

AMTEST

Parametrix
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033
Attention: Deb Lester

Date Received: 8/26/98
Date Reported: 9/18/98

Project Name: Middle Waterway
Project #: 55-1616-09(02)

PSDDA CHEMICALS OF CONCERN

AM TEST ID 98-A011971
CLIENT ID GS#12
DATE SAMPLED 8/25/98

	RESULT	Q	S.I.	M.L.
CONVENTIONALS (DRY WEIGHT)				
Total Solids (%)	68.6			
GRAIN SIZE DISTRIBUTION				
PHI	OPENING (MM)	% RETENTION		
	4.75	0.90		
-2,	4.00	0.10		
-1,	2.00	0.60		
0,	1.00	1.60		
+1,	0.50	8.60		
+2,	0.25	23.3		
+3,	0.125	31.1		
+4,	0.063	15.6		
+5,	0.032	2.90		
+6,	0.016	4.80		
+7,	0.008	2.60		
+8,	0.004	2.40		
+9,	0.002	0.80		
+10,	0.001	0.40		
>+10,	<0.001	4.20		

AMTEST

Parametrix
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033
Attention: Deb Lester

Date Received: 8/26/98
Date Reported: 9/18/98

Project Name: Middle Waterway
Project #: 55-1616-09(02)

PSDDA CHEMICALS OF CONCERN

AM TEST ID 98-A011972
CLIENT ID GS#13
DATE SAMPLED 8/25/98

	RESULT	Q	S.L.	M.L.
CONVENTIONALS (DRY WEIGHT)				
Total Solids (%)	89.0			
GRAIN SIZE DISTRIBUTION				
PHI	OPENING (MM)	% RETENTION		
	4.75	< 0.1		
-2,	4.00	0.10		
-1,	2.00	0.40		
0,	1.00	1.70		
+1,	0.50	13.9		
+2,	0.25	34.9		
+3,	0.125	27.4		
+4,	0.063	10.3		
+5,	0.032	4.30		
+6,	0.016	1.50		
+7,	0.008	0.80		
+8,	0.004	1.00		
+9,	0.002	0.20		
+10,	0.001	< 0.1		
>+10,	<0.001	3.40		

AMTEST

Parametrix
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033
Attention: Deb Lester

Date Received: 8/26/98
Date Reported: 9/18/98

Project Name: Middle Waterway
Project #: 55-1616-09(02)

PSDDA CHEMICALS OF CONCERN

AM TEST ID 98-A011973
CLIENT ID GS#14
DATE SAMPLED 8/25/98

	RESULT	Q	S.L.	M.L.
CONVENTIONALS (DRY WEIGHT)				
Total Solids (%)	67.2			
GRAIN SIZE DISTRIBUTION				
PHI	OPENING (MM)	% RETENTION		
	4.75	0.60		
-2,	4.00	0.10		
-1,	2.00	0.60		
0,	1.00	2.70		
+1,	0.50	25.3		
+2,	0.25	28.0		
+3,	0.125	14.9		
+4,	0.063	5.50		
+5,	0.032	10.6		
+6,	0.016	3.70		
+7,	0.008	1.60		
+8,	0.004	1.80		
+9,	0.002	0.20		
+10,	0.001	< 0.1		
>+10,	<0.001	4.50		

AMTEST

Parametrix
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033
Attention: Deb Lester

Date Received: 8/26/98
Date Reported: 9/18/98

Project Name: Middle Waterway
Project #: 55-1616-09(02)

PSDDA CHEMICALS OF CONCERN

AM TEST ID 98-A011974
CLIENT ID GS#2
DATE SAMPLED 8/25/98

	RESULT	Q	S.L.	M.L.
CONVENTIONALS (DRY WEIGHT)				
Total Solids (%)	82.7			
GRAIN SIZE DISTRIBUTION				
PHI	OPENING (MM)	% RETENTION		
	4.75	< 0.1		
-2,	4.00	0.10		
-1,	2.00	0.20		
0,	1.00	1.30		
+1,	0.50	13.3		
+2,	0.25	40.4		
+3,	0.125	24.9		
+4,	0.063	9.10		
+5,	0.032	3.90		
+6,	0.016	1.70		
+7,	0.008	0.20		
+8,	0.004	1.00		
+9,	0.002	0.20		
+10,	0.001	< 0.1		
>+10,	<0.001	3.60		

AMTEST

Parametrix
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033
Attention: Deb Lester

Date Received: 8/26/98
Date Reported: 9/18/98

Project Name: Middle Waterway
Project #: 55-1616-09(02)

PSDDA CHEMICALS OF CONCERN

AM TEST ID 98-A011975
CLIENT ID GS#1
DATE SAMPLED 8/25/98

	RESULT	Q	S.L.	M.L.
CONVENTIONALS (DRY WEIGHT)				
Total Solids (%)	100.			
GRAIN SIZE DISTRIBUTION				
PHI	OPENING (MM)	% RETENTION		
	4.75	1.70		
-2,	4.00	< 0.1		
-1,	2.00	2.20		
0,	1.00	4.30		
+1,	0.50	26.2		
+2,	0.25	42.8		
+3,	0.125	12.8		
+4,	0.063	4.40		
+5,	0.032	1.70		
+6,	0.016	1.90		
+7,	0.008	0.10		
+8,	0.004	0.40		
+9,	0.002	0.10		
+10,	0.001	< 0.1		
>+10,	<0.001	1.50		

AMTEST

Parametrix
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033
Attention: Deb Lester

Date Received: 8/26/98
Date Reported: 9/18/98

Project Name: Middle Waterway
Project #: 55-1616-09(02)

PSDDA CHEMICALS OF CONCERN

AM TEST ID 98-A011976
CLIENT ID GS#5
DATE SAMPLED 8/25/98

	RESULT	Q	S.L.	M.L.
CONVENTIONALS (DRY WEIGHT)				
Total Solids (%)	81.2			
GRAIN SIZE DISTRIBUTION				
PHI	OPENING (MM)	% RETENTION		
	4.75	1.80		
-2,	4.00	0.20		
-1,	2.00	1.20		
0,	1.00	3.20		
+1,	0.50	25.1		
+2,	0.25	30.3		
+3,	0.125	16.6		
+4,	0.063	8.40		
+5,	0.032	5.30		
+6,	0.016	2.30		
+7,	0.008	0.50		
+8,	0.004	1.10		
+9,	0.002	0.20		
+10,	0.001	< 0.1		
>+10,	<0.001	3.70		

AMTEST

Parametrix
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033
Attention: Deb Lester

Date Received: 8/26/98
Date Reported: 9/18/98

Project Name: Middle Waterway
Project #: 55-1616-09(02)

PSDDA CHEMICALS OF CONCERN

AM TEST ID 98-A011977
CLIENT ID GS#6
DATE SAMPLED 8/25/98

	RESULT	Q	S.L.	M.L.
CONVENTIONALS (DRY WEIGHT)				
Total Solids (%)	88.8			
GRAIN SIZE DISTRIBUTION				
PHI	OPENING (MM)	% RETENTION		
	4.75	1.00		
-2,	4.00	0.10		
-1,	2.00	1.50		
0,	1.00	4.40		
+1,	0.50	26.5		
+2,	0.25	34.2		
+3,	0.125	14.2		
+4,	0.063	5.00		
+5,	0.032	5.30		
+6,	0.016	< 0.1		
+7,	0.008	< 0.1		
+8,	0.004	0.90		
+9,	0.002	0.20		
+10,	0.001	< 0.1		
>+10,	<0.001	6.80		

AMTEST

Parametrix
5808 Lake Washington Blvd. N.E.
Kirkland, WA 98033
Attention: Deb Lester

