060	21	61.1	5.09	47.50
-1046	-1029	-1033	-1016	-1031			-1046	22	64.74	5.39	50.33
-1031	-1021	-1028	-1016	-1031			-1031	23	68.64	5.72	53.36
-1030	-1024	-1025	-1004	-1020			-1030	24	68.9	5.74	53.56
-1023	-1015	-1021	-1005	-1011			-1023	25	70.72	5.89	54.98
-1012	-1011	-1015	-999	-1008			-1012	26	73.58	6.13	57.20
-1005	-1008	-1011	-1011	-1012			-1005	27	75.4	6.28	58.62
-1008	-1013	-1013	-1011	-1013			-1008	28	74.62	6.22	58.01
-1004	-1006	-1011	-1004	-1009			-1004	29	75.66	6.30	58.82
-998	-1000	-1000	-990	-995			-998	30	77.22	6.43	60.03
-997	-993	-990	-974	-991			-997	31	77.48	6.45	60.24
-989	-978	-994	-987	-990			-989	32	79.56	6.63	61.85
-990	-987	-998	-1001	-979			-990	33	79.3	6.61	61.65
-994	-992	-982	-994	-981			-994	34	78.26	6.52	60.84
-997	-998	-995	-1001	-996			-997	35	77.48	6.45	60.24
-999	-995	-999	-998	-996			-999	36	76.96	6.41	59.83
-1006	-1001	-1005	-1009	-996			-1006	37	75.14	6.26	58.42
-1006	-1010	-1000	-1011	-1005			-1006	38	75.14	6.26	58.42
-998	-1009	-1007	-1014	-1021			-998	39	77.22	6.43	60.03
-1009	-1017	-1019	-1006	-1023			-1009	40	74.36	6.19	57.81
-1023	-1005	-1021	-1020	-1012			-1023	41	70.72	5.89	54.98
-1020	-1027	-1010	-1025	-1021			-1020	42	71.5	5.96	55.59
-1012	-1027	-1031	-1023	-1028			-1012	43	73.58	6.13	57.20
-1029	-1015	-1033	-1035	-1016			-1029	44	69.16	5.76	53.77
-1027	-1029	-1031	-1034	-1037			-1027	45	69.68	5.80	54.17
-1037	-1018	-1033	-1029	-1029			-1037	46	67.08	5.59	52.15
-1033	-1040	-1021	-1035	-1035			-1033	47	68.12	5.67	52.96
-1038	-1024	-1039	-1041	-1024			-1038	48	66.82	5.57	51.95
-1031	-1039	-1044	-1025	-1044			-1031	49	68.64	5.72	53.36
-1043	-1044	-1034	-1041	-1044			-1043	50	65.52	5.46	50.94
-1037	-1040	-1042	-1041	-1040			-1037	51	67.08	5.59	52.15
-1046	-1043	-1042	-1046	-1049			-1046	52	64.74	5.39	50.33
-1049	-1032	-1047	-1051	-1033			-1049	53	63.96	5.33	49.72
-1034	-1048	-1055	-1034	-1048			-1034	54	67.86	5.65	52.76
-1048	-1048	-1045	-1054	-1048			-1048	55	64.22	5.35	49.93
-1037	-1050	-1052	-1048	-1053			-1037	56	67.08	5.59	52.15
-1050	-1051	-1055	-1038	-1054			-1050	57	63.7	5.31	49.52
-1056	-1040	-1062	-1054	-1045			-1056	58	62.14	5.18	48.31
-1057	-1059	-1052	-1055	-1043			-1057	59	61.88	5.15	48.11
-1059	-1118	-1164	-1180	-1180			-1059	60	61.36	5.11	47.70
-1175	-1180	-1182	-1181	-1184			-1175	61	31.2	2.60	24.26
-1180	-1183	-1184	-1182	-1192			-1180	62	29.9	2.49	23.25
-1183	-1185	-1187	-1129	-985			-1183	63	29.12	2.43	22.64
-1002	-1022	-1061	-1085	-1105			-1002	64	76.18	6.35	59.22
-1120	-1131	-1156	-1162	-1234			-1120	65	45.5	3.79	35.37
-1228	-1249	-1246	-1236	-1249			-1228	66	17.42	1.45	13.54
-1233	-1242	-1247	-1235	-1245			-1233	67	16.12	1.34	12.53
-1238	-1250	-1254	-1240	-1254			-1238	68	14.82	1.23	11.52
-1240	-1250	-1246	-1236	-1232			-1240	69	14.3	1.19	11.12
-1249	-1249	-1250	-1257	-1248			-1249	70	11.96	1.00	9.30
-1251	-1249	-1247	-1247	-1236			-1251	71	11.44	0.95	8.89
-1249	-1238	-1256	-1255	-1239			-1249	72	11.96	1.00	9.30
-1249	-1236	-1249	-1244	-1238			-1249	73	11.96	1.00	9.30
-1249	-1235	-1255	-1253	-1248			-1249	74	11.96	1.00	9.30
-1249	-1250	-1252	-1249	-1243			-1249	75	11.96	1.00	9.30
-1247	-1237	-1255	-1255	-1246			-1247	76	12.48	1.04	9.70
-1256	-1239	-1252	-1252	-1246			-1256	77	10.14	0.84	7.88
-1246	-1244	-1255	-1244	-1255			-1246	78	12.74	1.06	9.90
-1239	-1255	-1251	-1248	-1252			-1239	79	14.56	1.21	11.32
-1251	-1251	-1242	-1251	-1239			-1251	80	11.44	0.95	8.89
-1254	-1241	-1253	-1252	-1251			-1254	81	10.66	0.89	8.29
-1247	-1251	-1251	-1243	-1254			-1247	82	12.48	1.04	9.70
-1252	-1254	-1242	-1254	-1237			-1252	83	11.18	0.93	8.69
-1250	-1238	-1252	-1239	-1252			-1250	84	11.7	0.97	9.10
-1243	-1258	-1239	-1254	-1242			-1243	85	13.52	1.13	10.51
-1256	-1239	-1252	-1241	-1253			-1256	86	10.14	0.84	7.88
-1240	-1251	-1244	-1255	-1251			-1240	87	14.3	1.19	11.12
-1248	-1250	-1253	-1257	-1253			-1248	88	12.22	1.02	9.50
-1246	-1256	-1251	-1249	-1245			-1246	89	12.74	1.06	9.90
-1248	-1236	-1248	-1245	-1241			-1248	90	12.22	1.02	9.50
-1224	-1227	-1199	-1189	-1192			-1224	91	18.46	1.54	14.35
-1190	-1187	-1168	-1180	-1173			-1190	92	27.3	2.27	21.22
-1173	-1162	-1175	-1175	-1173			-1173	93	31.72	2.64	24.66
-1172	-1176	-1179	-1177	-1161			-1172	94	31.98	2.66	24.86
-1162	-1177	-1173	-1170	-1178			-1162	95	34.58	2.88	26.88
-1176	-1178	-1165	-1178	-1179			-1176	96	30.94	2.58	24.05
-1182	-1171	-1178	-1167	-1177			-1182	97	29.38	2.45	22.84

-1177	-1171	-1179	-1183	-1165	-1177	98	30.68	2.56	23.85
-1178	-1178	-1172	-1179	-1164	-1178	99	30.42	2.53	23.65
-1179	-1183	-1167	-1181	-1165	-1179	100	30.16	2.51	23.45
-1175	-1178	-1165	-1181	-1175	-1175	101	31.2	2.60	24.26
-1165	-1179	-1173	-1178	-1179	-1165	102	33.8	2.82	26.28
-1177	-1180	-1180	-1165	-1179	-1177	103	30.68	2.56	23.85
-1180	-1169	-1176	-1183	-1168	-1180	104	29.9	2.49	23.25
-1183	-1181	-1175	-1182	-1168	-1183	105	29.12	2.43	22.64
-1184	-1182	-1168	-1179	-1164	-1184	106	28.86	2.40	22.44
-1181	-1182	-1174	-1179	-1166	-1181	107	29.64	2.47	23.04
-1182	-1186	-1168	-1184	-1166	-1182	108	29.38	2.45	22.84

K = 0.107148



**Vane Shear Raw Data  
Location 419  
54 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,419/54

zero =

-1295

calib =

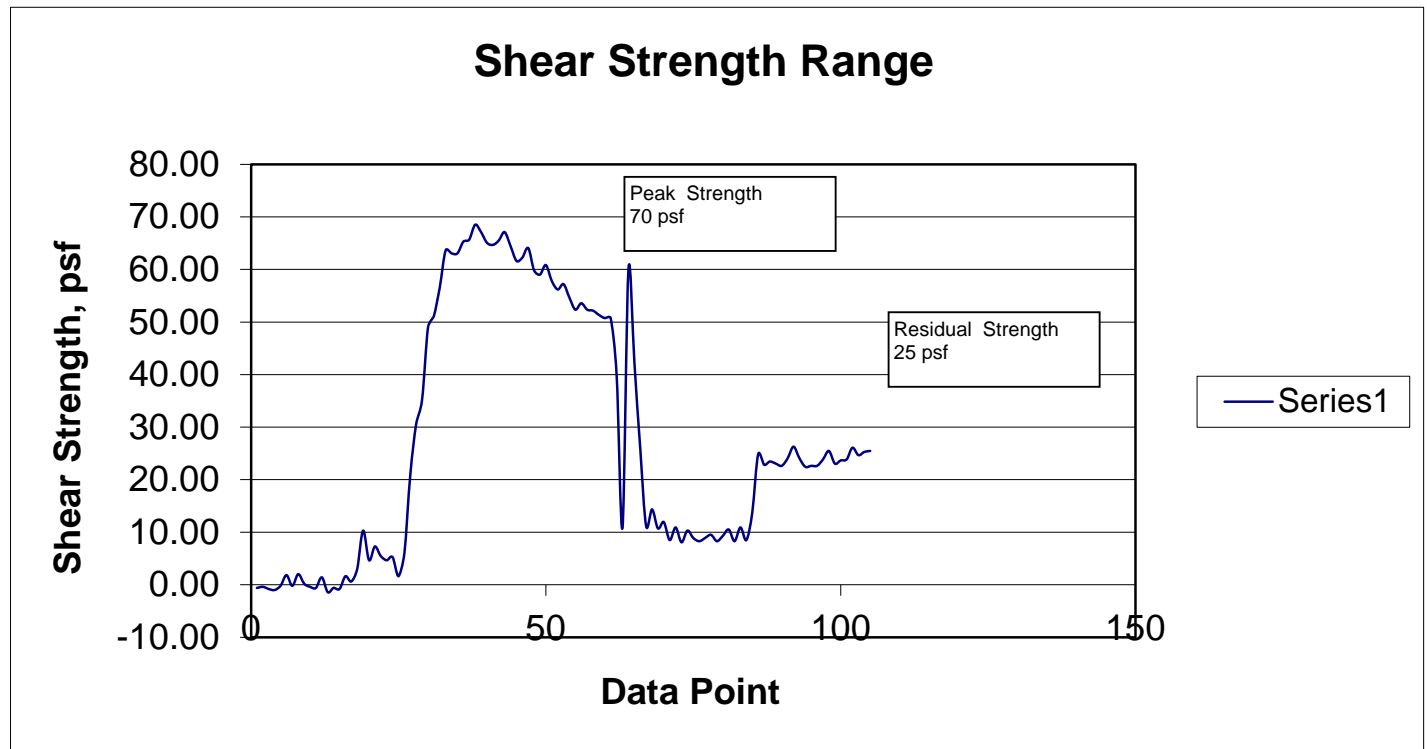
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1298	-1300	-1294	-1301	-1285	-1298	1	-0.78	-0.06	-0.61
-1297	-1294	-1298	-1301	-1292	-1297	2	-0.52	-0.04	-0.40
-1299	-1300	-1297	-1293	-1303	-1299	3	-1.04	-0.09	-0.81
-1300	-1306	-1287	-1301	-1284	-1300	4	-1.3	-0.11	-1.01
-1296	-1287	-1297	-1289	-1302	-1296	5	-0.26	-0.02	-0.20
-1286	-1299	-1294	-1299	-1297	-1286	6	2.34	0.19	1.82
-1296	-1291	-1300	-1303	-1302	-1296	7	-0.26	-0.02	-0.20
-1285	-1305	-1292	-1287	-1300	-1285	8	2.6	0.22	2.02
-1294	-1300	-1296	-1296	-1292	-1294	9	0.26	0.02	0.20
-1297	-1298	-1298	-1299	-1298	-1297	10	-0.52	-0.04	-0.40
-1298	-1294	-1302	-1296	-1307	-1298	11	-0.78	-0.06	-0.61
-1288	-1300	-1288	-1295	-1285	-1288	12	1.82	0.15	1.41
-1302	-1301	-1299	-1301	-1294	-1302	13	-1.82	-0.15	-1.41
-1298	-1297	-1299	-1286	-1302	-1298	14	-0.78	-0.06	-0.61
-1299	-1299	-1297	-1300	-1303	-1299	15	-1.04	-0.09	-0.81
-1287	-1302	-1283	-1295	-1279	-1287	16	2.08	0.17	1.62
-1292	-1290	-1295	-1276	-1282	-1292	17	0.78	0.06	0.61
-1280	-1277	-1270	-1271	-1248	-1280	18	3.9	0.32	3.03
-1244	-1248	-1261	-1255	-1261	-1244	19	13.26	1.10	10.31
-1272	-1264	-1274	-1272	-1263	-1272	20	5.98	0.50	4.65
-1259	-1271	-1268	-1267	-1267	-1259	21	9.36	0.78	7.28
-1268	-1268	-1262	-1269	-1259	-1268	22	7.02	0.58	5.46
-1272	-1266	-1269	-1261	-1271	-1272	23	5.98	0.50	4.65
-1269	-1269	-1260	-1283	-1273	-1269	24	6.76	0.56	5.26
-1287	-1271	-1282	-1281	-1286	-1287	25	2.08	0.17	1.62
-1265	-1270	-1236	-1228	-1201	-1265	26	7.8	0.65	6.06
-1191	-1172	-1176	-1173	-1152	-1191	27	27.04	2.25	21.02
-1144	-1154	-1144	-1119	-1121	-1144	28	39.26	3.27	30.52
-1121	-1103	-1090	-1089	-1072	-1121	29	45.24	3.77	35.17
-1053	-1059	-1051	-1043	-1044	-1053	30	62.92	5.24	48.92
-1042	-1026	-1033	-1023	-1022	-1042	31	65.78	5.48	51.14
-1015	-1016	-1002	-1004	-993	-1015	32	72.8	6.06	56.60
-980	-990	-991	-981	-981	-980	33	81.9	6.82	63.67
-983	-980	-982	-969	-981	-983	34	81.12	6.76	63.07
-983	-966	-983	-973	-977	-983	35	81.12	6.76	63.07
-972	-964	-970	-969	-957	-972	36	83.98	7.00	65.29
-970	-969	-960	-974	-966	-970	37	84.5	7.04	65.69
-956	-970	-962	-967	-973	-956	38	88.14	7.34	68.52
-963	-968	-971	-956	-972	-963	39	86.32	7.19	67.11
-973	-967	-970	-972	-961	-973	40	83.72	6.97	65.09
-975	-974	-971	-975	-962	-975	41	83.2	6.93	64.68
-971	-974	-959	-980	-975	-971	42	84.24	7.02	65.49
-963	-982	-973	-979	-982	-963	43	86.32	7.19	67.11
-976	-986	-990	-973	-987	-976	44	82.94	6.91	64.48
-990	-976	-989	-988	-991	-990	45	79.3	6.61	61.65
-987	-993	-981	-992	-990	-987	46	80.08	6.67	62.26
-978	-992	-993	-997	-998	-978	47	82.42	6.87	64.08
-999	-995	-997	-994	-1008	-999	48	76.96	6.41	59.83
-1003	-1007	-995	-1007	-999	-1003	49	75.92	6.32	59.02
-994	-999	-999	-1003	-1008	-994	50	78.26	6.52	60.84
-1009	-1005	-1009	-1007	-1014	-1009	51	74.36	6.19	57.81
-1017	-1017	-1025	-1026	-1013	-1017	52	72.28	6.02	56.19
-1012	-1027	-1023	-1026	-1028	-1012	53	73.58	6.13	57.20
-1025	-1014	-1034	-1024	-1036	-1025	54	70.2	5.85	54.58
-1036	-1035	-1024	-1035	-1032	-1036	55	67.34	5.61	52.35
-1030	-1035	-1039	-1032	-1031	-1030	56	68.9	5.74	53.56
-1036	-1036	-1022	-1038	-1043	-1036	57	67.34	5.61	52.35
-1037	-1035	-1039	-1035	-1042	-1037	58	67.08	5.59	52.15
-1041	-1038	-1028	-1041	-1040	-1041	59	66.04	5.50	51.34
-1044	-1031	-1045	-1045	-1036	-1044	60	65.26	5.44	50.74
-1044	-1052	-1036	-1048	-1057	-1044	61	65.26	5.44	50.74
-1097	-1210	-1213	-1220	-1227	-1097	62	51.48	4.29	40.02
-1241	-1239	-1274	-1269	-1191	-1241	63	14.04	1.17	10.92
-998	-964	-989	-1016	-1045	-998	64	77.22	6.43	60.03
-1085	-1091	-1094	-1151	-1155	-1085	65	54.6	4.55	42.45
-1167	-1229	-1231	-1234	-1237	-1167	66	33.28	2.77	25.87
-1240	-1225	-1242	-1232	-1241	-1240	67	14.3	1.19	11.12
-1224	-1236	-1224	-1242	-1241	-1224	68	18.46	1.54	14.35
-1242	-1237	-1246	-1246	-1241	-1242	69	13.78	1.15	10.71
-1236	-1245	-1242	-1243	-1247	-1236	70	15.34	1.28	11.93
-1253	-1245	-1271	-1262	-1257	-1253	71	10.92	0.91	8.49
-1241	-1257	-1250	-1253	-1259	-1241	72	14.04	1.17	10.92
-1255	-1245	-1254	-1248	-1254	-1255	73	10.4	0.87	8.09
-1244	-1254	-1237	-1254	-1237	-1244	74	13.26	1.10	10.31
-1251	-1249	-1253	-1250	-1248	-1251	75	11.44	0.95	8.89
-1254	-1249	-1252	-1243	-1255	-1254	76	10.66	0.89	8.29
-1251	-1254	-1255	-1253	-1256	-1251	77	11.44	0.95	8.89
-1248	-1250	-1252	-1254	-1254	-1248	78	12.22	1.02	9.50
-1254	-1242	-1250	-1241	-1254	-1254	79	10.66	0.89	8.29
-1249	-1253	-1250	-1257	-1255	-1249	80	11.96	1.00	9.30
-1243	-1259	-1249	-1253	-1250	-1243	81	13.52	1.13	10.51
-1254	-1240	-1249	-1244	-1255	-1254	82	10.66	0.89	8.29
-1241	-1252	-1241	-1258	-1254	-1241	83	14.04	1.17	10.92
-1253	-1244	-1247	-1248	-1235	-1253	84	10.92	0.91	8.49
-1227	-1228	-1209	-1194	-1185	-1227	85	17.68	1.47	13.74
-1172	-1183	-1186	-1176	-1182	-1172	86	31.98	2.66	24.86
-1182	-1171	-1182	-1180	-1177	-1182	87	29.38	2.45	22.84
-1179	-1181	-1165	-1178	-1181	-1179	88	30.16	2.51	23.45
-1181	-1176	-1181	-1179	-1174	-1181	89	29.64	2.47	23.04
-1183	-1180	-1178	-1179	-1164	-1183	90	29.12	2.43	22.64
-1176	-1176	-1160	-1177	-1175	-1176	91	30.94	2.58	24.05
-1165	-1179	-1170	-1181	-1178	-1165	92	33.8	2.82	26.28
-1176	-1181	-1185	-1169	-1185	-1176	93	30.94	2.58	24.05
-1184	-1172	-1183	-1177	-1180	-1184	94	28.86	2.40	22.44
-1183	-1182	-1181	-1183	-1168	-1183	95	29.12	2.43	22.64
-1183	-1187	-1174	-1183	-1169	-1183	96	29.12	2.43	22.64
-1177	-1186	-1169	-1179	-1184	-1177	97	30.68	2.56	23.85

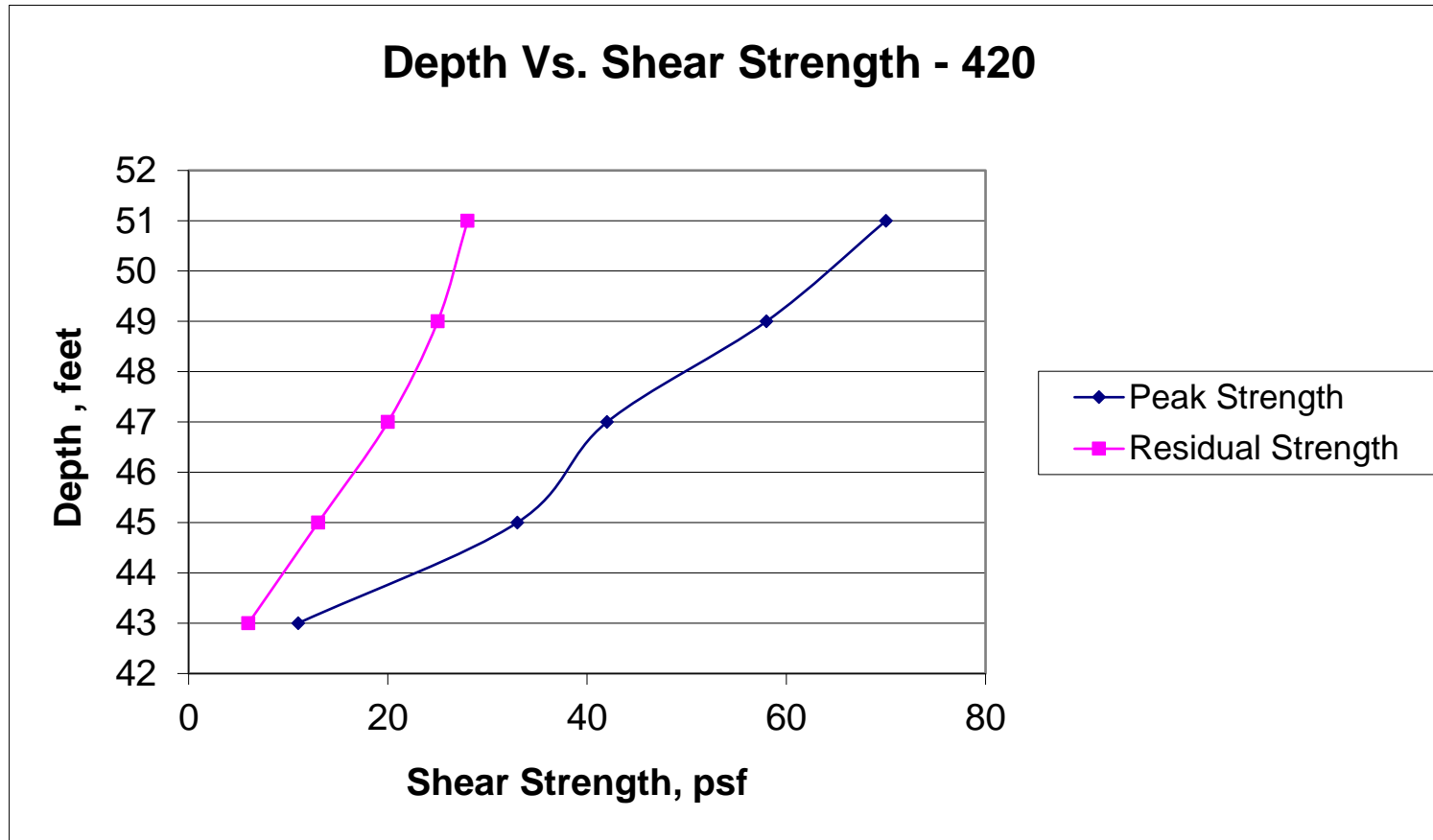
-1169	-1180	-1185	-1180	-1183	-1169	98	32.76	2.73	25.47
-1181	-1180	-1185	-1175	-1185	-1181	99	29.64	2.47	23.04
-1178	-1184	-1185	-1184	-1184	-1178	100	30.42	2.53	23.65
-1177	-1180	-1177	-1179	-1181	-1177	101	30.68	2.56	23.85
-1166	-1185	-1169	-1183	-1179	-1166	102	33.54	2.79	26.07
-1173	-1184	-1169	-1182	-1178	-1173	103	31.72	2.64	24.66
-1170	-1184	-1170	-1185	-1181	-1170	104	32.5	2.71	25.27
-1169	-1187	-1179	-1181	-1185	-1169	105	32.76	2.73	25.47

K = 0.107148



**Vane Shear Summary  
Location 420**

Depth, ft	Shear Strength, psf	
	Peak	Residual
43	11	6
45	33	13
47	42	20
49	58	25
51	70	28





**Vane Shear Raw Data  
Location 420  
43 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,420/43

zero =

-1295

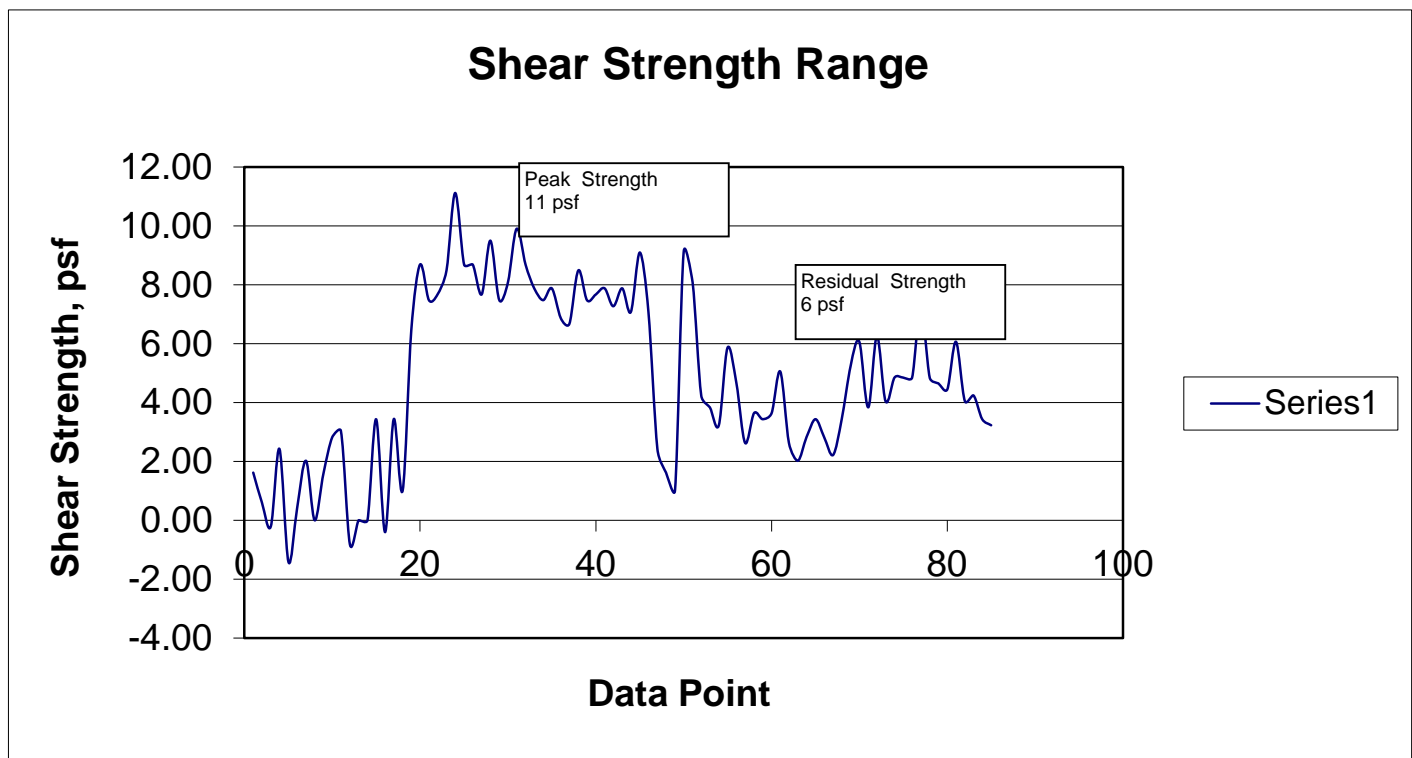
calib =

0.26 in-lb/unit ft-lb

Shear Strength, psf

-1287	-1292	-1284	-1296	-1281	-1287	1	2.08	0.17	1.62
-1292	-1282	-1291	-1284	-1300	-1292	2	0.78	0.06	0.61
-1296	-1291	-1296	-1292	-1295	-1296	3	-0.26	-0.02	-0.20
-1283	-1294	-1281	-1292	-1282	-1283	4	3.12	0.26	2.43
-1302	-1293	-1296	-1295	-1293	-1302	5	-1.82	-0.15	-1.41
-1293	-1285	-1293	-1284	-1298	-1293	6	0.52	0.04	0.40
-1285	-1291	-1280	-1292	-1281	-1285	7	2.6	0.22	2.02
-1295	-1281	-1298	-1296	-1294	-1295	8	0	0.00	0.00
-1287	-1280	-1296	-1292	-1298	-1287	9	2.08	0.17	1.62
-1281	-1298	-1297	-1281	-1295	-1281	10	3.64	0.30	2.83
-1280	-1298	-1290	-1294	-1296	-1280	11	3.9	0.32	3.03
-1299	-1299	-1284	-1296	-1279	-1299	12	-1.04	-0.09	-0.81
-1295	-1292	-1299	-1285	-1300	-1295	13	0	0.00	0.00
-1295	-1295	-1295	-1295	-1292	-1295	14	0	0.00	0.00
-1278	-1295	-1279	-1293	-1289	-1278	15	4.42	0.37	3.44
-1297	-1282	-1296	-1291	-1296	-1297	16	-0.52	-0.04	-0.40
-1278	-1297	-1285	-1294	-1290	-1278	17	4.42	0.37	3.44
-1290	-1274	-1285	-1280	-1282	-1290	18	1.3	0.11	1.01
-1263	-1277	-1277	-1260	-1274	-1263	19	8.32	0.69	6.47
-1252	-1265	-1257	-1252	-1262	-1252	20	11.18	0.93	8.69
-1258	-1262	-1246	-1261	-1256	-1258	21	9.62	0.80	7.48
-1257	-1257	-1251	-1253	-1241	-1257	22	9.88	0.82	7.68
-1253	-1241	-1254	-1248	-1261	-1253	23	10.92	0.91	8.49
-1240	-1257	-1247	-1258	-1253	-1240	24	14.3	1.19	11.12
-1252	-1240	-1253	-1241	-1256	-1252	25	11.18	0.93	8.69
-1252	-1256	-1250	-1251	-1254	-1252	26	11.18	0.93	8.69
-1257	-1243	-1254	-1239	-1253	-1257	27	9.88	0.82	7.68
-1248	-1253	-1239	-1253	-1255	-1248	28	12.22	1.02	9.50
-1258	-1240	-1256	-1241	-1256	-1258	29	9.62	0.80	7.48
-1255	-1258	-1260	-1258	-1261	-1255	30	10.4	0.87	8.09
-1246	-1252	-1242	-1254	-1248	-1246	31	12.74	1.06	9.90
-1252	-1261	-1252	-1258	-1257	-1252	32	11.18	0.93	8.69
-1256	-1245	-1257	-1249	-1255	-1256	33	10.14	0.84	7.88
-1258	-1254	-1253	-1251	-1258	-1258	34	9.62	0.80	7.48
-1256	-1254	-1261	-1242	-1253	-1256	35	10.14	0.84	7.88
-1261	-1241	-1263	-1260	-1259	-1261	36	8.84	0.74	6.87
-1262	-1259	-1253	-1260	-1243	-1262	37	8.58	0.71	6.67
-1253	-1253	-1240	-1260	-1248	-1253	38	10.92	0.91	8.49
-1258	-1262	-1257	-1256	-1245	-1258	39	9.62	0.80	7.48
-1257	-1265	-1250	-1259	-1242	-1257	40	9.88	0.82	7.68
-1256	-1264	-1253	-1259	-1246	-1256	41	10.14	0.84	7.88
-1259	-1258	-1263	-1255	-1260	-1259	42	9.36	0.78	7.28
-1256	-1260	-1248	-1259	-1246	-1256	43	10.14	0.84	7.88
-1260	-1261	-1258	-1246	-1259	-1260	44	9.1	0.76	7.07
-1250	-1259	-1245	-1262	-1245	-1250	45	11.7	0.97	9.10
-1260	-1256	-1274	-1261	-1280	-1260	46	9.1	0.76	7.07
-1283	-1291	-1276	-1286	-1277	-1283	47	3.12	0.26	2.43
-1287	-1288	-1296	-1282	-1295	-1287	48	2.08	0.17	1.62
-1290	-1286	-1251	-1250	-1236	-1290	49	1.3	0.11	1.01
-1250	-1246	-1252	-1240	-1255	-1250	50	11.7	0.97	9.10
-1255	-1259	-1253	-1263	-1258	-1255	51	10.4	0.87	8.09
-1274	-1272	-1276	-1270	-1279	-1274	52	5.46	0.45	4.24
-1276	-1278	-1265	-1278	-1263	-1276	53	4.94	0.41	3.84
-1279	-1263	-1278	-1273	-1281	-1279	54	4.16	0.35	3.23
-1266	-1282	-1280	-1273	-1275	-1266	55	7.54	0.63	5.86
-1272	-1281	-1265	-1278	-1277	-1272	56	5.98	0.50	4.65
-1282	-1275	-1280	-1278	-1274	-1282	57	3.38	0.28	2.63
-1277	-1280	-1277	-1274	-1282	-1277	58	4.68	0.39	3.64
-1278	-1281	-1277	-1280	-1273	-1278	59	4.42	0.37	3.44
-1277	-1277	-1281	-1272	-1277	-1277	60	4.68	0.39	3.64
-1270	-1282	-1266	-1280	-1267	-1270	61	6.5	0.54	5.05
-1282	-1273	-1278	-1273	-1281	-1282	62	3.38	0.28	2.63
-1285	-1264	-1280	-1266	-1280	-1285	63	2.6	0.22	2.02
-1281	-1274	-1282	-1265	-1281	-1281	64	3.64	0.30	2.83
-1278	-1277	-1279	-1271	-1280	-1278	65	4.42	0.37	3.44
-1281	-1275	-1284	-1267	-1277	-1281	66	3.64	0.30	2.83
-1284	-1265	-1283	-1280	-1282	-1284	67	2.86	0.24	2.22
-1278	-1279	-1281	-1274	-1254	-1278	68	4.42	0.37	3.44
-1269	-1268	-1263	-1274	-1262	-1269	69	6.76	0.56	5.26
-1265	-1266	-1271	-1267	-1270	-1265	70	7.8	0.65	6.06
-1276	-1269	-1274	-1274	-1270	-1276	71	4.94	0.41	3.84
-1264	-1270	-1271	-1269	-1269	-1264	72	8.06	0.67	6.27
-1275	-1268	-1272	-1272	-1262	-1275	73	5.2	0.43	4.04
-1271	-1272	-1271	-1266	-1270	-1271	74	6.24	0.52	4.85
-1271	-1276	-1266	-1274	-1258	-1271	75	6.24	0.52	4.85
-1271	-1272	-1270	-1272	-1272	-1271	76	6.24	0.52	4.85
-1259	-1272	-1258	-1268	-1271	-1259	77	9.36	0.78	7.28
-1271	-1274	-1259	-1269	-1263	-1271	78	6.24	0.52	4.85
-1272	-1257	-1272	-1273	-1269	-1272	79	5.98	0.50	4.65
-1273	-1271	-1273	-1258	-1273	-1273	80	5.72	0.48	4.45
-1265	-1274	-1258	-1272	-1258	-1265	81	7.8	0.65	6.06
-1275	-1260	-1275	-1259	-1268	-1275	82	5.2	0.43	4.04
-1274	-1272	-1280	-1267	-1278	-1274	83	5.46	0.45	4.24
-1278	-1283	-1265	-1278	-1278	-1278	84	4.42	0.37	3.44
-1279	-1265	-1280	-1273	-1284	-1279	85	4.16	0.35	3.23