Date Received: 8/26/98
Date Reported: 9/18/98

Project Name: Middle Waterway
Project #: 55-1616-09(02)

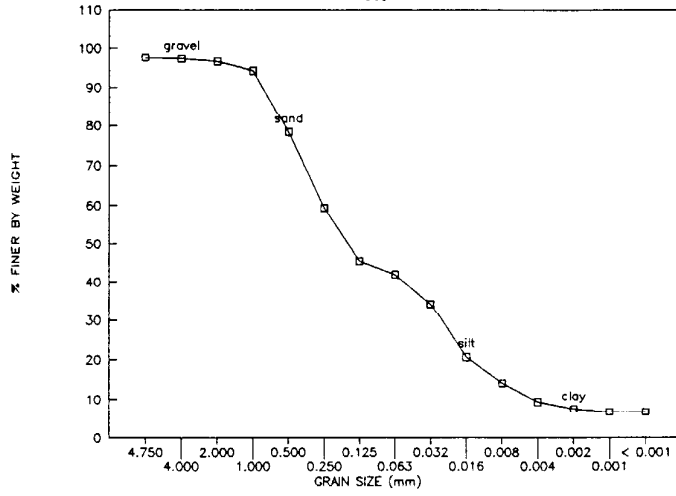
PSDDA CHEMICALS OF CONCERN

AM TEST ID 98-A011978
CLIENT ID GS#7
DATE SAMPLED 8/25/98

	RESULT	Q	S.L.	M.L.
CONVENTIONALS (DRY WEIGHT)				
Total Solids (%)	99.6			
GRAIN SIZE DISTRIBUTION				
PHI	OPENING (MM)	% RETENTION		
	4.75	1.10		
-2,	4.00	< 0.1		
-1,	2.00	2.20		
0,	1.00	7.80		
+1,	0.50	34.3		
+2,	0.25	38.4		
+3,	0.125	10.1		
+4,	0.063	2.70		
+5,	0.032	1.40		
+6,	0.016	< 0.1		
+7,	0.008	< 0.1		
+8,	0.004	0.40		
+9,	0.002	0.10		
+10,	0.001	< 0.1		
>+10,	<0.001	1.50		

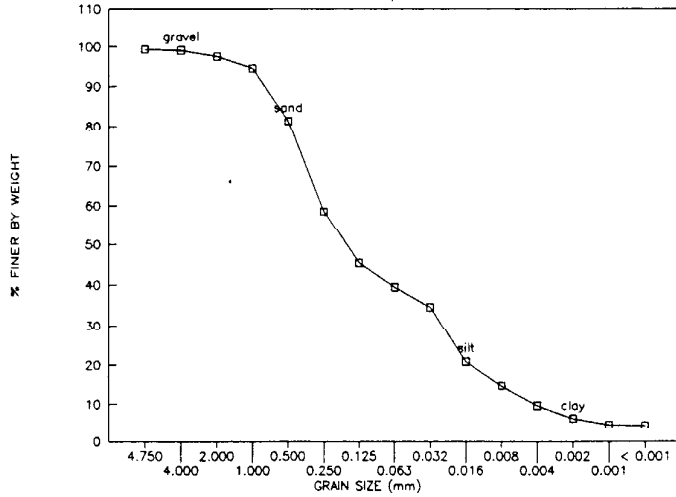
GRAIN SIZE DISTRIBUTION

11963



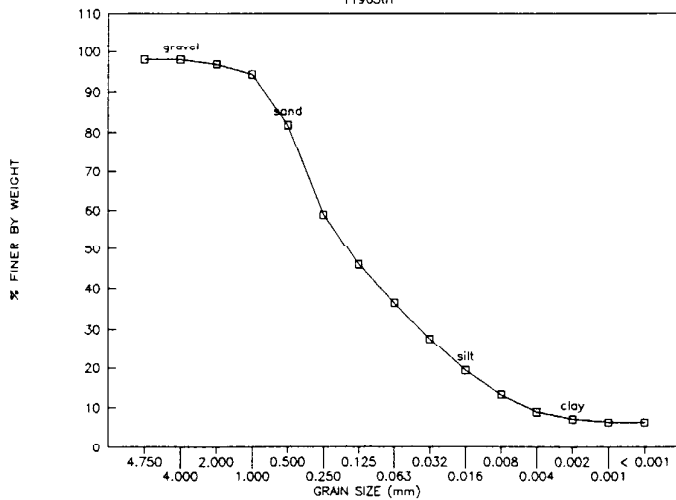
GRAIN SIZE DISTRIBUTION

11963dup

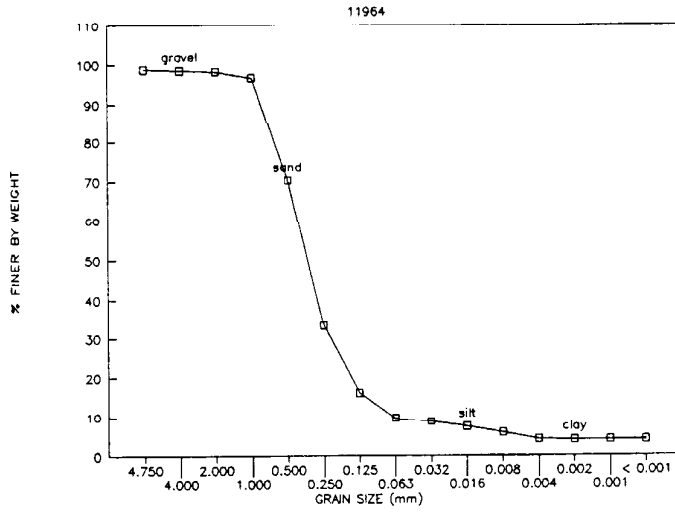


GRAIN SIZE DISTRIBUTION

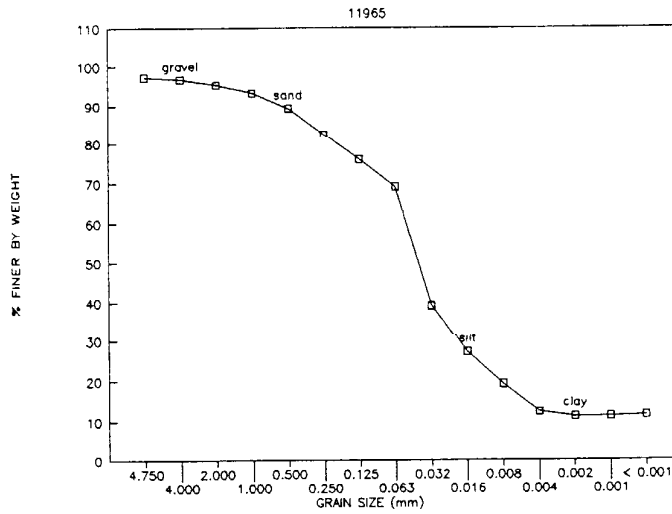
11963tri



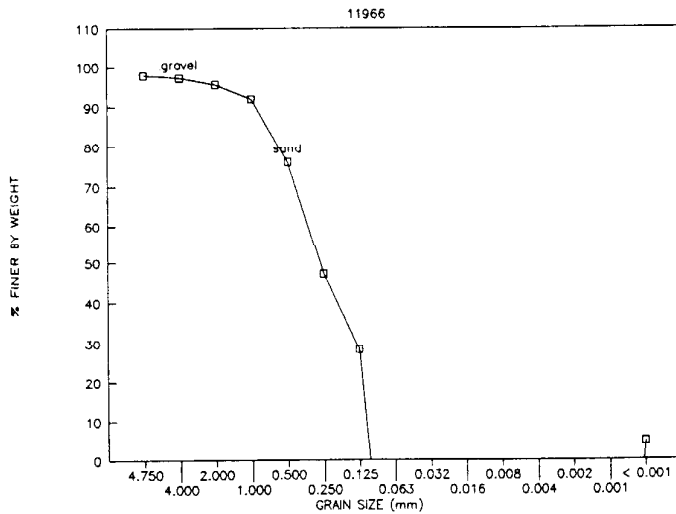
GRAIN SIZE DISTRIBUTION



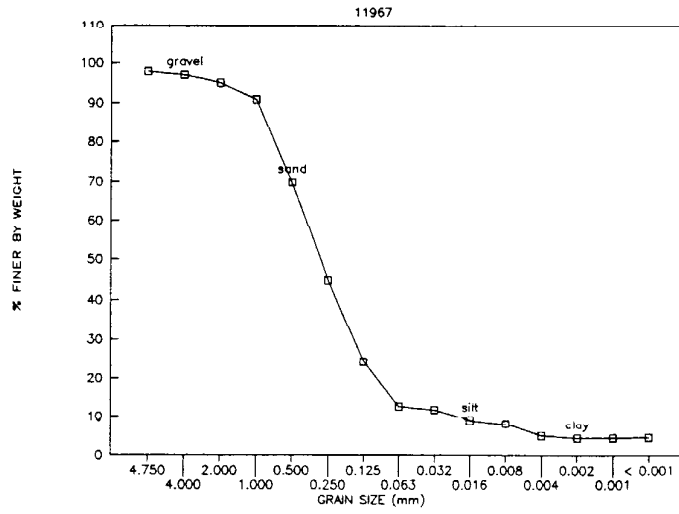
GRAIN SIZE DISTRIBUTION



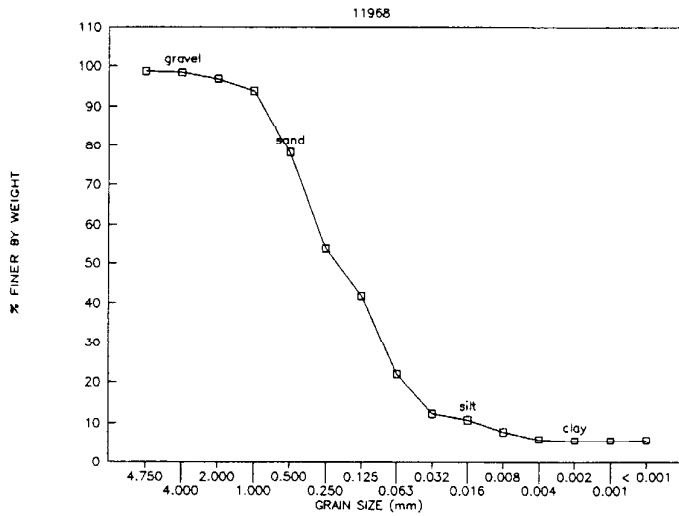
GRAIN SIZE DISTRIBUTION



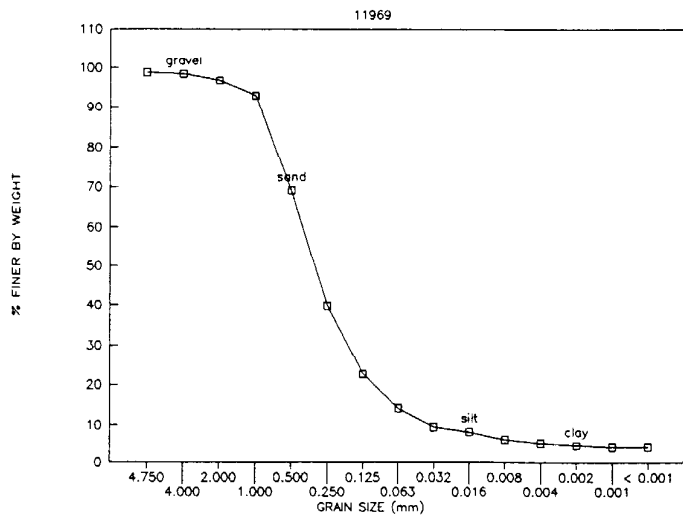
GRAIN SIZE DISTRIBUTION



GRAIN SIZE DISTRIBUTION

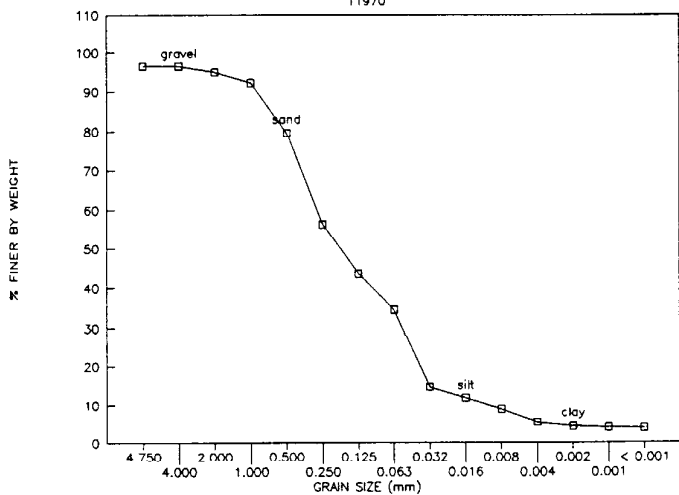


GRAIN SIZE DISTRIBUTION



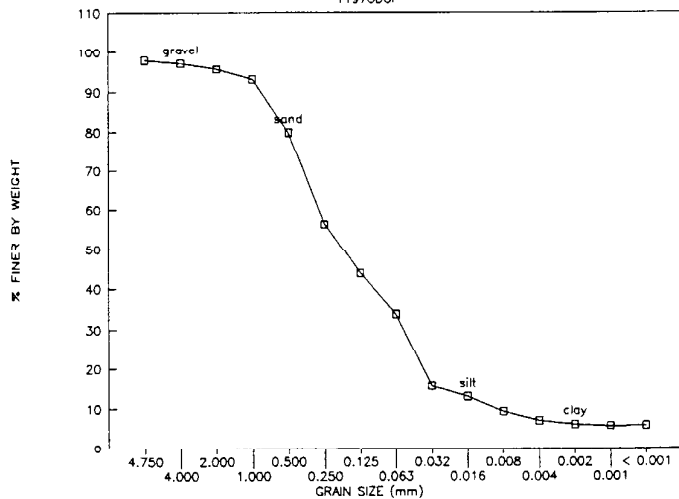
GRAIN SIZE DISTRIBUTION

11970



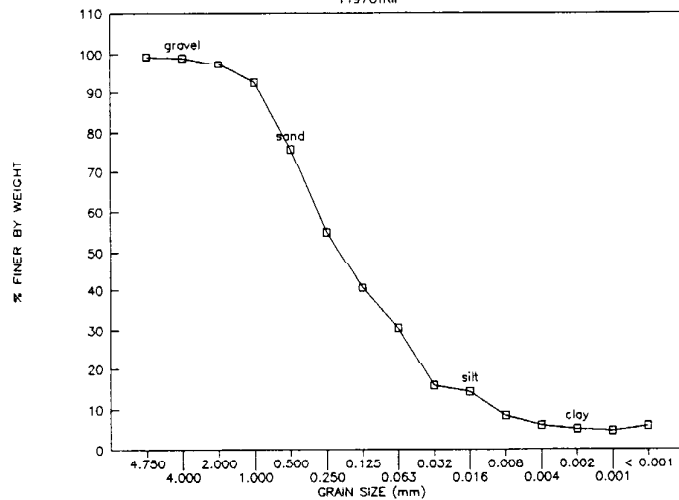
GRAIN SIZE DISTRIBUTION

11970DUP



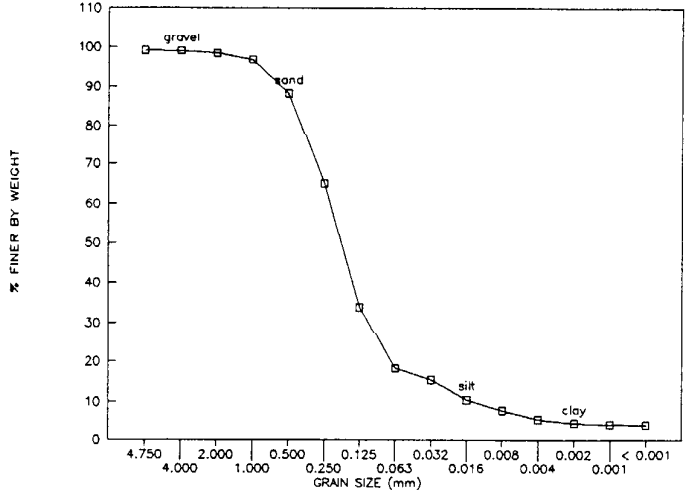
GRAIN SIZE DISTRIBUTION

11970TRIP



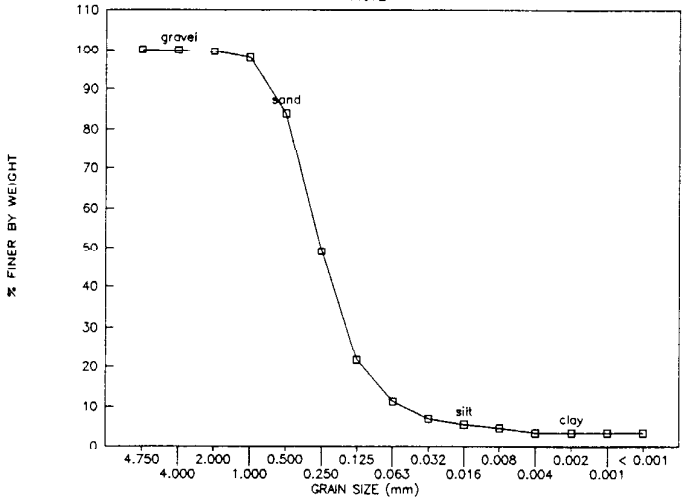
GRAIN SIZE DISTRIBUTION

11971



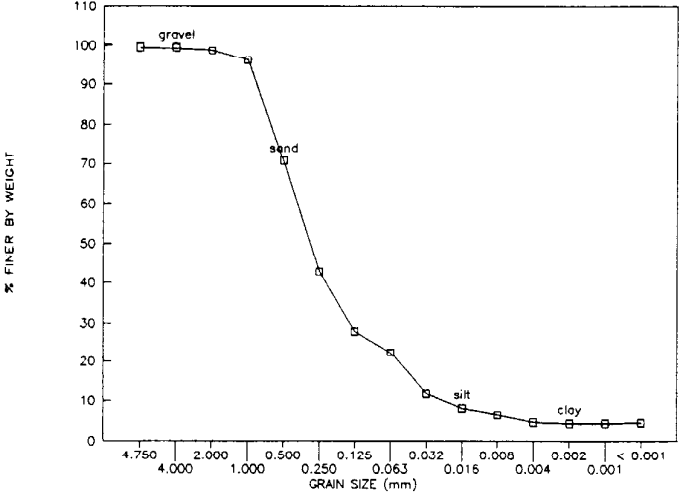
GRAIN SIZE DISTRIBUTION

11972

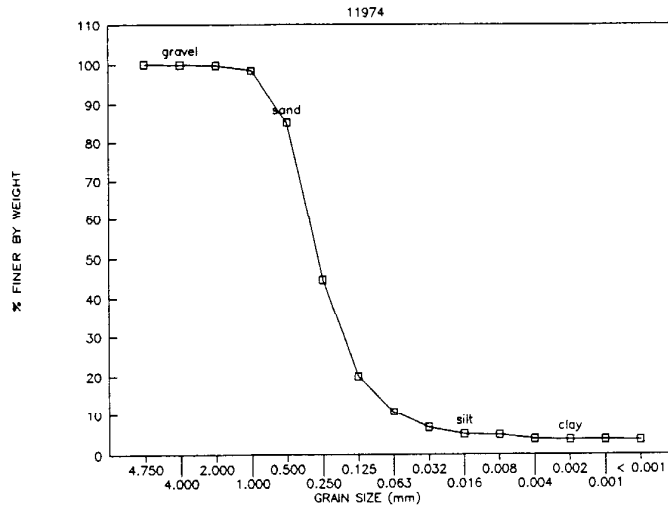