K = 0.107148



**Vane Shear Raw Data  
Location 420  
45 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,420/45

zero =

-1295

calib =

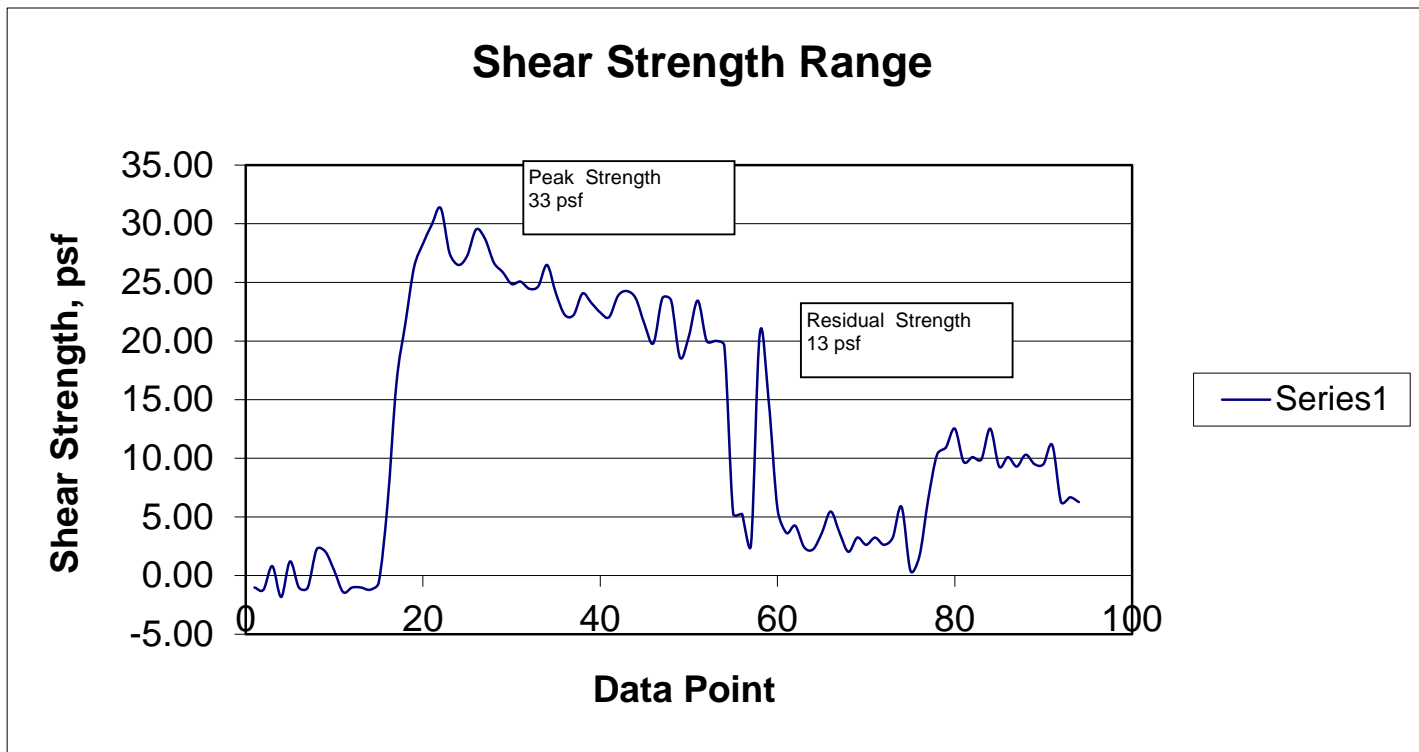
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1300	-1299	-1300	-1300	-1295	-1300	1	-1.3	-0.11	-1.01
-1301	-1289	-1300	-1285	-1297	-1301	2	-1.56	-0.13	-1.21
-1291	-1301	-1285	-1299	-1290	-1291	3	1.04	0.09	0.81
-1304	-1287	-1301	-1301	-1299	-1304	4	-2.34	-0.19	-1.82
-1289	-1301	-1295	-1298	-1302	-1289	5	1.56	0.13	1.21
-1300	-1300	-1301	-1299	-1287	-1300	6	-1.3	-0.11	-1.01
-1300	-1290	-1302	-1291	-1299	-1300	7	-1.3	-0.11	-1.01
-1284	-1302	-1302	-1293	-1298	-1284	8	2.86	0.24	2.22
-1285	-1301	-1300	-1291	-1301	-1285	9	2.6	0.22	2.02
-1293	-1299	-1287	-1301	-1298	-1293	10	0.52	0.04	0.40
-1302	-1302	-1286	-1301	-1300	-1302	11	-1.82	-0.15	-1.41
-1300	-1298	-1288	-1296	-1300	-1300	12	-1.3	-0.11	-1.01
-1300	-1301	-1294	-1298	-1285	-1300	13	-1.3	-0.11	-1.01
-1301	-1285	-1295	-1297	-1295	-1301	14	-1.56	-0.13	-1.21
-1298	-1285	-1292	-1275	-1279	-1298	15	-0.78	-0.06	-0.61
-1265	-1254	-1246	-1224	-1227	-1265	16	7.8	0.65	6.06
-1214	-1215	-1196	-1201	-1190	-1214	17	21.06	1.75	16.37
-1189	-1188	-1177	-1181	-1162	-1189	18	27.56	2.30	21.43
-1165	-1171	-1157	-1170	-1166	-1165	19	33.8	2.82	26.28
-1155	-1167	-1151	-1161	-1155	-1155	20	36.4	3.03	28.30
-1147	-1159	-1142	-1154	-1152	-1147	21	38.48	3.21	29.92
-1140	-1156	-1149	-1159	-1157	-1140	22	40.3	3.36	31.33
-1159	-1151	-1159	-1150	-1160	-1159	23	35.36	2.95	27.49
-1164	-1158	-1163	-1162	-1148	-1164	24	34.06	2.84	26.48
-1160	-1161	-1146	-1160	-1158	-1160	25	35.1	2.92	27.29
-1149	-1166	-1149	-1168	-1159	-1149	26	37.96	3.16	29.51
-1153	-1168	-1162	-1171	-1170	-1153	27	36.92	3.08	28.70
-1163	-1169	-1168	-1152	-1167	-1163	28	34.32	2.86	26.68
-1167	-1151	-1170	-1168	-1171	-1167	29	33.28	2.77	25.87
-1172	-1166	-1172	-1171	-1156	-1172	30	31.98	2.66	24.86
-1171	-1177	-1163	-1175	-1175	-1171	31	32.24	2.69	25.06
-1174	-1162	-1178	-1172	-1170	-1174	32	31.46	2.62	24.46
-1173	-1176	-1169	-1181	-1165	-1173	33	31.72	2.64	24.66
-1164	-1177	-1169	-1181	-1179	-1164	34	34.06	2.84	26.48
-1176	-1181	-1179	-1173	-1178	-1176	35	30.94	2.58	24.05
-1185	-1184	-1164	-1176	-1182	-1185	36	28.6	2.38	22.23
-1185	-1168	-1180	-1183	-1165	-1185	37	28.6	2.38	22.23
-1176	-1181	-1170	-1176	-1180	-1176	38	30.94	2.58	24.05
-1180	-1170	-1185	-1186	-1176	-1180	39	29.9	2.49	23.25
-1184	-1186	-1173	-1188	-1185	-1184	40	28.86	2.40	22.44
-1186	-1170	-1185	-1193	-1173	-1186	41	28.34	2.36	22.03
-1177	-1186	-1188	-1174	-1194	-1177	42	30.68	2.56	23.85
-1175	-1179	-1194	-1197	-1177	-1175	43	31.2	2.60	24.26
-1178	-1190	-1191	-1176	-1188	-1178	44	30.42	2.53	23.65
-1189	-1190	-1180	-1192	-1194	-1189	45	27.56	2.30	21.43
-1197	-1177	-1198	-1194	-1181	-1197	46	25.48	2.12	19.81
-1178	-1193	-1193	-1182	-1201	-1178	47	30.42	2.53	23.65
-1179	-1197	-1199	-1200	-1200	-1179	48	30.16	2.51	23.45
-1203	-1197	-1181	-1191	-1193	-1203	49	23.92	1.99	18.60
-1194	-1178	-1192	-1193	-1183	-1194	50	26.26	2.19	20.42
-1179	-1193	-1196	-1182	-1193	-1179	51	30.16	2.51	23.45
-1196	-1198	-1188	-1197	-1189	-1196	52	25.74	2.14	20.01
-1196	-1185	-1182	-1199	-1186	-1196	53	25.74	2.14	20.01
-1198	-1192	-1194	-1200	-1269	-1198	54	25.22	2.10	19.61
-1269	-1287	-1286	-1269	-1286	-1269	55	6.76	0.56	5.26
-1269	-1285	-1286	-1272	-1284	-1269	56	6.76	0.56	5.26
-1282	-1228	-1140	-1172	-1177	-1282	57	3.38	0.28	2.63
-1193	-1196	-1202	-1213	-1228	-1193	58	26.52	2.21	20.62
-1221	-1255	-1246	-1251	-1272	-1221	59	19.24	1.60	14.96
-1267	-1263	-1272	-1276	-1265	-1267	60	7.28	0.61	5.66
-1277	-1274	-1270	-1277	-1275	-1277	61	4.68	0.39	3.64
-1274	-1278	-1274	-1258	-1276	-1274	62	5.46	0.45	4.24
-1283	-1275	-1281	-1282	-1265	-1283	63	3.12	0.26	2.43
-1284	-1282	-1264	-1280	-1276	-1284	64	2.86	0.24	2.22
-1277	-1284	-1281	-1276	-1286	-1277	65	4.68	0.39	3.64
-1268	-1284	-1283	-1270	-1279	-1268	66	7.02	0.58	5.46
-1277	-1263	-1284	-1281	-1267	-1277	67	4.68	0.39	3.64
-1285	-1284	-1270	-1282	-1283	-1285	68	2.6	0.22	2.02
-1279	-1281	-1264	-1284	-1284	-1279	69	4.16	0.35	3.23
-1282	-1282	-1267	-1285	-1283	-1282	70	3.38	0.28	2.63
-1279	-1277	-1263	-1281	-1282	-1279	71	4.16	0.35	3.23
-1282	-1283	-1273	-1283	-1272	-1282	72	3.38	0.28	2.63
-1279	-1264	-1282	-1277	-1277	-1279	73	4.16	0.35	3.23
-1266	-1282	-1286	-1276	-1286	-1266	74	7.54	0.63	5.86
-1293	-1291	-1269	-1286	-1287	-1293	75	0.52	0.04	0.40
-1287	-1281	-1265	-1272	-1255	-1287	76	2.08	0.17	1.62
-1263	-1243	-1253	-1246	-1230	-1263	77	8.32	0.69	6.47
-1244	-1229	-1242	-1246	-1240	-1244	78	13.26	1.10	10.31
-1241	-1241	-1244	-1233	-1249	-1241	79	14.04	1.17	10.92
-1233	-1247	-1241	-1246	-1243	-1233	80	16.12	1.34	12.53
-1247	-1244	-1236	-1244	-1246	-1247	81	12.48	1.04	9.70
-1245	-1237	-1251	-1247	-1239	-1245	82	13	1.08	10.11
-1246	-1238	-1247	-1234	-1247	-1246	83	12.74	1.06	9.90
-1233	-1247	-1236	-1251	-1248	-1233	84	16.12	1.34	12.53
-1249	-1241	-1246	-1246	-1245	-1249	85	11.96	1.00	9.30
-1245	-1248	-1250	-1243	-1251	-1245	86	13	1.08	10.11
-1249	-1248	-1242	-1248	-1239	-1249	87	11.96	1.00	9.30
-1244	-1248	-1249	-1252	-1249	-1244	88	13.26	1.10	10.31
-1248	-1238	-1252	-1230	-1247	-1248	89	12.22	1.02	9.50
-1248	-1253	-1251	-1244	-1254	-1248	90	12.22	1.02	9.50
-1240	-1250	-1250	-1262	-1271	-1240	91	14.3	1.19	11.12
-1264	-1278	-1262	-1275	-1267	-1264	92	8.06	0.67	6.27
-1262	-1273	-1261	-1279	-1271	-1262	93	8.58	0.71	6.67
-1264	-1273	-1259	-1276	-1263	-1264	94	8.06	0.67	6.27

K =

0.107148



**Vane Shear Raw Data  
Location 420  
47 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,420/47

zero =

-1295

calib =

0.26 in-lb/unit ft-lb

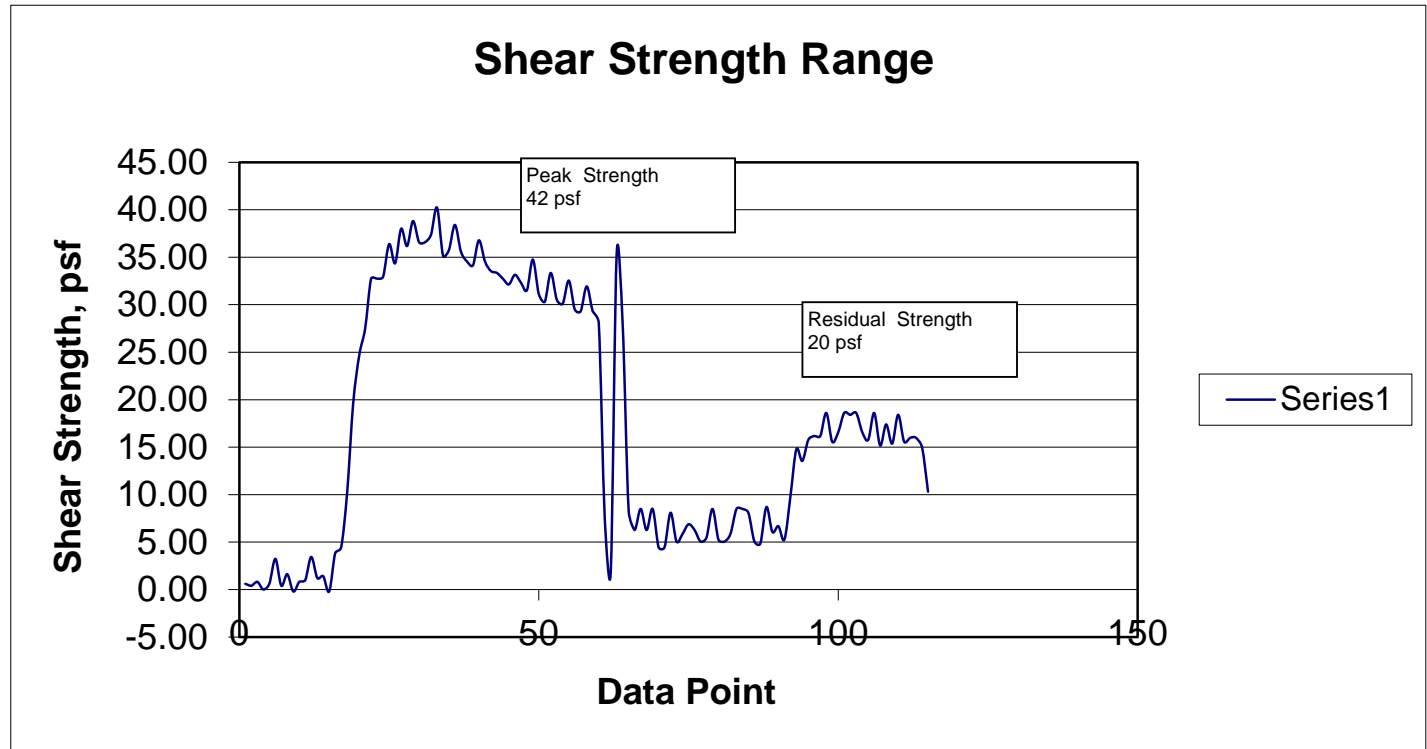
Shear Strength, psf

-1292	-1278	-1296	-1287	-1290	-1292	1	0.78	0.06	0.61
-1293	-1292	-1290	-1282	-1292	-1293	2	0.52	0.04	0.40
-1291	-1294	-1288	-1294	-1279	-1291	3	1.04	0.09	0.81
-1295	-1289	-1292	-1289	-1292	-1295	4	0	0.00	0.00
-1292	-1291	-1293	-1294	-1291	-1292	5	0.78	0.06	0.61
-1279	-1293	-1277	-1294	-1282	-1279	6	4.16	0.35	3.23
-1293	-1285	-1293	-1279	-1294	-1293	7	0.52	0.04	0.40
-1287	-1291	-1284	-1294	-1279	-1287	8	2.08	0.17	1.62
-1296	-1287	-1295	-1287	-1293	-1296	9	-0.26	-0.02	-0.20
-1291	-1279	-1292	-1277	-1293	-1291	10	1.04	0.09	0.81
-1290	-1291	-1290	-1290	-1293	-1290	11	1.3	0.11	1.01
-1278	-1295	-1280	-1289	-1278	-1278	12	4.42	0.37	3.44
-1289	-1291	-1294	-1289	-1293	-1289	13	1.56	0.13	1.21
-1288	-1278	-1292	-1279	-1288	-1288	14	1.82	0.15	1.41
-1296	-1288	-1292	-1290	-1288	-1296	15	-0.26	-0.02	-0.20
-1276	-1283	-1279	-1276	-1274	-1276	16	4.94	0.41	3.84
-1273	-1269	-1271	-1267	-1250	-1273	17	5.72	0.48	4.45
-1244	-1245	-1234	-1220	-1223	-1244	18	13.26	1.10	10.31
-1198	-1205	-1187	-1193	-1186	-1198	19	25.22	2.10	19.61
-1173	-1167	-1164	-1156	-1159	-1173	20	31.72	2.64	24.66
-1159	-1156	-1153	-1155	-1144	-1159	21	35.36	2.95	27.49
-1133	-1150	-1144	-1125	-1135	-1133	22	42.12	3.51	32.75
-1133	-1120	-1135	-1132	-1127	-1133	23	42.12	3.51	32.75
-1132	-1132	-1119	-1127	-1123	-1132	24	42.38	3.53	32.95
-1115	-1129	-1125	-1108	-1123	-1115	25	46.8	3.90	36.38
-1125	-1111	-1123	-1127	-1108	-1125	26	44.2	3.68	34.36
-1107	-1119	-1115	-1106	-1120	-1107	27	48.88	4.07	38.00
-1116	-1108	-1117	-1119	-1106	-1116	28	46.54	3.88	36.18
-1103	-1125	-1122	-1103	-1117	-1103	29	49.92	4.16	38.81
-1114	-1115	-1098	-1113	-1113	-1114	30	47.06	3.92	36.59
-1114	-1106	-1114	-1109	-1115	-1114	31	47.06	3.92	36.59
-1110	-1117	-1101	-1114	-1106	-1110	32	48.1	4.01	37.39
-1096	-1111	-1113	-1104	-1114	-1096	33	51.74	4.31	40.22
-1121	-1104	-1119	-1116	-1115	-1121	34	45.24	3.77	35.17
-1118	-1113	-1111	-1119	-1108	-1118	35	46.02	3.83	35.78
-1105	-1117	-1114	-1121	-1124	-1105	36	49.4	4.12	38.41
-1119	-1120	-1123	-1107	-1120	-1119	37	45.76	3.81	35.58
-1124	-1111	-1122	-1123	-1116	-1124	38	44.46	3.70	34.56
-1126	-1129	-1117	-1125	-1120	-1126	39	43.94	3.66	34.16
-1113	-1124	-1119	-1126	-1129	-1113	40	47.32	3.94	36.79
-1124	-1127	-1127	-1114	-1127	-1124	41	44.46	3.70	34.56
-1129	-1128	-1120	-1129	-1133	-1129	42	43.16	3.60	33.55
-1130	-1116	-1124	-1130	-1115	-1130	43	42.9	3.57	33.35
-1133	-1130	-1125	-1131	-1134	-1133	44	42.12	3.51	32.75
-1136	-1122	-1140	-1137	-1122	-1136	45	41.34	3.44	32.14
-1131	-1130	-1120	-1135	-1139	-1131	46	42.64	3.55	33.15
-1135	-1139	-1143	-1125	-1141	-1135	47	41.6	3.47	32.34
-1139	-1140	-1136	-1139	-1127	-1139	48	40.56	3.38	31.53
-1123	-1137	-1143	-1128	-1143	-1123	49	44.72	3.73	34.77
-1141	-1144	-1131	-1146	-1146	-1141	50	40.04	3.34	31.13
-1145	-1125	-1140	-1137	-1129	-1145	51	39	3.25	30.32
-1130	-1148	-1150	-1131	-1144	-1130	52	42.9	3.57	33.35
-1144	-1150	-1129	-1146	-1149	-1144	53	39.26	3.27	30.52
-1146	-1137	-1145	-1152	-1142	-1146	54	38.74	3.23	30.12
-1134	-1149	-1148	-1149	-1139	-1134	55	41.86	3.49	32.54
-1149	-1148	-1138	-1149	-1148	-1149	56	37.96	3.16	29.51
-1150	-1137	-1150	-1152	-1136	-1150	57	37.7	3.14	29.31
-1137	-1153	-1154	-1136	-1151	-1137	58	41.08	3.42	31.94
-1150	-1150	-1146	-1146	-1157	-1150	59	37.7	3.14	29.31
-1156	-1177	-1245	-1237	-1252	-1156	60	36.14	3.01	28.10
-1257	-1275	-1280	-1265	-1287	-1257	61	9.88	0.82	7.68
-1286	-1165	-1093	-1096	-1108	-1286	62	2.34	0.19	1.82
-1120	-1122	-1145	-1151	-1148	-1120	63	45.5	3.79	35.37
-1156	-1231	-1231	-1264	-1272	-1156	64	36.14	3.01	28.10
-1254	-1270	-1254	-1268	-1262	-1254	65	10.66	0.89	8.29
-1264	-1252	-1268	-1262	-1272	-1264	66	8.06	0.67	6.27
-1253	-1272	-1255	-1266	-1263	-1253	67	10.92	0.91	8.49
-1264	-1252	-1272	-1260	-1270	-1264	68	8.06	0.67	6.27
-1253	-1271	-1267	-1268	-1264	-1253	69	10.92	0.91	8.49
-1273	-1271	-1267	-1268	-1256	-1273	70	5.72	0.48	4.45
-1273	-1264	-1265	-1252	-1268	-1273	71	5.72	0.48	4.45
-1255	-1267	-1266	-1268	-1268	-1255	72	10.4	0.87	8.09
-1270	-1267	-1263	-1268	-1253	-1270	73	6.5	0.54	5.05
-1266	-1254	-1268	-1269	-1272	-1266	74	7.54	0.63	5.86
-1261	-1269	-1269	-1259	-1267	-1261	75	8.84	0.74	6.87
-1264	-1270	-1254	-1270	-1268	-1264	76	8.06	0.67	6.27
-1270	-1259	-1269	-1267	-1261	-1270	77	6.5	0.54	5.05
-1268	-1262	-1270	-1256	-1271	-1268	78	7.02	0.58	5.46
-1253	-1266	-1265	-1267	-1269	-1253	79	10.92	0.91	8.49
-1269	-1267	-1258	-1269	-1256	-1269	80	6.76	0.56	5.26
-1270	-1255	-1273	-1271	-1264	-1270	81	6.5	0.54	5.05
-1266	-1268	-1271	-1254	-1269	-1266	82	7.54	0.63	5.86
-1253	-1270	-1272	-1258	-1268	-1253	83	10.92	0.91	8.49
-1253	-1269	-1270	-1263	-1272	-1253	84	10.92	0.91	8.49
-1255	-1269	-1269	-1270	-1270	-1255	85	10.4	0.87	8.09
-1270	-1270	-1259	-1268	-1255	-1270	86	6.5	0.54	5.05
-1271	-1254	-1264	-1260	-1273	-1271	87	6.24	0.52	4.85
-1252	-1267	-1268	-1266	-1266	-1252	88	11.18	0.93	8.69
-1265	-1267	-1249	-1266	-1265	-1265	89	7.8	0.65	6.06
-1262	-1264	-1264	-1270	-1266	-1262	90	8.58	0.71	6.67
-1269	-1260	-1256	-1257	-1245	-1269	91	6.76	0.56	5.26
-1247	-1245	-1248	-1232	-1241	-1247	92	12.48	1.04	9.70
-1222	-1236	-1230	-1230	-1228	-1222	93	18.98	1.58	14.76
-1228	-1227	-1216	-1228	-1203	-1228	94	17.42	1.45	13.54
-1217	-1203	-1214	-1222	-1204	-1217	95	20.28	1.69	15.77
-1215	-1202	-1211	-1215	-1215	-1215	96	20.8	1.73	16.17
-1215	-1203	-1217	-1204	-1212	-1215	97	20.8	1.73	16.17



-1203	-1215	-1206	-1216	-1215	-1203	98	23.92	1.99	18.60
-1218	-1202	-1212	-1218	-1206	-1218	99	20.02	1.67	15.56
-1213	-1206	-1217	-1214	-1216	-1213	100	21.32	1.78	16.57
-1203	-1212	-1217	-1212	-1217	-1203	101	23.92	1.99	18.60
-1204	-1213	-1218	-1211	-1221	-1204	102	23.66	1.97	18.39
-1203	-1202	-1214	-1218	-1212	-1203	103	23.92	1.99	18.60
-1213	-1219	-1216	-1213	-1217	-1213	104	21.32	1.78	16.57
-1217	-1217	-1216	-1205	-1217	-1217	105	20.28	1.69	15.77
-1203	-1219	-1205	-1220	-1206	-1203	106	23.92	1.99	18.60
-1220	-1216	-1216	-1215	-1213	-1220	107	19.5	1.62	15.16
-1209	-1220	-1206	-1217	-1203	-1209	108	22.36	1.86	17.38
-1219	-1203	-1215	-1217	-1219	-1219	109	19.76	1.65	15.36
-1204	-1218	-1205	-1217	-1218	-1204	110	23.66	1.97	18.39
-1218	-1215	-1216	-1216	-1203	-1218	111	20.02	1.67	15.56
-1216	-1206	-1218	-1219	-1207	-1216	112	20.54	1.71	15.97
-1216	-1205	-1221	-1208	-1215	-1216	113	20.54	1.71	15.97
-1221	-1212	-1229	-1239	-1250	-1221	114	19.24	1.60	14.96
-1244	-1249	-1240	-1249	-1235	-1244	115	13.26	1.10	10.31