GRAIN SIZE DISTRIBUTION

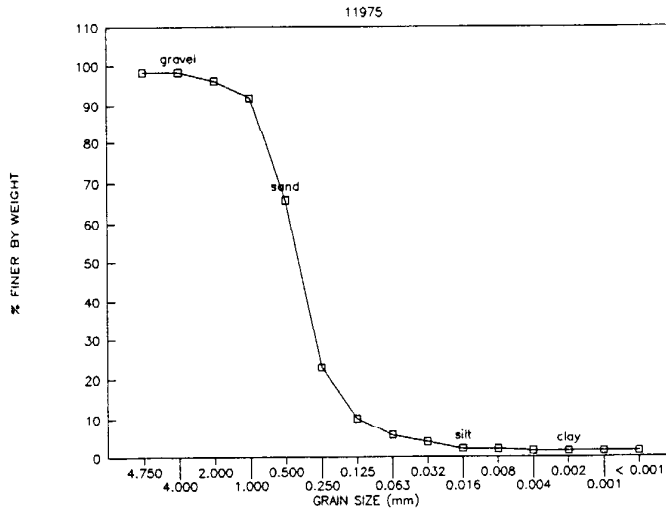
11973



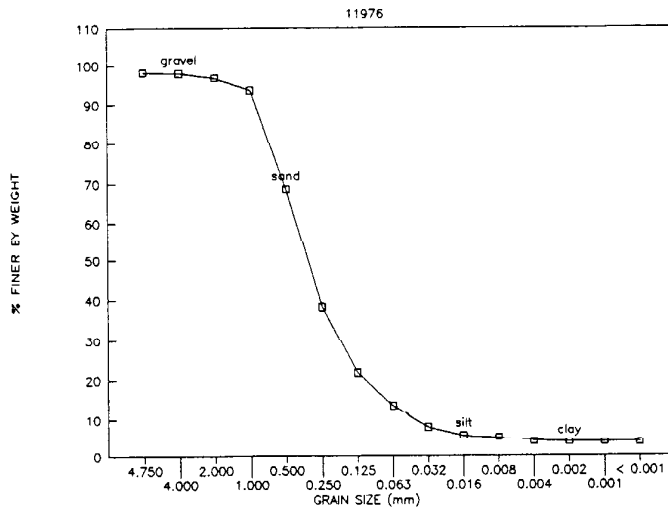
GRAIN SIZE DISTRIBUTION



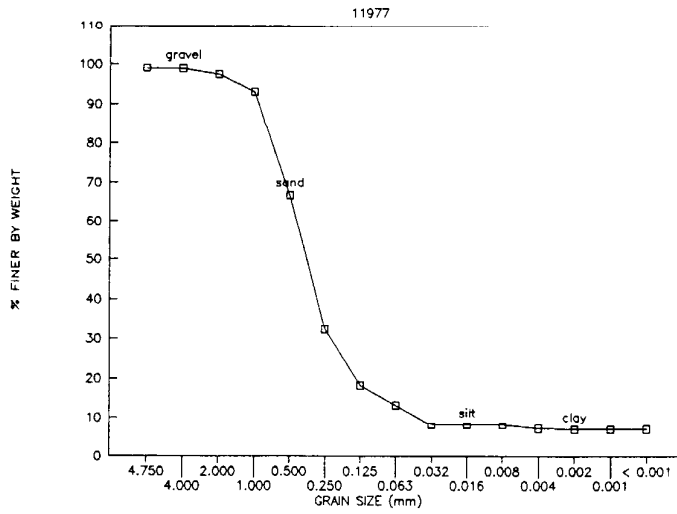
GRAIN SIZE DISTRIBUTION



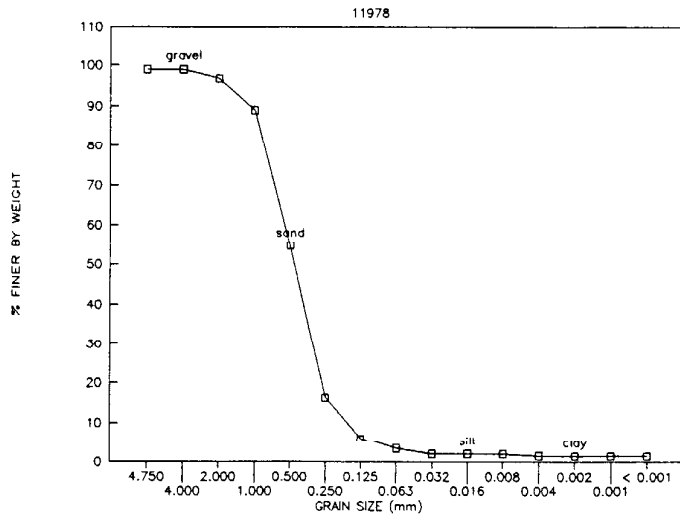
GRAIN SIZE DISTRIBUTION



GRAIN SIZE DISTRIBUTION

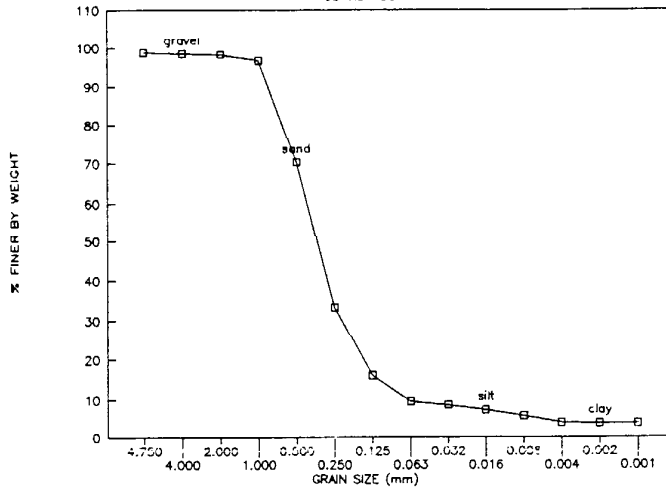


GRAIN SIZE DISTRIBUTION



GRAIN SIZE DISTRIBUTION

98-A011964

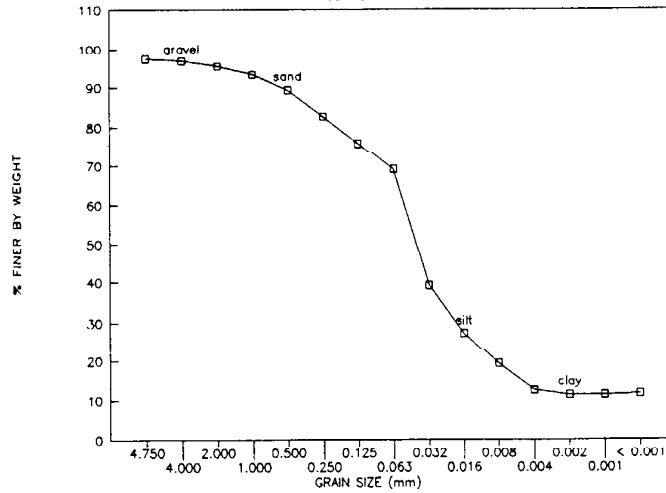


OCT 13 1998

Michael J. Nish

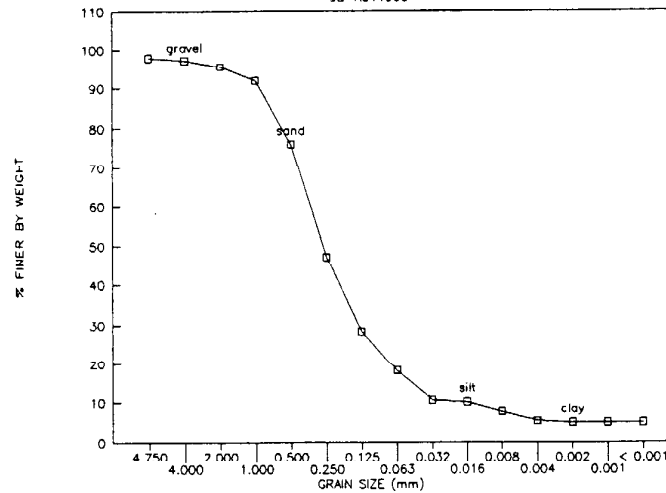
GRAIN SIZE DISTRIBUTION

98-A011965



GRAIN SIZE DISTRIBUTION

98-A011966



AMTEST

Parametrix
Attn: Deb Lester

Date Received: 08/26/98
Date Reported: 09/17/98

Project Name: Middle Waterway

QUALITY CONTROL
SEMI-VOLATILES
ANALYSIS DATES*

AM TEST SAMPLE NOS.	Extraction	Analysis
98-A011963	9/8/98	9/11/98
98-A011964	9/8/98	9/11/98
98-A011965	9/8/98	9/11/98
98-A011966	9/8/98	9/11/98
98-A011967	9/8/98	9/11/98
98-A011968	9/8/98	9/11/98

SAMPLE WEIGHTS

AM TEST SAMPLE NOS.	Weight (grams)	Volume (ml)
98-A011963	70.10	1.0
98-A011964	69.90	1.0
98-A011965	70.40	1.0