K = 0.107148



**Vane Shear Raw Data  
Location 420  
49 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,420/49

zero =

-1295

calib =

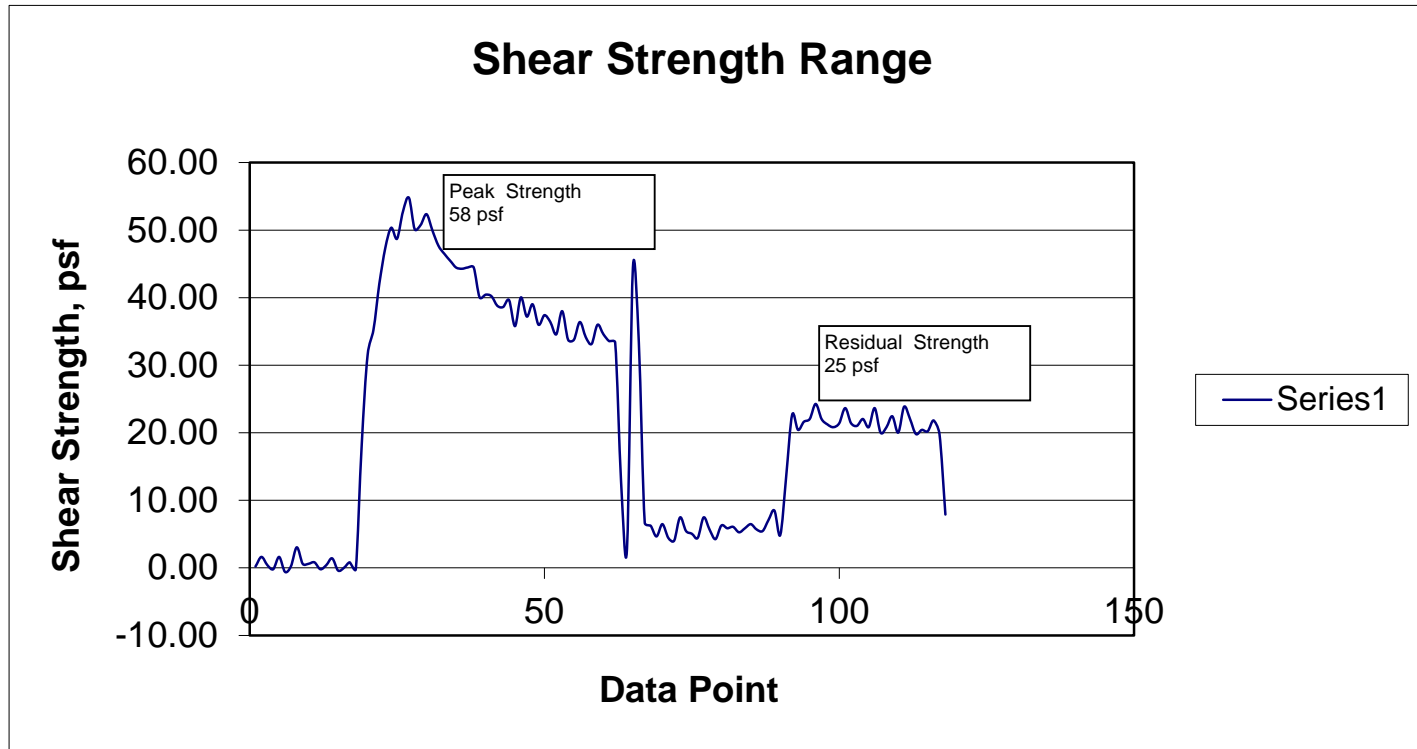
0.26 in-lb/unit ft-lb

Shear Strength, psf

-1294	-1291	-1294	-1288	-1295	-1294	1	0.26	0.02	0.20
-1287	-1295	-1281	-1295	-1280	-1287	2	2.08	0.17	1.62
-1293	-1289	-1294	-1282	-1299	-1293	3	0.52	0.04	0.40
-1296	-1295	-1295	-1296	-1291	-1296	4	-0.26	-0.02	-0.20
-1287	-1299	-1293	-1294	-1292	-1287	5	2.08	0.17	1.62
-1298	-1285	-1294	-1281	-1299	-1298	6	-0.78	-0.06	-0.61
-1294	-1296	-1290	-1291	-1292	-1294	7	0.26	0.02	0.20
-1280	-1295	-1281	-1292	-1283	-1280	8	3.9	0.32	3.03
-1292	-1301	-1287	-1295	-1286	-1292	9	0.78	0.06	0.61
-1292	-1290	-1297	-1282	-1295	-1292	10	0.78	0.06	0.61
-1291	-1293	-1292	-1300	-1289	-1291	11	1.04	0.09	0.81
-1296	-1301	-1293	-1296	-1290	-1296	12	-0.26	-0.02	-0.20
-1293	-1287	-1294	-1281	-1301	-1293	13	0.52	0.04	0.40
-1288	-1298	-1283	-1295	-1282	-1288	14	1.82	0.15	1.41
-1297	-1282	-1297	-1293	-1292	-1297	15	-0.52	-0.04	-0.40
-1295	-1296	-1292	-1288	-1297	-1295	16	0	0.00	0.00
-1291	-1295	-1282	-1294	-1287	-1291	17	1.04	0.09	0.81
-1296	-1281	-1272	-1227	-1233	-1296	18	-0.26	-0.02	-0.20
-1205	-1192	-1185	-1180	-1149	-1205	19	23.4	1.95	18.19
-1139	-1136	-1135	-1119	-1130	-1139	20	40.56	3.38	31.53
-1121	-1093	-1106	-1094	-1082	-1121	21	45.24	3.77	35.17
-1087	-1081	-1065	-1075	-1061	-1087	22	54.08	4.50	42.04
-1061	-1061	-1046	-1062	-1059	-1061	23	60.84	5.07	47.30
-1046	-1064	-1054	-1038	-1054	-1046	24	64.74	5.39	50.33
-1054	-1041	-1052	-1054	-1033	-1054	25	62.66	5.22	48.71
-1034	-1037	-1027	-1041	-1039	-1034	26	67.86	5.65	52.76
-1024	-1042	-1045	-1041	-1052	-1024	27	70.46	5.87	54.78
-1047	-1034	-1044	-1040	-1043	-1047	28	64.48	5.37	50.13
-1044	-1045	-1039	-1051	-1043	-1044	29	65.26	5.44	50.74
-1036	-1050	-1051	-1033	-1048	-1036	30	67.34	5.61	52.35
-1048	-1036	-1056	-1055	-1055	-1048	31	64.22	5.35	49.93
-1059	-1055	-1062	-1065	-1057	-1059	32	61.36	5.11	47.70
-1065	-1061	-1072	-1067	-1057	-1065	33	59.8	4.98	46.49
-1070	-1070	-1066	-1072	-1062	-1070	34	58.5	4.87	45.48
-1075	-1079	-1066	-1078	-1069	-1075	35	57.2	4.76	44.47
-1076	-1088	-1070	-1085	-1082	-1076	36	56.94	4.74	44.27
-1075	-1091	-1079	-1088	-1093	-1075	37	57.2	4.76	44.47
-1075	-1093	-1090	-1085	-1092	-1075	38	57.2	4.76	44.47
-1097	-1079	-1092	-1089	-1086	-1097	39	51.48	4.29	40.02
-1095	-1093	-1084	-1101	-1100	-1095	40	52	4.33	40.43
-1096	-1109	-1107	-1090	-1101	-1096	41	51.74	4.31	40.22
-1103	-1092	-1103	-1104	-1092	-1103	42	49.92	4.16	38.81
-1104	-1104	-1091	-1109	-1113	-1104	43	49.66	4.14	38.61
-1099	-1109	-1107	-1093	-1114	-1099	44	50.96	4.24	39.62
-1118	-1105	-1112	-1114	-1098	-1118	45	46.02	3.83	35.78
-1097	-1115	-1116	-1098	-1114	-1097	46	51.48	4.29	40.02
-1111	-1108	-1106	-1112	-1114	-1111	47	47.84	3.99	37.19
-1102	-1111	-1113	-1104	-1120	-1102	48	50.18	4.18	39.01
-1117	-1115	-1103	-1118	-1113	-1117	49	46.28	3.86	35.98
-1110	-1118	-1117	-1111	-1119	-1110	50	48.1	4.01	37.39
-1115	-1124	-1104	-1120	-1123	-1115	51	46.8	3.90	36.38
-1124	-1108	-1120	-1125	-1105	-1124	52	44.46	3.70	34.56
-1107	-1126	-1126	-1107	-1119	-1107	53	48.88	4.07	38.00
-1128	-1119	-1109	-1126	-1129	-1128	54	43.42	3.62	33.76
-1128	-1107	-1127	-1123	-1109	-1128	55	43.42	3.62	33.76
-1115	-1125	-1122	-1115	-1123	-1115	56	46.8	3.90	36.38
-1126	-1123	-1112	-1130	-1131	-1126	57	43.94	3.66	34.16
-1131	-1112	-1127	-1125	-1121	-1131	58	42.64	3.55	33.15
-1117	-1125	-1130	-1128	-1119	-1117	59	46.28	3.86	35.98
-1124	-1129	-1125	-1113	-1131	-1124	60	44.46	3.70	34.56
-1129	-1134	-1114	-1127	-1132	-1129	61	43.16	3.60	33.55
-1130	-1118	-1135	-1174	-1243	-1130	62	42.9	3.57	33.35
-1232	-1242	-1249	-1277	-1264	-1232	63	16.38	1.36	12.73
-1281	-1273	-1281	-1101	-1069	-1281	64	3.64	0.30	2.83
-1075	-1068	-1101	-1110	-1109	-1075	65	57.2	4.76	44.47
-1130	-1131	-1126	-1184	-1199	-1130	66	42.9	3.57	33.35
-1262	-1271	-1273	-1264	-1275	-1262	67	8.58	0.71	6.67
-1264	-1273	-1256	-1272	-1268	-1264	68	8.06	0.67	6.27
-1272	-1261	-1273	-1275	-1268	-1272	69	5.98	0.50	4.65
-1263	-1274	-1272	-1273	-1272	-1263	70	8.32	0.69	6.47
-1273	-1271	-1267	-1270	-1259	-1273	71	5.72	0.48	4.45
-1275	-1265	-1275	-1258	-1275	-1275	72	5.2	0.43	4.04
-1258	-1274	-1273	-1269	-1273	-1258	73	9.62	0.80	7.48
-1268	-1270	-1258	-1273	-1264	-1268	74	7.02	0.58	5.46
-1270	-1259	-1276	-1274	-1265	-1270	75	6.5	0.54	5.05
-1273	-1267	-1274	-1260	-1271	-1273	76	5.72	0.48	4.45
-1258	-1276	-1275	-1266	-1267	-1258	77	9.62	0.80	7.48
-1267	-1277	-1260	-1275	-1275	-1267	78	7.28	0.61	5.66
-1274	-1275	-1254	-1270	-1269	-1274	79	5.46	0.45	4.24
-1264	-1270	-1257	-1268	-1270	-1264	80	8.06	0.67	6.27
-1266	-1267	-1257	-1269	-1268	-1266	81	7.54	0.63	5.86
-1265	-1269	-1254	-1268	-1266	-1265	82	7.8	0.65	6.06
-1269	-1259	-1270	-1266	-1265	-1269	83	6.76	0.56	5.26
-1266	-1263	-1267	-1256	-1271	-1266	84	7.54	0.63	5.86
-1263	-1267	-1250	-1270	-1266	-1263	85	8.32	0.69	6.47
-1267	-1259	-1268	-1270	-1262	-1267	86	7.28	0.61	5.66
-1268	-1265	-1270	-1255	-1268	-1268	87	7.02	0.58	5.46
-1260	-1267	-1272	-1254	-1268	-1260	88	9.1	0.76	7.07
-1253	-1266	-1263	-1269	-1268	-1253	89	10.92	0.91	8.49
-1271	-1268	-1248	-1255	-1228	-1271	90	6.24	0.52	4.85
-1228	-1200	-1201	-1204	-1198	-1228	91	17.42	1.45	13.54
-1183	-1199	-1195	-1187	-1192	-1183	92	29.12	2.43	22.64
-1194	-1176	-1193	-1185	-1185	-1194	93	26.26	2.19	20.42
-1188	-1190	-1183	-1188	-1173	-1188	94	27.82	2.32	21.63
-1186	-1187	-1175	-1190	-1187	-1186	95	28.34	2.36	22.03
-1175	-1188	-1185	-1192	-1191	-1175	96	31.2	2.60	24.26
-1186	-1190	-1190	-1177	-1190	-1186	97	28.34	2.36	22.03

-1190	-1176	-1190	-1181	-1191	-1190	98	27.3	2.27	21.22
-1192	-1175	-1193	-1188	-1190	-1192	99	26.78	2.23	20.82
-1189	-1187	-1184	-1189	-1180	-1189	100	27.56	2.30	21.43
-1178	-1189	-1187	-1192	-1190	-1178	101	30.42	2.53	23.65
-1189	-1178	-1189	-1188	-1186	-1189	102	27.56	2.30	21.43
-1191	-1192	-1177	-1188	-1192	-1191	103	27.04	2.25	21.02
-1186	-1188	-1193	-1181	-1194	-1186	104	28.34	2.36	22.03
-1192	-1187	-1184	-1193	-1191	-1192	105	26.78	2.23	20.82
-1178	-1189	-1195	-1177	-1187	-1178	106	30.42	2.53	23.65
-1196	-1188	-1177	-1191	-1191	-1196	107	25.74	2.14	20.01
-1192	-1176	-1191	-1193	-1177	-1192	108	26.78	2.23	20.82
-1184	-1194	-1186	-1187	-1190	-1184	109	28.86	2.40	22.44
-1196	-1178	-1191	-1194	-1181	-1196	110	25.74	2.14	20.01
-1177	-1197	-1196	-1189	-1182	-1177	111	30.68	2.56	23.85
-1186	-1194	-1196	-1176	-1193	-1186	112	28.34	2.36	22.03
-1197	-1197	-1187	-1189	-1192	-1197	113	25.48	2.12	19.81
-1194	-1189	-1180	-1197	-1196	-1194	114	26.26	2.19	20.42
-1195	-1179	-1193	-1195	-1191	-1195	115	26	2.17	20.21
-1187	-1186	-1182	-1194	-1194	-1187	116	28.08	2.34	21.83
-1197	-1177	-1192	-1197	-1194	-1197	117	25.48	2.12	19.81
-1256	-1247	-1260	-1250	-1263	-1256	118	10.14	0.84	7.88

K = 0.107148



**Vane Shear Raw Data  
Location 420  
51 feet below Lake Surface  
(Water Depth + Depth Below Mudline)**

1/8/5,retec,420/51

zero =

-1295

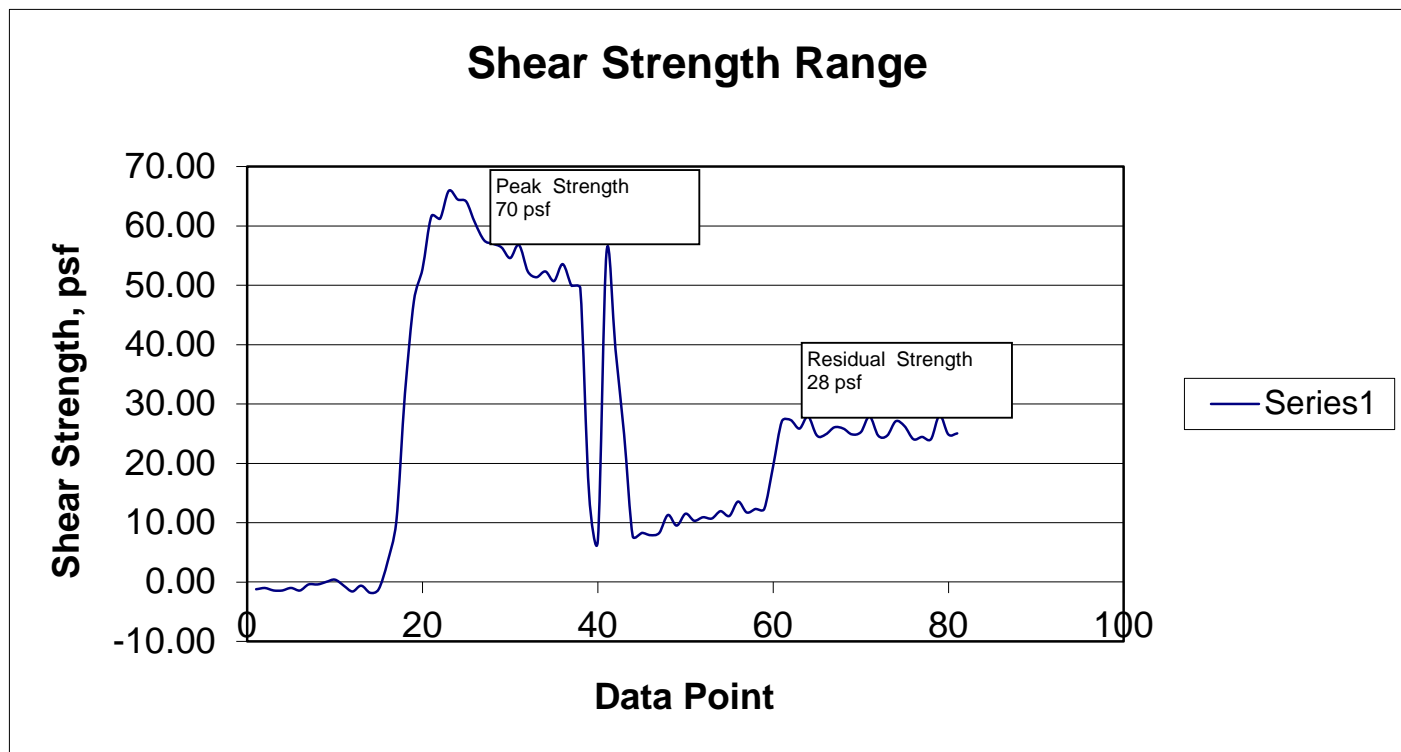
calib =

0.26 in-lb/unit ft-lb

Shear Strength, psf

-1301	-1295	-1301	-1288	-1300	-1301	1	-1.56	-0.13	-1.21
-1300	-1286	-1300	-1299	-1294	-1300	2	-1.3	-0.11	-1.01
-1302	-1286	-1300	-1302	-1292	-1302	3	-1.82	-0.15	-1.41
-1302	-1285	-1301	-1299	-1285	-1302	4	-1.82	-0.15	-1.41
-1300	-1289	-1300	-1302	-1291	-1300	5	-1.3	-0.11	-1.01
-1302	-1302	-1285	-1304	-1300	-1302	6	-1.82	-0.15	-1.41
-1297	-1302	-1290	-1299	-1299	-1297	7	-0.52	-0.04	-0.40
-1297	-1302	-1296	-1298	-1297	-1297	8	-0.52	-0.04	-0.40
-1295	-1305	-1297	-1297	-1301	-1295	9	0	0.00	0.00
-1293	-1303	-1295	-1301	-1296	-1293	10	0.52	0.04	0.40
-1298	-1299	-1287	-1301	-1301	-1298	11	-0.78	-0.06	-0.61
-1303	-1301	-1286	-1302	-1299	-1303	12	-2.08	-0.17	-1.62
-1298	-1299	-1296	-1302	-1283	-1298	13	-0.78	-0.06	-0.61
-1304	-1287	-1300	-1302	-1296	-1304	14	-2.34	-0.19	-1.82
-1301	-1296	-1295	-1285	-1301	-1301	15	-1.56	-0.13	-1.21
-1278	-1283	-1272	-1261	-1258	-1278	16	4.42	0.37	3.44
-1245	-1226	-1203	-1170	-1161	-1245	17	13	1.08	10.11
-1138	-1113	-1111	-1100	-1070	-1138	18	40.82	3.40	31.73
-1061	-1069	-1061	-1035	-1043	-1061	19	60.84	5.07	47.30
-1034	-1025	-1019	-1023	-1009	-1034	20	67.86	5.65	52.76
-990	-997	-1002	-987	-993	-990	21	79.3	6.61	61.65
-992	-982	-967	-986	-978	-992	22	78.78	6.56	61.25
-969	-973	-973	-970	-973	-969	23	84.76	7.06	65.89
-976	-973	-963	-982	-980	-976	24	82.94	6.91	64.48
-978	-985	-993	-984	-995	-978	25	82.42	6.87	64.08
-996	-996	-983	-1002	-1003	-996	26	77.74	6.48	60.44
-1010	-991	-1015	-1016	-1016	-1010	27	74.1	6.17	57.61
-1013	-1007	-1022	-1028	-1021	-1013	28	73.32	6.11	57.00
-1016	-1017	-1028	-1031	-1023	-1016	29	72.54	6.04	56.39
-1025	-1028	-1029	-1033	-1013	-1025	30	70.2	5.85	54.58
-1014	-1036	-1036	-1028	-1033	-1014	31	73.06	6.09	56.80
-1036	-1040	-1039	-1024	-1042	-1036	32	67.34	5.61	52.35
-1041	-1044	-1044	-1041	-1030	-1041	33	66.04	5.50	51.34
-1036	-1039	-1034	-1040	-1040	-1036	34	67.34	5.61	52.35
-1044	-1035	-1040	-1048	-1042	-1044	35	65.26	5.44	50.74
-1030	-1047	-1049	-1042	-1042	-1030	36	68.9	5.74	53.56
-1048	-1043	-1036	-1048	-1050	-1048	37	64.22	5.35	49.93
-1050	-1068	-1192	-1211	-1213	-1050	38	63.7	5.31	49.52
-1223	-1239	-1240	-1260	-1260	-1223	39	18.72	1.56	14.55
-1260	-1260	-1248	-1105	-1011	-1260	40	9.1	0.76	7.07
-1020	-1036	-1041	-1077	-1093	-1020	41	71.5	5.96	55.59
-1101	-1123	-1115	-1125	-1159	-1101	42	50.44	4.20	39.21
-1172	-1247	-1249	-1252	-1252	-1172	43	31.98	2.66	24.86
-1257	-1251	-1236	-1250	-1245	-1257	44	9.88	0.82	7.68
-1254	-1242	-1256	-1258	-1239	-1254	45	10.66	0.89	8.29
-1256	-1237	-1254	-1255	-1237	-1256	46	10.14	0.84	7.88
-1254	-1247	-1256	-1240	-1257	-1254	47	10.66	0.89	8.29
-1239	-1251	-1254	-1243	-1254	-1239	48	14.56	1.21	11.32
-1248	-1256	-1242	-1250	-1251	-1248	49	12.22	1.02	9.50
-1238	-1237	-1226	-1241	-1245	-1238	50	14.82	1.23	11.52
-1244	-1247	-1233	-1250	-1247	-1244	51	13.26	1.10	10.31
-1241	-1238	-1223	-1239	-1243	-1241	52	14.04	1.17	10.92
-1242	-1243	-1225	-1243	-1236	-1242	53	13.78	1.15	10.71
-1236	-1233	-1218	-1241	-1241	-1236	54	15.34	1.28	11.93
-1240	-1238	-1223	-1237	-1235	-1240	55	14.3	1.19	11.12
-1228	-1234	-1234	-1228	-1235	-1228	56	17.42	1.45	13.54
-1237	-1228	-1233	-1229	-1216	-1237	57	15.08	1.26	11.72
-1234	-1216	-1232	-1232	-1219	-1234	58	15.86	1.32	12.33
-1234	-1218	-1231	-1227	-1215	-1234	59	15.86	1.32	12.33
-1198	-1179	-1163	-1160	-1146	-1198	60	25.22	2.10	19.61
-1161	-1161	-1148	-1164	-1165	-1161	61	34.84	2.90	27.09
-1160	-1167	-1167	-1151	-1164	-1160	62	35.1	2.92	27.29
-1167	-1160	-1169	-1170	-1154	-1167	63	33.28	2.77	25.87
-1157	-1166	-1166	-1171	-1169	-1157	64	35.88	2.99	27.89
-1173	-1156	-1170	-1165	-1170	-1173	65	31.72	2.64	24.66
-1172	-1170	-1167	-1171	-1157	-1172	66	31.98	2.66	24.86
-1166	-1170	-1157	-1171	-1175	-1166	67	33.54	2.79	26.07
-1167	-1173	-1169	-1157	-1172	-1167	68	33.28	2.77	25.87
-1172	-1159	-1173	-1171	-1163	-1172	69	31.98	2.66	24.86
-1170	-1171	-1158	-1175	-1168	-1170	70	32.5	2.71	25.27
-1157	-1172	-1171	-1167	-1174	-1157	71	35.88	2.99	27.89
-1173	-1157	-1170	-1168	-1173	-1173	72	31.72	2.64	24.66
-1173	-1174	-1169	-1173	-1158	-1173	73	31.72	2.64	24.66
-1161	-1174	-1159	-1173	-1171	-1161	74	34.84	2.90	27.09
-1165	-1175	-1174	-1164	-1172	-1165	75	33.8	2.82	26.28
-1176	-1164	-1175	-1166	-1171	-1176	76	30.94	2.58	24.05
-1174	-1167	-1172	-1172	-1160	-1174	77	31.46	2.62	24.46
-1176	-1174	-1158	-1172	-1165	-1176	78	30.94	2.58	24.05
-1156	-1171	-1169	-1168	-1172	-1156	79	36.14	3.01	28.10
-1172	-1158	-1175	-1167	-1168	-1172	80	31.98	2.66	24.86
-1171	-1172	-1189	-1221	-1233	-1171	81	32.24	2.69	25.06

K = 0.107148



**SUB-ATTACHMENT 3D-2.4.3**  
**RETEC 2005 ESA Phase 3 Sediment Investigation -**  
**Geotechnical Data**





Client: The Retec Group, Inc.

Project No.: HQ36 & HQ37

Client Project: North Lake Union Geotech

### Case Narrative

1. The samples were submitted for analysis on January 21, 2005. Testing was completed on February 18, 2005.
2. The samples consisted of jars and Shelby tubes. The Shelby tubes were extruded and logged prior to testing.
3. The total organic content was measured according to ASTM D2974. The samples were mostly decomposed peat/organic silts and had very high water contents and high organic contents, as expected.
4. The moisture content was measured according to ASTM D2216.
5. The Atterberg limits were measured according to ASTM D4318.
6. The wet density was calculated from the weight and dimensions of the sample. The dry density was calculated from using the moisture and dry density results.
7. The percent fines were measured according to ASTM D1140.
8. The one dimensional consolidation was measured according to ASTM D2435. Very light loads were used to load the samples, because they were very soft and were very high moisture samples.
9. The data is provided in summary tables and plots.
10. There were no other noted anomalies in the samples or methods on this project.

Approved by:

Title:

  
Geotechnical Division Manager

Date:

2/19/05

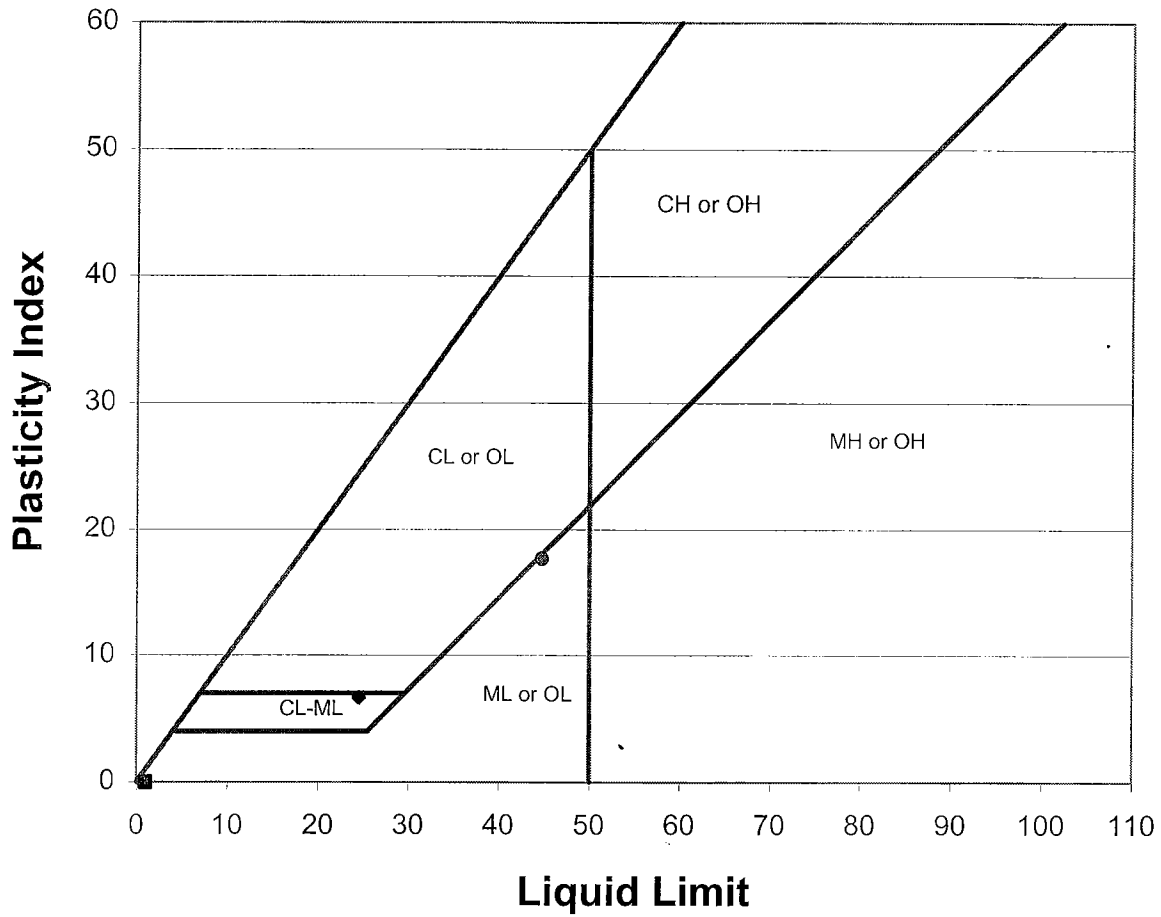
North Lake Union Geotech

Atterberg Limits

ASTM D4318

RETEC  
PSE10-18620-320

### Atterberg Limits



● NLU79GE-22-22.9	▲ NLU406-GE-9-10.5
◆ NLU411-GE-19-20.5	■ NLU80-GE-1.5-3.5

Sample Number	Plasticity Index	Liquid Limit	Plastic Limit	Classification
NLU79GE-22-22.9	17.7	44.8	27.1	CH
NLU406-GE-9-10.5	NA	NA	NA	Non-Plastic
NLU411-GE-19-20.5	6.6	24.5	17.9	CH
NLU80-GE-1.5-3.5	NA	NA	NA	Non-Plastic

HQ36

North Lake Union Geotech

Wet Density, Moisture Content and Dry Density

ASTM D422

The Retec Group, Inc.  
North Lake Union Geotech

Wet and Dry Density, Moisture Content

Sample Identification	Wet Density (lbs/ft <sup>3</sup> )	Moisture Content (%)	Dry Density (lbs/ft <sup>3</sup> )
NLU79-GE-3.5-5.5	66.0	144.2	27.0
NLU402-GE-3.0-5.0	68.2	238.1	17.8
NLU402-GE-8.0-10.0	66.1	700.0	8.3
NLU405-GE-3-5	66.1	558.7	10.0
NLU415-GE-0-2	81.3	159.1	31.4
NLU415-GE-2-4	69.6	809.2	7.7
NLU418-GE-3-5	63.3	883.4	6.4
NLU418-GE-6.5-8.5	66.3	637.7	9.0

Notes:

1. The moisture content was determined in accordance with ASTM D-2216.
2. The wet density was determined from the average length, diameter and wet weight of the sample.
3. The dry density was determined by dividing the wet density by (1+ moisture content).
4. The specific gravity was determined according to ASTM D-854.
5. The porosity was calculated from the bulk density and specific gravity values.

HQ36 & 37

North Lake Union Geotech

Sieve Analysis

ASTM D422

The Retec Group, Inc.  
PSE10-18628-320

Percent Retained in Each Size Fraction, By ASTM D422

Sieve Size (microns)	3-2"	2-1.5"	1.5-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8-#4	4750-2000	2000-850	850-425	425-250	250-150	150-75	<75
NLU80-GE-8.0-9.0	0.0	0.0	0.0	17.4	0.0	5.3	15.8	32.8	13.5	3.5	3.1	2.9	1.8	3.9
NLU401-GE-4.5-6.0	0.0	0.0	0.0	12.7	24.7	2.3	7.5	7.5	9.2	5.0	8.6	11.7	6.3	4.4
NLU401-GE-6.0-7.5	0.0	0.0	19.2	0.0	0.0	2.4	10.5	9.9	4.6	8.7	24.8	12.2	3.6	4.2
NLU401-GE-7.5-9.0	0.0	23.8	0.0	0.0	13.8	8.0	9.2	10.1	7.1	5.4	6.9	5.4	4.1	6.2
NLU402-GE-10.5-11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.8	1.0	1.5	4.5	91.7
NLU402-GE-12.5-13.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	1.3	2.1	1.6	1.8	5.3	86.6
NLU402-GE-25.0-26.5	0.0	0.0	0.0	25.5	20.2	17.7	17.0	10.7	1.7	0.9	1.0	0.8	0.7	3.7
NLU406-GE-3.0-3.5	0.0	0.0	38.2	0.0	6.1	3.1	7.6	10.3	9.1	6.4	7.0	5.0	3.8	3.5
NLU406-GE-3.5-4.5	0.0	0.0	0.0	0.0	28.3	1.8	6.0	2.5	3.1	4.8	7.9	8.6	9.6	27.4
NLU406-GE-9-10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.9	3.7	3.3	4.7	7.9	6.5	5.4	67.5
NLU408-GE-3-4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.8	20.0	40.3	27.1	6.6	2.0
NLU408-GE-7.5-9.0	0.0	0.0	31.5	19.3	1.6	0.0	3.2	8.7	13.7	11.3	5.5	2.1	1.0	2.2
NLU408-GE-11.5-13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.6	12.4	41.0	30.5	9.4	5.0
NLU408-GE-28.5-29	0.0	0.0	0.0	0.0	0.0	0.0	8.0	2.6	1.0	1.9	12.0	34.2	24.8	15.5
NLU410-GE-3.5-4.0	0.0	0.0	50.9	0.0	0.0	0.0	14.7	3.2	2.6	5.0	6.8	5.3	4.5	6.9
NLU410-GE-8.25-9.0	0.0	0.0	0.0	0.0	0.0	0.0	17.4	34.6	29.1	9.3	4.8	1.9	0.8	2.0
NLU410-GE-12.0-12.5	0.0	0.0	0.0	0.0	0.0	0.0	43.4	30.9	3.1	2.1	7.3	6.4	3.1	3.7
NLU410-GE-12.5-13.5	0.0	0.0	0.0	0.0	0.0	0.0	8.1	4.5	1.0	5.4	25.8	32.5	15.7	7.1

HQ36

The Retec Group, Inc.  
PSE10-18628-320

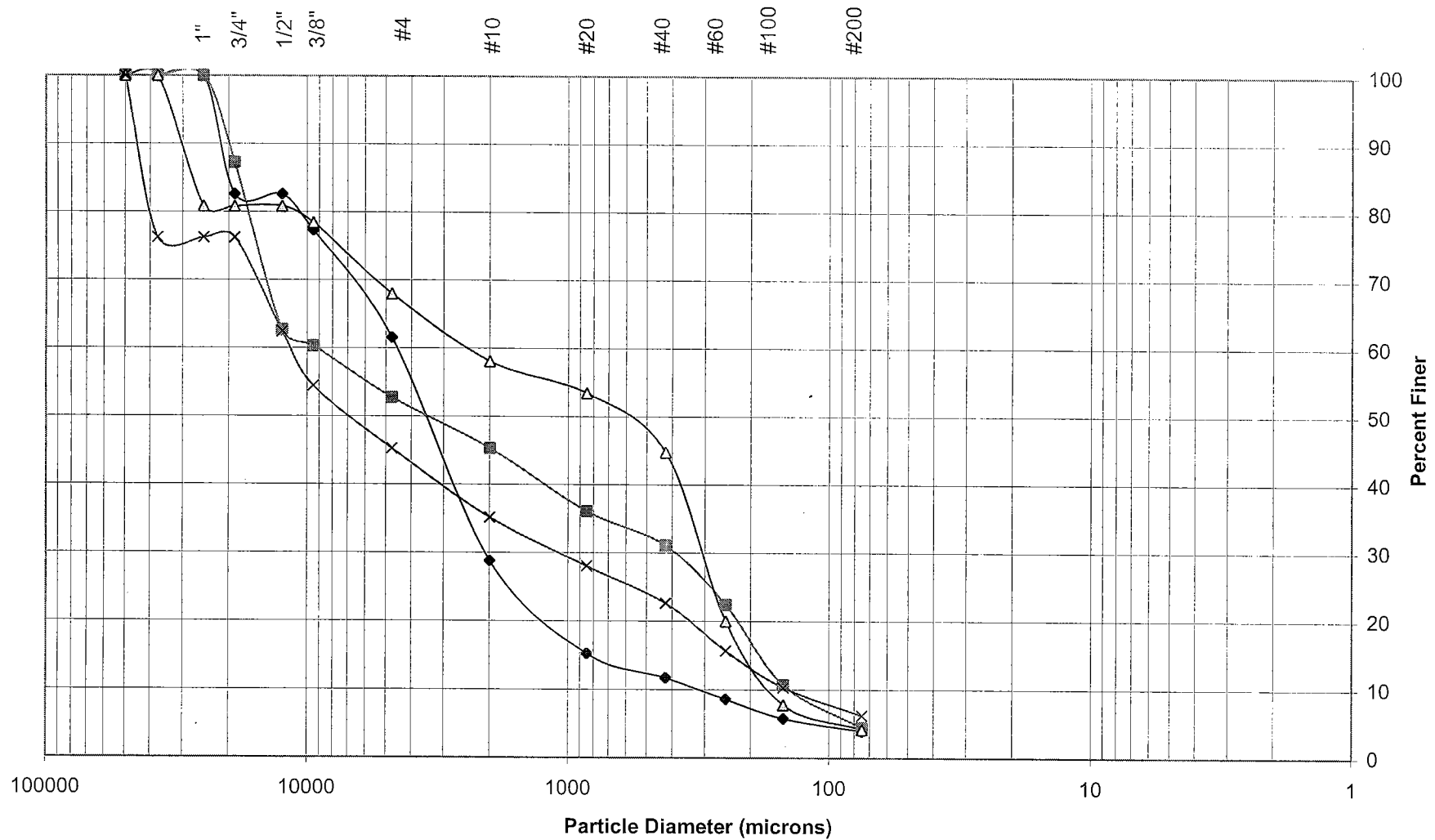
Percent Retained in Each Size Fraction, By ASTM D422

Sieve Size (microns)	3-2"	2-1.5"	1.5-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8-#4	4750-2000	2000-850	850-425	425-250	250-150	150-75	<75
NLU80-GE-8.0-9.0	0.0	0.0	0.0	17.4	0.0	5.3	15.8	32.8	13.5	3.5	3.1	2.9	1.8	3.9
NLU401-GE-4.5-6.0	0.0	0.0	0.0	12.7	24.7	2.3	7.5	7.5	9.2	5.0	8.6	11.7	6.3	4.4
NLU401-GE-6.0-7.5	0.0	0.0	19.2	0.0	0.0	2.4	10.5	9.9	4.6	8.7	24.8	12.2	3.6	4.2
NLU401-GE-7.5-9.0	0.0	23.8	0.0	0.0	13.8	8.0	9.2	10.1	7.1	5.4	6.9	5.4	4.1	6.2
NLU402-GE-10.5-11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.8	1.0	1.5	4.5	91.7
NLU402-GE-12.5-13.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	1.3	2.1	1.6	1.8	5.3	86.6
NLU402-GE-25.0-26.5	0.0	0.0	0.0	25.5	20.2	17.7	17.0	10.7	1.7	0.9	1.0	0.8	0.7	3.7
NLU406-GE-3.0-3.5	0.0	0.0	38.2	0.0	6.1	3.1	7.6	10.3	9.1	6.4	7.0	5.0	3.8	3.5
NLU406-GE-3.5-4.5	0.0	0.0	0.0	0.0	28.3	1.8	6.0	2.5	3.1	4.8	7.9	8.6	9.6	27.4
NLU406-GE-9-10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.9	3.7	3.3	4.7	7.9	6.5	5.4	67.5
NLU408-GE-3-4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.8	20.0	40.3	27.1	6.6	2.0
NLU408-GE-7.5-9.0	0.0	0.0	31.5	19.3	1.6	0.0	3.2	8.7	13.7	11.3	5.5	2.1	1.0	2.2
NLU408-GE-11.5-13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.6	12.4	41.0	30.5	9.4	5.0
NLU408-GE-28.5-29	0.0	0.0	0.0	0.0	0.0	0.0	8.0	2.6	1.0	1.9	12.0	34.2	24.8	15.5
NLU410-GE-3.5-4.0	0.0	0.0	50.9	0.0	0.0	0.0	14.7	3.2	2.6	5.0	6.8	5.3	4.5	6.9
NLU410-GE-8.25-9.0	0.0	0.0	0.0	0.0	0.0	0.0	17.4	34.6	29.1	9.3	4.8	1.9	0.8	2.0
NLU410-GE-12.0-12.5	0.0	0.0	0.0	0.0	0.0	0.0	43.4	30.9	3.1	2.1	7.3	6.4	3.1	3.7
NLU410-GE-12.5-13.5	0.0	0.0	0.0	0.0	0.0	0.0	8.1	4.5	1.0	5.4	25.8	32.5	15.7	7.1

HQ36

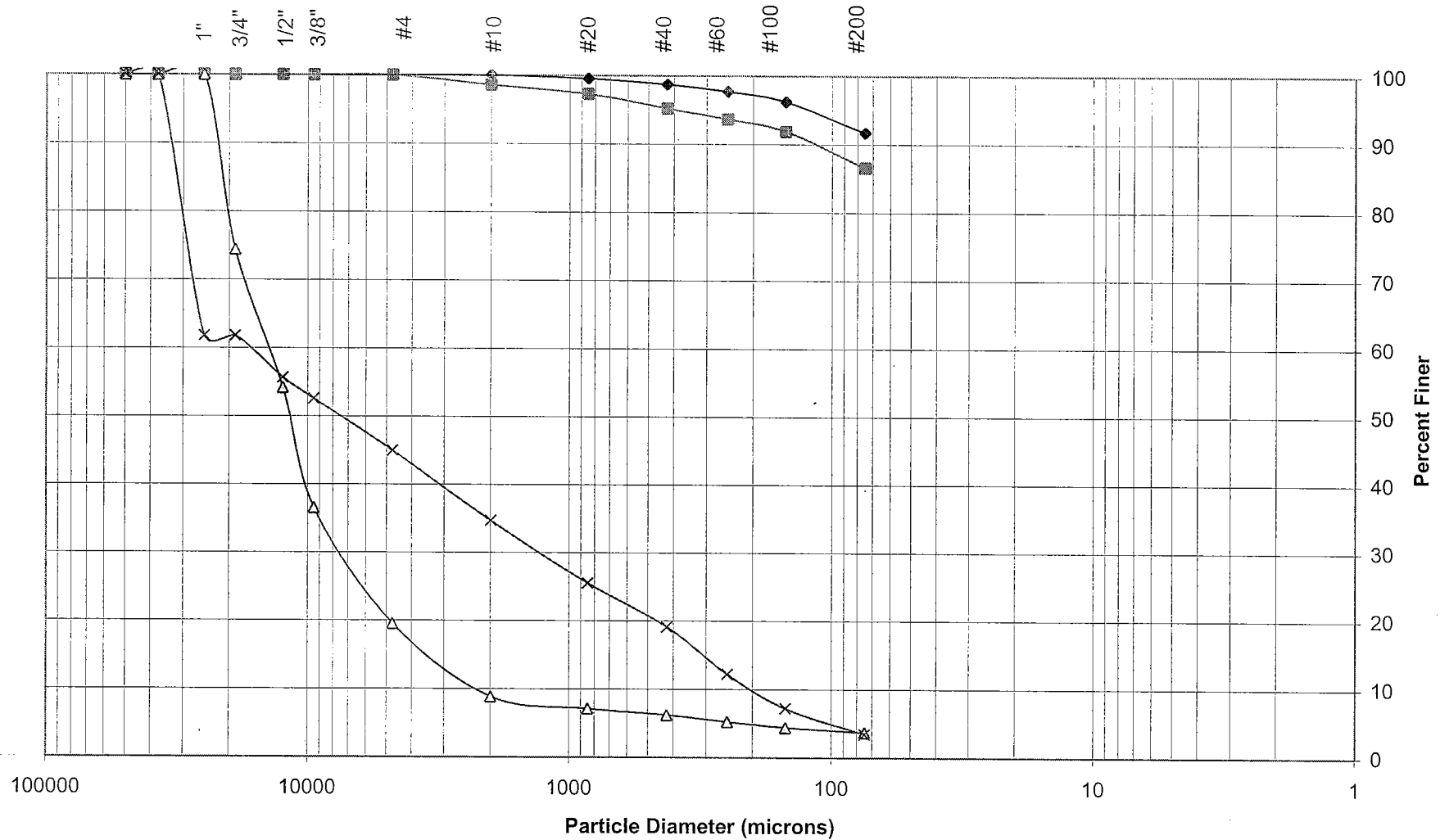


**Grain Size Distribution By ASTM D422**



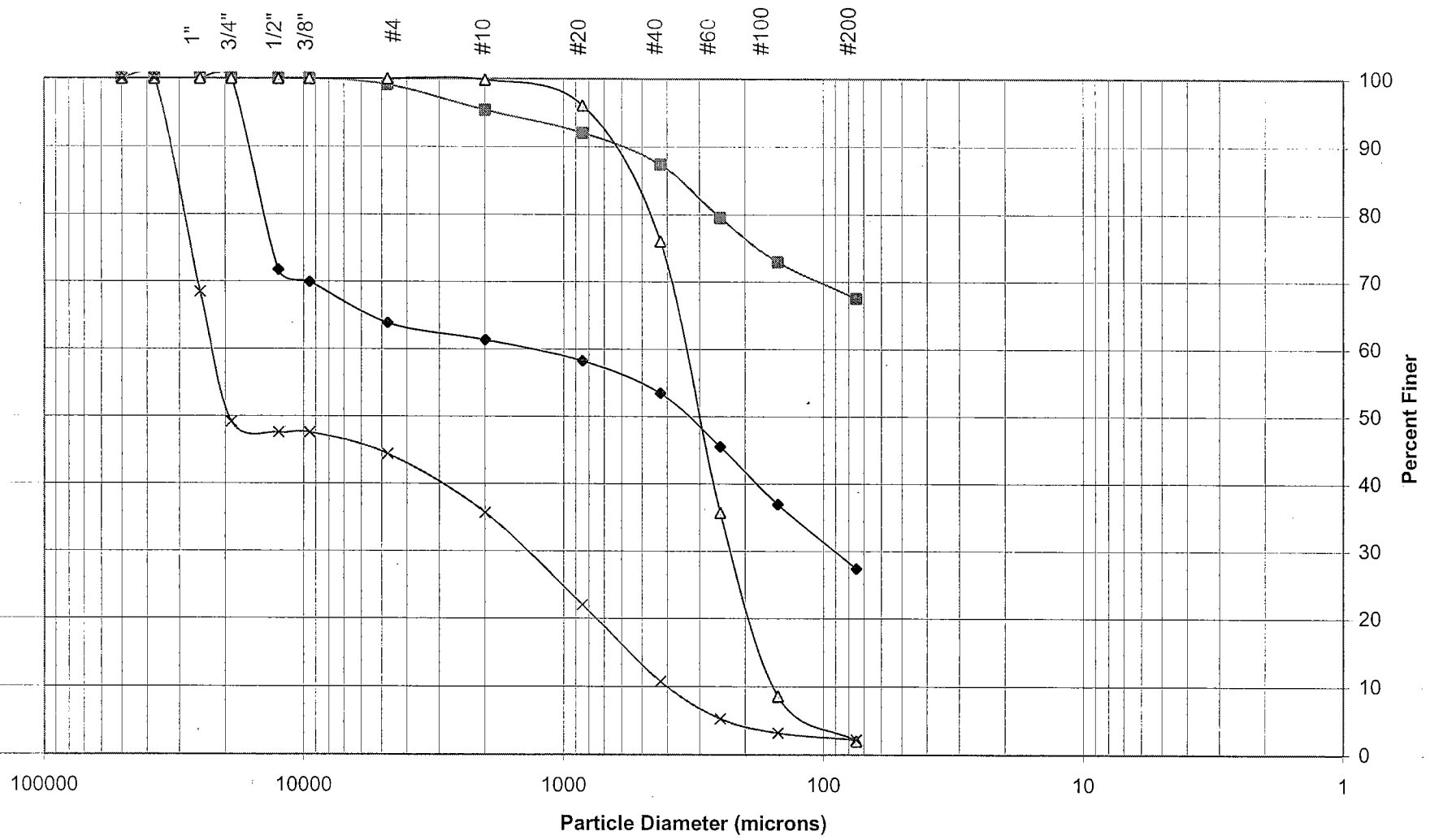
◆ NLU80-GE-8.0-9.0.0  
 ▲ NLU401-GE-6.0-7.5.0  
 ■ NLU401-GE-4.5-6.0.0  
 × NLU401-GE-7.5-9.0.0

**Grain Size Distribution By ASTM D422**



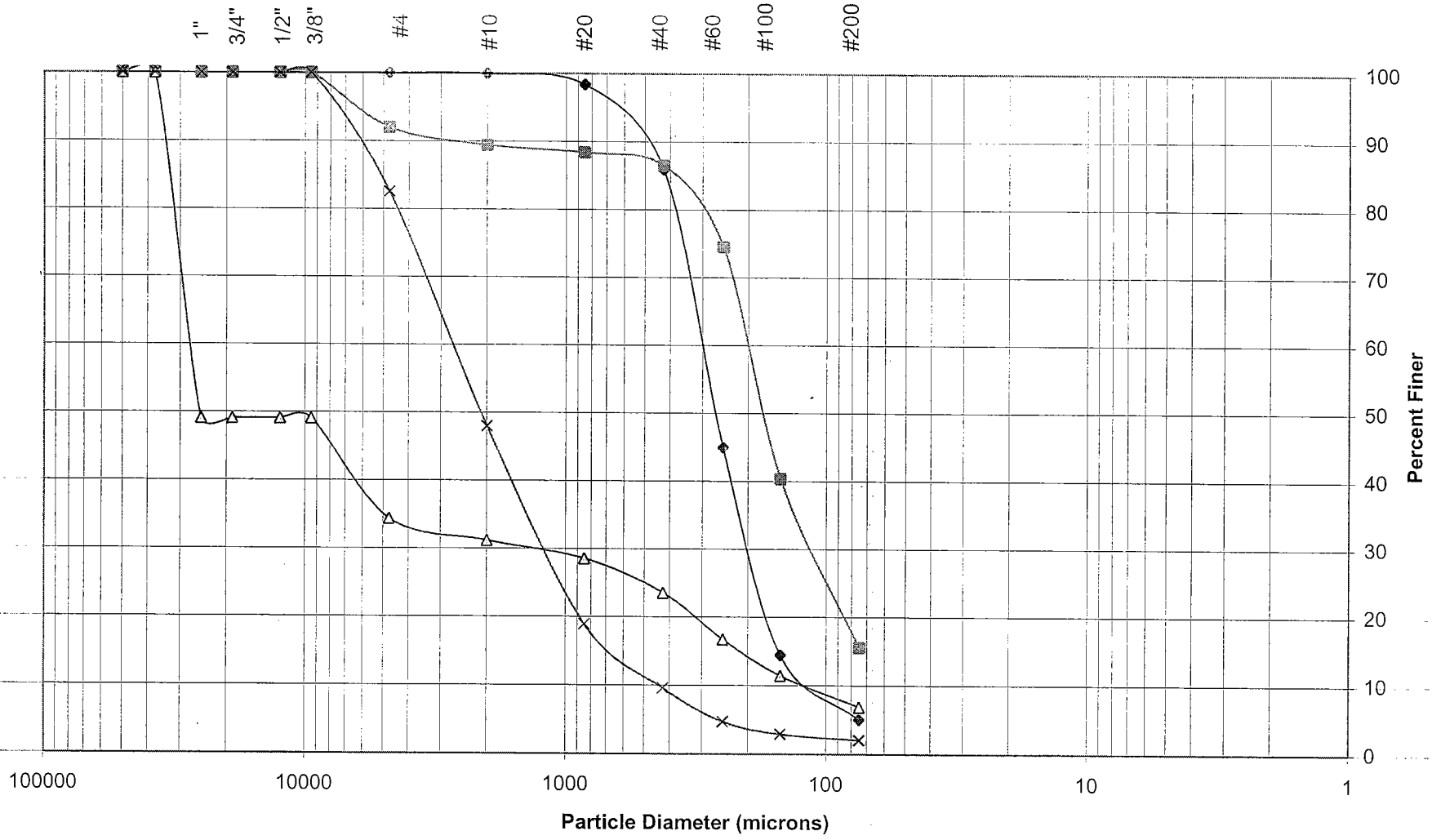
◆ NLU402-GE-10.5-11.0  
 ▲ NLU402-GE-25.0-26.5  
 ■ NLU402-GE-12.5-13.5  
 × NLU406-GE-3.0-3.5

### Grain Size Distribution By ASTM D422



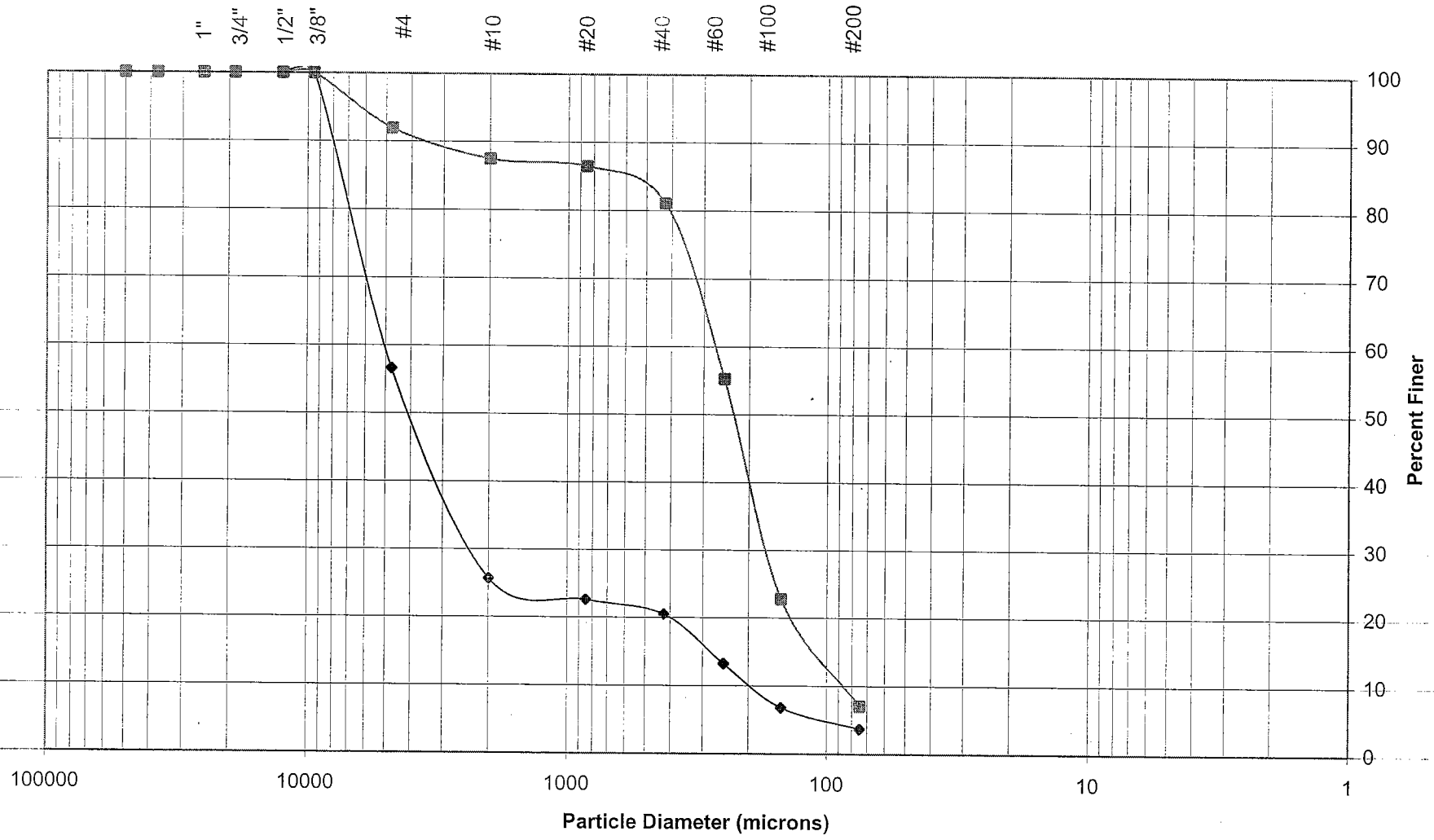
◆ NLU406-GE-3.5-4.5
■ NLU406-GE-9-10.5
▲ NLU408-GE-3-4.5
× NLU408-GE-7.5-9.0

**Grain Size Distribution By ASTM D422**



—◆— NLU408-GE-11.5-13    —■— NLU408-GE-28.5-29    —△— NLU410-GE-3.5-4.0    —×— NLU410-GE-8.25-9.0

### Grain Size Distribution By ASTM D422



◆ NLU410-GE-12.0-12.5

■ NLU410-GE-12.5-13.5

The Retec Group  
PSE10-18628-320

Percent Finer Than Indicated Size, By ASTM D422

Sample ID	Moisture Content (%)	1.5"	1"	3/4"	1/2"	3/8"	#4	#10	#20	#40	#60	#100	#200
NLU411-GE-3-4.5	22.7	100.0	100.0	100.0	100.0	100.0	90.5	82.1	71.3	49.5	17.1	5.6	2.9
NLU411-GE-6-7.5	21.8	100.0	100.0	100.0	100.0	100.0	86.0	80.3	76.3	61.5	26.4	7.4	3.6
NLU411-GE-9-10.5	11.5	100.0	82.4	77.5	77.5	73.5	69.2	66.1	64.0	59.8	51.0	40.1	29.0
NLU411-GE-14-15.5	9.3	100.0	100.0	100.0	100.0	100.0	76.4	69.5	64.1	56.0	42.5	30.0	19.6
NLU411-GE-19-20.5	14.6	100.0	100.0	100.0	90.3	90.3	83.6	81.3	79.2	76.3	70.7	66.2	61.3
NLU412-GE-0-.05	9.4	100.0	100.0	100.0	85.4	81.2	69.7	63.5	59.5	53.8	44.4	34.3	23.3

HQ37

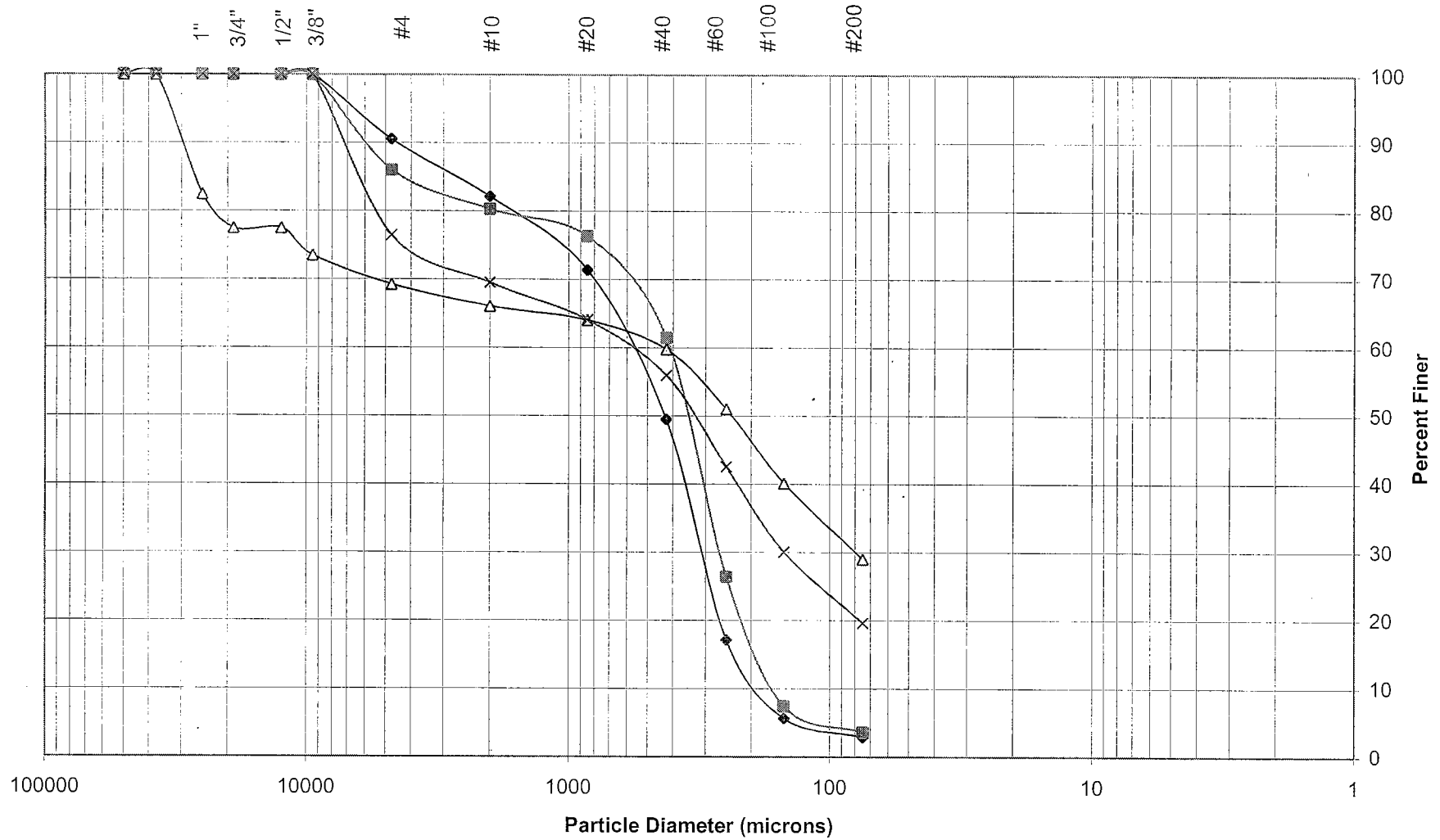
The Retec Group  
PSE10-18628-320

Percent Retained in Each Size Fraction, By ASTM D422

Sieve Size (microns)	1.5-1"	1-3/4"	3/4-1/2"	1/2-3/8"	3/8-#4	4750-2000	2000-850	850-425	425-250	250-150	150-75	<75
NLU411-GE-3-4.5	0.0	0.0	0.0	0.0	9.5	8.4	10.8	21.9	32.4	11.5	2.7	2.9
NLU411-GE-6-7.5	0.0	0.0	0.0	0.0	14.0	5.7	4.0	14.8	35.0	19.0	3.8	3.6
NLU411-GE-9-10.5	17.6	5.0	0.0	4.0	4.2	3.2	2.0	4.3	8.8	10.9	11.1	29.0
NLU411-GE-14-15.5	0.0	0.0	0.0	0.0	23.6	6.9	5.4	8.1	13.4	12.5	10.4	19.6
NLU411-GE-19-20.5	0.0	0.0	9.7	0.0	6.6	2.4	2.0	3.0	5.6	4.5	4.9	61.3
NLU412-GE-0-.05	0.0	0.0	14.6	4.2	11.5	6.2	4.0	5.7	9.4	10.1	11.0	23.3

HQ37

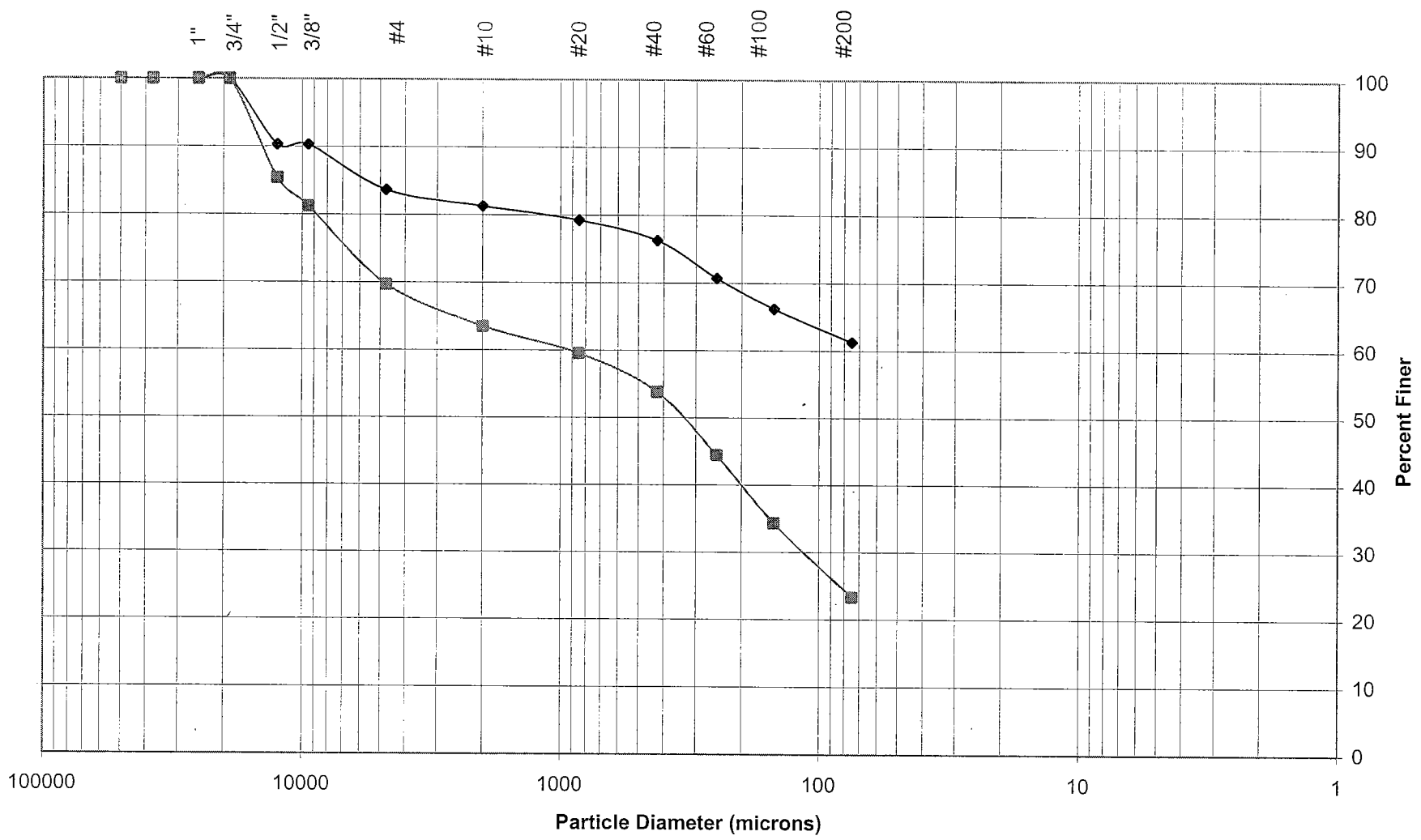
Grain Size Distribution By ASTM D422



◆ NLU411-GE-3-4.5 NLU411-GE-3-4.5  
 ▲ NLU411-GE-9-10.5 NLU411-GE-9-10.5  
 ■ NLU411-GE-6-7.5 NLU411-GE-6-7.5  
 × NLU411-GE-14-15.5 NLU411-GE-14-15.5



### Grain Size Distribution By ASTM D422



◆ NLU411-GE-19-20.5      ■ NLU412-GE-0-.05

North Lake Union Geotech

Moisture Content

ASTM D2216

The Retec Group, Inc.  
North Lake Union Geotech

Moisture Content

Client Sample Number	Moisture Content (%)
NLU79-GE-7.0-8.5	687.7
NLU79-GE-22-22.9	73.9
NLU415-GE-8.5-10	706.5
NLU415-GE-4.1-5.5	740.3
NLU415-GE-5.5-7.0	704.9
NLU415-GE-11.0-12.5	577.8

Moisture content by ASTM D2216.