98-A011966	69.81	1.0
98-A011967	69.10	1.0
98-A011968	70.50	1.0
98-A011963 MS	70.80	1.0
98-A011963 MSD	71.10	1.0
HS-3	1.00	1.0

*Includes all associated Quality Control Samples (MS/MSD, SRM, Blanks, etc.).

MS = Matrix Spike

MSD = Matrix Spike Duplicate

AMTEST

Parametrix
Attn: Deb Lester

Date Received: 08/26/98
Date Reported: 09/17/98

Project Name: Middle Waterway

QUALITY CONTROL
POLYNUCLEAR AROMATIC HYDROCARBONS
BLANKS

AM TEST Sample Number	BLANK (ug/kg)
<hr/>	
ORGANICS (ug/kg)	
LPAH	
Naphthalene	< 14
Acenaphthalene	< 14
Acenaphthene	< 14
Fluorene	< 14
Phenanthrene	< 14
Anthracene	< 14
2-Methylnaphthalene	< 14
HPAH	
Fluoranthene	< 14
Pyrene	< 14
Benzo (a) anthracene	< 14
Chrysene	< 14
Benzo (b) fluoranthene	< 14
Benzo (k) fluoranthene	< 14
Benzo (a) pyrene	< 14
Indeno (1,2,3-cd) pyrene	< 14
Dibenzo (a,h) anthracene	< 14
Benzo (ghi) perylene	< 14
SURROGATES RECOVERIES (%)	
2-Fluorophenol	50
D6-Phenol	57
D5-Nitrobenzene	59
2-Fluorobiphenyl	59
2,4,6-Tribromophenol	57
D14-Terphenyl	80

< = less than

Results are reported on a dry weight basis.