HQ36 & HQ37

North Lake Union Geotech

Core Logs on Shelby Tube Samples  
(Including Moisture Contents)

VISUAL CORE LOG

Client:	<u>The Retec Group, Inc.</u>	Date:	<u>2/15/05</u>
Project:	<u>North Lake Union Geotech</u>	Sample Extruded by:	<u>HB</u>
Core No.:	<u>NLU79-GE-3.5-5.5</u>	Sample Logged by:	<u>HB</u>
Sample No.:	<u>HQ36A</u>	Type:	<u>Shelby</u>
Depth of Sample:	<u>3.5-5.5</u>	Diameter of Sample:	<u>2.85</u>
Sample Recovery:	<u>22.5</u>		

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
			3.5	Top of Recovery
				Soft, Brown, Fibrous Organic Silt
		Density	4.0	
	812.9	TVS		
		MC	4.5	
			5.0	
	144.2	MC		3/4" Layer of Soft, Gray Clayey Silt
				Bottom of Recovery

VISUAL CORE LOG

Client:	<u>The Retec Group, Inc.</u>	Date:	<u>2/15/05</u>
Project:	<u>North Lake Union Geotech</u>	Sample Extruded by:	<u>HB</u>
Core No.:	<u>NLU80-GE-1.5-3.5</u>	Sample Logged by:	<u>HB</u>
Sample No.:	<u>HQ36D</u>	Type:	<u>Shelby</u>
Depth of Sample:	<u>1.5-3.5</u>	Diameter of Sample:	<u>2.85</u>
Sample Recovery:	<u>11"</u>		

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
	515.0		1.5	Top of Recovery
		MC		Soft, Brown, Fibrous Organic Silt
		Atter		
	456.1		2.0	Gray, Interbed, Inorganic
		TVS		Bottom of Recovery
			2.5	

VISUAL CORE LOG

Client: The Retec Group, Inc.  
 Project: North Lake Union Geotech  
 Core No.: NLU402-GE-3.0-5.0  
 Sample No.: HQ36I  
 Depth of Sample: 3.0-5.0  
 Sample Recovery: 19"

Date: 2/15/05  
 Sample Extruded by: HB  
 Sample Logged by: HB  
 Type: Shelby  
 Diameter of Sample: 2.85

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
	265.4	MC	3.0	Top of Recovery  Soft, Brown, Fibrous Organic Silt
	283.0	Consol	3.5	
			4.0	
	313.2	Density		
		TVS	4.5	
			5.0	Bottom of Recovery

VISUAL CORE LOG

Client: The Retec Group, Inc.  
 Project: North Lake Union Geotech  
 Core No.: NLU402-GE-8.0-10.0  
 Sample No.: HQ36J  
 Depth of Sample: 8.0-10.0  
 Sample Recovery: 21"

Date: 2/15/05  
 Sample Extruded by: HB  
 Sample Logged by: HB  
 Type: Shelby  
 Diameter of Sample: 2.85

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
			8.0	Top of Recovery
	676.1	TVS Density		Soft, Brown, Fibrous Organic Silt
			8.5	
	700.0	MC		
			9.0	
	768.1	MC		
			9.5	Bottom of Recovery
			10.0	
			10.5	





VISUAL CORE LOG

Client: The Retec Group, Inc.  
 Project: North Lake Union Geotech  
 Core No.: NLU415-GE-0-2  
 Sample No.: HQ37L  
 Depth of Sample: 0-2  
 Sample Recovery: 20"


Date: 2/15/05  
 Sample Extruded by: HB  
 Sample Logged by: HB  
 Type: Shelby  
 Diameter of Sample: 2.85

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
	159.0		0.0	Top of Recovery Soft, Gray Silty Clay Mottled with Brown Organic Silt
		Consol	0.5	
	326.9		1.0	Soft, Brown, Fibrous Organic Silt
		TVS Density		
	825.1		1.5	Very Soft Brown Organic Silt
		MC		Bottom of Recovery
			2.0	

VISUAL CORE LOG

Client: The Retec Group, Inc.  
 Project: North Lake Union Geotech  
 Core No.: NLU415-GE-2-4  
 Sample No.: HQ37M  
 Depth of Sample: 2-4  
 Sample Recovery: 21.5"


Date: 2/15/05  
 Sample Extruded by: HB  
 Sample Logged by: HB  
 Type: Shelby  
 Diameter of Sample: 2.85

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description	
			2.0	Top of Recovery Soft, Brown, Fibrous Organic Silt  Bottom of Recovery	
	809.2	Density	2.5		
		MC			
	794.3	MC	3.0		
		MC			
	778.7	MC	3.5		
		TVS			

VISUAL CORE LOG

Client: The Retec Group, Inc.  
 Project: North Lake Union Geotech  
 Core No.: NLU418-GE-3-5  
 Sample No.: HQ37N  
 Depth of Sample: 3-5  
 Sample Recovery: 20"


Date: 2/15/05  
 Sample Extruded by: HB  
 Sample Logged by: HB  
 Type: Shelby  
 Diameter of Sample: 2.85

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
			3.0	<p>Top of Recovery</p> <p>Soft, Brown, Fibrous Organic Silt</p>  <p>Bottom of Recovery</p>
	837.0	TVS		
		MC		
			3.5	
			4.0	
	409	Density		
		MC		
		Consol		
			4.5	

VISUAL CORE LOG

Client: The Retec Group, Inc.  
 Project: North Lake Union Geotech  
 Core No.: NLU418-GE-6.5-8.5  
 Sample No.: HQ370  
 Depth of Sample: 6.5-8.5  
 Sample Recovery: 20"

Date: 2/15/05  
 Sample Extruded by: HB  
 Sample Logged by: HB  
 Type: Shelby  
 Diameter of Sample: 2.85

Specimen Saved	Water Content (%)	Test Type	Depth (ft)	Classification and Description
	699.8	TVS MC	3.0	Top of Recovery Soft, Brown, Fibrous Organic Silt  Bottom of Recovery
			3.5	
			4.0	
	637.7	Density MC	4.5	

North Lake Union Geotech

Moisture Content and TVS  
(Shelby Tube Samples)

ASTM D2216  
ASTM D2974

The Retec Group

North Lake Union Geotech

Percent Moisture and Organic Matter

Sample ID	Moisture Content*	% Organic Matter
NLU79-GE-3.5-5.5	812.9	39.7
NLU80-GE-1.5-3.5	456.1	17.3
NLU402-GE-3.0-5.0	313.2	19.9
NLU402-GE-8.0-10.0	676.1	31.5
NLU405-GE-3-5	548.5	27.9
NLU415-GE-0-2	326.9	14.0
NLU415-GE-2-4	778.7	33.0
NLU418-GE-3-5	837.0	34.9
NLU418-GE-6.5-8.5	699.8	32.5

Moisture Content by ASTM D2216  
Organic Matter by ASTM D2974

HQ36 & HQ37

North Lake Union Geotech

Consolidation Tests

ASTM D2435



Project Number:	HQ37	Job Name:		Retec
Boring / Sample	NLU415-GE-0-2	Job Number		
Sample Initial Height	0.9779	Job Location	North Lake Union	
Initial Dial Reading	0.4623	DI After Seating Load	0.5519	

**Consolidation Test Summary**

S <sub>0</sub>	S <sub>90</sub>	S <sub>100</sub>	S <sub>f</sub>	t <sub>90</sub> (min)	H	Drainage Path	C <sub>v</sub> (ft <sup>2</sup> /day)	Load (tsf)	Strain Ratio
0.5516	0.5512	0.5512	0.5510	0.4	0.5510	0.2755	1.609	0.01	0.0235
0.5506	0.5474	0.5470	0.5471	5	0.5471	0.2736	0.127	0.02	0.0275
0.5458	0.5275	0.5255	0.5255	40	0.5255	0.2628	0.015	0.04	0.0496
0.5245	0.4705	0.4645	0.4645	63	0.4645	0.2323	0.007	0.09	0.1120
0.4640	0.4225	0.4179	0.4165	65	0.4165	0.2083	0.006	0.14	0.1611
0.4155	0.3708	0.3658	0.3658	35	0.3658	0.1829	0.008	0.24	0.2129
0.3640	0.3195	0.3146	0.3145	13	0.3145	0.1573	0.016	0.44	0.2654
0.3085	0.2330	0.2246	0.2246	17.5	0.2246	0.1123	0.006	0.84	0.3573
0.2270	0.2315	0.2320	0.2355	0.5	0.2355	0.1178	0.235	0.24	0.3461
0.2360	0.2466	0.2478	0.2480	4	0.2480	0.1240	0.033	0.09	0.3334
0.2485	0.2840	0.2879	0.2895	30	0.2895	0.1448	0.006	0.02	0.2909

**Sample Parameters**

Initial Moisture Content, %	159	Final Moisture Content, %	106
Initial Dry Unit Weight, lb/ft <sup>3</sup>	31	Final Dry Unit Weight, lb/ft <sup>3</sup>	43
Initial Void Ratio	4.01	Final Void Ratio	2.67
Initial Saturation	0.92	Final Saturation	1.00

The following equations were used to calculate the values shown in the table above:

$$C_v = T H^2 / t_{90}$$

Where:

T = the time factor for 90% consolidation

H = average of initial and final heights of the sample at each load, divided by 2

(S<sub>0</sub> + S<sub>100</sub>)/2 (for double drainage paths)

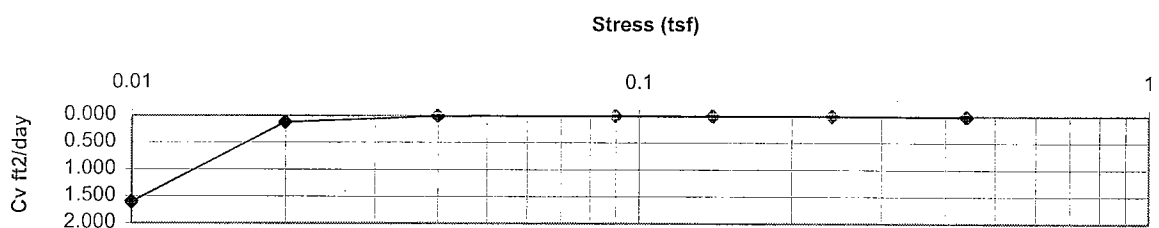
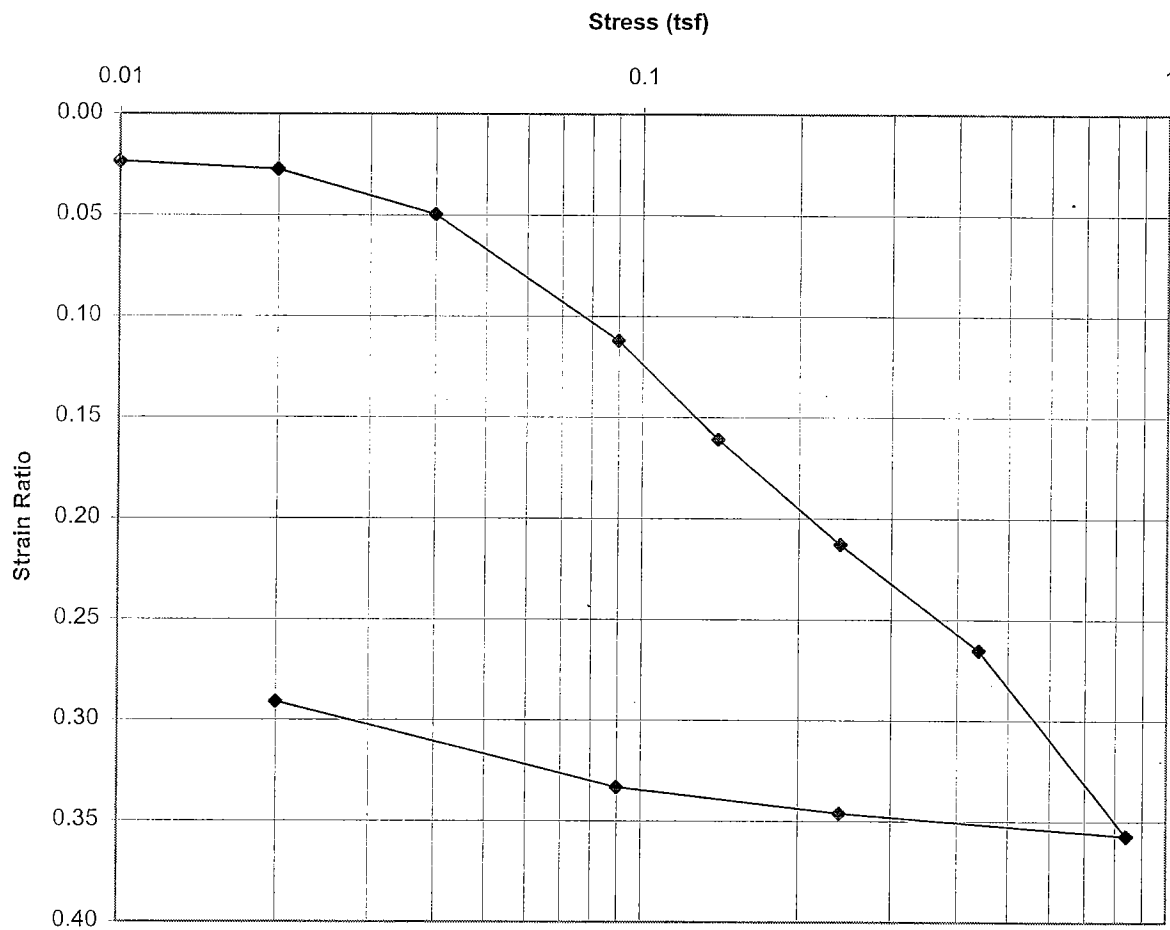
t<sub>90</sub> = the time at which 90% consolidation has occurred, as derived from square root of time plots for each load.

Notes to the Testing:

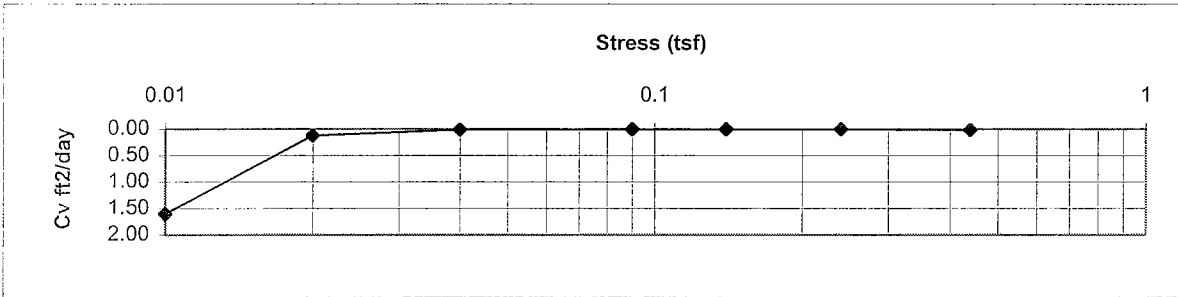
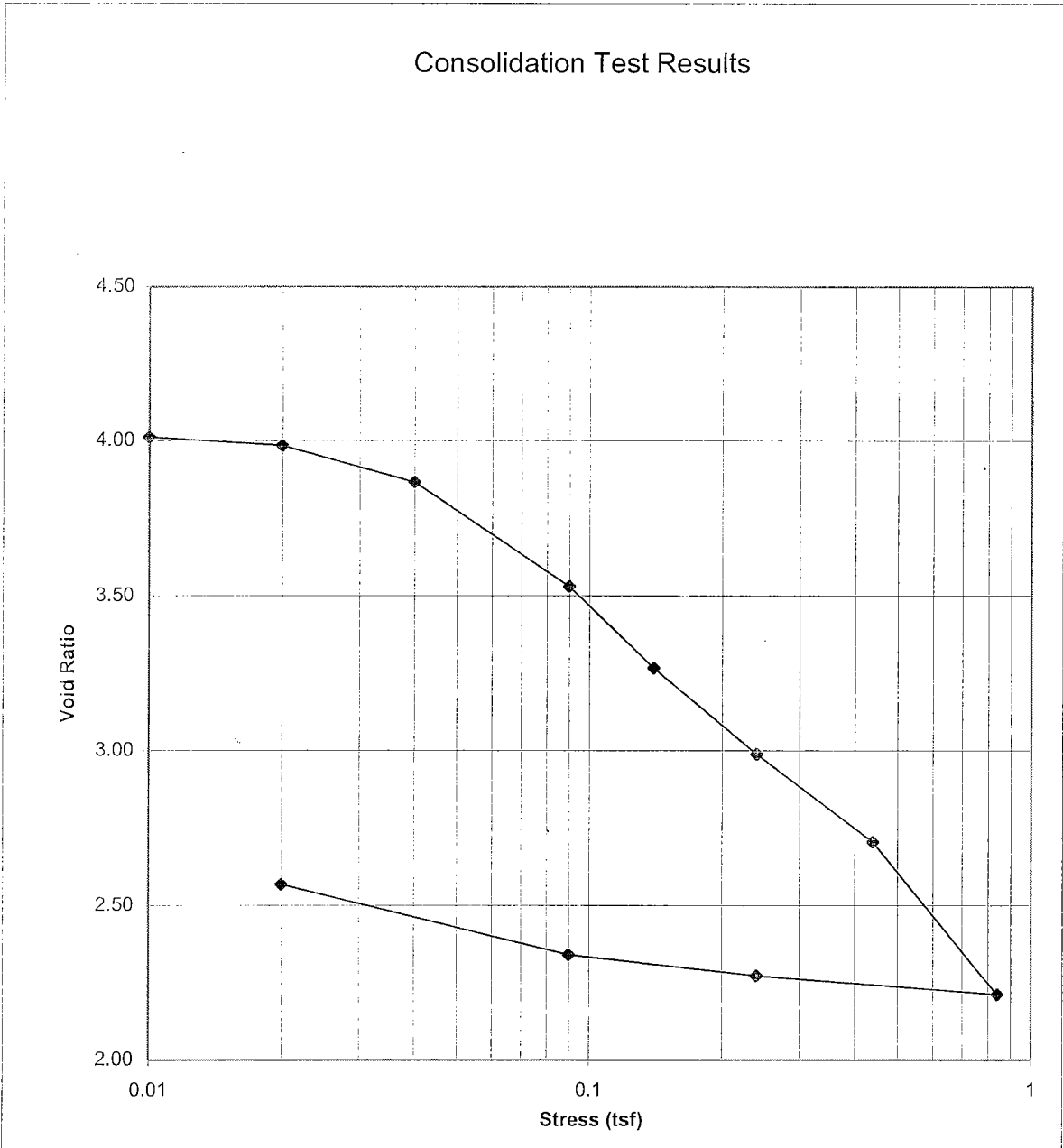
1. The sample was extruded from the sample tube and trimmed into a consolidation ring.
2. The sample was an organic silt.

### Consolidation Test Results

NLU415-GE-0-2



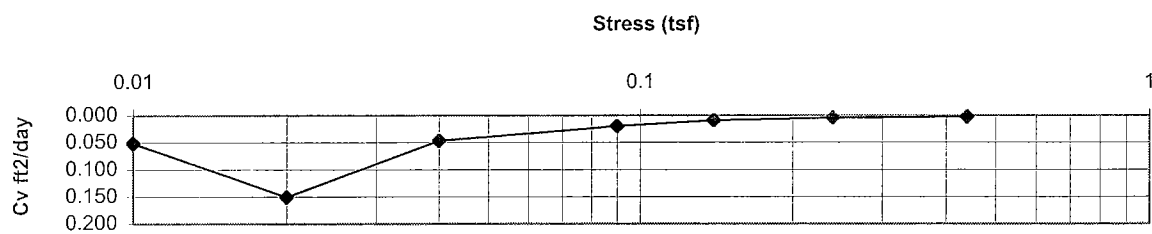
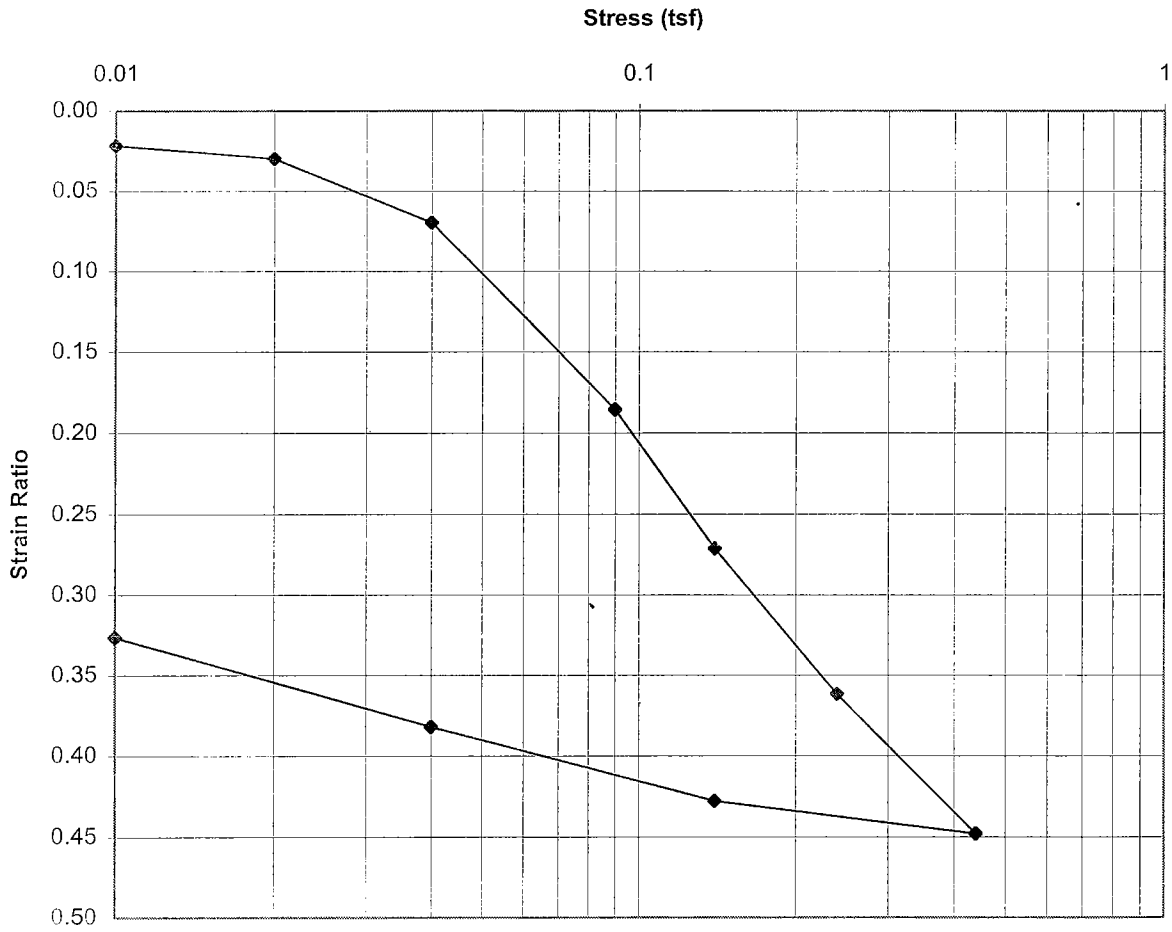
Consolidation Test Results



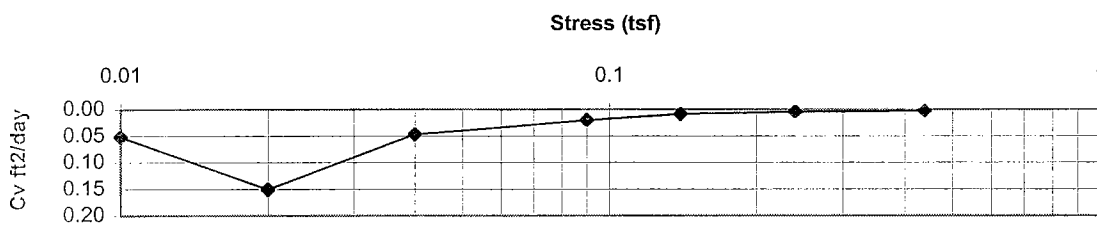
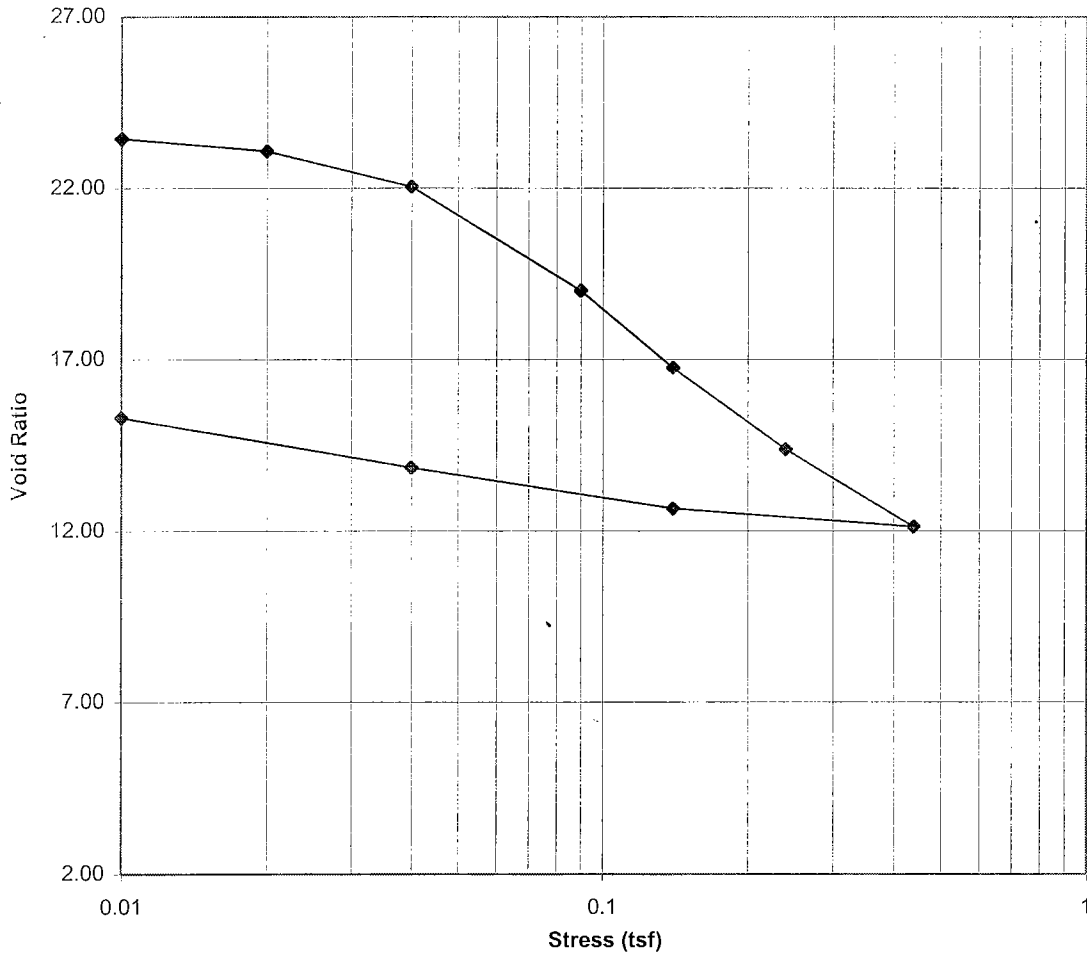


### Consolidation Test Results

NLU418-GE-3-5



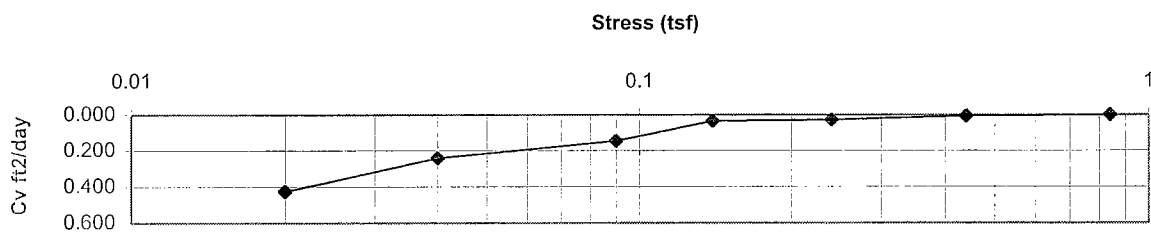
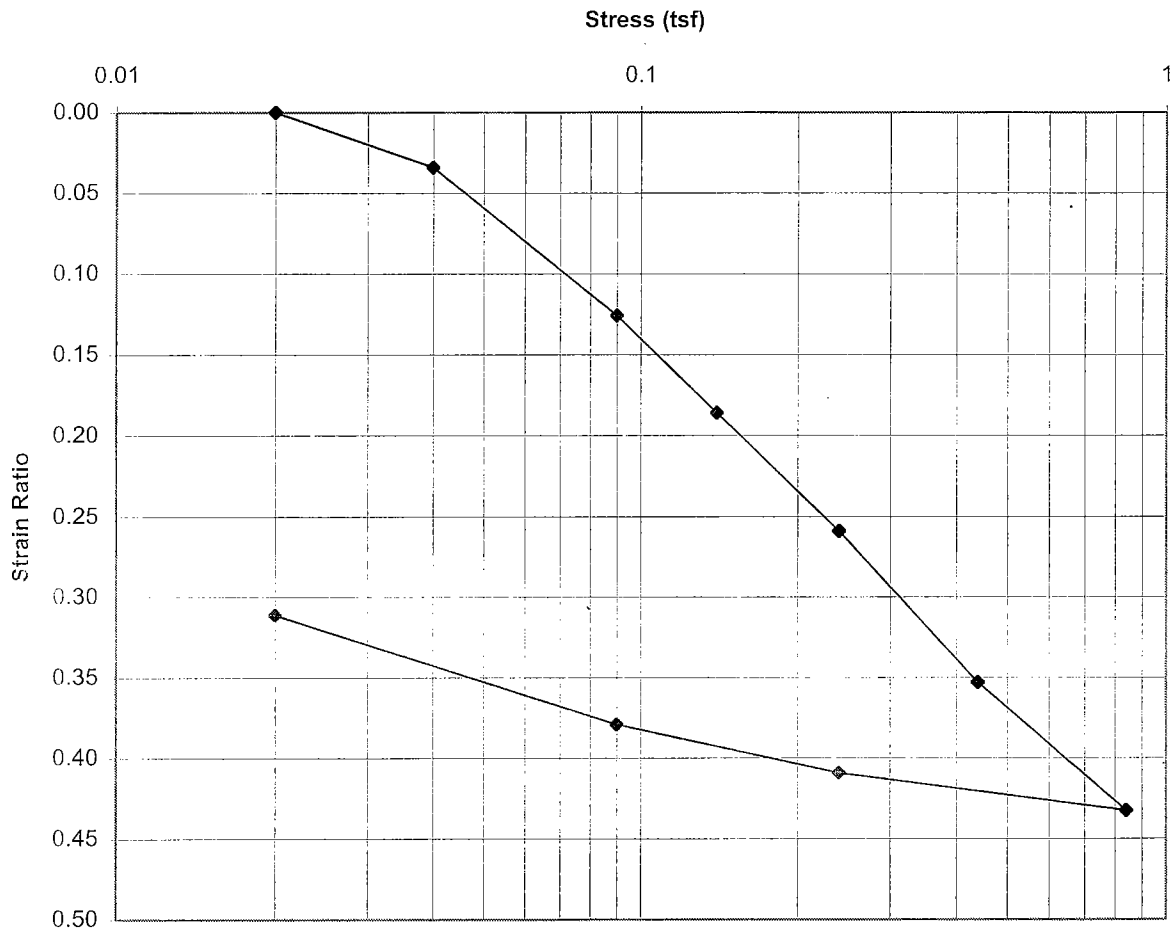
Consolidation Test Results





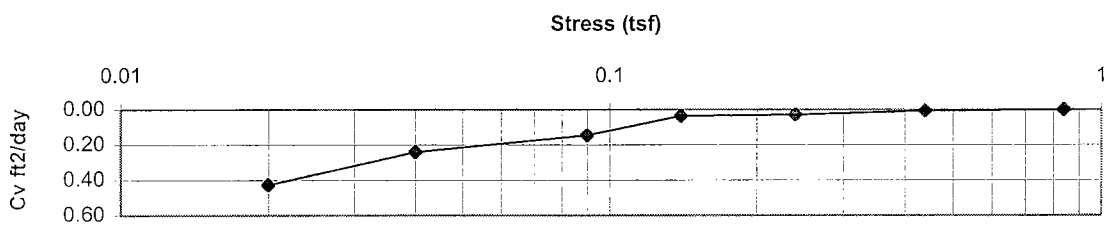
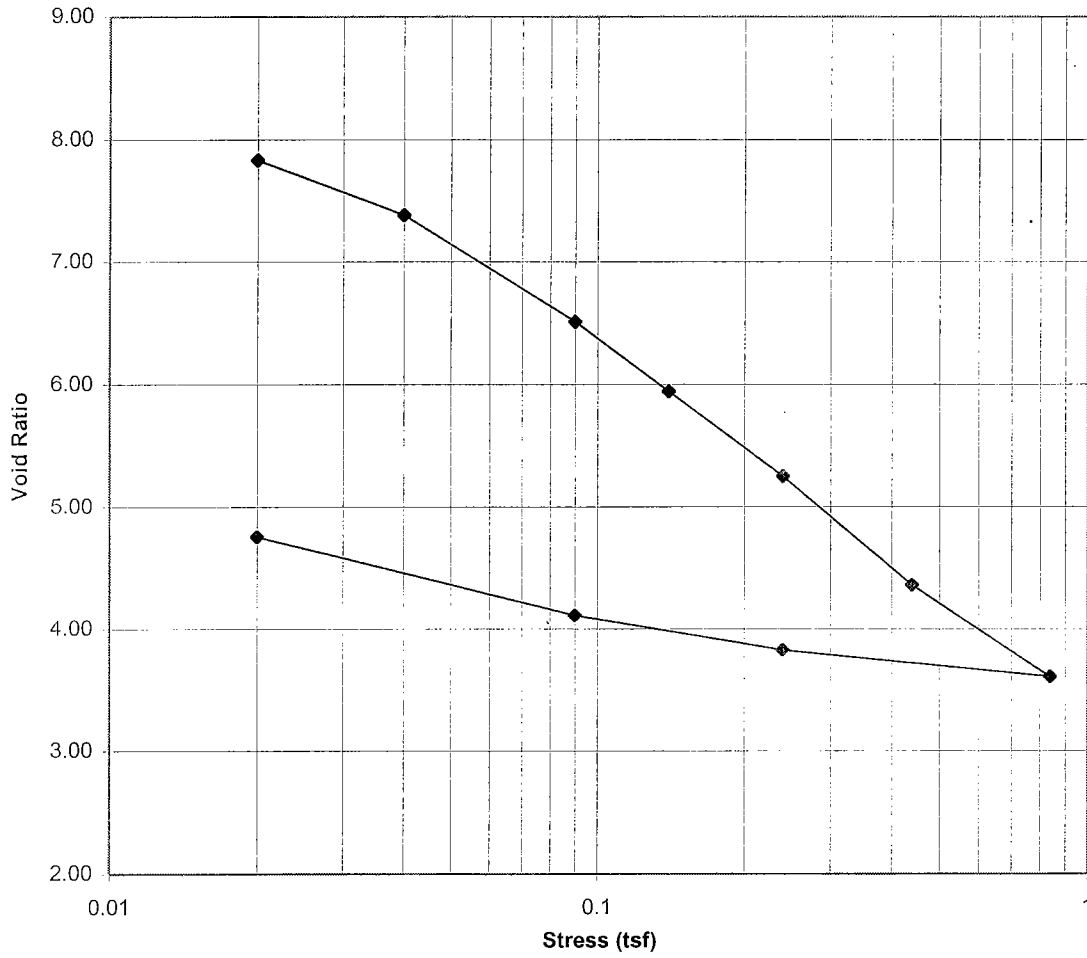
### Consolidation Test Results

NLU402-GE-3.0-5.0





Consolidation Test Results





**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

March 15, 2005

Mr. Mike Byers, PE  
The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134

**Subject: North Lake Union Geotech  
ARI Project No. HU50**

Dear Mr. Byers;

The data from the referenced project follows. The testing was completed on January 30, 2005. Please call to discuss any questions or comments you may have on the data or its presentation.

Best Regards,  
Analytical Resources Incorporated

A handwritten signature in black ink that reads "Harold Benny".

Harold Benny  
Geotechnical Division Manager  
206-695-6246  
[haroldb@arilabs.com](mailto:haroldb@arilabs.com)

Enclosures

cc: File HU50



Client: The Retec Group, Inc.

Project No.: HU50

Client Project: North Lake Union Geotech

### Case Narrative

1. The samples were submitted for grain size analysis and moisture content.
2. The samples were run according to ASTM D422 for the grain size analysis, with both sieve and hydrometer analysis. A specific gravity of 2.65 was assumed for the hydrometer calculations.
3. The moisture content was run according to ASTM D2216. The calculations are based on the dry weight of solids. Because the samples contained more water than solids, they have moisture contents above 100 percent.
4. The data is provided in summary tables and plots.
5. There were no other noted anomalies in the samples or methods on this project.

Approved by:  
Title:

*Harold Berry*  
Geotechnical Division Manager

Date:

*3/15/05*

# Chain of Custody Record

No 101025

The RETEC Group, Inc.  
 1011 S.W. Klickitat Way, Suite 207 • Seattle, WA 98134-1162  
 (206) 624-9349 Phone • (206) 624-2839 Fax  
 www.retec.com

1450



E-44

Project Name: <i>North Lake Union Geotech</i>		Project Number: <i>PS670-18628-520</i>		Analysis Requested <i>Moisture Content</i> <i>Stevir - ASTM 4227 #200</i>										Page ____ of ____			
Send Report To: <i>Mike Byers</i>		Sampler (Print Name): <i>S. Albano</i>												Sampler (Print Name): <i>Contact M. Byers</i>		Purchase Order #: _____	
Address:		Shipment Method:												Airbill Number:		Laboratory Receiving:	
Phone:		Fax:															
Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers											Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)	
<i>NLU418 GE 11.5-11.8</i>	<i>1/19/05</i>	<i>16:05</i>	<i>Soil</i>	<i>1</i>		<i>X</i>											
<i>NLU405 GE 1-2.25</i>	<i>1/19/05</i>	<i>9:35</i>	<i>Soil</i>	<i>1</i>		<i>X</i>											
<i>2.25-3.0</i>	<i>↓</i>	<i>9:45</i>	<i>↓</i>	<i>↓</i>		<i>X</i>											
<i>7.5-8.0</i>	<i>↓</i>	<i>10:25</i>	<i>↓</i>	<i>↓</i>		<i>X</i>											
<i>12-13.5</i>	<i>↓</i>	<i>11:25</i>	<i>↓</i>	<i>↓</i>		<i>X</i>											

Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Date: <i>3/3/05</i>	Time: <i>10:55</i>	Sample Custodian Remarks (Completed By Laboratory):			
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:	QA/QC Level	Turnaround	Sample Receipt	
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:	Level I <input type="checkbox"/>	Routine <input type="checkbox"/>	Total # Containers Received?	
				Level II <input type="checkbox"/>	24 Hour <input type="checkbox"/>	COC Seals Present?	
				Level III <input type="checkbox"/>	1 Week <input type="checkbox"/>	COC Seals Intact?	
				Other <input type="checkbox"/>	Other _____	Received Containers Intact?	
						Temperature?	

13.0/13

The Retec Group, Inc.  
North Lake Union Geotech

Initial Moisture Content

Client Sample Number	Depth (ft)	Moisture Content (%)
NLU405GE 1-2.5	1-2.5	382.1
NLU405GE 2.5-3.0	2.5-3.0	471.7

Moisture content by ASTM D2216.

HU50

The Retec Group, Inc.  
North Lake Union Geotech

Percent Finer (Passing) Than the Indicated Size

Sieve Size (microns)	3/4"	1/2"	3/8"	#4 (4750)	#10 (2000)	#20 (850)	#40 (425)	#60 (250)	#100 (150)	#200 (75)	32	22	13	9	7	3.2	1.3
NLU418GE 11.5-11.8	100.0	100.0	100.0	99.9	98.2	92.8	77.4	44.3	19.0	7.2	4.5	4.0	3.6	2.2	2.2	1.3	1.3
NLU405GE 7.5-8.0	100.0	93.3	88.5	84.9	78.7	65.5	48.5	28.3	18.4	13.6	11.2	9.0	7.9	6.7	6.2	5.1	3.9
NLU405GE 12-13.5	100.0	87.9	84.0	76.9	71.3	66.6	59.3	47.8	37.0	27.4	19.9	15.7	11.5	8.4	6.8	4.2	2.1

Testing performed according to ASTM D421/D422

HU50

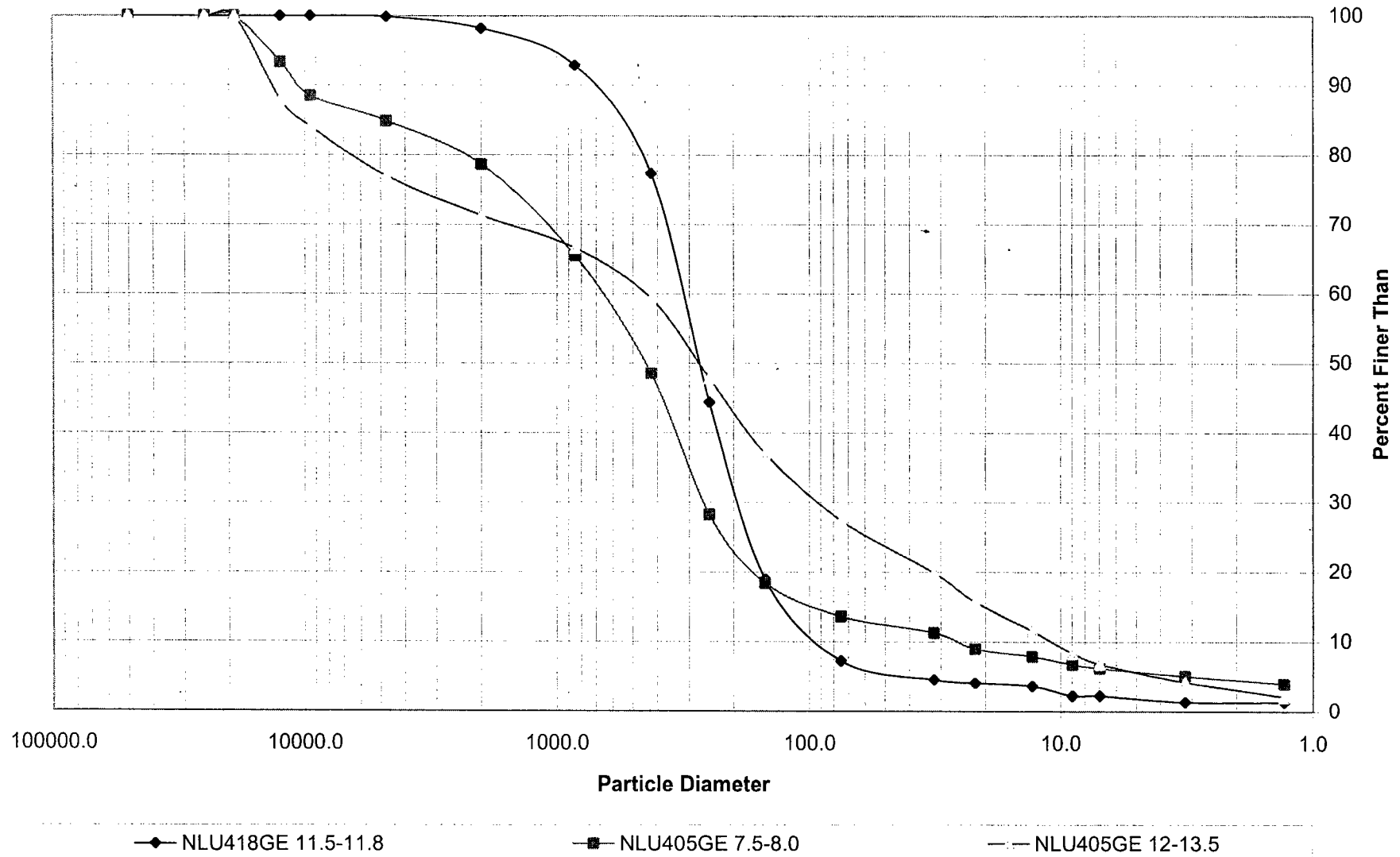
The Retec Group, Inc.  
North Lake Union Geotech

Percent Retained in Each Size Fraction

Description	% Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Very Coarse Silt	% Coarse Silt	% Medium Silt	% Fine Silt	% Fine Silt	% Very Fine Silt	% Clay
Particle Size (microns)	> 4750	4750-2000	2000-425	425-75	75-32	32-22	22-13	13-9	9-7	7-3.2	<3.2
NLU418GE 11.5-11.8	0.1	1.7	20.8	70.2	2.7	0.4	0.4	1.3	0.0	0.9	1.3
NLU405GE 7.5-8.0	15.1	6.2	30.1	34.9	2.4	2.2	1.1	1.1	0.6	1.1	5.1
NLU405GE 12-13.5	23.1	5.7	12.0	31.9	7.5	4.2	4.2	3.1	1.6	2.6	4.2

HU50

**Grain Size Distribution by Hydrometer**







**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

May 18, 2005

Mr. Mike Byers, P.E.  
The RETEC Group, Inc.  
1011 SW Klickitat Way, Suite 207  
Seattle, WA 98134

**Subject: PSE10-18064-430;  
ARI Project No. HY96**

Dear Mr. Byers;

The data from the referenced project follows. Please call to discuss any questions or comments you may have on the data or its presentation.

Best Regards,  
Analytical Resources Incorporated

Harold Benny  
Geotechnical Division Manager  
206-695-6246  
[haroldb@arilabs.com](mailto:haroldb@arilabs.com)

Enclosures

cc: File HY96



Client: The Retec Group, Inc.

Project No.: HY96

Client Project: PSE10-18064-430

### Case Narrative

1. The samples were submitted for grain size analysis according to PSEP methodology, both as received and after burning at 440° C.
2. The samples were run in a single batch.
3. The samples were split and washed in the normal way, following PSEP protocols. Following the wash step, the material retained on the #230 sieve was oven dried and sieved. The material was then placed in a crucible and was burned at 440°C. the material was then re-sieved.
4. The data for the as received sample was calculated and plotted in the standard manner. The burned material was calculated by using the burned weight of the coarse material and adding the weight of the fines, to get the "total weight of the sample."
5. The data is provided in summary tables and plots.
6. There were no other noted anomalies in the samples or methods on this project.

Approved by:

Title:

Geotechnical Division Manager

Date:

5/18/05

The Retec Group

North Lake Union

Organic Matter

Sample ID	% Organic Matter
NLU43	33.3
NLU48	37.6
NLU59	14.9
NLU61	36.7
NLU62	29.3
NLU71	30.5

Organic Matter by ASTM D2974

HY96

RETEC  
PSE10-18064-430

Percent Retained in Each Size Fraction

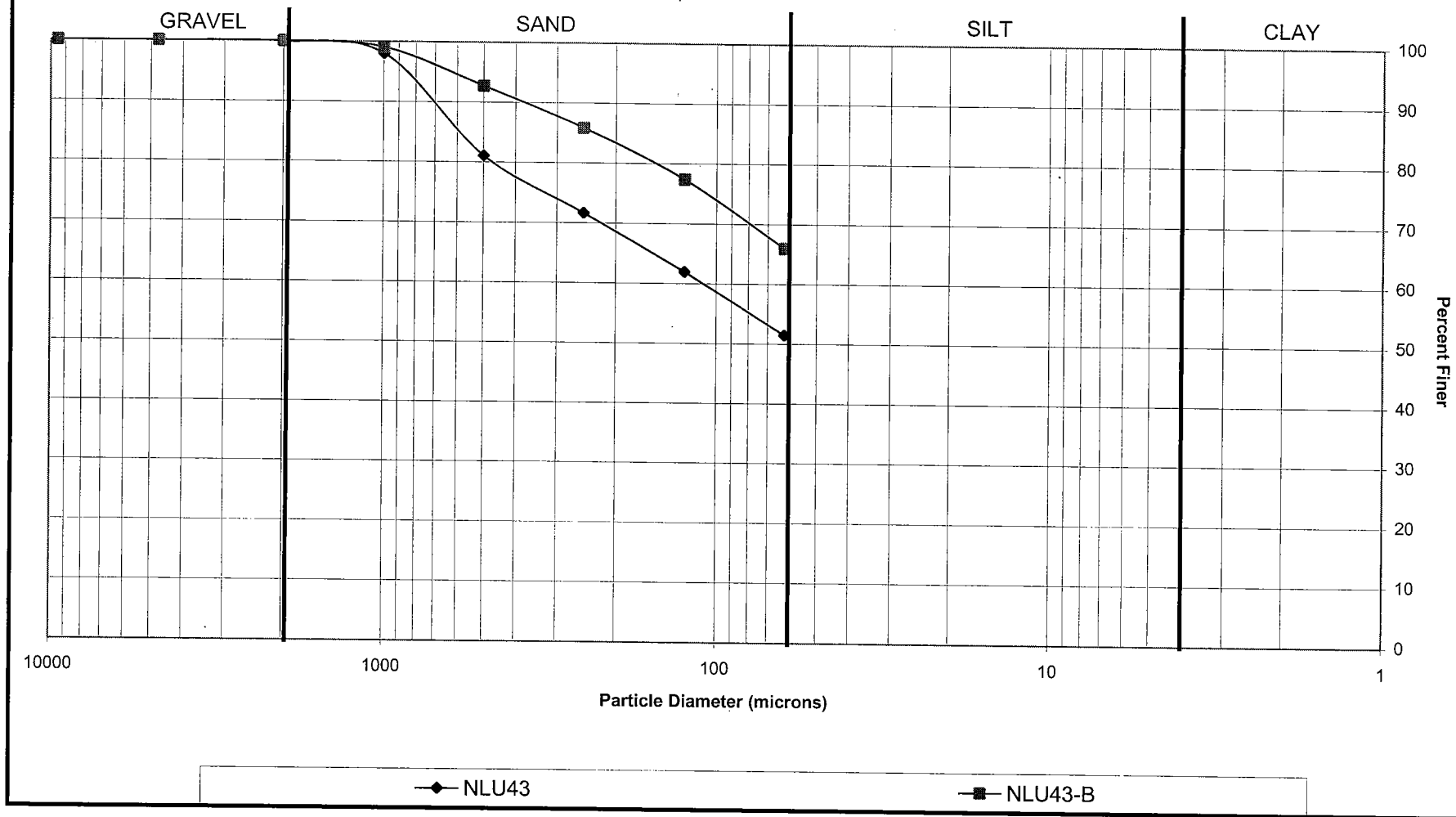
Sample No.	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand
Phi Size	> -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)
NLU43	0.1	1.9	16.9	9.4	9.7	10.5
NLU43-B	0.0	0.9	6.4	6.9	8.4	11.4
NLU48	0.0	3.6	16.0	7.9	8.1	9.3
NLU48-B	0.0	0.7	5.5	5.3	6.7	10.0
NLU59	41.3	8.9	10.9	14.2	10.6	4.1
NLU59-B	35.9	7.6	10.6	15.2	12.7	6.4
NLU61	0.1	0.1	11.7	9.8	11.1	11.4
NLU61-B	0.2	0.2	2.6	6.0	8.8	11.5
NLU62	0.0	0.1	10.2	11.9	16.3	19.6
NLU62-B	0.1	0.1	0.6	4.3	14.7	24.5
NLU71	0.3	3.4	17.7	15.5	12.7	9.9
NLU71-B	0.1	0.3	5.9	13.8	14.0	12.7

RETEC  
PSE10-18064-430

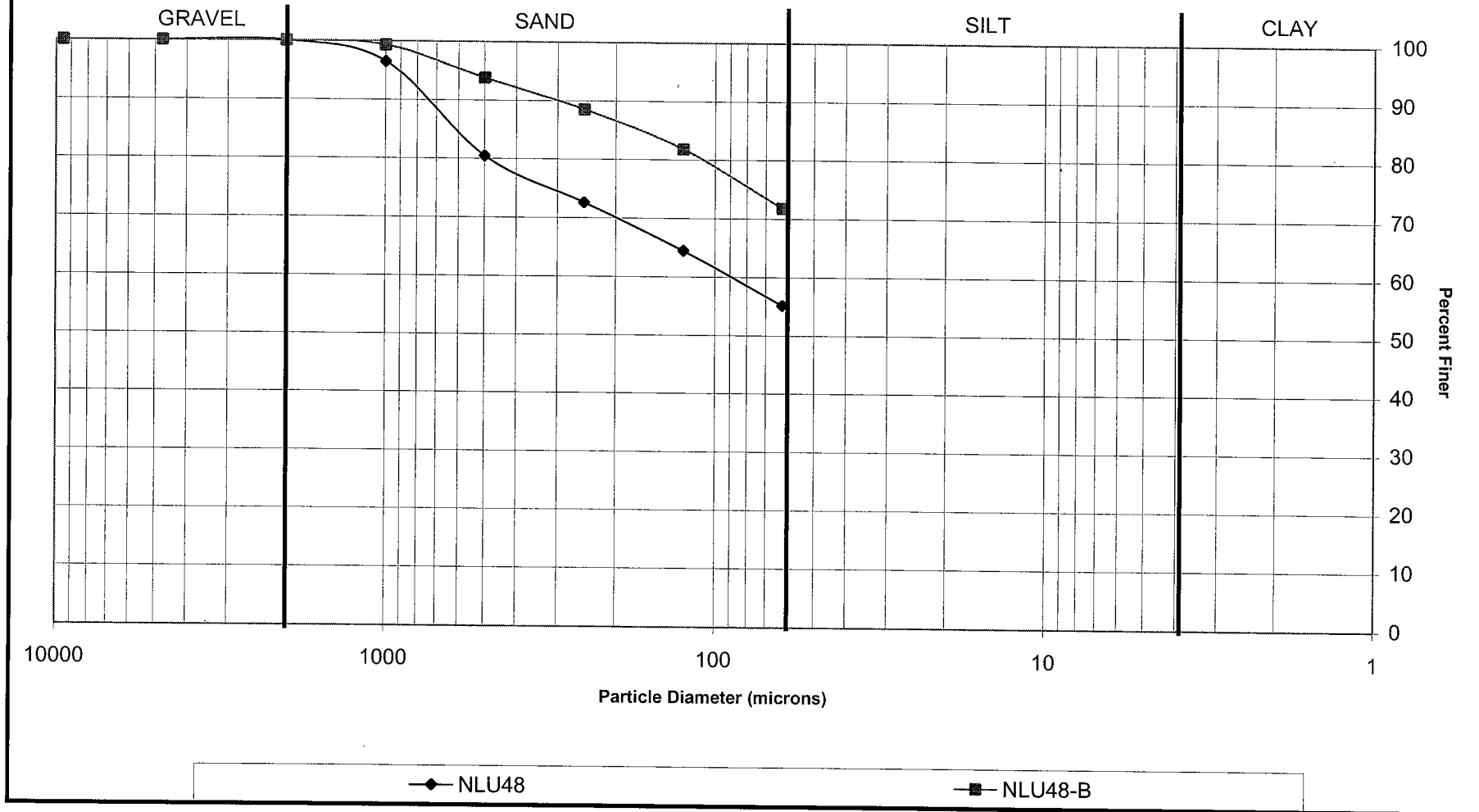
Comparison of Un-burned and Burned Grain Size Distribution

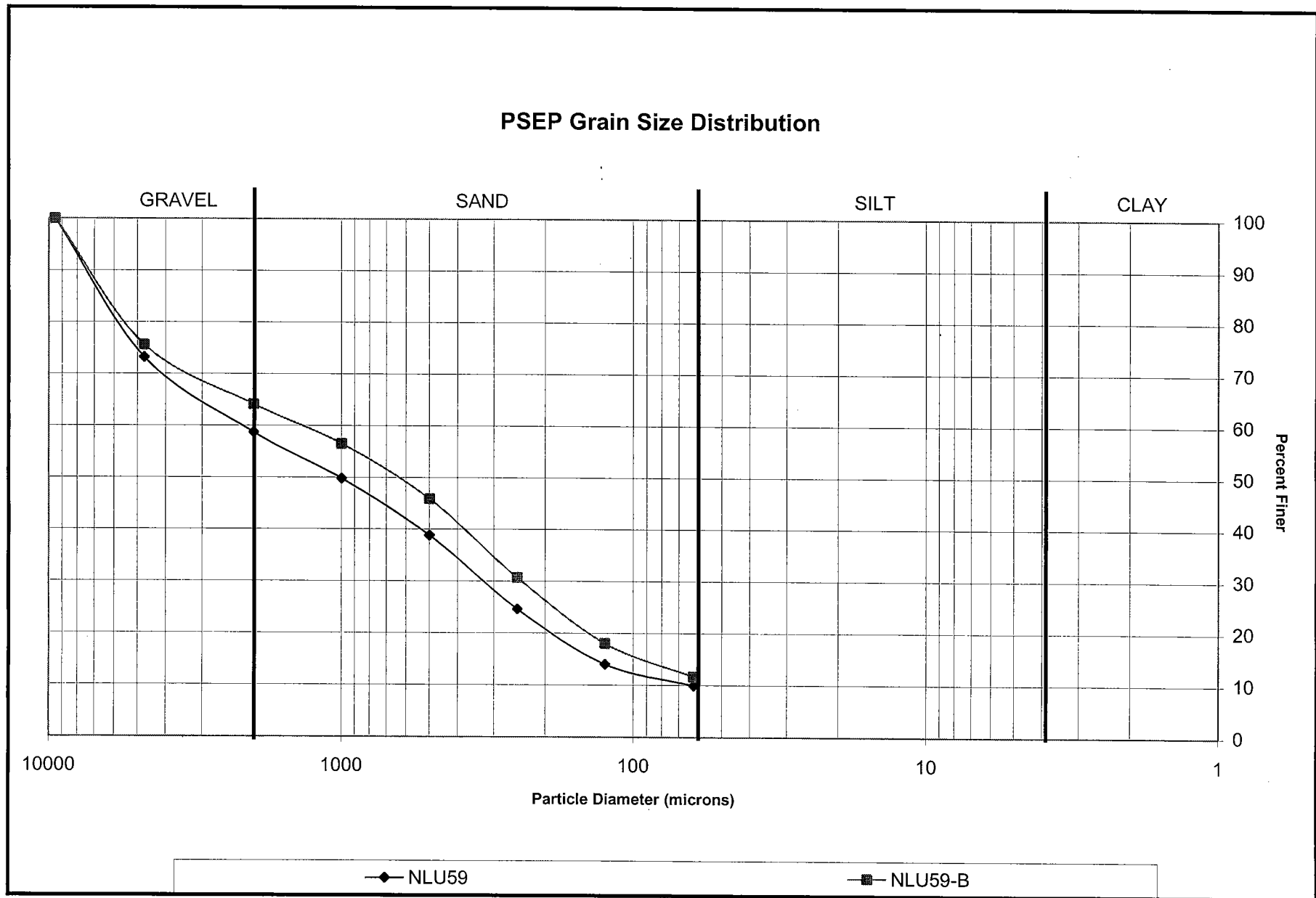
Sample No.	Gravel			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand
	-3	-2	-1					
Phi Size	-3	-2	-1	0	1	2	3	4
Sieve Size (microns)	3/8"	#4	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (62)
NLU43	100.0	100.0	99.9	98.0	81.1	71.6	61.9	51.4
NLU43-B	100.0	100.0	100.0	99.1	92.7	85.8	77.3	66.0
NLU48	100.0	100.0	100.0	96.4	80.5	72.6	64.5	55.2
NLU48-B	100.0	100.0	100.0	99.3	93.8	88.5	81.8	71.8
NLU59	100.0	73.2	58.7	49.7	38.8	24.6	14.0	9.9
NLU59-B	100.0	75.6	64.1	56.5	45.9	30.7	18.0	11.6
NLU61	100.0	100.0	99.9	99.8	88.1	78.3	67.2	55.8
NLU61-B	100.0	100.0	99.8	99.6	97.0	91.0	82.2	70.8
NLU62	100.0	100.0	100.0	99.8	89.6	77.7	61.4	41.8
NLU62-B	100.0	100.0	99.9	99.8	99.2	95.0	80.3	55.8
NLU71	100.0	100.0	99.7	96.3	78.6	63.1	50.4	40.5
NLU71-B	100.0	100.0	99.9	99.6	93.7	79.9	65.9	53.2