AMTEST

Parametrix
Attn: Deb Lester

Date Received: 08/26/98
Date Reported: 09/17/98

Project Name: Middle Waterway

QUALITY CONTROL POLYNUCLEAR AROMATIC HYDROCARBONS MATRIX SPIKE

AM TEST Sample Number 98-A011963
Client ID MW-A

COMPOUNDS	SAMPLE VALUE (ug/kg)	SAMPLE + SPIKE (ug/kg)	SPIKE CONCENTRATION (ug/kg)	RECOVERY (%)
LPAH				
Naphthalene	< 23	610	1200	53
Acenaphthalene	< 23	710	1200	62
Acenaphthene	< 23	750	1200	65
Fluorene	< 23	800	1200	70
Phenanthrene	240	1000	1200	66
Anthracene	70	820	1200	65
2-Methylnaphthalene	< 23	710	1200	62
HPAH				
Fluoranthene	650	1500	1200	74
Pyrene	670	1300	1200	55
Benzo (a) anthracene	460	1300	1200	73
Chrysene	730	1500	1200	67
Benzo (b) fluoranthene	600	1600	1200	87
Benzo (k) fluoranthene	470	1300	1200	72
Benzo (a) pyrene	460	1300	1200	73
Indeno (1,2,3-cd) pyrene	340	1100	1200	66
Dibenzo (a,h) anthracene	75	820	1200	65
Benzo (ghi) perylene	260	1000	1200	64

SURROGATES RECOVERIES (%)

2-Fluorophenol	44
D6-Phenol	57
D5-Nitrobenzene	55
2-Fluorobiphenyl	57
2,4,6-Tribromophenol	84
D14-Terphenyl	75

< = less than

AMTEST

Parametrix
Attn: Deb Lester

Date Received: 08/26/98
Date Reported: 09/17/98

Project Name: Middle Waterway

QUALITY CONTROL POLYNUCLEAR AROMATIC HYDROCARBONS MATRIX SPIKE

AM TEST Sample Number
Client ID

98-A011963
MW-A

COMPOUNDS	SAMPLE VALUE (ug/kg)	SAMPLE + SPIKE DUPLICATE (ug/kg)	SPIKE CONCENTRATION (ug/kg)	RECOVERY (%)
I.PAH				
Naphthalene	< 23	630	1200	55
Acenaphthalene	< 23	720	1200	63
Acenaphthene	< 23	770	1200	67
Fluorene	< 23	800	1200	70
Phenanthrene	240	1000	1200	66
Anthracene	70	860	1200	69
2-Methylnaphthalene	< 23	710	1200	62
HPAH				
Fluoranthene	650	1800	1200	100
Pyrene	670	1500	1200	72
Benzo (a) anthracene	460	1200	1200	64
Chrysene	730	1600	1200	76
Benzo (b) fluoranthene	600	1500	1200	78
Benzo (k) fluoranthene	470	1200	1200	63
Benzo (a) pyrene	460	1300	1200	73
Indeno (1,2,3-cd) pyrene	340	1100	1200	66
Dibenzo (a,h) anthracene	75	870	1200	69
Benzo (ghi) perylene	260	1000	1200	64
SURROGATES RECOVERIES (%)				
2-Fluorophenol		37		
D6-Phenol		49		
D5-Nitrobenzene		45		
2-Fluorobiphenyl		50		
2,4,6-Tribromophenol		70		
D14-Terphenyl		64		

< = less than

AMTEST

Parametrix
Attn: Deb Lester

Date Received: 08/26/98
Date Reported: 09/17/98

Project Name: Middle Waterway

QUALITY CONTROL
POLYNUCLEAR AROMATIC HYDROCARBONS
MATRIX SPIKE DUPLICATES

AM TEST Sample Number
Client ID

98-A011963
MW-A

COMPOUNDS	SAMPLE VALUE (ug/kg)	DUPLICATE VALUE (ug/kg)	RELATIVE PERCENT DIFFERENCE (%)
LPAH			
Naphthalene	610	630	3.2
Acenaphthalene	710	720	1.4
Acenaphthene	750	770	2.6
Fluorene	800	800	0
Phenanthrene	1000	1000	0
Anthracene	820	860	4.8
2-Methylnaphthalene	710	710	0
HPAH			
Fluoranthene	1500	1800	18
Pyrene	1300	1500	14
Benzo(a)anthracene	1300	1200	8.0
Chrysene	1500	1600	6.5
Benzo(b)fluoranthene	1600	1500	6.5
Benzo(k)fluoranthene	1300	1200	8.0
Benzo(a)pyrene	1300	1300	0
Indeno(1,2,3-cd)pyrene	1100	1100	0
Dibenzo(a,h)anthracene	820	870	5.9
Benzo(ghi)perylene	1000	1000	0

AMTEST

Parametrix
Attn: Deb Lester

Date Received: 08/26/98
Date Reported: 09/17/98

Project Name: Middle Waterway

QUALITY CONTROL
GC/MS SEMI-VOLATILES
STANDARD REFERENCE MATERIAL
HS-3

Sample Date: 9/03/98
Date Analyzed: 9/15/98

COMPOUNDS	MEASURED VALUE (ug/kg)	TRUE VALUE (ug/kg)	RECOVERY (%)	LABORATORY CONTROL LIMITS (ug/kg)
Naphthalene	2,100	9,000	23	280 - 4,440
Acenaphthylene	150	300	50	28 - 310
Acenaphthene	1,600	4,500	36	428 - 3,300
Fluorene	3,900	13,300	29	1,040 - 8,050
Phenanthrene	47,000	85,000	55	7,300 - 70,800
Anthracene	2,600	13,400	19	520 - 4,500
Fluoranthene	42,000	60,000	70	6,100 - 59,700
Pyrene	22,000	39,000	56	4,500 - 35,800
Benzo (a) Anthracene	7,600	14,600	52	1,490 - 12,100
Chrysene	8,900	14,100	63	1,700 - 13,400
Benzo (a) Pyrene	3,600	7,400	49	1,600 - 5,600
Benzo (b) Fluoranthene	5,200	7,700	68	2,800 - 10,300
Benzo (k) Fluoranthene	5,300	2,800	189	430 - 7,200
Benzo (ghi) perylene	2,600	5,000	52	960 - 3,900
Dibenzo (a, h) Anthracene	710	1,300	55	240 - 1,200
Indeno (1, 2, 3-cd) Pyrene	3,100	5,400	57	1,040 - 4,020
SURROGATE RECOVERIES (%)				
2-Fluorophenol	45			
D6-Phenol	55			
D5-Nitrobenzene	56			
2-Fluorobiphenyl	62			
2,4,6-Tribromophenol	76			
D14-Terphenyl	76			

AMTEST

Parametrix
Attn: Deb Lester

Date Received: 08/26/98
Date Reported: 09/17/98

Project Name: Middle Waterway

QUALITY CONTROL ANALYSIS DATES

Mercury	8/29/98
Total Solids	9/2/98
Total Volatile Solids	9/2/98
Total Organic Carbon	9/1/98
Acid Volatile Sulfides	8/31/98
Grain Size	9/2/98