### PSEP Grain Size Distribution



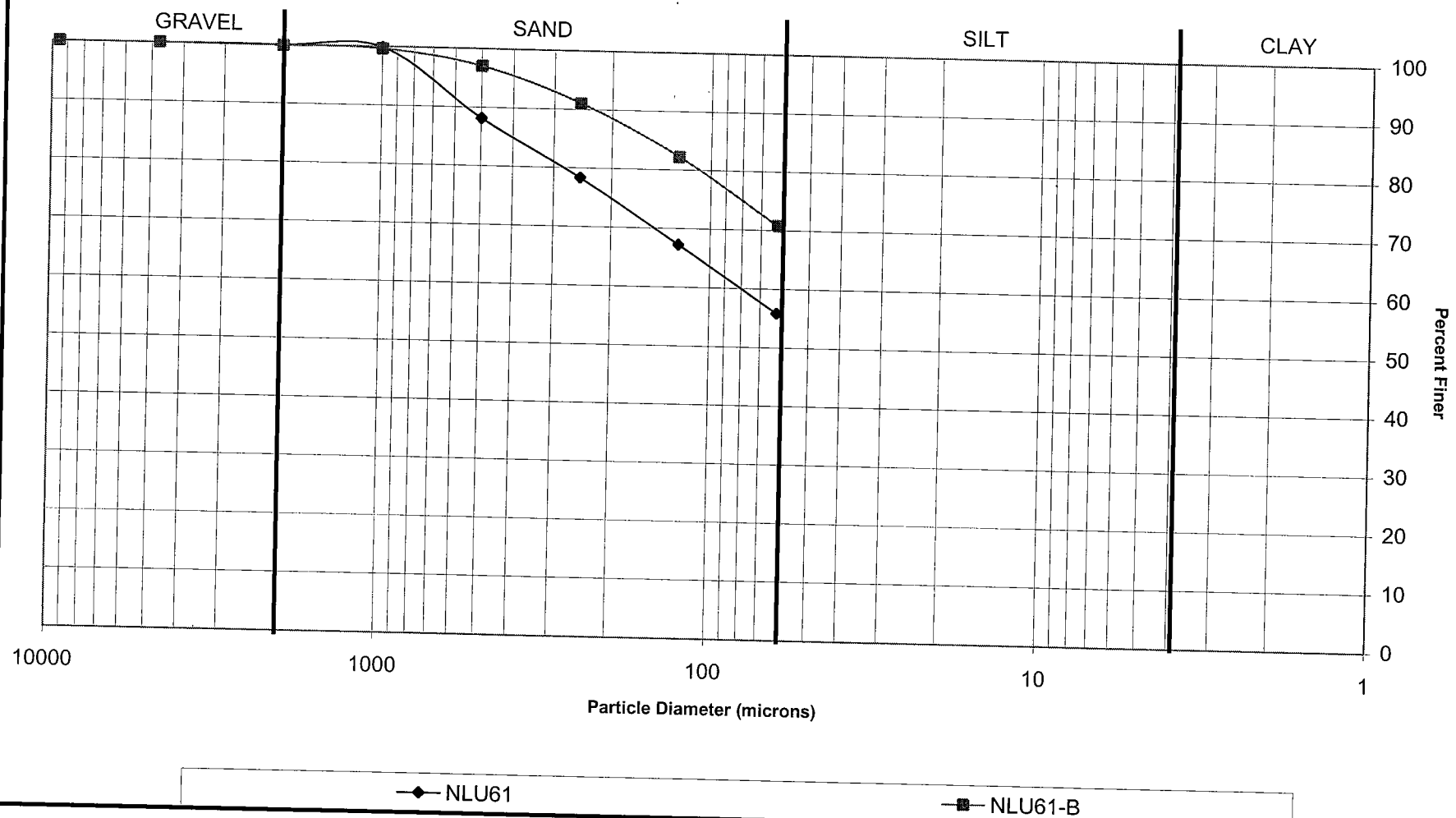
### PSEP Grain Size Distribution



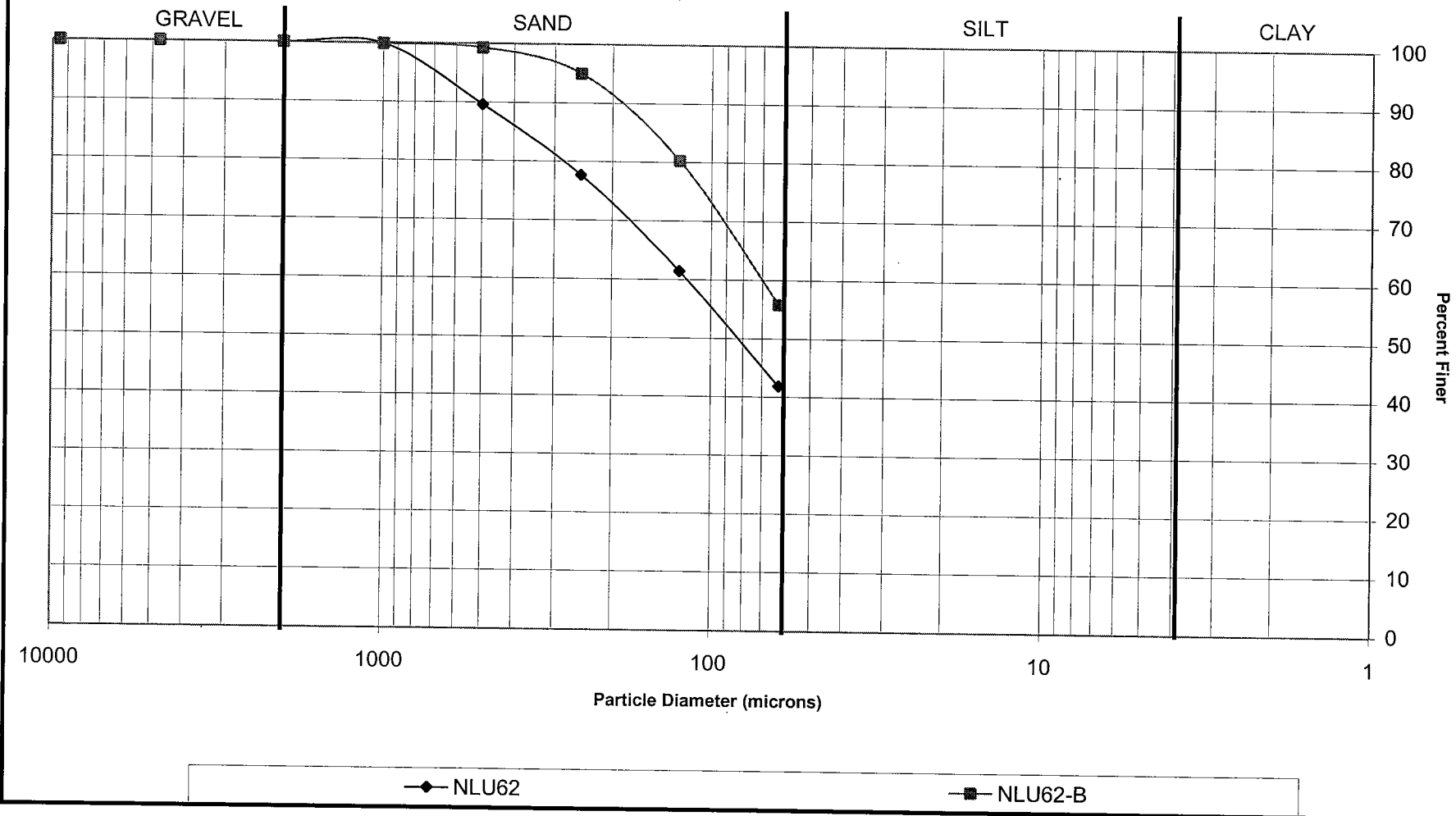




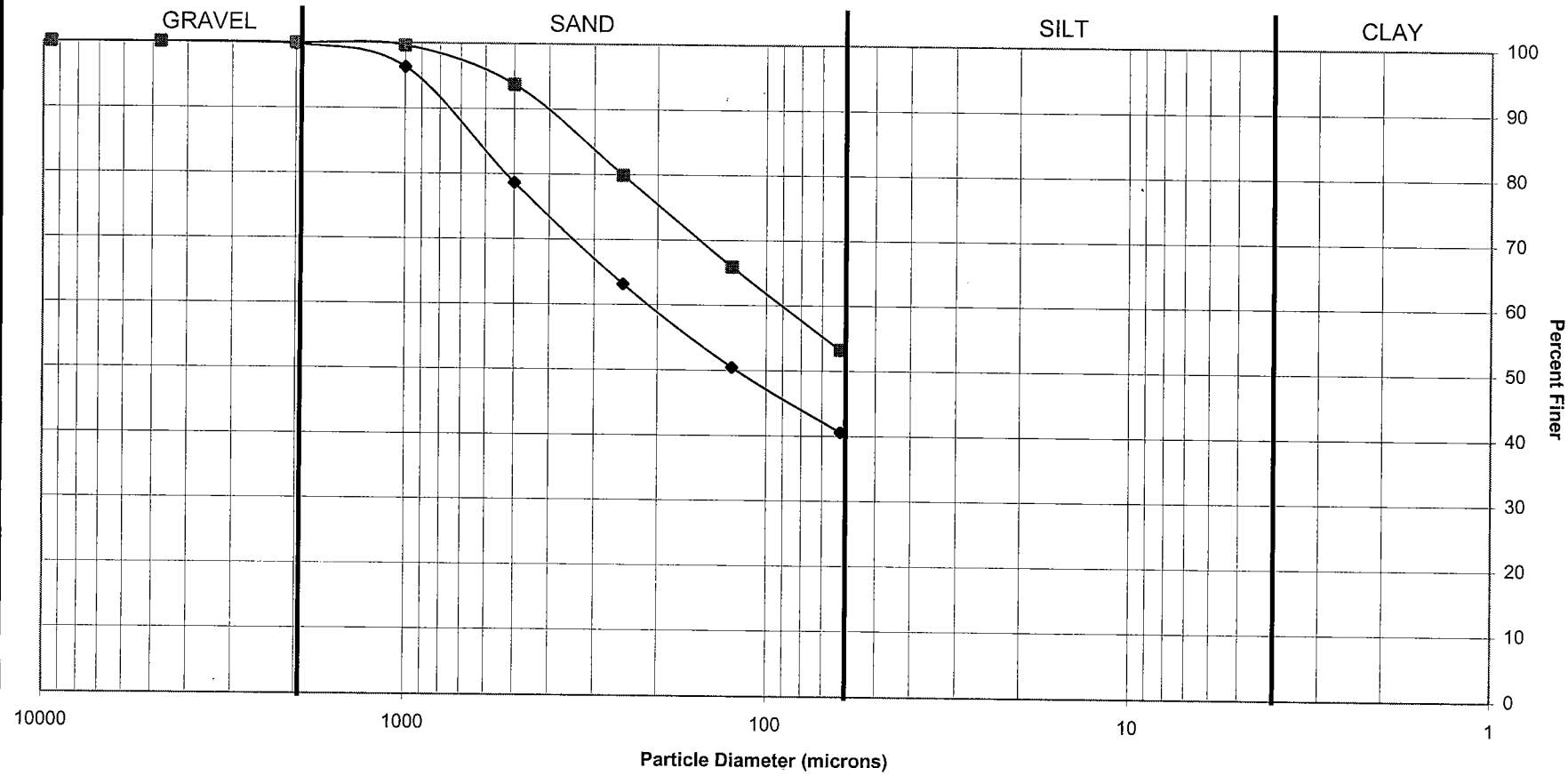
### PSEP Grain Size Distribution



### PSEP Grain Size Distribution



### PSEP Grain Size Distribution



◆ NLU71

■ NLU71-B

**SUB-ATTACHMENT 3D-2.5**  
**RETEC 2005 Phase 3 Bioassay Samples -**  
**Sediment Grain Size**

**Table A-2 Phase 3 Bioassay Surface Sediment Grain Size (PSEP) – April 2005**

Percent Retained in Each Size Fraction  Phi Size  Sieve Size (microns)	Gravel  > -1  > #10 (2000)	Sand						Silt				Clay			% Fines (sum of all silt and clay)
		Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Total Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	8 to 9	9 to 10	< 10	
		-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4		4 to 5	5 to 6	6 to 7	7 to 8	3.9-2.0	2.0-1.0	<1.0	
		10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)		62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9				
NLU13-TX-0010	0.8	1	6.4	5.3	6.2	5	23.9	1.8	12.2	16.2	18.2	9.8	6.7	10.4	75.3
NLU41-TX-0010	< 0.01	0.2	11.1	8.7	8.7	10.2	38.9	4.6	14.2	12.4	13.7	7.0	3.3	5.8	61
NLU51-TX-0010	3.7	2.4	6.9	16.1	23.2	13.2	61.8	4.1	6.1	7.6	5.4	3.6	1.5	6.1	34.4
NLU55-TX-0010	17.4	5.4	8.8	13.6	27.7	17.1	72.6	2.4	1.8	1.4	1.7	1.2	0.7	0.8	10
NLUD55-TX-0010	8.3	5.4	8.2	12.6	22.6	16.7	65.5	5.5	5.8	4.9	3.9	2.7	1.6	1.7	26.1
NLU64-TX-0010	0.1	1.1	14.3	10.0	11.3	10.8	47.5	5.8	12.9	11.3	9.1	5.7	3.3	4.3	52.4
NLU66-TX-0010	< 0.01	0.4	12.2	8.3	8.3	9.4	38.6	4.0	14.9	14.0	12.4	6.7	3.7	5.9	61.6
NLU69-TX-0010	< 0.01	0.9	13.4	7.1	7.5	9.4	38.3	5.8	16.0	13.6	11.9	6.0	3.3	5.1	61.7
NLU73-TX-0010	0.3	0.6	8.8	10.6	16.4	17.9	54.3	10.3	9.8	9.0	7.5	4.2	2.0	2.7	45.5
NLU173-TX-0010	1.0	0.6	8.6	10.1	15.4	18.0	52.7	9.6	11.2	8.1	7.8	4.2	2.6	2.8	46.3
NLU76-TX-0010	< 0.01	0.3	9.7	9.2	13.4	14.8	47.4	8.3	14.3	11.2	8.6	4.6	2.9	2.8	52.7
NLU81-TX-0010	0.1	0.5	11.9	8.1	8.7	10.7	39.9	7.3	16.1	11.3	10.9	5.9	3.7	4.9	60.1
NLU82-TX-0010	0.1	0.3	6.5	12.9	23.5	15.9	59.1	8.0	11.1	7.4	6.0	3.4	2.2	2.8	40.9
NLU83-TX-0010	< 0.01	1.0	12.8	7.6	7.8	8.5	37.7	3.2	14.0	13.5	13.6	7.3	3.9	6.8	62.3
NLU84-TX-0010	< 0.01	0.5	12.2	7.4	8.3	11.2	39.6	4.4	14.5	12.9	12.4	7.2	4.0	5.1	60.5
NLU85-TX-0010	0.5	0.4	10.5	7.6	8.0	9.8	36.3	3.8	12.8	13.9	12.9	8.3	5.0	6.5	63.2
NLU86-TX-0010	< 0.01	0.4	10.5	8.4	9.2	6.9	35.4	3.9	8.5	11.6	11.2	7.9	5.8	15.6	64.5
NLU87-TX-0010	< 0.01	0.4	10.6	6.9	8.8	8.0	34.7	3.8	10.8	14.3	13.3	9.0	5.3	8.9	65.4
NLU117-TX-0010	0.8	1.6	10.1	13.2	17.0	10.5	52.4	2.8	7.9	8.9	7.6	5.7	3.5	10.2	46.6
NLUD117-TX-0010	4.2	2.5	7.7	11.3	14.5	12.2	48.2	8.5	11.1	8.3	7.8	4.9	3.2	3.8	47.6
NLU EPA19-TX-0010	5.6	0.8	12.7	10.4	10.6	11.3	45.8	2.7	10.3	10.6	11.4	6.0	2.8	4.9	48.7
NLU EPA5-TX-0010	< 0.01	0.7	12.9	7.3	7.7	10.1	38.7	10.4	13.2	10.9	11.0	6.6	3.8	5.5	61.4
NLU REF1-TX-0010	10.1	3.3	6.6	13.2	16.7	14.7	54.5	15.9	8.7	4	2.6	1.7	1	1.5	35.4
NLU REF2-TX-0010	1.4	0.9	6.8	6.3	6.9	7.5	28.4	7.5	16.6	14.9	14.8	7.7	3.6	5.2	70.3

**Note:**

All grain size results are considered J-flagged as estimated values because of the apparent influence of organic material on sieving results  
Grain size analysis by PSEP method.

**SUB-ATTACHMENT 3D-2.6**  
**Floyd|Snider 2005 WSA Sediment Investigation -**  
**Geotechnical Data**

**SUB-ATTACHMENT 3D-2.6.1**  
**Floyd | Snider 2005 Moisture Content and**  
**Percent Organic Matter Data**



Client: Floyd, Snider

ARI Project No.: IG81

Client Project: Gas Works Sed WSA RI/FS

Client Project No.: 340542.002

Case Narrative

1. Four samples were retrieved from ARI sample archive on July 12, 2005.
2. The samples were tested for TVS according to ASTM Method D-2974.
3. There were no perceived anomalies to the samples or testing.

Released by:

Title:

*[Signature]*  
Laboratory Technician

Date:

7/19/05

Approved by:

Title:

*[Signature]*  
Laboratory Manager

Date:

7/19/05



Floyd, Snider

340542.002

Table 1. Percent Moisture and Organic Matter

Sample ID	Moisture Content*	% Organic Matter
GWS-EC16-0066	603.7	25.4
GWS-EC16-0173	517.2	16.3
GWS-EC21-0050	569.5	23.5
GWS-EC21-0177	506.7	17.0

Moisture Content by ASTM D2216

Organic Matter by ASTM D2974

IG81

**SUB-ATTACHMENT 3D-2.6.2**  
**Floyd|Snider 2005 Grain Size Data**

Floyd, Snider  
340542.002

Apparent Grain Size Distribution Summary  
Percent Finer Than Indicated Size

Sample No.	Gravel			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt				Clay	
	Phi Size	Phi Size	Phi Size						Phi Size	Phi Size	Phi Size	Phi Size	Phi Size	
	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
	3/8"	#4	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (62)	31.00	15.60	7.80	3.90	2.00	1.00
GWS-EC14-0112	100.0	100.0	100.0	99.7	86.4	75.6	65.3	54.8	54.1	43.6	33.6	24.5	11.5	6.6
GWS-EC14-0112	100.0	100.0	99.6	93.9	85.6	74.1	63.4	52.9	50.0	40.7	31.0	22.3	11.0	5.8
GWS-EC14-0112	100.0	100.0	99.9	97.7	86.1	76.2	66.1	55.2	53.8	43.2	33.6	24.9	11.7	6.2
GWS-EC07-0013	100.0	94.2	90.0	85.4	77.2	54.1	27.9	16.5	11.3	7.3	4.6	3.0	1.8	1.0
GWS-EC07-0034	100.0	96.8	94.4	92.2	85.7	74.2	61.7	48.1	41.0	29.4	20.2	13.6	9.4	5.5
GWS-EC07-0046	100.0	93.1	88.8	87.7	85.7	79.3	74.9	73.8	70.1	63.1	52.5	44.3	35.3	23.0
GWS-EC06-0023	100.0	99.7	98.8	97.6	93.2	86.7	75.7	62.8	56.5	44.8	30.5	19.9	13.3	7.3
GWS-EC06-0038	100.0	74.6	57.5	50.2	39.3	17.4	7.5	5.4	4.8	3.8	3.0	2.0	1.4	0.7

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

IB41

Floyd, Snider  
340542.002

Apparent Grain Size Distribution Summary  
Percent Retained in Each Size Fraction

Sample No.	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay		
Phi Size	> -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	< 10
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0
GWS-EC14-0112	0.0	0.3	13.4	10.7	10.3	10.5	0.8	10.5	10.0	9.1	13.0	5.0	6.6
GWS-EC14-0112	0.4	5.7	8.3	11.5	10.8	10.5	2.9	9.3	9.7	8.7	11.3	5.2	5.8
GWS-EC14-0112	0.1	2.2	11.6	9.9	10.2	10.9	1.4	10.6	9.6	8.7	13.3	5.5	6.2
GWS-EC07-0013	10.0	4.6	8.2	23.1	26.3	11.3	5.2	4.1	2.7	1.6	1.3	0.8	1.0
GWS-EC07-0034	5.6	2.2	6.5	11.5	12.5	13.6	7.1	11.6	9.2	6.6	4.2	3.9	5.5
GWS-EC07-0046	11.2	1.1	2.0	6.4	4.4	1.1	3.7	7.0	10.6	8.2	9.0	12.3	23.0
GWS-EC06-0023	1.2	1.2	4.4	6.5	11.0	13.0	6.3	11.6	14.3	10.6	6.6	5.9	7.3
GWS-EC06-0038	42.5	7.3	10.9	21.9	9.9	2.1	0.7	1.0	0.8	0.9	0.7	0.6	0.7

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

IB41

Floyd/Snider  
GAS WORKS SEDIMENT (340542.002)

Percent Finer Than Indicated Size

Sieve Size (microns)	2"	1"	3/4"	1/2"	3/8"	#4	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (63)
GWS-EC11-0019	100.0	100.0	100.0	100.0	99.2	95.6	87.5	82.4	73.0	42.9	11.7	2.9
GWS-EC11-0048	100.0	100.0	100.0	99.5	99.5	99.4	98.3	97.2	91.0	54.2	18.4	6.8
GWS-EC11-0067	100.0	100.0	100.0	100.0	100.0	100.0	99.8	97.7	80.5	33.7	5.3	1.1
GWS-EC07-0056	100.0	92.3	87.0	79.5	70.0	52.1	37.9	31.3	21.8	8.2	3.2	2.3
GWS-EC06-0056	100.0	100.0	100.0	96.1	93.3	89.0	77.8	68.5	50.6	18.0	5.7	3.6

IB41

Floyd/Snider  
GAS WORKS SEDIMENT (340542.002)

Percent Retained in Each Size Fraction

Sieve Size (microns)	>4750	4750-2000	2000-1000	1000-500	500-250	250-125	125-63	<63
GWS-EC11-0019	4.4	8.1	5.1	9.4	30.1	31.1	8.8	2.9
GWS-EC11-0048	0.6	1.1	1.1	6.3	36.8	35.9	11.6	6.8
GWS-EC11-0067	0.0	0.2	2.1	17.2	46.8	28.4	4.2	1.1
GWS-EC07-0056	47.9	14.2	6.6	9.5	13.6	4.9	0.9	2.3
GWS-EC06-0056	11.0	11.2	9.3	17.8	32.6	12.4	2.0	3.6

IB41

Floyd, Snider  
340542.002

PSEP Total Solids Analysis  
Percent of Wet Weight

Sample No.	Total Solids (%)
GWS-EC14-0112	18.1
GWS-EC14-0112	18.7
GWS-EC14-0112	18.3
GWS-EC07-0013	62.3
GWS-EC07-0034	41.7
GWS-EC07-0046	60.8
GWS-EC06-0023	29.1
GWS-EC06-0038	74.4

Triplicate Average	18.4
Standard Deviation	0.29
%RSD	1.58

(Total Solids at 90 C)

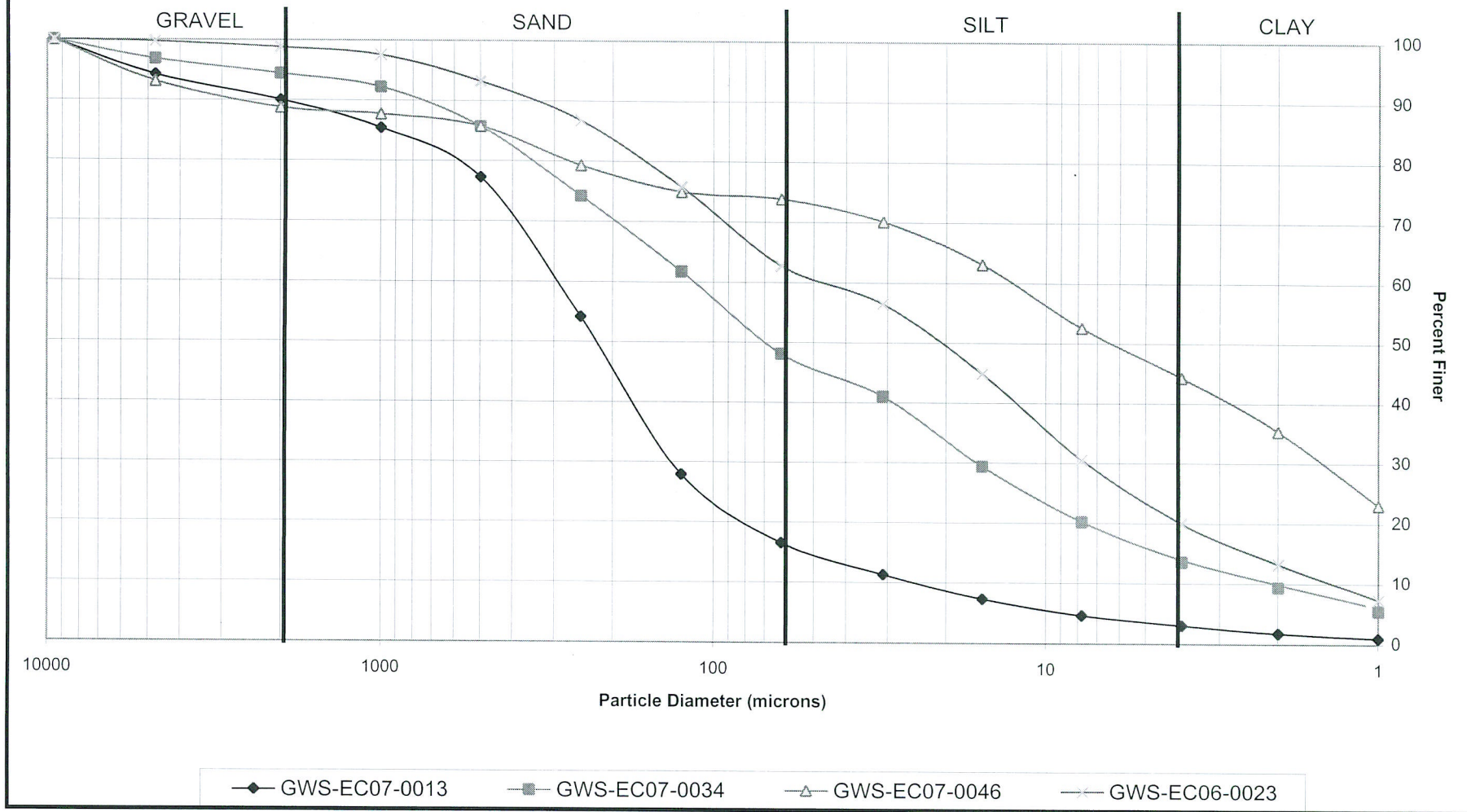
IB41





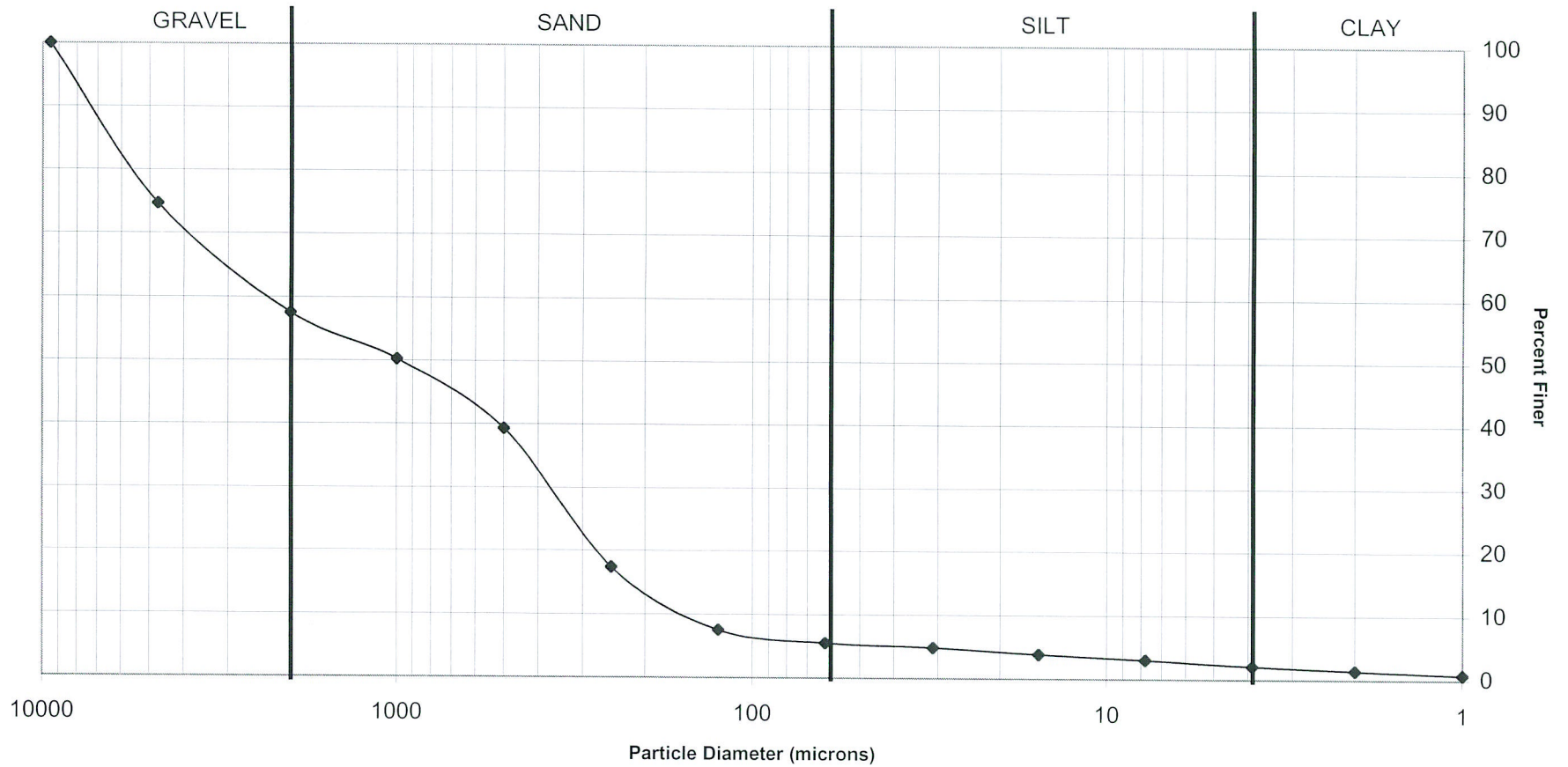


### PSEP Grain Size Distribution



000383

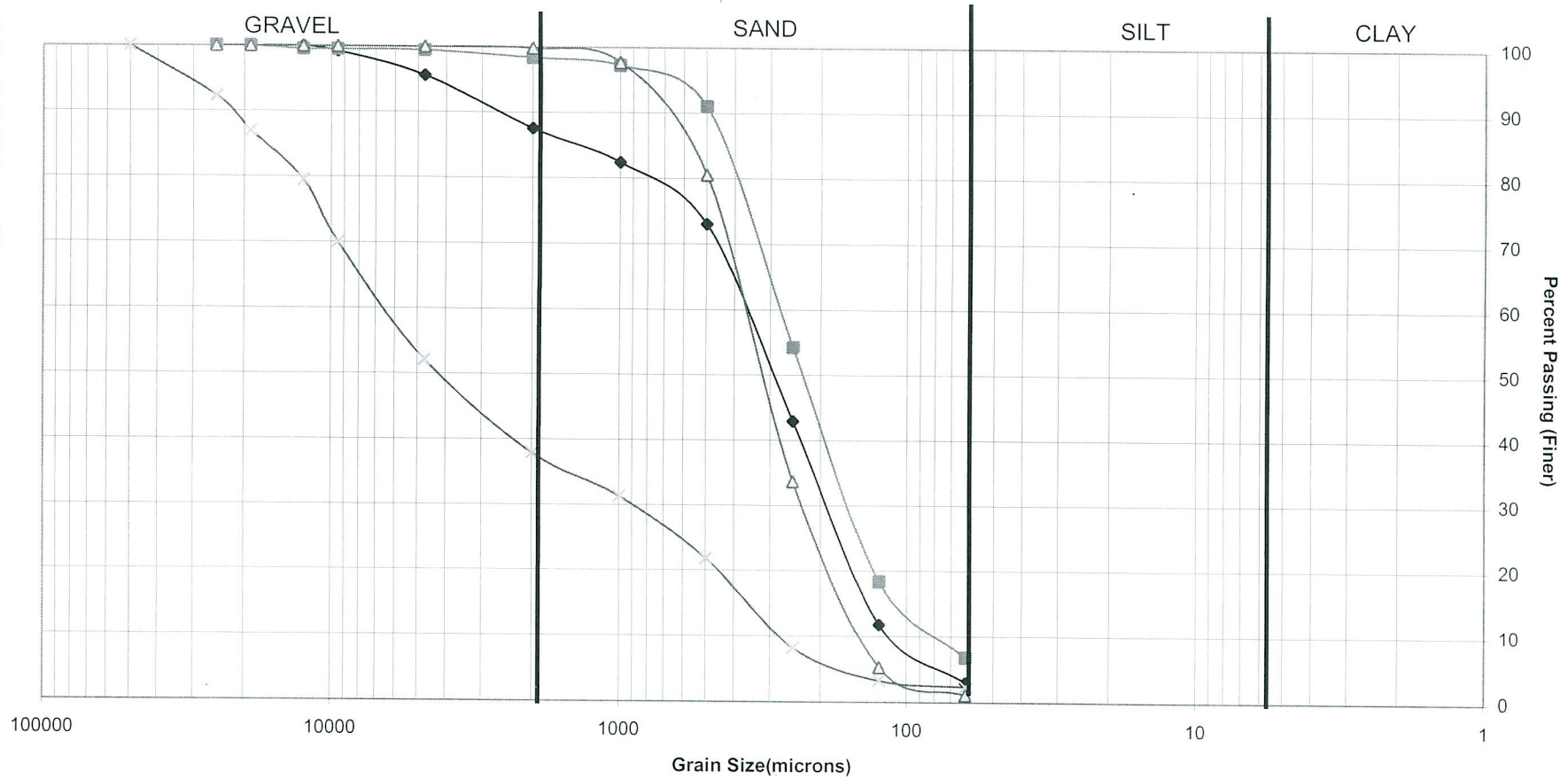
# PSEP Grain Size Distribution



000384

—◆— GWS-EC06-0038

### PSEP Sieve Only Grain Size Distribution

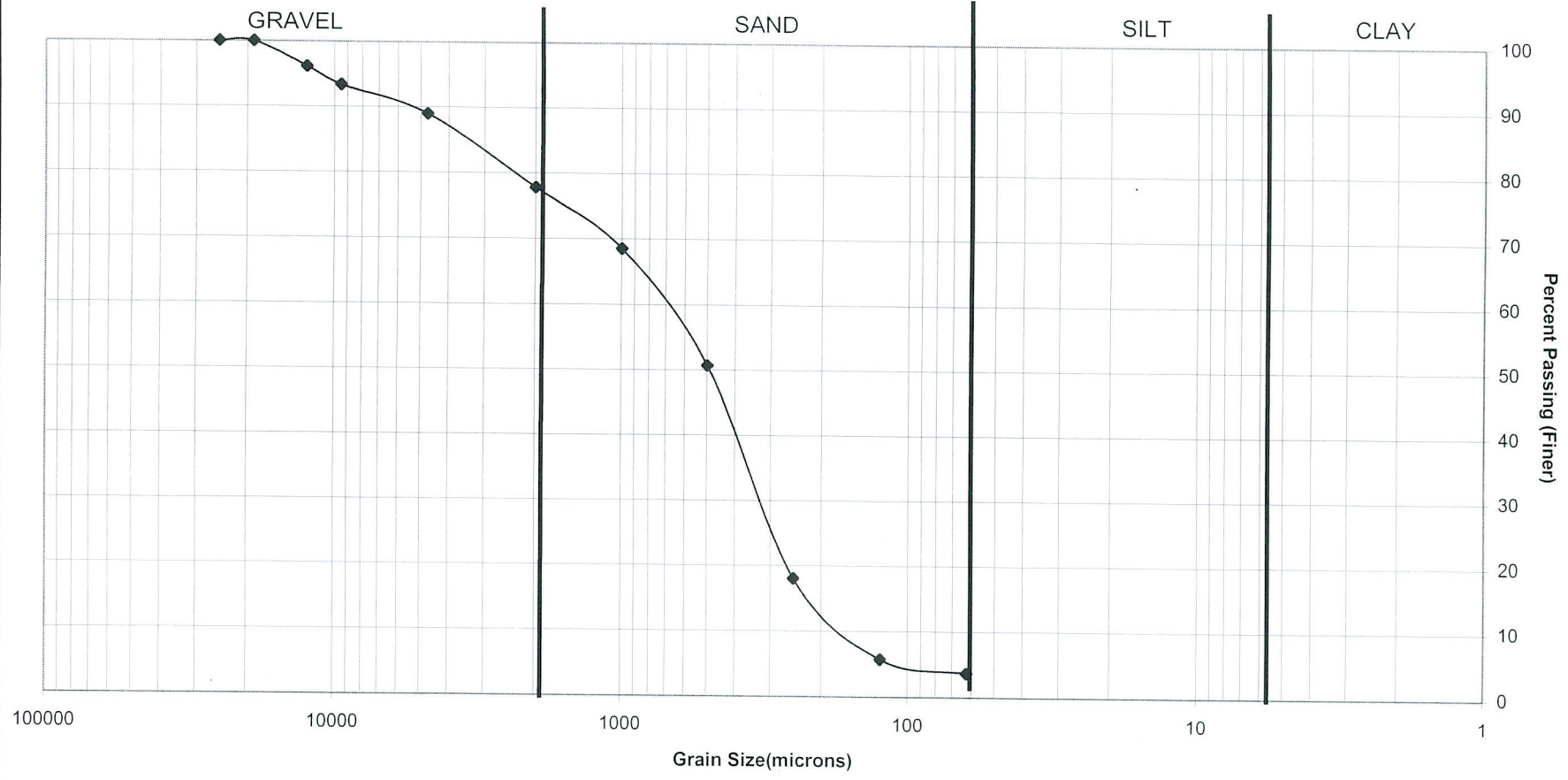


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◆ GWS-EC11-0019
■ GWS-EC11-0048
△ GWS-EC11-0067
× GWS-EC07-0056

000385

### PSEP Sieve Only Grain Size Distribution



IB41

—◆— GWS-EC06-0056

000386



Floyd, Snider  
340542.002

Apparent Grain Size Distribution Summary  
Percent Finer Than Indicated Size

Sample No.	Gravel			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt				Clay	
	-3	-2	-1						0	1	2	3	4	5
Phi Size	3/8"	#4	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (62)	31.00	15.60	7.80	3.90	2.00	1.00
GWS-EC12-0108	100.0	100.0	95.3	89.7	75.5	43.9	19.7	15.3	14.1	11.7	9.7	7.6	4.3	2.7
GWS-EC12-0108	100.0	98.6	95.5	90.4	75.2	42.3	17.8	13.5	12.5	10.3	8.1	5.6	3.1	1.7
GWS-EC12-0108	100.0	100.0	96.5	90.5	76.0	43.2	19.1	14.9	13.9	11.6	9.6	7.3	4.2	2.3
GWS-EC08-0006	100.0	100.0	100.0	98.1	87.5	82.0	77.4	71.7	70.6	61.8	48.3	33.3	19.6	15.0
GWS-EC08-0028	100.0	100.0	100.0	99.9	92.9	88.0	83.6	79.2	77.2	70.5	60.4	45.9	25.2	15.5
GWS-EC08-0048	100.0	100.0	100.0	100.0	95.6	90.5	86.0	81.2	79.9	73.6	61.0	45.9	25.5	16.1
GWS-EC08-0068	100.0	100.0	100.0	99.9	93.0	84.4	76.4	66.4	64.0	55.5	42.8	30.5	16.3	9.0
GWS-EC08-100	100.0	100.0	100.0	99.9	94.5	86.5	78.6	68.2	65.5	55.1	43.0	31.0	15.5	10.7
GWS-EC08-0129	100.0	100.0	100.0	99.9	93.1	86.3	80.1	72.4	69.3	57.3	46.0	32.9	16.0	8.4
GWS-EC12-0008	100.0	100.0	100.0	99.8	93.0	86.8	80.7	71.9	68.2	56.0	41.8	26.3	15.7	8.7
GWS-EC12-0043	100.0	100.0	100.0	99.9	97.8	93.9	90.2	85.6	83.0	71.0	62.1	47.7	25.9	17.6
GWS-EC12-0064	100.0	100.0	99.7	99.2	94.7	90.0	85.5	79.8	77.6	67.9	60.5	44.5	26.3	18.3
GWS-EC12-0084	100.0	100.0	100.0	99.5	93.4	87.0	80.3	71.5	69.5	59.1	47.5	36.6	21.2	14.9
GWS-EC13-0002	100.0	100.0	99.7	99.6	97.1	93.4	89.3	83.0	79.8	69.7	55.1	39.7	26.0	18.2
GWS-EC13-0050	100.0	100.0	100.0	99.9	93.8	87.9	83.1	77.8	76.7	67.3	57.9	45.4	26.4	19.2
GWS-EC13-0090	100.0	100.0	99.8	99.7	92.9	87.4	82.8	77.3	75.8	68.4	58.3	43.1	24.8	18.3
GWS-EC13-0124	100.0	100.0	100.0	99.9	94.9	89.5	85.3	80.5	79.4	70.8	59.8	45.1	23.7	16.2
GWS-EC04-0023	100.0	100.0	98.4	94.0	83.2	56.8	26.6	17.6	16.3	14.2	11.8	8.5	6.0	5.1

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

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Floyd, Snider  
340542.002

Apparent Grain Size Distribution Summary  
Percent Retained in Each Size Fraction

Sample No.	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay		
											Phi Size	8 to 9	9 to 10
Phi Size	> -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	< 10
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0
GWS-EC12-0108	4.7	5.6	14.2	31.6	24.3	4.4	1.2	2.4	2.0	2.1	3.3	1.6	2.7
GWS-EC12-0108	4.5	5.2	15.1	32.9	24.5	4.3	1.0	2.2	2.2	2.5	2.5	1.5	1.7
GWS-EC12-0108	3.5	6.0	14.5	32.8	24.1	4.2	1.0	2.3	2.0	2.3	3.1	1.9	2.3
GWS-EC08-0006	0.0	1.9	10.6	5.5	4.6	5.7	1.1	8.8	13.5	14.9	13.8	4.6	15.0
GWS-EC08-0028	0.0	0.1	7.0	4.9	4.3	4.4	2.0	6.7	10.2	14.4	20.7	9.7	15.5
GWS-EC08-0048	0.0	0.0	4.4	5.1	4.5	4.8	1.3	6.3	12.5	15.1	20.4	9.4	16.1
GWS-EC08-0068	0.0	0.1	7.0	8.6	8.0	10.0	2.4	8.5	12.7	12.4	14.1	7.3	9.0
GWS-EC08-100	0.0	0.1	5.5	7.9	7.9	10.4	2.7	10.5	12.1	12.0	15.5	4.8	10.7
GWS-EC08-0129	0.0	0.1	6.8	6.8	6.2	7.7	3.2	12.0	11.3	13.0	17.0	7.6	8.4
GWS-EC12-0008	0.0	0.2	6.7	6.2	6.1	8.8	3.7	12.2	14.2	15.6	10.6	6.9	8.7
GWS-EC12-0043	0.0	0.1	2.1	3.9	3.7	4.6	2.6	12.1	8.8	14.4	21.9	8.3	17.6
GWS-EC12-0064	0.3	0.5	4.5	4.7	4.5	5.8	2.1	9.7	7.4	16.1	18.1	8.0	18.3
GWS-EC12-0084	0.0	0.5	6.1	6.4	6.7	8.9	2.0	10.4	11.5	10.9	15.4	6.2	14.9
GWS-EC13-0002	0.3	0.1	2.6	3.7	4.1	6.2	3.3	10.1	14.5	15.4	13.7	7.8	18.2
GWS-EC13-0050	0.0	0.1	6.1	5.8	4.9	5.3	1.1	9.4	9.4	12.5	18.9	7.2	19.2
GWS-EC13-0090	0.2	0.1	6.7	5.5	4.6	5.4	1.5	7.4	10.1	15.2	18.3	6.5	18.3
GWS-EC13-0124	0.0	0.1	5.0	5.4	4.3	4.7	1.2	8.6	11.0	14.7	21.4	7.5	16.2
GWS-EC04-0023	1.6	4.5	10.7	26.4	30.2	9.0	1.3	2.1	2.5	3.2	2.5	0.9	5.1

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

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Floyd, Snider  
340542.002

PSEP Total Solids Analysis  
Percent of Wet Weight

Sample No.	Total Solids (%)
GWS-EC12-0108	51.5
GWS-EC12-0108	52.8
GWS-EC12-0108	52.9
GWS-EC08-0006	11.1
GWS-EC08-0028	11.6
GWS-EC08-0048	12.8
GWS-EC08-0068	12.9
GWS-EC08-100	14.0
GWS-EC08-0129	17.1
GWS-EC12-0008	13.8
GWS-EC12-0043	13.1
GWS-EC12-0064	13.8
GWS-EC12-0084	16.8
GWS-EC13-0002	17.2
GWS-EC13-0050	12.6
GWS-EC13-0090	13.5
GWS-EC13-0124	16.0
GWS-EC04-0023	34.8

Triplicate Average	52.4
Standard Deviation	0.76
%RSD	1.46

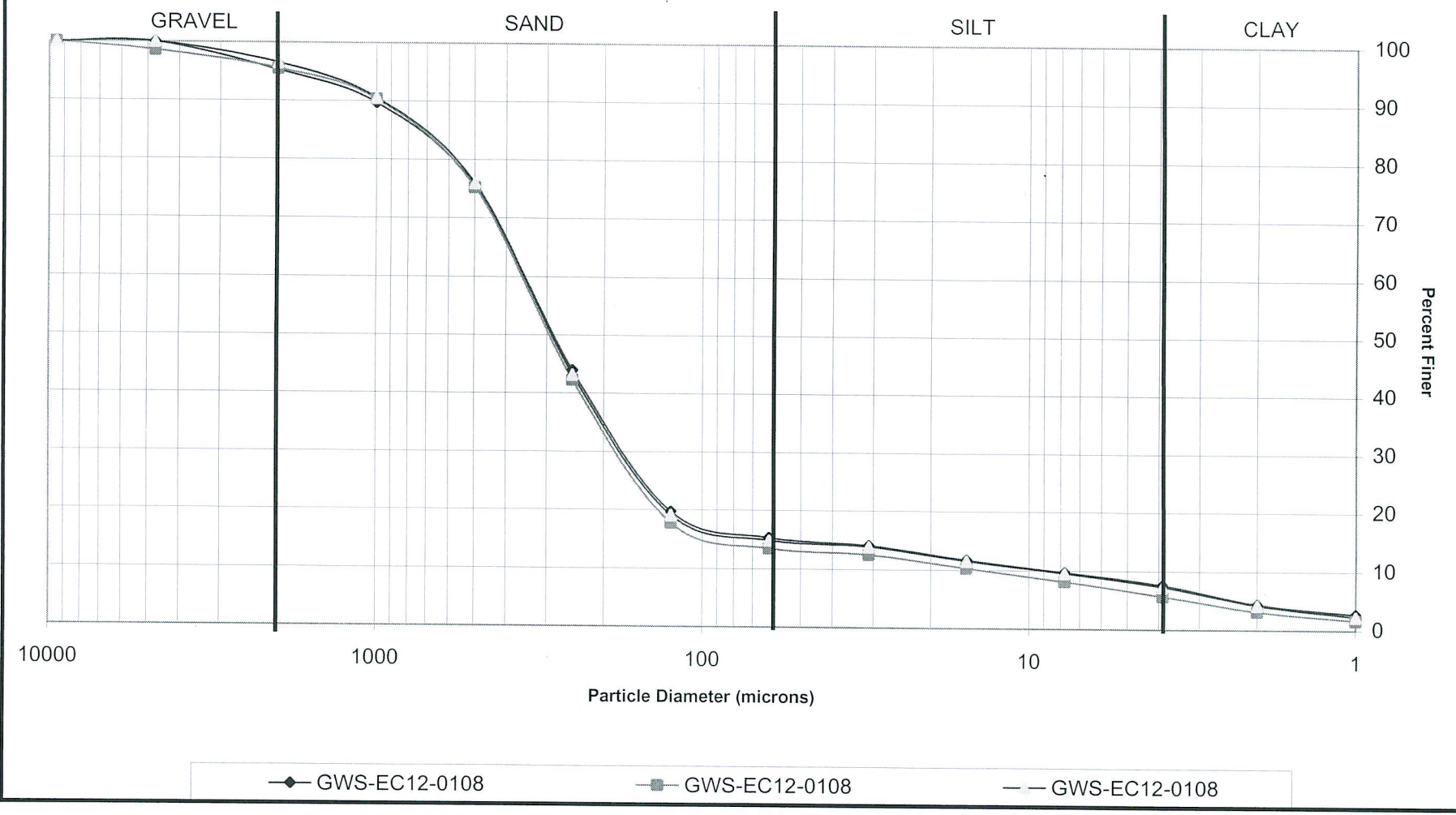
(Total Solids at 90 C)

IB52



### PSEP Grain Size Distribution

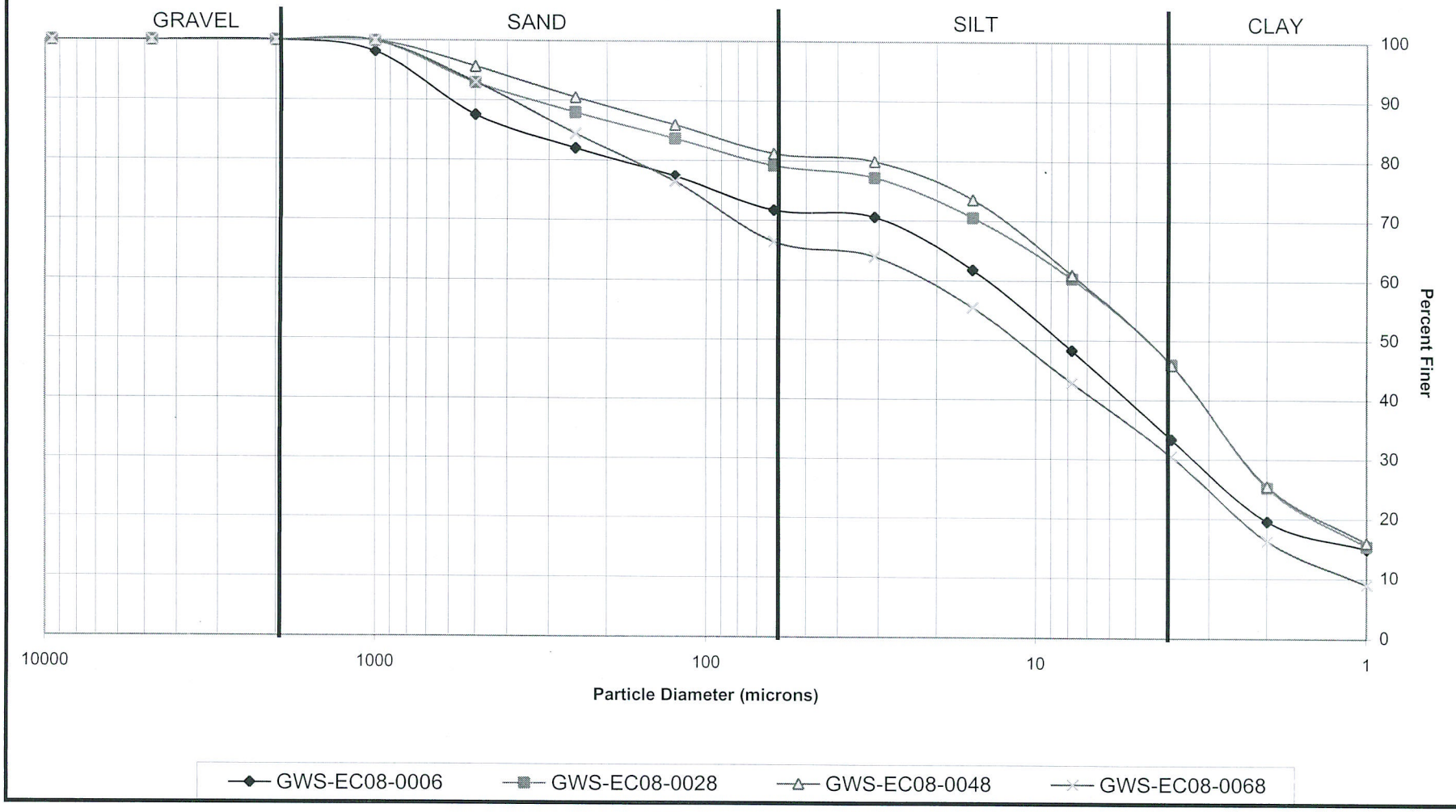
Triplicate Sample Plot



000440

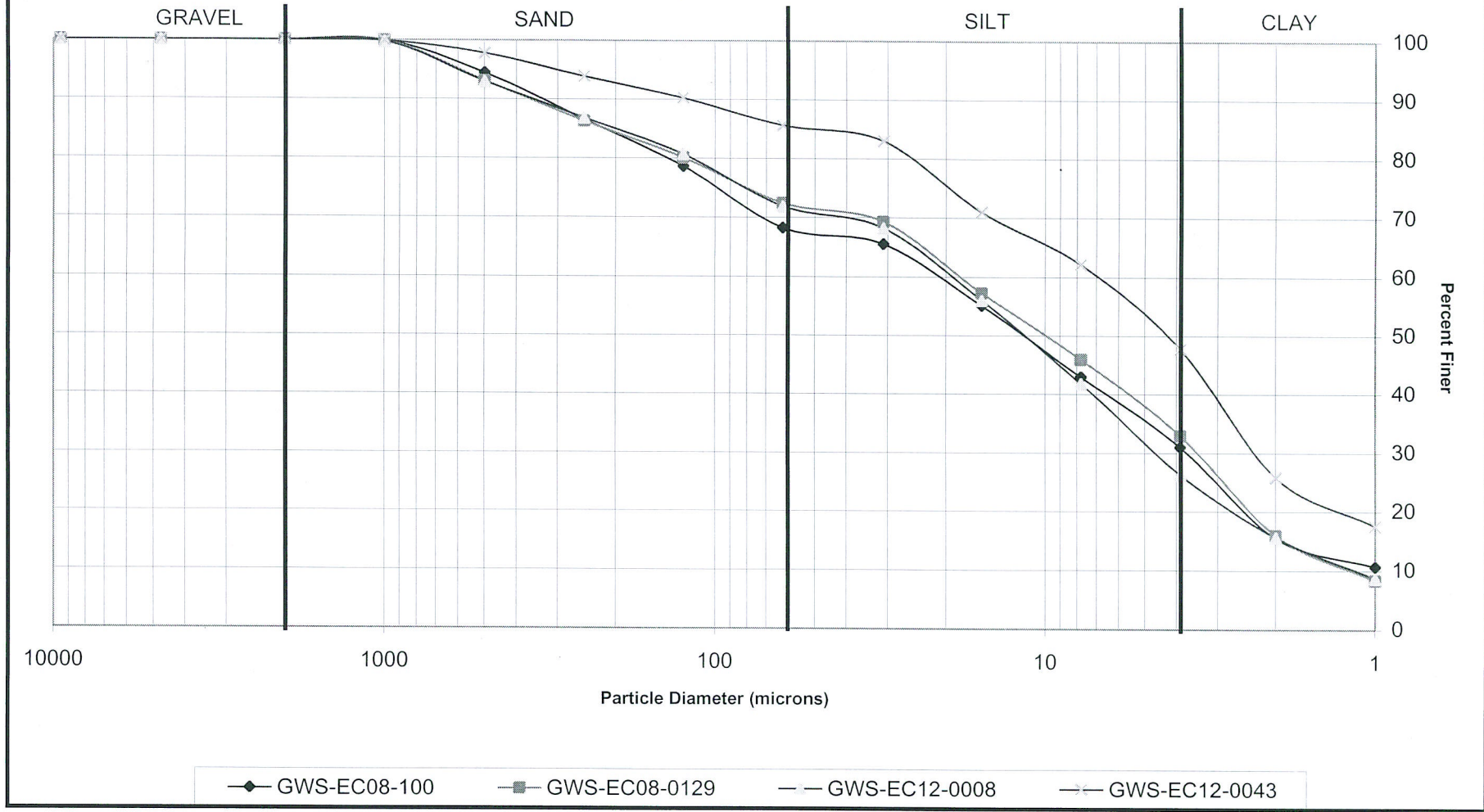


### PSEP Grain Size Distribution



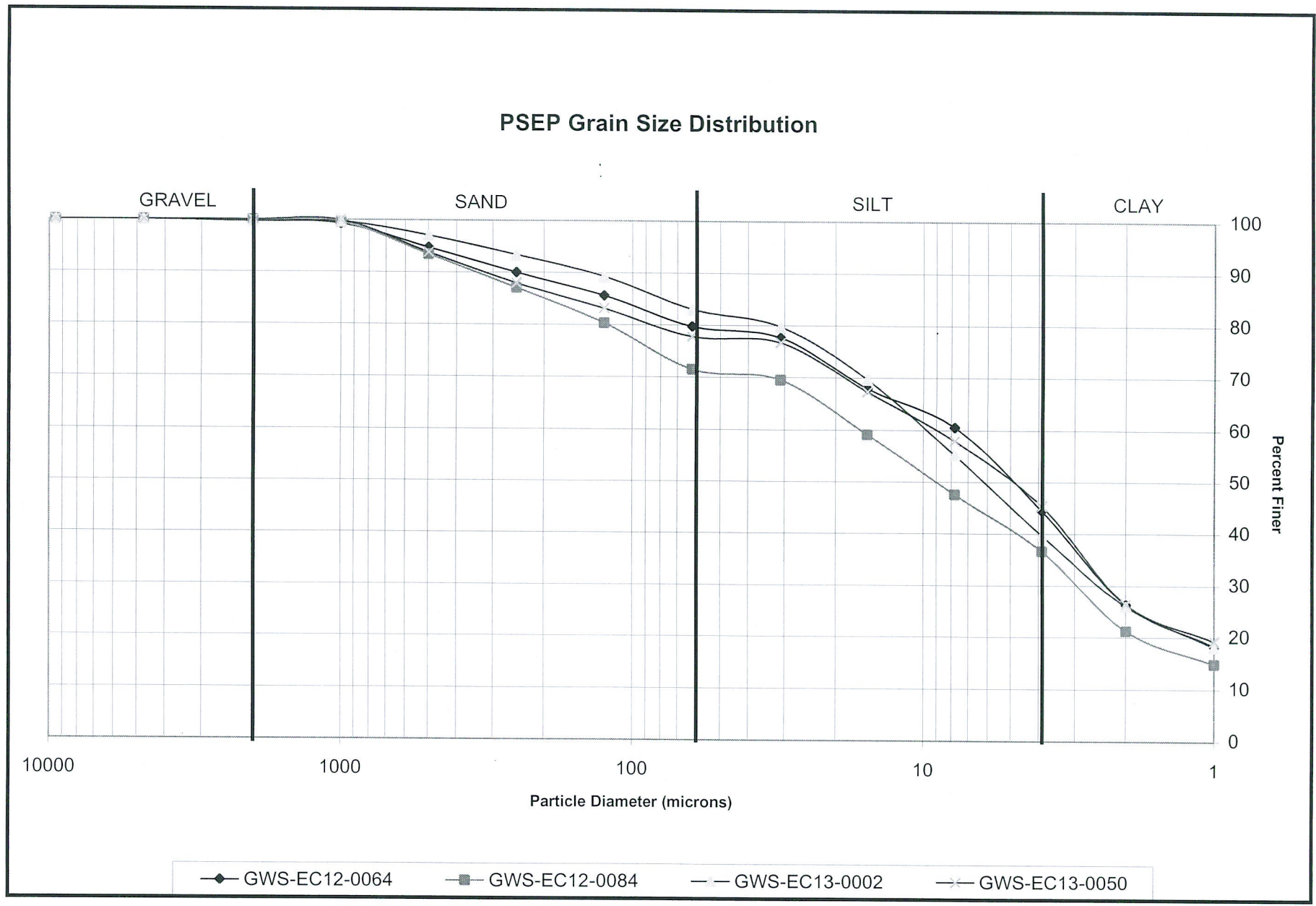
000446

### PSEP Grain Size Distribution



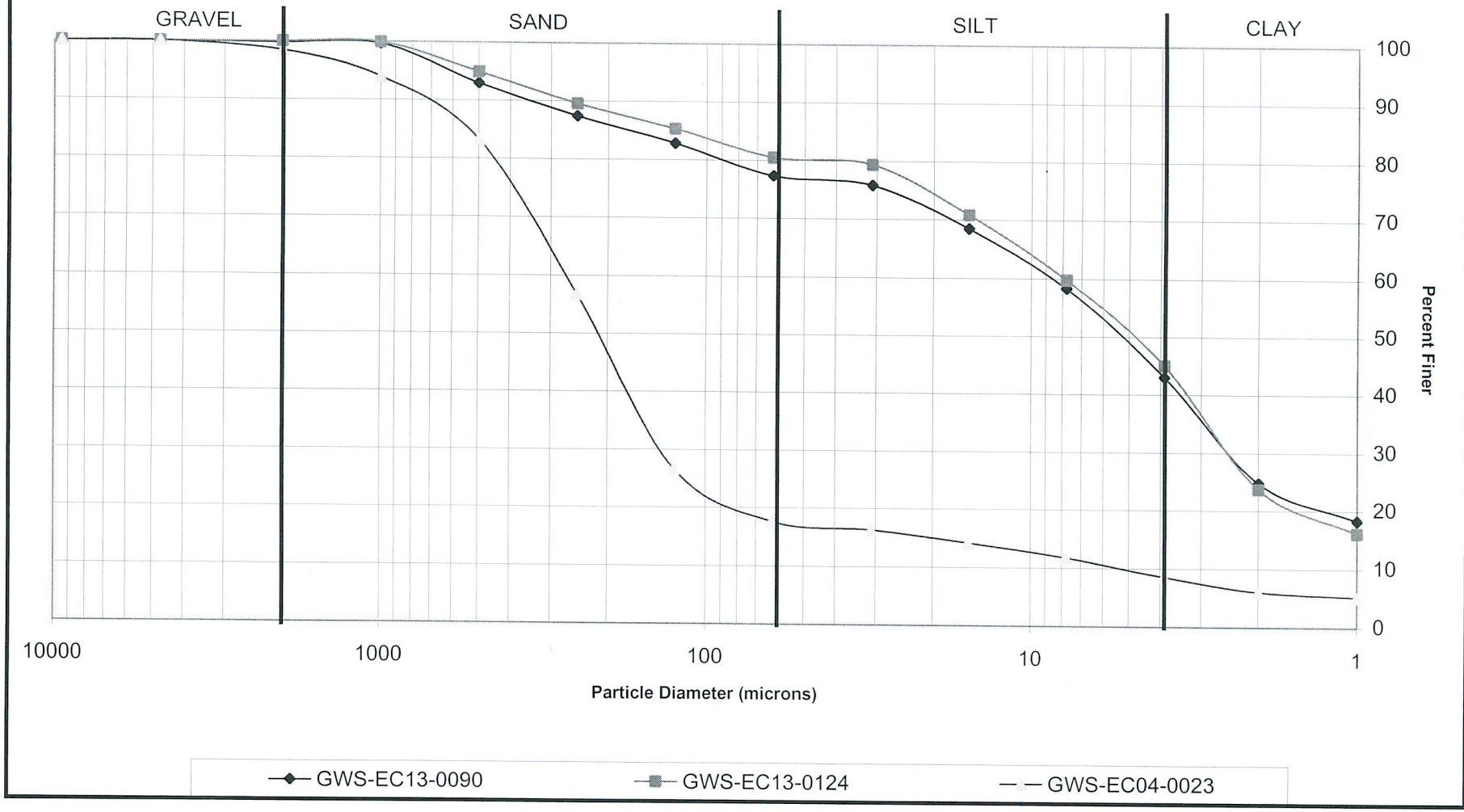
000447

### PSEP Grain Size Distribution



000448

### PSEP Grain Size Distribution



000449