MERCURY SAMPLE WEIGHTS

AM TEST SAMPLE NOS.	Weight (grams)
98-A011963	2.98
98-A011964	2.79
98-A011965	3.80
98-A011966	3.87
98-A011967	3.37
98-A011968	2.50
98-A011963 Duplicate	3.05
98-A011964 Spike	3.04
SRM	0.28

AMTEST

Parametrix
Attn: Deb Lester

Date Received: 08/26/98
Date Reported: 09/17/98

Project Name: Middle Waterway

QUALITY CONTROL MERCURY DUPLICATES

COMPOUNDS	98-A011963 (mg/kg)	98-A011963 (mg/kg)	RELATIVE PERCENT DIFFERENCE (%)
Mercury	0.260	0.298	14

MATRIX SPIKES

PARAMETERS	98-A011964 VALUE (mg/kg)	98-A011964+ SPIKE (mg/kg)	SPIKE CONCENTRATION (mg/kg)	RECOVERY (%)
Mercury	0.076	0.247	0.194	88

STANDARD REFERENCE MATERIAL

COMPOUNDS	MEASURED VALUE (mg/kg)	TRUE VALUE (mg/kg)	RECOVERY (%)
Mercury	2.69	3.10	87

BLANKS

RESULTS	
Mercury	< 0.02

AMTEST

Parametrix
Attn: Deb Lester

Date Received: 08/26/98
Date Reported: 09/17/98

Project Name: Middle Waterway

QUALITY CONTROL
CONVENTIONALS
TRIPLICATES

	#1	#2	#3
Total Solids (%)	57.7	57.1	59.1
Total Volatile Solids (%)	6.7	6.5	8.0
Total Organic Carbon (%)	5.0	4.6	4.6
Acid Volatile Sulfides (mg/kg)	210	220	150

CONVENTIONALS
BLANKS

	RESULTS
Total Organic Carbon (%)	< 0.05
Acid Volatile Sulfides (mg/kg)	< 5.0

< less than

AMTEST

Parametrix
Attn: Deb Lester

Date Received: 08/26/98
Date Reported: 09/17/98

Project Name: Middle Waterway

QUALITY CONTROL - CONVENTIONALS GRAIN SIZE TRIPLICATE ANALYSIS

AM TEST Sample Number
Client ID

98-A011963
MW-A

PHI	OPENING (mm)	RETENTION (%)		
		Sample	Duplicate	Triplicate
	4.75	2.4	0.7	2.0
-2	4.0	0.3	0.2	< 0.1
-1	1.7	0.7	1.6	1.2
0	1.0	2.4	3.0	2.5
+1	0.5	15.8	13.1	12.4
+2	.25	19.1	22.9	23.0
+3	.125	13.9	13.1	12.9
+4	.063	3.5	6.0	9.5
+5	.032	7.7	4.9	9.0
+6	.016	13.6	13.7	8.1
+7	.008	6.5	6.1	6.1
+8	.004	4.8	5.2	4.3
+9	.002	1.8	3.2	1.8
+10	.001	0.9	1.7	0.8
PASS	<.001	6.6	4.5	6.4

< = less than

AMTEST

Parametrix
Attn: Deb Lester

Date Received: 08/26/98
Date Reported: 09/17/98

Project Name: Middle Waterway

QUALITY CONTROL - CONVENTIONALS GRAIN SIZE TRIPLICATE ANALYSIS

AM TEST Sample Number
Client ID

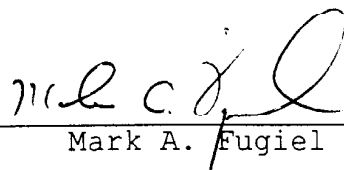
98-A011970
GS#10

PHI	OPENING (mm)	RETENTION (%)		
		Sample	Duplicate	Triplicate
	4.75	3.6	2.2	0.7
-2	4.0	0.0	0.7	0.3
-1	1.7	1.4	1.5	1.8
0	1.0	2.8	2.5	4.7
+1	0.5	12.6	13.2	16.7
+2	.25	23.3	23.7	20.9
+3	.125	12.7	12.3	14.3
+4	.063	9.1	10.1	10.2
+5	.032	19.8	18.3	14.6
+6	.016	2.9	2.6	1.5
+7	.008	2.8	3.6	4.8
+8	.004	3.4	2.4	2.5
+9	.002	1.0	0.9	0.9
+10	.001	0.3	0.4	0.4
PASS	<.001	4.2	5.7	5.8

< = less than

MAF/jb

REPORTED BY


Mark A. Fugiel

96 - 9182

Field Sample / Chain of Custody Record

Parametrix, Inc. · 5808 Lake Washington Blvd. · Kirkland, Washington 98033-7350 · 206-822-8880 · Fax 206-889-8808

Project Name: Middle Waterway Restoration Client: Champion Simpson
 Samplers: Deb Lester Recorder: Deb Lester

Matrix	# of Containers and Preservatives							Sample Number	Date			Analysis Required				
	Water	Tissue	Sediment	Other	Unpreserved	HCl	H2SO4		HNO3	NAOH	NAOH and Zinc Acetate		Other	Month	Day	Year
X												Aug	25	1998	2:30	Please Note: Sample containers have "Aug 24, 1998" as collection date - Samples were actually collected on Aug 25, 1998 GROUND WATER ANALYSIS ↓ GROUND WATER ANALYSIS WAT PAH / TOC / TS / TUS / HG PAH - WAT AUS PAH / TOC / TS / TUS / HG WAT AUS PAH / TOC / TS / TUS / HG WAT AUS PAH / TOC / TS / TUS / HG WAT AUS PAH / TOC / TS / TUS / HG WAT AUS
X												Aug	25	1998	3:30	
X												Aug	25	1998	2:00	
X												Aug	25	1998	1:00	
X												Aug	25	1998	12:00	
X												Aug	25	1998	12:05	
X												Aug	25	1998	2:50	
X												Aug	25	1998	2:50	
X												Aug	25	1998	3:00	
X												Aug	25	1998	3:00	
X												Aug	25	1998	12:55	
X												Aug	25	1998	1:10	
Total Containers: 12																

Chain of Custody Record (Please Print)

Relinquished By: (Name)	Date:	Time:	Received By: (Name)	Date:	Time:
<i>Deb Lester</i>	8/25/98	11:15	<i>John Doe</i>		

Shipping Information

Cooler#: _____
 Airbill #: _____
 _____ of _____ Coolers on this Airbill

Field Sample / Chain of Custody Record

Parametrix, Inc. • 5801 Lake Washington Blvd. • Kirkland, Washington 98033-7350 • 206-822-8880 • Fax 206-889-8808

Project Name: Middle Waterway Restoration Client: Champion / Simpson
 Samplers: Deb Lester Recorder: Deb Lester
 Project Number: 55-1616-09 (02)

Matrix	# of Containers and Preservatives							Sample Number	Date			Analysis Required				
	Water	Tissue	Sediment	Other	Unpreserved	HCl	H2SO4		HNO3	NaOH	NaOH and Zinc		Other	Month	Day	Year
X												Aug	25	1998	11:00	Please Note: Sample containers have "Aug 24, 1998" as collection date - Samples were actually collected on Aug 25, 1998 Grain Size Analysis
X															12:15	
X															12:30	
X															12:00	
X															11:30	
X															1:00	
X															1:30	
X															1:45	
X															3:00	
X															2:45	
X															2:50	
X												Aug	25	1998	3:00	

Total Containers: 12

Chain of Custody Record (Please Print)

Relinquished By: (Name)	Date	Time	Received By: (Name)	Date	Time
<i>Deb Lester</i>	8/25/98	11:15	<i>J. Blane</i>		

Shipping Information
 Code#: _____
 Airbill #: _____
 of _____ Coolers on this Airbill

ANALYTICAL DATA VALIDATION MEMORANDUM

MEMORANDUM

to: Project File October 19, 1998
from: Michael Kluck 55-1616-09 (02)
re: Middle Waterway Shore Restoration - Data Validation Summary

DATA REVIEW SUMMARY

Marine sediment samples were analyzed for polynuclear aromatic hydrocarbons (PAHs), mercury, and conventionals by AmTest Inc. in Redmond, Washington and reported as project number 55-1616-09(02). The analyses conducted and analytical methods used are shown in Table 1.

Table 1. Analyses conducted and methods utilized.

<u>Analysis Conducted</u>	<u>Analytical Method</u>
PAHs	EPA SW3550/8270
Mercury	EPA SW7471
Total solids (TS)	PSEP p.17
Total volatile solids (TVS)	PSEP p.20
Total organic carbon (TOC)	SM 5310B
Acid volatile sulfides (AVS)	DiToro, 1990
Grain size	PSEP p.9

Five surface sediment samples and one field duplicate sample were collected on 8/25/98 and analyzed for the parameters shown in Table 1. An additional ten sediment samples were collected on the same day, but were only analyzed for grain size and TS. Table 2 shows the sample numbers for which data were reviewed.

Table 2. Summary of samples and identification numbers.

Project Sample ID	Laboratory ID	Analyses Performed
MW-A	98-A011963	(see Table 1)
MW-C	98-A011964	(see Table 1)
MC-1	98-A011965	(see Table 1)
MW-1 Duplicate	98-A011966	(see Table 1)
MW-1	98-A011967	(see Table 1)
MW-F	98-A011968	(see Table 1)
GS#8	98-A011969	Grain size, TS
GS#10	98-A011970	Grain size, TS
GS#12	98-A011971	Grain size, TS
GS#13	98-A011972	Grain size, TS
GS#14	98-A011973	Grain size, TS
GS#2	98-A011974	Grain size, TS
GS#1	98-A011975	Grain size, TS
GS#5	98-A011976	Grain size, TS
GS#6	98-A011977	Grain size, TS
GS#7	98-A011978	Grain size, TS

The data validation was performed using the United States Environmental Protection Agency (U.S. EPA) Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (U.S. EPA 1994a,b) for guidance. Data validation included evaluation of the following (as appropriate):

- Holding Times and Sample Preservation
- Laboratory Method Blanks
- Standard Reference Sample (SRM) Recovery
- Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Recoveries
- Matrix Spike Duplicate Relative Percent Difference (RPD)
- Analytical Duplicate and Triplicate Samples
- Field Duplicate Sample RPD

DATA QUALITY SUMMARY

Summarized below is an evaluation of the quality assurance (QA) and quality control (QC) results associated with these sediment samples. Briefly, all laboratory and field QA/QC were within acceptable ranges. The field duplicate samples showed elevated RPDs for TOC, AVS, and mercury, but no validation flags were applied on this basis. Overall, there is no indication that the results for any of the parameters analyzed were significantly biased. No validation flags were applied on the basis of the QA/QC data evaluated.

GENERAL QA/QC

Two general irregularities were noted. First, to achieve lower detection limits, double the typical volume of sediment was extracted for PAH analysis. Two separate 35-gram aliquots were extracted

and the extracts combined prior to cleanup using gel permeation chromatography. Second, one of the grain size distribution plots (for sample AO11966) was missing data points for phi classes below +3. The laboratory sent a revised plot via U.S. mail that was received on October 19, 1998 and added into the original data package.

Holding Times and Blank Review

All samples were collected on August 25, 1998 and were prepared and analyzed within the holding times specified for each method.

Laboratory method blanks can provide information about systematic laboratory contamination due to reagents, glassware, etc. that may generate false positives (i.e., sample detections due to blank contamination). No contamination was detected in the laboratory blanks for these analyses.

Accuracy of Results

The percent recovery of each standard reference material (SRM) provide an indication of the laboratory's ability to measure analytes from marine sediments/sludges certified to contain metals at specified concentrations. The recovery of mercury from SRM CRM007-040 was 87%, within the predicted range. The recovery of PAHs from SRM HS-3 ranged from 19% - 189% of the certified value, but compared to the historical laboratory mean recovery were 79% - 139%. This range of recoveries was found to be acceptable, indicating that sample preparation and analysis procedures were sufficient to accurately quantify mercury and PAHs in a typical sediment/sludge matrix.

Matrix spike recoveries provide an indication of the laboratory's ability to recover spiked analytes from the sample matrix. The mercury MS recovery was 88%, within the acceptable range of 75% - 125%. The PAH MS recoveries ranged from 53% - 87%, and those for the MS duplicate (MSD) ranged from 55% - 100%. All of the MS and MSD recoveries were within the laboratory limits for acceptability. The MS relative percent differences for the PAH samples ranged from 0% - 18%, within the 20% criterion. This indicates sample preparation and analysis procedures were sufficient to accurately quantify these analytes in the actual sample matrix.

In addition, six surrogate and internal standard compounds are added during the preparation of PAH samples to account for possible losses and interferences during sample extraction, cleanup, and analysis. Recoveries of these compounds were within both U.S. EPA and laboratory recovery limits for all field and QC samples, indicating that significant sample losses did not occur and interferences were not identified.

Precision of Results

Relative standard deviations (RSDs) and/or RPDs were calculated for two pairs of QC samples, analytical duplicates/triplicates and field duplicates. The analytical duplicate and triplicate RSDs and RPDs indicate the degree of laboratory precision associated with one actual sample, and tend to provide information about sample homogenization. The field duplicate RPD indicates the degree of laboratory and field precision associated with one actual sample. Field duplicate RPDs tend to show greater variability than the RPDs associated with analytical duplicates and triplicates because they take into account both field and laboratory errors.

The analytical duplicate/triplicate RSDs were 1.8% for TS, 11.5% for TVS, 4.9% for TOC, and 19.6% for AVS. The analytical duplicate RPD for mercury was 14%. All of the analytical duplicate/triplicate results for these parameters were within acceptable ranges (<20%).

The RSDs for each of the different grain size classifications were evaluated, and no significant biases were identified. This indicates that sample homogeneity and sample matrix effects did not significantly affect the precision of the grain size results.

The field duplicate RPDs were 6.6% for TS, 20% for TVS, 45.6% for TOC, 113% for AVS, and 67.3% for mercury. For PAHs, field duplicate RPDs ranged from 0% to 58%, however, none of the results were greater than five times the practical quantitation limit (PQL). These RPDs show that the combined laboratory and field error was generally low, except for TOC, AVS, and mercury. Results for these analyses were not flagged solely on the basis of field duplicate results because the analytical duplicate results were acceptable and field duplicates are prone to greater error (such as differences in percent moisture). Also, EPA does not have promulgated criteria for evaluating field duplicate RPDs.

The RSDs for each of the different grain size classifications were evaluated, and no significant biases were identified. This indicates that field collection inconsistencies did not significantly affect the precision of the grain size results.

U.S. EPA 1994a. U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. Office of Solid Waste and Emergency Response, February 1994, EPA Publication No. 540/R-94-012.

U.S. EPA 1994b. U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. Office of Solid Waste and Emergency Response, February 1994, EPA Publication No. 540/R-94-013.

cc: Deb Lester _____